NJDOT Bicycle/Pedestrian Planning Assistance

WEST WINDSOR TOWNSHIP BICYCLE/PEDESTRIAN PLAN

West Windsor Township, Mercer County, NJ

FINAL PLAN

October 12, 2004

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I. INTRODUCTION

The New Jersey Department of Transportation (NJDOT) has selected the Township of West Windsor in Mercer County to receive assistance under the NJDOT Local Bicycle and Pedestrian Planning Assistance program. NJDOT retained Orth-Rodgers & Associates, Inc., a planning consulting firm, in conjunction with Bikeways Engineering, Inc., to provide technical assistance to the Township in preparation of a Bicycle and Pedestrian Plan. A subsequent step will involve preparation of a master plan amendment.

The study was guided by a Project Steering Committee, consisting of the Township Community Development Director, Township Engineer, and representatives from the police department, the Township's Bicycle and Pedestrian Task Force, and residents. The Task Force prepared a preliminary map of roadways and off-road areas for consideration as on-road facilities and multi-use trails, totaling some 28 miles of roads and 14 miles of multi-use trails. In addition, the Task Force prepared a Township-wide sidewalk inventory. This information is important in the development of a bikeway/pedestrian plan and master plan amendment.

In all, four meetings were held with the Project Steering Committee. In addition, a special meeting was held to present recommendations to the Bicycle and Pedestrian Task Force. A public meeting was held to gather input on needed improvements from Township residents.

For this plan, ORA has inventoried existing roadway conditions and pedestrian and bicycle facilities; identified bicycle and pedestrian generators; analyzed crashes; analyzed roadway bicycle compatibility; identified pedestrian facility deficiencies; and analyzed six high-priority "target" areas.

The plan provides general recommendations on bicycle and pedestrian facilities that are applicable to a wide variety of roads within the Township. These recommendations range from signage improvements such as placing "Share the Road" signs on a narrow local road to more significant improvements such as re-striping roadways to incorporate bike lanes or create crosswalks. Design guidelines are provided for all types of bikeways (shared roadways, compatible shoulders, bike lanes and multi-use trails) as well as for bicycle parking. Concept improvements have been prepared for the six target areas to illustrate how recommendations may be implemented to improve pedestrian and bicycle conditions in and around the surrounding areas. Preliminary order of magnitude cost estimates have also been provided for these improvements. Finally the plan summarizes funding sources available at the federal, regional and local levels to support implementation of the plan.

All recommendations have been made in accordance with guidelines presented in the NJDOT *Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines, (1996),* as well as the NJDOT *Pedestrian Compatible Planning and Design Guidelines, (1996),* and the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*.

II. THE BICYCLE AND PEDESTRIAN FACILITY PLANNING PROCESS

A ten-step process was undertaken for the development of West Windsor Township's Bicycle/Pedestrian Plan. The Plan presents the results of this process:

1. Form the Project Steering Committee. This Committee has worked closely with ORA to develop the Township's Bicycle/Pedestrian Plan.

2. Develop goals for bicycle and pedestrian networks and derive objectives to achieve each of these goals.

3. Inventory existing bicycle and pedestrian facilities within the Township. The Township assisted with this effort by providing a sidewalk inventory. In addition, a pedestrian facility deficiency analysis was performed for the Princeton Junction area.

4. Identify current and potential bicycle and pedestrian traffic generators and destinations, including schools, parks, community facilities, commercial and retail centers, employment centers, and transit hubs such as the Princeton Junction Train Station.

5. Identify areas with high numbers of bicycle and pedestrian crashes.

6. Identify potential corridors for bikeways, multi-use trails and sidewalks.

7. Based on state and national standards, determine the compatibility of potential on-street corridors for shared use by motorized traffic and bicyclists. Determine the feasibility of potential off-street multi-use trails and installation of sidewalks.

8. Identify corridors for bicycle facilities and make short and long-term recommendations based on the compatibility analysis, land use and density, the presence of generators, and roadway characteristics.

9. Develop concept improvements for bicycle and pedestrian enhancements at spot locations.

10. Develop design standards for all new bicycle and pedestrian facilities and make recommendations regarding operational issues such as signage, pavement markings, pavement widths, and typical intersection treatments.

III. GOALS & OBJECTIVES

The Township seeks to promote bicycling and walking as a viable form of transportation by providing bicycle and pedestrian facilities throughout the Township to facilitate access to parks, schools, shopping areas, and places of work. The primary purpose of this effort has been to advance a bicycle and pedestrian network that provides linkages to as many of the following generators as possible:

- Residential neighborhoods (including, but not limited to Princeton Junction, Penn's Neck, Edinburg, Sherbrooke, Grover's Mill, Berrien City, Dutch Neck, and other areas under development);
- Schools (Mercer County Community College, Mercer County Vo-tech, WWP High School South, Thomas Grover Middle School, Village Elementary School, Maurice Hawk Elementary School, and Dutch Neck Elementary School);
- Employment centers;
- Community facilities and services (Municipal Complex/Library/Senior Citizens Center, West Windsor Community Park, Mercer County Park, Van Nest Park, and Ron Rogers Arboretum);
- Transit stops, with emphasis on the Princeton Junction Train Station; and,
- Shopping centers (MarketFair, Southfield Shopping Center, Acme shopping center, Ellsworth, Village Square, Nassau Park and Nassau Pavilion).

In addition, the Plan evaluates recreational routes through greenbelts, utility, and sewer easements throughout the Township. Through meetings with the Project Steering Committee, the following goals and objectives have been developed for the Plan:

GOAL 1. Create a bikeway system that makes cycling a viable alternative to driving.
Objectives:

1. Provide accessible, convenient links to major bicycle generators and destinations.
2. Provide bicycle compatible routes to major shopping and commercial destinations, the Princeton Junction Train Station, employment centers, schools and community facilities.
3. Provide bicycle parking and storage at major bicycle destinations.
4. Work with employers and retailers to provide bicycle parking for commuters and patrons.
5. Create and publish maps or brochures of the existing and proposed bikeway network.

GOAL 2. Increase recreational bicycling and walking opportunities.
Objectives:

1. Create bicycle compatible roadways to improve accessibility to parks and recreational areas.
2. Develop network of multi-use trails.

GOAL 3. Improve bicyclist and pedestrian safety.
Objectives:

1. Institute bicycle and pedestrian safety programs for school children and educational efforts directed at adult cyclists and drivers.
2. Implement improvements such as targeted speeding enforcement or photo radar to improve safety conditions for bicyclists and pedestrians on roads that have documented speeding problems.
3. Work with the Police Department to track bicycle and pedestrian crashes and develop solutions for problem areas.
4. Use signage that clearly announces bicycle facilities and encourages drivers and cyclists to be aware of each other and to "share the road".
5. Use newspapers, the Township website, and newsletters to increase awareness of bicyclists and pedestrians.
6. Implement traffic calming measures to improve bicyclist and pedestrian safety.

7. Promote bicycle use as well as walking by sponsoring "Bike to Work" or days, bike registration programs, or a bicycle race through the Township.
8. Promote walking by sponsoring a "Walk Your Child to School" or "Walk to Work" day or other similar event.

GOAL 4. Improve pedestrian safety around Princeton Junction.

Objectives:

1. Improve deficient pedestrian crossings.
2. Ensure that all crosswalks have properly functioning pedestrian signals and push buttons.
3. Use signage to identify pedestrian crossings.
4. Use high-visibility crossing treatments at high activity crossing locations.
5. Provide sidewalks along roadways that provide access to the station.

GOAL 5. Continue to implement a sidewalk network that makes walking a viable alternative to driving.

Objectives:

1. Identify missing links in the existing sidewalk network.
2. Prioritize sidewalk improvements.
3. Provide sidewalks to improve accessibility to schools, community facilities, employment centers, commercial centers, and the train station.

GOAL 6. Encourage bicycling and walking through proactive implementation of bicycle facilities and pedestrian improvements.

Objectives:

1. Update Township plans, regulations, and policies to ensure that the needs of non-motorized traffic are represented. For instance, update ordinance to ensure that multi-use trails incorporated into new developments meet current NJDOT and AASHTO guidelines.
2. Assure that bicycle and pedestrian facilities are considered with all street maintenance work and that possible bicycle-motor vehicle conflicts/pedestrian-motor vehicle conflicts are taken into consideration.
3. Work with Mercer County and the State of New Jersey to incorporate bicycle facilities into roadway reconstruction, resurfacing, and improvement projects.
4. Require roadway pavement patching techniques that do not create unsafe conditions for cyclists.
5. Replace any drainage grates that may trap bicycle tires.

GOAL 7. Continuously improve and maintain bicycle and pedestrian facilities.

Objectives:

1. Incorporate bikeways/trails where feasible as new open space is acquired by the Township.
2. Coordinate with neighboring communities, the County, and the Greater Mercer TMA to provide linkages to create a regional bicycle/trail network.
3. Explore the possibility of funding multi-use trails through the Township's open space tax.
4. Fund bicycle facility, sidewalk and crosswalk maintenance as a regular part of the street maintenance budget.

GOAL 8. Amend the Township Master Plan to implement the Plan's recommendations.

Objectives:

1. Hold quarterly Steering Committee/Task Force meetings to review completed projects and to set goals for the following quarter and year.
2. Seek external funding sources to implement the Plan.
3. Follow NJDOT guidelines in maintaining and improving bicycle and pedestrian facilities.

IV. EXISTING CONDITIONS

Crashes Involving Bicyclists and Pedestrians

In the three-plus year period from January 2001 through February 2004, there were a total of 3 reported crashes involving bicyclists. Of these crashes, two occurred on heavily traveled roads, Alexander Road and Washington Road, while the third crash occurred near Meadow Road and Bear Brook Road. Figure 1 and Table 1 denote the locations and descriptions of crashes involving bicyclists.

During the same time period, there was a total of 22 crashes involving pedestrians within the Township. Of these crashes, eight either occurred on Nassau Park Boulevard or in the Nassau Park Shopping Center parking lot. Three crashes occurred in the Princeton Junction Train Station vicinity – one near the taxi stand located in the kiss-n-ride (Wallace Circle), the second one occurred in the Vaughn Drive commuter lot, and the third at the intersection of Hightstown Road and Cranbury Road. During the time period there were two fatal crashes. One fatal crash occurred on US 1 near Nassau Park Boulevard, where a pedestrian was struck by a driver driving under the influence of alcohol. The second fatal crash occurred near Alexander Road and Vaughn Drive in where a pedestrian attempted to cross Alexander Road outside the crosswalk while opposing traffic had a green signal. Descriptions of the crashes involving pedestrians are provided in Table 2; crash locations are illustrated in Figure 1.

Table 1
Crashes involving Bicycles*
January 2001 to February 2004

Map Key	Location	Description
23	Meadow Road, 50 feet east of Bear Brook Road	Bicyclist traveling against traffic along blind curve on Meadow Road was struck by vehicle that swerved in an attempt to avoid the path of bicyclist.
24	State Highway 64 (Hightstown Road) and Washington Road (C.R. 571)	Vehicle traveling westbound on Hightstown Road failed to yield to bicyclist and struck bicyclist.
25	Alexander Road and Harris Road	Bicyclist entered crosswalk from sidewalk, failed to stop, and was struck by vehicle.

* No bicycle fatalities during study period

Table 2
Crashes involving Pedestrians
January 2001 to February 2004

Map Key	Location	Description
1	Nassau Park Retail Center, 301 Nassau Park Boulevard	Vehicle backing out of parking space struck pedestrian loading items into vehicle.
2	Nassau Park Retail Center, 701 Nassau Park Boulevard	Vehicle making left turn in parking lot struck pedestrian walking in crosswalk.
3	Nassau Park Retail Center, 301 Nassau Park Boulevard	Vehicle struck pedestrian standing behind parked car while driving though aisle of parking lot.
4	Nassau Park Retail Center, Road 'D' Wal-Mart Entrance	Vehicle making right turn driving through parking lot struck pedestrian crossing in a crosswalk.
5	Nassau Park Retail Center, 251 Nassau Park Boulevard	Vehicle sideswiped pedestrian while driving through parking lot.
6	Nassau Park Retail Center, 701 Nassau Park Boulevard	Vehicle pulling into parking space sideswiped pedestrian standing next to parked vehicle.
7	Nassau Park Retail Center, Road 'H'	Vehicle making left turn struck pedestrian walking in aisle of parking lot.
8	McClain Avenue and Nassau Park Boulevard	Vehicle traveling northbound on Nassau Boulevard making left turn onto McClain Ave struck pedestrian crossing at McClain Avenue.
9*	U.S. Route 1 North and Nassau Park Boulevard	Driver of vehicle under the influence of alcohol traveled through red light on Route 1 North and struck pedestrian attempting to cross the roadway.
10	3499 Route 1 South, Charlie Brown's Parking Lot	Vehicle backing up from parking stall struck pedestrian walking through parking lot.
11	217 Clarksville Road, Village Square	Vehicle exiting parking lot struck pedestrian who was walking to car.
12	Banff Drive, 300 feet east of South Post Road	Vehicle traveling along Banff Drive struck pedestrian crossing same street.
13	Robbinsville Road and Old Trenton Road	Pedestrian wearing dark clothing was struck by vehicle while crossing Robbinsville Road at midblock location.
14	Heritage Blvd and Heath Court	Pedestrian exiting school bus was struck by vehicle illegally passing bus.
15*	Alexander Road and Vaughn Drive	Pedestrian crossing street on a red signal with a solid "don't walk" signal was struck by vehicle traveling through a green signal phase.
16	Princeton Junction Train Station, Vaughn Drive Parking Lot	Vehicle struck pedestrian while repositioning in parking space.
17	Princeton Junction Train Station, taxi stand	Pedestrian standing in lane of travel at taxi stand was struck by vehicle exiting taxi stand.
18	Princeton Hightstown Road and Clarksville Road	Pedestrian crossing Clarksville Road at midblock location was struck by vehicle traveling at a low rate of speed in the left turn lane.
19	Southfield Center Parking Lot, 335 Princeton Hightstown Road	Pedestrian collecting shopping carts was struck by vehicle traveling in parking lot.
20	Old Trenton Road, 1/4 mile north of Village Road	Pedestrian ran in front of on-coming vehicles on Old Trenton Road and was struck.
21	50 Saratoga Drive, 1/4 mile of Hamilton Drive	Pedestrian walking up to vehicle backing out of driveway to talk with driver was struck by vehicle.
22	Hightstown Road and Cranbury Road	Pedestrian wearing dark clothing was struck outside of the crosswalk while attempting to cross Hightstown Road

* DENOTES FATAL CRASH

Bicycle and Pedestrian Generators

Figure 2 illustrates major bicycle and pedestrian generators within the Township, including residential neighborhoods, schools, community facilities, existing multi-use trails, parks and preserved open space, commercial centers, and the Princeton Junction Train Station.

Princeton Junction Train Station

Public Transit Facilities

West Windsor is served by public transit in the form of both commuter rail and bus. The Princeton Junction Train Station is centrally located within the Township and is used by both Amtrak and New Jersey Transit. New Jersey Transit also runs the Dinky line, a 2.5 mile rail spur that connects Princeton Junction to Princeton Borough. New Jersey Transit Bus Routes 600, 605, and 976 traverses the northern section of the Township, providing scheduled stops at Nassau Park Retail Center, Princeton MarketFair, and Princeton Junction Train Station. In addition, New Jersey Transit Bus Route 609 services a small portion of the southeastern section of the Township, with scheduled stops at Mercer County Community College and Mercer County Vo-Tech School. The East Windsor Shuttle provides weekday commuter service for East Windsor Township and Hightstown Borough and travels through West Windsor Township along Princeton-Hightstown Road terminating at the Princeton Junction Train Station. The Township public transit network is highlighted in Figure 3.

FIGURE 1 – BICYCLE AND PEDESTRIAN CRASH LOCATIONS

FIGURE 2 – GENERATORS

FIGURE 3 – PUBLIC TRANSIT

Existing Bicycle Facilities

Site visits were conducted in the Township the fall of 2003 and spring of 2004. Measurements were taken of roadways identified by the Steering Committee in their map of desired corridors. In addition, ORA inventoried additional roadways that have the potential to provide important connections within the future bicycle network. Travel lane and shoulder widths were tabulated, along with right-of-way width information from the Township's tax maps. The presence of existing bicycle facilities, such as bike lane signage, striping, and stenciling, was also noted. These facilities are shown in Figure 4. Roadway data from the field inventories is detailed in Appendix A.

Field observations indicated that roadway conditions within the Township vary widely. Higher volume roads and areas of greater development density are closer to US 1 and the Northeast corridor line, while more rural conditions exist in the southeast and southwest corners of the Township. US 1 and the Northeast Corridor Line bisect the Township and create barriers to bicycle and pedestrian travel within the Township and the broader region. Tax map information indicates that in many locations, sufficient right-of-way exists to provide bicycle facilities. Roadway widening would be required in most cases.

Currently, there are three roadways with bicycle lanes, including sections of Village Road West, New Village Road, and New Edinburg Road. The diamond style stenciling used to designate the facilities on these three roadways is worn and is no longer recommended by NJDOT due to the similarities to the HOV stenciling found on some of New Jersey's busier roadways. The Township also provides bicycle racks at various community facilities throughout the Township, including West Windsor Public Library and Waterworks (located in West Windsor Community Park). Recently, the Greater Mercer TMA (GMTMA) has taken over authority of the bicycle lockers from the Township. They operate 68 bicycle lockers at the train station that are provided to customers on a fee basis. The bicycle racks at the station are provided free of charge. Bicycle racks are also located at Southfield Shopping Center (McCaffery's Shopping Center). Recommendations regarding bicycle parking facilities are provided in Chapter VI.

While there are a limited number of existing, signed bicycle lanes within the Township, a number of roadways have bicycle compatible shoulders or travel lanes wide enough to accommodate bicycle lanes. Roadways that exhibit these characteristics include: Southfield Road, Edinburg Road, South Mill Road, Rabbit Hill Road, and Lanwin Boulevard.

Bicycle lanes on New Village Road


Bicycle compatible shoulders on South Mill Road


Short-and long-term bicycle parking at the Princeton Junction Train Station

Bicycle Compatibility

The criteria used to analyze bicycle compatibility of Township roadways are taken from NJDOT's *Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines, (April 1996)*. It is the policy of NJDOT to promote bicycling as a "legitimate choice of personal transportation for short trips." To accomplish this, NJDOT has issued design guidelines for accommodating and encouraging shared use of roadways by motor vehicles, bicycles, and pedestrians. The NJDOT guidelines specify the minimum recommended pavement width and facility type (shared lane or shoulder) for shared use by bicycle and motor vehicle traffic.

The criteria used to determine compatibility are lane width, shoulder width, traffic volume, speed limit, the character of the area (urban or rural), and the presence or absence of on-street parking and heavy truck use. Table 3 shows how this data is used to determine whether a roadway is bicycle compatible and which type of facility is best suited given roadway characteristics.

All required information except traffic volume was collected in the field. Much of the average annual daily traffic (AADT) information used to represent traffic volume was provided either by NJDOT or the Delaware Valley Regional Planning Commission (DVRPC). Where AADT counts were not available, an estimate was made that best fits within one of three broad ranges: 1,200-2,000 vehicles per day; 2,000-10,000 vehicles per day; and over 10,000 vehicles per day or truck traffic over 5% of daily traffic.

The Bicycle and Pedestrian Task Force, in conjunction with the Project Steering Committee, selected roadways for preliminary analysis. Additional roads that provide access to major generators and destinations within the Township were also analyzed. The characteristics of each road were cross-referenced with the information found in Table 3 in order to conduct the analysis. Figure 6 illustrates the results of the analysis.

Table 3. NJDOT Bicycle Compatibility Guidelines

Condition I: AADT 1200*-2000

Speed Limit	Urban w/Parking	Urban w/o Parking	Rural
< 30 mph	Shared lane (12 ft.)	Shared lane (11 ft.)	Shared lane (10 ft.)
30-40 mph	Shared lane (14 ft.)	Shared lane (14 ft.)	Shared lane (12 ft.)
41-50 mph	Shared lane (15 ft.)	Shared lane (15 ft.)	Shoulder (3 ft.)
>50 mph	Not Applicable (NA)	Shoulder (4 ft.)	Shoulder (4 ft.)

*For volumes less than 1200, a shared lane is acceptable.

Condition II: AADT 2000-10,000

Speed Limit	Urban w/Parking	Urban w/o Parking	Rural
< 30 mph	Shared lane (14 ft.)	Shared lane (12 ft.)	Shared lane (12 ft.)
30-40 mph	Shared lane (14 ft.)	Shared lane (14 ft.)	Shoulder (3 ft.)
41-50 mph	Shared lane (15 ft.)	Shared lane (15 ft.)	Shoulder (4 ft.)
>50 mph	Not Applicable (NA)	Shoulder (6 ft.)	Shoulder (6 ft.)

Condition III: AADT over 10,000 or Trucks over 5%

Speed Limit	Urban w/Parking	Urban w/o Parking	Rural
< 30 mph	Shared lane (14 ft.)	Shared lane (14 ft.)	Shared lane (14 ft.)
30-40 mph	Shared lane (14 ft.)	Shoulder (4 ft.)	Shoulder (4 ft.)
41-50 mph	Shared lane (15 ft.)	Shoulder (6 ft.)	Shoulder (6 ft.)
>50 mph	Not Applicable (NA)	Shoulder (6 ft.)	Shoulder (6 ft.)

*Note: Whenever possible, minimum 8 foot shoulder should be provided on roadways with an AADT greater than 10,000 vehicles.

Approximately two-thirds of the roadway segments analyzed were found to be incompatible under NJDOT guidelines. This result should not be seen as limiting the potential for a Township-wide bikeway system. Southfield Road could be brought up to standard with relatively minor improvements, such as re-aligning the centerline to accommodate wider travel lanes near Village Elementary School and Thomas Grover Middle School. Some roadways may be incompatible for on-street bicycle use, but bicyclists may have access to off-street facilities, as is in the case along sections of Bear Brook Road, where an eight-foot wide path is currently being installed. Examples of roads that currently meeting NJDOT compatibility guidelines include Bennington Drive, Village Road East, and Edinburg Road. Other roads that are technically incompatible and have low volumes can be incorporated into the network. These roads are discussed further in Chapter V. It should be also stressed that roads classified as incompatible can still be used by bicyclists; the incompatibility designation simply indicates that these roadways are not optimal for bicycle use.

Compatible based on NJDOT Guidelines

Village Road East

Non-Compatible based on NJDOT Guidelines

Princeton-Hightstown Road

Existing Multi-use Trail Network

There is a limited multi-use trail network within the Township. Most of the trail network is located in Mercer County Park. This network is considered as one of the best maintained off-road trail systems in the region. Approximately 11 miles of trails traverse the park spanning from the Hamilton Township border to Edinburg Road. In addition to trails within Mercer County Park, there is a smaller trail network in Community Park and Ron Rogers Arboretum. The Township recently received NJDEP grant money through the Recreational Trails Program to construct the first segment of the Millstone River Trail, which when complete, will provide a path along the eastern portion of the Township. The D&R Canal Path, located on the northern side of the D&R Canal, spans 70 miles through central New Jersey. This linear park serves both local and regional passive recreation needs. In 2005, the Township will be re-applying for a TEA-21 grant allowing for the extension of the D&R Canal Path on the West Windsor side of the canal between Alexander Road and the D&R Canal Bridge at the Princeton Municipal Golf Course. (An earlier grant application was turned down.) A multi-use path is currently being constructed in conjunction with The Estates at Princeton Junction subdivision. The path is 8-feet wide and extends the length of the subdivision along newly realigned Bear Brook Road. This path will play a vital role in connecting multi-use trails in the Bear Brook Run/Duck Pond Run vicinity to the Train Station, the future Duck Pond Park, and points south. Recommendations for an off-road trail network will be provided later in The Plan. The existing trail network is shown in Figure 5.

FIGURE 4 – EXISTING BICYCLE FACILITIES

FIGURE 5 – BICYCLE COMPATIBILITY

Footpath along Millstone River

The red trail at Mercer County Park

Existing Pedestrian Facilities

The Bicycle and Pedestrian Task force inventoried approximately 162 miles of roadways within the Township to determine the presence of sidewalks. This inventory continues to be updated. Of the 162 miles surveyed, approximately 56% have sidewalks on both sides of the roadway while 15% have a sidewalk on one side of the roadway. The majority of these sidewalks are located within residential developments and do not necessarily provide linkages to major pedestrian destinations within the region. Occasionally, there are instances of no sidewalks in close proximity to township generators. For instance, roads that provide access to two of the Township's recreational facilities have no sidewalks (South Post Road and Conover Road, which provide access to Conover Athletic Field; and North Mill Road, Hendrickson Drive, and Princeton-Hightstown Road, which provide access to West Windsor Community Park). All of the Township's educational facilities, with the exception of Mercer County Community College and Mercer County Vo-Tech, are located on roadways with sidewalks on at least one side. Table 4 shows the percent of roadways with sidewalks on them.

Table 4.

Existing Sidewalk Inventory

Condition	Length (miles)	Percent of Total
Sidewalks on both sides of Roadway	91.1	56%
Sidewalks on one side of Roadway	24.5	15%
No sidewalks on Roadway	40.7	25%
Pedestrian Walkway	5.2	3%
Total	**161.5**	

Source: West Windsor Bicycle and Pedestrian Task Force

Lack of sidewalks on Millstone Road

Figure 6 depicts the existing sidewalk network in West Windsor Township. Depending on land use patterns, a sidewalk on one side of a roadway may be adequate. However, there are many instances where sidewalks are present on one side of a roadway very close to major generators and destinations. Ideally, sidewalks should be provided on both sides of roadways that connect residential areas to major destinations or high-visibility crossing treatments should be provided between sidewalk links on opposite sides of roadways.

FIGURE 6 –EXISTING SIDEWALK INVENTORY

Pedestrian Deficiencies in the Princeton Junction Area

A pedestrian facility deficiency analysis was performed in the Princeton Junction Train Station vicinity in order to assess conditions and identify necessary improvements. Field views were conducted to evaluate missing links in the sidewalk network, condition of crosswalks (including faded, worn, or missing crosswalks), lack of pedestrian push buttons, malfunctioning pedestrian actuation, areas in need of ADA-compliant curb ramps, and missing pedestrian educational plaques.

The Princeton Junction Train Station provides public transit access to the employment centers of New York, Philadelphia, and the Princeton vicinity. Over time, the development of the area around the train station has created a pedestrian "unfriendly" locale which has made it difficult for pedestrians to safely access the train station. There are many instances of missing sidewalk links, worn or missing crosswalks, curb ramps that do not meet ADA standards, and improperly functioning pedestrian signals. Pedestrian deficiencies in the Princeton Junction area are shown in Figure 7. Deficiencies of selected intersections are summarized in the following section. The following pictures illustrate examples of pedestrian deficiencies in the Princeton Junction area.

Lack of sidewalks in the Princeton Junction area makes it difficult for pedestrians to safely access the train station

Missing ADA curb cuts

Faded and worn crosswalk

FIGURE 7 – PEDESTRIAN DEFICIENCIES IN PRINCETON JUNCTION VICINITY

Existing Intersection Conditions

Clarksville Road and North Post Road

Land uses at this intersection consist of the Municipal Complex (municipal building, West Windsor Public Library, Senior Citizen Center, and the police and fire departments) and residences. Sidewalks are present on both sides of the roads at all corners except for Clarksville Road where sidewalks are present on the southern (eastbound) side only. Crosswalks are present at all four corners, but are worn and need to be improved. There are no ADA compliant curb ramps on the eastern corners of North Post Road. The pedestrian signal on the southeast corner is not properly actuated (provides only brief walking permission during walking phase).

Clarksville Road and Penn-Lyle Road/Harris Road

There are two primary land uses at this intersection, West Windsor-Plainsboro High School South on the southeast corner and residential uses at the remaining corners. Sidewalks are present on both sides of the roads at all corners except for Penn-Lyle Road where sidewalks are present on the eastern side only. There are crosswalks present at all four corners of the intersection, including the traffic diversion island, but they are worn. There are no ADA compliant curb ramps on the northeast corner of the intersection.

Clarksville Road and Princeton-Hightstown Road

WWP High School South and the Ron Rogers Arboretum are on the southwest and southeast corners, respectively. The northern part of the intersection has residential and home office uses. Sidewalks are absent on the eastern side of Princeton-Hightstown Road north of Clarksville Road. Crosswalks are present at all four legs of the intersection but are worn and faded. With the exception of the northeast corner, ADA compliant curb ramps are missing at all corners of the intersection.

North/South Post Road and Courtney Drive

Land uses at this intersection include the Municipal Complex one the eastern side and residential uses on the western side. The unnamed road across from Courtney Drive provides access to the public library. Sidewalks are present on both sides of all roads except for the eastern side of North Post Road, north of the Courtney Drive. The southern leg of the intersection does not have a crosswalk. The remaining legs have crosswalks, but they are faded.

Alexander Road/North Post Road

Land uses at this intersection include vacant land on the southeast corner, a train station parking lot on the northeast corner, and residential uses on the western side. Sidewalks are missing at all approaches of the intersection. There are no crosswalks or ADA compliant curb ramps at the intersection.

Wallace Road/Alexander Road

The Princeton Junction Train Station is on the eastern side of this intersection. Single-family homes are located on the remaining corners. There are sidewalks present on the eastern side of Wallace road, but none on Alexander Road. Crosswalks are missing at all legs of the intersection, including the traffic island at the intersection with Alexander Road. There are no ADA compliant curb ramps at this intersection.

Alexander Road and Princeton Hightstown Road

There is a gas station and senior housing on the southwest corner of this intersection. Commercial strip development, including a grocery store, occupies the northwest corner, while residential uses occupy the eastern side of the intersection. Sidewalks are present on only the south side of Alexander Road and the east side of Princeton-Hightstown Road, north of the intersection. Sidewalks are missing on both sides of the Princeton Hightstown Road, south of the

intersection. There are no crosswalks on Alexander Road and Princeton Hightstown Road. There is a worn crosswalk that leads to the traffic island on Princeton-Hightstown Road.

Wallace Road/Cranbury Road and Princeton-Hightstown Road
Land uses at this intersection consist of an auto repair shop on the southeast corner, small strip centers on the northeast and southwest corners, and the Princeton Junction Train station and electrical substation on the northwest corner. There are no sidewalks on any of the approaches to the intersection. Additionally, there are no crosswalks except for the southern approach. There are no ADA compliant curb ramps on the southwest and northeast corners of the intersection.

Vaughn Drive/Bear Brook Road and Alexander Road
The northern corners of the intersection contain office complexes. The West Windsor Parking Authority train station parking lot occupies the southeast corner and the Windsor Haven residential development is located at the southwestern corner. There is a bus shelter on the northeast corner of the intersection. Sidewalks are present on both sides of Bear Brook Road. Sidewalks are present on only one side of Alexander Road and Vaughn Drive (the eastern and southern sides, respectively). There are no sidewalks on Alexander Road south of the intersection. Crosswalks are present at all four approaches, but they are worn and faded.

Pedestrian and Bicycle Activity

Pedestrian and bicycle counts were conducted at the six "target areas," during the winter, spring, and summer of 2004. The count periods correspond to peak bicycle and pedestrian activity periods associated with the target area; the Bicycle and Pedestrian Task Force also made recommendations on count time periods. The following locations were examined:

- Hightstown Road and Wallace Road/Cranbury Road
- Wallace Road and Alexander Road
- Wallace Road and Scott Avenue
- Hightstown Road and Sherbrooke Drive
- Alexander Road and Harris Road (part of Alexander Road target area)
- Alexander Road and Scott Avenue (part of Alexander Road target area)
- Canal Pointe Boulevard and Mayfair Drive

The count data, in conjunction with field views performed throughout the study area, was used to provide recommendations to the six concept locations that were decided by the Steering Committee. Recommendations for the target areas are provided in Chapter V.

Table 5 summarizes pedestrian and bicycle counts for each location. The numbers indicate the total number of pedestrians and bicyclists that passed through or in close proximity to the intersection. Key crossing trends are described in the text below. The pedestrian crossing data served as particularly important input in the determination of needed improvements at the target areas, and are thus emphasized in the text. Bicycle and pedestrian count figures for the selected locations are located in Appendix B.

Table 5. Bicycle and Pedestrian Activity

Location	Date	Time	Bicycles	Pedestrians
Hightstown Road and Wallace/Cranbury Road	Tuesday, July 20, 2004	5:00 AM – 8:00 AM	7	45
	Wednesday, July 21, 2004	5:00 PM – 8:00 PM	9	43
Wallace Road and Alexander Road	Wednesday, June 23, 2004	5:00 AM – 8:15 AM	7	12
		4:45 PM – 8:00 PM	5	16
Wallace Road and Scott Avenue	Wednesday, March 31, 2004	6:30 AM – 9:00 AM	10	52
	Friday, April 16, 2004	4:30 PM – 7:00 PM	5	63
Hightstown Road and Sherbrooke Road	Wednesday, June 16, 2004	5:00 AM – 8:30 AM	4	17
		4:45 PM – 8:00 PM	15	40
Alexander Road and Harris Road	Friday, April 16, 2004	2:30 PM – 3:15 PM	2	13
Alexander Road and Scott Avenue	Friday, April 16, 2004	3:15 PM – 4:30 PM	2	13
Canal Pointe Boulevard and Mayfair Drive	Friday, April 16, 2004	11:30 AM -1:30 PM	1	13

Hightstown Road and Wallace/Cranbury Road

Pedestrian activity at this location consisted mostly of commuters accessing the Princeton Junction Train Station; some pedestrians were seen parking their cars in the Ellsworth Shopping Center and the Acme Shopping Centers, before walking to the train station. Other commuters live in the proximate residential neighborhoods. During the morning peak period, most pedestrians approaching the intersection came from the south along Hightstown Road. Nineteen pedestrians were observed cutting through the driveway/parking area of the hardware store or ice cream shop. This pedestrian flow accounted for the greatest activity in close proximity to the intersection, with 13 of the 19 pedestrians continuing across Wallace Road at a mid-block location. Within the intersection itself, the greatest activity in the morning peak period was on the northern leg, with seven crossings; most of these pedestrians were walking from the Ellsworth Shopping Center. The northern leg of the intersection also accounts for the greatest activity in the evening peak period, with 21 crossings. In both the morning and evening peak periods, the heaviest bicyclist activity occurred along Wallace Road and Cranbury Road (12 in the morning, and 7 in the evening).

Wallace Road and Alexander Road

The greatest pedestrian activity at this location occurred in the morning peak period, with eight pedestrians walking on the north side of Alexander Road before dispersing to cross Wallace Road at several different locations. These travelers headed towards the train station, with the majority cutting through the parking lot in order to access the station platforms. During the evening period, the greatest activity consisted of pedestrians leaving the train station and walking along Wallace Road; five pedestrians conducted this movement east of Alexander Road, and six pedestrians within the intersection of Wallace Road and Alexander Road. The greatest bicyclist activity consisted of persons riding west along Alexander Road, and turning right into Wallace Road; five bicyclists conducted this movement in the morning.

Wallace Road and Scott Avenue

Virtually all activity at this location consists of persons walking from or to the Train Station. The greatest pedestrian activity was seen in the eastern leg of this intersection, at the crosswalk. There were 38 crossings in the morning peak period, and 33 crossings in the evening peak period. Significant crossing activity also occurred in the area to the west of the eastern leg, with 18 crossings in the morning and 29 in the evening. Approximately 60% (73 out of 118) of the pedestrians observed crossed at the designated crosswalk.

Hightstown Road and Sherbrooke Drive
The Steering Committee expressed concern for the safety of pedestrians attempting to cross Hightstown Road in the vicinity of the Acme Shopping Center. In both the morning and evening peak periods, pedestrians crossing Hightstown Road at Sherbrooke Drive preferred the southern leg, with six in both time periods. Pedestrians were also observed crossing Hightstown Road north of the Acme Shopping Center and north of the Sunoco Station. The most significant activity at this location consisted of pedestrians and bicyclists traveling on the west side of Hightstown Road, with many of the travelers originating or terminating their trip in the Acme shopping center parking lot. This suggests that many commuters, who travel to work via train, leave their vehicles at the shopping center and proceed to walk to the train station.

Alexander Road and Harris Road
Pedestrian and bicycle counts were conducted at this location to coincide with the closing time of WWP High School. The greatest concentration of movements consisted of pedestrians and bicyclists traveling north along Harris Road and continuing east on Alexander Road. Pedestrians and bicyclists observed at the location consisted of a mix of both students and non-students.

Alexander Road and Scott Avenue
Pedestrian and bicycle counts were conducted at this location to coincide with the closing time of Maurice Hawk Elementary School. The greatest concentration of movements was along Scott Avenue between the elementary school and the train station. The majority of people observed were non-students.

Canal Pointe Boulevard at Mayfair Drive
Activity in this area consisted mostly of pedestrians crossing between the Colonnade Pointe housing development and Princeton MarketFair. Most of the pedestrians observed (four) did not cross at the existing crosswalks but rather chose to cross along a grassy strip of land between two stormwater detention basins near the shopping mall, across from the parking lot east of Mayfair Drive.

Opportunities & Constraints

The Township can build on the following opportunities to develop bicycle and pedestrian facilities:

- the Township's support for alternative transportation modes;
- the Township's success in obtaining outside funding for bicycle facilities and trail development;
- the presence of greenbelts and utility rights-of-way throughout the Township;
- the presence of destinations for bicyclists, including commercial establishments, community facilities, recreational amenities, and public transit facilities;
- the presence of sidewalks in most residential neighborhoods within the Township;
- available right-of-way in many locations to accommodate bicycle facilities (bike lanes or compatible shoulders); and,
- adequate shoulder width in some locations which already meet NJDOT bicycle compatibility guidelines;

While these opportunities provide an excellent starting point for the development of a bicycle and pedestrian network within the Township, there are also challenges that must be addressed. Constraints identified during field views include:

- insufficient shoulder width;
- insufficient cartway width to accommodate competing demands of motorized traffic, pedestrians, and bicyclists (especially at intersections);
- wide crossing distances at high volume intersections;
- roadways that act as barriers to bicycle and pedestrian traffic;
- narrow multi-use paths; and,
- utilities very close to existing roadway edges.

The following photographs illustrate some of these conditions within the Township.

Lack of Shoulders

North Post Road

Insufficient Cartway Widths

Meadow Road

Wide Crossings at High Volume Intersection

Penn-Lyle Road at Clarksville Road

Unsafe Drainage Grates

Old Trenton Road

There are other issues that could affect the implementation of a bicycle and pedestrian network. Opposition from property owners can impede the installation of sidewalks and multi-use trails. Since these facilities generally require support from neighborhoods, it is important to identify the safety, recreational, and health benefits of such facilities and consider concerns of residents in the design of facilities.

The Township must also examine its protected greenbelts and determine if easements allow pubic access and passive recreational use. The Township may also consider taking ownership of privately held greenbelts, and in the future, negotiating with property owners to permit passive recreation use, as stated in the Master Plan, in order to develop an extensive multi-use trail network.

V. PROPOSED BICYCLE AND PEDESTRIAN NETWORK

General Bicycle Network Recommendations

The existing conditions analysis was used to develop a proposed bikeway network. This network is shown in Figure 8. Connections are provided to community facilities and services, residential areas, retail and employment centers, existing Township facilities, and to existing or planned bikeway facilities within the surrounding municipalities such as Nostrand Road in Plainsboro Township. Recommendations for the Township's bicycle network are based on the existing measurements of the roadways (lane widths, shoulder widths, rights-of-way width, etc.), as well as the general characteristics of development and land uses in the area. Recommendations generally fall within four different types: bike lanes, compatible shoulders, shared roadways, or multi-use trails. Chapter VI contains design guidelines for these different types of bikeways. The Township should work closely with, state, county officials to successfully implement the bicycle network.

Bike Lanes

Bike lanes are generally recommended for collector or arterial roadways that provide direct connections in the bikeway network. Bike lanes also provide links between major employment centers, schools, shopping areas, and higher density residential areas. Roads recommended for installation of bike lanes typically are found in the northern section of the Township where the population and commercial centers are at a higher density than the more rural, lower density areas in the southern portion of the Township. Within the category of proposed bike lanes, it is useful to further categorize roadways into those needing minor or major improvements. Bike lanes designed with minor improvements can typically be created through spot widening or restriping of shoulders and travel lanes. For example, bike lanes can easily be accommodated on Edinburg Road north of Mercer County Park and on Lanwin Boulevard by placing bike lane stenciling in the shoulders of these two roadways. These two roads, along with the existing facilities on New Edinburg Road and New Village Road, would create a bicycle facilities stretching from Old Trenton Road to Princeton-Hightstown Road and from Village Road East to North/South Post Road. The facility would provide connections to Mercer County Park, Village Elementary School, and Thomas Grover Middle School. Bike lanes can be installed on the following roads with only minor improvements and thus be considered in the short term:

- Edinburg Road (north of Mercer County Park to New Edinburg Road)
- South Mill Road (north of New Edinburg Road)
- Rabbit Hill Road (north of Big Bear Creek Bridge)
- Southfield Road
- Lanwin Boulevard

Minor Improvements are Needed to Create Bike Lanes on these Roads

Edinburg Road near New Village Road


Rabbit Hill Road

FIGURE 8 – PROPOSED BICYCLE NETWORK

Bike lanes that require more significant improvements typically are incorporated into larger roadway improvement or construction efforts. For example, the Township could coordinate with the county to install bike lanes on county roads as part of planned capital improvements, such as milling or repaving. The installation of bike lanes should be considered as part of long-term improvement plans on the following roads:

- Clarksville Road (CR 638)
- Canal Pointe Boulevard
- Rabbit Hill Road (south of Big Bear Creek Bridge
- Old Trenton Road (CR 535)
- Village Road W (east of North/South Post Road)
- Penn-Lyle Road
- Washington Road (CR 526)
- Wallace Road

More Significant Improvements are Needed to Create Bike Lanes on these Roads


Clarksville Road


Wallace Road

Compatible Shoulders

Roadways recommended for compatible shoulders are typically lower volume roads or streets where the posted speed limit is below 30 MPH. All shoulder segments should be designed with the appropriate width according to NJDOT guidelines. Segments of roadways that currently meet these standards for shoulder width should be maintained as such, or upgraded to bike lanes if located within more developed parts of the Township. Compatible shoulders should be installed when future roadway construction and/or drainage improvements are planned for particular roads. Compatible shoulders should be installed on the following roadways as part of any future improvements:

- North Mill Road
- Cranbury Road (CR 615)
- North Post Road
- Windsor Road
- Conover Road
- Woodmere Way
- Bennington Drive
- Village Road West (west of South Mill Road)
- Village Road East
- Meadow Road
- South Post Road
- Millstone Road

Roadways Conducive for Compatible Shoulders


Windsor Road


North Post Road

Shared Roadways

A number of roadways have been selected for the bike network even though they cannot easily accommodate bike lanes or compatible shoulders. Most of these streets are located in residential areas and have low enough volumes to accommodate shared use. These roadways provide important connections to generators such as the train station, schools, parks, and other community facilities. Consequently, many of these roads are appropriate for bike route signage and could be designated as shared roadways. "Share the Road" signage should be installed on these roads. Some of these roads include:

- Scott Avenue
- Hendrickson Drive
- Harris Road
- Berrien Avenue
- Yeger/Melville Road
- Bear Brook Road
- Alexander Road (south of the Northeast corridor railline)
- South Mill Road

These Roads Should be Designated as Shared Roadways


Alexander Road


South Mill Road

Multi-Use Trails

There are a number of existing multi-use trails or pedestrian paths throughout the Township. The majority of these facilities have been installed by developers. While they provide an attractive pedestrian facility or a path for young or inexperienced bicyclists, they are often too narrow to safely accommodate a wide range of users. Studies also indicate a greater degree of risk in those locations where multi-use trails or side paths intersect roadways or driveways. In the future, multi-use paths should be at least 10

feet wide. They should also be limited to locations with relatively few driveway and roadway intersections since motorists can be taken by surprise at these places. Where they follow parallel roads, these paths should not be considered a substitute for on-road facilities, but rather should be used in conjunction with shoulders or bike lanes.

The Township is actively pursuing grants from the Federal and State government in order to implement a Township wide Trail Network. The Township should build upon the existing Township and regional trail network through placement of facilities along public rights-of-way, greenways, greenbelts, existing open space, and planned acquisition of open space. Such examples include:

- PSE&G Right-of-way
- Dinky Line Right-of-way
- Duck Pond Run Vicinity
- Assunpink Creek
- Grovers Mill Pond
- Van Nest Park

Potential Multi-use Trail Rights-of-Way

Duck Pond Run Vicinity

Trolley Line Trail

Environmental constraints, such as wetlands, floodplains, and streams should be considered when designing the ultimate alignment for these trails. Multi-use trail planning should be viewed as long-term projects that will require further environmental and engineering studies in order to design the facilities and obtain necessary permits. Close coordination with the County, State, and the Greater Mercer TMA will be required to successfully implement an off-road multi-use trail network.

Signage

In addition to the above opportunities for bicycle facilities, the Township should update existing bike route signage according to the *Manual on Uniform Traffic Control Devices* (MUTCD) standards. The township should also provide supplemental signage to indicate where facilities begin and end as well as provide directional information at intersections. Additional "Share the Road" signage should be installed on the Township's roadways to warn drivers and bicyclists of conditions which constrain maneuverability, such as where bicycle lanes or shoulders disappear to make room for turning lanes or in advance of narrow bridges. These signs should also be installed at locations where conflict potential is heightened, such as at approaches to high-volume, complex intersections. Multi-use trails should also be signed appropriately at intersections with roadways and high volume or high risk driveways.

Facility Improvements on County Roads

Many of the roads detailed in the proposed bicycle network are County roads and the County will thus be responsible for improving the roadway with a bicycle facility. The Township should make known to Mercer County their plans for county roadways within the Township. This can be done through adoption of a bicycle facility amendment to the Township Master Plan and periodically reviewing and commenting on the County long-range TIP.

Sidewalk Project Priorities

The Bicycle and Pedestrian Task Force was charged with creating a list of priority sidewalk improvement locations. Improvements at these locations are intended to promote walking as an alternative means of transportation. The top 15 locations (grouped alphabetically) identified by the Task Force are listed below. The list of top priorities was created by using the existing sidewalk inventory and applying a scoring system that is based on the presence of sidewalks within ½ mile and 1 mile of key Township generators. Other factors, such as routes that contain multiple generators as well as geographic diversity were also taken into consideration.

- Alexander/Wallace Rd "V" intersection
- Alexander Road- Orphan Bridge to Wallace Road
- Alexander Road- Vaughn Drive to Rozel Road
- Alexander Road- Canal Pointe Boulevard to D&R Canal
- Clarksville Road- Landing Lane to Cranbury Rd.
- 571- Wallace Road to Washington Road (bridge over train tracks)
- 571- Clarksville Road to Wallace Road
- 571- Slayback Drive to Lanwin Boulevard
- North Post Road- Orphan Bridge to Woodmeadow Lane
- North Post Road- Woodmeadow Lane to Library
- Old Bear Brook Road
- Scott Avenue- Alexander Road to Wallace Road
- Village Road- corner with Edinburg Road (short section in front of house)
- Village Road- V intersection with South Mill Rd.
- Wallace Rd- 571 to train Station Entrance

Other Recommendations

Bicycle and Pedestrian Education

In addition to physical improvements, bicyclist and pedestrian education programs are critical to reducing the number of crashes involving bicycles and pedestrians as well as to encourage people to use the new bicycle and pedestrian network. Many crashes can be attributed to a lack of knowledge on the part of bicyclists or motorists about traffic laws and proper etiquette.

The first step is typically to create a public awareness campaign aimed at drivers, cyclists, and pedestrians. Possible strategies include:

- Publishing flyers, pamphlets, and posters stressing the rights and responsibilities of all involved groups. Similar safety information can also be incorporated into a bikeway network or pedestrian network map.
- Distributing materials to the municipal complex, the train station, schools, and other destinations.
- Using the Township website, newsletters, and press releases to further publicize the campaign.
- Coordinating with the Greater Mercer TMA, local bicycle clubs, and the Bicycle and Pedestrian Task Force to develop and disseminate informational materials.

School-based bicycle safety programs should be evaluated and enhanced to incorporate strategies, such as:

- Incorporating bicycle and pedestrian safety information into the physical education curriculum.
- Incorporating driver and cyclist/pedestrian responsibility information into drivers' education courses.
- Developing a Safe Routes to School program.
- Developing a bicycle helmet distribution program.

- Holding a bicycle rodeo event for children with games, bicycle registration, safety training and helmet distribution.

Bicycle Rodeos Provide a Fun way to Educate Children about the Importance of Bicycle Safety

Adult education efforts are also important to encourage adults to bicycle and walk, as well as to make cyclists, pedestrians, and drivers aware of the need to share the road. Examples of adult programming include:

- Developing adult bicycle and pedestrian safety training programs.
- Sponsoring a Bike/Walk to Work Day or Week with local bicycling clubs and the Greater Mercer TMA.

The Township recently held its first annual *West Windsor Bike Fest.* This community event was held in May 2004 and provided a way for the Township to promote bicycling at a community-wide level. Events at Bike Fest included bicycle rides of varying lengths and degree of difficulties throughout the Township and a *Bike Safety Rodeo* sponsored by Dutch Neck School for families to ensure that both children and adults are aware of the proper safety signals and equipment. This community event is a fun, family oriented method of promoting bicycling and bicycle education.

VI. TARGET AREAS

At the request of the Steering Committee, six "target areas" within the Township were analyzed in greater detail. Concept plans for proposed pedestrian and bicycle facility improvements were prepared for the following locations:

- Hightstown Road and Wallace Cranbury Road
- Wallace Road and Alexander Road
- Wallace Road and Wallace Circle/Scott Avenue
- Hightstown Road and Sherbrooke Drive
- Alexander Road: from Berrien Avenue to the Gables Senior Housing Complex
- Canal Pointe Boulevard: in the vicinity of Princeton MarketFair

These concept drawings show how pedestrian and bicycle facilities could be implemented at the selected locations. The drawings include any appropriate signage and physical modifications required to accommodate new pedestrian and/or bicycle facilities. Signage, as described in Chapter VI, *Design and Operational Issues,* will supplement the proposed facilities and be placed according to NJDOT's *Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines,* NJDOT's *Pedestrian Compatible Planning and Design Guidelines, (1996)*, as well as the American Association of State Highway and Transportation Officials (AASHTO) *Guide for the Development of Bicycle Facilities*.

While the recommendations were developed for these site specific intersections, it should be noted that these types of improvements are applicable to other locations throughout the Township. The concepts are illustrated in Figures 9 through 14. General itemized cost estimates for the proposed improvements are provided in Appendix C.

The following briefly summarizes the existing conditions of the location as well as the recommended improvement concepts. Key issues associated with each of the target areas are also included below.

Hightstown Road and Wallace/Cranbury Road

Existing Conditions

The intersection of Hightstown Road (CR 571) with Wallace and Cranbury Road is the site of regular pedestrian activity, as discussed in Chapter IV, but lacks an adequate pedestrian infrastructure. The intersection has only one crosswalk, on the southern leg. Sidewalks are present on the northeast quadrant, extending from the Ellsworth shopping center, and a concrete pad is present on the northwest corner. Other examples of inadequate pedestrian infrastructure include the debris on the Northeast Corridor bridge, between the inner and outer guardrails, on both sides of the roadway. With a 4.5 foot separation between the two guardrails, there is sufficient room for pedestrians to walk on the bridge. The presence of the debris, however, likely discourages some pedestrians from using the bridge, including handicapped persons. A number of driveways in close proximity to the intersection are excessively wide, making the area less amenable to pedestrians. There is a pedestrian actuation phase for the signals, but no pedestrian signal heads. Further, street lighting for the area appears to be inadequate, particularly along the western curb line.

Crashes for the period of May 30, 2001 to June 30, 2004, were reviewed for this analysis. Eighteen crashes occurred in this time period, with two crash types being especially prominent: rear-end crashes for southbound vehicles, and left-turn crashes. Of the nine rear-end crashes, six occurred immediately proximate to the intersection, with three occurring within several hundred feet to the north. There were also five left-turn crashes, with four of these involving southbound through vehicles colliding with northbound vehicles turning left. Contributing factors to southbound rear-end crashes may include the limited sight distance, due to both horizontal and vertical curvature, on the Amtrak bridge; and long southbound queues, particularly in the evening peak hour. Indeed, with one exception, every one of the

rear-end crashes occurred between 4 to 7 PM on a weekday. Other possible factors include the outdated signal equipment at this intersection. The signal heads incorporate 8-inch signal indications, smaller than the 12-inch indications recommended for most intersections. It appears that visibility of the existing signal displays may be substandard, despite a flashing "Red Signal Ahead" sign on the Northeast Corridor bridge facing southbound Hightstown Road traffic.

There was one vehicle-pedestrian crash during the time period, which occurred around 7:15 PM on a February evening. The pedestrian was struck about 10 feet east of the crosswalk in the eastern leg. The crash report notes that "the area is dark outside the confines of the intersection." A lighting analysis was performed as part of this task, which indicated inadequate lighting across much of the intersection, particularly along the western curb line.

The lack of a left-turn lane on the southbound approach could be a contributing factor to both rear-end and left-turn crashes. In two crashes, a southbound motorist changed lanes at the last minute when he realized that the lead motorist in the inner lane was waiting to turn left. In one of the crashes, the passing motorist struck the lead motorist. In the other crash, the passing motorist took the northbound left-turn motorist by surprise, contributing to the crash. Observations of traffic flow at the intersection indicate that these sudden lane-change maneuvers on the southbound Hightstown Road approach are commonplace.

Recommendations

Figure 9 presents a conceptual plan intended both to improve the safety of pedestrian facilities at this intersection, and to improve its functionality for vehicular traffic. It is proposed to add a dedicated left-turn lane to the westbound, southbound and eastbound approaches. Right-of-way acquisition will be required for the westbound approach, but not the southbound or eastbound approaches. The addition of lanes to these approaches will improve traffic flow through the intersection, reducing the extensive southbound queues. With the addition of the left-turn lane to the southbound approach, it will be possible to add a signal phase to this intersection for protected left turns for the northbound and southbound Hightstown Road approaches. This will enable most of the left turn movements in the peak hours to be processed during the protected phase. Also, removing the left-turn traffic from the two southbound through lanes should reduce the occurrences of sudden lane-change maneuvers which appear to contribute to intersection crash problems. This reconfiguration should help address both rear-end and left-turn crashes.

If lanes are added as shown in the drawing, and if left turns are permitted to run during the subsequent all-movement phase for the northbound and southbound approaches, the overall intersection level of service will be C, an improvement over the intersection current level of service of D.[1]

The replacement of 8-inch signal displays with 12-inch displays should improve motorist awareness of signals in the intersection. Mast-arm mounted signals should be positioned within the intersection to better fall within the "cone of vision" of oncoming motorists. To significantly improve signal awareness for southbound motorists, a pole-mounted signal should be mounted on the northeast corner. Southbound motorists currently cannot see the signal display until they are approximately 320 feet from the northern leg crosswalk; installation of a signal display on the northeast corner will stretch this sight distance by another 150 feet, giving motorists more time to slow or stop for yellow or red indications. Improved signal displays should improve vehicular safety, as well as improve the safety of pedestrians in crosswalks; this is particularly true for pedestrians crossing in the northern leg.

[1] The "Level of Service (LOS)" evaluates intersections based upon how much delay motorists experience. Intersections with a LOS A experience little to no delay, while a LOS F indicates that the typical motorist must wait over 80 seconds to move through an intersection.

It is also proposed to relocate County route trailblazer signage currently mounted above State directional signs on the southwest corner. In their current position, the County signs, which have been installed below the 7-foot minimum sign height standard, could impede motorists' views of pedestrians crossing in the western leg. The "Princeton Train Station" sign on the southwest corner should be shifted to the west, also for the purpose of improving motorists' visibility of pedestrians.

Sidewalks are proposed for all four corners of the intersection. This is a particularly opportune time to install sidewalks on the southeast and southwest quadrants of the intersection. The application for a PNC Bank is before the Township, and pedestrian concerns can thus be addressed as part of the site plan approval process. There is high potential for redeveloping the old service station on the southeast corner, so pedestrian (and bicyclist) concerns could ultimately be addressed as part of the redevelopment process. High visibility crosswalks should be striped on all four legs. Although crossings on the southern leg might have some advantages over the northern leg, in terms of sight distance of vehicles approaching the intersection from the north, pedestrian crossings can be safely accommodated on the northern leg, and regular pedestrian activity is already present. For example, a pedestrian count conducted on July 21st from 5 PM to 8 PM, indicated 21 pedestrians crossing in the northern leg, and only 6 pedestrians in the southern leg of the intersection. Pedestrian signal displays should also be installed.

Sidewalks should also be extended along Hightstown Road in both directions from the intersection. The right-of-way of Princeton-Hightstown Road is 60 feet, and the current pavement width is about 52 feet. Therefore, to install 5 foot sidewalks and 3 foot grass buffers on both sides of the road would require acquisition of additional right-of-way, or landowners would need to install sidewalks as part of future redevelopment. Several lots along Hightstown Road have excessively wide driveways; these should be narrowed as part of future redevelopment, thus better controlling vehicular movements, and reducing the distance in which pedestrians are exposed to vehicular turning movements. Sidewalks should also be installed on the Northeast Corridor bridge, to encourage greater pedestrian movement.

The installation of six foot bicycle lanes is also proposed on Highstown Road. These lanes would begin on Washington Road and extend to Clarksville Road to the south. Installation of bike lanes on the east side of the road on the northbound approach, and on the west side of the road at the southbound approach, will require right-of-way acquisition (about seven feet on the northbound approach, and six feet on the southbound approach). Alternatively, bike lanes could be dropped shy of the intersection if roadway widening is not practicable.

Wallace Road and Alexander Road

Existing Conditions

Sidewalks are absent along both sides of Alexander Road between its intersection with Berrien Avenue and with Wallace Road. Land uses consist of single-family homes; trees, utility poles, mailboxes and other objects are found in the right-of-way on both sides of Alexander Road.

Recommendations

Figure 10 shows conceptual improvements for Alexander Road at its intersection with Wallace Road. Residents have expressed interest in having a sidewalk installed from the terminus of the existing sidewalk at Berrien Avenue, to Wallace Road. Based on West Windsor tax maps, there is room for a sidewalk within the existing Alexander Road right-of-way. Fewer constraints are present on the northern side of the road; however, even here, displacement of shrubbery, trees and possibly utility poles will need to occur. Based on the location of the existing sidewalk to the east of Berrien Avenue, and existing pedestrian activity, installation of a sidewalk would be desired on the north side more than the south side of Alexander Road. It should be noted that pedestrian activity along this section of Alexander Road is relatively low, with eight pedestrians counted from 5 AM to 8:15 AM on June 23, 2004. From 4:45 to 8 PM, one pedestrian was counted.

The NJDOT has proposed improvements at this intersection, primarily as a continuation of the new Alexander Road bridge project, and roundabout proposed for the intersection of North Post Road and Alexander Road. NJDOT is proposing a sidewalk on the west side of Alexander Road, between the new Alexander Road bridge and Wallace Road. NJDOT is also proposing an extension of the existing median island at the intersection of Wallce Road and Alexander Road. In conjunction with these NJDOT improvements, the West Windsor Bicycle and Pedestrian Plan recommends that high-visibility crosswalks be installed at the Wallace Road approach, to facilitate movement of pedestrians from the proposed sidewalk on the north side of Alexander Road to the NJDOT proposed sidewalk. Curbs on the median island at Wallace Road should be depressed to further facilitate pedestrian movement.

Wallace Road and Wallace Circle/Scott Avenue

Existing Conditions

Wallace Circle and Scott Avenue are both stop controlled streets and are separated at Wallace Road by a slight offset. The most significant land use in the area is the Princeton Junction Train Station. Single-family homes are present along Scott Avenue and the south side of Wallace Road. There are four portable "Yield to Pedestrian" stanchions located on Wallace Road at the intersection.

Sidewalks are present on the east side of Scott Avenue, the north side of Wallace Road, and the outer edge of Wallace Circle. There are two crosswalks at this location. There is a crosswalk located on a short (approximately 130 feet) tangent section between two reverse curves on Wallace Road; this crosswalk connects the sidewalk along Scott Avenue to the sidewalk on the northern side of Wallace Road. In-pavement reflectors were recently installed along this crosswalk. A second crosswalk is located at the terminus of Wallace Circle.

Recommendations

The recommendations for this location – presented in Figure 11 – are focused on providing easier access to the Princeton Junction Train Station, and accommodating the significant numbers of pedestrians that prefer to cross Wallace Road to the west of Scott Avenue. Additional crosswalks are recommended at the southern leg of Scott Avenue, as well as the eastern leg of Wallace Circle, and Wallace Circle Entrance. A sidewalk is recommended at the northwestern corner of Scott Avenue to provide a link between proposed crosswalks across Scott Avenue and Wallace Circle. The corner radius on the eastern curb of Wallace Circle should be reduced to provide pedestrians a shorter walking distance between Scott Avenue and Wallace Circle. Curb ramps are recommended at the Wallace Circle entrance. Bike lanes are recommended to be installed on Wallace Road from Scott Avenue and extending east to Hightstown Road. All pavement makings should be high visibility.

Hightstown Road and Sherbrooke Drive

Existing Conditions

This offset, mid-block intersection is located approximately 465 feet north of Alexander Road and approximately 1440 feet south of Cranbury Road/Wallace Road. Hightstown Road, the through road, runs north-south. Sherbrooke Drive and the Acme Shopping Center driveway are the stop controlled cross streets running east-west respectively. Land uses at this intersection consist of single-family housing on the eastern side of Hightstown Road and the Acme Shopping Center on the western side.

At the intersection, Hightstown Road is approximately 50 feet wide at the northern leg and 73 feet wide on the southern leg. This disparity in width is due to the presence of a bus pullout south of the shopping center driveway. Based on field views and a review of bus schedules, it appears as though no bus actually stops at this location. Despite the greater width of Hightstown Road at the southern leg, more pedestrians choose to cross here than the northern leg, likely due to the fact that most of the Acme Shopping Center is located to the south of Sherbrooke Drive.

Sidewalks are present on the east side of Hightstown Road from just north of the shopping center to Alexander Road but are absent on the east side of Hightstown Road. Sidewalks are present on both sides of Sherbrooke Drive. Although there are technically only two lanes on the roadway at this location, traffic in both directions often organizes itself into two lanes to accommodate turning movements. A row of newspaper stands on the sidewalk at the southern end of the shopping center driveway reduces the effective width of the sidewalk by half.

Recommendations

The primary goal of improvements at this intersection is to provide a safer crossing of Hightstown Road for pedestrians (Figure 12). The key improvements consist of a crosswalk across Hightstown Road in the southern leg, accompanied by a pedestrian median refuge. As noted above, most pedestrians currently prefer to cross in the southern leg. A median refuge is also recommended for the northern leg. Studies indicate that at unsignalized intersections on high volume or multi-lane roadways, physical islands typically have a greater ability than crosswalks to improve the safety of pedestrian crossings. The islands will also serve to channelize traffic, thus better organizing traffic flow; left-turn lanes are provided for both the northbound and southbound approaches. At the southwest corner of the intersection, a curb buildout is suggested to provide a shorter walking distance across Hightstown Road and to shadow the bus stop area should active transit service be reinstated. Sidewalks should be installed along the eastern side of Hightstown Road from Alexander Road to Cranbury Road. Six foot bike lanes on Hightstown Road through the intersection are also recommended; the bike lanes would continue through the intersection of Hightstown Road with Wallace and Cranbury Roads (see target area recommendations above). The addition of bike lanes will require shifting the curbline by about four feet on the west side of Highstown Road north of Sherbrooke Drive. All pavement marking should be high-visibility. The newspaper boxes should be relocated in order to make the sidewalk more navigable, particularly for handicapped persons.

Alexander Road: from Berrien Avenue to the Gables Senior Housing Complex

Existing Conditions

The Alexander Road study area extends from Berrien Avenue to the Gables Senior Housing Complex located approximately 300 feet west of Hightstown Road. There are four intersections along Alexander Road: Berrien Avenue, Scott Avenue, Harris Road, and the Acme Shopping Center driveway. Each side street along the corridor is stop controlled. Land uses along the corridor consist of single-family homes with the exception being the former Princeton Junction Fire House and a pizzeria east of Scott Avenue.

Sidewalks are present on the north side of Alexander Road only. Crosswalks are located at the senior housing complex driveway, Harris Road, Scott Avenue, and Berrien Avenue. Mobile "Yield to Pedestrian" stanchions are located at regular intervals along Alexander Road. Fluorescent "Pedestrian Crossing" signs are placed in advance of, and at each intersection along Alexander Road. Each intersection is detailed below:

Gables Senior Housing Complex and Alexander Road

A crosswalk across Alexander Road at the Gables driveway provides residents of the senior housing complex convenient access to the shopping center. The crosswalk is worn and in need of restriping. Curb ramps are located at both ends of the crosswalk.

Harris Road and Alexander Road

A diagonal crosswalk is striped across Alexander Road from the western corner of Harris Road. The crosswalk is worn and in need of restriping.

Scott Avenue and Alexander Road

There are two crosswalks located at this intersection. One crosswalk crosses Alexander Road; this crosswalk has worn longitudinal markings. The second crosswalk is located at the north side of Alexander Road and crosses Scott Avenue.

Berrien Avenue and Alexander Road

A diagonally-striped crosswalk extends from the east side of Berrien Avenue to the north side of Alexander Road where the existing sidewalk ends. The crosswalk is worn and in need of restriping.

Recommendations

The Bicycle and Pedestrian Task Force expressed concerns that vehicles speed along Alexander Road. Recommendations to this portion of Alexander Road include the installation of a speed hump in the vicinity of the township owned property between Scott Avenue and Harris Road. High-visibility crosswalks should either be replaced or installed at the eastern leg of Berrien Avenue, the southern, eastern, and northern legs of Scott Avenue, at the western leg of Harris Road, and at the sidewalk extending from the Gables Senior Housing Complex. ADA curb ramps should be installed at all crosswalk locations. Recommendations are illustrated in Figures 13a and 13b.

Canal Pointe Boulevard and Mayfair Drive

Existing Conditions

The target area is focused on Canal Pointe Boulevard between a multi-family housing development, Colonnade Point, and the Princeton MarketFair shopping center. Canal Pointe Boulevard has four 11-foot lanes with sidewalks on both sides of the road. There is a crosswalk across Canal Pointe to the east of Mayfair Drive; however, pedestrian counts indicate that very few pedestrians cross the roadway at this location. A pedestrian desire line is present on the grass between the two drainage swales on the MarketFair property. Sidewalks are missing on the rear of the MarketFair property in the vicinity of the proposed path.

Concerns have been expressed about speeding on Canal Pointe. Speed studies conducted for this Plan indicated that northbound traffic on Canal Pointe Boulevard has an 85th percentile speed of 44 mph, and southbound traffic has an 85th percentile speed of 46 mph. Since the speed limit on the roadway is 35 mph, it can be concluded that speeding is pervasive.

Recommendations

A combination of traffic calming measures and pedestrian facility enhancements are recommended to make this area more pedestrian and bicycle friendly (Figure 14). The existing four lane cross-section is proposed to be replaced by two 11-foot thru lanes, 6-foot bike lanes, and a 10-foot wide landscaped or striped median. Physical islands could be employed, particularly at key pedestrian crossings. At intersections with roadways, left turn slots should be provided. The existing crosswalk on the eastern leg at Mayfair Drive should be removed and replaced by a mid-block crosswalk and ADA curb ramps located between two drainage swales on the MarketFair property. A new sidewalk should be installed between the two drainage swales from the Canal Pointe curbline to the MarketFair internal drive. The existing sidewalk along the MarketFair internal drive – which terminates about 150 feet from the MarketFair driveway – should be extended to meet this sidewalk.

These improvements should have the effect of reducing vehicular speeds on Canal Pointe Boulevard, thus making the roadway more amenable to pedestrian and bicycle travel alike. The proposed physical islands will also serve to facilitate pedestrian crossings of the roadway. As indicated above, physical islands have been demonstrated to improve the safety of pedestrian crossings on multi-lane, high speed roadways. By being shifted to the east, the mid-block crosswalk will accommodate pedestrians in the location where most choose to cross the roadway.

Major new development is anticipated in the Canal Pointe area, and traffic studies should thus be conducted to determine whether the proposed three-lane cross section can accommodate an increase in traffic. It should be noted that roadway capacity issues are most critical at intersections, and the

provision of left-turn lanes at intersections may be sufficient to maintain reasonable vehicular levels of service, even under build-out.

As an alternative measure, the Township has expressed interest in creating a bicycle path off the roadway along Canal Pointe. As noted in the *NJDOT Bicycle Roadways and Bikeways*, a two-way bicycle path adjacent to a roadway is generally not recommended, especially where road and driveway intersections interrupt the facility, as would be the case here. There are various issues associated with two-way paths in such locations; as just one example, motorists exiting a driveway would not normally expect a bicyclist to approach along a path from the right. If such a bicycle path is installed, therefore, clear signing and marking at the intersections with roadways and driveways is critical. The bicycle facility easement should be at least 14 feet wide, to accommodate a 10 foot riding surface, and two foot graded shoulders on either side of the path. Signage for the bicycle facility would be posted a minimum of three feet from the path.

FIGURE 9 – HIGHTSTOWN ROAD AND WALLACE/CRANBURY ROAD

FIGURE 10 – WALLACE ROAD AND ALEXANDER ROAD

FIGURE 11 – WALLACE ROAD AND WALLACE CIRCLE/SCOTT AVENUE

FIGURE 12 – HIGHTSTOWN ROAD AND SHERBROOKE DRIVE

FIGURE 13A – ALEXANDER ROAD FROM BERRIEN AVENUE TO THE GABLES

FIGURE 13B – ALEXANDER ROAD FROM BERRIEN AVENUE TO THE GABLES

FIGURE 14 – CANAL POINTE BOULEVARD AND MAYFAIR DRIVE

VII. BICYCLE AND PEDESTRIAN DESIGN GUIDELINES AND OPERATIONAL ISSUES

Bicycle Facility Design Guidelines

The following guidelines, derived from NJDOT standards and shown in Table 5, are recommended for use by West Windsor Township in the construction of all new bicycle facilities. The standards can also provide guidance when the Township coordinates with Mercer County or NJDOT regarding bikeways on County and State roads.

Table 5. NJDOT Bikeway Types and Pavement Width Guidelines

Condition I: AADT 1200*-2000

Speed Limit	Urban w/ Parking	Urban w/o Parking	Rural
< 30 mph	Shared lane (14 ft.)	Shared lane (14 ft.)	Shared lane (10 ft.)
30-40 mph	Bike lane (5 ft.)	Bike lane (5 ft.)	Shoulder (4 ft.)
41-50 mph	Bike lane (6 ft.)	Bike lane (6 ft.)	Shoulder (6 ft.)
>50 mph	Not Applicable (NA)	Bike lane (6 ft.)	Shoulder (6 ft.)

* For volumes less than 1200, a shared lane is acceptable

Condition II: AADT 2000-10,000

Speed Limit	Urban w/ Parking	Urban w/o Parking	Rural
< 30 mph	Shared lane (14 ft.)	Shared lane (14 ft.)	Shoulder (4 ft.)
30-40 mph	Bike lane (5 ft.)	Bike lane (5 ft.)	Shoulder (4 ft.)
41-50 mph	Bike lane (6 ft.)	Bike lane (6 ft.)	Shoulder (6 ft.)
>50 mph	Not Applicable (NA)	Bike lane (6 ft.)	Shoulder (8 ft.)

Condition III: AADT over 10,000 or Trucks over 5%

Speed Limit	Urban w/ Parking	Urban w/o Parking	Rural
< 30 mph	Bike lane (5 ft.)	Bike lane (5 ft.)	Shoulder (4 ft.)
30-40 mph	Bike lane (6 ft.)	Bike lane (5 ft.)	Shoulder (6 ft.)
41-50 mph	Bike lane (6 ft.)	Bike lane (6 ft.)	Shoulder (6 ft.)
>50 mph	Not Applicable (NA)	Bike lane (6 ft.)	Shoulder (8 ft.)

*Note: Whenever possible, minimum 8 foot shoulder should be provided on roadways with an AADT greater than 10,000 vehicles

Since there is a great difference in skill levels among bicycle riders, different types of facilities are needed to serve cyclists in the Township. Advanced bicyclists will be best served by shared roadways while more novice cyclists will feel more comfortable traveling on facilities specifically designed to accommodate bicycle travel, such as bike lanes or off-street bike paths. The difference between compatible and designated roadways can be summarized by the following:

<u>Bike Lanes</u>

- Bike lanes are designated for exclusive or preferential use by bicycles through pavement striping and markings, and appropriate signage designated in the MUTCD. Bike lanes should be designed to accommodate bicycle traffic in only one direction. Each street should have a one-way lane in each direction, to discourage wrong-way riding.
- Bike lanes traveling through intersections should be located to the left of right turn lanes.

- Bike lanes should always be located to the right of the travel lane to reduce confusion for bicyclists and drivers. Where there is on-street parking, the bike lane should be located between the travel lane and the parking lane.
- A 5 foot or wider lane is preferable in all cases. The width of any curb gutter pan should not be included in this measurement. For roadways of greater traffic volume or higher speed limits, such as the case on Edinburg Road and Clarksville Road, a 6 foot bike lane is recommended.
- Drainage grates should be designed so that bicycle tires are not trapped in them and utility covers should be flush with the pavement.
- Bike lanes should be marked by a stripe at least 6 feet wide. A wider stripe can be used to further emphasize the presence of the lane. A line separating bike lanes from parking lanes may encourage drivers to park closer to the curb, creating more space for bicycles.
- Bike lanes should be adequately drained so that any precipitation run-off does not channel or pool within the bike lane and create a possible hazard to bicyclists. Bike lanes should also be routinely swept and be cleared of snow.
- AASHTO's *Guide for the Development of Bicycle Facilities* and MUTCD guidelines should be followed in the design of all intersections involving bike lanes.

Compatible Shoulders

- A 4 to 6 foot smooth, paved shoulder is recommended. If there is a curb, gutter, or guardrail, a wider shoulder should be considered. The width of any gutter pan should not be included in this measurement.
- An 8' shoulder should be used in areas with considerable truck traffic, with speed limits over 50 mph, or where high bicycle usage is expected.
- Shoulders used as bikeways should be adequately drained, swept, and cleared of snow.

Shared Roadways

- Travel lanes that are to be shared by bicycles and cars should be a minimum of 14 feet wide to allow cars full room to pass bicycles without entering another lane. On rural roads with fewer than 2,000 vehicles per and speed limits under 30 mph, a 10 foot wide shared lane is adequate.
- A width of 15 feet is recommended on steep grades or where there is considerable truck traffic.
- Travel and parking lanes can be restriped to create wider lanes to accommodate bicycles.
- Obstacles and barriers to bicycle travel should be addressed, including hazardous drainage grates, potholes, uneven manhole covers, angled rail-road crossings, and narrow bridges. Where certain obstacles cannot be improved but do not pose an undue risk to bicyclists, advance warning signs (as recommended by the MUTCD) should be used to alert bicyclists of their presence.

Multi-use Trails

- Multi-use trails should have a minimum width of 8 to 10 feet. A width of 12 to 14 feet is recommended for even greater capacity and safety.
- A graded area of at least 2 feet on either side of the surface is recommended to provide clearance of path-side obstacles.
- The path should ideally be separated from the roadway by at least 5 feet. If this is not possible, a suitable physical barrier should be provided to protect cyclists from traffic.
- Proper signage should be installed at areas of conflicts (driveways, streets, etc.)

Table 6 provides a brief synopsis of surface materials to consider when designing off-road trails.

Cars present obstacles to cyclists using this path

Trees interfere with cyclists' line of sight on this path

Table 6. Summary of Off-Road Trail Surfaces

Surface Material	Advantages	Disadvantages
Soil Cement	▪ uses natural materials ▪ more durable than natural soils ▪ smoother surface ▪ low cost	▪ surface wears unevenly ▪ not a stable all-weather surface ▪ erodes ▪ difficult to achieve correct mix
Granular stone	▪ soft but firm surface ▪ natural material ▪ moderate cost ▪ smooth surface ▪ accommodates multiple use	▪ surface can rut or erode with heavy rainfall ▪ regular maintenance to keep consistent surface ▪ replenishing stones may be long-term expense ▪ not for steep slopes
Asphalt	▪ hard surface ▪ supports most types of use ▪ all weather ▪ does not erode ▪ accommodates most user ▪ low maintenance	▪ high installation cost ▪ costly to repair ▪ not a natural surface ▪ freeze/ thaw can crack surface ▪ heavy construction vehicles need access
Concrete	▪ hardest surface ▪ easy to form to site conditions ▪ supports multiple use ▪ lowest maintenance ▪ resist freeze/ thaw ▪ best cold weather surface	▪ high installation cost ▪ costly to repair ▪ not a natural looking surface ▪ construction vehicles will need access to trail corridor
Native soil	▪ natural material ▪ lowest cost ▪ low maintenance ▪ can be altered for future improvements ▪ easiest for volunteers to build and maintain	▪ dusty ▪ ruts when wet ▪ not an all weather surface ▪ can be uneven and bumpy ▪ limited use ▪ not accessible
Wood chips	▪ soft, spongy surface- good for walking ▪ moderate cost ▪ natural material	▪ decomposes under high temperature and moisture ▪ requires constant replenishment ▪ not typically accessible ▪ limited availability
Recycled materials	▪ good use of recycled materials ▪ surface can vary depending on materials	▪ high purchase and installation cost ▪ life expectancy unknown

Bicycle Facility Operational Issues

Typically, bike lanes and compatible shoulders receive less attention in terms of maintenance and upkeep than the portion of roadway used by motor vehicles. It is important that bicycle facilities be maintained so that they are safe for bicycle riding. Bike lanes and shoulders should be swept just as automobile travel lanes are (at least once a month), and snow should be adequately removed. Careful patching after road and utility work is necessary to keep the surface smooth. Roads with high levels of bicycle use should not be resurfaced with the oil and chip methods as the loose surface is potentially dangerous to cyclists

The following actions are recommended by the 1999 AASHTO *Guide for the Development of Bicycle Facilities* as requirements in the operation and maintenance of bicycle facilities.

- Create a smooth surface free of potholes and debris.
- Eliminate dropoffs from pavement edges
- Inspect pavement conditions – do not allow unraveled pavement edges.
- Inspect signs – make certain that signs do not intrude into bicycle travel space.
- Control growth of trees, shrubs and vegetation.
- Supply trash and recycling receptacles and be sure that they are regularly emptied.
- Mow areas in the vicinity of bike paths.
- Plow snow – do not use deicing agents.
- Enforce and prevent unauthorized vehicles from using path.
- Maintain bicycle and shoulder lane stripings and markings.
- Establish an agency responsible for the control, maintenance, and policing of bicycle facilities.

Bicycle Facility Signage Guidelines

This section provides general descriptions of signage and pavement markings for bicycle traffic. It is not meant to include all bicycle facility signs or specifications available for use, but rather to provide an introduction to those signs that are most commonly used. For a complete listing and official use criteria, refer to the MUTCD, 2003 edition.

Bikeways on roadways must utilize existing traffic control signage. Bicyclists, as with other forms of traffic, benefit from and must abide by regulatory signs such as 'Stop', 'Yield', and 'Right Lane Must Turn Right' signs as well as warning signs such as 'Slippery When Wet', 'Stop Ahead', and 'Railroad Crossing' signs. Bicyclists also benefit from traffic signal devices and pavement markings. Where bicycle traffic is high or desirable and a bikeway is implemented, specific bicycle lane signage should be employed. The MUTCD includes a section specifically intended for this purpose - Part 9: Traffic Controls for Bicycle Facilities.

<u>Bike Lane Signage</u>

The MUTCD provides specific language for use of signs related to bike lanes. Where designated bike lanes are provided along roadways, the following signs should be part of the installation:

'No Parking' signage should be placed on bicycle lanes and compatible shoulders to prevent use of these facilities by motorists.

The 2003 edition of the MUTCD has adopted new signage regarding bicycle lanes that were recommended by the Bicycle Technical Committee of the National Committee on Uniform Traffic Control Devices (NCUTCD). Some of the new signs adopted include:

Compatible Shoulder/Shared Lane Signage

Due to the fact that many of the Township roadways are not compatible for bicycle lanes, a warning sign combination is recommended to be used frequently. Examples include:

These signs, standing individually or in combinations, should be used along compatible shoulders as well as shared roadways. Sign placement every one-quarter mile may not be excessive in some situations, but generally signs should not be spaced more than one-half mile apart in each direction of travel. Signs should be placed in both directions at side entrances onto a bikeway, before blind corners, and where roadways narrow to an unsafe shared width, such as at many stream crossings. These sign combinations may also be used for routes in locations where there is a considerable amount of bicycle traffic or in areas bicycle traffic is to be encouraged.

Bicycle Route Signage

For a more complete bicycle circulation system, signs that would enhance and encourage travel include bike route, directional, and marker signs. The MUTCD provides specific language for use of these signs. Where identified bike routes are provided along roadways/shoulders, the following signs should be part of the installation where appropriate:

Bicycle route signage should be placed throughout the network so that they:

- Provide connections to schools, community facilities, retail and commercial services,
- Designate popular routes in the Township and greater region,
- Provide connections to facilities in adjacent communities.

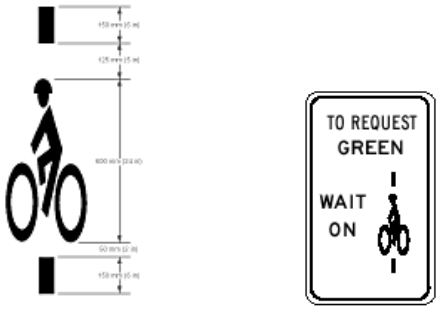
The use of directional arrows and route designation markers should supplement existing signage so that the signs provide information as to where the route proceeds at an intersection, the location of key destinations, and the name of key bicycle routes cyclists are traveling.

Bicycle Friendly Loop Detectors

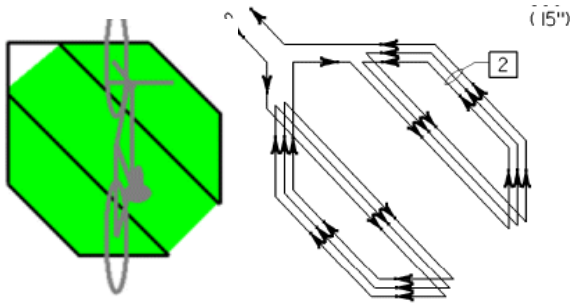
Most actuated traffic signals within the Township are not sensitive to detect cyclists. This forces a cyclist to either wait for a motor vehicle to arrive and actuate the signal, or to dismount and depress the pedestrian push button. The Township should install bicycle friendly loop detectors at traffic signals located along the bicycle network. Typical examples of bicycle friendly detectors are the quadruple loop, the diagonal quadruple loop, and the standard loop. Loop detectors increase the overall presence of detection area that will activate the signal. The increased surface area allows bicycles to be detected with greater ease than with traditional loop detector configurations.

If bicycle friendly loop detectors can not be installed, then a bicycle push button should be installed to allow cyclists to activate the traffic signal without dismounting from their bicycle.

Bicycle Loop Detector Stenciling and Signage



Bicycle Friendly Loop Detector Configurations



Pavement Marking Guidelines

Pavement markings require significantly greater planning and engineering design efforts than simply signing a road. For example, a striped bike lane should begin and end with a direct and immediate connection with a road or other facility which adequately accommodates bicycle traffic to the same or similar level as the bike lane. A bike lane should not "dead end" into a roadway without some sort of bicycle facility. This may encourage less experienced cyclists to venture onto the bike lane and find themselves in a traffic situation that they are ill-prepared to handle.

Bike lane symbols on the pavement should be installed at the same frequency as the 'Share the Road' sign. Signs and markings could be staggered for greater coverage except at the beginning of a road and where side roads enter the road with the bike lane, in which case both signs and markings should be used.

The following pavement markings from MUTCD are examples of pavement markings that might be used in West Windsor Township where appropriate. AASHTO guidelines should be followed in designing any pavement markings for bike lanes.

Figure 9C-3. Example of Bicycle Lane Treatment at a Right Turn Only Lane

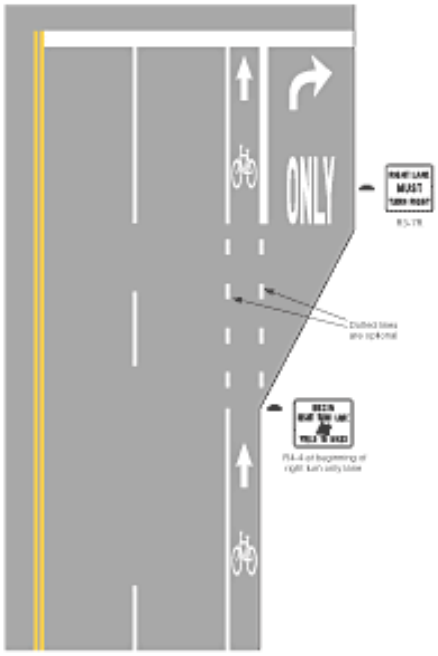
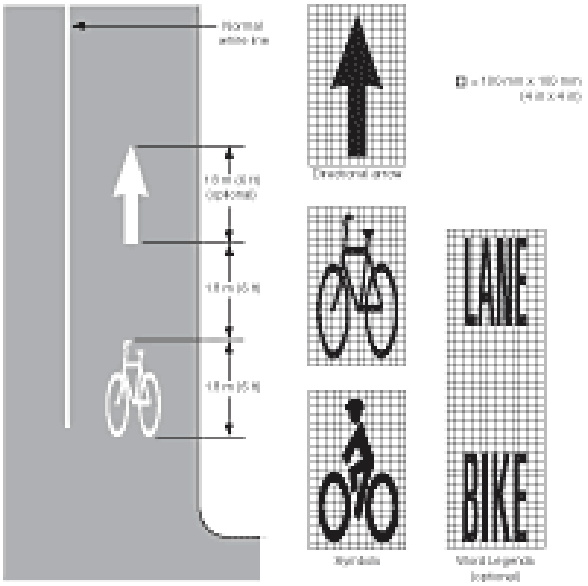


Figure 9C-6. Example of Optional Word and Symbol Pavement Markings for Bicycle Lanes



Defined (paint striped) bike lanes as a designated portion of the roadway tend to impart a greater sense of security for bicyclists and serve as a continuous reminder for motorists that cyclists may be present. The presence of bike lanes in some parts of the Township could lead, however, to some motorists incorrectly concluding that cyclists do not have the right to use a roadway where a bike lane does not exist. This incorrect assumption may also apply to 'Share the Road signs'. Education efforts, discussed in Chapter V, are especially important to prevent this misconception.

Bicycle Parking

The addition of safe, convenient bicycle parking facilities has been linked to increased bicycle ridership in many communities. As a result, additional bicycle parking facilities are recommended throughout the Township. Additional parking should be provided at all public facilities, such as public schools, parks and the train station. The Township should also consider replacing older racks with a more bicycle-friendly style rack. In addition, the Township should continue to work with employment and retail centers to provide additional bicycle parking to satisfy the demands of both customers and employees.

Bicycle parking is generally separated into two types of facilities; long-term, such as bicycle lockers, and short-term, such as bike racks. Long-term parking facilities are intended to provide safe protection, for both bicycles and accessories, from weather, theft, and vandalism for long periods of time. Long-term facilities in place at the train station are currently at capacity and should be expanded. Long-term facilities should also be provided at employment centers, multifamily residential developments, and at transit stops. Short term parking facilities provide bicycle parking for shorter periods of time where the bicycle is visible and convenient to entrances of buildings, commercial/retail centers, and public spaces. Typically, a bike rack should be no more than a 30-second walk from a building entrance, and at the very minimum, should be as close as or closer than the nearest car parking space. Protection from the weather is usually not provided, but is desirable. Locations of parking facilities should also be coordinated with bicycle compatible routes. Wave-style racks currently in

use throughout the Township, are not generally recommended since they are difficult for bicyclists to use and difficult to install in such a way that the maximum number of bicycles can be accommodated. Appendix D contains additional guidance on bicycle parking.

Inadequate Bicycle Parking Facilities within the Township

West Windsor-Plainsboro High School South

West Windsor Community Pool

Bicycle Parking Requirements

Bicycle parking requirements are found in the West Windsor land development ordinance (Section 200-27, Subsection B.(2). The ordinance requires that bicycle parking spaces be at least 10% of the first 100 required automobile spaces, plus 2% of remaining spaces. This ordinance exceeds many national standards, and reflects the Township's commitment to bicycling. Many New Jersey municipalities have no bicycle parking standards.

Pedestrian Facility Design Guidelines

In order to better accommodate pedestrians, West Windsor Township should construct all future sidewalks to be at least five feet in width with a vertical clearance that of eighty inches. This width will allow pedestrians to travel abreast or pass one another, and will provide sufficient room for pedestrians with strollers or carts. In major Township destinations, centers, or in the vicinity of schools and gathering places, sidewalks should be wider in order to allow for gathering and turning needs.

Except for rural or very low density areas, sidewalks should be installed on at least one side of roadways. Where sidewalks are not present, a minimum four-foot shoulder can accommodate pedestrians. Sidewalks installed too close to vehicular traffic, particularly on higher speed or volume roadways, typically discourage pedestrian travel due to the high noise levels and the perception of danger. Ideally, sidewalks should be placed with at least a four-foot buffer between the sidewalk and the travel lane. This setback distance provides a greater sense of safety to the pedestrian as well as an area to install landscaping, utilities, or an extra space for collection of debris such as trash, snow, and leaves. Sidewalks should be placed adjacent to the curb only in areas with limited right-of-way available.

Pedestrian Facilities at Signalized Intersections

Pedestrian activity is most concentrated at intersections, especially in town centers or transit centers. It is in these locations that most vehicle-to-pedestrian conflicts occur due to the higher concentrations of pedestrians and vehicle turning movements that are normally associated with intersections. Pedestrian facilities at intersections should be designed to provide enough gathering room for pedestrians who are waiting to cross the street. Intersections should be free of mail boxes, trash receptacles, or other objects that take up space or obstruct pedestrian paths, obscure pedestrian and driver lines of sight, or decrease pedestrian storage and queuing areas.

All signalized intersections should contain pedestrian indicators and appropriate educational plaques, to provide pedestrians with better guidance on when to cross the street. Pedestrian pushbuttons should be installed on a flat surface in order to allow full access of the pushbutton to handicapped or sight-impaired users. Pushbuttons should be properly signed with educational plaques to further assist pedestrians wishing to cross the street.

Recommended Pedestrian Crossing Plaques

Crosswalks

Crosswalks should only be installed only where they are needed in order to maximize their maximum safety potential. Locations of crosswalks should be considered primarily for the following locations:

- All signalized intersections with pedestrian heads;
- All intersections within ¼ mile of schools;
- All other locations where there is a need to clarify the exact crossing location when the proper location for a crossing would otherwise be confusing.

High visibility crosswalks should be employed for high-activity locations, such as schools or neighborhood centers. These crosswalks should consist of one to two foot stripes, placed parallel to each other, one to two feet apart. This striping style ensures added emphasis to the motorist. All crosswalks should be striped using thermoplastic material which is brighter and more durable than regular paint. Textured crosswalks, consisting of brick or stone pavers and typically used for aesthetic purposes, may also be used at crosswalk locations. Ten-foot widths for crosswalks are preferable.

Preferred Crosswalk striping methods

VIII. FUNDING OPPORTUNITIES

Federal Level

The Transportation Efficiency Act of the 21st Century (TEA-21) is the current source of funding for bicycle and pedestrian projects at the federal level. This bill was set to expire on September 30, 2003 and has since been reauthorized three times, extending the deadline to September 30, 2004. Since 1998, TEA-21 has provided over $734 million to bicycle and pedestrian related projects. The new federal transportation funding bill entitled: The Safe, Accountable, Flexible, and Efficient Transportation Equity Act of 2003 (SAFETEA) was intended to succeed TEA-21. Currently, there are two versions of SAFETEA (a Senate version and a House of Representatives version) under construction. Both versions of SAFETEA maintain many elements of TEA-21, including:

- Retains the *Enhancements* Program as well as Congestion Mitigation and Air Quality Program (*CMAQ)*, *Recreational Trails*, and *Scenic Byways*.
- Enhances the Safe Routes to School Program
- Maintains broad eligibility of bicycle and pedestrian projects in major funding categories.

Federal monies can be awarded to improvement and enhancement projects through the following programs:

Surface Transportation Program (STP) Funds

Often considered the most flexible source of funding, the STP provides monies for state, county, and local governments on any federal-aid road. All stages of the roadway improvement process (planning through design and construction) are eligible for funding. Bicycle and pedestrian facility improvements, as well as modification of sidewalks to comply with the Americans with Disabilities Act (ADA) are eligible for STP monies.

Congestion Mitigation and Air Quality (CMAQ)

Monies are awarded to projects that improve air quality or ease current levels of traffic congestion without adding new highway capacity. This fund is targeted towards states with air quality problems, such as New Jersey. Certain bicycle and pedestrian related projects eligible to use CMAQ funds are:

- Secure bicycle storage facilities and other facilities, including bicycle lanes, for the convenience and protection of bicyclists, in both public and private areas;
- New construction projects related to safe bicycle use; and,
- New construction and major reconstruction of paths, tracks, or areas solely for use by pedestrian or other non-motorized means of transportation.

Local Scoping

The purpose of this program is to provide federal funds directly to sub regions to advance projects through the National Environmental Policy Act (NEPA) process and preliminary engineering in an effort to develop a solution to a defined problem and make the project eligible for inclusion on the State Transportation Improvement Program (STIP). Municipalities are eligible for the Local Scoping Program but must work through their sub region, typically the county.

Local Lead

This program provides a means for sub regions to apply for federal funding to advance projects through final design, right-of-way acquisitions and/or construction. Each project is reviewed by the MPO (in this case the Delaware Valley Regional Planning Commission) for inclusion on the STIP. Local Lead Projects must satisfy the following criteria:

- Projects must be located on roads with functional classifications other than rural minor collector, rural local collector, or urban local or part of the National Highway System (NHS).
- Projects must be transportation related.
- Bridges must be included on the most recent National Bridge Inventory, Highway Bridge Replacement and Rehabilitation List.
- Design costs should exceed $100,000 (related projects can be combined).
- Construction costs should be a minimum of $250,000.
- A project must have received a current Categorical Exclusion (CE), a Finding of No Adverse Affect, or a Record of Decision from the FHWA.

Transportation Enhancements (TE)

Ten percent of all STP funds are designated for projects which foster more livable communities, preserve and protect environmental and cultural resources, and promote alternative modes of transportation. TE funds are to be used only for projects with a direct transportation relationship that enhance quality of life while reaching the greatest number of people. TE funds are available for design and right-of-way acquisition and construction of bicycle and pedestrian facilities as well as safety and educational activities for pedestrians and bicyclists. This includes:

- Adding bike lanes to existing roadways;
- Construction of new sidewalks, separate walking trails or paths; and,
- Conducting training to improve knowledge of bicyclists and pedestrians.

National Recreational Trails Fund

Money from this fund is managed by the Federal Highway Administration (FHWA) and distributed in New Jersey by NJDEP. In 2003, about $700,000 was available for projects in New Jersey and over $4 million has been distributed to the state since 1993. Townships must match 20% of project cost.

National Scenic Byways Fund

This fund is designed to provide monetary grants to roadways that are characterized by outstanding scenic, cultural, natural, recreational, and archeological qualities. Money is also available for implementation of state scenic byways programs. Bicycle and pedestrian facilities, such as rest areas, turn-outs, highway shoulder improvements, as well as land adjacent to the right-of-way of the road, are eligible for funding.

Section 402 Safety Fund

Money from this fund is primarily used for education of the public on safety awareness issues. These funds are administered by the National Highway Traffic Safety Administration.

Proposed Legislation

Currently, there are several bills in Congress that are designed to promote bicycle and pedestrian improvements. One such bill, the *Pedestrian and Cyclists Equity Act of 2003* (PACE) would create a national "Safe Routes to School" program which would provide funding to create safer streets around schools and encourage bicycling and walking for bicycle and pedestrian friendly projects. Currently, the bill seeks to earmark $250 million from the National Highway Trust Fund for the years 2004-2009. Grants would be distributed for improvements such as bike lanes and traffic calming, as well as educational and traffic safety programs. Another bill that would benefit cyclists is the *Bicycle Commuter Act*. This bill would extend tax benefits, similar to the Transit-Check program, to commuters who commute to work by bicycle.

State Level

State funded programs are administered by NJDOT's Division of Local Aid and Economic Development. Monies from the State Transportation Trust Fund are awarded to counties and municipalities by the State. The following grant programs are administered by the state:

Municipal Aid

Municipalities submit requests to the State for municipal aid each year. The application is reviewed, field checked, and then rated on completeness and effectiveness. Recommendations are then given to the Commissioner of Transportation for final approval. Municipalities must provide a 25 percent match to all funds received. In the 2004 fiscal year, the State distributed $67.5 million. West Windsor Township received $25,000 for improvements to North Mill Road.

County Aid

NJDOT allocates money to counties to perform improvements on roads and bridges under county jurisdiction. Aid to each county is dependent upon road mileage and population. Public transportation and other transportation projects are also included.

Bikeways

NJDOT allocates money specifically for bicycle related projects. New Jersey awarded approximately $6 million for bikeway improvements during the 2004 fiscal year. West Windsor Township received $100,000 for bicycle facility improvements for West Windsor Community Park and Mercer County Bikeway.

Safe Streets to School

This program addresses locally initiated pedestrian access and safety projects which will provide safe access to schools. Approximately $5.5 million was distributed by the state during the 2004 fiscal year.

Centers of Place

Centers of place funding can be acquired if a municipality meets one or more of the following criteria:

- Contains a Center with boundaries designated by the State Planning Commission (SPC).
- Has prepared a Strategic Revitalization Plan approved by the SPC.
- Is within an endorsed urban complex consisting of two or more municipalities and a designated center in a Metropolitan Planning Area.
- Is a Pinelands Town or Village under the Pinelands Comprehensive Management Plan. Pinelands Towns and Villages are beginning to receive treatment equivalent to State Plan designated Centers, in accordance with an agreement signed in June 1999 by the Pinelands Commission and the State Planning Commission.

Currently, the Township fails to meet any of the criteria mentioned above, but may wish to seek center designation in the future.

Locally Initiated Bicycle Projects

Money is awarded to projects that will result in the creation of a new bicycle facility or in making existing roadways compatible.

Locally Initiated Pedestrian Projects

Money is awarded to projects that will result in safer environments for pedestrians. Money is granted in a similar fashion to municipal aid.

Green Acres

The Green Acres program assists in funding for public recreation and conservation services. Multi-use trails could be funded under this program.

Other Tools

Metropolitan Planning Organizations (MPO)

The Delaware Valley Regional Planning Commission (DVRPC) employs a bicycle and pedestrian staff that works closely with the New Jersey Bicycle Advisory Council, the New Jersey Pedestrian Task Force and NJDOT in order to assist local municipalities in securing funding for bicycle and pedestrian related projects. Local Lead Projects initiated by the Township must be approved by the MPO in order to be included in the Transportation Improvement Program (TIP).

Greater Mercer Transportation Management Association (GMTMA)

The GMTMA provides technical assistance and support to implement demand management strategies or support strategies in areas with congestion, safety or accessibility problems, rapid growth or which offer little or no alternatives to automotive travel. The GMTMA also specializes in bicycle and pedestrian facility planning as well as organizing municipal workshops in creating bikeable and walkable communities.

Transportation Development Districts (TDD)

Bicycle and pedestrian facilities within a TDD can be funded through both public and private monies. Bicycle and pedestrian improvements can be included in the district improvement plan and funded through the TDD.

Developer-Provided Facilities

The Township should consider amending its land development ordinance to require bicycle and pedestrian facilities, including on-road and/or off-road multi-use trails and bicycle parking, as part of any new development.

Local Government

West Windsor Township can budget capital improvements funds for bicycle and pedestrian facility improvements and enhancements.

Private Foundations and Organizations

Bikes Belong Coalition offers grants for up to $10,000 to local organizations, agencies, and citizens for developing and continuing bicycle facilities projects that will be funded by TEA-21.

Community Support

Community support is necessary to ensure that the implementation of any bikeway plan is a success. To date, the West Windsor Township Bicycle/Pedestrian Task Force has shown much support and enthusiasm about the development of the Bicycle and Pedestrian Plan. The Friends of West Windsor Open Space (FOWWOS) has also shown considerable interest. Community groups and service clubs could be approached to provide labor and in-kind contributions for the implementation of the bicycle or enhanced pedestrian network. Corporate financial assistance in the form of corporate participation in educational and outreach efforts can be coordinated with the GMTMA.

NJDOT Bicycle/Pedestrian Planning Assistance

WEST WINDSOR TOWNSHIP BICYCLE/PEDESTRIAN PLAN

West Windsor Township, Mercer County, NJ

Appendices

Appendix A:
ROADWAY INVENTORY DATA

Appendix A
Roadway Inventory Data

Roadway	Speed Limit (MPH)	Cartway Width (Feet)	ROW Width (Feet)	Width Travel Lane 1	Width Travel Lane 2	Width Travel Lane 3	Width Travel Lane 4	Width Turn Lane 1	Width Turn Lane 2	Width CT Lane	Width Shoulder 1	Width Shoulder 2	Width Median	ADT	Parking Permitted	Existing Facility	NJDOT Compatibility Guidelines	Compatible
Alexander Road - east of Wallace Road	30	27	50	13.5	13.5									10K+	No	No	14' SL	No
Alexander Road - approaching Princeton-Hightstown Road	30	29	50	14.5	14.5									10K+	No	No	14' SL	Yes
Alexander Road - approaching US 1	40		80	12	13						8	8		10K+	No	No	4' SH	Yes
Alexander Road - approaching Vaughn Drive	40	50	70-80	12	12	11	12						3	10K+	No	No	14' SL	No
Alexander Road - at Berrien Avenue	30	27.5	41.5	13.5	14									10K+	No	No	14' SL	No
Alexander Road - at D&R canal	40	39	NA	14	14						5.5	5.5		10K+	No	No	4' SH	Yes
Alexander Road - at Roszel Road vicinity	40	57	70	11	11					13	11	10		10K+	No	No	4' SH	No
Alexander Road - in Bear Brook Road vicinity	25	52	80	26	26									10K+	No	No	14' SL	Yes
Alexander Road - in Old Bear Brook Road vicinity	30	24	30	11	10									10K+	No	No	14' SL	No
Alexander Road - south of Roszel Road	35	43		12	10	10	11							10K+	No	No	4' SH	No
Bear Brook Road	25	40		13.5-20	13.5-20					0-13				2-10K	No	No	14' SL	No
Benford Drive	25	30	50	15	15									2-10K	Yes	No	14' SL	Yes
Bennington Drive	30	35.5	70											2-10K	No	No	12' SL	Yes
Berrien Drive	25	24	50	12	12									2-10K	No	No	14' SL	No
Canal Point Boulevard	35	44	70	11	11	11	11							10K+	No	No	4' SH	No
Canal Point Boulevard - in park vicinity	35	35	60	17.5	17.5									2-10K	Yes	No	14' SL	No
Clarksville Road - approaching Quakerbridge Road	45	30	60	11.5	12.5						3	3		10K+	No	No	6' SH	No
Clarksville Road - at Avalon Watch Apartments	45	50	70	12.5	24						13.5			10K+	No	No	6' SH	No

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Roadway	Speed Limit (MPH)	Cartway Width (Feet)	ROW Width (Feet)	Width Travel Lane 1	Width Travel Lane 2	Width Travel Lane 3	Width Travel Lane 4	Width Turn Lane 1	Width Turn Lane 2	Width CT Lane	Width Shoulder 1	Width Shoulder 2	Width Median	ADT	Parking Permitted	Existing Facility	NJDOT Compatibility Guidelines	Compatible
Clarksville Road - at Everett Road	45	30	60	13	13									10K+	No	No	6' SH	No
Clarksville Road - at Hawk ES	25	40	80	15	13						8'-10'	4		10K+	No	No	14'SL	Yes
Clarksville Road - at WWP HS	25	50	80	24	12	14								10K+	No	No	4' SH	No
Clarksville Road - east of North Post Road	35	34	80	16	13.5							4.5		10K+	No	No	4' SH	No
Clarksville Road - Hawk ES to Penn-Lyle Road	35	34.5	60-80	13	13.5						4.5	3.5		10K+	No	No	4' SH	No
Clarksville Road - west of the Village Shoppe's	35	37	70	13	11						13			10K+	No	No	4' SH	No
Clarksville Road (CR 638) - at Benford Drive	35	35.5	60-80	19	13.5						0	2.5		13,270	No	No	4' SH	No
Clarksville-Grover Mill Road - at Princeton-Hightstown Road	35	52	60	10	10	10		11	11					10K+	No	No	4' SH	No
Clarksville-Grovers Mill Road - east of Princeton-Hightstown Road	35	25.5	60	11	12.5						1	1		2-10K	No	No	14' SL	No
Conover Road - at Conover Field entrance	45	22	50	10	10									<2K	No	No	15' SL	No
Cranbury Road (CR 615) - east of Princeton-Hightstown Road (CR 571)	25	22	33	11	11									2-10K	No	No	12' SL	No
Cranbury Road (CR 615) - from Middlesex County line to Rabbit Hill Road	25	23	52	11.5	11.5									5,783	No	No	12' SL	No
Cranbury Road (CR 615) - Rabbit Hill Road to Yeger Road	25	37.5	33	11	19						7.5			3,145	No	No	12' SL	No
Cubberly Drive	25	20	50	10	10									<2K	No	No	11' SL	No
Edinburg Road - at Conover Road/ Dickens Road	40	46	80	10	10						13	13		2-10K	No	No	14' SL	Yes
Edinburg Road - at New Edinburg Road	35	52	80	12	12			12	16		5	5		2-10K	No	No	14' SL	Yes
Edinburg Road - at Old Trenton Road	40	32	55	15	15									10K+	No	No	4' SH	No
Edinburg Road - Village Road East to Mercer County Park	40	51	60	15	10						9	10		2-10K	No	No	14' SL	Yes

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Edinsburg-Robinsville Road	45	30.5	50	12.5	12.5						3.5	2		2-10K	No	No	15' SL	No
Hendrickson Drive	25	27	45	11	16									<2K	No	No	11'SL	Yes
Hightstown Road - at southern leg of Acme shopping center driveway	35	73	80	40.5	32									10K+	No	No	4' SH	No
Lanwin Boulevard -	35	46	70	14	14						6	6	6	2-10K	No	No	14' SL	Yes
Lillie Drive	25	23	50	11.5	11.5									<2K	No	No	11' SL	Yes
Meadow brook Road	35	20	33	10	10									2-10K	No	No	14' SL	No
Meadow Road	35	26	33-50	13	13									2-10K	No	No	14'SL	No
Millstone Road - at Millstone River Bridge (Mercer County Bridge No. 6704)	35	30	50	11	11						4	4		3,971	No	No	14' SL	Yes
Millstone Road - between Cranbury Road and Millstone River	35	23	33-50	10	12.5									3,971	No	No	14' SL	No
Nassau Park Boulevard	35	66	40	12	12	12	12	12						10K+	No	No	4' SH	No
New Edinburg Road	35	52	80	13	13						5 (bike)	5 (bike)	16	2-10K	No	Yes	14' SL	Yes
New Village Road - at Yellows Stone Dr	35	52	80	12	12						5 (bike)	5 (bike)	15	2-10K	No	Yes	14'SL	Yes
New Village Road - at School Complexes; north of Old Trenton Road	25	42	80	19	19						5 (bike)	5 (bike)	21	2-10K	No	Yes	14'SL	Yes
North Mill Road - at West Windsor Community Park	25	23	33	9.5	9.5						2	2		<2K	No	No	11' SL	No
North Post Road - approaching Alexander Road	35	22.5	50	10.5	10						1	1		10K+	No	No	4' SH	No
North Post Road - at Village Road West	40	56	60	11	13			13	18					10K+	No	No	4' SH	No
North Post Road - at Ward Road	40	36	40	10	11	13								10K+	No	No	4' SH	No
North Post Road - in vicinity of WW Library	35	23	46.5	10.5	10.5									10K+	Yes	No	4' SH	No

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Roadway	Speed Limit (MPH)	Cartway Width (Feet)	ROW Width (Feet)	Width Travel Lane 1	Width Travel Lane 2	Width Travel Lane 3	Width Travel Lane 4	Width Turn Lane 1	Width Turn Lane 2	Width CT Lane	Width Shoulder 1	Width Shoulder 2	Width Median	ADT	Parking Permitted	Existing Facility	NJDOT Compatibility Guidelines	Compatible
North Post Road - in vicinity of WW Little League Complex	40	22	46.5	10	10						1	1		2-10K	No	No	14' SL	No
Old Meadow Road - south of US 1	35	28	40	14	14									2-10K	No	No	14' SL	Yes
Old Trenton Road (CR 535) - east of Windsor Road	35	24	40	12	12									10K+	No	No	4' SH	No
Old Trenton Road (CR 535) - east of Village Road East	50	23	40	10.5	12.5									10K+	No	No	4' SH	No
Old Trenton Road (CR 535) - west of Village Road East	45	24	52	12	12									10K+	No	No	4' SH	No
Old Trenton Road (CR535) - at Mercer County Park	40	29	100	15	12						1	1		10K+	No	No	4' SH	No
Old Trenton Road (CR535) - from South Post Road to Mercer County CC	45	52	80	13	13	13	13							14,871	No	No	4' SH	No
Penn-Lyle Road - at high school	25	27.5	50	14.5	11							2		2-10K	No	No	12' SL	No
Penn-Lyle Road - from West Winds Drive/ Stony Brook Drive	40	36	60	17	19									4,451	No	No	14' SL	Yes
Penn-Lyle Road - south of Canoe Brook Road	40	35.5	65	18	17.5									2-10K	No	No	14' SL	Yes
Princeton-Hightstown Road - north of Clarksville-Grovers Mill Road	50	32	80	17	15									10K+	No	No	4' SH	No
Princeton-Hightstown Road (CR 571) - between East Windsor Township and McGetrick Ln	50	44	60	11	11	11	11							18,218	No	No	6' SH	No
Princeton-Hightstown Road (CR 571) - north of Rabbit Hill Road	50	47.5	70-80	11	12.5	12.5	11.5							10K+	No	No	6' SH	No
Princeton-Hightstown Road (CR 571) - north of Southfield Road	50	47.5	70	12.5	12	11	12							20,470	No	No	6' SH	No
Quakerbridge Road - south of Clarksville Road	50	51	90	12	13.5	13.5	12							10K+	No	No	6' SH	No
Quakerbridge Road - south of Village Road West	50	49	90	12	13	12	12							10K+	No	No	6' SH	No
Rabbit Hill Road - at Big Bear Brook Bridge	35	25.5	33	11	11.5						1.5	1.5		2-10K	No	No	14' SL	No
Rabbit Hill Road - south of Barrington Drive	40	34	70	13	13						4	4		2-10K	No	No	14' SL	Yes

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Rabbit Hill Road - south of Bennington Drive	35	35	51.5	14.5	11						3	6.5		2-10K	No	No	14' SL	Yes
Rabbit Hill Road - south of Cranbury Road	40	34	35	12	12						5.5	4.5		2-10K	No	No	14' SL	Yes
Scott Avenue	25	26.5	13	13										2-10K	No	No	14'SL	No
South Lane	40	18	45-50	9	9									2-10K	No	No	3' SH	No
South Mill Road (CR 526) - between New Edinburg Road and Village Road West	25	22	66-80	11	11									2-10K	No	No	14' SL	No
South Mill Road (CR 526) - south of CR 571	35	48	80	13	13						11	11		2-10K	No	No	4' SH	Yes
South Post Road	35	25.5	33	12.5	13									2-10K	No	No	14' SL	No
Southfield Road - at school complex	25	28	38-50	17.5	10.5									2-10K	No	No	12' SL	No
Southfield Road - at Zaitz Park	35	39.5	50	10.5	20.5							8.5		2-10K	No	No	14' SL	Yes
Southfield Road - Middlesex County line	50	34	70	17	17									4,311	No	No	14' SL	Yes
Station Drive - at Washington Drive	25	29	33	15.5	13.5									2-10K	No	No	12' SL	Yes
Vaughn Drive	30	40	60	11	10									10K+	Yes	No	14' SL	No
Village Road East - from township line to Old Trenton Road	35	26	40	12	12						1	1		2-10K	No	No	14' SL	No
Village Road East - north of New Village Road	45	35	60	16	19									3,727	No	No	15' SL	Yes
Village Road West - approaching South Mill Road	35	31.5	33	12	11.5						4	4		10K+	No	No	4' SH	Yes
Village Road West - between Sapphire and North/ South Post Road	35	65	70-80	15	15						10 (bike)	10 (bike)	15	10K+	No	Yes	4' SH	Yes
Village Road West - from Quakerbridge Road (CR 533) to Deerfield Drive	45	23	66-73	12	12									11,564	No	No	6' SH	No
Village Road West - West of North/ South Post Road	45	49	66	11	12						6	5	15	10K+	No	No	6' SH	Yes

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Roadway Inventory Data

Roadway	Speed Limit (MPH)	Cartway Width (Feet)	ROW Width (Feet)	Width Travel Lane 1	Width Travel Lane 2	Width Travel Lane 3	Width Travel Lane 4	Width Turn Lane 1	Width Turn Lane 2	Width CT Lane	Width Shoulder 1	Width Shoulder 2	Width Median	ADT	Parking Permitted	Existing Facility	NJDOT Compatibility Guidelines	Compatible
Wallace Circle	15	38													No	No		NA
Wallace Rd - from Hightstown Road to train station entrance	25	34	50	11	11	12								10k+	No	No	14' SL	No
Wallace Rd - from train station entrance to NJT Parking Lot 4	25	35	50	19	16									10K+	No	No	14' SL	Yes
Wallace Road - at Princeton Junction Train Station	25	40.5	50	12	13.5			12			3			10K+	No	No	14' SL	No
Wallace Road - at Scott Avenue	25	35.5	65	18	17.5									10K+	No	No	14' SL	Yes
Washington Road - at Station Drive	25	35	45	15.5	16.5									2-10k	No	No	12' SL	Yes
Washington Road - north of Larry's Car Care	40	38	60	12.5	12						6	7.5		10K+	No	No	4' SH	Yes
Washington Road - north of Manor Drive	40	37	60	12	13						7	5		10K+	No	No	4' SH	Yes
Washington Road - north of P-H road	40	30	45	13.5	13						2.5	2		10K+	No	No	4' SH	No
Washington Road - north of US 1	40	38	45	13	13						6	6		10K+	No	No	4' SH	Yes
Windsor Road - between Old Trenton Road and South Lane	40	22	40	10	10									2-10K	No	No	3' SH	No
Woodmere Way	25	35	70	17.5	17.5									2-10K	No	No	12' SL	Yes

Appendix B:
BICYCLE AND PEDESTRIAN COUNT FIGURES

Appendix C:
GENERAL COST ESTIMATE FOR PROPOSED CONCEPT LOCATIONS

Appendix C.
Order-of-Magnitude Cost Estimate for Proposed Improvements--West Windsor Bikeway Plan
October 11, 2004

ESTIMATED QUANTITIES

ITEM NO.	ITEM	Alexander Road, Acme Shopping Center to Berrien Avenue		Alexander Road, Berrien Avenue to Wallace Road		Canal Pointe Boulevard, vicinity of Princeton MarketFair		Princeton-Hightstown Road and Cranbury Road/Wallace Road		Princeton-Hightstown Road and Sherbrooke Drive		Wallace Road and Scott Avenue		TOTAL	UNIT	UNIT COST	TOTAL COST
1	Excavation	10	$ 250.00	30	$ 750.00	800	$ 20,000.00	300	$ 7,500.00	250	$ 6,250.00	60	$ 1,500.00	**1450**	cubic yards	$ 25.00	$ 36,250.00
2	Full Depth Pavement	0	$ -	0	$ -	0	$ -	500	$ 20,000.00	80	$ 3,200.00	0	$ -	**580**	square yards	$ 40.00	$ 23,200.00
3	Bituminous Overlay	50	$ 300.00	0	$ -	0	$ -	300	$ 1,800.00	80	$ 480.00	75	$ 450.00	**505**	square yards	$ 6.00	$ 3,030.00
4	Concrete Curb	0	$ -	0	$ -	1500	$ 37,500.00	600	$ 15,000.00	1000	$ 25,000.00	120	$ 3,000.00	**3220**	linear feet	$ 25.00	$ 80,500.00
5	5-foot wide Concrete Sidewalk	0	$ -	325	$ 6,500.00	1570	$ 31,400.00	1750	$ 35,000.00	1150	$ 23,000.00	175	$ 3,500.00	**4970**	linear feet	$ 20.00	$ 99,400.00
6	ADA-compliant curb cut	5	$ 400.00	1	$ 80.00	2	$ 160.00	3	$ 240.00	5	$ 400.00	8	$ 640.00	**24**	units	$ 80.00	$ 1,920.00
7	Drainage Modifications	0	$ -	0	$ -	0	$ -	750	$ 33,750.00	400	$ 18,000.00	120	$ 5,400.00	**1270**	road linear feet	$ 45.00	$ 57,150.00
8	Erosion Control	0	$ -	0	$ -	0	$ -	750	$ 7,500.00	400	$ 4,000.00	120	$ 1,200.00	**1270**	road linear feet	$ 10.00	$ 12,700.00
9	Remove Existing Striping	0	$ -	0	$ -	1500	$ 675.00	1600	$ 720.00	1200	$ 540.00	0	$ -	**4300**	linear feet	$ 0.45	$ 1,935.00
10	Epoxy Resin Traffic Stripes	0	$ -	0	$ -	40000	$ 16,000.00	3600	$ 1,440.00	2800	$ 1,120.00	1100	$ 440.00	**47500**	linear feet	$ 0.40	$ 19,000.00
11	Thermoplastic Striping	550	$ 2,200.00	160	$ 640.00	15000	$ 60,000.00	600	$ 2,400.00	600	$ 2,400.00	1350	$ 5,400.00	**18260**	square feet	$ 4.00	$ 73,040.00
12	No Parking Bike Lane Signs	0	$ -	0	$ -	40	$ 8,000.00	8	$ 1,600.00	8	$ 1,600.00	6	$ 1,200.00	**62**	units	$ 200.00	$ 12,400.00
13	Other Traffic Signs	22	$ 6,600.00	0	$ -	30	$ 9,000.00	4	$ 1,200.00	10	$ 3,000.00	13	$ 3,900.00	**79**	units	$ 300.00	$ 23,700.00
14	Traffic Signal Revision	0	$ -	0	$ -	0	$ -	1	$ 150,000.00	0	$ -	0	$ -	**1**	lump sum	$ 150,000.00	$ 150,000.00
15	Removal of Existing Traffic Signs	12	$ 600.00	0	$ -	2	$ 100.00	0	$ -	0	$ -	2	$ 100.00	**16**	units	$ 50.00	$ 800.00
16	Trees	0	$ -	0	$ -	25	$ 7,500.00	0	$ -	0	$ -	0	$ -	**25**	units	$ 300.00	$ 7,500.00
17	Backfill and topsoil	0	$ -	0	$ -	7000	$ 52,500.00	0	$ -	0	$ -	600	$ 4,500.00	**7600**	square feet	$ 7.50	$ 57,000.00
18	Hydroseeding	0	$ -	0	$ -	7000	$ 1,750.00	0	$ -	0	$ -	600	$ 150.00	**7600**	square feet	$ 0.25	$ 1,900.00
	SUBTOTAL		$ 10,350.00		$ 7,970.00		$ 244,585.00		$ 278,150.00		$ 88,990.00		$ 31,380.00				**$ 661,425.00**
	CONTINGENCY (20%)		$ 2,070.00		$ 1,594.00		$ 48,917.00		$ 55,630.00		$ 17,798.00		$ 6,276.00				$ 132,285.00
	GRAND TOTAL		$ 12,420.00		$ 9,564.00		$ 293,502.00		$ 333,780.00		$ 106,788.00		$ 37,656.00				**$ 793,710.00**

NOTES:

1. No right-of-way acquisition costs are assumed in this cost estimate.
2. Unless otherwise noted, quantities shown reflect only the intersection areas illustrated on the concept plans.
3. The "Traffic Signal Revision" item assumes a replacement of the existing traffic signal. It is not believed that a significant portion of the existing signal system can be re-used with the proposed reconfiguration of the intersection.

Appendix D:
BICYCLE PARKING GUIDELINES