

Executive Summary

Walk Wilmington- A Comprehensive Pedestrian Plan is a coordinated and strategic effort to develop a safe, accessible and comfortable pedestrian system throughout Wilmington.

This Plan builds on existing assets in the City, including active and engaged City staff, a rich network of sidewalks and trails in many neighborhoods, and a commitment to better accommodating pedestrian travel. It attempts to address challenges that pedestrians face, such as access, connectivity and safety. It strives to improve pedestrian conditions on all roads, including large commercial arterial roads, through specific sidewalk, trail and road crossing recommendations, policy recommendations and changes to the way streets and intersections are designed and built.

VISION AND GOALS

The planning process for this Plan included extensive public participation, including outreach at community events, an online questionnaire and a Steering Committee comprised of local stakeholders. Out of this public process, a vision was articulated stating that *“The City of Wilmington will become a pedestrian-friendly environment, where citizens and visitors have safe and attractive alternatives for walking in and around the city.”* The following goals were established to help the City achieve its vision:



Figure 1 Public Outreach Table- Riverfront Farmers Market

Goal 1: Safety

Residents and visitors of all physical abilities will be able to travel safely on foot along and across the city’s roadways, trails, and sidewalks.

Goal 2: Transportation Choice

Pedestrians, regardless of location, mobility level, age or socioeconomic status, will be able to choose a convenient and comfortable mode of travel to reach their desired destination. Pedestrians will be a strong presence on the streets of Wilmington.

Goal 3: Built Environment, Land Use, and Connectivity

Land uses in Wilmington will provide pedestrians with walkable destinations and the built environment will enhance the pedestrian experience and encourage walking. Adjacent land uses will be connected by pedestrian facilities such as sidewalks and crosswalks so that pedestrians can safely and conveniently make trips on foot.

Goal 4: Education, Awareness and Enforcement

People will have access to educational opportunities to learn about the benefits of walking as well as access to walking resources. Wilmington will raise awareness and enforcement of safe walking and driving practices and pedestrian and motorist rights and responsibilities.

Goal 5: Health

Citizens will be more physically active by walking on a regular basis. Improving their health and reducing their health care costs. Creating more walking opportunities will also improve air quality, which will improve the outdoor environment.



Figure 2 Pedestrian with Stroller in Forest Hills Neighborhood

Goal 6: Economic Development

Tourists will be drawn to Wilmington for its comfortable walking environment.

Among southern coastal cities, Wilmington will stand out because it's walking routes are safe and convenient, as well as aesthetically pleasing.

The *Walk Wilmington: Comprehensive Pedestrian Plan* encourages pedestrian activity by working toward creating a safe and inviting environment for walking. The plan expands upon the foundation created by *Choices: The City of Wilmington Future Land Use Plan 2004-2025*, the *Wilmington Urban Area Metropolitan Planning Organization (WMPO) 2005-2030 Long Range Transportation Plan*, and several other city planning studies and reports.

WHY IS THIS IMPORTANT?

According to the North Carolina Department of Transportation (NCDOT) Division of Bicycle and Pedestrian Transportation, Wilmington is number two in the state for large cities with highest numbers of pedestrian crashes, just behind Asheville and just ahead of Gastonia.¹



Figure 3 Military Cutoff Road at Mayfaire – No pedestrian crossing facilities available.

Cost of Crashes

In addition to the direct impact to the victims and family of a crash involving a pedestrian, it is eye-opening when the cost to the Wilmington economy is examined. The numbers are telling- between 1997 and 2005, the cumulative impact of pedestrian fatalities to the city's economy was \$84 million and the impact of all pedestrian crash types combined was over \$118 million.²

Cost of Wilmington Pedestrian Crashes (1997-2005)

Injury Type	Cumulative Injuries 1997-2005	Cost per Injury ¹	Total
Fatality	20	\$4,200,000	\$ 84,000,000
Disabling event	45	\$240,000	\$ 10,800,000
Evident injury	207	\$71,000	\$ 14,697,000
Possible injury	240	\$35,000	\$ 8,400,000
Property Damage Only	29	\$4,800	\$ 139,200
Totals			\$ 118,036,200

¹ Note: Costs are 2007 estimates. Incidents occurring in earlier years may have different estimated costs.

¹ Source: Table 3. Ten NC cities with highest numbers of pedestrian crashes from 2001-2005, "Pedestrian Crash Facts Summary Report, 2001-2005", NCDOT Division of Bicycle and Pedestrian Transportation, downloaded from: http://www.pedbikeinfo.org/pbcat/pdf/summary_ped_facts5yrs.pdf, July 8, 2008.

² NCDOT Memorandum: 2007 Standardized Crash Cost Estimates for North Carolina. Brian G. Murphy, PE Traffic Safety Project Engineer, September 3, 2008. Obtained from: <http://www.ncdot.org/doh/preconstruct/traffic/Safety/ses/costs/costs.html>, September 6, 2008.

PLAN ELEMENTS

In order to improve conditions for pedestrian safety and comfort, the Plan provides recommendations for 450 miles of sidewalk projects and 182 traffic signal improvements to be installed over the next 20 years. Signal improvements consist primarily of adding pedestrian signalheads to existing traffic signals, although eight new traffic signals are recommended. The plan also recommends that the City pilot test two innovative approaches to improving road crossing safety and comfort for pedestrians and motorists- *pedestrian hybrid signals (HAWK signals)* and *Rapid Flash Beacons*. A significant portion of the proposed recommendations are located along roads owned and maintained by the North Carolina Department of Transportation (NCDOT). Subsequently, collaboration with NCDOT will be critical to implementing several of the proposed improvements.

Short Term (1-5 years): There are 26 miles of high priority sidewalk projects and 90 signal improvement projects that are recommended to be constructed within the next five years. These projects focus primarily on filling in gaps in the sidewalk network and improving road crossings in the downtown area, and improving pedestrian circulation around schools and parks, colleges and universities, and areas near large commercial or multifamily residential development.

Mid Term (5-10 years): Approximately 230 miles of sidewalk projects and 50 signal improvements have been identified for the 5-10 year timeframe. These larger scale projects consist of installing relatively long multi-block segments of new sidewalks and pedestrian signal retrofits. They are largely concentrated along the major arterial and collector roadways outside of downtown Wilmington, such as Market Street, College Road, and Shipyard Boulevard.

Long Term (10-20 years): Approximately 200 miles of long term sidewalk projects and 28 signal improvement recommendations have been identified in the plan. Sidewalk projects are found along some of the smaller collector and local roadways in the suburban part of Wilmington. Long term signal improvement recommendations are distributed throughout the City and consist primarily of adding pedestrian signalheads to existing traffic signals in areas that are anticipated to experience moderate levels of pedestrian activity.

Concurrent with Trail Improvement: A number of signalized road crossing improvements are recommended to be constructed at the same time nearby portions of the Cross-City Trail or other multi-use path improvements are made.

Facility recommendations are shown on the Recommended Sidewalk and Pedestrian Signal Improvements maps on pages 7 through 10.

In addition to the specific facility recommendations, the plan provides an entire chapter on suggestions for modifying City policies relating to zoning code regulations, crosswalk marking, sidewalk installation, pedestrian median refuge islands and other elements that are intended to produce a more hospitable and inviting pedestrian environment. These policy recommendations are supplemented by detailed recommendations for modifications to the city's technical specifications and standards governing road facility design. A series of three case studies illustrating the effects of these recommended policy and design standard changes is included in the plan. These studies focus on the following road intersections:

- Shipyard Boulevard and Carolina Beach Road
- South College Road and New Centre Drive
- Military Cutoff Road and Eastwood Road

The plan also provides a number of programmatic recommendations aimed at encouraging more people to travel as pedestrians, and educating pedestrians, drivers and enforcement personnel about safe behaviors.

FUNDING AND IMPLEMENTATION

Many actions, such as facility construction, will require funding to implement. Other actions, such as improved interagency coordination, are more procedural in nature and will subsequently have minimal fiscal impact. This plan identifies potential sources, such as NCDOT funding programs, developer contributions, the city budget and municipal bonds

The plan closes with 33 discrete implementation recommendations for the Port City to undertake as it strives to make Wilmington a better place for residents and visitors.

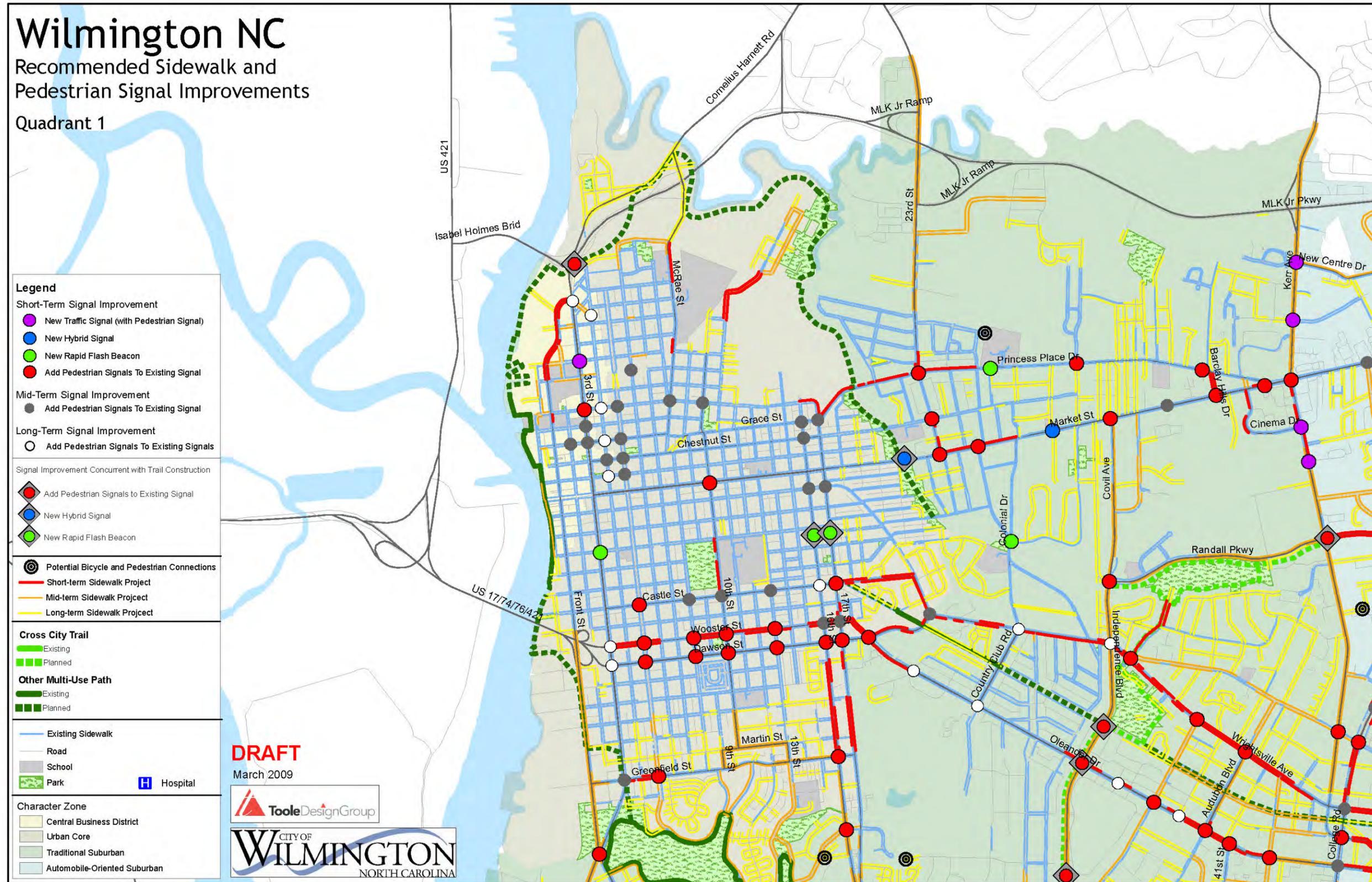


Figure 4 Recommended Pedestrian Facility Improvements - Quadrant 1

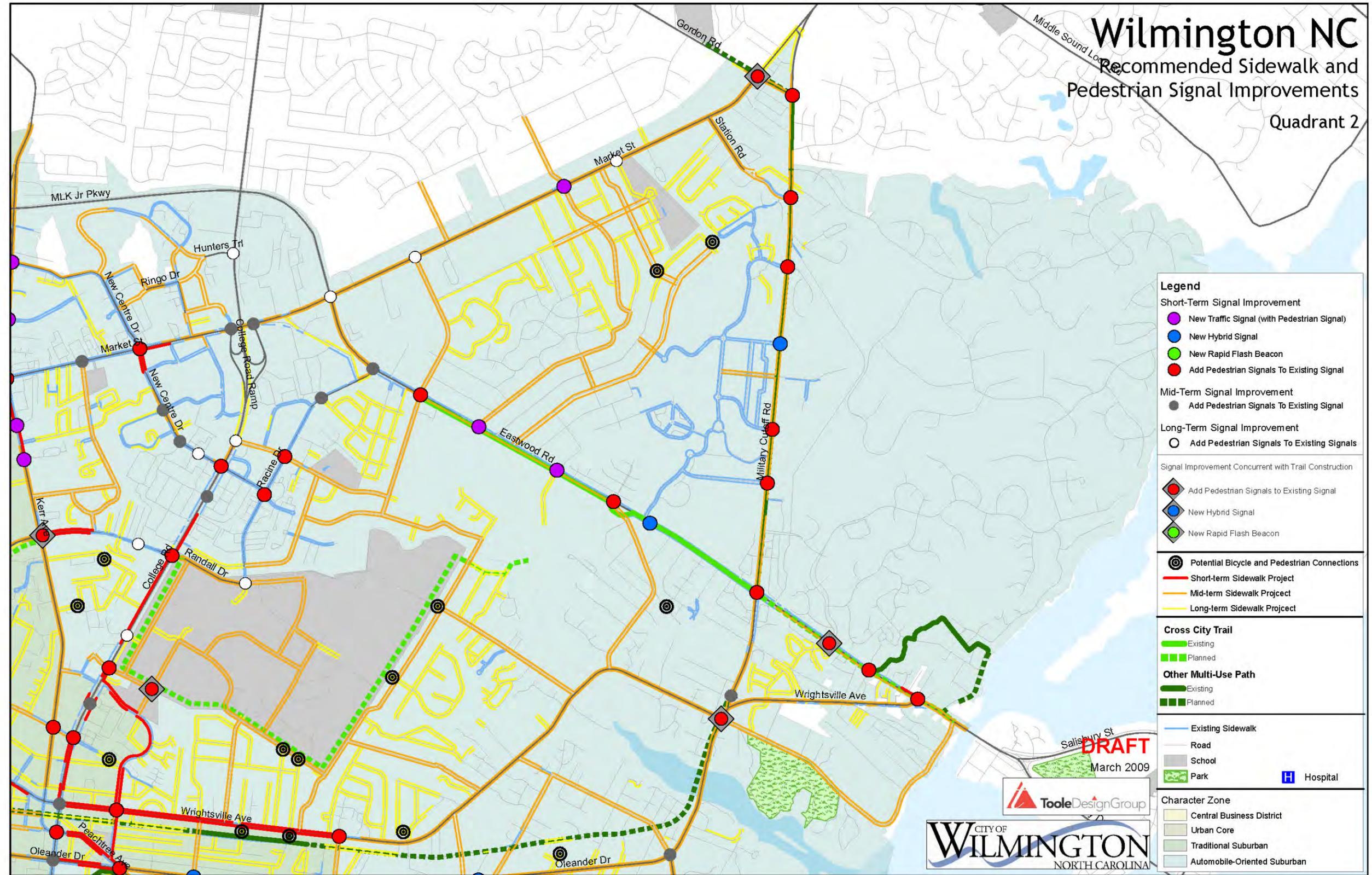


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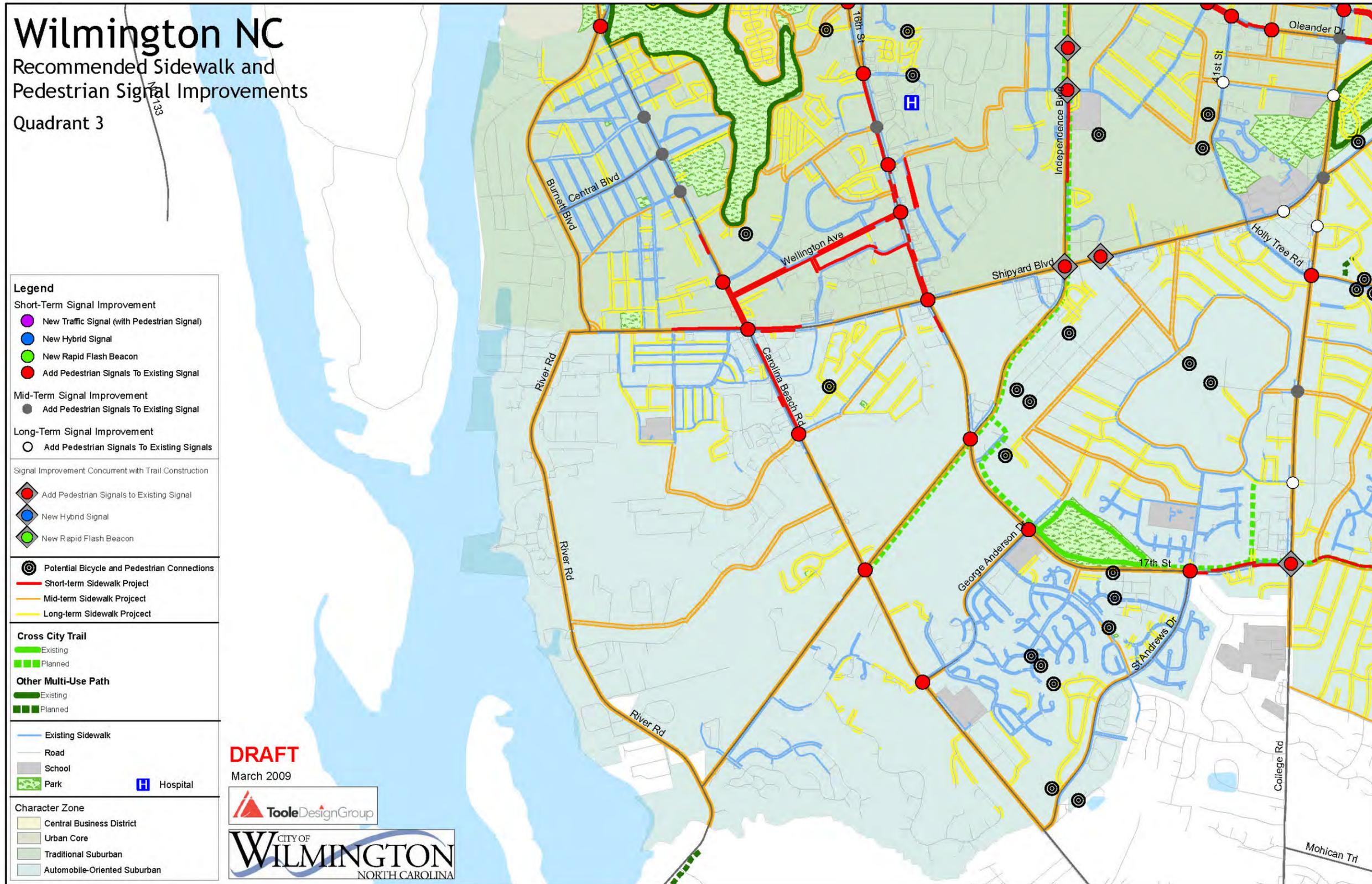


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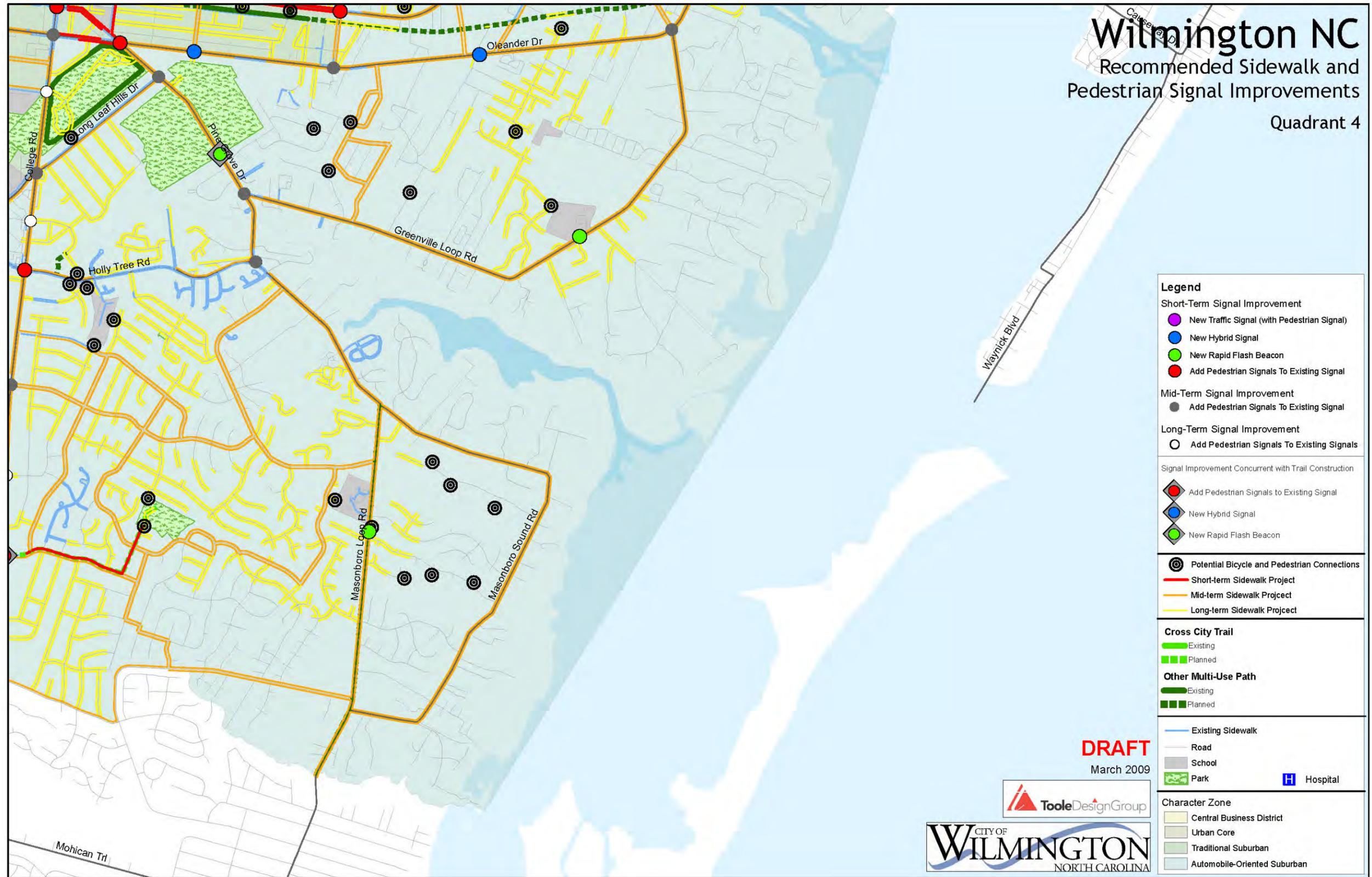


Figure 7 Recommended Pedestrian Facility Improvements - Quadrant 4

Walk Wilmington - A COMPREHENSIVE PEDESTRIAN PLAN



prepared by:



Acknowledgements

This plan was developed by the City of Wilmington with funding from the North Carolina Department of Transportation's Bicycle and Pedestrian Planning Grant Program.

About the NCDOT Bicycle and Pedestrian Planning Grant Program

The NCDOT Division of Bicycle and Pedestrian Transportation (NCDOT - DBPT) and the Transportation Planning Branch (TPB) have created a matching grant program to fund plan development. This program was initiated through a special allocation of funding approved by the North Carolina General Assembly in 2003 along with federal funds earmarked specifically for bicycle and pedestrian planning by the TPB. The planning grant program was launched in January 2004, and it is currently administered through NCDOT-DBPT and the Institute for Transportation Research and Education (ITRE) at NC State University.

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Chapter 1. Introduction

TAKING A WALK IN THE PORT CITY

Going for a stroll along the Riverwalk on a summer evening is a favorite pastime of many Wilmington residents and visitors. This part of the city has been walkable from its founding days in the mid-eighteenth century and has a lively street life year-round. Outside of the historic core of the city, the walking environment changes from a traditional compact grid network of streets with sidewalks to a loosely connected network of neighborhood streets, sidewalks, trails, and informal paths separated by arterial roadways with multiple lanes of traffic in each direction.

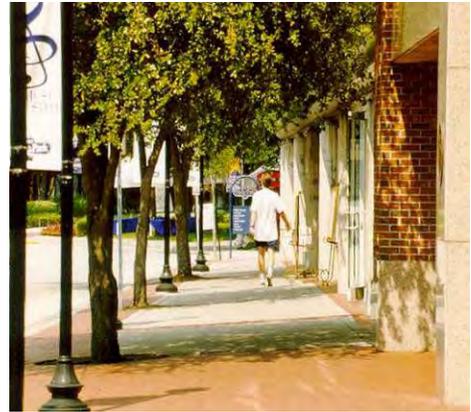


Figure 1 Great Walking Street

The pedestrian experience varies dramatically in different parts of Wilmington. The historic downtown area has a rich system of sidewalks, marked crosswalks, signalized intersections, and other accommodations for walkers. Within residential neighborhoods, there are many areas with low traffic volumes and low vehicle speeds, so walking on the side of road is fairly pleasant. However, along many of the city's major arterials, people must walk along busy roadways, and there are many areas where there are no sidewalks or crosswalks, resulting in a relatively unpleasant pedestrian environment.



Figure 2 Grand Opening of Cross City Trail
Source: WMPO

Wilmington's leaders understand the importance of creating a city where streets, sidewalks and other pedestrian accommodations are designed to make pedestrians feel safe and comfortable. Several initiatives and projects are underway to support pedestrians and bicyclists including the Safe Routes to School program, Neighborhood Traffic Management Program, Cross-City Trail, Military Cutoff Trail, River to the Sea Bikeway improvements, and sidewalk construction program. The



Figure 3 Halyburton Park Trail

Military Cutoff Trail is a popular route for leisure walking and bicycling which connects the neighborhood of Ogden with the Mayfaire development. The Cross-City Trail, which will eventually span over ten miles, will connect key destinations such as Wrightsville Beach, University of North Carolina - Wilmington, McCrary Park, Empie Park, Cameron Art Museum, Halyburton Park and James E. L. Wade Park.

The walking environment is the base from which all residents, employees and visitors experience Wilmington. The city's pedestrian system is vital to everyone, regardless of his or her transportation choice. Everyone who travels in the city is a pedestrian at some point during their journey. This includes walking to and from bus stops and parking facilities.



However, it takes more than sidewalks to ensure an effective and appealing pedestrian transportation system—it requires attention to elements both inside and outside of the right-of-way. These elements can include landscaping, lighting, building design, building orientation, access to transit, and the presence of street crossings.

Wilmington needs to build upon its current strategies for constructing, improving, and maintaining the pedestrian facilities throughout the city. This will help address problems such as gaps in the pedestrian system, inadequate maintenance and repair, and hazardous conditions. A key component to developing a walkable city is effective and sustained public education and involvement. Opportunities for education exist with relation to the laws governing our roads and sidewalks, the availability of city programs for pedestrians, as well as communicating the societal need for transportation choices.



Figure 5 Sidewalk at Castle Street and South Front Street

The *Walk Wilmington: Comprehensive Pedestrian Plan* serves as a framework for the implementation of new city policies, guidelines and design standards that ensure pedestrians are provided an adequate and safe transportation system. The plan also focuses on program development to expand education, encouragement and awareness campaigns and programs, which in turn helps to enhance safety and enforcement initiatives.

The *Walk Wilmington: Comprehensive Pedestrian Plan* encourages pedestrian activity by working toward creating a safe and inviting environment for walking. The plan expands upon the foundation created by *Choices: The City of Wilmington Future Land Use Plan 2004-2025*, the *Wilmington Urban Area Metropolitan Planning Organization (WMPO) 2005-2030 Long Range Transportation Plan*, and several other city planning studies and reports.

BENEFITS OF WALKING

There are many benefits to be gained from walking. These can include the opportunity to use walking as a means of transportation, promoting safer and more vibrant communities and helping to improve a person's health and fitness. As cities across the country grow, walking is becoming an important quality of life component and factor residents consider in choosing where to live. The benefits of walking are summarized below.



Figure 6 Crossing North 3rd Street

Vitality

Walkable cities include vibrant and active streets that promote commercial and social exchange. With approximately 40% of the land area of United States' cities dedicated to transportation, streets and sidewalks are a city's most expansive public space. Sidewalks ideally function as positive places to meet, play, live, work and shop.

Walking provides a range of benefits to the community. Many of the tangible benefits of providing pedestrian facilities include safer and healthier residents, cleaner air, and higher property values. Investing in safe and connected pedestrian facilities achieves multiple objectives and will help to ensure a high quality of life for Wilmington residents as well as visitors.

Equity

For many travelers, driving is not an option. About one-third of all Americans do not drive—they may be too young, too old, or unable to afford a car (2000 US Census). In Wilmington, approximately 12% of households do not own a car at all. The average family has to work for more than six weeks to pay a year's car expenses; while walking is an affordable option (US Census, 1998 median family income figures). Walking is the most broadly accessible form of transportation and recreation, requiring no fare, fuel, or license. For those who cannot use other modes of transportation, the ability to walk safely is essential. For young people, walking affords a sense of independence. For seniors, walking is an effective means to stay active, both physically and socially.

Health

The health benefits of regular physical activity are far-reaching: reduced risk of coronary heart disease, stroke, and other chronic diseases; lower health care costs; and improved quality of life for people of all ages. Walkable cities promote healthy citizens. Health professionals recommend walking as a form of physical activity to help prevent a host of diseases including obesity, heart disease, and some forms of cancer. Research conducted



Figure 7 Walking the Dog

by the US Centers for Disease Control found that "obesity is linked to the nation's number one killer—heart disease, as well as diabetes and other chronic conditions". The report also states that one reason for Americans' sedentary lifestyle is that "walking and cycling have been replaced by automobile travel for all but the shortest distances."¹

Transportation

Increasingly, Americans are considering walking or bicycling as they plan their trips for work, errands, entertainment and other reasons. This may be for health purposes, or it may be a decision based on environmental concerns, convenience, or other factors. Although it is too soon to declare it a trend, there is anecdotal data indicating that rising fuel costs will encourage more people to choose more affordable transportation options such as walking, bicycling or transit. This

"High gas prices have commuters looking for options"
-StarNews headline. June 3, 2008

¹ David B. Allison, PhD; Kevin R. Fontaine, PhD; JoAnn E. Manson, MD, DrPH; June Stevens, PhD; Theodore B. VanItallie, MD, Annual Deaths Attributable to Obesity in the United States ([JAMA, 1999](#)) 1530.-1538.

pattern may likely be accelerated by the current economic situation where more people cannot afford automobiles and the associated costs of insurance and maintenance. Furthermore, in many areas of the country, school systems are requiring more kids to walk because they simply cannot afford to bus them.

According to 2000 US Census data, in Wilmington, almost 3% of all work trips are by foot and a little over 12% of households do not own a car. Figure 8, Car Ownership Rates, illustrates the distribution of relative rates of car ownership around the city with darker colors corresponding to the census tracts where fewer people own cars. The areas with the lowest rates of car ownership are clustered along the river in the areas that generally correspond to the Central Business District Zone and the Urban Core Zone (see Figure 12).

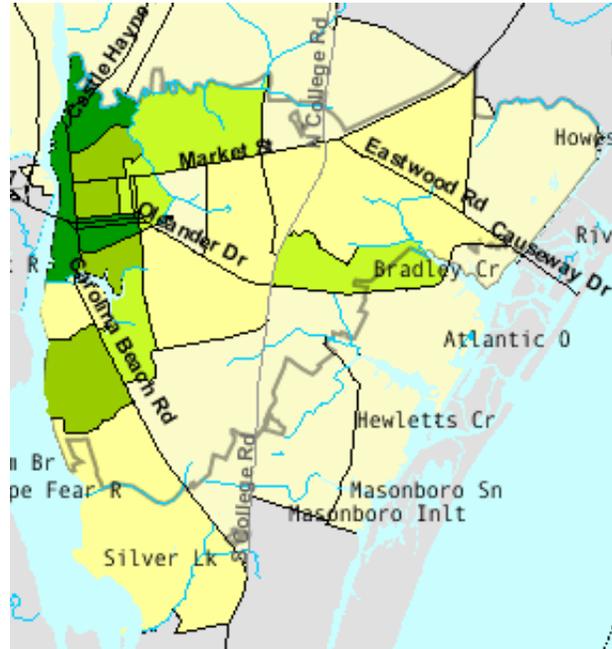


Figure 8 Car Ownership Rates

Source: US Census 2000 data

These are areas where it is more likely that people would need good pedestrian facilities. Whether it is by choice or by necessity, the city's demographics, climate, topography, and land use mix increase the likelihood that more residents may opt for the walking option in the future.

Quality of Life

For Americans, the single-occupant vehicle has dominated the realm of transportation. Land use development across the country, especially for suburban development, has focused on accommodating the vehicle first and all other modes second, or not at all. By prioritizing the car, transportation systems have a tendency to ignore populations that cannot, or do not drive: the young, the elderly, the disabled, others. When transportation projects ignore these populations, they may become isolated.

An inclusionary school of thought that has emerged in response is the universal design paradigm. The main principle behind universal design is to develop facilities that function for all users. For example, sidewalks and curb ramps that work for people in wheelchairs are also excellent for small children, people pushing strollers and other users. Furthermore, enabling

mobility in groups that do not drive themselves not only provides these groups with independence, but it also improves the quality of life for the community as a whole.

Benefits of incorporating universal design can include economic growth, improvement in safety, options and opportunities for exercise, less automobile traffic, and improvement in air quality.

The health and safety benefits are obvious. When people have opportunities to walk to destinations instead of drive, they can more easily meet the US Department of Health and Human Services' recommended minimum of 30-60 minutes of daily exercise.² When people increase their activity level they are proactive in the prevention of obesity-related diseases such as diabetes and heart disease. Additionally, more people out walking on the streets increases community awareness, an important crime prevention tool.



Figure 9 Leaving Winter Park Elementary School

The less apparent benefit is economic growth. Designing central business districts and other commercial areas with a focus on walkability creates benefits for shops, restaurants, and other businesses. When streets are pleasant and accessible by foot, people often stay in the shopping centers longer than if they were designed with an emphasis on motor vehicle circulation. Lodi, California saw a 12% decrease in retail center vacancy rates after making targeted improvements in pedestrian infrastructure and streetscape improvements.³

Taxpayers appreciate alternatives to vehicular transportation because transportation costs are generally lower in walkable communities. This is especially true in the current economy where more people may not be able to afford automobiles, insurance, and fuel. According to data from the U.S. Bureau of Labor Statistics, transportation costs can be reduced by \$600.00 per month if people do not own a car.⁴ This reduction in household expenses can free up money for other spending or investment. Furthermore if the trends of increasing fuel costs continue, more people will be willing to substitute other modes of transportation over the single-occupant vehicle.

² Dietary Guidelines for Americans, 2005. Available online at <http://www.health.gov/DietaryGuidelines/dga2005/document/default.htm>

³ "The Economic Benefits of Walkable Communities," by the Local Government Commission for the California Department of Health Services.

⁴ <ftp://ftp.bls.gov/pub/special.requests/ce/share/2004/age.txt>

BACKGROUND

Wilmington was incorporated in 1739 and officially earned city status in 1866. The city's prominent location on the Atlantic shore has contributed to its success in the railroad and shipping industries. Wilmington has been fortunate to experience steady growth since the nineteenth century, only experiencing setbacks during the Great Depression of the 1930s. Quickly bouncing back with post World War II growth, a state port was established by the North Carolina Legislature. In 1947 higher education established roots in the city when Wilmington College, now the University of North Carolina Wilmington opened for registration. The return of servicemen along with newcomers facilitated the suburban growth outside the downtown core.

Wilmington's early residential development focused mainly near the port and railroad stations. People could accomplish many of their trips by walking. First floor shops were complimented by offices and living areas in the second and third floors. All of the major institutions were located in the downtown. Motor vehicles were accommodated later in the mid to late twentieth century.

Like much of the United States, the City of Wilmington focused on accommodating personal motor vehicles in the late 1950s, as the automobile became available to the middle class. This resulted in a development pattern where uses were isolated keeping residential, industrial and retail establishments separate. Disconnected development patterns combined with a reliance on the automobile have resulted in higher congestion, degraded air quality, and less walking.



Figure 10 Sidewalk Ends at Intersection
South College Road at Oleander Drive

Much of the development constructed from the 1950s through the 1990s provided no sidewalks and few interconnecting streets. Many arterial streets were designed as multi-lane roadways with long spacing between signalized intersections, making it difficult to cross the street safely. Additionally, some of the arterial roadways were originally narrower local roadways that have been widened over time to carry increasing traffic at higher speeds. Sidewalks that were provided were often located at the back of the curb without buffers, creating an unpleasant

walking environment. This has resulted in hundreds of miles of suburban and semi-rural roads with no sidewalks and little opportunity to travel as a pedestrian.

Development in the city can be categorized into four character zones that radiate eastward starting with the *Central Business District Zone* shown in yellow, located on Cape Fear River (see Figure 11). The *Urban Core Zone*, shown in tan, includes the gridiron blocks of the downtown and coincides roughly with the 1945 corporate limits. Further to the east are the streetcar and post-WWII suburbs, within the *Traditional Suburban Zone*, shown in green. The furthest ring from the downtown is classified as the *Automobile-Oriented Suburban Zone*, shown in blue, and is characterized by low-density suburbs. Much of the land in the *Automobile-Oriented Suburban Zone* was annexed from New Hanover County by Wilmington within the last 20 years. The county has historically had fewer requirements for pedestrian accommodations so most roadways in older areas do not have sidewalks or street crossings. Tying together all four zones are several major state-maintained arterial roadways. Wilmington is unique among cities its size in that, with the exception of portions of the Martin Luther King, Jr. Parkway (US Highway 74), there are no freeways within the city limits. Please see Chapter 3 for a more detailed discussion of pedestrian facilities in the four character zones.

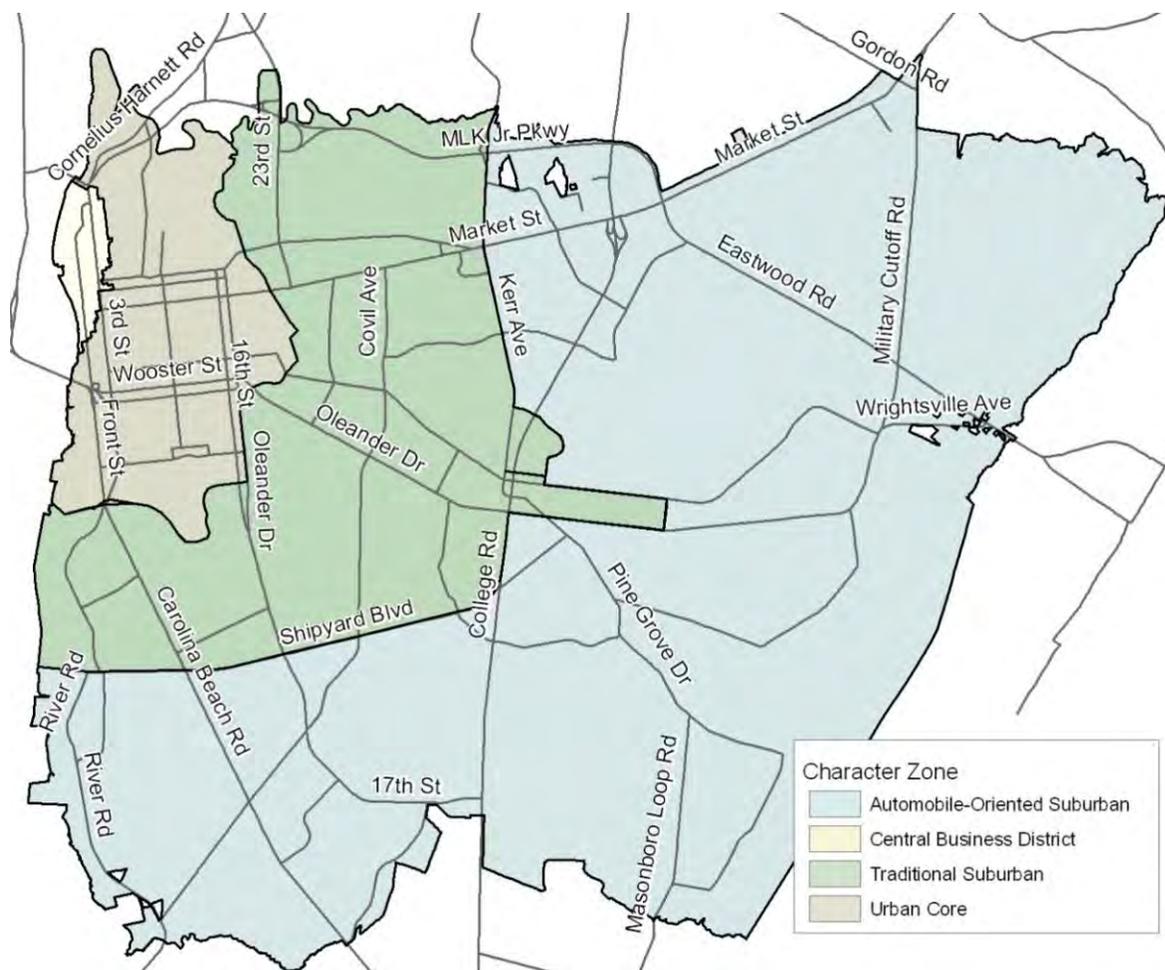


Figure 11 Wilmington Character Zones

Today, the City of Wilmington is a dynamic city of over 100,000 residents⁵. According to the US Census 2000, in 1999 Wilmington's median age was 34.1 years, which is slightly younger than the national median age of 35.3. However, 15.3% of the total population was 65 years old and over. Additionally, 15.1% of the total population had disability status compared to 12.4% nationally. In 1999 the median household income in Wilmington was \$31,099 per year and 13.3% of Wilmington's families had annual incomes below the poverty level. These three groups often use non-motorized transportation and/or mass transit. Subsequently, the quality and extents of the pedestrian network are important to providing mobility for these residents. Results of the online survey indicated that 37.7% of respondents frequently (three or more times a week) chose to walk for their errands.

⁵ Wilmington Metropolitan Planning Organization, 2008

The populations that are most affected by walking conditions are children and seniors. These individuals are generally unable to drive and are often dependent on others for long trips. Because of this, they can be isolated if they live in areas where even short trips are not walkable due to lack of sidewalks or safe routes to bus stops. For children this is especially problematic for trips to school. In the morning rush hour, schools are crowded with buses and cars driven by parents dropping their children off at school. This congestion reduces air quality when engines are idling and waiting to enter and exit parking lots. Many of the students live within walking distance of schools (walking distance ranges from 0.25 to 0.5 mile) but do not walk to school. There are a variety of reasons, including:



Figure 12 Winter Park Elementary at McMillan Avenue

- No safe routes to school
- Parents unaware of safe routes to school
- Parents uncomfortable letting their children walk unsupervised

Schools are also destinations for adults. Two institutions for higher education are located within the City of Wilmington: the University of North Carolina - Wilmington (UNCW) and Cape Fear Community College (CFCC). The main campus of CFCC is located in the *Central Business District Zone* and is a popular walking destination. UNCW is located further east of the downtown, within the *Automobile-Oriented Suburban Zone*. Because this campus is flanked by high-volume arterials, primary access is by private vehicle and shuttle bus, although a significant number of students were observed walking to and from school. Safe walking routes to and from these destinations are a critical element of this plan.

A similar destination is the New Hanover Regional Medical Center located on South 17th Street south of downtown. The hospital, and associated medical facilities in the immediate region provide medical care for many of the city's residents, and several patients and employees travel to and from these facilities by bus and/or on foot. Additionally, many of the patients are seniors or use assistive devices for traveling and are therefore more impacted by the quality and accessibility of the pedestrian system. Leading pedestrian interval signals, countdown timers, median refuge islands and other recommendations included in Chapter 4, Policies, Codes and Ordinances will enhance the safety and comfort of these groups.

The city's Parks and Urban Forestry Division is responsible for the maintenance of over 500 acres of public parks and landscaped areas. This will make the process for constructing and improving trails within the parks, as well as connecting the parks to the surrounding areas and neighborhoods, relatively easy, as there is only one level of government involved. The city's Streets Division is responsible for the construction and maintenance of all city-owned streets and all public sidewalks within the city limits. These two city departments have a critical role in maintaining or improving the quality of the existing pedestrian network and implementing the facility and policy recommendations included in this plan.



Figure 13 Greenfield Lake Trail

Most major arterials within the city are maintained and managed by the North Carolina Department of Transportation (NCDOT). These roads include US Highways 17 Business, 74, 76, 117, 421 and NC 132 and 133. Several

PLAN OUTLINE

Chapter 2 articulates Wilmington's vision, goals, and objectives related to pedestrians and provides an overview of the scope of work and public involvement process for the plan. Chapter 3 describes the existing pedestrian system, identifying key barriers to walking in Wilmington. Chapter 4 critiques existing pedestrian-related policies, codes and ordinances to ensure they support pedestrian travel. This chapter focuses on updating development ordinances to require the inclusion of pedestrian facilities in private residential and commercial development. Chapter 5 reviews existing pedestrian design standards and guidelines, and is supplemented with best practice design standards for pedestrian facilities. Chapter 6 identifies priority areas for pedestrian improvements. Chapter 7 addresses programs that support and encourage walking in Wilmington. Chapter 8 describes the process for constructing and maintaining pedestrian facilities and includes a chart of agencies/organizations and their realm of responsibility. This chapter also identifies current and potential funding sources and an implementation plan that names responsible parties and a general timeframe for implementation.

The technical appendix contains a variety of supplementary information: policy background, cost estimates, questionnaires and survey results. Most importantly, the Appendix contains design policy 'cut sheets' or white papers on key topics related to pedestrian accommodations.

Chapter 2. Vision and Plan Development

The City of Wilmington is committed to implementing safe and accessible pedestrian facilities, encouraging pedestrian-oriented site development patterns, implementing educational and encouragement programs to make residents aware of the importance of pedestrian safety and walking. The city recognizes the value of walking as a viable means of transportation, and for promoting environmental sustainability and the commercial vitality of downtown and neighborhood districts.

By 2030, the Wilmington metropolitan area population is expected to grow to 405,300. Quality of life issues, such as walkability, are critical to making this city a desirable place to live, work and recreate.

FORMULATION OF A PEDESTRIAN VISION AND GOALS/OBJECTIVES

Wilmington's commitment to pedestrians is growing. In April of 2007, the WMPO BikePed Committee was formed to advise the WMPO Transportation Advisory Committee on issues regarding pedestrian programs, projects policies and safety. Members consist of city, and NCDOT staff, as well as appointees from various governmental agencies within the WMPO. It is this committee's efforts and labors that earned the NCDOT grant for this plan. Furthermore, this committee is responsible for the overall concept of the plan.

The Transportation Advisory Committee and Wilmington City Council accepted the WMPO BikePed Committee's recommendation to pursue a pedestrian plan and appointed key players to the plan's Steering Committee. The purpose of the Steering Committee is to establish a cohesive vision and participate actively in the steering of the plan.

WILMINGTON PEDESTRIAN VISION

The City of Wilmington will become a pedestrian-friendly environment, where citizens and visitors have safe and attractive alternatives for walking in and around the city.

GOALS

The following goals were established to reach the pedestrian vision:

Goal 1: Safety

Residents and visitors of all physical abilities will be able to travel safely on foot along and across the city's roadways, trails, and sidewalks.

Goal 2: Transportation Choice

Pedestrians, regardless of location, mobility level, age or socioeconomic status, will be able to choose a convenient and comfortable mode of travel to reach their desired destination. Pedestrians will be a strong presence on the streets of Wilmington.

Goal 3: Built Environment, Land Use, and Connectivity

Land uses in Wilmington will provide pedestrians with walkable destinations and the built environment will enhance the pedestrian experience and encourage walking. Adjacent land uses will be connected by pedestrian facilities such as sidewalks and crosswalks so that pedestrians can safely and conveniently make trips on foot.

Goal 4: Education, Awareness and Enforcement

People will have access to educational opportunities to learn about the benefits of walking as well as access to walking resources. Wilmington will raise awareness and enforcement of safe walking and driving practices and pedestrian and motorist rights and responsibilities.

Goal 5: Health

Citizens will be more physically active by walking on a regular basis. Improving their health and reducing their health care costs. Creating more walking opportunities will also improve air quality, which will improve the outdoor environment.

Goal 6: Economic Development

Tourists will be drawn to Wilmington for its comfortable walking environment. Among southern coastal cities, Wilmington will stand out because it's walking routes are safe and convenient, as well as aesthetically pleasing.

OBJECTIVES AND POLICIES

Objectives and policies were developed for each goal to provide further direction for meeting the city's pedestrian goals and vision. Chapter 8, Implementation and Funding, describes the specific actions to achieve these goals and objectives.

Goal 1: Safety

Citizens of and visitors to Wilmington will be able to travel safely on foot along and across the city's roadways trails, and sidewalks. The Steering Committee specifically noted that children should have safe routes for walking to school.

Objective 1.1

All transportation projects should incorporate complete streets design elements. "Complete streets" are roadways designed and operated to enable safe, attractive, and comfortable access and travel for all users. Pedestrians, bicyclists, motorists and public transport users of all ages and abilities are able to safely and comfortably move along and across a complete street. All new traffic signals should include pedestrian signal heads and marked crosswalks.

Objective 1.2

The city will develop countermeasures to reduce the number of pedestrian crashes at identified locations. This will include using traffic calming as a tool to increase pedestrian safety and comfort.

Objective 1.3

The city will install three or more new signalized pedestrian crossings per year. (about \$150,000/year in 2008 dollars)

Objective 1.4

The city will conduct education and enforcement campaigns and will design streets to reduce motor vehicle speeds and increase safe driving and walking behaviors.

Objective 1.5

The city will encourage schools to apply for Safe Routes to School Grants and also to participate in other Safe Routes to School programs and events.

Objective 1.6

Provide greater awareness of pedestrian laws, rights and responsibilities to affected groups, including but not limited to law enforcement, court officials, and the general public.

Objective 1.7

Provide a higher level of enforcement to increase pedestrian safety.

Goal 2: Transportation Choice

Pedestrians regardless of location, mobility level, age or socioeconomic status will be able to choose a convenient and comfortable mode of travel to reach their desired destination. Pedestrians will be a strong presence on the streets of Wilmington.

Objective 2.1

The city will construct two miles (10,560 feet) of new sidewalk per year. (about \$422,000 in 2008 dollars)

Objective 2.2

The city will develop strategies and design solutions to overcome barriers to pedestrian travel in Wilmington, such as arterials, bridges and missing linkages.

Objective 2.3

Streets in Wilmington will be designed as multi-modal facilities, providing access to destinations by motor vehicle, on foot, by bicycle and by transit.

Objective 2.4

The city will increase the provision of off-road pedestrian paths and improve connectivity to existing paths and greenways.

Objective 2.5

The city will ensure that pedestrian facilities are maintained and repaired and are accessible for all users. This includes requiring property owners to maintain vegetation adjacent to sidewalks on a regular basis.

Goal 3: Built Environment, Land Use and Connectivity

Land uses in Wilmington will provide pedestrians with walkable destinations and the built environment will enhance the pedestrian experience and encourage walking. Adjacent land uses will be connected by pedestrian facilities such as sidewalks and crosswalks so that pedestrians can safely and conveniently make trips on foot.

Objective 3.1

Modify the city's codes, policies and ordinances to include requirements ensuring that new development is scaled and oriented to pedestrian travel, and that logical connections are provided internally and externally for pedestrians and bicyclists.

Goal 4: Education, Awareness and Encouragement

People will have access to educational opportunities to learn about the benefits of walking as well as access to walking resources. Wilmington will raise awareness and enforcement of safe walking and driving practices and pedestrian and motorist rights and responsibilities.

Objective 4.1

The city will encourage more citizens to travel as pedestrians for all types of trips, including work, errands, exercise and recreation.

Objective 4.1

The city will increase citizen participation in educational and encouragement programs and promotions.

Objective 4.2

The city will increase awareness and understanding of pedestrian laws, rights and responsibilities by affected groups, including but not limited to law enforcement, court officials, and the general public.

Objective 4.3

The city will conduct education and enforcement campaigns to increase safe driving and walking behaviors.

Objective 4.4

The city will encourage more students to walk to school and other destinations, either alone or with a parent or caregiver.

Objective 4.5

The city will encourage schools to apply for Safe Routes to School grants and also to participate in other Safe Routes to School programs and other events.



Figure 14 Mobile Speed Trailer

Goal 5: Health

Citizens will be more physically active by walking on a regular basis. Improving their health and reducing their health care costs. Creating more walking opportunities will also improve air quality, which will improve the outdoor environment.

Objective 5.1

Increase awareness of the recommended levels of daily physical activity and the health benefits of walking.

Goal 6: Economic Development

Walkable streets will become attractive destinations for residents and visitors. Increased pedestrian activity will promote private investment in retail, commercial and residential development. Wilmington will partner with local organizations on streetscape enhancement projects to create streets that are aesthetically pleasing, safe and convenient.

Objective 6.1

New streets in the *Central Business District Zone* and *Urban Core Zone* will incorporate pedestrian lighting along with vehicular lighting.

Objective 6.2

Existing corridors and thoroughfares will be retrofitted with pedestrian lighting.

Objective 6.3

Wilmington will continue to support the missions of *Wilmington Downtown, Inc.*, as it aims to revitalize the historic downtown.

Objective 6.4

Encourage the inclusion of amenities, plantings and art in pedestrian improvement projects.

Objective 6.5

The city will produce brochures and other materials to be distributed at events in order to encourage walking and to provide information about Transportation Demand Management services.

Objective 6.6

The city will work with the Wilmington Tree Commission to ensure that trees are included in the pedestrian environment while maintaining the pedestrian path of travel.

PLANNING CONTEXT

Wilmington's commitment to pedestrian planning is demonstrated in the city's comprehensive plan, *Choices: The City of Wilmington Future Land Use Plan 2004-2025*. Many of the priorities identified in the *Choices* plan are formalized in the adoption of the *Wilmington Urban Area Metropolitan Planning Organization 2005-2030 Long-Range Transportation Plan*. The decision to draft this pedestrian plan is a direct result of the goals and priorities originally identified by the community when the future land use plan was developed. This section highlights key pedestrian related components of the following plans:

- *Choices: The City of Wilmington Future Land Use Plan*
- *WMPO 2005-2030 Long Range Transportation Plan*
- *Wilmington Vision 2020: A Downtown Waterfront Plan*
- *Cape Fear Historic Byway Corridor Management Plan*
- *Dawson and Wooster Corridor Plan*
- *US 17 Business (Market Street) Corridor Study 2007*
- *Market Street Corridor Study 2009*
- *Joint Safe Routes to School Workshop*

The following section provides a general overview of each of these plans, and a detailed discussion, including identification of specific pedestrian-supportive elements is included in the Appendix.

Choices: The City of Wilmington Future Land Use Plan 2004-2025

The Future Land Use Plan establishes a vision for the city's landscape. The plan guides how the city's character and sense of place will evolve. Throughout the document are several strategies identified that relate to improving the pedestrian environment. The strategies identified were found in the following categories: *infill development, environmental resources, neighborhoods, public spaces, transportation, and sidewalk level of service*. Incorporating pedestrian-friendly and pedestrian-focused strategies in various sections demonstrates the comprehensive approach that the city has taken to improving the pedestrian network.

Additionally, the City of Wilmington Future Land Use Plan 2005 Progress Report relates a relevant finding drawn from public outreach conducted as part of the report development—"Although the city has developed to support cars as a main mode of transportation, there is a poor network of sidewalks for pedestrians, particularly in the recently annexed areas."

WMPO 2005-2030 Long Range Transportation Plan (LRTP)

The LRTP provides a foundation for all future transportation planning efforts, including pedestrian and bicycle facilities. This pedestrian plan aims to further develop and implement the pedestrian-oriented vision and goals established by the pedestrian element of the LRTP.

A specific example of this commitment is shown in the vision statement of the LRTP:

“To develop and maintain a safe place to live, work, raise a family and retire. The region will be known for its historic character and culture, a vibrant metropolitan urban area that promotes its water fronts, protects its environmental assets, recognizes the importance of its many neighborhoods, provides convenient travel choices for access to amenities throughout the Wilmington Metropolitan Area including well-integrated, connected public transportation, pedestrian, and bicycle networks and freight movement.”

The LRTP also identifies corridors and mixed-use transit oriented centers that should be retrofitted to better accommodate pedestrians. They include:

- Independence Boulevard
- Oleander Drive
- North and South Kerr Avenue

Wilmington Vision 2020: A Downtown Waterfront Plan

Vision 2020 seeks to strengthen and enhance the connections between downtown Wilmington and its historic waterfront. Currently, surface parking lots, a parking garage, a large hotel and other uses separate the restaurants, stores and clubs along Front Street from the Cape Fear River waterfront. Although there is the Riverwalk along the water, it is not as heavily used as it could be if the pathways to the waterfront were improved. *Vision 2020* contains a number of specific strategies and actions for improving these connections.

Cape Fear Historic Byway Corridor Management Plan

The corridor management plan contains several recommendations for improving the streetscape and visitor experience along the corridor, including installing street trees and plantings, street furniture, and landscaped medians.



Figure 15 Official Route of the Cape Fear Historic Byway
Source: *Cape Fear Historic Byway Management Plan*

Dawson and Wooster Corridor Plan

Dawson Street and Wooster Street are a parallel pair of one-way streets south of the city's central business district. Together, these streets comprise a heavily traveled segment of US 76 connecting Wilmington to Brunswick County. The plan presents a number of recommendations for improving the safety and comfort of pedestrians, bicyclists and motorists along the corridor.



Figure 16 Dawson and Wooster Plan Study Area

US 17 (Market Street) Business Corridor Study (2007)

The 2007 Market Street study focuses on the corridor between 3rd Street and Covil Avenue. The general purpose of the project was to evaluate this section of Market Street for opportunities to improve the streetscape, control heavy vehicle traffic, and improve corridor operation and safety for both motorists and pedestrians.

Market Street Corridor Study (2009)

The WMPO is currently developing a corridor plan for Market Street from Colonial Drive to the Pender County line. The project is focused on improving safety and mobility along the corridor for motorists, pedestrians, and other users. Recommendations will address access management, design standards, and conceptual designs. The plan is anticipated to be completed in February, 2009.

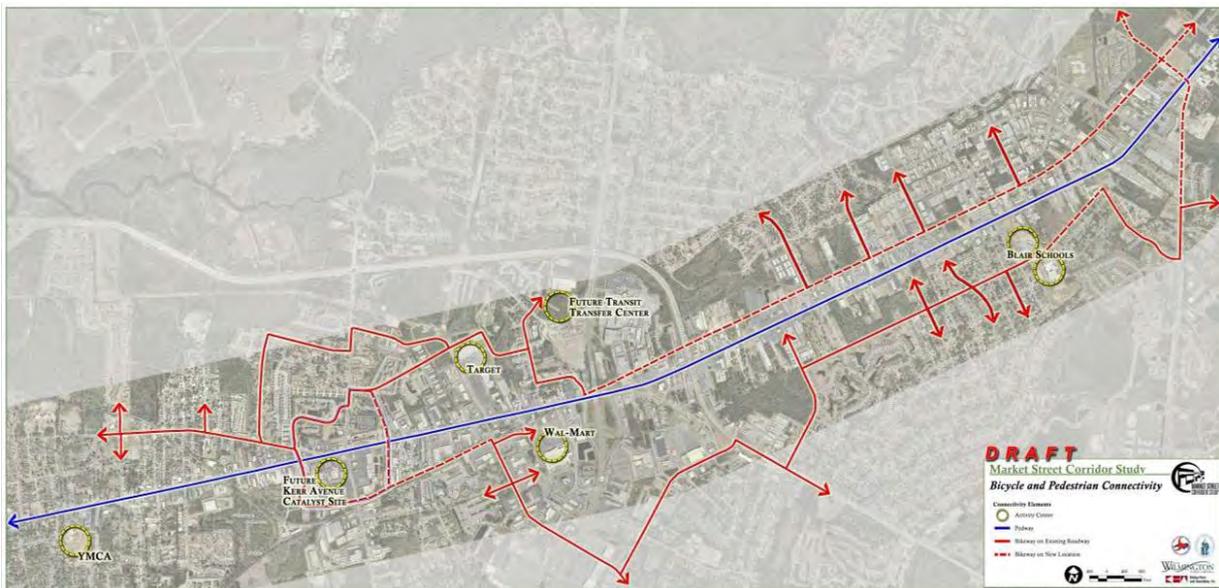


Figure 17 Market Street Corridor Study Bicycle and Pedestrian Connectivity Map

Source: Map developed by Kimley-Horn and Associates for WMPO

Joint Safe Routes to School Workshop for Bradley Creek, Holly Tree and Parsley Elementary Schools

In September, 2007, the city hosted a Safe Routes to Schools workshop for three elementary schools. This meeting marked the beginning of the Safe Routes to Schools program in Wilmington.

A report was generated after the workshop that identifies a series of specific recommendations for improving pedestrian and bicyclist comfort and safety along routes leading to each of the schools. Suggested improvements include new sidewalks, crosswalks, traffic signals, and other accommodations.



Figure 18 Holly Tree Safe Routes to School Recommendations

Other Related Planning Efforts

The city has studied pedestrian issues in other documents, such as the parks and recreation master plan, several corridor plans, small area plans and other transportation and land use studies.

SCOPE OF WORK AND PLANNING PROCESS

The project scope includes an examination of the existing pedestrian facilities in Wilmington, identification of key destinations, needed connectivity between destinations, regional or state routes, and barriers to walking. The scope also includes a review of existing policies, guidelines and ordinances to ensure they support pedestrian-friendly facilities and meet the transportation needs of all citizens. It should be noted that this plan does not include an exhaustive list of every pedestrian facility needed in Wilmington. Rather it provides the policy direction and design guidance to ensure that the city can use a rigorous approach to improving pedestrian accommodations in the future.



Figure 19 Stakeholder Walking Tour- May 11, 2008

To guide the planning process, the city assembled the plan Steering Committee to guide the development of the plan. The members are listed below:

Lawless Bean	Cape Fear Breeze
Brian Chambers	City of Wilmington Long Range Planning
Joe Chance	NCDOT Division 3
Tina D'Amico-Poole	New Hanover Health Network
Ilse Henagan	Coalition of Neighborhood Associations
Johnnie Henagan	Sunset Park Neighborhood Association
Nina Johnston	City of Wilmington Public Services
Ricky Meeks	Resident
Ken Nance	New Hanover County Public Schools
Chris O'Keefe	New Hanover County Planning
Lt. Ed Pigford	City of Wilmington Police
Jackson Provost	NCDOT Division 3
Jeff Sanchez	Centro Latino
Nolan Smith	WMPO BikePed Committee
Andrea Talley	City of Wilmington Community Services
John Vine-Hodge	NCDOT Division of Bicycle & Pedestrian Transportation
Misty Watkins	City of Wilmington Development Review

This group convened meetings throughout the plan's development. Every time that the committee has met, the group has taken a walking tour of the immediate environment to better understand the pedestrian environment in various parts of the city. During these walking tours, committee members were asked to identify and record both positive and negative experiences and assess the functionality and comfort of the pedestrian accommodations.

During the Steering Committee's February 2008 kick-off meeting, the overall vision, and goals for the city were discussed and recorded. Additionally, the goals for development of the Plan itself were discussed.

Goals for development of the Pedestrian Plan:

- 1. Answer the question "What's the benefit to me?" In doing so, the plan should explore the issues confronting pedestrians in Wilmington and provide recommendations for improving these challenges.*
- 2. Provide a comprehensive overview of the pedestrian transportation system, including facilities, priorities and opportunities.*

3. *Provide recommendations and implementation strategies to address Wilmington's diverse walking population, which includes the elderly, children, immigrants and tourists, and those with impairments.*
4. *Provide realistic and achievable recommendations that are within budgets. Furthermore, the plan should identify highly visible improvements that can be undertaken quickly with maximum cost benefit.*
5. *Assess interconnectivity of neighborhoods and developments and focus on connecting existing sidewalks in key locations.*
6. *Provide and describe processes for prioritizing pedestrian facility projects and provide maps showing locations of projects.*

Field Analysis

Field analysis was a major component of this plan. The consultant team carried out reconnaissance surveys for zones of the city: *central business district zone, urban core zone, traditional suburban zone, and the automobile-oriented suburban zone.* The intent of these surveys was not to develop an exhaustive list of every deficiency, large and small, within the city. Rather, the focus was on understanding general conditions and the character of the pedestrian environment in various parts of the city. During these field surveys, consultant staff examined elements affecting the pedestrian experience such as:

- sidewalk design and placement,
- curb ramp design,
- driveway access design,
- intersection design and configuration,
- pedestrian crossing accommodations,
- lane widths and number of lanes,
- speed limits and traffic speed,
- roadway character, and
- development character.



Figure 20 Pedestrian Crossing North 3rd Street Narrowly Missed by Car

Through this fieldwork, the project team developed an exhaustive photo library of pedestrian conditions throughout the city.

Stakeholder Interviews

Early in the plan development process, a series of interviews was conducted with staff in various city departments. Representatives from WAVE Transit and the New Hanover County Public Schools were also interviewed. Representatives from the North Carolina Department of Transportation Bicycle and Pedestrian Transportation Division as well as staff from the local NCDOT Division 3 were also interviewed during plan development. Findings from these interviews are included in the Appendix.

Interview Highlights

- ***Planning Division, Development Services Department***
Do current codes/ordinances/standards support pedestrian-oriented design/development? What are the loopholes? What are the shortcomings?
The existing built environment does not support pedestrian travel. We require, but then waive connections in new and re-development. And, some requirements are contradictory, such as buffers around commercial development which limit pedestrian access and don't add to a pedestrian-friendly environment.
- ***Traffic Engineering Division, Development Services Department***
What do you want from the plan?
A change in policy from the state. Currently, the city needs NCDOT approval to put pedestrian facilities on state-maintained roads. Most state roads are rural with low volumes and NCDOT policies are geared towards these, not roads in a city such as Wilmington.
- ***Parks, Recreation and Downtown Services Division, Community Services Department***
What are the things that have a negative impact on walkability?
 - Not enough pedestrian signals at crosswalks.
 - The city is bisected by major roads that are barriers, e.g., Carolina Beach Road between Shipyard Boulevard and Burnett Boulevard – 45 mph with some sidewalks, but mostly dirt paths.
 - Need to complete missing sidewalks.
 - Need mid-block crossing at neighborhood streets where the Cross-City Trail is planned.
- ***WAVE Transit***
In general, how accessible are bus stops?
 - Over 50% of the stops do not have sidewalks.
 - WAVE does work pro-actively with the city to install sidewalks, but WAVE has no authority or funding to install better access to bus stops.

- ***New Hanover County Public Schools***

In general, how accessible are New Hanover County Public Schools for kids walking or biking to school?

- Sidewalk access to schools is limited.
- Most kids take the bus to school or are driven to school.
- Very few walk or bike to school.
- Riding the bus is preferable to being driven.

Public Outreach

Plan development also included public outreach to ensure that the needs of the city's diverse populations were understood and addressed.

Two surveys were developed to gather information about citizen habits, preferences and priorities related to walking. The first survey was made available online during the spring of 2008. A hard copy questionnaire was distributed during popular public events: a



Figure 21 Public Outreach Table- Riverfront Farmers Market

Downtown at Sundown concert, the *Juneteenth Festival* and at the *Riverfront*

Farmers' Market. The online survey produced almost 250 results. Staff received almost 140 responses to the hardcopy questionnaire. During the in-person public outreach, the public was encouraged to provide written (or drawn) input on hard copy maps that were available at the event. Project staff and the consultant team assisted respondents and elicited a wide range of comments, ranging from suggestions for improvements at a discrete location (e.g. repair to existing sidewalks) to requests for new facilities along stretches of roadway (e.g. South College Road).

The Results from the two surveys are summarized below. The full survey report is found in the Appendix. While these surveys are not statistically significant because the responding audience is somewhat self-selected, they do provide a valuable representation of the communities' challenges, goals, and desires.

As evidenced in the survey results, the respondents support and understand the importance of improving walking conditions throughout the city. The respondents realize that walking provides transportation options, health benefits, opportunity for social interaction and an improved quality of life.

Online Survey Highlights:

- The survey was online during the spring of 2008 and was publicized by *Wilmington Star News*, as well as WMPO and city websites.
- The survey had a total of 12 questions; all of which were made available in both English and Spanish.

- 247 persons responded and 85 provided additional comments in an open format

Survey Results

- 99%** Respondents answered that they walk in the City of Wilmington
- 98.4%** Walk for exercise or personal fitness
- 92%** Walk to leisure activities
- 81.6%** Walk to reach destinations for running errands
- 53.6%** Lack of sidewalks and/or gaps in the sidewalk make walking difficult or unpleasant in the city
- 33.6%** Heavy traffic makes walking difficult or unpleasant in the city
- 30%** Said that intersection and road crossings are the most important areas for the city to focus on improving pedestrian facilities.

What should be the city’s TOP PRIORITY for improving the walking network?

Almost one-third of the respondents indicated that the city should focus on intersection and road crossing improvements as it enhances the pedestrian network. Over 20 percent of respondents said that more pedestrian facilities in residential neighborhoods.

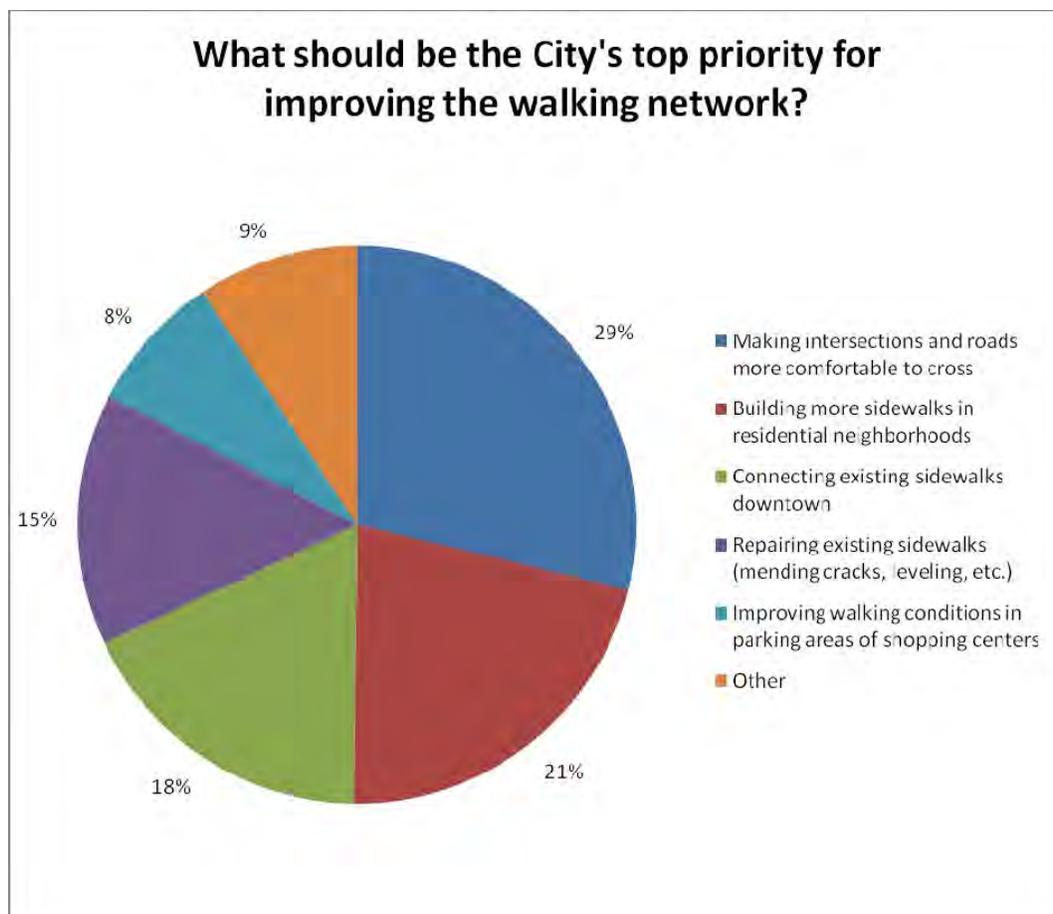


Figure 22 Top Priorities for Improving Walking Network

What is the MOST critical issue that people face while walking in the City of Wilmington?

- 66.9%** Unsafe street crossings or intersections
- 22.8%** Missing or poorly maintained sidewalks
- 3.1%** Lack of personal safety
- 7.1%** Other

Of the 85 respondents who made individual comments, the following ‘themes’ were most often mentioned:

- Need more connectivity between land uses (i.e. subdivision to retail, schools, parks, greenways, library, churches)
- Intersection improvements
- Need more enforcement of pedestrian laws (drivers don’t stop/yield to pedestrians)

Frequently mentioned areas needing pedestrian improvements:

- Oleander Drive
- Military Cutoff Road
- North and South 3rd Street
- Market Street

In-Person Survey Highlights:

The in-person pedestrian survey was developed to consult the public (who would most likely not participate in an online survey) about pedestrian conditions. Surveys were recorded by staff during three public events: a *Downtown at Sundown Concert*, the *Juneteenth Festival*, and the *Riverfront Farmers’ Market*.

- The survey had a total of nine questions.
- 138 persons responded.
- While not scientific, this survey provided useful information to the City of Wilmington and NCDOT staff.



Figure 23 Citizen Completing Survey at Juneteenth Festival

- 20%** Walk to destinations such as school and work
- 54%** Responded that sidewalks, crosswalks and pedestrian signals should be a top priority when constructing or improving roadways.
- 47%** Responded that environmental conditions, such as high speed traffic and lack of sidewalks, are the main reasons for why their children do not walk to school

6% Responded that distance was the main reason that their children do not walk to school

Along with requests for improvements in crossings and buffers (planting strips, parked cars and other objects that separate motorized transit from pedestrians and bikers), respondents requested improvements in bicycling access as well. Future improvements in bicycling amenities such as improved paving and crossings would likewise improve the pedestrian experience. This input is consistent with the online survey respondents.

City staff was very interested in gaining feedback on how the improvements could be funded. Interestingly, the option for “no new funding” was the least popular answer, receiving only 7% of the responses. The top two choices picked were:

23% Hotel tax paid mostly by visitors

20% Municipal bonds

Respondents were asked to scale the priority for pedestrian facility improvements from 1-10 (10 being the highest):

54% Rated the priority as a 10

8% Rated the priority below 7

Wilmington’s citizens are very comfortable with increasing signal timing to allow pedestrians more time to cross the street:

76% Responded that they were comfortable with minor increases in delay at traffic signals to allow pedestrians to cross more safely and comfortably.

Common written-in responses for places that could specifically benefit from improvements in the pedestrian environment include: Halyburton Park, Military Cutoff Road and Downtown Wilmington

Chapter 3. Pedestrian Transportation System

This chapter examines the existing pedestrian network within the city. Generally, the chapter describes the availability, quantity and quality of pedestrian facilities. These facilities include sidewalks, trails, crosswalks, signals, and signs. Ideally such facilities are easy to find, connect popular destinations, and are well maintained.

SYSTEM HIGHLIGHTS

Roadways

Roadways in Wilmington are owned and maintained by one of three entities. The City of Wilmington owns most local and collector roadways, and most of these roads are within residential neighborhoods. Major arterials are primarily the responsibility of NCDOT. In addition to the publicly-owned roads, a number of roads are owned and maintained by other entities such as property owner associations or other organizations. These roads are generally within planned developments, institutions such as UNCW, or within industrial areas.

Table 1 Roadway Ownership in Wilmington		
Jurisdiction	Miles	% of Total
City Roads	513	67
NCDOT Roads	145	19
Private Roads	107	14
<i>Total Roads</i>	<i>766</i>	<i>100</i>

As illustrated in Table 1, the large majority of roads are under the direct purview of the city. On these roads, the city has the direct authority to establish speed limits and pursue traffic calming measures, construct pedestrian amenities, acquire right of way and other actions. NCDOT roads comprise nearly 20% of the road network. On these roads, Wilmington must coordinate with the state on speed limits, roadway improvements, intersection and crossing design, sidewalk installation and other actions that address the pedestrian transportation system. Private roads comprise the smallest percentage of the city's road network. On private roads, the city has limited oversight once a project is developed, provided the roads comply with the city's standards. During the rezoning, subdivision, or redevelopment approval process the city has more authority to require pedestrian accommodations or specific roadway design elements.

Walking Conditions

Pedestrian transportation systems cannot be properly evaluated in the context of the city as a whole. Different areas of the city serve different roles and therefore have different needs regarding transportation and recreation. Wilmington development patterns and the corresponding character of the pedestrian system can be divided into four general zones: *Central Business District Zone*, *Urban Core Zone*, *Traditional Suburban Zone*, and *Automobile-Oriented Suburban Zone* (see Figure 24).

Within each of these zones, major arterials and local streets (non-arterial roadways) fulfill a critical role in the city's transportation network and provide varying levels of accommodation for pedestrians. These streets serve unique purposes and support differing volumes of traffic and therefore they should be assessed separately.

Much of the discussion and many of the recommendations in this plan are structured around these character zones. In this section, each area will be evaluated on the following aspects:

- *Connectivity* – does the pedestrian system provide convenient connections for non-vehicular travel?
- *Street Crossings* – does the crossing provide appropriate accommodations for pedestrians?
- *Quality of Facility* – generally, do pedestrian facilities look well maintained or is it in a state of disrepair?
- *Accessibility* – how easy is it for pedestrians with physical disabilities to use?
- *Streetscape Design* – does the surrounding area feel safe and welcoming for pedestrians?

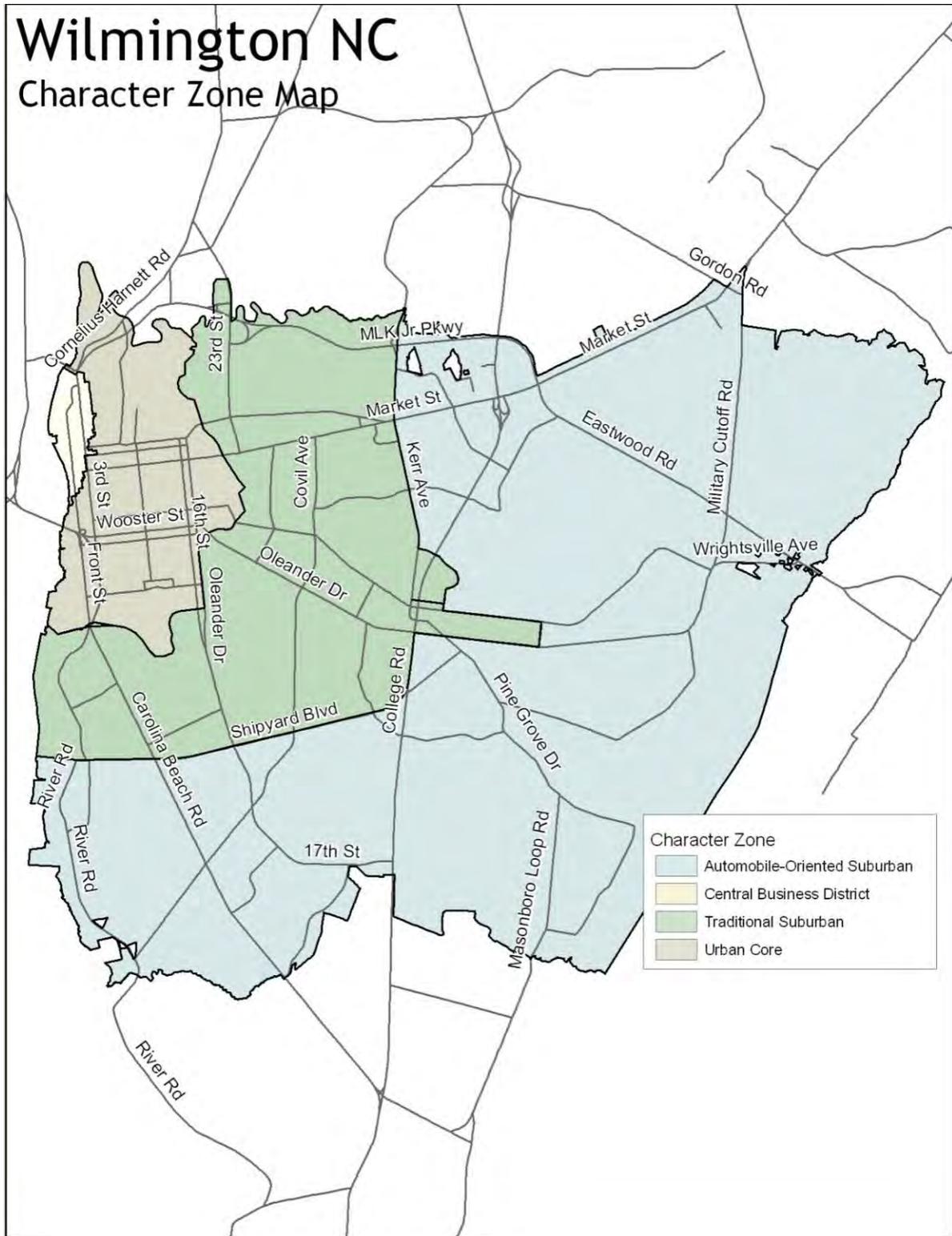


Figure 24 Wilmington Character Zone Map

Connectivity

When viewed from the perspective of a pedestrian, connectivity refers to the completeness of the walking network. In other words, are there facilities that get the pedestrian where they want to go? In order to serve as a viable option for even short trips, the pedestrian network should be comfortable and easy to use, and should provide direct connections to destinations. Most pedestrian trips are to and from schools, shopping areas, libraries and community centers, work places, recreational opportunities and transit. Sidewalks and street crossings should be designed so people can easily and comfortably find a direct route to a destination, and delays are minimized.

Connectivity is one of the most difficult and yet most important elements of transportation planning. People need to be able to access their destinations directly and safely. Missing sidewalks or crossing facilities may make walking trips difficult and deter people from choosing this transportation mode. In Wilmington, the pedestrian system generally provides good connectivity, but outside of the downtown, sidewalks, trails, and other walking facilities provide inconsistent functionality. This challenge can be observed in neighborhoods where residents may be able to walk to parks, schools and other institutions within the neighborhood, but may not be able to walk to other neighborhoods and destinations. Along the city's commercial arterials there are many areas that have decent sidewalk systems but provide poor crossing opportunities due to either long separations between crossings or the absence of marked crosswalks and pedestrian signals at intersections. As a consequence, many trips that could be taken on foot are done in motor vehicles. These short car trips add congestion on the region's roads and contribute emissions into the air.

60% of the pollution created by automobile emissions is created in the first few minutes of operations before pollution control devices begin to work effectively. National data show that 26.6% of all automobile trips are less than one mile in length.

Public input revealed a number of specific concerns regarding connectivity in Wilmington:

- *No sidewalks along many roads or missing gaps in the sidewalk system.*
- *Cracks, uneven surfaces, and raised sections of sidewalk that pose major impediments and safety hazards to individuals with mobility and visual impairments.*
- *Few, if any crosswalks for long distances along most major arterials.*

Approximately two years ago, the city's Public Services Department conducted an exhaustive survey of the city's sidewalk network, and they now have a reasonably accurate database with

the location of all sidewalks across the city. A map showing this network is located later in this chapter. It is easy to see that more streets have sidewalks in the city's downtown and surrounding neighborhoods than in other parts of the city. Many areas have sidewalks on one side, but not both sides of the street. Many major arterials do not have sidewalks, or have discontinuous sidewalks along a given block.

Many pedestrians will make their trips in spite of the absence of sidewalks. This is obvious from the worn paths or "goat trails" seen all over the city in areas where sidewalks do not exist, or may not be located ideally to serve most pedestrian trips. Through the public input process, a number of people indicated that gaps in the sidewalk network made trips difficult or deterred them from making more trips without a vehicle and 23% indicated that missing or poorly maintained sidewalks were the most critical issue facing pedestrians in Wilmington.

Street Crossings

Street crossings present one of the greatest safety hazards for pedestrian travel. When crossing the street, pedestrians are entering into the realm of motor vehicle traffic and are most exposed to danger. Pedestrians must contend not only with cross traffic (cars and trucks passing along the cross street) but must also be aware of vehicles turning left or right across their path.

Street crossings should be designed to provide maximum protection to the pedestrian through clear markings, appropriate signage or signalization, and adequate crossing time, pedestrian refuges (in certain cases) and other important elements. Signage and markings should provide clear guidance to both pedestrians and motorists as to their respective responsibilities at the crossing.

Sixty-seven percent of respondents to the online survey conducted as part of this plan indicated that **unsafe street crossings** are the most critical issue facing pedestrians in Wilmington. Through the public participation process and field observations, a number of specific concerns were raised related to street crossings in Wilmington. Due to the complexity of street crossings, this discussion is divided into two sections: crossing operation or the functionality of the crossing and crossing amenities, which deals with the design of the crossing. Proposed solutions to many of these concerns are detailed elsewhere in this plan. It should be noted that these conditions are not necessarily universal, but do occur often enough to warrant inclusion in this list:

Crossing Operation

- *Motorist behaviors, including stopping within the crosswalk or pedestrian crossing area, failing to stop or yield for pedestrians, running red lights and exceeding posted speed limits significantly increase safety hazards for*

pedestrians. Turning motorists are often in conflict with pedestrians crossing major arterials.

- *Do signals provide the minimum amount of time needed for a pedestrian to cross? Typical approaches assume pedestrians walk between 3.5 and 4.0 feet per second. However, this may be inadequate for people do not enter the crossing at the beginning of the WALK signal or slower pedestrians (including people with strollers or small children, or wheelchair or other assistive device users).*
- *Many pedestrian signals have a long delay (over 60 seconds) between the time the push button is depressed and the WALK signal is displayed This delay can lead to a lack of compliance.*
- *Pedestrians often fail to use legal crossings, cross against the light, or step into the roadway without checking for oncoming traffic. These behaviors put pedestrians at risk of being struck by motor vehicles.*



Figure 25 South College Road and Randall Parkway

Crossing Amenities

- *Many signalized intersections do not have pedestrian signals or marked crosswalks. Where present, the crosswalks may not be on all 'legs' (sides) of the intersection. This is most prevalent on multi-lane arterials.*
- *Multi-lane arterials carry substantial vehicle traffic and create wide intersections and long crossings for pedestrians. For example, at the main entrance of UNCW, pedestrians crossing South College Road must cross eight lanes (approx. 100').*
- *Throughout the city, stop bars at major signalized intersections appeared to be located within the legal pedestrian crossing area.*
- *Long distances between signalized intersections on major arterials (up to one mile separation) either discourages crossing or promotes crossing away from an intersection. Crossing treatments that improve functionality and pedestrian comfort, such as high visibility crosswalks, median refuge islands, and curb ramps that meet ADA requirements are lacking in many locations.*
- *Additional safety measures are needed around schools (such as crossing guards, signs and traffic calming).*



Figure 26 Shipyard Boulevard and Carolina Beach Road

Quality of Facility

The quality of walking facilities relates to the condition and functionality of sidewalks, curb ramps and crosswalks. Sidewalks that are too narrow or are in poor condition are less comfortable for pedestrians to use, and may discourage walking in that area. Conversely, a well designed and maintained sidewalk allows pedestrians to walk where they want to go in a comfortable setting. Pedestrian facilities that are in very poor condition, with large cracks, uneven surfaces, or under designed pathways may be inaccessible for pedestrians with certain disabilities. For example, a curb ramp that is too steep may not be mountable by a wheelchair user.

Accessibility

Accessibility refers to the suitability of the walking network for people with disabilities. The availability, design and condition of a particular sidewalk or curb ramp is important for any person but it is critical for a person with a disability who may need more time crossing a street or is in a wheelchair. Furthermore, a facility that is accessible to a person using an assistive device is almost certainly more usable by a person pushing a stroller, a small child, or someone who just needs a good walking surface. The following two sections describe some of the issues specific to two categories of pedestrians with disabilities.

Wheelchair Users

In 2002, 2.7 million Americans identified themselves as wheelchair users for the U.S. Census.⁶ Wheelchair and scooter users often travel much faster than walking pedestrians, especially on level surfaces or downgrades, but they can be much slower when traveling uphill. In addition, their stability and control can be affected by surfaces with cross-slopes, grades, or rough terrain. Wheelchair and scooter users require a wider path of travel than ambulatory pedestrians. Therefore, sufficient passing space should be provided to allow wheelchair users to pass one another and to turn around.

Furthermore, people who are unable to pull backward on their wheelchair wheels require a larger maneuvering space than those who can move one wheel forward and the other backward while turning. The turning diameter of a wheelchair or scooter is dependent upon the length of its wheelbase. Powered wheelchairs and scooters are generally longer than manual wheelchairs.

Because wheels are difficult to propel over uneven or soft surfaces, wheelchair and scooter users need firm, stable surfaces and structures such as ramps or beveled edges to negotiate changes in

⁶ United States. US Census Bureau. Disability Tables. Feb. 2008. Nov, 2008. <<http://www.census.gov/hhes/www/disability/disabtables.html>>

level. Curb ramps allow wheelchair users to negotiate curbs more easily. Because cross-slopes tend to cause wheelchairs and scooters to veer downhill, manual wheelchair users must perform additional work to continue traveling in a straight line over areas such as driveway crossings. Severe cross-slopes can cause wheelchairs to tip over sideways, especially during a turn.

Walking-Aid Users

People who employ walking aids include those who use canes, crutches, or walkers to ease their ability to travel. According to the 2002 U.S. Census, 9.2 million adult Americans reported having used a cane for longer than sixth months⁷. Surface quality significantly affects ease of travel for walking-aid users. Grates and cracks wide enough to catch the tip of a cane can be potentially dangerous for walking-aid users. Uneven surfaces can also be hazardous because they further reduce the already precarious stability of walking-aid users. Additionally, people who use walking aids tend to travel more slowly than other pedestrians. As a result, they benefit from longer pedestrian signal cycles at intersections and the presence of passing spaces to allow others to travel around them. A rapid change in cross-slope can also cause people with walkers to stumble. The potential limitations of walking-aid users include the following:

- Difficulty negotiating steep grades
- Difficulty negotiating steep cross-slopes
- Decreased stability
- Slower walking speed
- Reduced endurance
- Reduced ability to react quickly to dangerous situations
- Reduced floor reach

Streetscape

Streetscape refers to roadway design and condition as it impacts street users and nearby residents. Generally, the streetscape is considered to be the aesthetic quality of the public space, between building fronts. The streetscape includes building placement and façade design, street plantings and street furniture, parking location and design and the design of the roadway.

Because pedestrians move so much more slowly than cars, they are very aware of the surrounding environment. People tend to want to walk in settings that are attractive and visually interesting. Conversely, areas that are unattractive or are designed without consideration for the person walking by are unappealing and may make people feel unsafe.

⁷ Ibid

Streetscaping recognizes that streets are places where people engage in various activities, including walking, bicycling and driving. Streetscapes are an important component of the public realm (public spaces where people interact), which help defines a community's aesthetic quality, identity, economic activity, health, social cohesion and opportunity, not just its mobility.

Central Business District Zone

The *Central Business District Zone* extends roughly from the Cape Fear River east to North 4th Street and from Ann Street north to the Isabel S. Holmes Bridge. This is the historic business district for the city and many of buildings date back to Wilmington's early days as a busy port for the southeastern part of the county in the 1800s. Most of the structures are three to five stories tall and there is a significant amount of customer



Figure 27 Pedestrian Crossing North Front Street

oriented retail (bank tellers, restaurants, shops, etc.) on the first floor with office and residential above. There is a lively cultural and entertainment scene and there are a number of galleries, restaurants, clubs and bars in this area. Most tourists to Wilmington spend at least part of their trip in the *Central Business District Zone* taking advantage of these opportunities and they stay in one of the many hotels or inns in the area.

Cape Fear Community College is also located in this zone. This institution occupies a number of buildings clustered around Red Cross Street and North Front Street and draws nearly 7,600 students. Because it is a commuter school, students live in other parts of the region and travel to the campus daily by private vehicle, WAVE Transit, on foot or by bicycle.

In general, pedestrians in the *Central Business District Zone* have access to some of the best pedestrian facilities in the city. Streets are relatively narrow and low speed with moderate amounts of traffic. Especially near the riverfront, the sidewalks are prevalent and well maintained. Nearly anywhere vehicles have access; there are also sidewalks for pedestrians. During events, some of the major streets are closed to vehicles so that pedestrians can have more room to safely enjoy the area.

Crossing the short blocks is relatively easy because there are crosswalks at every intersection. Nearly all of those intersections have pedestrian signal heads as well. Pedestrian-activated signal buttons are installed at an appropriate height so that children and the physically handicapped can easily reach them. It should be noted that although nearly every signal has a pedestrian signal, the pedestrian signals along North 3rd Street and North 4th Street must be activated by a pedestrian, as opposed to being incorporated into the signal cycle, as they are on North Front Street and North 2nd Street. This means that if a pedestrian waiting to cross does not press the button in time; that pedestrian will not receive a walk signal and will not have adequate time to cross during the parallel green signal phase.

The *Central Business District Zone* also has some of the most inviting streetscapes for pedestrians. There are benches and trees that make walking for both leisure and transportation easy and comfortable. There is ample lighting and clear signage to help you reach your destination.



Figure 28 Residential Street in Older Neighborhood

North 3rd Street is somewhat different from other streets in the *Central Business District Zone*, primarily because it is a relatively wide five-lane arterial with narrower sidewalks. It is owned and maintained by NCDOT. The street is a major transportation corridor and connects US Highways 76 and 421 at the southern end to US Highway 74 and NC 133 at the north. Vehicles can be observed traveling at relatively high rates of speed in comparison to the somewhat more sedate pace closer to the river. Vehicles traveling in the north-south direction generally have longer green signal phases than on streets closer to the river. As a result, pedestrians must contend with wait times of 60 seconds or more, even when no vehicles are present.

The North 3rd Street streetscape project, which is currently in design, will dramatically change the pedestrian realm. The \$5-million bond-funded project will likely include a planted median with turning bays, crosswalk enhancements, and new traffic signals with pedestrian signal heads along North 3rd Street from the Martin Luther King, Jr. Parkway entrance (Davis Street) south to Market Street. The City of Wilmington will assume control of this roadway as part of this project. Construction on this project is scheduled to begin in 2009.

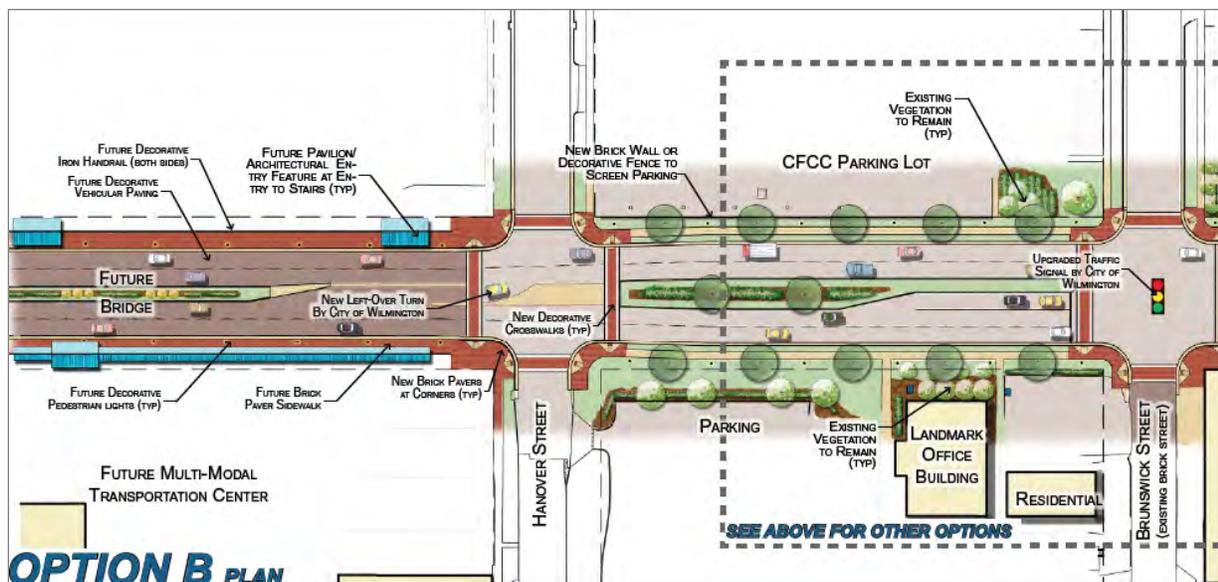


Figure 29 Design Concept for North 3rd Street Streetscape Improvements (Kimley-Horn/URS)

Urban Core Zone

The *Urban Core Zone* extends roughly from Greenfield Park north to Smith Creek and from the *Central Business District Zone* boundary and the Cape Fear River east to Burnt Mill Creek.

The *Urban Core Zone* is home to many of Wilmington's older residential neighborhoods and the streets are generally laid out in a traditional grid pattern. Blocks tend to be a little longer than in the *Central Business District Zone*, but most local streets have relatively narrow pavement widths.

There are several significant east-west arterials that carry vehicle traffic between the *Central Business District Zone* and the bridges that cross the Cape Fear River to the rest of the city. Dawson Street, Market Street, South 3rd Street, South 16th Street, South 17th Street and Wooster Street are some of the busiest roadways in this area.

Generally, there are good pedestrian accommodations along neighborhood streets. Most areas have sidewalks on two sides of the roadway, and traffic volumes and speeds are relatively slow, creating comfortable environments for people walking.

Pedestrian accommodations along many of the major arterials are inconsistent. This may be due in part to a pattern of successive roadway widening without adequate consideration for pedestrian accommodations. For example, a pedestrian walking along Dawson or Wooster Streets in the southern end of the character zone may find that sidewalks are missing. Furthermore, the streetscape is visually unappealing in many places, and walkers are forced to pass vacant lots littered with trash and other debris. In this heavily travelled corridor, there are long distances between signalized intersections and pedestrians were frequently observed crossing the roadway at unmarked midblock locations, often using such risky measures as standing in a travel lane waiting for cars to pass in the next lane before completing their trip. Recommendations included in the recently completed *Dawson and Wooster Corridor Plan* are designed to ameliorate many of these shortcomings. Most of the signal controlled intersection in this zone lack marked crosswalks and pedestrian signal heads, despite relatively high observed levels of pedestrian activity.

The *Urban Core Zone* has an example of one of the city's uncontrolled crosswalks accompanied by a pedestrian-activated blinking signal. Solomon Towers, located at the intersection of South Front Street and Castle Street is a large senior citizen public housing facility. Many of the residents rely on public transit for their local travel needs. Additionally, several use assistive devices such as wheelchairs, scooters or canes. The northbound bus stop is located on the east side of South Front Street, which means that residents from the apartment building must cross South Front Street to access the transit stop.

The city has installed a pedestrian activated crossing signal that combines both overhead signals and pedestrian warning signs and flashers on the side of the road. This is designed to increase awareness of crossing pedestrians while the signal is activated. However, many motorists were observed disregarding the flashing lights and illegally failing to yield to pedestrians, resulting in delays to cross the street. Some pedestrians were observed crossing halfway and waiting for a break in traffic before completing the crossing. It should be noted that the activation button is not ADA-compliant as it is located away from the paved sidewalk. Subsequently, it may be difficult for pedestrians using wheelchairs, walkers or other assistive devices to reach.



Figure 30 Pedestrian Crossing and Flashing Signal Activation Button

Traditional Suburban Zone

This area is home to many of Wilmington’s older residential neighborhoods, including County Club, Devon Park, East Wilmington, Forest Hills, Princess Place and Sunset Park. Inside the neighborhoods, the rectilinear grid of streets found in the *Urban Core Zone* gives way to a modified grid pattern. Sidewalk coverage is not as extensive as within the *Urban Core Zone*, with roughly one third of the streets having sidewalks on at least one side of the roadway. Many neighborhoods are bordered by major NCDOT arterial roadways, such as Market Street, Oleander Drive, Carolina Beach Road and North and South Kerr Avenue.



Figure 31 Pedestrian with Stroller in Forest Hills Neighborhood

The Forest Hills neighborhood has the Wilmington Walks Forest Hills Loop mapped walking route. Small kiosks within the neighborhood identify distances and major destinations (park, school, and YMCA). This project was an initiative of the city’s Parks, Recreation and Downtown Services Division.



Figure 32 Forest Hills Loop Kiosk

Sidewalk coverage and intersection crossings do not provide the same consistent level of accommodation as may be found in the *Central Business District* and *Urban Core Zones*. Pedestrians must contend with some of the widest pavement crossings in the city. For example, the intersection of Shipyard Boulevard (US Highway 117) and Carolina Beach Road (US Highway 421) requires pedestrians to cross up to eight lanes of traffic (approximately 110 feet). The case study section in Chapter 6, Pedestrian Facility Recommendations, provides an analysis of this intersection and recommends improvements to increase pedestrian safety and comfort.

Automobile-Oriented Suburban Zone

The city’s southern and eastern areas are included in the *Automobile-Oriented Suburban Zone*. This includes many of the city’s newer developments, including Mayfaire and the Autumn Hall mixed-use developments. This area is also home to many neighborhoods annexed into Wilmington from New Hanover County. Subsequently, the character of the area is mixed. The

newer developments built under the city's more stringent regulations typically provide sidewalks, curb and gutter. However many of the older neighborhoods built under the New Hanover County's regulations do not have sidewalks or curbs, making them difficult and costly to retrofit with pedestrian facilities. Fortunately, traffic speeds and volumes within neighborhoods tend to be fairly low compared to adjoining arterial roadways and many pedestrians feel comfortable walking in the street, as is evidenced by the numerous pedestrians seen walking throughout the neighborhoods within this zone.

Unfortunately, lack of sidewalk connectivity often means that residents wishing to walk outside of their neighborhoods to nearby stores, libraries, schools, etc. cannot comfortably make these trips. Similarly, longer trips for exercise or recreation may also be difficult. The trail within Halyburton Park is a very popular destination for walkers and joggers, but most users must drive to the park from their neighborhoods because pedestrian linkages are few and far between. When completed, the Cross-City



Figure 33 Halyburton Park

Trail will improve connectivity to surrounding communities, but the individual neighborhoods that are located along the trail must be provided with safe and comfortable connections in their own right. Currently, there are no marked and signaled crossings along Eastwood Road and Military Cutoff Road that afford cross-street access to the newly opened Military Cutoff Trail and Cross-City Trail. During a very brief observation period, pedestrians were observed attempting to cross from the new Mayfaire development over to the Military Cutoff Trail, in spite of the lack of pedestrian accommodations across Military Cutoff Road. Therefore, the city and NCDOT should assess the condition and convenience of community and neighborhood connections to the River to the Sea Bikeway, Cross-City Trail and Military Cutoff Trail at the same time design plans are developed for a given section of trail, as these trails will likely become major attractions for walking and bicycling as the system expands.

Summary

A table assessing these various elements across the city's character zones follows. Within the table, the various elements of the pedestrian environment are given a ranking based on relative quality or adequacy of a given element in comparison to other areas within the city. For purposes of this section, the rankings are ascribed as follows:

- **Excellent:** *These elements provide high levels of accommodation for pedestrians, such as sidewalks on both sides of the street, curb ramps are constructed to ADA standards, crossings have stop bars and crosswalks, intersections have pedestrian signals and the facilities provided are well-maintained. Little if any improvement is recommended for sections with this ranking.*
- **Good:** *These elements provide adequate levels of accommodation for pedestrians, such as sidewalks on at least one side of the street, pedestrian signals are provided but have a modest delay to obtain the walk signal, and the facilities are somewhat maintained. Curb ramps may be poorly constructed or aligned. Some improvements to these sections are recommended for sections with this ranking.*
- **Fair:** *These elements provide minimal levels of accommodations for pedestrians. There may be gaps in the sidewalk network. Curb ramps may be missing. Pedestrian crossing accommodations may be provided at some but not all signalized intersections. Maintenance of facilities is generally inconsistent; sidewalks may be well maintained in portions of the section while others need repair. Significant improvements are recommended for sections with this ranking.*
- **Poor:** *These elements provide few or no accommodations for pedestrians. Sidewalks have significant gaps in the pedestrian network. Of the sidewalks that do exist, they are interrupted by many driveways and other vehicle pathways. There are long crossing distances that are generally devoid of crossing facilities such as crosswalks and pedestrian signals. Significant improvements are recommended for sections with this ranking.*

Table 2 Summary of Pedestrian Conditions In Wilmington's Zones

Character Zone		Connectivity	Crossing Operation	Street Crossings Amenities	Sidewalk Quality	Accessibility	Streetscape Design
Central Business District Zone							
Arterial roadways 4- to 5- lanes. Relatively high traffic volumes but generally low speeds. Numerous stoplights slow traffic.		Very Good- sidewalks on almost all arterials. Numerous protected crossing opportunities.	Fair- Relatively long delay to obtain walk signal after pressing pedestrian crossing button. This delay may contribute to jaywalking. Turning vehicles may prevent pedestrians from crossing when they do have the WALK signal.	Very Good- Marked crosswalks on all four legs of an intersection. Pedestrian signals at almost all arterial intersections.	Very Good- Sidewalks and crosswalks are well-maintained and are of adequate width to accommodate all users.	Very Good- Sidewalks are in good repair. Curb ramps at intersections and meet ADA requirements for grade and surface. Pedestrian push buttons are generally accessible by users in wheelchairs. However audible signals are not in use. Allotted crossing times may not be sufficient for some users given the crossing distance.	Good- arterials in the CBD generally provide an attractive walking environment with interesting building frontages and street furniture. The pending streetscape improvement of North 3rd Street will dramatically improve this corridor.
Non-arterial roadways 1- to 2- lanes. Modest traffic volumes and slow speeds. Stoplights, stop signs, and road geometry slows traffic.		Very Good- sidewalks on almost all roadways. Lacking some pedestrian connections to CFCC area such as sidewalks and clear, logical pathways.	Good- Modest delay to obtain walk signal after pressing pedestrian crossing button. Frequent signal changes (or 'cycles') reduce the amount of time a pedestrian must wait for a WALK signal.	Very Good- Crosswalks at most intersections. Unsignalized mid block crossings along 2nd Street create comfortable environment. Crossings connecting to CFCC area may be uncomfortable for some users.	Very Good- Overall, sidewalks are in good repair and provide adequate width to accommodate the volume of users. Street furniture (plantings, signage, benches, trash cans, etc.) may infringe on pedestrian travel way.	Very Good- Sidewalks in good repair. Travel path generally clear from obstructions. Curb ramps meet ADA requirements.	Very Good- North Water Street is closed for festivals. Historic building frontages and narrow streets provide attractive and comfortable setting. Riverwalk along Cape Fear River provides scenic views for pedestrians.
Urban Core Zone							
Arterial roadways 4- to 6- lanes. Higher speed traffic and heavy volumes (e.g. Dawson & Wooster, Market St.)		Fair/Poor- Sidewalks along most arterials, however some arterials have long separations between crossings. Relatively short crossing times for the user given the road width.	Fair- Relatively long delay to obtain walk signal after pressing pedestrian crossing button. This delay may contribute to jaywalking. Turning vehicles may prevent pedestrians from crossing when they do have the WALK signal.	Fair- Generally, long crossing distances. Pedestrian crossing accommodations provided at some, but not all signalized intersections.	Fair- In some areas, sidewalks and crosswalks are well-maintained and are of adequate width. However, other areas have sidewalks in poor condition.	Fair- Where present, sidewalks are in good repair. Curb ramps at most, but not all intersections with pedestrian facilities. Pedestrian push buttons may or may not be easily accessible by users in wheelchairs. Audible signals are not in use. Allotted crossing times may not be sufficient for some users given the crossing distance.	Fair- Some arterials provide an attractive environment, while others may be very unappealing to pedestrians in conjunction with strip commercial or light industrial development. The pending Dawson and Wooster streetscape improvements will significantly improve this corridor.
Non-arterial roadways 2-lanes. Lower traffic volumes and speeds. Stoplights, stop signs and traffic calming slow traffic.		Very Good- sidewalks on almost all roadways. Curb ramps present on almost all intersections.	Good/Fair- Lower traffic speeds allow for more comfortable crossing operation, although failure of motorists to yield to pedestrians may contribute to vehicle/pedestrian conflicts.	Fair - Crosswalks and pedestrian signals at some larger signalized intersections. Crossings are relatively narrow. However, motorists were frequently observed stopping in the pedestrian crossing area.	Good/Fair- Overall, sidewalks are in good repair, although overgrowth infringes into the travelway in some areas effectively reducing the width of the travelway.	Good/Fair- Many sidewalks in good repair. However, debris and vegetation overgrowth onto the sidewalk in some areas effectively narrows the available width below minimum ADA requirements.	Very Good- Generally, secondary roadways are located in residential neighborhoods with attractive streetscapes and buffers between the sidewalk and adjoining roadway.

Table 2 Summary of Pedestrian Conditions In Wilmington's Zones							
Character Zone	Street Crossings			Streetscape Design			
	Connectivity	Crossing Operation	Amenities	Sidewalk Quality	Accessibility	Design	
Traditional Suburban Zone							
<p>Arterial roadways 6- to 8- lanes. Higher speed traffic and heavy volumes (e.g. Carolina Beach Road, Independence Street, Market Street.)</p> 	<p>Fair/Poor- Sidewalk sections along several arterials, however some arterials provide limited crossing options for pedestrians or relatively short crossing times for the user given the road width. Several arterials provide sidewalks on only one side for relatively short lengths. Generally, poor connections from neighborhoods to arterials.</p>	<p>Fair- Drivers observed failing to yield to motorists. High volumes of turning traffic can make road crossings difficult. Long distances between intersections. Even longer distances between signalized intersections in some cases.</p>	<p>Fair- Generally, long crossing distances. Very few median pedestrian refuges. Relatively few pedestrian signals and almost no intersections with crosswalks on all four legs of intersection.</p>	<p>Good- Where present, sidewalks are in serviceable condition. Good- Greenfield Lake Trail (part of the East Coast Greenway).</p>	<p>Fair- Sidewalks are in good repair. Curb ramps at some intersections (including some where no sidewalk is present). Most ramps meet ADA requirements for slope. Pedestrian push buttons may not be easily accessible by users in wheelchairs. Allotted crossing times may not be sufficient for some users given the crossing distance.</p>	<p>Poor- Many curb cuts and driveways to contend with. Many sidewalks directly abut the back of road curb. Many sidewalks directly abut surface parking lots. Few street trees or other landscaping.</p>	
<p>Non-arterial roadways 2-lanes. Lower traffic volumes and speeds. Few stoplights, stop signs and traffic calming slow traffic.</p> 	<p>Good/Fair- Sidewalks on many roadways. Many incomplete sidewalks- extend for two or three blocks and then end. Poor connections from neighborhoods to arterials and between nearby neighborhoods</p>	<p>Good/Very Good- Relatively low traffic volumes and speeds, combined with neighborhood layouts that deter cut-through traffic create many crossing opportunities inside neighborhoods</p>	<p>Very Good- Generally, crosswalks not provided, nor are they warranted. However, average road widths within neighborhoods allow comfortable crossing for most pedestrians.</p>	<p>Very Good- In some neighborhoods, sidewalks are found on one side of street only. Overall, sidewalks are in good repair and provide adequate width to accommodate the volume of users.</p>	<p>Good/Fair- Generally, curb ramps are in good repair. However, some older neighborhoods (e.g. Audubon and Sunset Park) have missing curb ramps at intersections.</p>	<p>Very Good- Within neighborhoods, moderate building setbacks and presence of buffer strips contributes to comfortable pedestrian environment.</p>	
Automobile-Oriented Suburban Zone							
<p>Arterial roadways 6- to 8- lanes. Higher speed traffic and heavy volumes (e.g. Oleander, College Road, Market St.)</p> 	<p>Poor- Very incomplete sidewalk network. Many arterials do not provide any sidewalks. Long distance between signalized intersections. Good- Eastwood Road and Military Cutoff Road provide 10-foot wide side path on one side for bicycling and walking. However, there are few crossings to get to the other side of the road.</p>	<p>Poor- Long crossing distances and expanses of pavement. Relatively high volumes of turning vehicles (many intersections have multiple turn lanes).</p>	<p>Poor- Many intersections do not provide pedestrian signals or crosswalks. Many roadways do not provide median refuges, in spite of long crossing distances. Many signs of latent demand including 'goat paths' along many arterials.</p>	<p>Fair- Where present, sidewalks and crosswalks are in fair condition and are of adequate width to accommodate all users.</p>	<p>Poor- Lack of sidewalks and crossing amenities impairs the mobility of many users.</p>	<p>Fair- many developments are separated from the sidewalk (and roadway) by large surface parking lots. Many curb cuts and driveways. Relatively few planted buffer strips.</p>	
<p>Non-arterial roadways 2-lanes. Lower traffic volumes and speeds. Stoplights stop signs, and traffic calming slow traffic.</p> 	<p>Fair- relatively few sidewalks, but lower traffic speeds and volumes results in adequate internal circulation. Relatively poor external circulation or connections between neighborhoods. Mayfaire and new Autumn Hall developments are exceptions to this.</p>	<p>Good/Very Good- Relatively low traffic volumes and speeds, combined with neighborhood layouts that deter cut-through traffic create many crossing opportunities inside neighborhoods</p>	<p>Good- Generally, crosswalks not provided, nor are they warranted. Average road widths within neighborhoods appear to be wider than in Traditional Suburban Zone neighborhoods.</p>	<p>Good- where present, sidewalks are in adequate condition.</p>	<p>Poor- Lack of sidewalks requires users of assistive devices to travel in roadway or along shoulders.</p>	<p>Good- Within neighborhoods, moderate building setbacks and presence of buffer strips contribute to comfortable pedestrian environment. Some areas do not have sidewalks; however roadways are relatively low speed/volume.</p>	

Walking Along/Across Major Arterials

Wilmington's arterials are in a special category, as they traverse the downtown, suburbs, coastal communities and the northern edges of the city. NCDOT owns and manages most arterials in Wilmington, and many are designated as North Carolina or United States highways. These are the primary vehicular routes, as there is only one freeway within the city. Subsequently, these streets carry the highest speeds and highest volumes of vehicular traffic. Many roads are four- or six-lanes wide, some with medians, center turn lanes or other elements. Typical speed limits on these arterials range from approximately 35 mph in the city's central business district to 55 mph in the suburbs. Up until early 2009, Eastwood Road had a speed limit of 55 mph. Shipyard Boulevard currently has a speed limit of 50 mph.

In spite of the all of these characteristics, many of Wilmington's arterials are also significant pedestrian thoroughfares because much of the commercial development and many schools, libraries, and other destinations are located along these major roadways. For example, Codington Elementary is located on Carolina Beach Road a four-lane divided arterial with a 45 mph speed limit. Although there is a sidewalk along the front of the school and a residential neighborhood on the other side of Carolina Beach Road, there are no convenient crossing locations for students and the sidewalk ends at the school property line.

Almost all neighborhoods share at least one border with a major arterial. Therefore, anyone wishing to walk for any significant distance in Wilmington must eventually walk along or across an arterial roadway. When traveling along these arterials, pedestrians may have difficulty reaching their destinations. There are often no sidewalks along one or both sides of the roadway. In some places, sidewalks are in poor repair. Pedestrians must cross numerous driveways, increasing their exposure to cars turning onto or off of the adjoining arterial.



Figure 34 Codington Elementary School
Located on Carolina Beach Road- a four lane divided arterial- 45 mph speed limit

Equally problematic are the long distances between crossing facilities. Throughout the city at any given moment, there are pedestrians crossing mid-block in locations that have not been designed to increase pedestrian safety, visibility and comfort. It is not uncommon to see people standing on the center turn lane on Market Street waiting to cross, dashing across when a break in traffic occurs. On Oleander Drive, between Hawthorne Drive and Greenville Avenue/Greenville Loop Road, there is approximately 1.5 miles between the signalized intersections. Mid-block crossing is difficult because there are many lanes of high-speed and high-volume traffic. There are no medians or other refuges for pedestrians to use for two-stage crossings. Pedestrians take unsafe risks running across the busy roads so that they do not have to walk a long distance out of their way.

In addition to the long distances between signalized intersections, there are relatively few places where pedestrian crosswalks and signals are provided on four legs of a signalized intersection. Sometimes no pedestrian accommodations are found. In spite of the fact that an implied crosswalk legally exists at the intersection of any two streets, when pedestrian signals are absent, pedestrians must navigate complex movements and negotiate right of way with vehicles.

Arterial streetscape elements are also not inviting to pedestrians. Wide roadways and proximity to relatively fast moving traffic increase the perception of exposure, whether or not there is a real increase in danger. Storefronts are located far from the road, separated by deep parking. Because of this, pedestrians have further to walk to access buildings and must often navigate through parking lots using driving aisles that were not designed to accommodate pedestrian travel.

PEDESTRIAN CRASH STATISTICS

The NCDOT Division of Bicycle and Pedestrian Transportation collects many statistics on bicycle and pedestrian crashes and injuries, including crash numbers, severity, cause, time of day and several other pieces of information. According to this data, Wilmington is one of the top ten North Carolina cities with highest numbers of pedestrian crashes.⁸ As Table 3 illustrates, only 2.7% of all pedestrian crashes in North Carolina occur in Wilmington. However, the number of crashes per 10,000 people is almost 33. This means that Wilmington ranks second in the state for pedestrian crashes when adjusted for population.

NCDOT uses an index for typing crash severity. Severity falls from “K” which stands for a fatal crash, to “O” which indicates no reported injury. More information on the NCDOT crash severity index can be found online at:

www.ncdot.org/doh/PRECONSTRUCT/traffic/TEPPL/Topics/N-13/N-13_d.pdf.

Table 3 Top 10 North Carolina Cities for Pedestrian Crashes (2001-2005)

	Number of Crashes	Percent of NC Total	Population	Crashes as Percentage of City Population	Crashes per 10,000 People
Asheville	246	2.02	71,119	0.35%	34.59
Wilmington	324	2.66	99,623	0.33%	32.52
Gastonia	220	1.81	67,776	0.32%	32.46
Charlotte	1,730	14.20	671,588	0.26%	25.76
Greensboro	595	4.88	247,183	0.24%	24.07
Durham	510	4.18	217,847	0.23%	23.41
Raleigh	840	6.89	375,806	0.22%	22.35
Fayetteville	343	2.81	171,853	0.20%	19.96
High Point	171	1.40	86,211	0.20%	19.84
Winston-Salem	298	2.45	215,348	0.14%	13.84

Figure 35 illustrates crash trends for the City of Wilmington for the years 1997 through 2005. Over this time period, the City of Wilmington experienced 567 total pedestrian-related crashes, 20 of which were type K (fatalities), 45 resulted in type A (disabling) injury, 207 resulted in type

⁸ Source: Table 3. Ten NC cities with highest numbers of pedestrian crashes from 2001-2005, “Pedestrian Crash Facts Summary Report, 2001-2005”, NCDOT Division of Bicycle and Pedestrian Transportation, downloaded from: http://www.pedbikeinfo.org/pbcat/pdf/summary_ped_facts5yrs.pdf, July 8, 2008.

B (evident) injury, and 240 resulted in type C (possible) injury. Twenty-nine crashes involved property damage only (type O).

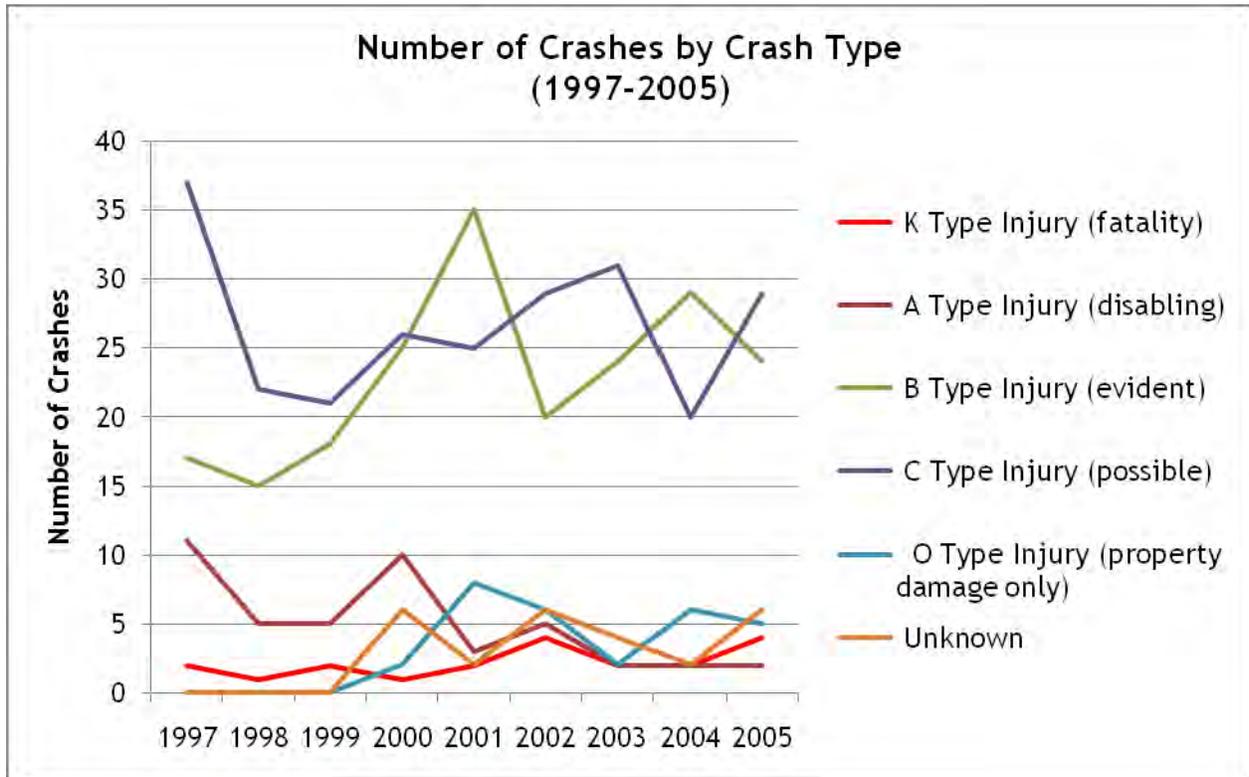


Figure 35 Trends in Pedestrian Crash Frequency by Type.

Source: "Pedestrian Crash Facts Summary Report, 2001-2005", NCDOT Division of Bicycle and Pedestrian Transportation, downloaded from: http://www.pedbikeinfo.org/pbcat/pdf/summary_ped_facts5yrs.pdf, July 8, 2008.

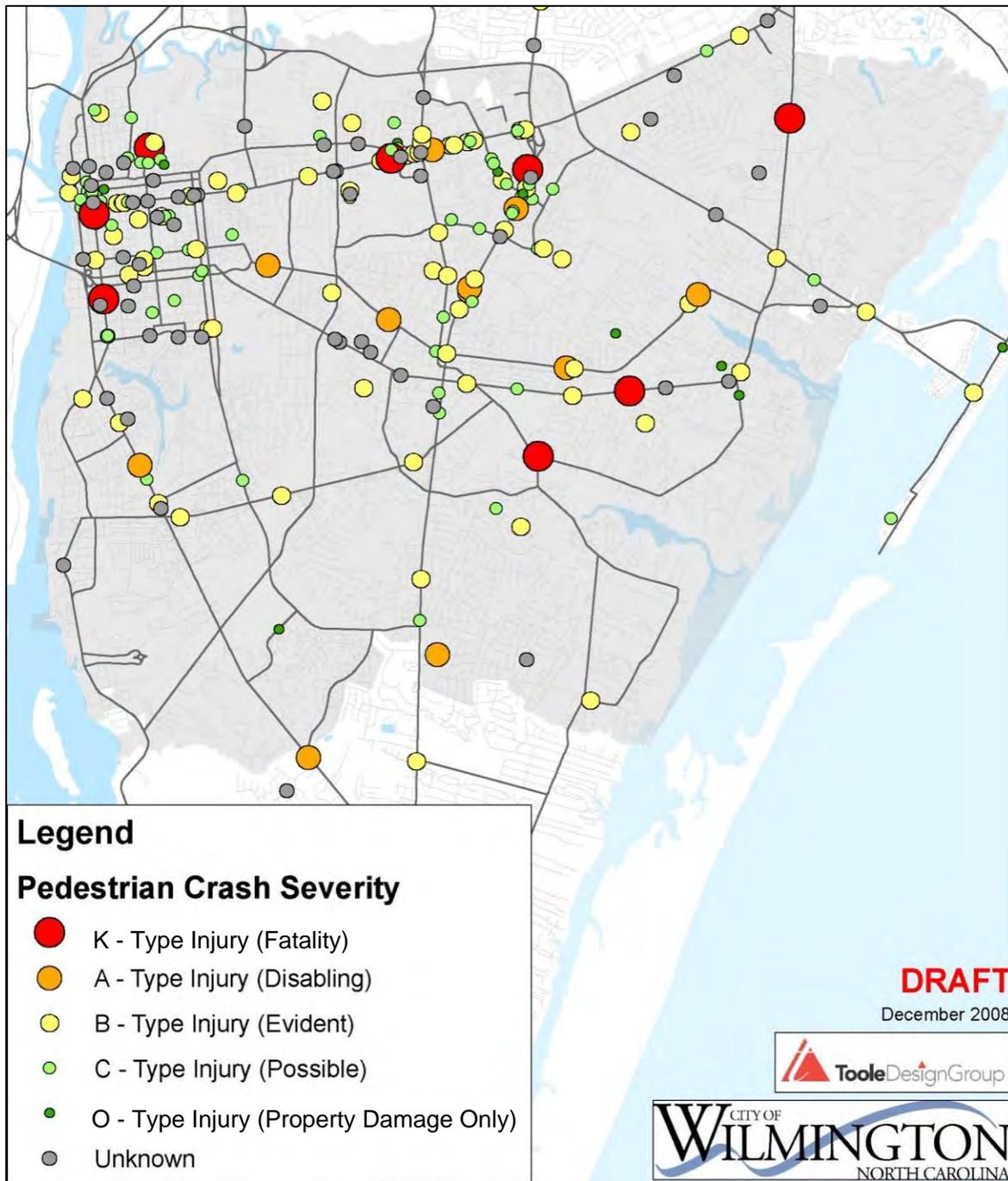


Figure 36 Map of Pedestrian Crashes in Wilmington 2003-2006
 Source: Pedestrian crash data obtained from Wilmington MPO April, 2008

Figure 36 shows the distribution of pedestrian crashes around the city between 2003 and 2007. This map clearly illustrates the fact that most crashes resulting in fatality and disabling injury occur on Wilmington’s major roadways, although the majority of crashes overall are more evenly distributed between local roads and major roads.

It is important to emphasize that a concentration of crash points does not directly indicate that a particular location is inherently worse for pedestrians than other areas. This information must be considered in the context of pedestrian volumes, accident reporting uniformity across the city and other factors.

When looking at the larger context, Wilmington scores somewhat better than the state overall. As indicated in Table 4, the percentage of total crashes that are fatal or disabling is approximately half the figure for the state. However, it ranks about six percentage points higher for 'possible' injuries where no trauma is readily apparent to the reporting officer.

Table 4 Crash Severity Comparison (1997-2006)

Injury Type	Percent of Total Crashes	
	Statewide	Wilmington
K Type Injury (fatality)	6.9%	3.5%
A Type Injury (disabling)	14.5%	7.9%
B Type Injury (evident)	35.4%	36.5%
C Type Injury (possible)	36.9%	42.3%
O Type Injury (property damage only)	3.8%	5.1%
Unknown	2.5%	4.6%
Totals	100.0%	100.0%

Cost of Crashes

In addition to the direct impact to the victims and family of a crash involving a pedestrian, it is eye-opening when the cost to the Wilmington economy is examined. Every year, NCDOT Traffic Safety Unit conducts an analysis of the cost of traffic crashes to the state. The injury costs include estimates of medical costs, public services, loss of productivity, employer cost, property damage and change in quality of life. The crash costs include the cost associated with the average number of injuries in each crash type. This information can be attributed to the pedestrian crash data for the city. The numbers are telling- between 1997 and 2005, the cumulative impact of pedestrian fatalities to the city's economy was \$84 million and the impact of all pedestrian crash types combined was over \$118 million.⁹

⁹ NCDOT Memorandum: 2007 Standardized Crash Cost Estimates for North Carolina. Brian G. Murphy, PE Traffic Safety Project Engineer, September 3, 2008. Obtained from: <http://www.ncdot.org/doh/preconstruct/traffic/Safety/ses/costs/costs.html>, September 6, 2008.

Table 5 Cost of Wilmington Pedestrian Crashes (1997-2005)

Injury Type	Cumulative Injuries 1997-2005	Cost per Injury ¹	Total
K Type Injury (fatality)	20	\$4,200,000	\$ 84,000,000
A Type Injury (disabling)	45	\$240,000	\$ 10,800,000
B Type Injury (evident)	207	\$71,000	\$ 14,697,000
C Type Injury (possible)	240	\$35,000	\$ 8,400,000
O Type Injury (Property Damage Only)	29	\$4,800	\$ 139,200
Unknown	26		
Totals	567		\$ 118,036,200

¹ Note: Costs are 2007 estimates. Incidents occurring in earlier years may have different estimated costs.

RECENT DEVELOPMENTS

Several recent projects within the City of Wilmington have made significant improvements for pedestrians and can act as models for other similar locations throughout the city.

Wrightsville Avenue Streetscape Project

In 2000, sections of Wrightsville Avenue were reconfigured to slow vehicular traffic and improve pedestrian comfort and safety. Within the Carolina Place and Ardmore neighborhoods, Wrightsville Avenue was converted from two-way to one-way operation. Streetscape improvements included street trees, new sidewalks, and decorative crosswalks. According to the city transportation planners, the mitigation efforts have worked so well that other neighborhoods around Wilmington are clamoring for similar projects.



Figure 37 Streetscape Improvement at Wrightsville Avenue and Wolcott Avenue

Sunset Park Gateway Treatment

The city recently installed gateway treatments along Burnett Boulevard at the entrances to the Sunset Park neighborhood. South of the neighborhood, Burnett Boulevard serves many industrial uses and has significant amounts of heavy truck traffic. The center chokers were installed to prevent these large vehicles from entering the neighborhood. The gateway treatment also provides a visual cue to all motorists that they are leaving an industrial area and entering a residential area where slower vehicle speeds are warranted.



Figure 38 Gateway treatment on Burnett Boulevard

Safe Routes to Schools

In early 2008, Wilmington successfully applied for a Safe Routes to Schools (SRTS) grant from NCDOT. During summer 2008, the city also spent approximately \$44,000 in its own funds to construct sidewalks and walkways, and install crosswalks and bicycle lanes around two schools.

- **Bradley Creek Elementary:** The city has constructed a walkway from Kingston Road to the rear of the school property. In addition, the city has received a \$211,800 grant that will be used to fund construction of a 3,100-foot-long sidewalk on Greenville Loop Road, crosswalk improvements, a new bicycle rack and various education and encouragement activities.
- **Holly Tree Elementary:** The city constructed a 360-foot-long sidewalk along Greenhowe Drive, installed three crosswalks and marked shoulders along Kirby Smith Drive. The Wilmington Police Department has also been enforcing a no stopping zone at the rear of the school to limit pedestrian and bicyclist conflicts with motor vehicles.
- **Rachel Freeman Elementary School:** The city constructed an 800-foot-long sidewalk along Princess Place Drive, connecting the Creekwood neighborhood to the school.

Neighborhood Traffic Management Program

The city's Neighborhood Traffic Management Program (NTMP) was created in 2004. Prior to that, the city installed speed humps throughout the city's neighborhoods based on resident

interest. The program places a greater emphasis on the analysis of street networks within a defined area, so as to provide solutions that benefit the neighborhood as a whole, as opposed to focusing on one particular street. Since its inception, city staff have conducted studies in 18 areas and held 36 meetings with over 1,600 participants. Interim improvements, including speed limit reductions and pavement markings, have been implemented in most of the study areas. Construction of the long-range improvements (i.e. mini-circles, center chokers, curb extensions, and impellers) has been completed in three neighborhoods: Windemere, Sunset Park and Creekwood.

WAVE Transit Route Restructuring

WAVE Transit recently restructured its entire fixed-route bus system. Two additional transfer stations were constructed on Columb Drive behind Target and on Independence Boulevard in front of the Independence Mall. The station on Columb Drive is temporary and will be replaced by the permanent facility on Cando Street, just north of Ringo Drive. Almost all of the new routes run in one-way loops, requiring most passengers to cross the street when boarding or alighting. Many of the redundant stops were removed and buses no longer travel through private parking areas, further reinforcing the need to improve pedestrian accessibility to and from WAVE Transit stations and stops.

River to the Sea Bikeway Dawson Street Pedestrian Refuge Island

In late 2008, NCDOT constructed a concrete pedestrian refuge island at the intersection of Dawson Street and the River to the Sea Bikeway. This project also narrowed the roadway from four lanes to three. Together, these two changes shorten the crossing distance and provide a protected location for pedestrians to cross. The project also includes new crosswalk markings. This project was co-funded by the Division of Bicycle and Pedestrian Transportation and NCDOT Division 3 at a cost of \$40,000.



Figure 39 New Pedestrian Refuge on Dawson Street at the River to the Sea Bikeway Crossing

Cross-City Trail

The city officially opened the first section of the Cross-City Trail along Eastwood Road between Military Cutoff Road and Cardinal Drive. This section of trail will soon connect to the Military Cutoff Trail along Military Cutoff Road and will eventually consist of 10-miles of multi-use paths for bicyclists and pedestrians extending from James E.L. Wade Park to Wrightsville Beach.



Figure 40 New Section of Cross-City Trail

NCDOT Spot Safety Project at South College Road and New Centre Drive

As part of the NCDOT Spot Safety Program, NCDOT has added an additional left-turn lane along northbound South College Road (US Highway 117/NC 132) onto New Centre Drive. Even though curb ramps and sidewalks are present on all four corners of the intersection, no pedestrian crossing accommodations (signals or crosswalks) existed before the intersection improvement, and none have been added as a result of the project.



Figure 42 South College Road Median (Before)

Although the change may result in more vehicle capacity through the intersection, it may degrade the comfort and safety of pedestrians crossing South College Road. Now, people crossing South College Road are in the intersection for a longer period of time.

Also, the raised concrete median along South College Road has been significantly narrowed. Although this median was not specifically designed or intended to function as a refuge, it did provide some accommodation for pedestrians prior to the completion of this project. At approximately 16 inches in width, the resulting median is too narrow to adequately serve this function.

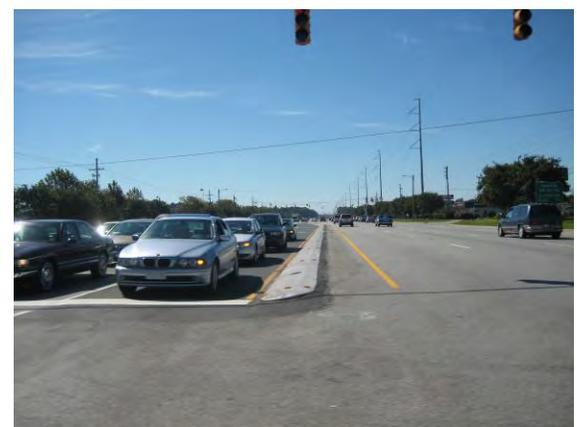


Figure 42 South College Road Median (After)

Riverwalk Expansion

The City of Wilmington has continually extended that Riverwalk north and south using both public and private funding. As identified in the *Vision 2020* plan, the Riverwalk will eventually stretch from the Isabel S. Holmes Bridge at the north to the Cape Fear Memorial Bridge at the south. Recent extensions have included the section between Ann Street and Nun Street. The section adjacent to the new convention center is under construction. In 2006, the Riverwalk was designated as part of the East Coast Greenway by the East Coast Greenway Alliance.

UPCOMING DEVELOPMENTS

In addition to current development activities, Wilmington has a number of pending projects that will provide significant benefits to pedestrians in the Port City. These have been intentionally designed to improve the public space and subsequently the pedestrian experience. Some developments, such as North 3rd Street streetscape project have been discussed elsewhere in this chapter. Other improvements that will provide pedestrians with either direct or indirect benefit are highlighted below.

Traffic Signal System Upgrade

The City is in the process of upgrading all existing traffic signal controllers, which will permit increased customization at intersections. This will allow the city to incorporate many pedestrian-friendly features into signal operations, including:

- Decreasing wait times during peak demand periods.
- Leading pedestrian interval (LPI) timing (see Chapter 4).
- Pedestrian activation controls on median refuges, allowing slower moving pedestrians to stop halfway across a crossing and complete the trip during a succeeding phase.
- Decreased wait times for vehicles if no pedestrians are present.

Scramble Intersection in Downtown Wilmington

Pedestrian scrambles are intersections where the traffic signal is programmed to stop vehicular traffic in all directions to allow pedestrians an opportunity to cross the intersection in any direction including diagonally.

Wilmington is currently considering piloting a pedestrian scramble signal phase in the downtown area. The intersection of North and South Front Street and Market Street may be an ideal location. Pedestrian scramble signal phases have been used for a number of years in Europe, Asia, Canada, and have recently been deployed in several cities in the United States.

Opinions on scrambles are mixed, but they are generally most appropriate for intersections with high volumes of pedestrian traffic and high volumes of turning vehicles. Theoretically, functionality for both pedestrians and cars is improved as there are reduced conflicts between turning cars and pedestrians than occur during normal signal operation.

It will be important for the city to carefully consider the operational characteristics of the intersection and incorporate this information into the pilot program. Additionally, the city must ensure that adequate advance educational outreach occurs to ensure that both drivers and pedestrians are informed about their respective responsibilities once the scramble is operational. An ongoing education campaign is important in downtown Wilmington because many drivers and pedestrians will be tourists, and this may be the first time they have encountered a scramble intersection and may not understand how to navigate it properly.

Cross-City Trail (John D. Barry Drive to Cameron Art Museum)

This project, currently let for bid, will construct a 10-foot-wide multi-use path along South 17th Street between John D. Barry Drive and the existing multi-use path in Halyburton Park and another segment of path between Halyburton Park and the Cameron Art Museum. The City of Wilmington is funding this project with bond funds authorized by voters in 2006 in partnership with NCDOT Division 3.



Figure 44 Pedestrian Scramble
Source: *Pedsafe.org*



Figure 44 Pedestrian Scramble Sign
Source: *FHWA Publication No. FHWA-RD-01-102 Pedestrian Facilities Users Guide-Providing Safety and Mobility*

Lake Avenue Sidewalks

This project, currently in the construction phase, will include a sidewalk along Lake Avenue between 41st Street and South College Road. The City of Wilmington is funding this project with bond funds authorized by voters in 2006.

North 3rd Street Streetscape Project

This project, currently in the design phase, will reconstruct North 3rd Street between Market Street and Davis Street. The project will likely include asphalt resurfacing, black decorative mast-arm traffic signals, underground utilities, pedestrian safety improvements, landscaped median, street trees, and other aesthetic improvements. The City of Wilmington is funding this project with bond funds authorized by voters in 2006.

South 3rd Street and Ann Street Pedestrian Safety Improvements

Design for pedestrian safety improvements at the intersection of South 3rd Street and Ann Street are currently underway. City staff has selected the single crosswalk alternative, which will likely consist of three decorative stamped asphalt crosswalks, a refuge island and a push button activated flashing warning beacon on the South 3rd Street approaches. The city has budgeted \$70,000 for the project in fiscal year 2008. Residents of the Old Wilmington neighborhood association have also pledged \$7,000 toward the improvements.

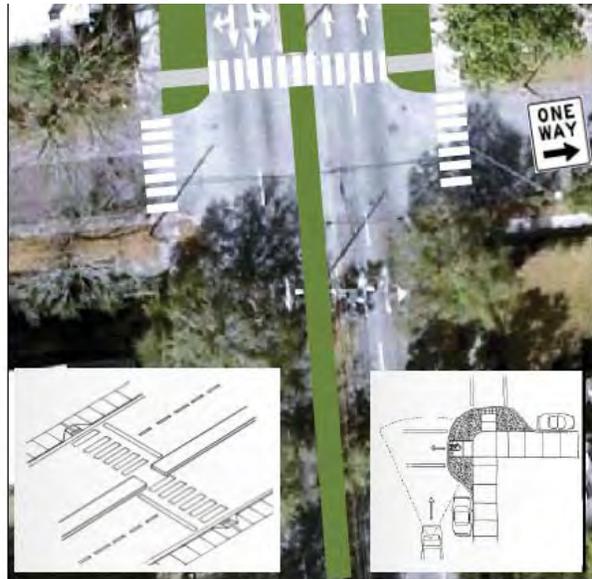


Figure 45 South 3rd Street and Ann Street Proposed Improvements

North Front Street Streetscape Project

This project, currently in the design phase, will reconstruct North Front Street between Market Street and North 3rd Street. The project will likely include asphalt resurfacing, black decorative mast-arm traffic signals, underground utilities, pedestrian safety improvements, landscaped median, street trees, and other aesthetic improvements. City staff is currently studying the feasibility of removing some of the existing traffic signals along North Front Street and installing four-way stops. This would lower the project costs and potentially improve the pedestrian environment. The City of Wilmington is funding this project with bond funds authorized by voters in 2006.

Dawson Street and Wooster Street Pedestrian Safety Improvements

As identified in the *Dawson & Wooster Corridor Plan*, the City of Wilmington plans to make pedestrian safety and aesthetic improvements to the Dawson Street and Wooster Street corridor. These improvements include decorative stamped asphalt crosswalks, pedestrian signal heads and landscaping at the intersections with South 5th Avenue, South 8th Street, South 10th Street, South 13th Street, South 16th Street and South 17th Street. The South 10th Street intersection has been identified as a priority, due to the amount of school-related pedestrian traffic.

Wooster Street Sidewalks

This project, currently in the design phase, will fill-in the gaps in sidewalk along Wooster Street between South 3rd Street and Oleander Drive. The City of Wilmington is funding this project with bond funds authorized by voters in 2006.

Independence Boulevard Widening Phase II

Phase II of the widening of Independence Boulevard between Shipyard Boulevard and Carolina Beach Road has been designed and should be let for bid in early 2009. This project will widen Independence Boulevard from two lanes to a four-lane divided facility. A southbound bicycle lane will be provided for the entire project length, while the northbound roadway will include a wide, outside lane. Sidewalks will be provided on the west side between Shipyard Boulevard and Carolina Beach Road and on the east side between Museum Drive and Carolina Beach Road. A 10-foot-wide multi-use path will be constructed on the east side between Croquet Drive and Museum Drive. This path will be part of the Cross-City Trail. Marked and signalized pedestrian crossings will be provided at South 17th Street. The City of Wilmington is funding this project with bond funds authorized by voters in 2006.

Randall Parkway Widening

The widening of Randall Parkway between Independence Boulevard and South College Road has been designed and should be let for bid in early 2009. This project will widen Randall Parkway from a two-lane divided facility to a four-lane divided facility. Bicycle lanes will be provided in both directions for the entire project length. Sidewalks will be provided on the north side between South College Road and Collegiate Drive and between South Kerr Avenue and Independence Boulevard and on the south side between South College Road and South Kerr Avenue. A 10-foot-wide multi-use path will be constructed on the south side between Independence Boulevard and South Kerr Avenue. This path will be part of the Cross-City Trail. Marked and signalized pedestrian crossings will be provided at South Kerr Avenue. This project funded through a congressional earmark.

NCDOT Wrightsville Avenue Widening

The widening of Wrightsville Avenue between Forest Hills Drive and Wilshire Boulevard is currently under construction. This project will widen Wrightsville Avenue from two lanes to four lanes, and add additional left- and right-turn lanes. The City of Wilmington has programmed \$22,000 to add sidewalks to the entire length of the project. The city and the WMPO have requested that NCDOT provide marked and signalized pedestrian crossings at the intersection of Wrightsville Avenue and Wilshire Boulevard, and these were included in the project design. This crossing is part of the Cross-City Trail.

NCDOT Kerr Avenue Widening

The widening of North and South Kerr Avenue between Martin Luther King, Jr. Parkway and Randall Parkway is currently in the design phase. NCDOT plans to begin construction in fiscal year 2012. This project will widen North and South Kerr Avenue from three lanes to a four-lane divided facility. The City of Wilmington has programmed \$1.1 million to add bicycle lanes and sidewalks to the entire length of the project. The city and the WMPO have requested that NCDOT provide marked and signalized pedestrian crossings at all signalized intersections included in the project, as well as pedestrian refuge islands where feasible.

Yield to Pedestrian Signage

Wilmington plans to install yield to pedestrian signage on several city-maintained roadways. These new signs are intended to increase the visibility of pedestrians to motorists (see *Yield to Pedestrian Signage* policy in Chapter 4). NCDOT has agreed to study the signs impact at the planned locations. The new signs will be located adjacent to right turn lanes at the following intersections:

- Racine Drive at New Center Drive
- Racine Drive at Oriole Drive

NCDOT State Transportation Improvements Plan (STIP)

The 2009-2015 State Transportation Improvements Program (STIP) has identified several projects in the Division 3 Transportation Improvements Plan (TIP) with the potential to impact Wilmington’s pedestrian network. As per the state’s policy of accommodating pedestrian and bicycle travel, sidewalks, crossings and other pedestrian amenities should be included in these projects to the extent possible to accommodate existing and future demand. A list of the Division 3 TIP projects follows:

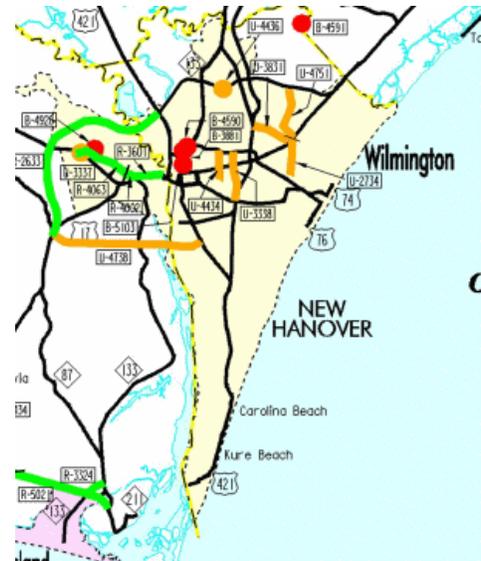


Figure 46 Division 3 STIP FY2009-2015

Table 6 NCDOT Division 3 STIP FY2009 - 2015

Project Number	Description
U-4751*	SR 1409 (Military Cutoff Road) to US 17. Multi-lanes on new Location. (4 miles)
U-4738*	US 17 to Independence Boulevard/Carolina Beach Road intersection. Construct a new facility with structure over the Cape Fear River. (9.5 miles)
U-4902	Colonial Drive to SR 1402 (Porters Neck Road). Access management improvements. (8.6 miles)
U-4903	Independence Boulevard to 17 th street. Mill and resurface. (1.4 Miles)
U-3338	SR 1175 (Kerr Avenue), Randall Parkway to SR 2649 (Martin Luther King, Jr. Parkway). Widen to multi-lanes. (3.1 miles)
U-4718	US 76 (Oleander Drive) and NC 132 (College Road). Intersection Improvements.
U-3831	SR 2048 (Gordon Road), NC 132 interchange ramp to west of US 17 business (Market Street). Widen to multi-lanes. (2.4 miles)
U-5017	Wilmington computerized signal system.
U-4436*	SR 1318 (Blue Clay Road) and US 17 (Wilmington Bypass). Construct an interchange.
U-4920	Randall Parkway, Independence Boulevard-Covil Avenue to South College Road.
B-4590	Smith Creek. Replace bridge no. 29
B-5103	Abandon railroad. Replace bridge no. 35
E-4516	US 74 (Eastwood Road), SR 1409 (Military Cutoff Road) to Cardinal Lane. Construct multi-use trail.
E-4749	Construct a bike path connecting the River To Sea Bikeway to the Eastwood road path.
SF-4903D	NC 132 (College Road) and SR 1272 (New Center Drive). Intersection Improvements.
W-5104	NC 132 (College Road), US 117 (Shipyard Boulevard) to US 421 (Carolina Beach Road). Various safety improvements. (4.4 miles)

LARGE COMMERCIAL PROPERTIES

During the development of this plan, many large scale commercial properties were assessed for pedestrian accommodation. There were some examples of properties providing good levels of accommodation, such as sidewalks and marked walkways leading through parking lots and across drive aisles and connections between adjoining buildings. Mayfaire Town Center is one recent project that provides relatively good accommodations for non-vehicular travelers. This particular property even provides sidewalks that extend to the edge of the NCDOT right-of-way on Military Cutoff Road, even though no sidewalk exists along Military Cutoff Road.

However, most large commercial properties are more typically characterized by large expanses of parking, which do not provide dedicated areas for pedestrians. The only connections to the interior of a development from the road are along the internal roadways and drive aisles. These parking lots act as barriers to people wishing to access the building from surrounding sidewalks.

Some of the policy strategies in Chapter 4 include recommendations for improving the overall design and layout of these large scale commercial projects.

PUBLIC TRANSPORTATION

WAVE Transit operates regularly scheduled bus service in Brunswick and New Hanover Counties. The transit system also provides a free downtown trolley and the Seahawk Shuttle, which serves the campus of UNCW and surrounding neighborhoods. The entire WAVE Transit fleet is equipped with bicycle racks.

In addition to its regularly scheduled service, WAVE Transit provides on-call paratransit services that provide curb-to-curb service. According to the transit system's website, no assistants or aides are provided by WAVE Transit. This means that all users must be able to navigate to the curb in order to access the vehicle.

Bus stops in Wilmington were assessed as part of this project. Observations indicated that bus stop suitability is not consistent throughout the city. In some areas, bus stops were located on the shoulder of a roadway without appropriate landing areas or pedestrian accommodations leading to the bus stop. Sidewalks and street crossings in the vicinity of a bus stop were frequently absent.

Bus stops are currently located on the near- and far-side of intersections, as well as mid-block. When bus stops are on the near-side of an intersection, pedestrians often cross in front of the bus and are exposed to adjacent traffic. When appropriate, bus stops should be moved to

controlled crossings and to the far-side of intersections. Far-side bus stops can reduce the crash risk to pedestrians as they encourage pedestrians to cross behind the bus at a signalized intersection and are more visible to other motorists.

The City of Wilmington should collaborate with WAVE Transit on the development of a policy for the installation and maintenance of pedestrian accommodations at and near transit stops.

INTERAGENCY COORDINATION

At the state and regional level, there are a number of agencies and plans that address transportation improvements which have a direct impact on pedestrian facilities in the city of Wilmington. Streets are either owned by the North Carolina Department of Transportation (NCDOT) or by the City of Wilmington, but all sidewalks in the public right-of-way are owned and maintained by the city. The following discussion summarizes the roles and responsibilities of these agencies. More detailed descriptions of the agencies and their plans that affect Wilmington's pedestrian network are located in the Appendix.

Transportation Policy Boards and Departments

Wilmington Metropolitan Planning Organization (WMPO)

The WMPO is charged with adopting the federally-mandated Long-Range Transportation Plan and the state-mandated Comprehensive Transportation Plan; the Metropolitan Transportation Improvement Program (MTIP) for road, transit, bicycle, and pedestrian investments; and the Unified Planning Work Program. After appropriate planning, engineering, and public input, the WMPO adopts specific alignments for proposed thoroughfares and transit corridors.

North Carolina Board of Transportation

The governor of the State of North Carolina appoints the members of the North Carolina Board of Transportation. The board adopts the State Transportation Improvement Program (STIP), the seven-year investment program determining how state and federal transportation funds will be spent statewide.

North Carolina Department of Transportation (NCDOT)

Almost 20% of the roadways in Wilmington are owned and maintained by NCDOT. Local NCDOT maintenance and operations are performed at the division level, and Wilmington is in Division 3. The Division of Bicycle and Pedestrian Transportation (DBPT), headquartered in Raleigh, is a central resource for bicycle and pedestrian planning in North Carolina.

Chapter 4. Policies, Codes and Ordinances

Existing policies, codes and ordinances regulate the infrastructure that both public and private entities construct in Wilmington, and ultimately determine the quality of the pedestrian environment. The Land Development Code (LDC) and the Technical Standards and Specifications Manual are the principal documents that include the policies, codes and ordinances for the construction and maintenance of facilities that impact pedestrian travel.

A review of existing standards was conducted to ensure that pedestrians are appropriately accommodated in city policies. Recommendations to update or improve policies and standards follow the most current research on pedestrian safety and the best practices of other jurisdictions across the country.

The following pages include a review of and recommendations for amending Wilmington's current pedestrian-related codes, ordinance and policies. Each policy review includes: a reference to the city's existing policy or standard on the topic; national best practice examples from other jurisdictions; and recommendations for updating or amending the Wilmington's policies or standards.

The recommended policy and regulatory changes included in this section are intended to address some of the more problematic issues. The 2003 NCDOT publication, "Guidelines for the Investigation and Remediation of Potentially Hazardous Bicycle and Pedestrian Locations" (www.ncdot.org/doh/PRECONSTRUCT/traffic/conference/reports/pb1.pdf) is an additional resource that should be considered for specific issues that are not covered in the following pages. This document presents best practices for a variety of pedestrian safety and comfort design elements.

4.1. DEVELOPMENT REGULATIONS

4.1.1 *Land Development Code Document Organization and Structure*

As currently structured, the LDC contains a significant amount of requirements relating to sidewalks and pedestrian facilities. However, it appears that an applicant must draw information from several different places in the 600+ page document to get a complete picture of certain key provisions relating to pedestrian accommodations. For example, a developer or applicant unfamiliar with the city LDC would have difficulty finding one area that provides guidance on the provision of pedestrian facilities in parking lots.

Recommendation

Identify key provisions that are typical to many different types of developments and consolidate all of these in one section. Include cross references to this section where necessary in the ordinance. This has several potential benefits:

- The LDC may become a shorter document
- LDC users would have one place to go for information
- The potential for contradictory provisions could be reduced
- Modifications to the LDC would be easier because the relevant information is all in one place.

4.1.2 Requirements for Sidewalks

During interviews with the City of Wilmington staff, a common concern from several interviewees involved with plan and development review related to the city's requirements for providing sidewalks. Many interviewed felt that current regulations did not provide enough guidance to staff regarding the application of sidewalk requirements to redevelopment or expansion projects. Furthermore, some felt that it was too easy for a developer to obtain a waiver from the sidewalk requirements because the guidelines for granting waivers provided excessive latitude to applicants.

Current Practice

Land Development Code: Article 7, Sec. 18-376. Sidewalks, walkways, and bikeways.

- (a) Sidewalks, walkways and other pedestrian ways shall be provided by the subdivider within or adjacent to a subdivision, as deemed necessary by the subdivision review board, upon reasonable evidence that the sidewalks, walkways or other pedestrian ways would be essential for pedestrian access to community facilities, that such is necessary to provide safe pedestrian movement outside the street or street rights-of-way area or that such is an extension or could reasonably become an extension of existing sidewalks, walkways and other pedestrian ways. All sidewalks, walkways, and other pedestrian ways shall be aligned as required by the subdivision review board and designed and constructed to conform to the City's Technical Standards and Specifications Manual. Sidewalks shall be indicated on all preliminary plans.
- (b) Sidewalks shall be required to be constructed in the following circumstances:

1. On a minimum of one side of the right-of-way of all thoroughfares such as freeways, expressways, arterials or collector streets, which are adjacent to the property to be developed.
2. On each side of the right-of-way of all thoroughfares such as freeways, expressways, arterials or collector streets that run through property to be developed if the subdivider intends to construct any portion of the thoroughfare as access to his development.
3. On each side of the right-of-way of all local streets extending through the property to be developed.

(c) The subdivision review board may exempt sidewalk installation in specific cases upon a finding that sidewalks are unnecessary for the protection of the public safety or welfare due to conditions peculiar to the site, to avoid impacting wetlands, or as part of a low impact design development plan.

Land Development Code: ARTICLE 9, OFF-STREET PARKING AND LOADING; DRIVEWAYS

Article 9 of the LDC provides guidance for the general layout and design of off-street parking facilities, as well as the number of spaces required. Wilmington should be recognized for requiring bicycle parking spaces on most new parking lots. However, this article does not contain clear guidance *mandating* pedestrian connections from building entrances to the adjoining sidewalk network.

Sec. 18-529. *Off-street parking design*, does require the applicant to show the proposed pedestrian circulation system in the plan, but it does not provide guidance on what that network should be.

Wilmington Design Preferences Manual

The 2005 Design Preferences Manual developed by the Development Services Department provides simple, clear guidance in a graphic form on preferred design elements for new development projects. Pictures are accompanied by brief list of key information. The guide does stress the importance of providing “landscaped pedestrian walkways” but it does not discuss where those walkways should go or what their function should be.

State of the Practice

Durham Unified Development Ordinance

Durham’s land development regulations- subdivision and zoning- are consolidated in a single Unified Development Ordinance (UDO). Section 12.4, Pedestrian and Bicycle Mobility of the UDO provides clear guidance for the installation of sidewalks. One important aspect is that all

new developments and redevelopments of existing property are required to comply with the requirements of this section.

Street Type	Rural Tier	Suburban Tier	Urban Tier	Compact Neighborhood/ Downtown Tiers
Freeways	None	None	None	None
Major/Minor Thoroughfare	None	Both Sides	Both Sides	Both Sides
Collectors	None	Both Sides	Both Sides	Both Sides
Nonresidential Street At least 2,000 daily trips (post development)	None	One Side	Both Sides	Both Sides
Less than 2,000 daily trips (post development)	None	One Side	One Side	Both Sides
Residential Street	None	One Side	One Side	Both Sides
Cul-de-Sac 400 or more linear feet	None	One Side	One Side	Both Sides
Less than 400 linear feet	None	None	One Side	Both Sides

Figure 47 Durham UDO Sidewalk Requirements Matrix

In the Durham example, sidewalk requirements are based on a combination of road classification, traffic volume, and zoning category.

Section 12.4.4 C. of the Durham UDO mandates that “Pedestrian and bicycle connections shall be made to any existing or proposed off-site pedestrian and bicycle facilities.”

Section 12.4.5 A. of the Durham UDO requires sidewalks to be constructed with a planting strip of three feet or more.

Asheville Unified Development Ordinance

Asheville’s UDO provides very clear criteria for the inclusion of sidewalks on public and private streets, as well as conditions under which sidewalk requirements may be waived. Applicability provisions cover both new development as well as redevelopment.

Section 7-11-7. Sidewalk requirements.

1. Sidewalks shall be required for all new construction and for renovations, additions and/or expansions to existing structures which fall into one of the following categories:
 - a. All new single family residential development which consists of 20 or more single family homes;
 - b. All new multi-family residential development, except for the construction of less than ten units;
 - c. All new office, institutional, commercial, and industrial development;

- d. All existing office, institutional, commercial, and industrial development additions or expansions to structures where the expansion results in an increase of more than 50 percent value of the structure as defined in section 7-11-2(b)(1)a of this chapter.
 - e. All new streets, improved streets or extension to streets.
2. Additional conditions for requiring sidewalks. Notwithstanding (1) above, the following findings must be made prior to the city engineer/designee requiring the construction of a new sidewalk or a "fee in lieu of" constructing a sidewalk for an applicable project. One of the following conditions must be met, as determined by the city engineer/designee.
- a. The applicable project area, including the street frontage, is identified as a needed pedestrian linkage within an adopted City of Asheville transportation or corridor plan, including but not limited to such plans as the Transportation Improvement Program (TIP), greenway, small area, pedestrian thoroughfare plans.
 - b. The current or projected (within five years) average daily traffic count (ADT) for the street is 300 vehicles per day or more as determined by the city Traffic Engineer. Traffic generated from the applicable project or any additions to the applicable project will be included in calculating the ADT for this condition.
 - c. In the event that sidewalk is not required, the developer must provide a recorded easement, if necessary, for the future development of the sidewalk. The developer wherever practical shall grade for the future development of a sidewalk.
3. Public and private streets. Sidewalks shall be constructed along all public and private street frontages that meet the requirements of section 7-11-7(2) of the lot for which the development is proposed.

City of Charlotte Zoning Ordinance

Charlotte's zoning ordinance provides unambiguous requirements for the provision of sidewalk connections from the entrance of any commercial development to the adjoining street network, except for freeways and expressways.

Chapter 12, Section 12.529. Sidewalk connections to public streets, including within commercial developments.

In order to promote and encourage pedestrian circulation, it is important to provide safe and adequate sidewalk facilities. Therefore, sidewalk connections will be required as described below for new commercial development, except for the following exceptions:

- a. A change of use in an existing building from a commercial use to another commercial use.
 - b. Expansions of less than 5% of the building area or 1,000 square feet, whichever is less.
 - c. Facade improvements to existing buildings.
 - d. Individual uses within a shopping center or a unified complex are not required to provide separate sidewalk connections as long as the entire center or complex as a whole provides common sidewalk connections.
1. Sidewalk connections shall be required after the effective date of this amendment between certain commercial buildings and all adjoining public streets except for freeways or expressways.

Recommendations

- The City of Wilmington should revise its LDC to ensure that sidewalk requirements apply to new development as well as redevelopment or expansion of existing properties. Asheville's approach provides very clear objective criteria for determining sidewalk applicability.
- The city should revise its LDC to clarify that pedestrian and bicycle connections are required to off-site pedestrian bicycle facilities (existing or planned) from the entrance of the proposed structure (or existing in the case of building modification or expansion). Charlotte's approach is a good example for these provisions.
- The city should require sufficient right-of-way dedication to ensure adequate space for a minimum two-foot grass buffer or planting strip between the back of curb and the sidewalk, similar to the process used in Asheville, NC. This requirement is currently located in the city's Technical Standards Manual (see "plaza"), but it may not be incorporated into roadway design if the applicant is not familiar with the Technical Standards Manual and does not plan on installing sidewalks at the time of development.
- The city should revise Article 9 of the LDC should provide clear guidance governing the provision and design of pedestrian circulation facilities within parking lots.

- The city should revise the Design Preferences manual to clearly illustrate that sidewalks should connect buildings with the surrounding pedestrian network. Also, pedestrian facilities should be designed within parking lots that provide customers with safe comfortable accommodations while traveling to and from their cars, a bus stop or adjoining sidewalks.

4.1.3 Sidewalk Maintenance

Sidewalk maintenance falls in to two categories- repairs to the sidewalk surface and clearing of debris and vegetation to make sidewalks passable.

Current Practice

With almost 300 miles of existing sidewalk and 450 miles of proposed sidewalk improvements, sidewalk pavement maintenance is a critical issue. Sidewalks within city owned rights-of-way are maintained by the Wilmington Streets Division. Sidewalks located in private developments are generally maintained by the property owners association. NCDOT generally does not maintain sidewalks along state-owned roads, instead turning responsibility over to the city.

Generally, sidewalk repairs are initiated based on complaints received by the Streets Division, although the city identified several sidewalk repair projects during a windshield survey conducted in 2007. Although the city has a pavement management system for tracking and planning roadway repair projects, it does not extend to sidewalks. The city has identified \$750,00 over five years in the Capital Improvements Plan for sidewalk repair and maintenance.

Clearing of vegetation, debris and other similar obstacles typically falls to the adjacent property owner (Wilmington Zoning Code, Sec. 11-56). In some parts of the city, shrubs, grass and other overgrowth effectively blocked sidewalks, rendering them virtually impassible for some users- especially those with disabilities that limit movement.

Recommendations

There is a sentiment amongst city staff that the current complaint-driven maintenance approach is insufficient for the city's expanding pedestrian network. The city should incorporate sidewalks into the city's roadway pavement management program so that repairs can be approached in a more systematic manner. This concept is supported by city staff.

Regarding routine maintenance and clearing of obstacles, more vigorous enforcement by the city's Code Enforcement officials will increase the likelihood that property owners will fulfill their responsibilities to keep sidewalks passable.

4.1.4 Fee in Lieu of Constructing Sidewalks

Fee in lieu provisions allow applicants to contribute money for the cost of providing a required piece of infrastructure instead of building the infrastructure at the time of development. Although the LDC does provide guidance for a fee in lieu for certain infrastructure, it is not clear if this approach can be used for sidewalks and other pedestrian amenities. The city clearly allows developers to pay a fee in lieu of providing required street trees in plazas (planting strips). Developers are also permitted by the city to use fee in lieu for parks and recreation requirements.

Fee in lieu programs can provide the city with more control over the timing of pedestrian facility construction. Furthermore, it can allow increased flexibility as to where the funds will be spent.

State of the Practice

Asheville

Section 7-11-7 of the Asheville UDO provides clear guidance to the city engineer on when fee in lieu may be used in place of sidewalk construction.

1. *Fee in lieu of construction.* Where a new sidewalk is required to be constructed, the city engineer/designee may waive the requirement that a sidewalk be constructed provided that the applicant makes a written request to the city engineer/designee for a waiver. The waiver will be granted under the conditions that the city engineer/designee determine that one of the following conditions exists and that the applicant pays a fee in lieu of constructing the sidewalk as described in the Fees and Charges Manual.
 - a. The pedestrian facility is not identified in the current Pedestrian Thoroughfare Plan as a needed pedestrian linkage.
 - b. The sidewalk is proposed to be constructed within an existing right-of-way where sufficient right-of-way or easement width does not exist or cannot be dedicated to build the sidewalk.
 - c. The pedestrian facility is identified on the Pedestrian Thoroughfare Plan but is a part of a NCDOT or city-funded project that includes sidewalks.

In no case shall the fee in lieu of constructing the sidewalk exceed 15 percent of the total cost of the approved project. The total cost of the project shall include all construction costs associated with the improvement as approved by the City of Asheville.

In the event that a fee in lieu of constructing a sidewalk is approved, the developer must provide a recorded easement if necessary for the future development of the sidewalk. The developer wherever practical shall grade for the future development of a sidewalk.

The fee in lieu of construction will not apply to level three projects unless specifically approved by the city engineer/designee. The fee in lieu of construction will not apply to new or reconstructed streets unless condition (e) (2) above applies.

2. *Use of fees.* All fees collected by the city pursuant to these provisions shall be accounted for separately from other monies, shall be expended only for the construction or rehabilitation of sidewalks or other pedestrian improvements in the same area as the development is located as defined by the city engineer/designee, and shall be expended within a reasonable amount of time after completion of the development (not to exceed five years) or returned to the developer.

Recommendation

- The City of Wilmington should consider developing a fee in lieu program to ensure that sidewalks are provided in the areas of highest need. Such a program will also provide the city with increased flexibility should unique site characteristics preclude the installation of sidewalks on that site.
- The city should consider crafting language that allows the approving authority to consider the installation of sidewalks in other, off-site locations if on-site improvements will not work due to peculiar site characteristics.

4.1.5 Pedestrian Benefit Zones

Pedestrian Benefit Zones are used by some cities to augment limited sidewalk construction funds in specific areas. This approach is similar to the fee-in-lieu program mentioned earlier, except that clearly defined “benefit zones” are developed that target the expenditure of funds. The City of Salisbury, NC has developed a program that identifies seven discrete benefit zones around the city.

Salisbury Land Development Ordinance

Section 4.9 Payment in Lieu Program

When the approving authority determines that the construction of a required sidewalk is unfeasible due to special circumstances, including, but not limited to: impending road widening, significant street trees, or severe roadside conditions; the approving authority shall require either: 1) payment in lieu of sidewalk construction, 2) construction of an equal linear foot of sidewalk elsewhere in the applicable Pedestrian Benefit Zone, or 3) a combination of the previous.

Payments received in lieu of construction shall be assigned to one of eight (8) Pedestrian Benefit Zones (see Figure 48) based on the location of the development seeking use of the payment in lieu program. These zones are areas in which the payments shall be spent for the safety and convenience of pedestrians utilizing the sidewalk or pedestrian network within that zone.

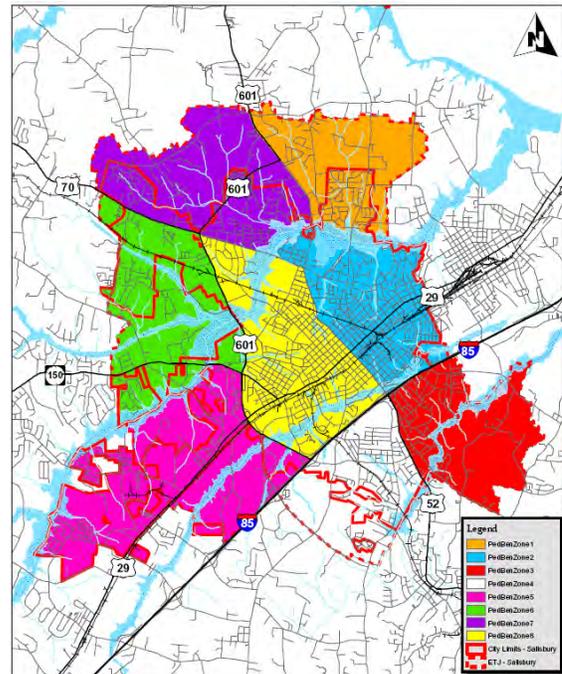


Figure 48 Salisbury, NC Pedestrian Benefit Zones

Recommendation

- The City of Wilmington should explore the development of pedestrian benefit zones that will help ensure that funds collected will be spent to serve the contributors of that fee. If these zones are drawn too large, the city may risk court challenges if it is found that funds are not being spent to benefit the people paying the fee.

It is recommended that these benefit zones be roughly two square miles in area. The City should also consider benefit zones corresponding to the following:

- Market Street
- North and South College Road
- Shipyard Boulevard
- South 17th Street
- Carolina Beach Road
- Oleander Drive
- Military Cutoff Road
- Corridor benefit zones should focus on improving sidewalk continuity along corridors, roadway crossing improvements (including curb ramps, pedestrian signals, pavement markings, and pedestrian refuges) and streetscape improvements.

The following map illustrates the pedestrian benefit zone concept as it might be applied to Wilmington. Zones are for illustrative purposes only and a more detailed analysis would be required to determine the actual extents and fees associated with any zone (see Figure 49)

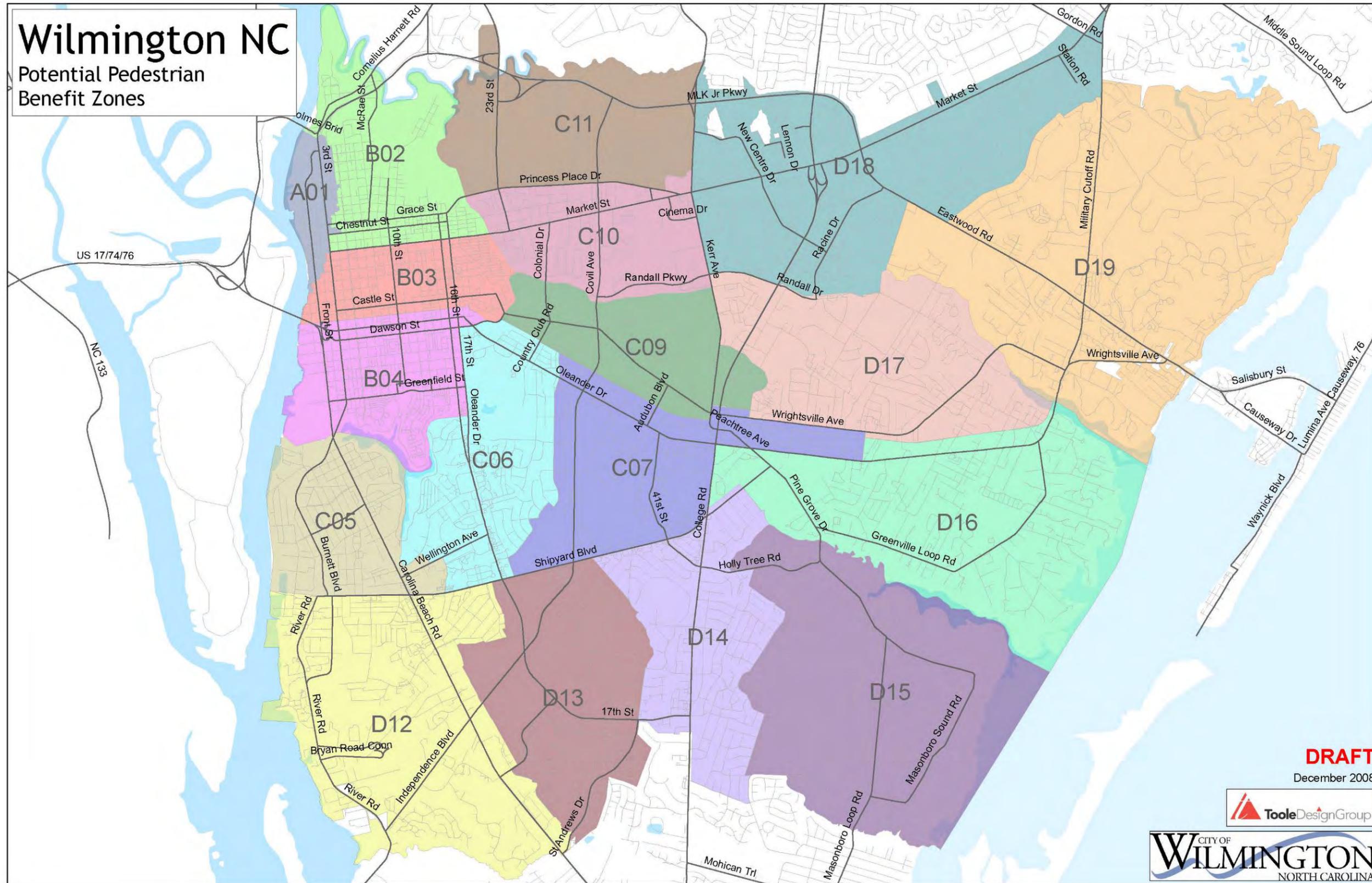


Figure 49 Conceptual Pedestrian Benefit Zones Map

Policy Requesting Sidewalks on All NCDOT Roads

WMPO and the City of Wilmington should adopt a resolution requesting pedestrian and bicycle accommodations on all state road projects within the city and urbanized area.

Current Policy or Practice

City of Wilmington

The City of Wilmington does not have a formal policy for requesting sidewalks and crossing facilities on all state road projects.

WMPO

WMPO does not have a formal policy for requesting sidewalks and crossing facilities on all state road projects.

State of the Practice

The MPO for the Charlotte area has recently adopted the *Mecklenburg-Union Planning Organization (MUMPO) Resolution Requesting NCDOT Include Sidewalks and Accommodations for Bicycles on All State Road Projects in the Mecklenburg-Union Metropolitan Planning Organization*.

This resolution states that:

- Sidewalks and on-street bicycle accommodations be included on all non-freeway transportation projects in the MPO;
- MUMPO recognizes that sidewalks are as much a part of a roadway project as the vehicle travel lanes;
- MUMPO is striving to become a truly multi-modal area and the accommodation for bicycles and pedestrians is essential in this effort;
- MUMPO requests NCDOT include full funding for sidewalks and on-street accommodations for bicycles as essential elements of all State Transportation Improvement Projects in the MPO area.

Recommendation

WMPO should work with its member municipalities to adopt resolutions requesting pedestrian facilities on all state road projects. The City of Wilmington should adopt a resolution requesting pedestrian facilities on all state road projects.

4.2. STREET CROSSING POLICIES

4.2.1 Crosswalk Marking Guidelines

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

The City of Wilmington has not established a policy detailing when and how to mark crosswalks. The following observations were made during field analysis:

- Crosswalks are marked at controlled locations only when there is a demonstrated pedestrian demand of one pedestrian present per cycle (on average)
- Marked crosswalks are only installed in combination with pedestrian signals and pushbuttons
- The marked crosswalks are generally placed where the crossing conflicts least with turning traffic
- Marking crosswalks across all legs of an intersection is rare except in the downtown area
- Stop line placement varies, but on local streets is typically set back beyond the sidewalk or pedestrian crossing area
- Standard details for intersection design do not show crosswalks or sidewalks to provide guidance on stop bar or signal detection placement.

State of the Practice- Uncontrolled Crossings (a.k.a. Mid-Block Crossings)

Other jurisdictions such as Raleigh, Durham, and Charlotte are adopting crosswalk marking policies for uncontrolled intersections and midblock locations based upon research completed by FHWA in 2005 which showed:

- On two-lane roads, of any traffic volume, marked crosswalks may be utilized
- On multi-lane roads, with raised medians, and over 15,000 vehicles per day, marked crosswalks alone increase the crash risk for pedestrians to cross the roadway
- On multi-lane roads, without raised medians, and over 12,000 vehicles per day, marked crosswalks alone increase the crash risk for pedestrians to cross the roadway
- Medians are recommended on roadways with 2 or more lanes
- Studies have shown that marked crosswalks attract pedestrians to cross within the designated crossing area

State of the Practice- Controlled Crossings

Other jurisdictions such as Raleigh, Durham, and Charlotte utilize marked crosswalks at all signal controlled intersection crossings.

Recommendation

Wilmington should:

- Develop and adopt crosswalk marking guidelines
- Modify standard design details to show pedestrian accommodations
- Modify current high-visibility marking design to reduce maintenance
- Modify standard design details to show pedestrian crosswalks and stop bar locations
- Install pedestrian signals on signalized crossings greater than two lanes
- Mark crosswalks at signalized intersections across all crossings

A proposed replacement detail for crosswalk markings and stop bar location may be found in Chapter 5, Design Standards.

4.2.2 Advance Yield Lines at Uncontrolled Marked Crosswalks (a.k.a. Mid-Block Crossings)

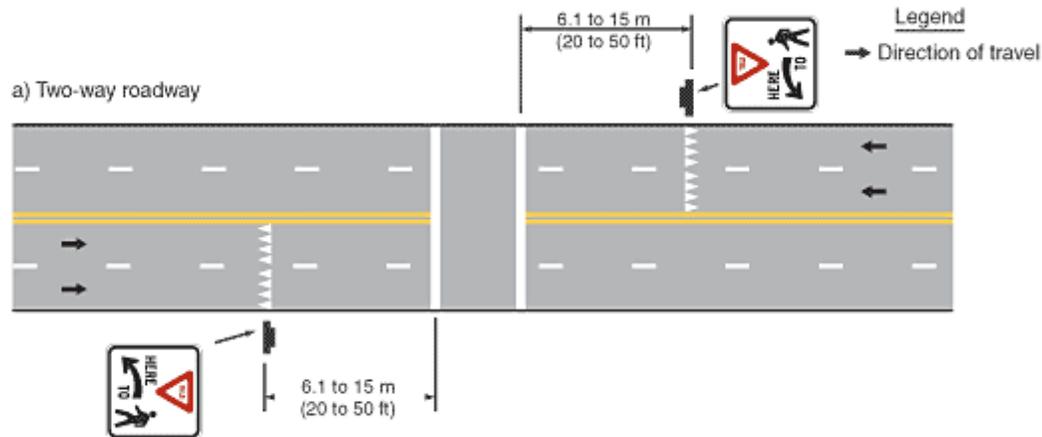


Figure 50 Advance Yield Lines at Uncontrolled Marked Crosswalks

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The city has adopted the MUTCD which defines the placement of advance yield lines. Advance yield lines do not appear to be in use in Wilmington.

NCDOT

NCDOT has adopted the MUTCD which controls the placement of advance yield lines. Advance yield lines do not appear to be in use in Wilmington. The NCDOT Midblock Pedestrian crossing warrant specifies the use of an advanced yield line for multi-lane crossings.

The Manual on Uniform Traffic Control Devices

Section 3b.16 defines yield lines in the MUTCD. The current wording of the MUTCD implies advanced yield lines are to only be utilized for uncontrolled, midblock crossings. This is in accordance with the North Carolina law requiring motorists to yield to pedestrians within marked crosswalks at uncontrolled crossings. Proposed changes to the 2009 edition of the MUTCD include improvements to the text to allow the placement of advanced yield line at uncontrolled crosswalks located midblock and at intersections.

Recommendation

City of Wilmington

Wilmington should adopt the proposed 2009 MUTCD language for advance yield lines.

NCDOT

NCDOT should adopt the proposed 2009 MUTCD language for placement of advance yield lines.

4.2.3 Pedestrian Scramble Phase

Current Policy or Practice

City of Wilmington

The City of Wilmington has not established a policy on the use of the pedestrian signal scramble phase.

NCDOT

NCDOT has not established a policy on the use of the pedestrian signal scramble phase.

State of the Practice

The pedestrian scramble phase is used in cities throughout the United States, such as Seattle, New Orleans, Pasadena, and Denver. The locations where the timing is utilized have high volumes of pedestrian traffic with a corresponding diagonal demand.

Recommendation

City of Wilmington

It is recommended the City of Wilmington develop a policy for utilizing the pedestrian scramble phase which will restrict its use to high pedestrian volume locations that exhibit a high diagonal crossing demand. It is recommended that Wilmington pilot study one or two intersections in the downtown area to assess the feasibility of this signal operation.

NCDOT

Where a requested pedestrian scramble phase is located on an NCDOT maintained roadway, it is recommended that NCDOT collaborate with the local entity to pilot study the project.

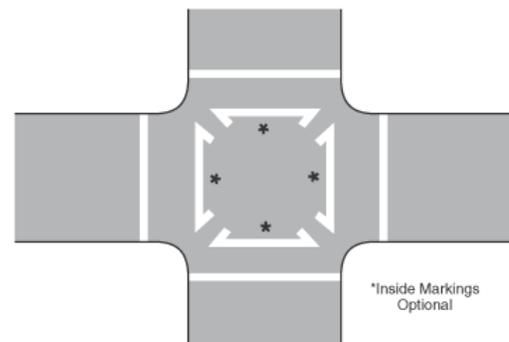


Figure 51 MUTCD Figure 35-17- Crosswalk Markings for Exclusive Phase that Permits Diagonal Crossing

4.3. INTERSECTION AND ROADWAY DESIGN POLICIES

4.3.1 Island Channelization and Pedestrian Refuge Islands at Intersections

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice *City of Wilmington and NCDOT*

The City of Wilmington and NCDOT currently employ median islands on many arterial roadways. The city and NCDOT do not typically utilize island channelization for right-turn lanes.



Figure 52 – Dual Median Islands on New York Avenue at Bladensburg Road Intersection in Washington, DC

State of the Practice

A number of research studies have shown that pedestrians receive a safety benefit from raised medians. Pedestrian refuge islands are also beneficial as they can potentially reduce exposure to motor vehicles. When utilized at signalized intersections, channelizing islands separating right-turn lanes from through-lanes can shorten cycle lengths by reducing the pedestrian crossing time.

Recommendation

Wilmington should:

- Provide median refuge islands on all roadways with four or more travel lanes
- Encourage NCDOT to provide median refuge islands on all roadways with four or more travel lanes (provide additional funding if necessary)
- Provide island channelization between through and turning traffic
- Encourage NCDOT to provide island channelization between through and turning traffic (provide additional funding if necessary)

NCDOT should:

- Develop cross sections and standards for roadways in urbanized areas that include median refuge islands
- Provide median refuge islands on all roadways with four or more travel lanes (provide additional funding if necessary)
- Provide island channelization between through and turning traffic (provide additional funding if necessary)

A proposed replacement detail for median refuge islands may be found in Chapter 5, Design Standards.

4.3.2 Turning Radius and Intersection Size

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington currently requires a 35-foot curb radius at all roadway intersections.

The curb at street corners shall be constructed on a thirty-five (35) foot radius unless otherwise directed. At driveways, the curb and gutter shall be constructed on a three (3) foot radius.

NCDOT

NCDOT has not established a policy on the use of augmenting turning radius or intersection size for traffic calming purposes.

State of the Practice

When roadways are constructed without consideration of the actual required turning radius of the vehicles utilizing them, the curb radius may be constructed to be larger than necessary which lengthens pedestrian crossing distances and increases vehicle turning speeds.

Recommendation

Wilmington should:

- Codify the allowed flexibility in choosing appropriate curb radii based upon the required effective curb radius of the design vehicle
- Develop criteria for the use of curb extensions

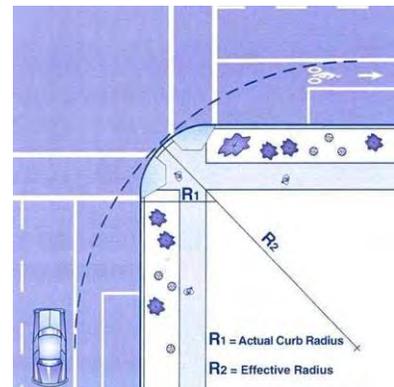


Figure 53 – Illustration of Actual Curb Radius vs. Effective Curb Radius from Oregon Pedestrian and Bicycle Design Guide.

4.3.3 Dual Turning Lanes

Current Policy or Practice

There are examples of dual right- and left-turn lanes at several intersections throughout the city. For example, NCDOT has just installed a second left-turn lane from northbound South College Road on to New Centre Drive and there are two right-turn lanes from northbound Wrightsville Avenue on to eastbound Wrightsville Avenue at the intersection with Eastwood Road.



Figure 54 Dual Right Turns on to eastbound Wrightsville Avenue from Northbound Wrightsville Avenue

State of the Practice

Dual right turns are used in locations where a single turning lane does not have the capacity to handle the turning traffic volumes through an intersection. The Federal Highway Administration’s (FHWA) report, “Signalized Intersections: Informational Guide FHWA-HRT-04-091” provides guidance on the use and design of dual right turn lanes. It states that right turn on red should only be allowed from the outside (rightmost) lane. Furthermore, it does advise that “a double turn lane will result in a wider footprint for the intersection and increase the distance pedestrians must cross, which increases their exposure to potential conflicts with vehicular traffic.” The report also raises the challenges posed for on road cyclists traveling through the intersection as they try and navigate the multiple turning vehicle movements. Table 7, extracted from the FHWA report, summarizes the issues related to double-right turn lanes.

Characteristics	Potential benefits	Potential Liabilities
Safety	Separation of right-turn vehicles.	Potential for sideswipes.
Operations	Higher right-turn capacity. Shorter green time. Less delay for following through vehicles.	Off-tracking of large vehicles.
Multimodal	None identified.	Longer pedestrian crossing distance, time, and exposure.
Physical	Potentially shorter intersection footprint than needed for single turn lane.	Wider intersection footprint.
Socioeconomic	None identified.	Right-of-way costs. Access restrictions to property.
Enforcement, Education, and maintenance	None identified.	None identified.

Dual turning lanes present particular challenges for visually impaired pedestrians. Without being able to see the intersection, a blind person may not be aware that the traffic pattern at the intersection is not typical. Extra precautions should be taken, such as audible pedestrian signals (APS) to maximize the information conveyed to all pedestrians.

Recommendations

City of Wilmington

Wilmington should consider other options before installing dual right turn lanes. Consideration must be given to all modes of transportation through the intersection. Dual right turn lanes are discouraged in the *Central Business District Zone*, *Urban Core Zone*, and *Traditional Suburban Zone* and other places where consistent pedestrian volumes are likely.

If dual right turn lanes must be used, pedestrian signals must be installed. A dedicated pedestrian phase on the parallel leg of the intersection is preferred. If a dedicated pedestrian phase cannot be used due to cycle length, then a leading pedestrian interval is strongly recommended.

NCDOT

NCDOT should consider other options before installing dual right-turn lanes. Consideration must be given to all modes of transportation through the intersection. Dual right turn lanes are discouraged in the *Central Business District Zone*, *Urban Core Zone*, and *Traditional Suburban Zone* and other places where consistent pedestrian volumes are likely.

4.3.4 Driveway Design

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington and NCDOT currently utilize driveway designs that allow for higher speed right turns from the roadway by motorists across the driveway. The Wilmington Standard SD8-02 provides the optimal pedestrian sidewalk design by carrying an approximately level sidewalk through the driveway.

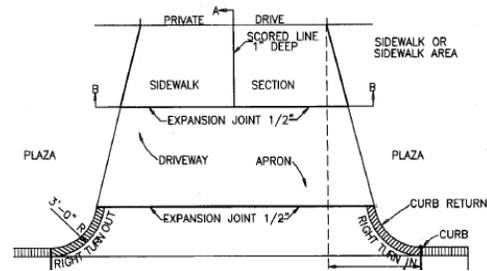


Figure 55 – Wilmington Standard Driveway Detail (SD 8-02)

Driveway crossings may put pedestrians at risk of a crash due to cars turning in and out of the driveway. Drivers must focus on oncoming traffic, navigating the driveway entrance, and vehicles exiting or entering the driveway. All of this activity may reduce the likelihood that a driver would see a pedestrian. Subsequently, the number of driveway/sidewalk intersections a pedestrian must cross should be reduced to the extent possible. Access management is included

in the City's Technical Standards and Specification Manual (page 7-11 – 7-15). The current regulations provide clear guidance on required spacing between driveways and the number of driveways allowed. Furthermore, the regulations clearly require non-compliant driveways to be removed or brought into compliance.

NCDOT

NCDOT currently stipulates that a paved driveway turnout (Std. No. 848.04) shall be used for commercial type entrances that generate 500 ADT or more. A 25 foot minimum curb radii is recommended with a 20 foot minimum driveway width. Uses

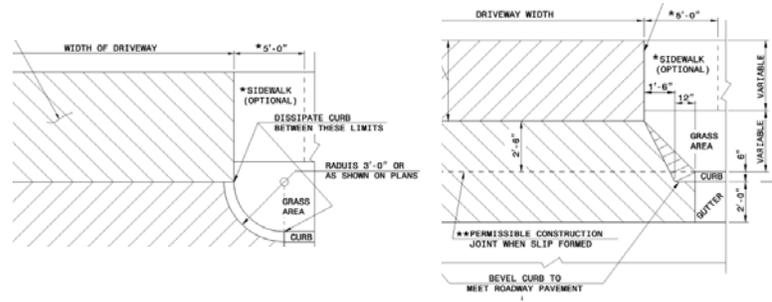


Figure 56 – NCDOT Std. 848.02 and 848.03

that generate less than 500 ADT may use NCDOT Std. No. 848.02 or Std. No. 848.03 utilizing the 3 foot minimum curb radii.

State of the Practice

Urban areas such as Charlotte; Washington, DC, Boston, Raleigh and Durham utilize curb radii for the driveway/roadway corner or a small triangular approach limited to the driveway ramp area preceding the apron (typically 3.5 foot maximum). The curb radii specified allows for increases in radii to serve the appropriate design vehicle.

Recommendation

Wilmington should:

- Identify opportunities to improve existing driveways
- Develop more flexible driveway design standards
- Require all new driveways to conform to Wilmington standards for vertical alignment and construction materials
- Continue to identify opportunities to reduce the number of driveways pedestrians must cross.

A proposed replacement detail for SD 8-02 may be found in Chapter 5, Design Standards.

NCDOT

NCDOT should continue to apply driveway design standards appropriate to the ADT of the site as it does in its current policy.

4.3.5 Pedestrian and Bicyclist Cut-Throughs on Cul-de-Sacs and Adjoining Streets

There are several examples in Wilmington where two cul-de-sacs come within short distances of each other but do not have any connection between them. Similarly, there are several streets that essentially dead end into each other but a barricade or some other obstacle blocks through traffic. Both of these situations present opportunities for increasing pedestrian and bicyclist connectivity.



Figure 57 Potential Cut-Through near Codington Elementary

Current Policy or Practice

Currently, Wilmington does not have a policy requiring pedestrian or bicycle connectivity between neighborhoods or developments.

State of the Practice

Charlotte recently conducted an exhaustive survey that identified many, if not most of the city's dead end streets in an effort to locate opportunities for increased bicycle and pedestrian connectivity between neighborhoods. Through that study, they identified 15 connections that were then improved by the city with aesthetically pleasing pass-throughs that allowed pedestrian and bicycle access by blocked automobile traffic.

Now, Charlotte requires full street interconnectivity between neighborhoods. In cases where full modal connectivity cannot be provided, the city will consider bicycle and pedestrian connections in lieu of a full street.



Figure 58 Conceptual Design- Pedestrian Cut Through. Merry Oaks Court, Charlotte, NC. *Source: Charlotte, NC*

Recommendations

Wilmington should identify all potential locations within the city that may be candidates for retrofitting bicycle and pedestrian connections between neighborhoods and developments. Once these locations have been identified, the city should work with the local neighborhoods to develop designs that address neighborhood concerns about vehicle traffic while allowing the free flow of cyclists and pedestrians.

The city should require bicycle and pedestrian connections between neighborhoods on all future developments.

Note: Figure 76 through Figure 79, Recommended Pedestrian Facility Improvements starting on page 154 illustrate potential pedestrian cut through locations throughout the city.

4.4. SIGNALS AND SIGNAGE POLICIES

4.4.1 Turning Vehicles Yield to Pedestrians Sign

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington has adopted the MUTCD which currently utilizes a word only version of the sign. There are no installations of this sign in Wilmington at present. However, Racine Drive will soon have these signs.

NCDOT

NCDOT uses the current version of the MUTCD as well and does not appear to have a provision allowing for the graphic version of the sign.

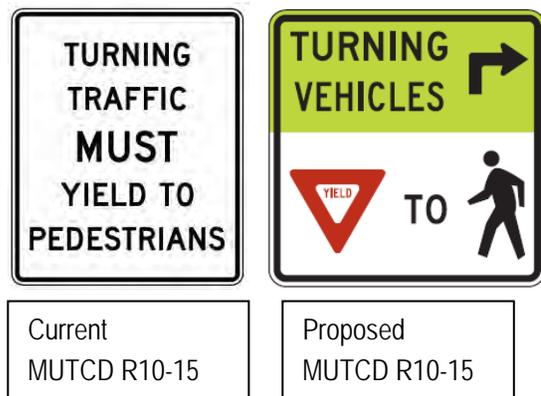


Figure 59 Yield to Pedestrians Signs

State of the Practice

Based upon research showing this sign to be effective at reducing conflicts between turning motorists and crossing pedestrians, this sign has been proposed for inclusion into the 2009 MUTCD.

Recommendation

City of Wilmington

The City of Wilmington should adopt the *Turning Vehicles Yield to Pedestrians* sign proposed for the 2009 MUTCD and utilize at locations with conflicts between turning vehicles and pedestrians.

NCDOT

NCDOT should adopt the *Turning Vehicles Yield to Pedestrians* sign proposed for the 2009 MUTCD and utilize at locations with conflicts between turning vehicles and pedestrians. However, NCDOT should study the sign's effectiveness at Racine Drive for use throughout the city.

4.4.2 *Leading Pedestrian Interval Signal Timing*

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

The City of Wilmington does not currently have a policy for using the leading pedestrian interval (LPI) at traffic signals.

State of the Practice

LPI is a signal phasing strategy used to improve pedestrian visibility to motorists in locations with heavy volumes of turning traffic and frequent pedestrian crossings. During the LPI, all motor vehicle flows are stopped for two to four seconds while pedestrians are given the WALK signal. This is designed to allow pedestrians to begin crossing in advance of vehicular turning movements which makes them more visible to motorists.



Figure 60 Leading Pedestrian Intervals Give Pedestrians a “Head Start” Before Turning Traffic Receives a Green Light.

Recommendation

City of Wilmington

The City of Wilmington should develop a policy for the use of LPI at signalized intersections. The city should pilot LPI in high pedestrian demand areas (such as North 3rd Street at Chestnut Street and North 3rd Street at Princess Street, and along North Front Street). The city should also use LPI in cases where there is high potential for auto/pedestrian conflicts, such as at intersections with dual right turn lanes (where pedestrians are not provided with a dedicated phase).

NCDOT

NCDOT should collaborate with the City of Wilmington on the pilot study of LPI in high pedestrian demand areas.

4.4.3 Pedestrian Actuated Signals and Push Button Locations

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington currently utilizes pedestrian push buttons to activate pedestrian signals at all locations where crosswalks are marked in conjunction with traffic signals, except on North Front Street, North 2nd Street and the intersections of Market Street and 16th Street and 17th Street). In these select locations, 'concurrent' signal operation is used. This means that pedestrians receive a walk signal at the same time as the auto traffic travelling in the same direction, without having to press a button.



Figure 61 Pedestrians Jaywalk During Midweek Evening with Low Traffic Volume on North 3rd Street at Chestnut

NCDOT

Most pedestrian signals on NCDOT maintained roadways in the City of Wilmington use the pedestrian push buttons to activate pedestrian signals.

State of the Practice

Pedestrian actuated signals should be used in cases where pedestrians are not routinely provided sufficient time to completely cross a roadway before the signal changes, and there is not sufficient pedestrian demand to warrant a WALK signal every cycle.

Concurrent pedestrian signals should be used in peak demand areas where the volume of pedestrians is sufficiently high that there is a likelihood that pedestrians will be crossing during most traffic cycles. Candidate locations include in Wilmington's *Central Business District Zone*, near the New Hanover Regional Medical Center, and near UNCW.

Recommendation

Wilmington should:

- Adopt 2009 MUTCD Guidance for Signal Siting and Design
- Reposition and upgrade older non-compliant push buttons
- Use concurrent signal operation in peak demand areas without push buttons

NCDOT

NCDOT should use concurrent signal operation in peak pedestrian demand areas without push buttons to activate pedestrian signals.

4.4.4 Signs for Uncontrolled Crossings

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington has adopted the MUTCD which allows the use of the R1-6 in-street bollard and the W11-2 pedestrian warning sign at uncontrolled crossings. At present, there are no installations of the in-street bollard. The W11-2 warning sign is utilized at a number of pedestrian crossings in Wilmington.

NCDOT

NCDOT has adopted the MUTCD which provides for the use of the R1-6 or W11-2.

State of the Practice

The use of the W11-2 is standard practice in the majority of communities in the United States. Unfortunately, despite this uniformity of use, the sign has proven to be ineffectual at improving motorist compliance with “yield to pedestrians in crosswalk” laws. Jurisdictions have begun experimenting with a new uncontrolled crosswalk sign based upon the approved MUTCD in-street bollard. Experiments have shown the in-street bollard and the modified side-of-street sign to be effective at increasing motorist compliance rates with the yield to pedestrians in crosswalk laws where utilized.



Figure 62 –Side of Street Uncontrolled Pedestrian Crossing Sign in Boulder, CO

Recommendation

Wilmington should:

- Adopt a standard side-of-street uncontrolled crosswalk sign design
- Develop an uncontrolled crosswalk signing policy
- Evaluate uncontrolled crosswalk signing policy and effectiveness
- Upgrade uncontrolled crossing locations across the city to comply with new policy

NCDOT

NCDOT should collaborate with the City of Wilmington to develop a policy for marking uncontrolled crosswalks within the city on NCDOT maintained roadways.

4.4.5 Flashing Warning Beacons (Rapid Flash Beacons)

(Note: a more detailed discussion of this policy may be found in the Appendix of this document)

Current Policy or Practice

City of Wilmington

The City of Wilmington uses the conventional flashing beacon. The city has adopted the MUTCD which defines where these may be used. The city has not adopted a policy for rapid flashing beacons.

NCDOT

NCDOT uses the conventional flashing beacon. NCDOT has adopted the MUTCD which defines where these may be used. NCDOT has not adopted a policy for rapid flashing beacons.



Figure 63 Flashing Beacon at Castle Street and South Front Street

State of the Practice

The Rapid Flash Beacon is a device using LED technology (instead of the traditional incandescent bulbs) in combination with crosswalk warning signs. The RFB design differs from the flashing beacon by utilizing:

- A rapid flashing frequency (60 times per second vs. 1 per second)
- Brighter light intensity
- Ability to aim the LED lighting



Figure 64 Rapid Flash Beacon and Accompanying Sign

Note: Sign has not been approved by FHWA

RFB effectiveness has been tested by a number of jurisdictions and the results indicate that this device increases motorist compliance to a much higher percentage than the standard flashing beacon. RFBs have been used in St. Petersburg, FL, Washington, DC and Boulder, CO.

The Federal Highway Administration has developed an interim approval notice authorizing the RFB without the accompanying signage.

RFBs should be considered for roadways with relatively short crossing distances, such as two lane roads or roads with wide medians. For roadways with longer crossing distances, pedestrian hybrid signals or fully signalized intersections should be considered.

Recommendation

Wilmington should:

- Develop a policy based upon the FHWA interim approval recommendation for use of the rapid flash beacon with the exception of the sign design.
- Develop a standard detail for the design of the sign.
- Develop a policy for restricting the use of the standard flashing beacon at uncontrolled pedestrian crossings.

NCDOT

NCDOT should:

- Collaborate with the City of Wilmington and other jurisdictions within North Carolina to pilot test the rapid flash beacon.
- Develop a policy based upon the FHWA interim approval recommendation for use of the rapid flash beacon with the exception of the sign design.
- Develop a standard detail for the design of the sign.
- Develop a policy for restricting the use of the standard flashing beacon at uncontrolled pedestrian crossings.

4.4.6 Pedestrian Hybrid Signals

(note: a more detailed discussion of this policy may be found in the Appendix of this document)

To provide a balance between pedestrian crossing needs and vehicular movement, some jurisdictions around the country have adopted the pedestrian hybrid signal, otherwise known as the HAWK (High-intensity Activated CrossWalk) signal. The signal stops traffic when pedestrian activated, and is appropriate in locations where a full signal may cause unnecessary traffic delay by stopping traffic for the entire pedestrian phase.



Figure 65 HAWK Signal in Tucson Arizona

This pedestrian activated signal is a combination of a flashing beacon and a traffic signal with pedestrian pushbuttons and pedestrian signal heads. It controls traffic on the main road using a combination of red and yellow signal lenses, while the minor approach is controlled by pedestrian signals and a stop sign for vehicles. This signal has been approved for inclusion into the MUTCD by the national committee and is included in the proposed language for the 2009 MUTCD. This signal may also be used at mid-block locations.

Current Policy or Practice

Wilmington and NCDOT have adopted the MUTCD which defines the pedestrian warrant for traffic control devices. Neither entity has a current policy for Pedestrian Hybrid Signals.

State of the Practice

The City of Tucson, AZ has used the HAWK signal, combined with a media campaign, to generate a high motorist yield rate, increasing compliance from 30 percent under normal conditions to 93 percent over an eight-month study period. This treatment is profiled in ITE's *Traffic Control Devices Handbook*. The signal has proven to be a successful tool to assist pedestrian crossings of multi-lane arterials with high vehicular volumes while minimizing vehicular delay to the arterial and discouraging minor roadway cut-through traffic.

Proposed language for the 2009 MUTCD defines the HAWK signal operation, provides warrants for its use, and provides installation guidance.

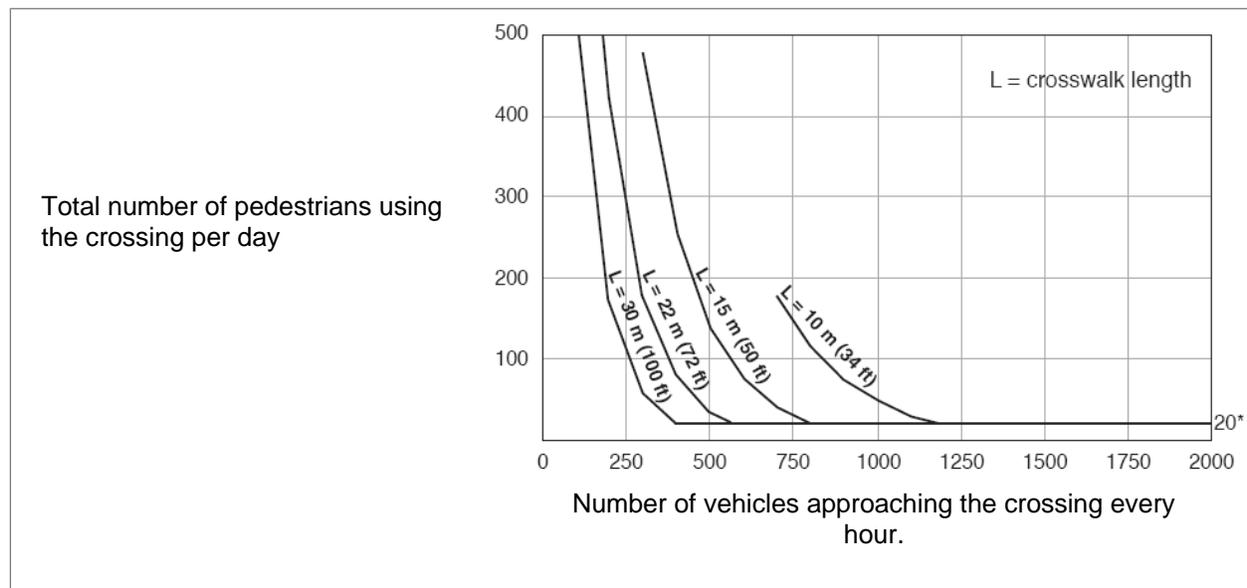


Figure 66 Chart providing guidelines for the installation of pedestrian hybrid signals on roadways with speeds of more than 35 mph. Source: *Figure 4F-2, 2007 notice of proposed amendments for the Manual on Uniform Traffic Control Devices*.

The proposed guidance is based on a combination of pedestrian volumes, vehicle volumes and speed limits, and crossing distances. The chart illustrates the recommended width thresholds for installation of a pedestrian hybrid signal on a roadway with a speed limit of 35 mph or greater. For example, the maximum crossing distance for a crossing that carries roughly 200 people per day on a road carrying roughly 500 vehicles per hour is fifty feet. Crossings greater than this width are not recommended.

Recommendation

Wilmington should adopt the proposed language for the 2009 MUTCD for both the pedestrian volume signal warrant and the pedestrian hybrid signal. The city should explore opportunities to pilot the pedestrian hybrid signal. Consideration should be given to locations that are along multi-lane arterials with relatively long distances (greater than four blocks or ¼ mile) between signalized intersections, and relatively high traffic volumes and vehicles speeds. Suggested locations are along major arterials such as Wooster Street or Market Street where there is considerable potential pedestrian demand and relatively long spacing between signalized intersections.

4.4.7 Posted Speed Limit Reductions

The speed of passing vehicles contributes directly to a pedestrian's sense of safety and comfort. The Pedestrian Level of Service¹⁰ model incorporates the posted speed limit, traffic volume, separation distance between sidewalks and traffic and other factors into the calculation that predicts a pedestrian's sense of comfort along a particular roadway.

Many of Wilmington's arterial roadways have relatively high speed limits of 35, 45, even 55 mph. At the same time, many pedestrians were observed walking along and across these arterials. In many cases, pedestrians were observed walking or crossing in locations where no 'formal' pedestrian facilities such as sidewalks or crosswalks had been provided. The array of shopping opportunities, schools, restaurants and other destinations along the arterials contributes to the pedestrian activity along and across these roads. Unfortunately, these roads are also where many of the city's fatal pedestrian crashes occurred (see Figure 36, p. 55).

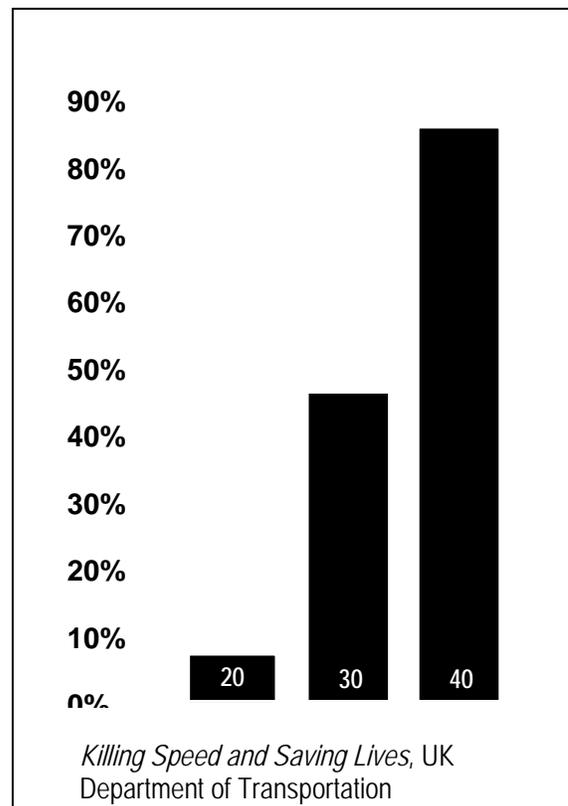


Figure 67 Pedestrian Fatality Related to Speed
Fatalities based on speed of vehicle. A pedestrian's chance of death if hit by a motor vehicle traveling at different speeds

¹⁰ "Modeling the Roadside Walking Environment: A Pedestrian Level of Service," Landis, et.al. TRB Publication No. 01-0511.

Motor Vehicle Speeds

Higher motor vehicle speeds create a less comfortable environment for pedestrians, increase required stopping distance, and increase the frequency and severity of pedestrian crashes. A pedestrian hit by a motorist traveling 40 mph has a slim chance of survival compared to a pedestrian who is hit by a car that is traveling only 20 mph.

Specific facility recommendations include treatments to reduce motorist speeds, such as speed cameras, raised crossings, and reducing turning radii. Enforcement programs such as developing a photo radar program and increasing penalties for speeding infractions are described in Chapter 7 to reduce motor vehicle speeds.

Current Policy or Practice

Wilmington currently does not have a policy for setting speed limits along major arterial roadways. According to discussions with WMPO staff, NCDOT generally uses the 85th percentile method of establishing speed limits on NCDOT-owned roads within the city, although there are cases where the city and NCDOT have negotiated a reduction in vehicle speed.

“Section 20 141. Speed Restrictions, of the North Carolina General Statutes governs the establishment of speed limits within the State. Subsection (f) allows a municipality to request a lower speed limit along a state road if it can be determined upon the basis of an engineering and traffic investigation that the prevailing speed is “greater than is reasonable and safe.”

Recommendations

Wilmington should consider coordinating with NCDOT to change speed limits on some non-limited access state roads in the city. Modifications should be applied based on character zone. Roadway designers shall utilize the table below when determining design speeds for new roadways and improved roadways. Figure 68 on the following page illustrates the implications of the proposed speed limit modifications.

Table 8 Recommended Speed Limits

Character Zone:	WMPO Roadway Functional Classification:			
	Local or Neighborhood Collector	Urban Collector	Arterial	Limited-access Arterial or Freeway ¹¹
Central Business District	25 mph	25 mph	25 mph	85 th percentile
Urban Core	25 mph	25 mph	25 mph	85 th percentile
Traditional Suburban	25 mph	35 mph	35 mph	85 th percentile
Automobile-Oriented	25 mph	35 mph	45 mph	85 th percentile

¹¹ Includes Martin Luther King, Jr. Parkway and Independence Boulevard

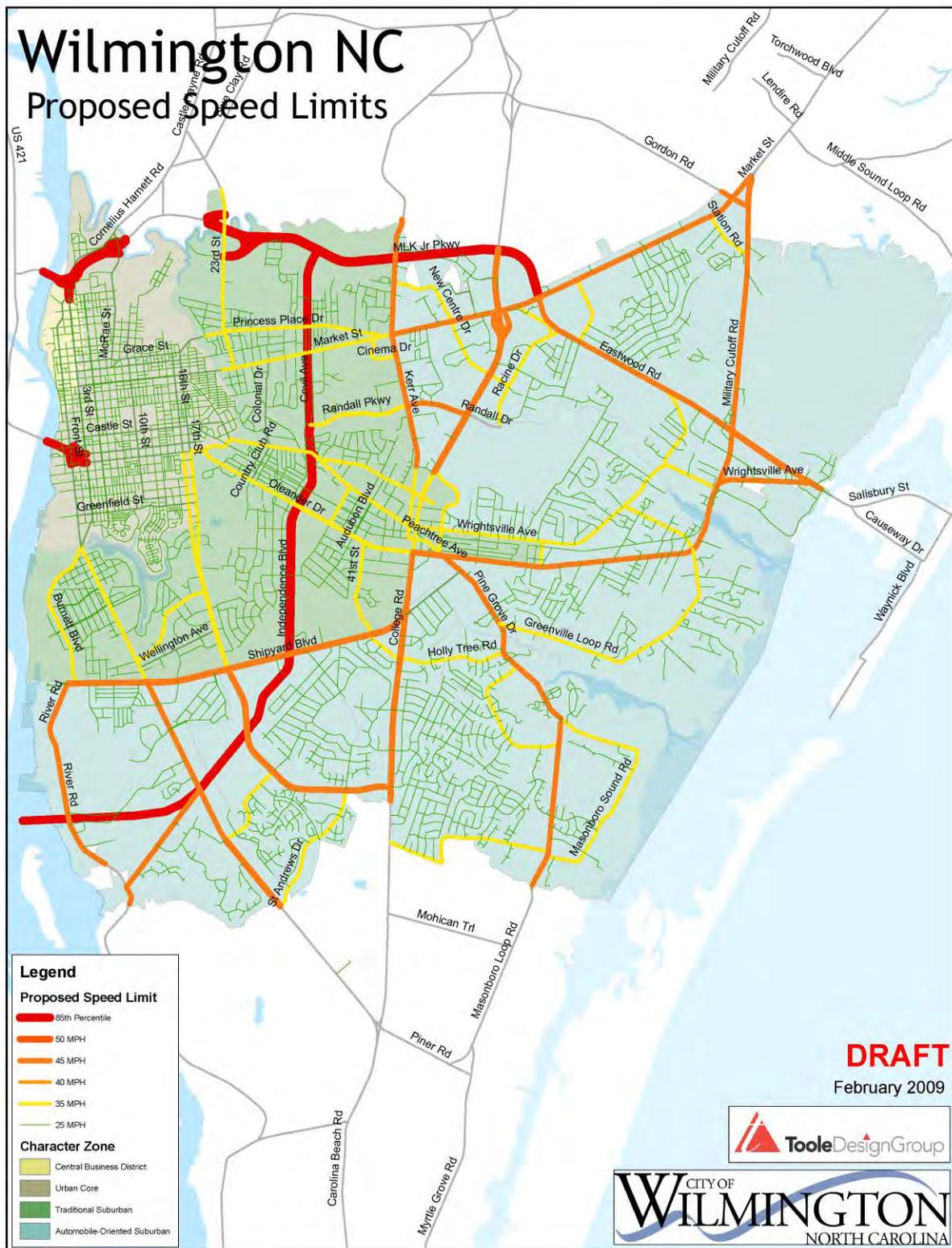


Figure 68 Proposed Speed Limits

4.5. SIDEWALKS, SHARED USE PATHS AND MULTI-USE TRAILS

4.5.1 Shared Use Path Design

This report provides some basic information on the appropriate design of shared use paths (also termed “greenways” or “multi-use trails”). The designer should also consult with the AASHTO *Guide for the Development of Bicycle Facilities* and the *Manual on Uniform Traffic Control Devices* (MUTCD) for further information on many other aspects of pathway design, such as horizontal and vertical alignment, the proper design of pathway structures, intersection design and other pertinent topics. It is essential to refer to these resources, as they provide further guidance and standards that are needed in order to ensure proper pathway design.

Shared-use paths serve a wide variety of users, including pedestrians, bicyclists, people with disabilities, and in-line skaters. Shared use paths should be designed with the volumes, various speeds and space requirements of different user groups in mind. According to the AASHTO *Guide for the Development of Bicycle Facilities*, shared use paths should be a minimum of 10 feet wide with 2 foot-wide shoulders. This will enable the path to operate as a two way facility. In areas with high volumes of trail users, 12-14 foot widths are recommended.

In extremely constrained conditions, pathway width can be reduced to 8’, however this is generally only appropriate for short sections of trails, and according to the AASHTO *Guide*, the following conditions should prevail: “(1) bicycle traffic is expected to be low, even on peak days or during peak hours, (2) pedestrian use of the facility is not expected to be more than occasional, (3) there will be good horizontal and vertical alignment providing safe and frequent passing opportunities, and (4) during normal maintenance activities the path will not be subjected to maintenance vehicle loading conditions that would cause pavement edge damage.” The MUTCD provides further guidance on the appropriate types and sizes of warning signs that can be used for narrow pinchpoints on pathways, as well as other pathway conditions that require warning signs.

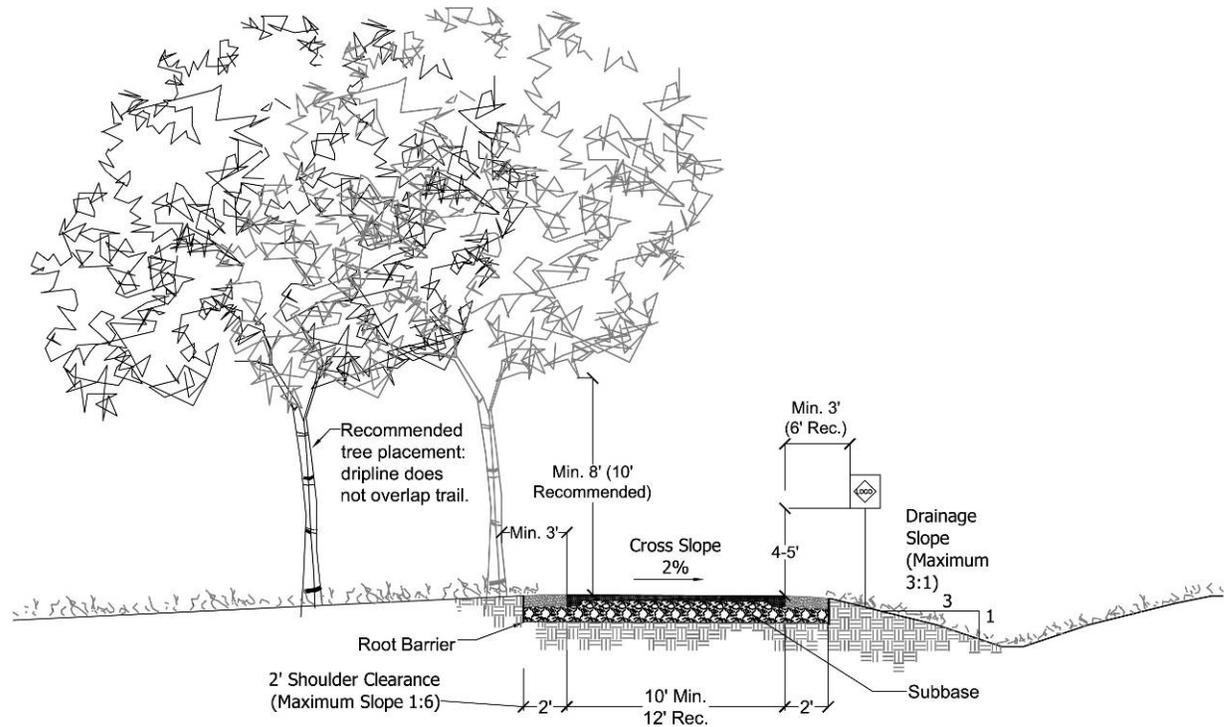


Figure 69 Shared Use Path Cross Section

4.5.2 Surface Types

Asphalt or concrete are the preferred surface types for multi-use trails. In some circumstances it may be appropriate to construct the path with a soft surface. Soft surface trails are generally not recommended in areas prone to flooding or where steep grades would cause the erosion of the trail surface. The surface should be designed to withstand loads transferred by the heaviest maintenance vehicle intended to travel along the pathway. The trail surface should be designed with appropriately compacted sub-grade, and the correct sub-base and pavement thickness in order to accommodate maintenance and emergency vehicles that will access the trail. Due to the wide variation in soil types and drainage conditions, the pavement structure and subsurface drainage should be designed to the specific conditions of each trail project.

4.5.3 Accessibility

Multi-use trails and sidewalks should comply with the provisions set forth in the Americans with Disabilities Act Accessibility Guidelines (ADAAG). Universal design principles should also be applied to all connections to the multi-use trail including parking lots, neighborhood connectors, adjoining roadways, and adjoining facilities (rest stops, buildings, restrooms, etc.)

Cross slopes on shared use paths should not exceed 2%. Running grades should be kept to minimum to provide for maximum accessibility. Every effort should be made to ensure running

grades are kept within ADA guidelines on shared use paths. In limited circumstances where achieving these grades would be prohibitively expensive or would denigrate a unique natural environment, exceptions can be made to running grade requirements. Making such an exception does eliminate the responsibility to meet ADA guidelines on all other aspects of trail design.

The following steps should be taken to mitigate steeper grades in these situations:

- Provide ADA compliant curb ramps at all intersections with sidewalks.
- Provide flat landings with benches to enable trail users to stop and rest if necessary
- Provide hand rails on the sides of the trail
- Widen the trail to allow more space for slower users
- Provide an alternative accessible route and use signage to direct people with physical disabilities to the route



Figure 70 Driveway Conflict on a Sidewalk

Steep downgrades are not recommended at roadway intersection approaches. Every effort should be made to keep intersection approaches at or below a 5% slope in order to reduce the possibility of a bicyclist or other wheeled user losing control and crashing into the intersection.

4.5.4 Shoulders

Two-foot wide graded shoulders should be provided along the entire length of the path unless right of way is constrained. The shoulders should typically be of some soft material to serve walkers and runners who prefer soft surfaces.

4.5.5 Shared Use Paths Adjacent to Roadways

Shared Use Paths adjacent to roadways, also known as sidepaths or wide sidewalks, can provide a more comfortable place for novice bicyclists and other people who are not comfortable riding on the road with traffic. However, shared use paths adjacent to roadways are most appropriate in corridors with few driveways and intersections. This is because these locations present a

safety problem due to conflicts between turning motorists and bicyclists. The photo to the left demonstrates such a conflict: the motorist in the driveway is looking to the left for breaks in traffic and does not see the bicyclist approaching from his right.

For the reasons described above, shared use paths adjacent to roadways should not be designated by signs or markings as bicycle facilities, and care should be taken in providing them as a facility intended to serve the needs of bicyclists. Along roadways with few driveways or intersections, shared use paths may be provided, however on-road bicycle facilities should also be provided as an alternative.

4.5.6 Wayfinding Signage, Trailheads and Other Trail Amenities

Wayfinding is very beneficial to pedestrians who are trying to navigate the city's streets and trails. This is especially important in areas where tourists and other people unfamiliar with an area are likely to be walking. There are several excellent sources for information on wayfinding signage, trailheads, and other amenities. For more information, refer to the following publications:

- *Signage and Wayfinding Design: A Complete Guide to Creating Environmental Graphic Design Systems*. Published by John Wiley & Sons, Inc, 2007. Author: Chris Calori.
- *Greenways: A Guide to Planning, Design and Development*. Published by Island Press, 1993. Authors: Charles A. Flink and Robert Searns.
- *Trails for the Twenty-First Century*. Published by Island Press, 2001. Authors: Charles A. Flink, Robert Searns, and Kristine Olka.

4.5.7 Lighting

Pedestrians are adversely affected by low-light conditions. Two-thirds of pedestrian fatalities occur between dusk and dawn. Lighting is important along sidewalks and walkways in commercial pedestrian districts such as historic downtown as well as at intersections and midblock crossings, particularly in locations near transit stops.

Preferred pedestrian-scale lighting is characterized by shorter light poles (i.e. 15-foot tall posts), lower wattages (except at crossings), shorter spacing between lamp posts, more even light distribution, and high pressure sodium vapor or metal halide lamps. Sodium vapor and metal halide lamps produce a better color definition and "white light" to areas with higher pedestrian volumes.

Shorter light poles may place the street light fixtures at eye level in the second floor bedroom window of high-density residential developments. The light fixtures should therefore be a full cut-off design with the bulb recessed within the fixture, or otherwise incorporate the appropriate shielding, in order to prevent light trespass.

Pedestrian light poles should be spaced as specified in the city's specifications (not reviewed for this plan). Pedestrian light fixtures should in-fill between street light poles. Distinctive pedestrian scale lamp posts could be used to improve the appearance of the streetscape in pedestrian oriented areas. Additional recommendations:

- Light poles should be placed either in the buffer zone, or on the far side of the sidewalk - and not within the through pedestrian zone.
- The required clear width must be maintained per the Americans with Disabilities Act Accessibility Guidelines (ADAAG).
- Light fixtures should be placed within reach of a maintenance vehicle parked on the adjacent roadway, to avoid damage to the adjacent sidewalk and landscaped areas.
- Street lampposts, pedestrian lampposts, and landscape plans must be coordinated to assure that the lights are not engulfed in a canopy of trees.
- Crosswalks should be illuminated at each end by a standard street lamp.

4.5.8 Transit Access

The location and design of bus stops can significantly impact the safety and comfort of pedestrians accessing transit services.

Recommendation

The City of Wilmington should coordinate with WAVE Transit to develop design guidelines for the location of bus stops, as well as accessibility and design of bus stops to increase pedestrian safety and the effectiveness of the transportation system.

Bus Stop Location

Care should be taken to place bus stops in locations that maximize pedestrian safety and convenience. Determining the best location for bus stops involves choosing among far-side, near-side, and mid-block placement. The table on the following page presents the advantages and disadvantages of each bus stop type.

Best practice research indicates that although each site is unique, generally bus stops should be located on the far side of intersections. Far-side bus stops have the safety benefit of encouraging pedestrians to cross the roadway at the intersection behind the bus. This increases the visibility of pedestrians to drivers traveling through or turning at the intersection. In contrast, pedestrians crossing the roadway in front of a near-side bus stop are not as visible to drivers approaching the intersection from behind the bus. The sight lines between pedestrians and these approaching cars are blocked by the stopped bus.

Mid-block stops can reduce the distance pedestrians need to travel however, they may encourage pedestrians to cross roadways at locations where there are fewer crossing treatments. When possible, bus stops should be located at controlled crossings. Where it is necessary to locate the bus stop mid-block, measures should be taken to improve the safety of the crossing.

Table 9 Bus Stop Location Characteristics

	Advantages	Disadvantages
Far-Side Stop	<ul style="list-style-type: none"> • Minimizes conflicts between right turning vehicles and buses • Provides additional right turn capacity by making curb lane available for traffic • Minimizes sight distance problems on approaches to intersection • Encourages pedestrians to cross behind the bus • Creates shorter deceleration distances for buses since the bus can use the intersection to decelerate • Results in bus drivers being able to take advantage of the gaps in traffic flow that are created at signalized intersections 	<ul style="list-style-type: none"> • May result in the intersections being blocked during peak periods by stopping buses • May obscure sight distance for crossing vehicles • May increase sight distance problems for crossing pedestrians • Can cause a bus to stop far side after stopping for a red light, which interferes with both bus operations and other traffic • May increase number of rear-end accidents since drivers do not expect buses to stop again after stopping at a red light • Could result in traffic queued into intersection when a bus is stopped in travel lane
Near-Side Stop	<ul style="list-style-type: none"> • Minimizes interferences when traffic is heavy on the far side of the intersection • Allows passengers to access buses closest to the crosswalk • Results in the width of the intersection being available for the driver to pull away from curb • Eliminated the potential of double stopping • Allows passengers to board and 	<ul style="list-style-type: none"> • Increases conflicts with right-turning vehicles • May result in stopped buses obscuring curbside traffic control devices and crossing pedestrians • May cause sight distance to be obscured for cross vehicles stopped to the right of the bus • May block the through lane during peak period with queuing buses

	<p>alight while the bus is stopped at a red light</p> <ul style="list-style-type: none"> Provides driver with the opportunity to look for oncoming traffic, including other buses with potential passengers 	<ul style="list-style-type: none"> Increases sight distance problems for crossing pedestrians
Mid-Block Stop	<ul style="list-style-type: none"> Minimizes sight distance problems for vehicles and pedestrians May result in passenger waiting areas experiencing less pedestrian congestion 	<ul style="list-style-type: none"> Requires additional distance for no-parking restrictions Encourages patrons to cross street at mid-block (jaywalking) Increases walking distance for patrons to cross at intersections
<p>Source: TCRP Report 19. <i>Guidelines for the Location and Design of Bus Stops</i>. Transportation Research Board, National Research Council. Sponsored by The Federal Transit Administration. 1996</p>		

Bus Stop Access

Transit stops should be designed to make boarding and alighting easy and safe for all passengers and must follow the ADAAG. ADA guidelines require a firm landing pad to be located at all bus stops to allow pedestrians to enter and exit the bus without entering the street. The landing pad must have a minimum length of eight feet (from the curb or roadway edge) and a minimum width of five feet.

Sidewalks should be constructed from the embarkation point (the landing pad where people enter/exit the bus) to the nearest intersection or to the nearest section of existing sidewalk. Streets within .25 mile of transit stops should have continuous sidewalks on both sides of the street, high-visibility crosswalk markings and other crosswalk safety features.



Figure 71 Level landing pad, Montgomery County, MD

4.6. BRIDGES

The NC Bridge Policy has three relevant sections as listed below and can be found at <http://www.ncdot.org/doh/preconstruct/altern/value/manuals/bpe2000.doc>. The DBPT staff reviews all bridge projects and makes recommendations for wide shoulders, sidewalks and bicycle-safe railings according to potential usage by pedestrians (and bicyclists).

4.6.1 Sidewalks on Bridges

Sidewalks shall be included on new bridges with curb and gutter approach roadways that are without control of access; in some cases, only one side may warrant a sidewalk. Sidewalks should not be included on controlled access facilities. A determination on providing sidewalks on one or both sides of new bridges will be made during the planning process according to the NCDOT Pedestrian Policy Guidelines. When a sidewalk is justified, it shall be a minimum of 5'-6" wide. A minimum handrail height of 42" is required.

4.6.2 Bridges Within Urban Area Boundaries

Urban Area Boundaries represent the outer limit of potential urban growth over the planning period – generally 20 to 25 years – and include more than enough land to accommodate anticipated growth. The full approach curbed width is to be provided for bridges with existing urban – type roadway sections (curb and gutter). On urban – type roadways without control of access ADA acceptable sidewalks shall be provided on new bridges. Sidewalks will be provided on structures for non-control of access facilities crossing control of access facilities. Sidewalks shall be provided on one or both sides in accordance with the project Environmental Planning Document. If future roadway widening is anticipated, additional bridge width should be considered to accommodate the planned curbed width.

Bridges within the Federal-aid urban boundaries with rural-type roadway sections (shoulder approaches) may warrant special consideration. To allow for future placement of ADA acceptable sidewalks, sufficient bridge deck width should be considered on new bridges in order to accommodate the placement of sidewalks. As part of the planning process, the functional classification will be reviewed to determine if its planning designation is applicable for the facility over the 20-year design period.

4.6.3 Bridges on Controlled Access Freeways

Bridge replacement projects on controlled access freeways where bicyclists are prohibited by law will generally *not* include facilities to accommodate bicyclists. In cases, however, where a bridge replacement project on a controlled access freeway impacts a non-controlled access roadway (i.e. a new overpass over an arterial roadway), the project should include the necessary access for bicycles on the non-limited access roadway, including such elements as: paved shoulders and bicycle crossing improvements to associated ramps and intersections.

4.6.4 Urban/Suburban Bridges (Closed Section)

On urban and suburban bridge projects, shoulder width should be based on anticipated (20 year) traffic volumes. The standard sidewalk barrier parapet (42" tall) should be used.

4.6.5 Bridge Retrofit Projects

Bridges can be retrofitted to better accommodate pedestrians. There are a variety of ways of accomplishing this:

3. Reducing the width and/or number of travel lanes to create more space for sidewalks. For example, a narrow sidewalk can be widened to provide for a more comfortable pedestrian environment, while maintaining adequate shoulder width for bicycling.
4. Adding a pedestrian/bicycle structure to the existing bridge structure. In some cases, bridge footers may have been constructed in anticipation of a future roadway widening, or it may otherwise be possible to add an additional structure for pedestrians and cyclists. Bridge retrofit solutions require detailed structural analysis to determine if the bridge can accommodate the additional weight of new facilities without compromising its structural integrity. Note that adding a structure on only one side could potentially create safety concerns as pedestrians could end up on the road and have to cross to reach the facility or walk along the shoulder or in the travel lane.

4.6.6 Bridge policy in the North Carolina Roadway Design Manual

Applicable sections of NCDOT's bridge policy, excerpted from the North Carolina Roadway Design Manual, are included below. The full document can be found on NCDOT's website at: <http://www.ncdot.org/doh/preconstruct/altern/value/manuals/RDM2001/part1/chapter6/pt1ch6.pdf>.

4.6.7 Bridge Deck Railing

All bridge railings shall conform to current AASHTO criteria and shall have been successfully crash-tested in accordance with FHWA guidelines. Generally bridges with no sidewalks or no anticipated sidewalks should have a Jersey barrier rail. When a sidewalk or designated bikeway is justified, appropriate railings shall be used.

Chapter 5. Design Standards

Design standards and guidelines regulate the infrastructure that both public and private entities construct in Wilmington, and ultimately determine the quality of the pedestrian environment. The City of Wilmington Technical Standards and Specification Manual is the principal document providing guidance for the design and installation of facilities that impact pedestrian travel.

There are several other documents that provide standards for facilities that affect pedestrian travel including:

- NCDOT Roadway Design Manual
- NCDOT Bicycle and Pedestrian Safety Manual
- AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities
- Manual on Uniform Traffic Control Devices (MUTCD), Current Edition
- AASHTO Green Book
- Highway Capacity Manual

A review of existing standards was conducted to ensure that pedestrians are appropriately accommodated in city design standards and guidelines. Recommendations to update or improve standards follow the most current research on pedestrian safety and the best practices of other jurisdictions across the country.

A number of revisions are being proposed to the current MUTCD standards (2003 edition) which will be incorporated into a 2009 edition¹². Many of the proposed changes provide additional clarity to existing pedestrian standards (i.e. criteria for marking crosswalks) or describe new tools or techniques to accommodate pedestrians (i.e. new crosswalk warning signs and the Pedestrian Hybrid Signals). Standards proposed for the 2009 edition of the MUTCD that were determined to be relevant and useful for improving pedestrian facilities within the City of Wilmington are recommended for eventual adoption by the city. These recommendations are included in the relevant policy discussion and are referred to as 2009 MUTCD changes.

¹² These proposed changes were published in the Federal Register on January 02, 2008 by FHWA, and are will be open for comment until July 31, 2008.

5.1. PEDESTRIAN DESIGN PRINCIPLES

The following principles should be incorporated as the foundation of plans and projects related to the pedestrian environment. Many of these goals go beyond the realm of responsibility of the City of Wilmington, and will require coordination with NCDOT, developers and landowners in the city.

The street environment should be safe for pedestrians and vehicles

Sidewalks and street crossings should be free of hazards and should minimize conflicts with vehicular traffic. The need to accommodate vehicular traffic flow should be balanced with the need to provide for other users, including pedestrians and bicyclists. Street design policy should reflect this balance.

The pedestrian network should be accessible to all

Sidewalks and street crossings should provide access for all people, regardless of their physical abilities. Universal design is the foundation for all pedestrian design.

The pedestrian network should be easy to use, and should provide direct connections to destinations

The pedestrian network should provide continuous and direct connections between destinations, including homes, schools, shopping areas, public services, work places, recreational opportunities and transit. Sidewalks and street crossings should be designed so people can easily find a direct route to a destination, and delays are minimized.

Enhanced pedestrian facilities should be considered in high pedestrian areas.

The street environment should feel comfortable and inviting to pedestrians

Good design should enhance the comfort and appeal of the pedestrian environment. Consideration should be given to separating pedestrians from vehicular traffic by the use of street trees and other measures. Street trees should provide shade – a critical element for walking trips that are made during the warmer months in Wilmington. An ideal pedestrian environment might also offer resting places and visual elements (such as special paving, street furnishings) that provide a sense of place. The streetscape environment should be active and interesting.

5.2. DESIGN STANDARD RECOMMENDATIONS

The following pages include a review of and recommendations for amending the Wilmington Technical Standards and Design Manual to improve the design of infrastructure to better accommodate pedestrian travel.

One general comment is that many existing standards details do not show pedestrian facilities (sidewalks, crosswalks, curb ramps, etc) on the details or they depict geometric designs that can contribute to a hazardous or uncomfortable pedestrian environment. This can have the effect of implying that these facilities are not required or that the motorist has priority at all times.

SD8-02 Standard Driveway Detail

This existing driveway detail results in the installation of driveways that allow higher speed vehicular right turns across sidewalks. The triangular ramps on either side of the driveway also require much more surface area than more traditional curved curb return between the driveway and the roadway.

The existing detail correctly shows the proper way to slope transitions and to maintain a level sidewalk to meet ADA requirements.

The proposed replacement detail replaces the triangular approach and departure areas with a curved approach and departure. The detail specifies the designer must choose the curb radii based upon the effective vehicular turning radius.

SD11-04 Pavement Markings Non-Signalized Intersections

SD11-05 Pavement Markings Non-Signalized Intersections

SD11-06 Pavement Markings Signalized Intersections

These existing details depicting standard striping treatments do not show any pedestrian features nor do they provide guidance for locating stop lines behind existing or potential future crosswalks. This omission of pedestrian features also impacts the installation of in-pavement vehicle detection loops. Generally, the positioning of these loops is governed by the placement of the stop line. Subsequently, many detection loops in intersections throughout Wilmington are actually located within the pedestrian crossing area.

The proposed replacement details show sidewalks, curb ramps, and crosswalks. Stop lines are shown as being located behind all pedestrian crossing areas.

SD11-15 Pedestrian Crossing Island

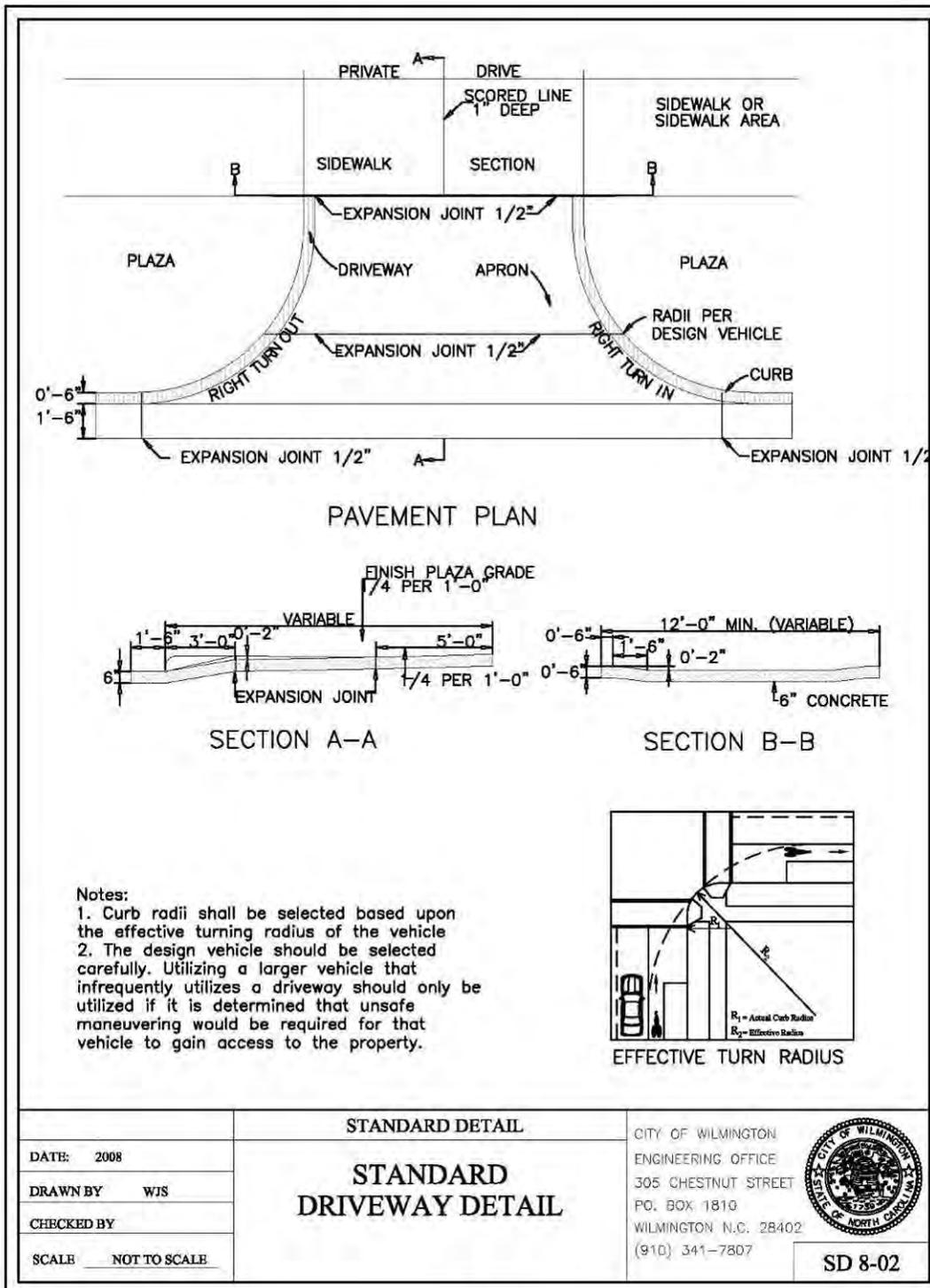
This proposed detail provides guidance for designing pedestrian crossing islands which deflect the pedestrian to face oncoming traffic and which are wide enough to store pedestrians and potentially bicyclists comfortably within the island. The detail was tentatively numbered SD11-15 and given a page number of 7-76 to be inserted after the roundabout pavement marking detail.

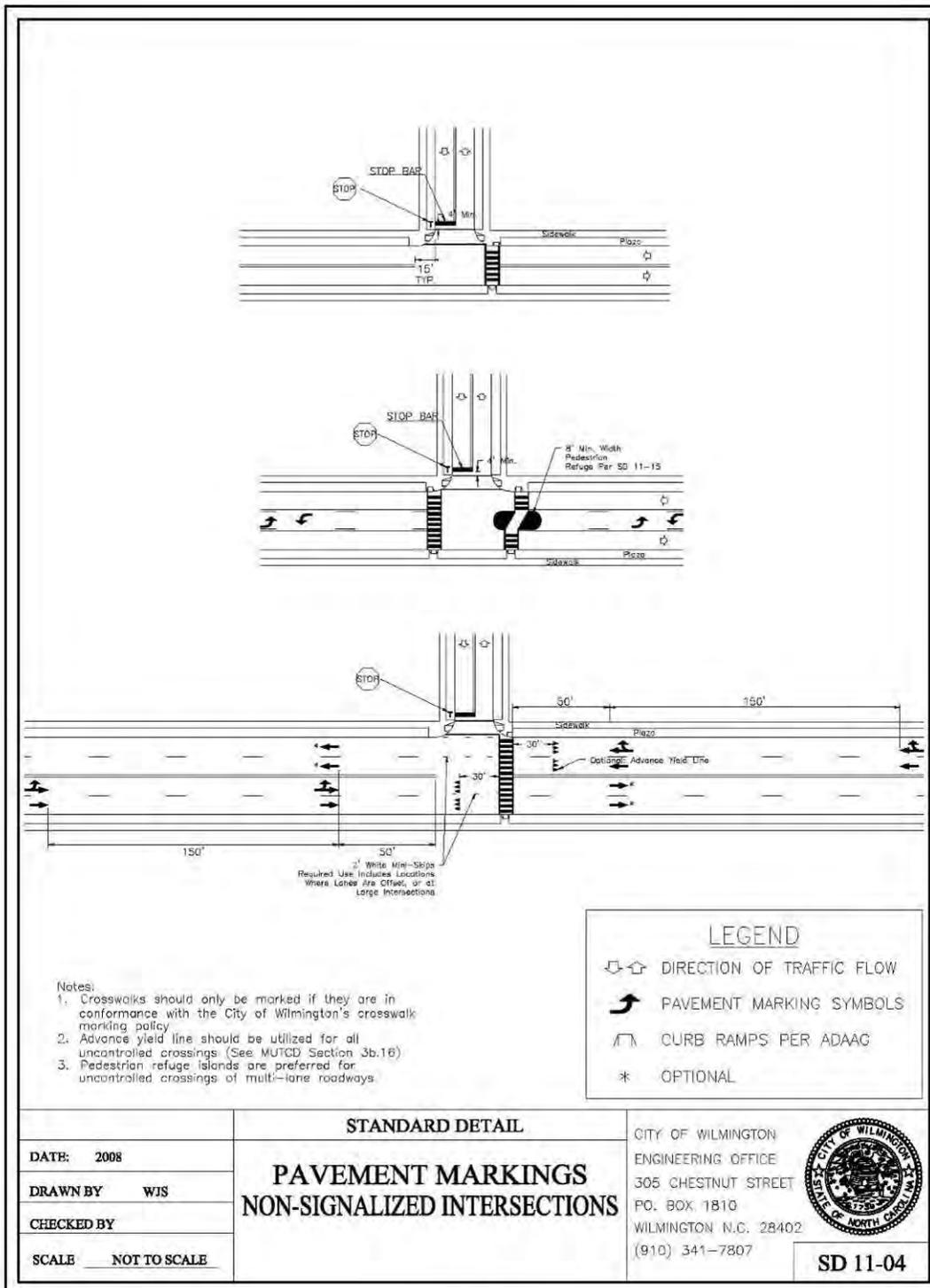
SD15-11 Parking Facility Under 25 Stalls Paved or Unpaved

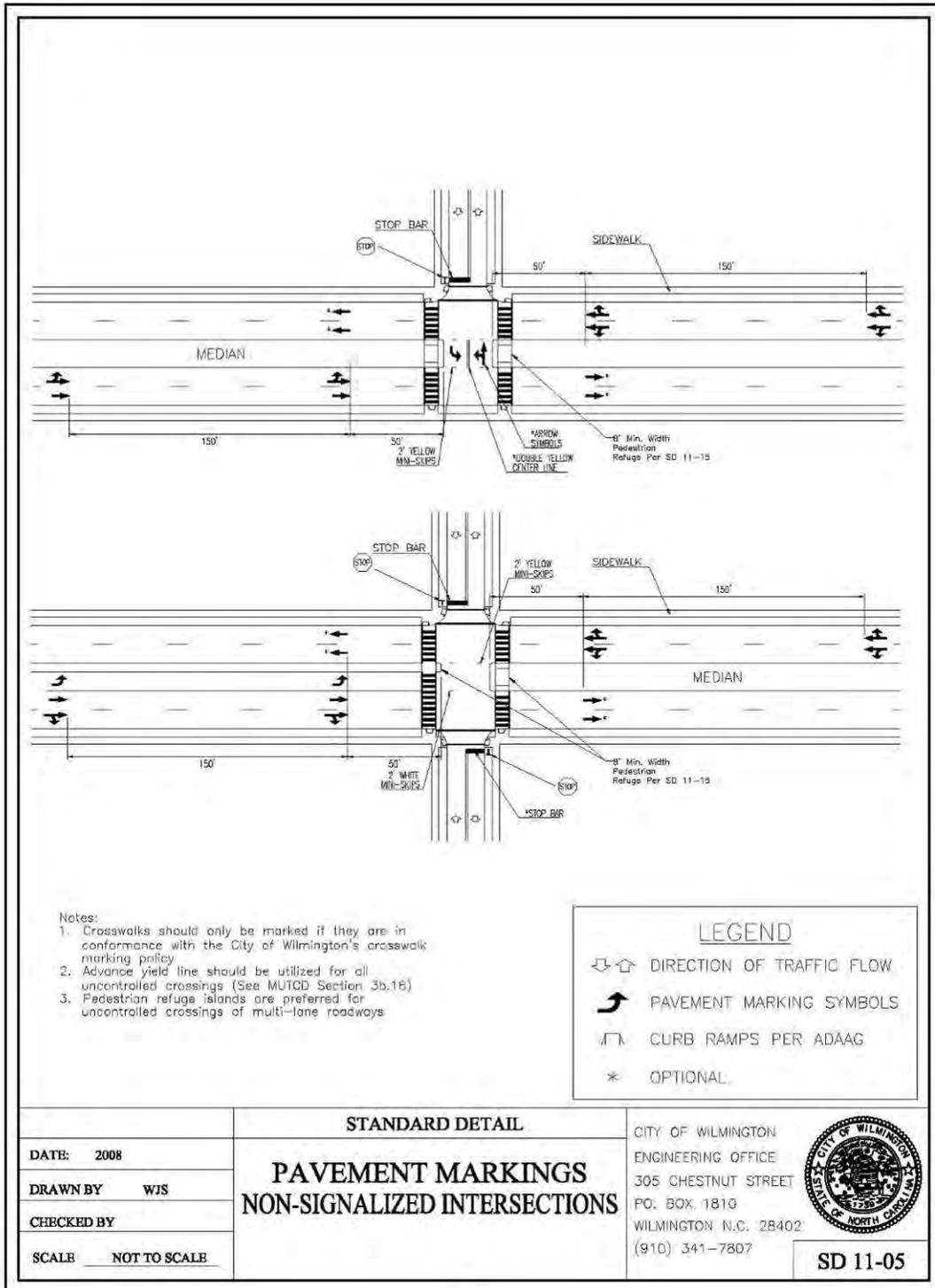
SD15-12 Parking Facility Equal to or Greater Than 25 Stalls

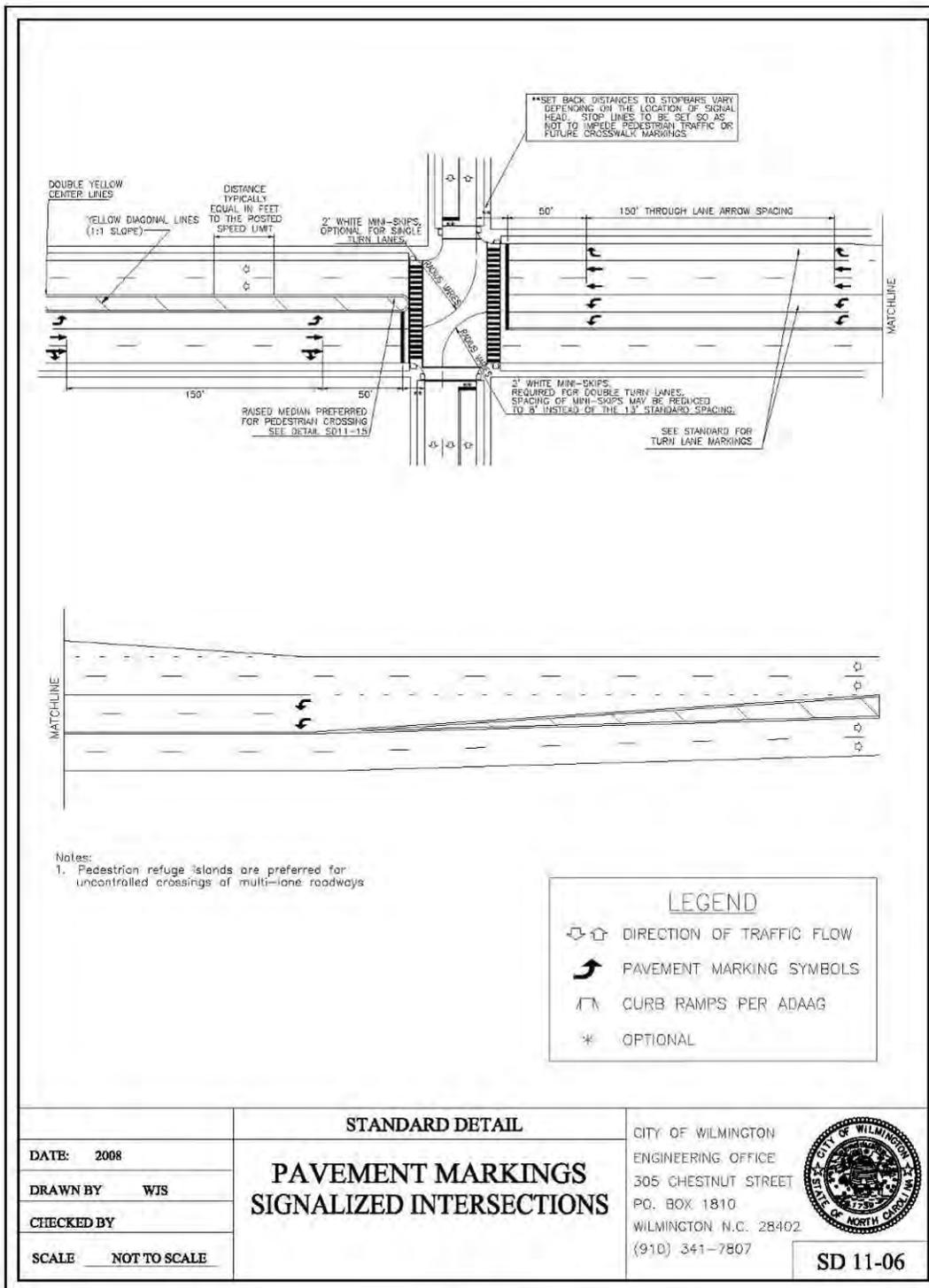
These existing details depicting standard striping treatments do not show any pedestrian features nor do they provide guidance for locating stop lines behind existing or potential future sidewalks.

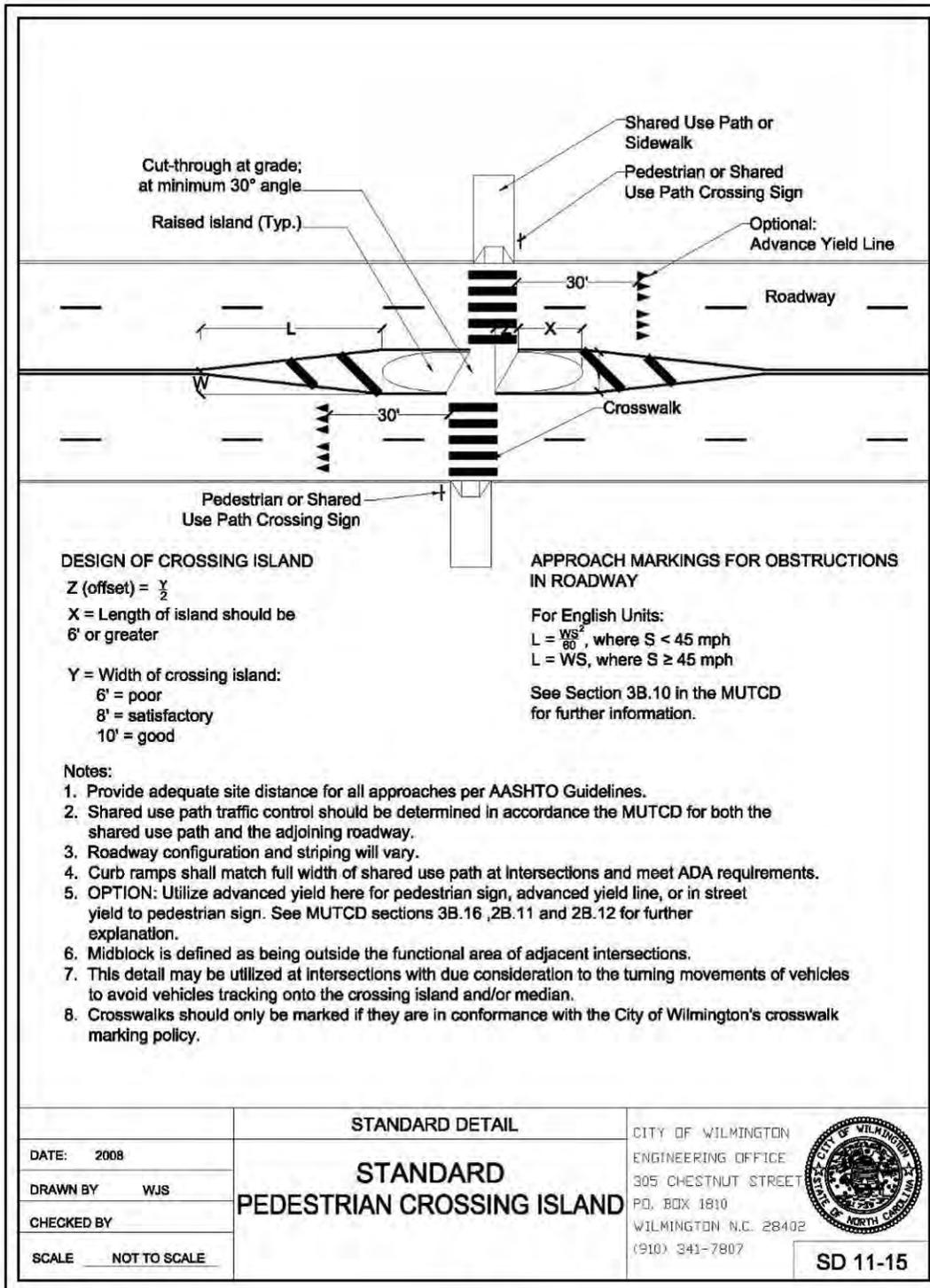
The proposed replacement details also show sidewalks, curb ramps, and crosswalks.

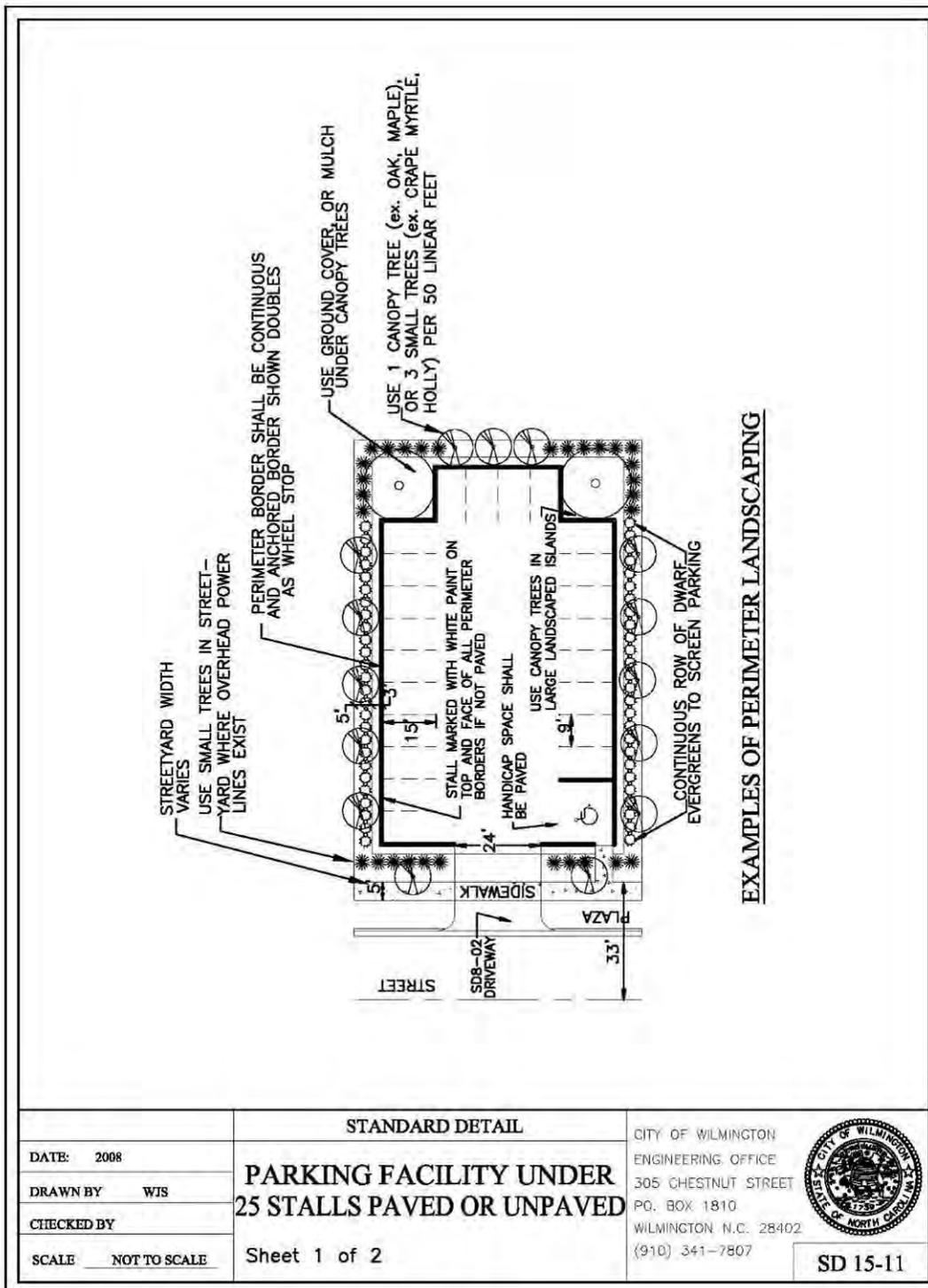




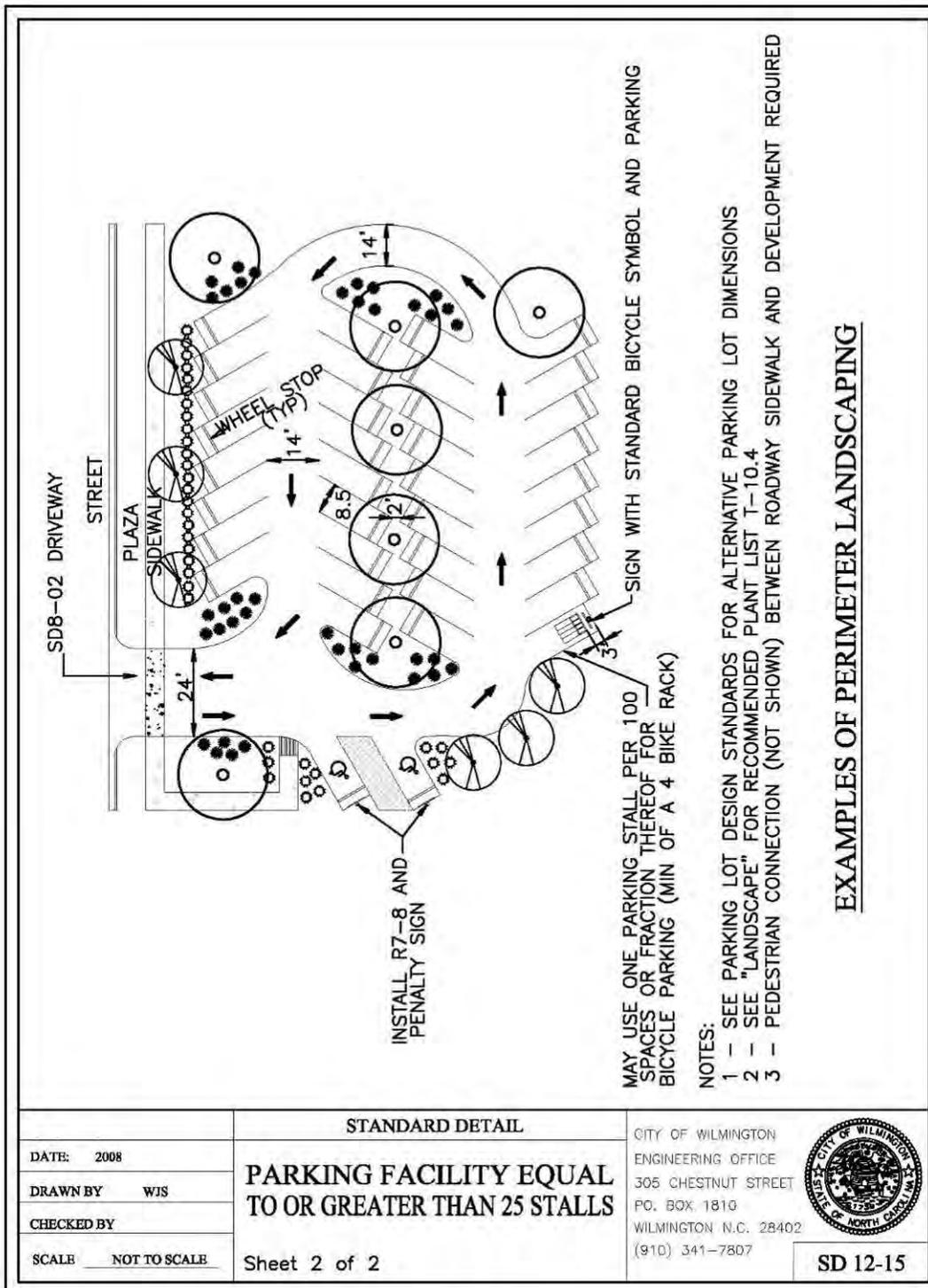








STANDARD DETAIL		 <p>CITY OF WILMINGTON ENGINEERING OFFICE 305 CHESTNUT STREET PO. BOX 1810 WILMINGTON, N.C. 28402 (910) 341-7807</p>
DATE: 2008	<p>PARKING FACILITY UNDER 25 STALLS PAVED OR UNPAVED</p>	
DRAWN BY WJS		
CHECKED BY		
SCALE NOT TO SCALE	Sheet 1 of 2	SD 15-11



Chapter 6. Pedestrian Facility Recommendations

There are pedestrian facility improvement needs throughout the city. Because it is simply not feasible to complete all projects within one or two years, this plan distributes improvement recommendations over a twenty year planning horizon. This chapter describes the existing pedestrian facility network and the distribution of relative pedestrian demand around the city. By contrasting areas of high demand with deficiencies in the facility network, it is possible to prioritize locations where improvements should be completed first with the biggest benefit to current users.

EXISTING PEDESTRIAN FACILITIES AND PEDESTRIAN DEMAND

Existing Pedestrian Facilities

There are almost 290 miles of sidewalks in Wilmington. The overwhelming majority of these sidewalks are owned by the city (97%). Three percent of sidewalks are privately owned, although some of these privately owned sidewalks are located adjacent to public roads within master planned developments (e.g. sidewalks along Town Center Drive or Monument Drive in Mayfaire Town Center). The maps on the pages 131 through 134 illustrate the extents of the existing pedestrian network, based on data obtained from the City of Wilmington. It should be noted that this plan does not attempt to assess the quality or accessibility of individual pedestrian facilities. Such an effort is outside of the scope of this project.

The dark blue lines indicate the presence of existing sidewalks. The yellow dots indicate existing traffic signals with at least one set of pedestrian signal heads, although some signals have multiple pedestrian signal heads. Triangles adjoining the yellow dots illustrate the orientation or leg(s) of the pedestrian signal heads. If a yellow dot is surrounded by a black circle, it has pedestrian signal heads on all four legs of the intersection. Black dots indicate traffic signals with either no data or no pedestrian signal heads. The existing conditions information was obtained from city staff at the outset of this project.

The highest concentration of sidewalks is in the central business district and urban character zone. Fortunately, this is also the area with highest relative potential pedestrian demand. However, several other areas of the city that have a relatively high potential for pedestrian activity do not have a significant amount of sidewalks or signalized intersections with pedestrian signal heads. For example, the sidewalk and pedestrian signal infrastructure in the vicinity of UNCW is inconsistent, and the sidewalk along the South College Road frontage of the campus travels only a short distance and there are no sidewalks along Wrightsville Avenue on the southern edge of campus. This disconnect between potential pedestrian demand and available

pedestrian accommodations exists in several other parts of the *Traditional Suburban Zone* and *Automobile-Oriented Suburban Zone*.

Wilmington has two major multi-use trails that will provide users long-distance non-motorized connections when complete. The 10-mile-long Cross-City Trail will allow users to travel from James E.L. Wade Park in the southeast section of the city to Wrightsville Beach when complete. The trail will connect several significant destinations, including Halyburton Park, Cameron Art Museum, Empie Park, McCrary Park, UNCW and the new Autumn Hall development. In August 2008, a two-mile-long section of the trail was formally opened along Eastwood Road. The segment along South 17th Street between John D. Barry Drive and the Cameron Art Museum should be under construction by the spring of 2009. Trail completion is anticipated to take five to seven years. Crossing major arterials will be challenging for many users, and the Cross-City Trail plan calls for several intersection crossing improvements.

The River to the Sea Bikeway is a 12-mile-long bikeway that connects downtown Wilmington to Wrightsville Beach with a combination of on- and off-road bicycle facilities (although on-road portions are for cyclists only). The trail takes users through a variety of settings, including local streets in residential neighborhoods, commercial streets and major arterials. As with the Cross-City Trail, roadway crossings pose potential challenges for trail users. Plans currently under development address some of these crossings, including Dawson Street, Independence Boulevard, and South College Road. More information on these plans is available under the section “Upcoming Developments” later in this chapter.

Pedestrian Demand

When determining where to prioritize city investments and other improvement mechanisms, it is important to understand where there is the highest potential pedestrian demand. These are areas where it is most likely that people would walk if there were sidewalks, crosswalks and other pedestrian accommodations. There are several ways to approach this task. The most detailed method involves collecting pedestrian counts at locations throughout the city. However, this approach is very labor intensive and was not included in the scope of this project. A reasonable approximation of likely potential pedestrian demand can be modeled using readily available data in a geographic information system (GIS) format. For this project, the following data was used to model pedestrian potential demand:

Population density was calculated using the 2000 US Census block group data. It is reasonable to assume that areas with higher population density will have higher potential for pedestrian activity. The following weightings were used:

<u>Population per Square Mile</u>	<u>Score +</u>
302.9 - 1035.4	1
1035.5 - 1815.8	2
1815.9 – 2565.7	3
2565.8 – 3521.7	4
3521.8 – 4800.0	5
4800.1 – 7380.0	6

Buffer polygons were drawn around schools and parks. It was assumed that the closer one gets to a school or a park, the higher the potential demand for walking. The following weightings were used:

<u>SCHOOL PROXIMITY</u>	<u>Score+</u>
¼ mile of school	3
½ mile of school	1
More than ½ mile	0

<u>Park PROXIMITY</u>	<u>Score+</u>
¼ mile of park	2
½ mile of park	1
More than ½ mile	0

Wilmington zoning categories were used as a proxy for pedestrian potential. For this analysis, commercial and mixed use zoning categories were given higher pedestrian potential scores than uses such as industrial. Scores were attributed to each zoning district based on the allowable density range and pedestrian generation potential. The following weightings were used:

Zoning Category	Pedestrian Generation Potential	Potential Population Density	Score+
AI	Low	Low	2
CB	High	Medium	5
CBD	High	High	6
CS	Medium	Medium	4
HD	High	High	6
HD-MU	High	High	6
HD-R	High	High	6
IND	Low	Low	2
LI	Low	Low	2
MF-H	High	High	6
MF-L	High	Medium	5
MF-MH	High	Medium	5
MF-M	High	Medium	5
MHP	High	Low	4
MSMU	High	High	6

MX	High	High	6
O & I-1	Low	Low	2
PD	High	Medium	5
R-10	High	Medium	5
R-15	Low	Low	2
R-20	Low	Low	2
R-3	High	High	6
R-5	High	High	6
R-7	Medium	Medium	4
RB	Medium	Medium	4

This data was combined using GIS to develop a pedestrian potential map showing the relative levels of anticipated pedestrian potential demand in several areas throughout the city. The graphic results of the pedestrian potential calculations are illustrated on the maps on the following pages (131 through 134), along with existing pedestrian conditions.

Potential Pedestrian Demand

Areas with higher projected potential pedestrian demand are indicated by the darker color on the maps. As would be anticipated, most of the *Central Business District Zone* and *Urban Core Zone* have higher levels of projected potential demand than in the *Automobile-Oriented Suburban Zone* of the city. There is also a concentration of potential demand in the vicinity of UNCW, due in large part to the density of housing and mixture of land uses in the surrounding area. Because schools and parks are major factors in the model, there are several islands of relatively high potential pedestrian activity in the *Traditional Suburban Zone* and *Automobile-Oriented Suburban Zone*.

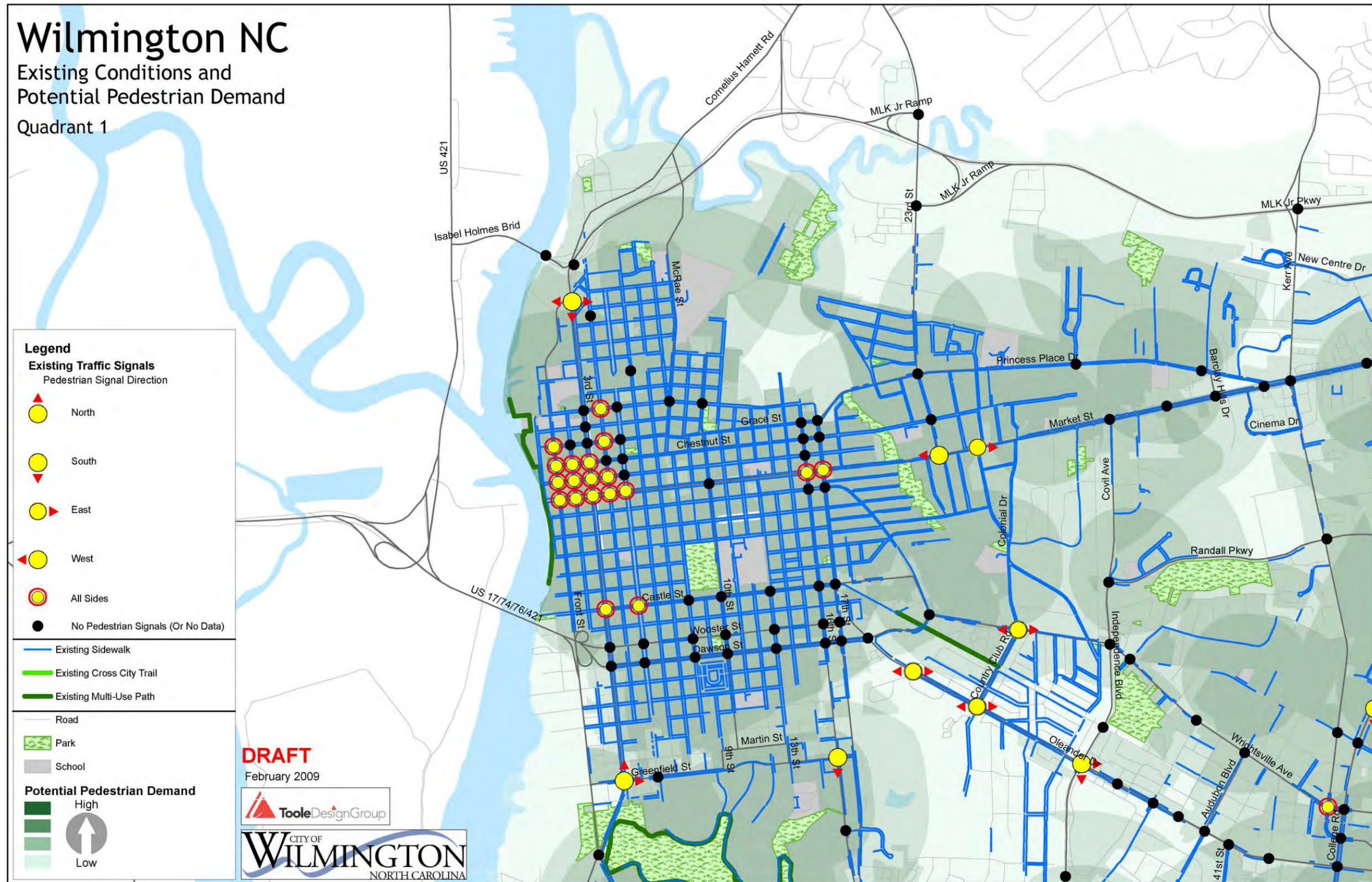


Figure 72 Existing Conditions and Potential Pedestrian Demand Quadrant 1

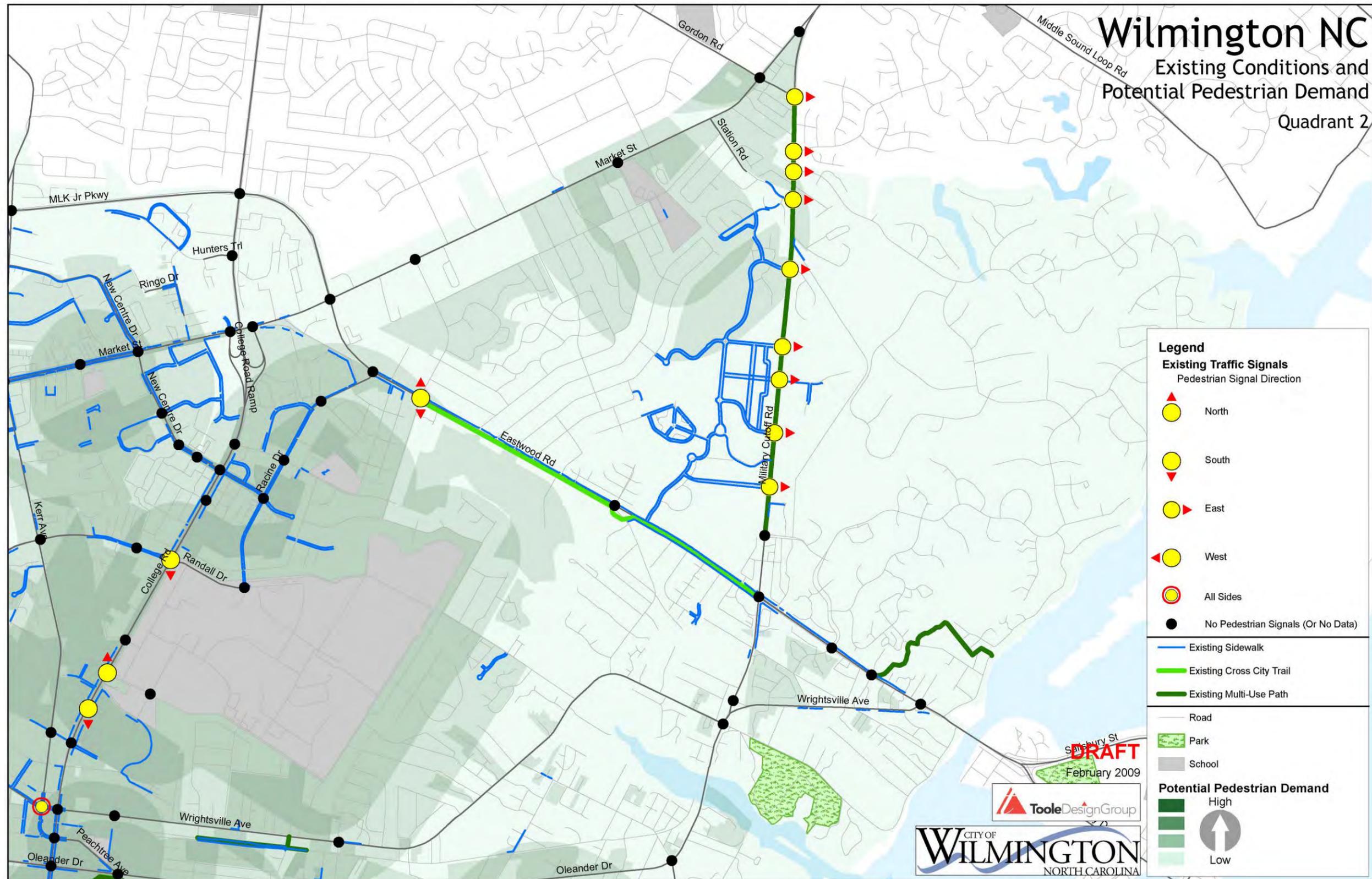


Figure 73 Existing Conditions and Potential Pedestrian Demand- Quadrant 2

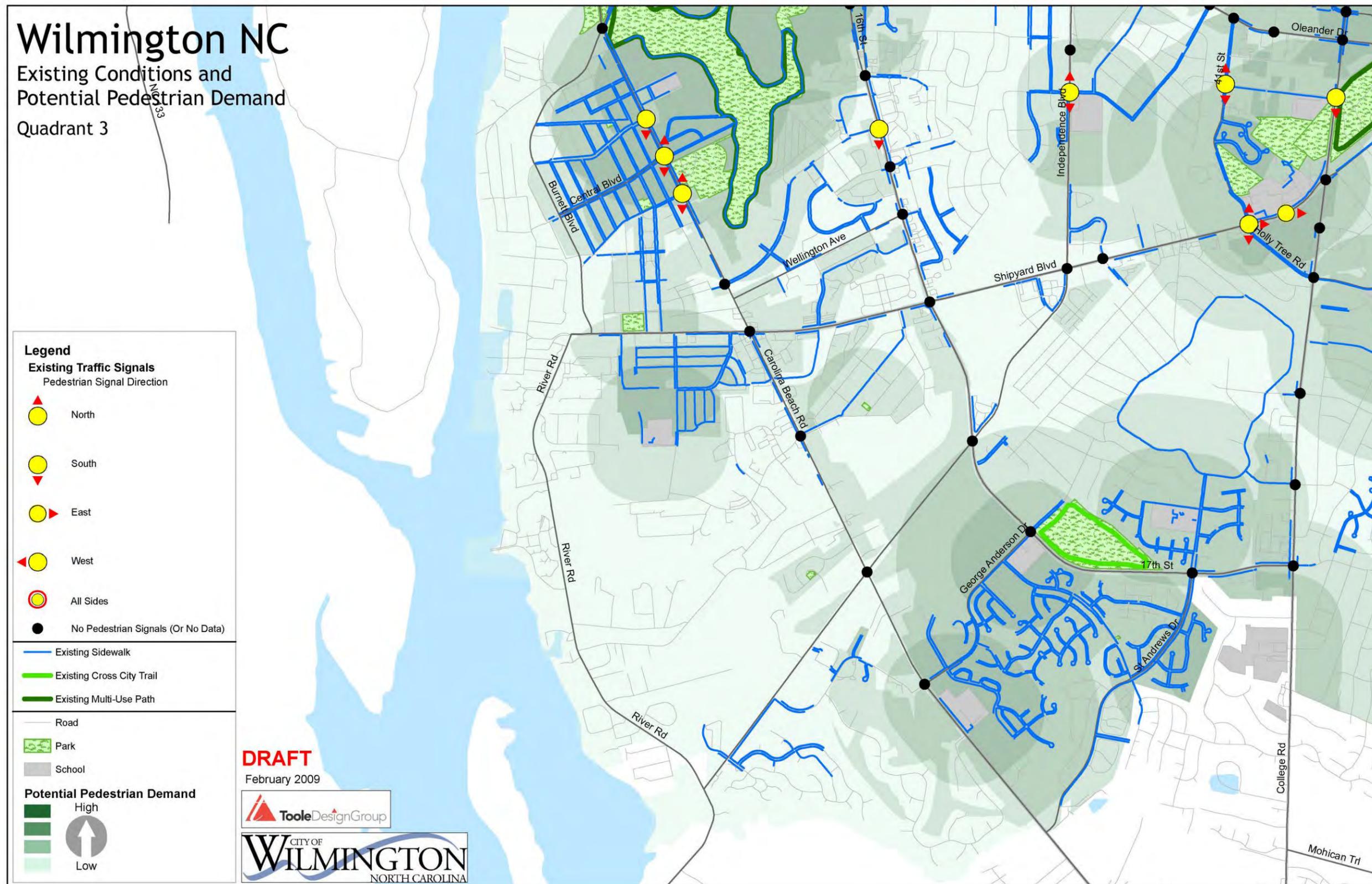


Figure 74 Existing Conditions and Potential Pedestrian Demand Quadrant 3

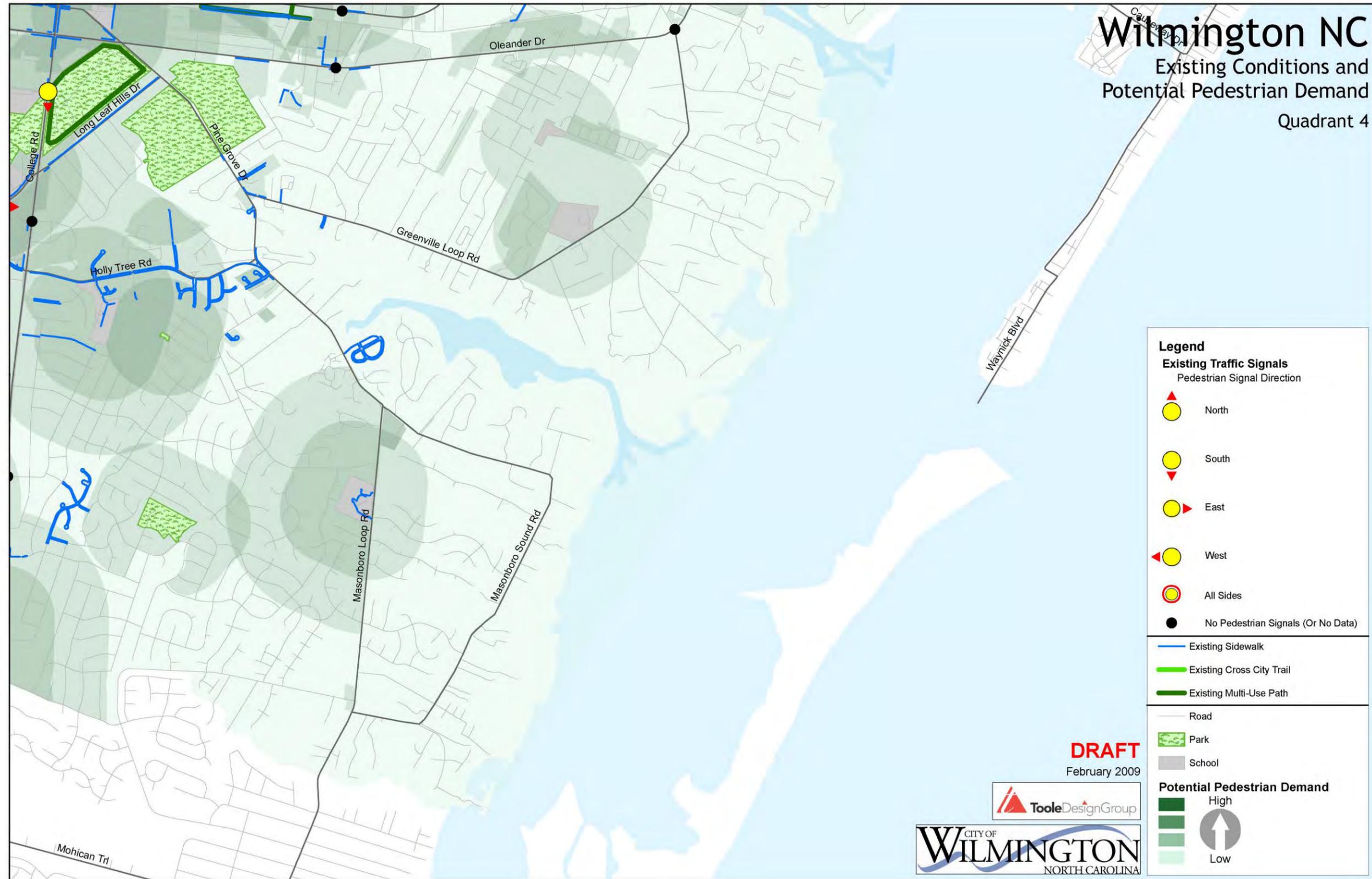


Figure 75 Existing Conditions and Potential Pedestrian Demand - Quadrant 4

PEDESTRIAN DEFICIENCY ANALYSIS

Once the high pedestrian potential demand areas were identified, pedestrian deficiencies were analyzed. These are areas where the existing sidewalk and pedestrian signal infrastructure is inadequate to serve the needs of Wilmington's pedestrians. It would not be feasible to complete a detailed field survey of existing conditions throughout the city-wide study area given time and project scope constraints. Therefore, the following elements were incorporated into the deficiency analysis:

- Missing sidewalk information
- Stakeholder input (city and WMPO staff, NCDOT staff, plan steering committee, WMPO BikePed committee, etc.)
- Public comments (online survey, public outreach, etc.)
- Consultant field analysis

Through discussions with project staff and the plan steering committee, it was determined that the examination would focus on Wilmington's arterial and collector roadways. These roadways have significant levels of observed pedestrian activity and the majority of the city's pedestrian crashes occur along major thoroughfares. Furthermore, the relatively high vehicle speeds and width of these roadways detract from a pedestrian's comfort, which is only exacerbated when there are no sidewalks or pedestrian signal heads.

PEDESTRIAN FACILITY PROJECT IDENTIFICATION

After the areas of high pedestrian deficiency were identified, they were contrasted with the pedestrian potential demand map to identify areas that exhibit both high potential pedestrian demand and high levels pedestrian deficiency. By combining these two pieces of information, areas with the highest need for pedestrian facility improvements were identified. This discussion will provide a general overview of recommended facility improvements divided into short-term (0-5 years), medium term (5-10 years) and long term (10-20 years) increments. A more detailed discussion of select roadway recommendations follows. The sidewalk and pedestrian signal improvements recommended in this Plan are not scheduled into the City's Capital Improvements Program. It is anticipated that during the annual capital projects prioritization process, these proposed projects will be considered for inclusion among other submittals from various City departments.

6.1.1 Sidewalk Recommendations

Approximately 450 miles of sidewalk improvement projects were identified along Wilmington's arterial and collector roadways. Even in the best of financial times, it is unrealistic to expect this amount of sidewalks to be constructed within the five-year planning horizon of this project. One of the objectives under *Goal 2: Transportation Choice*, of this plan calls for the construction of two miles of sidewalk per year. This length includes projects directly funded by the city and projects constructed through the private development process. Subsequently, a select subset of sidewalk improvement projects was identified based on the following planning factors: relative potential pedestrian demand, linkages to schools, linkages to parks, opportunities to expand existing sidewalk systems, linkages to existing signalized intersections and analysis of public comment.

Sidewalk projects are shown on the Recommended Sidewalk and Pedestrian Signal Improvements maps on the following pages (151 through 154). This plan recommends 26 miles of sidewalk projects to be completed in the short-term (0-5 years). These are shown by red  lines on the maps. Approximately 207 miles of sidewalk projects are recommended for construction in the mid-term (5-10 years). These are shown by the orange  lines. Approximately 223 miles of long term (10-20 years) sidewalk projects are shown by the yellow  lines on the maps. Tables summarizing short and mid-term sidewalk projects are included on the following pages. A table summarizing long-term sidewalk projects is included in the appendix. \

The calculated amount of sidewalk projects is based on the assumption that all arterial and collector roadways should have continuous sidewalk on both sides of the road. As seen on the maps, most of the sidewalk projects are located in the Traditional Suburban Zone and the Automobile-Oriented Suburban Zone.

Construction cost estimates were developed for the recommendations based on an estimated cost of \$5 per square foot for 4" thick, 5' wide poured in place concrete sidewalk. Because this is a city-wide plan and not a detailed project site design study, the costs are intended to be general and used for planning purposes only and do not include right-of-way acquisitions, curb ramp installation, new driveway aprons, grading, drainage improvements or retaining walls, and other elements. Construction costs will vary based on the ultimate project scope (i.e. potential combination of projects, or use of Wilmington or NC DOT labor) and economic conditions at the time of construction. Actual construction costs should be determined at the time of the project and should include estimates based on: sidewalk thickness and width, number of curb ramps required, driveway aprons, surface (if surface other than concrete is desired), drainage

improvements, curb and gutter or grassed swale, signage, right of way acquisition, demolition, engineering, utility relocation, mobilization, temporary access, bus stop improvements, street furniture and other project costs. A table showing approximate unit costs for various project elements may be found in the appendix.

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
10th St	Ann St	Castle St	1,107	0.21	\$27,663
11th St	Hall St	King St	1,343	0.25	\$33,570
16th St	Wright St	Greenfield St	3,711	0.70	\$92,778
17th St	College Rd	Saint Andrews Dr	2,284	0.43	\$57,103
	Rankin St	Grace St	409	0.08	\$10,226
	Shipyards Blv	Private Dr (North of Independence Blv)	371	0.07	\$9,268
	Wooster St	Greenfield St	2,849	0.54	\$71,235
23rd St	Market St	Chestnut St	581	0.11	\$14,517
	Princess Place Dr	Belvedere Dr	649	0.12	\$16,233
Audubon Blvd	Oleander Dr	Peachtree Av	198	0.04	\$4,940
Barclay Hills Dr	Princess Place Dr	Market St	1,028	0.19	\$25,702
Bethal Rd	Brookview Rd	Waltmoor Rd	1,236	0.23	\$30,909
Carolina Beach Rd	Hart St	Parkway Blv	5,593	1.06	\$139,827
Castle St	Colwell Av	Wrightsville Av	2,659	0.50	\$66,487
Cinema Dr	Market St	Private Drive	856	0.16	\$21,401
College Rd	Fountain Dr	Private Dr (North of Randall Dr)	4,093	0.78	\$102,315
		Wrightsville Av	3,111	0.59	\$77,776
Dawson St	Wrightsville Av	Oleander Dr	1,556	0.29	\$38,906
Delaney Av	Wellington Av	Glen Meade Rd	1,968	0.37	\$49,189
Eastwood Rd	Military Cutoff Rd	Marina St	424	0.08	\$10,603
Front St	Hanover St	3rd St	3,700	0.70	\$92,492
	Walnut St	Red Cross St	161	0.03	\$4,017
Greenfield St	3rd St	Lake Shore Dr	662	0.13	\$16,561
Harbour Dr	Troy Dr	17th St	2,366	0.45	\$59,155
Independence Blvd	Reston Ct	Canterbury Rd	2,166	0.41	\$54,142
Kerr Ave	Private	Market St	1,833	0.35	\$45,817
King St	Railroad St	11th St	1,868	0.35	\$46,700
MacMillan Ave	Pine Grove Dr	College Rd	6,701	1.27	\$167,516
Market St	Barnard Dr	23 Rd St	1,868	0.35	\$46,691
	Cinema Dr	Princess Place Dr	239	0.05	\$5,984
	New Centre Dr	Walton Rd	716	0.14	\$17,891
	Saint Marks Pl	21 St St	250	0.05	\$6,262
McRae St	Fanning St	Bladen St	306	0.06	\$7,649
	Nixon St	Bess St	942	0.18	\$23,542
New Center	Market St	Sigmon Rd	1,036	0.20	\$25,890
Oleander Dr	Hawthorne Rd	42 Nd St	5,090	0.96	\$127,258
	Pine Grove Dr	College Rd	2,102	0.40	\$52,554

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
	Wooster St	Mimosa Pl	2,928	0.46	\$73,204
Peachtree Ave	Pine Grove Rd	47th St	2,180	0.12	\$54,503
Pinegrove Dr	Oleander Dr	Peachtree Ave	2,463	0.34	\$61,576
Princess Place Dr	17th St	25 Th St	3,493	0.66	\$87,335
Randall Pkwy	Collegiate Dr	Kerr Av	2,424	0.46	\$60,593
Rankin St	17th St	16th St	385	0.07	\$9,615
Rosemont Av	Wilshire Blv	End of Street	2,109	0.40	\$52,723
Shipyard Blvd	Savannah Ct	Shipyard Blv	5,999	1.14	\$149,963
	Troy Dr	Vance St	3,782	0.72	\$94,547
Troy Dr	Harbour Dr	Wellington Av	680	0.13	\$17,008
Waltmoor Rd	Bethal Rd	College Rd	2,383	0.45	\$59,564
Wellington Ave	Carolina Beach Rd	17th St	7,607	1.44	\$190,174
Wilshire Blvd	Wrightsville Av	Rosemont Av	108	0.02	\$2,704
Wooster St	6th St	3rd St	2,177	0.41	\$54,416
	8th St	Oleander Dr	6,392	1.01	\$159,793
Wrightsville Ave	44 Th St	Independence Blv	9,669	1.83	\$241,734
	Castle St	Independence Blv	4,992	0.95	\$124,789
	College Rd	Hawthorne Dr	12,745	2.41	\$318,618
Total			140,903	25.98	\$3,522,568

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
10th St	Martin St	Marstellar St	1,800	0.34	\$44,996
11th St	Lake Shore Dr	Greenfield St	1,331	0.25	\$33,272
13th St	Lake Shore Dr	Martin St	3,727	0.71	\$93,187
17th St	Independence Blv	John D Barry Dr	13,440	2.55	\$336,007
	Shipyard Blv	Independence Blv	4,830	0.91	\$120,752
23rd St	Shirley Rd	Private Drive (North of MLK PKY)	10,032	1.90	\$250,794
2nd St	End of St	Hanover St	1,126	0.21	\$28,143
3rd St	Willard St	Carolina Beach Rd	267	0.05	\$6,678
41st St	Shipyard Blv	Lake Av	1,564	0.30	\$39,099
42nd St	Wrightsville Av	Spirea Dr	4,133	0.78	\$103,313
5th St	Greenfield St	Meares St	1,542	0.29	\$38,551
6th St	Taylor St	Howard St	448	0.08	\$11,205
9th St	Greenfield St	Martin St	802	0.15	\$20,040
Airlie Rd	Oleander Dr	Causeway, 76	15,702	2.97	\$392,557
Amber Dr	Greenhowe Dr	Bethal Rd	9,104	1.72	\$227,588
Audubon Blvd	Wrightsville Av	Peachtree Av	1,470	0.28	\$36,739
Beasley Rd	Masonboro Loop Rd	Pine Grove Dr	15,416	2.92	\$385,399
Bess St	6th St	Mcrae St	2,250	0.43	\$56,239
Brenda Dr	Englewood Dr	Patricia Dr	4,057	0.77	\$101,421
Brookview Rd	Colony Cir	Bethal Rd	4,040	0.77	\$101,010
Brunswick St	4th St	3rd St	164	0.03	\$4,088

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
	6th St	7th St	373	0.07	\$9,337
	Front St	2nd St	619	0.12	\$15,480
Burnett Blvd	Shipyards Blvd	Front St	16,626	3.15	\$415,644
Camberly Dr	Tanbridge Rd	Long Leaf Acres Dr	2,431	0.46	\$60,764
Canterbury Rd	Live Oak Pkw	Echo Ln	1,895	0.36	\$47,380
Canterwood Dr	17th St	Medical Center Dr	2,987	0.57	\$74,673
Cardinal Dr	Clear Run Dr	Market St	8,472	1.60	\$211,793
Cardinal Extension Dr	Clear Run Dr	Market St	4,681	0.89	\$117,020
Carolina Beach Rd	Burnett Blvd	Kentucky Av	145	0.03	\$3,633
	Independence Blvd	Raleigh St	6,264	1.19	\$156,609
		Saint Andrews Dr	14,055	2.66	\$351,376
	Medical Center Dr	Southern Blvd	1,816	0.34	\$45,405
Carolyn Dr	Brenda Dr	Clearbrook Dr	1,992	0.38	\$49,809
Causeway Dr	Military Cutoff Rd	Marina St	715	0.14	\$17,871
Chippenham Dr	Hearthside Dr	Saint Andrews Dr	1,426	0.27	\$35,653
Cinema Dr	Princess Place Dr	Market St	419	0.08	\$10,475
Clarendon St	Stanley St	King St	432	0.08	\$10,800
Clear Run Dr	College Acres Dr	Mallard St	9,041	1.71	\$226,023
Clearbrook Dr	Carolyn Dr	Greenville Loop Rd	4,057	0.77	\$101,432
College Acres Dr	Oriole Dr	Racine Dr	6,413	1.21	\$160,319
College Rd	17th St	Shipyards Blvd	16,330	3.09	\$408,244
	Long Leaf Hills Dr	Oleander Dr	5,298	1.00	\$132,450
	Oriole Dr	New Centre Dr	842	0.16	\$21,050
	Pine Cliff Dr	17th St	3,629	0.69	\$90,718
Collegiate Dr	Market St	Greenway Av	1,467	0.28	\$36,668
	Randall Pkw	Lullwater Dr	607	0.12	\$15,181
Colony Cir	Brookview Rd	Brookview Rd	2,289	0.43	\$57,236
	Commons Way	Nottingham Ln	248	0.05	\$6,189
Columb Dr	Ringo Dr	New Centre Dr	796	0.15	\$19,890
Commons Way	Colony Cir	Kings Arm Ct	1,457	0.28	\$36,414
Covil Ave	Market St	Canterbury Rd	5,601	1.06	\$140,031
Crews Dr	Price Dr	Private	2,644	0.50	\$66,104
Cypress Dr	Wisteria Dr	Lake Shore Dr	1,026	0.19	\$25,660
Darlington Ave	Covil Av	Market St	3,420	0.65	\$85,508
Davis St	3rd St	4th St	950	0.18	\$23,738
Dawson St	Clear Run Dr	Wrightsville Av	79	0.02	\$1,983
	Oleander Dr	Wrightsville Av	134	0.03	\$3,341
	Price Dr	Crews Dr	1,377	0.26	\$34,421
	Rose Ave	Wrightsville Av	2,514	0.48	\$62,843
Denee Dr	Lennon Dr	Private Dr	2,094	0.40	\$52,348
Disney Dr	Colony Cir	Hampton Rd	1,308	0.25	\$32,708
Donald E Gore Dr	George Anderson Dr	Jeb Stuart Dr	3,083	0.58	\$77,074
Eagles Nest Dr	Amber Rd	Beasley Rd	5,544	1.05	\$138,611
Eastwood Rd	Bay Creek Dr	Hillsdale Dr	5,652	1.07	\$141,302
	Market St	Racine Dr	4,114	0.78	\$102,847

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
	Military Cutoff Rd	Marina St	6,126	1.16	\$153,155
Echo Ln	Marlwood Dr	Canterbury Rd	2,417	0.46	\$60,437
Englewood Dr	Oleander Dr	Clearbrook Dr	3,536	0.67	\$88,399
Floral Pkwy	Oleander Dr	Wrightsville Av	3,758	0.71	\$93,959
Fordham Rd	Canterbury Rd	Oleander Dr	2,723	0.52	\$68,080
Fountain Dr	Saint James Dr	Kerr Av	667	0.13	\$16,686
Front St	Queen St	Burnett Blv	9,833	1.86	\$245,826
George Anderson Dr	17th St	Summerlin Falls Ct	2,696	0.51	\$67,402
	Carolina Beach Rd	Breezewood Dr	728	0.14	\$18,203
	Robert Hoke Rd	Donald E Gore Dr	817	0.15	\$20,434
Glen Meade Rd	Marlwood Dr	17th St	2,176	0.41	\$54,408
Gordon Rd	Military Cutoff Rd	North of Market St	2,077	0.39	\$51,930
Grace St	Nutt St	Water St	133	0.03	\$3,313
Green Meadows Dr	Amsterdam Way	Market St	3,879	0.73	\$96,975
	Market St	Toulon Dr	7,286	1.38	\$182,150
Greenfield St	9th St	16th St	3,020	0.57	\$75,497
	Front St	2nd St	567	0.11	\$14,179
Greenhowe Dr	College Rd	Amber Rd	6,103	1.16	\$152,585
Greenville Ave	Wrightsville Av	Military Cutoff Rd	8,437	1.60	\$210,928
Greenville Loop Rd	Pine Grove Dr	Oleander Dr	29,283	5.55	\$732,079
Greenway Ave	Kerr Av	Lullwater Dr	3,956	0.75	\$98,890
GREENWICH Ln	Nottingham Ln	Waltmoor Rd	1,856	0.35	\$46,402
Halifax Rd	Sweetbriar Rd	Lincoln Rd	5,568	1.05	\$139,206
Hamilton Dr	Macmillan Av	Riegel Rd	3,973	0.75	\$99,317
Hampton Rd	Kelly Rd	Disney Dr	3,369	0.64	\$84,219
Hanover St	4th St	3rd St	336	0.06	\$8,409
	Front St	3rd St	589	0.11	\$14,737
Harnett St	6th St	Love St	176	0.03	\$4,412
	Front St	3rd St	478	0.09	\$11,962
Hawthorne Dr	Wrightsville Av	Oleander Dr	2,427	0.46	\$60,666
Hinton Ave	Oleander Dr	Greenville Ave	5,102	0.97	\$127,561
Hoggard Dr	Hamilton Dr	Private St	812	0.15	\$20,293
Holly Tree Rd	Warlick Dr	Pine Grove Dr	1,986	0.38	\$49,649
	Web Trace	College Rd	1,628	0.31	\$40,697
Hooker Rd	Rose Av	Wrightsville Av	7,574	1.43	\$189,356
Hunters Tr	Ringo Dr	New Centre Dr	7,210	1.37	\$180,256
Hurst Dr	Hamilton Dr	College Rd	2,126	0.40	\$53,140
Independence Blvd	Carolina Beach Rd	Shipyard Blv	15,511	2.94	\$387,763
	Market St	Canterbury Rd	15,982	3.03	\$399,545
	River Rd	Carolina Beach Rd	10,924	2.07	\$273,100
	Shipyard Blv	Canterbury Rd	3,609	0.68	\$90,225
Jeb Stuart Dr	Donald E Gore Dr	Longstreet Dr	8,389	1.59	\$209,727
John S Mosby Dr	R L Honeycutt Dr	John D Barry Dr	685	0.13	\$17,117
Judges Rd	Albemarle Rd	Market St	3,129	0.59	\$78,214
Kelly Rd	Hampton Rd	Beasley Rd	6,136	1.16	\$153,408

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
Kerr Ave	Market St	Private Drive (N of Alandale Dr)	11,928	2.26	\$298,202
	Randall Pkw	Franklin Av	3,413	0.65	\$85,322
	Randall Pkwy	Maple Av	12,091	2.29	\$302,280
King St	Clarendon St	Center St	775	0.15	\$19,371
Kirby Smith Dr	Waltmoor Rd	Greenhowe Dr	10,263	1.94	\$256,583
Lake Ave	College Rd	Halifax Rd	3,548	0.67	\$88,712
Lake Branch Dr	Lake Shore Dr	Greenfield St	1,037	0.20	\$25,918
Lake Shore Dr	Carolina Beach Rd	Willard St	23,556	4.46	\$588,910
Lansdowne Rd	Navaho Trl	College Rd	2,991	0.57	\$74,785
Lennon Dr	Market St	Hunters Tr	2,565	0.49	\$64,129
Live Oak Pkwy	Gillette Dr	Canterbury Rd	2,098	0.40	\$52,448
Long Leaf Acres Dr	Eastwood Rd	Toulon Dr	8,183	1.55	\$204,586
Long Leaf Hills Dr	College Rd	Pine Grove Dr	3,827	0.72	\$95,677
Longstreet Dr	Shipyard Blv	Pine Valley Dr	4,093	0.78	\$102,316
Lullwater Dr	Market St	Greenway Av	7,944	1.50	\$198,600
MacMillan Ave	Park Av	Wrightsville Av	285	0.05	\$7,134
Main St	Military Cutoff Rd	Town Center Dr	2,649	0.50	\$66,220
Mallard St	Clear Run Dr	Wrightsville Av	3,838	0.73	\$95,940
Market St	Gordon Rd	Martin Luther King Jr Pky	22,931	4.34	\$573,283
	Martin Luther King Jr Pky	New Centre Dr	5,776	1.09	\$144,410
Marlwood Dr	Glen Meade Rd	Echo Ln	1,716	0.33	\$42,911
Marsh Hawk Ct	College Rd	Amber Rd	2,449	0.46	\$61,218
Martin St	13th St	9th St	3,020	0.57	\$75,503
Masonboro Loop Rd	Masonboro Sound Rd	County Rd	3,603	0.68	\$90,069
	Pine Grove Dr	Masonboro Sound Rd	14,636	2.77	\$365,893
Masonboro Sound Rd	Masonboro Loop Rd	Pine Grove Dr	26,046	4.93	\$651,154
McRae St	Bess St	Nixon St	264	0.05	\$6,599
Medical Center Dr	Wisteria Dr	17th St	3,902	0.74	\$97,545
Midland Dr	Parkway Blv	Newkirk Av	2,390	0.45	\$59,758
Military Cutoff Rd	Gordon Dr	Airlie Rd	27,214	5.15	\$680,339
Navaho Trl	Masonboro Loop Rd	Lansdowne Rd	11,486	2.18	\$287,157
New Centre Dr	College Rd	Private Dr (East of College Rd)	235	0.04	\$5,874
	Hunters Tr	Kerr Av	2,308	0.44	\$57,707
	Private Drive (South of Dapple Ct)	Hunt Club Rd	1,700	0.32	\$42,512
Newkirk Ave	Shipyard Blv	Midland Dr	720	0.14	\$18,004
Nottingham Ln	Colony Cir	Greenwich Ln	732	0.14	\$18,297
Nutt St	Red Cross St	Hanover St	772	0.13	\$19,299
Oleander Dr	Airlie Rd	Greenville Ave	7,013	1.33	\$175,330
	College Rd	42 Nd St	2,452	0.46	\$61,300
	New Hanover Medical Park Dr	Savannah Ct	1,435	0.27	\$35,866
	Pine Grove Dr	Greenville Loop Rd	24,722	4.68	\$618,058

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
Oriole Dr	College Rd	Cardinal Dr	7,543	1.43	\$188,576
Page Ave	Wrightsville Av	Wilshire Blv	2,260	0.43	\$56,496
Park Ave	Floral Pkw	Kerr Av	7,541	1.43	\$188,534
Parkway Blvd	Midland Dr	Carolina Beach Rd	1,075	0.20	\$26,869
Patricia Dr	Clearbrook Dr	Brenda Dr	1,904	0.36	\$47,598
Peachtree Ave	Kerr Av	42 Nd St	2,220	0.42	\$55,507
Pine Grove Dr	Kilarney Rd	Masonboro Sound Rd	8,318	1.58	\$207,957
	Mayberry Ct	Oleander Dr	12,160	2.30	\$304,000
Pine Valley Dr	College Rd	Beasley Rd	6,709	1.27	\$167,735
		Robert E Lee Dr	1,146	0.22	\$28,641
	Shipyards Blv	Robert E Lee Dr	5,179	0.98	\$129,486
Price Dr	Riegel Rd	Riegel Rd	8,980	1.70	\$224,489
Private St	Saint James Dr	Hoggard Dr	367	0.07	\$9,177
R L Honeycutt Dr	Jeb Stuart Dr	John S Mosby Dr	7,661	1.45	\$191,518
Racine Dr	Old Eastwood Rd	Eastwood Rd	391	0.07	\$9,774
Railroad St	Stanley St	King St	429	0.08	\$10,734
Raleigh St	Vance St	Carolina Beach Rd	8,155	1.54	\$203,876
Randall Dr	College Rd	Reynolds Dr	6,487	1.23	\$162,183
Randall Pkwy	Covil Av	Kerr Av	6,981	1.32	\$174,517
Red Cross St	Front St	Nutt St	150	0.03	\$3,745
Reynolds Dr	Randall Dr	Reynolds Dr	2,409	0.46	\$60,225
Ridgewood Heights Dr	Rose Ave	Wrightsville Av	4,350	0.82	\$108,742
Riegel Rd	Rose Av	Hamilton Dr	10,124	1.92	\$253,100
Ringo Dr	Columb Dr	Hunters Tr	3,694	0.70	\$92,352
River Rd	Sunnyvale Rd	Shipyards Blv	14,316	2.71	\$357,902
		South of Independence Blv	12,224	2.32	\$305,598
Robert E Lee Dr	Longstreet Dr	Longstreet Dr	13,092	2.48	\$327,298
Robin Hood Rd	17th St	Lake Shore Dr	4,026	0.76	\$100,654
Rogersville Rd	Wrightsville Av	Eastwood Rd	9,195	1.74	\$229,876
Rose Ave	Clear Run Dr	Wrightsville Av	12,890	2.44	\$322,260
Saint Nicholas Rd	Blair School Rd	Blair School Rd	5,059	0.96	\$126,468
Scientific Park Dr	Kornegay Av	23 Rd St	7,448	1.41	\$186,205
Shipyards Blvd	Holbrook Av	College Rd	18,078	3.42	\$451,951
	Hospital Plaza Dr	Willard St	4,104	0.78	\$102,608
	River Rd	East of Vance St	4,455	0.84	\$111,376
Southern Blvd	Carolina Beach Rd	Burnett Blv	2,453	0.46	\$61,323
Spartan Rd	Market St	Tanbridge Rd	6,834	1.29	\$170,840
Spirea Dr	41 St St	College Rd	5,156	0.98	\$128,889
St Andrews Dr	Carolina Beach Dr	Chippenham Dr	5,083	0.96	\$127,068
Stanley St	Railroad St	Clarendon St	3,178	0.60	\$79,458
Station Rd	Market St	Military Cutoff Rd	4,975	0.94	\$124,387
Steeplechase Dr	Chippenham Dr	17th St	1,147	0.22	\$28,670
Stokely Dr	Denee Dr	Ringo Dr	1,698	0.32	\$42,440
Sunnyvale Dr	River Rd	Carolina Beach Rd	14,961	2.83	\$374,031
Sutton Dr	Waltmoor Rd	Brookview Rd	1,400	0.27	\$34,993

Street Name	From	To	Linear Feet	Linear Miles	Approx. Cost
Sweetbriar Rd	Lincoln Rd	Halifax Rd	3,022	0.57	\$75,538
Tanbridge Rd	Eastwood Rd	End of Road	14,191	2.69	\$354,779
Toulon Dr	Green Meadows Dr	Long Leaf Acres Dr	1,316	0.25	\$32,911
Van Campen Blvd	Market St	Sigmon Rd	273	0.05	\$6,829
Vance St	Rutledge Dr	Raleigh St	3,225	0.61	\$80,626
Wagoner Dr	Hurst Dr	Randall Dr	6,252	1.18	\$156,294
Wallace Ave	Oleander Dr	Wrightsville Av	2,637	0.50	\$65,925
Waltmoor Rd	College Rd	Greenwich Ln	3,714	0.70	\$92,845
Water St	Nutt St	Walnut St	374	0.07	\$9,354
	Princess St	Ann St	1,797	0.34	\$44,922
Wells Rd	Tanbridge Rd	Windemere Rd	981	0.19	\$24,518
William and Mary Pl	Navaho Trl	Commons Way	1,267	0.24	\$31,685
Wilshire Blvd	College Rd	Rosemont Av	8,504	1.61	\$212,597
	Montclair Dr	Page Av	70	0.01	\$1,746
Windsor Dr	Arden Rd	Wrightsville Av	198	0.04	\$4,949
Wisteria Dr	Cypress Dr	Medical Center Dr	800	0.15	\$19,990
Wood Dale Dr	Wrightsville Av	Riegel Rd	4,963	0.94	\$124,081
Wrightsville Ave	Hawthorne Dr	Rogersville Rd	15,634	2.96	\$390,862
	Military Cutoff Rd	Eastwood Rd	7,774	1.47	\$194,353
	Oleander Dr	Rogersville Rd	5,891	1.12	\$147,266
Total			1,092,698	206.94	\$27,317,447

6.1.2 Multi-Use Path Recommendations

Ultimately, the Cross-City Trail will travel approximately 10 miles between Halyburton Park and Wrightsville Beach. The paved off-road trail will be at least eight feet in width, with striped crosswalks at all intersections and crossing signals at each major intersection. Recreational and cultural destinations along the trail will include Halyburton Park, Cameron Art Museum, the park behind Alderman Elementary, Independence Mall, Hanover Center, Empie Park, Ann McCrary Park, and Autumn Hall. Pine Valley Elementary School, Alderman Elementary School, Cape Fear Center for Inquiry, and UNC Wilmington are among the destinations.

Cross-City Trail elements are illustrated by the light green  lines on the Recommended Sidewalk and Pedestrian Signal Improvement maps (151 through 154). Existing trail segments are shown in a solid line and proposed segments are dashed. Other multi-use trails are shown by the dark green  lines on the maps. The Adopted Cross City Trail Plan (6/17/2008) is

illustrated on Figure 80. Table 12 Multi Use Path Recommendations shows approximate lengths and costs for the proposed trail segments.

Table 12 Multi Use Path Recommendations		
Path Segment	Linear Feet	Approx. Cost ¹
CROSS CITY TRAIL	68,698	\$1,373,956
Autumn Hall	7,414	\$148,278
Eastwood	5,775	\$115,491
Independence	20,466	\$409,323
McCrary Park	3,665	\$73,303
Museum	3,649	\$72,983
Peele	1,971	\$39,426
Randall	5,381	\$107,622
Rosemont	1,797	\$35,950
UNCW Connector	10,077	\$201,542
Waltmoor	8,502	\$170,039
OTHER MULTI-USE PATH	90,583	\$1,811,661
Burnt Mill Ck	9,687	\$193,748
Colwell	4,167	\$83,339
CSX North	10,013	\$200,251
CSX South	5,314	\$106,279
Masonboro Lp	9,245	\$184,907
Military Cutoff	21,489	\$429,787
Park	21,703	\$434,057
Riverwalk North	5,048	\$100,967
Riverwalk South	1,875	\$37,509
Summers Rest	2,041	\$40,818
Grand Total	235,672	\$4,713,449
¹ Note: Cost estimate assumes 8' wide asphalt path @ \$20 per linear foot		

6.1.3 Signalized Intersection Recommendations

In addition to identifying recommended sidewalk and trail improvement projects, this plan provides recommendations for pedestrian signal and associated street crossing improvements. As shown in the existing conditions maps (151 through 154), there are a number of existing signalized intersections in Wilmington that do not have pedestrian signal heads in all directions, and many intersections with relatively high pedestrian demand scores provide no pedestrian signalization. Furthermore, there are several intersections between existing or proposed multi-use paths and arterial or collector roadways. In order to improve pedestrian safety and comfort, as well as enhance the connectivity of the pedestrian system, pedestrian signals and crosswalks are recommended in several locations. The recommendations include a combination of

retrofitting pedestrian signals to existing signalized intersections, installing new traffic signals with pedestrian signals and crosswalks, and pilot testing rapid flash beacons and pedestrian hybrid signals.

Related pedestrian appurtenances must be considered with every new or retrofitted pedestrian signal, such as:

- marked crosswalks (see Crosswalk Marking Guidelines, p. 84),
- median refuge islands (see Island Channelization and Pedestrian Refuge Islands at Intersections, p. 88),
- curb ramps (see City of Wilmington Technical Standards)
- pedestrian push buttons (unless concurrent signals are warranted- see Pedestrian Actuated Signals and Push Button Locations, p. 97), and

appropriate signage (see Turning Vehicles Yield to Pedestrians Sign, p. 95).

When improving signals for pedestrian accommodation, the City must also consider the impact of the proposed changes on bicycle and vehicle traffic traveling through the intersection, as well as needed upgrades to related traffic control equipment such as in-ground vehicle detection loops and/or video detection devices (if present). These devices will likely need to be upgraded in conjunction with any signalization improvement.

There are 182 intersections identified for traffic signal improvements and 170 of those locations include retrofitting existing signalized intersections with pedestrian signals. Recommendations were prioritized based on the presence of existing or proposed sidewalks or side paths at an intersection, relative potential pedestrian demand and location on a likely pedestrian travel route, and proximity to schools. The plan recommends a variety of short-term project improvements. Pedestrian signal retrofits to existing signals are identified on the maps by red ● dots. In some cases, there may be one or more existing pedestrian signals at an intersection, but more signals are recommended in order to ensure enhanced utility to pedestrians approaching the intersection from any side. Priority locations for new traffic signals with pedestrian appurtenances are identified on the map by purple ● dots.

In addition to identifying opportunities for new traffic signals or retrofitting pedestrian signals to conventional traffic signals, this plan recommends that Wilmington and NCDOT consider installing a number of pedestrian hybrid signals and rapid flash beacons. These types of signals are not in widespread use in North Carolina and there are no existing examples of either signal type in Wilmington. Therefore, it is recommended that Wilmington and NCDOT pilot test the signals in a few locations to evaluate their effectiveness and refine installation guidelines and policies. This plan recommends four potential pilot test sites for pedestrian hybrid signals and

two pilot test sites for rapid flash beacons. All of the pilot test locations identified are within relative close proximity to an existing school and demonstrated a relatively high amount of potential pedestrian activity.

Short-term pedestrian hybrid signal recommendations are indicated with a blue ● dot and are generally recommended for relatively high speed, high volume multi lane arterial roadways.

Rapid-flash beacons are identified on the maps by a green ● dot and are recommended on narrower two lane arterial and collector roadways.

Pedestrian Hybrid Signal

Wilmington should consider pilot testing a pedestrian hybrid signal in one or more of the following locations:

- *Market Street between Colonial Drive and Covil Avenue or between Covil Avenue and North and South Kerr Avenue.* These are both ½ mile stretches of roadway without signalized crossings with the exception of the signal located at Barclay Hills and Princess Place. Market Street has five lanes through this section (four travel lanes, and one center turn lane). There are several side streets leading to the corridor from adjoining neighborhoods, and there is a relatively high potential pedestrian demand score in the area. A number of pedestrians were observed attempting to cross Market Street in this area. A median pedestrian refuge should be considered in addition to the pedestrian hybrid signal.
- *Greenville Loop Road or Oleander Drive between Wallace Avenue and Greenville Avenue.* Pedestrian hybrid signals should be considered along these roads if sidewalks are provided and no pedestrian signals are installed. Currently, these are both long stretches of high speed multi-lane roadway straddled by residential neighborhoods. There are also schools located near both roads that would be more accessible by foot or bicycle if safer and more comfortable pedestrian accommodations were provided.
- *Market Street at South 21st Street.* Pedestrian hybrid signals should be considered at this crossing connecting Bullock Park and Wallace Park. This is also the location where the planned Burnt Mill Creek multi-use path will cross Market Street. A pedestrian hybrid signal is recommended instead of a full stop signal as it will reduce the potential cut through traffic into nearby residential neighborhoods.

Rapid Flash Beacons

Wilmington should consider pilot testing rapid-flash beacons in the following locations:

- *Princess Place Drive near Rachel B. Freeman Elementary.* There is currently a marked crosswalk across Princess Place Drive directly across from the entrance to Rachel B. Freeman Elementary. There is a relatively high calculated pedestrian demand in this area, and the school is surrounded by neighborhoods. The presence of a relatively complete sidewalk network on both sides of the street makes this an ideal location to pilot test a rapid-flash beacon if it is determined that there is a problem with drivers failing to yield to pedestrians in the area.

- *Colonial Drive near Forest Hills Elementary.* Colonial Drive in the vicinity of Forest Hills Elementary is a relatively narrow two lane roadway with a fairly extensive sidewalk network. The road is bounded by a large residential neighborhood, making it an ideal setting for children to travel to and from the school on foot and by bicycle. This is an ideal location to pilot test a rapid flash beacon if it is determined that there is a problem with drivers failing to yield to pedestrians.

Mid-term signal improvements are identified by a grey  dot. There are a total of 47 locations identified for pedestrian signal retrofits to existing traffic signals. Long term signal improvements are shown with a white  dot. There are 28 locations identified where pedestrian signalheads should be added to existing traffic signals.

Several additional potential pedestrian signal enhancements are identified for locations along the planned Cross-City Trail, River to the Sea Bikeway and other multi-use paths. The signal recommendations are indicated with a yellow  dot. It is anticipated that these recreational trail facilities, when completed, will attract a significant number of users. Therefore, it is recommended that Wilmington consider installing pedestrian signals at key crossings concurrent with trail construction.

Wilmington should consider concurrent timing for pedestrian signals located in the Urban Core Zone and near major pedestrian attractors such as UNCW. Leading pedestrian intervals should be considered for locations with relatively high volumes of turning vehicles.

Table 13, Priority Pedestrian Signal Recommendations summarizes signal recommendations.

Because this plan did not include a detailed inventory and evaluation of existing facilities at each of the intersections recommended for improvement, the costs included are approximations of what an average intersection improvement would cost. Cost breakdowns for various elements associated with typical signal improvement projects are included in the appendix of this document.

Pedestrian Signal Recommendations	Map Symbol	Number of Locations Proposed	Approx. Cost
Short (0-5 years)			\$4,475,000
Add Ped Signals (2 Legs)		1	\$20,000
Add Ped Signals (3 Legs)		9	\$540,000
Add Ped Signals (All Directions)		62	\$2,480,000
New Hybrid Signal		5	\$400,000
New Rapid Flash Beacon		5	\$75,000
New Signal		8	\$960,000

Mid (5-10 years)			\$1,880,000
Add Ped Signals (2 Legs)		3	\$60,000
Add Ped Signals (3 Legs)		3	\$180,000
Add Ped Signals (All Directions)		41	\$1,640,000
Long (10-20 years)			\$1,070,000
Add Ped Signals (1 Legs)		1	\$10,000
Add Ped Signals (2 Legs)		3	\$60,000
Add Ped Signals (3 Legs)		2	\$120,000
Add Ped Signals (All Directions)		22	\$880,000
With Trail Construction			\$645,000
Upgrade Signal With Trail		13	\$520,000
New Hybrid Signal		1	\$80,000
New Rapid Flash Beacon		3	\$45,000
		Grand Total	\$8,070,000

The locations identified on the following maps are conceptual and a detailed engineering study is required to determine the feasibility of the new signal equipment, including an assessment of the impact of the proposed pedestrian signal on vehicle traffic patterns. For more information on recommended signal timing approaches and signal siting strategies, see Chapter 4, Policies, Codes and Ordinances and the Appendix of this plan.

6.1.4 Bicycle and Pedestrian Cut-Through Recommendations

The maps also identify 68 potential bicycle and/or pedestrian connections between stub streets, cul de sacs, trail connections, and other opportunity locations. These are indicated on the maps by the black dots surrounded by concentric circles . These connection points have been identified by city staff over time through a number of different methods, including community input, field analysis, review of subdivision construction plans and other approaches.

Prior to completing any bicycle or pedestrian connection, it is recommended that the City work with affected stakeholders, including neighborhood residents, through-commuters, and adjoining property owners. For more information, see 4.3.5, Pedestrian and Bicyclist Cut-Throughs on Cul-de-Sacs and Adjoining Streets on page 93.

Highlights of Key Corridor Recommendations

There are several corridors in Wilmington that have high observed levels of pedestrian activity and should therefore be priority candidates for improvements. The following discussion provides an overview of the recommendations intended to enhance the pedestrian experience in these busy corridors.

- *Market Street.* Pedestrian signal heads are recommended for all existing traffic signals along Market Street within the Central Business District, Urban Core, and Traditional Suburban zones. The roadway currently has sidewalks for most of its length from the Central Business District Zone to the Traditional Suburban Zone, although the sidewalk coverage drops off in the Automobile-Oriented Zone. This roadway passes through several commercial areas with relatively high potential for pedestrian activity (and significant pedestrian activity was observed during field visits). In addition to the retrofit pedestrian signal heads, several relatively small sidewalk improvement projects are recommended to close gaps along the corridor. Wilmington should consider piloting at least one pedestrian hybrid signal in the stretch between Covil Avenue and North and South Kerr Avenue.
- *Military Cutoff Road.* Pedestrian signal heads are recommended for the following signalized intersections along Military Cutoff Road north of Eastwood Road: Eastwood Road, Parker Farm Road, Destiny Way, Monument Drive (pedestrian hybrid signal), Town Center Drive, Station Drive, Gordon Road. Currently, the pedestrian signals are designed to allow pedestrians to travel parallel to Military Cutoff Road, but they do not aid in crossing the busy arterial roadway. Although the calculated pedestrian potential is not as high as other areas of the city, the Military Cutoff Trail is likely to induce pedestrian demand to cross the road to and from the Mayfaire mixed use development. Furthermore, the calculations do not reflect the increased population density of the relatively new Mayfaire development. Once the connection between the Military Cutoff Trail and the Cross-City Trail link to Wrightsville Beach, there is likely to be a significant increase in demand due to a desire to ride a bicycle or walk to the beach. See the concept design study for this area at the end of this chapter for more information.
- *South College Road.* New sidewalks and pedestrian signals are recommended along South College Road in the vicinity of UNCW. The area has very high potential pedestrian demand, and there are several restaurants, shops and other commercial destinations frequented by students at the university that are within walking distance, but are not walkable due to the lack of adequate infrastructure. In addition to several proposed sidewalk improvement projects, pedestrian signal retrofits are recommended for existing traffic signals along the busy eight lane arterial roadway. See the concept design study for this area at the end of this chapter for more information.
- *Carolina Beach Road at Shipyard Boulevard.* Pedestrian crossing signals and new sidewalks are recommended for locations in the vicinity of this intersection. There are several low-income, transit-dependent residential neighborhoods in the area, as well as many restaurants, shops and other destinations that attract walkers. Several pedestrians were observed walking along shoulders and crossing away from the intersection in this area. This may be due to a concern for personal safety because

there are relatively high volumes of large turning vehicles. In addition to installing sidewalks and pedestrian signals (in coordination with NCDOT), the city should consider installing yield to pedestrian signs at this intersection to provide increased visibility for pedestrians to turning motorists. See the concept design study for this area at the end of this chapter for more information.

- *Dawson Street and Wooster Street.* Wilmington should implement the Dawson and Wooster Corridor Plan and install sidewalks along Wooster Street to close the network gaps. Currently, there is good connectivity along Dawson Street and along the several cross streets. Furthermore, the city should construct the traffic calming devices recommended in the Dawson and Wooster Plan and partner with NCDOT to manage vehicle speed in this area at no more than 35 mph. It appears that the current prevailing speed is well in excess of the posted speed limit, resulting in an environment that is uncomfortable for pedestrians to walk. There are several traffic lights along both roadways, but the GIS data indicates that there are no pedestrian accommodations (pedestrian signals), which can significantly hinder north/south circulation traffic between neighborhoods, bus stops, and the hospital. Pedestrian signal heads are strongly encouraged to allow protected pedestrian crossings of the corridor.
- *Oleander Drive.* retrofit pedestrian signals to all existing signals between Independence Boulevard and Pine Grove Drive within Traditional Suburban Zone. Consider adding pedestrian actuation to emergency signal at Wallace Avenue.

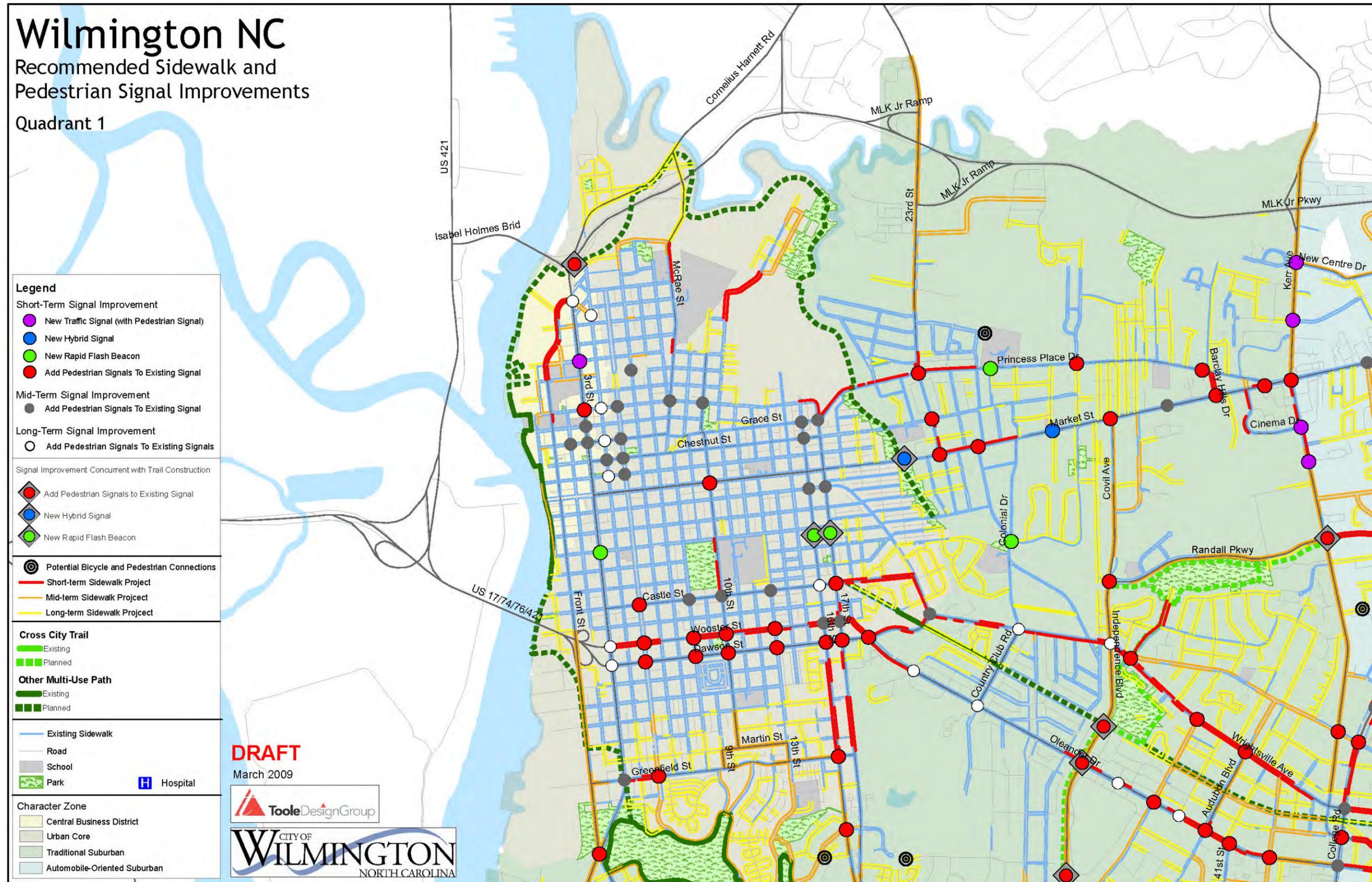


Figure 76 Recommended Pedestrian Facility Improvements - Quadrant 1

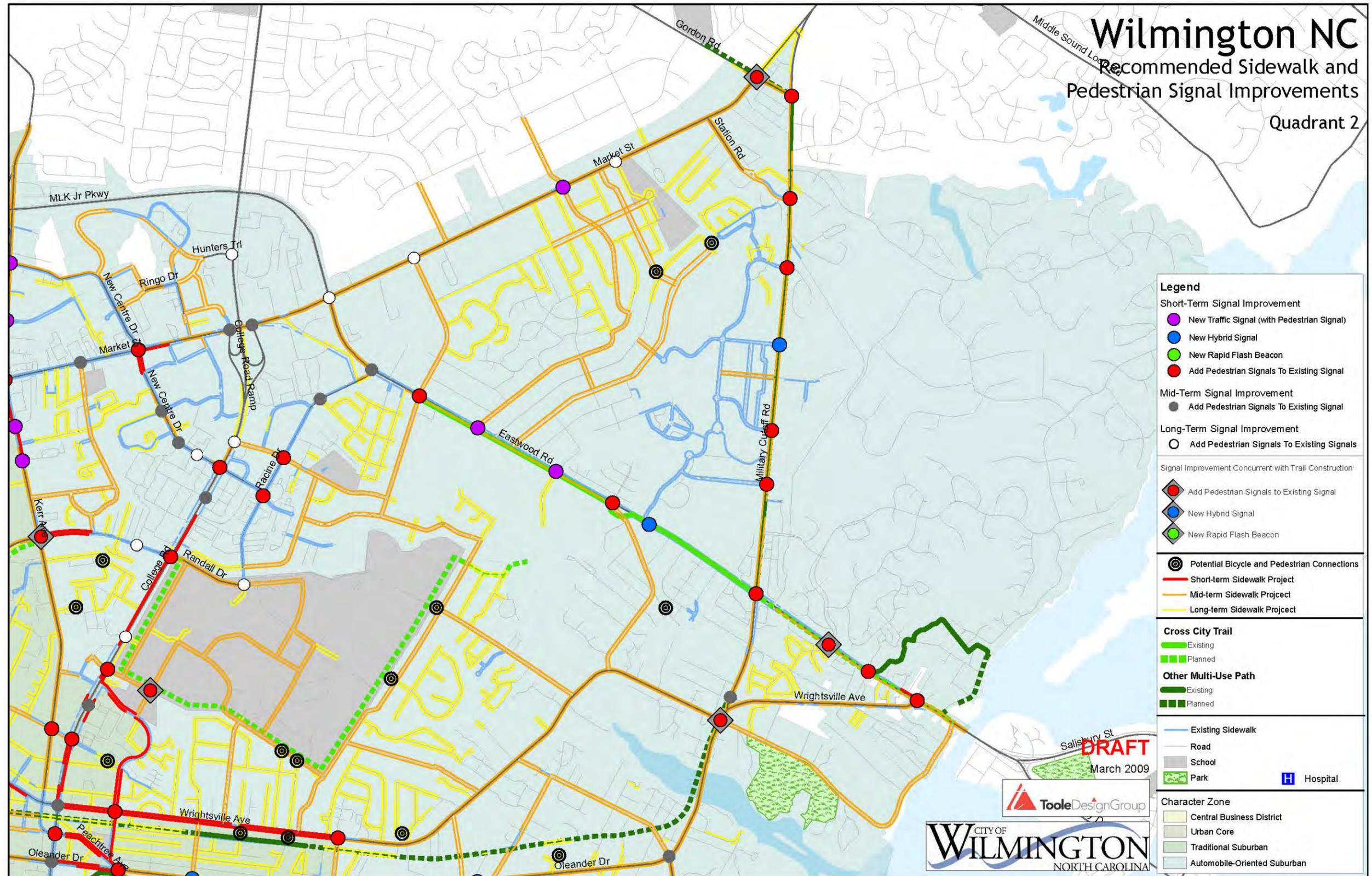


Figure 77 Recommended Pedestrian Facility Improvements - Quadrant 2

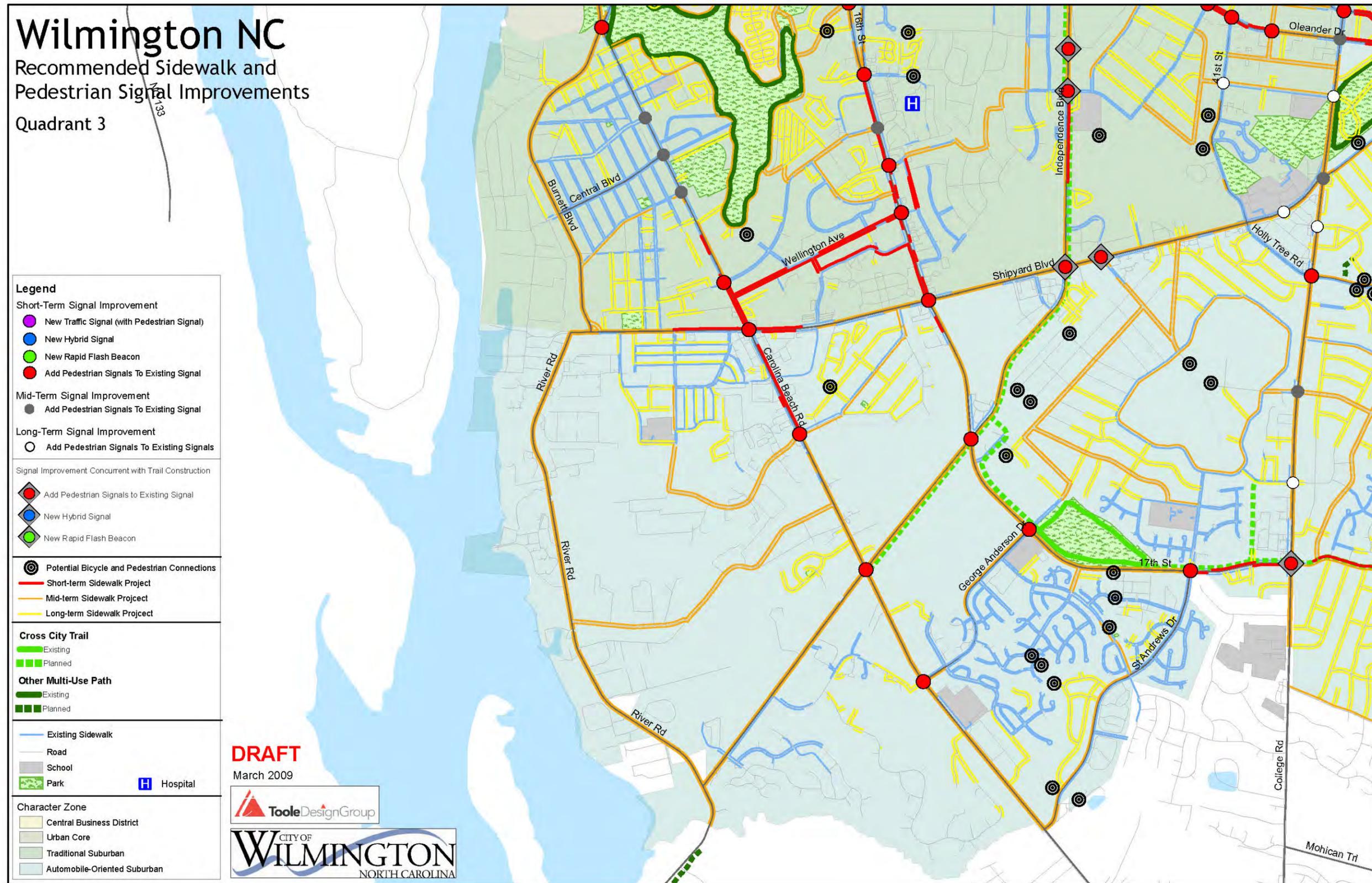
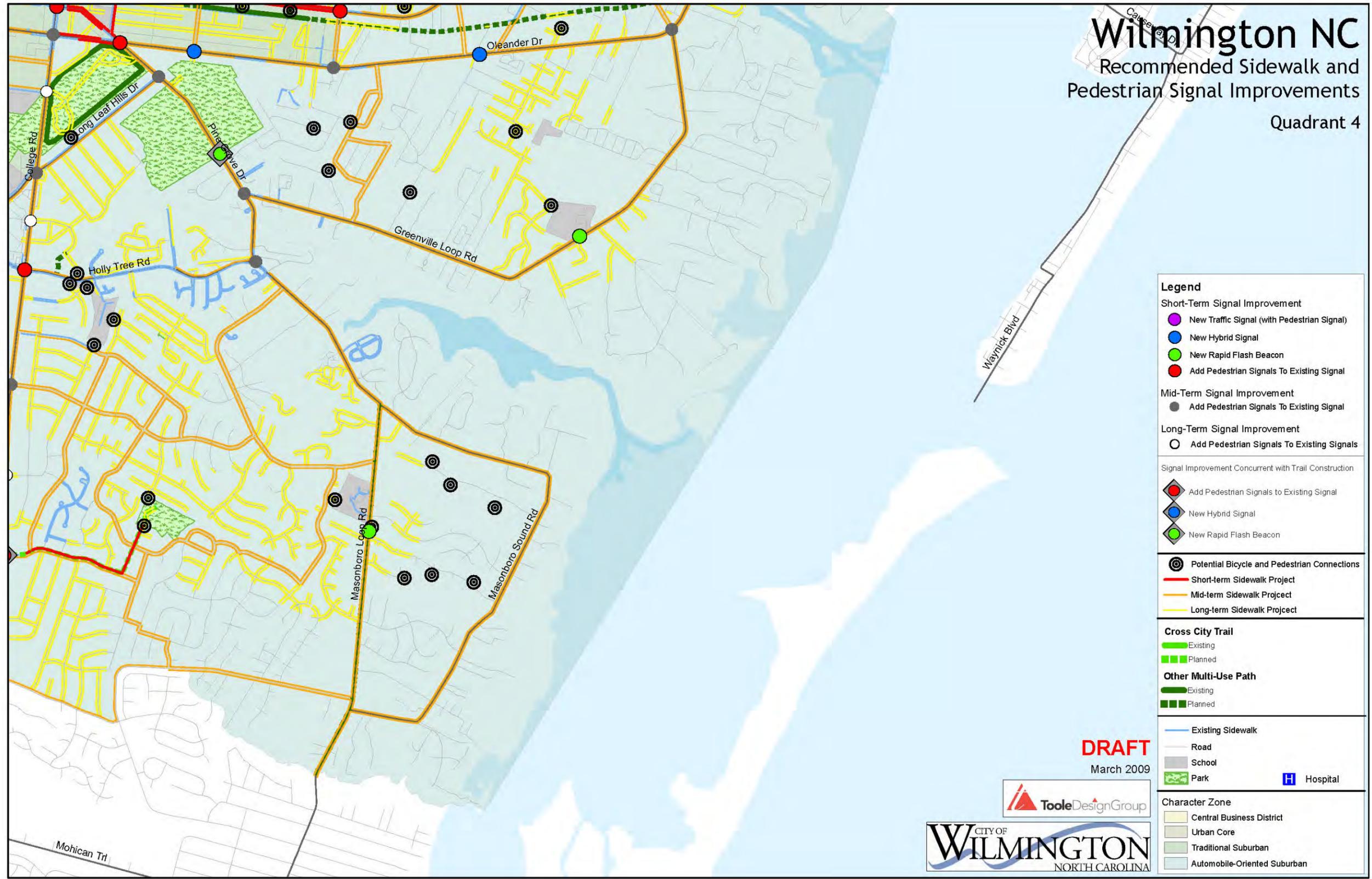


Figure 78 Recommended Pedestrian Facility Improvements - Quadrant 3

Wilmington NC

Recommended Sidewalk and Pedestrian Signal Improvements

Quadrant 4



DRAFT
March 2009



Figure 79 Recommended Pedestrian Facility Improvements - Quadrant 4

WILMINGTON The Cross-City Trail Alignment Adopted by Wilmington City Council on June 17, 2008

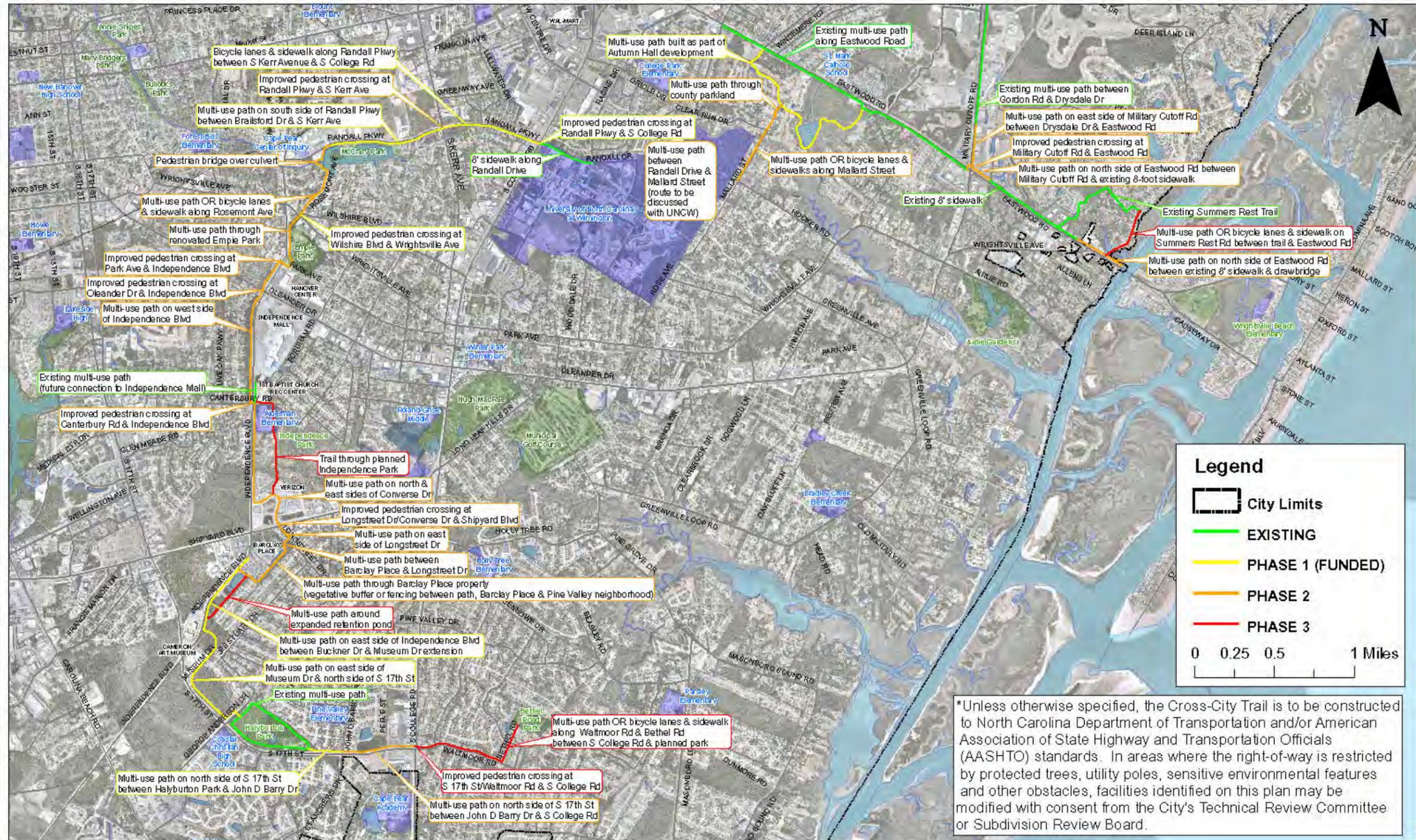


Figure 80 Adopted Cross City Trail Plan

DESIGN STUDY AREAS

As part of this plan, three locations have been selected for further study to develop conceptual improvement plans to illustrate the benefits of implementing the recommendations detailed in this chapter. These areas have been identified for their similarity to the other parts of Wilmington. By selecting challenges that are fairly representative of conditions community-wide, the concepts illustrated may be readily adapted to other areas, and they will facilitate discussions to improve pedestrian conditions crossing NCDOT- maintained roadways. The three study areas identified are:

- Intersection of Shipyard Boulevard and Carolina Beach Road
- Intersection of Eastwood Road and Military Cutoff Road
- Intersection of South College Road and New Centre Drive

All of these intersections are located in the *Automobile-Oriented Suburban Zone*. The existing design of these intersections exemplifies the challenges for pedestrians associated with a transportation system that is designed almost exclusively around motorized vehicles.

The concepts illustrate the importance of re-evaluating lane width policy and speed limit to develop roadways that serve the multitude of users who require access. The existing practice of designing only for the convenience of motorized traffic is resulting in geometrics and operational conditions that make it expensive and difficult to accommodate pedestrians across these roadways. Maintaining 12-foot travel lanes and large curb radii will require widening at all of the intersections which will add significant cost to the project.

The concepts also illustrate the many low cost opportunities to significantly reduce the size of the intersections by recapturing unneeded roadway space and reducing travel lane widths to 11-feet. The reductions in pedestrian crossing distances will shorten the necessary pedestrian crossing times. This will make providing pedestrian facilities more palatable to NCDOT as it will reduce the overall traffic delay that would result if pedestrian facilities were provided with the existing geometrics at each intersection.

Shipyards Boulevard and Carolina Beach Road

Context

This intersection is located in the southwest corner of Wilmington, close to the state port. Most of the development along both roads is automobile-oriented commercial. To the northwest of this intersection is the Sunset South neighborhood. This is a recent Hope VI project completed to provide affordable housing opportunities for many Wilmington residents who previously resided in traditional public housing projects. To the southwest of this intersection is the economically-depressed and transit-dependent neighborhood of Long Leaf Park. Due to the demographics of this area, it is reasonable to expect that many residents will walk to transit stops on Shipyards Boulevard or Carolina Beach Road and to the stores and restaurants located in the area.

Intersection Description



Figure 81 Intersection of Carolina Beach Road and Shipyards Boulevard.

Note: Graphic does not reflect recent construction on southwest and northwest corners or new sidewalks.

Carolina Beach Road (US Highway 421) connects downtown Wilmington and the Cape Fear Memorial Bridge to Monkey Junction and Pleasure Island. Shipyard Boulevard (US Highway 117) carries traffic from the state port on the Cape Fear River east to South College Road, which connects to Interstate 40. Both roads carry significant amounts of car and heavy truck traffic. At the intersection, Carolina Beach Road has five to six lanes and is undivided. Southbound Carolina Beach Road has dual left-turn lanes, a through-lane, and a shared through and right-turn lane. Northbound there is one left-turn lane, a through-lane, and a shared through and right-turn lane. At the intersection, eastbound Shipyard Boulevard has one left-turn lane, a through-lane, and a shared through and right-turn lane. A 20-foot-wide grass median divides it from the westbound lanes. Westbound Shipyard Boulevard has two through-lanes, dual left-turn lanes and a dedicated right-turn lane. A 4-foot-wide concrete median divides it from the eastbound lanes. Although there are sidewalks at the northwest, southeast and southwest corners of the intersection, crosswalks and pedestrian signals are not present.

Vehicle stop lines appear to be within the legally-defined pedestrian crossing areas on all legs of the intersection.



Figure 82 Pedestrian Crossing Shipyard Boulevard

Intersection Observations

During a brief observation of this intersection, five pedestrians were observed crossing either Shipyard Boulevard or Carolina Beach Road. One pedestrian appeared to make an attempt to wait for a green light to cross, but there were no gaps in turning traffic. This pedestrian ended up crossing against the signal. No other pedestrians appeared to wait for green lights to cross, and three crossed to the median of Shipyard Boulevard or roadway centerline on Carolina Beach Road and waited for a break in traffic to complete the crossing.

The lack of pedestrian accommodations at the intersection makes it unclear when and where it is safe for pedestrians to cross the roadway. The stop bar position causes vehicles to stop in the location where pedestrians should be crossing. Traffic turning on a green signal must then negotiate right of way with pedestrians caught in the roadway. The positioning of stopped vehicles in the desired crossing area forces pedestrians to cross behind a stopped vehicle which limits their visibility to other drivers placing them at risk of a collision while crossing.

Recommendations

(Note: See Appendix for full graphic and memorandum describing proposed recommendations)

The following concept plan illustrates the proposed recommendations for improvements to this intersection. Highlights of the physical improvements include:

- Install high-visibility crosswalks on all four legs of intersection (note: this will require relocating the stop bar and vehicle detection loops in the pavement)
- Install high visibility crosswalks on right-turn slip lanes on Carolina Beach Road
- Install large traffic islands on northwest and southeast corners of intersection
- Install median pedestrian refuge island on Shipyard Boulevard. Widen eastern Shipyard Boulevard median from four feet to eight feet
- Narrow eastbound travel lanes on Shipyard Boulevard to 11 feet
- Install pedestrian countdown signals and activation equipment for all crosswalks
- Reduce right turn radius on northeast and southwest corners of intersection to 55' and 50' respectively
- Install sidewalk leading north and east from northeast corner of intersection
- Ensure all driveways are Wilmington standard "ramp" type. Close southern McDonald's driveway on Carolina Beach Road.



Figure 83 Shipyard Boulevard and Carolina Beach Road Partial Recommendations

Note: See Appendix for full size concept plan and accompanying descriptions memorandum

Intersection of Military Cutoff Road and Eastwood Road

Context

This intersection is located in the northeast corner of Wilmington, close to Wrightsville Beach. Most of the development along both roads is automobile-oriented commercial. To the northwest of this intersection is a medium density residential neighborhood. There is a branch of the New Hanover County Public Library to the northeast of the intersection, and the new Mayfaire mixed use development is approximately one-half mile to the north along Military Cutoff Road. There are large commercial developments on the southeast and southwest corners of the intersection. The Cross-City Trail along the south side of Eastwood Road currently terminates at the intersection. The Military Cutoff Trail begins to the north at the intersection of Military Cutoff Road and Drysdale Drive. The city plans to connect both to the eight-foot-wide sidewalk at the northeast corner.

Intersection Description

Military Cutoff Road (US Highway 76) connects Oleander Drive (US Highway 76) to Market Street (US Highway 17 Business).

Eastwood Road (US Highway 74-76) carries traffic from Wrightsville Beach to North College Road, which connects to Interstate 40.

Both roads carry significant amounts of motor vehicle traffic. Eastbound and westbound Eastwood Road have narrow concrete medians, dual left-turn lanes, two through-lanes and dedicated right-turn lanes. At the intersection, southbound Military Cutoff Road has dual left-turn lanes, one through-lane and a shared through and right-turn lane. There is no median. Northbound Military Cutoff Road has dual left-turn lanes, two through-lanes, and a dedicated right-turn lane. There is no median.

Although there are sidewalks at the northwest



Figure 84 Existing Conditions of Military Cutoff Road Intersection with Eastwood Road

and southeast corners of the intersection as well as a 10-foot multi-use path at the southwest corner, crosswalks and pedestrian signals are not present.

Intersection Observations

The intersection covers a large area due to generous turning radii and wide travel lane widths. Pedestrian crossings are difficult to navigate due to the placement of stop lines within the pedestrian crossing area, lack of pedestrian amenities (signals, ramps, crosswalks, sidewalks, etc), and long crossing distances. Although the Cross City Trail goes through this intersection, there are no crossing accommodations for trail users.

Recommendations

(Note: See Appendix for full graphic and memorandum describing proposed recommendations)

The following concept plan (see Figure 85) illustrates the proposed recommendations for improvements to this intersection. Highlights of the physical improvements include:

- Install high-visibility crosswalks on all four legs of intersection (note: this will require relocating the stop bar and vehicle detection loops in the pavement)
- Install high visibility crosswalks on right-turn slip lanes on Military Cutoff Road
- Install large traffic islands on northwest and southeast corners of intersection to reduce the size of the intersection, length of pedestrian crossings, and to provide refuge for waiting pedestrians and cyclists.
- Install median pedestrian refuge on each approach with a preference for a minimum 8-foot width median to accommodate the Cross City Trail Traffic.
- Narrow all travel lanes to 11 feet to create necessary space to construct refuge islands.
- Install pedestrian countdown signals and activation equipment for all crosswalks
- Reduce right turn radius on northeast and southwest corners of intersection to induce yielding behavior into motorists and to slow them on the approach to the crosswalks.
- Install sidewalk leading to intersection on all approaches (except the western edge of Military Cutoff Road north of the intersection) and provide sidewalk connections to adjacent developments.

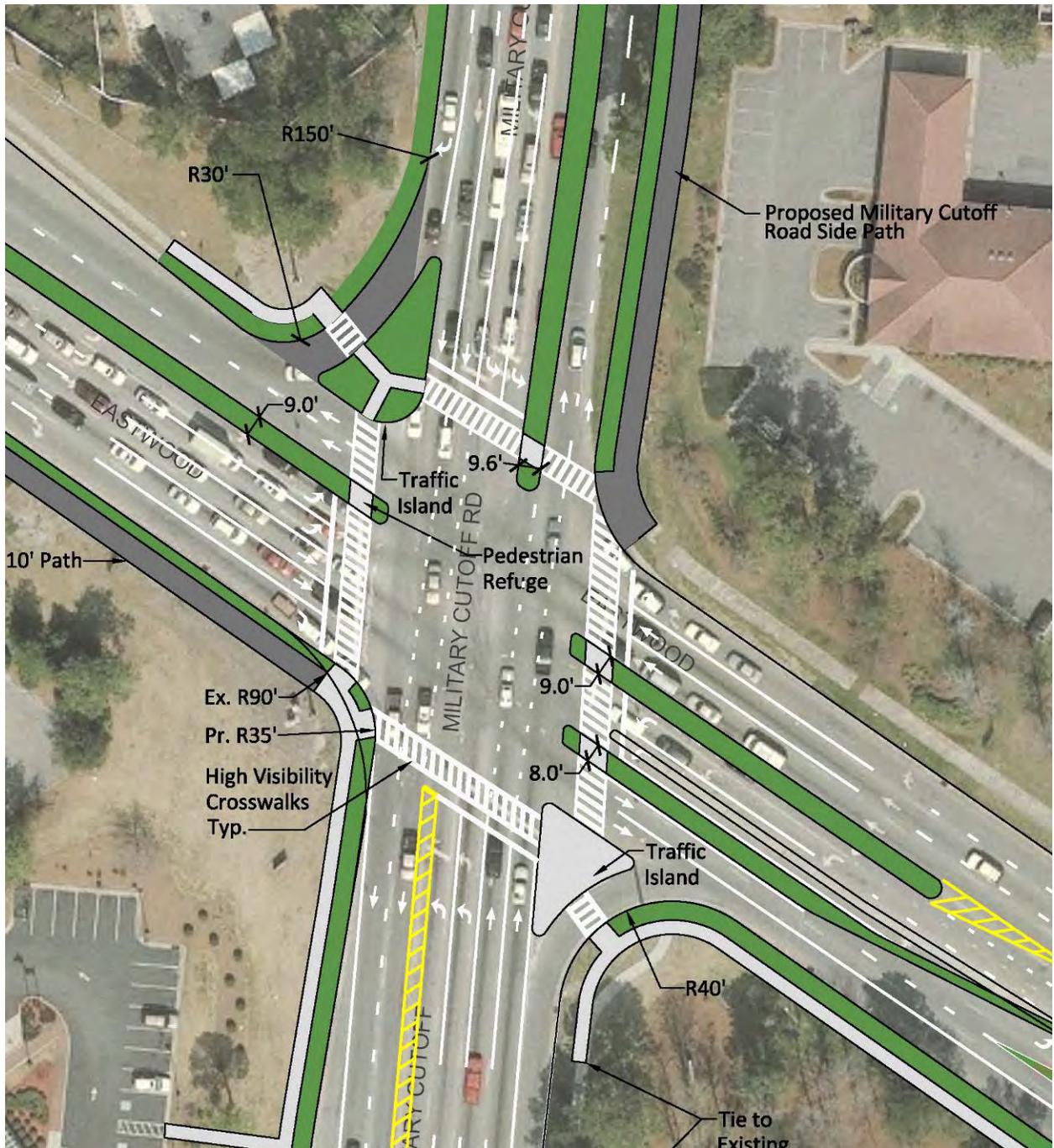


Figure 85 Proposed changes to Military Cutoff Road Intersection with Eastwood Road.

Note: See Appendix for full size concept plan and accompanying descriptions memorandum

Intersection of South College Road and New Centre Drive

Context

This intersection is surrounded on all sides by intensive automobile-oriented commercial development. Figure 86 illustrates the abundance of asphalt parking lots in the area. The UNCW campus is approximately one half mile to the south, along South College Road, and there are several higher density residential developments in the vicinity of the intersection. Over the course of the *Walk Wilmington* planning process, NCDOT added a second left-turn lane from northbound South College Road onto westbound New Centre Drive.

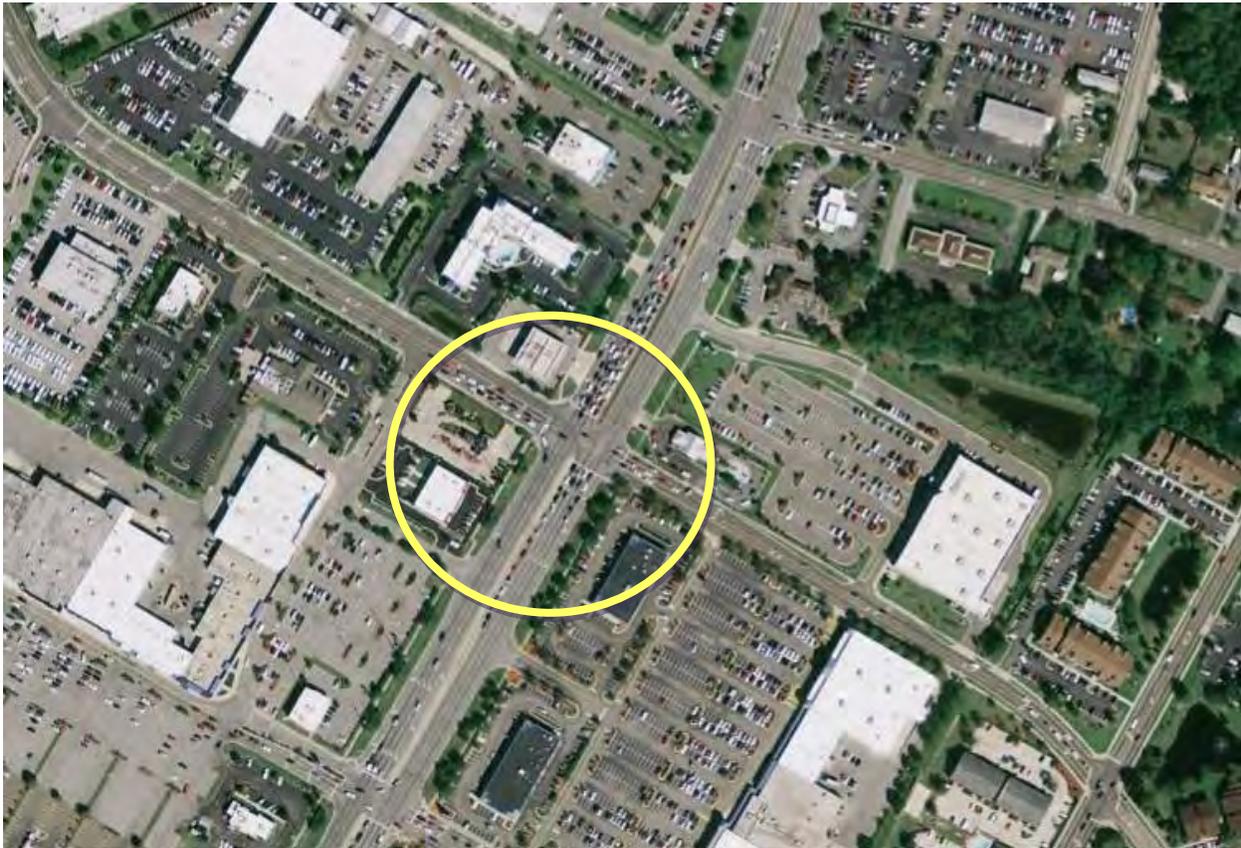


Figure 86 South College Road and New Centre Drive Context

Intersection Description

South College Road (US Highway 117 & NC 132) connects Interstate 40 to UNCW and Pleasure Island. New Centre Drive carries local traffic from Racine Drive to North Kerr Avenue. Both roads carry significant amounts of motor vehicle traffic. Eastbound New Centre Drive has a dedicated left-turn lane, one through-lane and a dedicated right-turn lane. There is no median. Westbound New Centre Drive has a dedicated left-turn lane, one through-lane and a shared

through and right-turn lane. There is no median. At the intersection, southbound South College Road has a narrow concrete median, one left-turn lane, three through-lanes, and a dedicated right-turn lane. Northbound South College Road has narrow concrete median, dual left-turn lanes (recent NCDOT addition), three through-lanes, and a dedicated right-turn lane.

Although there are sidewalks at all four corners of the intersection, there are no crosswalks or pedestrian signals.

Intersection Observations

The intersection violates the traffic engineering principal of providing balanced lanes on the approach and departure to minimize confusion for motorists. Eliminating the lane imbalance created an opportunity to recapture space and shorten pedestrian crossings.

The intersection has consistent pedestrian demand which is not accommodated. This may leave pedestrians guessing if they have time to cross; and may encourage pedestrians to cross at



Figure 87 – New Centre Drive and South College Road

locations where they are not as visible to oncoming traffic. Pedestrians crossing must rely on watching the traffic signal to determine when they might have time to cross. Figure 87 shows a pedestrian crossing away from the intersection on New Centre Drive and along the stop line to cross South College Road

Recommendations

(Note: See Appendix for full graphic and memorandum describing proposed recommendations)

The following concept plan illustrates the proposed recommendations for improvements to this intersection. Highlights of the physical improvements include:

- Install high-visibility crosswalks on all four legs of intersection (note: this will require relocating the stop bar and vehicle detection loops in the pavement)
- Install curb extensions and tighten curb radii to reduce the size of the intersection, length of pedestrian crossings, and to provide refuge for waiting pedestrians and cyclists.
- Install median pedestrian refuge on each approach with a preference for a minimum six-foot width median. Install dual medians on northbound South College Road to provide

slower moving pedestrians with a landing spot in case they cannot complete the crossing in one cycle.

- Narrow all travel lanes to 11 feet to create necessary space to construct refuge islands.
- Narrow driveway openings to reduce pedestrian crossing distances.
- Install pedestrian countdown signals and activation equipment for all crosswalks
- Reduce right turn radius on northeast and southwest corners of intersection to induce yielding behavior into motorists and to slow them on the approach to the crosswalks.
- Install sidewalk leading to intersection on all approaches and provide sidewalk connections to adjacent developments.

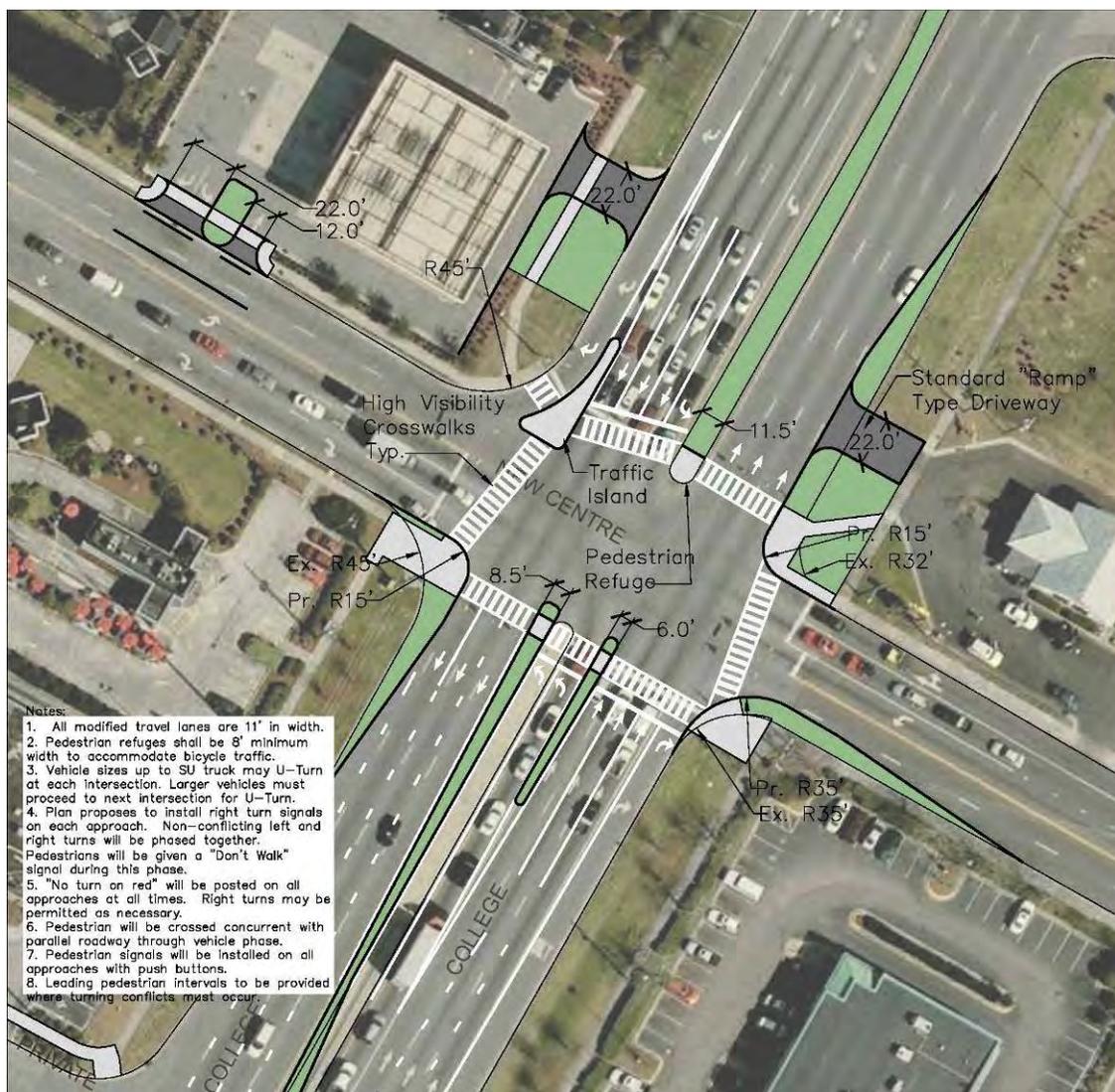


Figure 88 – Conceptual redesign of intersection to shorten crossing distances and recapture unnecessary roadway space to provide pedestrian accommodations.

Chapter 7. Education, Encouragement and Enforcement

PLANNING OUTSIDE OF DESIGN

To create a successful walkable environment it is necessary to venture beyond design solutions. Several other factors must be considered. People need to understand the rules for travel, they need to feel welcome and valued as a pedestrian, and they need to be aware of the consequences of breaking the rules. Users' behavior can be influenced by design, but ultimately they need to be taught and encouraged to navigate their environment safely and effectively. This chapter describes several programs and strategies that complement policy changes or physical improvements described elsewhere in this plan.

7.1. EDUCATION

Everyone at some point is a pedestrian. For some people this is only when they are leaving their cars in the parking lot and walking towards their destinations. Regardless of the distance that people regularly walk, many are not aware of their rights and responsibilities as pedestrians. Therefore, it is important to inform both drivers and pedestrians. Studies have shown that the most successful education programs focus on teaching children, who then encourage their parents to set a proper example and follow the rules¹³. Educating children is an effective strategy for multiple reasons. The first is that children are less likely to develop bad habits if they are taught proper and safe pedestrian behavior early on. Additionally, by teaching children it is possible influence their parents to set proper examples. Parents generally will behave more cautiously when they know that their children are observing. Another reason to target younger audiences is language barriers connecting to households with adults who do not speak English. These adults are less likely to learn from television campaigns, radio commercials or written media. Adults who do not speak English also may not participate in community meetings unless there is a translator, which for many communities is difficult to provide. To achieve a wider reach, children should be considered a valuable resource.

7.1.1 *Safe Routes to School*

Recognizing that there was a need to provide safe routes for children to walk to school, the U.S. Department of Transportation Federal Highway Administration established the National Center of Safe Routes to School in the summer of 2005 (<http://www.ncdot.org/transit/bicycle/saferoutes/SafeRoutes.html>).

¹³ [GET CITATION]

The National Center for Safe Routes to Schools, maintained by the University of North Carolina Highway Safety Research Center, offers resources to help communities get both the funding and the educational materials necessary to ensure safe routes for the students to walk to school.

Wilmington recognizes the potential of this program and has already undertaken several projects on behalf of this program. These are described in more detail in Chapter 3, The Pedestrian Transportation System.

Local Success: In 2008, Bradley Creek Elementary was awarded a \$211,000 grant for sidewalk improvements and pedestrian educational and encouragement programs.

The Safe Routes to School Program promotes consensus planning by encouraging all stakeholders to participate in the process from the beginning. Parents, neighbors, teachers, police officers and even policy makers are invited to discuss the barriers and challenges children face when walking to school. Although engineering projects such as extending sidewalks and striping crosswalks tend to get the most visible attention, a During kick-off meetings, the stakeholders are guided by Safe Routes to School Instructors on a walk to assess the existing walking conditions that students would face if they were to walk to school. During this walk parents, teachers and policy makers are instructed on how children would safely navigate their environment. It is important that both students and their adult role models follow the same rule sets to ensure safety for all.

Children also learn about pedestrian safety in class from their teachers and they reinforce those lessons at home with their parents. Parents are encouraged to practice these skills while conducting everyday activities such as during evening errands and on weekend excursions. Parents receive a refresher course and their children have the opportunity to practice with their parents and younger siblings.

7.1.2 National Highway Traffic Safety Administration (NHTSA) National Safety Curriculum

Until recently, pedestrian safety education was either the responsibility of states, schools or individual households. The National Highway Traffic Safety Administration (NHTSA) has recognized that this can lead to inconsistent or even nonexistent pedestrian safety education for children. In attempt to fix this problem, NHTSA is developing a curriculum that will be offered nationwide for all students in kindergarten through fifth grades. The curriculum, to be released in the 2010-2011 school year, will cover topics such as identifying safe places to walk, crossing streets safely, crossing intersections and driveways safely as well as bus safety skills. The curriculum includes lesson plans, skill-based activities as well as homework activities to be practiced with the parents. Essentially the teachers will have all the resources necessary to

incorporate the safety skills and lessons into their syllabi. Students across the country will have more opportunities to learn everyday skills.

Just as with the Safe Routes to School Program and the pedestrian safety curriculum, students can influence their parents to model safe behavior. When this curriculum is made available it is recommended that Wilmington's schools take advantage of the resources and teach the course to their students.

7.1.3 Collaboration with the Media

The local media can play a significant role in communicating with the public. The Wilmington Star News has demonstrated a commitment to covering the topic of pedestrian safety through regular articles on the subject. The City could capitalize on this opportunity by developing a series of educational pieces that address both safe driving and safe walking behaviors. These pieces could also cover the rules applicable to all users of public roadways.

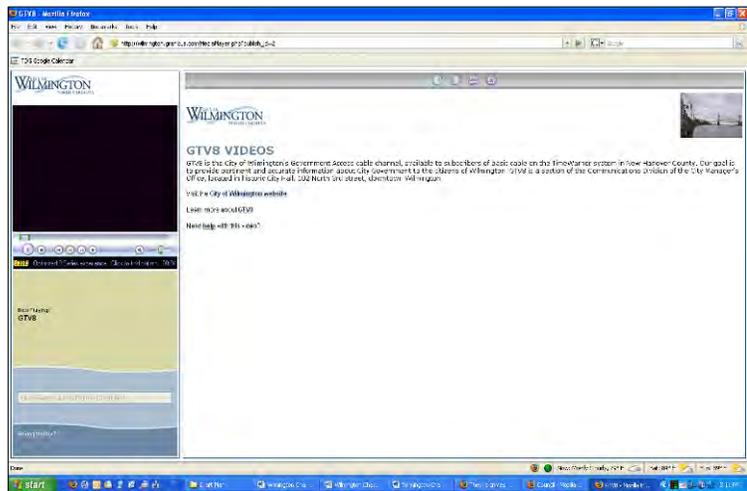


Figure 89 GTV8 Video Streaming Website

http://wilmington.granicus.com/MediaPlayer.php?publish_id=2

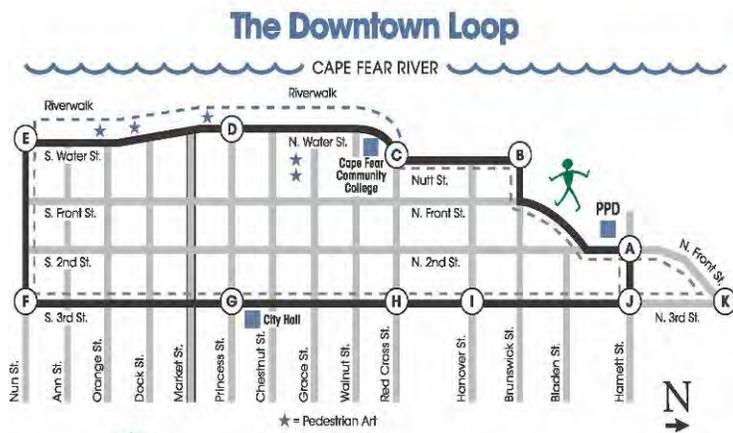
The city's cable access television station, GTV8, could be an excellent format for providing instruction on appropriate walking and driving behaviors. GTV8 is available both over the cable network as well as through streaming online content that can be viewed on personal computers. The city could develop an educational series that is targeted at certain audiences such as children, seniors, or non-English speakers.

7.2. ENCOURAGEMENT

Encouragement is not simply casting pedestrian travel in a positive light. Encouragement promotes awareness about walking as a form of transportation showing that it is not only achievable but also enjoyable.

7.2.1 Wilmington Walks

This program provides exercise and walking information for various neighborhoods throughout the City of Wilmington. Elements include brochures, signs, course markers and maps (see example) to establish walking paths and programs throughout the community.



The *Downtown Loop* is a mapped route in downtown Wilmington that takes walkers through some of the most scenic parts of the city, including the historic downtown and the Riverwalk. The *Forest Hills Loop* is another heavily utilized route in central Wilmington that incorporates parts of the River to the Sea Bikeway and local sidewalks and paths. Due to the popularity of this initiative, citizens have requested assistance through the Wilmington Walks program with developing local loop trail networks in several parts of the city. More information about the program may be found online at: http://www.wilmingtonnc.gov/Portals/0/parksrec/wilm_walks.pdf.

7.2.2 International Walk to School Day

The National Center for Safe Routes to School organizes a one-time event for schools to encourage walking to school.¹⁴ For one day (or week or month depending on the school), students walk to school with the encouragement and assistance of their school. The goal is for students and parents to see how fun and easy



Figure 91 Walk to School Day Parade- Holly Tree Elementary. Source: Joshua Mello, WMPO

¹⁴ <http://www.walktoschool.org/index.cfm>

walking to school can be. Parents can appreciate the healthy benefits of walk such as creating an outlet for exercise and a way to reduce car emissions, and the students gain a sense of independence.

To participate, schools from around the world register with the National Center for Safe Routes to School (free of charge) and receive access to resources to help facilitate their event. With the help of the resources, the schools get creative and make the event their own. Some schools station teachers at checkpoints to cheer on the walking students. Other schools that do not have safe routes for walking will instead walk around the track at the school. For many schools, the event stirs up awareness and appreciation for safe routes for walking.

This even helps the community to understand how to navigate the environment as a pedestrian. People may only be thinking about how to get children to and from school safely, but in doing so they are also evaluating the pedestrian transportation system throughout the community as a whole. This line of thinking makes for safer pedestrians and safer drivers.

Starting in 2001, eight counties (with a total of 23 schools) in North Carolina participated in the International Walk to School Day. Bradley Creek and Holly Tree elementary schools participated in 2008. And enthusiasm for the program is growing statewide. It is recommended that all of Wilmington's elementary schools participate in this event.

7.2.3 Walking/Running Clubs

Walking and/or running clubs are community organized groups that regularly walk or jog throughout the community. They can have basic purposes for social and exercise outlets. Alternatively, they can have more complex intentions of surveying existing conditions to be alerted to the maintenance agencies, neighborhood surveillance.

These clubs are helpful for the pedestrian transportation network for several reasons. Even if conditions are not ideal for walking, it is often safer to walk in a group. These groups can get people walking before recommendations from plans are implemented. These groups also make new and untried routes familiar quickly. People can test walking routes with groups that they can later choose to take on their own. Walking in groups also makes the pedestrians more visible to drivers. The more often drivers see groups of people walking the more likely it is that the drivers will anticipate pedestrians along the road in the future. Groups of pedestrians create a stronger presence than individuals alone. These groups can help maintenance and policing agencies by adding eyes on the route. The clubs do not necessarily need to participate in the maintenance and policing duties, but if they identify and report problematic conditions on the route that can be helpful for the agencies that are responsible for those duties.

7.3. ENFORCEMENT

Enforcement programs can be challenging. To be effective, the program should focus on awareness and education, rather than punishment. If people start to vilify the enforcer, the program may actually result in an increase of the undesired activity. Many drivers, pedestrians and even enforcement officials are simply unaware of the actual laws related to pedestrians and bicyclists. NCDOT has several resources that describe the rights and responsibilities of both drivers and pedestrians, including *NCDOT's A Guide to NC Bicycle and Pedestrian Laws* (<http://ncdot.org/transit/bicycle/laws/resources/BikePedLawsGuidebook-Full.pdf>).

Additional information is available online at:
http://ncdot.org/transit/bicycle/laws/laws_pedlaws.html.

It is important to treat all parties fairly and consistently. In the context of this plan, it is important to address both vehicular and pedestrian offenders. There must be consequences for all infractions. Consequences should include warnings with short explanations and then a gradual increase in penalization. Also, the entire jurisdiction must buy-in to the enforcement program. Enforcers should not enforce differing rule sets in different parts of the city, as this can result in a “zone” mentality where people won’t exercise the same consideration citywide. Following the institution of increased penalties, progressive ticketing is recommended as it increases contact between motorists, pedestrians and police.

1. **Educating** — Establish community awareness of the problem. The public needs to understand that drivers are speeding and the consequences of this speeding on pedestrian safety. Raising awareness about the problem will change some behaviors and create public support for the enforcement efforts to follow.
2. **Warning** — Announce what action will be taken and why. Give the public time to change behaviors before ticketing starts. Fliers, signs, newspaper stories and official warnings from officers can all serve as reminders.
3. **Ticketing**—Finally, after the warning time expires, hold a press conference announcing when and where the police operations will occur. If offenders continue their unsafe behaviors, officers issue tickets.

Source: Pedestrian and Bicycle Information Center. www.walkinginfo.org

Another important aspect of a successful enforcement program is to recognize the nature of the problem. If the majority of users practice unsafe behavior, there may be an issue with the physical design. Subsequently, it would be ineffective and costly to permanently station an

officer at the site and issue citations. When the vast majority of users are breaking the law, it may be necessary to change the physical environment first.

It should be noted that enforcement alone does not usually achieve long-term effects. Enforcement needs to be partnered with strong education and encouragement efforts as well as physical improvements where necessary.

Cities throughout the country often require offenders (both drivers and pedestrians) to take a course on specific laws that relate to pedestrian and vehicular safety. It is beneficial for students to learn from people directly involved with enforcement process. Instructors of the course can include emergency trauma and medical staff, police officers, transportation advocates and even judges. In some communities the citation is removed after the offender take this course. It would be advantageous to create a publicly accessible citywide policy that explains when offenders have the option or are required to enroll in the course. This should be made available in English as well as Spanish.

7.3.1 Police Reporting of Pedestrian Crashes

The Institute for Transportation Research and Education (ITRE) is currently developing a curriculum for police officers around the state that will promote awareness and understanding of pedestrian and bicycle laws. The curriculum is scheduled to be available soon, and trainings will be conducted around the state. The city should take advantage of this program to enhance the capacity of their police force in dealing with pedestrian safety and regulation. For more information, contact Mary Meletiou, Bicycle and Pedestrian Program Manager for ITRE.

7.3.2 Pedestrian Safety Awareness Campaign

An example of an enforcement/education campaign is The Metropolitan Washington Council of Governments' (MWCOC) *Street Smart Campaign* which was launched in 2002. Wilmington initiated a similar campaign in January of 2009. The safety and education components consist of safety pamphlets and advertisements on radio, television, buses, and bus shelters in both English and Spanish. Different messages are directed at drivers, pedestrians, and bicyclists. Drivers are reminded to be aware of, and considerate to, the rights of pedestrians and bicyclists. One way that this was conveyed was during an evening demonstration where officers showcased the lengthy distances required for vehicles to come to a halt at different speeds. This illustrates that higher speeds are more lethal for pedestrians, and that drivers may not fully grasp how much time is actually necessary to stop when driving at fast speeds. Studies have proven that higher speed crashes are more lethal for pedestrians.

Pedestrians and bicyclists are reminded of traffic regulations and safety tips. This campaign has been coupled with pedestrian stings where a plain-clothes enforcement officer is sent into a crosswalk and drivers are monitored for compliance with the law to yield to pedestrians in a crosswalk.¹⁵

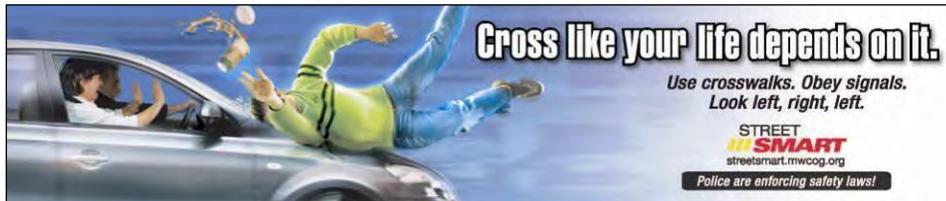


Figure 92 MWCOG launched *Street Smart*, a Pedestrian Enforcement/Education campaign, to improve the safety of all users. The image was advertised on Metrobus exteriors to increase pedestrian's awareness of their responsibilities.

There is no single approach to improving pedestrian safety. It is important to assess the problem, and identify the correct palette of tools that adequately address the nature of the problem and result in sustainable solutions.

7.4. INTERAGENCY COORDINATION

7.4.1 Coordination with NCDOT

Effective coordination with NCDOT is essential for implementing the *Walk Wilmington: A Comprehensive Pedestrian Plan* and developing a more multi-modal transportation system in Wilmington. A number of issues were identified related to the review of state roadway projects that hinder pedestrian travel in Wilmington. The following recommendations were developed to ensure that pedestrians and bicyclists are routinely accommodated in all roadway projects.

Issue

NCDOT designs for non-freeway roadway projects may not include sidewalks or other pedestrian accommodations. For each proposed project, Wilmington staff must present a defensible case to NCDOT staff to include sidewalks or other pedestrian accommodations.

Recommendation

NCDOT's existing policies state that *"bicycling and walking shall be a routine part of the NCDOT's planning, design, construction, and operations activities..."* NCDOT should ensure that all road design projects include accommodations for pedestrians as stated in their policy.

¹⁵ Rivara, F. P., Booth, C. L., Bergman, A. B., Rogers, L. W. & Weiss, J. Prevention of pedestrian injuries to children: effectiveness of a school training program. *Pediatrics* 88, 770-775 (1991)

NCDOT staff involved in planning, design or implementation of state road projects should promote NCDOT's multi-modal policies and ensure integration of pedestrian facilities.

Recommendation

NCDOT should establish a staff person within each division to coordinate with the City of Wilmington and other municipalities and address the multi-modal needs of each project. While the central NCDOT Division of Bicycle and Pedestrian Transportation (in Raleigh) currently serves in this capacity, a regional contact would benefit all cities and towns.

Recommendation

NCDOT Project Development Environmental Analysis and Roadway Design staff should submit notifications of scoping or design plans for roadway projects to the WMPO coordinator and the NCDOT Division of Bicycle & Pedestrian Transportation with sufficient notice to allow for meaningful input on the design. This will make sure that WMPO staff can effectively participate in the design process and will ensure that opportunities to include pedestrian facilities are not missed.

Issue

NCDOT often resists funding pedestrian improvements on state roadways.

Recommendation

As NCDOT's policy is to routinely accommodate pedestrian travel on state roadways, therefore NCDOT should fund these improvements in urbanized areas.

Recommendation

The City of Wilmington and the WMPO should adopt a policy requesting NCDOT to build pedestrian and bicycle facilities on all state roads within the urbanized area.

7.4.2 Coordination with WAVE Transit (Cape Fear Public Transportation Authority)

Every time a person travels to or from a WAVE Transit bus stop, they are likely traveling as a pedestrian. Therefore, the pathways leading to the stop should be sufficient to allow people to travel with safety and comfort. This is especially important for travelers with disabilities or those traveling with small children. With over 125,000 passengers each month¹⁶, it is important for the Wilmington and WAVE Transit to coordinate regularly on bus stop siting decisions and access improvements. WAVE Transit recently completed a complete overhaul of many of the systems bus routes. One of the criteria used in the decision making process was the safety of

¹⁶ Crossroads: WAVE Transit Official Defends Bus Service, Wilmington Star News Online, accessed: <http://crossroads.starnewsonline.com/default.asp?item=2338981>, April 2' 2009.

pedestrians traveling to and from the stop. Nevertheless, some bus stops are still located in locations that are not served by facilities such as sidewalks and improved street crossings.

A comprehensive inventory and assessment of transit system bus stops was not conducted during the development of this pedestrian plan, although a small number of stops were looked at during the field work portion of the project. It is recommended that Wilmington collaborate with WAVE Transit to assess the condition of bus stops and pathways leading to the stops. Montgomery County, Maryland conducted a similar project in partnership with the county's RideON transit service that identified needed bus stop improvements. The county then developed a 5-year capital improvements plan for retrofitting bus stops.

Chapter 8. Implementation and Funding

IMPLEMENTATION

The *Walk Wilmington: Comprehensive Pedestrian Plan* establishes the city’s goals and objectives for walkability, and presents recommendations and guidelines for improving pedestrian facilities throughout the Port City. This chapter includes a series of action items and recommended coordination to help the city prioritize next steps and implement the recommendations in the plan.

RECOMMENDATIONS

The recommendations in the table below are intended to complement recommendations found elsewhere in this plan. Generally, they represent implementation guidance for the concepts discussed in Chapter 4, Policies, Codes and Ordinances and Chapter 6, Pedestrian Transportation System.

Table 14 Zone Recommendations	
Zone	RECOMMENDATIONS
Central Business District Zone	
Arterial roadways	<ul style="list-style-type: none"> Reduce speed limit to 25mph, except on limited access roads. Install recommended sidewalks along all roadways (see Chapter 6). Install recommended pedestrian signals (see Chapter 6). Pedestrian signals in the CBD should be concurrent with leading pedestrian intervals. Install high visibility crosswalks on all legs of intersections Install pedestrian signage at all crossings to alert motorists of pedestrians Install pedestrian oriented wayfinding signage per other Wilmington plans
Non-arterial roadways	<ul style="list-style-type: none"> Reduce speed limit to 25 mph, except on limited access road Install recommended sidewalks along all roadways (see Chapter 6). Pedestrian signals in the CBD should be concurrent with leading pedestrian intervals. Pilot scramble phase pedestrian signal. Install pedestrian oriented wayfinding signage per other Wilmington plans
Urban Core Zone	
Arterial roadways	<ul style="list-style-type: none"> Reduce speed limit to 25 mph except on limited access roads Implement Dawson and Wooster plan Install recommended sidewalks along all roadways (see Chapter 6). Install recommended pedestrian signals (see see Chapter 6). Install button actuated pedestrian signals at all signalized intersections. Pilot hybrid pedestrian signal (consider Wooster Street) Use leading pedestrian intervals at intersections with significant turning volumes Pedestrian signals should be on all legs of an intersection Install pedestrian oriented wayfinding per other Wilmington plans
Non-arterial roadways	<ul style="list-style-type: none"> Reduce speed limit to 25 mph except on limited access roads Install standard crosswalks at all signalized intersections Install pedestrian signals at all signalized intersections

Table 14 Zone Recommendations	
Zone	RECOMMENDATIONS
<i>Traditional Suburban Zone</i>	
Arterial roadways	<p>Reduce speed limit to 35 mph, except on limited access roads.</p> <p>Install recommended sidewalks along all roadways (see Chapter 6).</p> <p>Install recommended pedestrian signals (see Chapter 6).</p> <p>Install push button activated pedestrian signals at all signalized intersections</p> <p>Use leading pedestrian intervals at intersections with significant turning volumes</p> <p>Install high visibility crosswalks on all legs at signalized intersections</p> <p>Install pedestrian signage at all crossings to alert motorists of pedestrians</p> <p>Install median refuge islands at all signalized intersections with pavement widths of over 60 feet</p> <p>Consider installing signalized (using hybrid signals, rapid flash beacons or HAWK signals) mid block crossings with refuge islands at key locations (e.g. intersections with River to the Sea Bikeway or Cross-City Trail) or road segments with long distances (over ¼ mile between intersections)</p> <p>Implement access management and new driveway design standards</p>
Non-arterial roadways	<p>Reduce speed limit to 35 mph along all urban collectors and 25 mph along all local streets and neighborhood collectors.</p> <p>Install recommended sidewalks along all roadways (see Chapter 6).</p> <p>Install recommended pedestrian signals (see Chapter 6).</p> <p>Continue to implement the neighborhood traffic calming program throughout the city.</p> <p>Consider installing unsignalized mid block crossings with refuge islands at key locations (e.g. intersections with River to the Sea Bikeway or Cross-City Trail) or road segments with long distances (over ¼-mile between intersections).</p> <p>Identify opportunities to improve pedestrian connectivity through adjoining cul de sacs, dead end streets and other areas.</p>
<i>Automobile- Oriented Suburban Zone</i>	
Arterial roadways	<p>Reduce speed limit to 45 mph, except on limited access roads.</p> <p>Install recommended sidewalks along all roadways (see Chapter 6).</p> <p>Install recommended pedestrian signals (see Chapter 6).</p> <p>Install push button activated pedestrian signals at all signalized intersections (consider using concurrent phase at South College Road and Randall Parkway).</p> <p>Use leading pedestrian intervals at intersections with significant turning volumes.</p> <p>Install high visibility crosswalks at all signalized intersections.</p> <p>Install pedestrian signage at all crossings to alert motorists of pedestrians.</p> <p>Install median refuge islands at all signalized intersections with pavement widths of over 60 feet.</p> <p>Consider installing signalized (using hybrid signals, rapid flash beacons or HAWK signals) mid block crossings with refuge islands at key locations (e.g. intersections with River to the Sea Bikeway or Cross-City Trail) or road segments with long distances (over ¼ mile between intersections).</p>
Non-arterial roadways	<p>Reduce speed limit to 35 mph along all urban collectors and 25 mph along all local streets and neighborhood collectors.</p> <p>Install recommended sidewalks along all roadways (see Chapter 6).</p> <p>Install recommended pedestrian signals (see Chapter 6).</p> <p>Continue to implement the neighborhood traffic calming program throughout the city.</p> <p>Consider installing unsignalized mid block crossings with refuge islands at key locations (e.g. intersections with River to the Sea Bikeway or Cross-City Trail) or road segments with long distances (over ¼ mile between intersections).</p> <p>Identify opportunities to improve pedestrian connectivity through adjoining cul de sacs, dead end streets and other areas.</p>

FUNDING

Many actions, such as facility construction, will require funding to implement. Other actions, such as improved interagency coordination, are more procedural in nature and will subsequently have minimal fiscal impact. This plan identifies potential sources, such as NCDOT funding programs, the city budget and municipal bonds. Developer contributions through a Pedestrian Benefit Zone or “fee-in-lieu” program (see Chapter 4, Policies, Codes and Ordinance) or improvements during construction are also possible funding sources.

Where city funds are used, public outreach participants indicated a preference for hotel taxes or municipal bonds (see Chapter 2, Vision and Plan Development). Hotel taxes are typically born by visitors and generally do not directly impact Wilmington residents. Municipal bonds are approved by voters through the referendum process, and there are precedents in the city for this funding strategy. An exhaustive list of funding sources for pedestrian and bicycle projects may be found in the Appendix.

RECOMMENDED ACTION ITEMS

The following action items are categorized into the goals presented in Chapter 2 of this plan, and indicate the agencies or divisions involved in carrying out each action. The first column describes the specific action. Column two indicates which goal(s) are supported by the specific action. The goals are:

- **Goal 1: Safety**
- **Goal 2: Transportation Choice**
- **Goal 3: Built Environment, Land Use, and Connectivity**
- **Goal 4: Education, Awareness and Enforcement**
- **Goal 5: Health**
- **Goal 6: Economic Development**

Column three provides the general timeframe for implementation. For certain actions, more than one timeframe may be indicated to reflect the fact that there may be a short-term action followed by ongoing or continuous activity. Column four identifies the parties with primary responsibility for implementing the specific action. Column five provides suggestions for funding sources for a particular action. Column six provides references to related sections in this plan or related Wilmington planning documents.

Recommended Action	Supports Goal?						Timeframe	Agency/Division	Funding	Plan Section Reference
	1	2	3	4	5	6				
1. Compile and analyze data related to pedestrian collisions throughout the City of Wilmington annually. Identify intersection and mid-block locations with higher incidence of pedestrian collisions; develop prioritized list of locations needing improvements.	X			X	X		Ongoing	Traffic Engineering, Police, Planning, NCDOT, WMPO	NCDOT Spot Safety & Hazard Mitigation Funds, SRTS, City Budget	
2. Identify countermeasures to reduce the number of pedestrian crashes	X			X	X		Develop policies within two years, review regularly	Traffic Engineering, Planning	City Budget, WMPO	Chapter 4 Policies, Codes and Ordinances, 0 Chapter 7 Education, Encouragement and Enforcement
3. Install recommended crosswalks and pedestrian signals.	X	X	X				Short-term (0-5 years) 90 signal improvements Mid-term (5-10 years) 47 signal improvements Long-term (10-20 years) 28 signal improvements	NCDOT, Traffic Engineering	NCDOT Spot Safety & Hazard Mitigation Funds, SRTS, City Budget, Pedestrian Benefit Zones	6.1.3 Signalized Intersection Recommendations
4. Install recommended sidewalks	X	X	X				Short-term (0-5 years) 26 miles Mid-term (5-10 years) 206 miles Long-term (10-20 years) 222 miles	NCDOT, Traffic Engineering, Planning, WMPO	Bonds, SRTS Funds, NCDOT Spot Safety & Hazard Mitigation, Construct with Development, Pedestrian Benefit Zones	6.1.1 Sidewalk Recommendations
5. Install recommended multi-use paths	X	X	X				Ongoing	NCDOT, Traffic Engineering, Planning, WMPO	Bonds, SRTS Funds, NCDOT Spot Safety & Hazard Mitigation, Construct with Development, Benefit Zones	6.1.2 Multi-Use Path Recommendations
6. Install median pedestrian refuges on all roads with pavements widths of greater than 60 feet	X	X	X				NCDOT Roads- ongoing coordination with NCDOT. City Roads- approximately two median improvements per year.	Engineering, Traffic Engineering, NCDOT	NCDOT Spot Safety & Hazard Mitigation Funds, Install w/ Road Improvement	4.3 Intersection and Roadway Design Policies 5.2 Design Standard Recommendations
7. Develop mid-block crossing installation guidelines	X	X					Within two years	Planning, Traffic Engineering		4.2 Street Crossing Policies
8. Reduce speed on Wilmington's arterial roadways	X		X	X	X		Within five years	NCDOT, Traffic Engineering, Planning, WMPO		4.4.7 Posted Speed Limit Reductions
9. Pilot test leading pedestrian interval signals	X	X					Within two years	Planning, Traffic Engineering		4.4.2Leading Pedestrian Interval Signal Timing
10. Pilot test pedestrian hybrid signals and rapid flash beacons	X	X					Within two years	NCDOT, Planning, Traffic Engineering	NCDOT Spot Safety & Hazard Mitigation Funds, SRTS, City Budget	4.4.5 Flashing Warning Beacons (Rapid Flash Beacons), 4.4.6 Pedestrian Hybrid Signals,
11. Train enforcement officers on pedestrian and bicyclist safety laws, schedule ITRE Training Program in Wilmington	X	X		X			Ongoing, conduct ITRE training when available	Police, ITRE, WMPO	City Budget, officer education grants if available	7.1 Education, 7.3 Enforcement
12. Implement pedestrian safety education and enforcement campaign to educate drivers and pedestrians about proper behaviors and improve compliance with pedestrian laws	X			X			Within two years, then ongoing	Planning, Police, WMPO, NHCS	City Budget, SRTS,	7.1 Education, 7.3 Enforcement
13. Increase annual budget for new sidewalks from \$150,000/year to at least \$300,000/year. (Currently, less than four percent of the city's streets and sidewalks capital projects budget is spent on new sidewalk construction).	X	X	X				Immediately	Mayor and Council; Engineering; Streets	City Budget; Municipal Bonds	4.1.5 Pedestrian Benefit Zones
14. Collaborate with NCDOT to meet both agencies goals of creating more walkable streets on NCDOT-maintained roadways (except freeways).	X	X	X				Ongoing	Planning; WMPO; Mayor and Council		7.4 Interagency Coordination Coordination with NCDOT
15. Work with NCDOT to ensure the provision of pedestrian accommodations on state-maintained roadways. The city will work with NCDOT to create context-sensitive streets that include transit, bicycle-	X	X	X				Ongoing	Planning; Streets; Engineering; NCDOT; WMPO		Chapter 4 Policies, Codes and Ordinances, 0 7.4 Interagency Coordination Coordination with NCDOT

and pedestrian-friendly design features as part of NCDOT street design and construction process.												
16. Construct approximately two miles of sidewalk per year as recommended in Chapter 6.	X	X	X			X	Ongoing	Planning; Streets; Engineering; NCDOT; private developers	NCDOT Spot Safety & Hazard Mitigation Funds, SRTS, City Budget, Bonds	6.1.1 Sidewalk Recommendations		
17. Continue to improve and expand the Cross-City Trail, River to the Sea Bikeway and the East Coast Greenway, which includes the Riverwalk.	X	X				X	Ongoing	Planning; Streets; Engineering; NCDOT; WMPO	City Budget, Transportation Enhancements Grants Bonds, SRTS	6.1.2 Multi-Use Path Recommendations		
18. Coordinate with WAVE Transit to identify bus stops that need sidewalks and crosswalks. Develop plan for prioritizing installation of these improvements.	X	X			X	X	Within two years	Planning; WAVE Transit; Streets		7.4.2 Coordination with WAVE Transit (Cape Fear Public Transportation Authority) Wave		
19. Coordinate with WAVE Transit to develop design guidelines for the location of bus stops to improve pedestrian safety and accessibility	X	X			X	X	Within two years	Planning; WAVE Transit; Engineering		7.4.2 Coordination with WAVE Transit (Cape Fear Public Transportation Authority)		
20. Identify barriers to walking for citizens, particularly those with mobility limitations or special needs	X	X			X		Ongoing	Planning		Accessibility in Chapter 3		
21. Coordinate with the New Hanover County School system in an effort to locate more schools where students can walk or bicycle to school sites Design school facilities to allow convenient pedestrian access from adjacent neighborhoods (existing or planned).	X	X	X				Ongoing	NHCS, Planning,	NCDOT Spot Safety & Hazard Mitigation Funds, SRTS, City Budget, Bonds			
22. Update existing policies, codes and ordinances	X	X	X		X	X	Within two years	Planning		Chapter 4 Policies, Codes and Ordinances,		
23. Protect existing street connections and platted non-existing streets, and consider restoring appropriate street, bicycle and pedestrian connections that were previously severed.	X	X	X				Within ten years, ongoing protection	Planning; private developers; Engineering; Streets		4.3.5 Pedestrian and Bicyclist Cut-Throughs on Cul-de-Sacs and Adjoining Streets, 6.1.4 Bicycle and Pedestrian Cut-Through		
24. Require direct on-site pedestrian connections between new development, transit stops, and existing or planned sidewalks.		X	X				Within two years	Planning; private developers; WAVE Transit		4.1.2 Requirements for Sidewalks		
25. Develop lighting design guidelines and standards	X	X	X			X	Within two years	Planning		4.5.7 Lighting		
26. Review future land use plan to ensure that proposed development patterns support and promote pedestrian mobility			X				Within four years	Planning		4.1 Development Regulations		
27. Require new development to construct sidewalks throughout the site and connect to neighboring pedestrian systems to achieve connectivity between development sites and neighborhoods.			X			X	Within two years	Planning; private developers		4.1 Development Regulations		
28. Develop pedestrian education campaign to improve pedestrian behavior and safety	X			X			Ongoing	Planning; Information Technology; Communications Office; Police; Community Services		7.1 Education, 7.2 Encouragement		
29. Develop driver education campaign to improve driver behavior and respect for pedestrians	X			X			Ongoing	Police; NCDOT Division of Motor Vehicles		7.1 Education, 7.3 Enforcement		
30. Coordinate with and support local agencies and organizations working to increase the daily physical activity of Wilmington citizens.				X	X	X	Ongoing	Parks, Recreation & Downtown; WMPO Bicycle and Pedestrian Committee; local non-profit and advocacy organizations	Safe Routes to Schools, New Hanover County Medical Center, UNCW, public-private partnerships	7.2 Encouragement		
31. Continue to support "Walk Wilmington" program to promote community walking				X	X	X	Ongoing	Parks, Recreation & Downtown		7.2 Encouragement		
32. Work with Wilmington Downtown Inc. to prioritize streetscape improvement projects		X	X	X		X	Ongoing	Parks, Recreation & Downtown; Downtown Wilmington, Inc; City Manager's Office				
33. Implement wayfinding plan for the historic downtown		X		X		X	Within two years	Parks, Recreation & Downtown; Planning		Cape Fear Historic Byway Plan		

Walk Wilmington - A COMPREHENSIVE PEDESTRIAN PLAN APPENDIX



prepared by:

TooleDesignGroup

Appendix

PLANNING CONTEXT

Wilmington's commitment to pedestrian planning is demonstrated in the city's comprehensive plan, *Choices: The City of Wilmington Future Land Use Plan 2004-2025*. Many of the priorities identified in the *Choices* plan are formalized in the adoption of the *Wilmington Urban Area Metropolitan Planning Organization 2005-2030 Long-Range Transportation Plan*. The decision to draft this pedestrian plan is a direct result of the goals and priorities originally identified by the community when the future land use plan was developed. This section highlights key pedestrian related components of the following plans:

- *Choices: The City of Wilmington Future Land Use Plan Cape Fear Historic Byway*
- *WMPO 2005-2030 Long Range Transportation Plan*
- *Wilmington Vision 2020: A Downtown Waterfront Plan*
- *Cape Fear Historic Byway Corridor Management Plan*
- *Dawson and Wooster Corridor Plan*
- *US 17 Business (Market Street) Corridor Study 2007*
- *Joint Safe Routes to School Workshop*
- *Market Street Corridor Study 2009*

Choices: The City of Wilmington Future Land Use Plan 2004-2025

There are several specific strategies identified in the city's comprehensive plan that relate to improving the pedestrian environment. These are identified below:

Infill

Strategy 1.2.3

Encourage mixed used development as an alternate to the typical development pattern in the city characterized by unconnected, uncoordinated, commercial development along thoroughfares and isolated limited access residential developments. In addition to a mixture of compatible uses, this type of development should provide amenities and walkways to increase pedestrian activity, decrease a reliance on individual vehicles, and foster transit usage. All structures should be fully integrated into the mixed use development through common themes (including, but not limited to lighting, benches, landscaping, and other decorative features but not necessarily building design), integration with a variety of uses, non-linear arrangement, common spaces, pedestrian walkways, vehicular access connections and other features.

Environmental Resources

Strategy 1.2.1

Promote compact development and infill that minimizes vehicle trips and vehicle miles traveled with a mix of integrated community uses (e.g., housing, shops, workplaces, schools, parks, and civic facilities) within walking or bicycling distance.

Strategy 1.2.2

Encourage development patterns and neighborhood street designs that are conducive to pedestrian and bicycle use (e.g., narrower streets with bike paths).

Neighborhoods

Strategy 1.2.1

Implement Neighborhood Traffic Studies throughout the city to identify each neighborhood's specific traffic, parking, and pedestrian problems. The study may be a part of the residential area planning process.

Public Spaces

Strategy 1.2.5

Evaluate options for creating a pedestrian mall integrated with the Riverwalk and associated public space along a section of North Water Street.

Transportation

Strategy 1.2.1

Improve safety by limiting the number of conflict points along all major roadways. Non-traversable medians, driveway restrictions, internal development cross-access, and other techniques that minimize the number of potential collision points on higher-volume public roadways increases safety and reduces vehicle delay. Limiting the number and type of conflict points between vehicles, and between vehicles and pedestrians, or bicyclists also creates a less complex driving environment and reduces the occurrence of driver error.

Strategy 1.3.2

Include pedestrian and bicycle accommodations as an integral element of all transportation-related capital projects and programs when feasible. It should be noted that not all streets should have sidewalks, multi-use paths, or bicycle lanes. Given limited funding, factors such as connectivity, safety, environmental issues, and cost will be a consideration in evaluating the feasibility of constructing a pedestrian or bicycle facility.

Level of Service

Strategy 1.1.2

Acceptable Level of Service for sidewalks shall be defined as sidewalks located within a one-quarter mile walking distance from all elementary and middle schools and from all major medical facilities.

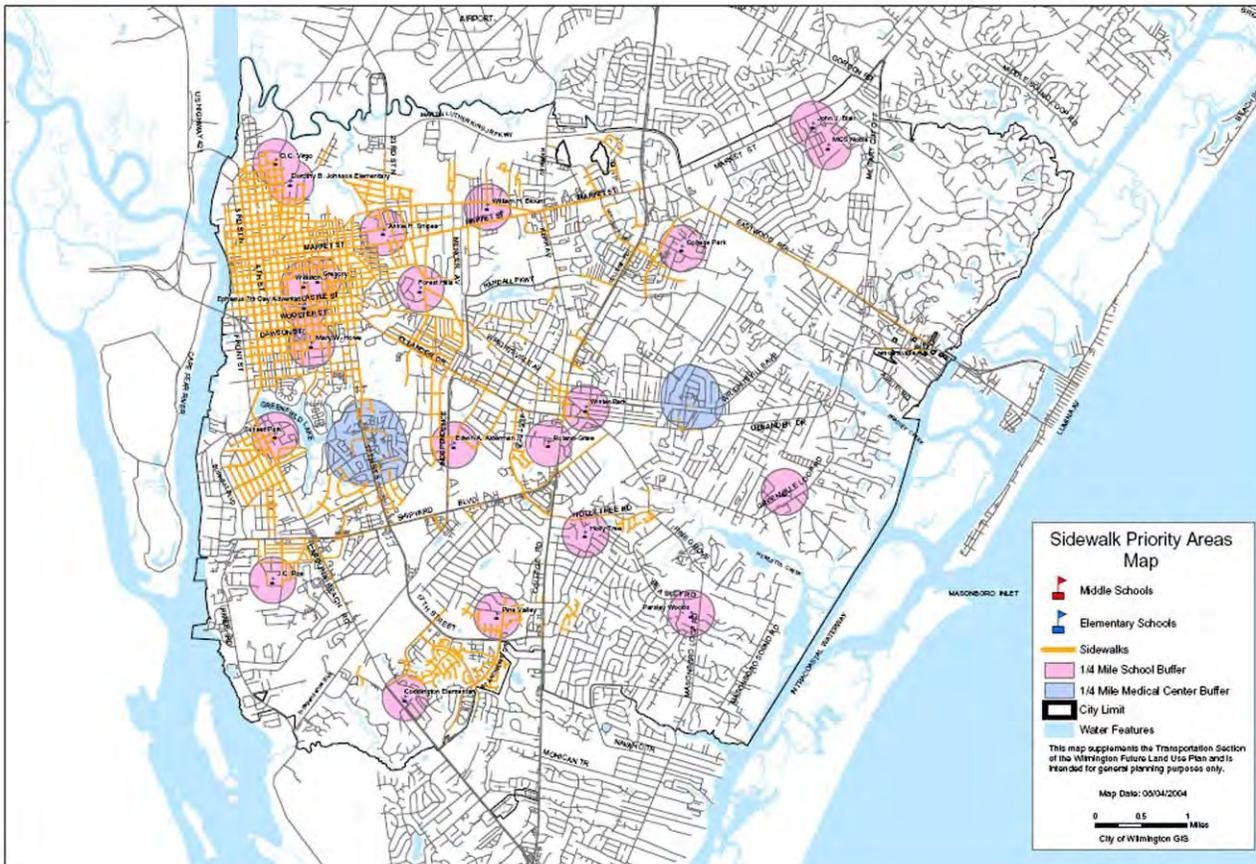


Figure 1: Sidewalk Priority Areas Map from *Choices: The City of Wilmington Future Land Use Plan*

The City of Wilmington Future Land Use Plan 2005 Progress Report relates a relevant finding drawn from public outreach conducted as part of the report development- “Although the City has developed to support cars as a main mode of transportation, **there is a poor network of sidewalks for pedestrians**, particularly in the recently annexed areas.”

WMPO 2005-2030 Long Range Transportation Plan (LRTP)

The LRTP provides a foundation for all future transportation planning efforts, including pedestrian and bicycle facilities. This pedestrian plan aims to further develop and implement the pedestrian-oriented vision and goals established by the pedestrian element of the LRTP.

*Wilmington Urban Area Metropolitan Planning Organization
2005-2030 Long-Range Transportation Plan*

The emphasis on pedestrian accommodation is clear from the vision statement of the *Wilmington Urban Area Metropolitan Planning Organization: 2005-2030 Long-Range Transportation Plan (LRTP)*:

*“To develop and maintain a safe place to live, work, raise a family and retire. The region will be known for its historic character and culture, a vibrant metropolitan urban area that promotes its water fronts, protects its environmental assets, recognizes the importance of its many neighborhoods, provides convenient travel choices for access to amenities throughout the Wilmington Metropolitan Area including well-integrated, connected public transportation, **pedestrian**, and **bicycle** networks and freight movement.”*

Chapter 5: *The Regional Pedestrian System* element of the LRTP is dedicated to pedestrian transportation facilities. The chapter clearly explains the benefits of walking, and why future policies and plans should prioritize improvements to the pedestrian environment. Among the benefits, the chapter lists improvements in public transit, alleviation of traffic congestion, public cost saving, improvement in air quality, improvement in public health and energy efficiency.

The LRTP also identifies corridors and mixed-use transit oriented centers that should be retrofitted to better accommodate pedestrians. They include:

- Independence Boulevard
- Oleander Drive
- North and South Kerr Avenue

Wilmington Vision 2020: A Downtown Waterfront Plan

Vision 2020 seeks to strengthen and enhance the connections between downtown Wilmington and its historic waterfront. Currently, surface parking lots, a parking garage, a large hotel and other uses separate the restaurants, stores and clubs along Front Street from the Cape Fear River waterfront. Although there is the Riverwalk along the water, it is not as heavily used as it could be if the pathways to the waterfront were improved. *Vision 2020* contains a number of specific strategies and actions for improving these connections.

Strategy 1.1.1: Provide an interconnected street and circulation system to support a mix of alternative modes of transportation and provide alternative routes for bicyclists, pedestrians, and drivers. Since well-planned communities provide a supporting network of local and collector streets to accommodate development, as well as unified property access, and circulation systems, all new development and redevelopment approvals should support this strategy.

Strategy 1.1.5: Support and help implement policies of the Wilmington Urban Area Transportation Plan

Strategy 1.3.1: Protect pedestrian safety and provide mobility, particularly in high-pedestrian use areas such as schools, residential neighborhoods, parks, medical centers, and other activity centers by constructing sidewalks or multi-use paths. Sidewalk priority investment areas should focus on locations identified in the Sidewalk Priority Areas Map that follows this section. Those areas within a ¼ mile of schools and medical centers that show sidewalk deficiencies should be prioritized through an internal assessment and then included in the CIP.

Strategy 1.3.7: Consider establishing a transit overlay zone in the vicinity of the new transfer facility allowing higher-density and reduced parking in exchange for a higher level of pedestrian and transit infrastructure and amenities. The transit overlay zone should be considered in conjunction with priority redevelopment strategies outlined in this Plan.

Strategy 2: Connect People to the River by increasing *physical* and visual access to the water.

Action 1. Improve access to the Riverwalk along key pedestrian routes. There are 15 east-west streets that should be improved with shade trees, streetscape furnishings, and sensitively designed signage directing visitors to the waterfront. Crosswalks on east-west streets should be paved with special materials to reinforce pedestrian direction to the waterfront and create an organized hierarchy in the street pattern.

Strategy 5: Invest Public Resources to improve public amenities, attract private investment, and increase overall community value.

Action 1. Return Front Street to a two-way traffic pattern with new streetscape treatment.

Streetscape improvements should focus on the sidewalk and include tree species, prototypes for tree grates, lighting standards, underground utilities, and special paving materials to identify crosswalks and emphasize the significance of the street. In addition, historic medallions could be placed in the sidewalk at each corner of an intersection to mark the historic district.



Figure 2 Proposed Front Street Section from Vision 2020 Downtown Waterfront Plan

Cape Fear Historic Byway Corridor Management Plan

The Cape Fear Byway extends along the Cape Fear River from Wilmington's historic downtown along a series of city streets to Greenfield Lake Park. The *Historic Byway Corridor Management Plan* seeks to preserve and promote the historic character and natural beauty of North Carolina's first urban scenic byway.



Figure 3 Official Route of the Cape Fear Historic Byway

Source: *Cape Fear Historic Byway Management Plan*

The plan identifies a number of goals that directly or indirectly relate to *Walk Wilmington: Comprehensive Pedestrian Plan*.

- **Goal #1:** Encourage visitors to get out of their cars and safely explore the corridor by alternative means of transportation such as on foot, bike, trolley, horse carriage and even boat.
- **Goal #11:** Increase pedestrian and biking safety along the byway corridor, particularly on 3rd Street.
- **Goal #12:** Preserve the existing brick streets and make recommendations for additional streets to be covered in brick.

The corridor management plan contains several recommendations for improving the streetscape and visitor experience along the corridor, including installing street trees and plantings, street furniture, and landscaped medians. In this vein of enhancing the overall aesthetics of the corridor, the plan recommends installing brick (not stamped colored pavement) sidewalks and road crossings in several locations. While this does contain a certain visual appeal, consideration should be given to the accessibility of this surface treatment. Over time, bricks may shift and become dislodged, creating an uneven surface for pedestrians. This may result in a tripping hazard and it may become difficult for people in wheelchairs or using other assistive devices to navigate. People using white tipped canes may also have difficulty navigating the uneven surface. There are several cities around the country, such as Alexandria, Virginia, that

are considering either removing brick sidewalks in certain areas rather than contend with the annual cost and inconvenience of maintaining their brick sidewalks.

The historic byway plan contains a number of specific recommendations intended to improve pedestrian convenience, safety and comfort along the corridor. These include sidewalk repair, wayfinding signage, several midblock crossings, curb extensions and pedestrian refuges, crosswalk marking enhancements, and pedestrian scale lighting. The plan also recommends a new pedestrian bridge across a portion of Greenfield Lake. In addition to pedestrian-oriented recommendations, there are several topics related to improvements for bicyclists. .



Figure 4 Photo Simulation of Greenfield Park Entrance
 Source: Cape Fear Historic Byway Corridor Management Plan

Dawson and Wooster Corridor Plan

Dawson Street and Wooster Street are a parallel pair of one-way streets south of the city’s central business district. Together, these streets are a heavily traveled segment of US 76 connecting Wilmington and points to the east with the bridge to Brunswick County and beaches to the west. According to the corridor plan, NCDOT ranked the intersections of Wooster/8th Streets and Wooster/6th Streets amongst “the most ‘potentially hazardous intersection locations’ in the state.” The plan presents a number of recommendations for improving the safety and comfort of pedestrians, bicyclists and motorists along the corridor.



Figure 5 Improvements along the Dawson Street and Wooster Street Corridor
 Source: Dawson and Wooster Corridor Plan

Included are a number of specific recommendations for decorative stamped asphalt crosswalks, pedestrian signal heads and landscaping at the intersections with South 5th Avenue, South 8th Street, South 10th Street, South 13th Street, South 16th Street and South 17th Street.

US 17 (Market Street) Business Corridor Study (2007)

The 2007 Market Street study focuses on the corridor between 3rd Street and Covil Avenue. According to the study, the corridor presents a relatively uncomfortable environment for pedestrians.¹ The study is a refinement of a 2004 project that looked at the entire length of Market Street from the waterfront to the eastern edge of the city. The general purpose of the project was to evaluate this section of Market Street for opportunities to improve the streetscape, control heavy vehicle traffic, and improve corridor operation and safety for both motorists and pedestrians. A number of different alternatives were considered, including reducing Market Street from a four lane roadway (two lanes in each direction) to a two lane roadway with a landscaped median, bike lanes, and on-street parking. The preferred alternative includes the lane reduction down to two lanes, median improvements and intersection improvements. The recommended roadway should also include pullout areas for bus stops and curb extensions to further control traffic and reduce pedestrian crossing distances.

Market Street Corridor Study (2009)

The WMPO is currently developing a corridor plan for Market Street from Colonial Drive to the Pender County line. The project is focused on improving safety and mobility along the corridor for motorists, pedestrians, and other users. Recommendations will address access management,

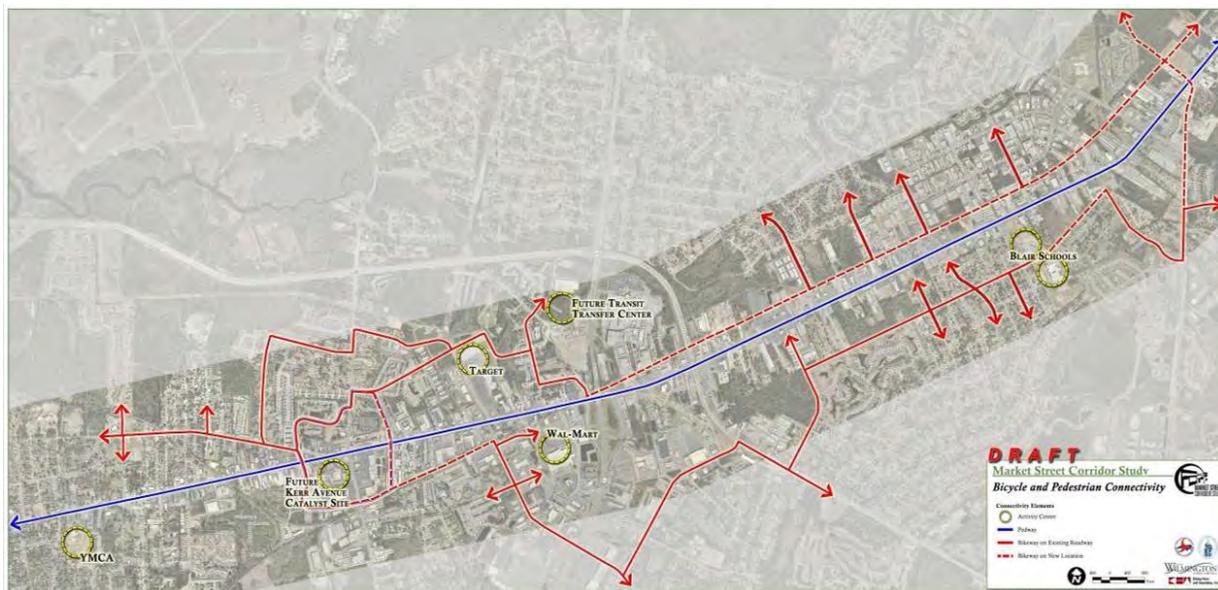


Figure 6 Market Street Corridor Study Bicycle and Pedestrian Connectivity Map

Source: Map developed by Kimley-Horn and Associates for WMPO

¹ The US 17 Business Corridor Study states that the level of service for pedestrians ranges from “C” to “F.”

design standards, and conceptual designs.

According to a survey conducted for the plan, sidewalks, bike accommodations and intersection improvements were amongst the most frequently identified improvements needed, well ahead of road widening.² Currently, the preferred design continues the landscaped median identified through the US 17 (Market Street) Corridor Study for much of the length of the corridor. The plan is anticipated to be completed in February, 2009.

Joint Safe Routes to School Workshop for Bradley Creek, Holly Tree and Parsley Elementary Schools

In September, 2007, the city hosted a Safe Routes to Schools workshop for three elementary schools. This meeting marked the beginning of the Safe Routes to Schools program in Wilmington. Through the workshop, a number of goals were established:

- Increase the number of parents who feel that their children are safe when walking and bicycling
- Increase the number sidewalks and bicycle paths
- Educate parents about walking school buses
- Improve the health of children
- Make existing sidewalks and bicycle paths safer
- Increase the number of bicycle racks
- Decrease the number of parents driving their children to school
- Create model educational program
- Enforce speed limits
- Increase adult supervision where children walk or bicycle
- Educate children on proper walking and bicycling techniques in order to instill confidence
- Better connect communities and schools
- Create safer walking routes to school bus stops
- Develop walking and bicycling habits early in life



Figure 7 Holly Tree Safe Routes to School Recommendations

The report identifies a series of specific recommendations for improving pedestrian and bicyclist comfort and safety along routes leading to each of the schools. Suggested

² Source: Market Street Corridor Study Public Workshop presentation, October 2008. Accessed on WMPO website at: <http://www.wmpo.org/market.html>.

improvements include new sidewalks, crosswalks, traffic signals, and other accommodations. The report also recommends the implementation of recommendations from several neighborhood traffic studies that should help control vehicle speeds in the adjoining neighborhoods. In addition to funding, implementation of workshop recommendations will also require coordination with NCDOT, private property owners, local school officials and homeowner associations.

INTERAGENCY COORDINATION

At the state and regional level there are a number of agencies and plans that address transportation improvements which have a direct impact on pedestrian facilities in the city of Wilmington. Streets are either owned by the North Carolina Department of Transportation (NCDOT) or by the City of Wilmington, but all sidewalks in the public right-of-way are owned and maintained by the City of Wilmington.

Transportation Policy Boards and Departments

Wilmington Metropolitan Planning Organization (WMPO)

Under federal law, any urbanized area (as defined by the Census Bureau) exceeding a population of 50,000 people shall establish a Metropolitan Planning Organization (MPO) whose purpose is to coordinate transportation planning and programming among the member governments. The WMPO planning area includes New Hanover County, the southeastern portion of Pender County and the northeastern portion of Brunswick County.

The WMPO is charged with adopting the federally-mandated Long-Range Transportation Plan and the state-mandated Comprehensive Transportation Plan; the Metropolitan Transportation Improvement Program (MTIP) for road, transit, bicycle, and pedestrian investments; and the Unified Planning Work Program. After appropriate planning, engineering, and public input, the WMPO adopts specific alignments for proposed thoroughfares and transit corridors.

North Carolina Board of Transportation

The governor of the State of North Carolina appoints the members of the North Carolina Board of Transportation. The board adopts the State Transportation Improvement Program (STIP), the seven-year investment program determining how state and federal transportation funds will be spent statewide. The board then awards contracts for construction based on the STIP. The Board is charged with setting policies for state-maintained and -operated transportation systems regardless of mode. The board has 19 members, plus the non-voting Secretary of Transportation.

The NCDOT Board of Transportation Strategic Plan

This is a Board of Transportation policy document which guides the functions to be carried out by the North Carolina Department of Transportation.

The plan's system vision states that:

“The transportation system in North Carolina will provide safe, affordable choices for the movement of all people and products. The system will support and sustain economic

opportunities throughout the state. It will be a well-maintained, reliable, multi-modal and connected system that is considerate of local land-use plans, natural resources and the environment. This system will be planned and operated in partnership with communities, local, regional, state and federal agencies, and private entities.”

The plan identifies balance, choices, partnership, open communication and safety as guiding principles that relate to pedestrian mobility. The plan includes the following goal and objectives:

Goal:

Provide a safe and well-maintained interconnected transportation system that offers modal choices for the movement of all people and goods.

Objectives:

Strive to meet transportation system needs for services, construction and maintenance

- Develop partnerships with other transportation providers
- Support the development of multi-modal transportation systems
- Ensure transportation safety through the enforcement of applicable state and federal laws
- Continuously monitor and update the department’s long-range transportation plan

NCDOT Board of Transportation Resolution: Bicycling and Walking in North Carolina, a Critical Part of the Transportation System

In 2000, the NCDOT Board adopted a resolution stating that:

“Bicycling and walking shall be a routine part of the NCDOT’s planning, design, construction, and operations activities and supports the Department’s study and consideration methods of improving the inclusion of these modes into the everyday operations of North Carolina’s transportation system.” It also resolves that “North Carolina cities and towns are encouraged to make bicycling and pedestrian improvements an integral part of their transportation planning and programming.”

North Carolina Department of Transportation (NCDOT)

Almost 20% of the roadways in Wilmington are owned and maintained by NCDOT. Local NCDOT maintenance and operations are performed at the division level, and Wilmington is in Division 3. The Division of Bicycle and Pedestrian Transportation is headquartered in Raleigh, and it has is a central resource for bicycle and pedestrian planning in North Carolina.

“NCDOT recognizes the importance of bicycling and walking and seeks to provide a supportive environment, both physically and institutionally, for these non-motorized modes of transportation. Although historically a municipal rather than state responsibility, in 1992 the DOT began to join with localities in making improvements to the pedestrian environment, thus setting in motion the expansion of opportunities for the walking public.

NCDOT Division of Bicycle and Pedestrian Transportation policy (2007)

A number of key milestones in the 1990s advanced pedestrian transportation in North Carolina and acknowledged the need to provide for the oldest mode of transportation used by humans:

- 1992: NCDOT expanded their bicycle program to include pedestrian transportation. The Office of Bicycle and Pedestrian Transportation was born and was later elevated to division status within the department.
- 1993: North Carolina Board of Transportation set aside \$500,000 for pedestrian projects.
- 1994: NCDOT implemented a policy for providing incidental pedestrian facilities in highway improvement projects.
- 1995: the Board of Transportation allocated \$1.4 million annually for pedestrian facility construction.

Most construction of pedestrian facilities occurs at the local or highway division level. The current statewide allocation for small scale pedestrian improvements stands at \$1.4 million, divided equally among the state's 14 highway divisions. In addition to state funding, the 2005 Safe, Accountable, Flexible, Efficient, Transportation, and Equity Act: A Legacy for Users (SAFETEA-LU) requires NCDOT to set aside federal funds from eligible categories for the construction of pedestrian transportation facilities.

NCDOT Comprehensive Transportation Plans

The Transportation Planning Branch (TPB) of NCDOT provides technical assistance to metropolitan planning organizations (MPOs), small urban areas and counties across North Carolina in the development of Comprehensive Transportation Plans (CTPs).

CTPs are 20-25 year plans for improvements to the transportation system, based on future land use, employment and population changes in an area.

A CTP is mutually adopted by the MPO or local governments (if not in an MPO) and the North Carolina Department of Transportation and becomes the blueprint for which transportation infrastructure improvements are made in an area.

The transportation needs identified through the development of the CTP are prioritized by either the MPOs or the rural planning organizations (RPOs) and presented to the Board of Transportation for programming during the biennial update of the STIP.

All designated metropolitan planning organizations are required every three years to update and maintain a transportation plan with a 20-year planning horizon.

NCDOT State Transportation Improvement Program

This program of capital projects describes the region's and the state's anticipated investments in transportation over a 7-year period. The STIP is updated every two years by the North Carolina Board of Transportation and include projects from the MTIPs that are endorsed by local MPOs.

Improvements for bicycling and walking may be included in the STIP as part of the construction of a highway project or, where no highway project is programmed, as an independent bicycle or pedestrian project. Bicycle and pedestrian projects follow essentially the same STIP process as do highway projects. One distinction, however, is that bicycle and pedestrian improvements may not be part of a long-range transportation plan. Integrating these two modes into local transportation plans in the future will strengthen both the incidental and independent project selection process.

NCDOT: Bicycling and Walking: A Long Range Transportation Plan

This plan was adopted in 1996 by the Board of Transportation. The plan established the following vision.

“All citizens of North Carolina and visitors to the state will be able to walk and bicycle safely and conveniently to their desired destinations, with reasonable access to all roadways.”

To meet the plan's vision, a series of goals are stated as follows:

Goal 1

Provide the bicycle and pedestrian facilities necessary to support the mobility needs and economic vitality of communities throughout North Carolina.

Focus Areas:

- Provide for quality independent projects and schedule more local bicycle and pedestrian transportation improvements in the State Transportation Improvement Program
- Provide for more incidental bicycle and pedestrian improvements by ensuring that the various units within the NCDOT consider bicyclists and pedestrians
- Develop and fund projects that improve transit access for bicyclists and pedestrians
- Identify, preserve, and develop abandoned rail corridors for bicycle and pedestrian transportation

Goal 2

Provide a comprehensive program of education and enforcement strategies that will improve the safety of all bicyclists and pedestrians.

Focus Areas:

- Develop and implement school-based pedestrian safety curricula and programs
- Develop, publish, and maintain a clearinghouse of bicycle, pedestrian, and motorist safety materials targeting at-risk ages and groups
- Encourage law enforcement agencies to enforce laws impacting bicycle and pedestrian safety

Goal 3

Institutionalize bicycle and walking considerations to enhance current transportation practices at the state, regional, county, and local level.

Focus Areas:

- Provide ongoing training and information exchange for state and local staff and officials
- Assess and incorporate federal, state, and local legislation, regulations, ordinances, and policies concerning bicyclists and pedestrians
- Advocate the establishment of bicycle and pedestrian citizen committees to promote the development of local plans and programs

Goal 4

Identify and promote new and innovative ways to advance bicycle and pedestrian safety and enjoyment through research and needs assessment.

Focus Areas:

- Conduct research to identify pedestrian and bicyclist safety needs to guide countermeasure and program development
- Periodically evaluate the effectiveness of bicycle and pedestrian facility and safety education programming
- Implement and evaluate innovative programming procedures, training

Goal 5

Encourage bicycling and walking as viable transportation options.

Focus Areas:

- Sponsor statewide promotions and events, and encourage local activities aimed at increasing awareness of bicycling and walking opportunities
- Improve tourism opportunities for non-motorized travel throughout North Carolina
- Develop, implement and promote bicycle/pedestrian commuter incentive programs at the state, regional, county, and local level

NCDOT Pedestrian Policy

A sidewalk policy was developed in 1993 whereby the NCDOT will participate with localities in the construction of sidewalks as “incidental features” of highway improvement projects. Prior to this policy, the NCDOT participation in sidewalk construction was limited to replacing sidewalks which were disturbed during roadway construction. At the request of a locality, state funds for a

sidewalk are made available if matched by the requesting locality, using a sliding scale based on population. The NCDOT participation generally may not exceed two percent of the highway project construction cost. NCDOT will only cover the cost for installing a 5-foot wide concrete sidewalk within NCDOT right-of-way. Additional costs for right-of-way acquisition, wider sidewalks or different paving materials are borne by the municipality.

NCDOT Greenway Policy

In 1994 the NCDOT adopted an administrative policy to consider greenways and greenway crossings in the highway planning process. This policy was incorporated so that critical corridors which have been adopted by localities for future greenways will not be severed by highway construction.

STAKEHOLDER INTERVIEWS

City of Wilmington

Traffic Engineering Division

Don Bennett	Signals & management	910-341-4696
Richie Brown	Signs, pavement markings	
& TRC review	910-341-4699	

Engineering Division

Brett Russell	Construction management	910-341-5890
Dave Cowell	Capital projects	910-341-5879

Planning Division

Christine Hughes	Long range planning	910-341-5885
Anthony Prinz	Transportation (TRC Review)	910-341-5891
Joshuah Mello	Transportation (Long Range)	910-341-3234
Bill McDow	Neighborhood traffic	910-341-7819
Jamison Fair (starts in May)	Current planning	910-341-5807

Police

David Conklin	Deputy chief	910-343-3610
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Parks, Recreation & Downtown Services

Andrea Talley	Recreation supervisor	910-341-0836
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Streets

Jay Carter	Street & sidewalk maintenance	910-341-7899
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Cape Fear Public Transportation Authority (WAVE Transit)

Albert Eby	Director	910-202-2035
Matthew Kunic	Planner	910-202-2057

New Hanover County Public Schools

Bill Hance	Planning, technology & operations	910-763-5431
Carmen Gintoli	Facilities planning	910-254-4325
Ken Nance	Transportation	910-254-4285
Kiersten Wildeboer	Health & drivers' ed	910-254-4173

Planning Division

April 9, 2008

Christine Hughes	Long range planning	910-341-5885
Anthony Prinz	Transportation (TRC Review)	910-341-5891
Bill McDow	Neighborhood traffic	910-341-7819

Ron Saderfield

1. Briefly describe what your role in helping to create a more walkable city.
2. How does the City address internal circulation on private development and the connection of these developments to surrounding areas? Example: Military Cutoff Road.

We encourage as many connections as possible, especially to the sidepath, through the Technical Review Committee (TRC) process. Developers consider these connections as amenities that make their development attractive; thus, they don't resist them. Surrounding neighborhoods sometime resist, however. Example: Windemere and Mayfair. Neighborhoods also resist connections through their neighborhoods to schools. Vehicle connections between neighborhoods are one issue that people more easily agreed to.

Pedestrian connections can be considered as adding to the overall project costs, especially for developers. And, once the connection is made, it must match existing elevations and amenities.

3. What does the City's SRTS program look like?

The MPO is certified to receive funds and administer grants. We now have a pilot program grant for Bradley Creek ES, with the major element being sidewalks between a trailer park and the school

Joshua Mello is the City's SRTS coordinator and the money flows through the MPO. It's easier for the City's Public Works department to install sidewalks to schools using City money. Grant funding is more complicated and takes longer. It's easy to justify the expense.

There are no specific design standards for sidewalks to schools.

4. Do you address internal pedestrian circulation for parking lot layouts?

There is the code, and there's what happens in real life. We just amended the code for parking lot landscaping, because we want a people-friendly design. However, the code doesn't specify pedestrian circulation; we rely on the TRC reviewer to pay attention to this.

5. Do the current codes/ordinances/standards support pedestrian-oriented design/development? What are the loopholes? What are the shortcomings?

The existing built environment does not support pedestrian travel. We require, but then waive connections in new and re-development. And, some requirements are contradictory, such as buffers around commercial development which limit pedestrian access and don't add to a pedestrian-friendly environment.

We are currently working through a series of code amendments. Changes to the multi-family development regulation will make access easier overall, however, pedestrians are not addressed specifically. In contrast, pedestrian needs are specifically addressed in the urban mixed use district, which aims to make these developments more self-sufficient, (i.e., people don't need to travel outside the district for shopping, schools, works, etc.).

6. What types of pedestrian-friendly design elements or requirements do developers most often resist? What strategies have you used to encourage more pedestrian-friendly development/design?

It is a mixed bag and depends on the developer. City policies are not clear on where pedestrian facilities should be and what the standards for them are. While the policy says pedestrian facilities are required, there is not much undeveloped land – the City is 90% built out -- to apply them to. Redevelopment and small developments are it and developers push back on the requirement to include pedestrian facilities in their project when the surrounding areas have none.

Driveway permits are approved by the City's traffic engineer.

7. What role does the City have on issues of safety, ADA accessibility and transit stops/accessibility?

Safety and ADA compliance is also inconsistent, with ramps missing or in the wrong place.

Pedestrian access to WAVE Transit

- The City recently built sidewalks, ramps and installed striping for the temporary central station created coincident with the March 31 route restructuring.
 - There are growing pains associated with WAVE transitioning from a City department to a regional transit agency.
 - The City does not create bus stops. It is up to WAVE Transit to do this.
 - The sidewalk prioritization plan does not reflect bus routes because they change.
 - Properly done, excess parking needs can be resolved through better public transit, if the funding is there. The perception is that only a certain class of people ride the bus, i.e., those who are transit dependent.
8. What strategies (either processes or aspects of the Zoning Ordinance, Sidewalk Ordinance or other ordinances) have worked well in getting new development to adequately address pedestrian needs?

There is an effort through the TRC process to have all development plans comply with existing transportation plans, such as collector street plans, especially with respect to pedestrians and bicycles. See: Monkey Junction Collector Street Plan.

New Hanover County and the Wilmington Metropolitan Planning Organization are currently working on a collector street plan for the Monkey Junction area. With your help, we hope to develop a guide and design standards for collector streets and also produce a map of future connections (automobile, bicycle and pedestrian) between area neighborhoods, shopping centers, schools and workplaces. The goals of these activities are to improve interconnectivity and relieve pressure on S.College Road (NC 132), Carolina Beach Road (US 421) and Myrtle Grove Road. A public workshop was held on February 28, 2008.

The goal is to find funding for retrofits, especially for County land annexed to the City. The collector street plan includes 50 spots to retrofit.

The issues differ, depending upon where you are in the City:

1. Downtown the issue is how to cross arterials
2. In the suburbs, sidewalks are what's needed.

9. Should improvements to existing sidewalks be required during redevelopment if the sidewalk does not meet the City's standards?

The County did not require sidewalks, so portions of the County annexed to the City do not have sidewalks. This has created issues for the City.

The City's sidewalk program places higher priority for sidewalks in high pedestrian areas, such as schools, hospitals and downtown.

The Neighborhood Traffic Program started with only 1 traffic-calming installation – a round about when the program was revised, each neighborhood wanted sidewalks.

Sidewalks are managed by the traffic engineer.

10. When you look at where Wilmington is today and the vision for walkability in the future, what are the biggest barriers to getting there?

Walkability is an issue when developing neighborhood plans. Speeding and internal circulation are factors affecting walkability.

The City-wide master plan is more concerned with vehicular traffic. Sidewalks are used for internal neighborhood circulation; major intersections are not always addressed. They are wide and have higher speeds. Even when pedestrian facilities are installed at major intersection, pedestrians and motorists get mixed signals. And some intersections on roads under NCDOT control don't have pedestrian facilities, creating a "missing link." The conflict extends to aesthetics, as NCDOT wants arterials and intersections to be easily maintainable, i.e., no pedestrian facilities, no landscaping, few signs, etc.

We need to have a longer vision in mind when deciding whether or not to include pedestrian facilities on a road or at an intersection. Even when crash data and other information make the case for installing facilities, doing so is complex and costly. Drainage, signal timing, signage, striping, landscaping, etc., all need to be redesigned and recalibrated.

11. With regards to the City's relationship with NC-DOT, what are the top 3 things you wish they would do, at the project level, to ensure walkability.

NCDOT has the final say on TRC reviews of roads they maintain. Their policy does not allow much flexibility; they adhere fairly strictly to the AASHTO. It is only when we have hard

evidence of a different outcome, such as crash data, or a project is related to SRTS, that they are more flexible.

Examples of successes in working with NCDOT are:

- Wooster & Wrightsville Avenue
- A mid-block crossing near the Dawson Street & Oleander Drive intersection

12. What would you like to get out of the Pedestrian Master Plan?

1. Something to educate the development community and elected officials as leverage to propose/agree to/approve more pedestrian-friendly facilities. 6 of the 7-member Council are connected to the development community, and 6 of the 7-member Planning Commission, which is appointed by the Council, are, too. We can use
 - case studies/best practices from other communities
 - information on how a good pedestrian network will reduce congestion and crashes
2. Site-specific recommendations. We can identify about 20 locations with pedestrian connection issues. THEN, need to negotiate with NCDOT to allow changes. (NCDOT is paying for this study, so they should be willing to implement its recommendations.)
3. Change NCDOT's policy and practices for pedestrian facilities. Their re-organization may solve part of this. The plan should identify what the problems are, suggest ways to improve our relationship with them, and end up with their willingness to make trade-offs between pedestrian and vehicular facilities.
4. A ranking system for new sidewalk installation (talk with Richard Kind) that includes all criteria. For example, transit access is missing.

- Understanding that anything built ends up in his maintenance schedule. The new pavements management system does not currently include sidewalks and shared use paths; they will need to be included in the future as more are built – i.e., the complaint-based maintenance system will no longer be the best way to maintain them.

Traffic Engineering Division

Friday, April 4, 2008

Don Bennett	Signals & management	910-341-4696
Richie Brown	Signs, pavement markings	
& TRC review	910-341-4699	

1. Briefly describe what your role in helping to create a more walkable city.
 - a. Richie Brown
 - Completes plans reviews for sidewalk improvements. He also sometimes reviews internal circulation for proposed developments.
 - He oversees the crew that installs and maintains signal and pavements markings.
 - Sometimes provide crosswalk information to Engineering for larger projects.
 - Works with Streets Division of Public Services when they install new sidewalks.
 - b. Don Bennett
 - Evaluates signals for re-timing
 - Counts pedestrians (through observation)
 - Recommends pedestrian facilities needed on NCDOT roads
 - Works with other City departments, eg, works with Andrea Talley on the cross city trail to identify the best intersections for the trails to cross roads – to avoid conflicts between motorized and non-motorized.
 - Does some work on capital projects
 - Has not received requests for pedestrian facilities to improve access to bus stops.

2. What are the responsibilities of the Street Maintenance Division in regards to maintenance of pedestrian facilities? Who handles enforcement?
 - a. Work with others to develop mid-block crossings with pedestrian refuge
 - Install between complex intersections
 - May include HAWK or beacon
 - Create in locations where motorists expect to see pedestrians, e.g., at major pedestrian generators/attractors.
3. What internal divisions and/or agencies do you collaborate with most when it comes to pedestrian facility maintenance issues?
 - a. They both work with NC DOT, Wilmington Parks & Recreation (especially on the Cross City Trail) Development Review (with the objective of having sidewalks on all existing streets and at intersections).
 - With respect to development review – they review the internal circulation and sometimes the inter-connectedness between the private property owner and surrounding areas/destinations.
 - They will propose paths between developments that are not in the public ROW. For example, the multi-use path on Eastwood Road. This is a City project with some private development money.
 - b. They do some review of proposals for improved walking and biking to schools. The SRTS position was filled less than a year ago, so the program is just beginning.
 - Their review is limited to technical comments.
 - Schools built when the land was in the County (but now in the City) have fewer sidewalks than City schools
 - c. They do some transportation planning work with the MPO
4. What do you want from the plan?
 - a. System for non-motorized travel that allows people to walk short distances, e.g. to the mall, school.

- IMPORTANT to facilitate these movements without compromising the vehicular traffic system. Wilmington has no by-passes or over passes. There are no good alternative routes for vehicles to travel than on the existing roads. North-South roads have especially high volumes that cannot be interrupted.
- b. Recognition that pedestrian paths are not corridors of crime. This is a stigma that needs to change.
- c. Funding to resolve pedestrian access problems inherited when neighborhoods were annexed from the County – especially schools, e.g., Forest Hills.
 - Sidewalks are added to some schools when they are renovated.
 - Example of school that desperately needs sidewalks: Bradley Creek – is a trailer park next to it with no sidewalks, so the kids take the bus to school.
- d. A change in policy from the State. Currently, the City needs NCDOT approval to put pedestrian facilities on state-maintained roads. Most state roads are rural with low volumes and NCDOT state policies are geared towards these, not roads in a city such as Wilmington.

Practice: Because Wilmington does not use LPI, Don Bennett tries to install more pedestrian facilities at intersections where there is less pedestrian-vehicle conflict, even if it means pedestrians do not have a direct path.

Engineering Division

April 9, 2008

Brett Russell Construction management 910-341-5890

1. Briefly describe what your role in helping to create a more walkable city.
2. Do inspections take place of all new pedestrian facilities? What is most often out of compliance? How could the process (application, review) or laws/codes be adjusted to ensure greater compliance?
3. Some communities require SF infill development (single lot) to build sidewalk on streets with no sidewalk or sidewalk with missing gaps. Does Wilmington? If not, should it?

4. Should improvements to existing sidewalks be required during redevelopment if the sidewalk does not meet the City's standards? *Examples: No sidewalks, Sidewalks at back of curb or 4' wide sidewalks.*

Brett is a construction manager for capital projects who makes sure things are built correctly. He is not part of the TRC process.

If a sidewalk does not exist, a property owner is required to put in a sidewalk when making an improvement to their property, especially if the improvement affects the public ROW – e.g., a driveway apron.

In terms of maintenance standards, the City requires those that disrupt the sidewalk to replace an entire panel, not just restore with a patch. This is a good policy.

We have a lot of sidewalks to nowhere and lack a management plan to tie things together. There is not sidewalk in-fill budget; no pot of money to fund in-fill sidewalks.

Payment-in-lieu program payments are absorbed into the general fund.

For new development the City code requires a 4' to 6' wide planting strip (called a plaza in Wilmington) between the sidewalk and the street. To get this, the City requires a pedestrian access easement on the far side of the ROW. The easement is limited by building set back requirements.

Sidewalks are an underused City asset, including 10' multi-use paths.

Parks, Recreation & Downtown Services

Friday, April 4, 2008

Andrea Talley Recreation supervisor 910-341-0836

1. Briefly describe what your role in helping to create a more walkable city.
 - Project manager for 10-mile Cross City Trail, which is an off-road, multi-use trail. It will eventually get to Wrightsville Beach.
 - Heads "Wilmington Walks", a healthy community/fitness organization that measures walking courses for neighborhoods. The program provides Education and Encouragement materials for neighborhoods.
 - Works with Joshua Mello in Planning

- Meets with staff in Public Services department to identify easy places for sidewalks.
 - Participates in MPOs ped/bike advisory committee, which makes recommendations on ped/bike projects. Because each jurisdiction funds its own projects, the recommendations are “advisory” and not used to spend regional funds. Priority projects are listed at the local level.
2. What are the things you see as most useful for walkability?
- The signage plan that is in-process. The plan will include way-finding and destinations signs, street signs.
3. What are the things that have a negative impact on walkability?
- Need Ped heads at crosswalks.
 - The City is bisected by major roads that are barriers, e.g., Carolina Beach Road between Shipyard and 3rd Street – 45 mph with some sidewalks, but mostly dirt paths.
 - Need to complete missing sidewalks.
 - Need mid-block crossing @ neighborhood streets where the cross city trail is.
 - Need sidewalks from places people walk to from their neighborhoods, e.g., Wrightsville Avenue (County Club neighborhood) is not walkable because there are no sidewalks. Lots of older people live there. There is some internal circulation, but no connection to the nearby park.
 - No historic preservation staff to oversee the downtown district.³
4. How walkable are most City parks?
- OK. Access will improve with build-out of Cross-City Trail, as it will connect 6 parks and 5 schools, UNCW and 3 neighborhood shopping centers.
5. What would you like to get from the Pedestrian Master Plan?
- Changes to policies that inhibit walkability, such as

³ No public spaces manager, such as exists in Washington, D.C.

- i. The loophole that waives sidewalks from a new development if a storm water retention pond is built.
 - ii. Developments on corners are only required to build on 1 street, not all streets
 - iii. No pedestrian circulation plan for developments – only a sidewalk along the street and in front of retail stores.
- A policy that any new development built across the cross city trail must build the trail
- A greenways map that includes
 - i. Portion of the East Coast Greenway and the connections to it from Wilmington
 - ii. the River to Sea trail
 - iii. Cross City Trail
- Sidewalks on Wrightsville Avenue between downtown and College Road
 - i. Students cannot walk to businesses along Wrightsville Avenue because there are very, very few sidewalks.
- More connections from neighborhoods to the Cross City Trail. Traffic Engineering can help make this happen. The public will want the connections.

Cape Fear Public Transportation Authority (WAVE Transit)

April 7, 2008

Albert Eby	Director	910-202-2035
Matthew Kunic	Planner	910-202-2057

1. Briefly describe what your role in helping to create a more walkable city.
 - City and County bus systems combined in 2004, based upon a 5-year plan resulting from the merger. Now, operates as a separate transit authority serving both. Result is a more efficient service, with fewer stops – better spaced. Short term plan is at: http://wmpo.org/PDF/2004_WAVETransit_Short_Range_Plan.pdf

- Restructured bus routes took effect on March 31, 2008. Service was expanded in the County and the north end of the City to new apartment and condo complexes.
- Local newspaper articles on the changes are at:
<http://www.starnewsonline.com/article/20080407/NEWS/804070348/-1/xml>

http://wwaytv3.com/wave_transit_kicks_off_new_routes_schedules_with_free_fare_day/03/2008

- Temporary center transfer location includes is on-street with shelters, passenger waiting area.
- Same amount of service – just redistributed.
- Some bus stops were eliminated. Stops with highest use and customer comment were kept. Stops that were too close together were consolidated. Standard of ¼ mile maximum distance between stops. Stops at generators such as the hospital were maintained.
- New administrative center/Central Station to be constructed a couple blocks away will have a covered bus passenger area, restrooms, real-time bus arrival information⁴, etc.
- All signs were replaced with new WAVE Transit signs. Bus schedule information is not posted at stops.
- Service included in 5-year plan for which funds were not available include:
 - Airport Shuttle
 - Southern Beaches
 - _____Neck
- Contract service to UNC Wilmington
 - Provides transportation for students living within 1 mile of campus
 - No parking zone within 1 mile radius around UNCW; no cars on campus between 7:00 am and 4:00 pm (need to confirm this).

⁴ Currently, real-time bus arrival information is available for 3 bus routes. Customers can check on-line (via a desktop computer or a PDA). Dispatchers use the system to manage bus service.

- More information on UNCW bus service is at:
http://www.uncw.edu/ba/parking_trans/parkandride.htm
2. In general, how accessible are WAVE stops? How accessible are they for your customers with disabilities?
- Over 50% of the stops do not have sidewalks. Sidewalks are harder to get in the County, as the development standards do not require developers to install stops.
 - Customers with disabilities who cannot access their bus stop are offered paratransit service.
 - WAVE does work pro-actively with the City to install sidewalks, but WAVE has no authority or funding to install better access to bus stops.
 - WAVE maintains bus stops with amenities such as shelters and trash cans. The City does the same for a few stops, but most bus stop maintenance is the responsibility of the property owner of the property on which the stop is located.
3. How do you manage bus stops? Do you have a bus stop inventory program? So you have standards for location and amenities?
- WAVE has 300 bus stops. Transit systems has an inventory (note: inventory never received)
4. What is your relationship with the City of Wilmington to improve access to bus stops?
- Community telephone survey in 2007 –
 - Designed to learn what transportation improvements people want and if they are willing to pay additional taxes to get it. Public transportation included, e.g., “What would make you more inclined to ride the bus?”
 - 1154 responses
 - Hope to get federal or state funding to add sidewalks, e.g., New Freedom grant program.
5. How would you describe the general approach/attitude of the development community in Wilmington towards creating a more walkable City? Do developers automatically include adequate pedestrian facilities? Are they amenable to design changes to accommodate pedestrians?

- Not involved with route/stop planning with new developments.
- Learn of project after approval/build-out.

6. What would you like to get from the Pedestrian Master Plan?

- Funds to install more sidewalks
- More user-friendly service
- Implement more of the service identified in the short range plan.
- Increase the percentage of choice riders. Currently only at 10 to 15%.
- More information is included in their annual report at:

http://www.wavetransit.com/07_Annual_Report.pdf

Wave Transit Community Attitude Survey

A communitywide public attitude survey administered by the UNCW Department of Public and International affairs has given the Authority a great barometer of the how Southeastern North Carolina residents feel about public transportation. In early 2008, the Authority plans to present the findings and analysis of the survey to local elected officials. The survey sought public attitudes on items ranging from public perception, to use of the system, to funding transit initiatives in the area.

New Hanover County Public Schools

Bill Hance	Planning, technology & operations	910-763-5431
Carmen Gintoli	Facilities planning	910-254-4325
Ken Nance	Transportation	910-254-4285
Kiersten Wildeboer	Health & drivers' ed	910-254-4173

Ken Nance

4-9-08

1. Briefly describe what your role in helping to create a more walkable city.

City's Sidewalk Committee just formed and Ken is a citizen appointee to the committee. The committee is determining priorities for new sidewalk installation. The City has an interest in

providing sidewalk access to schools. However, he understands that sidewalks are expensive to build.

Ken is the assistant director of transportation for the NHCPS's transportation office, he supports this, as it will eventually reduce operating costs for busing kids to school. He represents the schools on the Cape Fear Breeze employer group.

<http://www.capefearbreeze.com/Default.htm>

2. In general, how accessible are New Hanover County Public Schools for kids walking or biking to school?

Sidewalk access to schools is limited. Most kids take the bus to school or are driven to school. Very few walk or bike to school. Riding the bus is preferable to being driven.

3. Do you have a SRTS program? If so, what impact has it made?

Ken is not involved with SRTS efforts. The NHCPS does not have a SRTS person.

4. What is your relationship with the City of Wilmington to improve access to schools?

Through his participation with Cape Fear Breeze – involved with non-motorized transportation indirectly.

Even if developers install sidewalks, someone needs to maintain them. This is the issue.

5. How would you describe the general approach/attitude of the development community in Wilmington towards creating a more walkable City? Do developers automatically include adequate pedestrian facilities? Are they amenable to design changes to accommodate pedestrians?

Does not know.

6. What would you like to get from the Pedestrian Master Plan?

More sidewalks so kids can walk to school safely and reduce dependence on being bused.

Carmen Gintoli

April 11, 2008

1. What is your relationship with the City of Wilmington to improve access to schools?

Work with the City in 2 ways:

- a. City requires the school system to upgrade/restore sidewalks around the perimeter of a school when renovating it. Last new school built in the City was in 1997. No more room; an elementary school requires 17 acres; middle and high schools require more.
 - b. Attend TRC meetings when a development is proposed that impacts schools. Schools request to mitigate impact. The City decides what developer does or does not provide.
2. How would you describe the general approach/attitude of the development community in Wilmington towards creating a more walkable City? Do developers automatically include adequate pedestrian facilities? Are they amenable to design changes to accommodate pedestrians?

See answer in 1b above.

Also – not a guarantee that school system’s requests will be given. Developers only talk with the school system in the TRC process. It is through the TRC process that the school system learns of the developer’s plans.

In some cases, the County requires developers to provide set aside for land to build a new school or expand an existing school. The County also has a mechanism for developers making a cash contribution for improvements to schools needed to accommodate projected enrollment from the development. For example, one developer provided \$2M over a 10 year period for a 2000 household development. This is a relatively new requirement. Chris O’Keeffe from the County Planning Office can provide more information. Not aware that the City does the same.

3. Do you have a SRTS program? If so, what impact has it made?

Not aware of a safe routes to schools program.

For new or renovated schools, on-site circulation is reviewed by NCDOT.

The school systems policy/practices for internal circulation are:

- Non-motorized is separated from motorized.
- ESs and MSs have 2 parking lots – 1 for visitors and 1 for faculty and staff
- An ADA accessible pathway is striped in each parking lot, but no other sidewalks or pedestrian facilities are provided.

- Each school has a bus drop off facility
- Sidewalks are in a greenbelt and students only cross the front driveway to get into the school. A speed hump is used to calm traffic. It is level with the sidewalk at the highest point, 8' to 10' wide and painted.

4. What would you like to get out of the Pedestrian Master Plan?

Wants to support pedestrian access, but needs City assistance in doing so.

SUPPLEMENTAL POLICY INFORMATION

Crosswalk Marking Research and Crosswalk Marking Policy Implications

Introduction

Planning for Pedestrians

Walking is the most basic form of travel. The pedestrian is also the most challenging transportation user to successfully design for. Most able bodied pedestrians can travel anywhere (e.g. crossing mid-block, through vegetated areas, or diagonally across an intersection).

The lack of pedestrian facilities (sidewalks, shoulders, signals, etc) is an inconvenience often overcome by necessity. The pedestrian's mobility allows them to take the most direct route to save time and energy. Pedestrians are also reluctant to take out of the way routes as they are the slowest mode of travel. Unlike

motorists, who are restricted to roadways, it should be assumed that pedestrians will walk almost anywhere whether or not dedicated pedestrian infrastructure is present.

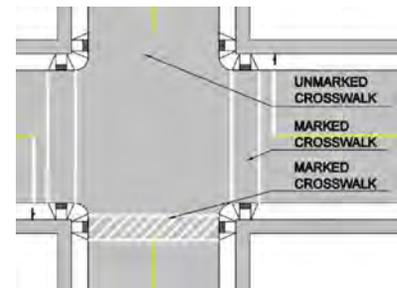
This paper examines the issues related to pedestrian crosswalks and provides recommendations for the city to improve accommodations for residents and visitors. Research indicates that a lack of pedestrian facilities makes walking less attractive and decreases pedestrian safety. The recommendations overview below is followed by a discussion of research on crosswalk marking, an overview of current NCDOT and city crosswalk marking policy, and finally detailed recommendations for improving crosswalk related policy in Wilmington. The research should be viewed as complimentary as each successive research project built upon the previous research. The earliest research controlled for few variables limiting its applicability, while recent research assessed multiple variables allowing the development of detailed crosswalk marking recommendations that are being applied at a national level.



Winter Park Elementary School generates regular pedestrian traffic at this marked crosswalk location where the sidewalk network is incomplete on S. McMillan

Pedestrian Rights While Crossing the Street

Pedestrian travel requires crossing roadways. Due to the pedestrian's slower speed, inherent vulnerability and conflicts with motor vehicles, the majority of pedestrian injuries and fatalities occur while crossing the road. North Carolina law⁵ recognizes this problem by providing the pedestrian the right to claim the right-of-way at all intersections unless they are controlled by traffic signals or specifically prohibited with signs.



Example of legal marked and unmarked pedestrian crossings

Pedestrian crossings at intersections without painted lines or other markings are known as unmarked crosswalks. Similar to marked crosswalks, drivers are required by law to yield to pedestrians within unmarked crosswalks. Marking crosswalks alerts motorists to locations where they should expect pedestrians and shows pedestrians a preferred crossing location.

Recommendations Overview

The list below highlights recommendations for improving crosswalks within the city. For a more detailed discussion, please see the section Crosswalk Recommendations at the end of this paper.

- Develop and adopt crosswalk marking guidelines
- Modify standard design details to show pedestrian accommodations
- Modify current high-visibility marking design to reduce maintenance

Background

Safety and Effectiveness of Marking Crosswalks

Over the last 35 years, a number of research studies have looked at the safety implications of marking crosswalks at controlled crossings (stop sign or signal) versus uncontrolled crossings. Some studies have also attempted to identify how other variables such as vehicle volume, speed, crossing distance, motorists behavior, and pedestrian behavior should influence the decision to mark crosswalks.

⁵North Carolina Law 20-155. Right-of-way. (c) The driver of any vehicle upon a highway within a business or residence district shall yield the right-of-way to a pedestrian crossing such highway within any clearly marked crosswalk, or any regular pedestrian crossing included in the prolongation of the lateral boundary lines of the adjacent sidewalk at the end of a block, except at intersections where the movement of traffic is being regulated by traffic officers or traffic direction devices.

Research to date indicates marking crosswalks has the following results:

Marking crosswalks at controlled crossings

- Increases motorist awareness of pedestrians.
- Does not significantly increase or decrease pedestrian crash rates.
- Encourages pedestrian use and enables engineers to channelize pedestrians to locations where they are most visible to approaching motorists (i.e. in front of stopped vehicles at intersections instead of between).

Marking crosswalks at uncontrolled crossings

- Increases motorist awareness of pedestrians.
- Neither increases nor decreases pedestrian crash rates for two-lane crossings.
- Potentially increases pedestrian crash rates for crossing more than 2 travel lanes if other devices are not implemented in conjunction with the marked crossing depending upon vehicle volumes and speeds.

Analysis of Significant Crosswalk Research

To assess existing City of Wilmington and NCDOT crosswalk marking policies, the major crosswalk studies completed since 1972 were reviewed to determine the limits of the research and to synthesize their findings as they relate to developing policies for marking crosswalks.

Pedestrian Crosswalk Study: Accidents in Painted and Unpainted Crosswalks, City of San Diego Study 1972

This study was the first major study of pedestrian safety at uncontrolled crossings. For the first phase of the study, the author analyzed crosswalk crash data covering a five-year period at 400 intersections. Only four-leg perpendicular intersections with two-way main road traffic were analyzed. A second phase of the study involved the collection of 24-hour pedestrian counts and vehicular counts at 40 of the 400 intersections to enable calculation of exposure risk while analyzing 5-years of crash data for each intersection.

Study Limitations:

- Results applicable only to uncontrolled intersections as signal and stop intersections were not studied.

- Pedestrian behavior was not recorded. Conclusions regarding pedestrian behavior were hypothesized based upon crash statistics and pedestrian counts.
- Motorist behavior was not recorded. Author did not attempt to hypothesize motorists behavior (i.e. failure to yield, speeding, passing stopped vehicles, etc.)
- No control for the following critical variables:
 - number and width of travel lanes (and corresponding pedestrian crossing exposure)
 - vehicle volumes
 - vehicle speeds
 - crosswalk design (i.e. ladder style or parallel lines)

Study findings supported by study data:

- Highest percentages of accidents involved persons under age 14 (32%) and persons over age 70 (21%).
- Highest percentage of accidents was between 5 and 7 p.m. (24%).
- Pedestrians were twice as likely to be struck in a marked crosswalk versus an unmarked crosswalk:
- Pedestrian crashes in marked crosswalks were higher than in unmarked crosswalks by a 6 to 1 ratio
- Pedestrians utilized the marked crosswalk by a ratio of almost 3 to 1 over unmarked crosswalks.
- Highest percentage of pedestrian crashes occurred while pedestrian was finishing crossing (36%).
- Lowest percentage of pedestrian crashes occurred while pedestrian was beginning crossing (9%).
- Only three percent of crashes involved a turning vehicle.

Study findings not supported by study data:

- Pedestrians have a “false sense of security” at marked crosswalks.

- Pedestrians engage in risky behavior at marked crosswalks indicated by far side crashes.

Discussion of study limitations and findings:

The study author's conclusion that marked crosswalks "may cause pedestrians to have a false sense of security and to place themselves in a hazardous position with respect to vehicular traffic" is not supported by the collected data.

As the author did not collect data on pedestrian behavior, the author apparently came to this conclusion based upon the fact that pedestrians were almost three times likely to be struck in a marked crossing. Since the analysis did not divide the different accident rates with vehicular volume, speed, and travel lanes crossed, this generalized statement may not be true for all uncontrolled crossings. The author did not assess motorist behaviors such as passing a stopped vehicle, failing to yield, speeding, etc. The author's conclusions place an extraordinary burden on the pedestrian that is not supported by law.

The locations pedestrians were struck does not prove they suffered from "a false sense of security". Only six percent of the pedestrians were struck as they began crossing the roadway. This small percentage of crashes may have been caused by pedestrians who were not paying attention or may have had a false sense of security. Given that this is a small percent, it is not appropriate to apply this finding to all pedestrians.

The majority of the pedestrians (94%) were struck within the crosswalk, with 36% struck while finishing their crossing. This data does not support the hypothesis the pedestrians had a false sense of security. This data more likely indicates the pedestrians had trouble judging gaps, were impatient waiting for gaps (i.e. ran across road), were in multiple threat situations where a vehicle hit them by passing another stopped vehicle, or motorists failed to yield the right-of-way as required. The author failed to consider the motorists role in these crashes as it could be easily surmised the motorists failed to understand their duties to give the right-of-way to the pedestrian once they were within the crosswalk. The lack of data indicating the number of travel lanes crossed is a critical factor that was overlooked in this study.



Pedestrians crossing Castle Street at 6th Street in middle of intersection looking at oncoming traffic

Pedestrian Crosswalk Case Studies, FHWA Study 2001

This study analyzed the effect of crosswalk markings on driver and pedestrian behavior at uncontrolled intersections. The study utilized a before/after methodology at eleven intersections in four cities to determine:

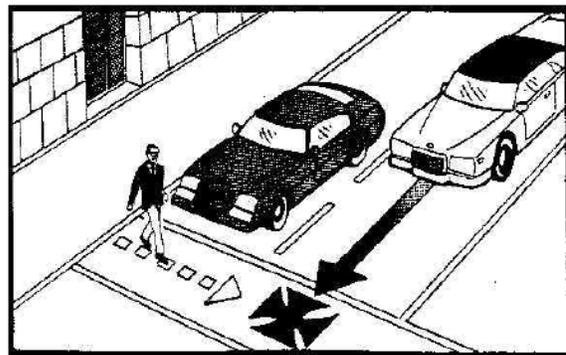
- Whether pedestrians were more likely to cross a street within a marked crosswalk
- Whether drivers operate slower and/or yielded more often to pedestrians crossing at a marked location
- Whether pedestrians use more, less, or the same amount of caution when crossing at a marked pedestrian crosswalk compared with an unmarked location

Study findings supported by data:

1. Pedestrian scanning for traffic increased 3-10% after installation of marked crosswalks.
2. Motorist awareness of pedestrians increased after installation of marked crosswalks, as indicated by the reduction in speed of vehicles approaching a pedestrian in a crosswalk.
3. Marking crosswalks neither improved nor degraded motorists yielding behavior.
4. Marked crosswalks attracted pedestrians walking alone (increase from 7-17%) to cross within them.
5. Marked crosswalks do not have a significant impact attracting groups of pedestrians to cross within them.

Discussion of study limits and findings:

This study only focused on lower volume (approximately 10,000 ADT or less) roadways with no more than 2 travel lanes. The study results should not be applied to multiple threat conditions found on roadways with four or more lanes of traffic. The study also did not assess roadways with posted vehicle speeds over 30 MPH. The study supports marking crosswalks on lower speed, two lane roadways at uncontrolled crossings.



Multiple-threat graphic detailing how pedestrians are struck on multi lane roads by car passing stopped vehicle from FHWA 2005 Study.

Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations, FHWA Study 2005

This study analyzed five years of pedestrian crash data at 1,000 marked and 1,000 unmarked crosswalk locations at comparable uncontrolled locations (i.e. traffic volume, pedestrian exposure, number of lanes, median type, speed limit). The study did not analyze pedestrian or motorists behavior but did describe causes of crashes based upon the crash reports. Sample pedestrian and vehicle counts were developed for each location to calculate relative exposure.

Study findings which are supported by data:

1. On two-lane roads, marked crosswalks alone were no safer than unmarked crosswalks.
2. On multi-lane roads, without raised medians, and under 12,000 vehicles per day, marked and unmarked crosswalks provided the same amount of protection.
3. On multi-lane roads, with raised medians, and under 15,000 vehicles per day, marked and unmarked crosswalks provided the same amount of protection.
4. On multi-lane roads, with or without raised medians, and over 15,000 vehicles per day, a marked crosswalk by itself, without other safety enhancements, was associated with greater pedestrian danger.
5. The presence of a raised median provided significantly greater protection on multi-lane roads compared to no median.
6. No correlation between crosswalk condition and pedestrian crashes.
7. Pedestrian counts showed that 66.1% of pedestrians crossed at marked crosswalks compared to 33.9% at unmarked crosswalks.
8. On multi-lane roads, 81.3% of older adults and 76% of young children crossed in marked crosswalks.

Discussion of study limits and findings:

The author was careful to conclude that “When considering marked crosswalks at uncontrolled locations, the question should not simply be: ‘should I provide a marked crosswalk or not?’ Instead, the question should be: ‘Is this an appropriate tool for getting pedestrians across the street?’ Regardless of whether marked crosswalks are used, there remains the fundamental obligation to get pedestrians safely across the street.”

The findings in this report provide further context to the findings of the 1972 crosswalk study - uncontrolled crossing with marked crosswalks alone on higher volume, multi-lane arterials place increase the likelihood pedestrians will be injured. The author was clear in recommending additional engineering treatments (signal, medians, active warning signs, etc) on multi-lane

roadways over 12,000 ADT are necessary for pedestrians to safely cross the roadway – not just recommending the elimination of the crosswalk.

The study did not encompass a wide range of pedestrian crossing treatments for multi-lane roadways so it was not possible to develop warrant criteria for specific treatments (i.e. raised crossings, flashing signs, etc.). The study was also limited by the fact that 93% of the crossings analyzed were on roadways with speed limits between 25 to 35 MPH which limits the studies applicability to developing recommendations based upon a roadways speed limit. The results of this study have led to the development of specific guidance language for marking uncontrolled marked crosswalks proposed for the next edition of the MUTCD.

Crosswalk Markings and the Risk of Pedestrian-Motor Vehicle Collisions in Older Pedestrians, Journal of American Medical Association Report, Nov. 2002

This observational study assessed urban marked and unmarked crosswalks at approximately 800 controlled (stop or signal) and uncontrolled locations. The control broke down as follows:

Control Type	Number	Percent
Signal	406	51%
Stop	134	17%
Uncontrolled	254	32%
Other	5	<1%

The study adjusted for traffic volume, speed, travel lanes, crosswalk type (parallel line, high visibility) and crosswalk condition, presence of pedestrian refuge islands, pedestrian age, and pedestrian volume.

Study findings which are supported by data:

1. 300% increase in risk for pedestrians at locations where crosswalks were faded or worn.
 - Indicates need to maintain crosswalk markings.
 - Indicates crosswalk markings have an awareness effect.
2. Minimal difference in pedestrian risk found for marked or unmarked crosswalks located at signal or stop control locations.

3. Approximately four times increased pedestrian risk at locations where crosswalks were marked at uncontrolled locations when not adjusted for crossing distance, vehicle flow, and pedestrian age.
4. Approximately two times increased risk at locations where crosswalks were marked at uncontrolled locations when adjusted for crossing distance, vehicle flow, and pedestrian age.
5. Of the 406 traffic signalized intersections, 95% of the traffic signals had pedestrian signal heads installed.

Discussion of study limits and findings:

These results, show a 3.6 times greater risk of crash for pedestrians crossing at uncontrolled crossings adding, support for the findings of the 1972 study showing a six-times greater risk of crashes. This is the most comprehensive study found to date that included controlled intersections (signal and stop) as part of the analysis. The analysis of the pedestrian/vehicle crashes was limited to pedestrians over 65 years old; therefore there may be limits to the applicability of these findings to other age groups. It is important to note however, that older pedestrians are a known high-risk group for crashes and injuries.

Implications of Research on Commonly Held Crosswalk Safety Theories

Theory #1: Marked crosswalks create a “false sense of security”

Throughout the country, many agencies and engineers are reluctant to install marked crosswalks at controlled (stop, yield, or signal) and uncontrolled locations. This is primarily due to a misinterpretation of a groundbreaking 1972 study⁶ of uncontrolled crossing locations in San Diego, California. This study only analyzed uncontrolled crosswalks and did not take into account variations in traffic conditions and roadway geometry. *Therefore this study and its conclusions do not apply to controlled marked crosswalk locations.*

Unfortunately, due to failures to understand the context and limits of the 1972 crosswalk study, this study has been cited to prove the perception that marked crosswalks increase pedestrian risk taking and create a false sense of security.

⁶ Herms, Bruce. 1972. Pedestrian Crosswalk Study: Accidents in Painted and Unpainted Crosswalks, Transportation Research Record No. 406, Transportation Research Board, Washington, DC.

The FHWA 2001 study found that pedestrians scanned more for oncoming traffic in marked crosswalk versus unmarked crosswalks. This is indicative of more cautious rather than less cautious behavior. These studies show that it is not appropriate to classify all pedestrians as having a “false sense of security” while in a crosswalk.

Theory #2: Crosswalks should only be installed where “warranted” based on pedestrian volume to maintain motorist awareness

There is no legal difference between marked crosswalks and unmarked crosswalks at intersections. The majority of traffic engineering is arranged around the concept of meeting warrants to justify need. Unfortunately, developing warrants to prove pedestrian need for facilities is not a simple task. Therefore most agencies are moving towards land use policies for pedestrian accommodation restricting the use of warrant for pedestrian crossing signals. The pedestrian-only traffic signal (a signal to stop traffic - not a pedestrian signal head) is the only existing warrant within the MUTCD specific to pedestrians.

NCDOT has developed a midblock-uncontrolled crossing warrant to justify marking crosswalks. This warrant is based upon the 2005 FHWA uncontrolled crossing study with the exception of the pedestrian volume. The 2005 FHWA study did not recommend any pedestrian volume warrants.

There is no evidence from research that marking crosswalks reduces their effectiveness for promoting motorists to yield for pedestrians or that marked crosswalks lose credibility to motorists if pedestrians are not routinely present. The 2001 FHWA study of behavior showed that motorist behavior neither improved nor degraded when crosswalks were marked.

Theory #3: Crosswalks should be installed at all legal crossing locations as they encourage pedestrians to use them and they protect the pedestrian

The 1972 study, 2001 study, and 2005 study showed that marked crosswalks were effective at attracting pedestrians to utilize them. These studies show that where it is important to channelize pedestrians for their safety, a marked crosswalk is a useful tool for the engineer.

The marking of the crosswalk alone at uncontrolled crossings should be done carefully in accordance with the findings of the 2005 study when applied to uncontrolled crossings of multilane roadways with speeds over 40 mph. These roadways will require additional engineering treatments to supplement the marked crosswalk.

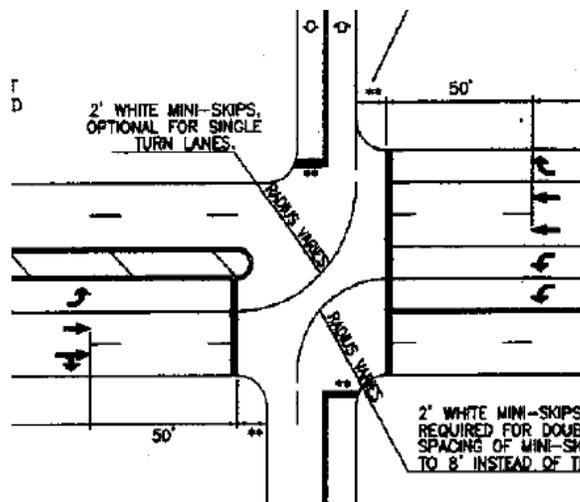
The research does provide evidence marking crosswalks at controlled (stop or signal) intersections degrades pedestrian safety or motorist respect for pedestrians regardless of volume (vehicle or pedestrian), width, or speed of the roadway.

Current Policy and Practice

Existing City of Wilmington Policies

Existing policies are informal and not in writing. The informal policy generally follows the following practices:

- Crosswalks are marked at controlled locations only when there is a demonstrated pedestrian demand of one pedestrian present per signal cycle.
- Marked crosswalks are only installed in combination with pedestrian signals and pushbuttons.
- The marked crosswalks are generally placed where the crossing conflicts least with turning traffic.
- Marking crosswalks across all legs of an intersection is rare except in the downtown area.
- Stop bar placement varies:
 - Stop bars are typically set back on local streets beyond the sidewalk or pedestrian crossing area
 - At some locations the bar is placed within the pedestrian crossing area (College Road, Eastwood Road, Wrightsville Avenue)
- Standard details for intersection design do not show crosswalks or sidewalks to provide guidance on stop bar or signal detection placement.



Existing NC DOT Policies

Pedestrian Policy Guidelines:

- Requires Wilmington to ask for pedestrian facilities on NCDOT roadways.
- No written guidelines for marking crosswalks at signalized or stop control intersections.

- Requires Wilmington to match 40% - 50% of project cost [verify] for new projects.
- Stop bar placement varies but typically set back on 10-15 feet from intersection.

NCDOT STANDARD PRACTICE C-36 For Crosswalks – Mid-Block (Unsignalized) Signing

- Requires engineering study.
- Should not be installed on roadways with a speed limit greater than 35 MPH.
- Should not be located within 300 feet of a non-signalized intersection and 400 feet of a signalized intersection.
- On street parking spaces should be eliminated no less than 50 feet on each curbside approach lane to the mid-block crosswalk and no less than 25 feet on each curbside exiting lane
- Installations of refuge or safety islands should be installed for mid-block crosswalks on multi-lane roadways if sufficient roadway width is available
- Mid-block crosswalks should not be installed on streets with an ADT volume exceeding 12,000 vehicles per day. If a raised pedestrian refuge median is provided the ADT should not exceed 15,000 vehicles per day.
- A minimum pedestrian crossing volume of 25 pedestrians per hour for at least four hours of a typical day should be met in order to warrant a Mid-Block Crosswalk.
- Provide raised median pedestrian refuge at mid-block crosswalks where the total crossing width is greater than 60 feet
- Use high-visibility (ladder-style) crosswalk markings to increase visibility longitudinally.
- Provide advance stop or yield lines to reduce multiple threat collisions.
- Provide advanced crosswalk warning signs for vehicle traffic.
- Use curb extensions to increase the visibility of the driver and the pedestrian.
- Utilize Z crossing configuration to require pedestrian to face oncoming traffic.

State of the Practice

The Manual on Uniform Traffic Control Devices (MUTCD) – Section 3B.17

The *MUTCD* states “Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining and delineating paths on approaches to and within signalized intersections, and on approaches to other intersections where traffic stops.”

It further states that “crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements.” It also states “crosswalk markings should not be used indiscriminately. An engineering study should be performed before they are installed at locations away from highway traffic signals or STOP signs.”

This has been misconstrued by some to mean that they should only be marked if there is a significant pedestrian demand. In actuality, this statement is in the *MUTCD* to advise an engineering study before marking a crosswalk at an uncontrolled location. There are no restrictions or guidelines for installing crosswalks at signalized intersections.

Pedestrian Facilities Users Guide, FHWA

The *Pedestrian Facilities Users Guide*, published by the Federal Highway Administration (FHWA) in 2002 recommends utilizing marked crosswalks to improve predictability and visibility by encouraging pedestrians to cross at locations visible to conflicting traffic. Additionally crosswalks should be located to limit exposure by routing pedestrians in as direct a manner as possible, taking advantage of crossing islands where available.

Designing Sidewalks and Trails for Access, Part II of II

The flared portion of the curb ramp does not necessarily need to be contained within the crosswalk. The majority of the examples of “Good Curb Ramp Design” included in this manual show the flared portion of the curb ramp extending beyond the marked crosswalk. The guide also recommends the provisions of crosswalk markings with edge lines to guide vision impaired pedestrians across the roadway.

Crosswalk Recommendations

Develop and Adopt Crosswalk Marking Guidelines

The City of Wilmington should adopt clear crosswalk marking guidelines for use by staff and consultants. An adopted policy will be a helpful tool for negotiations to provide pedestrian accommodations across NCDOT controlled roadways. An adopted policy will also provide a framework to assess crosswalk marking requests. It is also recommended that the City of Wilmington:

- Develop a marked crosswalk policy for stop controlled and signalized intersections that supports marking of crosswalks to channelize pedestrians.
- Adopt the NCDOT pedestrian midblock, uncontrolled crosswalk marking policy.
- Develop an uncontrolled pedestrian crosswalk marking policy that follows the guidelines outlined in the 2005 FHWA crosswalk study.
- Provide high visibility markings at all uncontrolled crosswalks and all crosswalks (including signalized or stop-controlled crosswalks) leading to a block with a school, within a designated school zone area, along a designated school walking route, on blocks adjacent to a major WAVE Transit facility, or at locations with high pedestrian activity.

Modify Standard Design Details to Show Pedestrian Accommodations

City of Wilmington standard design details should be modified to show pedestrian accommodations. The current details largely mirror NCDOT roadway designs which are not appropriate for urbanized areas. Adoption of new standard details showing pedestrian facilities will be a helpful tool for negotiations with developers and NCDOT as new roadway projects are constructed or existing roadways are reconstructed. Details showing pedestrian facilities will give more appropriate guidance to the placement of stop lines, signal detection equipment, signal control boxes, and other utilities within the pedestrian realm. Having identical details to NCDOT implies full support for the application of NCDOT roadway design standards (rural and suburban character) within the City of Wilmington (urban character).

Modify Existing Decorative Crosswalk Marking Design to Improve Visibility

High-visibility crosswalk markings are strongly preferred over decorative markings because they are easier for motorists to see. Wilmington's policy should be modified to require crosswalks constructed of decorative materials to include 12 inch wide reflective white lines along the boundary of the crosswalk to maximize visibility. It is recommended the policy also require that the decorative surface be firm, stable and slip resistant and vertical displacement not exceed ¼ inch, and horizontal gaps not exceed ½ inch per ADA requirements.



Decorative crosswalks require the solid white markings to conform to the MUTCD and to be visible to motorists

Modify Current High-Visibility Marking Design to Reduce Maintenance

The current Wilmington and NCDOT high-visibility marking

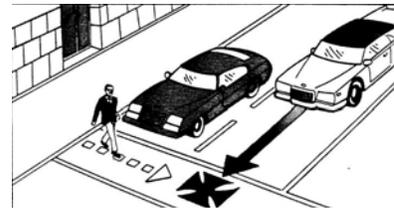
style consists of white longitudinal stripes 24 inches wide and spaced 24 inches apart bounded by 6 inch parallel white lines. This style is generally fairly visible to motorists but subject to wear by motor vehicles.

It is recommended that Wilmington utilize the flexibility provided by the MUTCD to develop a high-visibility crosswalk marking that will reduce wear of the pavement marking by motor vehicles. An example is the City of Seattle's high-visibility marking style (piano) which consists of two white longitudinal stripes eight inches wide separated by and 8 inch space. Each set of lines is separated by a space of 60 inches.

Advance Yield Lines at Uncontrolled Marked Crosswalks

Introduction

Multiple threat crashes are common on multi-lane roads when a driver in one lane yields to a pedestrian, and a driver in the adjacent lane fails to yield or stop – striking the pedestrian. These types of crashes are often fatal for the pedestrian due to



the higher speed nature of the crash. Numerous studies have shown that the use of advance yield lines at uncontrolled marked crosswalks in conjunction with “Yield Here for Pedestrians” signs can reduce the incidence of multiple threat crashes.

Current Policy or Practice

City of Wilmington

The city has adopted the MUTCD which defines the placement of advance yield lines. Advance yield lines do not appear to be in use in Wilmington.

NCDOT

NCDOT has adopted the MUTCD which controls the placement of advance yield lines. Advance yield lines do not appear to be in use in Wilmington. The NCDOT Midblock Pedestrian crossing warrant specifies the use of an advanced yield line for multi-lane crossings.

The Manual on Uniform Traffic Control Devices

Section 3b.16 defines yield lines in the MUTCD. The current wording of the MUTCD implies advanced yield lines are to only be utilized for uncontrolled, midblock crossings.

Recommendations Overview

Adopt the proposed 2009 MUTCD language for placement of Advanced Yield Lines

Discussion of Existing Policies

State of the Practice

The MUTCD allows for the use of advance yield lines at unsignalized midblock crosswalks. This is in accordance with the North Carolina law requiring motorists to yield to pedestrians within marked crosswalks at uncontrolled crossings. Proposed changes to the 2009 edition of the MUTCD include improvements to the text to allow the placement of advanced yield line at uncontrolled crosswalks located midblock and at intersections.

Excerpts of proposed 2009 MUTCD language:

Section 3B.16 Stop and Yield Lines

Guidance:

Yield lines may be used to indicate the point behind which vehicles are required to yield in compliance with a YIELD (R1-2) sign or a Yield Here To Pedestrians (R1-5 or R1-5a) sign.

Yield lines (see Figure 3B-15) shall consist of a row of solid white isosceles triangles pointing toward approaching vehicles extending across approach lanes to indicate the point at which the yield is intended or required to be made.

If yield or stop lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, the yield lines should be placed 6.1 to 15 m (20 to 50 ft) in advance of the nearest crosswalk line, and parking should be prohibited in the area between the yield or stop line and the crosswalk (see Figure 3B-16).

Standard:

If yield lines are used at a crosswalk that crosses an uncontrolled multi-lane approach, Yield Here To Pedestrians (R1-5 series) signs (see Section 2B.11) shall be used.

Recommendation

Develop guidelines and design details for use of advanced yield lines at uncontrolled pedestrian crossings

It is recommended that City of Wilmington develop guidelines and standard details for utilizing advanced yield lines at all multi-lane uncontrolled crossings. Advance stop bars should be allowed mid-block and at uncontrolled intersections on multi-lane roads. The adopted standard should follow the proposed language provided in the 2009 MUTCD.

The following additional criteria should be considered in the City of Wilmington to complement the proposed MUTCD language:

- The application of this treatment should only be used where a crosswalk meets the warrants of the City of Wilmington's crosswalk marking policy.
- On streets with on-street parking, it is recommended that parking be restricted near the crosswalk, and curb extensions be provided to improve sight distances between motorists and pedestrians.
- Solid lane line striping should be provided on the upstream side of the stop bar for a distance equivalent to the required stopping sight distance (i.e. 155 feet at 25 mph, 200 feet at 30 mph, 2004 AASHTO Exhibit 3-1 on level ground).
- Consideration should be given to providing an overhead pedestrian crosswalk sign on multi-lane roadways with uncontrolled crosswalks.

Leading Pedestrian Interval

Introduction

Pedestrian signals are intended to control the flow of pedestrian traffic across a roadway. They are most frequently at intersections, but they are installed at non-intersection locations as well. The most common type of pedestrian signal timing provides pedestrians with a WALK signal at the same time adjacent street vehicular traffic has a green light (concurrent phasing). At locations where there are large movements of turning vehicles, it can be difficult for pedestrians to begin crossing the roadway at the start of the walk signal as the turning vehicles are often reluctant to yield to the pedestrians. A Leading Pedestrian Interval (LPI) signal provides a two- to four-second WALK signal in advance of the green light.

Background

Since most signals are timed to provide the minimum time required for a pedestrian crossing, a delay in beginning the crossing movement may leave pedestrians trapped in the roadway or at the curb as the WALK signal changes to DON'T WALK. This places them in potential conflict with cross street traffic as it receives a green light. This may be particularly problematic if the crossing distance is long or does not provide a median refuge where pedestrians can wait for the next WALK signal. Frustrated pedestrians who are not able to cross the roadway may be more likely to take risks (crossing away from the signal or crossing on a DON'T WALK signal). In addition to the potential for a pedestrian crash, a pedestrian crossing away from the signal or on a DON'T WALK signal may increase vehicular delay.

LPI is a signal phasing strategy to improve pedestrian visibility to motorists in locations with heavy volumes of turning traffic and frequent pedestrian

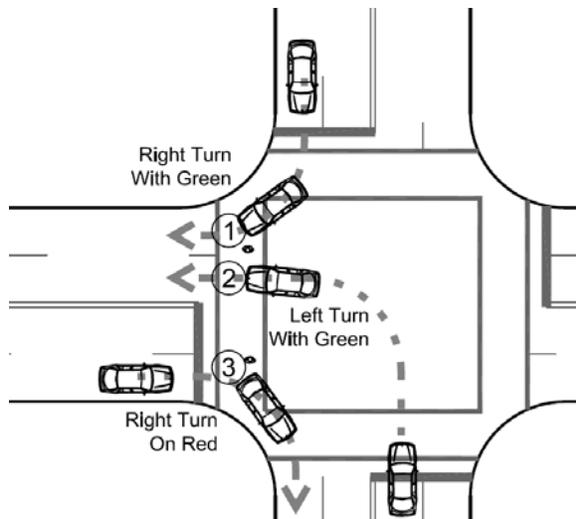


Figure 9 – There are three potential conflict points between pedestrians and motorists at a typical intersection



Figure 8 - Leading pedestrian interval provides person a head start – walk signal is given while motorists have red light

crossings. During the LPI, all motor vehicle flows are stopped for two to four seconds while pedestrians are given the WALK signal. This is designed to allow pedestrians to begin crossing in advance of vehicular turning movements which makes them more visible to motorists. The reduction in pedestrians entering the crosswalk after the signal changes may improve intersection efficiency as well as pedestrian safety. In many cases, an LPI is a simple, inexpensive treatment because the signal controller can be retimed relatively easily or programmed to operate only during peak pedestrian demand times. LPIs can be complemented by geometric design changes that shorten crossing distances which contributes to reductions in the required signal cycle duration.

Recommendations Overview

The list below highlights recommendations for implementing LPIs in the city. For a more detailed discussion, please see the section Recommendations at the end of this paper.

- Develop policy for the use of LPI at signalized intersections
- Pilot LPI in high pedestrian demand areas (such as N. 3rd St. at Chestnut St. and Princess St., and Market St. at Front St.)

Current Policy or Practice

City of Wilmington

The city currently does not have a policy on the use of Leading Pedestrian Intervals (LPI) nor is it in use anywhere in Wilmington. According to city staff, the current instrumentation is not readily capable of reprogramming with LPI due to technology limitations. However, the city will soon be upgrading signal timing equipment which will allow increased control over discrete elements of the signal operation.

NCDOT

The NCDOT currently does not have a policy on the use of Leading Pedestrian Intervals (LPI).

State of the Practice

LPIs have been used successfully for decades in the United States. They are in use in:

- Ashville, Raleigh, Charlotte, Chapel Hill, Cary
- St. Petersburg, FL
- Washington, DC

Jacksonville, NC is considering several locations around the city to pilot LPI signals. Numerous studies have confirmed that LPIs reduced right-of-way violations by turning motorists with pedestrians. LPIs are an effective treatment as they are typically low in cost yet offer much of the benefit of dedicated pedestrian signal phasing/pedestrian scramble patterns while minimizing delay to pedestrians and motorists.

The Manual on Uniform Traffic Control Devices

There is no specific language on this signal timing strategy in the MUTCD. The timing is accomplished by extending the time of the all red clearance interval while simultaneously providing the desired WALK signal. Changing this interval is allowed in the MUTCD.

Recommendation

Develop Policy for the use of LPI at Signalized Intersections

The City of Wilmington should develop a guiding policy for the use of Leading Pedestrian Intervals at signalized intersections. The city is well positioned to utilize this technique as all existing pedestrian crossings utilize the pedestrian push button to generate the walk signal. The use of this technique will:

- Improve pedestrian safety by allowing them to exert their right to cross the roadway in a safe manner
- Improve pedestrian safety by encouraging them to cross where they are most visible to cross traffic
- minimize delay to motorists as the extra time will not be called unless a pedestrian is present
- encourage use of the pedestrian push buttons as the pedestrian will be rewarded with LPI

LPIs are recommended in locations where there are frequent conflicts between pedestrians and turning vehicles at signalized intersections. In particular, LPIs should be utilized at intersections where multiple left turn lanes are provided and pedestrian phase must be concurrent with the turning vehicle phase. Where an LPI is in use, Accessible Pedestrian Signals (APS) should be provided to alert pedestrians with vision impairments that the pedestrian crossing phase has begun. Restrictions of motorists turning right-on red are also advisable to maintain the integrity of the LPI timing scheme.

Pilot LPI in High Pedestrian Demand Areas

As soon as the technology is available, Wilmington should pilot LPI signals in several high pedestrian demand areas around the city. Suggested locations should have relatively high pedestrian volumes such as areas in the historic downtown or near the University of North Carolina at Wilmington Campus.

Island Channelization and Median Pedestrian Refuges at Intersections

Introduction

Many arterial roadways have multiple lanes of traffic which require pedestrians to make long crossings. In Wilmington, it is not unusual to find arterials with eight or nine travel lanes with intersection crossing distances of 100 feet or more. Island channelization and median pedestrian refuges are two approaches that can effectively reduce the time the pedestrian is in a travel lane by dividing the crossing into shorter ‘segments.’ Instead of facing an uninterrupted stretch of asphalt from one curb to another, the islands and refuges insert places in the crossing where a pedestrian is allowed to stand outside of the vehicle travel way. These improvement approaches can make these long crossings feel more comfortable to users.

A number of research studies have shown that pedestrians receive a safety benefit from raised medians. For example, in *Safety Effects of Marked vs. Unmarked Crosswalks at Uncontrolled Locations: Executive Summary and Recommended Guidelines*, the presence of a raised median was found to improve the safety of crosswalks. This study found that there was no safety benefit from medians that were not raised. This is particularly important on roadways with more than one travel lane in each direction.

Refuge islands are also beneficial for pedestrians as they can potentially reduce exposure to motor vehicles. When utilized at signalized intersections, refuge islands separating right turn lanes from through lanes can shorten cycle lengths by reducing the pedestrian crossing time. This can be particularly helpful on roadways such as College Road where the time required to cross pedestrians exceeds the time required for motorists to clear the side roads. An example retrofit at Randall Parkway and College Road



Figure 10 – Example retrofit opportunity at College Road and Randall Parkway to shorten pedestrian crossing.

shows how a pedestrian crossing island at the right turn can reduce the required crossing time (at 3.5 ft/sec) by 13 seconds by reducing the pedestrian crossing from 145 feet to 100 feet.

At complex or irregularly shaped intersections, median refuges can provide pedestrians with a place to stop and assess the traffic pattern through the intersection.

Recommendations Overview

The list below highlights recommendations for improving push buttons within the City. For a more detailed discussion, please see the section Recommendations at the end of this paper.

- Provide Median Refuge Islands on all Roadways with 4 or More Travel Lanes
- Provide Island Channelization between Through and Turning Traffic

Current Policy or Practice

Existing City of Wilmington Policies

- Vertical curbing is required to protect median function and landscaping. Many of the existing medians in Wilmington extend this vertical curbing into the crosswalk area (marked or unmarked).
- For local streets: minimum median width - 10' face-to-face.
- For collector streets: minimum median width - 13' face-to-face, to provide for possible left turns, access cuts, etc.
- Medians are reserved for landscaping only; no decorative structures, non-traffic signs, etc. are permitted.
- Sight distance triangle standards apply based on a case-by-case review using AASHTO stopping distance information for the rated speed of the street.
- Minimum length of medians shall be 100 feet.

NCDOT

- Generally provide medians along roadways – vary from flush to raised
- Prefer flush pavement with markings to raised islands where speeds exceed 45 mph
- Section 6.5 (Crossing Distances) of NCDOT's *Guidelines for the Investigation and Remediation of Potentially Hazardous Bicycle and Pedestrian Locations* (September, 2003) states that "...it is not recommended that non-motorists be forced to cross more than three lanes at a time, including turn lanes..."

The Manual on Uniform Traffic Control Devices (MUTCD)

Adequate roadway capacity should be provided at a signalized location. Before an intersection is widened, the additional green time pedestrians need to cross the widened roadways should be considered to determine if it will exceed the green time saved through improved vehicular flow. (Section 4B.05 Adequate Roadway Capacity).

Discussion of Existing Policies

The guidelines and policies established by NCDOT, Wilmington, and AASHTO allow for the use of medians. The NCDOT guidelines establish medians of sufficient width to provide pedestrian refuge (i.e. minimum 6 feet at the crossing).

Channelizing islands and medians can also be used in conjunction with other measures to reduce vehicle turning speed. Slower turning vehicles provide more time for pedestrians to cross and are easier for pedestrians to anticipate. Additionally, slower turning vehicles allow drivers increased reaction time and are easier to stop or slow down when necessary. All of these factors have the potential to benefit pedestrians through safer and more comfortable crossings and increase driver rates of yielding to pedestrians in the crossing.

State of the Practice

ITE's Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities provides some guidance on the use of medians for pedestrian refuge (2006):

- On multi-lane thoroughfares, medians are important to aid pedestrians in their crossings. Even a narrow median of 6 to 8 ft. can be more desirable to a crossing pedestrian than the same width added to another element of the thoroughfare.
- At intersection crossings, extend the median nose beyond the crosswalk to provide an enclosed pedestrian refuge.
- Avoid providing overly wide medians at the expense of unreasonably narrowing the roadside. In urban contexts, roadsides of appropriate widths should take higher priority than wide medians. However, the design needs to balance the safety, operational, and pedestrian needs of the street.
- In contrast to medians in rural areas, in urban areas the width of medians at intersections should only be as wide as necessary to provide the desired function (such as pedestrian refuge), otherwise the intersection loses operation efficiency and vehicles crossing the median may use the width inappropriately (side-by-side queuing, angled stopping, etc.).

- If the median will not be landscaped, consider using pavers, colored stamped concrete, stone, or other contrasting material to create visual interest and an aesthetic appearance.
- The guidelines further recommend 6 feet as the minimum width for a median that serves as a pedestrian refuge, with a recommended width of 8 feet.

Multiple Median Islands

Figure 2 at right depicts the use of multiple medians in Washington, DC. At this busy intersection, medians have been installed on both sides of traffic turning left from New York Avenue (east-west) onto Bladensburg Road (north-south). For pedestrians, this provides two locations to stand outside of the vehicle travelway while crossing New York Avenue. This allows pedestrians to make this crossing more comfortably, especially if they are forced to interrupt their crossing due to insufficient time.



Figure 2 – Dual median islands on New York Avenue at

Note also the use of colored surface treatments on the islands to make them more noticeable to both drivers and pedestrians. This is also designed to improve the overall aesthetic of the streetscape in this vicinity.

Recommendation

Provide Median Refuge Islands on all Roadways with 4 or More Travel Lanes

It is recommended that Wilmington require pedestrian refuge islands to limit crossings to no more than three travel lanes.

At intersections, medians provide effective refuge for pedestrians when the median nose extends beyond the crosswalk. An accessible route through the median is required for pedestrians, either through the use of curb ramps, or a cut-through. Wilmington should work with NCDOT to retrofit multilane arterial intersections with channelizing traffic islands to separate right turning lanes from through lanes to shorten crossing distances. This would also allow for reduced traffic signal cycle lengths as the pedestrian crossing time may be shortened. Wilmington should develop standard detail drawings that show an urbanized, preferred design which provides the following:

- Provision of raised medians on all roadways with four or more through travel lanes. Minimum width should be six feet to accommodate pedestrians and eight feet to accommodate bicyclists.
- Pavement level cut-throughs or ADA compliant curb ramps should be installed leading to all crosswalks to ensure accessibility.
- An approach that is offset from the edge of the traffic lane and appropriately treated with signage, markings or other treatments to provide motorists with sufficient warning of the island's presence.

Provide Island Channelization between Through and Turning Traffic

- An option for shortening pedestrian crossings is to separate left turn and through lanes to allow trapped pedestrians a place to wait and to limit last second lane changes by motorists

Wilmington should develop policies and design guidance for reducing turning vehicle speed while enhancing pedestrian visibility to motorists. Wilmington should work with NCDOT ensure various speed reducing features when median islands (“porkchops”) are installed on multilane arterials. Wilmington should develop standard detail drawings that show an urbanized, preferred design which provides the following:

- Turning radii and 55-60 degree approach angle that will require slower vehicle turning speeds.
- Implementation of raised crosswalks across the slip ramp approach to require slower speeds and to promote yielding to pedestrians.

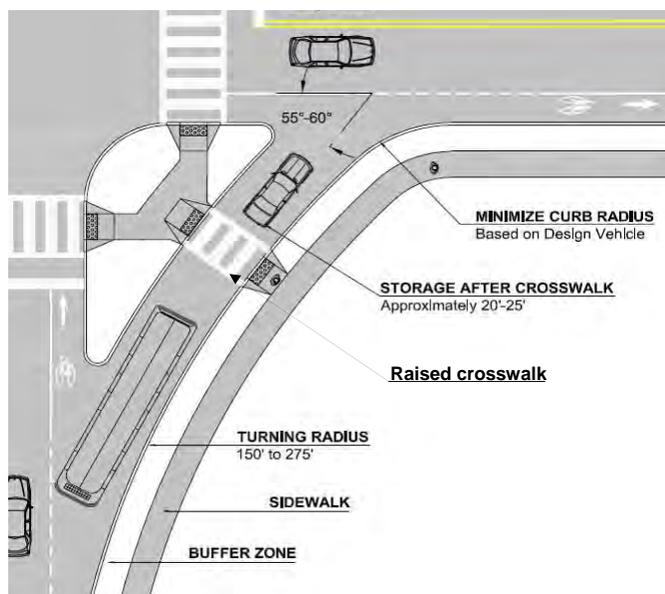


Figure 3 – Example of a slip design that can shorten pedestrian crossings of wide roadways and minimize high speed right turns and promote motorist yielding for pedestrians. Source: Maryland SHA

- Consider allowing yield control right turns for motorists to improve intersection capacity and reduce need for long right turn lanes (utilize only if raised crosswalk is implemented).

Turning Radius and Intersection Size

Background

The intersection of two roadways requires construction of curves (designated by a curb radius) to allow vehicles to maneuver while turning without driving over the curb line or entering into opposing travel lanes. Large curves are utilized to allow larger vehicles (such as trucks) to turn within the roadway and/or to allow smaller vehicles to turn at higher speeds. Larger curves require more land and lengthen pedestrian crossing distances. The required curb radius for a vehicle to make the turn is known as the effective curb radius. Oftentimes, this differs from the actual constructed curb radius. When roadways are constructed without consideration of the actual required turning radius of the vehicles utilizing them, the curb radius may be constructed to be larger than necessary which lengthens pedestrian crossing distances and increases vehicle turning speeds.

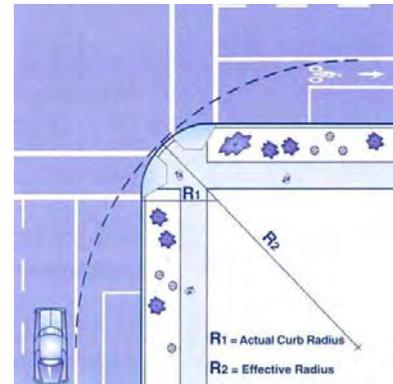


Figure 11 – Illustration of actual curb radius vs. effective curb radius from Oregon Pedestrian and Bicycle Design Guide.

Recommendations Summary

- Allow Flexibility in Choosing Appropriate Curb Radii
- Specify Minimum Curb Radii based upon the Required Effective Curb Radius
- Develop Criteria for Use of Curb Extensions

Current Policy

Existing City of Wilmington Policies

Current policy requires a minimum radius of 35 feet for all intersections with no reference to design vehicle or the context of the roadway.

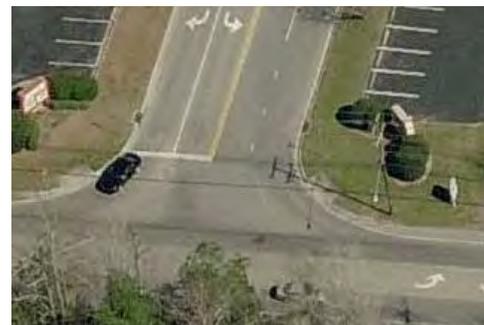


Figure 12 – The darkened pavement shows the typical vehicle tracking requirements at Kerr Avenue/Fountain Drive intersection. Utilizing larger curb radius results in intersections that are larger in size than necessary.

Existing NC DOT Policies

Existing NC DOT policies reference the AASHTO design guideline to determine curb radius.

State of the Practice

The American Association of State Highway and Transportation Officials, Policy on the Geometric Design of Highways and Streets (AASHTO Green Book, 2004) provides the basis for roadway geometric design throughout the country. The Green Book states that “Where it is appropriate to provide for turning vehicles within minimum space, as at unchannelized intersections, the corner radii should be based on the minimum turning path of the selected design vehicles.”

The Green Book also states that “the appropriate design may depend on other factors such as the type, character and location of the intersecting roads, the vehicular and pedestrian traffic volumes, the number and frequency of the larger vehicles involved in turning movements, and the effect of these larger vehicles on other traffic. For example, if turning traffic is nearly all passenger vehicles, it may not be cost-effective or pedestrian friendly to design for large trucks. However, the design should allow for the occasional large truck to turn by swinging wide and encroaching on other traffic lanes without disrupting traffic significantly.”

The following general principles and recommended practices for intersection size and turning radius design are provided in *the ITE Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities*:

- Intersections should be designed as compact as practical in urban contexts. Intersections should minimize crossing distance, crossing time, exposure to traffic, encourage pedestrian travel and increase safety.
- Use a design speed appropriate for the context. Motorists traveling at slower speeds have more time to perceive and react to conflicts at intersections.
- Curb return radii should be designed to accommodate the largest vehicle type that will frequently turn the corner (sometimes referred to as the control vehicle). This principle assumes that the occasional large vehicle can encroach into the opposing travel lane. If encroachment is not acceptable, then a larger design vehicle should be used.
- Curb return radii should be designed to reflect the “effective” turning radius of the corner. The effective turning radius takes into account the wheel tracking of the design vehicle utilizing the width of parking and bicycle lanes. Use of the effective turning radii allows a smaller curb return radius while retaining the ability to accommodate larger design vehicles.

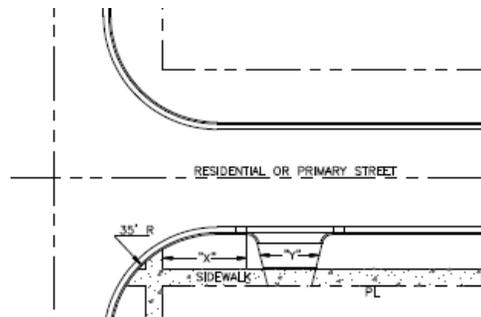


Figure 13 – Design detail from Wilmington design guideline specifying 35’ minimum radius.

- In urban centers and urban cores where pedestrian activity is intensive, curb return radii should be as small as possible.
- On multi-lane thoroughfares, large vehicles may encroach entirely into the adjacent travel lanes (in the same direction of travel).
- To help select a design vehicle, identify bus routes to determine whether buses are required to turn at the intersection. Also check transit service plans for anticipated future transit routes. Map existing and potential future land uses along both streets to evaluate potential truck trips turning at the intersection.
- Apply curb return radii that are compatible with the design vehicle. Occasional turns by vehicles that are larger than the design vehicle could be accomplished by turning more slowly and possibly encroaching into oncoming travel lanes to complete the turn.
- Curb return radii of different lengths can be used on different corners of the same intersection to match the design vehicle turning at that corner. Compound, spiral, or asymmetrical curb returns can be used to better match the wheel tracking of the design vehicle (see AASHTO's Green Book for the design of spiral and compound curves).
- If large vehicles need to encroach into an opposing travel lane, consider placing the stop line for opposing traffic further from the intersection.

- In urban centers and urban cores at intersections with no vehicle turns, the minimum curb return radii should be 5 ft.
- A typical minimum curb return radius of 10 to 15 ft. should be used where:
 - High pedestrian volumes are present or reasonably anticipated;
 - Volumes of turning vehicles are low;
 - The width of the receiving intersection approach can accommodate a turning passenger vehicle without encroachment into the opposing lane;
 - Passenger vehicles constitute the majority of turning vehicles;
 - Bicycle and parking lanes create additional space to accommodate the “effective” turning radius of vehicles;
 - Low turning speeds are required or desired; and
 - Occasional encroachment of turning school bus, moving van, fire truck, or oversized delivery truck into an opposing lane is acceptable.

- Curb radii will need to be larger where:
 - Occasional encroachment of a turning bus, school bus, moving van, fire truck, or oversized delivery truck into the opposing lane is not acceptable;
 - Curb extensions are proposed or might be added in the future; and
 - Receiving thoroughfare does not have parking or bicycle lanes and the receiving lane is less than 12 ft. in width.

Recommendation

Allow Flexibility in Choosing Appropriate Curb Radii

It is recommended that Wilmington update its turning radii policy to match the flexibility provided within the AASHTO guide. Wilmington's current minimum radius policy (Chapter 7, table 2) requires a 35 ft radius for all streets regardless of need.

The curb radius design policy should be expanded to allow more flexibility in intersection design based on site conditions and traffic characteristics. The designer should be permitted to select the smallest curb radius that serves the required design vehicles, considering the available effective curb radius, the presence of turning bus traffic, vehicular volumes, the percentage of heavy vehicles (i.e. potential design vehicle), pedestrian safety, land use, and convenience (relative to the heavy vehicle driver). The *ITE Context Sensitive Solutions in Designing Major Urban Thoroughfares for Walkable Communities* detailed previously should be used as a guide in expanding the policy.

Specify Minimum Curb Radii based upon the Required Effective Curb Radius

The discussion of minimum curb radius should be reorganized around the minimum effective curb radius.

Develop Criteria for Use of Curb Extensions

It is also recommended that Wilmington develop a policy describing when curb extensions should be installed as part of retrofit projects, rehabilitation projects, resurfacing projects, and new construction. It is generally recommended that curb extensions be utilized to shorten crossing distances and to enhance the public space or to provide space for a bus shelter wherever possible on arterial roadways and at multi-legged intersections.

Driveway Design

Introduction

Driveways are low volume intersections. They require curb cuts which intrude across the pedestrian walking area. Pedestrians have the legal right-of-way while walking across all driveways unless they are controlled by a traffic signal. The design of the driveway influences driver behavior and pedestrian comfort. Motorists are unlikely to yield to pedestrians crossing wide driveways that allow vehicles to turn into them at speeds over 10-15 mph placing them at risk of being struck by a vehicle.

Roadways with frequent driveways can contribute to a poor pedestrian environment as the pedestrian must constantly be assessing traffic for potentially turning traffic across their path. These types of roadways are typically congested and often have higher vehicle crash rates because of the frequent and possibly unexpected entry and exit of vehicles into the roadway. These factors further contribute to an uncomfortable pedestrian environment. Access management is a technique where agencies limit driveways by encouraging shared driveways or otherwise limiting access points to specified locations along a roadway.



Figure 14 – Example left turn conflict where pedestrian may not be seen by turning motorist along Market Street.

Multi-lane roadways without medians present particular challenges to both pedestrians and motorists as motorists turning left into a driveway are focused on finding gaps in oncoming traffic. While focusing on gaps in traffic, the motorist's sight lines of potentially conflicting pedestrians are blocked by the approaching vehicles. Motorists often accelerate rapidly to clear a gap on multi-lane roadways which puts the pedestrian at risk when walking along the roadway.

Recommendations Summary

- Identify Opportunities to Improve Existing Driveways
- Develop More Flexible Driveway Design Standards
- Require all New Driveways to Conform to Wilmington Standards for Vertical Alignment and Construction Materials

Current Policy or Practice

Existing City of Wilmington Policies and Standards

Wilmington policies provide a range of options for driveway design. The driveway widths at the property

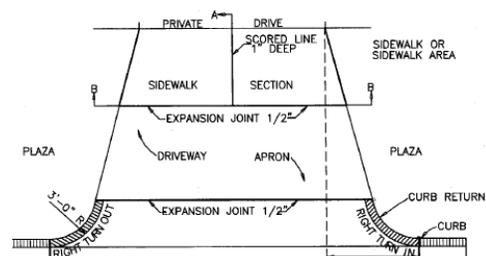


Figure 15 – Wilmington standard driveway detail (SD 8-02)

line provide a range of widths from 13 feet to 36 feet depending upon the use with an option for widths up to 50 feet with approval by the engineer.⁷ Wilmington requires minimum driveway tapers of 13 feet for access, and 3 feet for exit (Standard Details- Table 4, pg 7-10). Detail SD 8-02 is the preferred design to be used in all circumstances unless otherwise approved by the engineer. The details require the transition to occur at the apron if a plaza is present maintaining a level sidewalk. The minimum driveway radius is 3 feet for both entrance and exit.

Wilmington’s current driveway design requires the driveway apron to rise from street level to the sidewalk level so that a pedestrian crossing a driveway will not experience a change in grade.

Thoroughfare standards dictate the maximum number of driveways per property frontage, minimum separation between driveways on a single property, and minimum separation from intersecting roadways and property lines.⁸ Shared driveways serving adjoining properties are allowed with approval by the City Engineer, and interconnectivity between adjoining parking lots is strongly encouraged.

For all other locations, driveways may not exceed fifty percent of the property line.

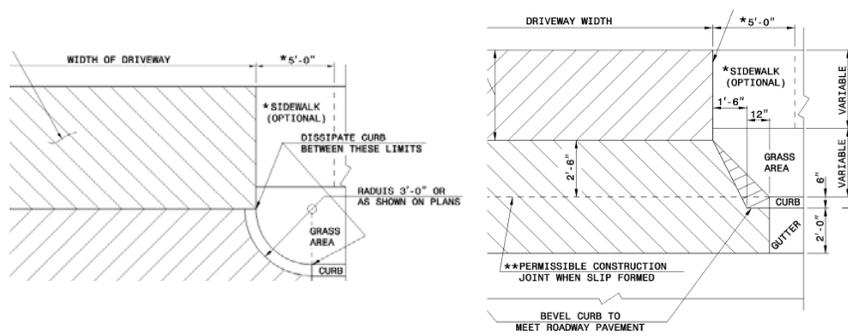


Figure 16 – NCDOT Std. 848.02 and 848.03

Existing NC DOT Policies

A paved driveway turnout (Std. No. 848.04) shall be used for commercial type entrances that generate 500 ADT or more. A 25 foot minimum curb radii is recommended with a 20 foot minimum driveway width. Uses that generate less than 500 ADT may use NCDOT Std. No. 848.02 or Std. No. 848.03 utilizing the 3 foot minimum curb radii.

Discussion of Existing Policies

Current city driveway design standards are similar to NCDOT standards; however there are opportunities for improvement. The minimum driveway taper requirement requires pedestrians



Figure 17 -Driveway built to SD 8-02 standards on Fountain Drive

⁷ For the purposes of this paper, the focus will be on non 1 or 2 Family Residential Standards which allow driveways as narrow as 9 feet.

⁸ For a list of all Thoroughfare Segments, see page 7-12 of the Technical Standards and Specification Manual.

to make longer crossings than if no taper is required. Furthermore, the minimum driveway taper required for SD 8-02 results in an effective curb radius of 20 feet which can allow motorists to turn at speeds of 10-20 mph across the sidewalk reducing the likelihood they will yield to pedestrians crossing on the sidewalk within the driveway.

Some recent commercial development projects on NCDOT maintained arterials have driveways that continue at street grade through the sidewalk crossing. This effect is a driveway which looks and feels like a narrow road intersection. Pedestrians walking along the sidewalk step down into the driveway apron. The driveway aprons have asphalt surfaces which further contributes to the sense of crossing a road intersection as opposed to crossing a driveway.

The NCDOT recommendation for a minimum curb return radius of 25 feet on many commercial driveways exposes a pedestrian to turning vehicles for longer periods of time than a smaller requirement would due to the resulting crossing distance.

The access management standards do have the potential to reduce the number of driveways pedestrians in Wilmington will be required to cross.

Recommendations

Look for Opportunities to Improve Existing Driveways

Wilmington should expand its driveway policy to address access management and limit conflict points when properties are redeveloped, sold, or change use. Additionally, when roadways are being constructed, reconstructed or resurfaced, existing driveways should be reviewed for opportunities to consolidate or reduce their width to conform to the access management policy.

Revise Standards to Reduce Driveway Crossing Distance

Wilmington should consider develop driveway design standards appropriate to the ADT of the site (similar to NCDOT's policy). New design standards should require the minimum necessary driveway width, curb radii, and tapers to facilitate access for larger vehicle access (if necessary) and to accommodate the anticipated vehicle volume. The curb radii selected should be based upon the effective turning radius necessary to make the turn without off tracking onto the curb. Locations which allow parking may be constructed with curb radii as small as 3 feet.

Require all New Driveways to Conform to Wilmington Standards for Vertical Alignment and Construction Materials

Wilmington should require all new driveway aprons to be constructed of concrete or other contrasting surfacing. Additionally, all driveways within the city should be constructed so that the driveway apron is at sidewalk level where the sidewalk crosses the driveway.

Turning Traffic “Yield to Pedestrians” Sign (at Signalized Intersections)

Introduction

When crossing a street with a WALK signal at a signalized intersection, pedestrians may be deterred from entering the crosswalk by vehicles turning across their path from intersecting roadways. Many communities are installing “Yield to Pedestrians” signs to alert drivers of the presence of pedestrians and the applicable laws.

Background

The most common type of pedestrian signal timing provides pedestrians with a WALK signal at the same time as parallel vehicular traffic has a green light (concurrent phasing). At locations where there are large movements of turning vehicles, it can be difficult for pedestrians to begin crossing the roadway at the start of the walk signal as turning motorists are often reluctant to yield to the pedestrians. At long crossings where pedestrians are provided the minimum crossing time, this can leave them in the roadway when the signal changes.

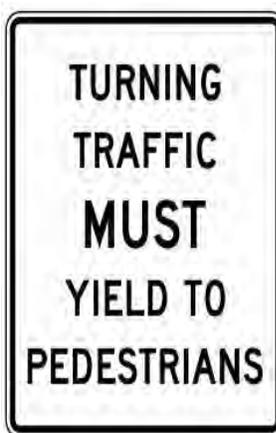


Figure 18 – At locations where motorists regularly fail to give the right of way to the pedestrian while turning, a TURNING TRAFFIC YIELD TO PEDESTRIANS sign can be a useful educational tool to reduce conflicts.

Drivers are unaware of their responsibility to yield to pedestrians in crossing in the legal marked or unmarked crosswalk when they turn onto the receiving roadway.

At locations with higher volumes of turning traffic, pedestrians may be stuck at the curb for multiple signal cycles before they get a gap. In severe cases, pedestrians may be left with three choices:

- jaywalking at any perceived acceptable gap in traffic which may leave them in the roadway and may impede traffic
- moving down or upstream from the signal for a midblock crossing



Current MUTCD R10-15



Proposed MUTCD R10-15

- waiting for motorists on subsequent signal changes to allow them to begin to cross

Pedestrians have the same intolerance to delay as motorists so they often resort to jaywalking or midblock crossings if they must wait longer than 30-60 seconds for a crossing opportunity⁹. On multi-lane roadways this may place them at risk of being struck as they are frequently difficult to see for drivers in adjacent travel lanes. Crossing outside of the intersection also conflicts with driver expectance to look for pedestrians at intersections in front of stopped vehicles. For reasons of pedestrian and driver safety, as well as North Carolina Law providing pedestrians legal right of way at all crosswalks (marked or unmarked), it is important to educate and remind drivers of their responsibility to yield.

Current Policies or Practice

When a pedestrian is provided with a WALK signal or a green light (if pedestrian signals are not provided), North Carolina law requires vehicular traffic to yield to pedestrians in crosswalks at signalized intersections while turning, unless separate phases are provided for the turning vehicle and crossing pedestrian.

City of Wilmington

The city has adopted the MUTCD which controls use of this sign. However, this sign does not appear to be in use in Wilmington.

NCDOT

NCDOT has adopted the MUTCD which controls use of this sign.

The Manual on Uniform Traffic Control Devices

The MUTCD allows use of the TURNING TRAFFIC MUST YIELD TO PEDESTRIANS sign (R10-15) as an additional reminder to drivers to yield to pedestrians while turning.

State of the Practice

Proposed changes to the 2009 edition of the MUTCD include an update of the text only sign design to improve readability by adding figures in place of the text legend. Variations of this sign are in widespread use throughout the United States. Testing of this sign found that it was effective in reducing left-turn conflicts between motorists and pedestrians 20-65% and right-turn conflicts 15-30%¹⁰.

⁹ The Highway Capacity Manual indicates pedestrians engage in risk taking crossing behavior as their wait times exceed 30 seconds. At 60 seconds of waiting they are very likely to not comply with traffic control devices if an opportunistic gap appears in traffic.

¹⁰ Effect on Vehicle-Pedestrian Conflicts of "Turning Traffic Must Yield to Pedestrians" Sign. *TRANSPORTATION RESEARCH RECORD 1553*

Recommendation

It is recommended that the City of Wilmington adopt the YIELD TO PEDESTRIANS WHILE IN CROSSWALK sign proposed for 2009 MUTCD and install these signs at signalized locations where there is regular conflict between turning motorists and pedestrians. This sign may be used at signalized intersections with and without marked crosswalks provided pedestrians are not lawfully restricted from the roadway.

Pedestrian Actuated Signals and Push Button Locations

Introduction

Pedestrian signals are used to inform pedestrians when it is their turn to cross a street. There are two general approaches to controlling pedestrian signals: pedestrian actuated signals are designed so that a button must be depressed to call the WALK signal; concurrent signals are designed so that the WALK signal is displayed every cycle and no button is required.

The actuation device (generally a button) should be placed in a location where it is easily accessible by all users, including those with disabilities. Furthermore, the controls should clearly instruct users on proper signal operation.

Generally, pedestrian actuated signals are used in cases where pedestrians are not routinely provided sufficient time to completely cross a roadway before the signal changes and there is not sufficient pedestrian demand to warrant a WALK signal every cycle. In these cases, if the push button is not actuated by a crossing pedestrian, the pedestrian may become trapped within the roadway while the cross traffic is given a green light, potentially placing the pedestrian at risk of being struck by a moving vehicle.



Figure 1 – Pedestrians jaywalk during midweek evening with low traffic volume on 3rd Street at Chestnut

Pedestrians are less likely to utilize push buttons or are likely to jaywalk in areas with low or intermittent vehicular volume and/or long wait times. Pedestrians are also likely to jaywalk (even if the button is pushed) if there is a delay of more than 30 seconds and gaps in traffic are available.

It is challenging for cities that attract

large volumes of visitors to educate them to utilize pedestrian push buttons to generate a walk signal. This is particularly true if the visitor is used to being provided sufficient time to cross the roadway as a routine accommodation at signalized intersections.

Recommendations Overview

The list below highlights recommendations for improving push buttons within the City. For a more detailed discussion, please see the section Recommendations at the end of this paper.

- Adopt 2009 MUTCD Guidance for Signal Siting and Design
- Reposition and Upgrade Older Non-Compliant Push Buttons
- Use Concurrent Signal Operation in Peak Demand Areas without Pushbuttons

Current Policy and Practice

City of Wilmington

The city has adopted the MUTCD which controls placement of push buttons and pedestrian signals. The City of Wilmington currently utilizes push buttons and pedestrian signals at almost all signalized intersections where pedestrian signals and crosswalks are provided.

In many places, the signal design is the flashing hand and countdown timer combination. However, there are locations where there are no countdown timers in use. According to discussions with Wilmington staff, the city plans to upgrade all pedestrian signals with a countdown timer.

Throughout Wilmington, push buttons are installed in a variety of locations. In many locations, buttons are positioned in a manner that makes them easily accessible to all pedestrians. However there are several situations where the pedestrian signal push buttons are not located in accordance with best practices or MUTCD guidance.

Examples include locations where the push button is located too high for a wheelchair user and locations where the push button is located away from the sidewalk or is blocked by utilities (such as a signal control box). The example in the photo below shows a push button at the intersection of South College Street and Randall Road where the push button is attached to a phone pole which is away from the paved area of the sidewalk. This push button may be difficult to reach for a user in a wheelchair or other assistive device who cannot easily move on unpaved areas. Generally, these examples of incorrectly positioned buttons appear to be older installations.



Figure 2 - College and Randall - not accessible

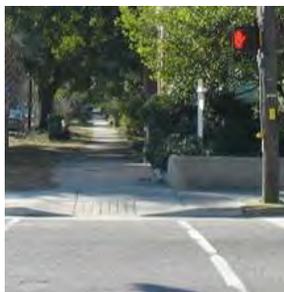


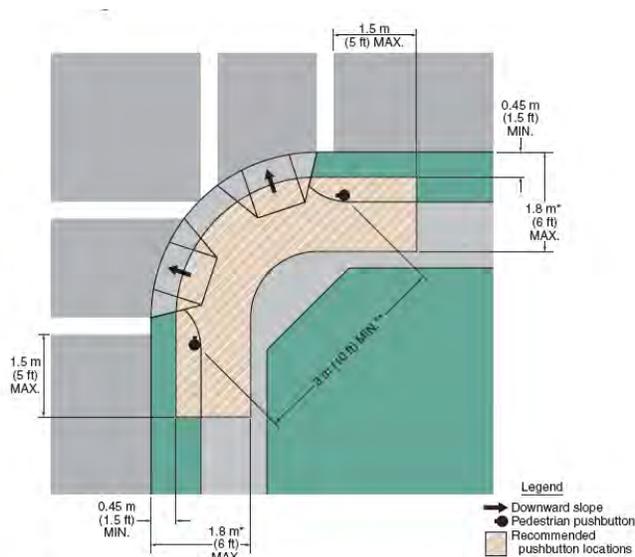
Figure 3 - Castle and South – Good Retrofit

NCDOT

NCDOT recommends the installation of countdown pedestrian signal heads at all locations with pedestrian signals on NCDOT maintained roads.

The Manual on Uniform Traffic Control Devices

The MUTCD provides guidance on the location of push buttons and pedestrian signals. There are no warrants for installing a pedestrian signal head or push buttons. The manual states “where pedestrian movements regularly occur, pedestrians should be provided with sufficient time to cross the roadway by adjusting the traffic control signal operation and timing to provide sufficient crossing time every cycle or by providing pedestrian detectors.”



- * Where there are constraints that make it impractical to place the pedestrian pushbutton between 0.45 m (1.5 ft) and 1.8 m (6 ft) from the edge of the curb, shoulder, or pavement, it should not be further than 3 m (10 ft) from the edge of curb, shoulder, or pavement.
- ** Where there are constraints on a particular corner that make it impractical to provide the 3 m (10 ft) separation between the two pedestrian pushbuttons, the pushbuttons may be placed closer together or on the same pole.

Figure 5 - Proposed graphic for the 2009 MUTCD: Recommended Pushbutton Locations

The timing is accomplished by extending the time of the all red clearance interval while simultaneously providing the desired WALK signal. Changing this interval is allowed in the MUTCD.

Discussion of Current Policy and Practice

The city has a mixture of both old and new technology in its current inventory of pedestrian push button mechanisms. In many locations, actuators are positioned in such a way that they may be difficult to use for some users. More recent push button installations appear to be using

current technology and installation practices which should make them more accessible to all users.

The existing timing of signals within Wilmington provides inconsistent messaging to pedestrians. At some signalized locations they are provided with crosswalks, pedestrian signals, and push buttons. The timing allows most pedestrians sufficient time to cross the roadway. At other signalized locations there is no pedestrian infrastructure provided but there is sufficient time for the pedestrian to cross while other signalized intersections do not provide time for pedestrians to cross the roadway.



Figure 4- Pedestrian Push Button Instructions

State of the Practice

It is a common misconception that pedestrian push buttons are required for a signal to be accessible to the disabled. Push buttons are not required at locations where the walk signal is provided with each signal cycle.

Research on push buttons has also found that the location and design of the push button is critical to ensure usage. A push button that is located close to the crossing and shows an indication that it has been activated is more likely to be used by waiting pedestrians. Additionally, instructions should be provided to inform pedestrians on proper crossing behavior, including which button to push to cross in the desired direction.

One example of current technology is the audible pedestrian system which is designed to aid pedestrians with vision impairments. This approach provides noises, such as chirping, clicks, and other tones that are strategically located to guide sight-impaired pedestrians at street crossings (also in use in other locations where additional information is important). These audible techniques should be complemented by Braille writing on instruction signs that are reachable and located for that purpose.

Pedestrian and Bicycle Information Center (PBIC)

For optimal pedestrian service, fixed-time signal operation usually works best. Pedestrian pushbuttons may be installed at locations where pedestrians are expected intermittently. Quick response to the pushbutton or feedback to the pedestrian (e.g.- indicator light comes on) should be programmed into the system. When used, pushbuttons should be well-signed and within reach and operable from a flat surface for pedestrians in wheelchairs and with visual disabilities. They should be conveniently placed in the area where pedestrians wait to cross. Section 4E.09

within the MUTCD provides detailed guidance for the placement of pushbuttons to ensure accessibility (www.walkinginfo.org).

2009 MUTCD

Proposed language for the 2009 MUTCD provides enhanced guidance on the placement of push buttons (see figure 6 which has been developed for addition to the 2009 MUTCD).

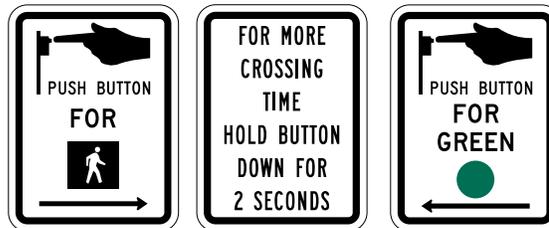


Figure 6 - Proposed pushbutton signs for the 2009 MUTCD

The new MUTCD edition also contains a provision to provide additional crossing time for pedestrians who hold the button for 2 seconds or more, and has added a number of additional pedestrian pushbutton signs (right) based on signs successfully used in Canada.

Recommendation

Adopt 2009 MUTCD Guidance for Siting and Design

It is recommended that City of Wilmington adopt the proposed 2009 MUTCD language to provide more guidance on locating push buttons in typical and constrained situations.

Push buttons should be designed according to the standards and guidelines in Sections 4E.08 and 4E.09 of the Manual of Uniform Traffic Control Devices (MUTCD). They shall be a minimum of 2" across in at least one direction. The force required to activate the buttons should not be greater than 5 pounds. It is desirable for pushbuttons to offer confirmation that the button has been pressed. In locations where new pedestrian signals are being installed, Accessible Pedestrian Signals should be provided.

Reposition and Upgrade Older Non-Compliant Push Buttons

In order to improve the utility of pedestrian infrastructure for all users, the City of Wilmington should develop an inventory and replacement plan for noncompliant pedestrian push buttons. These should be assessed for both push button design as well as location. These older push button mechanisms should be upgraded to newer technology that is easier to operate and incorporates instructions for users.

Use Concurrent Signal Operation in Peak Demand Areas without Pushbuttons

In general, if pedestrians are present during a majority of the signal phases during the peak hour for a particular leg of an intersection, the pedestrian signal phase should be automatic and pedestrian push buttons should not be used. In particular, the City of Wilmington should consider eliminating pedestrian push buttons in the downtown core as this is an area that

attracts a lot of tourists and it is an area where pedestrians are present at the majority of the signal cycles.

However, in areas with intermittent pedestrians, push buttons may be used to reduce delays to vehicular traffic. It is recommended that the City of Wilmington evaluate push button installations throughout the city for compliance with ADA and to determine actual need for push button. Where a signal requires pedestrian actuation, it is recommended that it be installed to meet the accessibility guidelines.

Signs for Uncontrolled Crossings

Introduction

Many street crossings a pedestrian must make during a trip occur at locations where there are no traffic signals, stop signs, or other traffic controls. These are classified as “uncontrolled crossings.” These locations include intersections where only one leg of travel is required to stop (e.g. a local street intersecting an arterial).



Figure 19 – W11-2

Background

Research of pedestrian safety at uncontrolled crossings has shown that some motorists are not in complete understanding of yield to pedestrian laws nor do they understand what the standard MUTCD (W11-2) sign is attempting to convey (the MUTCD W11-2). To help motorists understand the law, an in-street bollard (the MUTCD R1-6) was developed which graphically tells the motorists what to do. As of 2003 it has been adopted for use at a national level for uncontrolled pedestrian crossings.

Recommendations Overview

The list below highlights recommendations for improving motorist compliance with the yield to pedestrian in crosswalk law at uncontrolled crosswalks:

- Adopt a Side-of-Street Uncontrolled Crosswalk Sign
- Develop an Uncontrolled Crosswalk Signing Policy
- Evaluate Uncontrolled Crosswalk Signing Policy and Effectiveness
- Upgrade Uncontrolled Crossing Locations Across the City to Comply with New Policy

Current Policy or Practice

City of Wilmington Policies



The City of Wilmington does not appear to have a policy for signing uncontrolled pedestrian crossings. However, there are many places around the city where Pedestrian Warning Signs are used.

NCDOT Policies

NCDOT has adopted the MUTCD which provides for the use of the R1-6 or W11-2

Manual on Uniform Traffic Control Devices - Pedestrian Warning Signs

Figure 20 - R1-6

Section 2C.01 of the 2003 MUTCD states “warning signs call attention to unexpected conditions on or adjacent to a highway or street and to situations that might not be readily apparent to road users.” ITE’s Traffic Control Devices Handbook (TCDH) further explains that it is not possible to identify every potential hazard a driver may encounter, and thus the decision to provide a warning should be based on the definition of the function of a warning sign (2001). The TCDH points out “warning signs are particularly useful to unfamiliar drivers. The role of warning signs is especially important in view of the fact that the driver may not be able to get information from other sources.” While drivers should possess a basic knowledge of the types of potential hazards that may be encountered, the driver is not expected to anticipate extraordinary dangers, impediments, or obstructions. This is particularly true for drivers who are unfamiliar with a given road. However, signs should be installed judiciously, as overuse may cause noncompliance and create visual clutter, reducing the readability of each sign.

Warning signs associated with pedestrian, bicyclist, and school zone conditions may utilize a fluorescent yellow-green background to increase visibility. Warning signs that identify locations of unexpected entries into the roadway in advance (through the use of supplemental plaques with the legend AHEAD, XX FEET, or NEXT XX MILES) should be accompanied by a similar warning at the point of entry, supplemented with a diagonal downward pointing arrow plaque identifying the location of the crossing. The 2003 MUTCD recommends fluorescent-yellow green warning signs not be mixed with yellow signs within the same area.

Proposed language for the 2009 MUTCD recommends that all pedestrian, bicyclist, and school zone related signing use the fluorescent-green color instead of yellow. It will require that all school zone related signs be fluorescent-green in color.

Manual on Uniform Traffic Control Devices - In-Street Pedestrian Crossing Signs

The R1-6a in-street pedestrian sign is in the MUTCD (see right) and is in widespread use across the country and in the City of Wilmington to remind motorists of their responsibilities at

crosswalks. The 2003 MUTCD does not provide guidance for when to use the sign except to restrict its use at signalized intersections.

Proposed revisions for the 2009 MUTCD clarify conditions under which it is appropriate to provide the sign. The following criteria are proposed additions:

- Prohibition of post mounting this sign on the left or right side of the roadway
- The sign shall be mounted on the center line, lane line, or median island

State of the Practice

In-Street Pedestrian Signs

The City of Wilmington currently uses these signs on certain collector and neighborhood streets.

Side-of-Street Pedestrian Uncontrolled Crosswalk Signs

To compensate for the poor legibility of the in-street crossing sign (R1-6a), some agencies have developed a side-of-street sign. This is not found in the MUTCD, but is a modified version of the R1-6a for use on the side of the road.

Maryland State Highway

MD SHA utilizes a Side-of-Street Pedestrian Crossing sign (see right)

which may be used at uncontrolled crosswalk locations that do not meet the specifications MD SHA prescribed for the use of the in-street pedestrian crossing sign (where the roadway’s clear width is less than 24 feet, where the speed limit is over 35 mph, or where there are 4 or more lanes of vehicular traffic).

Boulder, Colorado

Boulder uses a similar sign (see right) which was tested as a replacement for the warning sign assembly (W11-2). The City of Boulder found that motorists’ yielding rates increased following installation of this sign, compared to locations with the W11-2 only. A summary of their yielding rates is shown in the table on the following page. Boulder also developed warrant criteria for this sign which requires a minimum of 20 pedestrians crossing per hour and a minimum vehicular volume of 1,500 per day.



Figure 21 - Maryland SHA MD-MUTCD Side-of-Street Pedestrian Crossing Sign R1-6a (1)



Figure 22 – Boulder, CO side of street uncontrolled pedestrian crossing sign

Compliance Results for Boulder, CO “State Law – Yield to Pedestrians” Sign

Location	Vehicle Volume (daily) *	Pedestrian Volume (3 peak hours)	Yield Compliance (Before)	Yield Compliance (After)	Percent Increase
9 th Street & Walnut	10,000	190	54%	93%	+72%
9 th Street & Hawthorne	-----	-----	-----	-----	-----
19 th Street & Sumac	3,000	50	96%	**	n/a
University & 15 th Street	10,000	180	47%	69%	+47%
University & 17 th Street	10,000	170	68%	89%	+31%
Iris & 15 th Street	20,000	10	5%	50%	+900%
Arapahoe & 13 th Street	14,000	140	34%	65%	+91%
Arapahoe & 11 th Street	12,000	130	38%	70%	+84%
Alpine west of Broadway	5,000	550	91%	90%	0%
Mapleton & 8 th Street	-----	70	82%	87%	+6%
19 th Street & Norwood	3,000	40	24%	33%	+38%
Greenbriar & Chambers	-----	-----	-----	-----	-----
Walnut & 16 th Street	3,000	140	25%	**	n/a
19 th Street & Upland	-----	-----	-----	-----	-----
Pearl & 19 th Street	12,000	80	21%	66%	+214%
Linden & 4 th Street	3,000	100	45%	81%	+80%
Folsom south of Arapahoe	14,000	50	28%	**	n/a

Table 1 – Boulder, Colorado motorist yielding behavior results of evaluation of side street crossing sign

Recommendations

Adopt a Side-of-Street Uncontrolled Crosswalk Sign

The City of Wilmington should develop a Side-of-Street Uncontrolled Crosswalk Sign similar to that used in Boulder and MD SHA in lieu of the current practice of providing a W11-2 supplemented with the R1-6a.

Develop an Uncontrolled Crosswalk Signing Policy

The City of Wilmington should update its uncontrolled crosswalk signing policy and sign standards to better align with current research and best practices. The City of Wilmington should adopt the proposed language for the 2009 MUTCD describing the use of the R1-6a sign.

The City of Wilmington should develop warrant criteria (similar to the City of Boulder) to determine when to provide pedestrian signs. Criteria may also include vehicle volume, roadway cross section, motorist operating speed, and sight distance.

Evaluate Uncontrolled Crosswalk Signing Policy and Effectiveness

The City of Wilmington should develop draft criteria and study the effectiveness of the sign in increasing motorist compliance. Results of an evaluation of the sign should be used to further refine the warrant criteria for installation. Once criteria are developed for uncontrolled crossing

signs, it is recommended that the City of Wilmington develop a plan to upgrade signs at all uncontrolled crossings to bring them into compliance.

It is recommended that the City of Wilmington develop guidelines restricting the use of the W11-2 pedestrian warning sign at uncontrolled crosswalks and develop guidance for utilizing the W11-2 to provide advanced warning of unexpected pedestrian crossings.

Upgrade Uncontrolled Crossing Locations Across the City to Comply with New Policy

It is recommended that the City of Wilmington develop a plan for upgrading all uncontrolled crossings to comply with policies developed for marking and signing uncontrolled crossings.

Signalized Intersection Crosswalk Markings and Pedestrian Signals

Introduction

It can be assumed that people will walk almost anywhere regardless of whether specific pedestrian infrastructure is present or not. Furthermore, pedestrians generally have an expectation that a signalized intersection will allow them to safely cross the roadway. It is therefore important that signalized intersections accommodate the pedestrian crossing.

Traffic signals are designed to stop traffic and allow cross street traffic (including pedestrians) to cross the intersecting roadway. In North Carolina, as in most states, the pedestrian has the legal right-of-way when the traffic signal displays green (for motorists) and/or when the pedestrian signal displays a “walk” symbol for the desired direction of travel. Restricting pedestrians from the right-of-way is accomplished by posting a “NO PEDESTRIANS” sign or by displaying a DO NOT WALK symbol where signals are installed.

Transportation engineering is built on the principals of uniformity and predictability. It is reasonable that pedestrians should have the expectation that if traffic is stopped by a signal, they should have an opportunity to cross the entire street unless they are given information stating otherwise. Since most signals are timed to provide the minimum time required for a pedestrian



Figure 23 – Crosswalks encourage pedestrians to cross where they can be seen by turning traffic. This person is crossing between vehicles which makes difficult to see to turning vehicles. This potentially places him at risk of being struck. Stop lines placed close to the adjacent roadway encourage pedestrians

crossing, any delay by the pedestrian in beginning to cross may leave them in the roadway or at the curb as the WALK signal changes to DONT WALK. This places them in potential conflict with cross street traffic. This is particularly problematic if the crossing distance is long or does not provide a refuge (protected area on the median) for pedestrians. Pedestrians who are not able to cross the roadway relatively easily are more likely to take risks (crossing away from the signal or crossing on a DONT WALK signal) which can increase vehicular delay or result in a crash.

Pedestrians are typically reluctant to travel out of their way so it is incumbent upon designers to make safer crossings such as signalized intersections more convenient or to make the convenient crossing safer. If designated crossings are located far apart, pedestrians may choose their own time and location for crossing the roadway, which may not be the optimal time or location, potentially placing them at risk.

Recommendations Summary:

The list below highlights recommendations for signaling crosswalks within the City. For a more detailed discussion, please see the section Recommendations at the end of this paper.

- Modify standard design details to show pedestrian crosswalks
- Install pedestrian signals on signalized crossings greater than two lanes
- Mark crosswalks at signalized intersections across all crossings

Current Policy or Practice

Current City of Wilmington Policies

Existing policies are informal and not in writing. The informal policy generally includes the following practices:

- Crosswalks are marked at controlled locations only when there is a demonstrated pedestrian demand of one pedestrian present per cycle (on average)
- Marked crosswalks are only installed in combination with pedestrian signals and pushbuttons

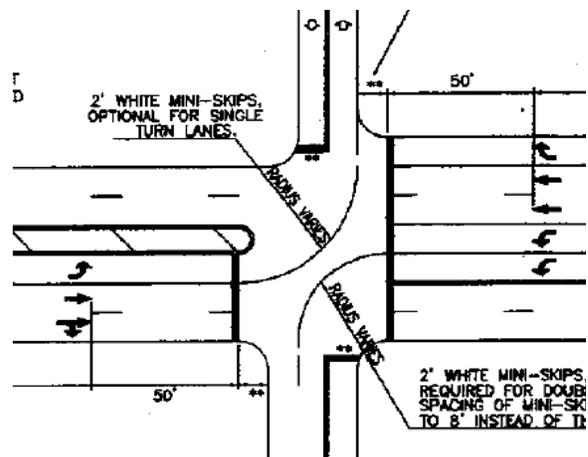


Figure 24 - City of Wilmington controlled intersection detail does not provide crosswalk marking guidance and is identical to NCDOT standard details for signalized intersections.

- The marked crosswalks are generally placed where the crossing conflicts least with turning traffic
- Marking crosswalks across all legs of an intersection is rare except in the downtown area
- Stop line placement varies, but on local streets is typically set back beyond the sidewalk or pedestrian crossing area
- Standard details for intersection design do not show crosswalks or sidewalks to provide guidance on stop bar or signal detection placement.

Crosswalks are not included on standard intersection marking details. Therefore, magnetic vehicle detection loops are generally installed immediately behind the vehicle stop line. This has an unintended and potentially costly consequence that increases the difficulty for retrofitting because crosswalk installation generally results in moving the stop bar back from the intersection, which then requires moving the detection loop back accordingly. Moving the loop requires revisions to the signal plan and timing.

Current NCDOT Policies

Pedestrian Policy Guidelines

- Requires Wilmington to ask for pedestrian facilities on NCDOT roadways and TIP projects
- Requires Wilmington to match 40% - 50% of project cost (verify) for new projects
- At some locations, stop line is placed within the pedestrian crossing area (College Road, Eastwood Road, Wrightsville Avenue)
- NCDOT standard practice C-36 details signalization and crosswalk marking procedures for uncontrolled midblock crossings



Figure 25 – Stop lines placed within the pedestrian area in conjunction with no pedestrian signals sends a message the pedestrian is not welcome – regardless of the fact that the pedestrian is legally entitled to cross at this location. This layout would be a likely contributing factor in a pedestrian crash at this location.

Manual on Uniform Traffic Control Devices (MUTCD)

The MUTCD does not provide specific guidance on marking crosswalks or pedestrian signalization at signalized intersections. The MUTCD provides guidance on the dimensions and

design of painted crosswalks. The MUTCD section 3B.17 states “crosswalks should be marked at all intersections where there is substantial conflict between vehicular and pedestrian movements.”

The MUTCD also states, “The design and operation of traffic control signals shall take into consideration the needs of pedestrian as well as vehicular traffic.” If at signalized intersections there is a need for “provisions for a given pedestrian movement, signal faces conveniently visible to pedestrians shall be provided by pedestrian signal heads or a signal face for an adjacent vehicular movement.” There are currently many instances in the study area where signals are not visible at pedestrian crossing locations.

Discussion of Existing Policies

The existing timing of signals within Wilmington provides inconsistent messages to pedestrians. At some signalized locations they are provided with crosswalks, pedestrian signals, and push buttons with crossing time provided for them to cross roadway. At other signalized locations there is no pedestrian infrastructure provided but there is sufficient time for the pedestrian to cross, yet other signalized intersections do not provide time for pedestrians to cross the roadway. This inconsistent application of pedestrian signals and timing is likely to be a contributing factor in pedestrian crashes. This inconsistency may also contribute to the pedestrians’ lack of confidence in provided pedestrian amenities which may contribute to poor compliance and use of existing facilities.

Some pedestrian crossings are compromised by the placement of motor vehicle stop lines near the curb line of the adjacent roadway while others are set to protect the pedestrian crossing area. When marked crosswalks are provided at intersections, it varies from marking all legs to only marking one leg. This has resulted in a system that is inconsistent and unpredictable for the pedestrian, and which may lead to poor stop back compliance at marked crossings.

This typically results in the installation of crosswalks only a portion of the legal crossings across the major roadway. The minor roadway typically will not have marked crossings. However, recent intersection improvement projects may have expanded upon the pedestrian accommodations by providing additional marked crosswalks, set back stop lines, sidewalks, curb ramps, and signals varying from two legs to four legs of a typical junction of two roadways.

The current NCDOT standards for installing crosswalks are more applicable to rural areas of the

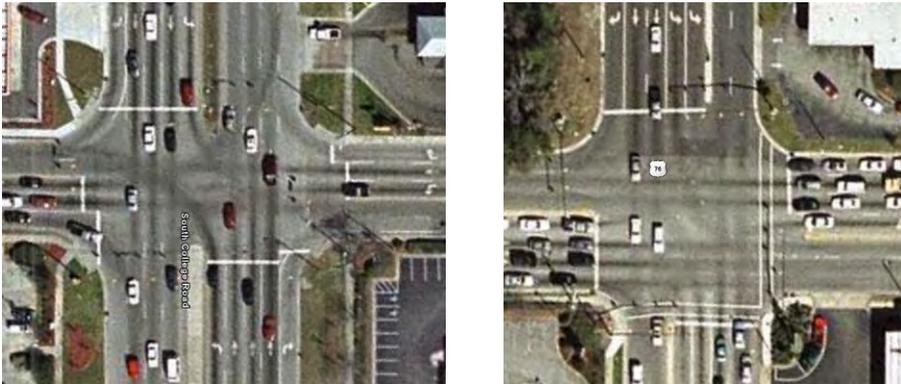


Figure 26 – Examples of the variations in stop line placement and crosswalk placement.

state, where there is lower crossing activity than is found in most parts of Wilmington. Many other North Carolina cities (such as Raleigh and Charlotte) have developed and adopted their own crosswalk marking standards that are used during discussions with NCDOT when installing or improving state-owned and operated roadways.

Recommendations

Modify Standard Design Details to Show Pedestrian Accommodations

City of Wilmington standard design details should be modified to show pedestrian accommodations. The present details largely mirror NCDOT roadway designs which are not appropriate for urbanized areas. Adoption of new standard details showing pedestrian facilities will be a helpful tool for negotiations with developers and NCDOT as new roadway projects are constructed or existing roadways are reconstructed. Standard details should also show advance stop bars.

Details showing pedestrian facilities will minimize placement of stop lines, signal detection equipment, signal control boxes, and other utilities within the pedestrian realm. Having identical details to NCDOT implies full support for the application of NCDOT roadway design standards (rural in character) within the City of Wilmington, which is not always appropriate given the city's urban (or urbanizing) character.

Install Pedestrian Signals on Signalized Crossings greater than Two Lanes

The City should install pedestrian signals on roadways over two travel lanes in width. At crossings wider than two lanes, pedestrians may have difficulty making it all the way across the roadway if they do not start crossing at the beginning of the crossing cycle (typically crossing is

on the green light at intersections without pedestrian signals) or if they move more slowly than the 'design pedestrian.'

There are currently pedestrian signals at most signalized intersections in the downtown and immediate surrounding areas. The City should expand on this commitment to multi-modal travel by installing pedestrian signals at major intersections in other areas. Understanding that it is impractical to install signal heads immediately, priority should be given to locations that are of significant value to pedestrians, such as:

- Intersections near educational and institutional facilities such as schools, universities and libraries;
- Intersections near retail and employment centers;
- Intersections serving the Cross-City Trail, River-to-Sea Bikeway, Greenfield Park and other major recreational or pedestrian facilities;
- Intersections near transit stops; and
- Areas with slower moving pedestrians, such as senior communities, hospitals and tourist areas.

Many of these locations will require collaboration with NCDOT and/or a detailed study to determine the ultimate location and configuration of the crosswalks.

Mark Crosswalks at Signalized Intersections Across All Crossings

The City of Wilmington should begin a program to mark crosswalks at all signalized intersections. It is recommended that the standard be to mark all legs of the intersection. Variations from this standard should occur only in rare circumstances where engineering judgment determines a safety problem will be created by marking a crosswalk, or where pedestrian facilities do not exist. The pedestrian should be accommodated at all legal crossing locations. (i.e. a 4 leg intersection should have a minimum of 3 crosswalks).

High visibility (ladder) markings should be the standard marking at all crosswalks leading to a block with a school, within a designated school zone area, along a designated school walking route, or at locations with high pedestrian activity.

It is recommended that Wilmington work with NCDOT to provide marked crosswalks at all NCDOT controlled intersections with traffic signals. Pedestrian traffic signals should be provided at legal crossings and signal timing should be evaluated to determine if adequate time to cross based on the surrounding context is provided.

Flashing Warning Beacons

Introduction

A flashing beacon is a traffic control signal that operates in a flashing mode (flash rate is defined as one flash per second). It is typically a single light, but can be installed in other combinations. A common application is to add a flashing amber signal to the top of a standard pedestrian sign to provide warning of a pedestrian crossing. The flashing signal has also been used on overhead signs at crosswalks. School zones are sometimes identified with flashing beacons that operate during specific periods of the day. Studies have found inconsistent rates of motorist compliance with laws to stop or yield for pedestrians at uncontrolled crosswalks when only flashing beacons were provided.



Rapid Flashing Beacon

A modified version of the flashing beacon – a rapid flashing beacon (LED lights with flash rates of 60 flashes per second) has undergone evaluation in Florida, Washington, DC, and Colorado. This sign has shown to result in high rates of motorist compliance with laws to stop or yield for pedestrians at uncontrolled crosswalks when only rapid flashing beacons were provided.

Current Policy or Practice

City of Wilmington

The city has adopted the MUTCD which defines the use of flashing beacons. The City of Wilmington does not have a current policy for rapid flashing beacons.

NCDOT

NCDOT has adopted the MUTCD which defines the use of flashing beacons. The NCDOT does not have a current policy for rapid flashing beacons.

The Manual on Uniform Traffic Control Devices

Section 4k defines flashing beacons in the MUTCD. FHWA issued an interim approval for this device on July 16, 2008.



Flashing Beacon

Recommendations Overview

- Develop a policy based upon the FHWA interim approval recommendation for use of the rapid flash beacon with the exception of the sign design.
- Develop a standard detail for the design of the sign
- Develop a policy for restricting the use of the standard flashing beacon at uncontrolled pedestrian crossings

State of the Practice

Flashing Beacons

A flashing beacon is a traffic control signal that operates in a flashing mode (flash rate is typically one flash per second). It is typically a single light, but can be installed in other combinations. A common application is to add a flashing amber signal to the top of a standard pedestrian sign to provide warning of a pedestrian crossing. The flashing signal has also been used on overhead signs at crosswalks. School zones are sometimes identified with flashing beacons that operate during specific periods of the day.

In some cases, pedestrian detection is used to activate the beacons. Detection can be either passive or active. For flashing beacons with active detection a pedestrian must press a pushbutton. For flashing beacons with passive detection, there are a number of options including bollards with motion sensors. The MUTCD provides guidance for the use of flashing beacons in Chapter 4K.

Studies have found inconsistent rates of motorist compliance with laws to stop or yield for pedestrians at uncontrolled crosswalks when only flashing beacons were provided. This is in large part due to variations in roadway conditions at each of the study sites.

Rapid Flash Beacon, RFB

The Rapid Flash Beacon is a device using LED technology (instead of the traditional incandescent bulbs) in combination with crosswalk warning signs. The RFB design differs from the flashing beacon by utilizing:

- A rapid flashing frequency (60 times per second vs. 1 per second)
- Brighter light intensity
- Ability to aim the LED lighting



Rapid Flashing Beacon, Washington DC

Additionally, pauses can be incorporated at chosen intervals to create patterns and increase motorist recognition of accompanying information.

The RFB can be constructed using solar power to simplify installation. They are currently not included in the MUTCD but are similar in concept to in-roadway lighting, which is permitted in the MUTCD. RFBs have been used on crosswalk signs in a number of locations around the US including:

- Boulder, Colorado
- St. Petersburg, Florida
- Washington, DC

These jurisdictions have tested the effectiveness of the device and the results indicate that this device increases motorist compliance to a much higher percentage than the standard flashing beacon.

Boulder uses a pedestrian activated RFB, with the Side-of-Street Uncontrolled Crosswalk sign with imbedded LED lights. In St. Petersburg, the RFB is also pedestrian activated but is used with a standard W11-2 sign with a separate LED device. In St Petersburg, the RFB includes an audible message to give the pedestrian crossing safety information, and a light directed on the pedestrian to improve visibility for approaching motorists. Both cities have evaluated motorists yielding rates at locations with the RFB. Results are summarized in the following tables.

St. Petersburg, Florida Motorist Compliance Rates

Lanes	24 Hour Volume	Posted Speed	Media n	Baseline Yield Rate	7 Day Yield Rate	90 Day Yield Rate	180 Day Yield Rate	Location
3	12,245	35	No	n/a	75%	82%	n/a	1 st N/61 st St
4	18,367	35	Yes	n/a	96%	92%	91%	22 nd Ave N/7 th St
4	17,657	35	Yes	n/a	60%	62%	68% ¹¹	4 th St/18 th Ave S
5	19,192	35	Yes	0.26%	84%	82%	n/a	58 th /3 rd Ave N
5	16,352	40	No ¹²	n/a	93%	71%	n/a	Central Ave/61 st St
4	19,422	35	Yes	0.49%	84%	82%	n/a	MLK St/15 th Ave. S
4	12,723	35	No ¹³	n/a	78%	93%	76%	9 th Ave N/26 th St

¹¹ This is actually a 270 day count, there was no data for 180 days at this location

¹² Parking is restricted on this roadway so sight distance to the crosswalk and the sign is ideal because the roadway is flat and straight. There are opposing left turn pockets (the 5th lane) at this location.

¹³ Parking is restricted on this roadway so sight distance to the crosswalk and the sign is ideal because the roadway is flat and straight

City of Boulder Compliance Results – Pedestrian actuated flashing signs

Location	Year Installed	Vehicle Volume (daily) *	Pedestrian Volume (3 peak hours)	Yield Compliance (Before)	Yield Compliance (After)	Percent Increase
Pearl (2900 Block)	10/00	24,000	70	26%	54%	+110%
Canyon & 11 th Street	01/01	19,000	460	38%	80%	+110%
Broadway & Pleasant	07/01 removed 10/04	39,000	530	16%	71%	+340%
Broadway & 18 th Street	07/01	43,000	440	23%	78%	+240%
Pearl west of 48 th Street	01/02 removed 07/03	18,000	10	0%	9%	Infinite
Folsom & Walnut	06/02	23,000	100	11%	54%	+390%
Broadway & Norwood	09/02	17,000	20	6%	60%	+900%
Valmont & Center Green	07/03	24,000	10	6%	83%	+1280%
Canyon & 19 th Street	02/04	24,000	80	10%	55%	+450%
Broadway & 17 th Street	10/04	43,000	180	42%	67%	+60%
Canyon & 10 th Street **	02/05	19,000	No Data	No Data	No Data	n/a

* - Many of the daily traffic volumes have been estimated from peak-hour turning movement counts and should be considered approximations.

** - Data collection has not yet occurred.

Recommendation

Develop a rapid flashing beacon policy based upon FHWA’s interim approval notice

It is recommended that the City of Wilmington develop a rapid flashing beacon policy and sign standard for use at uncontrolled crossings to better align with current research and best practices. City of Wilmington should develop warrant criteria (similar to the City of Boulder) to determine when to use the RFB. Factors to consider may include vehicle volume, roadway cross-section, motorist operating speed, and sight distance. The warrant criteria should be adjusted based on the RFB’s effectiveness in increasing motorist compliance to stop for pedestrians under various conditions.

The proposed Side-of-Street Uncontrolled Crosswalk Sign should be utilized as the sign base for the RFB standard in place of the W11-2 as shown in the example photo. Boulder has adopted the side-of-street sign as the base sign for the RFB. This will be consistent with the sign proposed for uncontrolled crossings in the City of Wilmington.

Develop a policy restricting the use of the standard flashing beacon at uncontrolled pedestrian crossings

It is recommended that the City of Wilmington develop a policy restricting the use of the standard flashing beacon (1 flash per second) at uncontrolled pedestrian crossings. To ensure uniformity of application, the rapid flash beacon should be the only device utilized for uncontrolled pedestrian crossings where an enhanced warning device is warranted.

Pedestrian Hybrid Signals (HAWK) and Pedestrian Volume Signal Warrant

Introduction

Engineers base their decision to install a traffic signals on 8 criteria (warrants) defined in the MUTCD. One of the criteria is based on pedestrian volumes (Warrant 4). Roadways which are difficult to cross due to high traffic volumes and/or high operating speeds will reduce pedestrian demand by discouraging pedestrians from attempting to cross. This makes the pedestrian warrant difficult to achieve in practice.



It can also be undesirable to install a signal on a high volume roadway if pedestrian use is infrequent or occurs at specific, but limited periods of time.

To provide a balance between pedestrian crossing needs and vehicular movement, some jurisdictions around the country have adopted the Pedestrian Hybrid Signal, otherwise known as the HAWK (**H**igh-intensity **A**ctivated **C**ross**W**alk) signal. The signal stops traffic when pedestrian activated, and is appropriate in locations where a full signal may cause unnecessary traffic delay by stopping traffic for the entire pedestrian phase.

This pedestrian activated signal is a combination of a flashing beacon and a traffic signal with pedestrian pushbuttons and pedestrian signal heads. It controls traffic on the main road using a combination of red and yellow signal lenses, while the minor approach is controlled by pedestrian signals and a stop sign for vehicles. This signal has been approved for inclusion into the MUTCD by the National Committee and is included in the proposed language for the 2009 MUTCD. This signal may also be used at mid-block locations. The National Committee has also approved a reduction in the pedestrian volume warrant.

Recommendations Overview

Adopt the proposed language for the 2009 MUTCD for both the pedestrian volume signal warrant and the Pedestrian Hybrid Signal.

Current Policy or Practice

City of Wilmington

The city has adopted the MUTCD which defines the pedestrian warrant for traffic control devices. The City of Wilmington does not have a current policy for Pedestrian Hybrid Signals

NCDOT

NCDOT has adopted the MUTCD which defines the pedestrian warrant for traffic control devices. NCDOT does not have a current policy for Pedestrian Hybrid Signals.

The Manual on Uniform Traffic Control Devices

Section 4C.05 defines the existing MUTCD pedestrian volume signal warrant (No. 4) shown below.

Standard: The need for a traffic control signal at an intersection or midblock crossing shall be considered if an engineering study finds that both of the following criteria are met:

- A. The pedestrian volume crossing the major street at an intersection or midblock location during an average day is 100 or more for each of any 4 hours or 190 or more during any 1 hour; and*
- B. There are fewer than 60 gaps per hour in the traffic stream of adequate length to allow pedestrians to cross during the same period when the pedestrian volume criterion is satisfied. Where there is a divided street having a median of sufficient width for pedestrians to wait, the requirement applies separately to each direction of vehicular traffic.*

The Pedestrian Volume signal warrant shall not be applied at locations where the distance to the nearest traffic control signal along the major street is less than 90 m (300 ft), unless the proposed traffic control signal will not restrict the progressive movement of traffic.

The MUTCD does not have a current policy for Pedestrian Hybrid Signals.

State of the Practice

Pedestrian Hybrid Signal (Hawk)

In the City of Tucson, Arizona, the HAWK signal, combined with a media campaign, has generated a high motorist yield rate, increasing compliance from 30 percent under normal conditions to 93 percent over an eight-month study period. This treatment is profiled in ITE's *Traffic Control Devices Handbook*. The signal has proven to be a successful tool to assist pedestrian crossings of multi-lane arterials with high vehicular volumes while minimizing vehicular delay to the arterial and discouraging minor roadway cut-through traffic.

Placement

The HAWK signal is best suited for uncontrolled crossings of multi-lane, higher speed or volume roadways where there is a need to provide occasional pedestrian crossings without inordinate delay to motor vehicles (i.e. school crossings, low volume neighborhood street crossings of high volume, multi-lane arterials). See proposed MUTCD warrant graphic included below.

Design of Vehicular Signal

Traffic signal head with the following 3-lens configuration:

Red – Red
Yellow

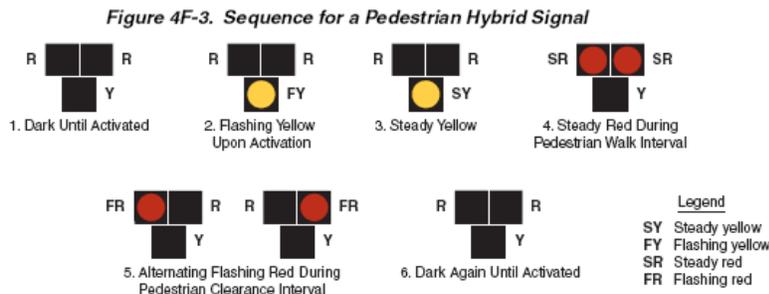
Design of Pedestrian Signal

Standard pedestrian countdown signal head

Operation

The HAWK signal remains dark for vehicles and a DON'T WALK signal is shown for pedestrians until it's activated. The signal proceeds in the following manner upon activation by a pedestrian:

- A flashing yellow light alerts the driver that conditions are changing and to use caution. (Pedestrians see a steady “DON'T WALK” signal)
- A steady yellow light alerts drivers that they should prepare to stop.
- A steady red light gives the clear signal to motorists to stop for pedestrians (pedestrians receive the “WALK” signal)
- After a set interval, a wigwag flashing red signal (i.e. top and bottom alternating red flash) is used to indicate to drivers to stop and only proceed after pedestrians have cleared the crosswalk (pedestrians receive the flashing “DON'T WALK” signal).



Proposed language for the 2009 MUTCD defines the HAWK signal operation, provides warrants for its use, and provides installation guidance. The following pages contain the proposed language.

CHAPTER 4F. PEDESTRIAN HYBRID SIGNALS

Section 4F.01 Application of Pedestrian Hybrid Signals

Support: A pedestrian hybrid signal is a special type of hybrid signal used to warn and control traffic at an unsignalized location to assist pedestrians in crossing a street or highway at a marked crosswalk.

Option: A pedestrian hybrid signal may be considered for installation at a location that does not meet other traffic signal warrants to facilitate pedestrian crossings.

Standard: If used, pedestrian hybrid signals shall be used in conjunction with signs and pavement markings to warn and control traffic at locations where pedestrians enter or cross a street or highway. A pedestrian hybrid signal shall only be installed at a marked crosswalk.

Guidance: If a location meets the traffic control signal warrants under Sections 4C.05 and/or 4C.06 and a decision is made not to install a traffic control signal, a pedestrian hybrid signal should be considered. If one of the signal warrants of Chapter 4C is met and a traffic control signal is justified by an engineering study, and if a decision is made to install a traffic control signal, it should be installed based upon the provisions of Chapters 4D and 4E.

If a traffic control signal is not justified under the signal warrants of Chapter 4C and if gaps in traffic are not adequate to permit pedestrians to cross, or if the speed for vehicles approaching on the major street is too high to permit pedestrians to cross, or if pedestrian delay is excessive, the need for a pedestrian hybrid signal should be considered on the basis of an engineering study that considers major-street volumes, speeds, widths, and gaps in conjunction with pedestrian volumes, walking speeds, and delay.

For a major street where the posted or statutory speed limit or the 85th-percentile speed is 60 km/h or less or is 35 mph or less, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-1 for the length of the crosswalk.

For a major street where the posted or statutory speed limit or the 85th-percentile speed exceeds 60 km/h or exceeds 35 mph, the need for a pedestrian hybrid signal should be considered if the engineering study finds that the plotted point representing the vehicles per hour on the major street (total of both approaches) and the corresponding total of all pedestrians crossing the major street for 1 hour (any four consecutive 15-minute periods) of an average day falls above the applicable curve in Figure 4F-2 for the length of the crosswalk.

For crosswalks that have lengths other than the four that are specifically shown in Figures 4F-1 and 4F-2, the values should be interpolated between the curves.

Section 4F.02 Design of Pedestrian Hybrid Signals

Standard: Except as otherwise specified in this Section, a pedestrian hybrid signal shall meet the provisions of Chapters 4D and 4E.

A pedestrian hybrid signal face shall consist of three signal sections, with a CIRCULAR YELLOW signal indication centered below two horizontally aligned CIRCULAR RED signal indications (see Figure 4F-3).

When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

- A. At least two pedestrian hybrid signal faces shall be installed for each approach of the major street,
- B. A stop line shall be installed for each approach of the major street,
- C. A pedestrian signal head conforming to the provisions set forth in Chapter 4E shall be installed at each end of the marked crosswalk, and
- D. The pedestrian hybrid signal shall be pedestrian actuated.

Guidance: When an engineering study finds that installation of a pedestrian hybrid signal is justified, then:

- A. Parking and other sight obstructions should be prohibited for at least 30 m (100 ft) in advance of and at least 6.1 m (20 ft) beyond the marked crosswalk,
- B. The installation should include suitable standard signs and pavement markings, and
- C. If installed within a signal system, the pedestrian hybrid signal should be coordinated.

On approaches having posted speed limits or 85th-percentile speeds in excess of 60 km/h (35 mph) and on approaches having traffic or operating conditions that would tend to obscure visibility of roadside hybrid signal face locations, both of the minimum of two pedestrian hybrid signal faces should be installed over the roadway.

On multi-lane approaches having posted speed limits or 85th-percentile speeds of 60 km/h (35 mph) or less, either a pedestrian hybrid signal face should be installed on each side of the

approach (if a median of sufficient width exists) or at least one of the pedestrian hybrid signal faces should be installed over the roadway.

Support: Section 4D.11 contains additional provisions regarding lateral and longitudinal positioning of signal faces for approaches having a posted or 85th-percentile speed exceeding 60 km/h or exceeding 40 mph.

Standard: A CROSSWALK STOP ON RED (symbolic circular red) (R10-23) sign (see Section 2B.59) shall be mounted adjacent to a pedestrian hybrid signal face on each major street approach. If an overhead pedestrian hybrid signal face is provided, the sign shall be mounted adjacent to the overhead signal face.

Option:

A Pedestrian (W11-2) sign (see Section 2C.52) with an AHEAD (W16-9P) supplemental plaque may be placed in advance of a pedestrian hybrid signal. A warning beacon may be installed to supplement the W11-2 sign.

Guidance: If a warning beacon supplements a W11-2 sign in advance of a pedestrian hybrid signal, it should be programmed to flash only during the yellow and red signal indications of the pedestrian hybrid signal.

Standard: If a warning beacon is installed to supplement the W11-2 sign, the design and location of the beacon shall comply with the provisions of Sections 4L.01 and 4L.03.

If a pedestrian hybrid signal is installed at or immediately adjacent to an intersection with a side road or driveway, vehicular traffic on the side road or driveway shall be controlled by STOP signs.

Section 4F.03 Operation of Pedestrian Hybrid Signals

Standard: Pedestrian hybrid signal indications shall be dark (not illuminated) during periods between actuations.

Upon actuation by a pedestrian, a pedestrian hybrid signal face shall display a flashing CIRCULAR YELLOW signal indication, followed by a steady CIRCULAR YELLOW signal indication, followed by both steady CIRCULAR RED signal indications during the pedestrian walk interval, followed by alternating flashing CIRCULAR RED signal indications during the pedestrian clearance interval (see Figure 4F-3). Upon termination of the pedestrian clearance interval, the pedestrian hybrid signal faces shall revert to a dark (not illuminated) condition.

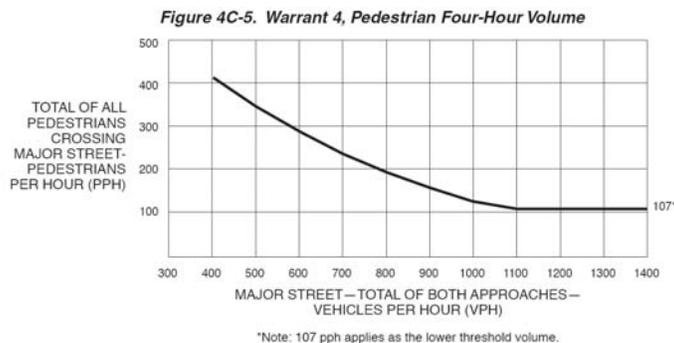
Except as noted in the Option below, the pedestrian signal heads shall continue to display a steady UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are either dark or displaying flashing or steady CIRCULAR YELLOW signal indications. The pedestrian signal heads shall display a WALKING PERSON (symbolizing WALK) signal indication when the pedestrian hybrid signal faces are displaying steady CIRCULAR RED signal indications. The pedestrian signal heads shall display a flashing UPRAISED HAND (symbolizing DONT WALK) signal indication when the pedestrian hybrid signal faces are displaying alternating flashing CIRCULAR RED signal indications. Upon termination of the pedestrian clearance interval, the pedestrian signal heads shall revert to a steady UPRAISED HAND (symbolizing DONT WALK) signal indication.

Option: Where the pedestrian hybrid signal is installed adjacent to a roundabout to facilitate crossings by pedestrians with visual disabilities and an engineering study determines that pedestrians without visual disabilities can be allowed to cross the roadway without actuating the pedestrian hybrid signal, the pedestrian signal heads may be dark (not illuminated) when the pedestrian hybrid signal faces are dark.

Guidance: The duration of the flashing yellow interval should be determined by engineering judgment. The steady yellow interval should not have a duration of less than 3 seconds or more than 6 seconds (see Section 4D.26). The longer intervals should be reserved for use on approaches with higher speeds.

Pedestrian Volume Signal Warrant (No. 4)

Proposed language and figures have been developed for the next edition of the MUTCD to simplify the pedestrian volume signal warrant (warrant 4). The proposed warrant eliminates the gap analysis required by the existing warrant, and is based on a combination of pedestrian volume and vehicle volume (a surrogate for gaps). The proposed graphic depicting the pedestrian signal warrant is shown below. If a crossing meets this warrant, the designer has the option to choose either a full signal or the hybrid pedestrian signal.



Revised warrant criteria for Warrant 4 – graphic proposed for 2009 MUTCD

Recommendation

Adopt the proposed language for the 2009 MUTCD for both the pedestrian volume signal warrant and the Pedestrian Hybrid Signal.

It is recommended that City of Wilmington adopt the proposed language for the 2009 MUTCD for both the pedestrian volume signal warrant and the Pedestrian Hybrid Signal.

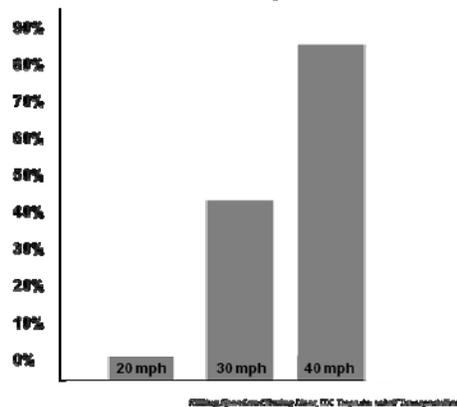
This signal will be a useful tool for roadways with an uncontrolled crossing where a marked crosswalk alone is not recommended and where the installation of a full signal will cause excessive vehicular delay or induce traffic to shift to lower volume neighborhood streets. This signal will also be an important option for improving the safety of crosswalks on the cities multi-lane arterials that do not have median islands. Although this device was not in widespread use at the time of the FHWA crosswalk study, it may be an appropriate treatment for uncontrolled crossings that require a signal as per the study.

Posted Speed Limits

Introduction

The establishment of speed limits requires balancing the relative importance of safety, convenience, engineering, and enforcement. The public will disregard speed limits if they are perceived to be unreasonable by their standards. If large percentages of motorists ignore the speed limits, it then becomes difficult to enforce the speed limit.

Fatalities based on speed of vehicle
A pedestrian's chance of death if hit by a motor vehicle



The most effective way to manage speed on roadways is to engineer the roadway to the desired operating speed within the context of the surrounding land use. The roadway should be a balanced designed developed in a context sensitive manner¹⁴ that balances efficiency, safety, aesthetics, and multi-modal mobility.

The existing practice of primarily relying on the 85th percentile speed of motorists and functional classification of the roadway fails to account for potential changes to the roadway environment. Relying primarily on existing speeds also limits the ability to change critical engineering values such as lane width, horizontal deflection, deceleration lane lengths, and corner curb radii which can be utilized to manage operating speeds on a roadway.

Speed is also a major factor in the severity of crashes. Higher speed crashes between vehicles result in increases in injuries, fatalities, and property damage. Pedestrians hit by vehicles at speeds in excess of 30 mph have a 45-50% chance of death.

Recommendations Overview

Wilmington should develop an arterial context sensitive speed limit policy based upon surrounding land use, roadway purpose, and multi-modal balance goals.

Current Policies or Practice

City of Wilmington

The City of Wilmington does not appear to have a speed limit policy.

NCDOT

NCDOT follows the Guidelines for the Establishment of Restrictive Speed Limits policy developed in 1995. This policy states:

“35 mph or lower speed limits should be considered when the overall amount of roadside development is or exceeds 75% for a given roadway length of 0.25 mile. This development may be residential and/or commercial.”

AASHTO Green Book

From page 71:

Urban arterial streets should be designed and control devices regulated, where practical, to permit running speeds of 20 to 45 mph. Speeds in the lower portion of this range are applicable to local and collector streets through residential areas and to arterial streets through more crowded business areas, while the speeds in the higher

¹⁴ See handbook – “When Main Street is a State Highway” developed by the Maryland State Highway Association <http://www.marylandroads.com/businesswithSHA/projects/ohd/mainstreet/mainstreet.asp>

portion of the range apply to hightype arterials in outlying suburban areas. For arterial streets through crowded business areas, coordinated signal control through successive intersections is generally needed to permit attainment of even the lower speeds. Many cities have substantial lengths of signal-controlled streets that operate at speeds of 15 to 25 mph.

Under less crowded conditions in suburban areas, it is common on preferred streets to adopt some form of speed zoning or control to limit high operating speeds. In such areas, pedestrians along the arterial or vehicles on cross streets, although relatively infrequent, may be exposed to potential collisions with through drivers. Such through drivers may gradually gain speed as urban restrictions are left behind or may retain their open-road speeds as they enter the city. Thus, although through traffic should be expedited to the extent practical, it may be equally important to limit speeds to reduce the risk of crashes and to serve local traffic.

Discussion of Existing Policies

The application of speed limits on NCDOT owned roadways within Wilmington strongly favors the through movement of motorists. It appears that there is a need to reevaluate speed limits along NCDOT roadways within the context of the extent of development alongside the roadway. The evaluation should consider the number of access points, pedestrian and bicyclist access along and across the roadway and the accident rate of the roadway.

The posted 45 mph speed limits the engineering flexibility which will be required to improve pedestrian crossing accommodations across NCDOT roadways by making it difficult to narrow travel lanes. Travel lanes of 11 feet will create additional space on many roadways to create or improve pedestrian refuge islands enabling the signalization and installation of crosswalks at many locations.

The higher posted speed limit along these arterial roadways also limits the ability to reduce speeds to a more appropriate 25 mph in school zones to reduce the likelihood of a child fatality in the event of a collision.

It appears that the City of Wilmington the authority to establish speed limits within the City Limits, including NCDOT owned roadways.

State of the Practice

Expert System for Recommending Speed Limits in Speed Zones, NCHRP Report 0367, November 2006

This report recommended setting speed limits differently in urban areas:

In urban areas with high pedestrian and bicycle activity, many experts recommend selecting the 5 mph multiple closest to the 50th percentile speed (the 50th percentile speed is the speed at or below which 50 percent of motorists drive on a given road) as the speed limit.

An analysis of 52 studies between 1966 and 1995 found “a reduction in speed limit was associated with a reduction in fatal and injury crashes”

- a 6 mph reduction in the speed limit was associated with approximately a 10% reduction in injury crashes and a 20% reduction in fatal crashes
- a 12 mph reduction in the speed limit was associated with approximately a 20% reduction in injury crashes, and a 40% reduction in fatal crashes.

Recommendation

Develop an arterial context sensitive speed limit policy based upon surrounding land use, roadway purpose, and multi-modal balance goals.

It is recommended that speed limits be restricted to the following:

- 25 mph in school zones
- 35 mph on arterials with development in accordance with NCDOT policy
- 25 mph on residential streets

COST ESTIMATES

Estimated Unit Construction Costs for Various Elements

Unit costs are based on 2008 dollars and were assigned based on historical cost data from state departments of transportation and other sources. The costs are intended to be general and used for planning purposes. Construction costs will vary based on the ultimate project scope (i.e. potential combination of projects, or use of City of Wilmington or NCDOT forces) and economic conditions at the time of construction.

Item	Unit	Unit Cost
Thermoplastic Pavement Marking 4"	LF	0.50
Thermoplastic Pavement Marking 6"	LF	1.00
Thermoplastic Pavement Marking 8"	LF	2.00
Thermoplastic Pavement Marking 12"	LF	3.00
Thermoplastic Pavement Marking Symbol	EA	250.00
Thermoplastic Pavement Marking Parking "T"	EA	2.50
Thermoplastic Pave. Marking High Visibility Crosswalk (15 FT x 40 FT)	EA	250.00
Eradicate Pavement Marking	LF	2.00
Sign Panel	SF	15.00
Sign Post	LF	10.00
Sign (Average 6 SF Panel, 11 LF Post)	EA	200.00
Sign Post Removal	EA	45.00
Remove and Reset Sign Panel and Post	EA	500.00
Remove and Reset Sign Panel	EA	250.00
Oversized Sign and Support (Double Post)	EA	1000.00
Cantilever Sign and Support	EA	27000.00
Asphalt Concrete Surface	TON	65.00
Asphalt Concrete Base	TON	60.00
Aggregate	CY	50.00
Concrete Pavement	SY	40.00
Trail Pavement (4 IN Surface, 6 IN Base, 6 IN Aggregate)	SF	2.50
Trail Pavement (6 FT Wide, 4 IN Surface, 6 IN Base, 6 IN Aggregate)	LF	15.00
Trail Pavement (8 FT Wide, 4 IN Surface, 6 IN Base, 6 IN Aggregate)	LF	20.00
Trail Pavement (10 FT Wide, 4 IN Surface, 6 IN Base, 6 IN Aggregate)	LF	25.00
Trail Pavement (12 FT Wide, 4 IN Surface, 6 IN Base, 6 IN Aggregate)	LF	30.00
Pavement Milling (1.5 in)	SY	5.25
Asphalt Entrance (30 FT Wide, 20 FT Long)	EA	1900.00
Demolition of Pavement/Excavation	CY	15.00
Obscuring	SY	200.00
Raised Crossing Pavement (3 IN high, 15 FT Wide, 40 FT Long)	EA	715.00
Raised Crossing Pavement (6 IN high, 15 FT Wide, 40 FT Long)	EA	1430.00
Textured Concrete	SF	8.00
Colored Concrete		
Stamped/Colored Asphalt	SF	5.00

Item	Unit	Unit Cost
Signal Loop Detector	EA	1210.00
Signal Head	EA	5000.00
Pedestrian Signal Head	EA	5000.00
Pedestrian/Bike Signal (Best Guess for 4 leg Intersection)	EA	40,000.00
Fully Signalized 4 Leg Intersection	EA	121000.00
Remove Roadway Lighting Structure	EA	500.00
Sidewalk (4 IN PCC)	SF	5.00
Curb Ramp	EA	400.00
Curb and Gutter	LF	45.00
Concrete Median	SY	300.00
Bollard	EA	260.00
	SY	126.00
Unit Pavers	SF	15.00
Remove Drainage Inlet	EA	500.00
Drainage Inlet/Catch Basin	EA	3000.00
Project Drainage (Per SF of New Pavement)	SF	2.13
Engineering Costs	Percent	15%
Contingency	Percent	25%

Long Term Sidewalk Improvements Recommendations

Construction cost estimates were developed for the recommendations based on an estimated cost of \$5 per square foot for 4" thick, 5' wide poured in place concrete sidewalk. Because this is a city-wide plan and not a detailed project site design study, the costs are intended to be general and used for planning purposes only and do not include right-of-way acquisitions, curb ramp installation, new driveway aprons, grading, drainage improvements or retaining walls, and other elements. Construction costs will vary based on the ultimate project scope (i.e. potential combination of projects, or use of Wilmington or NC DOT labor) and economic conditions at the time of construction. Actual construction costs should be determined at the time of the project and should include estimates based on: sidewalk thickness and width, number of curb ramps required, driveway aprons, surface (if surface other than concrete is desired), drainage improvements, curb and gutter or grassed swale, signage, right of way acquisition, demolition, engineering, utility relocation, mobilization, temporary access, bus stop improvements, street furniture and other project costs.

Street	Length (FT)	Length (MI)	Approx. Cost.
10TH ST	1,864	0.35	\$46,604
11TH ST	333	0.06	\$8,331
12TH ST	2,959	0.56	\$73,976
14TH ST	1,665	0.31	\$41,626
15TH ST	4,556	0.86	\$113,894
18TH ST	834	0.16	\$20,856
19TH ST	3,830	0.72	\$95,762
20TH ST	1,474	0.28	\$36,849
21 ST ST	805	0.15	\$20,126
22 ND ST	982	0.19	\$24,549
23 RD ST	1,467	0.28	\$36,679
26 TH ST	725	0.14	\$18,113
27 TH ST	1,433	0.27	\$35,816
29 TH ST	3,869	0.73	\$96,734
2ND ST	2,002	0.36	\$47,594
30 TH ST	2,795	0.53	\$69,867
31ST ST	2,689	0.51	\$67,222
39 TH ST	2,620	0.50	\$65,492
3RD ST	116	0.02	\$2,908
41 ST ST	5,499	1.04	\$137,481
43 RD ST	1,700	0.32	\$42,488
47 TH ST	1,185	0.22	\$29,637

Street	Length (FT)	Length (MI)	Approx. Cost.
48 TH ST	609	0.12	\$15,231
48TH ST	611	0.12	\$15,268
4TH ST	5,994	1.14	\$149,838
51st ST	773	0.15	\$19,337
52 ND ST	2,668	0.51	\$66,698
54TH ST	2,117	0.40	\$52,929
58TH ST	4,019	0.76	\$100,477
5TH AV	704	0.13	\$17,592
5TH ST	1,277	0.24	\$31,916
6TH ST	3,232	0.61	\$80,804
7TH ST	785	0.15	\$19,622
8TH ST	1,214	0.23	\$30,354
ADAMS ST	1,446	0.27	\$36,155
ADELAIDE DR	2,962	0.56	\$74,053
AIRLIE FOREST CT	1,971	0.37	\$49,269
ALABAMA AV	1,278	0.24	\$31,954
ALBERT	3,006	0.57	\$75,159
ALLENS LN	743	0.14	\$18,582
ALLEY	55	0.01	\$1,374
ALOHA LN	399	0.08	\$9,985
ALPINE DR	1,910	0.36	\$47,757
AMHEARST CT	938	0.18	\$23,461
AMPHITHEATRE DR	869	0.16	\$21,715
AMY DR	2,359	0.45	\$58,982
ANDERSON ST	375	0.07	\$9,376
ANDOVER	465	0.09	\$11,634
ANDOVER RD	5,108	0.97	\$127,707
ANDREWS REACH LP	3,637	0.69	\$90,921
ANTELOPE TRAIL	738	0.14	\$18,453
APOLLO DR	2,872	0.55	\$71,805
APPLETON	3,830	0.73	\$95,749
ARCHER DR	1,587	0.30	\$39,668
ARDLEY CT	458	0.09	\$11,444
ARIZONA AV	462	0.09	\$11,544
ASHLEY	5,375	1.02	\$134,378
ASTER CT	9,251	1.75	\$231,267
ATHENS LN	1,324	0.25	\$33,090
ATLANTIS CT	2,102	0.40	\$52,541
AUTUMN HALL DR	2,753	0.52	\$68,834
AVENTURAS DR	2,251	0.43	\$56,279

Street	Length (FT)	Length (MI)	Approx. Cost.
AVINE CT	313	0.06	\$7,836
AZALEA DR	1,104	0.21	\$27,612
BAGLEY	879	0.17	\$21,969
BARCLAY HILLS DR	2,494	0.47	\$62,338
BAREFOOT DR	1,684	0.32	\$42,103
BARKLEY AV	710	0.14	\$17,758
BARKSDALE RD	1,282	0.24	\$32,061
BARLOW CT	138	0.03	\$3,439
BARNETT AV	768	0.15	\$19,205
BATTERY PL	1,439	0.27	\$35,979
BEAR CT	313	0.06	\$7,829
BEASLEY ST	323	0.06	\$8,085
BEAUREGARD DR	3,683	0.70	\$92,065
BEAVER CREEK CT	998	0.19	\$24,962
BEDFORD FOREST DR	1,911	0.36	\$47,767
BEECHCLIFF DR	774	0.15	\$19,353
BELGRAVE	508	0.10	\$12,692
BELL ST	1,484	0.28	\$37,112
BELVEDERE DR	717	0.14	\$17,934
BENJAMIN AV	1,906	0.36	\$47,649
BENTLEY DR	205	0.04	\$5,114
BETHAL RD	4,525	0.86	\$113,121
BIRCH CREEK DR	3,989	0.76	\$99,722
BIRDIE LN	1,900	0.36	\$47,509
BLACK ST	434	0.08	\$10,856
BLAIR SCHOOL RD	4,162	0.79	\$104,044
BLAND ST	527	0.10	\$13,164
BLENHEIM PL	571	0.11	\$14,285
BLUEBIRD LN	852	0.16	\$21,311
BOATHOUSE RD	1,279	0.24	\$31,975
BOGEY DR	1,962	0.37	\$49,053
BONHAM AV	6,458	1.22	\$161,448
BORDEAUX AV	938	0.18	\$23,454
BOUGAINVILLEA	3,067	0.58	\$76,672
BRADFORD RD	2,863	0.54	\$71,566
BRAEMAR LN	1,808	0.34	\$45,193
BRAGG DR	5,333	1.01	\$133,337
BRICKLE AV	723	0.14	\$18,087
BRISTOL RD	1,711	0.32	\$42,774
BRITTAIN DR	29	0.01	\$723
BROAD ST	1,132	0.21	\$28,294

Street	Length (FT)	Length (MI)	Approx. Cost.
BROOKSHIRE LN	6,427	1.22	\$160,678
BRUNSWICK ST	517	0.10	\$12,933
BRYAN AV	1,888	0.36	\$47,210
BUCKINGHAM AV	1,433	0.27	\$35,825
BUNTING DR	448	0.08	\$11,195
BURKE AV	525	0.10	\$13,123
BURNEY ST	2,156	0.41	\$53,906
BUTTER CLAM CT	208	0.04	\$5,206
CABLE CAR LN	3,143	0.60	\$78,571
CADDY	1,521	0.29	\$38,028
CAIN CT	396	0.08	\$9,905
CALHOUN DR	2,590	0.49	\$64,755
CALVERT PL	356	0.07	\$8,908
CAMDEN	5,024	0.95	\$125,594
CAMELIA DR	2,803	0.53	\$70,077
CAMELLIA LN	2,264	0.43	\$56,607
CAMERON CT	4,277	0.81	\$106,918
CAMPBELL ST	898	0.17	\$22,456
CAMPUS VIEW	225	0.04	\$5,631
CAMWAY DR	3,998	0.76	\$99,955
CANTERBURY RD	58	0.01	\$1,451
CAPE FEAR	1,521	0.29	\$38,021
CAPE HARBOR DR	28	0.01	\$701
CAPRI DR	1,739	0.33	\$43,480
CARL ST	2,712	0.51	\$67,800
CARLTON AV	1,940	0.37	\$48,502
CARNATION CT	1,055	0.20	\$26,376
CARRIAGE WY	342	0.07	\$8,542
CARTER AV	2,146	0.41	\$53,661
CASCADE RD	3,946	0.75	\$98,649
CASTLE HAYNE RD	4,091	0.77	\$102,287
CASTLE ST	406	0.08	\$10,147
CASTLEWOOD DR	289	0.05	\$7,216
CASWELL ST	1,399	0.27	\$34,979
CEDAR AV	5,141	0.97	\$128,515
CEDAR RIDGE DR	2,455	0.47	\$61,366
CELLINE CT	376	0.07	\$9,389
CENTER ST	1,159	0.22	\$28,965
CHALMERS DR	5,763	1.09	\$144,085
CHANCERY PL	32	0.01	\$798
CHAPPEL AV	909	0.17	\$22,732

Street	Length (FT)	Length (MI)	Approx. Cost.
CHARLES PAINE DR	1,048	0.20	\$26,211
CHARTER DR	3,030	0.57	\$75,757
CHELON	4,623	0.88	\$115,580
CHELSEA LN	2,207	0.42	\$55,178
CHENEY PL	236	0.05	\$5,900
CHERRY AV	4,397	0.83	\$109,930
CHESTER ST	3,289	0.62	\$82,213
CHESTNUT ST	303	0.06	\$7,566
CHURCH ST	619	0.12	\$15,486
CIRCLE ST	392	0.07	\$9,803
CLAIRIDGE RD	1,543	0.29	\$38,571
CLAY ST	4,925	0.93	\$123,129
CLEMSON DR	1,567	0.30	\$39,177
CLUBHOUSE DR	2,177	0.41	\$54,437
COBBLESTONE DR	2,790	0.53	\$69,749
COLLEGE ACRES DR	2,569	0.49	\$64,220
COLLEGE RD	4,232	0.80	\$105,788
COLLETON CT	597	0.11	\$14,934
COLLINWOOD CT	943	0.18	\$23,585
COLONY	1,762	0.33	\$44,053
COLUMBUS	1,686	0.32	\$42,159
COLWELL AV	1,809	0.34	\$45,217
COMPTON ST	2,646	0.50	\$66,156
CONFEDERATE DR	4,697	0.89	\$117,426
CONSTITUTION	1,282	0.24	\$32,062
COOPER CT	253	0.05	\$6,332
COPLEY RD	423	0.08	\$10,564
CORBETT ST	1,542	0.29	\$38,541
COSTMARY LN	948	0.18	\$23,708
COULTER PL	795	0.15	\$19,868
COUNTRY CLUB RD	27	0.01	\$668
COVINGTON RD	1,480	0.28	\$37,010
COWAN ST	1,546	0.29	\$38,648
CRAWLDAD CT	1,413	0.27	\$35,329
CRETE DR	1,176	0.22	\$29,388
CREWS DR	1,296	0.25	\$32,400
CROCUS CT	689	0.13	\$17,220
CROMWELL	873	0.17	\$21,836
CROQUET DR	1,018	0.19	\$25,457
CROSS CREEK RD	1,134	0.22	\$28,362
CROSSOVER ST	703	0.13	\$17,576

Street	Length (FT)	Length (MI)	Approx. Cost.
CROWLEY	313	0.06	\$7,836
CURLEW DR	582	0.11	\$14,551
CYPRESS DR	1,736	0.33	\$43,394
CYPRESS GROVE DR	4,436	0.84	\$110,908
DANBURY ST	214	0.04	\$5,345
DAPHINE	869	0.17	\$21,725
DAPHINE CT	122	0.02	\$3,061
DAPHINE DR	430	0.08	\$10,748
DAPPLE CT	998	0.19	\$24,949
DARBY ST	2,184	0.41	\$54,600
DARE ST	977	0.19	\$24,432
DARTMOUTH ST	1,204	0.23	\$30,105
DAVIE DR	2,134	0.40	\$53,356
DAVIS LN	116	0.02	\$2,906
DAWSON ST	488	0.09	\$12,211
DECATUR DR	2,556	0.48	\$63,904
DELAWARE AV	1,251	0.24	\$31,270
DELGATO AV	384	0.07	\$9,602
DEPARTURE CT	502	0.10	\$12,556
DERBY DOWN	1,398	0.27	\$34,959
DEVON CT	647	0.12	\$16,169
DEVONSHIRE LN	3,583	0.68	\$89,580
DEWITT RD	1,116	0.21	\$27,903
DEXTER ST	2,015	0.38	\$50,384
DISNEY DR	3,035	0.58	\$75,874
DIXIE AV	3,231	0.61	\$80,780
DOBBS ST	1,477	0.28	\$36,934
DOCTORS	1,007	0.19	\$25,173
DOE CLEARING CT	471	0.09	\$11,784
DOGWOOD LN	281	0.05	\$7,020
DOLPHIN CT	446	0.08	\$11,155
DONNA AV	966	0.18	\$24,151
DORSETT PL	1,702	0.32	\$42,554
DOUGHTON DR	1,077	0.20	\$26,936
DOVE CT	907	0.17	\$22,674
DOVER RD	2,690	0.51	\$67,245
DUCK HAWK CT	264	0.05	\$6,607
DUDLEY DR	198	0.04	\$4,945
DUNMORE RD	4,051	0.77	\$101,287
DURBIN CT	1,659	0.31	\$41,467

Street	Length (FT)	Length (MI)	Approx. Cost.
EARLY DR	2,474	0.47	\$61,858
EASTWIND RD	6,693	1.27	\$167,323
EBB TIDE LN	760	0.14	\$19,007
ECHO FARMS	2,892	0.55	\$72,307
EDGEWOOD RD	2,939	0.56	\$73,463
EDINBORO LN	1,040	0.20	\$25,993
EDWARDS ST	2,127	0.40	\$53,185
ELISHA DR	5,112	0.97	\$127,809
ELM ST	2,087	0.40	\$52,187
ELMORE ST	654	0.12	\$16,352
EMERALD COVE CT	831	0.16	\$20,773
EMERSON ST	1,266	0.24	\$31,657
EMORY ST	377	0.07	\$9,414
EMPIE PARK	459	0.09	\$11,470
ESTATE DR	2,311	0.44	\$57,777
ESTATE RD	753	0.14	\$18,826
ESTELLE LEE DR	837	0.16	\$20,915
EVANS ST	5,169	0.98	\$129,228
EVERGREEN DR	1,005	0.19	\$25,133
EWELL DR	1,439	0.27	\$35,976
EXETER PL	87	0.02	\$2,168
FAIRLAWN DR	2,355	0.45	\$58,884
FAIRVIEW DR	3,628	0.69	\$90,689
FALL DR	2,263	0.43	\$56,587
FANNING ST	509	0.10	\$12,724
FAWN CREEK DR	807	0.15	\$20,184
FEDERAL EXPRESS RD	454	0.09	\$11,358
FEDERAL PARK DR	1,422	0.27	\$35,551
FENWICK PL	1,548	0.29	\$38,706
FILLMORE DR	3,040	0.58	\$76,005
FINIAN DR	1,451	0.28	\$36,286
FLINT DR	475	0.09	\$11,873
FLORIDA	551	0.10	\$13,773
FOREST AV	2,021	0.38	\$50,522
FOREST CREEK	1,261	0.24	\$31,523
FOREST PARK RD	1,560	0.30	\$38,988
FOREST RD	3,792	0.72	\$94,802
FOWLER ST	2,013	0.38	\$50,325
FOXGLOVE CT	308	0.06	\$7,688
FOXHALL CT	1,448	0.28	\$36,210
FRANCIS MARION	5,845	1.11	\$146,115

Street	Length (FT)	Length (MI)	Approx. Cost.
DR			
FRANKLIN AV	2,554	0.48	\$63,847
FRATERNITY CT	247	0.05	\$6,175
FRENCH RD	2,422	0.46	\$60,548
GADDY DR	377	0.07	\$9,413
GADWALL CT	635	0.12	\$15,866
GARDEN AV	1,225	0.23	\$30,633
GARDEN TERRACE DR	181	0.03	\$4,518
GARDENIA CT	197	0.04	\$4,930
GARDENIA LN	2,296	0.43	\$57,406
GASTON ST	858	0.16	\$21,455
GATEWAY DR	1,371	0.26	\$34,286
GEORGE ANDERSON DR	2,233	0.42	\$55,823
GEORGETOWN RD	71	0.01	\$1,779
GIBSON AV	1,768	0.34	\$44,205
GILES	1,609	0.30	\$40,222
GILLETTE DR	6,029	1.14	\$150,732
GILLMOSS LN	194	0.04	\$4,862
GLASGOW DR	495	0.09	\$12,367
GLEASON RD	1,690	0.32	\$42,245
GLEN MEADE RD	1,692	0.32	\$42,304
GLENN ST	685	0.13	\$17,115
GOLDEN EAGLE CT	699	0.13	\$17,479
GORDON RD	653	0.06	\$8,361
GORES	644	0.12	\$16,092
GORHAM	1,859	0.35	\$46,479
GRADY AV	1,690	0.32	\$42,244
GRAHAM ST	956	0.18	\$23,909
GRANDE MANOR CT	550	0.10	\$13,762
GREENDALE DR	2,303	0.44	\$57,574
GREENLEAF DR	1,529	0.29	\$38,236
GREENWELL CT	944	0.18	\$23,609
GREENWOOD AV	2,938	0.56	\$73,456
GREY LEAF DR	2,623	0.50	\$65,571
GROUSE CT	1,756	0.33	\$43,912
GUFFORD DR	1,492	0.28	\$37,291
HALIFAX RD	2,751	0.52	\$68,785
HAMILTON DR	794	0.15	\$19,845
HAMPSHIRE DR	2,266	0.43	\$56,651

Street	Length (FT)	Length (MI)	Approx. Cost.
HAMPTON RD	831	0.16	\$20,775
HANOVER ST	720	0.14	\$17,990
HARDSCRABBLE CT	1,755	0.33	\$43,874
HARNETT ST	671	0.13	\$16,778
HARRISON ST	542	0.10	\$13,538
HART ST	1,479	0.28	\$36,963
HARVEST GROVE LN	609	0.12	\$15,227
HAVELOCK LN	486	0.09	\$12,153
HAWTHORNE PL	883	0.17	\$22,066
HAYMARKET LN	4,994	0.95	\$124,852
HEAD RD	1,947	0.37	\$48,686
HEIDE DR	2,891	0.55	\$72,284
HENRY H WATTERS DR	1,523	0.29	\$38,079
HENRY ST	4,132	0.78	\$103,305
HILL ST	1,363	0.26	\$34,080
HILLANDALE DR	767	0.15	\$19,187
HILLSDALE DR	3,594	0.68	\$89,853
HILTON ST	2,487	0.47	\$62,187
HOGGARD DR	3,564	0.68	\$89,098
HOLLINS RD	3,158	0.60	\$78,943
HOLLY DR	1,498	0.28	\$37,454
HOLMLOCK	796	0.15	\$19,889
HONEYSUCKLE ST	1,291	0.24	\$32,277
HOOD DR	2,576	0.49	\$64,407
HORSHAM CT	305	0.06	\$7,632
HOSPITAL PLAZA DR	1,773	0.34	\$44,316
HOWARD ST	1,607	0.30	\$40,167
HUDSON DR	1,971	0.37	\$49,276
HUGH MACRE PARK	919	0.17	\$22,978
HUGH MCRAE PARK	1,396	0.26	\$34,895
HUGH MCRAE PARK RD	7,142	1.35	\$178,538
HUNT CLIFF CT	305	0.06	\$7,632
HUNT CLUB RD	3,819	0.72	\$95,479
HUNTER DR	1,075	0.20	\$26,887
HUNTING RIDGE RD	5,358	1.02	\$133,951
HUNTINGTON RD	4,672	0.89	\$116,800
HURST ST	1,172	0.22	\$29,292
IBIS CT	623	0.12	\$15,568
IKE DR	403	0.08	\$10,080

Street	Length (FT)	Length (MI)	Approx. Cost.
IKNER LN	969	0.18	\$24,236
INLAND GREENS	735	0.14	\$18,372
INLAND GREENS DR	7,045	1.34	\$176,127
IRIS ST	3,281	0.62	\$82,037
ISLAND COVE	1,458	0.28	\$36,460
IVO CET DR	1,939	0.37	\$48,475
J R KENNEDY DR	2,073	0.39	\$51,822
JACKSON DR	1,636	0.31	\$40,890
JACKSON ST	1,561	0.30	\$39,035
JACKSONVILLE AV	2,066	0.39	\$51,652
JARED CT	1,203	0.23	\$30,068
JASPER PL	1,530	0.29	\$38,241
JEB STUART DR	1,779	0.34	\$44,467
JEFFERSON ST	1,074	0.20	\$26,849
JENNINGS DR	3,834	0.73	\$95,853
JOHN D BARRY DR	366	0.07	\$9,141
JOHN S MOSBY DR	1,508	0.29	\$37,706
JOHNSON ST	498	0.09	\$12,461
JONES RD	829	0.16	\$20,725
JUMPIN RUN DR	3,953	0.75	\$98,824
KAY ST	780	0.15	\$19,504
KELLUM CT	448	0.08	\$11,193
KELLY RD	1,212	0.23	\$30,300
KENAN CT	315	0.06	\$7,875
KENT ST	1,731	0.33	\$43,278
KENTUCKY AV	640	0.12	\$16,009
KESTRAL DR	164	0.03	\$4,107
KESWICK CT	844	0.16	\$21,109
KETTERING PL	568	0.11	\$14,194
KIDDER ST	3,800	0.72	\$95,004
KILDARE RD	132	0.03	\$3,292
KIMBERLY	763	0.14	\$19,077
KING ST	715	0.14	\$17,866
KINGSLEY RD	912	0.17	\$22,788
KINGSTON RD	5,647	1.07	\$141,164
KINSTON AV	1,307	0.25	\$32,680
KIRBY SMITH DR	2,109	0.40	\$52,733
KIRKLEY CT	328	0.06	\$8,193
KORNEGAY AV	785	0.15	\$19,615
KUBECK CT	1,294	0.25	\$32,350

Street	Length (FT)	Length (MI)	Approx. Cost.
KYLE CT	503	0.10	\$12,578
LAKE DR	1,551	0.29	\$38,780
LAKE FOREST	8,303	1.57	\$207,582
LAKE SHORE DR	609	0.12	\$15,227
LAKEWOOD PL	488	0.09	\$12,191
LAME ST	124	0.02	\$3,095
LAMPPOST	1,598	0.30	\$39,941
LANCASTER RD	4,869	0.92	\$121,713
LANCOME CT	535	0.10	\$13,382
LANDS END CT	581	0.11	\$14,537
LANTERN	1,705	0.32	\$42,619
LARCHMONT DR	3,078	0.58	\$76,950
LARK CT	268	0.05	\$6,704
LATIMER DR	945	0.18	\$23,634
LAUREL LN	683	0.13	\$17,067
LEATHERWOOD DR	856	0.16	\$21,389
LEE DR	4,245	0.80	\$106,134
LEEWARD LN	53	0.01	\$1,337
LEGARE CT	478	0.09	\$11,956
LEXINGTON DR	2,191	0.41	\$54,770
LIBERTY CT	454	0.09	\$11,358
LILAC CT	397	0.08	\$9,932
LILLINGTON DR	42	0.01	\$1,051
LINCOLN CT	1,297	0.25	\$32,420
LINGO AV	1,045	0.20	\$26,135
LIONS	626	0.12	\$15,651
LIONS DEN DR	405	0.08	\$10,129
LIONS GATE DR	1,554	0.29	\$38,845
LISMORE	264	0.05	\$6,593
LITTLE JOHN	933	0.18	\$23,323
LIVERPOOL ST	1,140	0.22	\$28,502
LONG LEAF ACRES DR	3,236	0.61	\$80,895
LONG LEAF HILLS DR	11	0.00	\$275
LORING	701	0.13	\$17,520
LOU BELLE ST	2,079	0.40	\$51,973
LOUISA LN	1,181	0.22	\$29,533
LOUISIANA AV	2,619	0.50	\$65,464
LOVINGSTON LN	1,556	0.30	\$38,900
LYNCHFIELD CT	408	0.08	\$10,205
LYNDON AV	1,990	0.38	\$49,749

Street	Length (FT)	Length (MI)	Approx. Cost.
MACCUMBER LN	1,258	0.24	\$31,449
MACRAE AV	89	0.02	\$2,231
MADELINE DR	2,320	0.44	\$58,009
MADISON ST	366	0.07	\$9,152
MAIDES AV	3,154	0.60	\$78,857
MALLARD ST	1,140	0.22	\$28,510
MALPASS AV	1,144	0.22	\$28,595
MALVERN RD	919	0.17	\$22,987
MAMIE CT	220	0.04	\$5,489
MANHATTAN DR	431	0.08	\$10,764
MANLY AV	1,833	0.35	\$45,820
MAPLE AV	6,324	1.20	\$158,089
MARBLEHEAD CT	442	0.08	\$11,060
MARGUERITE DR	596	0.11	\$14,889
MARIGOLD CT	1,237	0.23	\$30,915
MARION DR	408	0.08	\$10,193
MARKET ST	2,857	0.51	\$68,006
MARLBORO ST	463	0.09	\$11,578
MARLIN CT	1,507	0.29	\$37,686
MARSTELLAR ST	4,012	0.76	\$100,303
MARTIN ST	4,963	0.94	\$124,078
MARYLAND AV	576	0.11	\$14,395
MAULTSBY DR	21	0.00	\$536
MAYFIELD	955	0.18	\$23,867
MAYFLOWER DR	433	0.08	\$10,820
MCCARLEY	543	0.10	\$13,566
MCCLAMMY ST	1,037	0.20	\$25,936
MCCLELLAND DR	1,436	0.27	\$35,893
MCCOMBERS LN	806	0.15	\$20,144
MCDONALD DR	1,720	0.33	\$43,010
MCEACHERN CT	1,984	0.38	\$49,605
MCKINNON DR	266	0.05	\$6,662
MCRAE ST	3,926	0.75	\$98,160
MEARES ST	439	0.08	\$10,987
MEETING CT	417	0.08	\$10,420
MEGANS PLACE DR	1,142	0.22	\$28,539
MELINDA DR	1,054	0.20	\$26,361
MELISSA CT	1,019	0.19	\$25,466
MERCER AV	9,843	1.87	\$246,066
MERRIMAC DR	1,482	0.28	\$37,041
METTING RD	2,187	0.41	\$54,674

Street	Length (FT)	Length (MI)	Approx. Cost.
MICHIGAN AV	575	0.11	\$14,377
MILDRED AV	567	0.11	\$14,167
MILITARY CUTOFF RD	1,644	0.22	\$28,412
MIMOSA PL	443	0.08	\$11,080
MOCKINGBIRD LN	5,973	1.13	\$149,320
MONITOR DR	2,085	0.40	\$52,120
MONROE ST	4,181	0.79	\$104,527
MONTCLAIR DR	2,953	0.56	\$73,835
MONTFORD DR	1,880	0.36	\$47,001
MONTGOMERY AV	2,624	0.50	\$65,605
MOONLIGHT LN	398	0.08	\$9,949
MORGAN ST	692	0.13	\$17,308
MORTON CT	324	0.06	\$8,109
MOSLEY ST	3,403	0.65	\$85,085
MOSS ST	992	0.19	\$24,792
MULBERRY AV	734	0.14	\$18,346
MYERS ST	686	0.13	\$17,153
MYNA	669	0.13	\$16,733
NASH DR	1,532	0.29	\$38,307
NAUTILUS DR	454	0.09	\$11,359
NEW BERN AV	2,608	0.49	\$65,199
NEWKIRK AV	302	0.06	\$7,558
NEWTON ST	436	0.08	\$10,902
NINA PL	305	0.06	\$7,630
NOBEL SCHOOL RD	279	0.05	\$6,987
NORTH CAROLINA AV	933	0.18	\$23,335
NORTHWOOD DR	5,047	0.96	\$126,181
NORWOOD AV	788	0.15	\$19,695
NOTTINGHAM LN	2,025	0.38	\$50,615
NUN ST	363	0.07	\$9,074
NUTT ST	1,191	0.23	\$29,764
OAK BLUFF LN	3,376	0.64	\$84,393
OAK ST	644	0.12	\$16,102
OAKCLIFF DR	1,377	0.26	\$34,436
OAKCREST DR	3,323	0.63	\$83,073
OAKLAND DR	792	0.15	\$19,794
OAKLEAF DR	3,647	0.69	\$91,182
OFF FLORAL & 39	723	0.14	\$18,078
OLD DAIRY RD	884	0.17	\$22,094
OLD EASTWOOD RD	2,451	0.47	\$61,268

Street	Length (FT)	Length (MI)	Approx. Cost.
OLD FOARDS LN	575	0.11	\$14,365
OLD MEARS RD	1,560	0.30	\$38,992
OLD MILITARY RD	2,320	0.44	\$57,994
ORCHARD AV	674	0.13	\$16,845
ORCHARD TRACE	1,329	0.25	\$33,236
ORIOLE DR	395	0.08	\$9,868
OSPREY LN	661	0.13	\$16,527
OVERBROOK RD	3,111	0.59	\$77,767
OWENCROFT CT	974	0.18	\$24,362
OXMORE PL	492	0.09	\$12,295
PARK	2,586	0.49	\$64,648
PARK AV	10,137	1.92	\$253,417
PARKWAY	3,077	0.58	\$76,934
PARKWAY DR	2,604	0.49	\$65,102
PARMELE DR	2,651	0.50	\$66,277
PARTRIDGE RD	5,440	1.03	\$135,999
PATRICK AV	2,630	0.50	\$65,743
PATRIOT	753	0.14	\$18,819
PAVILION PL	411	0.08	\$10,267
PEACHTREE AV	9,892	1.87	\$247,299
PEIFFER	2,483	0.47	\$62,063
PENN ST	753	0.14	\$18,827
PEPYS LN	2,213	0.42	\$55,317
PERSHING CT	788	0.15	\$19,688
PETREL CT	699	0.13	\$17,476
PICKARD RD	1,470	0.21	\$28,135
PICKETT DR	2,153	0.41	\$53,833
PINE CLAY RD	2,031	0.39	\$50,787
PINE CLIFF DR	5,203	0.98	\$130,080
PINE GROVE DR	1,003	0.19	\$25,085
PINE HILLS DR	4,098	0.78	\$102,443
PINE NEEDLE DR	1,707	0.32	\$42,674
PINE ST	9,202	1.74	\$230,062
PINECREST	10,379	1.97	\$259,486
PINEWOOD	536	0.10	\$13,395
PINTAIL CT	745	0.14	\$18,623
PLAZA DR	702	0.13	\$17,555
PLUM NEARLY LN	802	0.15	\$20,058
POLK ST	1,091	0.21	\$27,286
POMPANO CT	488	0.09	\$12,206
PONDEROSA LN	2,146	0.41	\$53,639

Street	Length (FT)	Length (MI)	Approx. Cost.
POPLAR ST	1,432	0.27	\$35,809
POWELL	254	0.05	\$6,341
PRICES LA	998	0.19	\$24,947
PURDUE DR	1,115	0.21	\$27,873
QUEEN ST	1,480	0.28	\$37,008
RABBIT RUN RD	1,814	0.34	\$45,350
RACINE DR	475	0.09	\$11,863
RAINBOW DR	1,787	0.34	\$44,672
RAMP	287	0.05	\$7,179
RANDALL	1,400	0.19	\$24,542
RAYNOR CT	491	0.09	\$12,277
RED BERRY DR	4,469	0.85	\$111,725
RED BIRD RD	1,695	0.32	\$42,371
RED BUD	688	0.13	\$17,189
RED WING LN	874	0.17	\$21,861
REGENCY DR	1,034	0.20	\$25,843
REILLY DR	2,079	0.39	\$51,963
RENOVAH	5,612	1.06	\$140,310
RESTON CT	2,351	0.45	\$58,774
RIEGEL DR	618	0.12	\$15,454
RIEGEL RD	1,423	0.27	\$35,587
RILL RD	1,712	0.32	\$42,804
ROBERT HOKE RD	1,466	0.28	\$36,646
ROLLING HILLS CV	1,750	0.33	\$43,741
ROSELAND DR	901	0.17	\$22,530
ROYAL BONNET DR	1,915	0.36	\$47,884
RUTLEDGE DR	1,133	0.22	\$28,331
RUXTON	2,883	0.55	\$72,083
SABRA DR	525	0.10	\$13,120
SAINT JOHNS CT	2,392	0.45	\$59,795
SAMUEL COOPER DR	943	0.18	\$23,564
SAND HILLS DR	1,939	0.37	\$48,476
SCHRIBERS LN	712	0.13	\$17,791
SEA EAGLE CT	816	0.15	\$20,390
SEABROOK CT	1,080	0.20	\$26,993
SEABURY CT	286	0.05	\$7,138
SEAHAWK CT	761	0.15	\$19,031
SEBRELL	904	0.17	\$22,588
SEMMES DR	6,904	1.31	\$172,611
SENTINEL LN	7	0.00	\$185
SEQUOIA CT	632	0.12	\$15,796

Street	Length (FT)	Length (MI)	Approx. Cost.
SHADOW CT	1,306	0.25	\$32,648
SHADY GROVE DR	446	0.08	\$11,142
SHAMROCK DR	3,337	0.63	\$83,423
SHELLEY DR	708	0.13	\$17,696
SHERWOOD DR	1,277	0.24	\$31,925
SHINNWOOD RD	537	0.10	\$13,418
SHIPYARD	37	0.01	\$916
SMITH CREEK	662	0.13	\$16,547
SOLID HOLLOW LN	208	0.04	\$5,192
SORORITY CT	323	0.06	\$8,081
SOUTH CAROLINA AV	3,520	0.67	\$88,009
SOUTHGATE RD	3,960	0.75	\$98,991
SOUTHALL DR	842	0.16	\$21,049
SOUTHWOOD RD	2,148	0.41	\$53,712
SOVEREIGN PL	1,565	0.30	\$39,117
SPARROW HAWK CT	1,709	0.32	\$42,725
SPAULDING DR	1,735	0.33	\$43,379
SPOFFORD	1,559	0.30	\$38,975
SPOTSWOOD CT	506	0.10	\$12,656
SPRING AV	700	0.13	\$17,491
SPRUCE	710	0.13	\$17,738
SPRUCE DR	4,262	0.81	\$106,560
STADIUM DR	2,962	0.56	\$74,062
STAFFORDSHIRE DR	398	0.08	\$9,958
STERLING PL	1,586	0.30	\$39,649
STEWART	2,199	0.42	\$54,969
STOCKBRIDGE PL	573	0.11	\$14,322
STONEBRIDGE RD	1,611	0.31	\$40,266
STRADLEIGH RD	2,831	0.54	\$70,787
STRATFORD	2,514	0.48	\$62,851
SUFFOLK LN	986	0.19	\$24,662
SUMMIT	1,347	0.26	\$33,670
SUMTER DR	1,112	0.21	\$27,807
SUNCOURT VILLA DR	808	0.15	\$20,209
SURREY DOWNS CT	463	0.09	\$11,582
SURRY ST	750	0.14	\$18,751
SWEETBRIAR RD	2,777	0.53	\$69,420
SWEETGUM	1,982	0.38	\$49,553

Street	Length (FT)	Length (MI)	Approx. Cost.
HOLLOW RD			
SYCAMORE ST	1,663	0.32	\$41,583
SYLVAN DR	1,792	0.34	\$44,791
TALON CT	131	0.03	\$3,280
TANBRIDGE RD	796	0.15	\$19,912
TANSEY CLOSE DR	1,220	0.23	\$30,492
TARA DR	1,107	0.21	\$27,680
TEAL ST	4,057	0.77	\$101,423
TENNESSEE AV	396	0.08	\$9,898
TERRACE	1,641	0.31	\$41,020
THAXTON CT	138	0.03	\$3,455
THRUSH DR	1,595	0.30	\$39,883
TIDEWATER LN	1,067	0.20	\$26,685
TIPTON CT	2,021	0.38	\$50,537
TOTTENHAM CT	977	0.19	\$24,424
TOULON DR	3,203	0.61	\$80,071
TRADD CT	923	0.18	\$23,077
TREADWELL ST	786	0.15	\$19,650
TREYBROOKE DR	4,352	0.82	\$108,809
TROLLY LN	790	0.15	\$19,738
TROWBRIDGE ST	2,464	0.47	\$61,593
TUDOR CT	463	0.09	\$11,579
TULANE DR	2,277	0.43	\$56,937
TULIP DR	295	0.06	\$7,366
TULLAMORE RD	73	0.01	\$1,816
TWIN MAGNOLIAS LN	886	0.17	\$22,150
TWO CHOPT RD	3,142	0.60	\$78,560
UNIVERSITY DR	1,307	0.25	\$32,681
Unknown	3,104	0.59	\$77,589
UNNAMED	1,035	0.20	\$25,871
UPPER REACH DR	1,719	0.33	\$42,968
UPTON CT	808	0.15	\$20,199
VARSAITY DR	3,707	0.70	\$92,677
VENUS CT	374	0.07	\$9,344
VERBINIA DR	1,847	0.35	\$46,176
VERDURA DR	602	0.11	\$15,060
VICTORY GARDENS DR	1,749	0.33	\$43,731
VILLA PL	891	0.17	\$22,269
VILLAGE DR	1,594	0.30	\$39,850
VILLAGE PARK DR	1,472	0.28	\$36,793

Street	Length (FT)	Length (MI)	Approx. Cost.
VINEYARD LN	925	0.18	\$23,122
VIOLET CT	1,741	0.33	\$43,521
VIRGINIA AV	271	0.05	\$6,767
WADDELL ST	604	0.11	\$15,088
WAGON CT	659	0.13	\$16,479
WAKEFIELD RD	737	0.14	\$18,430
WALDEN DR	1,515	0.29	\$37,875
WALLACE	556	0.11	\$13,897
WALLACE AV	5,925	1.12	\$148,131
WALLINGTON RD	5,856	1.07	\$141,645
WALNUT ST	708	0.13	\$17,692
WARD ST	829	0.16	\$20,715
WARLICK DR	1,130	0.18	\$24,010
WASHINGTON ST	960	0.18	\$24,008
WATER ST	2,312	0.44	\$57,793
WAYNE DR	3,347	0.63	\$83,665
WEB TRACE	390	0.07	\$9,755
WEeping WILLOW RD	3,615	0.69	\$90,384
WELLESEY PL	964	0.18	\$24,092
WELLSPRING	722	0.14	\$18,055
WESLEY AV	2,171	0.41	\$54,274
WEST CASCADE RD	2,630	0.50	\$65,744
WEST DR	1,782	0.34	\$44,541
WESTCHESTER RD	4,317	0.82	\$107,918
WESTON CT	377	0.07	\$9,416
WESTOVER RD	1,102	0.21	\$27,538
WESTPRONG	890	0.17	\$22,258
WESTWOOD DR	2,444	0.46	\$61,098
WETSIG RD	2,649	0.50	\$66,222
WHINBRELL CT	275	0.05	\$6,866
WHISPER CREEK LN	5,116	0.97	\$127,899
WHISTLER AV	609	0.12	\$15,227
WHITING CV	663	0.13	\$16,580
WHITNER DR	4,083	0.77	\$102,079
WICKFORD RD	3,884	0.74	\$97,104
WICKSLOW DR	1,083	0.21	\$27,074
WIDGEON DR	2,104	0.40	\$52,605
WILLANDA DR	2,148	0.41	\$53,712
WILLARD ST	1,092	0.21	\$27,312
WILLIAMSON DR	1,935	0.37	\$48,369

Street	Length (FT)	Length (MI)	Approx. Cost.
WILLOW ST	2,631	0.50	\$65,776
WILMINGTON AV	1,379	0.26	\$34,485
WILSHIRE	1,182	0.22	\$29,538
WILTON CT	968	0.18	\$24,203
WIMBLEDON CT	776	0.15	\$19,401
WINDEMERE RD	3,906	0.74	\$97,642
WINDTREE RD	1,634	0.31	\$40,858
WINSLOW AV	197	0.04	\$4,931
WINSTON	2,317	0.44	\$57,931
WINTERGREEN RD	1,464	0.28	\$36,610
WISTERIA DR	2,504	0.47	\$62,591
WISTERIA LN	1,311	0.25	\$32,783
WOOD DALE DR	144	0.03	\$3,591
WOODBINE ST	1,048	0.20	\$26,201
WOODFIELD CT	332	0.06	\$8,311
WOODLAND DR	2,150	0.41	\$53,747
WOODS	719	0.14	\$17,978
WOOSTER ST	708	0.13	\$17,697
WORTH DR	4,698	0.83	\$109,925
WRENWOOD	417	0.08	\$10,418
WRIGHT ST	982	0.16	\$21,641
WRIGHTSVILLE AV	511	0.10	\$12,779
WYNNWOOD ST	715	0.14	\$17,865
YAUPON DR	2,143	0.41	\$53,571
YESTER OAKS DR	364	0.07	\$9,097
YORKSHIRE LN	5,519	1.05	\$137,976
YUCCA DR	1,000	0.19	\$24,993
ZINNIA CT	696	0.13	\$17,388
Grand Total	1,259,943	238.13	\$31,433,549

Recommended Signal Improvements

The following table details the signal recommendations identified on the facility recommendations maps in the master plan report document. Costs are approximate and are for planning purposes only. They are based on the unit cost of installing additional pedestrian signal heads and related signal appurtenances and do not include other potential project costs such as timing reprogramming, striping (variable due to pavement width), moving existing stop bars, right of way acquisition, and other potential project requirements. The field “CITYID” relates to the traffic signal dataset obtained from the City of Wilmington.

Intersection	CITYID	Approximate Cost
Short Term		\$4,088,000
10TH ST & DAWSON ST	0026	\$40,000
10TH ST & WOOSTER ST	0088	\$40,000
13TH ST & DAWSON ST	0027	\$40,000
13TH ST & WOOSTER ST	0078	\$40,000
16TH ST & DAWSON ST	0028	\$40,000
16TH ST & GREENFIELD ST	0246	\$30,000
16TH ST & ROBIN HOOD RD	0491	\$40,000
17TH ST & CASTLE ST	0030	\$40,000
17TH ST & DAWSON ST	0029	\$40,000
17TH ST & GEORGE ANDERSON DR	C037	\$40,000
17TH ST & GLEN MEADE RD	0204	\$40,000
17TH ST & INDEPENDENCE BLVD	C031	\$40,000
17TH ST & J D BARRY DR/ST ANDREWS DR	C033	\$40,000
17TH ST & SAVANNAH CT/HOSPITAL PLAZA DR	0616	\$40,000
17TH ST & SHIPYARD BLVD	0070	\$40,000
17TH ST & WELLINGTON AVE	0432	\$40,000
23RD ST & CHESTNUT ST	0378	\$40,000
23RD ST & MARKET ST	0040	\$30,000
23RD ST & PRINCESS PLACE DR	0038	\$40,000
3RD ST & BRUNSWICK ST	(blank)	\$121,000
3RD ST & RED CROSS ST	0003	\$40,000
5TH AVE & CASTLE ST	C009	\$40,000
5TH AVE & DAWSON ST	0025	\$40,000
5TH AVE & WOOSTER ST	0079	\$40,000
8TH ST & DAWSON ST	0089	\$40,000
ANN ST & 3RD ST	(blank)	\$15,000
CAROLINA BCH RD & FRONT ST/BURNETT BLV	0019	\$40,000
CAROLINA BCH RD & RALEIGH ST/PARKWAY BLV	0313	\$40,000
CAROLINA BEACH RD & BELL ST	(blank)	\$40,000
CAROLINA BEACH RD & GEORGE ANDERSON DR	(blank)	\$40,000
CAROLINA BEACH RD & INDEPENDENCE BLVD	0601	\$40,000
CAROLINA BEACH RD & SHIPYARD BLVD	0024	\$40,000
COLLEGE RD & HOGGARD DR/HURST DR	0531	\$30,000
COLLEGE RD & HOLLY TREE RD	0362	\$40,000
COLLEGE RD & NEW CENTRE DR	0240	\$40,000
COLLEGE RD & PEACHTREE AVE	0435	\$40,000

Intersection	CITYID	Approximate Cost
COLLEGE RD & RANDALL PKWY	0128	\$30,000
COLLEGE RD & WILSHIRE BLVD	0237	\$40,000
COLONIAL DR & WAYNE DR	(blank)	\$15,000
EASTWOOD RD & AUTUMN HALL DR	(blank)	\$121,000
EASTWOOD RD & CARDINAL DR	0339	\$20,000
EASTWOOD RD & LONGLEAF ACRES DR	(blank)	\$121,000
EASTWOOD RD & PLAZA EAST/HAMPTON INN	0644	\$40,000
EASTWOOD RD & ROGERSVILLE RD	0778	\$40,000
EASTWOOD RD & WRIGHTSVILLE AVE	0213	\$40,000
EASTWOOD RD near TOWN CENTER DR	(blank)	\$55,000
GREENFIELD ST & 5TH AVE	C012	\$40,000
GREENVILLE LOOP RD & STONEBRIDGE RD	(blank)	\$15,000
INDEPENDENCE/COVIL & RANDALL/MERCER	0900	\$40,000
KERR AV & MCCLELLAND DR	(blank)	\$121,000
KERR AV & PRIVATE (south of FRANKLIN AV)	(blank)	\$121,000
KERR AVE & CINEMA DR	(blank)	\$121,000
KERR AVE & WILSHIRE BLVD	0332	\$40,000
MARKET & GREEN MEADOWS	(blank)	\$121,000
MARKET ST & 10TH ST	0037	\$40,000
MARKET ST & 29TH ST	(blank)	\$55,000
MARKET ST & BARCLAY HILLS DR	0440	\$40,000
MARKET ST & COVIL AVE	0357	\$40,000
MARKET ST & FOREST HILLS DR	0041	\$30,000
MARKET ST & KERR AVE	0049	\$40,000
MARKET ST & NEW CENTRE DR	0346	\$40,000
MARKET ST & NORTH 17 SHOPPING CENTER	0224	\$40,000
MASONBORO LP & DUNMORE RD	(blank)	\$15,000
MILITARY CUTOFF RD & CAYMAN CT	(blank)	\$30,000
MILITARY CUTOFF RD & DESTINY WAY	0952	\$30,000
MILITARY CUTOFF RD & EASTWOOD RD	0202	\$40,000
MILITARY CUTOFF RD & GORDON RD	0884	\$40,000
MILITARY CUTOFF RD & MONUMENT DR	(blank)	\$55,000
MILITARY CUTOFF RD & STANTON RD	(blank)	\$30,000
MILITARY CUTOFF RD & THE FORUM	0895	\$30,000
OLEANDER DR & 41ST ST	0227	\$40,000
OLEANDER DR & 42ND ST	0231	\$40,000
OLEANDER DR & AUDUBON BLVD/LINCOLN RD	0233	\$40,000
OLEANDER DR & DAWSON ST	0420	\$40,000
OLEANDER DR & DOGWOOD LN	(blank)	\$55,000
OLEANDER DR & FLORAL PKWY/FORDHAM RD	0046	\$40,000

Intersection	CITYID	Approximate Cost
OLEANDER DR & PINE GROVE DR	0050	\$40,000
OLEANDER DR & WALLACE AVE	C027	\$55,000
PRINCESS PLACE DR & 26TH ST	(blank)	\$15,000
PRINCESS PLACE DR & 30TH ST	0379	\$40,000
PRINCESS PLACE DR & FIRE STATION	C029	\$40,000
RACINE DR & NEW CENTRE DR	C032	\$40,000
RACINE DR & ORIOLE DR	C036	\$40,000
TABOR LN & KERR AV	(blank)	\$121,000
WOOSTER ST & 8TH ST	(blank)	\$40,000
WRIGHTSVILLE AV & PAGE AV	(blank)	\$40,000
WRIGHTSVILLE AVE & FLORAL AVE	0318	\$40,000
WRIGHTSVILLE AVE & HAWTHORNE DR	0607	\$40,000
WRIGHTSVILLE AVE & MACMILLAN AVD	0483	\$40,000
WRIGHTSVILLE AVE & WILSHIRE BLVD	0223	\$40,000
Mid Term		\$1,790,000
10TH ST & CASTLE ST	C018	\$40,000
13TH ST & CASTLE ST	C020	\$40,000
16TH ST & CHESTNUT ST	0198	\$40,000
16TH ST & DOCK ST	0203	\$40,000
16TH ST & GRACE ST	0035	\$40,000
16TH ST & WOOSTER ST	0080	\$40,000
17ST ST & DOCK ST	0193	\$40,000
17TH AND GRACE ST/PRINCESS PL DR	0034	\$40,000
17TH ST & MEDICAL CENTER DR	0206	\$30,000
17TH ST & WOOSTER ST	0081	\$40,000
2ND ST & GRACE ST	C002	\$40,000
3RD ST & GRACE ST	0005	\$40,000
3RD ST & GREENFIELD ST	(blank)	\$20,000
3RD ST & WALNUT ST	0004	\$40,000
4TH ST & CHESTNUT ST	C005	\$40,000
5TH AVE & CHESTNUT ST	C010	\$40,000
5TH AVE & GRACE ST	C011	\$40,000
5TH AVE & PRINCESS ST	C013	\$40,000
5TH AVE & RED CROSS ST	C014	\$40,000
6TH ST BRIDGE	C015	\$40,000
8TH ST & CASTLE ST	C016	\$40,000
8TH ST/MCRAE ST & RED CROSS ST/RANKIN ST	C017	\$40,000
CAROLINA BCH RD & NORTHERN BLVD	0021	\$30,000
CAROLINA BEACH RD & CENTRAL BLVD	0022	\$20,000

Intersection	CITYID	Approximate Cost
CAROLINA BEACH RD & SOUTHERN BLVD	0023	\$20,000
COLLEGE RD & KMART SHOPPING CENTER	0212	\$30,000
COLLEGE RD & OLEANDER DR	0047	\$40,000
COLLEGE RD & PINE VALLEY RD	0365	\$40,000
COLLEGE RD & SHIPYARD BLVD/LONG LEAF HILLS	0067	\$40,000
COLLEGE RD & UNIVERSITY SHOP CENTERS	0561	\$40,000
COLLEGE RD & WRIGHTSVILLE AVE	0048	\$40,000
EASTWOOD RD & RACINE DR	0624	\$40,000
MARKET ST & COLLEGE RD EAST RAMP	0242	\$40,000
MARKET ST & COLLEGE RD WEST RAMP	0243	\$40,000
MARKET ST & LULLWATER DR	0409	\$40,000
MARKET ST east of DARLINGTON AV	(blank)	\$40,000
NEW CENTRE DR & BOB KING DR	0914	\$40,000
NEW CENTRE DR & SHOPPING CENTER	0784	\$40,000
OLEANDER DR & GREENVILLE LP RD/GREENVILLE AVE	0052	\$40,000
OLEANDER DR & HAWTHORNE DR	0291	\$40,000
PINE GROVE DR & LONG LEAF HILLS DR	0199	\$40,000
PINE GROVE RD & GREENVILLE LP RD	0220	\$40,000
PINE GROVE RD & HOLLY TREE RD	0604	\$40,000
RACINE DR & CARL ST	C038	\$40,000
RANKIN ST & 10TH ST	C019	\$40,000
WRIGHTSVILLE AVE & DAWSON ST	0421	\$40,000
WRIGHTSVILLE AVE & MILITARY CUTOFF RD	0782	\$40,000
Long Term		\$1,010,000
16TH ST & CASTLE ST	0031	\$40,000
3RD ST & DAWSON ST	0335	\$40,000
3RD ST & WOOSTER ST	0334	\$40,000
41ST ST & LAKE AVE	C022	\$40,000
4TH ST & GRACE ST	C006	\$40,000
4TH ST & PRINCESS ST	C007	\$40,000
4TH ST & RED CROSS ST	C008	\$40,000
COLLEGE RD & BRAGG DR	0924	\$40,000
COLLEGE RD & CASCADE RD/SHOPPING CENTER	0361	\$40,000
COLLEGE RD & HUNTERS TRL	0338	\$40,000
COLLEGE RD & LAKE AVE	0441	\$30,000
COLLEGE RD & ORIOLE DR	0239	\$40,000
COLLEGE RD & RIEGEL DR	0234	\$40,000
DAVIS ST & N 4TH ST	0919	\$40,000
MARKET ST & BLAIR SCHOOL RD	0482	\$40,000
MARKET ST & CARDINAL DR	0888	\$40,000

Intersection	CITYID	Approximate Cost
MARKET ST & MLK JR PKWY/EASTWOOD RD	0721	\$40,000
MLK PKW/3RD ST & FRONT ST/DAVIS ST	0082	\$10,000
NEW CENTER DR @ COLLEGE ACRES APTS	(blank)	\$40,000
OLEANDER DR & 39TH ST	0232	\$40,000
OLEANDER DR & COLUMBUS DR/	0214	\$20,000
OLEANDER DR & COUNTRY CLUB RD	0043	\$20,000
OLEANDER DR & MALL ENTRANCE	0228	\$40,000
RANDALL DR & RACINE DR	UNCW	\$40,000
RANDALL PKWY & SHOPPING CENTER	C035	\$40,000
SHIPYARD BLVD & HOGGARD H S/SHOPPING CENTER	0209	\$30,000
WRIGHTSVILLE AVE & COLONIAL DR/COUNTRY CLUB DR	0042	\$20,000
WRIGHTSVILLE AVE & INDEPENDENCE BLVD	0899	\$40,000
With Trail Construction		\$620,000
16TH ST & ANN ST	(blank)	\$15,000
17TH ST & ANN ST	(blank)	\$15,000
COLLEGE RD & 17TH ST/WALTMOOR RD	0395	\$40,000
EASTWOOD RD & PEMBROKE JONE DR/LIONS GATE	0751	\$40,000
HAMILTON DR & HURST DR	UNCW	\$40,000
INDEPENENCE BLVD & PARK AVE	0898	\$40,000
INDEPENDENCE BLVD & CANTERBURY RD	0205	\$40,000
INDEPENDENCE BLVD & MALL ENTRANCE	0947	\$40,000
KERR AVE & RANDALL PKWY	0605	\$40,000
MARKET ST & GORDON RD	0390	\$40,000
MARKET ST near 21ST ST	(blank)	\$55,000
MLK PKW & ISABEL HOLMES BRIDGE	0918	\$40,000
OLEANDER DR & INDEPENDENCE BLVD	0045	\$40,000
PINE GROVE DR @ Municipal Golf Course	(blank)	\$15,000
SHIPYARD BLVD & INDEPENDENCE BLVD	0603	\$40,000
SHIPYARD BLVD & LONGSTREET DR/CONVERSE RD	0068	\$40,000
WRIGHTSVILLE AVE & AIRLIE RD/OLEANDER DR	0189	\$40,000
Grand Total		\$7,508,000

NORTH CAROLINA LAWS AND REGULATIONS RELATING TO BICYCLING AND WALKING

North Carolina General Statutes, Chapter 20: Motor Vehicles

Part 11. Pedestrians' Rights and Duties.

§ 20-172. Pedestrians subject to traffic control signals.

(a) The Board of Transportation, with reference to State highways, and local authorities, with reference to highways under their jurisdiction, are hereby authorized to erect or install, at intersections or other appropriate places, special pedestrian control signals exhibiting the words or symbols "WALK" or "DON'T WALK" as a part of a system of traffic control signals or devices.

(b) Whenever special pedestrian control signals are in place, such signals shall indicate as follows:

(1) WALK. – Pedestrians facing such signal may proceed across the highway in the direction of the signal and shall be given the right-of-way by the drivers of all vehicles.

(2) DON'T WALK. – No pedestrian shall start to cross the highway in the direction of such signal, but any pedestrian who has partially completed his crossing on the "WALK" signal shall proceed to a sidewalk or safety island while the "DON'T WALK" signal is showing.

(c) Where a system of traffic control signals or devices does not include special pedestrian control signals, pedestrians shall be subject to the vehicular traffic control signals or devices as they apply to pedestrian traffic.

(d) At places without traffic control signals or devices, pedestrians shall be accorded the privileges and shall be subject to the restrictions stated in Part 11 of this Article. (1937, c. 407, s. 133; 1973, c. 507, s. 5; c. 1330, s. 31; 1987, c. 125.)

§ 20-173. Pedestrians' right-of-way at crosswalks.

(a) Where traffic control signals are not in place or in operation the driver of a vehicle shall yield the right-of-way, slowing down or stopping if need be to so yield, to a pedestrian crossing the roadway within any marked crosswalk or within any unmarked crosswalk at or near an intersection, except as otherwise provided in Part 11 of this Article.

(b) Whenever any vehicle is stopped at a marked crosswalk or at any unmarked crosswalk at an intersection to permit a pedestrian to cross the roadway, the driver of any other vehicle approaching from the rear shall not overtake and pass such stopped vehicle.

(c) The driver of a vehicle emerging from or entering an alley, building entrance, private road, or driveway shall yield the right-of-way to any pedestrian, or person riding a bicycle, approaching on any sidewalk or walkway extending across such alley, building entrance, road, or driveway. (1937, c. 407, s. 134; 1973, c. 1330, s. 32.)

§ 20-174. Crossing at other than crosswalks; walking along highway.

(a) Every pedestrian crossing a roadway at any point other than within a marked crosswalk or within an unmarked crosswalk at an intersection shall yield the right-of-way to all vehicles upon the roadway.

(b) Any pedestrian crossing a roadway at a point where a pedestrian tunnel or overhead pedestrian crossing has been provided shall yield the right-of-way to all vehicles upon the roadway.

(c) Between adjacent intersections at which traffic control signals are in operation pedestrians shall not cross at any place except in a marked crosswalk.

(d) Where sidewalks are provided, it shall be unlawful for any pedestrian to walk along and upon an adjacent roadway. Where sidewalks are not provided, any pedestrian walking along and upon a highway shall, when practicable, walk only on the extreme left of the roadway or its shoulder facing traffic which may approach from the opposite direction. Such pedestrian shall yield the right-of-way to approaching traffic.

(e) Notwithstanding the provisions of this section, every driver of a vehicle shall exercise due care to avoid colliding with any pedestrian upon any roadway, and shall give warning by sounding the horn when necessary, and shall exercise proper precaution upon observing any child or any confused or incapacitated person upon a roadway. (1937, c. 407, s. 135; 1973, c. 1330, s. 33.)

Part 11A. Blind Pedestrians – White Canes or Guide Dogs.

§ 20-175.1. Public use of white canes by other than blind persons prohibited.

It shall be unlawful for any person, except one who is wholly or partially blind, to carry or use on any street or highway, or in any other public place, a cane or walking stick which is white in color or white tipped with red. (1949, c. 324, s. 1.)

§ 20-175.2. Right-of-way at crossings, intersections and traffic control signal points; white cane or guide dog to serve as signal for the blind.

At any street, road or highway crossing or intersection, where the movement of traffic is not regulated by a traffic officer or by traffic control signals, any blind or partially blind pedestrian shall be entitled to the right-of-way at such crossing or intersection, if such blind or partially blind pedestrian shall extend before him at arm's length a cane white in color or white tipped with red, or if such person is accompanied by a guide dog. Upon receiving such a signal, all vehicles at or approaching such intersection or crossing shall come to a full stop, leaving a clear lane through which such pedestrian may pass, and such vehicle shall remain stationary until such blind or partially blind pedestrian has completed the passage of such crossing or intersection. At any street, road or highway crossing or intersection, where the movement of traffic is regulated by traffic control signals, blind or partially blind pedestrians shall be entitled to the right-of-way if such person having such cane or accompanied by a guide dog shall be partly across such crossing or intersection at the time the traffic control signals change, and all vehicles shall stop and remain stationary until such pedestrian has completed passage across the intersection or crossing. (1949, c. 324, s. 2.)

§ 20-175.3. Rights and privileges of blind persons without white cane or guide dog.

Nothing contained in this Part shall be construed to deprive any blind or partially blind person not carrying a cane white in color or white tipped with red, or being accompanied by a guide dog, of any of the rights and privileges conferred by law upon pedestrians crossing streets and highways, nor shall the failure of such blind or partially blind person to carry a cane white in color or white tipped with red, or to be accompanied by a guide dog, upon the streets, roads, highways or sidewalks of this State, be held to constitute or be evidence of contributory negligence by virtue of this Part. (1949, c. 324, s. 3.)

Part 11B. Pedestrian Rights and Duties of Persons with a Mobility Impairment.

§ 20-175.5. Use of motorized wheelchairs or similar vehicles not exceeding 1000 pounds gross weight.

While a person with a mobility impairment as defined in G.S. 20-37.5 operates a motorized wheelchair or similar vehicle not exceeding 1000 pounds gross weight in order to provide that person with the mobility of a pedestrian, that person is subject to all the laws, ordinances, regulations, rights and responsibilities which would otherwise apply to a pedestrian, but is not subject to Part 10 of this Article or any other law, ordinance or regulation otherwise applicable to motor vehicles. (1991, c. 206, s. 1.)

North Carolina General Statutes, Chapter 136: Roads and Highways

§ 136-44.14. Curb ramps or curb cuts for handicapped persons.

(a) Curbs constructed on each side of any street or road, where curbs and sidewalks are provided and at other major points of pedestrian flow, shall meet the following minimum requirements:

(1) No less than two curb ramps or curb cuts shall be provided per lineal block, located at intersections.

(2) In no case, shall the width of a curb ramp or curb cut be less than 40 inches.

(3) The maximum gradient of such curb ramps or curb cuts shall be eight and thirty-three one hundredths percent (8.33%) (12 inches slope for every one inch rise) in relationship to the grade of the street or road.

(4) One curb ramp or curb cut may be provided under special conditions between each radius point of a street turnout of an intersection, if adequate provisions are made to prevent vehicular traffic from encroaching on the ramp.

(b) Minimum requirements for curb ramps or curb cuts under subsection (a) shall be met (i) in the initial construction of such curbs, and (ii) whenever such curbs are reconstructed, including, but not limited to, reconstruction for maintenance procedures and traffic operations, repair, or correction of utilities.

(c) The Department of Transportation, Division of Highways, Highway Design Section, is authorized and directed to develop guidelines to implement this Article in consultation with the Governor's Study Committee on Architectural Barriers (or the Committee on Barrier Free Design of the Governor's Committee on Employment of the Handicapped if the Governor's Study Committee on Architectural Barriers ceases to exist). All curb ramps or curb cuts constructed or reconstructed in North Carolina shall conform to the guidelines of the Highway Design Section.

(d) The Department of Transportation, Division of Highways, Highway Design Section, is authorized and directed to provide free copies of this Article together with implementer guidelines and standards, to municipal and county governments and public utilities operating within the State. (1973, c. 718, ss. 1-4.)

ONLINE SURVEY RESULTS

Memorandum

Subject: Online Questionnaire Results
Project: Wilmington Pedestrian Master Plan (TDG No. 5177)
Location: Wilmington, NC
Date: April 23, 2008

The purpose of this memorandum is to summarize the results of an online survey that was available for the citizens of Wilmington, North Carolina that asked for their opinions and perceptions of the pedestrian amenities throughout the City. The survey was administered electronically and was publicized in local publications such as The Wilmington Star and on the Metro Planning Organization's website. The questionnaire was made available from February through March of 2008. 135 responses were received. Respondents represented a fairly balanced mix of ages and genders.

Included in this memo are key highlights of the survey as well as graphic representations of the data. This is followed by a list of typed-in responses to multiple choice questions when "other" was selected. Attached to the memo are the original questions with summaries of the responses.

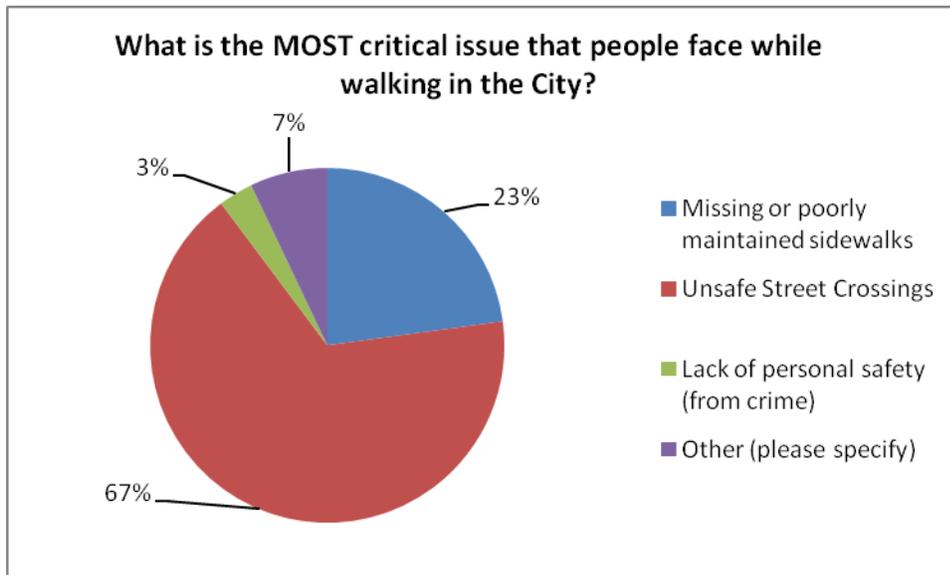
Key Highlights of the Survey:

- Many respondents cited missing or incomplete sidewalks as one of the most critical challenges to walking in Wilmington. This was followed closely by a concern over lack of crosswalks taking people where they want to walk.
- There were many requests and recommendations for improvements to specific neighborhoods, intersections, or sidewalks.
- Respondents tend to drive to their locations. 80% said that their most frequent walking trips were to their cars. Most respondents rarely walk (less than 1-2 times per month) to destinations such as work, school or to a bus stop.
- Other common reasons for walking in Wilmington were for leisure and fitness.
- 14% walk to work frequently (3 or more days per week).
- In response to a question about factors that make it more difficult or unpleasant to walk in Wilmington, the most frequently cited factors were
 - No sidewalks or gaps in sidewalks
 - Heavy Traffic
 - Drivers not stopping for pedestrians
 - Fast vehicle speeds
- The need to improve pedestrian conditions was also emphasized 67% of respondents cited unsafe crossings and intersections as the most critical issues that pedestrians face in the City. Many of the written-in responses also suggested that more crosswalks be added to make for a more comfortable pedestrian experience.
- In response to questions about locations that need improvements to better accommodate pedestrians, the most popular areas were on major corridors such as Market Street and near

highway interchanges such as Market Street at College Road or Martin Luther King, Jr. Parkway at North 23rd Street.

- Neighborhood streets were also cited an area in need of some improvements as well.
- Although 98% of the respondents answered that they do not have mobility limitations, a common request in the comments was to improve accessibility for people of all mobile abilities. Respondents are aware that the multi-modal paths and crossings may not be fully serving people with various ability limitations.
- Along with requests for improvements in crossings and buffers (tree lawns, parked cars and other objects that separate motorized transit from pedestrians and bikers), respondents requested improvements in bicycling access as well. Future improvements in bicycling amenities such as improved paving and crossings would improve the pedestrian experience as well.

The online questionnaire was used to broaden the reach of public input; however it is important to note that this questionnaire is self-selected and the results should not be considered statistically significant. Summary tables and charts illustrating the results of the questionnaire are included in the following pages. A complete table of responses is included as an addendum to this memo.



If you walk in the City of Wilmington, please tell us why and how often.

	Frequently (3 or more days per week)	Occasionally (several times per month)	Rarely or never (less than 1-2 times per month)
I walk or exercise for personal fitness	69.9% (86)	26.0% (32)	4.1% (5)
I walk the dog	55.8% (58)	10.6% (11)	33.7% (35)
I walk for leisure	61.7% (71)	33.0% (38)	5.2% (6)
I walk to the bus stop	11.5% (10)	6.9% (6)	81.6% (71)
I walk all the way to work	14.4% (13)	3.3 (3)	82.% (74)
I walk all the way to school	9.5% (8)	6.0% (5)	84.5% (71)
I walk to reach destinations for running errands, shopping or entertainment	37.3% (38)	34.3% (35)	28.4% (29)
I walk to my car	80.6% (79)	7.1% (7)	12.2% (12)

Written-In Responses

Written-in responses to multiple choice questions when "Other" was selected. Responses have been organized by question, and then thematically by the general topic of the response. Where one response covers multiple topics, it has been

Question No. 4. What is the MOST critical issue that people face while walking in the City of Wilmington? ("Other" selected)

Physical Improvements (7 responses)

Sidewalks, Crosswalks, and Intersections (5 of 7)

- Lack of sidewalks and crosswalks
- There are very few places that one does not require a car to get to; these needs to be addressed. For example, if I wanted to walk from my Pine Valley home to Hoggard High School or Hugh MacRae Park, it is nearly impossible because of lack of sidewalks, dangerous crossings, and heavy traffic. An elevated crosswalk would help get from one side to another.
- No sidewalks
- Not enough safe sidewalks to travel through the city.
- Many intersections have no "walk" signal

Other (2 of 7)

- Beautification efforts
- Lack of pleasant downtown venues and shops, aside from Riverwalk and central Front Street

Question No. 5. Which of the following factors make it more difficult or unpleasant for you to walk in Wilmington? ("Other" selected)

Physical Improvements (20 of 21)

Sidewalks, Crosswalks, and Intersections (20 of 20)

- Not enough sidewalks and lack of pedestrian crossings e.g. Eastwood Rd and Military Cutoff Intersection
- lack of sidewalks, lack of crosswalks, lack of crosswalk technology
- Sidewalks never constructed in areas annexed by the City. Example- College Acres.
- No designated cross walks at Mercer or Covil and Market. No cross walks on Market from Forest Hills to Kerr Ave.
- Though I am not disabled, I do think the lack of curb ramps on sidewalks in Wilmington is a big issue
- No side walks in my neighborhood or work area.
- bushes and trees obstructing sidewalk

- Two of the most dangerous ped intersections are New Center & Market and Kerr & Market. We need a walk light at both as there are many people who try to walk at these 2 and occasionally a ped is killed j-walking down the block. I drive this street twice a day every day and see tourists trying to get over to Target all the time looking frustrated and scared, for good reason. At Kerr & Market the neighborhood people walk all the time and endanger themselves and their children because there's not enough time to cross and there's always a turn arrow for cars even when the light is red for straight.
- no opportunity to cross Military Cutoff safely
- Lack of crosswalks near bus stops and at handicapped ramps
- lack of crosswalks/pedestrian signals at intersections
- Lack of adequate cross walks
- Lack of crosswalks
- too long distances between controlled intersections
- Large intersections with no island in center for pedestrians
- No crosswalks at many busy intersections
- no crosswalk nor pedestrian cycle in traffic lights
- lack of crosswalks on busy thoroughfares
- not enough crosswalks towards the Wrightsville beach area

Driver Behavior (1 of 21)

- Drivers seem to be unaware of pedestrian "right of way", especially where schools and youth are concerned.

Other (1 of 20)

- no trees for shade

Question no. 7. Which areas of Wilmington need the most improvements (such as new sidewalks or safer crossings) to improve your walking experience? Please rate each area according to need. ("Other" selected)

Physical Improvements (13 of 17)

Sidewalks, Crosswalks, and Intersections (8 of 14)

- A sidewalk leading to Halyburton on 17th extension would be great!!!
- All areas need sidewalks to promote people using them. Many neighborhoods have no sidewalks at all, and this should be seriously considered as a "step" in the right direction toward a more walker-friendly city.
- Many neighborhoods have no sidewalks at all, and this should be seriously considered as a "step" in the right direction toward a more walker-friendly city.

- Cross walks on Oleander
- At major intersections, especially near UNCW and Hospital
- many more crosswalks
- Crosswalks at Market & Porters Neck Rd
- At most major intersections, there are no pedestrian cross-walks or "Walk" lights - cars rule

Other (6 of 14)

- Bike access
- Need PRIMARY corridors linking downtown to UNCW, Wrightsville Beach, etc. with wide (10') separate surfaces; with arterial corridors linking schools, parks, neighborhoods, etc., using a minimum of 6' wide separate paved surfaces. These paved "walkways" should serve as multi-use facilities for walking, jogging, biking, roller blading, etc. Other cities throughout the country provide this service.
- Pedestrian over passes needed on College near UNCW, Market between Forest Hill and Kerr, and Oleander between the Mall and Shopping Center.
- bus stops
- Bradley creek bridge - lots of pedestrians in danger
- Need shelters and benches at bus stops

Miscellaneous (3 of 17)

- Independence Avenue and Park Avenue
- substantial improvements needed on N. 2nd St near bus depot
- To and from downtown from Greenfield Lake

Other comments (not related to a specific question)

Physical Improvements (65 of 85)

Sidewalks/Trails (41 of 65)

- All major intersections should have a crosswalk signal with a pedestrian button to push when you want to cross the street!! Sidewalks are also a must.
- As Wilmington grows and the availability of retail around many of the neighborhoods grows, particularly in the neighborhoods away from downtown Wilmington, there is no reason more people could walk. I would love to be able to walk to the park near my house, or walk to the grocery store or local restaurants, however, I can't because there are no crosswalks or sidewalks along the busiest of roads, Market St. It is taking my own life in my hands. Maybe if people could walk around more, we actually would be a "Fit Community" like out sign says and there would be less of a need for cars on the road.

- Everything I need is within walking distance, but I drive because the traffic is too dangerous! No sidewalks, no bike lanes and overdevelopment is insane. There are no cross walks on any of the corridors I use.
- Generally there seems to be more interest in moving traffic than pedestrian safety. There are long sections of Market St with no where to cross safely. Right turn on red is a problem where Mercer and Covil meet Market. And sections of sidewalk are missing in that area
- If Wilmington were more pedestrian friendly, our tourist industry would improve, and it would take some of the traffic off the streets as well. It's really a quality of life issue. It's ridiculous that I live within 1 mile of two shopping centers, a mall, and schools, and grocery stores, and within two miles of downtown, and I have to drive to those places because I'm afraid of crossing streets, etc, with my child. I could walk to almost everything I need to get to, if there were adequate walks. My out of town visitors think it's ridiculous that they have to drive downtown and find parking when they could easily walk there (if there were walks) as well.
- Living in the winter park area one sees the patch work of sidewalks that do not intersect with other sidewalks. The massive volume of traffic makes it difficult for mothers with strollers, bicycle and foot traffic to walk the edge of the road. On floral pwky old people are walking in knee high grass to get to Hanover shopping center? From my house to Hugh McRae Park or to Empie Park there are no safe crosswalks or acceptable sidewalks. I would like to see the trolley easement combined into the project and branches reaching out from some main point or pathway.
- Love to walk and ride bicycles. Sidewalks and bikeways are not connected simply end. Pedestrian crossing signals outside of downtown are non-existent. On wide streets e.g. Military Cutoff, there is no safety island.
- Pedestrians are treated like 3rd class citizens in this town. Everything about the way the system works (from the short light changes, to the lack of sidewalks, to the lack of cuts to make wheeling a stroller or a wheelchair down from the sidewalk) seems to say "we don't want you to walk here. Walking downtown is marginally better than walking further away from the downtown, but all the sidewalks in this city need work, and its a crime that developments are allowed to build without sidewalks. Every morning, I cross Market at Lullwater to catch the bus to work, and I am afraid I'm going to be hit by a car. A non-able bodied person would not be able to cross the street before the light changes.
- the city needs to become pedestrian friendly - sidewalks everywhere, crosswalks, pedestrian crossing lights - keep us fit, save gas, make the town even more enjoyable.
- We need more sidewalks in Wilmington, not just downtown. There should be a sidewalk along Greenville Loop Road so people can walk to the bus stop on Oleander. The new sidewalks and bike paths along Eastwood Rd and Military Cutoff have no pedestrian crossings at the intersection of those streets. There should be a pedestrian crossing across from St. Mark Catholic School. There should be a pedestrian crossing on Military Cutoff to get from the sidewalk to Mayfair Towne Center. As gas prices rise, it is increasingly important that people be able to walk to a bus stop or to shopping centers. Children should be able to walk to school e.g. Bradley Creek School, but they can't without the sidewalks in place along Greenville Loop Road.

- Wilmington is a lovely city and I would like to walk (and bike) more, but do not because of lack of sidewalks and traffic safety issues.
- Would like to see more sidewalks or walking paths put in place where feasible
- A good example for sidewalks would be all around the neighborhoods near UNCW. For example, the grass along Racine drive has a trail worn it not as there are now sidewalks. Pine Valley and Eagles Nest HAD a plan for sidewalks a couple of years ago but was taken away.
- Downtown neighborhoods generally have sidewalks and we use them often. Other neighborhoods have few sidewalks - and people must walk in the streets. Above certain approved density. Developers should be made to design with sidewalks.
- I don't know who to complain to about messy sidewalks, and cars parked blocking the sidewalk
- I feel like there should be more connection throughout the city by means of walking/biking. Chattanooga is a great example of how they connecting their city via old vehicle bridges, etc.
- I often walk with a stroller downtown, and some sidewalks have poor handicap access. Most downtown are very dirty, especially outside of bars. The stench in the mornings is embarrassing to the city!
- I love walking around Wilmington and it's one of the major reasons I moved into the downtown. I find it very difficult and extremely unsafe to cross Third Street, especially with dogs. I can't even imagine doing it with children! The cars go way too fast and there's no safe place to wait. Many other streets in downtown are pleasant to walk on. However, it's impossible to walk or bike around the rest of Wilmington like down 16th. I biked it one day and felt I had taken my life in my hands. To be a great city we need to have pedestrian and bike areas where people can feel safe. This will make our city more welcoming, pleasant and green. Thanks!
- I would like to walk more, but the lack of sidewalks on through streets keeps me in my car.
- I would LOVE sidewalk in my neighborhood. Lots of people walk, walk their dogs, stroll their children and we have to jockey for right of way in the MIDDLEBORO SUBDIVISION.
- If there were sidewalks and bikepaths and safer intersections I would use them!
- Need to have additional crosswalk signals and striping along 3rd street downtown, particularly near CFCC. Should have a law that requires cars to yield to pedestrians within crosswalks and fine vehicles if they don't stop. Need to have bus that goes from downtown, to college, to the beach. Need to have bus shelters at key bus stop locations, or at least benches so people are not "loitering". Would like more greenways, or off road biking facilities for families and young kids that allow you to get from place to place, not just at parks.
- Really looking forward to the trail system that will link many of the areas parks/amenities. I am involved with the NC Geocachers Organization, and we would be happy to help with this effort in any way that we can! Michelle Frazier
- Rule of thumb - every major street should also have a pedestrian option!

- There are many places with sidewalks that simply end for no reason or end in a steep curb, making it ridiculous for physically impaired people to use the sidewalks. Also, a neighborhood such as Forest Hills is in great proximity to New Hanover Center & Independence Mall but walking there is almost out of the question due to lack of crosswalks, ending sidewalks. Also it could be beautified along Oleander in those locations to make people feel like it is a pleasant walk to go to the shopping centers, instead of across some asphalt wasteland -- so much parking that is never used -- certainly some space could be carved out for trees to lure in the pedestrians.
- We need more trails to connect all parks and downtown. A trail to the beach would be nice as well.
- 3rd St. S at Ann St. needs crosswalk and improvement. There should be a stop sign there to calm excessive speeding on 3rd St.
- Crossing 3rd Street is a real challenge.
- Crossing Independence Blvd from Park Avenue or Oleander Drive is a nightmare. Missing or obscured sidewalks on north side of Oleander Drive near Independence Blvd. Missing sidewalks on north side of Park Ave.
- Crossing lights were installed all along Military Cutoff even across side streets which see relatively little traffic but there was no provision made for crossing Military Cutoff for those living on the north side to get to the stores or Mayfaire. It would be wise to reinstall some of those crossing lights from the small side streets to the major thoroughfare.
- Crossing major north south streets in downtown (3rd and Orange for example) is horrible due to fast traffic, no crosswalk, and limited visibility. Crossing any major road in the Wrightsville Beach/Mayfaire area can be impossible and even more so during "the season". Such a shame to have the potential for not using a car but have concerns for safe crossings.
- Crossing South Third Street is a nightmare.
- I live downtown on 3rd street. Crossing 3rd street is nearly impossible due to the traffic (mostly speed). The only intersections on the South side to cross are Market and Castle. That is at least 6 blocks from one another. The lights on Market and Castle have long waits and the buttons to press when you want to cross do not always work. I am very concerned about the safety, particularly with children walking to St. Mary's. Aside from that, the medians are way too narrow. People who try to cross and get stuck in a median are in real danger.
- I live in the Forest Hills neighborhood with my wife and two children. We walk or run everyday in and around Forest Hills but would really like to have safe routes available across Independence to Hanover Center and Empie Park. There are many people in our neighborhood who would walk or ride bikes to nearby shopping if we had available pedestrian crosswalks. This would help the relieve traffic congestion, ease stress to the environment and contribute to more healthy lifestyle for all. Thank you.
- I would like to see if the city of Wilmington and the town of Wrightsville beach can place a cross walk at the intersection of eastwood rd and Wrightsville ave. along this major road, there

is no convenient crosswalk from the north side of the road to the south side where lumina station one and two are. Thank you for your time and consideration. Wendell Seebachan

- I would like to walk to shops in my neighborhood, or bike to school, but I will not cross college or market without an improvement in pedestrian safety.
- I'm sorry I haven't written before about the pedestrian problems of crossing Market St but I've observed the problems of people on foot, of all ages, for at least 10 yrs (since traffic picked up). Another location that could use a walk light is College Rd to allow foot traffic close to New Center and the shopping centers on both sides of College. It would help the college students as well.
- It makes no sense that sidewalks w/ handicapped ramps end at intersection where there are NO crosswalks. Many examples all over city, such as at all Dawson & Wooster intersections, 3rd & cross streets, traffic signaled intersections. There are far too many locations to cite all here.
- My children attend Holly Tree Elementary and ride their bicycles to school on Kirby Smith. The intersection between Kirby Smith and Greenhowe currently has stop signs on Greenhowe only. THIS IS NOT SAFE FOR THE MANY CHILDREN THAT WALK OR BIKE TO AND FROM TO SCHOOL USING KIRBY SMITH. YOU MUST, AGAIN, MUST INSTALL 4-WAY STOP SIGNS AT THIS PARTICULAR INTERSECTION. Many students on bicycles go left onto Greenhowe from Kirby Smith and are frequently in danger of being hit by cars driving straight on Kirby Smith. PLEASE CONSIDER PUTTING IN 4-WAY STOP SIGNS AS SOON AS POSSIBLE. Also, we see a lot of children going to Roland-Grise and Hoggard from Masonboro area, trying to cross College on Holly Tree. We have witnessed many, again, many accidents here, once involving a high school student on a bicycle who was, needless to say, badly injured. As of now, I see a student on a bicycle every morning at about 8:20 traveling north on College and then crossing Holly Tree to go to Hoggard. So many students from Masonboro area attend Hoggard and I see many of them trying to cross. Please make this crossing safer for students also by installing pedestrian lights with push-buttons.
- Need to have additional crosswalk signals and striping along 3rd street downtown, particularly near CFCC. Should have a law that requires cars to yield to pedestrians within crosswalks and fine vehicles if they don't stop. Need to have bus that goes from downtown, to college, to the beach. Need to have bus shelters at key bus stop locations, or at least benches so people are not "loitering". Would like more greenways, or off road biking facilities for families and young kids that allow you to get from place to place, not just at parks.
- One of the joys of living in the historic district is walking in the downtown. Tourists as well as residents should feel that crossing streets is safe and orderly. Third street north of Market has opportunities for crossing, but south of Market where tourists like to "visit" neighborhoods crossing is difficult and often dangerous.
- Please add blinking lights to pedestrian cross walks, especially at the intersection of 23rd & Chestnut, near the Annie Snipes School. Thank you
- The city is essentially divided into pockets by major traffic arteries. Without adequate, protected crosswalks, pedestrian traffic is extremely limited. i.e., you can't cross Market, Carolina Beach Rd. or S. College Rd. on foot without risking your life.

- We need a 3rd street crosswalk at Ann.

Pedestrian Facilities in General/Overpasses (8 of 65)

- Being downtown requires walking. Unfortunately, I am unable to take my family downtown because much of the area is still not very handicap accessible.
- There need to be pedestrian bridges or overpasses over S.College and Market so that areas are connected for pedestrians. E.g., from Hugh McCrae Park over to the senior center would be an ideal place, and there's already a height-limiting sign over that road anyway.
- Being downtown requires walking. Unfortunately, I am unable to take my family downtown because much of the area is still not very handicap accessible.
- Fix the bridges and put in pedestrian or vehicle overpasses wherever possible. Make dead end neighborhood streets interconnect. Put overhead streetlights everywhere possible. Make shoulders wider. Signage needs to be improved, you have to be in the intersections to read the names of intersecting streets. Street names change at intersections, confusing at best, for travelers. The sign in the intersection will only list the name of one the connector streets. Road surfaces are poor. Lines painted on the surface are faded. Signal lights are hanging from wooden poles hung by electric cables. Fix them in place on metal poles, hurricanes come through here.
- Wilmington is a college town, and it is really quite a shame how few options pedestrian, and or bike riders have for maneuvering their way around this town, especially college students.
- As it develops, I hope the north end of downtown can become a pedestrian friendly zone, with easy and attractive access to the Almont properties, convention center and Hilton Park.
- I walk 4 times a week for health benefits. If the conditions were more accommodating for pedestrians and cyclist I would also walk to my local grocery store in New Hanover center, to Independence Mall and the parks and other services within walking and cycling distance.
- I strongly endorse more & better walking / running/ green space in this community. Quality of life has yielded to rapid development. Everybody loses!

Bicycle Facilities (11 of 65)

- We walk and ride bikes as a family often. The more biking and pedestrian friendly our town in the higher our standard of living in this town.
- Bike paths go hand-in-hand with this problem, and since the area is so flat, more people would take advantage of biking given the right opportunities. Too many kids get driven to school because of inadequate bike and walking paths. Also, please consider a car-free zone downtown, where people can park outside the CBD and walk to the center.
- I'd like to add that biking in Wilmington is dangerous, too. I'd love to bike and walk more often. Please listen to the citizens, consider the future of all of our children, and add sidewalks and bike lanes for our health!
- Don't forget bicycles. Wilmington seems very unsafe and not friendly to bicycles and pedestrians.

- Because of poor road design, both walking and bike riding are very dangerous! Narrow bridges and busy major highways separate the city into zones that are impossible to cross.
- All developers should be required to consider pedestrians and bicyclers when getting approval for development. If we are going to be less car/gas dependent, we need to create communities where getting around without cars is possible.
- Addressing walking facilities is certainly needed, but in my opinion creating a safe space and barrier between vehicles and all alternative transportation methods, such as BIKING, are essential for better mobility in this City.
- Thank you so much for taking action on this issue. The deaths and injuries caused by cars in this city are entirely unacceptable. I support every effort the city may take in making streets safer for walkers and bikers of all ages.
- More bike paths
- We live in a tourist, nature and family-oriented area and the city is woefully lacking in walkways and bike paths for locals and visitors alike. I would ride my bike far more if it were safe to do so and a lot of people like me could save on gas and the city could save on road wear and experience fewer accidents.
- Getting to Greenfield Lake from downtown area (17th Street to River/North side across Castle, Dawson and Wooster via walking or cycling is dangerous and tedious.

Other (2 of 65)

- Streetscape improvements such as more trees and better lighting would increase pedestrians on the sidewalk outside of the commercial historic district and could lead to less criminal activity.
- When I do walk for exercise, it is not always convenient for me to carry water. Maybe water fountain or drink machine in some areas. Mainly water fountains because I don't like to carry cash, and change will slow me down.

Plan/Policy Improvements (3 of 85)

- The proposed Pedestrian Master Plan should be expanded in scope to include not only walking but jogging, bicycle use, roller blade use, and skate board use. Surfacing should be sufficiently wide to accommodate all of these uses. A 10' wide paved surface is sufficient. Political, social, and economic issues associated with providing just pedestrian facilities are too significant to limit the scope to a single activity. A "Master Plan" is more comprehensive than planning for a single function. It reviews and analyzes all allied uses of the limited resources of funds, land availability, enforcement, maintenance, etc. In theory or reality, one would not plan individually for each of the above listed multiple uses of a trail or "sidewalk". Suggest wrapping them all into a multiple use pedestrian, walking, hiking, bicycle, jogging master plan that provides catch up for the old downtown and early subdivisions, the recently annexed areas of the City, proposed County areas to be annexed, and the remainder of this small county so that this public need can be planned and executed as new annexation and new construction is approved, and not after the fact. As you are aware, walking for pleasure has been the number one recreational activity in America for the last 15 years. Let's assure that Wilmington and

New Hanover County do their part in providing a Master Plan and facilities for the number one recreational activity sought by its residents and those looking for retirement amenities.

- It will be best to encourage walking where the community and business owners can benefit: retail/shopping areas. There will more support if citizens benefit from pedestrian traffic instead of feeling burdened for the cost of it.
- Pedestrians and transit riders are viewed as second-class citizens in Wilmington. We need to focus more resources on pedestrian and transit facilities so that they become more appealing forms of transportation. All people are pedestrians before they are drivers, we need to remember that!

Transit Improvements (4 of 85)

- Need to have additional crosswalk signals and striping along 3rd street downtown, particularly near CFCC. Should have a law that requires cars to yield to pedestrians within crosswalks and fine vehicles if they don't stop. Need to have bus that goes from downtown, to college, to the beach. Need to have bus shelters at key bus stop locations, or at least benches so people are not "loitering". Would like more greenways, or off road biking facilities for families and young kids that allow you to get from place to place, not just at parks.
- Walking improvements need to be coordinated with improvements to WAVE.
- Market Street between 16th and Colonial is a residential area, not a high-speed highway corridor. The city needs to enforce speed limits every day, including the WAVE buses. To pretend that this stretch of road is safe for four lanes of traffic is a dereliction of duty on the part of public officials. It is a death trap.

Driver Behavior (11 of 85)

- Need to have additional crosswalk signals and striping along 3rd street downtown, particularly near CFCC. Should have a law that requires cars to yield to pedestrians within crosswalks and fine vehicles if they don't stop. Need to have bus that goes from downtown, to college, to the beach. Need to have bus shelters at key bus stop locations, or at least benches so people are not "loitering". Would like more greenways, or off road biking facilities for families and young kids that allow you to get from place to place, not just at parks.
- drivers need to be educated/reprimanded about sharing the roads with pedestrians
- Market Street between 16th and Colonial is a residential area, not a high-speed highway corridor. The city needs to enforce speed limits every day, including the WAVE buses. To pretend that this stretch of road is safe for four lanes of traffic is a dereliction of duty on the part of public officials. It is a death trap.
- In the county, speed of the cars is out of control and unsafe for and pedestrian (i.e. walkers, joggers, and bikers...)
- Everything I need is within walking distance, but I drive because the traffic is too dangerous! No sidewalks, no bike lanes and overdevelopment is insane. There are no cross walks on any of the corridors I use.
- Drivers turning when light walk is on. Drivers are looking at traffic not pedestrian.

- I live downtown and specifically moved here so I could walk to all our wonderful restaurants, art galleries, coffee shops, theatres, shops, the river, etc. I walk my dogs daily from one end of Front Street to the other and back. I also jog several times a week in the downtown area. Unfortunately, so many drivers don't pay any attention to pedestrians. I've almost been run over countless times by drivers who don't come to a full stop at stop signs and red lights, who don't look both ways before turning, who stop on top of crosswalks, etc. There are also too many skateboarders and bicyclists on the sidewalks. It's dangerous for everyone when someone tries to ride their bike or board down a crowded sidewalk. This seems to happen more often near Cape Fear Community College. I think Segways can be dangerous on crowded sidewalks as well. Anything that can be done to make downtown safer for pedestrians would be wonderful.
- We have lived in Wilmington for the past 7 years. Having moved our family from a state that is pedestrian friendly throughout, this was the first issue we noticed. The unsafe speed limit around the schools and neighborhoods, the lack of stop signs where common sense dictates necessity, the attitude of drivers towards pedestrians, all of which encourages driving as the only means of transportation.
- I'm very pleased that Wilmington is interested in improving our pedestrian facilities. Next we'll have to crack down on the crazy drivers.
- I don't know who to complain to about messy sidewalks, and cars parked blocking the sidewalk
- Creating a safe walking/biking pathway from downtown Wilmington/Front Street to the intersection of Carolina Beach Road/Third Street/Greenfield Lake would be a welcome change in Wilmington's pedestrian landscape. Many times, for festivals and other activities, my family has wanted to walk or ride our bikes downtown, but the hazardous conditions and traffic on Front Street and Third Street are daunting enough to keep us at home us put us in the car.

Funding (1 of 85)

- Any pedestrian improvements made should not be funded by monies intended for roads (i.e. gas tax, etc.). Separate funding should be made available by other means. (Tennis shoe tax, sales tax, jaywalking fines, etc. Education is extremely important. No one uses existing crosswalks so why build more?

Miscellaneous (4 of 85)

- I like the neighborhood walks. I.e. Forest Hills walkway.
- Stop talking about it - act!
- Have already sent comments via e mail
- Walking around Wilmington makes you feel like you're in a reverse fishbowl with all the people in there metal coffins staring out at you like there's something wrong with you - why are you walking? Are you poor? Lost your license? For cycling things are even worse.

FUNDING

Funding Sources

Local, state, federal, and private funding is available to support the planning, construction, right of way acquisition and maintenance of bicycle and pedestrian facilities. Available funding sources are related to a variety of purposes including transportation, water quality, hazard mitigation, recreation, air quality, wildlife protection, community health, and economic development. This appendix identifies a list of some of the bicycle and pedestrian facility funding opportunities available through federal, state, nonprofit and corporate sources. An important key to obtaining funding is for local governments to have adopted plans for greenway, bicycle, pedestrian or trail systems in place prior to making an application for funding.

Funding Allocated by State Agencies

Funding Opportunities Through NCDOT:

Bicycle and Pedestrian Independent Projects Funded Through the Transportation Improvement Program (TIP)

In North Carolina, the Department of Transportation, Division of Bicycle and Pedestrian Transportation (DBPT) manages the Transportation Improvement Program (TIP) selection process for bicycle and pedestrian projects. Projects programmed into the TIP are independent projects – those which are not related to a scheduled highway project. Incidental projects – those related to a scheduled highway project – are handled through other funding sources described in this section. The division has an annual budget of \$6 million. Eighty percent of these funds are from STP-Enhancement funds¹⁵, while the State Highway Trust provides the remaining 20 percent of the funding. Each year, the DBPT regularly sets aside a total of \$200,000 of TIP funding for the department to fund projects such as training workshops, pedestrian safety and research projects, and other pedestrian needs statewide. Those interested in learning about training workshops, research and other opportunities should contact the DBPT for information.

A total of \$5.3 million dollars of TIP funding is available for funding various bicycle and pedestrian independent projects, including the construction of multi-use trails, the striping of

¹⁵ After various administrative adjustments for programs within the Surface Transportation Program, or "STP", there is a 10% set-aside for Transportation Enhancements. The 10% set-aside is allocated within NCDOT to internal programs such as the Bicycle/Pedestrian Division, the Rail Division, the Roadside Environmental Unit, and others. The Enhancement Unit administers a portion of the set-aside through the Call for Projects process.

bicycle lanes, and the construction of paved shoulders, among other facilities. Prospective applicants are encouraged to contact the DBPT regarding funding assistance for bicycle and pedestrian projects. For a detailed description of the TIP project selection process, visit: http://www.ncdot.org/transit/bicycle/funding/funding_TIP.html. Another \$500,000 of the division's funding is available for miscellaneous projects.

Incidental Projects – Bicycle and pedestrian accommodations such as bike lanes, widened paved shoulders, sidewalks and bicycle-safe bridge design are frequently included as incidental features of highway projects. In addition, bicycle-safe drainage grates are a standard feature of all highway construction. Most bicycle and pedestrian safety accommodations built by NCDOT are included as part of scheduled highway improvement projects funded with a combination of National Highway System funds and State Highway Trust Funds.

Sidewalk Program – Each year, a total of \$1.4 million in STP-Enhancement funding is set aside for sidewalk construction, maintenance and repair. Each of the 14 highway divisions across the state allocates \$100,000 annually from each division's budget for this purpose. Funding decisions are made by the district engineer. Prospective applicants are encouraged to contact their district engineer for information on how to apply for funding.

Governor's Highway Safety Program (GHSP) – The mission of the GHSP is to promote highway safety awareness and reduce the number of traffic crashes in the state of North Carolina through the planning and execution of safety programs. GHSP funding is provided through an annual program, upon approval of specific project requests. Amounts of GHSP funds vary from year to year, according to the specific amounts requested. Communities may apply for a GHSP grant to be used as seed money to start a program to enhance highway safety. Once a grant is awarded, funding is provided on a reimbursement basis. Evidence of reductions in crashes, injuries, and fatalities is required. For information on applying for GHSP funding, visit: www.ncdot.org/programs/ghsp/.

Funding Available Through North Carolina Metropolitan Planning Organizations (MPOs)

MPOs in North Carolina which are located in air quality nonattainment or maintenance areas have the authority to program Congestion Mitigation Air Quality (CMAQ) funds. CMAQ funding is intended for projects that reduce transportation related emissions. Some NC MPOs have chosen to use the CMAQ funding for bicycle and pedestrian projects. Local governments in air quality nonattainment or maintenance area should contact their MPO for information on CMAQ funding opportunities for bicycle and pedestrian facilities.

Transportation Enhancement Call for Projects, EU, NCDOT

The Enhancement Unit administers a portion of the enhancement funding set-aside through the Call for Projects process. In North Carolina the Enhancement Program is a federally funded cost reimbursement program with a focus upon improving the transportation experience in and through local North Carolina communities either culturally, aesthetically, or environmentally. The program seeks to encourage diverse modes of travel, increase benefits to communities and to encourage citizen involvement. This is accomplished through the following twelve qualifying activities:

1. Bicycle and Pedestrian Facilities
2. Bicycle and Pedestrian Safety
3. Acquisition of Scenic Easements, Scenic or Historic Sites
4. Scenic or Historic Highway Programs (including tourist or welcome centers)
5. Landscaping and other Scenic Beautification
6. Historic Preservation
7. Rehabilitation of Historic Transportation Facilities
8. Preservation of Abandoned Rail Corridors
9. Control of Outdoor Advertising
10. Archaeological Planning and Research
11. Environmental Mitigation
12. Transportation Museums

Funds are allocated based on an equity formula approved by the Board of Transportation. The formula is applied at the county level and aggregated to the regional level. Available fund amount varies. In previous Calls, the funds available ranged from \$10 million to \$22 million.

The Call process takes place on even numbered years or as specified by the Secretary of Transportation. The Next Call is anticipated to take place in 2009. For more information, visit: www.ncdot.org/financial/fiscal/Enhancement/

Bicycle and Pedestrian Planning Grant Initiative, managed by NCDOT, DBPT

To encourage the development of comprehensive local bicycle plans and pedestrian plans, the NCDOT Division of Bicycle and Pedestrian Transportation (DBPT) and the Transportation

Planning Branch (TPB) have created a matching grant program to fund plan development. This program was initiated through a special allocation of funding approved by the North Carolina General Assembly in 2003 along with federal funds earmarked specifically for bicycle and pedestrian planning by the TPB. The planning grant program was launched in January 2004, and it is currently administered through NCDOT-DBPT and the Institute for Transportation Research and Education (ITRE) at NC State University. Over the past three grant cycles, 48 municipal plans have been selected and funded from 123 applicants. A total of \$ 1,175,718 has been allocated. Funding is secured for 2007 at \$400,000. Additional annual allocations will be sought for subsequent years. For more information, visit www.itre.ncsu.edu/ptg/bikeped/ncdot/index.html

Safe Routes to School Program, managed by NCDOT, DBPT

The NCDOT Safe Routes to School Program is a federally funded program that was initiated by the passing of the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) in 2005, which establishes a national SRTS program to distribute funding and institutional support to implement SRTS programs in states and communities across the country. SRTS programs facilitate the planning, development, and implementation of projects and activities that will improve safety and reduce traffic, fuel consumption, and air pollution in the vicinity of schools. The Division of Bicycle and Pedestrian Transportation at NCDOT is charged with disseminating SRTS funding.

The state of North Carolina has been allocated \$15 million in Safe Routes to School funding for fiscal years 2005 through 2009 for infrastructure or non-infrastructure projects. All proposed projects must relate to increasing walking or biking to and from an elementary or middle school. An example of a non-infrastructure project is an education or encouragement program to improve rates of walking and biking to school. An example of an infrastructure project is construction of sidewalks around a school. Infrastructure improvements under this program must be made within 2 miles of an elementary or middle school. The state requires the completion of a competitive application to apply for funding. For more information, visit www.ncdot.org/programs/safeRoutes/ or contact Leza Mundt at DBPT/NCDOT, (919) 807-0774.

The North Carolina Conservation Tax Credit (managed by NCDENR)

This program, managed by the North Carolina Department of Environment and Natural Resources, provides an incentive (in the form of an income tax credit) for landowners that

donate interests in real property for conservation purposes. Property donations can be fee simple or in the form of conservation easements or bargain sale. The goal of this program is to manage stormwater, protect water supply watersheds, retain working farms and forests, and set-aside greenways for ecological communities, public trails, and wildlife corridors. For more information, visit: www.enr.state.nc.us/conservationtaxcredit/.

Land and Water Conservation Fund (LWCF)

The Land and Water Conservation Fund (LWCF) program is a reimbursable, 50/50 matching grants program to states for conservation and recreation purposes, and through the states to local governments to address "close to home" outdoor recreation needs. LWCF grants can be used by communities to build a trail within one park site, if the local government has fee-simple title to the park site. Grants for a maximum of \$250,000 in LWCF assistance are awarded yearly to county governments, incorporated municipalities, public authorities and federally recognized Indian tribes. The local match may be provided with in-kind services or cash. The program's funding comes primarily from offshore oil and gas drilling receipts, with an authorized expenditure of \$900 million each year. However, Congress generally appropriates only a small fraction of this amount. The allotted money for the year 2007 is \$632,846.

The Land and Water Conservation Fund (LWCF) has historically been a primary funding source of the US Department of the Interior for outdoor recreation development and land acquisition by local governments and state agencies. In North Carolina, the program is administered by the Department of Environment and Natural Resources. Since 1965, the LWCF program has built a permanent park legacy for present and future generations. In North Carolina alone, the LWCF program has provided more than \$63 million in matching grants to protect land and support more than 800 state and local park projects. More than 37,000 acres have been acquired with LWCF assistance to establish a park legacy in our state. For more information, visit: <http://ils.unc.edu/parkproject/lwcf/home1.html>

NC Adopt-A-Trail Grant Program

This program, operated by the Trails Section of the NC Division of State Parks, offers annual grants to local governments to build, renovate, maintain, sign and map and create brochures for pedestrian trails. Grants are generally capped at about \$5,000 per project and do not require a match. A total of \$108,000 in Adopt-A-Trail money is awarded annually to government agencies. Applications are due during the month of February. For more information, visit : <http://ils.unc.edu/parkproject/trails/grant.html>.

Recreational Trails Program

The Recreational Trails Program (RTP) is a grant program funded by Congress with money from the federal gas taxes paid on fuel used by off-highway vehicles. This program's intent is to meet the trail and trail-related recreational needs identified by the Statewide Comprehensive Outdoor Recreation Plan. Grant applicants must be able contribute 20% of the project cost with cash or in-kind contributions. The program is managed by the State Trails Program, which is a section of the N.C. Division of Parks and Recreation.

The grant application is available and instruction handbook is available through the State Trails Program website at <http://www.fhwa.dot.gov/environment/rectrails/>. Applications are due during the month of February. For more information, call (919) 715-8699.

North Carolina Parks and Recreation Trust Fund (PARTF)

The fund was established in 1994 by the North Carolina General Assembly and is administered by the Parks and Recreation Authority. Through this program, several million dollars each year are available to local governments to fund the acquisition, development and renovation of recreational areas. Applicable projects require a 50/50 match from the local government. Grants for a maximum of \$500,000 are awarded yearly to county governments or incorporated municipalities. The fund is fueled by money from the state's portion of the real estate deed transfer tax for property sold in North Carolina.

The trust fund is allocated three ways:

For information on how to apply, visit: www.partf.net/learn.html

Powell Bill Program

Annually, State street-aid (Powell Bill) allocations are made to incorporated municipalities which establish their eligibility and qualify as provided by statute. This program is a state grant to municipalities for the purposes of maintaining, repairing, constructing, reconstructing or widening of local streets that are the responsibility of the municipalities or for planning, construction, and maintenance of bikeways or sidewalks along public streets and highways. Funding for this program is collected from fuel taxes. Amount of funds are based on population and mileage of town-maintained streets. For more information, visit http://www.ncdot.org/programs/Powell_Bill/.

Urban and Community Forestry Assistance Program

This program offers small grants that can be used to plant urban trees, establish a community arboretum, or other programs that promote tree canopy in urban areas. The program operates as a cooperative partnership between the NC Division of Forest Resources and the USDA Forest Service, Southern Region. To qualify for this program, a community must pledge to develop a street-tree inventory, a municipal tree ordinance, a tree commission, and an urban forestry-management plan. All of these can be funded through the program. For more information, contact the NC Division of Forest Resources. For more information and a grant application, contact the NC Division of Forest Resources and/or visit http://www.dfr.state.nc.us/urban/urban_grantprogram.htm.

North Carolina Health and Wellness Trust Fund

The NC Health and Wellness Trust Fund was created by the General Assembly as one of 3 entities to invest North Carolina's portion of the Tobacco Master Settlement Agreement. HWTF receives one-fourth of the state's tobacco settlement funds, which are paid in annual installments over a 25-year period.

Fit Together, a partnership of the NC Health and Wellness Trust Fund (HWTF) and Blue Cross and Blue Shield of North Carolina (BCBSNC) announces the establishment of Fit Community, a designation and grant program that recognizes and rewards North Carolina communities' efforts to support physical

activity and healthy eating initiatives, as well as tobacco-free school environments. Fit Community is one component of the jointly sponsored Fit Together initiative, a statewide prevention campaign designed to raise awareness about obesity and to equip individuals, families and communities with the tools they need to address this important issue.

All North Carolina municipalities and counties are eligible to apply for a Fit Community designation, which will be awarded to those that have excelled in supporting the following:

- physical activity in the community, schools, and workplaces
- healthy eating in the community, schools, and workplaces
- tobacco use prevention efforts in schools
- Designations will be valid for two years, and designated communities may have the opportunity to reapply for subsequent two-year extensions. The benefits of being a Fit Community include:

- heightened statewide attention that can help bolster local community development and/or economic investment initiatives (highway signage and a plaque for the Mayor's or County Commission Chair's office will be provided)
- reinvigoration of a community's sense of civic pride (each Fit Community will serve as a model for other communities that are trying to achieve similar goals)
- use of the Fit Community designation logo for promotional and communication purposes. The application for Fit Community designation is available on the

Fit Together Web site: www.FitTogetherNC.org/FitCommunity.aspx.

Fit Community grants are designed to support innovative strategies that help a community meet its goal to becoming a Fit Community. Eight to nine, two-year grants of up to \$30,000 annually will be awarded to applicants that have a demonstrated need, proven capacity, and opportunity for positive change in

addressing physical activity and/or healthy eating. For more information, visit: www.healthwellnc.com/

Federal Agency Funding Sources

Wetlands Reserve Program

This federal funding source is a voluntary program offering technical and financial assistance to landowners who want to restore and protect wetland areas for water quality and wildlife habitat. The US Department of Agriculture's Natural Resource Conservation Service (USDA-NRCS) administers the program and provides direct payments to private landowners who agree to place sensitive wetlands under permanent easements. This program can be used to fund the protection of open space and greenways within riparian corridors. For more information, visit <http://www.nrcs.usda.gov/PROGRAMS/wrp/>.

The Community Development Block Grant (HUD-CDBG)

The U.S. Department of Housing and Urban Development (HUD) offers financial grants to communities for neighborhood revitalization, economic development, and improvements to community facilities and services, especially in low and moderate income areas. Several communities have used HUD funds to develop greenways, including the Boulding Branch Greenway in High Point, North Carolina. Grants from this program range from \$50,000 to \$200,000 and are either made to municipalities or non-profits. There is no formal application

process. For more information, visit:
www.hud.gov/offices/cpd/communitydevelopment/programs/.

USDA Rural Business Enterprise Grants

Public and private nonprofit groups in communities with populations under 50,000 are eligible to apply for grant assistance to help their local small business environment. \$1 million is available for North Carolina on an annual basis and may be used for sidewalk and other community facilities. For more information from the local USDA Service Center, visit:
<http://www.rurdev.usda.gov/rbs/busp/rbeg.htm>

Rivers Trails and Conservation Assistance Program (RTCA)

The Rivers, Trails, and Conservation Assistance Program, also known as the Rivers & Trails Program or RTCA, is the community assistance arm of the National Park Service. RTCA staff provide technical assistance to community groups and local, State, and federal government agencies so they can conserve rivers, preserve open space, and develop trails and greenways. The RTCA program implements the natural resource conservation and outdoor recreation mission of the National Park Service in communities across America

Although the program does not provide funding for projects, it does provide valuable on-the-ground technical assistance, from strategic consultation and partnership development to serving as liaison with other government agencies. Communities must apply for assistance. For more information, visit: www.nps.gov/ncrc/programs/rtca/ or call Chris Abbett, Program Leader, at 404-562-3175 ext. 522.

Public Lands Highways Discretionary Fund

The Federal Highway Administration administers discretionary funding for projects that will reduce congestion and improve air quality. The FHWA issues a call for projects to disseminate this funding. The FHWA estimates that the PLHD funding for the 2007 call will be \$85 million. In the past, Congress has earmarked a portion of the total available funding for projects. For information on how to apply, visit: <http://www.fhwa.dot.gov/discretionary/>

Local Funding Sources

Municipalities often plan for the funding of pedestrian facilities or improvements through development of Capital Improvement Programs (CIP). In Raleigh, for example, the greenways system has been developed over many years through a dedicated source of annual funding that has ranged from \$100,000 to \$500,000, administered through the Recreation and Parks Department. CIPs should include all types of capital improvements (water, sewer, buildings,

streets, etc.) versus programs for single purposes. This allows municipal decision-makers to balance all capital needs. Typical capital funding mechanisms include the following: capital reserve fund, capital protection ordinances, municipal service district, tax increment financing, taxes, fees, and bonds. Each of these categories are described below.

Capital Reserve Fund

Municipalities have statutory authority to create capital reserve funds for any capital purpose, including pedestrian facilities. The reserve fund must be created through ordinance or resolution that states the purpose of the fund, the duration of the fund, the approximate amount of the fund, and the source of revenue for the fund. Sources of revenue can include general fund allocations, fund balance allocations, grants and donations for the specified use.

Capital Project Ordinances

Municipalities can pass Capital Project Ordinances that are project specific. The ordinance identifies and makes appropriations for the project.

Municipal Service District

Municipalities have statutory authority to establish municipal service districts, to levy a property tax in the district additional to the citywide property tax, and to use the proceeds to provide services in the district. Downtown revitalization projects are one of the eligible uses of service districts.

Tax Increment Financing

Tax increment financing is a tool to use future gains in taxes to finance the current improvements that will create those gains. When a public project, such as the construction of a greenway, is carried out, there is an increase in the value of surrounding real estate. Oftentimes, new investment in the area follows such a project. This increase in value and investment creates more taxable property, which increases tax revenues. These increased revenues can be referred to as the “tax increment.” Tax Increment Financing dedicates that increased revenue to finance debt issued to pay for the project. TIF is designed to channel funding toward improvements in distressed or underdeveloped areas where development would not otherwise occur. TIF creates funding for public projects that may otherwise be unaffordable to localities. The large majority of states have enabling legislation for tax increment financing.

Installment Purchase Financing

As an alternative to debt financing of capital improvements, communities can execute installment/ lease purchase contracts for improvements. This type of financing is typically used for relatively small projects that the seller or a financial institution is willing to finance or when up-front funds are unavailable. In a lease purchase contract the community leases the property or improvement from the seller or financial institution. The lease is paid in installments that include principal, interest, and associated costs. Upon completion of the lease period, the community owns the property or improvement. While lease purchase contracts are similar to a bond, this arrangement allows the community to acquire the property or improvement without issuing debt. These instruments, however, are more costly than issuing debt.

Taxes

Many communities have raised money through self-imposed increases in taxes and bonds. For example, Pinellas County residents in Florida voted to adopt a one-cent sales tax increase, which provided an additional \$5 million for the development of the overwhelmingly popular Pinellas Trail. Sales taxes have also been used in Allegheny County, Pennsylvania, and in Boulder, Colorado to fund open space projects. A gas tax is another method used by some municipalities to fund public improvements. A number of taxes provide direct or indirect funding for the operations of local governments. Some of them are:

Sales Tax

In North Carolina, the state has authorized a sales tax at the state and county levels. Local governments that choose to exercise the local option sales tax (all counties currently do), use the tax revenues to provide funding for a wide variety of projects and activities. Any increase in the sales tax, even if applying to a single county, must gain approval of the state legislature. In 1998, Mecklenburg County was granted authority to institute a one-half cent sales tax increase for mass transit.

Property Tax

Property taxes generally support a significant portion of a municipality's activities. However, the revenues from property taxes can also be used to pay debt service on general obligation bonds issued to finance greenway system acquisitions. Because of limits imposed on tax rates, use of property taxes to fund greenways could limit the municipality's ability to raise funds for other activities. Property taxes can provide a steady stream of financing while broadly distributing the tax burden. In other parts of the country, this mechanism has been popular

with voters as long as the increase is restricted to parks and open space. Note, other public agencies compete vigorously for these funds, and taxpayers are generally concerned about high property tax rates.

Excise Taxes

Excise taxes are taxes on specific goods and services. These taxes require special legislation and the use of the funds generated through the tax are limited to specific uses. Examples include lodging, food, and beverage taxes that generate funds for promotion of tourism, and the gas tax that generates revenues for transportation related activities.

Occupancy Tax

The NC General Assembly may grant towns the authority to levy occupancy tax on hotel and motel rooms. The act granting the taxing authority limits the use of the proceeds, usually for tourism-promotion purposes.

Fees

Three fee options that have been used by local governments to assist in funding pedestrian and bicycle facilities are listed here:

Stormwater Utility Fees

Greenway sections may be purchased with stormwater fees, if the property in question is used to mitigate floodwater or filter pollutants.

Stormwater charges are typically based on an estimate of the amount of impervious surface on a user's property. Impervious surfaces (such as rooftops and paved areas) increase both the amount and rate of stormwater runoff compared to natural conditions. Such surfaces cause runoff that directly or indirectly discharge into public storm drainage facilities and creates a need for stormwater management services. Thus, users with more impervious surface are charged more for stormwater service than users with less impervious surface. The rates, fees, and charges collected for stormwater management services may not exceed the costs incurred to provide these services. The costs that may be recovered through the stormwater rates, fees, and charges includes any costs necessary to assure that all aspects of stormwater quality and quantity are managed in accordance with federal and state laws, regulations, and rules.

Streetscape Utility Fees

Streetscape Utility Fees could help support streetscape maintenance of the area between the curb and the property line through a flat monthly fee per residential dwelling unit. Discounts would be available for senior and disabled citizens. Non-residential customers would be charged a per foot fee based on the length of frontage on streetscape improvements. This amount could be capped for non-residential customers with extremely large amounts of street frontage. The revenues raised from Streetscape Utility fees would be limited by ordinance to maintenance (or construction and maintenance) activities in support of the streetscape.

Impact Fees

Developers can be required to provide greenway impact fees through local enabling legislation. Impact fees, which are also known as capital contributions, facilities fees, or system development charges, are typically collected from developers or property owners at the time of building permit issuance to pay for capital improvements that provide capacity to serve new growth. The intent of these fees is to avoid burdening existing customers with the costs of providing capacity to serve new growth (“growth pays its own way”). Greenway impact fees are designed to reflect the costs incurred to provide sufficient capacity in the system to meet the additional needs of a growing community. These charges are set in a fee schedule applied uniformly to all new development. Communities that institute impact fees must develop a sound financial model that enables policy makers to justify fee levels for different user groups, and to ensure that revenues generated meet (but do not exceed) the needs of development. Factors used to determine an appropriate impact fee amount can include: lot size, number of occupants, and types of subdivision improvements. If Wilmington is interested in pursuing open space impact fees, it will require enabling legislation to authorize the collection of the fees.

Exactions

Exactions are similar to impact fees in that they both provide facilities to growing communities. The difference is that through exactions it can be established that it is the responsibility of the developer to build the greenway or pedestrian facility that crosses through the property, or adjacent to the property being developed.

Bonds and Loans

Bonds have been a very popular way for communities across the country to finance their pedestrian and greenway projects. A number of bond options are listed below. Contracting with a private consultant to assist with this program may be advisable. Since bonds rely on the support of the voting population, an education and awareness program should be implemented

prior to any vote. Billings, Montana used the issuance of a bond in the amount of \$599,000 to provide the matching funds for several of their TEA-21 enhancement dollars.

Revenue Bonds

Revenue bonds are bonds that are secured by a pledge of the revenues from a certain local government activity. The entity issuing bonds, pledges to generate sufficient revenue annually to cover the program's operating costs, plus meet the annual debt service requirements (principal and interest payment). Revenue bonds are not constrained by the debt ceilings of general obligation bonds, but they are generally more expensive than general obligation bonds.

General Obligation Bonds

Cities, counties, and service districts generally are able to issue general obligation (G.O.) bonds that are secured by the full faith and credit of the entity. In this case, the local government issuing the bonds pledges to raise its property taxes, or use any other sources of revenue, to generate sufficient revenues to make the debt service payments on the bonds. A general obligation pledge is stronger than a revenue pledge, and thus may carry a lower interest rate than a revenue bond. Frequently, when local governments issue G.O. bonds for public enterprise improvements, the public enterprise will make the debt service payments on the G.O. bonds with revenues generated through the public entity's rates and charges. However, if those rate revenues are insufficient to make the debt payment, the local government is obligated to raise taxes or use other sources of revenue to make the payments. G.O. bonds distribute the costs of land acquisition and greenway development and make funds available for immediate purchases and projects. Voter approval is required.

Special Assessment Bonds

Special assessment bonds are secured by a lien on the property that benefits by the improvements funded with the special assessment bond proceeds. Debt service payments on these bonds are funded through annual assessments to the property owners in the assessment area.

State Revolving Fund (SRF) Loans

Initially funded with federal and state money, and continued by funds generated by repayment of earlier loans, State Revolving Funds (SRFs) provide low interest loans for local governments to fund water pollution control and water supply related projects including many watershed

management activities. These loans typically require a revenue pledge, like a revenue bond, but carry a below market interest rate and limited term for debt repayment (20 years).

Partnerships

Another method of funding pedestrian systems and greenways is to partner with public agencies and private companies and organizations. Partnerships engender a spirit of cooperation, civic pride and community participation. The key to the involvement of private partners is to make a compelling argument for their participation. Major employers and developers should be identified and provided with a “Benefits of Walking”-type handout for themselves and their employees. Very specific routes that make critical connections to place of business would be targeted for private partners’ monetary support following a successful master planning effort. Potential partners include major employers which are located along or accessible to pedestrian facilities such as multi-use paths or greenways. Name recognition for corporate partnerships would be accomplished through signage trail heads or interpretive signage along greenway systems. Utilities often make good partners and many trails now share corridors with them. Money raised from providing an easement to utilities can help defray the costs of maintenance. It is important to have a lawyer review the legal agreement and verify ownership of the subsurface, surface or air rights in order to enter into an agreement.

Local Trail Sponsors

A sponsorship program for trail amenities allows smaller donations to be received from both individuals and businesses. Cash donations could be placed into a trust fund to be accessed for certain construction or acquisition projects associated with the greenways and open space system. Some recognition of the donors is appropriate and can be accomplished through the placement of a plaque, the naming of a trail segment, and/or special recognition at an opening ceremony. Types of gifts other than cash could include donations of services, equipment, labor, or reduced costs for supplies.

Volunteer Work

It is expected that many citizens will be excited about the development of a greenway corridor. Individual volunteers from the community can be brought together with groups of volunteers from church groups, civic groups, scout troops and environmental groups to work on greenway development on special community work days. Volunteers can also be used for fund-raising, maintenance, and programming needs.