



BUCKS-MERCER

TRANSIT NEEDS ASSESSMENT CONCEPT DEVELOPMENT



2009



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Executive Summary

The purpose of this project is to explore work commute trip patterns across the Delaware River from Bucks County to Mercer County, and to identify ways to better serve these trips with public transit. This project specifically focuses on trips from Bucks County to downtown Trenton and to major employers along the Route 1 corridor in Mercer County, as well as off Interstate 95 in Hopewell and Lawrence townships.

To this end, a series of surveys have recently been conducted which shed light on the trip patterns of current transit riders in several Mercer County focus areas. Together with Census journey-to-work data from 2000, these survey results permit an identification of concentrations of trip origins in Bucks County, which in turn informs transit routing and service concepts that would serve these observed trip origins. In terms of transit concepts, this report focuses on fixed-route commuter bus services that could be attractive to a largely discretionary rider market, and not on job access or human services shuttle operations.

The analyses in this report have confirmed that there is significant potential demand for new transit connections between portions of Bucks County and job concentrations in Mercer County. Extensions of NJ TRANSIT service into Bucks County as part of the Route 1 BRT project (currently proposed as Route 650P) appear well-placed to meet some of this potential demand, particularly if extended southward and supplemented by the other service concepts suggested here.

It bears reinforcing though that with a few exceptions (Newtown, Bristol, Morrisville, Trenton, etc.) most of the potential trips served either originate or terminate in locations where land use patterns are heavily auto oriented (or in many cases both). In this context, in order for new services to be attractive to a principally discretionary passenger base, who will be particularly sensitive to time savings, providing meaningful and significant transit preferential treatments will be critical. The proposed peak bus shoulder lanes on the new Scudder Falls Bridge represent a significant first step in this direction, but much more will be required.

Background and Data Summary

Project Purpose / Introduction

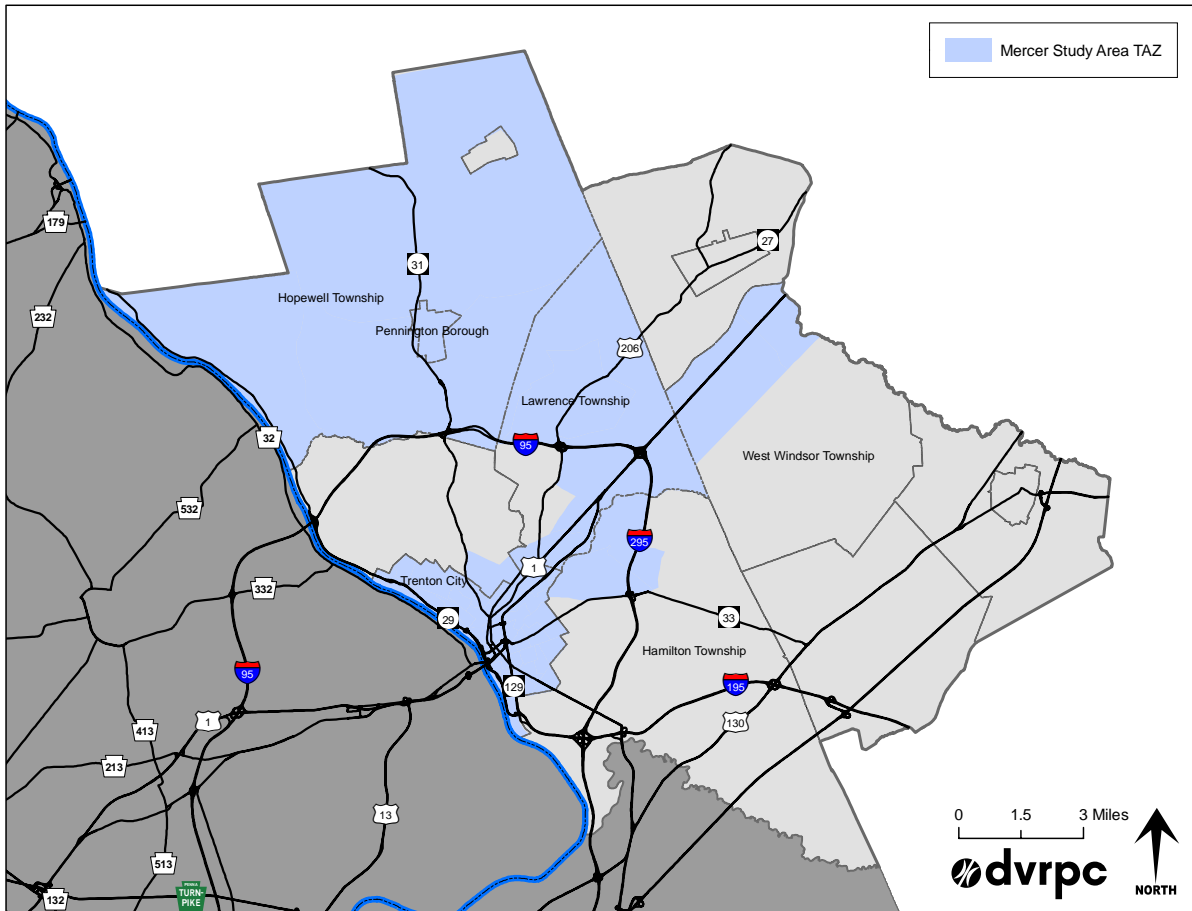
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Study Area Description

The geographic focus for this study includes all of Bucks County, as well as portions of Mercer County concentrated along the Interstate 95 and Route 1 corridors that contain a number of major employment centers. These include Hopewell Township, Pennington Borough, the City of Trenton, and portions of Lawrence Township, Hamilton Township, and West Windsor Township. Study area portions of Mercer County are illustrated in Figure 1.

Figure 1: Mercer County Study Area Boundaries



Source: DVRPC 2009

Identifying Key Origins: Census and Survey Data

2000 Census Journey-to-Work Summary

Census 2000 journey-to-work data indicates the locations of Bucks County work trip origins for destinations in the Mercer County study area. Tables 1 and 2 summarize the top-ten origin municipalities and origin Traffic Analysis Zones (TAZ), respectively.

Table 1: Top 10 Bucks County municipal concentrations of study area trip origins (2000)

Municipality	Workers
Lower Makefield Township	2,226
Falls Township	1,778
Bristol Township	1,490
Middletown Township	1,293
Morrisville Borough	948
Newtown Township	863
Bensalem Township	570
Northampton Township	445
Upper Makefield Township	362
Solebury Township	248

Source: Census 2000

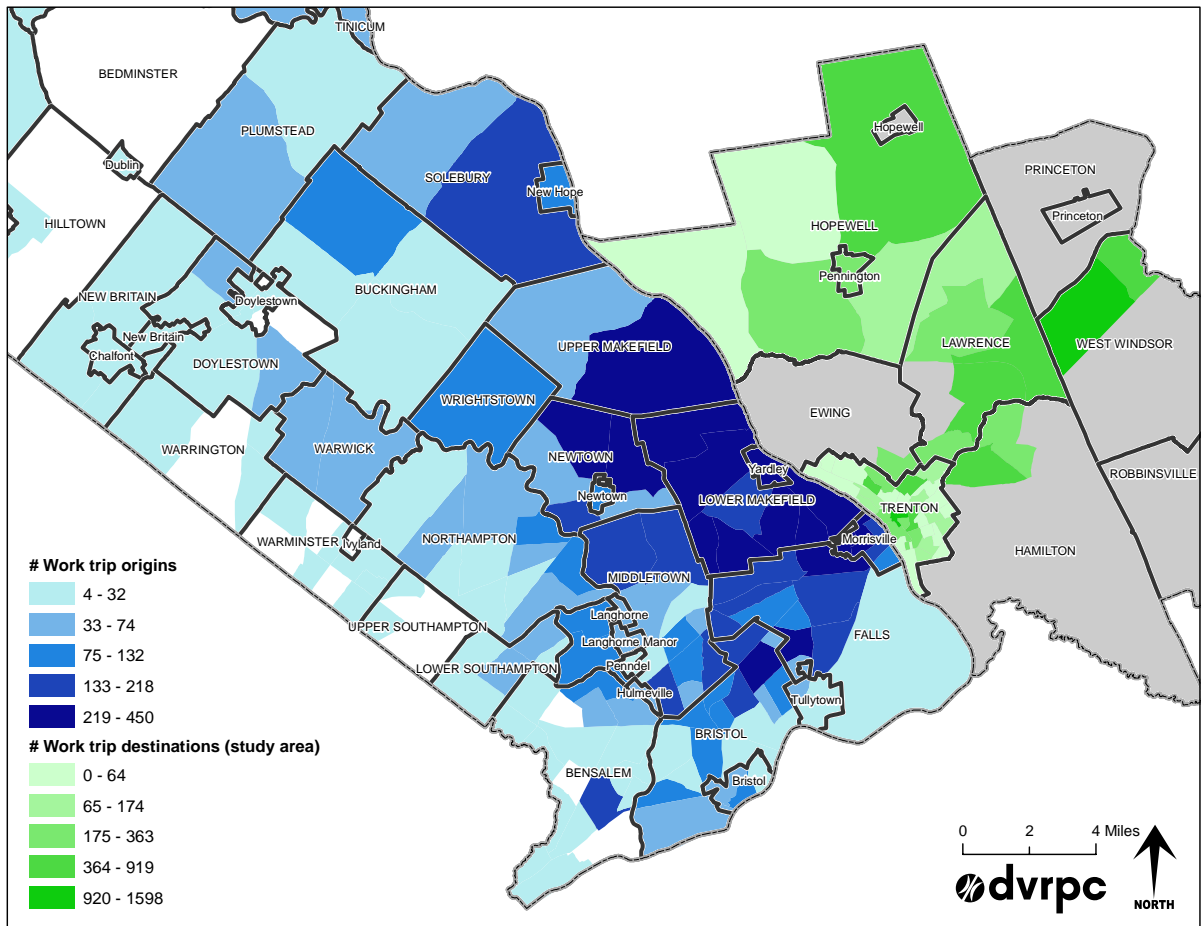
Table 2: Top 10 Bucks County TAZ concentrations of study area trip origins (2000)

TAZ #	Municipality	Workers
972	Falls Township	450
1351	Lower Makefield Township	364
970	Morrisville Borough	348
1301	Lower Makefield Township	343
963	Upper Makefield Township	313
1720	Lower Makefield Township	298
965	Lower Makefield Township	294
1350	Newtown Township	287
887	Bristol Township	279
1740	Lower Makefield Township	273

Source: Census 2000

These tables illustrate a predictable concentration of origins in the eastern portion of lower Bucks County – the portion of the county closest to Mercer County. However, a further examination of the data reveals a somewhat more dispersed origin pattern. Figure 2 illustrates the complete TAZ-level dataset, and indicates concentrations of origins as dispersed as Bensalem Township.

Figure 2: Bucks to Mercer Study Area TAZ-level journey-to-work trip patterns



Source: Census 2000

2008 Hamilton and Trenton Station Surveys

With assistance by NJ TRANSIT staff, DVRPC conducted surveys of passengers boarding New Jersey Transit trains at Hamilton and Trenton stations on the Northeast Corridor Line in May 2008. While very few of the survey respondents make the specific trips focused on in this study (Bucks County origins to study area Mercer County destinations), a review of ZIP code results and respondent addresses indicate that a number of boarding passengers do originate in Bucks County, arriving at Hamilton or Trenton stations by automobile, SEPTA R7 service, or SEPTA bus service (Route 127). Specifically, the survey results indicate that a significant portion of each station's passenger base—roughly 33% of Trenton and 12% of Hamilton northbound passengers—originate in Bucks County. Table 3 summarizes mode choice for Bucks County station patrons, as reflected in the survey results (the modes included in each table are the modes for which responses from Bucks County patrons—as reflected by self-reported ZIP codes, with some level of resulting uncertainty—were received).

Table 3: Mode of Station Access for Trenton Station patrons from Bucks County

Response	Response Count	Weighted Total	% of Responses
Drove alone and parked	253	1,280	80.1%
Car dropped off	21	106	6.6%
Carpooled and parked	18	91	5.7%
SEPTA train	16	81	5.1%
Passenger in carpool	5	25	1.6%
Bicycle	1	5	0.3%
Bus	1	5	0.3%

Source: DVRPC 2009

Table 4: Mode of Station Access for Hamilton Station patrons from Bucks County

Response	Response Count	Weighted Total	% of Responses
Drove alone and parked	94	450	84.7%
Car dropped off	7	34	6.3%
Carpooled and parked	7	34	6.3%
Passenger in carpool	1	5	0.9%

Source: DVRPC 2009

As Tables 3 and 4 indicate, fully 94% of Bucks-originating Trenton passengers and 100% of Hamilton passengers arrive at their respective stations via automobile (whether alone or pooled). This dominant auto mode share among people who are manifestly potential transit riders (they are Northeast Corridor passengers) is indicative of the presently uncompetitive nature of transit options for the first leg of their northbound trips. On a positive note, these passengers represent an untapped potential target market for new or revised bus service that would connect with Trenton and/or Hamilton stations.

Table 5 summarizes the top ten Bucks County origin ZIP codes for Trenton and Hamilton passengers (combined), and Table 6 reflects all Bucks County municipalities with address-matched survey respondent addresses, ranked in descending order by combined Hamilton and Trenton origins. Both tables include an estimated 100% weighted count based on the survey response rates, but it should be noted that the weighted totals are likely to be somewhat undercounted since they are not extrapolated from all usable returned surveys, but instead from the portion of usable surveys that provided ZIP codes (for Table 5) or where survey respondents' addresses were able to be matched in the GIS¹ (for Table 6).

¹ Address-matching rates were 84% for Hamilton Station (781 of 934) and 84% for Trenton Station (815 of 970). These are total matched addresses, not just those for Bucks County.

Table 5: Top 10 Bucks County ZIP codes for Hamilton and Trenton station boardings

ZIP code	Post Office Name	Sample Count	Weighted Full Count
19067	Morrisville	143	724
18940	Newtown	29	147
19047	Langhorne	23	116
18938	New Hope	19	96
19020	Bensalem	18	91
19053	Feasterville / Trevose	11	56
18966	Southampton	10	51
19007	Bristol	10	51
19030	Fairless Hills	9	46
19056	Levittown	9	46

Source: DVRPC 2009

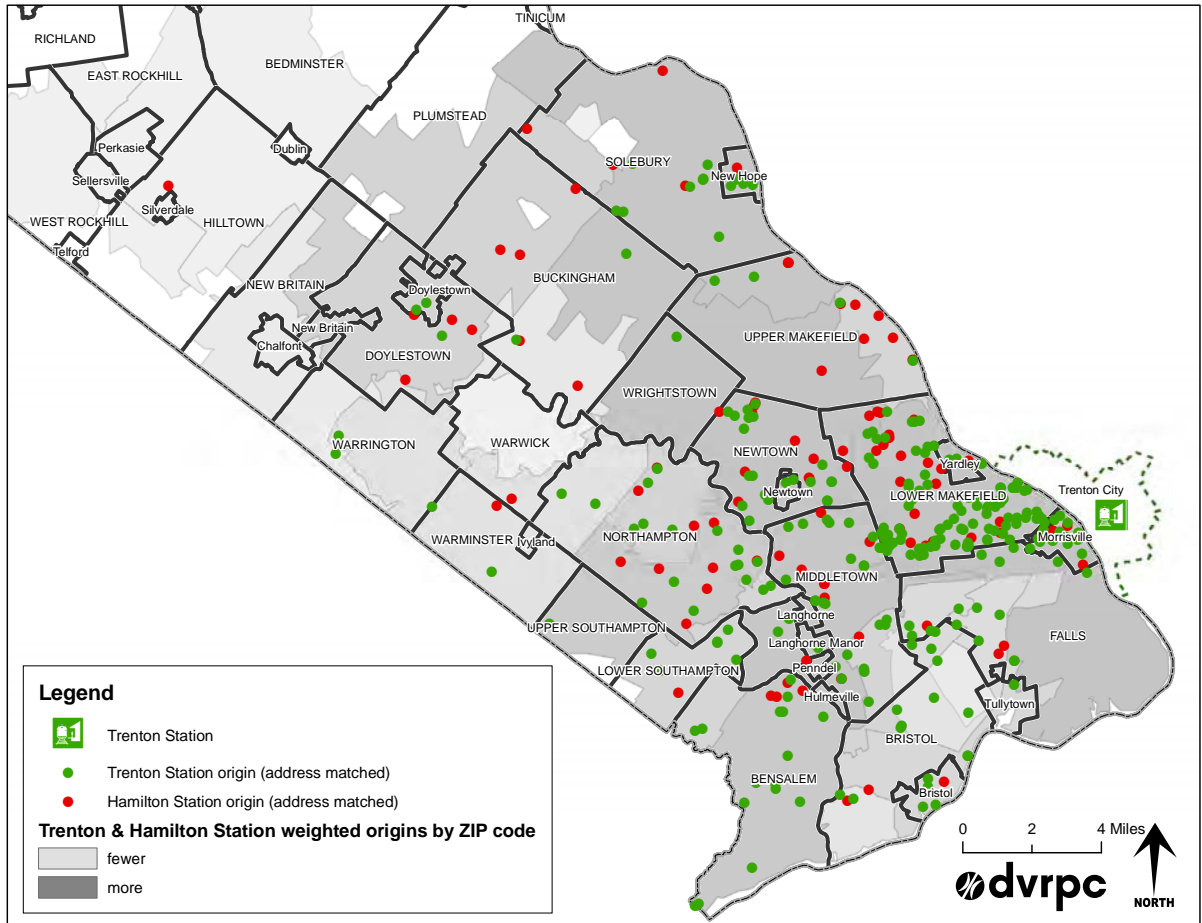
Table 6: Bucks County municipalities ranked by Hamilton and Trenton station boardings

Municipality	Trenton Weighted Count	Hamilton Weighted Count	Combined Weighted Count
Lower Makefield Township	390	101	490
Falls Township	213	29	241
Middletown Township	152	43	195
Newtown Township	111	72	183
Northampton Township	96	43	139
Bensalem Township	96	19	115
Solebury Township	56	34	89
Upper Makefield Township	30	48	78
Bristol Township	61	14	75
Morrisville Borough	56	14	70
Lower Southampton Township	35	5	40
Yardley Borough	35	5	40
New Hope Borough	30	5	35
Buckingham Township	15	19	34
Bristol Borough	25	5	30
Warrington Township	20	0	20
Doylestown Township	5	14	19
Doylestown Borough	10	5	15
Newtown Borough	10	0	10
Hilltown Township	5	5	10
Warminster Township	5	5	10
Langhorne Manor Borough	5	0	5
Penndel Borough	5	0	5
Tullytown Borough	5	0	5
West Rockhill Township	5	0	5
Wrightstown Township	5	0	5
Bucks County total	1,483	489	1,971

Source: DVRPC 2009

Figure 3 combines both of these datasets in illustrative form. Bucks County address-matched origin points for survey respondents are overlaid on a ZIP code map, with higher volume origin ZIPs being shaded in a darker gray.

Figure 3: Hamilton & Trenton address-matched boards plus weighted boards by ZIP code



Source: DVRPC 2009

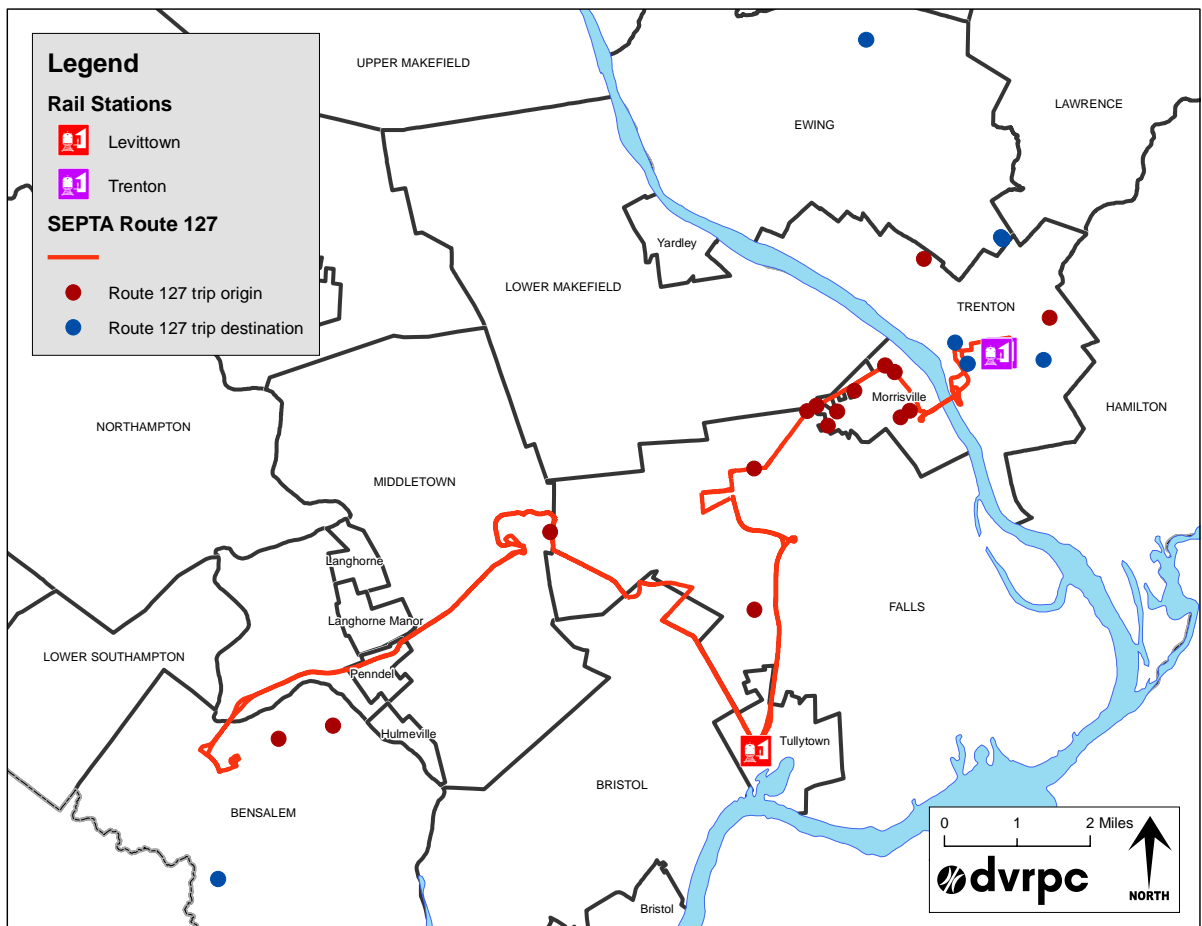
Table 5, Table 6, and Figure 3 reveal a Bucks County passenger origin distribution for Hamilton and Trenton stations that is similar to the Bucks County origin distribution from the Census journey-to-work analysis above. As a result, any bus service designed to serve the trip origins identified as part of the Census analysis would also serve these rail station passengers, provided the stations are served on the Mercer County ends of the routes. For these passengers, such a service would act as a feeder for Northeast Corridor rail service. For more details on methods and results for the 2009 Hamilton and Trenton station surveys, see DVRPC publication No. 08064: *FY08 NJ Transit Rail Customer Survey*.

SEPTA Route 127 Bus Passenger Survey

SEPTA Route 127 connects Lower Bucks County to Trenton. Major trip anchors include Neshaminy and Oxford Valley malls in Bucks County, Levittown Station on the SEPTA R7 line, downtown Trenton, and Trenton Station. SEPTA currently operates 14 weekday roundtrips between Neshaminy Mall and Trenton Transit Center (Trenton Station) from 5:20 A.M. until 9:00 P.M., with roughly hourly headways throughout the day.

DVRPC staff conducted surveys of interstate Route 127 passengers (from the intersection of Pennsylvania Avenue and Bridge Street in Morrisville to Trenton Station) during July 2008. Of 61 surveys distributed, 20 were returned completed. According to SEPTA's FY2009 Annual Service Plan, typical weekday boards are 397 (roughly 200 round-trip riders), and SEPTA passenger counts during 2008 indicate that daily interstate passengers average 75 eastbound and 97 westbound. Based on an average of these interstate volumes, the 20 usable survey responses represent a rider participation rate of roughly 23%. Figure 4 illustrates the geographic distribution of passenger-reported trip origins and destinations that were able to be address-matched in GIS (all 20 origins and 16 destinations).

Figure 4: SEPTA Route 127 with survey respondent origins and destinations



Source: DVRPC 2009

Although the small absolute number of responses means that the data has a high level of uncertainty, a review of these limited results is nevertheless instructive:

- ◆ A majority of respondents (12 of 20) began their trip at home
- ◆ 14 of 20 respondents reached the bus on foot
- ◆ Nearly every respondent (18 of 20) identified a trip destination within Trenton
- ◆ Of these, a majority (11 of 20) identified Trenton Station (the Route 127 terminus) as their destination

However, the results of the Trenton Station survey (summarized above) imply that few of the Route 127 passengers ending their trip at Trenton Station make rail transfers: just one boarding rail passenger indicated that he or she arrived at Trenton Station via the Route 127 bus. The Route 127 survey results also found only one passenger whose stated trip included a Northeast Corridor rail transfer at Trenton. This limited transfer activity likely relates to Route 127's limited service and very long headways, which limit its usefulness for discretionary riders desiring timely transfers.

Transit Service Concepts

Bucks Origin Hotspot Evaluation

The Census and survey data summarized in Chapter 1 can be combined to identify concentrations of trip origins in Bucks County (“hotspots”). The method selected to inform this evaluation was a spatial analysis using ArcGIS, where each data input was converted to a raster dataset, assigned a weight relative to the other data inputs, and then aggregated into a composite layer. The precise method used is summarized below.

Raster Analysis Summary

The GIS data inputs used in the analysis (from Chapter 1) were as follows:

- ◆ Traffic Analysis Zone (TAZ) level Bucks County work trip origins for trips ending in the Mercer County study area (see Figure 2). To better highlight true concentrations – which are more likely to be effectively served by transit – origins per acre were calculated.
- ◆ Address-matched Bucks County origins for Trenton and Hamilton stations (see Figure 3). For the purposes of this analysis, the two point datasets were combined into a single dataset.
- ◆ Address-matched Bucks County origins for SEPTA Route 127 (see Figure 4).
- ◆ Transit Scores calculated at the TAZ level for Bucks County using 2005 estimated Census data. Although Transit Scores do not relate to the specific Bucks→Mercer movement under evaluation, they provide a proxy for general likelihood to support transit on the origin end.

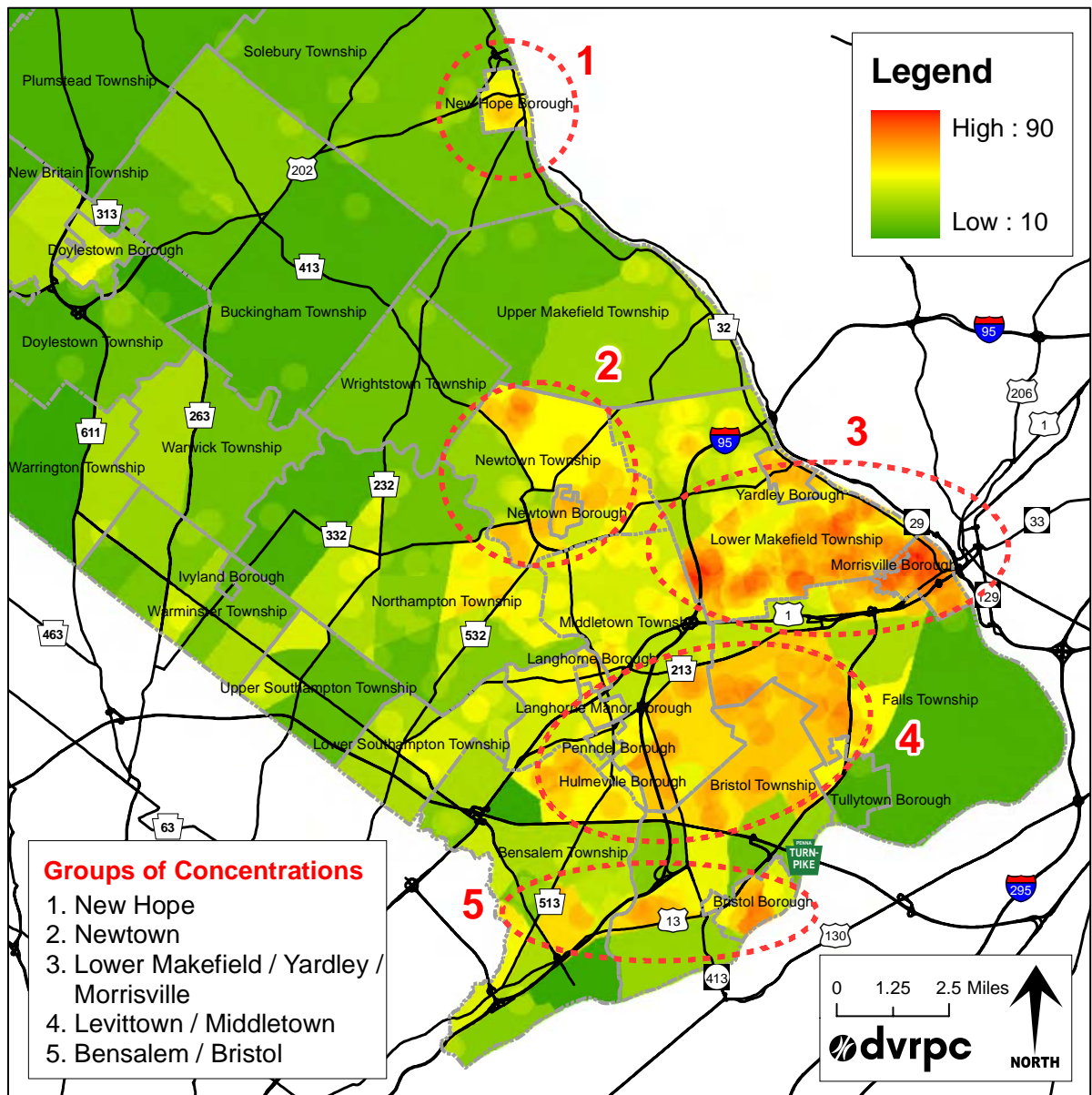
Each raster dataset was prepared using a 50 meter grid, and densities for point layers (Trenton, Hamilton, and Route 127 origins) were rasterized using a consistent 500 meter radius. In conducting the weighted sum aggregation to create the final hotspot dataset, each input dataset was first classified into 10 bins using the quantiles classification method in ArcGIS (i.e., they were grouped into the top 10%, next 10%, etc). In the case of Transit Scores and Route 127 origins, where there were fewer than 10 possible values for each record, records were nonetheless converted to a 10-point scale (i.e., Transit Score low or marginal = 1, medium = 5, medium-high = 8, etc). The weights applied to each input were:

- ◆ Traffic Analysis Zone (TAZ) level Bucks County work trip origins for trips: **x4** (most important, since it reflects the specific trip pattern under study)

- ◆ Trenton/Hamilton station origins: **x3** (second-most important, since the sample size is relatively large and reflects actual transit usage)
- ◆ Transit Scores: **x2** (second-least important, since it does not relate to the specific trip pattern under study – included as a proxy for transit viability; scores of medium or higher were weighted favorably)
- ◆ Route 127 origins: **x1** (least important, since the sample size for the dataset was small)

This weighted-sum aggregation resulted in a composite hotspot layer, as depicted in Figure 5 below.

Figure 5: Composite trip origin hotspot map for Bucks County



Source: US Census Bureau 2000, DVRPC 2009

As summarized in Figure 5, five broad concentrations of origins are apparent following the aggregation analysis. From north to south, these are New Hope, Newtown, Lower Makefield/Yardley/Morrisville, Levittown/Middletown, and Bensalem/Bristol, with Lower Makefield representing the largest and most dense concentration of origin hotspots. With the exception of New Hope, each of these concentrations can generally be served via US Route 1, Interstate 95, or both.

Greater Mercer TMA Route 1 Shuttle Service

In addition to SEPTA Route 127, the Bucks to Mercer trip patterns under study here were previously served by the Greater Mercer TMA's "Route 1 Express." This service operated from late 1993 through 1995, and was funded (roughly \$100,000 per year using motorcoach buses) as a congestion mitigation effort while Route 1 was under construction with one lane closed.

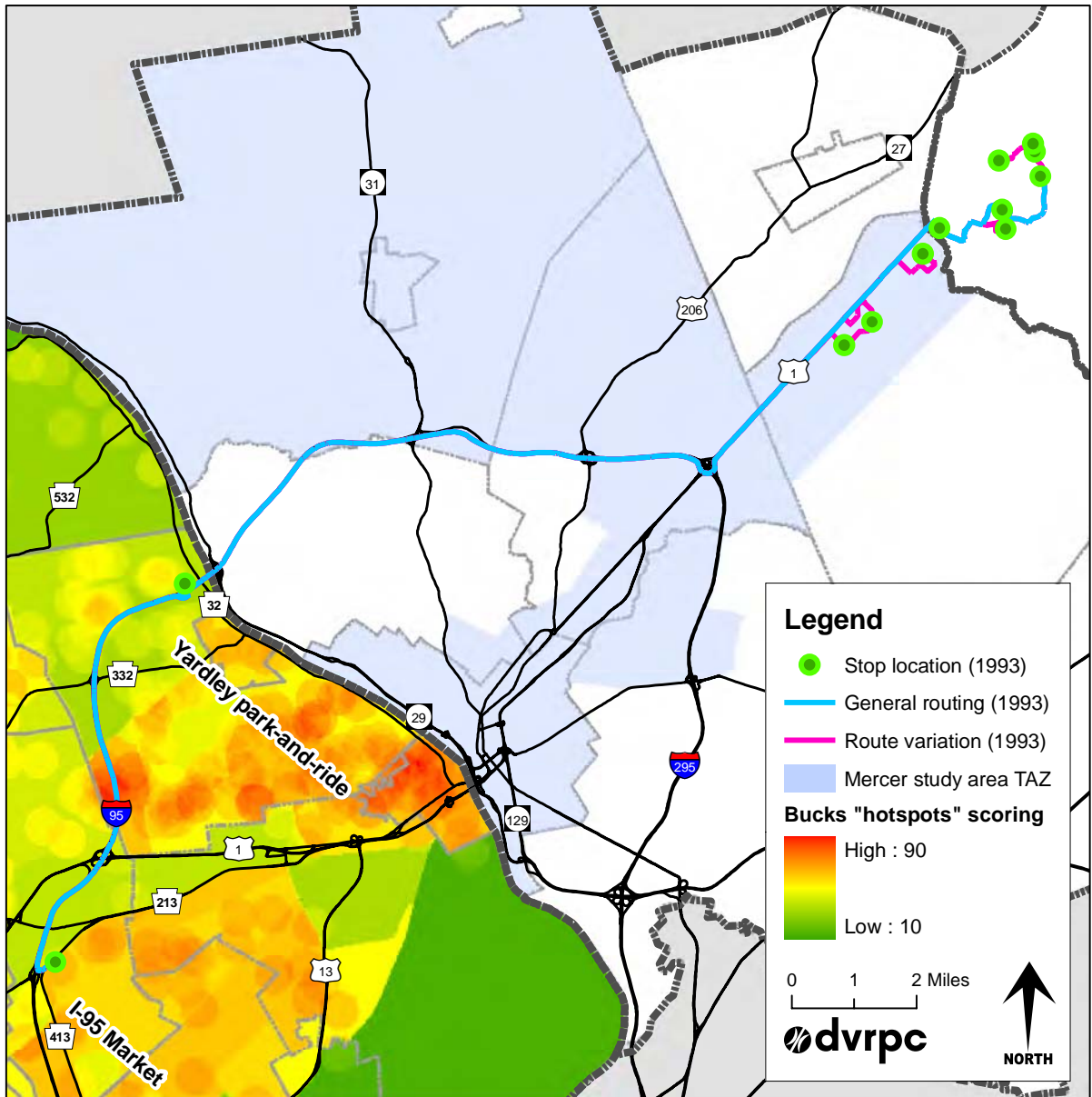
The Route 1 Express service picked up passengers at two Lower Bucks County park-and-ride locations: the I-95 market at the juncture of I-95 and business Route 1 and the Yardley park-and-ride at the intersection of Taylorsville and Woodside roads, adjacent to I-95. Over the course of the service's operations, 3-4 route variations at a time (A, B, C, and D) served these origins then operated along Interstate 95 to Route 1 in Mercer County, serving varying sets of employer destinations along Route 1. In the context of the hotspots in Figure 5, these park-and-ride locations would have drawn from the Levittown/Middletown and Lower Makefield/Yardley/Morrisville origin concentrations.

On the Mercer and Middlesex counties side, destination stops varied depending on route variation and changed over time (1993-95). At varying times, stops included:

- ◆ FMC Corporation site (new University Medical Center at Princeton [UMCP] in Plainsboro)
- ◆ Bristol Myers Squibb
- ◆ American Reinsurance
- ◆ Merrill Lynch
- ◆ 201 / 301 / 555 / 755 College Rd. East
- ◆ Robert Wood Johnson
- ◆ Education Testing Service [ETS] (former location along Route 1)
- ◆ David Sarnoff Center
- ◆ Centrum
- ◆ 212 / 214 Carnegie Center
- ◆ Princeton Overlook
- ◆ American Cyanamid

Figure 6 depicts the routings and stop locations for "Route 1 Express" service in December 1993.

Figure 6: Greater Mercer TMA "Route 1 Express" (1993)



Source: Greater Mercer TMA 1993 / 1995, DVRPC 2009

Route 1 Express service typically operated three buses per day, each making one northbound A.M. trip and one southbound P.M. trip. Notably, the service was free for passengers. In 1995, there were just over 30,000 boards, or roughly 15,000 round-trip passengers. Dividing this number by 250 (the rough number of annual non-weekend, non-holiday workdays) yields an estimated 120 typical weekday boards (60 round-trip riders), which compares to 397 weekday boards (roughly 200 round-trip riders) for SEPTA Route 127 in 2007.

This relatively low level of ridership is somewhat surprising given the number of unique destinations served, free service, and construction-related congestion along Route 1 at the time. This is indicative of the challenges in making transit service a competitive option where both origins and destinations

have auto-oriented configurations, and bears consideration in the current study – the locations of origin stops are key in affecting time competitiveness, and other strategies should be pursued to benefit transit performance and competitiveness along the route.

Route 1 Bus Rapid Transit (BRT)

Like the historic Route 1 Express service described above, the proposed Route 1 Bus Rapid Transit (BRT) project would include multiple park-and-ride locations in Lower Bucks County along I-95, with bus service connecting patrons with destinations along the Route 1 corridor in Mercer and Middlesex counties. In addition, the main “trunk” of the Route 1 BRT service would operate in exclusive rights-of-way, potentially offering legitimate time savings over automobile commutes.

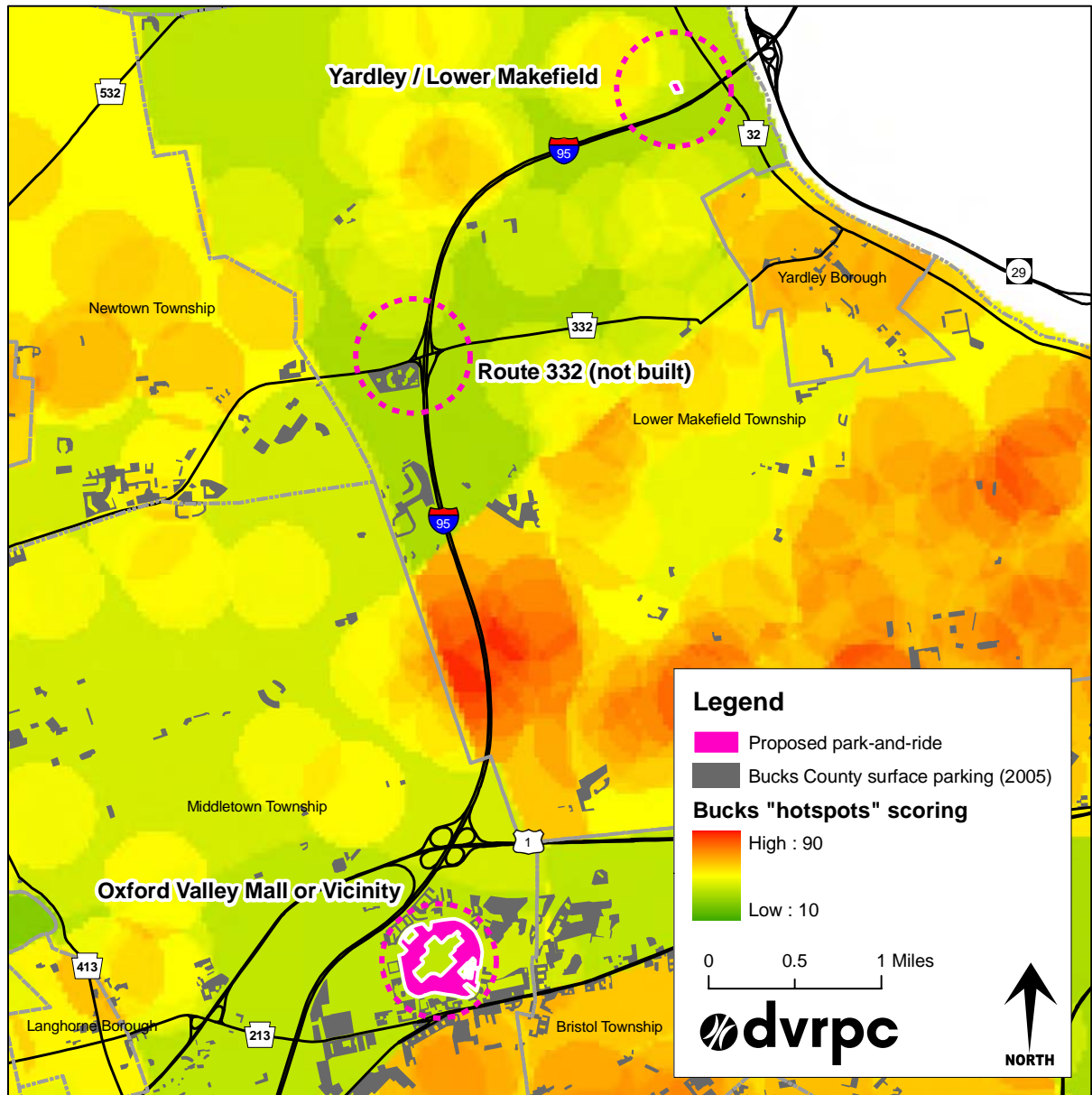
Under a full implementation of the BRT project, feeder bus routes would connect various southerly origin points (including the Bucks County park-and-rides) to destinations along the Route 1 corridor. Each feeder route would continue along the BRT’s exclusive right-of-way to an eventual northern terminus at the proposed South Brunswick rail station on the Northeast Corridor, north of Princeton Forrestal Village. Select attractors would be directly served en route (permitting one-seat-rides for some southerly park-and-ride patrons), and a major transfer facility at the southern end of the main BRT right-of-way (near Quaker Bridge Mall, just north of the I-95/295/Route 1 interchange) would enable transfers to other BRT routes serving other destinations.

The Central New Jersey Route 1 BRT Alternatives Analysis (a conceptual alternatives analysis published in February 2006) suggests three Bucks County park-and-ride facilities:

- ◆ Oxford Valley Mall or vicinity, located near the intersection of I-95 with Route 1 in Bucks County (the mall parking lot would be used if agreement could be reached with the mall’s Kravco/Simon ownership)
- ◆ Route 332 at I-95 (a new facility would be constructed)
- ◆ Yardley/Lower Makefield park-and-ride at Woodside/Taylorville road intersection, just off I-95 (the existing park-and-ride – currently used for carpools, van pools, the Princeton Airporter shuttle, and formerly used for the GMTMA Route 1 Express – would be expanded)

These locations are illustrated in Figure 7 below in the context of the origin hotspots identified in this report, as well as other surface parking facilities in Bucks County.

Figure 7: Proposed Bucks County park-and-ride locations from Route 1 BRT report



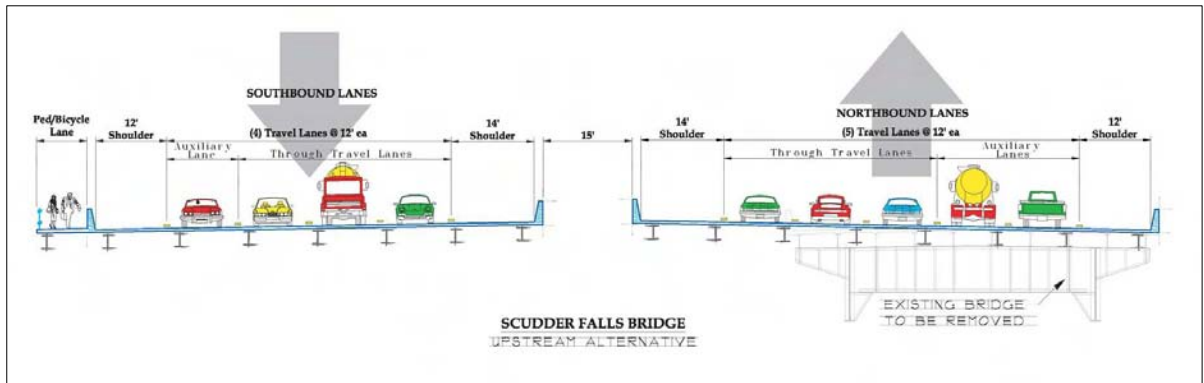
Source: Central New Jersey Route 1 BRT Alternatives Analysis 2006, DVRPC 2005 / 2009

In Spring 2009, NJ TRANSIT proposed a “near-term implementation strategy” for the Route 1 BRT, which will include a series of route modifications and creations by 2015, along with a host of targeted capital investments in transit preferential treatment along roadways (which will be especially critical in attracting park-and-ride passengers). Notably for the current project, one of the early phase routes proposed – Route 650P – would serve Lower Bucks County via I-95 and the three park-and-ride locations depicted in Figure 7. This route, which is proposed to have 30-minute peak and hourly off-peak headways, would have a routing similar to the Greater Mercer TMA “Route 1 Express.” It would directly serve a number of job destinations along Route 1 north of Trenton (as well as Princeton Junction Station on the Northeast Corridor) with a one-seat-ride. Transit preferential treatments are hoped to include exclusive transit lanes on the I-95 Scudder Falls Bridge, exclusive transit lanes on

I-95 in the merge onto Route 1 near the Quakerbridge Mall, and preferential treatments along Route 1 itself.

Figure 8 depicts the current proposed cross-section for the Scudder Falls Bridge replacement. The 14-foot shoulders are proposed to accommodate NJ TRANSIT buses during “congested conditions.”

Figure 8: Proposed Scudder Falls Bridge replacement cross-section



Source: DRJTBC 2009

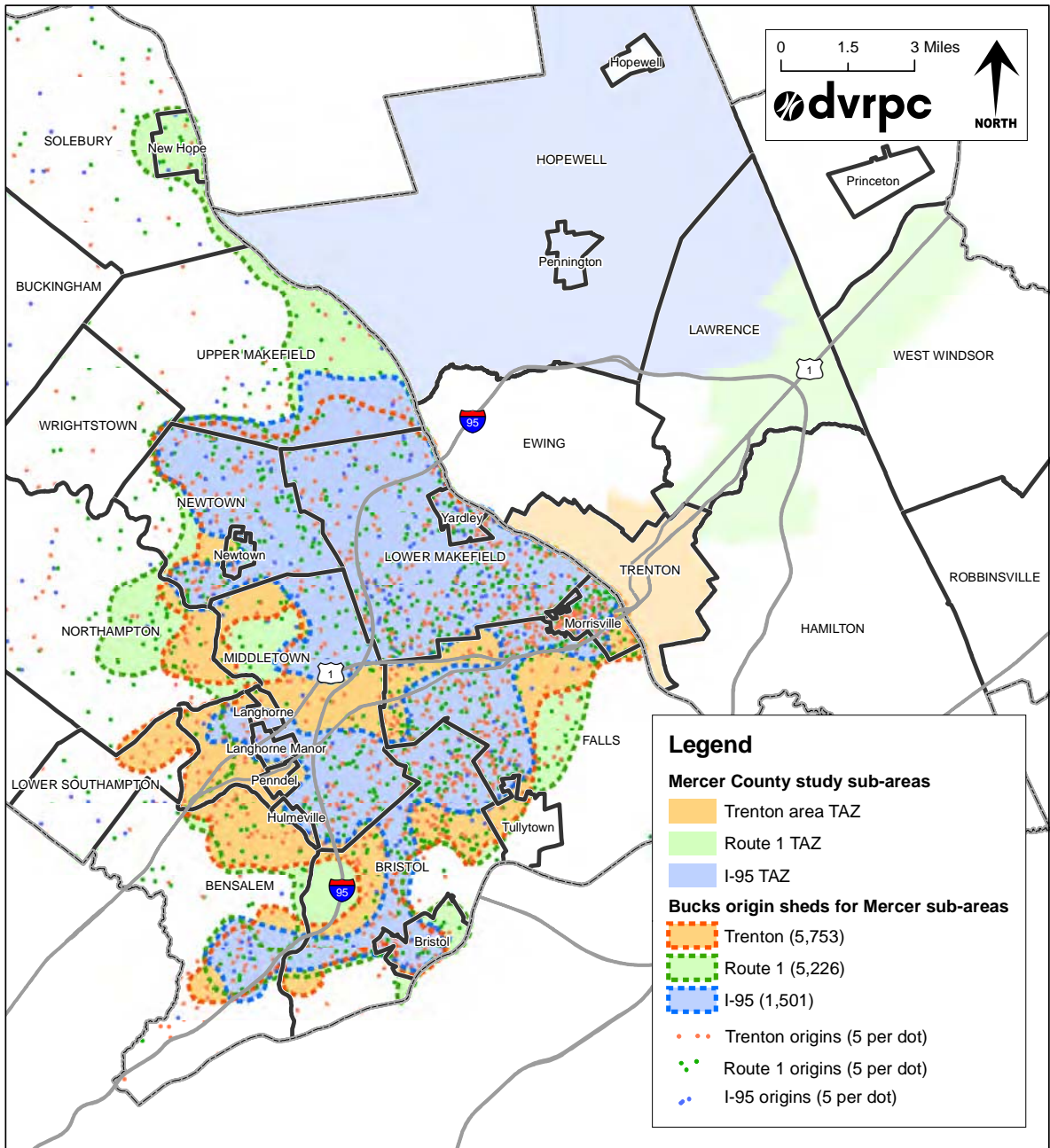
These shoulder lanes would represent a significant preferential treatment for transit, and by simply using the shoulders (rather than marked or branded bus lanes) this configuration would avoid the pitfalls that often befall BRT/bus lanes, where extremely high frequencies are often needed to maintain the visibility required for transit to retain exclusive ownership of the space.

NJ TRANSIT estimates that Route 650P would attract roughly 900 boards per day for trips to and from Bucks County by 2015 (or roughly 450 round-trip riders). In addition to Route 650P, another proposed near-term BRT route (Route 651P) would connect Burlington City, NJ, and the Burlington South RiverLINE park-and-ride with parts of the Route 1 corridor, including Princeton Junction Station and Princeton Borough. This route would also provide indirect park-and-ride access from Lower Bucks County via the Burlington-Bristol Bridge, although bridge congestion and tolls would likely make this a less attractive option for many potential Bucks County riders than Route 650P.

Matching Origins and Destinations

In order to know whether the Lower Bucks service patterns proposed under the Route 1 BRT project (and new Route 650P specifically) would effectively match journey-to-work origins with destinations – and to propose additional services where they do not – it is useful to take a closer look at origin patterns for specific “sub-areas” of this project’s Mercer County study area. To this end, staff split out the Census 2000 journey-to-work flows from Figure 2 to identify the Bucks County work trip origins for destinations in three sub-areas: Trenton, the Route 1 corridor north of Trenton, and the I-95 corridor. These three origin patterns were mapped in GIS, symbolized using dot densities, and a boundary was drawn around TAZ areas with relatively high concentrations to approximate a primary shed or market area for each Mercer destination sub-area. Figure 9 depicts the three Mercer sub-areas, as well as Bucks shed estimates for each.

Figure 9: Specific Census 2000 JTW trip patterns and Bucks County sheds



Source: US Census Bureau 2000, DVRPC 2009

As Figure 9 indicates, there is no significant difference between the shapes and extents of the Bucks County market sheds for the Trenton, Route 1, and I-95 employment sub-areas. Notably, if Figure 9 is compared with the hotspots identified in Figure 5, the New Hope, Lower Makefield/Yardley/Morrisville, Levittown/Middletown, and Bensalem/Bristol origin concentration areas are all shared by each of the three sheds summarized in Figure 9. Only the New Hope concentration appears to have a disproportionate relationship with the Route 1 corridor.

This means that with the possible exception of New Hope (which is a lower level concentration of origins in any case), it will be important for each of the origin hotspots to be connected with destinations in all three of the Mercer sub-areas. In terms of magnitude, flows to the Trenton and Route 1 sub-areas are comparable in scale (at 5,753 and 5,226 journey-to-work origins, respectively). Flows to the I-95 sub-area were of a lower magnitude – 1,501 trips. It bears noting that a certain portion of the Route 1 shed has likely shifted to the I-95 shed since the 2000 Census with the relocation of Merrill Lynch offices from Route 1 to a new campus in Hopewell Township.

Park-and-Ride Locations and Gaps

The park-and-ride locations proposed as part of the Route 1 BRT project are effectively located to accommodate easy on/off access for the transit vehicles from I-95. They also appear appropriate for capturing park-and-ride commuters from four of the five origin concentrations identified in this report (Figure 5), at least for those commuting to destinations in the Route 1 sub-area:

- ◆ Commuters from the New Hope concentration can reach the Yardley park-and-ride via Route 32/River Road.
- ◆ Commuters from Lower Makefield/Yardley/Morrisville can readily access the Route 332 or Yardley park-and-rides, although those from the vicinity of Morrisville might find this option too circuitous to be competitive.
- ◆ Commuters from broader Newtown can reach the 332/I-95 park-and-ride via Route 332.
- ◆ Commuters from Levittown/Middletown can readily access the Oxford Valley Mall park-and-ride.

The only origin concentration not served by any of the three proposed park-and-rides is the broader Bensalem/Bristol hotspot, for which Trenton destinations are already effectively served by SEPTA R7 rail service to Trenton.

Essentially then, the combination of R7 service and Route 1 BRT park-and-ride service (if effectively implemented) with the three park-and-ride locations already proposed would leave three significant gaps to be filled via additional park-and-rides and/or routings:

- ◆ Service from Newtown, Lower Makefield/Yardley/Morrisville, and Levittown/Middletown to Trenton;
- ◆ Service from Newtown, Lower Makefield/Yardley/Morrisville, and Levittown/Middletown to I-95 locations; and
- ◆ Service from Bensalem and Bristol to the I-95 and Route 1 destination sub-areas.

Service from Newtown, Lower Makefield/Yardley/Morrisville, and Levittown/Middletown to Trenton

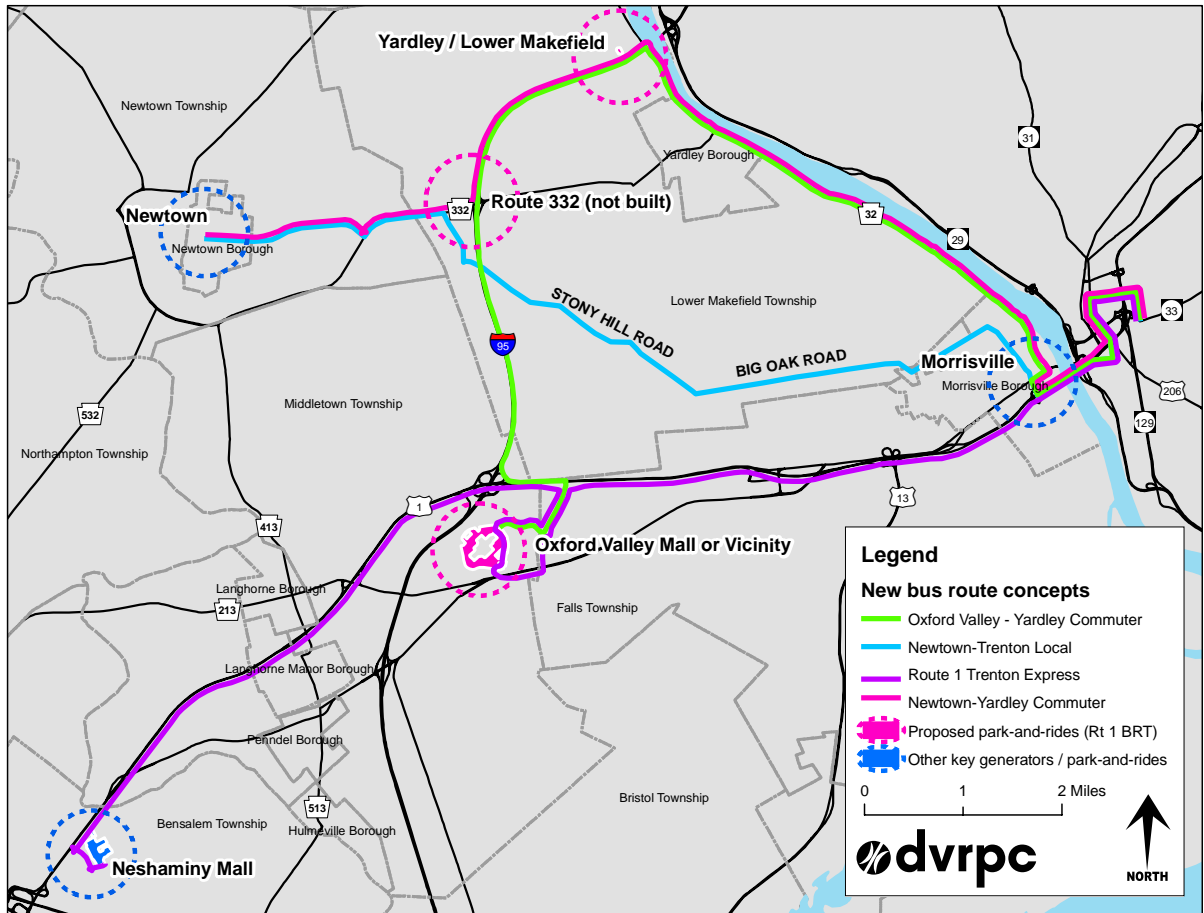
This connection is challenging because of the dispersed distribution of origin connections. Route 1 provides the best high-speed east-west access into Trenton, and speed will be important for attracting

a passenger base of largely choice riders. SEPTA Route 127 operates along the parallel business Route 1 corridor, taking just less than 1 hour 20 minutes during peak periods between Neshaminy Mall in Bensalem and Trenton Station. A potential limited stop park-and-ride operation along highway Route 1 could cover the same distance in roughly 30 minutes (uncongested drive times are roughly 15-20 minutes). On the other hand, park-and-ride locations along Route 1 would be less accessible from the Newtown and Lower Makefield/Yardley/Morrisville areas, and the Route 1 bridge into Trenton is a potential bottleneck, with no transit-preferential treatments available or planned. After considering the distribution of origin concentrations, several potential routing concepts emerge.

- ◆ **Route 1 highway/park-and-ride routing (“Route 1 Trenton Express”)**: This would be a highway park-and-ride service with three park-and-ride locations: Neshaminy Mall, Oxford Valley Mall, and central Morrisville Borough. The Neshaminy Mall terminus would draw from northern portions of Bensalem Township, the Oxford Valley Mall park-and-ride would draw from Middletown/Levittown and portions of Lower Makefield, and the Morrisville stop would capture walk up and local riders similar to SEPTA Route 127. End-to-end running time would be roughly 30-35 minutes.
- ◆ **Oxford Valley / Yardley commuter route**: This would be a park-and-ride service similar to the above, connecting each of the three park-and-ride locations proposed as part of the Route 1 BRT (NJ TRANSIT proposed Route 650P) with downtown Trenton via River Road. This routing concept would also include service to Morrisville. End-to-end running time would also be roughly 30-35 minutes.
- ◆ **Newtown-Yardley commuter route**: This would capture walk-up and/or park-and-ride passengers from Newtown, and would also connect with the Route 332 and Yardley park-and-rides (shared with the Route 1 BRT), reaching Trenton by way of River Road. This routing concept would also include service to Morrisville. End-to-end running time would also be roughly 30-35 minutes.
- ◆ **Newtown-Trenton local route**: This routing would connect Newtown Borough with Trenton via Lower Makefield and Morrisville (Newtown-Yardley Road → Route 332 → Stony Hill Road → Big Oak Road → Pennsylvania Avenue). This route would be intended to attract mostly walk-up and/or bike-up ridership, and would directly serve portions of Lower Makefield Township that show as significant origin hotspots in the raster analysis. These residential areas are of low to moderate densities, and most local streets have sidewalks that connect with the routing proposed above. End-to-end running time would be roughly 40 minutes.

Each of these routing concepts (summarized in Figure 10) would reach Trenton via the Route 1 expressway bridge, and would terminate at Trenton Station after routing through downtown Trenton. These routes could be pursued independently of one another. If the suggested Route 1 Trenton Express were implemented, for example, an Oxford Valley terminus might not make sense for the Oxford Valley / Yardley commuter route, since passengers from the vicinity of Oxford Valley Mall would have a much faster ride to Trenton on the Express service.

Figure 10: Routing concepts connecting Lower Bucks origins to Trenton

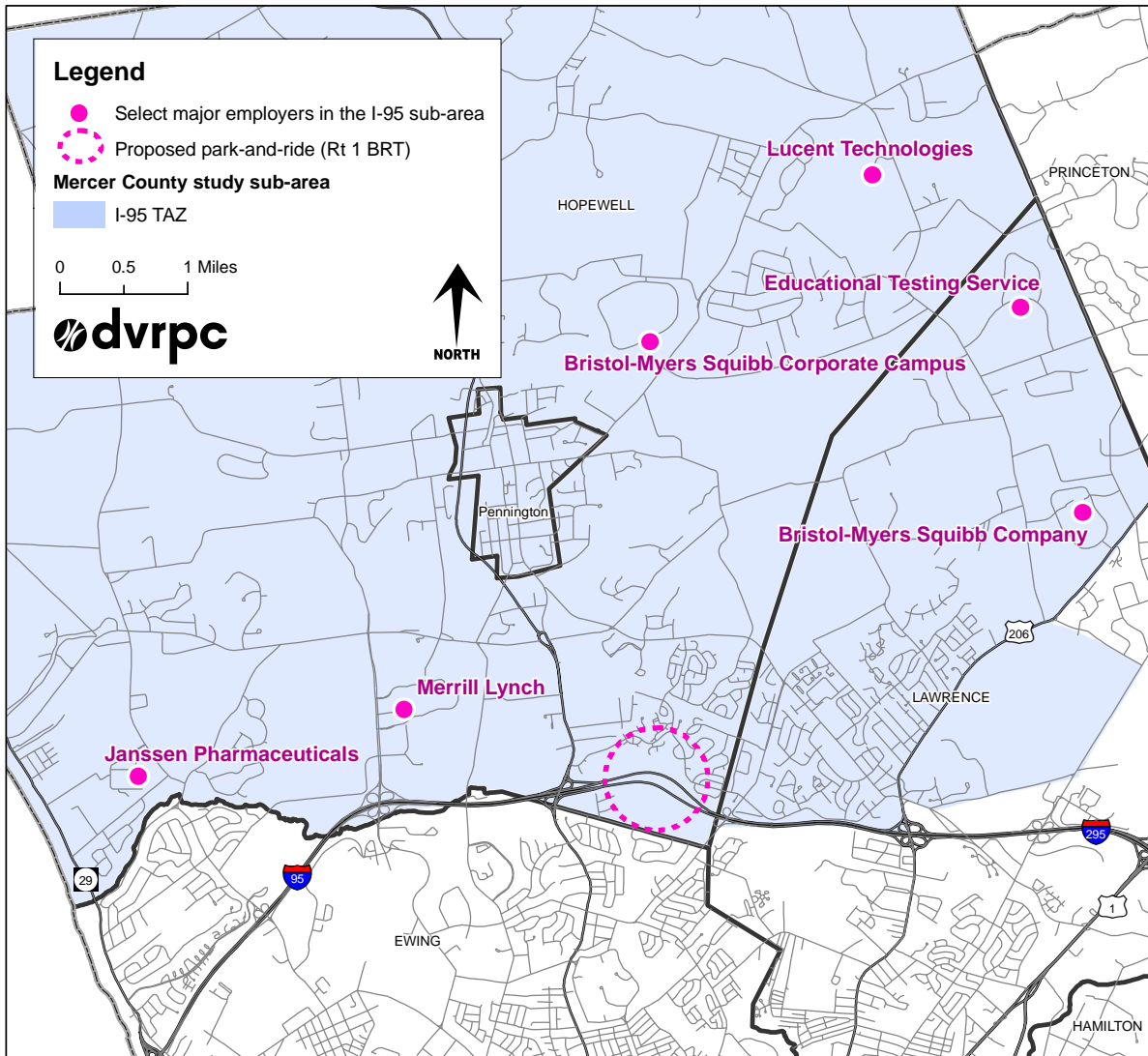


Source: DVRPC 2009

Service from Newtown, Lower Makefield/Yardley/Morrisville, and Levittown/Middletown to I-95 locations

The main challenge with connecting Lower Bucks origins to job destinations in the I-95 sub-area is that while there are significant employers and significant interstate flows – although, as Figure 9 indicates, not as significant as the other two sub-areas – job centers in the I-95 sub-area are much more dispersed. This is illustrated in Figure 11.

Figure 11: Select major employers in the Mercer I-95 study sub-area



Source: DVRPC 2009

This level of dispersion makes it difficult (and potentially prohibitively so) to serve these destinations with a transit route or routes in a cost-effective way that would also be attractive for discretionary riders. Perhaps the only option might take the form of individual employer-operated or sponsored shuttles that would pick up passengers from the proposed I-95 park-and-ride location for the Route 1 BRT in southern Hopewell Township. Under this scenario, passengers would board proposed NJ TRANSIT Route 650P at Bucks County park-and-rides, ride Route 650P to the Hopewell Township park-and-ride, and would transfer there onto shuttles to their ultimate destinations. Given the times, distances, and presumed costs involved, it is difficult to envision this operating pattern being particularly competitive barring significant increases in the time or monetary costs of auto trips. It bears noting that recent significant investments to the Scotch Road interchange (exits 3A/B, west of the proposed park-and-ride) could make that interchange a viable alternate park-and-ride location. This could permit effective shuttle access to at least one major employer: Merrill Lynch, which is accessed from Scotch Road.

Service from Bensalem and Bristol to the I-95 and Route 1 destination sub-areas

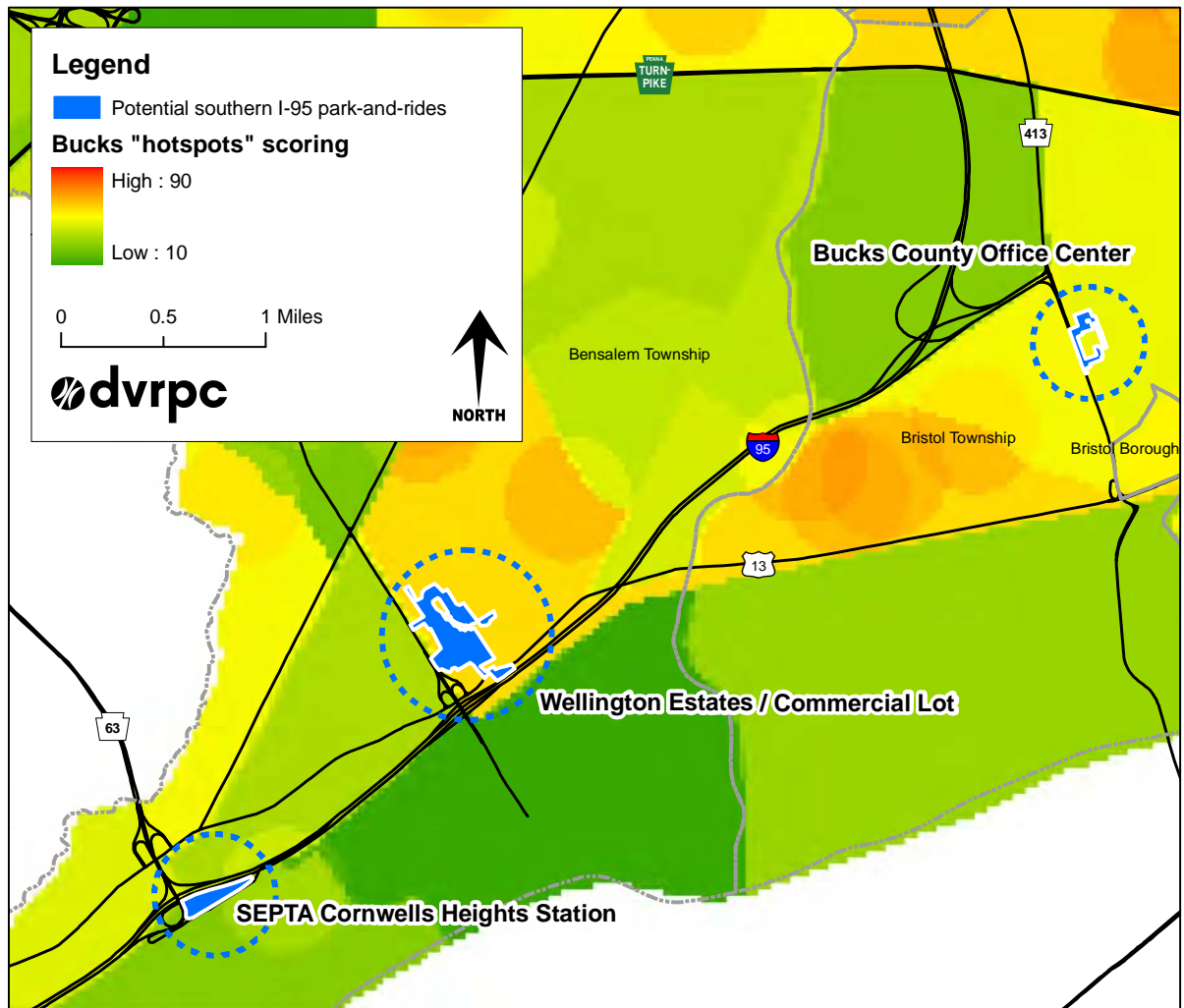
In the case of destinations in the I-95 sub-area, the same challenges described above for other origin clusters would also be true for origins in Bensalem and Bristol. The dispersed nature of job destinations makes any effective service challenging. For destinations in the Route 1 sub-area, however, access may be effectively provided through one or more additional and more southerly park-and-ride locations along I-95 (in addition to the three already proposed as part of the Route 1 BRT project for NJ TRANSIT Route 650P). Under this scenario, Route 650P would serve park-and-ride origins from each of the Bucks County hotspots identified in Figure 5.

After examining parcel-level land uses and aerial photography around each of next three southerly exits from I-95 (south of the proposed Oxford Valley Mall park-and-ride), several possibilities for additional park-and-rides present themselves:

- ◆ **Exit/milepost 40 (Route 413/Bristol):** Commercial parking lot for the Bucks County Office Center office park, located just off I-95 on Route 413. This Bristol Township property is proximate to Bristol Borough, and is a former High School in the Bristol School District. A shared-use parking arrangement (such as that proposed for Oxford Valley Mall) may be possible.
- ◆ **Exit/milepost 37 (Street Road):** Mixed-use commercial parking lot adjacent to the Wellington States housing development and Korman Suites apartment complex. This parcel is located along Street Road north of I-95, and is located within a hotspot identified in Figure 5.
- ◆ **Exit/milepost 36 (Cornwells Heights Park-and-Ride):** SEPTA park-and-ride for R7 and Amtrak rail service. A shared-use parking arrangement may be appropriate, since available parking supply is ample. SEPTA 2008 parking data indicates that Cornwells Heights' permit parking stalls are 78% utilized, with roughly 75 open stalls daily. Of 1,600 free non-SEPTA stalls, just less than half (750) are typically available/unused. Bus operations would need to be coordinated with SEPTA's operations of the Cornwells Heights parking lot shuttle (SEPTA Route 316).

Figure 12 depicts the locations of these possible park-and-ride sites in the context of the hotspots origin mapping from Figure 5.

Figure 12: Potential southerly park-and-rides to serve Bensalem and Bristol origins



Source: DVRPC 2009

Each of these three potential locations would permit similar on/off access for transit vehicles as the three northern park-and-ride locations already proposed.

As an alternative to extending proposed Route 650P to one or more of these southern park-and-ride options, service to the Route 1 corridor from Bensalem and Bristol might also be provided via an extension of proposed Route 651P over the Burlington-Bristol Bridge to Bristol Borough and vicinity, and NJ TRANSIT staff have suggested that this extension might be more cost-effective than an extension of Route 650P. A park-and-ride terminus at the Bucks County Office Center location in Figure 12 would also be appropriate for an extended Route 651P.

Conclusion / Next Steps

As the analyses in this report have confirmed, there is significant potential demand for new transit connections between portions of Bucks County and job concentrations in Mercer County. Extensions of NJ TRANSIT service into Bucks County as part of the Route 1 BRT project (currently proposed as Route 650P) appear well-placed to meet some of this potential demand, particularly if extended southward and supplemented by the other service concepts suggested here.

However, it bears reinforcing that with a few exceptions (Newtown, Bristol, Morrisville, Trenton, etc.), most of the potential trips served either originate or terminate in locations where land use patterns are heavily auto oriented (or in many cases both). In this context, in order for new services to be attractive to a principally discretionary passenger base who will be particularly sensitive to time savings, providing meaningful and significant transit preferential treatments will be critical. The proposed peak bus shoulder lanes on the new Scudder Falls Bridge represent a significant first step in this direction, but much more will be required.

Next steps:

- ◆ NJ TRANSIT will continue to pursue its incremental implementation strategy for the Route 1 BRT, in close partnership with local stakeholders. The first significant stage of outreach to Pennsylvania stakeholders (with a focus on proposed Route 650P) occurred in a meeting at the offices of the Delaware River Joint Toll Bridge Commission in June 2009, and the strategies and materials NJ TRANSIT presented at that meeting are consistent with the findings of this report.
- ◆ NJ TRANSIT and SEPTA should explore issues of jurisdiction in considering all operational possibilities for new services.
- ◆ Should any of the park-and-ride or routing concepts suggested in this report advance, a more detailed evaluation will be required, as will discussions and negotiations with property owners for shared-use parking arrangements.
- ◆ During FY2010, DVRPC will undertake a long-range strategic bus service plan for Mercer County, which will include consideration of new service concepts under multiple long-range development scenarios. This report and the full results of NJ TRANSIT's near-term implementation plan for BRT will inform that project.

Abstract

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Abstract: This project explores work commute trip patterns across the Delaware River from Bucks County to Mercer County, and presents concepts to better serve these trip patterns with public transit. This project specifically focuses on trips from Bucks County to downtown Trenton and to major employers along the Route 1 corridor in Mercer County, as well as off Interstate 95 in Hopewell and Lawrence townships, and relates closely to NJ TRANSIT's near-term incremental implementation strategy for the Route 1 Bus Rapid Transit project in Central New Jersey.

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