INCREASING INTERMODAL ACCESS TO TRANSIT

PHASE III

Delaware Valley Regional Planning Commission

2006

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty, and intercity agency that provides continuing, comprehensive, and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia in Pennsylvania; and Burlington, Camden, Gloucester, and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.

The DVRPC logo is adapted from the official seal of the Commission and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole while the diagonal bar signifies the Delaware River flowing through it. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey. The logo combines these elements to depict the areas served by DVRPC.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA) The Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for this report's findings and conclusions, which may not represent the official views of policies of the funding agencies.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF CHARTS

LIST OF MAPS

Note: Unless otherwise indicated, all photos in this report were taken between November 2005 and January 2006 by Gregory R. Krykewycz, PP, AICP.

EXECUTIVE SUMMARY

Phase III of a continuing project to assess and increase non-motorized access to transit stations examined six stations (three in New Jersey and three in Pennsylvania). Three Burlington County RiverLINE stations were studied (Beverly/Edgewater Park, Burlington Town Center, and Riverton) as a follow-up to a 2002 DVRPC report assessing Transit Village potential for these stations and others. Three SEPTA rail stations were studied (Cynwyd, Eastwick, and Oreland) based on their having a high observed proportion of commuters from within one mile using station parking facilities.

Each station was analyzed using Bicycle Level of Service (BLOS) and Pedestrian Level of Service (PLOS) models at the one mile and one quarter mile radii, respectively. These models score road segments based on their physical attributes as well as the intensities of their vehicular traffic. The use of these models resulted in a summary of the nonmotorized compatibility of individual road segments, which was supplemented by a qualitative examination of access conditions in the immediate vicinity of each station. A summary of recommended improvements/enhancements was prepared for each station, noting strategies that would address specific problem areas.

In general terms, Phase III analysis found that:

- Pedestrian Level of Service (PLOS) scores tended to be somewhat higher for the New Jersey station areas studied, as these stations tended to be located within moderately-dense, mixed-use, walkable communities with grid-based street networks that deconcentrated automobile traffic. In contrast, the Pennsylvania stations studied tended to be located in suburban areas with less interconnected street networks and land uses.

- Pedestrian Level of Service (PLOS) scores were higher overall than Bicycle Level of Service (BLOS) scores. This is largely because BLOS scores reflect conditions within the roadway which cannot be improved through the provision of sidewalks and where the provision of physical buffering (either through physical buffers or dedicated space) is much more problematic.

- In many cases, comparatively minor investments in station sites and their immediate vicinity (such as bicycle racks, painted crosswalks, and signage) have the ability to markedly improve and encourage nonmotorized station access. See Table 22 for a summary of recommendations by station area.

INTRODUCTION

This report is Phase III in a continuing program to assess the accessibility of transit stations for pedestrians and bicyclists and to promote strategies and improvements that would improve this accessibility. Phase II, published last year (DVRPC Publication No. 05022), employed the statistically-calibrated Bicycle Level of Service (BLOS) and Pedestrian Level of Service (PLOS) models. These models were developed by Bruce W. Landis, in collaboration with the Tampa and Miami MPOs as well as the Florida DOT, as tools to assess and compare accessibility by non-motorized modes. Phase III continues the application of these tools over a larger number of transit station areas – three in Pennsylvania and three in New Jersey.

In employing these tools for analysis, data for a road segment that influence pedestrian and bicyclist comfort, such as the volume and speed of auto traffic and the presence and quality of sidewalks and buffers, are collected and used as inputs for the BLOS and PLOS models, resulting in a level of service grade or score. In contrast to vehicular level of service measures for a road segment or intersection, bicycle and pedestrian LOS measures relate to comfort and the perception of safety rather than throughput or efficiency.

The basic premise of the project is that people will only walk or bicycle to a transit station (as opposed to driving/parking) if they feel they can safely do so, and are originating within a comfortable distance. Accordingly, pedestrian levels of service are assessed within one quarter mile of each transit station studied (typically defined as the five-minute walk / ‘pedestrian shed’), and bicycle levels of service within one mile of each station. At the quarter mile radius, every road segment is evaluated and assigned a PLOS score. Major roadways, typically collector and arterial routes, are evaluated for bicycle levels of service at the one mile radius.

The resulting LOS scores, in combination with a qualitative evaluation of existing pedestrian and bicycle-related amenities in the immediate vicinity of stations studied, informs recommendations for targeted improvements that would positively impact non-motorized accessibility.

Method and data assumptions

Both LOS models rely on the collection of data relating to roadway characteristics which were determined to have a statistically-significant impact on the compatibility of a road segment with non-motorized travel.

Specifically, the data collected to inform BLOS scoring are:

- Roadway configuration (including the number of through and turning lanes, lane and shoulder width, and presence/absence of designated bicycle lanes)
- Traffic volume (AADT) and characteristics of traffic (including directional split, the proportion of heavy truck traffic, and the posted speed limit)
- Availability of on-street parking and presence of parked cars
- Pavement condition

Somewhat counter intuitively, the presence of a designated bicycle lane does not impact the BLOS score more positively than an unmarked shoulder, and has a unique impact on the score only where the designated bicycle lane is located to the left of a painted on-street parking lane. Further, the BLOS model does not address the impact on bicycle compatibility of newer, less traditional strategies such as shared lane pavement markings (‘sharrows’), which are recommended in various portions of this report. For details on ‘sharrows,’ see Appendix A.

It should also be noted that the BLOS model evaluates conditions for bicyclists traveling in the cartway rather than on sidewalks (which is typically discouraged or prohibited). In contrast, the PLOS model favorably evaluates configurations and improvements which contribute to a feeling of protection by pedestrians from vehicles traveling in the cartway. Data informing the PLOS scoring are:

- The width of the outside auto travel lane
- Availability of on-street parking and presence of parked cars
- Presence and width of sidewalks and planted buffers
- Street tree spacing
- Traffic volume (AADT) and posted speed limit

In the case of factors such as directional split, pavement condition, and the proportion of heavy truck traffic, default values from the model were used where segment-specific data did not exist, or where there was no basis for changing the default estimate. An example where another value was input for one of these factors was in the case of a designated truck bypass route, where the proportion of heavy vehicle traffic was assumed to be roughly twenty percent (20%) as opposed to the two percent (2%) assumed for typical roadways.

Data for each of these factors were input, resulting in a numerical LOS score which corresponds with a range of letter grades. Table 1 (below) depicts the LOS score ranges associated with each LOS grade.

Table 1: PLOS and BLOS Scoring Standards

Numeric LOS Score	LOS Grade
< 1.5	A
> 1.5 and < 2.5	B
> 2.5 and < 3.5	C
> 3.5 and < 4.5	D
> 4.5 and < 5.5	E
> 5.5	F

Source: BLOS software documentation.

These letter grades are ordinal measures (an 'A' is comparatively better than a 'C,' etc.), and are scaled based on the original bicyclist and pedestrian field survey research that the two models resulted from. Where PLOS and BLOS scores and grades are referenced in this report, they represent the average score for both sides of all roadway segments. For example, if a given segment had two-foot sidewalks along one side and four-foot sidewalks along the other, an average sidewalk width of three feet was input to the PLOS model.

In addition, where relevant characteristics varied along a given road segment (such as in the case of a variable width buffer or sidewalk), the data input was that deemed to be most typical along that segment. Measurement data for all roadways was field collected by DVRPC staff at the quarter mile radius, and informed by GIS data at the one mile radius for major roadways (verified and supplemented by aerial photography).

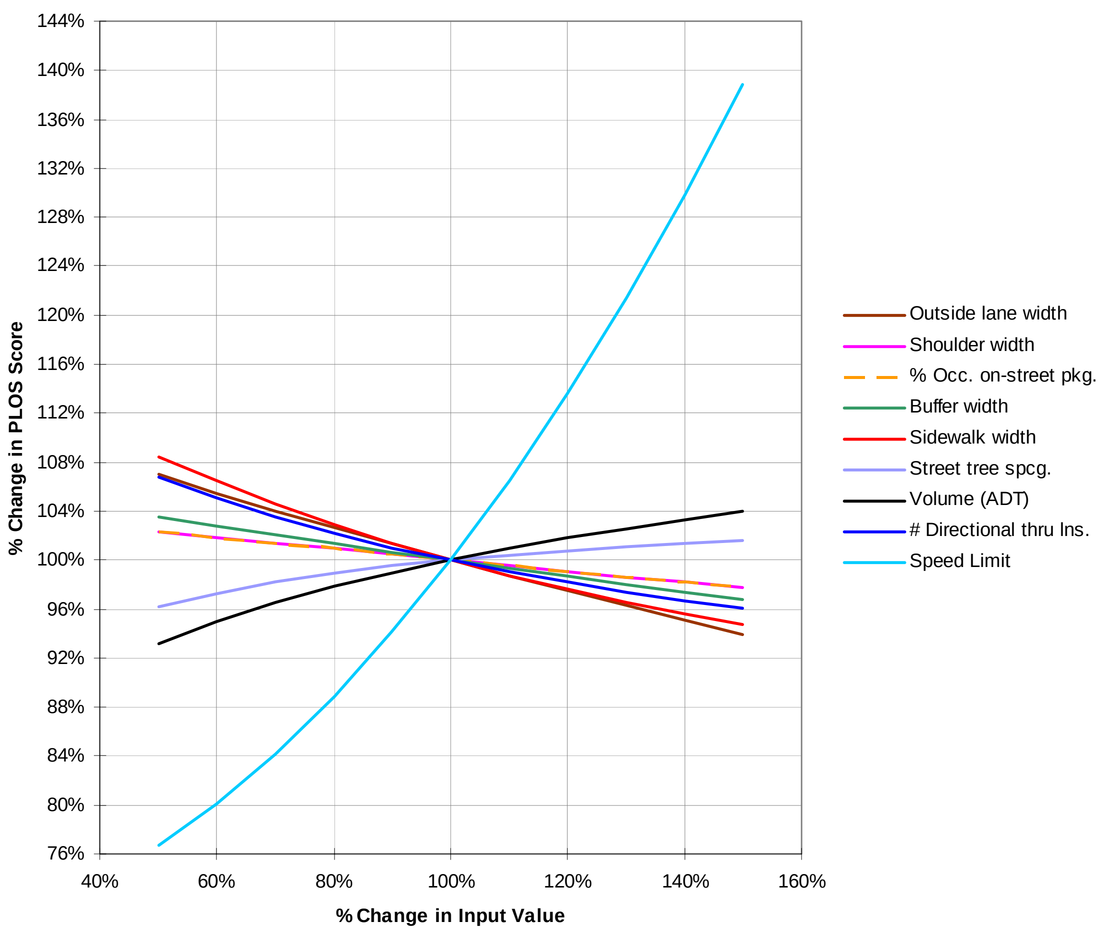
In the case of traffic volumes, where actual field-counted AADTs were not available for a given roadway segment, calibration runs of the DVRPC traffic simulation model were used to roughly estimate typical volumes. Volumes for roadways not included in the DVRPC model were estimated based on counts or modeled values for comparable roadways in the immediate vicinity.

Sensitivity Analysis for PLOS and BLOS models

The relative impacts of each input characteristic on PLOS and BLOS scores was assessed using a sensitivity analysis (facilitated by the SensIt sensitivity analysis extension for Microsoft Excel). The scores' sensitivities illustrate the observed pedestrian and bicyclist comfort levels which informed the formulation and calibration of both models. For the analysis, baseline (100%) values for each of the inputs represent estimates of typical observed values for which a variation of 50% in either direction would not result in unreasonable values. For analysis of the BLOS model, baseline values include a speed limit of 40 mph, a combined width of the outside lane & shoulder of 16 feet, and 25% occupied on-street parking. In addition to the above speed and parking values, PLOS model baseline values include buffer and sidewalk widths of 4 feet. Both analyses reflect scores for an undivided bidirectional roadway. It is also worth noting that a numerical increase in the LOS score corresponds to a lower (less favorable) LOS grade.

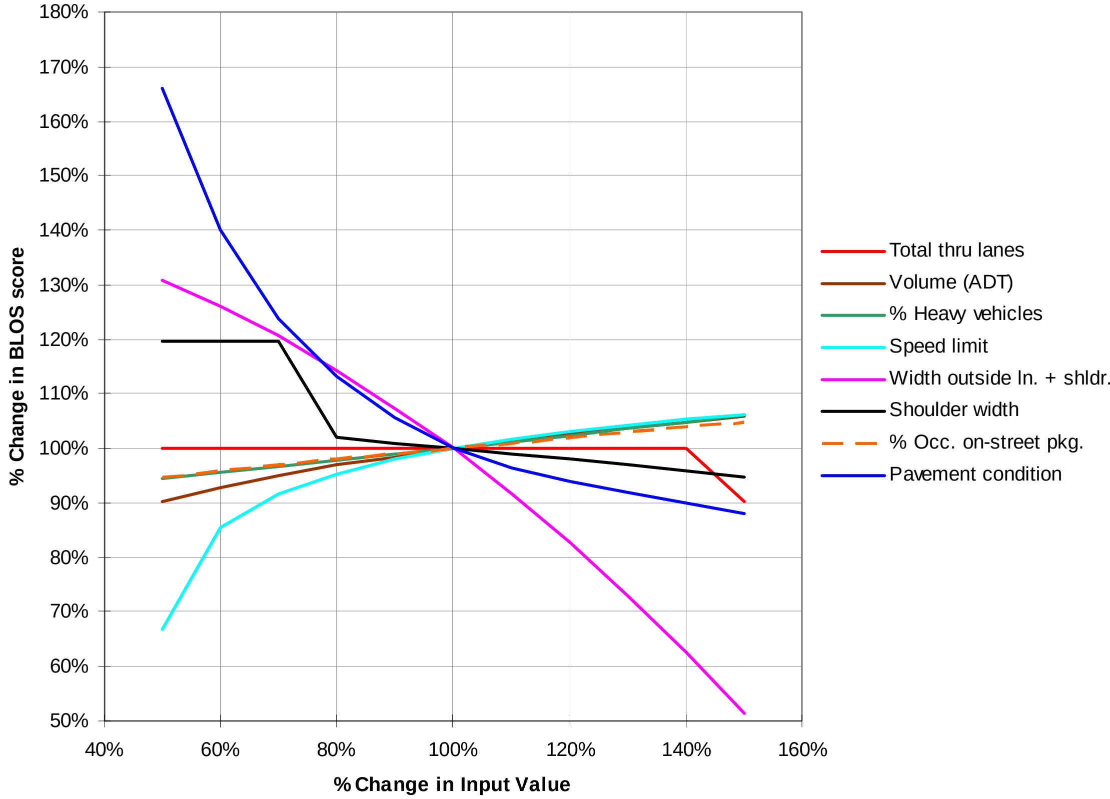
As Chart 1 indicates, by far the most significant value in terms of PLOS scoring is the posted speed limit. This would seem to be consistent with intuition; no typical amount of sidewalk width or buffering will allow pedestrians to feel comfortable with 50-mph traffic. The most significant physical design characteristic of the pedestrian realm appears to be the width of the sidewalk, which the PLOS score is more sensitive to than buffer width and street tree spacing.

Chart 1: PLOS Sensitivity Analysis



In the case of the BLOS model, the two factors with the largest impact on scores are the combined width of the outside lane/shoulder and pavement condition. Note that pavement condition is based on FHWA's five point pavement surface condition rating, and that the baseline (100%) value reflects a grade of 3 (fair). It is also worth noting that for certain inputs, including pavement rating and the number of through lanes, values other than whole numbers lack a real world correspondence. However, the sensitivity analysis reflected in Chart 2 nonetheless illustrates the general trend and magnitude of the impacts of changes in the values of these inputs. As with the PLOS model, a roadway's speed limit also has a substantial impact, particularly in the positive direction where a speed limit is reduced.

Chart 2: BLOS Sensitivity Analysis



Station selection method

As previously noted, this report evaluates pedestrian and bicycle accessibility for six regional rail stations – three in Pennsylvania and three in New Jersey. Both station sets were selected to further previous DVRPC work relating to station access. The overall station selection concept was based on the notion that any eventual improvements intended to improve pedestrian/bicycle access should be targeted where surrounding land uses may be expected to generate the highest number of discretionary bikers/pedestrians. The specific method employed to select stations differed between the two states.

In Pennsylvania, all SEPTA rail stations at which parking lot license plate surveys have been performed by DVRPC staff were ranked by the proportion of drivers whose addresses were located within one mile of the rail station. The notion here was that these drivers could represent a latent 'bicycle market' should bicycle access be improved. Table 2 (below) indicates the five highest ranked results by this criterion.

Table 2: Top Five Regional Stations by Proximity of Drivers

Station	Line	Total Plates	Plates Within 1 Mi.	% Within 1 Mi.
Oreland	SEPTA R5	65	46	70.77%
Cynwyd	SEPTA R6	35	18	51.43%
Wynnefield Ave.	SEPTA R6	49	23	46.94%
Eastwick	SEPTA R1	34	15	44.12%
Bristol	SEPTA R7	78	28	35.90%

Source: DVRPC station shed mapping, 2006.

The stations shaded in orange were those selected for study in Phase III (Wynnefield Avenue was not studied in this round in order that three separate regional rail routes – the R1, R5, and R6 – would have stations studied).

In New Jersey, three Burlington County stations along the New Jersey Transit RiverLINE were studied as a followup to the March 20002 DVRPC Transit Village Design In Burlington County study (DVRPC Publication No. 02013). The stations selected – Riverton, Burlington Town Center, and Beverly / Edgewater Park – were the three stations deemed in the 2002 study to have the highest proportion of existing 'transit-supportive' land uses within a one quarter mile radius, and which did not have overlapping one mile station sheds (the Palmyra station would otherwise have been second in this list). Table 3 (below) summarizes the six stations selected for Phase III study.

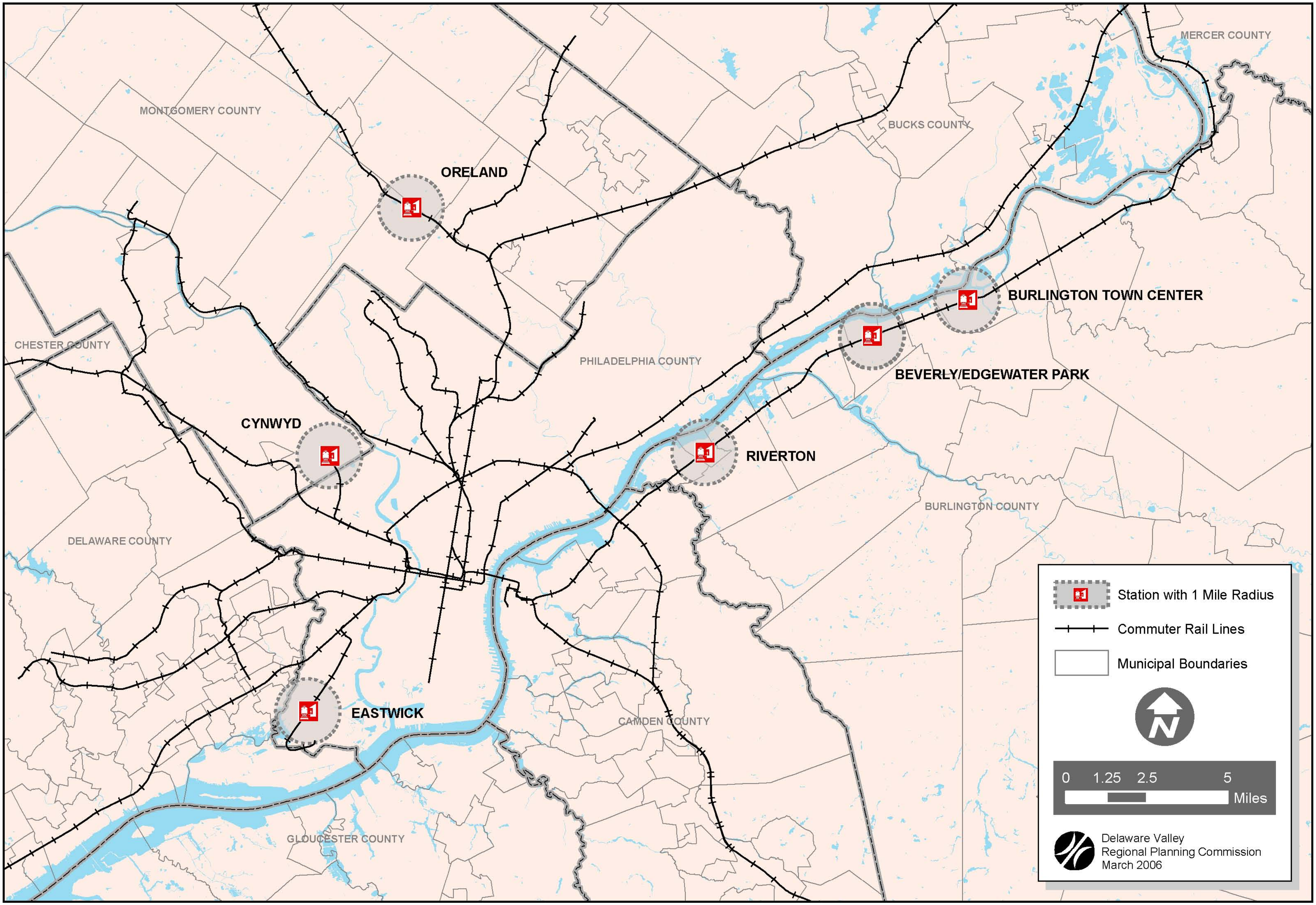
Table 3: Stations Selected for Phase III Study

Station	Line	County
Beverly / Edgewater Park	RiverLINE	Burlington
Burlington Town Center	RiverLINE	Burlington
Cynwyd	SEPTA R6	Montgomery
Eastwick	SEPTA R1	Philadelphia
Oreland	SEPTA R5	Montgomery
Riverton	RiverLINE	Burlington

Source: DVRPC, 2006.

Map 1 depicts the six station areas examined in Phase III as well as their relative locations in the region. The following sections contain the study results for each station area, presented in the same order as in Table 3.

Map 1: Phase III Station Study Areas



BEVERLY / EDGEWATER PARK STATION

Introduction/Summary

The Beverly/Edgewater Park RiverLINE station is located along the boundary of Beverly City and Edgewater Park Township at the intersection of Route 630/Cooper St. and Pennsylvania/Railroad Ave. Land uses to the north of the station (at the quarter mile radius) and northwest (at the one mile radius) within Beverly City are arrayed along an interconnected, walkable grid street network. In contrast, areas to the south of the station (in Edgewater Park Township) are less intensely developed, and streets are of a less interconnected, more curvilinear type.

Within the quarter mile pedestrian shed, there are far more road segments to the north of the station than to the south. Due to the widespread presence of sidewalks as well as relatively low traffic intensities, streets throughout the pedestrian shed typically score highly for pedestrian levels of service, with many segments having a grade of 'B.'

BLOS grades for roadways within 1 mile of the station range from a high of 'A' to a low of 'D.' High grades, where they are present in this station area, typically reflect a combination of wide shoulders and low traffic intensities.

Station area land use

As illustrated in table 4 and map 2 below, detached residential land uses are the most frequently occurring at both the one mile and one quarter mile radii. Concentrations of commercial uses occur along Pennsylvania/Railroad Avenue at the quarter mile radius and at the intersection of Warren Street, Beverly Road, and Cooper Street at the one mile radius (this intersection, at the heart of Beverly City, is located just outside the station's quarter mile pedestrian shed). Accordingly, pedestrian access between the rail station and both commercial concentrations is possible. Table 4 indicates the relative proportion of land uses occurring within one mile of the station, from the highest proportion to the lowest. Map 2 illustrates these land uses at both radii.

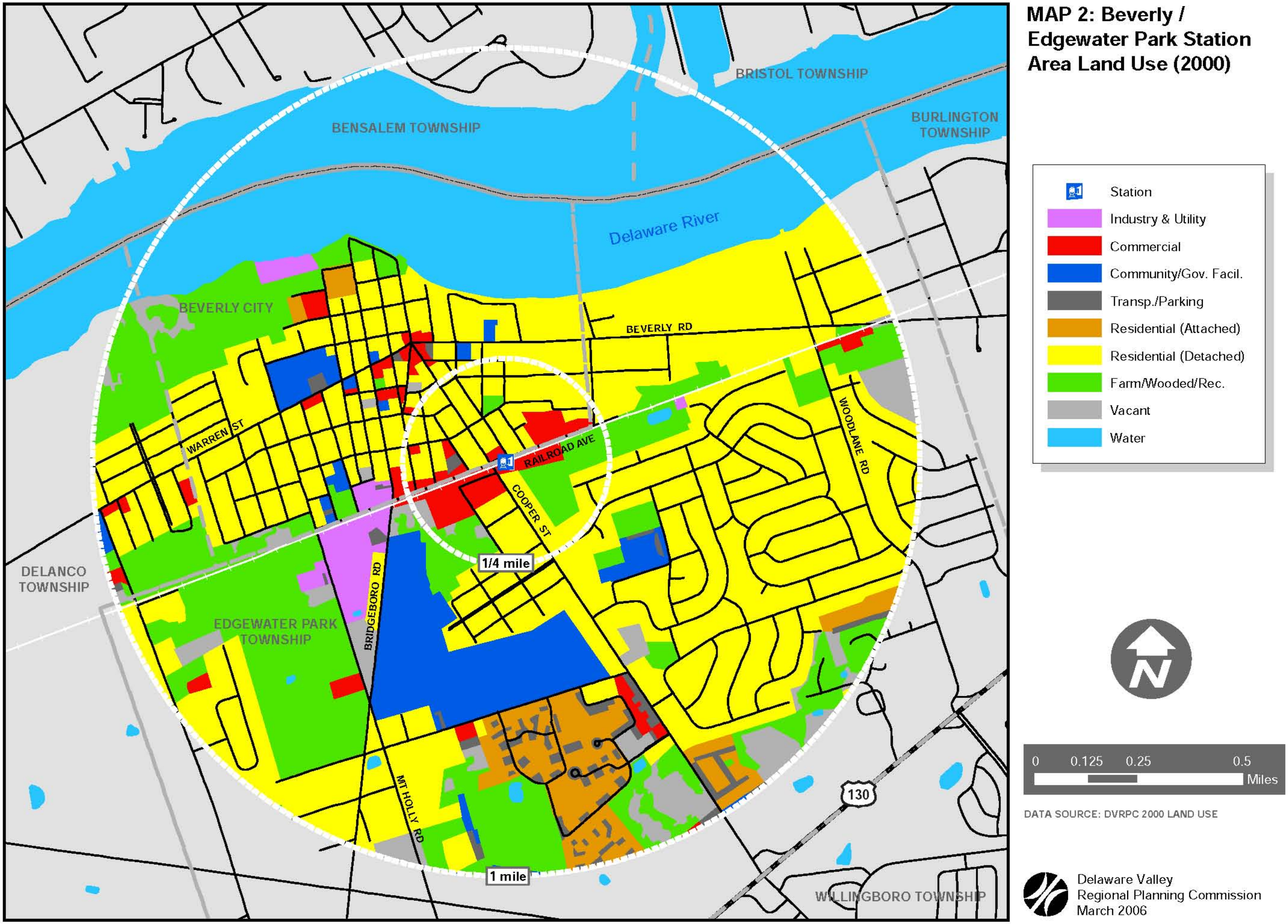
Similar to other RiverLINE station areas examined, residential land uses are dispersed throughout the study area at both the quarter mile and one mile radii. However, due to the station's presence at the edge of an interconnected, grid-based street network, pedestrian and bicycle traffic from the north may be expected to be congregate along Cooper Street, which provides the most direct access. To the south of the station, due to a less interconnected street network, Cooper Street is a collector for traffic of all modes, including bicycle and pedestrian. Most commercial uses in Beverly City are located within (or just outside) the station's quarter mile radius, making pedestrian access to these uses convenient.

Table 4: Beverly/Edgewater Park Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	883.0	55.81%
Farmland/Wooded/Recreation	333.4	21.07%
Community & Government Facilities	110.9	7.01%
Vacant	74.0	4.68%
Residential (Attached)	67.9	4.29%
Commercial	53.3	3.37%
Transportation & Parking	31.4	1.99%
Industry & Utility	28.2	1.78%
TOTAL	**1,582.2**	**100.0%**

Source: DVRPC 2000 land use.

MAP 2: Beverly / Edgewater Park Station Area Land Use (2000)



Pedestrian LOS results and summary

Table 5 below contains the PLOS scores calculated for road segments within one quarter mile of the Beverly/Edgewater Park station. Road segments are arranged alphabetically for ease of reference.

Table 5: Beverly/Edgewater Park Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Blyler Ave.	West of Cooper St.	3.46	C
Chestnut St.	North of Pennsylvania Ave.	2.44	C
Church St.	East of Cooper St.	1.52	B
Cooper St.	South of Blyler Ave.	2.32	B
Cooper St.	North of Blyler Ave.	2.15	B
Elizabeth St.	North of Pennsylvania Ave.	2.36	B
Farnum St.	North of Pennsylvania Ave.	1.87	B
Garfield Ave.	East of Walton Ave.	3.01	C
Hess Ave.	West of Cooper St.	3.22	C
Jennings St.	North of Pine St.	1.54	B
Laurel St.	North of Pennsylvania Ave.	1.59	B
Nikki's Pl.	West of Cooper St.	3.34	C
Parker Ave.	Pine St. to Church St.	1.89	B
Parker Ave.	North of Church St.	2.20	B
Pennsylvania Ave.	Elizabeth St. to Cooper St.	1.88	B
Pennsylvania Ave.	Walton Ave. to Elizabeth St.	1.69	B
Pennsylvania Ave.	West of Cooper St.	2.68	C
Perkins Rd.	West of Parker Ave.	3.23	C
Pine St.	Entire length	1.25	A
Putnum St.	West of Cooper St.	1.70	B
Severs Ave.	South of Stevenson Ave.	1.80	B
Spruce St.	Pine St. to Penna. Ave.	1.65	B
Spruce St.	Putnum St. to Pine St.	1.96	B
Stevenson Ave.	North of Severs Ave.	1.80	B
Van Possum Ave.	South of Blyler Ave.	1.96	B
Walton Ave.	North of Pennsylvania Ave.	1.72	B

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:

As depicted in Table 5, many study area road segments score similarly for pedestrian LOS, owing to similarities in traffic intensities and configurations. Pine Street had the highest score at 1.25 (the only study area segment with an LOS of 'A'). This score results from a combination of consistent buffers (averaging roughly 5.5 feet), consistent sidewalks (averaging 4 feet on both sides), frequent street trees (spaced 40-45 feet on center), and low vehicular intensities in terms of speed and estimated volume.

Lowest PLOS scoring:

The lowest PLOS score in this study area occurred along Blyler Avenue (3.46; LOS 'C'). This segment, which provides access to the park & ride lot servicing the RiverLINE station, has no sidewalks and comparatively high estimated daily traffic volumes (owing to vehicles accessing the station lot). However, a dedicated pedestrian walkway provides access between the lot and Cooper Street with proximity to the station.

Bicycle LOS results and summary

Table 6 below contains the BLOS scores calculated for road segments within one mile of the Beverly/Edgewater Park station. Road segments are arranged alphabetically for ease of reference.

MAP 3: Beverly / Edgewater Park Station Area PLOS Scores (1/4 Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 170 340 680 Feet

IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Table 6: Beverly/Edgewater Park Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
Bridgeboro Rd.	West of Mt. Holly Rd.	2.41	B
Route 626	North of Railroad Ave.	0.00	A
Route 626	Charles St. to Railroad Ave.	1.62	B
Route 626	Mt. Holly Rd. to Charles St.	2.51	C
Route 630	North of Railroad Ave.	1.43	A
Route 630	South of Elm St.	2.20	B
Route 630	Penna./Railroad Ave. to Green St.	2.78	C
Route 630	Green St. to Elm St.	3.64	D
Mt. Holly Rd.	North of Railroad Ave.	1.00	A
Mt. Holly Rd.	South of Railroad Ave.	1.77	B
Route 543	West of Cooper St.	2.98	C
Route 543	East of Cooper St.	4.02	D
Woodlane Rd.	South of Harrison Ave.	0.00	A
Woodlane Rd.	North of Harrison Ave.	1.10	A

Source: DVRPC field work and model output, 2006.

Highest BLOS scoring:

There are two road segments in the study area which have the highest possible BLOS score (0.00; LOS ‘A’) – Route 626 (north of Railroad Avenue) and Woodlane Road (south of Harrison Avenue). These scores relate to particularly wide shoulders (11 and 9 feet, respectively) and relatively low posted speed limits (25 and 35 mph, respectively).

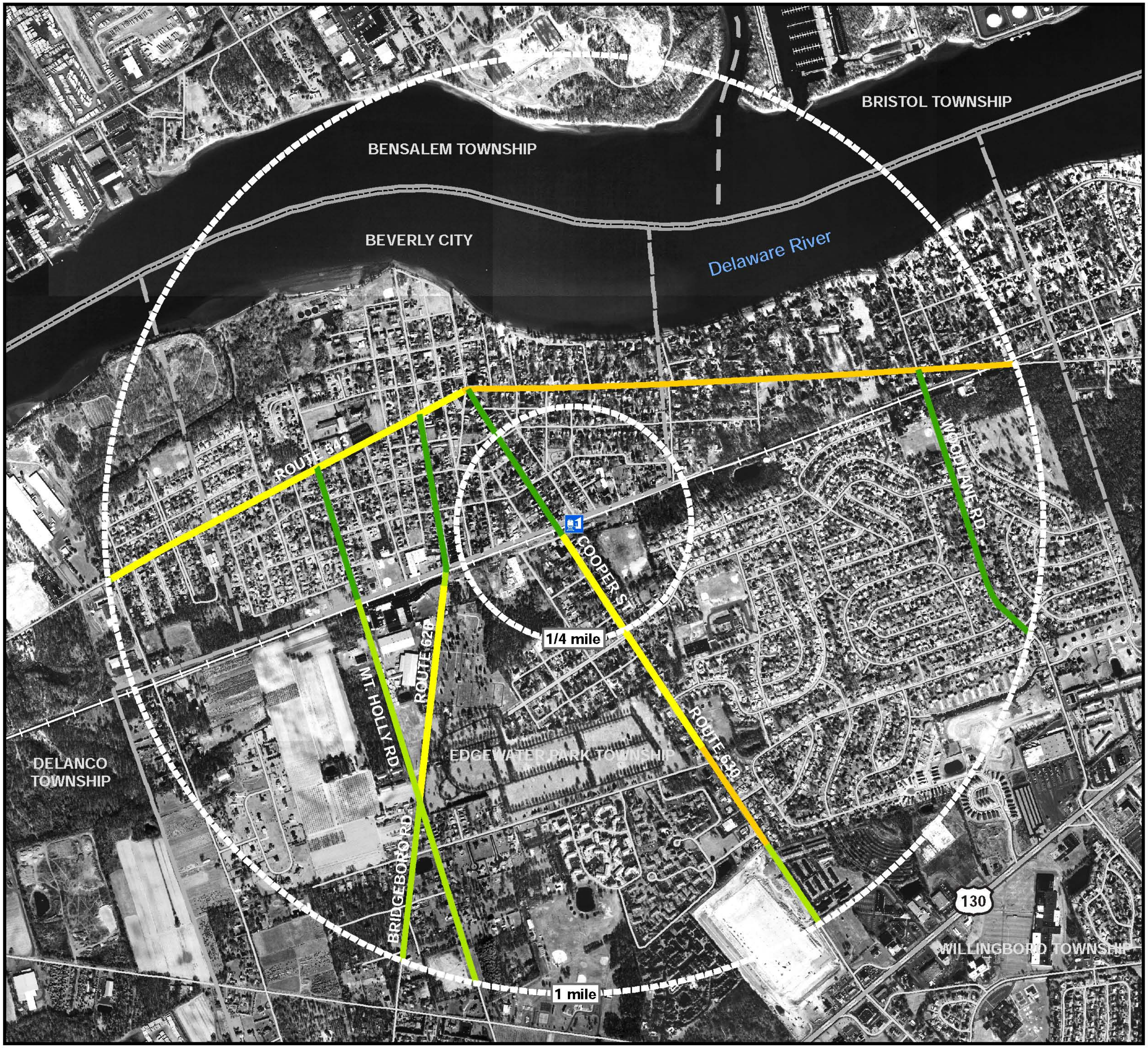
Lowest BLOS scoring:

The lowest study area BLOS score was associated with the portion of Route 543 east of Cooper Street (4.02; LOS ‘D’). The portion of this road segment within the one mile station radius has a narrow average shoulder of only 2 feet, a 40-mph speed limit, and relatively high traffic volumes (an ADT of over 11,000).

Conditions for pedestrians/bicyclists in the immediate station vicinity

Sidewalks in the vicinity of the station are in good condition, with many appearing to have been reconstructed in association with the station’s construction. Due to the configuration of the street network, most pedestrian traffic may be expected to originate to the north of the station, which is the side from which the station platform is accessed. Whereas pedestrian access from the station park & ride lot is enhanced by a dedicated walkway, clear crosswalk, and wide sidewalks, direct pedestrian access along Cooper Street from the north is potentially impaired by the lack of a crosswalk over the eastern side of the intersection with Pennsylvania/Railroad Avenue, a three-lane crossing distance.

MAP 4: Beverly / Edgewater Park Station Area BLOS Scores (1 Mile Radius)



BLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 0.125 0.25 0.5 Miles

IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Walkway connecting park & ride lot with Cooper Street

Railroad Avenue crossing distance between Beverly City (right) and station location (left)

The station platform itself is accommodating to pedestrians, as it includes both a shelter and several benches. In terms of bicycle compatibility, a bicycle rack is present at the station, and bicycles are comfortably accommodated on the RiverLINE trains themselves with vertical bicycle racks being conspicuous on all trains. There are no marked bicycle lanes along roadways in the vicinity of the station.

Suggested improvements to enhance pedestrian/bicyclist accessibility

In order to enhance station pedestrian access from Beverly City, a crosswalk over Pennsylvania/Railroad Avenue should be provided at the intersection with Cooper Street. This is the sole specific pedestrian access improvement recommended, as pedestrian compatibility is already high throughout the station's 'pedestrian shed.'

Bicycle accommodation should be enhanced along the study area length of Cooper Street through the provision of either dedicated bicycle lanes or shared lane pavement markings. Bicycle compatibility along major roadways is inconsistent throughout the study area, and specifically inconsistent along Cooper Street, which may be expected to be the most significant route for bicycle station access. Bicycle LOS is high north of the station, but lower to its south where traffic intensity is higher. The segment of Cooper Street to the immediate south of the station already has an average shoulder width of 4 feet, and approximates a 4-foot bicycle lane in the BLOS model. These shoulders should become designated bicycle lanes and painted as such. North of Pennsylvania/Railroad Avenue in Beverly City, where speeds are lower and parallel parking is permitted, a shared lane pavement marking ('sharrow') strategy may be appropriate (see Appendix A for more information on sharrows).

Additionally, conceptual planning is to be undertaken for a new Transit Oriented Development (TOD) surrounding the Beverly/Edgewater Park station. A project of this sort would provide an opportunity for the improvement of pedestrian and bicycle access along Cooper Street. Plans should address the enhancement of pedestrian and bicycle access from outside the immediate planning area in order to facilitate the best possible integration with surrounding land uses.

Relevant aspects of regional and state bicycle and pedestrian plans

Portions of Routes 543 and 626 at the one mile radius to the Beverly/Edgewater Park Station are identified as Low and Medium Priority bicycle links in the New Jersey Department of Transportation's Statewide Bicycle and Pedestrian Master Plan (Phase 2). These routes are identified as Low Priority pedestrian links in the same plan. See Appendix B for a summary of the NJ State Plan.

Relevant Transportation Improvement Program (TIP) projects

The planned Delaware River Heritage Trail (TIP project 02390) is proposed to traverse the study area. Depending on trail alignment, this project has the potential for enhancing pedestrian and bicycle station access. While a final proposed alignment has not yet been determined, a spokesman for the Burlington County Resource Conservation Department indicated that an alignment which would cross the Beverly / Edgewater Park boundary along Cooper Street is presently under consideration. Such an alignment would enhance station access, and therefore be desirable from the perspective of this study. A dedicated bicycle access route along Cooper Street is specifically recommended above, and this alignment could provide such a route.

BURLINGTON TOWN CENTER STATION

Introduction/Summary

Like the other RiverLINE station areas studied in this report, the immediate vicinity of the Burlington Town Center station (within one quarter mile) is an older, pre-automobile mixed-use community. Streets at this radius typically have sidewalks, and are associated with relatively low vehicle travel volumes and 25-mph speed limits. Accordingly, virtually all of the road segments within one quarter mile of the Burlington Town Center RiverLINE station score highly for pedestrian levels of service, with most segments having a grade of 'B.'

In contrast, BLOS grades for major roadways within 1 mile of the station are low, with a grade of 'D' being the most common. Such low grades are due to an absence of passable shoulders, high traffic volumes/speeds, or a combination of both elements. Clearly, in the absence of dedicated bicycle lanes, the presence of passable shoulders (which are free of obstructions such as parked vehicles) is critical to passability by bicyclists. An illustration of the importance of this factor can be seen in the eastern divided portion of Route 130, where the BLOS grade rises from 'E' to 'A' where a ten-foot shoulder is present (versus a lack of any shoulder).

Station area land use

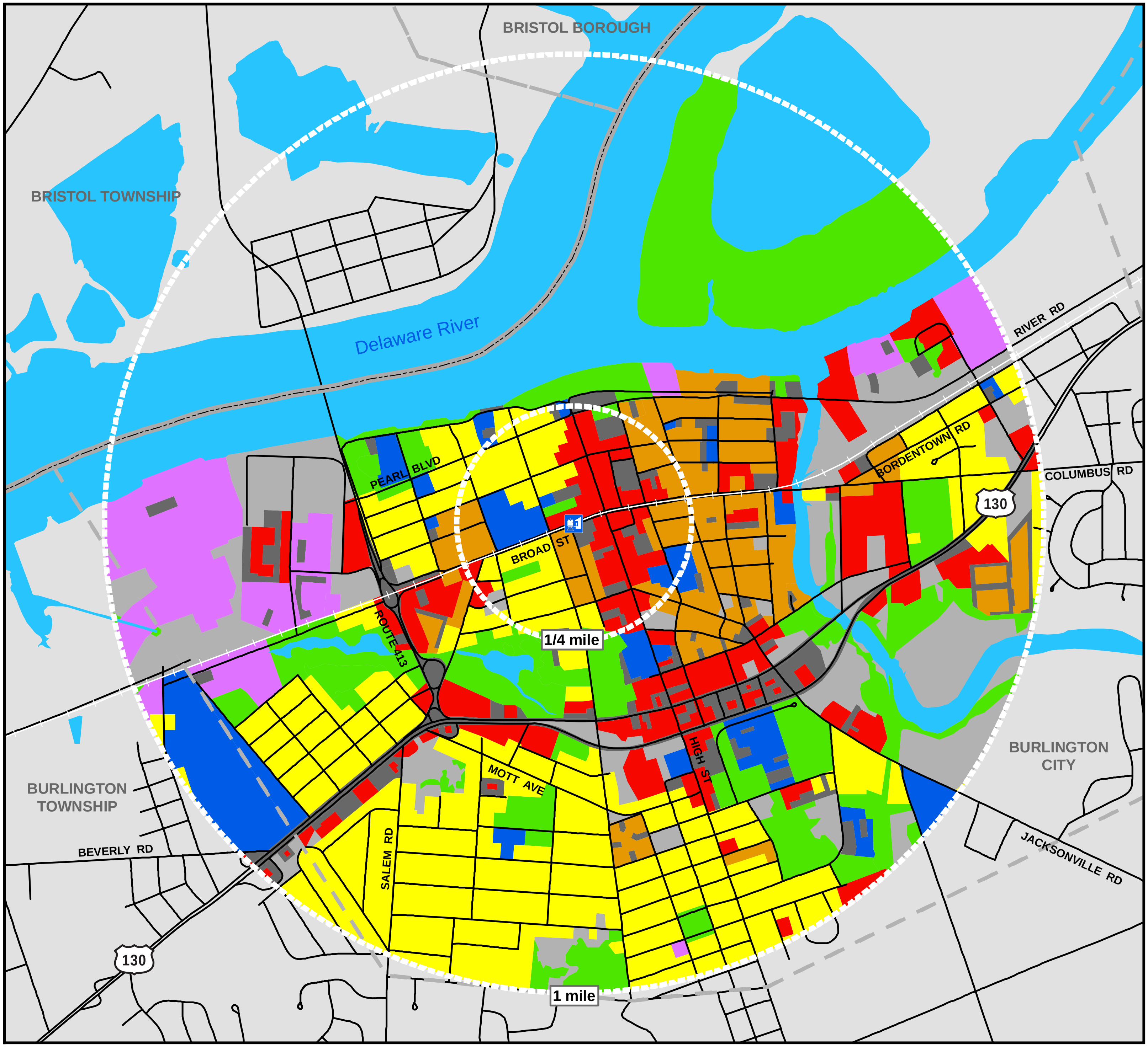
As illustrated in table 7 and map 5 below, residential and commercial land uses are among the most frequently occurring land uses at both the one mile and one quarter mile radii. In addition, the highest density of residential and commercial uses occurs within (or close to) the one quarter mile radius, as may be expected of an older, mixed-use downtown. Table 7 indicates the relative proportion of land uses occurring within one mile of the station, from the highest proportion to the lowest. Map 5 illustrates these land uses at both radii.

The presence of residential land uses throughout the station area, as well as a fairly interconnected, grid-based street network, mean that Burlington City residents may access the RiverLINE station for their daily commutes from virtually any direction. Accordingly, there is no single access route for which bicycle or pedestrian accessibility is most important; demand, and trip patterns, may be expected to be fairly well dispersed. However, given the prevalence of residential uses at a moderate density to the south of Route 130, the poor bicycle compatibility for much of Route 130 presents a substantial impairment to the ability of these residents to reach the Burlington Town Center station by bicycle.

Table 7: Burlington Town Center Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	391.6	27.5%
Farmland/Wooded/Recreation	280.0	19.7%
Vacant	185.8	13.0%
Commercial	156.7	11.0%
Residential (Attached)	122.7	8.6%
Transportation & Parking	102.2	7.2%
Industry & Utility	100.5	7.1%
Community & Government Facilities	85.6	6.0%
TOTAL	**1,425.1**	**100.0%**

Source: DVRPC 2000 land use.



MAP 5: Burlington Town Center Station Area Land Use (2000)

- Station
- Industry & Utility
- Commercial
- Community/Gov. Facil.
- Transp./Parking
- Residential (Attached)
- Residential (Detached)
- Farm/Wooded/Rec.
- Vacant
- Water

0 0.125 0.25 0.5 Miles

DATA SOURCE: DVRPC 2000 LAND USE

Delaware Valley
Regional Planning Commission
March 2006

Pedestrian LOS results and summary

Table 8 below contains the PLOS scores calculated for road segments within one quarter mile of the Burlington Town Center station. Road segments are arranged alphabetically for ease of reference.

Table 8: Burlington Town Center Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Barclay St.	East of Stacy St.	1.70	B
Cherry St.	West of Engle Ave.	2.81	C
Clarkson St.	East of Lawrence St.	1.96	B
Conover St.	West of Talbot St.	1.17	A
Engle Ave.	South of Broad St.	3.03	C
Federal St,	East of High St.	1.50	A
Federal St.	West of High St.	2.09	B
High St.	South of Broad St.	1.68	B
High St.	North of Broad St.	2.25	B
Juniper St.	West of Locust St.	1.39	A
Lawrence St.	South of Broad St.	1.77	B
Locust St.	South of Broad St.	1.74	B
Mechanic St.	East of Lawrence St.	2.05	B
N. Broad St.	East of High St.	1.80	B
Pearl Blvd.	West of High St.	2.12	B
River Rd.	East of High St.	2.30	B
S. and N. Broad St.	West of High St.	2.20	B
S. Broad St.	East of High St.	2.02	B
Stacy St.	North of Broad St.	1.69	B
Talbot St.	North of Broad St.	1.57	B
Union St.	West of High St.	1.63	B
Union St.	Between High St. & Stacy St.	1.38	A
Union St.	East of Stacy St.	1.27	A
Union St.	West of Wood St.	1.65	B
Washington St.	South of Broad St.	1.99	B
Wood St.	North of Broad St.	1.61	B
Wood St.	South of Broad St.	1.76	B

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:
While nearly all of the road segments in the study area score favorably for pedestrian compatibility, Conover Street (west of Talbot Street) had the highest score at 1.17 (LOS ‘A’). This score results from a combination of one of the widest average sidewalk widths (7.25 feet), along with one of the highest observed proportions of occupied on-street parking (80%), resulting in an excellent degree of physical buffering between pedestrians and vehicles traveling in the cartway.

Lowest PLOS scoring:
The lowest PLOS score in this study area occurred for Engle Avenue (3.03; LOS ‘C’), owing to a lack of sidewalks, buffers, and a low proportion of occupied on-street parking (5%). However, comparatively low vehicle volumes and speeds reduce the need for such improvements, and prevent this road segment from having a score of ‘D’ or lower.

MAP 6: Burlington Town Center Station Area PLOS Scores (1/4 Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 170 340 680 Feet

IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Bicycle LOS results and summary

Table 9 below contains the BLOS scores calculated for road segments within one mile of the Burlington Town Center station. Road segments are arranged alphabetically for ease of reference.

Table 9: Burlington Town Center Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
Bordentown Rd.	North of Columbus Rd.	3.52	D
Broad St.	West of Tatham St.	3.73	D
Columbus Rd.	East of Williams St.	2.67	C
Columbus Rd.	West of Williams St.	2.34	B
Columbus Rd.	East of Rt. 130	0.92	A
High St.	North of Broad St.	4.23	D
High St.	South of Broad St.	4.14	D
Mott Ave.	Entire length	3.04	C
Pearl St.	West of Saint Mary St.	2.35	B
Pearl St.	East of Saint Mary St.	0.91	A
Route 130	East of Route 670	0.77	A
Route 130	West of Route 670	5.05	E
Route 413	North of Conover St.	4.10	D
Route 413	Route 130 to Conover St.	4.46	D
Route 541	Mott Ave. to Rt. 130	3.94	D
Route 541	South of Mott Ave.	2.50	B
Route 541 (bypass)	South of Route 670	6.78	F
Route 543	West of Rt. 130	4.26	D
Route 656	East of Saint Mary St.	0.95	A
Route 670	South of Rt. 130	1.46	A
Salem Rd.	South of Rt. 130	2.50	B
Washington Ave.	Entire length	3.19	C

Source: DVRPC field work and model output, 2006.

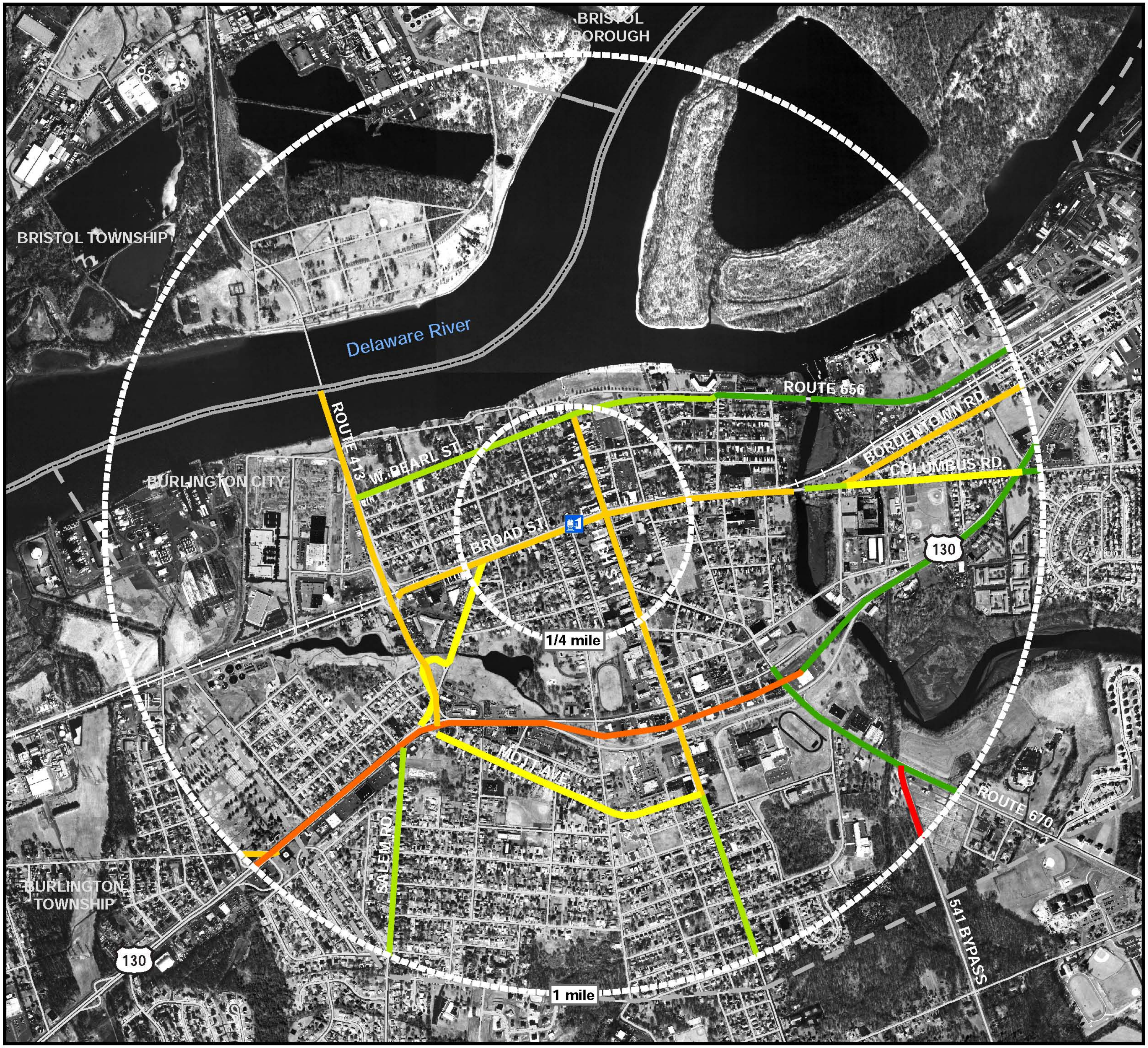
Highest BLOS scoring:
The highest BLOS score and grade in this area occurred for that portion of Route 130 east of Route 670 (0.77; LOS 'A'). Although this segment of Route 130, like the remainder of the route, is associated with comparatively high vehicle volumes and speeds, the presence of a ten foot shoulder has an enormous impact on bicycle compatibility.

Lowest BLOS scoring:
The lowest BLOS score was associated with the Route 541 bypass (6.51; LOS 'F'). The portion of this road segment within the one mile station shed is a designated truck route with consequently a much higher estimated proportion of heavy truck traffic than the typical roadway. This characteristic greatly reduces compatibility with bicycle travel.

Conditions for pedestrians/bicyclists in the immediate station vicinity

Sidewalks in the vicinity of the station, as in the majority of the quarter mile 'pedestrian shed,' are in sound condition. Direct station access for pedestrians and bicyclists is enhanced by clearly marked crosswalks at the intersections of Broad Street with Wood and High Streets. As there is no platform access from the northern side of Broad Street, would-be riders from areas north of the station need to cross to the southern side of Broad Street. Mid-block crosswalks provide direct access to the southern side of the station platform from the southern side of Broad Street. Broad Street in this area consists of a single narrow lane in the eastern direction, which reduces the cartway width pedestrians must traverse and also likely reduces vehicle speed.

MAP 7: Burlington Town Center Station Area BLOS Scores (1 Mile Radius)



BLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 0.125 0.25 0.5 Miles

IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

The station platform itself is accommodating to pedestrians, as it includes both a shelter and several benches. However, no bicycle racks are present, and there is no conspicuous signage informing bicyclists whether bicycles are permitted to be locked to platform fencing or rails. Bicycles are comfortably accommodated on the RiverLINE trains themselves, with vertical bicycle racks being conspicuous on all trains. There are no marked bicycle lanes along roadways in the vicinity of the station.

Mid-block crosswalk connecting station platform to southern side of Broad Street.

View from platform west to intersection of Broad Street and Wood Street – crosswalks are present over entire length of crossing.

Suggested improvements to enhance pedestrian/bicyclist accessibility

As previously discussed, pedestrian compatibility is very high throughout the station's 'pedestrian shed' due to such factors as the prevalence of sidewalks in good condition, the presence of green buffers with street trees separating these sidewalks from cartways, and the relatively low speed and volume of vehicular travel on most road segments.

However, bicycle compatibility is much less favorable along major station access roadways, likely forcing would-be bicyclists from outside the comfortable quarter mile 'pedestrian shed' to either drive to the station area, bicycle on sidewalks, or substitute auto trips for their potential rail trips.

Accordingly, designated bicycle lanes of some variety should be provided along the main axes of station access – Broad and High Streets. These may take the form of bicycle lanes to the street side of on-street parking areas, or of shared-lane pavement markings ('sharrows') indicating that the outer edge of the cartway is to be shared with bicyclists (see Appendix A). The addition of a hypothetical 4-foot bicycle lane along High Street between Broad Street and Route 130 would improve BLOS scoring from 4.14 (LOS 'D') to 3.02 (LOS 'C'). The BLOS model does not specifically account for a shared-lane pavement marking strategy. It should also be noted that the angled parking along this portion of High Street may present an additional safety impediment to the implementation of a bicycle lane. 'Back-in' angled parking, such as recently provided in Pottstown, Montgomery County, may provide a safer configuration where a bicycle lane abuts.

Additionally, portions of Route 130 – especially the segment between Salem Road and Route 541 – should be prioritized for bicycle-related improvements, including the addition of a designated bicycle lane. The extensive portions of Route 130 with very low bicycle compatibility (a BLOS grade of 'E') present a substantial barrier to bicycle access from residential areas to the south of the roadway. The hypothetical addition of a 4-foot bicycle lane along a portion of Route 130 between Route 413 and High Street would result in an improvement of the BLOS score from 5.05 (LOS 'E') to 3.77 (LOS 'D').

Finally, bicycle station access should be enhanced by the provision of bicycle racks at the station itself or in close proximity (perhaps along the southern frontage of S. Broad St., opposite the station).

Relevant aspects of regional and state bicycle and pedestrian plans

The study area portions of Routes 130 and 413 are identified as 'Low Priority' bicycle links in the New Jersey Department of Transportation's Statewide Bicycle and Pedestrian Master Plan (Phase 2). This same plan identifies the study area portion of Route 413 as a 'Medium Priority' pedestrian link, along with the western portion of Route 130 in the study area. The eastern portion of Route 130 is identified as a 'Low Priority' pedestrian link. See Appendix B for a summary of the NJ State Plan.

Relevant Transportation Improvement Program (TIP) projects

A portion of Route 130 recommended above for bicycle compatibility improvement is affected by TIP project 95078B5, 'Route 130 Salem Road / Keim Blvd / Mott Ave / Washington Ave.' According to NJDOT, this project is scheduled for conceptual development in Fiscal Year 2006. From the perspective of this study, this project should, where possible, incorporate design features which would permit safe bicycle and pedestrian travel across Route 130 at the affected intersections.

CYNWYD STATION

Introduction/Summary

Cynwyd Station, located at the terminus of SEPTA's R6 Cynwyd line, is located just north of City Avenue. in Lower Merion Township. The most frequently occurring land uses at both the one mile and quarter mile radii are detached residential uses, with commercial uses being concentrated along key corridors (Bala Avenue, City Avenue, and Montgomery Avenue). The study area street network is fairly interconnected, and reflects a modified grid pattern. Largely due to the consistent presence of sidewalks, no road segment at the quarter mile radius has a PLOS score lower than 'C.' Due to high traffic volumes, however, along with a typical absence of passable shoulders, many road segments at the one mile radius have BLOS scores of 'D' or lower.

Station area land use

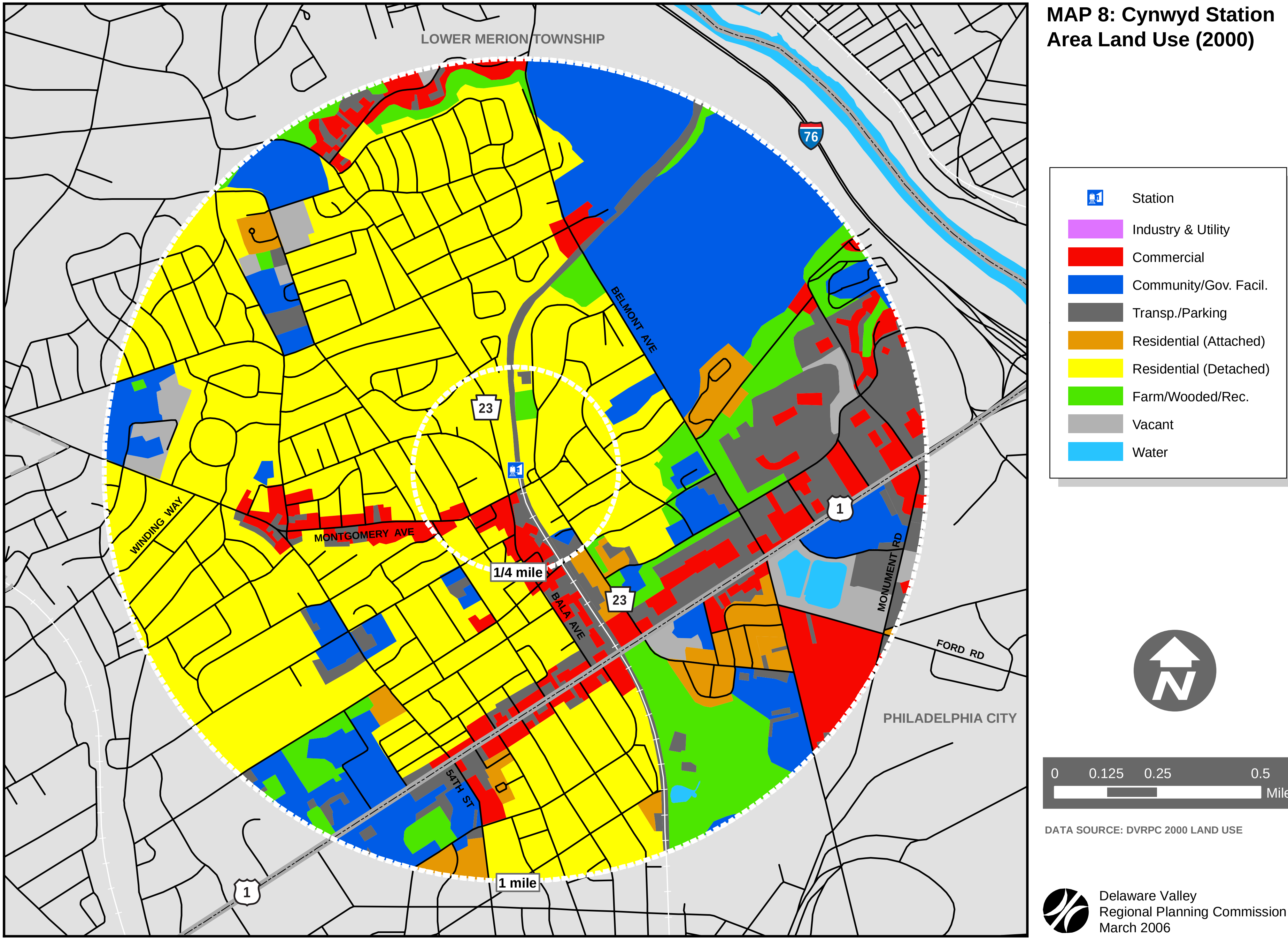
As illustrated in table 10 and map 8 below, detached residential land uses comprise nearly half of the total land coverage within one mile of the station, and more than half within one quarter mile. Community & government facilities comprise nearly 20% of the area within one mile, largely due to the size of the West Laurel Hill Cemetery. Given that the station is largely surrounded by residential uses at the quarter mile radius, no single route is maximally important for pedestrian access. However, since commercial uses are concentrated along Bala and Montgomery Avenues at both the one quarter and one mile radii, these routes – for which the station is located at the juncture – should generally be considered the most significant for nonmotorized access improvement.

Table 10: Cynwyd Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	990.1	49.5%
Community & Government Facilities	375.4	18.8%
Transportation & Parking	209.1	10.5%
Commercial	162.6	8.1%
Farmland/Wooded/Recreation	150.6	7.5%
Residential (Attached)	68.0	3.4%
Vacant	43.8	2.2%
TOTAL	**1,999.5**	**100.0%**

Source: DVRPC 2000 land use.

MAP 8: Cynwyd Station Area Land Use (2000)



DATA SOURCE: DVRPC 2000 LAND USE

Delaware Valley
Regional Planning Commission
March 2006

Pedestrian LOS results and summary

Table 11 below contains the PLOS scores calculated for road segments within one quarter mile of Cynwyd station. Road segments are arranged alphabetically for ease of reference.

Table 11: Cynwyd Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Bala Ave.	South of Montgomery Ave.	2.86	C
Bala Ave.	Route 23 to Bala Cir.	1.93	B
Bryn Mawr Ave.	South of Montgomery Ave.	2.16	B
Bryn Mawr Ave.	North of Montgomery Ave.	2.08	B
Clwyd Rd.	Entire length	2.51	C
Colwyn Ln.	East of Clwyd Rd.	3.06	C
Colwyn Ln.	West of Clwyd Rd.	1.85	B
Concord Cir.	East of Cynwyd Rd.	1.78	B
Cons. State Rd. / Rt. 23	North of Montgomery Ave.	3.32	C
Cons. State Rd. / Rt. 23	South of Montgomery Ave.	3.11	C
Cynwyd Rd.	North of Highland Ave.	2.51	C
Cynwyd Rd.	North of Union Ave.	2.11	B
Cynwyd Rd.	East of Bala Ave.	1.97	B
Cynwyd Rd.	North of Bala Ave.	1.96	B
Cynwyd Rd.	South of Highland Ave.	1.75	B
Cynwyd Rd.	South of Bala Ave.	1.58	B
Hardie Way	South of Montgomery Ave.	1.57	B
Hardie Way	East of Cynwyd Rd.	1.56	B
Heather Rd.	Entire length	1.85	B
Highland Ave.	West of Cynwyd Rd.	2.58	C
Highland Ave.	East of Cynwyd Rd.	2.17	B
Llandrillo Rd.	North of Montgomery Ave.	2.09	B
Montgomery Ave.	Bala Ave. to Llandrillo Rd.	2.91	C
Montgomery Ave.	West of Cynwyd Rd.	2.75	C
Newfield Way	East of Route 23	1.80	B
Newfield Way	West of Route 23	1.43	A
Rhyle Ln.	Entire length	1.82	B
Righters Ferry Rd.	East of Route 23	2.67	C
Summit Ln.	West of Bryn Mawr Ave.	2.30	B
Trevor Ln.	North of Llandrillo Rd.	1.85	B

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:

The road segment with the highest PLOS score for the Cynwyd Station study area was Newfield Way to the west of Route 23 (1.43; LOS 'A'), which is a dead-end street off Conshohocken State Road. This score results largely from a combination of consistent sidewalks (4 feet), narrow – but present – buffers, and particularly low estimated traffic volumes (being a terminating street with fewer than ten homes fronting).

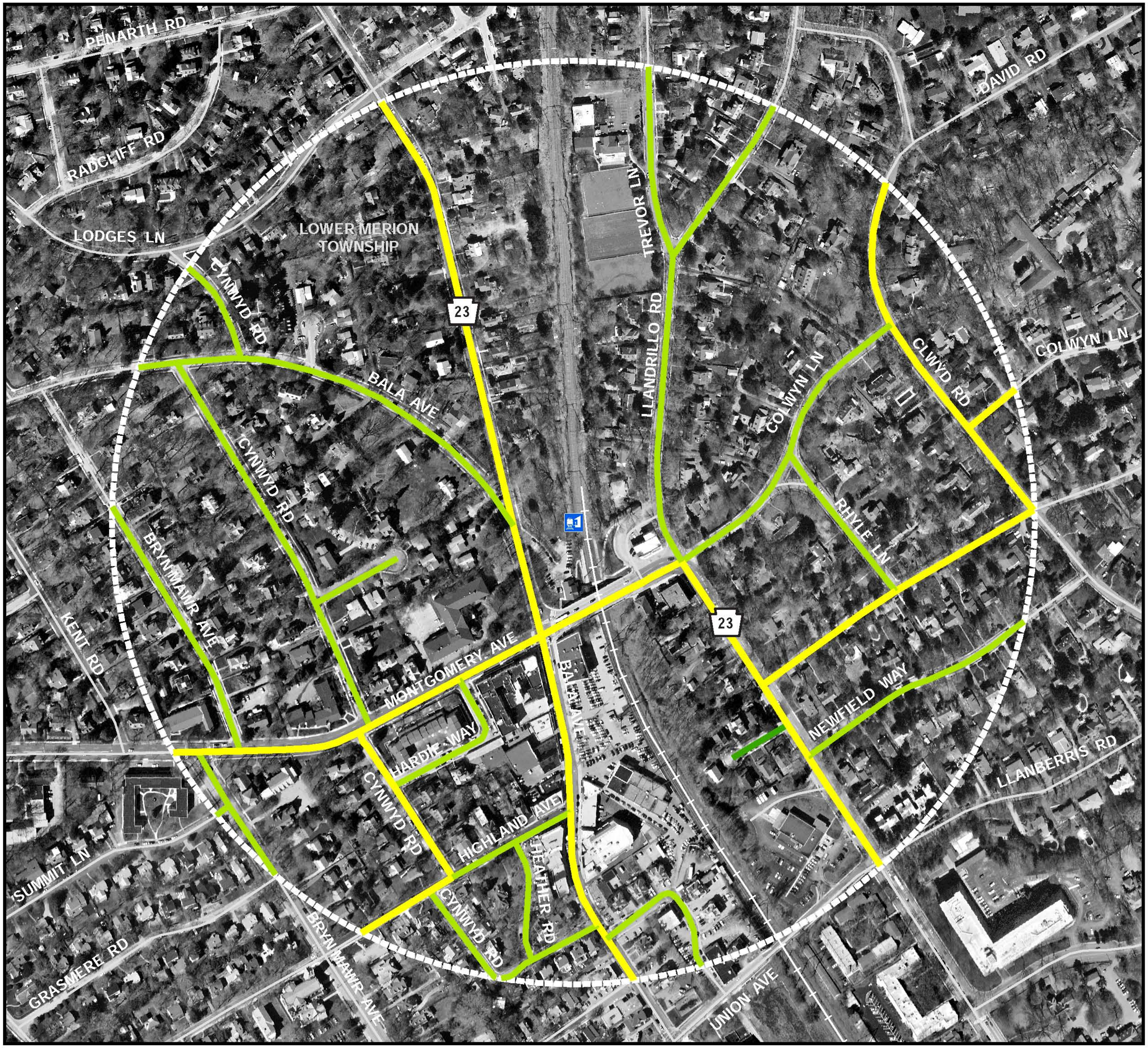
Lowest PLOS scoring:

The lowest PLOS score in this study area occurred for the portion of Conshohocken State Road / Route 23 north of Montgomery Ave. (3.32; LOS 'C'). While this score is not particularly low, it is the lowest in the study area and is due largely to a high posted speed limit of 45-mph.

Bicycle LOS results and summary

Table 12 below contains the BLOS scores calculated for road segments within one mile of Cynwyd station. Road segments are arranged alphabetically for ease of reference.

MAP 9: Cynwyd Station Area PLOS Scores (1/4 Mile Radius)



PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 175 350 700 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley Regional Planning Commission
March 2006

Table 12: Cynwyd Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
54th St.	South of City Ave.	0.00	A
Bala Ave.	South of Montgomery Ave.	3.61	D
Belmont Ave.	North of City Ave.	6.90	F
Belmont Ave.	South of City Ave.	2.66	C
City Ave.	Entire length	5.37	E
Cons. State Rd. / Rte. 23	South of Montgomery Ave.	4.42	D
Cons. State Rd. / Rte. 23	North of Montgomery Ave.	3.86	D
Conshohocken Ave.	South of City Ave.	0.28	A
Ford Rd.	East of Belmont Ave.	0.70	A
Levering Mill Rd.	Entire length	3.96	D
Manayunk Rd.	Entire length	3.49	C
Montgomery Ave.	Entire length	4.05	D
Monument Rd.	South of City Ave.	3.50	C
Old Lancaster Rd.	North of City Ave.	3.44	C
Rock Hill Rd.	West of Route 23	4.99	E
Rock Hill Rd.	East of Route 23	4.59	E
St. Asaphs Rd. / Presidential Blvd.	East of Route 23	3.08	C
Winding Way	West of Montgomery Ave	3.66	D

Source: DVRPC field work and model output, 2006.

<u>Highest BLOS scoring:</u>
The study area road segment with the highest BLOS score is 54th Street within the City of Philadelphia, which has the highest possible BLOS score of 0.00 (LOS 'A') owing largely to the presence in both directions of dedicated 5-foot bicycle lanes.

<u>Lowest BLOS scoring:</u>
The lowest study area BLOS score was associated with Belmont Ave. north of City Ave. (6.90; LOS 'F'). This road segment has no shoulder, outside lanes less than 10 feet in width, relatively high traffic volumes, and a comparatively high proportion of truck traffic (11%). This was the lowest calculated BLOS score among the six station areas examined.

Conditions for pedestrians/bicyclists in the immediate station vicinity

As previously noted, Cynwyd station is located at the intersection of two major roadways – Route 23 and Montgomery Avenue. Pedestrian station access from both roadways is accommodated by sidewalks along all abutting fronts. Despite the low-lying arrangement to the station relative to both roads, bicycle access is enhanced by a ramped sidewalk (from Route 23/Bala Ave.) and a more gently sloped pedestrian/bicycle path (from Llandrillo Rd. by way of a driveway).

Sloped driveway providing station access from Route 23

Sloped path (right) providing station access from a driveway abutting Llandrillo Rd. (left)

MAP 10: Cynwyd Station Area BLOS Scores (1 Mile Radius)

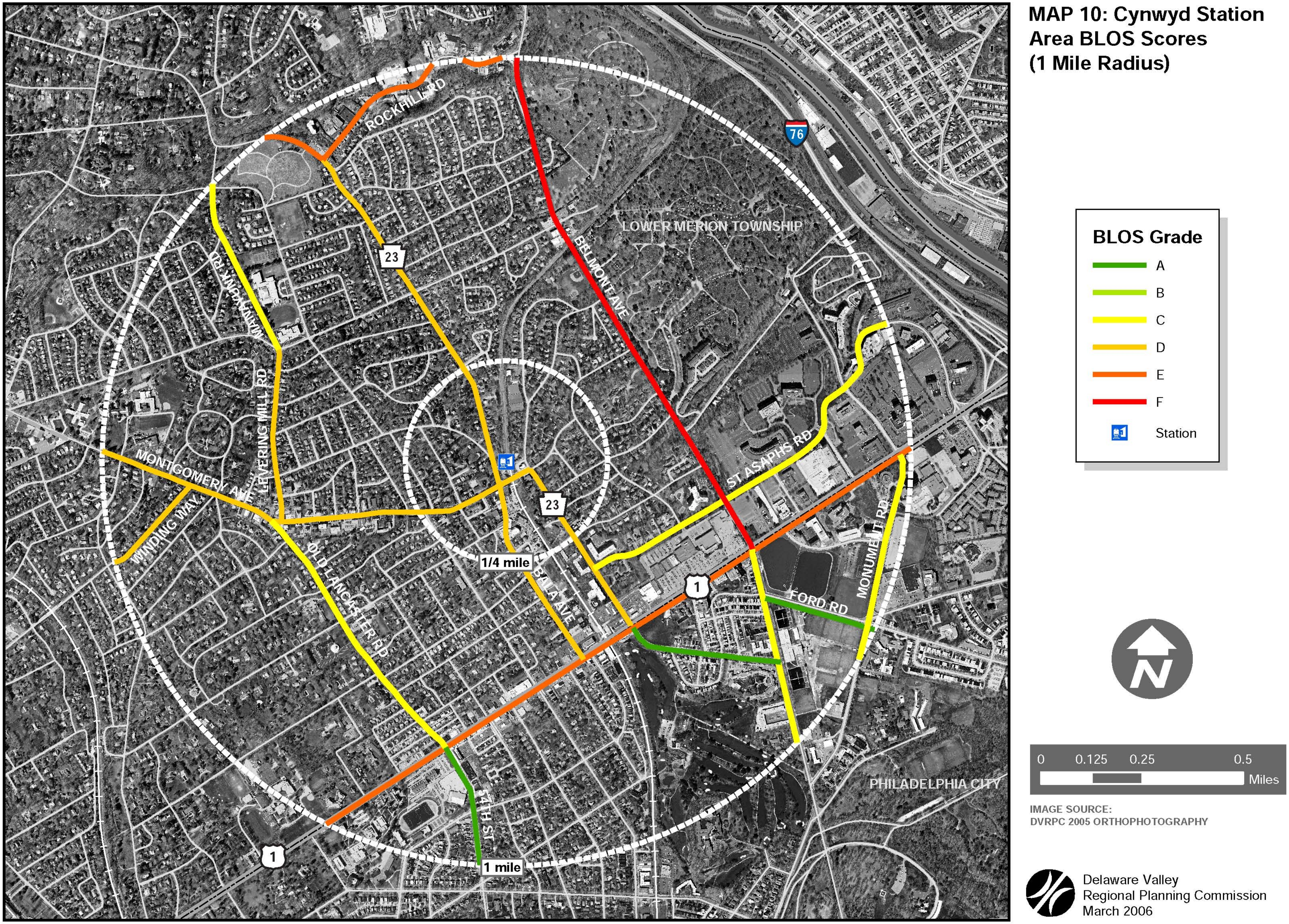


IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Bicycle access is made less convenient, however, by the absence of station bicycle racks. Further, where Montgomery Avenue passes over the rail tracks, narrow lanes, narrow sidewalks, and relatively high vehicle intensities combine to create an uncomfortable environment for bicycle travel. If would-be bicyclists from areas east and south of the station are not aware of the sloped entry path abutting the driveway off Llandrillo Road, they consequently may feel as if the station cannot be safely accessed by bicycle.

Montgomery Avenue bridge over rail tracks.

Lack of shoulder along Route 23 in the station area.

The absence of shoulders along the entire study area lengths of both major roadways providing station access, combined with relatively high traffic volumes, contribute to poor BLOS scores of 'D' for both roadways.

Suggested improvements to enhance pedestrian/bicyclist accessibility

Sidewalks along Montgomery Avenue and Route 23, which provide direct station access, should be better buffered from these relatively high intensity roadways (using planted strips and street trees, for example). It should be noted however that given the high estimated traffic volumes, PLOS model calculations do not reflect a substantial improvement in scores for the hypothetical addition of such planted buffers. For example, the addition of a 4-foot planted buffer including street trees planted 50-feet on center would improve the PLOS score from 2.91 (LOS 'C') to just 2.61 (LOS 'C') for the portion of Montgomery Avenue between Bala Avenue and Llandrillo Road.

In addition, given the importance of Montgomery Avenue and Route 23 to bicycle access, bicycle lanes, shared lane markings (see Appendix A), or (at a minimum) shoulders should be provided along these roadways. Bicycle Levels of Service are presently less favorable than Pedestrian LOS scores, with BLOS scores of 'D' being associated with all segments in the station vicinity. The addition of hypothetical 4-foot bicycle lanes to Montgomery Avenue (for example) would improve the BLOS score from 4.05 (LOS 'D') to 2.93 (LOS 'C').

Bicycle station access should also be enhanced by the addition of bicycle racks at the station. Presently, SEPTA regional rail riders are not permitted to carry bicycles on trains during peak periods. Accordingly, without bicycle racks or other designated bicycle parking areas at the station, commuters are effectively prevented from using a bicycle as part of their work trip.

Finally, the sloped eastern station access path is not visible from Montgomery Avenue / Route 23. Wayfinding signage should be provided along this frontage directing pedestrians and bicyclists to this means of station access. Such signage would be helpful in enhancing awareness that the comparative inhospitability of the Montgomery Avenue rail overpass bridge may be avoided by riders approaching the station from the east.

Relevant aspects of regional and state bicycle and pedestrian plans

The most recent regional Bicycle and Pedestrian Mobility Plan for Southeastern Pennsylvania (from the DVRPC *Direction 2020* long range plan of 1995) identified a primary proposed bicycle corridor along City Avenue, a primary bicycle route along Montgomery Avenue (within the Right-of-Way), and a proposed bicycle route along Conshohocken State Road (Route 23) within the right-of-way. The recommendations in this report are consistent with this plan.

Relevant Transportation Improvement Program (TIP) projects

There are no relevant TIP projects affecting nonmotorized access in the immediate vicinity of the station. However, through an ongoing relationship between DVRPC and PennDOT District 6, road resurfacing projects in suburban Pennsylvania counties within the DVRPC region are assessed by DVRPC for possible improvements to bicycle compatibility through restriping. As study area road segments under PennDOT jurisdiction are resurfaced in the future, the bicycle-related improvements recommended above should be implemented as feasible.

EASTWICK STATION

Introduction/Summary

Eastwick Station, located along SEPTA's R1 airport line, is located in the immediate vicinity of Interstate 95 and Philadelphia International Airport. There is a greater proportion of industrial and heavy commercial land uses in the vicinity of this station than in the case of the other station areas studied. Accordingly, the study area street network tends to be oriented more toward high-speed throughput than an interconnection of uses, and a higher than typical proportion of the study area's land use is dedicated to transportation facilities. However, there are concentrations of moderate-density residential uses to the west and north of the station at both the one quarter mile and one mile radii, and efforts have been made in this area to accommodate bicycle and pedestrian connectivity. Consequently, PLOS and BLOS scores in residential portions of the study area are typically high, with most such segments having a score of 'B' or 'A.'

Station area land use

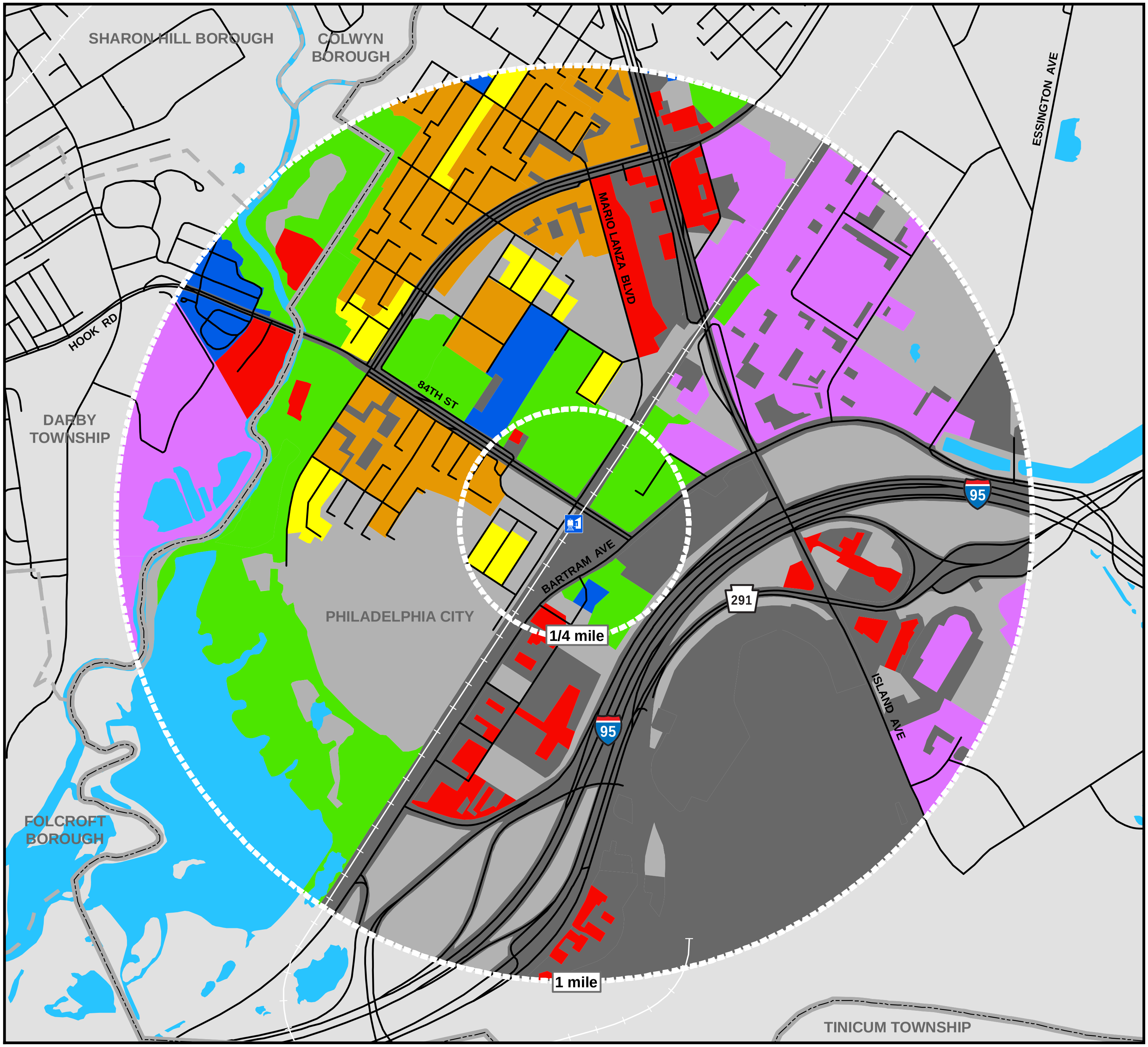
As illustrated in table 13 and map 11 below, transportation and vacant land uses together comprise more than half of the study area at both the one mile and one quarter mile radii. Residential land uses comprise just 11% of study area land uses, and are concentrated to the west and north of the station. In terms of pedestrian and bicycle station access, road segments connecting these uses to the station are perhaps most critical. Additionally, a complex of hotels has recently been developed to the immediate south of the station (on the opposite side of Bartrum Avenue). Whereas the interior of this commercial development has a high level of pedestrian compatibility (featuring ample sidewalks, street trees, and buffers from the roadway), pedestrian and bicycle access to any neighboring land uses or sites, including the station, is presently limited.

Table 13: Eastwick Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Transportation & Parking	668.1	35.1%
Vacant	430.5	22.6%
Farmland/Wooded/Recreation	251.0	13.2%
Industry & Utility	226.9	11.9%
Residential (Attached)	165.1	8.7%
Commercial	82.2	4.3%
Residential (Detached)	42.4	2.2%
Community & Government Facilities	36.8	1.9%
TOTAL	**1,903.0**	**100.0%**

Source: DVRPC 2000 land use.

MAP 11: Eastwick Station Area Land Use (2000)



DATA SOURCE: DVRPC 2000 LAND USE

Delaware Valley Regional Planning Commission
March 2006

Pedestrian LOS results and summary

Table 14 below contains the PLOS scores calculated for road segments within one quarter mile of Eastwick station. Road segments are arranged alphabetically for ease of reference.

Table 14: Eastwick Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
84th St. (inner lanes)	Entire length	4.02	D
84th St. (outer ln. northbnd)	North of Crane St.	2.70	C
84th St. (outer ln. southbnd)	North of Crane St.	2.07	B
85th St.	Luther Pl. to Eastwick Pl.	2.38	B
86th St.	Luther Pl. to Mario Lanza Blvd.	2.39	B
Bartram Ave.	South of 84th St.	3.56	D
Bartram Ave.	North of 84th st.	3.15	C
Crane St.	Entire length	2.05	B
Eastwick Pl.	Entire length	2.44	B
Harley Ave.	Entire length	1.94	B
Luther Pl.	Entire length	2.38	B
Mario Lanza Blvd.	North of Crane St.	2.65	C
Mario Lanza Blvd.	86th St. to Crane St.	1.78	B
Suffolk Pl.	Entire length	1.26	A
Tinicum Blvd.	South of Bartram Ave.	1.91	B

Source: DVRPC field work and model output, 2006.

<u>Highest PLOS scoring:</u>
While many of the local road segments in the study area score favorably for pedestrian compatibility, Suffolk Place (a street that terminates to the west of the station) had the highest score at 1.26 (LOS 'A'). This score results largely from a combination of wide sidewalks (5 feet) buffers, frequent street trees (spaced roughly 40 feet on center), and low vehicular intensities in terms of speed and estimated volume.

<u>Lowest PLOS scoring:</u>
The lowest PLOS score in this study area occurred for the inner lanes of 84th Street (4.02; LOS 'D'). These road segments comprise what amounts to a limited-access, high-volume roadway. Presumably pedestrian and/or bicycle traffic is intended to be diverted to the outer lanes of 84th street, which are less continuous but associated with much lower vehicular intensities. This PLOS score is the lowest calculated among the six phase III station areas examined.

Bicycle LOS results and summary

Table 15 below contains the BLOS scores calculated for road segments within one mile of Eastwick station. Road segments are arranged alphabetically for ease of reference.

Table 15: Eastwick Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
84th St. (inner lanes)	Bartram Ave. to Lindbergh Blvd.	4.24	D
Bartram Ave.	East of Island Ave.	4.64	E
Bartram Ave.	West of Island Ave.	0.00	A
Essington Ave.	North of Bartram Ave.	0.00	A
Hook Rd.	West of Lindbergh Blvd.	5.20	E
Island Ave.	South of Bartram Ave.	2.72	C
Island Ave.	North of Bartram Ave.	0.00	A
Lindbergh Ave.	West of 84th St.	0.81	A
Lindbergh Ave.	East of 84th St.	0.19	A
Mario Lanza Blvd.	South of Lindbergh Blvd.	0.00	A

Source: DVRPC field work and model output, 2006.

MAP 12: Eastwick Station Area PLOS Scores (1/4 Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 175 350 700 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

MAP 13: Eastwick Station Area BLOS Scores (1 Mile Radius)

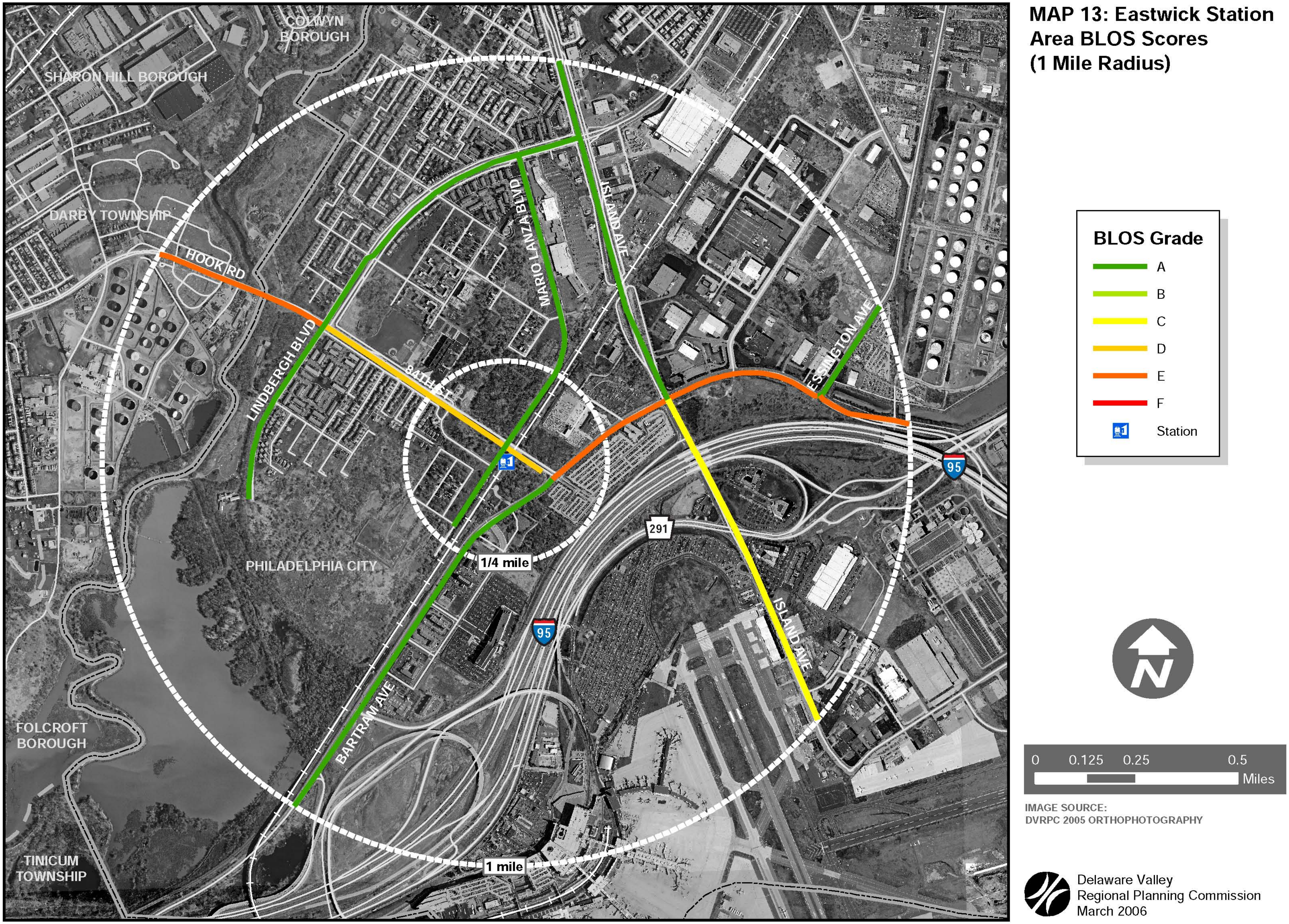


IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Highest BLOS scoring:

There are four road segments in the study area which have the highest possible BLOS score (0.00; LOS 'A') – Bartram Ave. (west of Island Ave.), Essington Ave. (north of Bartram Ave.), Island Ave. (north of Bartram Ave.), and Mario Lanza Blvd. (south of Lindbergh Blvd.). Despite high traffic volumes, these scores are high largely due to particularly wide shoulders in the case of Essington and Island Avenues (roughly 12 feet on average) and dedicated bicycle lanes (in the case of Bartram Ave. and Mario Lanza Blvd.).

Lowest BLOS scoring:

The lowest study area BLOS score was associated with Hook Road west of Lindbergh Blvd. (5.20; LOS 'E'). The portion of this road segment within one mile of the station has a comparatively narrow shoulder (an estimated 3 feet on average), which is insufficient to offset a high estimated proportion of heavy truck traffic (8%) and AADT (22,000).

Conditions for pedestrians/bicyclists in the immediate station vicinity

Unlike the other Phase III stations examined, Eastwick Station does not exist in the center of a community. Rather, it exists on the edge of the Eastwick neighborhood. Many more homes are located within one mile of the station than within one quarter mile. To this end, bicycle access may be more convenient for many neighborhood residents than pedestrian access. Mario Lanza Blvd., located along the western side of the station and along which on-street diagonal station parking is situated, accommodates bicycle station access from the main portion of the Eastwick neighborhood through dedicated bicycle lanes along both sides of the roadway. Unfortunately, the usefulness of these bicycle lanes is somewhat lessened by the absence of station bicycle racks.

Diagonal parking along Mario Lanza Blvd. adjacent to station

Dedicated bicycle lane along Mario Lanza Blvd.

Pedestrian access to the station is possible from residential portions of Eastwick south of 84^{th} St. During a recent field visit, several SEPTA riders were observed walking from the station along 85^{th} Street to these residences. This roadway has a comparatively high LOS score (2.38; 'B') due largely to very low estimated traffic volumes. It is also connected to the terminus of Suffolk Place via a dedicated pedestrian walkway. However, this road segment has no sidewalks, despite the presence of painted crosswalks at various intersections in the vicinity. Further, it might be described as an inhospitable pedestrian environment, as a notable amount of debris was visible in the brush along the sides of the roadway. This same brush contributes to a sense of isolation and lack of visibility for pedestrians.

Intersection of 85th St. and Eastwick Pl. (note crosswalks despite a lack of sidewalks).

Suffolk Place in background; walkway in foreground provides connection to 85th St.

Finally, although 85th St. provides the most direct pedestrian access from Eastwick residences to the station, and appears to be the most used segment for this purpose, it terminates shy of the station site. An improved path runs across green space from the terminus of 85th St. to the intersection of Crane St. and Mario Lanza Blvd, and a pedestrian-worn path is visible directly between the 85th St. terminus and the station site. Pedestrian access would be better accommodated (and encouraged) if this well-worn path were to be improved as such.

85th street between Suffolk Place (background) and Eastwick Place.

Pedestrian-worn path connecting 85th St. (background) with Mario Lanza Blvd. adjacent to station (foreground).

Suggested improvements to enhance pedestrian/bicyclist accessibility

As noted above, pedestrian compatibility is already fairly high along road segments connecting the station with residential areas, largely due to a land use and roadway pattern which is intended to separate pedestrians from high-intensity roadways.

However, given an established pattern of pedestrian station access between the terminus of Suffolk Place and Mario Lanza Blvd., sidewalks should be provided along 85th Street (along with better street-side maintenance). Further, the pedestrian-worn path connecting 85th Street and Mario Lanza Blvd. should be improved in order to acknowledge and encourage pedestrian station access.

Additionally, a crosswalk already exists between recent hotel/commercial development along Tinicum Blvd. and the northern side of Bartram Avenue. A sidewalk connection between this crosswalk terminus and the Eastwick Station access drive should be provided to enable safe pedestrian access between the station and this new commercial development.

Bicycle compatibility along major roadways is inconsistent throughout the study area, but strong (with an LOS of 'A') along Mario Lanza Blvd. and Bartram Ave. along both sides of the station in its immediate vicinity. Bicycle racks should be provided at the station to enable would-be bicycle/train riders to take full advantage of these bicycle lanes during peak travel times as part of a typical work commute (current SEPTA policy prohibits non-folding bicycles on trains during peak periods).

Relevant aspects of regional and state bicycle and pedestrian plans

The most recent regional Bicycle and Pedestrian Mobility Plan for Southeastern Pennsylvania (from the DVRPC Direction 2020 long range plan of 1995) identified a primary bicycle route within the Right-of-Way of Island Avenue (within the study area) and proceeding south along Bartram Avenue (adjacent to the since-constructed Eastwick Station). Although dedicated bicycle lanes have been provided along this portion of Bartram Avenue, they have not yet been provided along Island Avenue in this area.

Relevant Transportation Improvement Program (TIP) projects

The planned Eastwick Transportation Center (TIP project 60556) is expected to include an enhanced Eastwick Station in the vicinity of the current facility along with a host of intermodal access improvements. Any eventual final design should incorporate the types of access improvements addressed in this section.

ORELAND STATION

Introduction/Summary

Oreland Station, part of SEPTA's R5 Doylestown line, is located within a moderate-density, mixed-use community. The most common land use at both the one quarter mile and one mile radii is detached residential, but there is also a concentration of commercial uses within the one quarter mile radius. The study area street network is fairly interconnected in the vicinity of the station, but the rail right-of-way itself creates a barrier which roughly parallels Pennsylvania Avenue. BLOS and PLOS scores are mixed, with BLOS scores tending to be low due to an absence of passable shoulders and PLOS scores suffering in some areas due to a discontinuity of sidewalks.

Station area land use

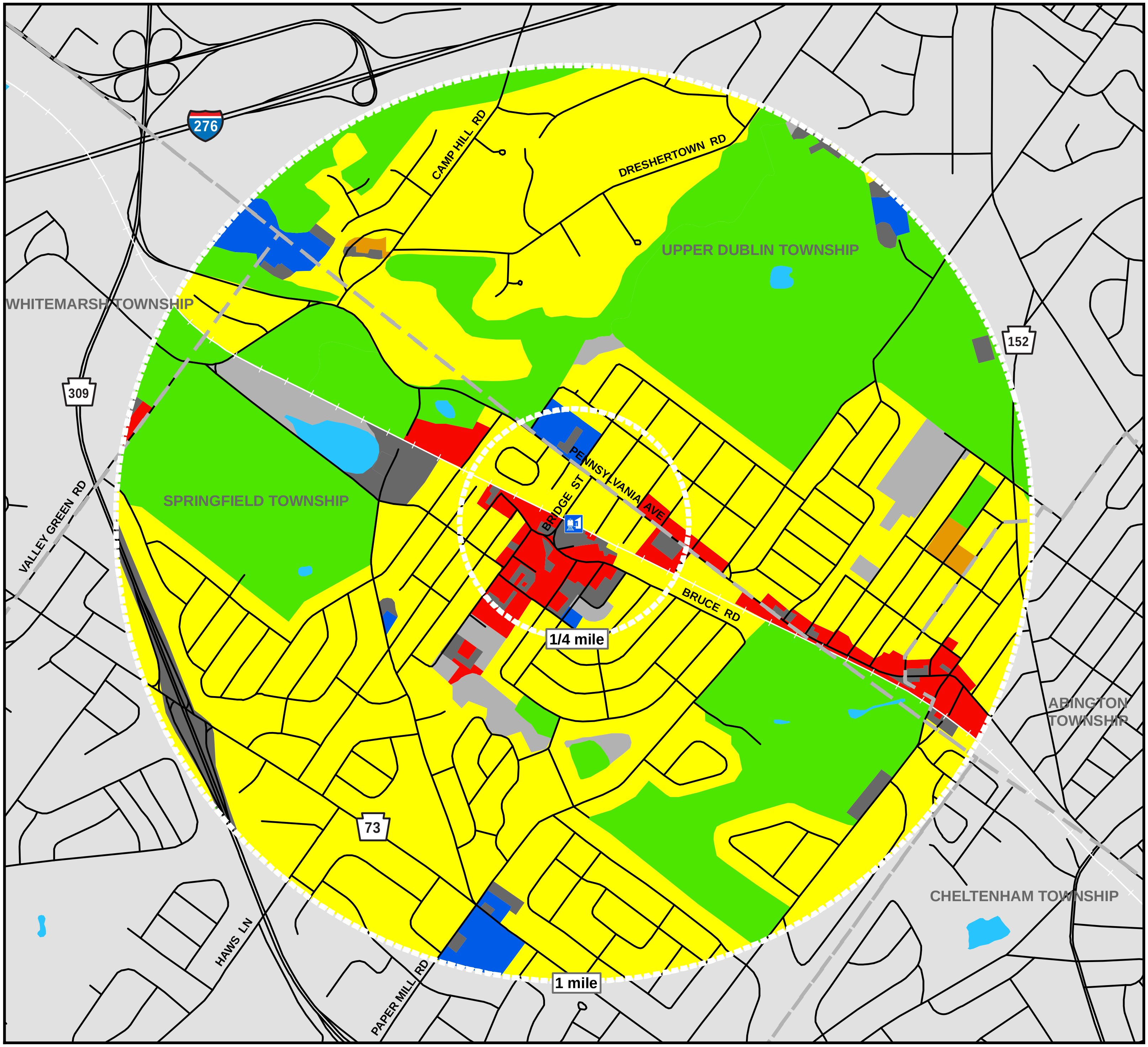
As illustrated in table 16 and map 14 below, detached residential land uses together comprise more than half of the study area at both the one mile and one quarter mile radii. Green spaces account for just less than one-third of land coverage, largely due to several golf course uses occurring within one mile of the station. Commercial uses are concentrated in the immediate vicinity of the station at the quarter mile radius (along Bruce Road) and along Pennsylvania Avenue at the one mile radius.

Table 16: Oreland Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	1139.2	56.32%
Farmland/Wooded/Recreation	642.5	31.76%
Vacant	74.0	3.66%
Commercial	66.0	3.27%
Transportation & Parking	59.1	2.92%
Community & Government Facilities	35.6	1.76%
Residential (Attached)	6.2	0.30%
TOTAL	**2022.6**	**100.00%**

Source: DVRPC 2000 land use.

MAP 14: Oreland Station Area Land Use (2000)



DATA SOURCE: DVRPC 2000 LAND USE

Delaware Valley
Regional Planning Commission
March 2006

Pedestrian LOS results and summary

Table 17 below contains the PLOS scores calculated for road segments within one quarter mile of Oreland station. Road segments are arranged alphabetically for ease of reference.

Table 17: Oreland Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Allison Rd.	South of Ulmer Ave.	2.18	B
Allison Rd.	Bruce Rd. to Ulmer Ave.	1.71	B
Bala Ave.	North of Pennsylvania Ave.	2.24	B
Bridge St.	Entire length	2.93	C
Bruce Rd.	Bridge St. to Montgomery Ave.	2.45	B
Bruce Rd.	East of Allison Rd.	2.31	B
Bruce Rd.	Allison Rd. to Montgomery Ave.	2.26	B
Calwell Ave.	East of Roesch Ave.	2.70	C
Clement Rd.	Entire length	1.80	B
Eherenport Ave.	West of Bridge St.	3.47	C
Heritage Dr.	South of Pennsylvania Ave.	1.76	B
Integrity Ave.	South of Eherenport Ave.	2.28	B
Lafayette Ave.	North of Pennsylvania Ave.	3.08	C
Lorraine Ave.	North of Walnut Ave.	3.09	C
Lorraine Ave.	South of Walnut Ave.	2.58	C
Montgomery Ave.	South of Ulmer Ave.	2.81	C
Montgomery Ave.	North of Ulmer Ave.	1.86	B
Orlando Ave.	Weldy Ave. to Rech Ave.	3.41	C
Orlando Ave.	East of Weldy Ave.	2.02	B
Park Ave.	South of Pennsylvania Ave.	1.63	B
Pennsylvania Ave.	Rech Ave. to Lafayette Ave.	3.79	D
Pennsylvania Ave.	West of Rech Ave.	3.61	D
Pennsylvania Ave.	East of Lafayette Ave.	3.27	C
Plymouth Ave.	South of Eherenport Ave.	2.50	C
Rech Ave.	North of Pennsylvania Ave.	3.22	C
Rech Ave.	South of Pennsylvania Ave.	1.63	B
Roesch Ave.	South of Eherenport Ave.	2.00	B
Ronald Cir.	South of Heritage Dr.	1.76	B
Ulmer Ave.	East of Dale Rd.	3.20	C
Ulmer Ave.	West of Dale Rd.	2.48	B
Walnut Ave.	West of Roesch Ave.	2.27	B
Weldy Ave.	North of Pennsylvania Ave.	1.78	B
Weldy Ave.	South of Pennsylvania Ave.	1.71	B

Source: DVRPC field work and model output, 2006.

<u>Highest PLOS scoring:</u>
Park Avenue and Rech Avenue (both south of Pennsylvania Avenue) each had the highest PLOS score in the study area (1.63; LOS 'B'). Both of these road segments are terminating/stub residential streets, the high scores for which are due in large part to average sidewalk and buffer widths of at least 4-feet as well as low estimated traffic volumes. The high score for Park Avenue is significant in terms of station access as this roadway provides direct access to the station from the north (it terminates at the station site).

<u>Lowest PLOS scoring:</u>
The lowest PLOS score in this study area occurred for Pennsylvania Avenue west of Rech Avenue (3.79; LOS 'D'). This portion of Pennsylvania has narrow average sidewalks and buffers (having sidewalks on only one side of the street), and a relatively high posted speed limit of 40-mph.

MAP 15: Oreland Station Area PLOS Scores (1/4 Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 175 350 700 Feet

IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Bicycle LOS results and summary

Table 18 below contains the BLOS scores calculated for road segments within one mile of Oreland station. Road segments are arranged alphabetically for ease of reference.

Table 18: Oreland Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
Camp Hill Rd.	South of Pennsylvania Ave.	5.20	E
Camp Hill Rd.	North of Pennsylvania Ave.	4.67	E
Church Rd.	Entire length	3.56	D
Dreshertown Rd.	East of Camp Hill Rd.	4.34	D
Haws Lane	South of Church Rd.	3.26	C
Mount Carmel Ave.	East of Pennsylvania Ave.	3.57	D
Paper Mill Rd.	South of Church Rd.	3.46	C
Pennsylvania Ave.	Entire length	4.35	D
Valley Green Rd.	South of Camp Hill Rd.	3.93	D

Source: DVRPC field work and model output, 2006.

<u>Highest BLOS scoring:</u>
The study area road segment with the highest BLOS score was Haws Lane, with a modest BLOS score of 3.26 (LOS ‘C’). In contrast to the other study area segments examined, this segment had a relatively wide average lane width (of roughly 14.5 feet), relatively low traffic volumes, and a 25-mph speed limit.

<u>Lowest BLOS scoring:</u>
The lowest study area BLOS score was associated with Camp Hill Road south of Pennsylvania Avenue (5.20; LOS ‘E’). The portion of this road segment within the one mile radius has a narrow average shoulder width (1 foot) and a 40-mph posted speed limit.

Conditions for pedestrians/bicyclists in the immediate station vicinity

Pedestrian accessibility to Oreland station is mixed. As noted above, riders from the northern side of the station may walk along Pennsylvania Avenue to Park Avenue for direct station access. A pedestrian overpass permits access to the eastbound platform from Park Avenue as well. On the other hand, Pennsylvania Avenue itself has among the lowest PLOS scores in the study area, largely due to a typical lack of sidewalks on the northern side of the roadway and instances of discontinuous sidewalks on the southern side. These attributes lessen what would otherwise be excellent pedestrian accessibility from the north.

Discontinuous sidewalk along southern side of Pennsylvania Avenue (just east of Heritage Drive).

A crosswalk permits safe walking across Pennsylvania Avenue, but connects to no sidewalks on the northern side.

MAP 16: Oreland Station Area BLOS Scores (1 Mile Radius)

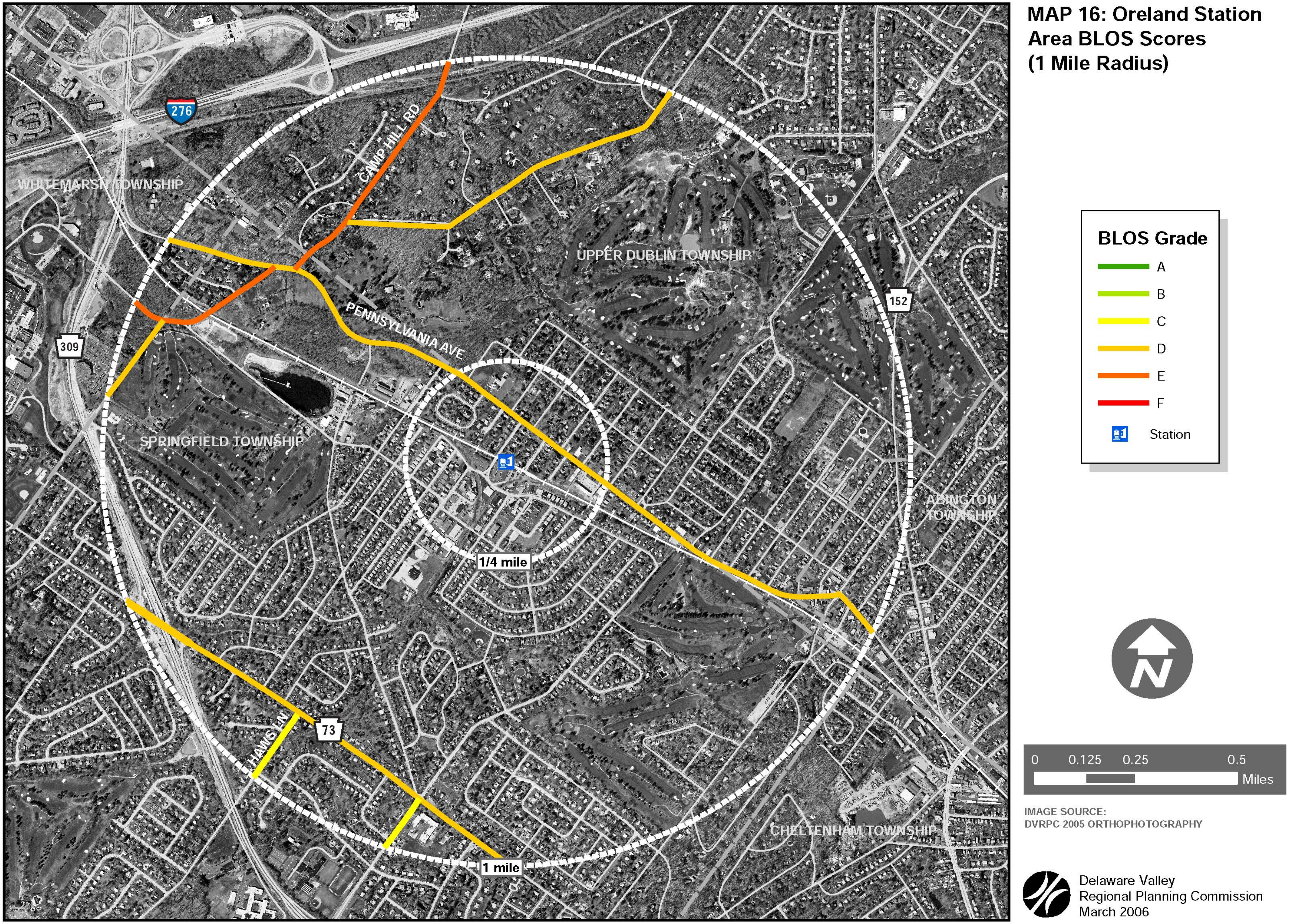
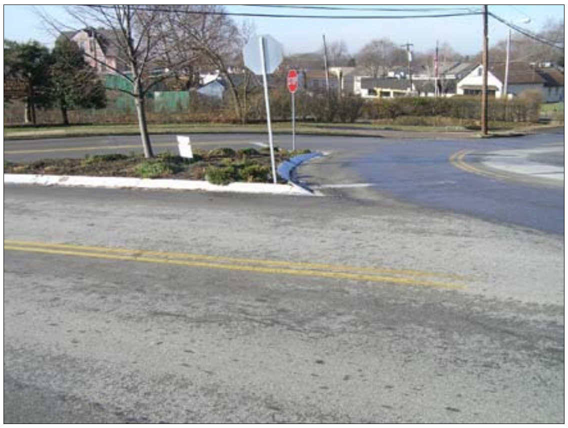


IMAGE SOURCE:
DVRPC 2005 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

From the south, the station site is accessible from Bruce Road / Eherenport Avenue. Segments of Bruce Road typically have relatively high PLOS scores due to fairly consistent sidewalks and a low posted speed limit (25-mph). However, the intersection of Bridge Avenue, Bruce Road, and Eherenport Avenue (to the immediate west of the station) is hazardous for pedestrians, featuring no crosswalks. This may make station access uncomfortable even from the Station Square apartments located opposite the station on Bridge Street. The complexity of this intersection is aggravated from a pedestrian standpoint by a lack of sidewalks and poor pavement condition where an abandoned rail right-of-way crosses Eherenport Avenue (just to the west of the intersection).



Lack of crosswalks at intersection of Bridge Avenue, Bruce Road, and Eherenport Avenue.

Lack of sidewalks adjacent to rail crossing (Eherenport Avenue).

The most significant roadway in terms of bicycle station access would be Pennsylvania Avenue, which presently has a BLOS score of ‘D’ for all segments due largely to a lack of passable shoulders and a 40-mph posted speed limit. Additionally, the station site itself does not feature bicycle racks. As bicycles are not permitted to be carried on trains during peak periods, this effectively prevents commuters from accessing the station by bicycle.

Suggested improvements to enhance pedestrian/bicyclist accessibility

Continuous sidewalks should be provided along both sides of Pennsylvania Avenue in order to enhance pedestrian access. During a morning field view in the area, DVRPC staff observed commuters walking along the grass edge adjacent to the northern side of Pennsylvania Avenue. Additionally, wayfinding signage should be added along Pennsylvania Avenue to alert pedestrians of station accessibility from Park Avenue. The station’s location at the southern terminus of Park Avenue presents an opportunity to have excellent pedestrian access from the north, and these minor capital investments would contribute to the promotion of safe pedestrian station accessibility as a local amenity.

Pedestrian access from the southern side of the station should be supported by pedestrian-related improvements to the intersection of Bruce Road, Bridge Avenue, and Eherenport Avenue. As previously noted, this intersection is complex and unsignalized. At a minimum, crosswalks should be provided (supported with signage or other elements deemed necessary) to permit safe pedestrian crossings over Bruce Road and Bridge Street in this area.

To improve bicycle station access, bicycle lanes (or shared lane pavement markings) should be provided along both sides of Pennsylvania Avenue within the study area. The addition of hypothetical 4-foot bicycle lanes would improve the BLOS score for this roadway from 4.35 (LOS ‘D’) to 3.19 (LOS ‘C’). In addition, bicycle racks should be provided at the station itself.

Finally, an abandoned rail right of way abuts Bruce Road in close proximity to the station entrance, continuing southward into Springfield Township with a path roughly perpendicular to the R5 rail line. If a portion of this right-of-way could be converted to a mixed-use pedestrian/bicycle pathway, it would provide a safe, direct, and dedicated means of pedestrian and bicycle station access from neighborhoods to the south of the station. The possibility of such a 'rails to trails' conversion should be investigated.

Station platform viewed from Pennsylvania Ave. (signage here would encourage pedestrian access).

Abandoned rail line (viewed from Bruce Road / station parking area).

Conceptual alignment of a multipurpose trail that would connect Oreland Station (on the north) with Oreland Mill Road (on the south), with a branch providing access to an existing recreation area. Much of the trail would follow an abandoned rail right-of-way, providing comfortable bicycle/pedestrian station access from residences to the south of the station.

Relevant aspects of regional and state bicycle and pedestrian plans

The most recent regional Bicycle and Pedestrian Mobility Plan for Southeastern Pennsylvania (from the DVRPC *Direction 2020* long range plan of 1995) identified a primary bicycle route within the Right-of-Way of Church Road (within the study area).

Relevant Transportation Improvement Program (TIP) projects

No current TIP projects are to be located within the study area. However, through an ongoing relationship between DVRPC and PennDOT District 6, road resurfacing projects in suburban Pennsylvania counties within the DVRPC region are assessed by DVRPC for possible improvements to bicycle compatibility through restriping. As study area road segments under PennDOT jurisdiction are resurfaced in the future, the bicycle-related improvements recommended above should be implemented as feasible.

RIVERTON STATION

Introduction/Summary

Riverton Borough within one quarter mile of the Riverton RiverLINE station is a fairly dense community with an interconnected, grid-based street network. Streets at this radius typically have sidewalks, and are associated with relatively low vehicle travel volumes and 25-mph speed limits. Accordingly, most of the road segments within one quarter mile of the Burlington Town Center RiverLINE station score highly for pedestrian levels of service, with many segments having a grade of 'A.'

BLOS grades for roadways within 1 mile of the station are mixed, with grades ranging from 'D' to 'A.' High grades, where they are present in this station area, are typically due to a combination of wide shoulders and relatively low vehicular intensities. It should also be noted that both the Cinnaminson and Palmyra RiverLINE stations (to the north and south, respectively) are both located within one mile of the Riverton station.

Station area land use

As illustrated in table 19 and map 17 below, residential land uses are the most frequently occurring at both the one mile and one quarter mile radii. Commercial uses at both radii are concentrated along Route 543 (which runs along the RiverLINE right-of-way). Within the quarter mile 'pedestrian shed,' commercial uses have proximity to the RiverLINE station, and are typically of a pedestrian-oriented character. Table 19 indicates the relative proportion of land uses occurring within one mile of the station, from the highest proportion to the lowest. Map 17 illustrates these land uses at both radii.

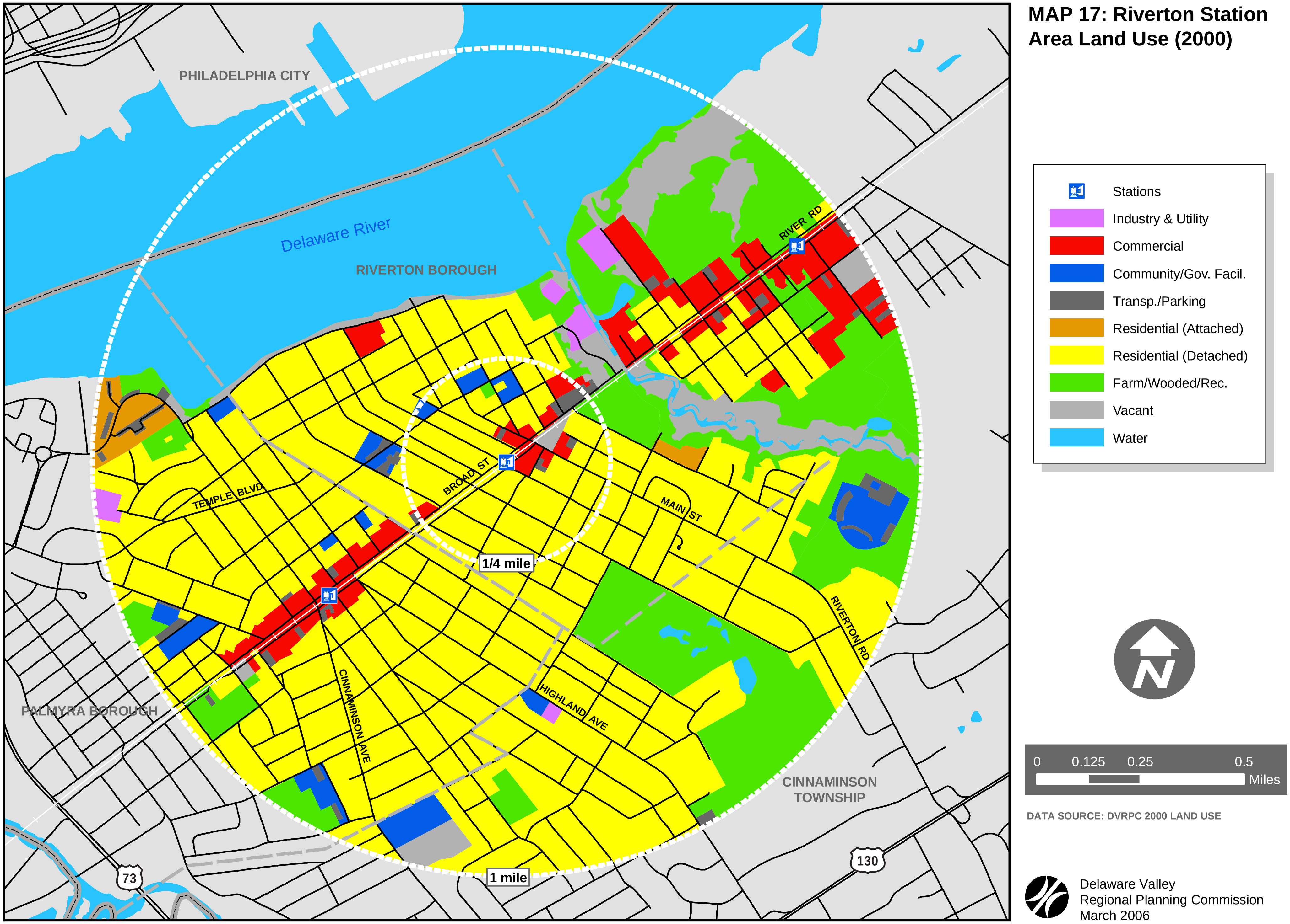
Similar to other RiverLINE station areas studied, the presence of residential land uses throughout the station area, in combination with a fairly interconnected, grid-based street network, mean that there is no single access route for which bicycle or pedestrian accessibility is most important. Commercial uses abutting Route 543 to the south and north of Riverton station at the one mile radius are more proximate to the Palmyra and Cinnaminson stations. Most commercial uses in Riverton Borough are located within the quarter mile radius of Riverton station, making pedestrian access to these uses convenient.

Table 19: Riverton Station Area Land Use Summary

Land Use	Acreage	% of total land covg.
Residential (Detached)	984.6	62.4%
Farmland/Wooded/Recreation	312.1	19.8%
Commercial	100.7	6.4%
Vacant	88.8	5.6%
Community & Government Facilities	41.3	2.6%
Transportation & Parking	22.4	1.4%
Residential (Attached)	16.9	1.1%
Industry & Utility	12.3	0.8%
TOTAL	**1,579.1**	**100.0%**

Source: DVRPC 2000 land use.

MAP 17: Riverton Station Area Land Use (2000)



DATA SOURCE: DVRPC 2000 LAND USE

Delaware Valley
Regional Planning Commission
March 2006

Pedestrian LOS results and summary

Table 20 below contains the PLOS scores calculated for road segments within one quarter mile of the Riverton station. Road segments are arranged alphabetically for ease of reference.

Table 20: Riverton Station Area PLOS Summary

Road Segment	Location	PLOS Score	PLOS Grade
Cedar St.	South of Broad St.	1.89	B
Church Ln. & Maple Ave.	North of Broad St.	3.11	C
Cinnaminson St.	North of Broad St.	1.02	A
Cinnaminson St.	South of Broad St.	1.19	A
Elm Ter.	South of Broad St.	1.61	B
Fifth St.	East of Main St.	1.49	A
Fourth St.	Entire length	1.43	A
Fulton St.	North of Broad St.	1.35	A
Harrison St.	South of Lippincott Ave.	1.21	A
Harrison St.	Lippincott Ave. to Main St.	1.73	B
Howard St.	North of Main St.	1.42	A
Linden Ave.	North of Broad St.	1.02	A
Linden Ave.	South of Broad St.	1.49	A
Lippincott Ave.	North of Broad St.	0.82	A
Lippincott Ave.	Broad St. to Harrison St.	1.70	B
Lippincott Ave.	Harrison St. to Seventh St.	1.18	A
Lippincott Ave.	East of Seventh St.	2.85	C
Main St.	North of Broad St.	1.83	B
Main St.	S. Broad St. to Seventh St.	1.91	B
Main St.	East of Seventh St.	2.07	B
Midway Way	Entire length	1.60	B
Penn St.	North of Fourth St.	1.25	A
Route 543	Entire length	2.41	B
S. Broad St.	South of Thomas Ave.	0.90	A
S. Broad St.	Lippincott Ave. to Main St.	2.11	B
S. Broad St.	Thomas Ave. to Lippincott Ave.	1.58	B
Seventh St.	Cedar St. to Cinnaminson St.	2.12	B
Seventh St.	Cinnaminson St. to Main St.	1.34	A
Seventh St.	Main St. to Linden Ave.	1.60	B
Thomas Ave.	North of Broad St.	1.43	A
Thomas Ave.	South of Broad St.	1.56	B

Source: DVRPC field work and model output, 2006.

Highest PLOS scoring:

While many of the road segments in the study area score favorably for pedestrian compatibility, Lippincott Avenue (north of Broad Street) had the highest score at 0.82 (LOS 'A'). This score results largely from a combination of particularly wide buffers (14.5 feet), frequent street trees (spaced 40 feet on center), and low vehicular intensities in terms of speed and estimated volume. This portion of Lippincott Avenue had the highest PLOS score of any road segment in the six Phase III study areas.

Lowest PLOS scoring:

The lowest PLOS score in this study area occurred for Church Lane and Maple Avenue (3.11; LOS 'C'). These streets have the character of alleys, and are not designed to accommodate pedestrians. This design, however, in part permits the high pedestrian compatibility of adjacent streets by accommodating vehicle access to rear garages. Comparatively low vehicle volumes prevent these road segments from having a score of 'D' or lower.

MAP 18: Riverton Station Area PLOS Scores (1/4 Mile Radius)

PLOS Grade

- A
- B
- C
- D
- E
- F
- Station

0 170 340 680 Feet

IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley
Regional Planning Commission
March 2006

Bicycle LOS results and summary

Table 21 below contains the BLOS scores calculated for road segments within one mile of the Riverton station. Road segments are arranged alphabetically for ease of reference.

Table 21: Riverton Station Area BLOS Summary

Road Segment	Location	BLOS Score	BLOS Grade
Cinnaminson Ave.	North of Broad St.	1.20	A
Cinnaminson Ave.	South of Broad St.	3.45	C
Highland Ave.	North of Greenwood Ave.	3.24	C
Highland Ave.	South of Greenwood Ave.	2.07	B
Main St.	North of Broad St.	0.00	A
Main St.	Broad St. to Seventh St.	2.60	C
Main St.	Seventh St. to Woodside Ln.	3.39	C
Riverton Rd.	South of Woodside Ln.	1.64	B
Route 543	North of Main St.	4.04	D
Route 543	South of Delaware Ave.	0.00	A
Route 543	Delaware Ave. to Highland Ave.	3.54	D
Route 543	Highland Ave. to Main St.	1.66	B
Temple Blvd.	Entire length	0.00	A

Source: DVRPC field work and model output, 2006.

<u>Highest BLOS scoring:</u>
There are three road segments in the study area which have the highest possible BLOS score (0.00; LOS 'A') – Main Street (north of Broad), Route 543/Broad Street (south of Delaware Avenue), and Temple Blvd. These scores stem in large part from particularly wide shoulders (6, 8, and 10 feet, respectively) and 25-mph posted speed limits.

<u>Lowest BLOS scoring:</u>
The lowest study area BLOS score was associated with the portion of Route 543/River Road north of Broad Street (4.04; LOS 'D'). The portion of this road segment within one mile of the station has no shoulder, a 45-mph speed limit, and relatively high vehicle volumes (an ADT of roughly 11,000).

Conditions for pedestrians/bicyclists in the immediate station vicinity

Sidewalks in the vicinity of the station are in sound condition. Direct station access for pedestrians and bicyclists is enhanced by clearly marked crosswalks at the intersections of Broad Street/Route 543 with Main Street and Thomas Avenue with Wood and High Streets. As is the case at the Burlington Town Center station, there is no platform access from the northern side of Broad Street. Accordingly, would-be riders from areas north of the station need to cross to the southern side of Broad Street, likely at one of these two intersections (which are the two closest to the station). Unfortunately, these two intersections are nearly 1,000 feet apart. Pedestrians walking south on Lippincott Avenue (north of Broad Street; the study area segment with the highest PLOS score), who can see the station platform as they walk toward it, must nonetheless walk a total of 1,000 feet (to either Main Street or Thomas Avenue and back) in order to access the platform. A mid-block crosswalk on the northern side of the platform would be especially problematic, as the station is located on the southern side of the tracks, causing these tracks to be a substantial safety barrier to would-be access from the north.

Lippincott Avenue also provides the most direct station access from the south. Unfortunately, the portion of Lippincott Avenue closest to the station is the most problematic for pedestrians. The sidewalk terminates short of a rather complex intersection with South Broad Street, and there are no crosswalks in the roadway.

MAP 19: Riverton Station Area BLOS Scores (1 Mile Radius)

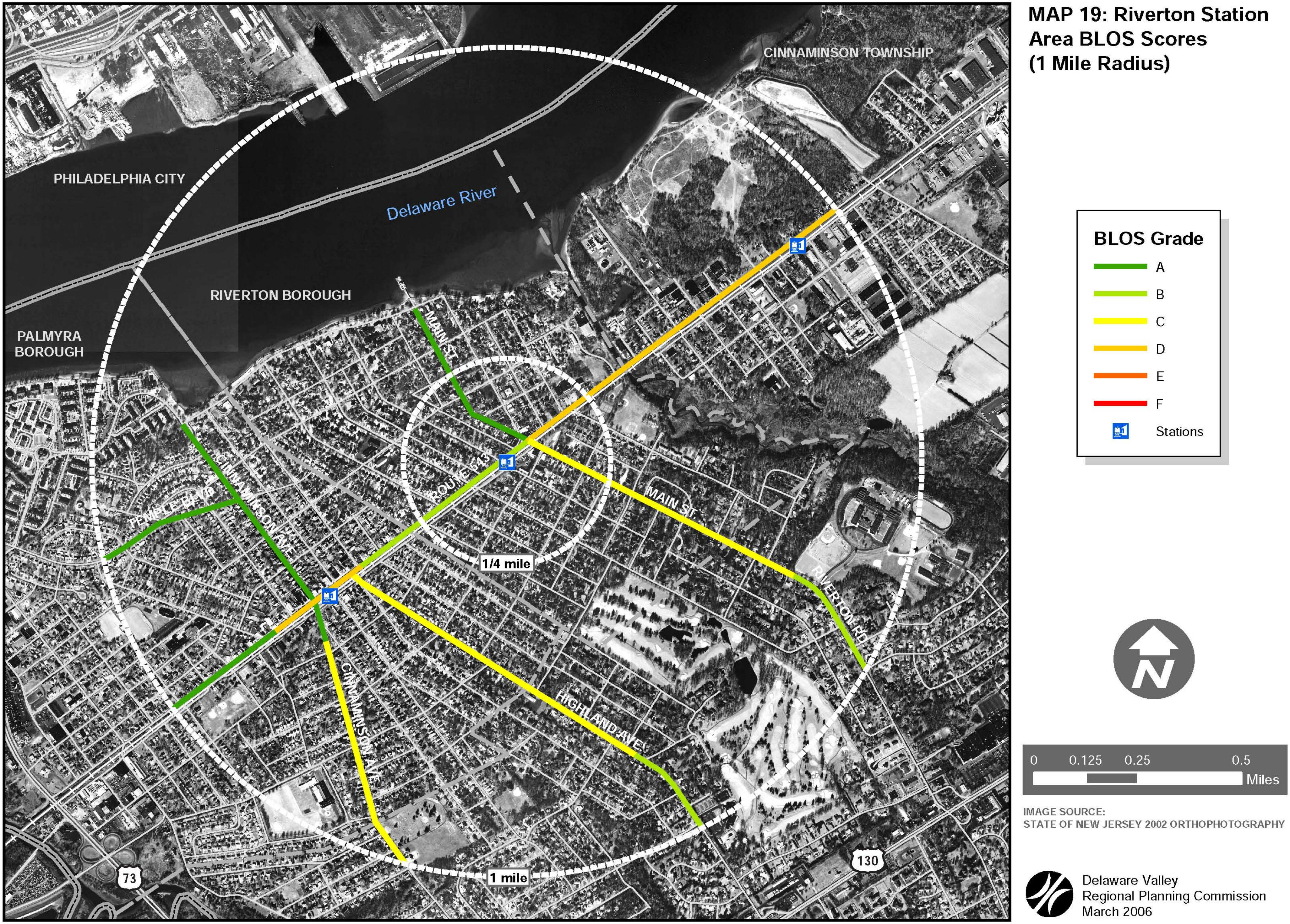


IMAGE SOURCE:
STATE OF NEW JERSEY 2002 ORTHOPHOTOGRAPHY

Delaware Valley Regional Planning Commission
March 2006

Lippincott Avenue north of Broad Street (viewed from station platform)

Problematic pedestrian access along Lippincott Avenue south of Broad Street (viewed from platform area)

It is notable that the road segment which all pedestrians and bicyclists must traverse at some point in order to reach the platform (South Broad Street between Thomas Avenue and Main Street) has an unusually wide walkway with buffering from both traffic and trains, resulting in excellent accommodation for direct station access.

The station platform itself is accommodating to pedestrians, as it includes both a shelter and several benches. In addition, a bicycle rack is present at the southern end of the platform's access ramp. Bicycles are comfortably accommodated on the RiverLINE trains themselves, with vertical bicycle racks being conspicuous on all trains. There are no marked bicycle lanes along roadways in the vicinity of the station.

Buffered station access walkway along S. Broad St. (from Thomas Ave. to station platform) – vehicular cartway is to the right, rail line to the left

Platform area (bike rack on left, shelter on right)

Suggested improvements to enhance pedestrian/bicyclist accessibility

As previously discussed, pedestrian compatibility is high throughout the station's 'pedestrian shed.' The sole specific improvement recommended involves the intersection of Lippincott Avenue and South Broad Street to the south of the station platform, where additional pedestrian accommodations should be made. These should take the form of a continued sidewalk, marked crosswalks, or some combination thereof.

Bicycle compatibility along major roadways is inconsistent throughout the study area, but strong (with an LOS of 'B') along Route 543 in the immediate vicinity of the station. Direct station access to three RiverLINE stations enhances the importance of Route 543's bicycle compatibility within Riverton station's one mile shed. Accordingly, portions of this roadway that presently do not score highly for bicycle compatibility, including River Road north of Main Street (which has no shoulders) as well as the portion of North Broad Street between Delaware Avenue and Highland Avenue (which has angled parking in lieu of shoulders or parallel parking areas, and is adjacent to the Palmyra station) should be prioritized for bicycle-related investments (including bicycle lanes or shared-lane pavement markings).

Within the Riverton and Palmyra Borough cores, shared-lane pavement markings ('sharrows') may be especially appropriate along this roadway. Given the higher intensity of vehicle traffic, a dedicated bicycle lane might be more appropriate for portions north of Main Street. The hypothetical addition in the BLOS model of a 4-foot shoulder/bicycle lane to this portion of Route 543 would be associated with a marked improvement in overall bicycle compatibility, with the LOS score improving from 4.04 (LOS 'D') to 2.80 (LOS 'C').

In addition, bicycle lanes or 'sharrows' should be provided along Main Street, especially south of Broad Street. Main Street, which is the most significant northwest/southeast artery for station bicycle access, has a BLOS of 'A' north of Broad Street but a BLOS of 'C' to the south, owing to an absence of any shoulder as well as higher traffic volumes than segments north of Broad Street. Hypothetical 4-foot bicycle lanes would improve LOS scoring from 2.60 (LOS 'C') to 1.23 (LOS 'A') between Broad and Seventh Streets, and from 3.39 (LOS 'C') to 2.06 (LOS 'B') eastward. The BLOS model does not specifically account for shared-lane pavement markings ('sharrows').

Relevant aspects of regional and state bicycle and pedestrian plans

Portions of Route 543 at the one mile radius to the Riverton Station are identified as Low and Medium Priority bicycle links in the New Jersey Department of Transportation's Statewide Bicycle and Pedestrian Master Plan (Phase 2). The entirety of Route 543 at this radius is identified as a Low Priority pedestrian link in the same plan. See Appendix B for a summary of the NJ State Plan.

Relevant Transportation Improvement Program (TIP) projects

The planned Delaware River Heritage Trail (TIP project 02390) would traverse Riverton Borough (and the one mile station shed), running roughly parallel to the Delaware River. While a final proposed alignment has not yet been determined, a spokesman for the Burlington County Resource Conservation Department indicated that several alignments either along or parallel to Broad Street are presently under consideration. One alignment presently under discussion is the extension of the landscaped station access walkway/promenade northward and southward along the RiverLINE, incorporating it as part of the Heritage Trail. From the perspective of this study, alignments which incorporate direct station access – such as this promenade extension alignment – should be encouraged.

SUMMARY AND RECOMMENDATIONS

The following sections contain photographs from the road segments among the six station areas which had the highest and lowest BLOS and PLOS scores. These photographs are not presented to suggest that segments with poor scores be redesigned to be more similar to those with high scores. In some cases, a more pedestrian or bicycle friendly parallel or alternate route is available, or another mitigating characteristic explains designs which are unfriendly to nonmotorized modes. Rather, a comparison between these images is intended to illustrate the types of physical conditions, incorporated in the BLOS and PLOS models, which make a road segment desirable or undesirable for pedestrians and bicyclists.

Highest phase III BLOS scoring

There are a number of study area road segments with the highest possible BLOS score (0.00; LOS 'A'). In most cases, these scores reflect a combination of particularly wide shoulders, dedicated bicycle lanes, or both. The photo below depicts one of these road segments: Mario Lanza Boulevard adjacent to the Eastwick R1 station.

Mario Lanza Boulevard to the north of Eastwick Station. Factors yielding the highest possible BLOS score include 5-foot bicycle lanes in both directions and a high average width of dedicated on-street parking/shoulder areas, which will typically allow cars to avoid obstructing the bicycle lanes.

Lowest phase III BLOS scoring

The lowest BLOS score was associated with the portion of Belmont Avenue north of City Avenue (6.90; LOS 'F') (located within one mile of the Cynwyd R6 station).

Belmont Avenue north of City Ave (east of Cynwyd Station). The relatively poor BLOS score relates to the lack of shoulders, narrow lanes (typically less than 10 feet in width), and a comparatively high proportion of truck traffic (11%). (*Image source*: Microsoft/Pictometry; http://local.live.com).

Highest phase III PLOS scoring

The phase **III** road segment with the highest PLOS score was Lippincott Avenue (north of Broad Street) in the immediate vicinity of Riverton Station, which had a score of 0.82 (LOS 'A').

Lippincott Avenue north of Broad Street. Factors yielding a desirable pedestrian environment include consistent sidewalks (roughly 4.75 feet avg. width), an unusually generous green buffer between the sidewalk and roadway (14.5 feet), frequent street trees (spaced 40 feet on center), and a high proportion of occupied on-street parking (estimated at 40% for the length of the block) which provides an additional physical barrier from moving cars.

Lowest phase III PLOS scoring

The lowest PLOS score was associated with the inner lanes of 84th Street in the vicinity of Eastwick Station (4.02; LOS 'D').

84th Street north of Bartrum Avenue. Factors influencing a negative score are a lack of any continuous sidewalk and high estimated vehicular volumes. (*Image source*: Microsoft/Pictometry; http://local.live.com).

Recommendation summary

Table 22 summarizes the recommendations presented in this report for each Phase III station area. For details concerning recommendations for each respective station area, see the appropriate section of this report.

Table 22: Summary of Improvement Recommendations by Station Area

Station	Bikeway along key route(s)	Crosswalk/ intersection improvement(s)	Streetscape/ buffering improvements	Station bike racks	Wayfinding signage	Off-road bike/ped path	Sidewalk improvement(s)
Beverly/ Edgewater Park	X	X					
Burlington Town Center	X			X			
Cynwyd			X	X	X		
Eastwick				X		X	X
Oreland	X	X		X	X	X	X
Riverton	X	X					

Source: DVRPC, 2006.

It is worth noting that the improvements most commonly recommended – station bicycle racks and bicycle lanes/shared lane markings to denote bicycle routes – are among the least capital-intensive.

This page intentionally left blank.

APPENDIX A

Shared-lane pavement marking ('sharrow') detail

Several portions of this report reference the possibility of employing shared lane pavement markings (or shared lane arrows) as an alternative to dedicated bicycle lanes. The purpose of these 'sharrows' is to direct cyclists away from parked cars (and potential door openings) while promoting awareness among drivers of cyclists' right to use the road. Below are two examples of shared-lane pavement markings taken from a 2004 report of the San Francisco Department of Parking & Traffic.

Example of a 'sharrow' in San Francisco

Alternate shared-lane marking (Cambridge, Mass.)

Sharrows may be appropriate where continuity of bicycle routes is needed, but where there is insufficient room for a dedicated bicycle lane. A uniform design and implementation strategy for 'sharrows' has been proposed to be included as a new item in the Manual on Uniform Traffic Control Devices (MUTCD) by the Bicycle Technical Committee of the National Committee on Uniform Traffic Control Devices (NCUTCD). To date, such an adoption has not occurred. The summary report of the Bicycle Technical Committee can be downloaded from the following location: http://members.cox.net/ncutcdbtc/sls/slmtoncjan05.pdf.

The proposed guidance language, as submitted by the Bicycle Technical Committee (February 18, 2005), is as follows:

Section 9C.XX Shared Lane Marking

<u>Support:</u>

The Shared Lane Marking is intended to:

1. Help bicyclists position themselves in lanes where the traveled way is too narrow for a motorist and a bicyclist to travel side by side within the same traffic lane.
2. Encourage safe passing of bicyclists by motorists.
3. Reduce the chance of a bicyclist's impacting the open door of a parked vehicle in a shared lane with on-street parallel parking.
4. Alert road users of the lateral location bicyclists may occupy.
5. Reduce the incidence of wrong-way bicycling.

<u>Option:</u>

The Shared Lane Marking shown in Figure 9C-XX may be used to assist bicyclists with positioning in a shared lane and to alert road users to the location a bicyclist may occupy.

Standard:

If used in a shared lane with on-street parallel parking, Shared Lane Markings shall be placed so that the centers of the markings are a minimum of 3.4 m (11 ft) from the curb face, or from the edge of pavement where there is no curb.

Guidance:

If used, the Shared Lane Marking should be placed immediately after an intersection and spaced at intervals not greater than 75 m (250 ft) thereafter.

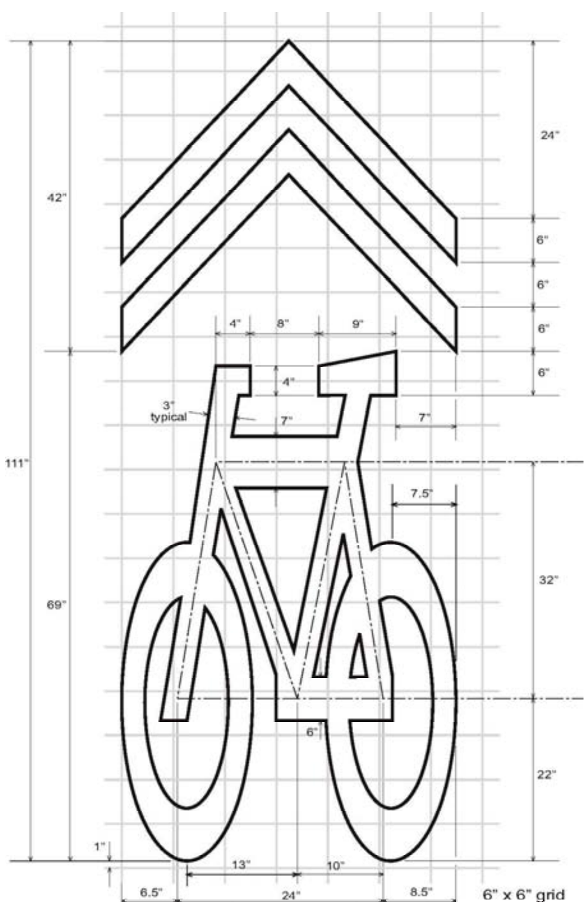
If used on a street without on-street parking with an outside travel lane less than 4.2 m (14 ft) wide, the centers of the Shared Lane Markings should be no closer than 1.2 m (4 ft) from the curb face, or from the edge of pavement where there is no curb.

The Shared Lane Marking is recommended primarily for use in urban areas.

Option:

Where used on a shared lane with on-street parking, the distance from the curb, or from the edge of pavement where there is no curb, may be increased beyond 3.4 m (11 ft).

Figure 9C-XX. Shared Lane Marking



APPENDIX B

Summary of New Jersey Statewide Bicycle and Pedestrian Master Plan

In 2004 NJDOT released Phase 2 of the Statewide Bicycle and Pedestrian Master Plan. The plan vision states: *New Jersey is a state where people choose to walk and bicycle; residents and visitors are able to conveniently walk and bicycle with confidence and a sense of security in every community; and both activities are a routine part of the transportation and recreation systems and support active, healthy life styles.*

While Phase 1 focused on policies, Phase 2 concentrates on facilities. This emphasis is the result of heightened interest in developing bicycle and pedestrian accommodations to the extent that funding requests for such projects far exceed available funds. Phase 2 is intended to provide clear guidance on prioritization of state investment in bicycle and pedestrian facilities.

Phase 2 accomplished this prioritization using analytical methods involving measures of demand and suitability applied to the CMS roadway network. Segments of the CMS network were identified as high priority where demand is high and facilities are least suitable.

Bicycle Demand is principally a function of demographics and mode split, where a younger population, college students, a high transit mode split and numbers of current bicycle commuters contribute to demand. Pedestrian Demand is derived from street network, population and employment densities and the balance of land uses.

Suitability is a level-of-service measure, a way of quantifying how comfortable a bicyclist or pedestrian would be traveling along or across a given facility. Bicycle Suitability is determined by roadway characteristics such as traffic speed and volume, presence of shoulders, or shoulder lane width. Pedestrian Suitability, defined as the ability of a person on foot to cross the roadway, factors in the speed and volume of traffic, the presence of a median refuge, and spacing of signalized crossings to determine overall delay from waiting for a safe gap in traffic in which to cross. Details on the analytical methodology used to classify priority segments may be found in the Phase 2 plan document.

Whereas study areas road segments in this report are not identified as priority segments in the State Plan, the State Plan's goals, objectives, and policies reference the importance of enhancing bicycle and pedestrian accessibility to transit stations generally.

TITLE: INCREASING INTERMODAL ACCESS TO TRANSIT: PHASE III

Publication No.: **06011**

Date Published: August 2006

Geographic Area Covered: One quarter mile and one mile radii surrounding Beverly/Edgewater Park, Burlington Town Center, Cynwyd, Eastwick, Oreland, and Riverton rail stations.

Key Words: Beverly/Edgewater Park Station, Burlington Town Center Station, Cynwyd Station, Eastwick Station, Oreland Station, Riverton Station, New Jersey Transit RiverLINE, Pedestrian Level of Service (PLOS), Bicycle Level of Service (BLOS), Pedestrian Safety, Bicycle Safety, Pedestrian Compatibility, Bicycle Compatibility.

ABSTRACT: Phase III of this continuing project assessed non-motorized (pedestrian and bicycle) accessibility to six rail stations in the region. Three Burlington County RiverLINE stations (Beverly/Edgewater Park, Burlington Town Center, and Riverton) and three SEPTA rail stations (Cynwyd, Eastwick, and Oreland) were analyzed using PLOS and BLOS model software. Field measurements and observations provided data for this analysis, which was supplemented by a qualitative examination of access conditions in the immediate vicinity of each station. A summary of recommended enhancements was prepared for each station, noting strategies that would address specific problem areas. Generally, Phase III analysis found that PLOS scores tended to be somewhat higher for the New Jersey station areas studied than the Pennsylvania stations, and that PLOS scores were higher overall than BLOS scores. In many cases, comparatively minor investments in station sites and their immediate vicinity (such as bicycle racks, painted crosswalks, and signage) have the ability to markedly improve and encourage nonmotorized station access.

Delaware Valley Regional Planning Commission
190 North Independence Mall West, 8th Floor
Philadelphia, PA 19106-1520

Phone: 215-592-1800
Fax: 215-592-9125
Internet: www.dvrpc.org

Staff Contact: Joseph F. Hacker, Ph.D., AICP
Direct Phone: 215-238-2935
Email: jhacker@dvrpc.org

Delaware Valley Regional Planning Commission

190 North Independence Mall West
8th Floor
Philadelphia, PA 19106-1572
215.592.1800
www.dvrpc.org