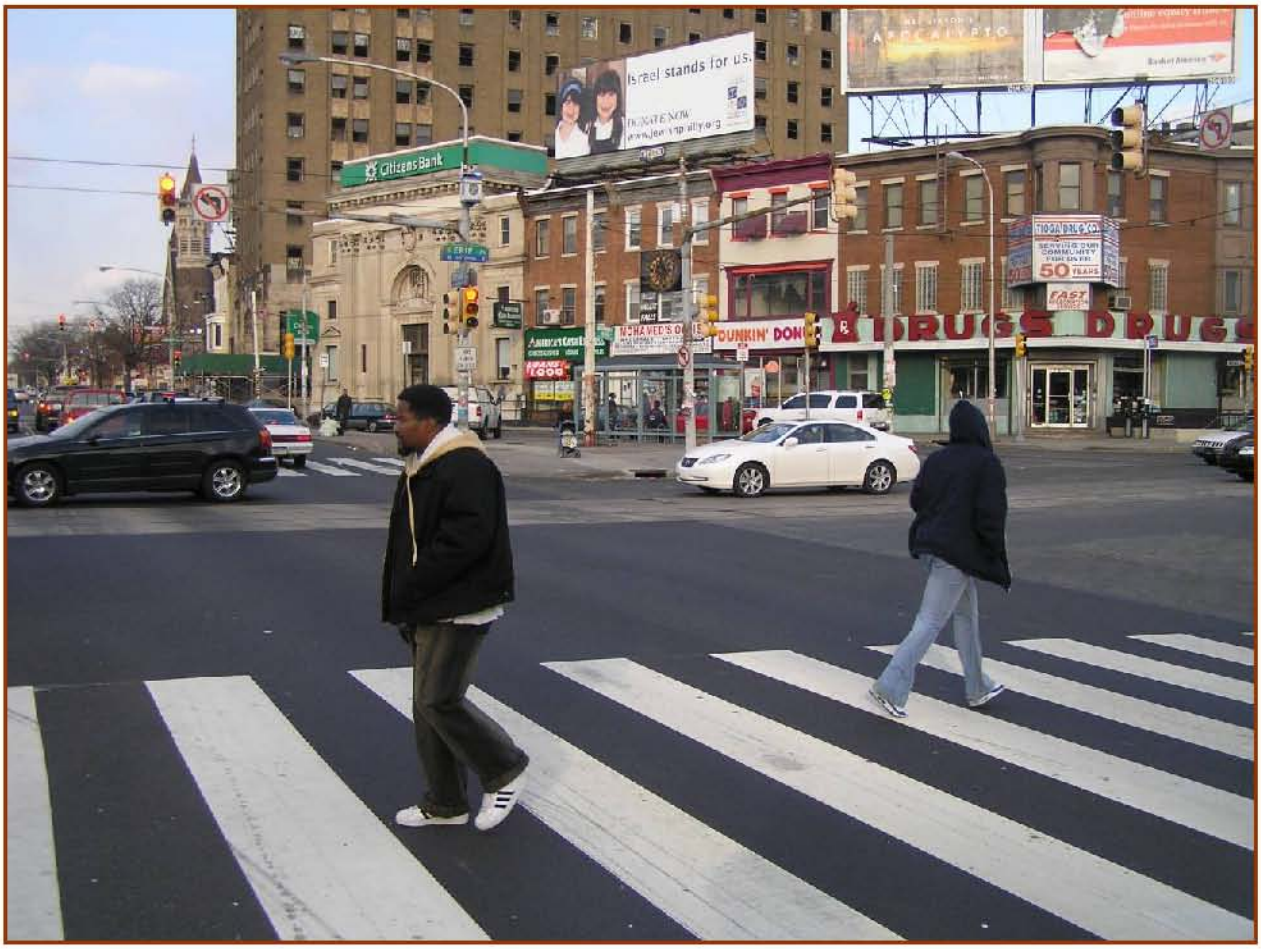
North Broad Street Pedestrian Crash Study

July 2008



Delaware Valley Regional Planning Commission

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CONTENTS

TABLES

MAPS

FIGURES

EXECUTIVE SUMMARY

This report presents a descriptive analysis of 210 pedestrian-involved motor vehicle crashes that occurred in six pedestrian crash clusters and nine Location Priority Listing ("priority") pedestrian crash clusters along or intersecting a four-mile-long segment of North Broad Street (PA 611) between Diamond and Nedro streets in the City of Philadelphia from 2000 to 2006. This represents perhaps the largest concentration of such crashes in the Pennsylvania state highway system during this period.

Police reports for each of the crashes were coded using the *Pedestrian and Bicycle Crash Analysis Tool* (PBCAT), a database program for classifying motor vehicle crashes involving pedestrians and bicyclists according to the specific actions of the motorist and the pedestrian precipitating the crash. Tabulations were performed for all crashes and for the subset of priority cluster crashes by pedestrian crash type and group, age of pedestrian and driver, the time of day, day of the week, and the month in which crashes occurred, and roadway illumination levels.

The principal findings of this analysis are as follows:

Location: Each priority crash cluster location lies proximate to a Broad Street Subway station and coincides with one or more SEPTA bus routes. Nearly half (46 percent) of the crashes analyzed took place in one of nine priority clusters. The highest density of crashes took place between Lehigh and Erie avenues, where five clusters are located within one mile.

Crash types: Two out of five crashes occurred when a motorist, either moving straight or turning, failed to give way to a pedestrian crossing the roadway in either a marked or unmarked crosswalk. Such crashes occur disproportionately after dark. Despite the apparent high level of transit-generated pedestrian activity, only two crashes were bus related.

Fatal crashes: Seven crashes resulted in nine fatalities, most of them pedestrians. Nearly all the fatal crashes occurred after dark.

Age of pedestrians: More than half of pedestrians involved in crashes were working-age adults between the ages of 25 and 59 years. A minority of crashes involved children under age 15 (4 percent) or persons age 60 and older (13 percent). Pedestrian age was unknown or not recorded for 13 percent of crashes.

Time of occurrence: Crashes mostly occurred during the afternoon commute and early evening hours and were roughly evenly distributed across all seven days of the week. A significant number of priority cluster crashes occurred in the late evening and early morning hours.

Accuracy of crash reports: Of the 244 crash reports received from the PennDOT Accident Reporting System, 25 were miscoded bicycle crash reports, one involved a scooter, and eight were illegible and not included in this analysis.

The data suggest that significant reductions in pedestrian crashes might be achieved by enhancing the lighting of crosswalk areas in priority crash cluster locations; and targeting enforcement of yield-to-pedestrian laws at such locations during the mid- to late afternoon hours on weekdays. Countermeasures aimed at improving the safety of children and the elderly, while valuable in their own right, will likely yield little to no reduction in pedestrian crashes within the study area.

The information presented in this report is intended for use by a road safety audit team as an aid in identifying and prioritizing engineering, enforcement, and education countermeasures appropriate to the most prevalent crash types, as part of pedestrian road safety audit of the study area.

1.0 INTRODUCTION

Since 1997 DVRPC has conducted planning studies intended to further pedestrian safety and access in the region under its annual work program. The most recent federal surface transportation act presented new priorities and capital funding opportunities, prompting a shift in the focus of this work. The federal Safe, Accountable, Flexible, and Efficient Transportation Equity Act – Legacy for Users (SAFETEA-LU), enacted in 2005, revises funding structures and establishes a new Highway Safety Improvement Program, almost doubling infrastructure safety spending and requiring evidence-driven solutions and measurable results.

While crashes involving pedestrians in the Philadelphia metropolitan region during the years 2003 to 2005 accounted for only approximately four percent of all crashes, they represent 17 percent of fatal crashes. The high pedestrian fatality rate nationally has prompted the Federal Highway Administration to consider its reduction as one of its "vital few" priorities for safety.

Responding to SAFETEA-LU mandates, PennDOT, in collaboration with DVRPC, other Metropolitan Planning Organizations (MPOs), and other safety stakeholders throughout the state, developed a Strategic Highway Safety Plan (SHSP). DVRPC's contribution to this effort was the development, through its Regional Transportation Safety Task Force, of a regional transportation safety action plan. Through analysis of historic crash data, the identification of crash "black spot" locations where the targeted application of countermeasures would likely yield significant reductions in crashes. Countermeasures so identified would be eligible for federal funds.

Out of DVRPC's regional crash analysis, one particularly large black spot for pedestrian-involved crashes was identified. Consisting of a "cluster of clusters" along a four-mile stretch of North Broad Street, Philadelphia, this black spot was selected for a detailed analysis of pedestrian-involved crashes and precipitating driver and pedestrian actions over a six-year period.

Data available from state crash databases including PennDOT's Crash Reporting System and its predecessor, Accident Records System, are insufficient for understanding the factors contributing to pedestrian crashes and the identification of crash-related countermeasures. To generate the requisite data, police reports were coded using the Pedestrian and Bicycle Crash Analysis Tool (PBCAT), a database application developed by the Federal Highway Administration (FHWA) for classifying crashes according to a typology of contributing factors specific to pedestrian-involved crashes. The information presented in this report is intended for use in conjunction with a planned road safety audit to aid the audit team in identifying and prioritizing appropriate crash-related engineering, enforcement, and education countermeasures.

Portions of the study area have recently been audited under DVRPC's Road Safety Audit project. These include Allegheny, Erie, and Olney avenues in the immediate vicinity of North Broad Street. In addition, a capital project along the corridor, scheduled for letting in the summer of 2008, includes significant pedestrian safety improvements: 77 percent of all signals will be outfitted with pedestrian signal heads with countdown timers and timed with a three-second lead pedestrian interval, 15-foot-wide crosswalks will be installed, and curbed median refuge islands will be built at high pedestrian volume intersections.

North Broad Street's pedestrian crash "mega-cluster," one among the few true pedestrian crash black spots, reflects a confluence of high pedestrian and vehicle volumes rarely found outside major central business districts. Regionally, most pedestrian-involved crashes occur outside of black spots and therefore will remain outside the reach of the black spot approach to crash and fatality reduction prescribed in the state and regional safety plans. A reduction in pedestrian fatalities can be achieved only through a system wide reduction in vehicle speeds.

2.0 STUDY AREA DESCRIPTION

Broad Street is a principal arterial and the city's main north/south thoroughfare, extending from I-95 and the sports complex in the south to the Montgomery County Line to the north.

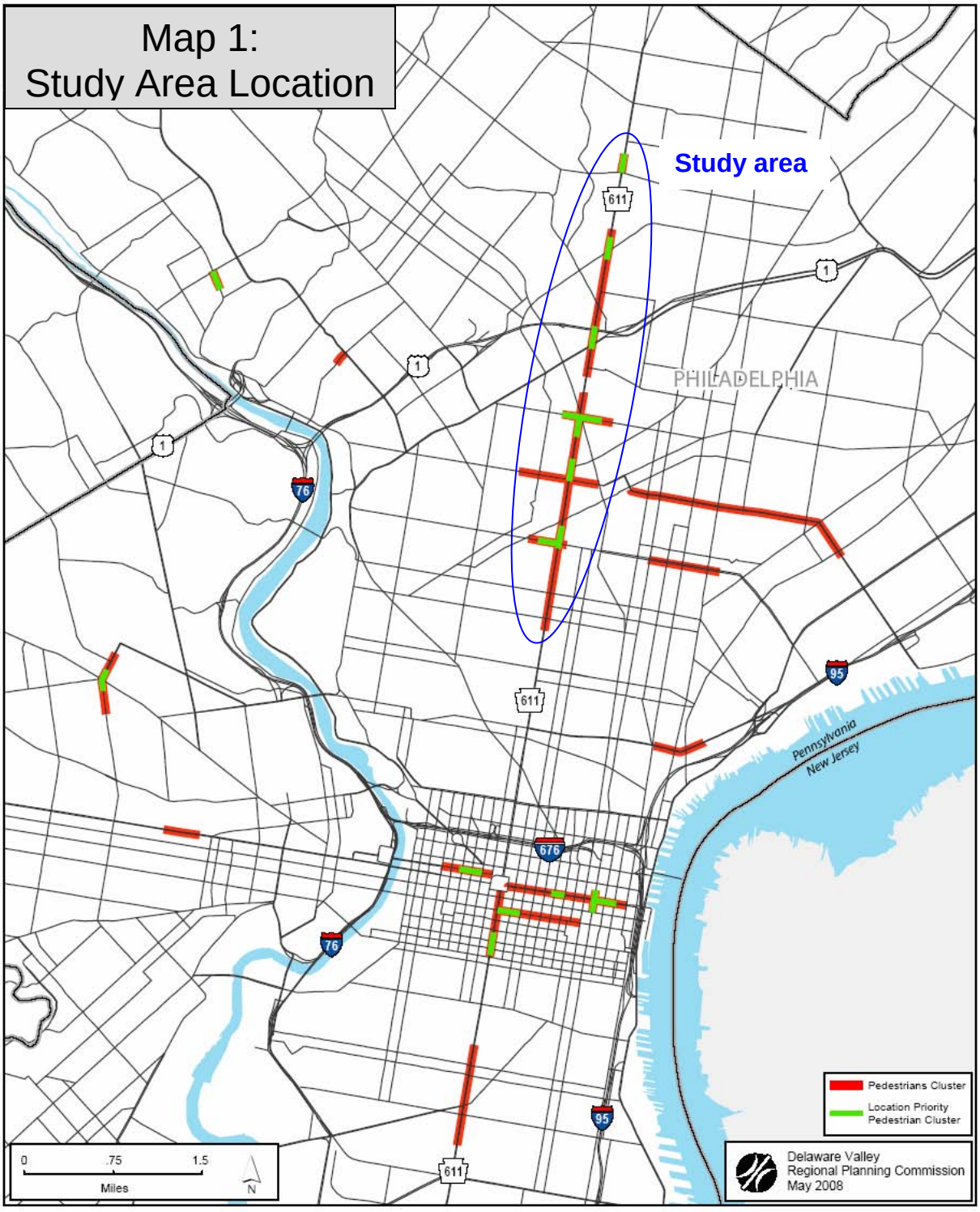
The study area lies between the 2700 and 5800 blocks (inclusive) of North Broad Street. Located within it are eight station stops of the Broad Street Subway Line, which in 2007 averaged over 110,000 riders per day. The roadway carries 2,000 bus trips on 12 routes and an average 43,000 vehicles daily. The Olney Transportation Center at the intersection of North Broad Street and Olney Avenue provides subway riders with many bus connections. SEPTA provides regional rail service at its North Broad (R5 Doylestown and R6 Norristown) and North Philadelphia (R7 Trenton) stations.

The typical roadway section is 69 feet wide, consisting of three lanes by direction separated by a gore-delineated median the width of a travel lane, which becomes left-turn pockets at major intersections. Traffic lanes average 9.5 feet in width. The curb lanes and occasionally the center median are used for parking during nonpeak hours. The posted speed limit is 25 mph throughout. Roadway alignment is straight and level. Sidewalks are continuous.

Land uses in this corridor are largely commercial, with several large storage facilities and parking lots. Frontage varies between rowhouse residential, storefront retail, large institutions (hospitals), surface parking lots, and vacant or underutilized land. The major employers along the route are hospitals: Temple University, Albert Einstein, and Shriners' Childrens'. Retail nodes are found at the intersections of Olney, Erie, and Lehigh avenues.

The study area traverses three city planning areas, which together comprise North Philadelphia. The population of approximately 200,000 residents is overwhelmingly African American. Well over half the population lives below the poverty line.

The study area is defined by a group of six pedestrian crash clusters (in which at least five crashes occurred within 1,000 centerline feet over five years) along or intersecting North Broad Street. Within these clusters are found nine Location Priority Listing ("priority") pedestrian crash clusters in which the crash rate is at least one standard deviation higher than the statewide average for roads of a similar functional class. Each priority cluster is proximate to a subway station. Map 1 on the following page presents the crash clusters of which the study area is comprised (circled) in relation to all pedestrian and pedestrian priority crash clusters in the City of Philadelphia.


Map 1:
Study Area Location
Study area
PHILADELPHIA
611
1
76
95
676
Pennsylvania
New Jersey
Pedestrians Cluster
Location Priority Pedestrian Cluster
0 .75 1.5
Miles
N
Delaware Valley Regional Planning Commission
May 2008

3.0 METHOD

In the 1970s the National Highway Traffic Safety Administration (NHTSA) developed a typology and a classification method for pedestrian- and bicyclist-involved motor vehicle crashes according to the sequence of events and precipitating actions.[1] Pedestrian-involved crashes were analyzed using the *Pedestrian and Bicycle Crash Analysis Tool* (PBCAT) Version 2.0, a database application developed for classifying pedestrian- and bicyclist-involved crashes based on the precrash sequence of actions of the parties involved.[2] PBCAT assists the user in interpreting police report narratives and crash diagrams by posing a series of questions; then, based on the answers given by the user, the software assigns the crash to one of NHTSA's 69 pedestrian crash types and 15 generalized crash groups.

A query of PennDOT's Accident Records System (ARS[3]) in August 2006 returned 244 pedestrian-involved crashes occurring in 2000 through the end of March 2006 within the selected pedestrian crash clusters comprising the study area. Police accident reports for 34 incidents were either miscoded as bicycle crashes, duplicate reports, or illegible and unusable. The remaining 210 reports varied in degree of thoroughness, but most had at a minimum a cursory description of the crash and a diagram outlining the precrash sequence of events. These were coded into and typed by PBCAT, and the summaries were tabulated.

Other factors can help in understanding the crash problem. The temporal distribution of crashes by time of day, day of the week, or month of the year may suggest when to target enforcement activities, for example. Fields containing these data, as well as weather, illumination, crash severity, fatalities, senior- or under-aged driver, DUI and speeding, were taken from the ARS database and appended to the PBCAT-generated database. These data were only available for the years 2001 to 2006, so this analysis takes into account 156 total records, or approximately 75 percent of the total number of reported crashes in the study area.

The analytical results are summarized as follows:

- Crashes for the entire study area by crash type and age of pedestrian;
- Crashes for the entire study area by select factors included in the PennDOT ARS, including time of day, month, weather, and illumination (2001 - 2006 only);
- Pedestrian priority crash cluster crashes by crash type and age of pedestrian;
- Pedestrian priority crash cluster crashes by select factors included in the PennDOT ARS, including time of day, month, weather, and illumination (2001 - 2006 only);
- Physical descriptions of each individual priority cluster location; and
- Common factors in fatal crashes.

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[1] Hunter, William W., Jane C. Stutts, Wayne E. Pein and Chante L. Cox. *Pedestrian and Bicycle Crash Types of the Early 1990's,* Report No. FHWA-RD-95-163. McLean, VA: Federal Highway Administration, Office of Safety and Traffic Operations R&D, June 1996.

[2] Harkey, David L., Sean Tsai, Libby Thomas, and William W. Hunter. *Pedestrian and Bicycle Crash Analysis Tool (PBCAT): Version 2.0 Application Manual,* Report No. FHWA-HRT-06-089. McLean, VA: Federal Highway Administration, Office of Safety Research and Development, March 2006. Although NHTSA uses the term *crash type*, its classification system is more accurately one of contributing factors.

[3] Now called the Crash Reporting System (CRS), accessible through a new web-based spatial application, the Crash Analysis and Retrieval Tool (CDART), which was not available when this study was initiated.

4.0 PROFILE OF ALL CRASHES

An analysis of the 210 pedestrian-motor vehicle crashes recorded from 2000 to 2006 within six PennDOT-identified pedestrian crash clusters comprising the study area is presented below.

4.1 Crash type and crash group distribution

For simplicity of analysis, NHTSA identified five generalized crash groups based on the primary movements of either the driver or pedestrian that contributed to the crash. Table 1 below presents the distribution of crashes by crash group.

Table 1: Crashes by crash group

Crash group	Description	Crashes	Percent
Other	Crash occurred under unusual or indeterminate circumstances, or belonged to crash types with small frequencies.	65	31
Crossing Roadway – Vehicle Not Turning	Driver was moving straight ahead while the pedestrian was crossing the roadway.	50	24
Crossing Roadway – Vehicle Turning	Driver was turning and the pedestrian was crossing the roadway.	36	17
Dash/Dart-Out/Multiple Threat	Pedestrian moved into the roadway in such a way that the motorist was unable to anticipate the move and avoid the crash. Pedestrian ran into the roadway in front of a motorist whose view of the pedestrian was not obstructed *(Dash)*, walked or ran into the road and was struck by a motorist whose view of the pedestrian was blocked until an instant before impact *(Dart-Out),* or entered the traffic lane in front of stopped or slowing traffic and was struck by a vehicle traveling in the same direction as the stopped or slowed traffic *(Multiple Threat)*.	31	15
Pedestrian in Roadway – Unknown Circumstances	Specific movements precipitating the crash are unknown, but pedestrian was in roadway prior to incident.	28	13

Source: DVRPC, 2008

Almost 25% of the reported incidents were identified with the crash group “Crossing Roadway — Vehicle Not Turning.” These include those listed in Figure 2 as “Motorist Failed to Yield” as well as those identified as “Pedestrian Failed to Yield.”

Crashes identified as “Crossing Roadway — Vehicle Turning” constituted 17% of the total number of incidents. These include the 21 crashes identified as “Motorist Left Turn — Parallel Paths” as well as any other crashes that involved motor vehicle turning movements.

Crashes identified as “Dash/Dart-Out/Multiple Threat” incidents constituted 15% of all crashes in the study. These incidents involved pedestrians running into the flow of traffic.

Twenty-eight of the crashes were grouped as “Pedestrian in Roadway — Unknown Circumstances”. The movements of the motor vehicles involved in these incidents are unknown, but the pedestrians were located in or adjacent to the roadway at the time of the crash.

Almost one-third of all crashes are in the “Other/Unknown/Unusual Circumstances” crash group. The 18 crash types of this group represented in the data are listed below in Table 2.

Table 2: "Other/Unknown/Unusual Circumstances" crashes by crash type

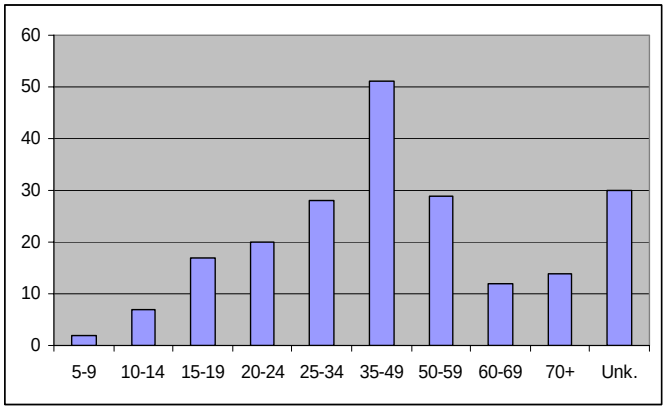
Crash type	Crashes
Pedestrian Loss of Control	8
Intersection — Other/Unknown	7
Motor Vehicle Loss of Control	7
Backing Vehicle — Roadway	6
Vehicle —Vehicle/Object	6
Entering/Exiting Parked Vehicle	5
Non-intersection — Other/Unknown	5
Working in Roadway	4
Commercial Bus-Related	3
Playing in Roadway	3
Other — Unknown Location	3
Emergency Vehicle—Related	2
Other Unusual Circumstances	2
Waiting to Cross — Vehicle Turning	2
Backing Vehicle — Parking Lot	1
Off Roadway — Other/Unknown	1
Waiting to Cross — Vehicle Not Turning	1
Walking Along Roadway With Traffic — From Behind	1

Sources: DVRPC, PennDOT, 2008

4.2 Pedestrian and motorist age distribution

Nearly one in four crashes (51) involved a pedestrian between 35 and 49 years of age. Twenty-nine crashes involved pedestrians aged 50 to 59, and 28 crashes involved pedestrians aged 25 to 34. Just over half (51 percent) of all crashes involved pedestrians between ages 25 and 59. Figure 2 below illustrates the age distribution of pedestrians involved in crashes within the study area.

Figure 1: Crashes by pedestrian age group



Source: PennDOT, 2006

Pedestrians younger than 16 years and older than 59 years were each involved in 13 percent of all crashes. Pedestrian age was unknown in 12 percent of crashes.

The age distribution of pedestrians involved in each of the four most frequent types of crashes is presented in Table 3 (below). The median age of pedestrians varies only modestly across crash types, falling between the ages of 35 and 49 years for each crash type except *Motorist Left Turn — Parallel Paths,* where the median fell to between 50 and 59 years of age.

Table 3: Crashes by crash type and pedestrian age group

Crash type description	5–9	10–14	15–19	20–24	25–34	35–49	50–59	60–69	70 +	Unk.	Total
Motorist Failed to Yield	0	0	4	5	4	10	9	3	1	5	41
Walking in Roadway	0	0	4	2	3	6	1	3	1	6	26
Dash	0	2	3	1	3	5	0	1	1	7	23
Motorist Left Turn — Parallel Paths	0	0	1	3	1	4	6	0	4	2	21

Source: DVRPC, 2008

Figure 3, right, illustrates crashes by age of driver. Drivers between the ages of 26 and 50 accounted for 38 percent of all crashes. Eighteen percent of the crashes involved drivers above the age of 50; 10 percent involved those over the age of 60. Only 6 percent of the crashes involved drivers younger than 21 years of age. One incident involved a driver younger than 16. Driver age was not recorded for 37 percent of crashes.

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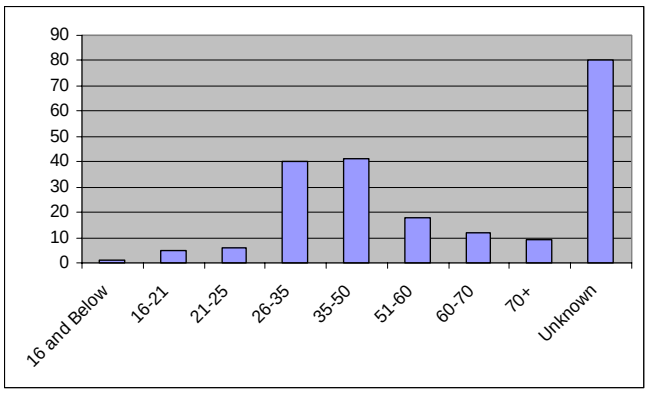
Figure 3: Crashes by driver age group

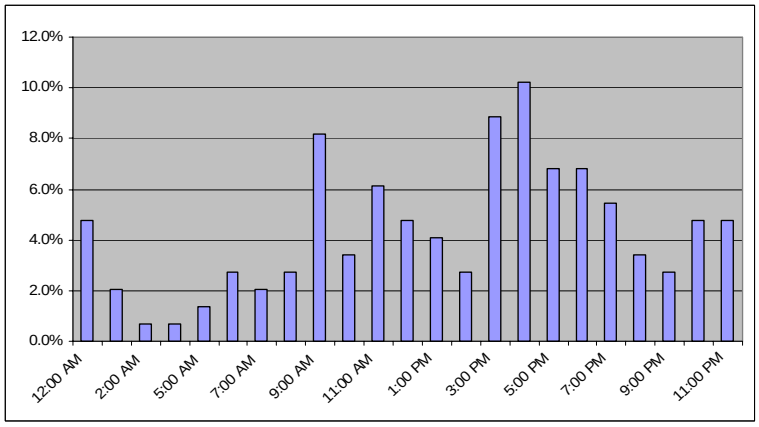


Source: PennDOT, 2006

4.3 Distribution by time of day, day of the week, month, and illumination level

The temporal distribution of crashes (time of day, day of the week, or month in which the crash occurred) may provide clues to activity patterns that might be associated with increased crash frequency. Crash data can also indicate the degree to which environmental factors, such as illumination levels and weather conditions, contribute to crashes. Temporal distribution and environmental factors for crashes that occurred in 2001 through 2006 are analyzed. Crashes that occurred in 2000 (26 percent of the 210 crashes occurring from 2000 through 2006) were omitted from this analysis because the data is no longer available.

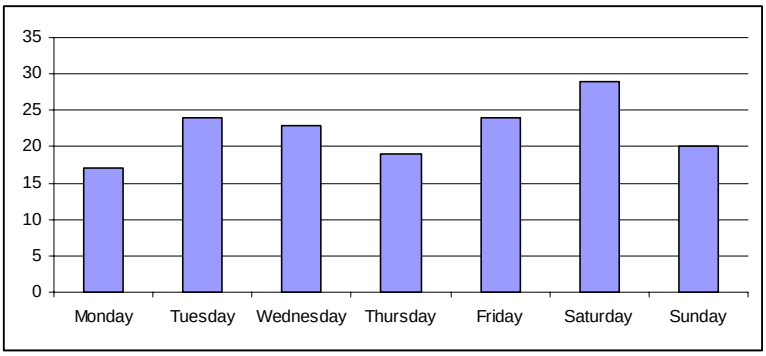
Figure 3: Crashes by time of day



Source: PennDOT, 2006

The peak hour for crashes was 4 p.m., when just over 10 percent of crashes occurred (Figure 4, left). The four-hour period of 3 p.m. through 6 p.m. accounted for one-third of all crashes. A secondary four-hour peak of 8 through 11 a.m. included just over 22 percent of crashes. Several crashes did not have their time of incidence recorded.

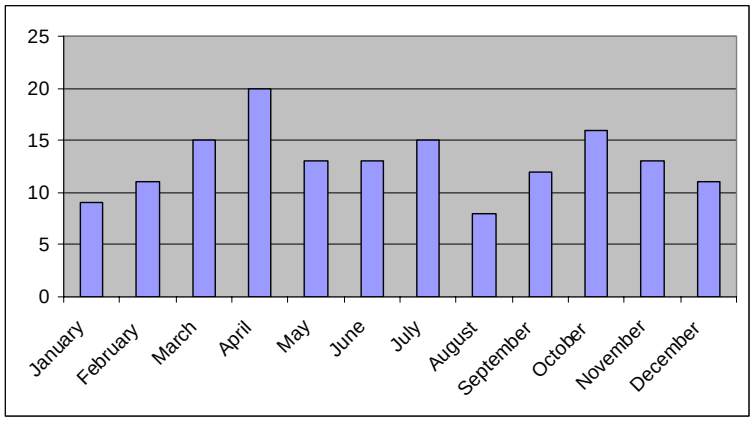
Figure 4: Crashes by day of the week



Source: PennDOT, 2006

Crash frequency is roughly consistent across the week, showing no significant difference between weekdays and weekends.

Figure 5: Crashes by month



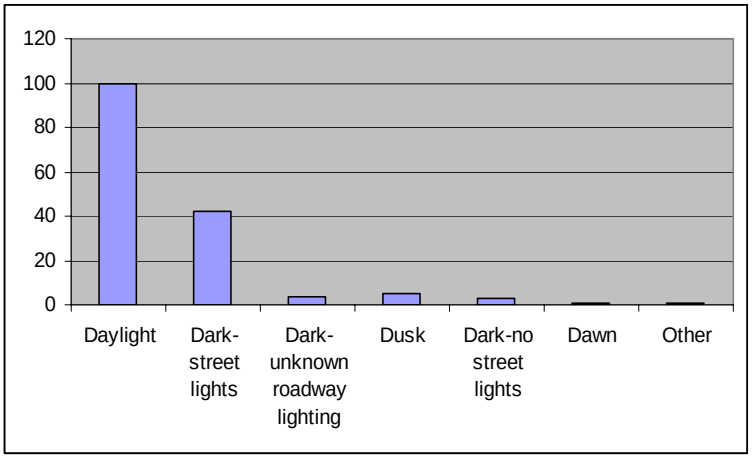
Source: PennDOT, 2006

April had the highest number of crashes (20). January and August saw the lowest number of crashes — 9 and 7, respectively (Figure 6, left).

Approximately 64 percent of the crashes took place in daylight hours, while 27 percent took place at night on illuminated streets (Figure 7, below left).

Motorist Failed to Yield crashes are more likely to occur after dark with street lights – 31 percent of crashes under such conditions were of this type -- than under daylight conditions, where they comprise just 11 percent of crashes.

Figure 6: Crashes by illumination level



Source: PennDOT, 2006

4.4 Summary: all pedestrian crashes

- One in five crashes was a *Motorist Failure to Yield* crash, where the motorist failed to yield to a pedestrian. Such crashes were strongly over-represented among nighttime crashes.
- Two in five crashes occurred when a motorist, either moving straight or turning, failed to give way to a pedestrian crossing the roadway in a marked or unmarked crosswalk.
- Just over half of all crashes involved pedestrians between ages 25 and 59; pedestrians younger than 16 years and older than 59 years were each involved in 13 percent of all crashes.
- The four-hour period of 3 p.m. through 6 p.m. accounted for one-third of all crashes. A secondary four-hour peak of 8 through 11 a.m. included just over 22 percent of crashes.
- Crash frequency is roughly consistent across the week, showing no significant difference between weekdays and weekends.

5.0 PROFILE OF PRIORITY CLUSTER CRASHES

A pedestrian crash priority cluster is a segment of roadway in which the pedestrian crash rate is at least one standard deviation higher than the statewide average for roads of a similar functional class. There are nine such clusters in the study area, in which 96 crashes occurred (one cluster had only four crashes, likely due to one or more crashes discovered to have been miscoded on the scene as a pedestrian crash but actually involving a bicyclist). See Table 4 below for crashes by priority cluster. Locations of these clusters are shown on Map 2, page 16.

Clusters 7, 14, and 15 are all located around the Erie Avenue intersection; clusters 12 and 23 are both located around the Lehigh Avenue intersection. These two intersections accounted for 27 percent of all the crashes in the study area. Factoring in the 16 crashes that occurred around the Allegheny Avenue intersection, which is roughly midway between Erie and Lehigh, 34 percent of all crashes took place on a one-mile stretch of the study area.

Table 4: Crashes by priority cluster

Priority cluster	Location	Crashes
Cluster 7	Broad Street from between Tioga and Venango to just past Erie	21
Cluster 8	Broad Street south of Chew to Grange	7
Cluster 9	Broad Street between Roosevelt Blvd. and Cayuga	4
Cluster 10	Broad Street south of Ruscomb to Wagner	13
Cluster 11	Broad Street between Allegheny and Ontario	16
Cluster 12	Broad Street between Huntingdon and Somerset	16
Cluster 14	Erie Avenue between Broad St. and Old York Rd.	6
Cluster 15	Erie Avenue between Broad St. and 16th St.	5
Cluster 23	Lehigh Avenue between Broad St. and 16th St.	8

Source: PennDOT, 2006

5.1 Crash type and crash group distribution

The distributions of crashes by crash type and group in the priority clusters mirror those found of the entire study area. More than half (57 percent) of all priority cluster crashes were of four types (Table 5, below). By crash group, a plurality (31 percent) fell into the *Other/Unknown/Unusual Circumstances* group, while *Crossing Roadway — Vehicle Not Turning* group included one out of four crashes.

Table 5: Priority cluster crashes by crash type

Crash group	Crash type	Crashes	Percent
Crossing Roadway - Vehicle Not Turning	Motorist Failed to Yield	23	24
Pedestrian in Roadway - Circumstances Unknown	Walking in Roadway	13	13
Dash/Dart-Out/Multiple Threat	Dash	10	11
Crossing Roadway - Vehicle Turning	Motorist Left Turn — Parallel Paths	9	9

Source: DVRPC, 2008

Crossing Roadway crashes, where the motorist fails to yield to a pedestrian in a marked or unmarked crosswalk, account for 39 percent of all crashes (Table 6, below).

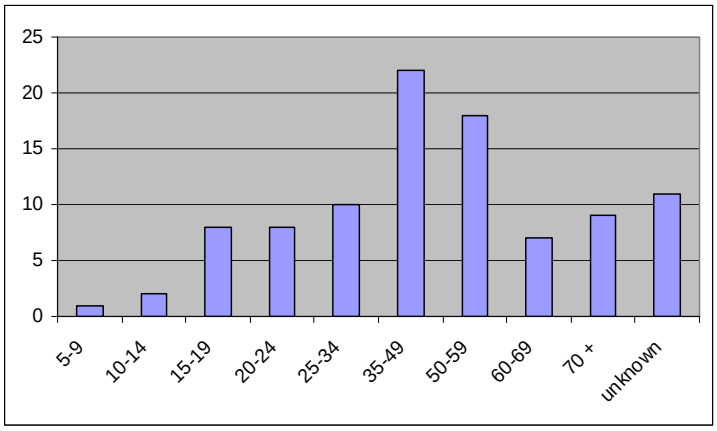
Table 6: Priority cluster crashes by crash group

Crash group	Crashes	Percent
Other/Unknown/Unusual Circumstances	31	31
Crossing Roadway — Vehicle Not Turning	24	25
Dash/Dart — Out/Multiple Threat	15	16
Crossing Roadway — Vehicle Turning	13	14
Pedestrian in Roadway — Circumstances Unknown	13	14

Source: DVRPC, 2008

5.2 Pedestrian and driver age distribution

Figure 8: Pedestrians in priority cluster crashes by age group



Source: PennDOT, 2006

The age distribution of pedestrians involved in crashes within priority clusters generally mirror that for all crashes within the corridor, with the exception of crashes involving pedestrians between the ages of 50 and 59, who were involved only 14 percent of incidents in the entire corridor but 20 percent of those within a priority cluster (Figure 8, below).

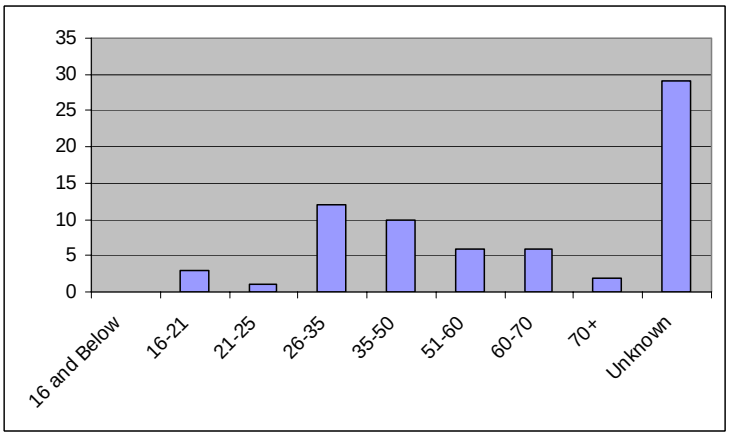
The age distribution of pedestrians by crash type in priority cluster crashes resembles that for all crashes in the corridor. No notable age pattern emerges for any single crash type: the pedestrians involved in crashes are predominantly working-age adults, especially those in the 35 – 49 year age group (Table 7, below).

Table 7: Priority cluster crashes by crash type and pedestrian age group

Crash type	5–9	10–14	15–19	20–24	25–34	35–49	50–59	60–69	70 +	Unk.	Tot.
Motorist Failed to Yield	0	0	2	3	3	5	5	2	1	2	23
Walking in Roadway	0	0	3	2	1	3	0	2	0	2	13
Dash	0	1	1	0	2	2	0	0	1	3	10
Motorist Left Turn — Parallel Paths	0	0	1	0	1	1	4	0	2	0	9

Source: DVRPC, 2008

Figure 8: Drivers in priority cluster crashes by age group



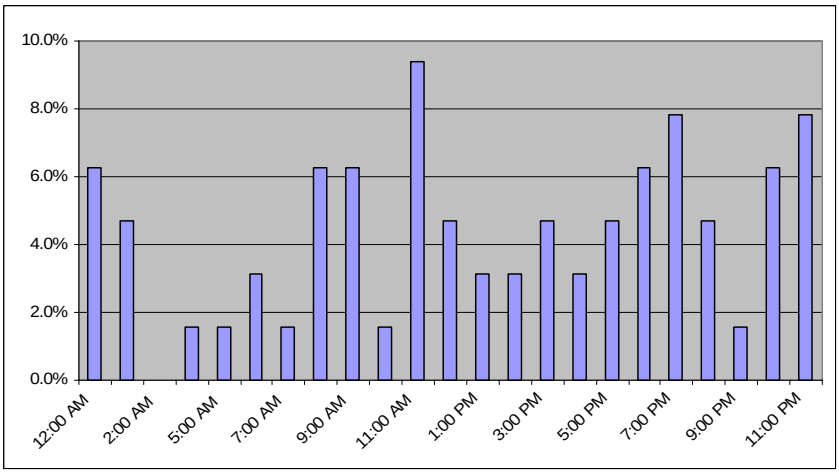
Source: PennDOT, 2006

Nearly one-third of crashes occurring in priority clusters involved drivers between the ages of 26 and 50 (Figure 9, left). Eighteen percent involved drivers above the age of 50, and 12 percent involved drivers over the age of 60.

Drivers under the age of 26 accounted for 6 percent of crashes. Driver age is unknown in 42 percent of crashes.

5.3 Distribution by time of day, day of the week, month, and illumination level

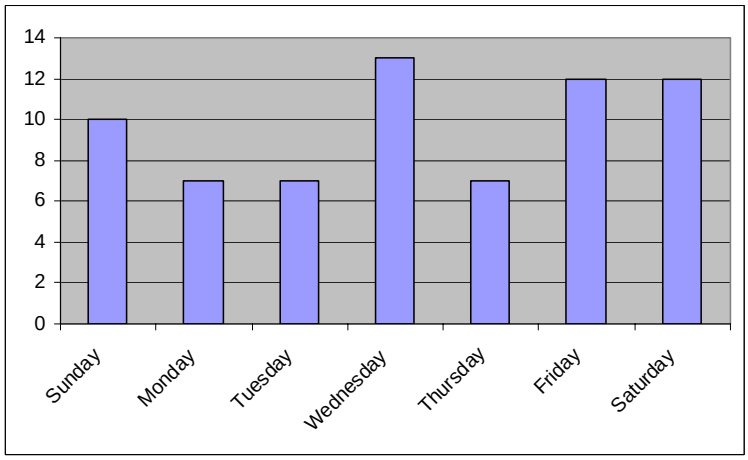
Figure 9: Priority cluster crashes by time of day



Source: PennDOT, 2006

The peak hour for crashes was 11 a.m. (9 percent); the 7 p.m. and 11 p.m. hours each saw 8 percent of crashes (Figure 10, left). More than one out of four crashes (26 percent) took place during the hours of 10 p.m. through 1 a.m. The four-hour periods of 8 through 11 a.m. and 5 through 8 p.m. each saw 15 crashes (23 percent). Several crashes did not have their time of incidence recorded.

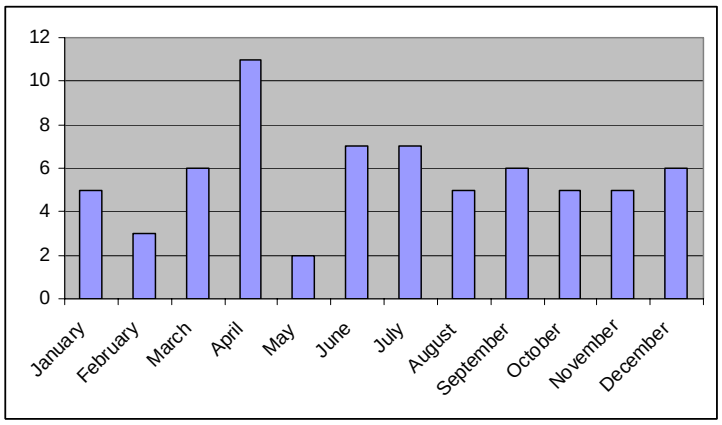
Figure 10: Priority cluster crashes by day of the week



SOURCE: PennDOT, 2006

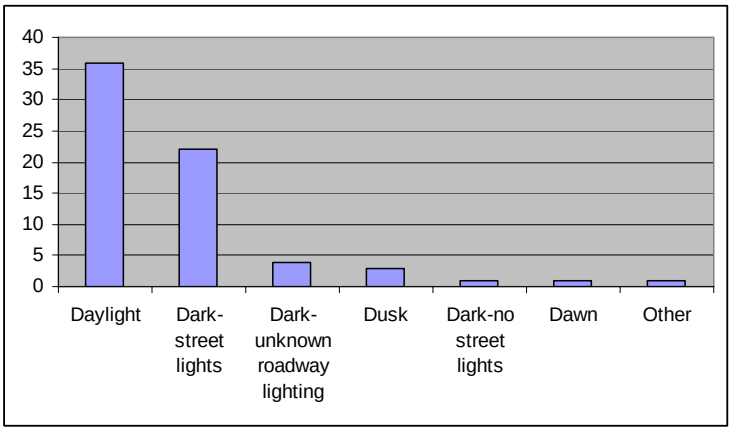
The distribution of crashes in priority clusters by day of the week is shown in Figure 11, left. Crashes occur more frequently on Friday through Sunday than other days.

Figure 11: Priority cluster crashes by month



Source: PennDOT, 2006

Figure 12: Priority cluster crashes by illumination level



Source: PennDOT, 2006

Figure 12 depicts the monthly pattern of crashes in priority clusters. As in the whole corridor, crashes peaked in April. With most of the remaining months having between 4 and 7 crashes.

As in the entire corridor, most priority cluster crashes occurred in daylight (Figure 13, below left). Of the crashes that occurred in conditions other than full daylight, most were illuminated with street lights.

Non daylight crashes were concentrated in priority cluster locations, while such locations account for 36 percent of total daylight incidents in the full study area, 56 percent of incidents that occurred during periods of limited or no daylight took place in a priority cluster.

5.4 Summary: pedestrian priority cluster crashes

- *Crossing Roadway* crashes, where the motorist fails to yield to a pedestrian in a marked or unmarked crosswalk, account for 39 percent of all crashes.
- The pedestrians involved in crashes are predominantly working-age adults, especially those in the 35–49 year age group. There was no significant difference in pedestrian ages between priority cluster crashes and all crashes.
- Non daylight crashes were concentrated in priority cluster locations.
- More than one out of four crashes (26 percent) took place during the hours of 10 p.m. through 1 a.m.
- Crashes were more likely to occur during a Friday, Saturday, or Sunday than on other days.

6.0 PRIORITY CLUSTER PROFILES

Each of the nine pedestrian priority cluster locations is described in detail, including street conditions, surrounding land uses, and any unusual conditions that could contribute to pedestrian-involved motor vehicle crashes. Deviations from the typical geometric and operating environment of North Broad Street within the study area as described in Section 2.0, page 3 are noted. Cluster descriptions are presented in order from north to south and are accompanied by aerial photos taken in 2005. The position of each priority cluster in relationship to the corridor is show on Map 2 below.

Cluster 8 (Map 3, page 18) lies between Olney Avenue and Clearview Street and includes the Old York Road and Clearview Street intersections. The portion of the cluster south of Chew Street has a raised median. The three intersections located on North Broad Street all have crosswalks, as do the three east/west streets that intersect with this portion of North Broad Street. The Olney Transportation Center, located at the southern tip of the cluster, is a station stop of the Broad Street Line and a hub for nine bus routes. SEPTA route 55 travels north and south along North Broad Street in the cluster.

Commercial land uses dominate this location. Old York Road intersects North Broad Street at an oblique angle; pedestrians crossing Old York Road on the west side of North Broad Street may be particularly vulnerable to high-speed northbound traffic turning left onto Old York Road from North Broad Street. Motorists can turn north onto Old York Road from either direction on Broad Street, as well as from Grange Road.

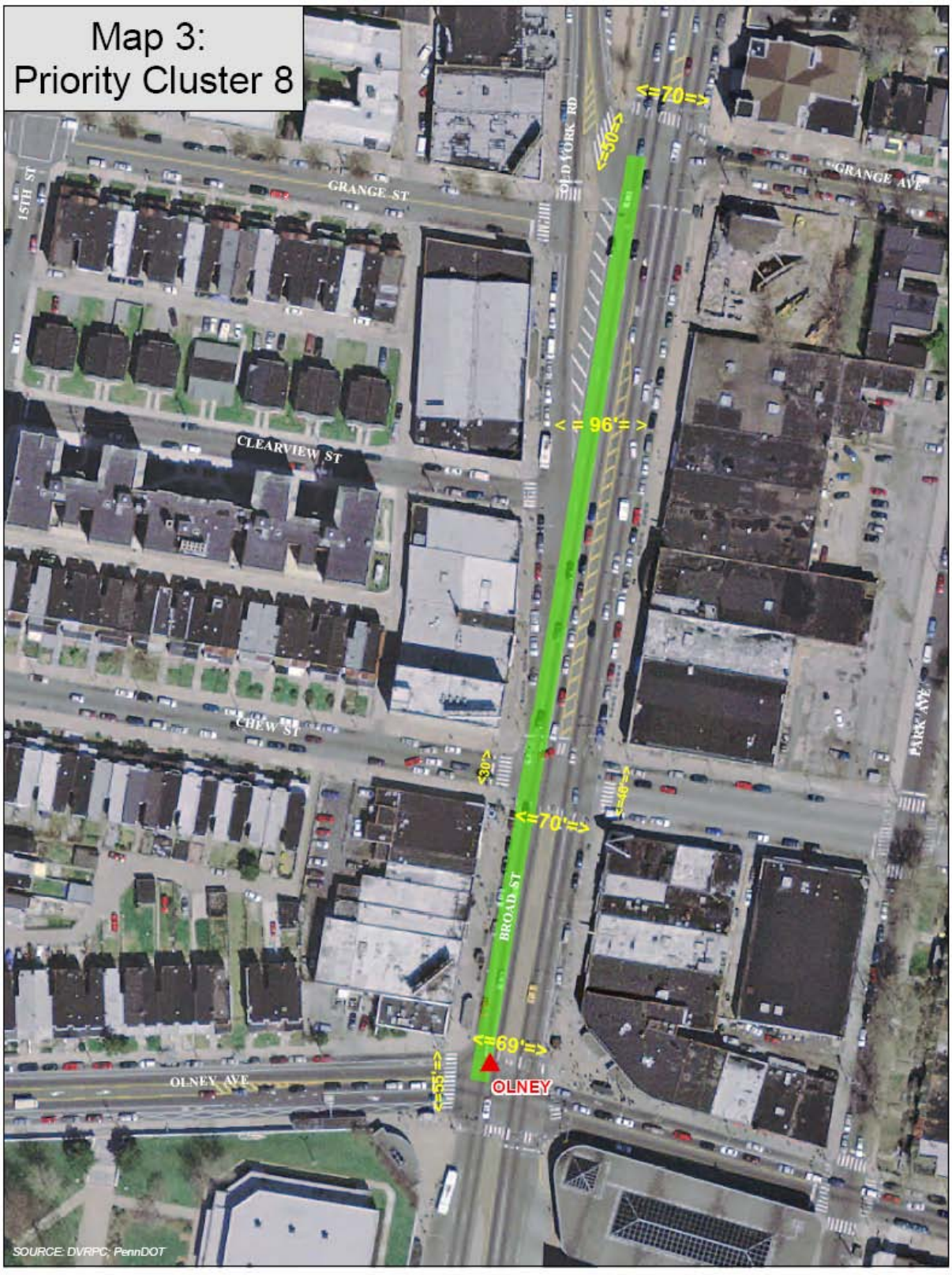
Seven crashes were reported in this cluster between 2000 and 2006. Two of these crashes were in the *Dash/Dart-Out/Multiple Threat* group. No other distinct patterns emerged.

Cluster 10 (Map 4, page 19) extends from just south of the intersection of North Broad and Ruscomb streets north to the Wagner Avenue intersection. The cluster includes the Logan stop on the Broad Street Line, a transfer point to SEPTA's route J bus, which runs on Lindley Avenue. Linley intersects North Broad Street immediately north of a SEPTA Regional Rail viaduct, under which both streets pass (88 feet along North Broad; approximately 70 feet along Lindley). A gas station is located partially underneath the viaduct, occupying a small block bounded by North Broad, Lindley, Windrim, and Old York Road. Lindley, Windrim and Wagner all intersect North Broad at acute angles.

Of the 13 crashes that took place in cluster 10, four were *Dash* and three each were *Motorist Failed to Yield* and *Walking in Roadway*.

Cluster 9 (Map 5, page 20) begins at the Hunting Park stop on the Broad Street Subway and extends north to just beyond the intersection of Cayuga Street. Commercial land uses predominate. All of the intersections have marked crosswalks. The Hunting Park subway stop is only accessible on the east side of the street via a triangle-shaped median between Roosevelt Boulevard and Bristol Street, or by a midblock stairway on the west side. Hunting Park Avenue, the predominant intersecting street, carries an approximate average of 22,500 vehicles daily.

Five crashes occurred in this cluster, three of which were of the *Crossing Roadway—Vehicle Turning* type.



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008

N
0 150
FEET

Priority Cluster
Subway Station


Map 4:
Priority Cluster 10
15TH ST
CARLISLE ST
WAGNER AVE
LINDLEY AVE
<=79=>
FISHERS LN
BROAD ST
Logan
<=97'=>
OLD YORK RD
<=100'=>
<42'>
<=76'=>
RUSCOMB ST
WINDRIM AVE
CARLISLE ST
ALBANUS ST
SOURCE: DVRPC; PennDOT
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REGIONAL PLANNING COMMISSION
MAY 2008
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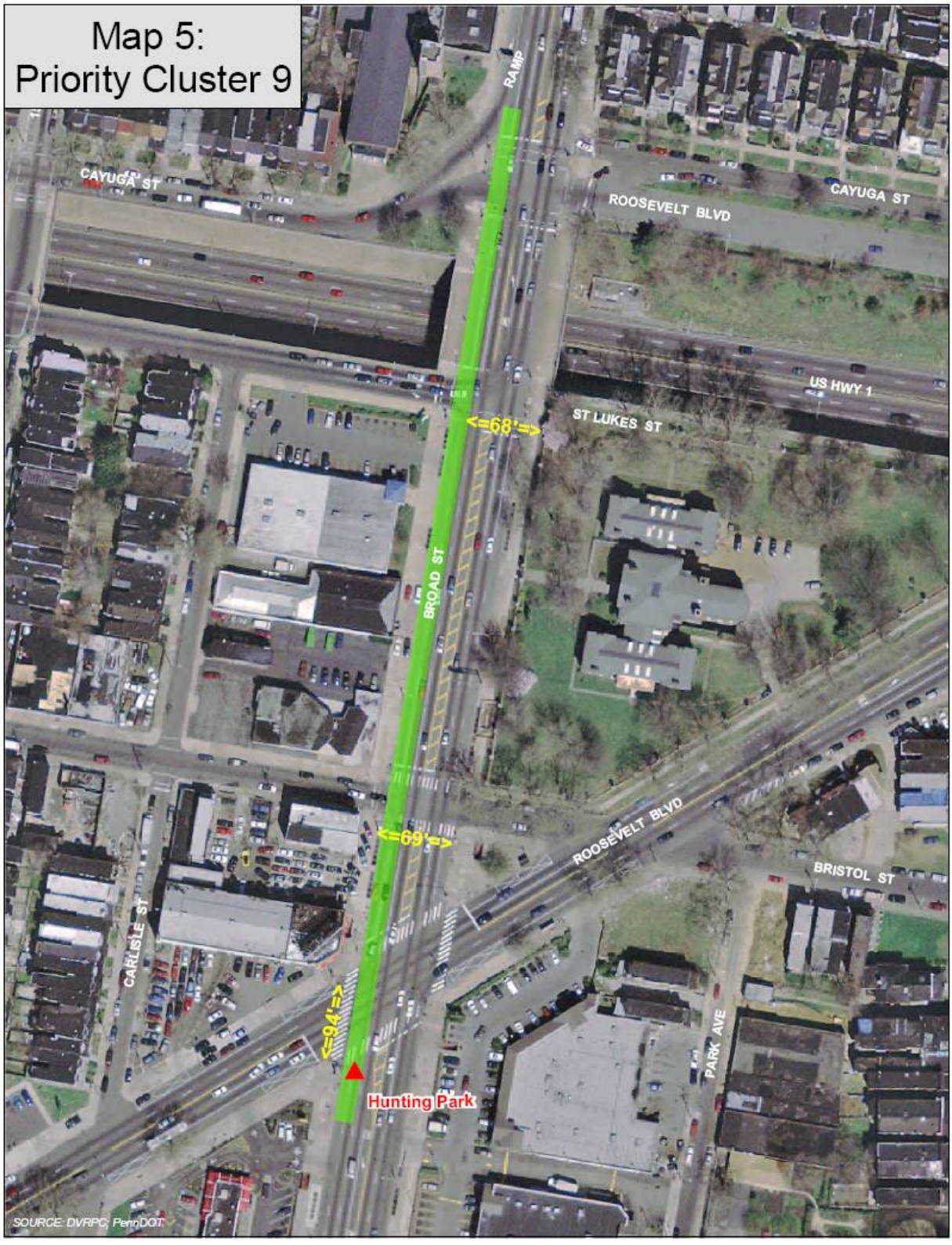
Priority Cluster
Subway Station


Map 5:
Priority Cluster 9
RAMP
CAYUGA ST
ROOSEVELT BLVD
CAYUGA ST
US HWY 1
ST LUKES ST
<=68'=>
BROAD ST
<=69'=>
ROOSEVELT BLVD
BRISTOL ST
CARLISLE ST
<=94'=>
PARK AVE
Hunting Park
SOURCE: DVRPC, PennDOT
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008
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150
FEET
Priority Cluster
Subway Station

Cluster 7 (Map 6, page 22) extends from half a block south of Tioga Street to just north of Erie Avenue (AADT approx. 8,000). The Erie station on the Broad Street Subway lies at the northern terminus to this cluster, which includes the North Broad Street intersections with Pacific Street and Lenox Avenue. SEPTA bus route 56 operates east and west on Erie Avenue, intersecting the northern tip of this cluster. There are wide, clearly marked crosswalks at each of the four major intersections. There is also a gore-delineated median approximately 10 feet wide, which becomes a left-turn lane approaching each intersection.

The block between Tioga and Venango streets is fronted by Shriner's Hospital and its various parking lots, while the block between Venango and Erie streets has a mix of commercial and residential uses and a few vacant lots. Germantown Avenue (AADT 5,500) intersects Broad Street at an acute angle at the northern end.

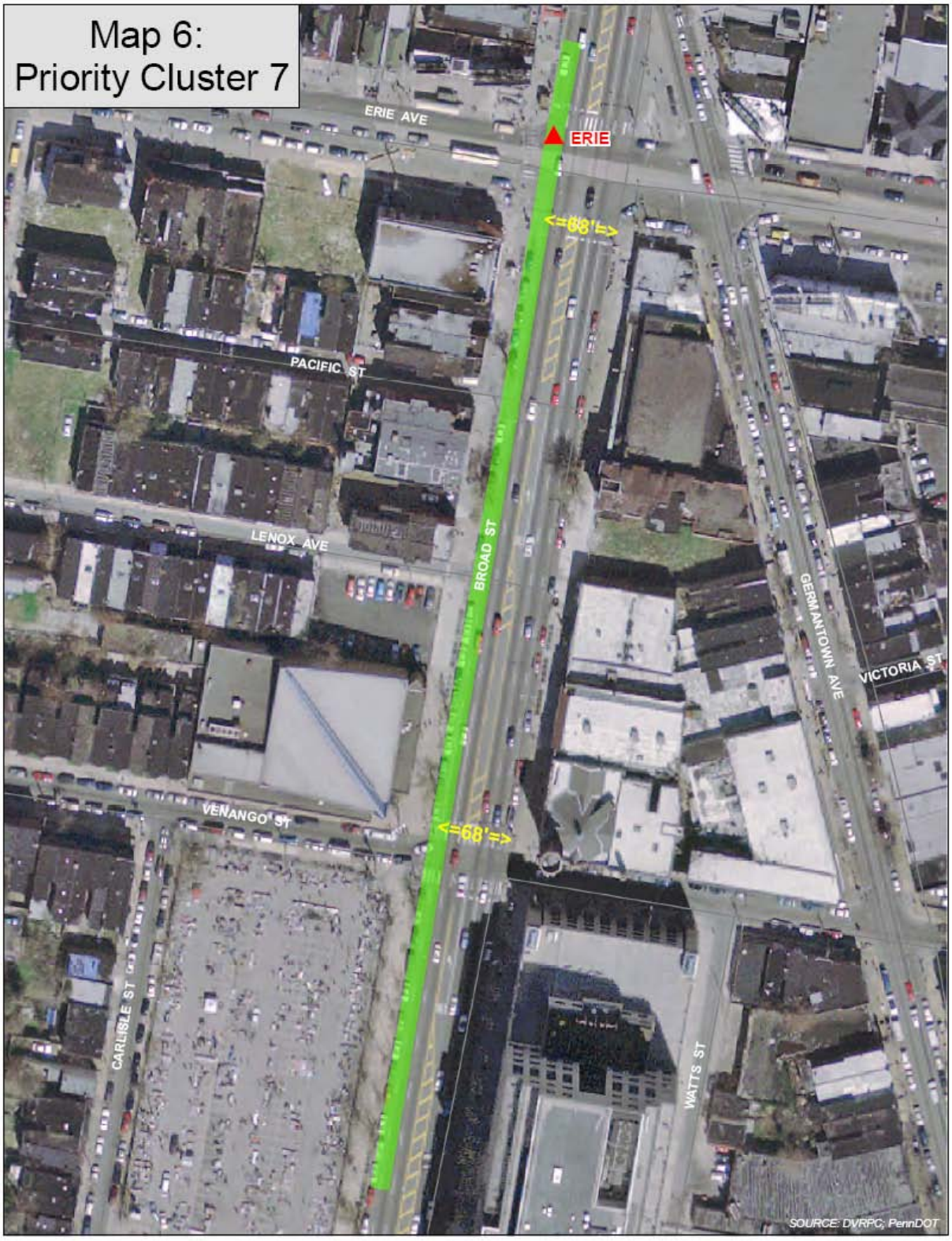
Twenty-one pedestrian-involved crashes were coded in this cluster, making it the most active cluster in the study area. One-third of these crashes were classified as *Motorist Failure to Yield*. Twelve of the crashes took place at night or dusk, a much higher percentage than the rest of the study area.

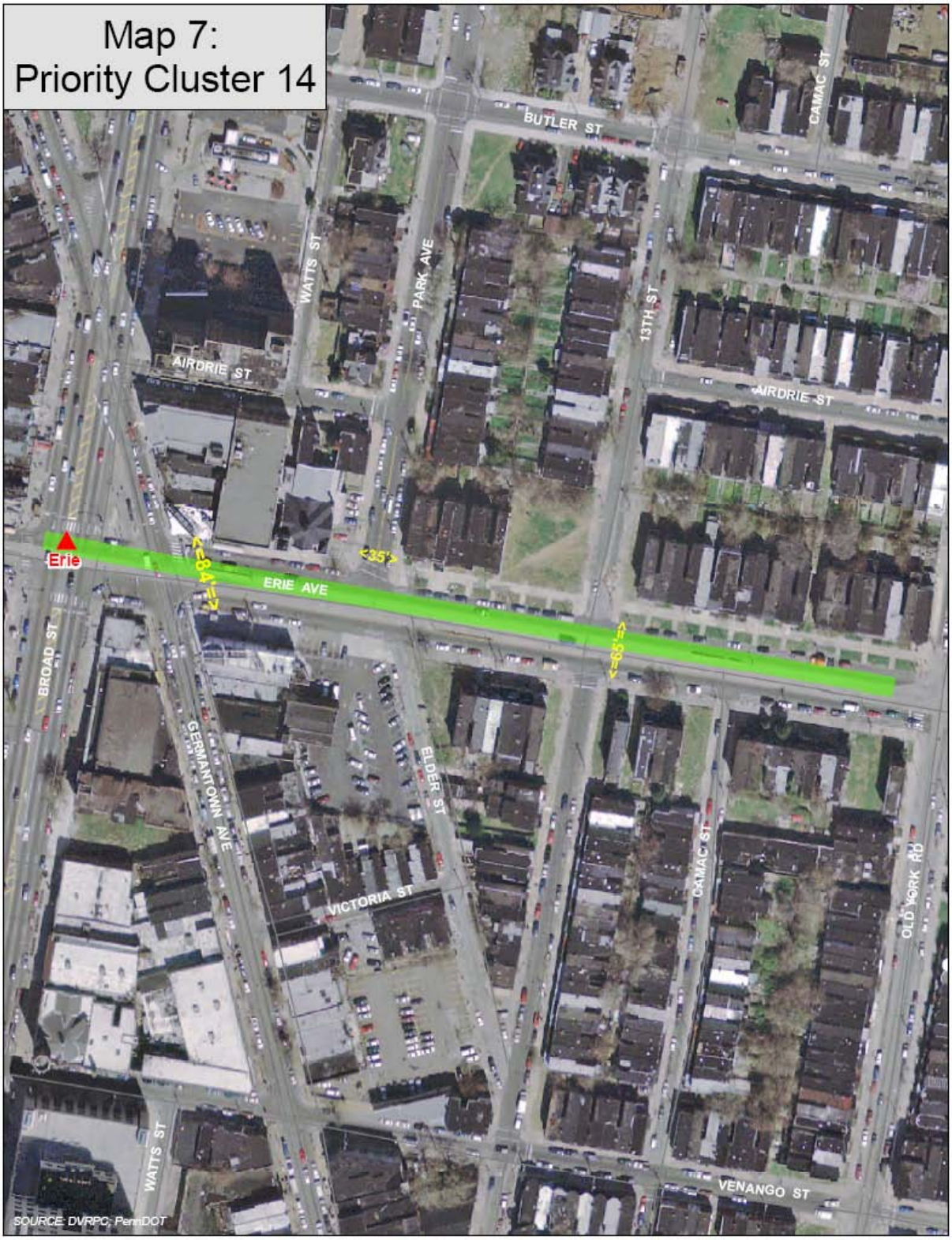
Cluster 14 (Map 7, page 23) is located on Erie Avenue (AADT: 9,000) from North Broad Street east to Old York Road. This segment includes the Erie station on the Broad Street Line and the intersection of Erie and Germantown avenues. Commercial uses predominate until Elder Avenue, where residential uses become more common. SEPTA routes 53 and 56 buses both run along this cluster, operating on a former trolley way in the center of the street. Tracks and platforms remain intact along a concrete bed raised midblock; the track area is delineated by deep rumble strips and post-mounted yellow flashers at each block end.

Three of six crashes in this cluster were *Motorist Failed to Yield;* other crash types represented were *Dart-Out*, *Motorist Left Turn — Parallel Paths*, and *Other/Unknown/Unusual*.

Cluster 15 (Map 8, page 24) extends along Erie Avenue west from North Broad Street to just past the Sydenham Street and includes the Erie station on the Broad Street Line. It includes the intersection of 15th Street and Erie Avenue, as well as the junction of Erie and Carlisle Street. There is on-street parking and marked crosswalks. The cluster's land use is entirely residential, with many vacant lots. SEPTA bus routes 53, 56, and XHX all operate along this cluster.

Of the four crashes, two were *Backing Vehicle — Roadway.*


Map 6:
Priority Cluster 7
ERIE AVE
ERIE
<=68'=>
PACIFIC ST
LENOX AVE
BROAD ST
GERMANTOWN AVE
VICTORIA ST
VENANGO ST
<=68'=>
CARLISLE ST
WATTS ST
SOURCE: DVRPC, PennDOT
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008
N
0
150
FEET
Priority Cluster
Subway Station



DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008

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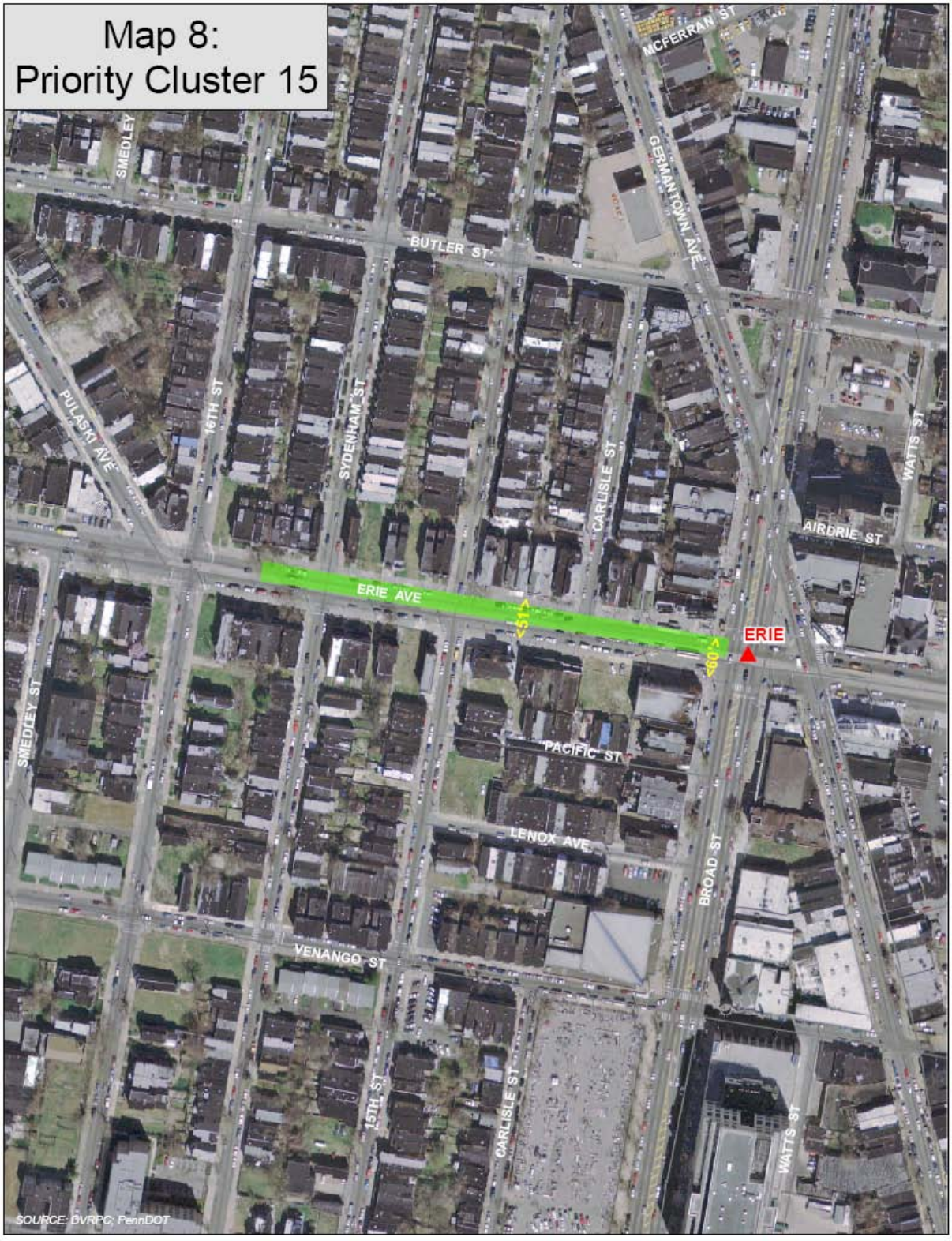
FEET

Priority Cluster
Subway Station


Map 8:
Priority Cluster 15
MCFERRAN ST
SMEDLEY
GERMANTOWN AVE
BUTLER ST
PULASKI AVE
16TH ST
SYDENHAM ST
CARLISLE ST
WATTS ST
AIRDRIE ST
ERIE AVE
<51'>
<60'>
ERIE
SMEDLEY ST
PACIFIC ST
LENOX AVE
BROAD ST
VENANGO ST
15TH ST
CARLISLE ST
WATTS ST
SOURCE: DVRPC; PennDOT
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008
N
0
300
FEET
Priority Cluster
Subway Station

Cluster 11 (Map 9, page 26) extends north from the intersection of Broad Street and Allegheny Avenue to Broad and Ontario streets. The Allegheny stop on the Broad Street Line is situated at the southern tip of this cluster. This cluster also marks the junction of North Broad Street and Rising Sun Avenue. Temple University Hospital dominates the eastern street frontage for the length of the cluster, as well as the west side above Westmoreland Street. The rest of the street is lined with commercial uses. The SEPTA route 60 bus travels east and west along Allegheny Avenue, which carries an average 8,000 vehicles daily.

Of the 16 pedestrian-involved crashes, *Motorist Left Turn — Parallel Paths* were reported four times, while *Dash* and *Walking in Roadway* occurred three times each.

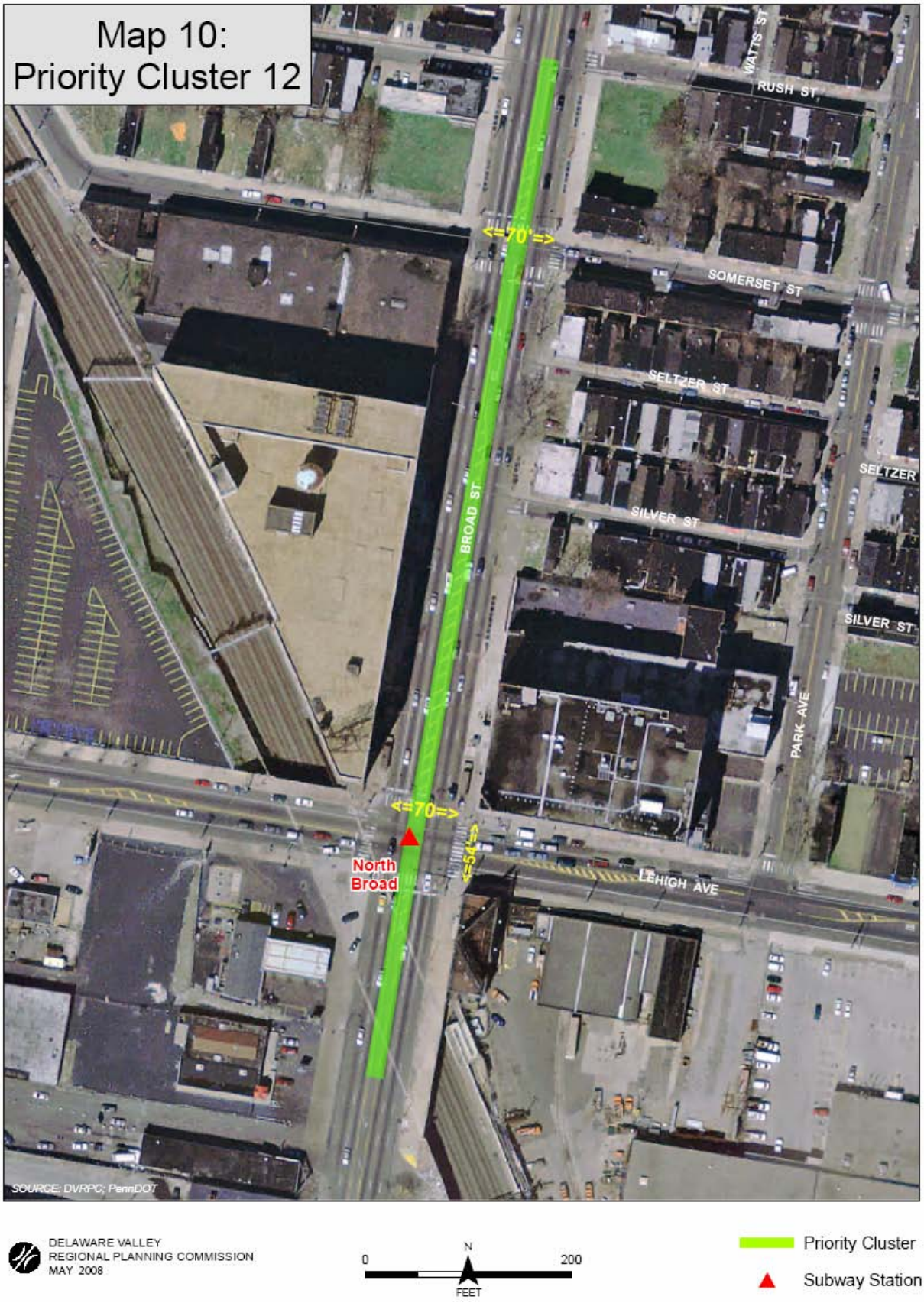
Cluster 12 (Map 10, page 27) begins between Huntingdon and Lehigh avenues and ends just north of Somerset Street. The North Philadelphia station on the Broad Street Line and the North Broad regional rail station are both located in this cluster. Several large storage facilities occupy a large portion of the cluster between Lehigh and Somerset. The rest of the land is in primarily commercial use.

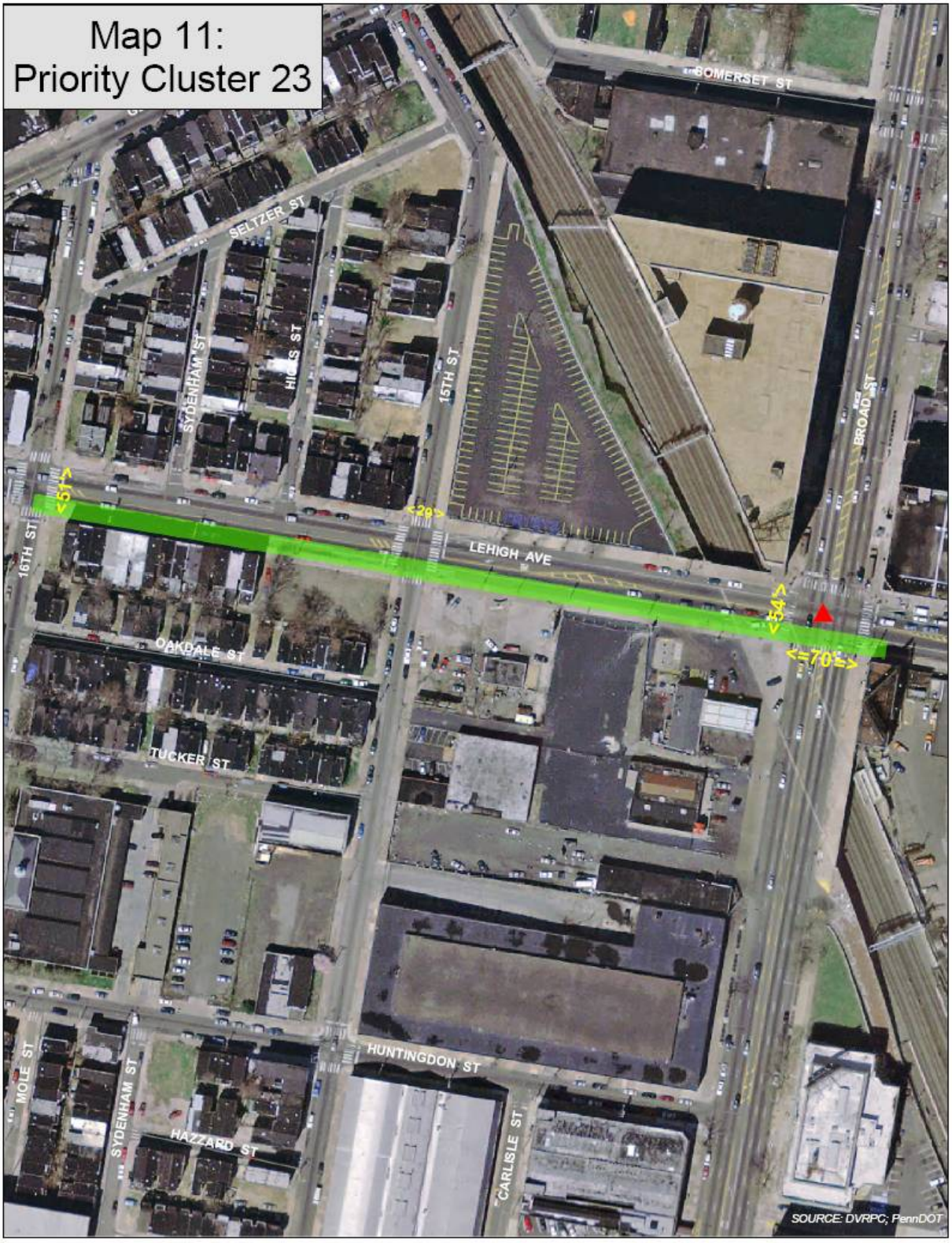
Out of 16 crashes, five were *Motorist Failed to Yield* and four were *Walking in Roadway*.

Cluster 23 (Map 11, page 28) is located on Lehigh Avenue (AADT: 9,700) from North Broad Street west to 16th Street. It is the southernmost cluster in the study area. Lehigh Avenue is two-way, with one lane in each direction. The north side between Broad and 15th streets is fronted by a large parking lot; the south side is almost entirely vacant lots. The 1500 block is primarily residential, with several vacant lots. SEPTA route 54 runs along Lehigh Avenue within the cluster area, which is intersected by Hicks and Sydenham streets.

There were seven crashes in this cluster, two of which were *Motorist Failed to Yield*. No other crash types appeared more than once.


Map 9:
Priority Cluster 11
BROAD ST
WESTMORELAND ST
RISING SUN AVE
<=74'=>
<=27'=>
Allegheny
<=50'=>
CARLISLE ST
PARK AVE
<=69'=>
CARLISLE ST
ROSEWOOD ST
ALLEGHENY AVE
SOURCE: DVRPC, PennDOT
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008
N
0
200
FEET
Priority Cluster
Subway Station


Map 10:
Priority Cluster 12
WATTS ST
RUSH ST
<=70'=>
SOMERSET ST
SELTZER ST
SELTZER
BROAD ST
SILVER ST
SILVER ST
PARK AVE
<=70=>
North
Broad
<=54=>
LEHIGH AVE
SOURCE: DVRPC; PennDOT
DELAWARE VALLEY
REGIONAL PLANNING COMMISSION
MAY 2008
N
0
200
FEET
Priority Cluster
Subway Station



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MAY 2008

N
0 200
FEET

Priority Cluster

Subway Station

7.0 FATALITIES

Six crashes in the study area resulted in nine fatalities, which included seven pedestrians, one driver, and one vehicle passenger (Table 8, below). Five of these incidents took place in a priority cluster. Table 17 lists the characteristics of each crash that resulted in a fatality. Only Cluster 7, which was the most active cluster in the study area, had more than one fatality. Crashes defined as *Walking in Roadway* incidents were the only crash type that resulted in more than one pedestrian fatality.

Characteristics such as month and day were largely dispersed, but four of the five fatal crashes for which a time of crash was recorded took place between 10 p.m. and 1 a.m., with street lights for illumination.

Table 8: Fatalities

Crash type	Fatalities	Pedestrian age(s)	Priority cluster	Crash month	Crash day	Crash illumination	Crash hour
Dart-Out	1 pedestrian	77	15	October	Friday	Daylight	11 AM
Dash	1 pedestrian	No data available	No data available	No data available	No data available	No data available	No data available
Non intersection—Other/Unknown	1 pedestrian, 2 vehicle passengers	50	7	May	Tuesday	Dark—street lights	11 PM
Other — Unknown Location	1 pedestrian	80	10	September	Wednesday	Dark—street lights	10 PM
Walking in Roadway	1 pedestrian	Unknown	7	April	Monday	Dark—street lights	1 AM
Walking in Roadway	2 pedestrians	22, 46	11	September	Sunday	Dark—street lights	12 AM

Source: PennDOT, 2006

8.0 SUMMARY

The principal findings of this study of pedestrian-involved crashes on North Broad Street are as follows:

- Three out of four priority cluster crashes and more than one in three crashes overall took place in six priority clusters along one mile of North Broad Street and three major intersecting avenues: Lehigh, Westmoreland, and Erie.

- *Crossing Roadway* crashes, where the motorist fails to yield to a pedestrian in a marked or unmarked crosswalk, accounted for 39 percent of all crashes.

- Nearly one-third of crashes were classified as unusual/rare crash types.

- The vast majority of crashes involved adult pedestrians between 15 and 59 years old.

- The study area is active for pedestrian crashes from dawn to well past midnight, seven days a week, throughout the year.

- Compared to overall crashes, *Motorist Failed to Yield* crashes, priority cluster crashes and fatal crashes are more likely to have occurred at night under streetlights.

- An accurate picture of crashes on North Broad Street was compromised by incomplete or inaccurate police reports: A number of reports were found to be miscoded as bicyclist crashes and were discarded. Several other reports were illegible and not included in the analysis. An additional 28 reports contained insufficient information to accurately assign a crash type. Driver age was not recorded for 37 percent of crashes; pedestrian age was not recorded for 12 percent of crashes.

The crash data paints a portrait of a corridor with continuous pedestrian activity from early morning until late at night, seven days a week, involving adults as they use transit, shop and run errands, travel to entertainment venues, and commute to and from work. Schoolchildren and the elderly are a very small proportion of crash victims within the study area.

A programmed signal project scheduled for letting in the summer of 2008 includes measures designed to improve pedestrian safety, including curbed medians at each of the priority cluster intersections except Olney Avenue (which already has them) and pedestrian signal heads with countdown timers at all signalized intersections within the study area. These countermeasures correspond with those recommended by the FHWA to address *Crossing Roadway* crashes, the corridor's most prevalent crash category. The crash data suggests, however, insufficient nighttime lighting at crosswalks as a significant contributing factor in these crashes, indicating a need for improved lighting.

Crash data alone are insufficient to comprehensively identify and address pedestrian safety issues; but when coupled with a site visit, they can help complete the picture. The information presented in this report is intended for use in conjunction with a pedestrian road safety audit, to include cluster locations on intersecting streets outside of the signal project area, to aid the audit team in identifying and prioritizing engineering, enforcement, and education countermeasures specific to the most prevalent types of pedestrian crashes.

North Broad Street Pedestrian Crash Study

Publication No.: 08034

Date Published: May 2008

Geographic Area Covered: North Philadelphia

Key words: pedestrian, crashes, road safety audit, contributing factors, PBCAT

Abstract: Between 2000 and 2006 there were 210 reported pedestrian-motorist crashes in nine PennDOT-defined pedestrian crash priority clusters on intersecting a four-mile-long segment of North Broad Street (PA 611) from Diamond to Nedro streets, possibly the heaviest concentration of such crashes in the entire Pennsylvania state highway system. Police reports for these crashes were coded and analyzed using the *Pedestrian and Bicycle Crash Analysis Tool* (PBCAT), a database application for classifying pedestrian- and bicyclist-involved motor vehicle crashes according to the specific actions of the motorist and the pedestrian precipitating the crash. The age distribution of the pedestrians involved, the time of day and day of the week in which crashes occurred, and roadway illumination levels at the time of the crash were also examined. The information is intended for use in conjunction with a planned road safety audit to aid the audit team in identifying and prioritizing appropriate crash-related engineering, enforcement, and education countermeasures.

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North Broad Street Pedestrian Crash Study

July 2008

Delaware Valley Regional Planning Commission