



LINWOOD BICYCLE AND PEDESTRIAN PLAN



Final Report
April 2012

Prepared For:
The City of Linwood and
The New Jersey Department of Transportation

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Baker



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1.0 INTRODUCTION AND SUMMARY

The City of Linwood requested bicycle and pedestrian planning assistance from the New Jersey Department of Transportation-Office of Bicycle and Pedestrian Programs (NJDOT-OBPP) to develop a Bicycle and Pedestrian Plan. NJDOT-OBPP contracted Michael Baker Jr., Inc. to assist Linwood in developing the Bicycle and Pedestrian Plan through analyzing existing conditions and recommending conceptual improvements.

The following goals were identified for this Plan by the study team and Steering Committee:

- Enhance the existing bike path
- Provide east-west connections from bike path
- Encourage and educate residents
- Promote safety
- Increase availability of bike racks
- Install sidewalks

These goals guided development of the recommendations found in this Plan.

This Plan was sponsored through NJDOT's Bicycle and Pedestrian Local Technical Assistance Program. Through this program, New Jersey municipalities have an opportunity to identify pedestrian and bicycle issues that they would like addressed. Upon the request of a local entity, NJDOT provides consultant planning services to the community to perform planning studies that evaluate needs and opportunities relating to bicycle and pedestrian circulation and safety. The planning study serves as a basis for developing proposals for implementing specific improvements. The studies are locally driven in a partnership arrangement with the applicant and have a strong public outreach component.

1.1 SCOPE OF SERVICES

The Linwood Bicycle and Pedestrian Plan was completed following a series of tasks:

- **Data Collection** – Vehicular, pedestrian and bicycle counts were conducted at locations of interest. Site visits were performed to identify key bicycle and pedestrian trip generators, travel patterns, and the location and number of parked bicycles. Data was collected for key roadways to assess bicycle compatibility as well as sidewalk condition.
- **Transportation Facility Assessment** – Bicycle and pedestrian crash data was evaluated. Roadway and sidewalk conditions were assessed.
- **Recommendations** – Conceptual improvements were developed to enhance bicycle and pedestrian mobility and safety.
- **Public Involvement** – The study incorporated an active public outreach component. A Steering Committee was formed, comprising local officials and residents. Two Steering Committee meetings were held to provide input and direction to the study team. A Public Information Center was held on November 29, 2011, and input was also gathered at the Linwood Country Fair in May 2011, and via an online survey.

1.2 SUMMARY OF RECOMMENDATIONS

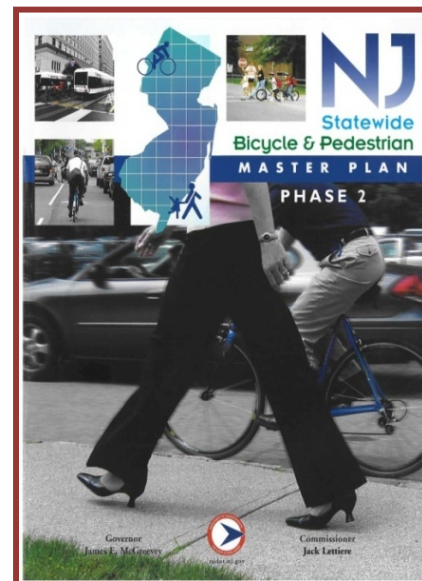
Following is a summary of recommendations in the Plan:

- Extend Linwood bike path from the intersection of Oak Avenue and Wabash Avenue past Mainland Regional High School to New Road
- Widen existing bike path to at least 11 feet
- Revise signage along bike path to reduce excess use of Stop signs and “Walk Bike Across Intersection” signs
- Install bike lanes on Central Avenue
- Replace concrete curb and gutter on Shore Road, and install bike-compatible shoulders
- Re-stripe Ocean Heights Avenue for bike-compatible treatment
- Restrict parking on Poplar Avenue and Seaview Avenue to make roadways bike-compatible
- Install shared lane markings on Oak Avenue
- Replace existing bike racks with recommended models, and install bike racks where needed, such as Linwood City Hall
- Install sidewalks according to priority rating system
- Implement safety improvement at the intersection of Oak Avenue, Wabash Avenue, and Somers Avenue
- Implement promotional and educational activities for walking and bicycling in Linwood

1.3 NEW JERSEY STATEWIDE BICYCLE AND PEDESTRIAN MASTER PLAN

The Local Technical Assistance Program, and by association this study, is governed by the goals and objectives of the New Jersey Statewide Bicycle and Pedestrian Master Plan. The Master Plan has the following goals:

- **Build the Infrastructure:** “Create bicycle and pedestrian infrastructure by planning, designing, constructing and managing transportation and recreational facilities that will accommodate and encourage use by bicyclists and pedestrian and be responsive to their needs.”
- **Improve Access:** “Make community destinations, transit facilities and recreation facilities accessible and convenient for use by all types and skill levels of bicyclists and pedestrians.”
- **Update Policies, Ordinances and Procedures:** “Reform land use planning policies, ordinances and procedures to maximize opportunities for walking and bicycling.”
- **Educate and Enforce:** “Develop and implement education and enforcement programs that will result in reduction of crashes and a greater sense of security.”



- **Foster a Pro-Bicycling and Pro-Walking Ethic:** “Increase bicycling and walking by fostering a pro-bicycling and pro-walking ethic in individuals, private sector organizations and all levels of government.”

Wherever possible, these goals should be factored into the bicycle and pedestrian planning and concept development process. *The Statewide Bicycle and Pedestrian Master Plan, Update* is available online at <http://www.bikemap.com/RBA/NJBikePed.pdf>

2.0 EXISTING CONDITIONS

Existing conditions in Linwood were investigated in order to evaluate bicycle and walking conditions, and identify deficiencies and potential improvements. Data was gathered on crash activity, presence and conditions of sidewalks, and presence and condition of bicycle facilities. Data was gathered on key roadways to identify bicycle compatibility.

2.1 BICYCLE AND PEDESTRIAN TRIP GENERATORS AND ACTIVITY

Bicycle and pedestrian trip generators and travel patterns are illustrated in **Figure 1**. The map illustrates land use areas in Linwood, which is heavily residential. Commercial uses are mainly concentrated along US Route 9. Trip generators include schools, parks, shopping centers, and public buildings.

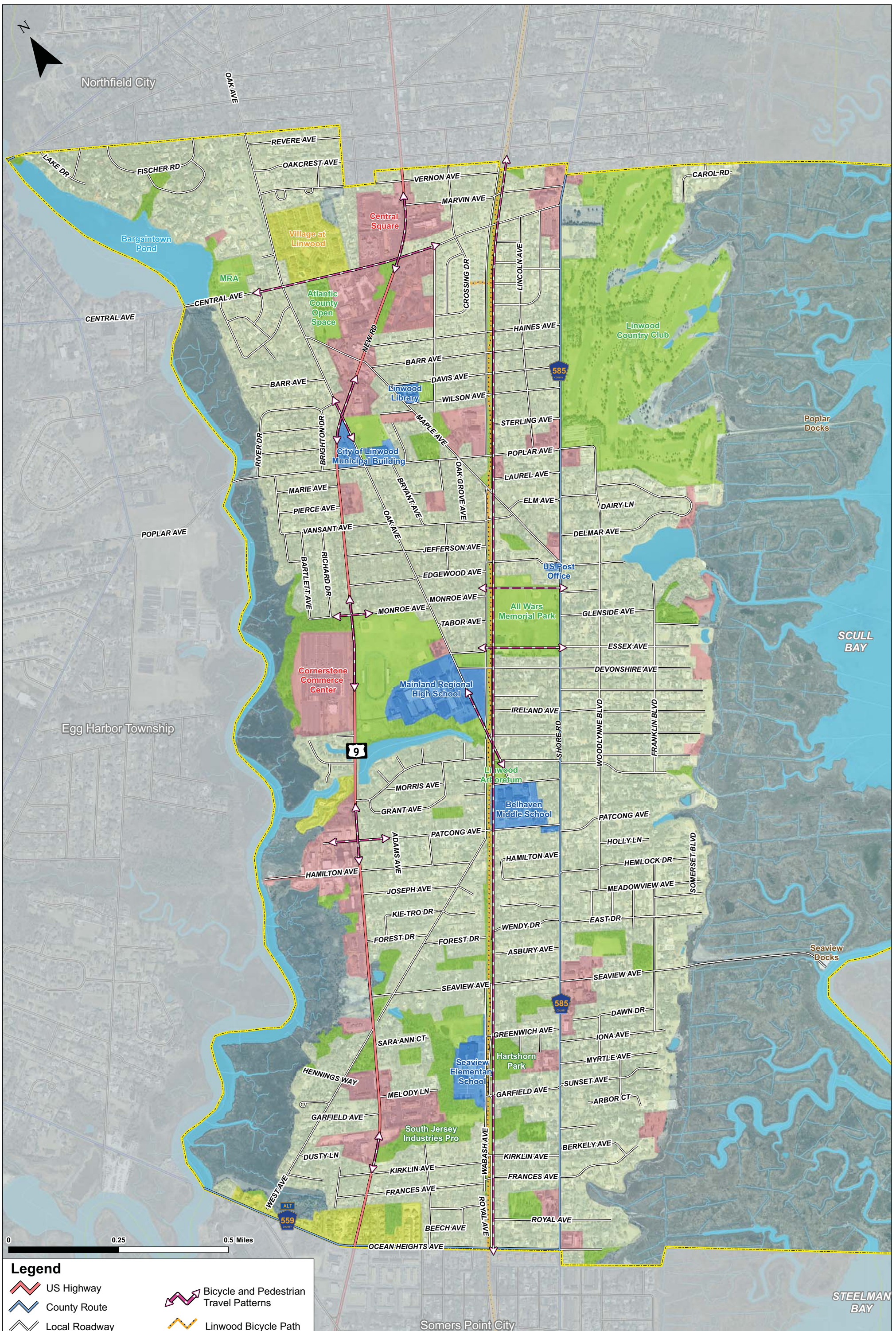
2.2 BICYCLE AND PEDESTRIAN CRASH ANALYSIS

Bicycle and pedestrian crash reports were received from the City of Linwood Police Department for the period of November 2008 to February 2011. The analyzed data is described in **Table 1**.

Table 1: Pedestrian and Bicycle Crashes

Date	Time	Location	Severity	Lighting	Crash Description
11/29/08	12:05 PM	New Rd., 177 ft North of Monroe Ave.	Complaint of Pain	Daylight	A motorist traveling south on New Rd. (US 9) struck an on-duty officer who was walking back to his vehicle.
10/08/09	1:56 PM	New Rd., 4 ft South of Central Ave.	Incapacitated	Daylight	A motorist traveling north on New Rd. ran a red light and struck a pedestrian who was crossing New Rd. and had the green light.
11/12/10	2:53 PM	Shore Rd., 27 ft South of Belhaven Ave.	Incapacitated	Daylight	A motorist traveling south on Shore Rd. (CR 585) struck a crossing guard who stepped off the sidewalk and into Shore Rd.
01/31/11	9:52 AM	Intersection of New Rd. and Garfield Ave.	Complaint of Pain	Daylight	A motorist traveling east on Garfield Ave. began to turn right onto southbound New Rd. and struck a pedestrian crossing Garfield Ave.
09/22/09	8:45 AM	Intersection of New Rd. and Kirklin Ave.	Complaint of Pain	Daylight	A motorist traveling west on Kirklin Ave. stopped at a stop sign and after proceeding, struck a bicyclist who was traveling south on the NB shoulder of New Rd.
02/22/11	1:12 PM	Intersection of New Rd. and Leeds Ave.	Complaint of Pain	Daylight	A motorist exiting from 222 New Rd. struck a bicyclist who was traveling south on the NB side of New Rd.

As noted, there were six crashes during the study period, comprising four pedestrian crashes and two bicycle crashes. Five of the six crashes occurred on New Road. The two bicycle crashes both involved bicyclists traveling against traffic on New Road. There were no geographic clusters.



Linwood Bicycle and Pedestrian Plan
Figure 1: Bicycle and Pedestrian Trip Generators

July 2011

Legend

US Highway	Bicycle and Pedestrian Travel Patterns
County Route	Linwood Bicycle Path
Local Roadway	Municipal Boundaries
Residential, High Density	Recreational Land
Residential, Single Unit	Civic/Educational
Commercial/Services	



2.3 SIDEWALK INVENTORY AND ASSESSMENT

NJDOT County and State Sidewalk Inventory data was used to determine the presence and condition of sidewalks on county and state routes, and this data was field verified. Field views were also conducted in order to inventory sidewalks on the following local roadways: Central Avenue, Poplar Avenue, Oak Avenue, Devonshire Avenue, Patcong Avenue, Monroe Avenue, and Seaview Avenue.

The sidewalk inventory included data collection for sidewalk width and condition; presence, width and type of a buffer; and adjacent roadway characteristics such as posted speed limits and parking. Missing sidewalks links were identified on most roadways and were especially conspicuous on New Road.

The sidewalk condition was rated based on the following criteria:

- Good/Fair Condition – New or nearly new material, or minor defects.
- Poor Condition – Major defects, such as severe cracking.
- No Sidewalk – Sidewalk is not present.

The location and condition of the existing sidewalks are illustrated in **Figure 2**.

2.4 BICYCLE COMPATIBILITY ASSESSMENT

State, county and key local roadways in Linwood were evaluated for compatibility with bicycle travel, using *NJDOT Bicycle Compatible Roadways and Bikeways* guidelines (April 1996). The roadways were identified by the study team in collaboration with members of the Steering Committee, and selected to create a comprehensive network that could accommodate bicyclists traveling to all major land uses. “Bicycle compatible” refers to roadway conditions that, taken together, are considered suitable for a fairly wide range of bicyclists. Criteria used to determine bicycle compatibility are: lane width, shoulder width, traffic volume, speed limit, character of the area (urban or rural), presence or absence of on-street parking, and truck volumes. Traffic volumes and speed are important factors; generally, as either increase on a roadway, it is recommended that a travel lane shared by motorists and bicyclists increase in width, or that shoulders or bike lanes be available for use by bicyclists. A Bicycle Compatibility Matrix was developed to detail the results of the assessment. The Matrix is presented in **Table 2** and the compatibility status is illustrated in **Figure 3**.

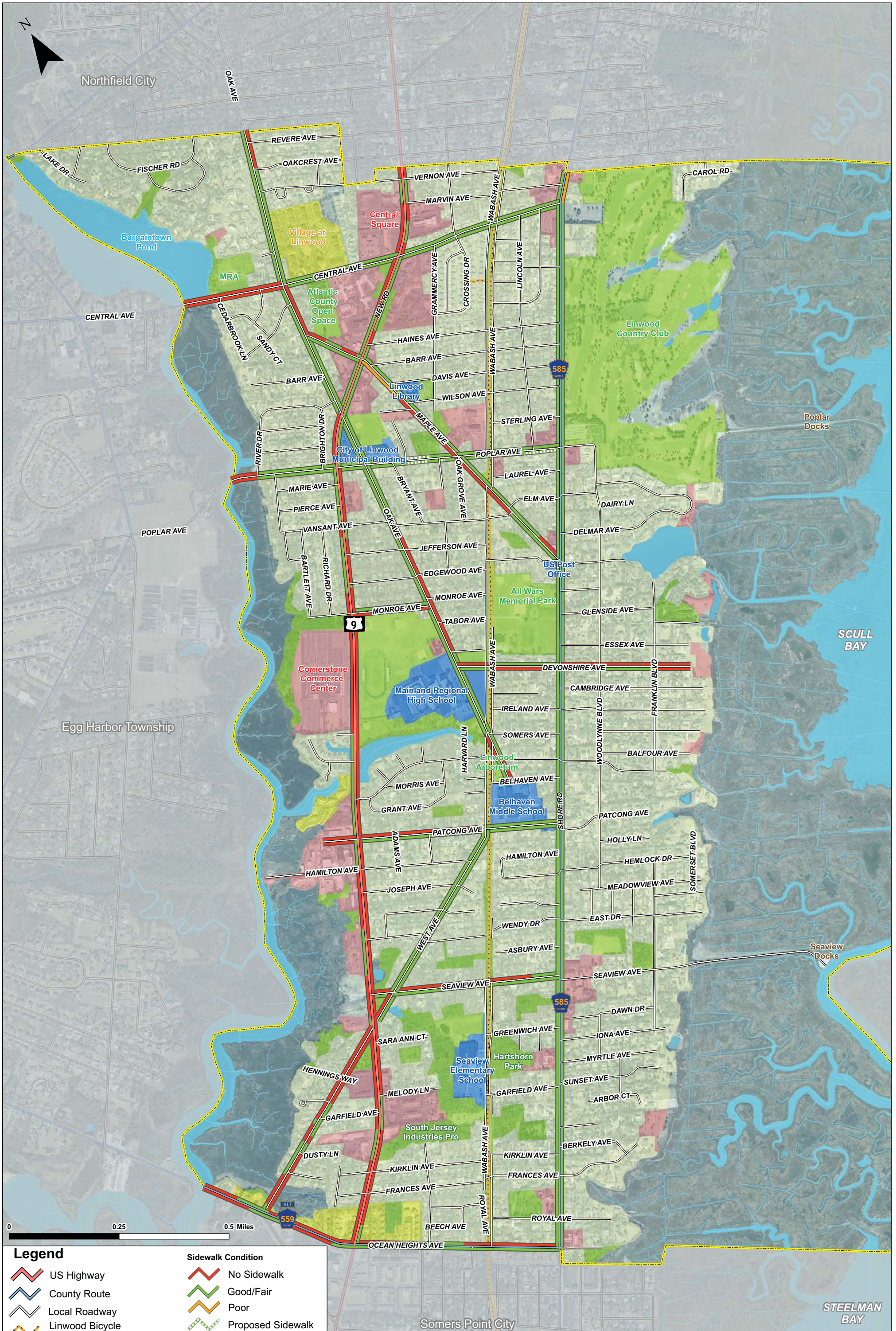
Three categories were developed for this assessment:

- Category A indicates roadways that meet all NJDOT criteria for bicycle compatibility.
- Category B indicates roadways that do not technically meet NJDOT criteria due to permitted on-street parking, but that can be considered bicycle compatible since the on-street parking is rarely used.
- The final category includes the roadways that are not compatible.

Roadways that are identified as bicycle compatible are often attractive candidates for incorporating into a planned bicycle network. However, it should be emphasized that roadways are open to bicyclists

whether or not the roadway meets compatibility criteria, nor is the compatibility evaluation intended to assess safety. Bike compatible roadways may have more room for bicyclists to operate, but municipalities have successfully incorporated incompatible roadways into bicycle networks.

Many of the roadways in Linwood identified as technically incompatible have relatively low volumes and low speeds, and thus can comfortably accommodate bicyclists. Patcong Avenue and Maple Avenue serve as examples.



Legend

- | | |
|---------------------------|----------------------|
| US Highway | No Sidewalk |
| County Route | Good/Fair |
| Local Roadway | Poor |
| Linwood Bicycle Path | Proposed Sidewalk |
| Residential, High Density | Municipal Boundaries |
| Residential, Single Unit | Recreational Land |
| Commercial/Services | Civic/Educational |

Linwood Bicycle and Pedestrian Plan
Figure 2: Sidewalk Inventory

July 2011



Baker



STEELMAN BAY

Table 2: Bicycle Compatibility Matrix

Road Name	Between	And	AADT (year)*	Speed Limit (mph)	# of Lanes	Street Parking Permitted (Y/N)	Total Pavement Width (ft)	SH/Lane//Lane/SH NB/NB//SB/SB (ft)	SH/Lane//Lane/SH EB/EB//WB/WB (ft)	Bicycle Compatible	
										Status	Action Needed
US 9 (New Road)	Oean Heights Ave	Monroe Ave	16286 (2009)	40-45	2	N	40.5	8.5/12//12/8		Yes	
	Monroe Ave	Haines Ave	x ≥ 10000	40		N	34	5/12//12/5		Yes	
	Haines Ave	Central Ave	16813 (2011)			N	38	7/12//12/7		Yes	
	Central Ave	Linwood Border	17200 (2011)			N	30	3/12//12/3		No	4' SH
CR 585 (Shore Road)	CR 559 Alt (Ocean Heights Ave)	Patcong Ave	10497 (2009)	35	2	N	29.5	14.5//15		No	4' SH
	Patcong Ave	Glenside Ave	11894 (2007)			N	31	15.5//15.5		No	4' SH
	Glenside Ave	Central Ave	11356 (2008)			N	30.5	16//14.5		No	4' SH
	Central Ave	Linwood Border	x ≥ 10000			N	35	18.5//16.5		No	4' SH
CR 559 Alt (Ocean Heights Avenue)	Township Border	West Ave	18063 (2007)	35	2	N	25		1/11//11/2	No	4' SH
	West Ave	US 9	5367 (2009)			N	26.5		1.5/11//12/2	No	14' SL
	US 9	Wabash Ave	4587 (2007)			N	31.5		4/12//12/3.5	Yes	
Poplar Avenue	Township Border	US 9	1651 (2009)	25	2	Y	39			Yes	
	US 9	Oak Ave	1651 (2009)			Y	40		20//20	Yes	
	Oak Ave	Cedar Pl	1651 (2009)			Y (EB only)	35		19//16	Yes	
	Cedar Pl	Oak Grove Ave	1651 (2009)			Y (WB Only)	Varies 27-30		13-16//14	Yes (EB) No (WB)	12' SL (WB)
	Oak Grove Ave	Wabash Ave	1357 (2009)			N	26.5		12.5//14	Yes	
	Wabash Ave	CR 585 (Shore Rd)	1357 (2009)			Y (WB Only)	31		12.5//18.5	Yes	
Maple Avenue	CR 585 (Shore Rd)	Wabash Ave	248 (2007)	25	1	Y	22	2.5/17/2.5		Yes	
	Wabash Ave	Poplar Ave	704 (2007)		2	Y	35			Yes	
	Poplar Ave	Oak Ave	316 (2008)		2	Y	27.5			Yes	

Road Name	Between	And	AADT (year)*	Speed Limit (mph)	# of Lanes	Street Parking Permitted (Y/N)	Total Pavement Width (ft)	SH/Lane//Lane/SH NB/NB//SB/SB (ft)	SH/Lane//Lane/SH EB/EB//WB/WB (ft)	Bicycle Compatible	
										Status	Action Needed
Oak Avenue	Morris Ave	Somers Ave	2254 (2011)	25	2	Y	37			No	14' SL
	Somers Ave	Essex Ave				N	37			Yes	
	Essex Ave	Poplar Ave	1687 (2011)			Y (NB Only)	31			No	14' SL
	Poplar Ave	US 9	2000 ≤ x ≤ 10000			N	31			Yes	
	US 9	Central Ave				Y	31			No	14' SL
	Central Ave	Village Blvd				Y	26	2/24/0		No	14' SL
	Village Blvd	Vernon Ave				Y	30	2/26/2		No	14' SL
	Vernon Ave	Linwood Border				Y	30			No	14' SL
Patcong Avenue	US 9	Wabash Ave	2817 (2007)	25	2	Y	30		15//15	No	14' SL
	Wabash Ave	CR 585 (Shore Rd)	2817 (2007)	25	2	Y	30		16//14	No	14' SL
Seaview Avenue	West Ave	CR 585 (Shore Rd)	2636 (2007)	25	2	Y	28			No	14' SL
	CR 585 (Shore Rd)	Franklin Blvd	2000 ≤ x ≤ 10000	25	2	Y	22			No	14' SL
	Franklin Blvd	Seaview Dock	2000 ≤ x ≤ 10000	25	2	N	20			No	12' SL
West Avenue	CR 559 Alt	Patcong Ave	907 (2009)	25	2	Y	30			Yes	
Central Avenue (CR 661)	Township Border	Oak Ave	2000 ≤ x ≤ 10000	25	2	Y	26		13//13	No	14' SL
	Oak Ave	US 9	3400 (2011)			Y	32		16//16	No	14' SL
	US 9	Grammercy Ave	4113 (2011)			Y (WB Only)	36		21//15	No	14' SL
	Grammercy Ave	Warren Ave	2000 ≤ x ≤ 10000			Y (WB Only)	33		13//20	No	14' SL
	Warren Ave	CR 585 (Shore Rd)	2000 ≤ x ≤ 10000			Y	40		20//20	No	14' SL
Woodlyne Boulevard	Poplar Ave	Hemlock Dr	1200 ≤ x ≤ 2000	25	2	Y	37			Yes-B	
	Hemlock Dr	Meadow View Ave	1200 ≤ x ≤ 2000			Y	35			Yes-B	
	Meadow View Ave	East Dr	1200 ≤ x ≤ 2000			Y	31			Yes-B	

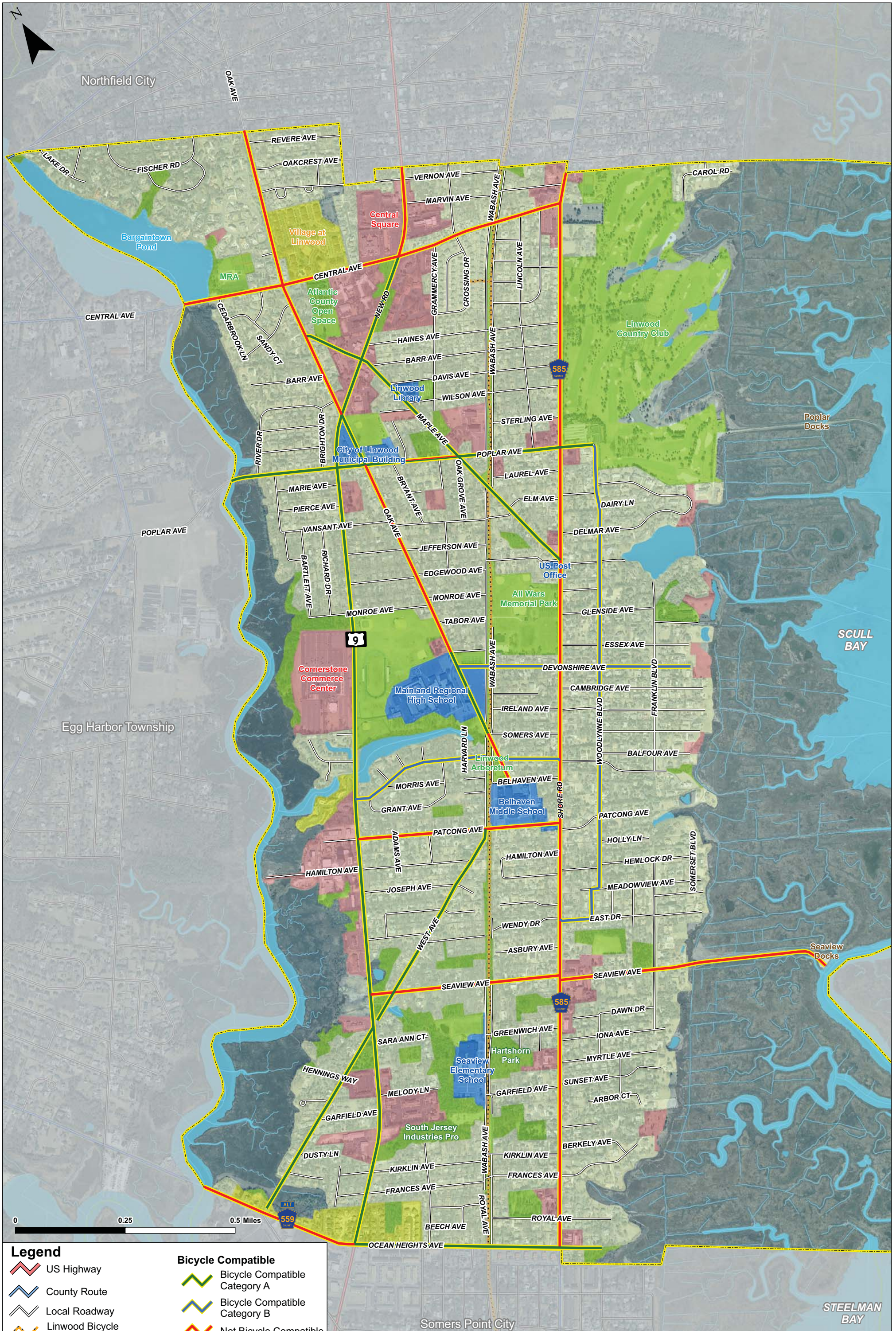
Road Name	Between	And	AADT (year)*	Speed Limit (mph)	# of Lanes	Street Parking Permitted (Y/N)	Total Pavement Width (ft)	SH/Lane//Lane/SH NB/NB//SB/SB (ft)	SH/Lane//Lane/SH EB/EB//WB/WB (ft)	Bicycle Compatible	
										Status	Action Needed
Meadow View Drive	Woodlynne Blvd	Woodlynne Blvd	1200 ≤ x ≤ 2000	25	2	Y	31			Yes-B	
Devonshire Avenue	CR 585 (Shore Rd)	Franklin Blvd	1200 ≤ x ≤ 2000	25	2	Y	37			Yes-B	
East Drive	CR 585 (Shore Rd)	Woodlynne Blvd	1200 ≤ x ≤ 2000	25	2	Y	31			Yes-B	
Monroe Avenue	Wabash Ave	Oak Ave	508 (2011)	25	2	Y	30			Yes	
	Oak Ave	US 9	448 (2011)	25	2	Y	37			Yes	
Morris Avenue	CR 585 (Shore Rd)	Oak Ave	1200 ≤ x ≤ 2000	25	2	Y	30			Yes-B	
School House Drive	Wabash Ave	US 9	1200 ≤ x ≤ 2000	25	2	Y	30		2/26/2	Yes-B	

*AADT – Average Annual Daily Traffic, with most recent year collected. For roadways with no count data, volumes were estimated based on similar roadways and land uses.

SH - Shoulder

SL - Shared Lane

Yes-B - Roadways that do not technically meet criteria since on-street parking is permitted, but can be considered bicycle compatible since the on-street parking is rarely used



Legend

- US Highway
- County Route
- Local Roadway
- Linwood Bicycle Path
- Residential, High Density
- Residential, Single Unit
- Commercial/Services

Bicycle Compatible

- Bicycle Compatible Category A
- Bicycle Compatible Category B
- Not Bicycle Compatible
- Municipal Boundaries
- Recreational Land
- Civic/Educational

Linwood Bicycle and Pedestrian Plan
Figure 3: Bicycle Compatibility
 November 2011



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3.0 PUBLIC INVOLVEMENT

An active public involvement component was important to the Plan. Input was received from the project Steering Committee; persons attending the 2011 Linwood Country Fair; an online survey; and a Public Information Center held to display recommendations.

3.1 STEERING COMMITTEE

Two Steering Committee meetings were held on June 1st, 2011 and October 11th, 2011. The first meeting was held to gather input on key issues and opportunities, and the second meeting was held to present draft conceptual improvements. The Steering Committee is comprised primarily of local residents, with attendance from local officials and an SJTPO representative.

3.2 LINWOOD COUNTRY FAIR

Baker personnel attended the Linwood Country Fair on May 7, 2011, to inform residents of the Bicycle and Pedestrian Plan. A table was shared with the Environmental Commission, and basic maps and information provided about the project. About 10 persons stopped at the table during this event.

3.3 ONLINE SURVEY

An Online Survey was available from May 4th, 2011 to May 31st, 2011 with a link to the survey posted on the City's website.

A total of 40 responses were received. Some of the key findings are:

- 93% of the respondents lived in Linwood
- 90% of the respondents owned a bicycle in working condition
- When asked what would encourage more frequent walking, 50% identified improved trails and paths, and 45% said more or improved sidewalks.
- When asked what would encourage more frequent bicycling, 58% identified more or improved bike lanes, and 55% identified improved trails and paths.

In an open-ended question, participants were asked to list bicycle and pedestrian deficiencies and/or improvements for roadways throughout Linwood. Following is a summary of the most popular responses:

- Improve sidewalks and crosswalks along New Road
- Improve sidewalks and crosswalks on Shore Road
- Improve pedestrian travel on Central Avenue
- Improve bicycle travel on New Road, Shore Road, and Central Avenue

A summary of responses received from the Online Survey is provided in **Appendix A**.

3.4 PUBLIC INFORMATION CENTER

A Public Information Center was held on November 29th, 2011 from 4 to 7 PM, and attendees provided feedback on the proposed Bicycle and Pedestrian Plan. The proposal to extend the Linwood bike path drew the most attention. One attendee welcomed the idea, but another attendee questioned the

safety of running a public path through the Mainland Regional High School tract. A summary of the Public Information Center is provided in **Appendix B**.

4.0 PROPOSED BICYCLE NETWORK

A bicycle network is proposed to accommodate trips to major land uses in the city, comprising both public roadways and the Linwood bike path. Roadways to be incorporated in this network were selected in collaboration with Linwood residents on the project steering committee. The Plan proposes enhancing roadways in the network for the use of bicyclists through appropriate signing, striping and markings. Improvements are also proposed for the bike path.

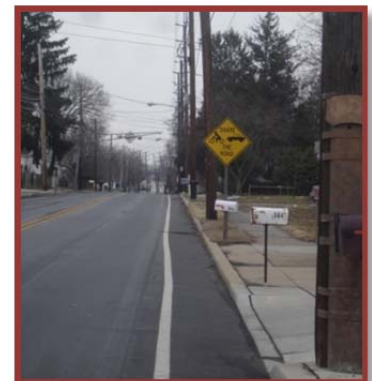
4.1 BICYCLE FACILITY TYPES

NJDOT's *Planning and Design Guidelines for Bicycle Compatible Roadways and Bikeways* outline the types of on-road bicycle facilities that were considered for Linwood's roadway network: Bicycle Lane, Paved Shoulder, and Shared Lane. Specific roadway attributes (pavement width, parking provisions, traffic volumes, posted speed limit, etc.) were inventoried and assessed to determine the feasibility of each facility under existing conditions. No major road improvements are proposed. These facilities have been successfully applied on urban and suburban roadway networks in attempts to better accommodate bicycle travel. Following is a description of each facility:

Bike Lane. Bicycle lanes are designated travel lanes for exclusive or preferential use by bicyclists, and are typically 5 to 6 feet in width. Bicycle lanes are often located on roadways in urban settings with moderate to high vehicular traffic volumes, moderate to high posted speeds and permitted or designated on-street parking. According to the Manual on Uniform Traffic Control Devices, bicycle lanes must include the words "bike lane" or the bike lane symbol; they may be accompanied by bike lane signs. Studies have shown that bike lanes have many safety benefits, and one study concluded that they were the safest type of bike facility. They decrease the number of bicyclists riding on the sidewalk, and they increase the compliance of bicyclists with traffic controls.



Paved Shoulders. A paved shoulder accommodates bicyclists on the roadway shoulder adjacent to vehicular travel lanes. Paved shoulders can be located on urban or rural roadways with moderate to high vehicular traffic volumes and moderate to high posted speeds. Paved shoulders for bicyclists typically range in width from 4 to 6 feet, and are occasionally supplemented with 'Share the Road' warning signs. Shoulders are used in a variety of circumstances. Bicyclists appreciate them because they indicate an area of roadway in which motorists normally do not encroach. On roadways where 5-foot bike lanes cannot be fit, 3- to 4-foot shoulders



can sometimes be striped. This creation of 4-foot shoulders on Shore Road is proposed for this reason. Studies show that on roadways without on-street parking, the effect of shoulders is similar to bike lanes.

Shared Lane. A shared lane accommodates bicyclists and motorists in the same travel lane. Shared lanes can be located on roadways with low vehicular traffic volumes and low posted speeds, and are occasionally supplemented with ‘Share the Road’ warning signs. Wide outside travel lanes (ideally 14 feet) are often desired for shared lane facilities.



Shared Lane Markings

Informally referred to as “sharrows,” shared lane markings are a sub-category of shared lanes; bicyclists shared the road with motorists, but markings guide bicyclists with lateral positioning, unlike the typical shared lane. The sharrow markings comprise two chevrons together with a bicyclist symbol, with the center of the chevron marked 11 feet from the curb on streets with parking, and 4 feet from the curb on streets without parking. These markings are placed after intersections and spaced at intervals of at least every 250 feet. They should be accommodated by “Bicycles May Use Full Lane” signs (MUTCD R4-11). They are particularly recommended for use on urban streets with on-street parking where bike lanes cannot be accommodated. They are a relatively new marking, having just been approved for inclusion in the 2009 Manual on Uniform Traffic Control Devices (MUTCD). Initial studies show a number of safety benefits of sharrows. In one study in San Francisco, sharrows were shown to reduce sidewalk riding by 35% and the number of wrong-way bicyclists by 80%. They also were demonstrated to increase the distance between bicyclists and passing cars and parked cars.¹ The success of sharrows in increasing distance between bicycles and cars was also demonstrated in other studies.²



¹ San Francisco Department of Parking and Traffic, *San Francisco’s Shared Lane Pavement Markings: Improving Bicycle Safety*, 1984.

² FHWA, *TechBrief: Evaluation of Shared Lane Markings*, FHWA Publication No. FHWA-HRT-10-044, October 2010.

Bike Path

Bike paths (often referred to as shared use paths, since they accommodate a variety of non-motorized users, especially pedestrians) are bikeways that are physically separated from motorized traffic by an open space or barrier.



4.2 PROPOSED BICYCLE FACILITIES

This section presents proposed and improved bicycle facilities throughout Linwood. Improvements within each facility type are discussed below. **Figure 4** indicates the roadways proposed for the facilities. Pieced together, the facilities comprise a comprehensive bicycle network using select streets that can be used to travel the length of the city.

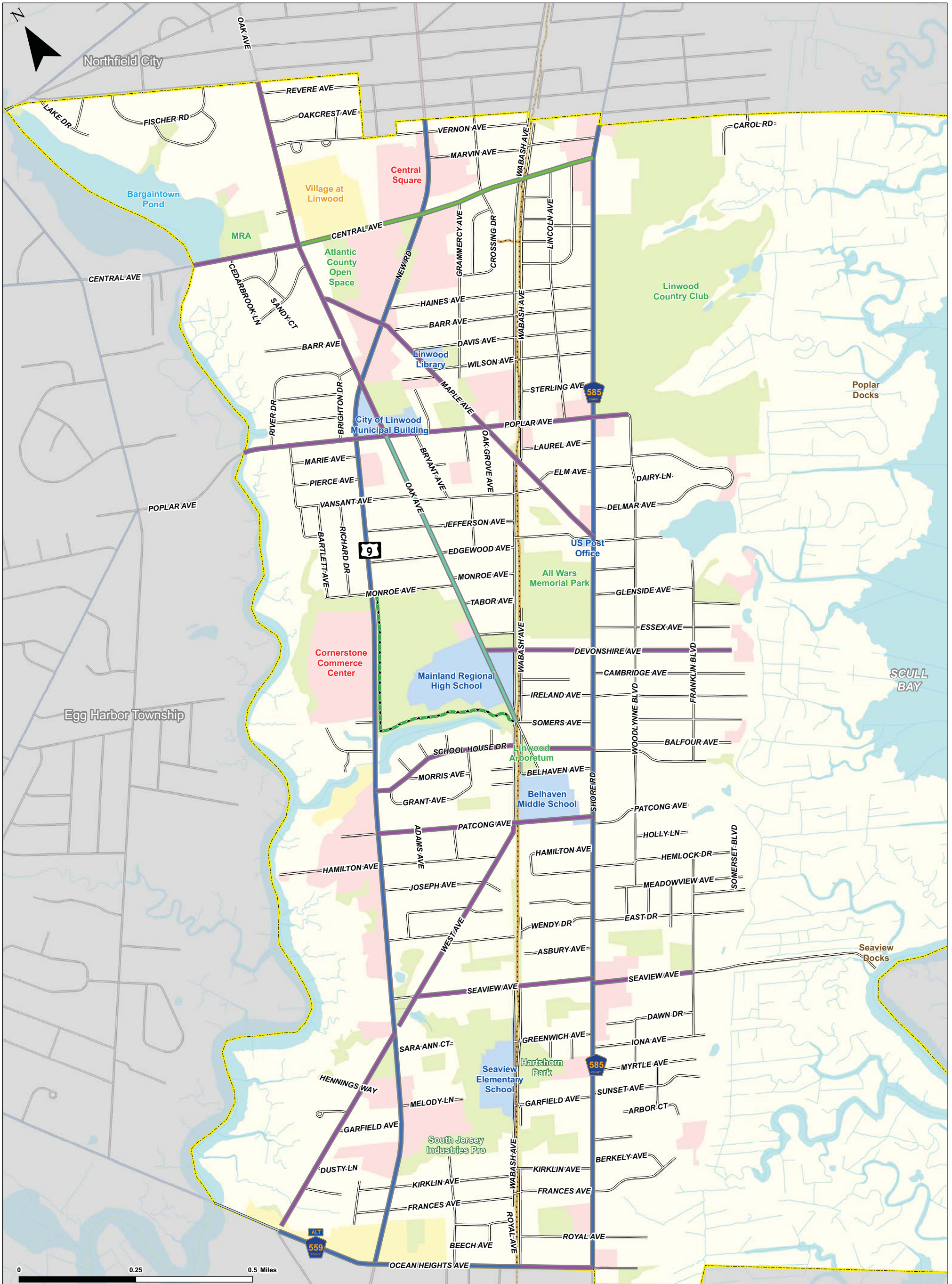
4.2.1 Bike Path

The Linwood Bike Path is the premier bicycle facility in Linwood; indeed, it is the only designated bicycle facility in Linwood. It accommodates not just bicyclists, but also pedestrians, joggers, skateboarders, and in-line skaters. It is widely used, and contributes greatly to the quality of life in the community. It is not just a place for exercise, but a place for gathering. To increase its ability to accommodate and encourage bicycle and pedestrian travel in the community, a number of strategies are recommended.



Extend Bike Path to New Road

The most visible strategy involves extending the Bike Path to New Road via the Mainland Regional High School tract. The path extension along New Road would tie into the future signalized access into the Cornerstone Commerce Center, and would thus permit safer travel to Cornerstone for high school students as well as residents of the surrounding neighborhood. This strategy was developed following coordination with representatives of the Mainland Regional School District, who expressed interest in a safer route for their students.



Legend

- US Highway
- County Route
- Local Roadway
- Linwood Bicycle Path
- Municipal Boundaries
- Residential, High Density
- Residential, Single Unit
- Commercial/Services

Bicycle Facilities

- Bicycle Lane
- Bike Path Extension
- Signed Share The Road
- Signed Share The Road, with Shoulder
- Shared Lane Markings (Sharrows)
- Recreational Land
- Civic/Educational

Linwood Bicycle and Pedestrian Plan
Figure 4: Proposed Bicycle Network

November 2011



Baker



As illustrated in **Figure 5**, a 12-foot wide path extension would begin at the intersection of Oak Avenue and Wabash Avenue, and run to the south of the High School. Immediately to the west of the High School, there are two options for extending the path to New Road: it could be placed immediately north of Off's Pond, or it could swing north just past the high school to the existing 18-foot service road.

There are pros and cons associated with either bike path alignment:

Alignment north of Off's Pond

- Pro – A bike path in this position could remain on the periphery of the high school tract for the entire length of the extension. It would also be more scenic than the other alignment, given its proximity to Off's Pond.
- Con – The bike path alignment immediately north of Off's Pond would be in close proximity to the outfield fence of a softball field, and the sideline of a soccer field. Based upon initial field views, the path might also disturb vegetation within the buffer area of the wetlands and riparian zone associated with Off's Pond. However, it should be noted that even if the path is found to disturb vegetation within a wetland buffer area, conditions would likely still be favorable for gaining a permit for construction under state environmental regulations provided reasonable efforts are made to avoid and minimize the disturbance to regulated resources.

Alignment south of 18-foot service road

- Pro – A path in this position would be farther removed from athletic playing surfaces, although it would be closer to the small bleachers north of the softball/soccer field.
- Con – A path here would run through the high school tract, not on the periphery. It would thus be more difficult to segregate from the high school tract.

On the final segment of the extension, the bike path could be placed parallel to and 5 feet to the east of New Road.

At the study Public Meeting in November 2011, the idea of the bike path extension met with general approval, although two residents did express concern about placing the path through the high school tract, in part for safety reasons. These concerns can be addressed in several ways:

- A fence can be installed between the bike path and the softball field/soccer field to distinguish the bike path area from the school area
- As a practical matter, there is no reason why operations on the bike path extension would present different issues of personal safety than the existing bike path, which passes immediately adjacent to Seaview Elementary School and Belhaven Middle School, and which also passes through a leafy and relatively secluded area between Seaview Avenue and Patcong Avenue.



Linwood Bicycle and Pedestrian Plan
Figure 5: Proposed Bike Path Extension
 September 2011

LEGEND

- XXXXX Fence
- Linwood Bike Path



High school students ride their bikes south, in the northbound shoulder of New Road, as part of a trip from the high school entrance to the Cornerstone Commerce Center. The proposed bike path extension would be able to better accommodate these trips.

Widen Bike Path

The width of the existing Linwood Bike Path is indicated in **Figure 6**. As shown, the bike path is typically 8.5 feet in width below Maple Avenue, and typically 10 feet in width above Maple Avenue. Based on anecdotal field views, there are high numbers of pedestrians on the path. Several respondents to the online survey also expressed concern about dog walkers occupying much of the path with stretched out leashes, and these were also observed on field views.

According to the 1999 AASHTO *Guide for the Development of Bicycle Facilities*, the recommended width for a two-directional shared use path is 10 feet, although in rare instances, a width of 8 feet is adequate. The discussion of desirable bike path width is expanded in AASHTO's February 2010 draft *Guide for the Planning, Design and Operation of Bicycle Facilities*. The draft 2010 Guide indicates that wider pathways of 11 to 14 feet are recommended in locations with a high percentage of pedestrians and high user volumes, which is the case in Linwood. As noted in the Guide, an 11-foot pathway will permit a bicyclist to pass another path user going the same direction, at the same time that a path user is approaching from the opposite direction.

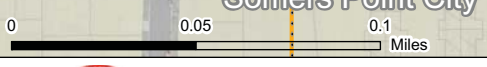
SOUTH

MIDDLE

NORTH



Somers Point City



Linwood Bicycle and Pedestrian Plan
 Figure 6: Right of Way Width of Bike Path and Wabash Avenue

November 2011

Given the popularity of the Linwood Bike Path, it is recommended that the bike path width be increased to at least 11 feet in width, and a width of 12 to 14 feet would be desirable. To create a facility that significantly reduces conflicts between pedestrians and bicyclists, the path could be widened to 15 feet in width, with 10 feet reserved for two-way bicycle traffic, and 5 feet reserved for two-way pedestrian traffic.

There is ample existing right-of-way to widen the path, and the path can be widened within the existing grass median, which hosts the existing bike path. Through most of Linwood, the ROW varies between 90 and 135 feet, including the width of Wabash Avenue. The grass median varies from 21 to 55 feet in width. The only segment where widening would be constrained is below Maple Avenue, with a 40 foot ROW (including Wabash Avenue) and only an 11.5 foot median.

Along with widening the path, lighting standards along the path will also need to be moved. To the extent practicable, the widening should take place along only one side, but since lights are found along both sides of the path, some relocation of lights is unavoidable.

Cost estimates for widening the bike path are provided in Section 8.2.



A wider path would reduce conflicts between dog walkers and other users.

Revise Signage along Bike Path

There is an excess of signage along the bike path. There are 19 intersections of east-west roadways with the bike path, and at 18 of these intersections, there is either a “Walk Bike Across Intersection” sign or Stop sign. **Figure 7** indicates the type and location of signs. Linwood is only about 2.5 miles in length, resulting in a high frequency of Stops for a bike facility. Further, at a number of these intersections, the intersecting street is Stop-controlled. At virtually every intersection, the side street has low or moderate traffic volumes, with a 25 MPH speed limit.

The study team conducted many field views throughout the study, and it was observed that bicyclists rarely stopped or walked their bike across the intersection, with the exception of major cross streets such as Ocean Heights Avenue. The problem with the profusion of signage, and signage where not needed, is that it can lead bicyclists to ignore such signage at intersections where not doing so is actually dangerous.

It is thus recommended that a number of the “Walk Bike Across Intersection” signs and Stop signs be removed. The recommendations are presented in **Figure 8**. Stop signs along the bike path are retained for Garfield Avenue, Greenwich Avenue, Devonshire Avenue, and Poplar Avenue since these are all-way stops, and it would be confusing if certain approaches were not controlled. Stop signs are also retained

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Other Improvements

Given the heavy use of the bike path, consideration should be given to striping a centerline. As noted in the 1999 AASHTO Guide, a centerline may be beneficial in areas with heavy volumes of bicyclists, and will help to remind users that it is a two-way path.

It is also recommended that the unpaved shoulder be level with the paved path, to facilitate transitions both on and off the path.

SOUTH

MIDDLE

NORTH



Signs Along the Bike Path

- Bike Path "Walk Bike Across Intersection" Sign
- Roadway "Stop" Sign
- Bike Path "Stop" Sign

- Bike Path "Stop" Sign and "Walk Bike Across Intersection" Sign

Linwood Bicycle and Pedestrian Plan
Figure 7: Existing Signs Along Bike Path

SOUTH

MIDDLE

NORTH



Existing and Proposed Signs Along the Bike Path

-  Proposed Bike Path W2-1 Sign
-  Existing Roadway "Stop" Sign
-  Existing Bike Path "Stop" Sign

Linwood Bicycle and Pedestrian Plan
Figure 8: Proposed Signs Along Bike Path

4.2.2 Bike Lanes

Although bike lanes are generally the most preferred type of on-road bicycle facility, there are few opportunities for installing them on Linwood roadways. The installation would require removing on-street parking from virtually any roadway on which they would be proposed. Because Central Avenue has a higher volume than most east-west roadways, and minimal use of on-street parking, this was seen as more promising for bike lanes than other roads.

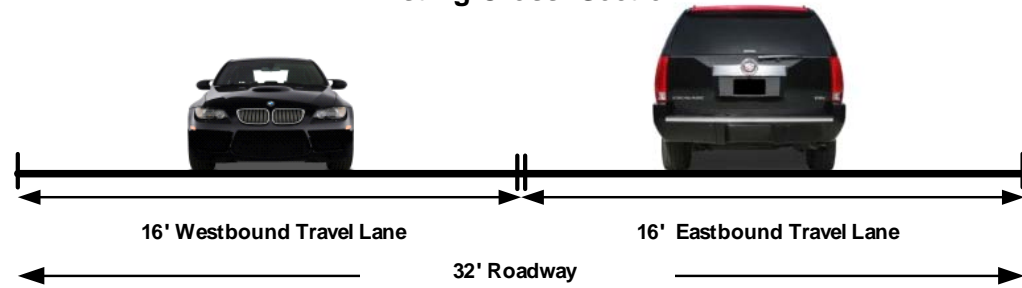
A conceptual design was prepared for Central Avenue to indicate the likely cross-section if bike lanes were installed, as shown in **Figure 9**. Because of the varying width of Central Avenue between Shore Road and Oak Avenue, four different cross-sections would be necessary. On-street parking could be retained on only one segment – and even then on only one side – for the easternmost section between Warren Avenue and Shore Road, where the roadway is 40 feet wide. On this section parking is proposed for the westbound side, to accommodate persons parking at Central United Methodist Church. Other than parking associated with the church, Central Avenue appears to receive very little use of on-street parking. On field views, there were never more than two vehicles parked on the entire length of the roadway.

It is noted that the changes in cross section are typically not significant, as the 5-foot bike lanes would be a constant cross-section element. Travel lanes would vary from 11 to 13 feet in width. There would be some transition, however minimal, between the different sections. The greatest transition would occur at Warren Avenue, as the 8-foot parking lane on westbound Central Avenue to the east of Warren Avenue would be eliminated.

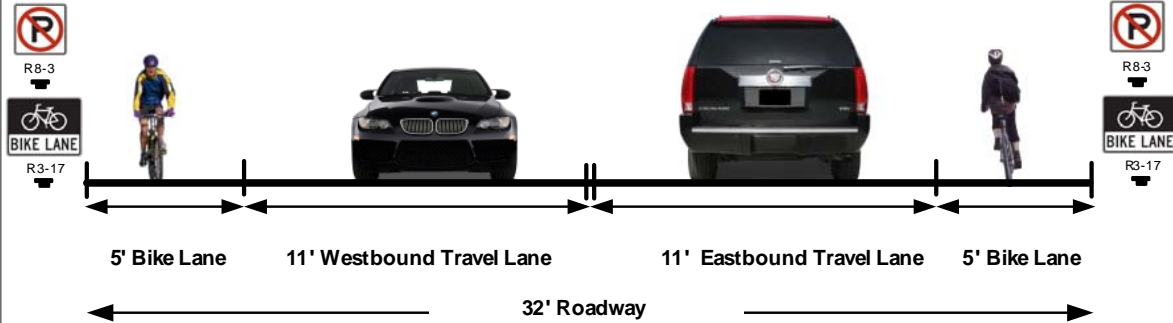
Further illustrating the practical difficulties in installing bike lanes on Central Avenue, the section to the west of Oak Avenue cannot accommodate them at all. There are two travel lanes of 13 feet in width, and these are too narrow to stripe bike lanes.

Central Avenue - Between Oak Avenue and New Road (US 9)

Existing Cross- Section

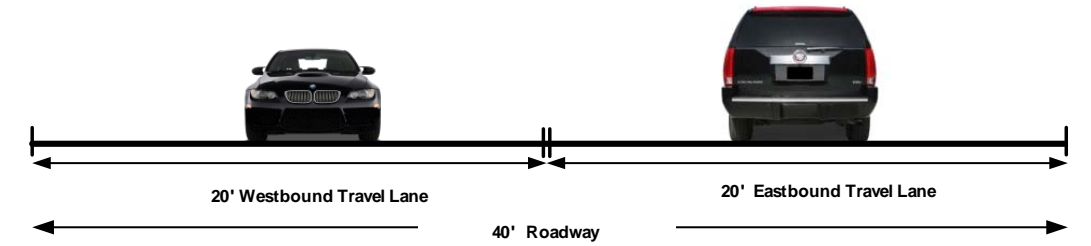


Proposed Cross- Section

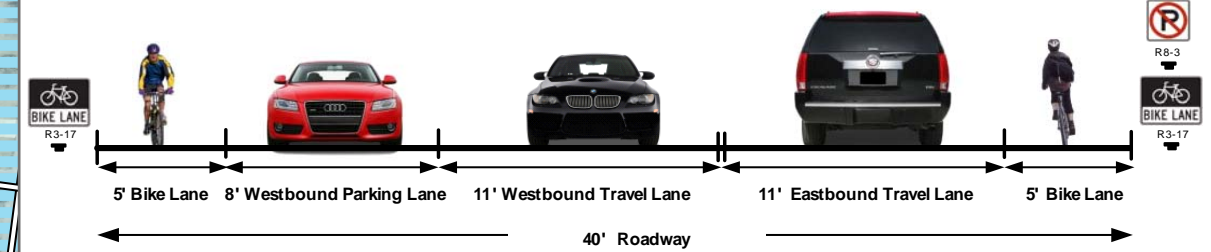


Central Avenue - Between Warren Avenue and Shore Road (CR 585)

Existing Cross- Section

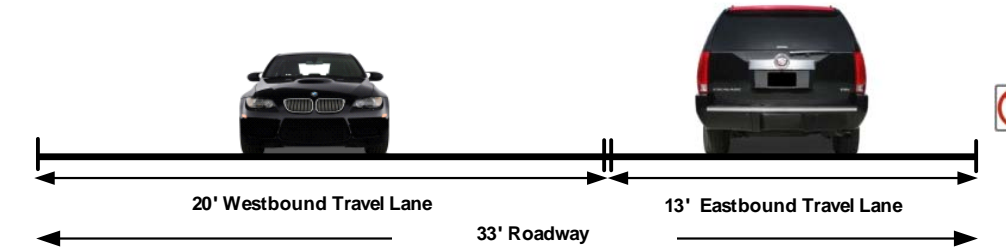


Proposed Cross- Section

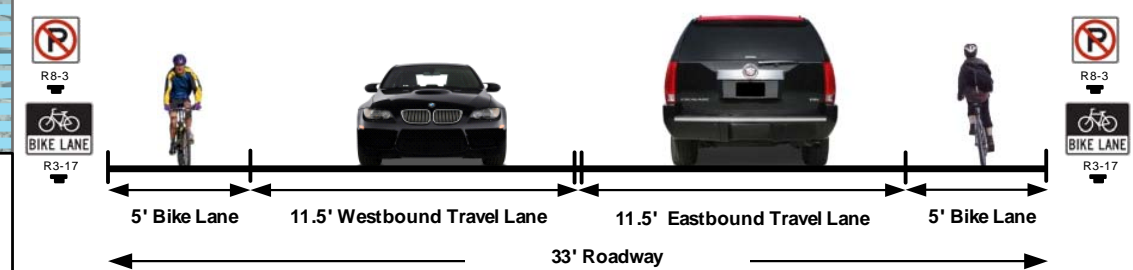


Central Avenue - Between Grammercy Avenue and Warren Avenue

Existing Cross- Section

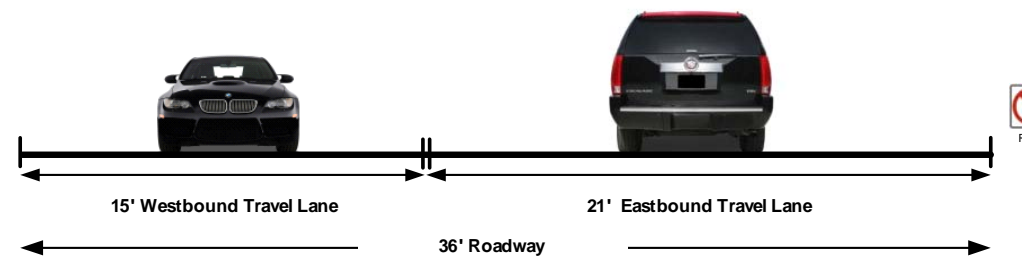


Proposed Cross- Section

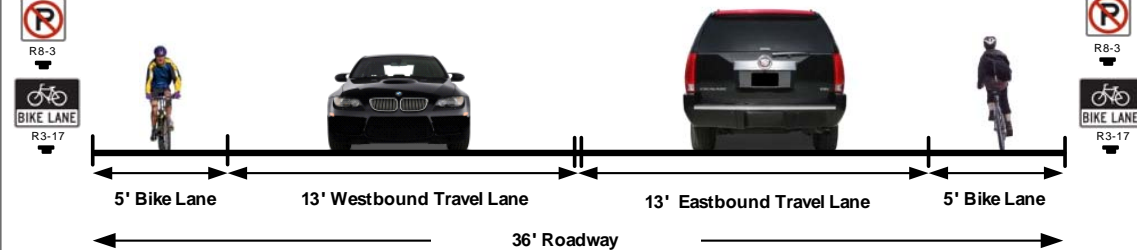


Central Avenue - Between US 9 and Grammercy Avenue

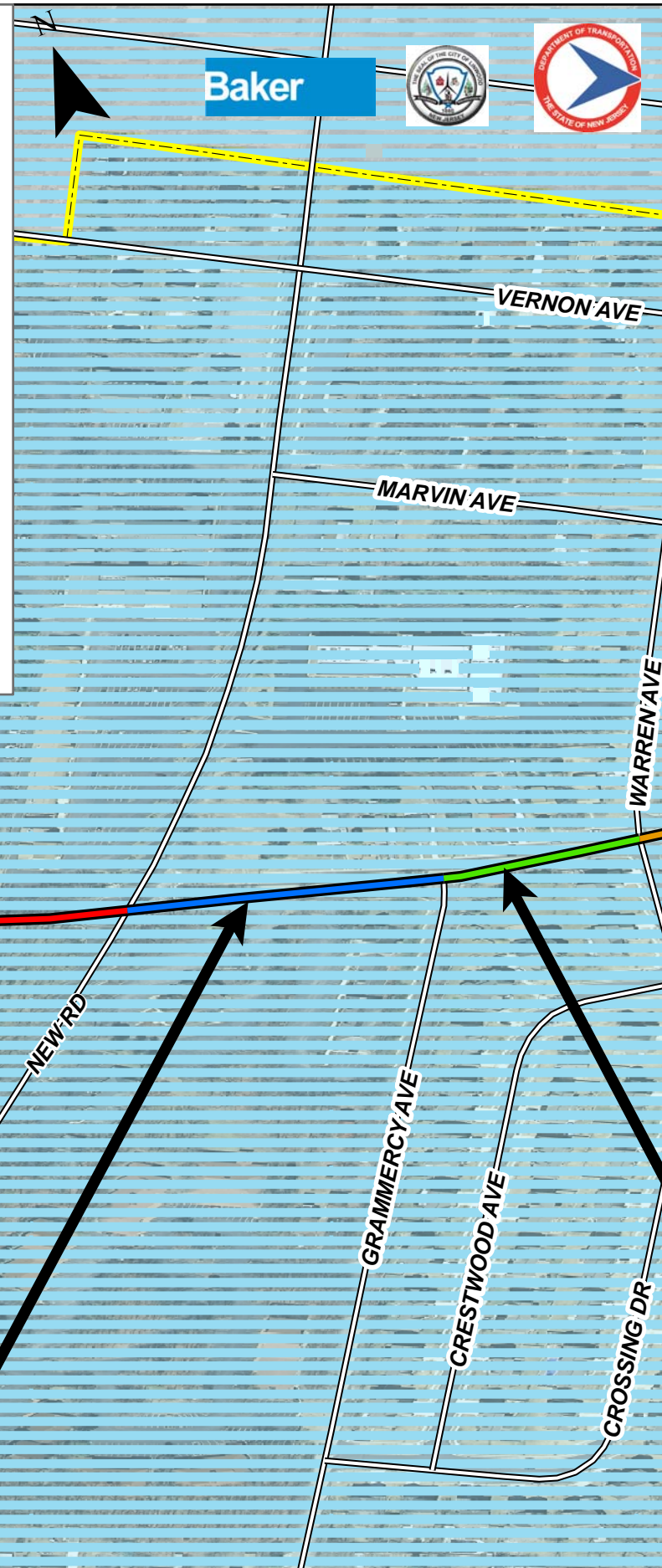
Existing Cross- Section



Proposed Cross- Section



Linwood Bicycle and Pedestrian Plan
Figure 9: Bike Lanes on Central Avenue
 November 2011



4.2.3 Bicycle Compatible Shoulders

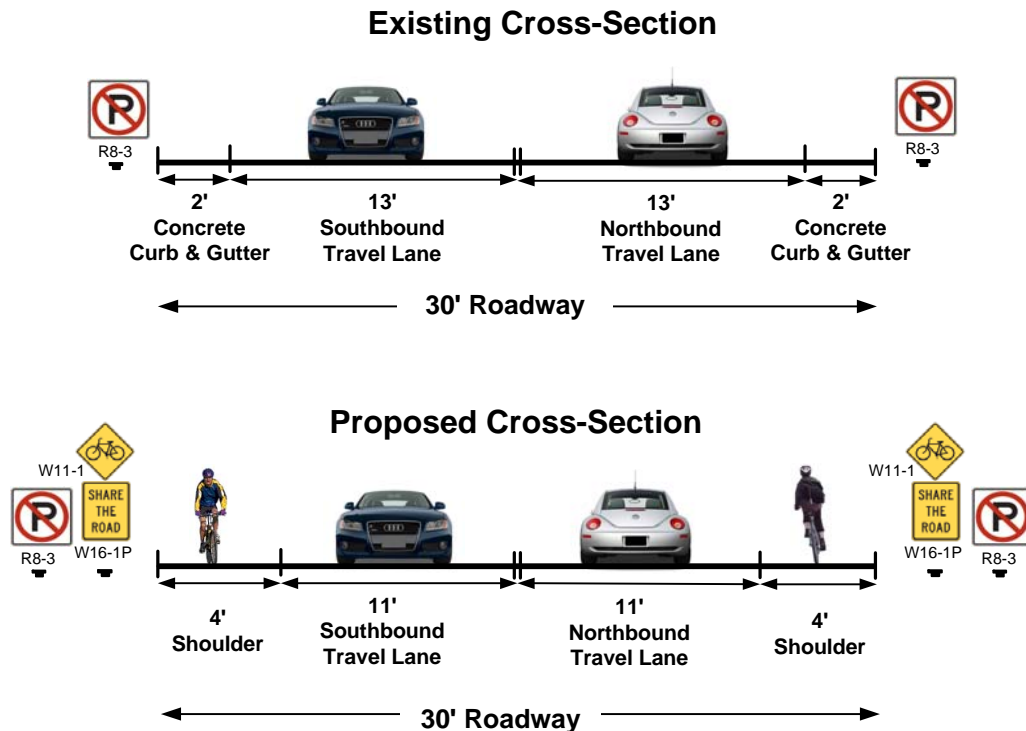
The only road with bicycle compatible shoulders currently is New Road. No change is proposed for the design of this roadway. Shoulders are proposed to be created on Shore Road and Ocean Heights Avenue, as discussed below.

Shore Road

The typical cross-section on Shore Road is comprised of two 13-foot travel lanes and a two-foot concrete curb and gutter section. The problem with a concrete curb and gutter section on this roadway is the seam created at the junction with the asphalt-paved roadway. This seam is in the vicinity where a typical bicyclist would ride, desiring to stay as far away from moving traffic as possible. Concrete gutter sections are less common than they used to be, due in part to greater expense of installation and maintenance. As part of future scheduled resurfacing of this roadway, it is recommended that the concrete gutter be replaced with asphalt, thus eliminating the concrete-asphalt seam. When this takes place, Shore Road should be restriped as two 11-foot lanes and 4-foot bicycle-compatible shoulders.

Figure 10 indicates the cross-section before and after.

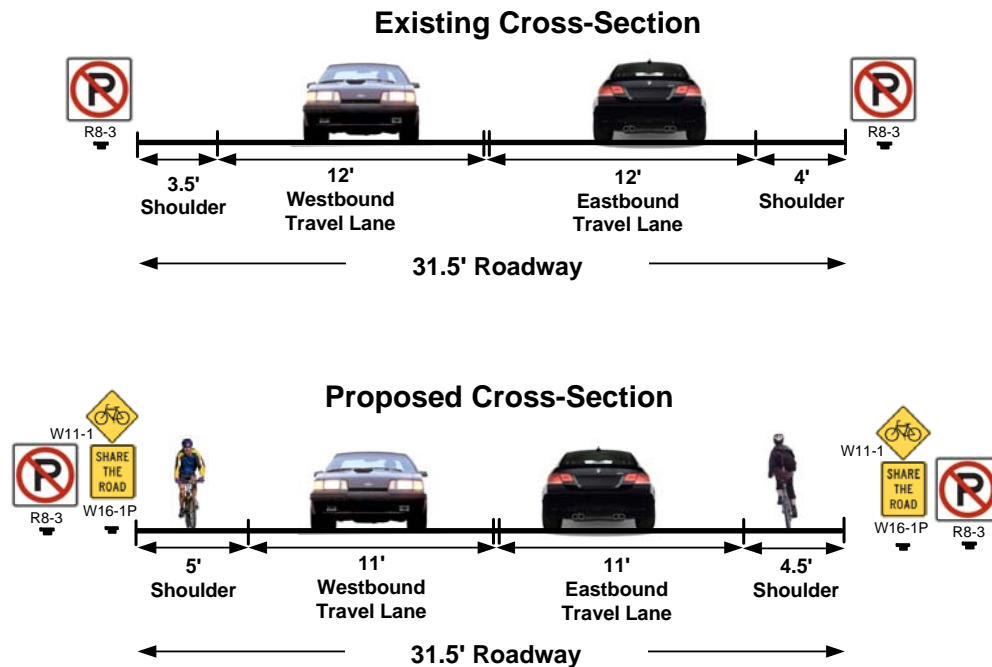
Figure 10: Proposed Treatment on Shore Road



Ocean Heights Avenue

The plan for Ocean Heights Avenue differs according to section, as indicated in **Figure 11**. Between Wabash Avenue and New Road, Ocean Heights Avenue is 31.5 feet wide, with 12-foot travel lanes and 3.5 to 4 foot shoulders. To make this section more compatible for bicycle travel, the travel lanes should be reduced to 11 feet, and the shoulders widened.

Figure 11: Proposed Shoulders on Ocean Heights Avenue



4.2.4 Shared Lanes

Under the Plan, most of the on-road bicycle network in Linwood would consist of shared lanes. As noted earlier, shared lanes (as opposed to bike lanes or striped shoulders) are appropriate for accommodating bicycle travel in Linwood, since many of the roadways have low traffic volumes and posted speeds. Minimal treatments are recommended for these roadways, since widening or the removal of on-street parking is generally impracticable. If desired, “Share the Road” signs may be installed at 1000-foot intervals. Although a number of these roadways are technically incompatible by NJDOT standards, the infrequent use of on-street parking (on streets where parking is permitted) makes these roadways more comfortable for bicyclists than indicated by strict application of the compatibility matrix.

Roads recommended for “Share the Road” treatment include:

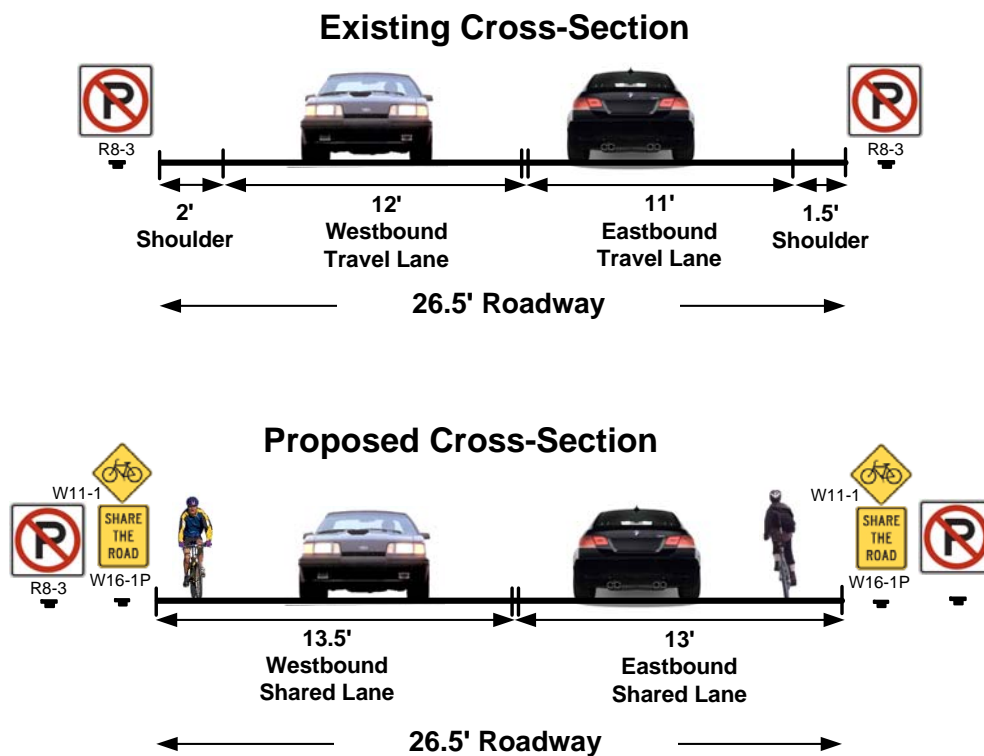
- Seaview Avenue
- West Avenue
- Ocean Heights Avenue (between Wabash Avenue and Shore Road)
- Patcong Avenue

- Schoolhouse Drive
- Devonshire Avenue
- Maple Avenue
- Poplar Avenue
- Oak Avenue (between Poplar Avenue and the border with Northfield Borough)
- Central Avenue (between Oak Avenue and the border with Egg Harbor Township)

Illustrations are provided for the proposed shared lane treatments on Ocean Heights Avenue, Poplar Avenue, and Seaview Avenue.

On Ocean Heights Avenue between West Avenue and New Road, the cross-section is comprised of 11-foot and 12-foot travel lanes, and 1.5 to 2-foot shoulders. The shoulders are too narrow to accommodate bicyclists, and the travel lanes are also too narrow to be bike-compatible. Therefore, on this section, it is proposed that shoulders be eliminated, and the travel lanes widened to 13 to 13.5 feet (**Figure 12**). These widths are slightly shy of the 14-foot shared lane width preferred for this roadway, but represent an improvement over existing conditions.

Figure 12: Proposed Shared Lanes on Ocean Heights Avenue



Most of Poplar Avenue is bicycle-compatible under existing conditions. The only section not bicycle-compatible is between Cedar Place and Oak Grove Avenue. To make this section compatible, it is recommended that parking be prohibited on the westbound side (**Figure 13**). On-street parking is not heavily used here, and the existing travel lane of 14 feet is too narrow to accommodate on-street parking in any case.

Seaview Avenue is a relatively narrow roadway (varying between 22 and 28 feet in width), it is recommended that on-street parking be prohibited on at least one side of the roadway, and preferably on both sides (**Figure 14**).

Although restricting on-street parking on Poplar Avenue and Seaview Avenue as recommended above would improve conditions for bicyclists, it should be noted Poplar Avenue and Seaview Avenue can adequately accommodate bicyclists under existing conditions because of the low traffic volumes and speeds.

Figure 13: Proposed Treatment on Poplar Avenue

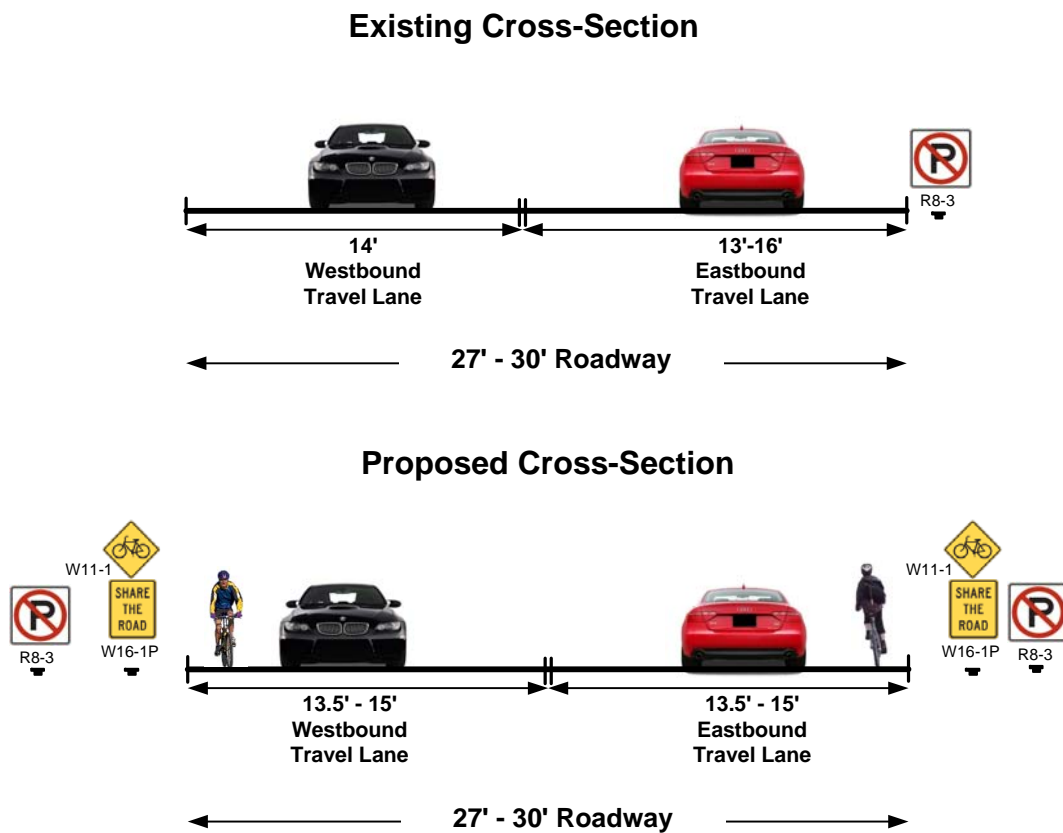
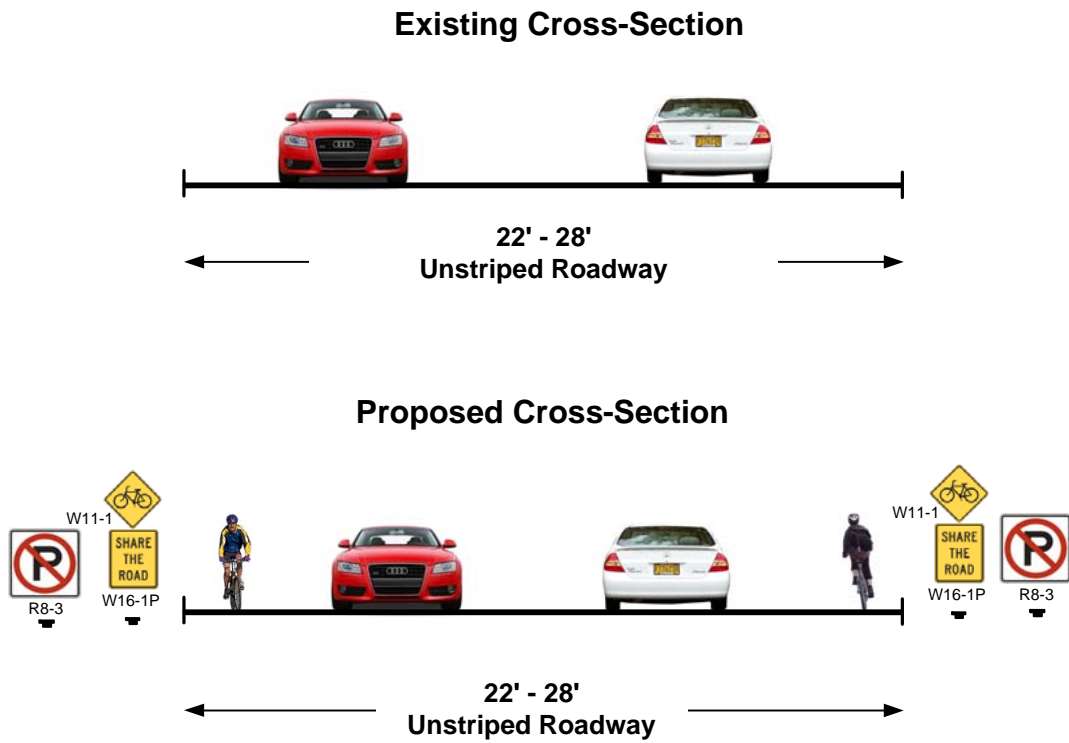


Figure 14: Proposed Treatment on Seaview Avenue



4.2.5 Shared Lane Markings

As noted above, shared lane markings, or “sharrows,” are a sub-category of shared lanes. They are proposed for only one roadway in Linwood: Oak Avenue. This roadway would be a good place to install sharrows since on-street parking on Oak Avenue is used to a greater extent than other collector roadways, and sharrows are effective at encouraging bicyclists to ride at an appropriate distance from parked cars (and thus avoid “dooring”). Further, this roadway receives regular bicycle use, given its location proximate to schools. Sharrows are thus recommended to be placed on Oak Avenue between the Municipal Building and Belhaven Middle School.

4.3 BICYCLE PARKING

Bicycle parking is an important element of the bicycle infrastructure. Well-maintained bicycle parking can help encourage bicycle trips to destinations that might otherwise be avoided. Further, in the absence of visible and functional bicycle parking, bicyclists may simply choose to lock their bikes to lamp posts or other fixtures.

An effective way to determine the best place to locate bike racks is to identify where bicyclists currently park their bikes. Conversely, placing bike racks where they go unnoticed or in locations inconvenient to

bicyclists, will ensure that they go unused. As noted in *Bicycle Parking Guidelines* (Association of Pedestrian and Bicycle Professionals (APBP), 2nd edition), short-term parking racks should be:

- Placed no more than 50 feet from the door of the destination; otherwise, cyclist may lock to other street furniture or trees.
- Visible from the destination to reassure cyclists about the security of the rack.
- Located in a high-traffic area with passive surveillance or eyes on the street.
- Located along the desire line from adjacent bikeway (the path that cyclists are most likely to travel).

A comprehensive survey of bike parking facilities was not conducted as part of this study, but bike parking facilities were reviewed on Thursday, June 9th, at the three schools in Linwood. **Table 3** provides a summary of the approximate number of bike rack spaces at each school, and occupancy:

Table 3: Bike Parking at Schools

School	Spaces (Approximate)	Number of Bikes
Mainland Regional High School	0	11
Belhaven Middle School	138	62
Seaview Elementary School	120	39

As noted above, no bike parking is provided at Mainland Regional High School. On a field view, it was noted that eight bicycles were attached to a chain-link fence by the entrance to the school. Several other bicycles were scattered around the premises.

Based on the field views, there is sufficient parking at Belhaven Middle School and Seaview Elementary School, although the bike racks at both locations are either the “Wave” or “Comb” variety, neither of which is recommended for use by the Association of Pedestrian and Bicycle Professionals. The “Wave” rack is not recommended as it supports a bicycle only in one place. Additionally, it is often misused by bicyclists who lock a bicycle parallel to the frame (not perpendicular), thus permitting only two bicycles to be locked to a rack that has capacity for four bicycles. The “Comb” rack is worse than the “Wave,” since it supports the bicycle by the tire; this makes the bicycle more susceptible to theft, and the tire can become bent. For both types of bike racks, handlebar conflicts are common between adjacent bikes, and, in general, it can be difficult to lift in as many bicycles as the manufacturer promises.



On the left: comb bike racks at Seaview Elementary School. On the right: comb bike racks in the background, and wave bike racks in the foreground, at Belhaven Middle School.

For each location, the design of bicycle racks will vary as the available space for secure bike parking may be limited. The following criteria are recommended by APBP:

- Support the bicycle upright by its frame in two places.
- Prevent the wheel of the bicycle from tipping over.
- Enable the frame and one or both wheels to be secured.

Two of the most commonly recommended bike racks are the “Inverted-U” and “Post and Ring” style bike racks. Both designs support bicycles at two points, are intuitive to use and inexpensive. These can be easily arranged in a series to expand capacity of parking at any one location.



Inverted-U bike rack from Sunshine U-LOK Corporation



Post and Ring bike racks shown at the Philadelphia Zoo

In Linwood, bicycle racks are recommended to be placed at the following locations, among others:

- Linwood City Hall
- Cornerstone Commerce Center, Central Square, and other major retail centers
- US Post Office
- Mainland Recreational Association (MRA)
- Mainland Regional High School

5.0 SIDEWALK PRIORITY

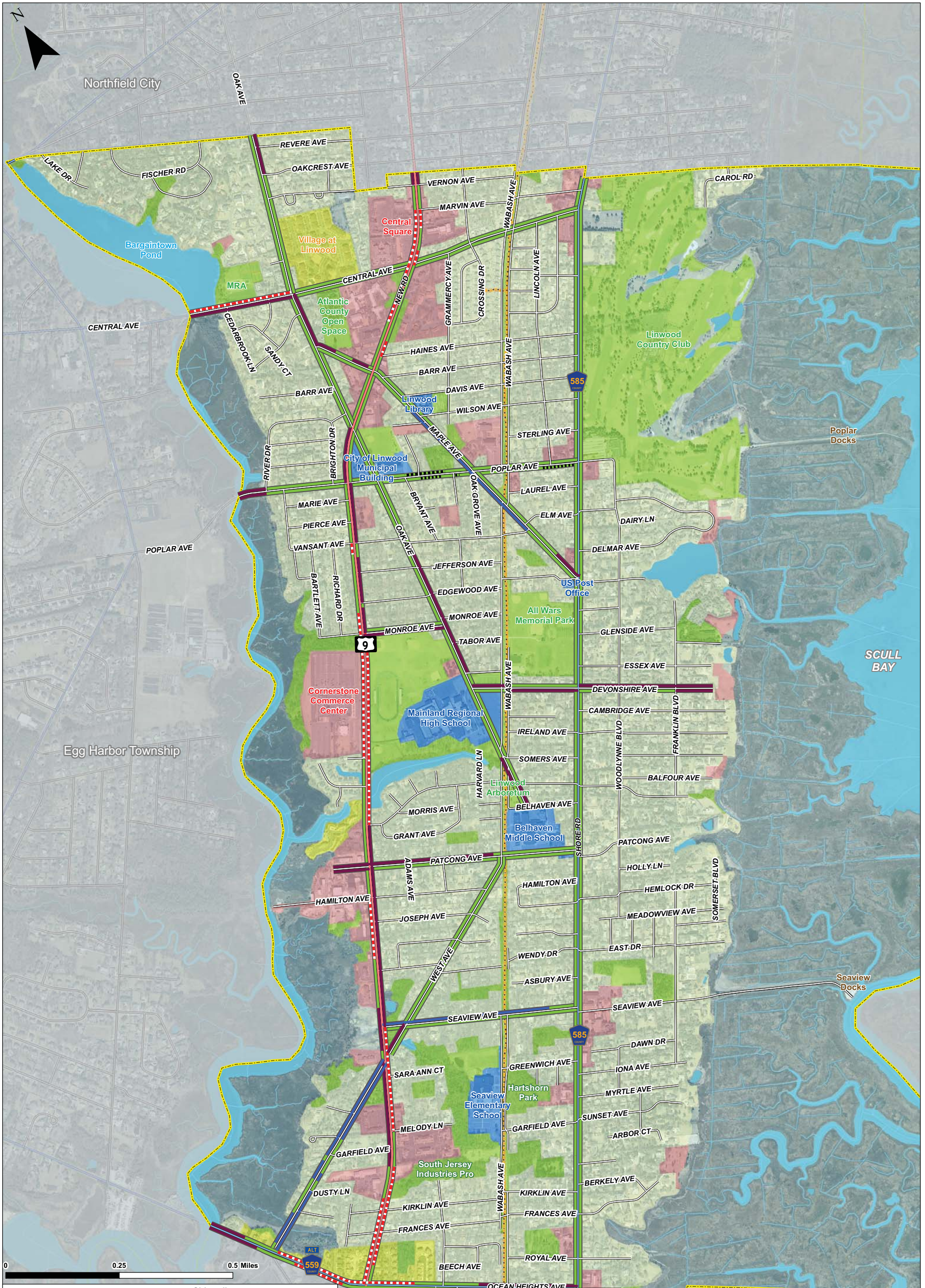
Sidewalks are absent along many roadway segments in Linwood, as revealed by the Sidewalk Inventory discussed in Section 2.0. Given the many segments without sidewalks, the City should set priorities for installing sidewalks as the capital program permits. A proposed Sidewalk Priority rating is illustrated in **Figure 15**, and the initial categorization of sidewalk priorities was determined using the criteria in **Table 4**. A higher priority is assigned to missing sidewalk segments proximate to pedestrian-friendly land uses, schools, transit stops and public facilities. Further, missing segments on roadways with higher volumes and speeds are also considered to be high priority.

Table 4: Sidewalk Priority System Ranking

Adjacent Land Use		Block Frontage with Sidewalk	
Pedestrian-Friendly Commercial	5	Neither side has sidewalk	4
Other Commercial	3	1 side has sidewalk	2
Residential		Posted Speed	
4 or more units/acre	4	40+ mph	4
<4 units/acre	2	35 mph or below	2
School Proximity (max. of 2 schools)		Daily Traffic Volumes	
Elementary School		10,000 +	4
<1/4 mile	6	<10,000	2
1/4 to 1/2 mile	4		
Middle or High School			
<1/2 mile	6		
>1/2 mile to 1 mile	4		
Transit Route Proximity			
<1/4 mile	4		
1/4 to 1/2 mile	2		
Public Facilities			
<1/4 mile	4		
1/4 to 1/2 mile	2		

For each missing sidewalk segment, the appropriate score is assigned for each criterion, and tallied. Following the initial categorization of sidewalk priority, modifications were made to better reflect local conditions, and to incorporate input from Linwood Steering Committee members. Modifications were also made to the priority categories to reflect practical constraints. For example, West Avenue west of New Road has a narrow right-of-way, so installing sidewalks here would be more prohibitive than on other evaluated roadways. While sidewalks on the north side of Seaview Avenue would be desirable, installing sidewalks on this side would result in the removal of many trees, and residents have in the past expressed concern about that possibility. If not for that logistical difficulty, sidewalks on the north side of Seaview would be considered a high priority. On the south side of Maple Avenue, sidewalk installation would also result in tree and landscaping removal. Due to the above constraints, Maple Avenue, West Avenue, and Seaview Avenue have all been placed in the “Low Priority” category.

As seen in **Figure 15**, extensive portions of New Road are ranked as “High Priority.” Sidewalks are important along New Road, given the high traffic volumes and speeds on this roadway, as well as the major commercial uses and community facilities that generate pedestrian traffic. In the community survey, when asked to identify bicycle and pedestrian deficiencies in Linwood, the lack of sidewalks along New Road was cited as an issue by 8 of the 40 respondents, over twice the frequency as any other issue. Sidewalks are also identified as high priorities on Central Avenue (to permit residents to safely walk to the MRA) and on Ocean Heights Avenue. On the latter roadway, high traffic volumes and the presence of major retail uses make sidewalks a high priority.



Legend

	US Highway		High Priority Sidewalk
	County Route		Medium Priority Sidewalk
	Local Roadway		Low Priority Sidewalk
	Linwood Bicycle Path		Existing Sidewalk
	Residential, High Density		Proposed Sidewalk by the City
	Residential, Single Unit		Municipal Boundaries
	Commercial/Services		Recreational Land
			Civic/Educational

Linwood Bicycle and Pedestrian Plan
Figure 15: Sidewalk Priority
 December 2011

6.0 INTERSECTION IMPROVEMENTS

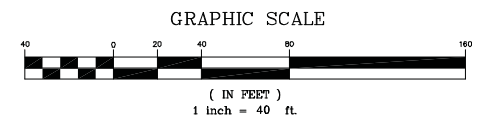
The intersection of Oak Avenue, Wabash Avenue and Somers Avenue has been identified as a problematic intersection for pedestrians and bicyclists, due to the geometry and to the confluence of multiple roadways and the bike path. The City of Linwood identified a plan in 2008 to reduce the potential for conflicts at this intersection, as shown in **Figure 16**. As seen, the plan proposes:

- 1) vacating East Wabash Avenue to the south of Oak Avenue, and;
- 2) bending West Wabash Avenue to the north of Oak Avenue in order to intersect with the Mainland Regional High School driveway.

Since this plan was developed, the vacation of East Wabash Avenue to the south of Oak Avenue has been implemented. Strategy 2, re-aligning West Wabash Avenue to intersection with the school parking lot, still needs to take place. It is recommended that Linwood proceed with this improvement, in order to reduce the number of conflict points at the intersection of Oak Avenue and Wabash Avenue.



Figure 16: Safety Improvement at Oak Avenue, Wabash Avenue, and Somers Avenue



**CONCEPTUAL ROADWAY SAFETY PLAN
INTERSECTION OF OAK AVE, WABASH
AVE, SOMERS AVE, & THE BIKE PATH**
CITY OF LINWOOD, ATLANTIC CO. NEW JERSEY

THIS PLAN IS NOT VALID UNLESS A RAISED SEAL IS AFFIXED HERETO

STEPHEN M. MAZUR, P.E.
PROFESSIONAL ENGINEER
N.J. LIC. No. 45128

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 N.J. State Board of Professional Engineers & Land Surveyors Certificate No. 2162818190

REVISIONS:
2008 0127 - Revised Project #3 - SMM

DATE:	10/10/08
SCALE:	1" = 40'
DRAWN BY:	SMM
CHK'D BY:	SMM
PROJECT No.	LN08001

7.0 PROMOTION AND EDUCATION

The expansion of the bike network, and development of pedestrian facilities, should not take place in a vacuum. To encourage safe use of existing and proposed facilities, and more walking and bicycling trips in general, it is recommended that Linwood promote walking and bicycling and implement educational programs on recommended practices and safety. Educational programs are particularly recommended for persons under age 17, but should not be restricted to this group. Many adult bicyclists have never received basic instruction in how to safely ride among traffic, and this is a useful skill.

7.1 CURRENT PROGRAMS AT SCHOOLS

Below is a summary of current programs promoting walking and bicycling at Linwood schools:

Seaview Elementary School

The school has an active program to encourage students to walk and bicycle to school, including the following components:

- The school has recently reconfigured the bike racks to make access and use easier for the children.
- In the fall and spring, the school has “Walk to School Wednesdays.” The principal meets students every Wednesday at the park gazebo, and walks with them to the school. She encourages the families to use the bike path to travel to school every day, and students are encouraged to walk, bike, scooter or skateboard to school.
- The school teaches bike path etiquette to promote bike path use and safety. Discussions include riding single file when someone is approaching from the opposite direction, stepping off when stopping to chat and curbing and controlling dogs while on the path.

Belhaven Middle School

Belhaven Middle School does not have a formal program for promoting walking and bicycling. However, on an informal basis, the 5th grade science teacher promotes physical activity and general health for his students. This teacher regularly rides his bike to school and parks it in front of his classroom to provide a constant visual reminder of how important it is for a person to be dedicated to both his/her health and the environment. The teacher also gives his students a “stamp reward” for riding their bicycles or walking to school to encourage them to take an active role in their well-being.

Mainland Regional High School

There are no programs at the high school.

Mainland High School is a different case than Seaview or Belhaven. Safe Routes to School programs have historically targeted the students at elementary and middle schools; indeed, federal SRTS funding is only available to grades K-8. High school students do not need the same kind of instruction that elementary and middle school students do. It is further noted that from a logistical perspective that a smaller percentage of students would be expected to walk to the High School since it is a regional

school, and thus draws students from a larger geographic area than the other schools. Of the 1,510 students at Mainland Regional High School, roughly one-third are from Linwood, one-third from Northfield, and one-third from Somers Point. For these reasons, a formal program is less critical at Mainland.

However, it would still be beneficial if promotion of walking and bicycling can occur at Mainland to some degree. Although high school students are less in need of instruction than younger students, many are unaware of safe bicycling principles. Further, students from other towns, and not just Linwood, could be expected to bicycle to Mainland, so there is potential for growth in this area. There is a noticeable drop-off in students bicycling to school at Mainland, versus the other two schools in Linwood. Based on the presence of parked bikes, less than 1% of the students at Mainland bicycle to school, compared to 14% of the students at Belhaven, and 9% of the students at Seaview. This is a low modal split by any standard.

7.2 PROMOTIONAL ACTIVITIES

A wide variety of programs are available to encourage Linwood residents to walk or bicycle more. This section provides a “starting point” by listing websites with strategies and case studies. Some of the more promising strategies include:

- **Walk to School Day.** This is one of the most fundamental strategies for encouraging younger residents to walk or bicycle. As discussed above, a program is present at Seaview Elementary School. No program is present at Belhaven Middle School or the Mainland Regional High School. Although sometimes referred to as “Walk and Roll to School Day,” this event has been popularized in the past as “Walk to School Day,” and the typical focus has been on encouraging walking. However, the National Center for Safe Routes to School is organizing the inaugural “Bike to School Day” on May 9, 2012, and it is recommended that Linwood School District coordinate with that event.

Programs encouraging walking and bicycling at the high school could be different than at the middle school or elementary school. As one idea, walking/bicycling could be one of the units available in physical education classes. In the fall or spring, P.E. teachers could enroll students in walking and bicycling events for a minimum number of miles.

- **Join a Walking or Bicycling Club.** Residents of Linwood can start a club to encourage other residents to log a certain number of miles per week on foot or bicycling.
- **Special Events.** A Walk to School Day is an example of a special event; other examples include Trail Day, Car Free Day, Traffic Safety Day, and Bicycle to Work Day. The Linwood Country Fair could be used as a springboard to make residents aware of special events planned for that year.

- **Awareness Campaign.** Public service announcements on cable television, posters, brochures and bumper stickers could be used to promote increased use of walking or bicycling in general, for errands, work trips, school and other purposes, or to promote special event days.
- **Commuter of the Month.** A Linwood business or public agency could recognize the employee that walks or bicycles to work with the greatest frequency.
- **Bicycle Rodeo.** This event is used to promote safe bicycling among children, through the distribution of literature, safety instruction, appropriate fitting of bicycle helmets, and other activities.

7.3 RESOURCES

Below are websites that encourage walking and bicycling, and safe behavior.

Pedestrian and Bicycle Information Center (PBIC)

The PBIC, which is partially funded by the FHWA, is an excellent place to start in reviewing strategies to encouraging walking and bicycling. Following are links to some of their web pages:

Walking

- <http://www.walkinginfo.org/promote/strategies.cfm>
- <http://www.walkinginfo.org/promote/case-studies.cfm>

Bicycling

- <http://www.bicyclinginfo.org/promote/strategies.cfm>
- <http://www.bicyclinginfo.org/promote/case-studies.cfm>
- <http://www.bicyclinginfo.org/education/resource/bestguide.cfm>

National Center for Safe Routes to School

The National Center serves as the information clearinghouse for the federal Safe Routes to School program. Below is a webpage on encouragement strategies.

- <http://guide.saferoutesinfo.org/encouragement/>

New Jersey Department of Transportation

NJDOT has a number of web pages encouraging bicycling and walking, as seen below.

- <http://www.state.nj.us/transportation/commuter/bike/>
- <http://www.state.nj.us/transportation/commuter/pedsafety/>
- <http://www.state.nj.us/transportation/commuter/bike/tourtips.shtm>

National Highway Traffic Safety Administration (NHTSA)

NHTSA distributes a packet called “Getting to School Safely Community Action Kit”. Within the packet, fact sheets about bicycle and pedestrian safety are available and can be found at the following website:

- http://www.nhtsa.gov/people/injury/buses/Getting_to_School/index.html

Other Sites

Following are two other examples of state and local encouragement strategies, the first from the Bicycle Alliance of Washington (State), and the second from the City of Santa Barbara, California.

- <http://www.bicyclealliance.org/getinvolved/promote.html>
- <http://www.santabarbaraca.gov/NR/rdonlyres/77DDBC2E-BCF5-44E8-9859-70FBA64AFDB5/0/Chapter9Goal5EncouragingPeopletowalk.pdf>

7.4 ENFORCEMENT

A key component of a safe and well traveled transportation system is an enforcement program for traffic regulations as they apply to each type of roadway users: motorists, bicyclists, and pedestrians. As bicycle facilities are installed, it is recommended that local ordinances and regulations be developed and revised. A review of enforcement regulations and practices may assist in identifying opportunities to partner with community, county, or state organizations to inform users about safe bicycle and pedestrian travel behavior, such as required use of helmets by bicyclists under the age of 17 (N.J.S.A 39:4-10.1), or the changes in N.J.S.A 39:4-36 which require motorist to stop for pedestrians in the crosswalk. Outreach and promotion through community channels and events is a critical piece to remind motorists, bicyclists, and pedestrians of applicable laws and recommended travel practices. Linwood has participated in the New Jersey Pedestrian Decoy Safety Program in the past, and should continue involvement in this program in the future as warranted.



8.0 IMPLEMENTATION AND FUNDING

It is recommended that Linwood determine the most practicable means for implementing the recommendations made in this Plan. The implementation matrix and cost estimates provided in this chapter are intended to assist Linwood in that effort.

8.1 IMPLEMENTATION MATRIX

The final component of the Plan, and one of the most critical, is the plan for implementation. **Table 5** summarizes recommendations in the Plan, and indicates the projected timeframe, order-of-magnitude cost category, priority, and responsible party. This “implementation matrix” is intended to assist Linwood in prioritizing the recommendations, and determining the most cost-effective means of carrying them out. It is noted that many of the recommendations are the city’s responsibility, although it can apply for state or federal funding for a number of the improvements, such as installing sidewalks as part of a Safe Routes to School program.

Table 5: Implementation Matrix

Location	Issue	Improvement	Timeframe	Cost	Priority	Responsibility
County						
Shore Road	Bike accommodation	Repave Shore Road, and install bike-compatible shoulders	Long	High	Medium	County
Ocean Heights Avenue	Bike accommodation	Re-stripe Ocean Heights Avenue to more compatible lanes	Medium	Low	Low	County
Municipal						
Mainland Regional High School Tract	Multi-use path	Extend bike path from Oak Avenue and Wabash Avenue past Off’s Pond to along New Road	Medium	High	High	Linwood
Bike path	Multi-use path	Widen bike path	Long	High	Medium	Linwood
Bike path	Multi-use path	Reduce excess use of Stop and Walk Bike Across Intersection signs	Short	Low	Medium	Linwood
Central Avenue	Bike accommodation	Install bike lanes	Medium	Low	Medium	Linwood
Poplar Avenue and Seaview Avenue	Bike accommodation	Restrict parking	Short	Low	Low	Linwood
Oak Avenue	Bike accommodation	Install shared lane markings	Short	Low	Medium	Linwood
Various	Bike accommodation	Install bike racks, and replaced old racks	Short	Low	High	Linwood
Various	Pedestrian accommodation	Install sidewalks	Varies	Varies	Varies	Linwood (seek funding from state)
Intersection of Oak Avenue, Wabash Avenue, Somers Avenue	Safety improvement	Re-align West Wabash Avenue	Medium	Medium	High	Linwood
No location	Pedestrian and bicycle	Implement promotional and educational activities	Short	Low	High	Linwood

Legend:

Timeframe	Cost
Short = 1-2 years	Low = <\$25,000
Medium = 3-4 years	Medium = \$25,000 - \$100,000
Long = 5 years	High = \$100,000+

8.2 COST ESTIMATES

Order-of-magnitude cost estimates are summarized in **Table 6** for the major improvements discussed in the plan. It should be emphasized that these are planning-level “ballpark” estimates, and estimates will likely change as improvements are actually designed. The estimates in the table are intended to be conservative.

The first sub-table summarizes signing and striping improvements. Costs are calculated assuming that these are stand-alone improvements; if signing and striping is done as part of regularly scheduled roadway maintenance, the costs are significantly reduced. Further, many municipalities are able to perform some of these tasks under each project with their own forces, which would further reduce costs. Assumptions used in preparing striping and signing costs are summarized at the bottom of Table 6.

The bike path cost estimates are shown in the second sub-table. The estimates of the bike path extension near the Mainland Regional High School do not include fence installation or relocation. Widening the existing bike path to 11 feet would involve stripping soil for 2.5 feet on either end of the path and paving it. It should be acknowledged that this would leave a seam between the exiting asphalt and the proposed asphalt which is not favorable to bicyclists. Other options to be considered would involve excavating the existing path and re-paving the entire proposed width. If this were to be done, Linwood should consider widening the path to 15 feet, since the additional labor would be relatively minor. The cost of this would obviously be greater than the cost estimate listed in the table. Another option might be installing cinder for the additional path width; it would be assumed that this path would be used by runners, and less so by bicyclists.

Sidewalk cost estimates are shown in the third sub-table. It should be noted that sidewalk costs do not include costs associated with installing or relocating utilities or drainage facilities. An estimate of these costs is not appropriate for planning-level estimates.

Cost estimates for strategies involving only the installation of signs are not provided, since this is relatively minimal. On average, a sign proposed in this Plan costs approximately \$75 to \$90. NJDOT provides the information contained in these Local Bicycle and Pedestrian Plans as a service to local communities. The Department and its consultants strive to provide quality planning studies that include a range of recommended improvements, but make no claims, promises, or guarantees about the availability of funding to complete the projects recommended.

Table 6: Cost Estimate

Roadway Improvements

Concept	Roadway	Low Range	High Range
Bike Lane	Central Avenue	\$ 6,000	\$ 9,000
Shared Lane Markings	Oak Avenue	\$ 7,500	\$ 11,000
Share the Road with Shoulder	Ocean Heights Avenue	\$ 6,000	\$ 9,000
	Shore Road	\$ 24,000	\$ 36,500

Bike Path Improvements

Concept	Low Range	High Range
Extension of Bike Path Option A	\$ 161,000	\$ 241,000
Extension of Bike Path Option B	\$ 164,000	\$ 246,000
Widening of Bike Path	\$ 134,000	\$ 200,000

Sidewalk Improvements

Roadway	Priority	Number of Segments	Low Range	High Range
New Road (US 9)	High	11	\$ 832,000	\$ 1,249,000
New Road (US 9)	Medium	6	\$ 559,000	\$ 839,000
Other Roadways (4 roadways)	High	6	\$ 607,000	\$ 910,000
Other Roadways (9 roadways)	Medium	22	\$ 1,126,000	\$ 1,689,000
Other Roadways (2 roadways)	Low	3	\$ 351,000	\$ 527,000

Assumptions

	Bike Lane	Shared Lane Markings 'Sharrow'	Share the Road
Sign Spacing	Beginning of facility	Beginning of facility	Beginning of facility
	End of facility	Before major intersection	After major intersection
	After major intersection	After major intersection	Every 1000 ft
Marking Spacing	Every 500 ft	Every 250 ft	N/A

APPENDIX A: ONLINE SURVEY RESULTS

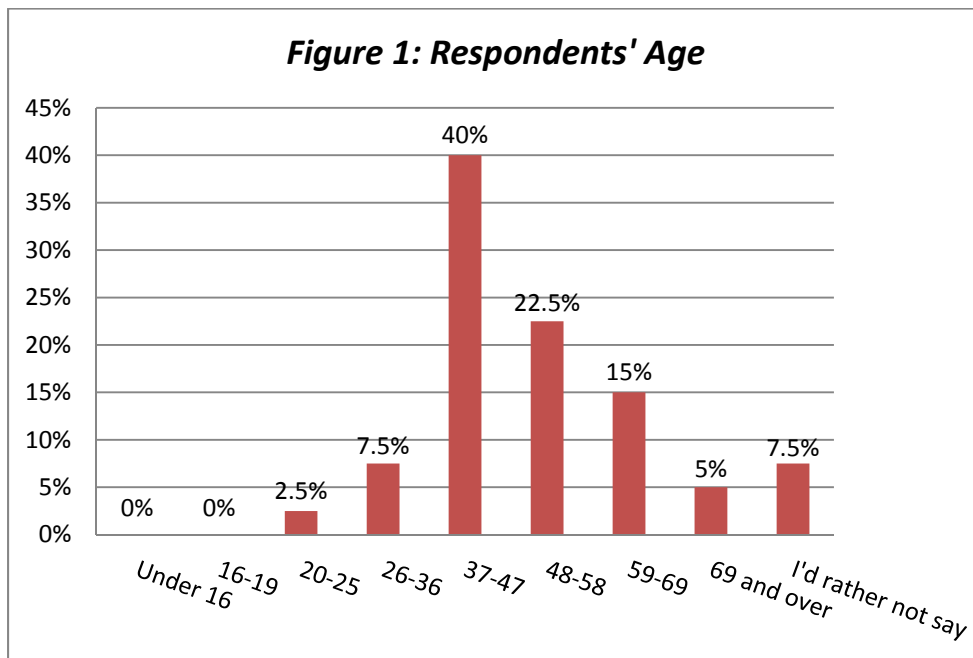
Under the Public Outreach Task for this study, an online survey was designed and made available to residents in order to gather input on bicycle and pedestrian deficiencies and opportunities in Linwood.

Survey Results

A link to the survey was posted on the City of Linwood’s website. The survey was available online from May 4, 2011 through May 31, 2011 and during that time 40 responses were received. Of these, 93% of respondents reported living in Linwood, while 5% reported living in an adjacent community such as Somers Point, Northfield, and Egg Harbor Township and the remaining 3% did not live in either cities. 87% of Linwood’s residents responded that they worked outside of Linwood and its adjacent communities, while 8% worked in Linwood and 5% worked in an adjacent community.

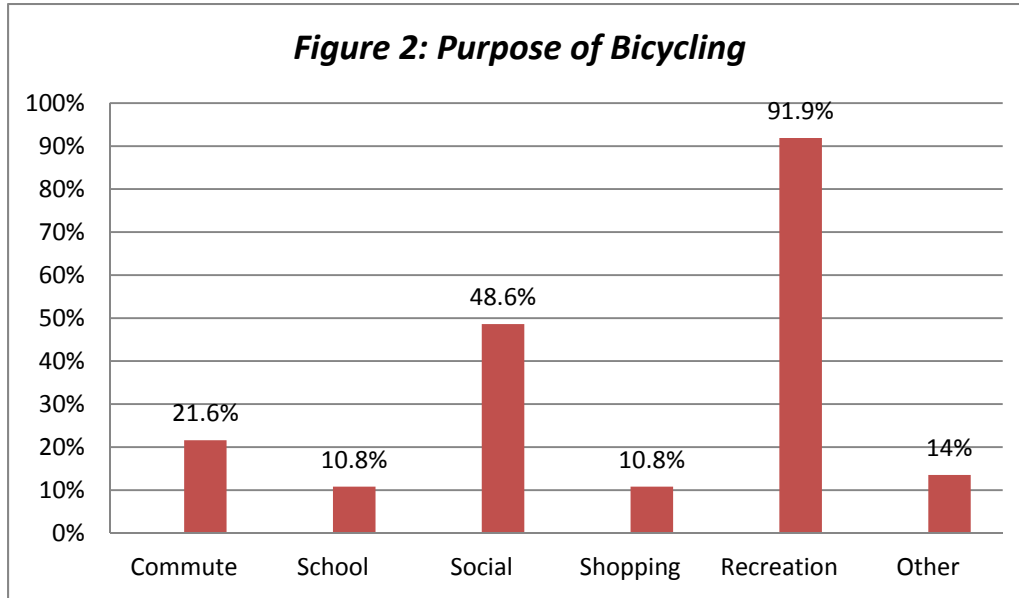
Gender and Age

Respondents’ age ranged from 20 to over 70 years old. The 37-47 year old category was the greatest percentage of respondents, at 40% (**Figure 1**). Persons aged 48-58 were the second largest category, at 22.5%. Respondents answering the question on gender were evenly split between male and female at 47.4% each, with 5.3% preferred not the answer.



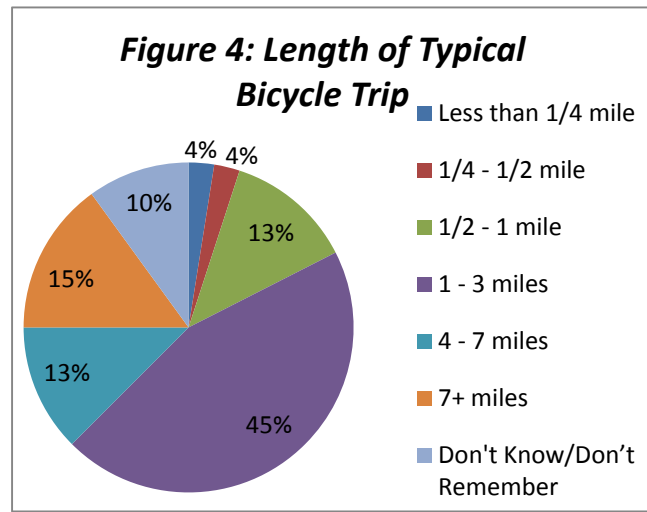
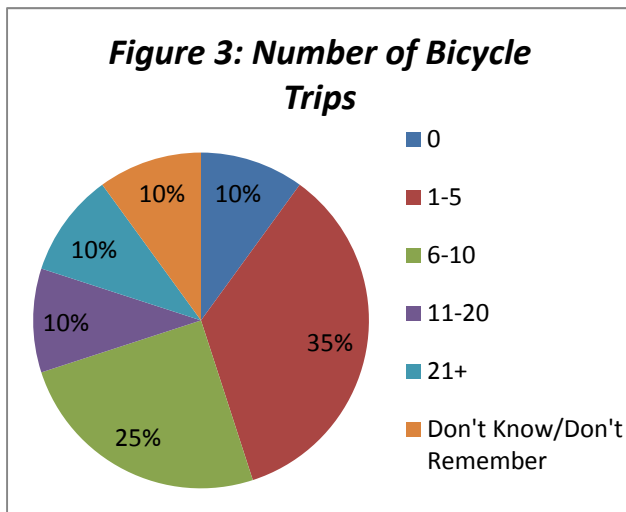
Bicycle Ownership & Purpose

Ninety percent of respondents own a bicycle in a working condition. Bicycle owners were asked to identify the typical purpose of their bicycling with the ability to choose more than one purpose. The vast majority said that they bicycle for recreational purposes. **Figure 2** illustrates the results.

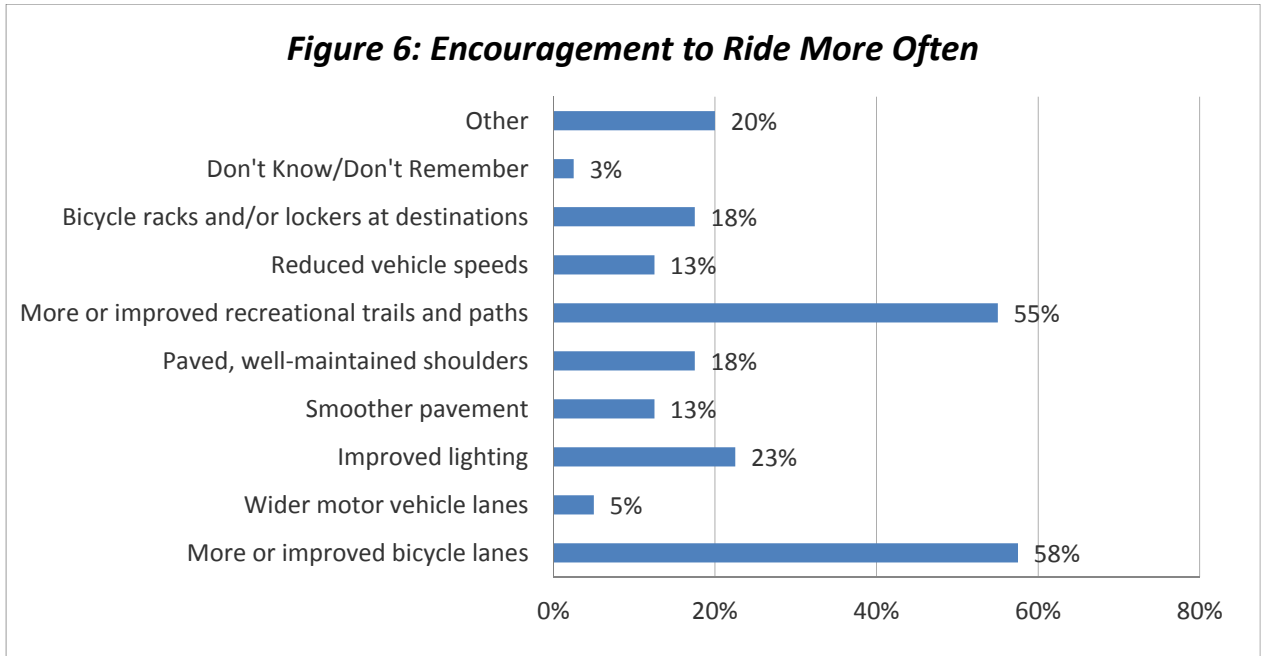
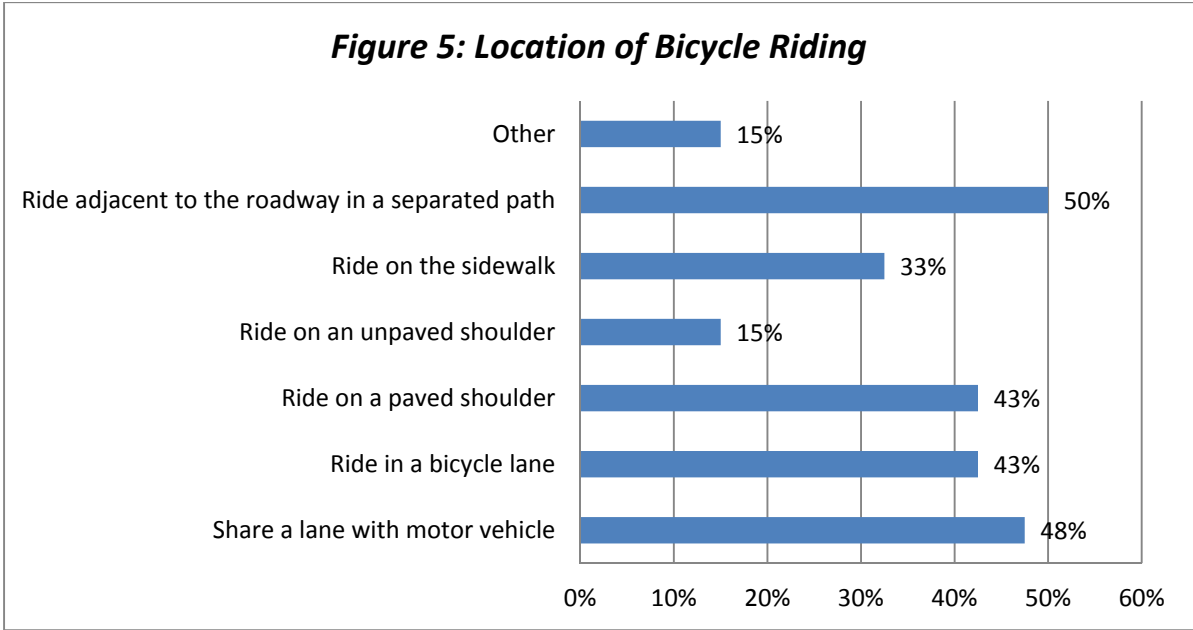


Bicycle Trips

Bicycle owners were asked to indicate the number of trips they had taken by bicycle in the last month. Thirty-five percent said that they took between 1 and 5 bicycle trips, and 25% took 6 to 10 bicycle trips. When asked about the length of their typical bicycle trip, the largest plurality, at 45%, indicated that they rode 1 to 3 miles. **Figures 3 and 4** illustrate the results.

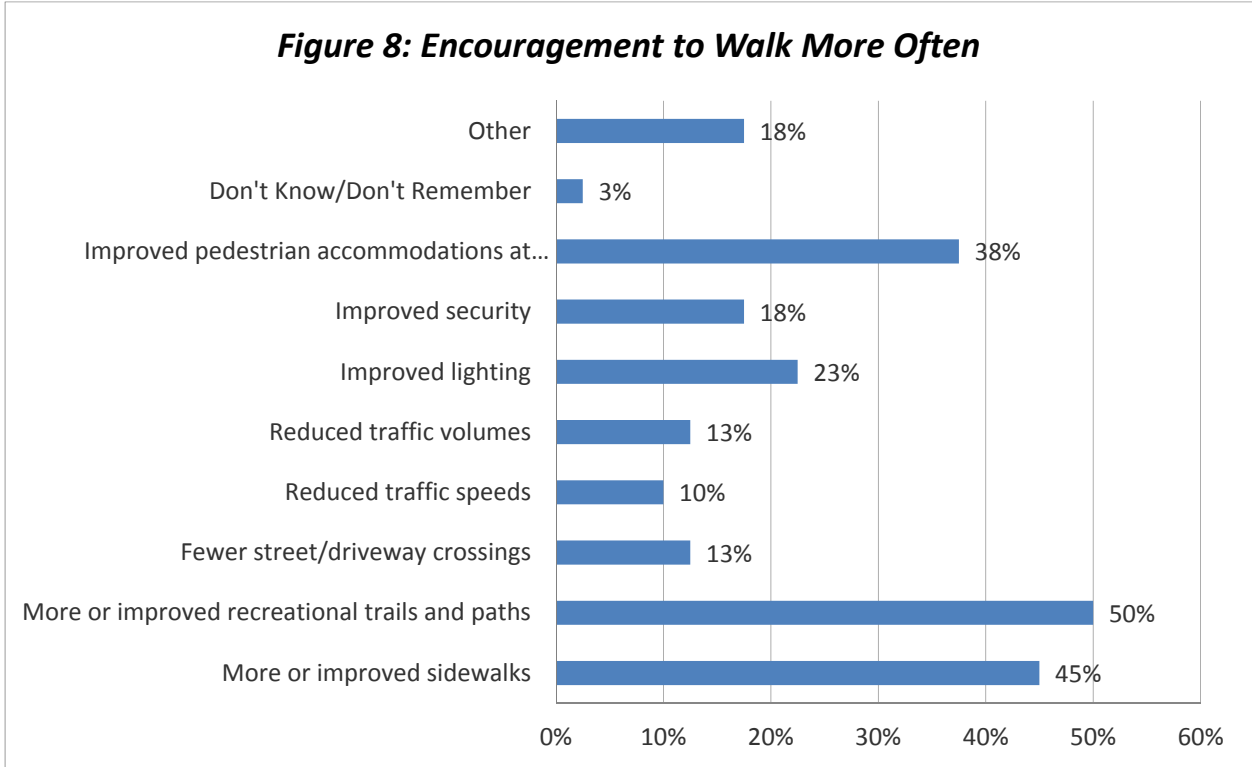
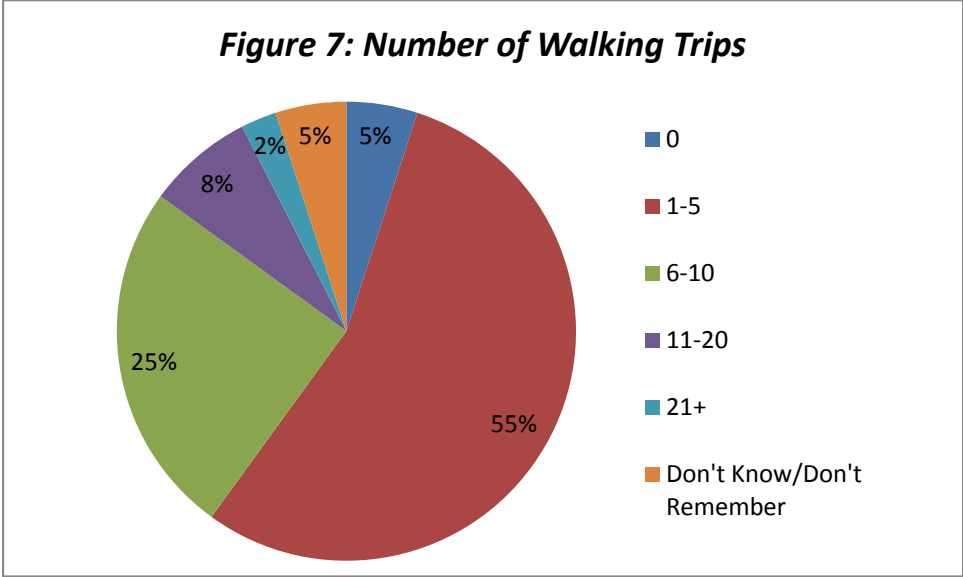


When asked where they ride their bicycle, exactly half of respondents said that they rode adjacent to the roadway in a separated path, while 48% shared a lane with a motor vehicle. When used to indicate the feature that would encourage them to ride more often, the highest percentage, 58%, said they would like to see more or improved bicycle lanes. **Figures 5 and 6** illustrate the results.



Walking Trips

Just over half of the respondents said that they walked 1-5 trips in the past 7 days. Half of the respondents said they would like to see more or improved recreational trails and paths in order to encourage them to walk more often (**Figures 7 and 8**).



Bicycle and Pedestrian Deficiencies and Improvements

Respondents were asked to list bicycle and pedestrian deficiencies and/or improvements for roadways throughout Linwood. Responses are organized by whether the deficiency or improvement is an engineering, enforcement or safety issue. Where an issue was cited by more than one person, the number of responses is indicated in parentheses.

Category	Bicycle Travel	Pedestrian Travel
Engineering	<p>General</p> <ul style="list-style-type: none"> • Oak Avenue • Monroe Avenue • Ocean Heights Avenue • Poplar Avenue • Shore Road (2) • Central Avenue (2) • West Avenue • Four way stop signs • New Road (3) • Repave School House Drive • Oak Avenue (link to Northfield and Egg Harbor Township) • Intersection at Wabash Avenue and Oak Avenue • No sidewalks on west end of Central Avenue 	<p>General</p> <ul style="list-style-type: none"> • Continuous and maintained sidewalks <ul style="list-style-type: none"> ○ In front of High School ○ Parks and Boat Ramps ○ Library and Post Office ○ Local business near Edgewood Avenue ○ Seaview Avenue • Oak Avenue • Central Avenue (3) • Maple Avenue • Hamilton Avenue • Seaview Avenue • West Avenue • Too many pedestrian crossings and signs (distractions to drivers)
	<p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Install flashing yellow light at intersection • Traffic light at Monroe Avenue • Painted crosswalks • Sidewalks (2) • Wide separate bike lanes • Wide shoulders 	<p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Crosswalk in front of Cornerstone Commerce • Install light at Monroe Avenue and Route 9 • Crosswalks (3) • Sidewalks (8) • Signals to alert drivers for pedestrians • Narrow shoulder
	<p>Shore Road (CR 585)</p> <ul style="list-style-type: none"> • Install flashing yellow light at intersection (2) • Wider • Smoother and wider shoulder • Parallel path • Sidewalks 	<p>Shore Road (CR 585)</p> <ul style="list-style-type: none"> • Install street lights at designated pedestrian crossings • Signals to alert drivers for pedestrians • Crosswalks (2) • Sidewalks (3)

Category	Bicycle Travel	Pedestrian Travel
Engineering	<p>Bike Path</p> <ul style="list-style-type: none"> • Wider bike path • Extension of bike path <ul style="list-style-type: none"> ○ East-west ○ Past Mainland Regional H. S. ○ Behind Cornerstone Development • Bike lane on Wabash Avenue, parallel to bike path (2) 	<p>Bike Path</p> <ul style="list-style-type: none"> • Bike path on Wabash Avenue • Extension of bike path <ul style="list-style-type: none"> ○ East of Linwood ○ West of Linwood ○ From Patcong Creek ○ From Bargaintown Lake
	<p>Enforcement</p> <p>General</p> <ul style="list-style-type: none"> • Reduce speed limits <p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Vehicles should yield to bicyclist in designated crosswalks 	<p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Vehicles should yield to pedestrians in designated crosswalks
Safety	<p>General</p> <ul style="list-style-type: none"> • Increase visibility at intersection of Poplar Avenue and Wabash Avenue (across from Linwood Market) by cutting bushes <p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Crossing (3) • Ride bike on shoulder <p>Shore Road (CR 585)</p> <ul style="list-style-type: none"> • Crossing (2) 	<p>General</p> <ul style="list-style-type: none"> • Pierce Avenue filled with excessive sand • Poplar Avenue to bike path <p>New Road (Route 9)</p> <ul style="list-style-type: none"> • Crossing (4) <p>Shore Road (CR 585)</p> <ul style="list-style-type: none"> • Crossing (2) • Crossing at Memorial Park

APPENDIX B: PUBLIC INFORMATION CENTER COMMENTS

Public Information Center

November 29, 2011

What bicycle and pedestrian concepts do you like? Why?

1. The more bike access the better, because biking is a great way to get around. Besides it doesn't use any energy, unlike cars, and bicycles don't pollute. Cars do though. It's healthier too. Plus, by biking you get more exercise.
2. Our family uses the bike path every day on our walk to and from Seaview Avenue School and every day in the summer on our way to the MRA. It is a true gem!
3. Bike path to Route 9 near lake, because it starts some east-west route. Very scenic!
4. Signage and widening is great.

What bicycle and pedestrian concepts could be improved? Why?

1. From my point of view, I think that having a public bike path running through the Mainland High Grounds is dangerous. Anyone could walk on the bike path. But it's where the Mainland students go to school. They have gym class on the fields too, so maybe the bike path could be restricted to the public during the time that the Mainland students could be in school. In other words, could the bike path be restricted during the Mainland school hours?
2. Very concerned about having the school grounds open to the public. Fencing off the softball field and giving the ability for citizens to mingle with Mainland students could present problems/safety for students. The wooded area could become a safety issue. Currently, the wooded area of the existing bike path between Belhaven and Seaview Avenue is very frightening! Any section near New Road should be protected from New Road drivers by a four foot curb! Thanks.
3. Roads that have heavy bike use have bike symbols painted on roadway.
4. We do need more lighting and safety protections on crosswalks.

Do you have recommendations to add to the bicycle and pedestrian improvements?

1. I think that the new section of the bike path by Mainland High School should be lighted with lamps on the existing bike path (like the same kind of lamps) because it could be dangerous when it is night time or on rainy days with no much of sunlight. Also, the curb I think should be at least 3 feet high so that the cars would stop, because a 3 foot high wall would probably stop traffic more than a curb. But then again, a police car will not be able to get past a big wall if there is an emergency on the bike path.
2. - Widen the bike path.
- Sidewalk installed on Central Avenue connecting MRA to Oak Avenue.
- Sidewalk on Seaview between Shore Road and bike path on north side.
3. Less signage!
4. Great plan!