Union County Route 1&9 Corridor Study

Final Report

June 2011

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ROUTE 1&9 CORRIDOR STUDY

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I. EXECUTIVE SUMMARY

Goals

The Union County Division of Planning and Community Development initiated the Route 1&9 Corridor Study with funding through the North Jersey Transportation Planning Authority and the County to identify improvements that will meet the changing needs of the region and support municipal goals of improved safety, enhanced quality of life, and maintaining opportunities for redevelopment along the corridor. The Study was completed in June 2011.

Background

Within Union County, Route 1&9 passes through the Cities of Elizabeth, Linden, and Rahway. A spine of commerce and community in the region, it serves a sizable portion of the county's residents and jobs. Route 1&9 provides connections to key transportation facilities, and forms a critical regional and national link as a parallel route to the New Jersey Turnpike.

New Jersey Department of Transportation (NJDOT) has completed several projects in recent years to improve conditions, including the reconstruction of the Elizabeth River Viaduct, North Avenue intersection upgrades, the Magnolia Avenue Bridge reconstruction, the Rahway River Bridge replacement and the Bayway Circle improvements. Also, the NJDOT designated this section of the highway a Safe Corridor and undertook one of the first Safety Impact Team studies to identify problem spots. Despite these efforts, over four miles of the seven mile study corridor still has a crash rate higher than the state average for similar roadways.

Key Issues

The corridor is evolving from its historic emphasis on manufacturing to one with a mix of both industrial and retail uses. The growing number of shopping centers draws shoppers from throughout the region. The route also bisects dense residential neighborhoods in Elizabeth, Linden, and Rahway, affecting the local quality of life. As a result of its many functions, corridor users face varied challenges:

- Automobile traffic faces a transition from a high speed divided highway north and south of the corridor to a signalized arterial with numerous friction points.
- Freight traffic within the corridor deals with challenging access to businesses along and within the vicinity of the corridor.
- Pedestrians attempting to cross Route 1&9 face long crosswalks, gaps in the sidewalk network, aggressive drivers, many conflicts with traffic, and an overall uninviting environment.
- Transit users face an unappealing environment with few amenities.
- A lack of sufficient wayfinding signage results in U-Turns on residential streets.
- During off peak hours the corridor suffers from aggressive driving and high speed traffic.
- Deficient lighting, pavement conditions, and drainage are common throughout the study corridor.

These conditions and the evolving nature of the area require a proactive examination of ways to improve conditions for all users of the Route 1&9 Corridor.

Methodology

The project team analyzed existing conditions within the corridor using a combination of available data, field investigations, and informed input from local stakeholders and advisors. The corridor assessment included traffic and safety analyses, an investigation of pedestrian and bicycle conditions, lighting, freight and truck uses, and a review of existing transit, land use, demographic, and environmental data as well as NJDOT Management Systems data.

Recommendations

The Study resulted in corridor-wide recommendations and intersection-specific improvements based on these assessments. Recommended corridor-wide improvements to improve circulation, safety, roadway aesthetics and maintenance and ultimately make Route 1&9 a more appealing roadway for all users. They include the following:

Lighting

- Review existing lighting conditions within the corridor.
- Repair, upgrade, or replace lighting as needed based on a conditions assessment.
- Review crash incidence during dawn, dusk, or night periods.
- Improve pedestrian scale lighting at locations where the need is greatest.
- Review and consider revising lighting ordinances to manage off-roadway light sources.

Drainage

- Review conditions at locations where documented drainage issues have been identified.

Pavement/ Striping

- Resurface the corridor within Linden and Elizabeth using modern pavement design or concrete to handle the high volumes of traffic, including heavy vehicles.
- Replace existing striping and pavement markings with thermoplastic markings to extend the lifespan of markings and reduce maintenance needs.
- Review spacing of stop bars and crosswalks for compliance with engineering standards.

Signage

- Develop signature wayfinding signage for the corridor.
- Focus signage on points of interest to reduce U-Turns and use of local streets
- Install backlit cross-street signage at all signalized intersections.
- Provide pedestrian oriented directional signage to major landmarks as appropriate.

Sidewalks/Crosswalks

- Install missing sidewalks along entire corridor.
- Provide improved sidewalks at bus stops and make ramps ADA compliant.
- Upgrade pedestrian signal heads to include countdown timers that inform the pedestrian of the remaining seconds available to cross.
- Restripe crosswalks to continental style at signalized intersections in transition areas between higher speed sections of the corridor and more urban settings where pedestrian activity is higher.
- Move traffic stop bars to increase distance between stop bars and crosswalks for better visibility and effectiveness.

- Ensure sidewalks to bus stops get snow clearance priority.
- Investigate new technologies in pedestrian detection.
- Provide pedestrian scale lighting at crosswalks to increase pedestrian visibility.

Bicycle

- Review bicycle compatibility along potential parallel routes within the context of the Draft Union County Bicycle Master Plan.

Transit

- Designate bus stops more prominently with the use of colored bus stop pads, special pedestrian oriented lighting and backlit bus stop sign pylons.
- Provide higher intensity, pedestrian oriented lighting of a different color spectrum and/or higher foot candle level to help denote bus stop waiting areas and critical access paths to bus stops.
- Use transit pylons to provide highly visible bus stop identification from a distance.
- Provide more transit information at bus stops.
- Improve bus stop amenities (shelters, lighting, seating) at locations where space permits.
- Perform a crime prevention assessment for each bus stop within the corridor.

Maintenance

- Work with NJDOT to streamline requests and provide an estimated response time to the requesting city or county.

Freight Access

- Investigate improved access to and from the Tremley Point area to take pressure off of Wood Avenue and Stiles Street.
- Investigate a longer-term improved connection from Interstate 278 to Route 1&9 Southbound and the ConocoPhillips facility.

A New Corridor Identity

- Apply consistent cross sections and roadside treatments for three specific contexts found within the study corridor. With new investments, the corridor can achieve an overall enhanced identity consistent with the evolving context of the corridor:
    - The **arterial sections** of the roadway, characterized by few access points and limited traffic lights, would have buildings set back from the roadway and provide for street trees along the property lines.
    - The **transitional sections** could have buildings set back from the roadway or close to the street and would provide increased street trees along the property lines or in a buffer area between the roadway and sidewalk.
    - The **urban sections** would have buildings closer to the roadway and provide street trees or roadside planters along the sidewalk.

The recommendations seek to address both immediate concerns and to develop a context to evolve the roadway to meet the changing needs of both the corridor and its users. Additional recommendations included in the final report provide detailed concepts for each of the key intersections along the corridor. An implementation matrix spells out proposed responsibilities and time-frames for each improvement.

II. INTRODUCTION

Within Union County, Route 1&9 is a challenging route for most users and modes. Automobile traffic faces a transition from a high speed, limited access roadway north and south of the study corridor to a signalized arterial with a significant number of friction points at intersections and driveways. The corridor lacks good signing and wayfinding.

Freight traffic within the corridor deals with challenging access to many freight uses along and within the vicinity of the corridor, as well as insufficient signing and delays at signalized intersections, affecting on-time deliveries for local and longer haul freight.

Pedestrians attempting to cross Route 1&9 face long crosswalks, gaps in the sidewalk network, aggressive drivers, many conflicts with traffic, and an overall uninviting environment.

Transit users face an unappealing environment that lacks information, amenities, and the daunting task of likely having to cross Route 1&9 as a pedestrian at least once on their journey. Local residents face further problems caused by Route 1&9 traffic, as the lack of sufficient wayfinding signage often forces U-Turns to occur through residential streets.

During off peak hours the corridor suffers from aggressive driving and high speed traffic.

The study corridor, shown in Figure 1, consists of an eight mile segment of Route 1&9 that passes through the Cities of Elizabeth, Linden, and Rahway. This segment of Route 1&9 is a key connection for regional commerce and local communities alike. The corridor links a sizable portion of the county's residents and jobs, and provides access to countless major public, commercial, retail, distribution, and industrial facilities in Union County. These include Newark-Liberty International Airport, Linden Airport, the Port of Newark/Elizabeth, and industrial facilities at Bayway and Tremley Point. In addition, this section of Route 1&9 provides direct or indirect connections to key regional highways, including the New Jersey Turnpike, Interstates 78 and 278, NJ Route 439, the Garden State Parkway, and the Goethals Bridge.

The study area includes 29 signalized intersections with left turn control primarily provided by left turn lanes. Additionally, there are several interchanges and more than 50 right-in/right-out street intersections. Driveway access for commercial and residential uses is common throughout the corridor. Route 1&9 accommodates Annual Average Daily Traffic (AADT) volumes ranging from 47,000 in the vicinity of Interstate 278 to 119,000 near Newark Airport and the northern terminus of the study corridor according to data available for 2007 through 2009. The number of travel lanes per direction is generally three throughout the corridor, but widens to four or more at several locations in the vicinity of intersections and interchanges. Crash rates are high throughout the corridor, and crashes involving pedestrians, especially fatalities, occur at rates above the statewide average. There are locations with a high incidence of crashes located within a ½ mile radius of the study corridor.

The character of the roadway shifts dramatically as drivers enter from both the northern and southern termini of the study area. From the north, Route 1&9 operates as a freeway, carrying traffic from the Pulaski Skyway from Hudson County and Newark to Interstate 78 in Elizabeth. From the south, as drivers pass through Avenel, Route 1&9 takes on many characteristics of a freeway, with wide lanes, a wide shoulder, and limited access points. Upon entering Rahway, a shift to a narrower cartway with more frequent signalized intersections and denser development along the roadway is evident.

A journey along Route 1&9 in Union County is an opportunity to see the industrial history of the area. The study corridor, one of the first roads in the United States, provides access to the former General Motors assembly plant site in Linden, Linden Airport (which was used for fighter plane construction), the Merck facility in Rahway, the ConocoPhillips Refinery in Linden, Newark Liberty International Airport, and the largest container port on the East Coast, located in Elizabeth. Dozens of smaller manufacturing and warehouse operations are situated along the study corridor.

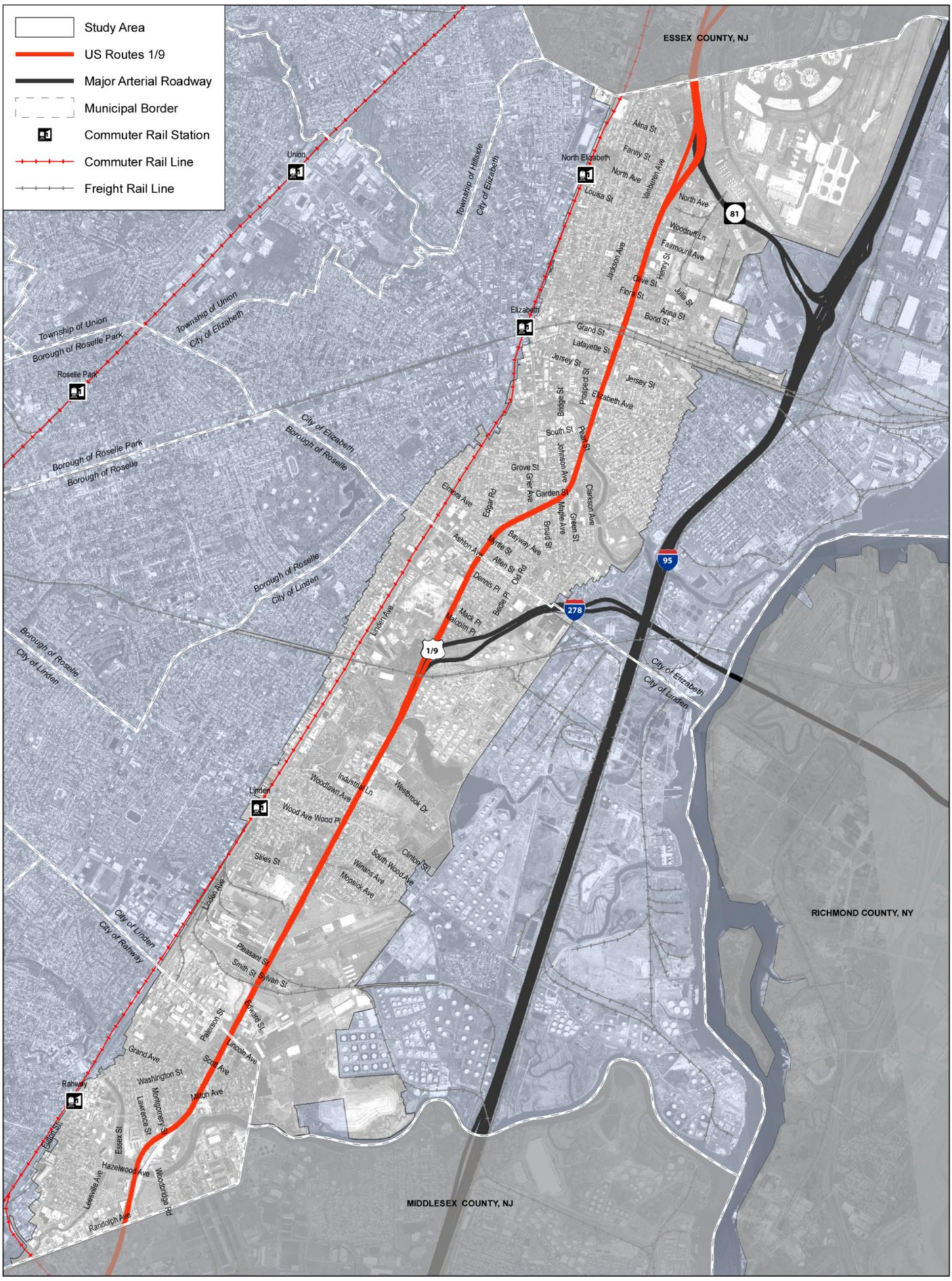
CORRIDOR GOALS

- *Provide safe and efficient travel for all modes of travel.*
- *Improve pedestrian accommodations in this corridor as a key component that will need to be balanced with the needs of regional vehicular and freight mobility.*
- *Allow pedestrians and vehicular traffic to move safely and efficiently in tandem to create a more appealing overall route.*
- *Provide reliable travel times to efficiently move people and goods.*
- *Improve maintenance to both the highway and adjacent properties to help improve the surrounding areas and aim to make the corridor a more inviting environment.*
- *Provide clear corridor signing and wayfinding and provide U-turn movements with the smallest possible impact on local residents.*

A series of recent transportation investments have greatly improved some of the deficiencies within the study area, including major bridge replacements over the Rahway and Elizabeth Rivers as well as ongoing improvements as part of NJDOTs Safe Corridors Program. While these projects have started the process of addressing the long-standing congestion-related vehicular deficiencies in the area, safety, connectivity, and congestion still remain as challenges for vehicular and non-motorized traffic traveling along and across the corridor.

The project team, in coordination with Union County and the Technical Advisory Committee (including members of the project area cities and regional agencies), defined the overall goals for the Route 1&9 Corridor, as listed in the callout box. The team determined that improvement concepts should be focused on safety, address maintenance issues, work toward the management and mitigation of congestion where possible (with minimal community impact), and accommodate a multitude of users. Given the significant volumes of heavy vehicle traffic that traverse the study corridor on a daily basis, any improvements to traffic conditions would help keep Route 1&9 viable as a key freight corridor.

This report describes these recommended improvements, defines a long term goal for the overall corridor cross section, and provides supporting data and mapping on the key issues and outreach process.



Study Area
Corridor of US Routes 1 & 9
Union County, New Jersey

0 1,400 2,800 5,600 Feet

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Figure 1 - Route 1&9 Corridor Project Study Area

III. IMPROVEMENT RECOMMENDATIONS

Following the analysis of existing conditions data detailed in Section III, field investigations, and input from municipalities, the Technical Advisory Committee (TAC), the Union County Transportation Advisory Board and the Linden Industrial Association the project team identified improvement recommendations both corridor-wide and at specific locations. These recommendations aim to improve circulation and overall safety for vehicular and pedestrian traffic, improve roadway aesthetics and maintenance, reduce driver confusion through the use of wayfinding, reduce or mitigate congestion and ultimately make Route 1&9 a more appealing roadway for all users.

Improvement concepts include short and long term plans for the overall corridor and specific Intersection/ Spot improvements. These initiatives seek to improve existing and projected deficiencies in safety, operations, and connectivity and are detailed individually below.

A. Corridor-Wide Improvements

Corridor-wide improvements aim to address deficiencies that were observed throughout the study area, including:

- Inconsistent signing and striping
- A lack of sufficient U-Turn locations
- Deficient pavement
- A lack of overall maintenance
- Poor bicycle compatibility
- Insufficient lighting
- Overall corridor context

These deficiencies were identified based on a review of existing traffic data, field observations, and local input from the SAC. Specific improvements for each deficiency are outlined below.

Lighting

The project ream reviewed crash data for the entire study corridor and observed that the percentage of crashes occurring during dawn, dusk, or night was consistently above the statewide average at most signalized intersections within the corridor. This was confirmed by SAC members who cited insufficient lighting as a significant problem throughout the study area. It was also noted that glare from off-roadway sources, including parking lots, advertising signage, and businesses, is a concern which may be mitigated through improved highway lighting. Additionally pedestrian scale lighting is not available at all intersections and transit stops with pedestrian activity.

Inoperable lighting along Route 1&9 Northbound

- A review of existing lighting conditions within the corridor should be completed. This should include the identification of damaged or non-operating fixtures, measuring luminance levels for the roadway (including vertical luminance levels) and an assessment of levels for pedestrian-scale lighting.

- Lighting should be repaired, upgraded, or replaced as needed based on a lighting conditions assessment.
- A detailed review of crashes occurring at night should be undertaken at numerous locations within the study area identified as having an overrepresented number of crashes occurring during dawn, dusk, or night. Locations within the corridor that should be reviewed to identify any similar cause of crashes occurring during dawn, dusk, or night include:
    - Milton Avenue/Paterson Street
    - Grand Avenue
    - Wood Avenue
    - Park Avenue
    - Grier Avenue
    - South Broad Street
    - Maple Avenue
    - Jersey Avenue
    - East Grand Street
    - Bond/Anna/Flora Streets
    - Fairmount Avenue
- Specific sites for upgraded pedestrian scale lighting are identified in the individual intersection sections below.
- Additionally, the cities should consider lighting ordinances to manage off-roadway light sources. (The Illuminating Engineering Society and the International Dark Sky Association have developed model lighting ordinance guidance that can be found at http://www.darksky.org/).

Drainage

Several segments within the study corridor were identified as having existing drainage concerns based on data provided by NJDOT's Drainage Management Systems (DMS). Further, several locations were identified as having an overrepresented percentage of crashes occurring on wet pavement, indicating potential drainage issues.

A review of drainage focusing on improvements aimed at fixing existing documented drainage issues should be undertaken. Locations where drainage issues were identified include:

- Milton Avenue/Paterson Street (Wet pavement crashes)
- Grier Avenue (NJDOT DMS)
- South Broad Street (Wet pavement crashes, NJDOT DMS)
- Maple Avenue (NJDOT DMS)
- Jersey Avenue (NJDOT DMS)
- East Grand Street (NJDOT DMS)
- Bond Street (Wet pavement crashes, NJDOT DMS)
- Anna/Flora Streets (NJDOT DMS)
- Fairmount Avenue (Wet pavement crashes)
- North Avenue (Wet pavement crashes, NJDOT DMS)

Pavement/ Striping

A review of 2010 NJDOT Pavement Management System (PMS) data indicated that a significant portion of the study corridor exhibits either very poor or poor pavement based on the Surface

Distress Index (SDI) or deficient pavement based on the International Roughness Index (IRI). Poor or deficient conditions were especially evident within Linden and Elizabeth, where the entire segment of the study corridor within each municipality is deficient or in poor/very poor condition. Additionally, worn striping and pavement markings were evident throughout the corridor during field visits.

Worn striping typical of entire Route 1&9 Corridor

- To address the nearly 7-mile segment of poor pavement, the resurfacing of the corridor within Linden and Elizabeth is recommended using modern pavement design or concrete to handle the high volumes of traffic, including heavy vehicles.
- NJDOT should replace existing striping and pavement markings with thermoplastic markings to extend the lifespan of markings and reduce maintenance needs.
- A review of MUTCD compliance for stop bar/crosswalk spacing should be completed.

Signage

Wayfinding signage throughout the corridor is inconsistent and in many cases nonexistent. This problem is further exacerbated by the fact that the corridor has a variety of uses that draw unfamiliar drivers, including Newark Liberty International Airport, regional shopping centers, Ports of Newark/Elizabeth, and local destinations like the Rosedale/Hilldale cemeteries. Additionally, the signing of Route 1&9 itself is inconsistent throughout the corridor, contributing to driver confusion. It was noted that there are several locations where Route 1&9 is signed as Spring Street, Edgar Road and the NJDOT Straight Line Diagrams designate Route 1&9 as Herbert Highway.

One of the concerns most consistently heard from local and freight-focused stakeholders was the lack of wayfinding and advance warning signage for major industrial points of interest or connecting routes to freight destinations like Bayway Refinery or the Tremley Point section of Linden. The lack of signage creates a challenging environment for truck drivers who may not frequently use the corridor. Further, once a destination or connecting route is missed, opportunities for U-Turns are limited, forcing trucks onto narrower, primarily residential side streets.

In order to address these deficiencies, the following improvements are recommended throughout the corridor:

- Sign Route 1&9 at all cross streets and wayfinding signs as Route 1&9 only.
- Develop signature wayfinding signage for the corridor. Focus signage on points of interest to reduce U-Turns and use of local streets (specific sites are identified in the spot improvement section below) The City of Elizabeth has installed attractive "trailblazer" directional signs oriented at motorists to direct them to area landmarks/destinations, such as Midtown Elizabeth. This concept can be expanded throughout the entire corridor for vehicular, bicycle, and pedestrian traffic.

Backlit street sign increases visibility

- Provide improved highway directional signage at key locations (specific sites are identified in the spot improvement section below).
- Install backlit cross-street signage at all signalized intersections.
- Provide pedestrian oriented directional signage to major landmarks as appropriate.

Sidewalks/Crosswalks

Safe and convenient movements are essential for pedestrians that use this corridor for transit, work, school, religious observance, and shopping trips. Improvements to the pedestrian environment will increase mobility for walkers while calming traffic throughout the corridor. The recommendations include the following:

Countdown Pedestrian Head

- Install missing sidewalks along entire corridor (specific sites noted below).
- Provide improved sidewalks at bus stops and make ramps Americans with Disabilities Act (ADA) compliant.
- Upgrade pedestrian signal heads to include countdown timers that inform the pedestrian of the remaining seconds available to cross.
- Restripe crosswalks to continental style at transition areas from higher speed sections of the corridor to signalized intersections in more urban settings where pedestrian activity is higher.
- Move traffic stop bars to increase distance between stop bars and crosswalks for better visibility and effectiveness.
- Ensure sidewalks to bus stops get snow clearance priority.

Continental crosswalks raise visibility and driver expectation

- Investigate new technologies in pedestrian detection that eliminate the need to utilize pedestrian push buttons to activate the pedestrian phase. For example, the City of New Brunswick is utilizing automatic pedestrian detection at high activity intersections.
- Provide pedestrian scale lighting at crosswalks to increase pedestrian visibility.

Bicycle

A review of bicycle compatibility indicated that nearly the entire corridor was not bicycle compatible, based on NJDOT's guidelines, largely due to the high Annual Average Daily Traffic (AADT), high percent of heavy vehicles, and a lack of wide shoulders throughout most of the corridor. Based on the review of traffic data and field observations, the project team determined that Route1&9 was not an optimal through route for bicycle traffic. Given the number of alternative parallel routes within the study area, a review of bicycle compatibility along potential parallel routes should be completed. This review should be done in the context of the Draft Union County Bicycle Master Plan.

Transit

While the project corridor has access to transit via existing bus service along and across the study corridor in addition to four regional rail stations within one mile of the corridor, inconsistent scheduling, frequency, and traveler information makes using transit within the corridor challenging. The following elements are recommended for all bus stops along Route 1&9:

- Designate bus stops more prominently with the use of colored bus stop pads, special pedestrian oriented lighting and backlit bus stop signs. Colored bus stop pads, which could consist of colorized concrete or other color striping materials alerts motorists that this is a bus stop and reinforces that this is a no parking area. If automobiles are deterred from parking or entering the bus stop, it becomes easier for the bus driver to see waiting customers. For bus customers, it provides reassurance that they are waiting at a proper, designated bus stop.
- Provide higher intensity, pedestrian oriented lighting of a different color spectrum and/or higher foot candle level to help denote bus stop waiting areas and critical access paths to bus stops. Bus stop lighting, which covers both the sidewalk and the bus stop itself, can help reinforce this as a waiting area. Together with the colored bus stop pad, additional bus stop lighting increases the visibility and the safety of the bus stop.
- In addition, higher illumination levels also serve as a good security tool. Crime prevention studies link higher intensity lighting levels with greater perceptions of customer security. A different color spectrum than used by ambient street lighting is suggested to help differentiate and identify the bus stop as a different use from other portions of the Route 1&9 roadway.
- Use transit pylons to identify bus stops. Route 1&9 is a commercial roadway with many competing signs. Backlit transit panels can provide highly visible bus stop identification from a distance and can add a sense of identity. While most regular bus drivers will know where bus stops are located, these signs can serve as "beacons" for pedestrians to see from a distance—this is particularly helpful at night. The example to the right depicts a backlit schedule panel from London, which makes it easier for customers to read transit information at night. The blue push button activates the backlit feature for a set time, before automatically switching off. This panel displays an area map, trip times and bus departure times.

- Provide more transit information at bus stops. Bus stops along Route 1&9 are currently designated by a bus stop sign displaying the route number and destination. Presently, there is no bus map, route strip map, schedule or other transit information posted along Route 1&9 bus stops. It would be helpful if additional transit information were provided, such as a route strip map, bus departure times from that stop, and "how to ride" guide for new or occasional customers.
    - For night time customers, consideration should be given to installing customer-activated back lit sign post schedule panels. These can be

solar powered or conventional electric panels. A customer simply presses a button to activate a backlit sign panel for a preset amount of time, to enable customers to read schedule information at night.

- Post the *My Bus Stop* identifier number at each bus stop. To provide improved bus stop information for customers with web enabled devices, in November 2010, NJ Transit introduced a new bus stop signage and information program called "My Bus Stop." This program consists of new bus stop signage displaying a 5 digit bus stop number. Customers can text the bus stop number to "MyBus" to obtain the next bus departure times from that bus stop. For customers without web devices, but who have cell phones, under this program customers can call into 973-275-5555 or 511, and input the bus stop ID number to get the next three scheduled trips. According to NJ Transit, this feature makes automated bus schedule information available 24 hours a day for the first time.
- Provide neighborhood area maps at each bus stop. Neighborhood maps could be installed on either bus stop sign posts (see photo) or in larger panels on bus stop shelters. Neighborhood maps provide guidance from the bus stop to nearby destinations and streets.

While the above mentioned elements should apply to all Route 1&9 bus stops in the study area, the elements below are recommended where space permits at each bus stop:

- Provide bus stop amenities such as shelters with windbreaks, interior lighting, seating and trash receptacles where space permits. As customers must wait in inclement weather during all seasons, bus stop shelters afford some relief from rain, snow, sun and wind.
- Perform a crime prevention assessment for each bus stop. This type of assessment compares reported criminal activity (by type of crime) at each bus stop to determine whether there are repeated patterns of antisocial behavior. The incidence of real and perceived criminal activity can deter bus customers. In some instances, physical improvements to the bus stop such as providing better bus stop lighting and appropriate streetscape improvements can reduce antisocial behavior.

Finally, an investigation into a coordinated shuttle service from the existing bus stops and train stations to retail centers and major employers should be completed.

Poor Maintainance along sidewalk at North Avenue

Coordination of Maintenance

Maintenance was consistently cited as an ongoing concern throughout the corridor in terms of street cleaning, sign replacement, mowing, and lighting. The amount of debris and garbage along Route 1&9 leads to a general unkempt feel throughout the study corridor. Improving overall corridor maintenance would create a greater sense of community identity and help drivers realize they are in a place, not a speedway.

- Of specific concern was having a consistent appropriate contact for maintenance requests. Within the current

organization of the NJDOT, the project team has identified the primary contact for all roadway maintenance requests for this section of New Jersey as the NJDOT Mount Arlington Regional Office.

- City officials should provide all maintenance requests in writing and include details regarding the issue and mileposts, direction (northbound or southbound side) and provide a contact person if there are questions on the issue or to respond to when the request is complete.
- NJDOT should streamline requests and provide an estimated response time to the requesting city or county.

Roadway lighting maintenance is generally performed by PSE&G when a light is out it can be reported by calling them directly or by filling out a form at this website (http://www.pseg.com/home/customer_service/outage_info/streetlight_out.jsp). If requests are not being addressed then the entity which pays the lighting bill should follow up. While a detailed inventory was beyond the scope of this study, lighting was reviewed in a sample segment of the corridor. In this review we noted that the majority of lights in the section examined appear to be on utility poles, which are generally paid for by the State.

- As such the NJDOT Mount Arlington Office should be contacted and should work with PSE&G to get the lighting repaired/maintained.
- The remainder of the corridor should be examined as part of the recommended lighting study noted in the lighting section above.

Corridor Context

Overall the roadway corridor lacks a sense of place between two freeway-like segments: Traveling northward from Avenel, and southward from Newark. There are few defining elements along the roadway for users to distinguish residential sections from the mixed residential/retail, commercial and industrial sections. For example, the streetscape within the urban sections gives few indications of active pedestrian traffic. The profile of the roadway remains relatively uniform despite changes in the surrounding context.

During the course of the study, the overall lack of consistent corridor signage was identified as a cause of driver confusion, an issue that might be compounded by the absence of strong context. The current cross section of Route 1&9 and roadside treatments may contribute to overall poor driver behavior. To address and improve these conditions, the NJDOT should consider the application of a consistent cross section and roadside treatment. As development and redevelopment progresses and new roadway projects occur within the corridor, a more consistent cross section and roadside treatment could be completed. With new investments, the corridor can achieve an overall improved identity over the long term. As the corridor redevelops, these improvements can be completed by developers and property owners. As roadway improvements are completed this cross section and improvements should be included.

Additionally, as improvements occur, existing driveways should be examined for conformance with the Highway Access Code. Proposed improvements should bring existing driveways into conformance and seek to provide shared access points to limit highway friction.

Three typical sample sections have been developed to apply within the corridor at the locations shown in Figure 2. Each of these cross sections will require further investigation and discussion with affected parties including NJDOT and each of the cities. Of specific concern will be the feasibility of providing additional rights-of-way for sidewalks and shoulders, and the feasibility of providing less than 12 foot lanes on a heavily travelled truck corridor. These concepts are meant to be a starting point of further study and investigation to improve the long term viability of this corridor for all modes of travel, balancing regional needs with local travel and residents.

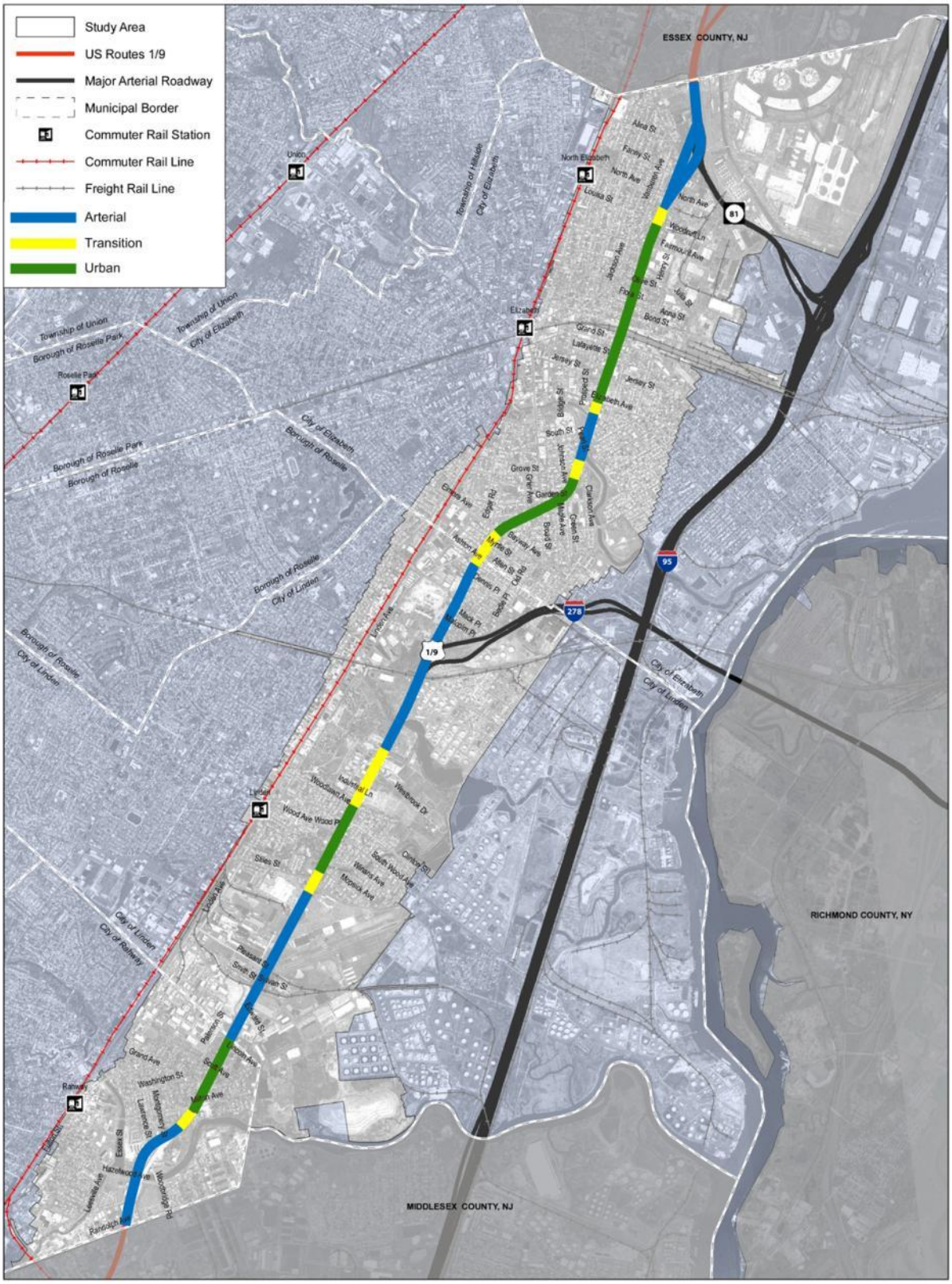


Figure 2 – Recommended Cross Section Types by Segment

Arterial Cross Section

For the arterial sections of the roadway, characterized by few access points and limited traffic lights, the recommended cross section generally will have buildings set back from the roadway and provide street trees along the property lines. The roadway will provide full shoulders (6-8 feet), maintain a 3 foot median barrier, and provide full travel lane widths (12 feet) and five foot sidewalks.

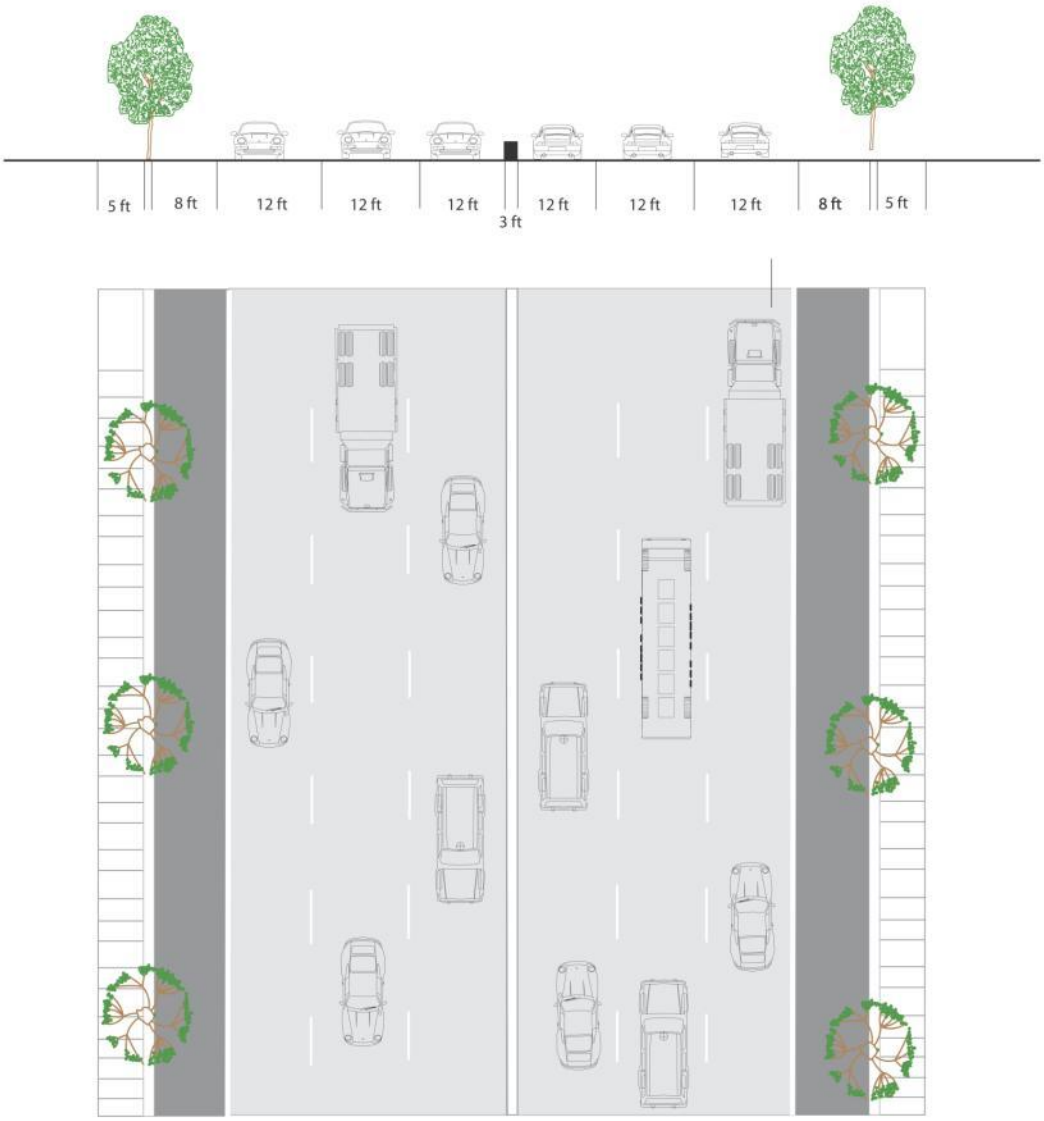


Figure 3 – Arterial Cross Section

Transitional Cross Section

This cross section could be applied as a visual queue to allow drivers to adjust behaviors between Arterial and Urban sections. This signifies a change or transition in context and driver expectation. The Transitional cross section could have buildings set back from the roadway or close to the street and will provide increased street trees along the property lines or in a buffer area between the roadway and sidewalk. The roadway will begin to narrow the shoulders (6 feet) and lane widths (11-12 feet) and provide a buffer area between roadway and sidewalks (2 feet). Five-foot sidewalks could be provided and at the first intersection continental crosswalks and pedestrian-scale lighting should be included. Advance signage warning of a signal and the presence of pedestrians ahead should be provided.

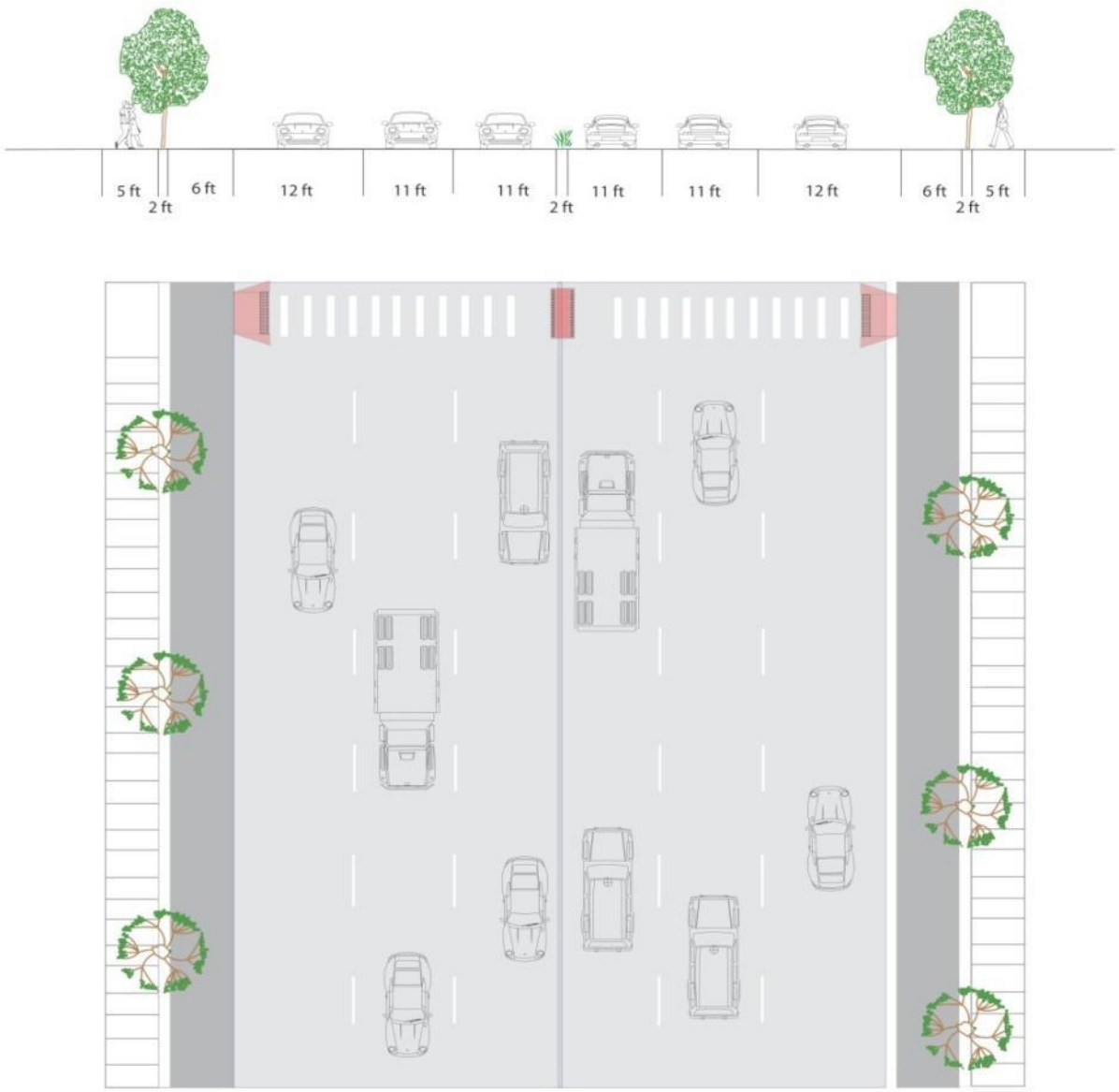


Figure 4 – Transitional Cross Section

Urban Cross Section

This cross section generally will have buildings closer to the roadway and provide street trees or roadside planters along the sidewalk. The roadway could provide limited shoulders, narrow lane widths (11 feet) and eight to ten foot sidewalks. There should be crosswalks at each signalized intersection and pedestrian-scale lighting throughout the section.

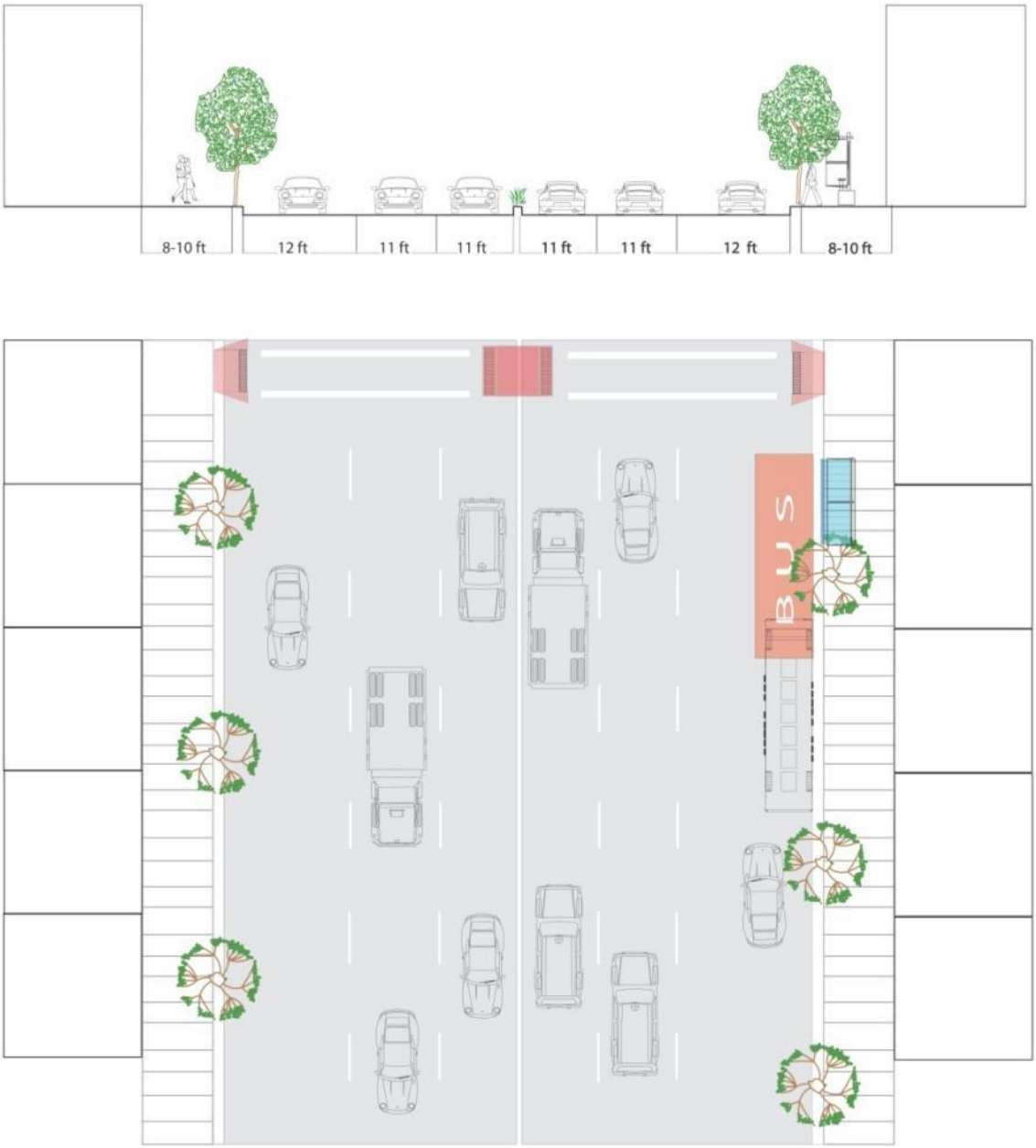


Figure 5 – Urban Cross Section

Additional Context Considerations

In addition to the cross sections, the overall beautification and maintenance of buildings and storefronts should be encouraged. Development of placemaking improvements at key locations can help create a community focal point. For example applying creative, cost effective design concepts to Route 1&9 bus stops can transform a standard bus stop into a showcase of artistic, playful bus stops that can capture the public's imagination—both transit customer and non-transit customer alike.

Another method is to encourage volunteers from the community to serve as "mayors" or unofficial owners of a particular bus stop shelter, street corner, or section of roadside. Active ownership helps discourage vandalism and anti-social behavior—this is akin to the various "adopt a highway" programs.

B. Spot Improvements

In addition to the overall corridor improvements, spot improvements are recommended at a number of locations, as described in the following sections moving from south to north along the study corridor.

Milton Avenue, Rahway

Several location-specific improvements are recommended for this intersection, which is a primary connection into downtown Rahway for residents of that city living east of Route 1&9. While the newly constructed causeway south of this intersection has alleviated congestion concerns in this area, it has had the unintended consequence of higher speed traffic approaching the Milton Avenue intersection from the south. The vertical curve of the causeway further exacerbates this problem by creating a situation where many drivers do not expect to encounter a signalized intersection at the foot of the bridge. In order to alleviate this situation, advance flashing "red signal ahead" signage is recommended on the northbound approach.

The City of Rahway supports a red light camera at this intersection and is currently in discussions with NJDOT on this issue.

To improve pedestrian conditions at and near the intersection, several upgrades to pedestrian accommodations are recommended. The extreme length of the existing crosswalk makes it difficult for pedestrians to easily traverse it in a single cycle. In the short term, a review of the existing pedestrian signal phase should be completed and potential extension of that phase should be considered. Further, advance warning signage of the presence of pedestrians on the newly constructed structure should be installed. The existing crosswalk should be relocated to run perpendicular to Route 1&9, effectively shortening the crossing length from approximately 130 feet to 110 feet. This repositioning of the crosswalk would require shifting the existing stop bar on Route 1&9 southbound approximately 20 feet north. To further highlight the presence of pedestrians in this area, and to denote the area north of this intersection as a transitional area

between arterial and urban areas, the repositioned sidewalk should be striped in a continental style. To enhance this area as a transitional area between arterial and urban sections, street trees, narrowed lanes, striped shoulders, and/or improved sidewalks should be considered south of Milton Avenue. In order to address significant sidewalk gaps where worn paths were noted during field visits, the installation of sidewalk along Route 1&9 northbound and southbound north of the intersection is recommended.

An assessment of drainage issues and improvements to address existing documented drainage issues should be completed. A lighting study should be completed to review the operability and maintenance of existing fixtures, assess lighting levels and introduce targeted improvements to provide pedestrian scale lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

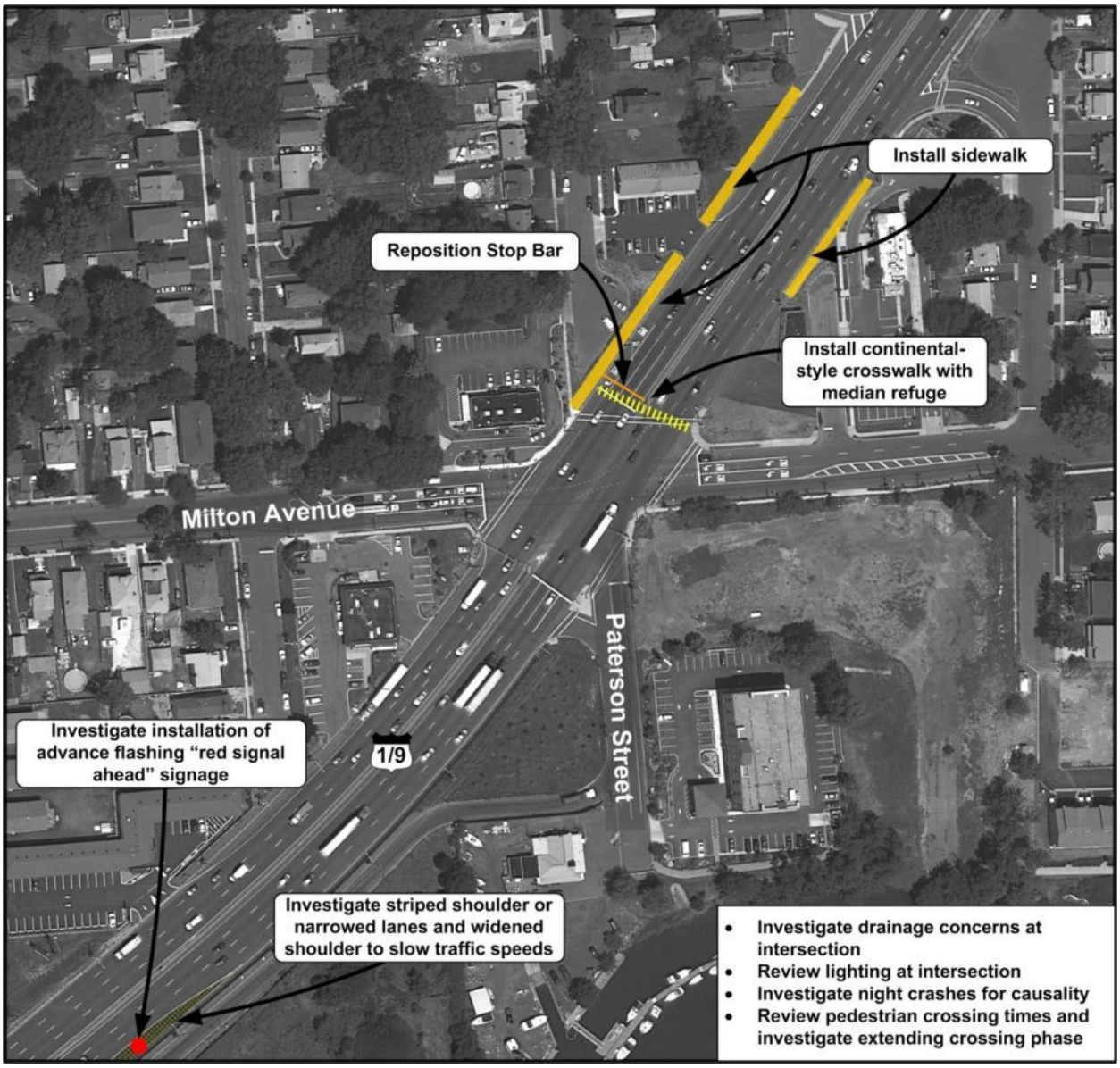


Figure 6 – Route 1&9 at Milton Avenue/Paterson Street Improvements

Grand Avenue, Rahway

To highlight the presence of pedestrians in this area, and to denote this location as a transitional area between arterial and urban areas, the installation of street trees, narrowed lanes, and/or improved sidewalks should be considered. In this spirit, sidewalk should be installed along Route 1&9 northbound adjacent to the QuickChek (MP 39.39) between Grand Avenue and Scott Avenue.

For traffic travelling on Lower Road from Tremley Point and other industrial uses, signage directing traffic to Route 1&9 northbound and southbound should be upgraded. Specifically, improvements include the installation of advance warning signage approaching Lincoln Avenue from Lower Road westbound, directing northbound traffic to use Lincoln Avenue and southbound traffic to use Grand Avenue. In order to accommodate increased usage by heavy vehicles at the intersection of Grand Avenue and Route 1&9, the existing left turn bays should be extended to allow increased vehicle storage space.

The Union County Engineer suggests the investigation of an additional signal at E. Lincoln and Route 1&9 to relieve traffic on E. Grand, a residential neighborhood, and divert traffic from E. Grand to E. Lincoln. This recommendation needs further analysis for signal warrants and NJDOT standards as it would be within 1300 feet of an existing signal, and the NJDOT minimum spacing for new signals is generally 1500 feet.

Figure 7 – Route 1&9 at Grand Avenue Improvements

Lighting concerns should be addressed with further detailed analysis. A lighting study should be completed to review the operability and maintenance of existing fixtures, assess lighting levels and introduce targeted improvements to provide pedestrian scale lighting.

Avenue C/Sylvan Street, Linden

This location, centered on a CSAO-owned railroad overpass, has several deficiencies that primarily impact heavy vehicle and pedestrian movements through this section of the study area.

The CSAO line in this location is a valuable section of infrastructure. Though currently underutilized, this rail connection is an integral rail corridor that has the potential for increased usage and utility as part of the overall effort to redevelop an area that has been identified for industrial revitalization (former GM site and neighboring property).

The rail line is identified as the Linden Industrial Track. It is owned by Conrail and connects the Northeast Corridor and the Chemical Coast Line. The latter is a major freight lien owned by Conrail. The line serves as a potential alternate route to and from the North Jersey Terminal area. The removal of this bridge would bifurcate a critical piece of railroad infrastructure in the region.

Several stakeholders mentioned that this bridge is frequently struck by heavy vehicles and that resurfacing projects may have resulted in the clearance being less than is currently posted, As such, the posted bridge clearance on Route 1&9 at the rail overpass should be assessed to ensure it is adequate.

There is significant pedestrian activity under the CSAO Bridge along Route 1&9 and a clear need to provide increased accessibility. This area sees pedestrian activity primarily generated by the industries in the area and the neighborhood south of Pleasant Street. Pedestrians walking from as far as the Linden Railroad Station have been observed. A potential for increased pedestrian traffic exists from future development of retail and housing on the former GM Property.

In order to improve pedestrian circulation along Route 1&9 northbound north of Avenue C, improvements to the area beneath the existing rail overpass should be investigated. Options to improve this severe pedestrian deficiency include:

- Shift Route 1&9 to one side to allow enough width on the other for a sidewalk
- Narrow travel lanes within this section to accommodate a sidewalk
- Widen the clearance area when the rail overpass is replaced.
- Provide a pedestrian walkway under the current elevated railroad embankment. This may be accomplished by cutting back the embankment so that the walkway is a wide open area the necks down under a simple single track deck bridge.
- Provide a pedestrian bridge parallel to the existing CSAO rail overpass or separate structure attached to the exiting overpass, using the existing railroad right of way and embankment to provide accessible walkway approach ramps

Lighting beneath the overpass should be improved as well.

If improvements to pedestrian circulation adjacent to Route 1&9 cannot be completed, an alternative would be to install sidewalks along Sylvan Road and provide an at-grade protected pedestrian crossing of the existing rail line in the vicinity of the Linden Shopping Center. However this route is circuitous and would be unlikely to be utilized by pedestrians.

Freight traffic using Sylvan Street, including the Safety-Kleen Systems, Inc. and General Magnaplate Corp, was identified as a circulation concern. Opportunities for traffic to

access/egress these sites are limited as left turns are not available and U-Turns are out of the way. In order to address these concerns, the potential for a vehicular cross-access easement between the two properties to be provided between Sylvan Road and the Magnaplate site should be investigated. This would provide Sylvan Street users with direct access to the signal at Airport Road and Route 1&9 without having to make a U-Turn. Further, access between Safety-Kleen and Airport Road should be investigated and encouraged, as this access point is significantly easier for truck traffic to use than the current access from Sylvan Road via Route 1&9.

At the signalized intersection with Avenue C, a sidewalk gap on the northeastern corner of the intersection should be addressed. A review of lane widths within this area and improved lane designation should be completed. Additionally, the signal heads should be relocated to the appropriate location above the travel lanes. Advance signage should be installed for northbound traffic wishing to access Pleasant Street north of the railroad overpass.

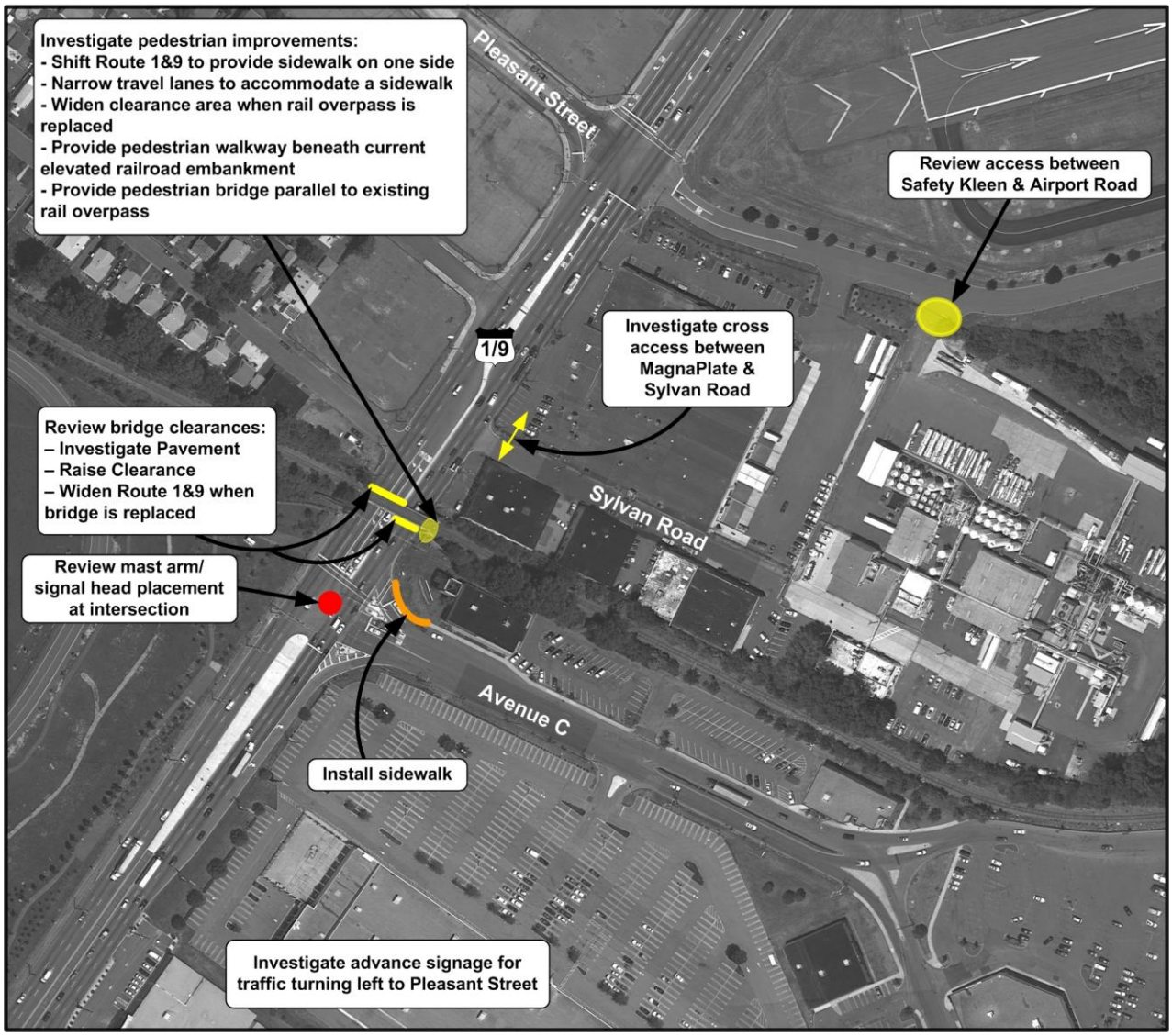


Figure 8 – Route 1&9 at Avenue C/Sylvan Street Improvements

Wood Avenue, Linden

Wood Avenue serves as the primary connector between the eastern portion of Linden and the Linden Train Station located downtown. Given that it carries a significant amount of pedestrian traffic, a crosswalk should be provided on the northbound approach of Route 1&9. (Numerous pedestrians were observed using this currently unmarked crossing during field visits.) Further, as with any other signal improvement within the corridor, upgraded countdown pedestrian signal heads should be installed for all crossings at the intersection.

In order to address safety concerns at and approaching the intersection, a review of lane widths within this area should be undertaken. Additionally, the signal heads should be relocated to the appropriate location above the travel lanes. An assessment of the southeast corner turning radius should be completed to address difficulties heavy vehicles have navigating that area. Vehicle clearance should be improved by increasing the length of the all-red phase at the intersection to address crash issues.

To accommodate the significant volume of heavy vehicles turning left from Route 1&9 southbound to Wood Avenue, the existing left-turn storage bay should be extended. This may

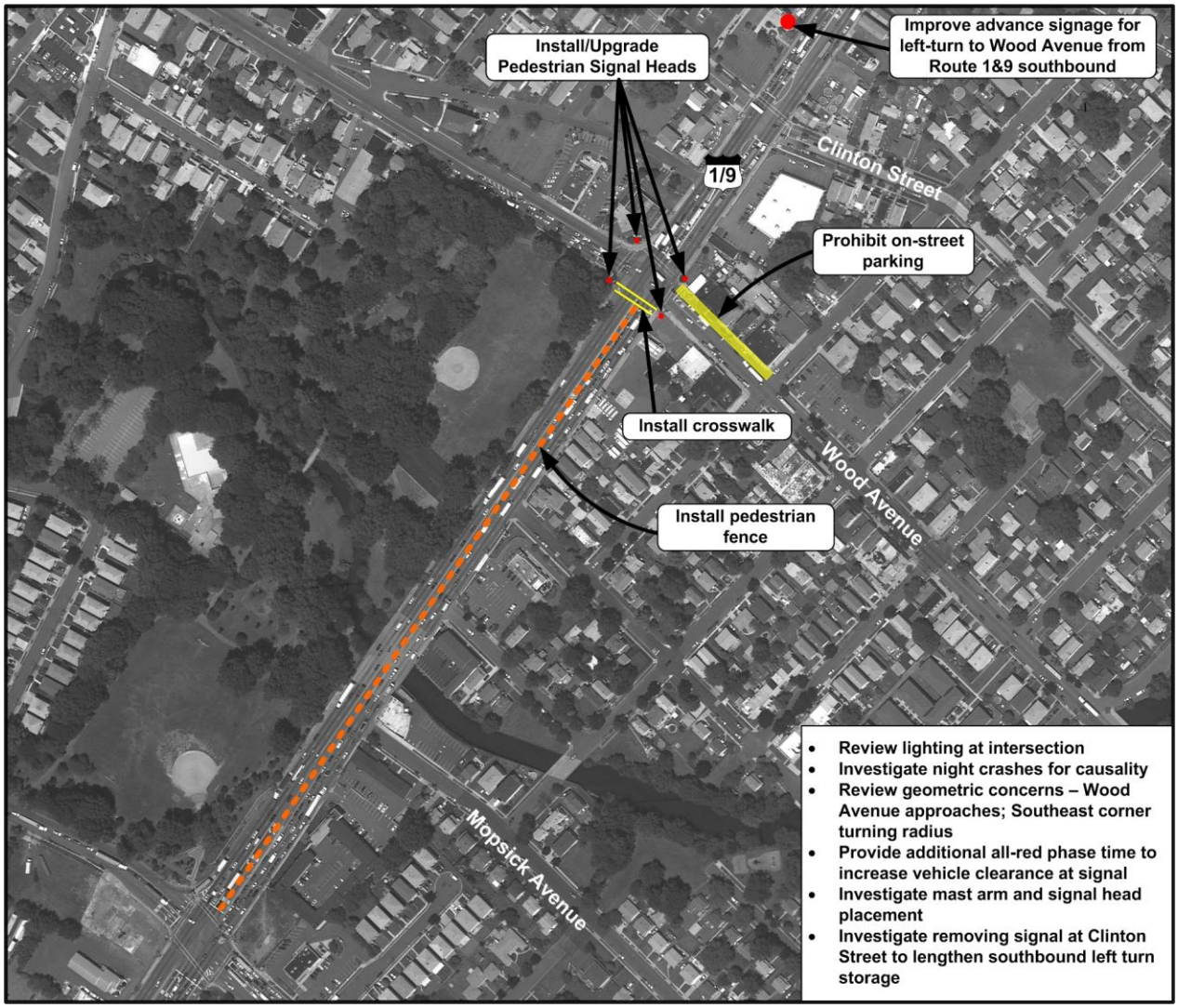


Figure 9 – Route 1&9 at Wood Avenue Improvements

require the removal of the existing signal at Clinton Street, for which a more detailed analysis would be required. Under any improvement concept, improved advance signage for trucks using Wood Avenue to access Tremley Point should be provided.

In order to address lighting concerns, a detailed lighting study should be completed, including a review of operability and maintenance of existing fixtures, assessment of lighting levels, and targeted improvements to provide pedestrian scale lighting. Further, a review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

In order to improve vehicular circulation at the intersection, parking should be prohibited and enforced within the right-turn only lane of the Wood Avenue westbound approach.

Finally, "don't block the box" pavement markings and signage should be installed at the intersection, as backups at this location often extend through the intersection.

Wheeler Park Vicinity, Linden

The section of Route 1&9 adjacent to Wheeler Park in Linden was identified as an area of concern, as it includes a skate park that is frequently used by older children. The skate park is located midblock between Stiles Street and Wood Avenue across the street from a fast food restaurant. The fact that Route 1&9 is divided only by a raised curb within this section allows children to jaywalk across six travel lanes between the skate park and a fast food restaurant on the northbound side of the highway, creating a potentially hazardous condition.

In order to address this current condition, a pedestrian fence is recommended to deter crossings in this location. The installation of a fence would force pedestrians to walk approximately 0.3 miles to use either of the two signalized intersections.

Wood Avenue to Willow Glade Road, Linden

This section of Route 1&9 includes two signalized intersections at Wood and Woodlawn Avenues. This section of the study area is largely defined by the Commerce Road/Industrial Way properties along Route 1&9 southbound and Rose Hill Cemetery along Route 1&9 northbound. A common concern noted throughout this section was the difficulty in accessing the industrial properties from Route 1&9 northbound, and likewise accessing the cemetery from Route 1&9 southbound. Further, signage for traffic accessing these sites from the adjacent direction is insufficient, often leading to driver confusion as to how to access each location. When combined, these problems create many unnecessary U-Turns throughout the area, including many within residential neighborhoods along the corridor.

In order to improve wayfinding for vehicles trying to access Commerce Road/Industrial Way businesses, advance signage should be provided approaching each location. For traffic accessing Commerce Road/Industrial Way, wayfinding signage should be provided that directs northbound traffic to Wood Avenue, Linden Avenue, Willow Glade Road, and ultimately Route 1&9 southbound. Likewise, for traffic traveling southbound that misses the turn to Industrial Way, signage should be provided approaching Wood Avenue, which serves as the optimal U-Turn route. To further improve access to Commerce Road, an increased turning radius from Route 1&9 should be investigated to allow heavy vehicles to more easily turn into and out of the many industrial uses in this area.

Similarly, for northbound traffic accessing the cemetery, advance guide signage should be provided approaching the turn into the cemetery driveway. Further, for traffic destined to the

cemetery from Route 1&9 southbound, signage should be provided directing vehicles to turn left onto Woodlawn Avenue, which provides direct alternate access into the cemetery.

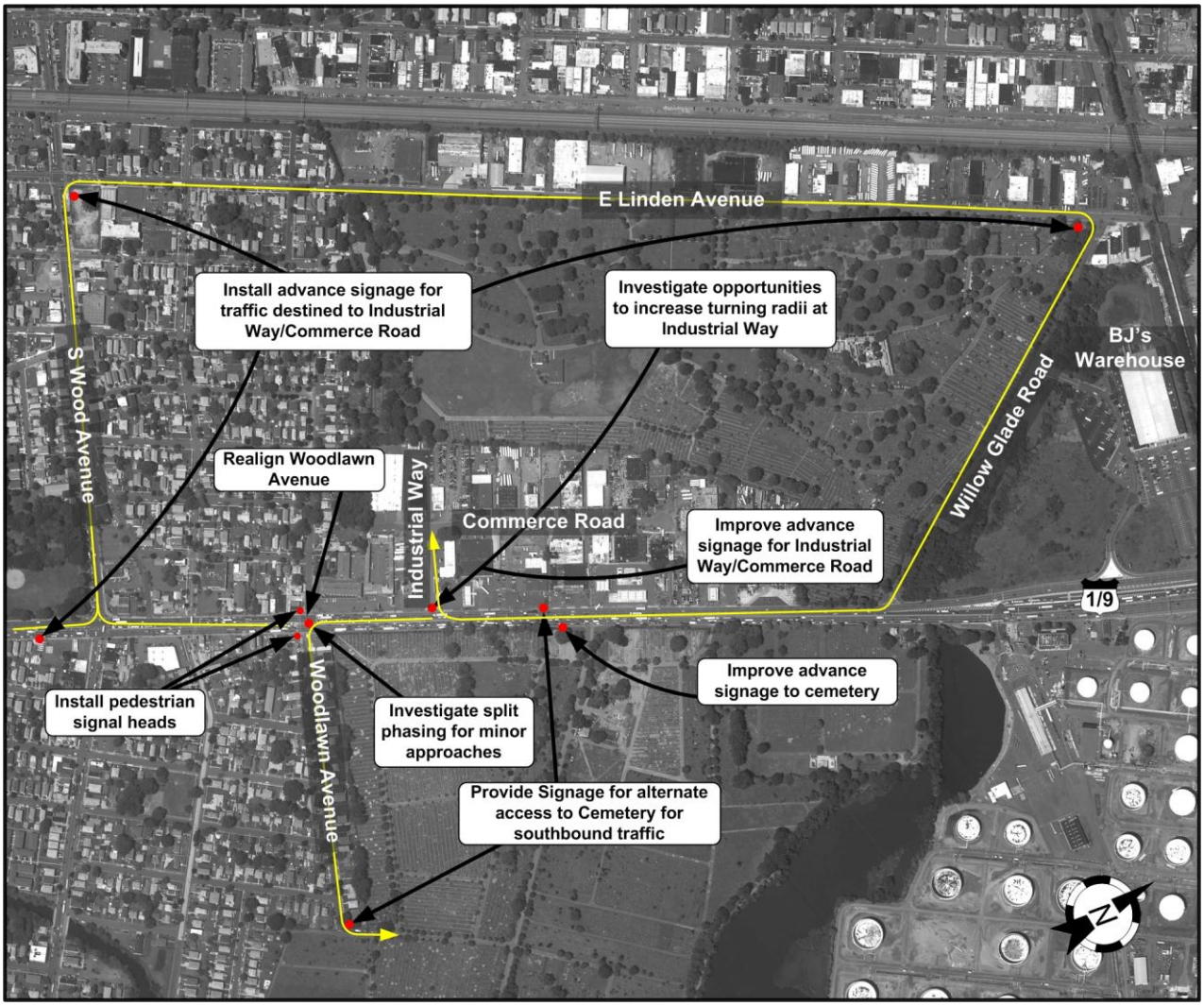


Figure 10 – Route 1&9 at Wood Avenue/Woodlawn Avenue/Willow Glade Road Improvements

Woodlawn Avenue, Linden

At the signalized intersection at Woodlawn Avenue, two deficiencies were noted during field visits. The eastbound and westbound approaches of Woodlawn Avenue are offset, yet move simultaneously during the existing signal timing plan. While a long-term improvement concept would involve realigning the existing approaches of Woodlawn Avenue, split-phasing should be investigated to alleviate the potential hazard caused by the offset approaches and resulting left-turn crashes. Split-phasing will allow the eastbound and westbound approaches of Woodlawn Avenue to have separate signal phases, reducing the number of potential conflicts at the intersection. Pedestrian signal heads are not installed for the crosswalk along the northbound approach of Route 1&9. In order to improve this deficiency, countdown pedestrian signal heads should be installed.

Finally, "don't block the box" pavement markings and signage should be installed at the intersection, as backups at this location often extend through the intersection.

Clinton Street, Linden

"Don't block the box" pavement markings and signage should be installed at the intersection, as backups at this location often extend through the intersection.

Tremley Point Access, Linden

In order to improve connections to Tremley Point, alleviate some traffic off of Wood Avenue and Stiles Avenue, and provide alternate access roadways that bypass residential neighborhoods along Stiles Street and Wood Avenue, a new potential linkage should be examined. Initial conceptual routes, shown below utilize the proposed upgraded intersections at Pleasant Street and Airport Road (being improved as part of the GM site redevelopment) and redirect truck traffic to and from Tremley Point along new alignment(s) and could include connections to Avenue C, Airport Road, Lower Road, and ultimately Wood Avenue. These proposed alignments would abut and or utilize portions of current or former railroad rights-of-way. These rights-of-way were identified on City of Linden tax maps, and would require further investigation for feasibility. These connections may require new at-grade railroad crossings located between Lower Road and Linden Airport. With the significant upgrades to Pleasant Street as part of the GM redevelopment the opportunity to utilize that capacity for truck traffic to the east could greatly improve overall truck flows and manage some of the U-Turn concerns as well. Care would need to be taken to avoid impacts to residential neighborhoods to the southwest.

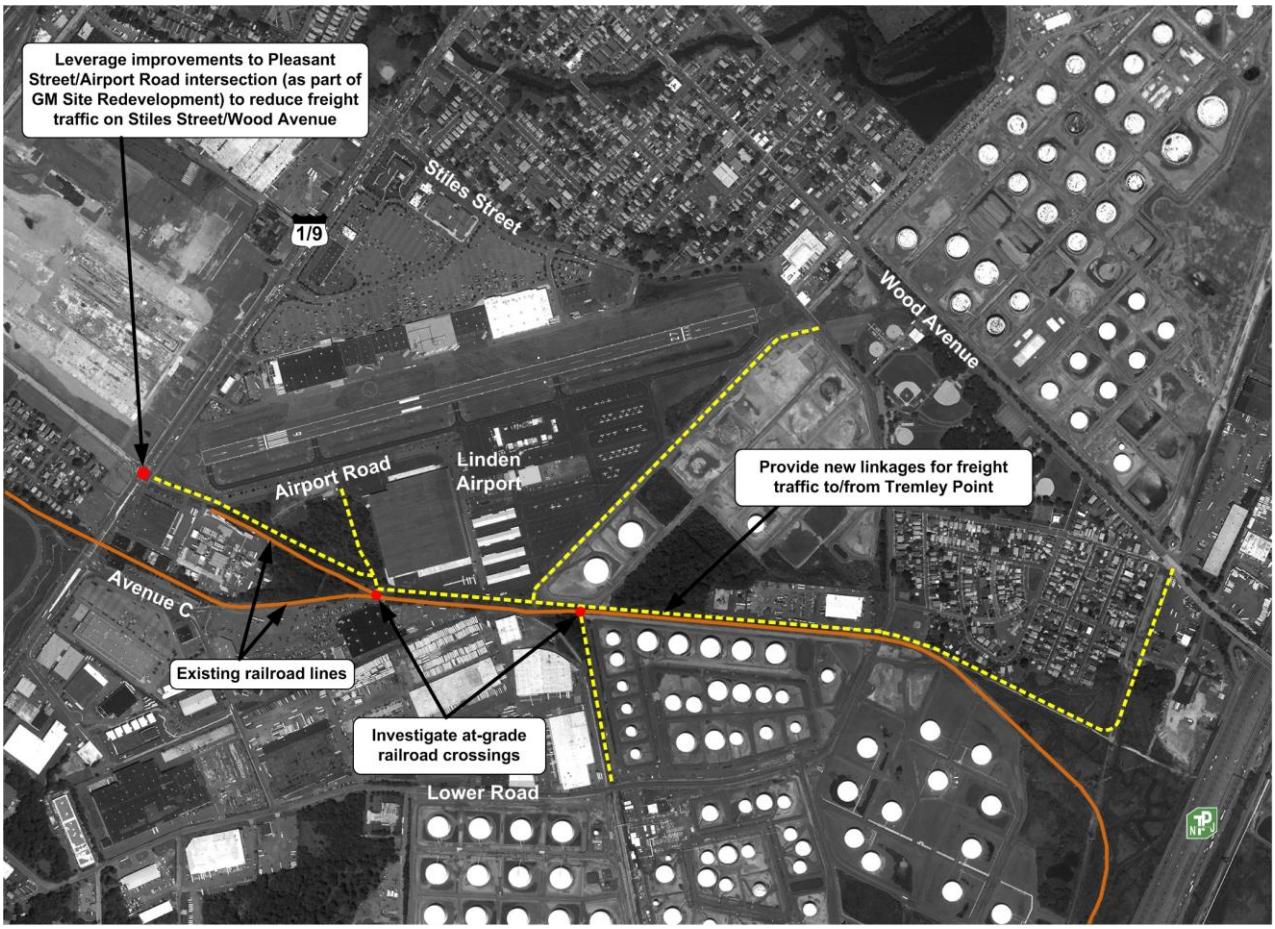


Figure 11 – Tremley Point Access Improvements

Morse Mill Road/BJ's Warehouse, Linden

A sidewalk gap was noted along Route 1&9 southbound between the BJ's Warehouse driveway and Morse Mill Road intersection. Further, a NJ Transit bus stop is located north of the BJ's Warehouse driveway that lacks sidewalk connections to any adjacent land uses. In order to improve access to transit, the bus stop should be moved to within the existing island at the BJ's Warehouse driveway. By shifting the bus stop to within the island, buses would no longer be forced to stop within a live lane of traffic. Further, the installation of sidewalk south to the signalized intersection at Morse Mill Road and west to the BJ's Warehouse property would link the bus stop to the major trip generators adjacent to the bus stop.

Finally, the existing crosswalk at Morse Mill Road should be restriped as a continental style crosswalk, denoting this area as a transitional location between urban and arterial roadway segments.

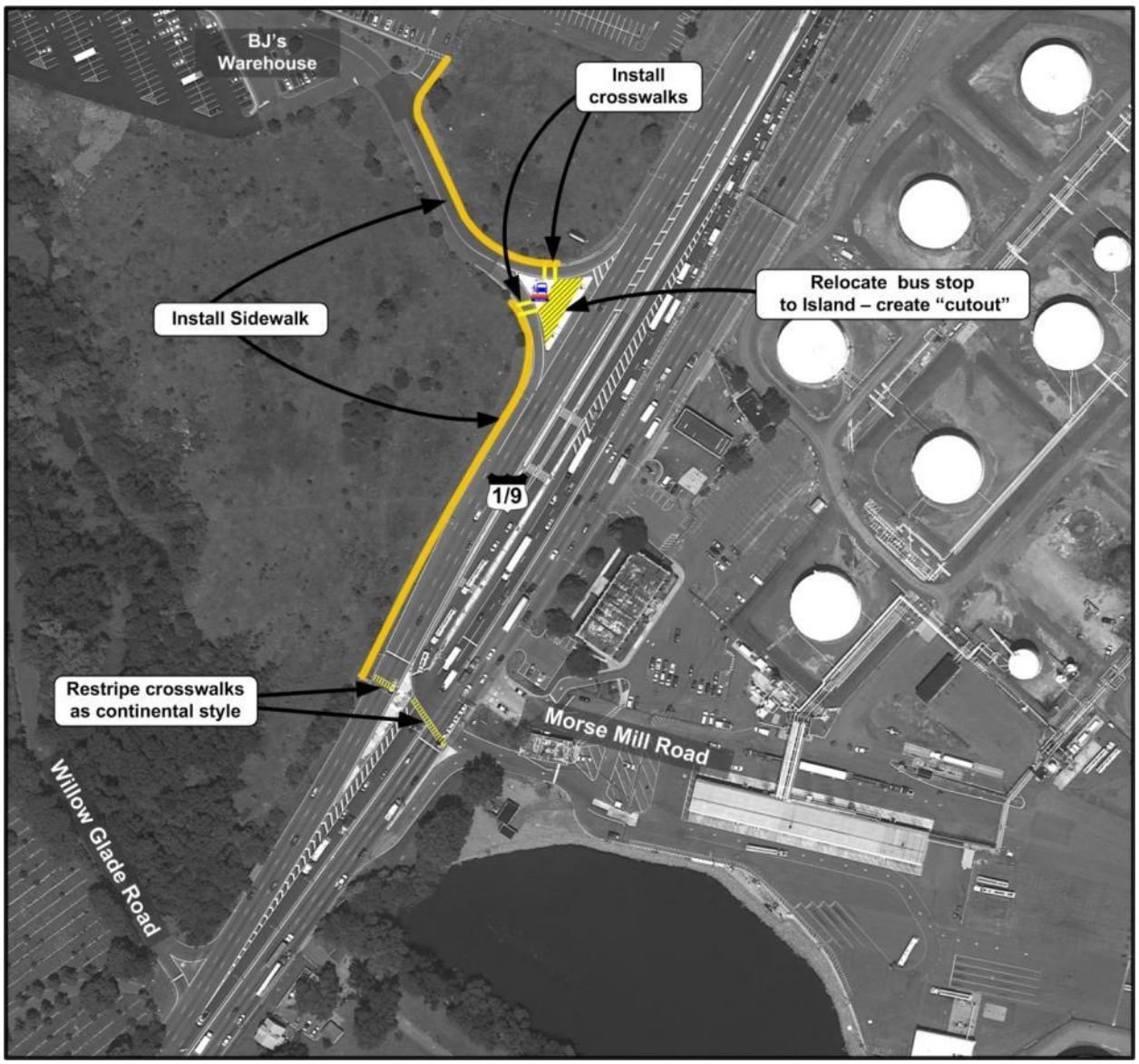


Figure 12 – Route 1&9 at BJ's Warehouse/Morse Mill Road Improvements

I-278 Interchange

This interchange was consistently cited as having significant problems with lane choice for traffic coming from Interstate 278 westbound, as well as traffic traveling southbound on Route 1&9. Driver confusion for traffic coming from Interstate 278 westbound is common as many vehicles exit to the right at the base of the ramp not knowing that doing so forces them to enter the Bayway Refinery complex. For traffic traveling southbound on Route 1&9, advance signage for traffic wishing to exit to the Bayway Refinery via the Morse Mill Road intersection is insufficient, especially given that the existing exit is to the left.

Two short-term improvements are recommended. First, the installation of on-pavement lane designation markings on the I-278 ramps will help alleviate the potential for same direction-side crashes. Second, upgrading advance signage with overhead signs directing traffic to the appropriate lanes to reach Route 1&9 south or the entrance to the Bayway Refinery for traffic on the I-278 ramps, as well as traffic traveling southbound on Route 1&9 may address current driver confusion within this section of the study corridor.

A long-term solution at this interchange should be investigated to shift the existing I-278 ramps to a flyover that merges with Route 1&9 from the right. This investigation should also include the installation of a forward jughandle which would remove the current left-lane access from the state highway for or traffic accessing ConocoPhillips from Route 1&9 southbound. These improvements could be combined with the longer term plan for the completion of the “missing moves” project of the I-278 Interchange.

Finally, local stakeholders noted that traffic from I-278 destined to the BJ’s Warehouse often attempts to cross three lanes of Route 1&9 south of the signalized intersection to access Willow Glade Road. In order to prevent this from occurring, the existing Jersey barrier should be extended to bar this movement. Signage directing BJ’s Warehouse traffic to use Wood Avenue/Linden Avenue/Willow Glade Road should be provided in advance of this area.

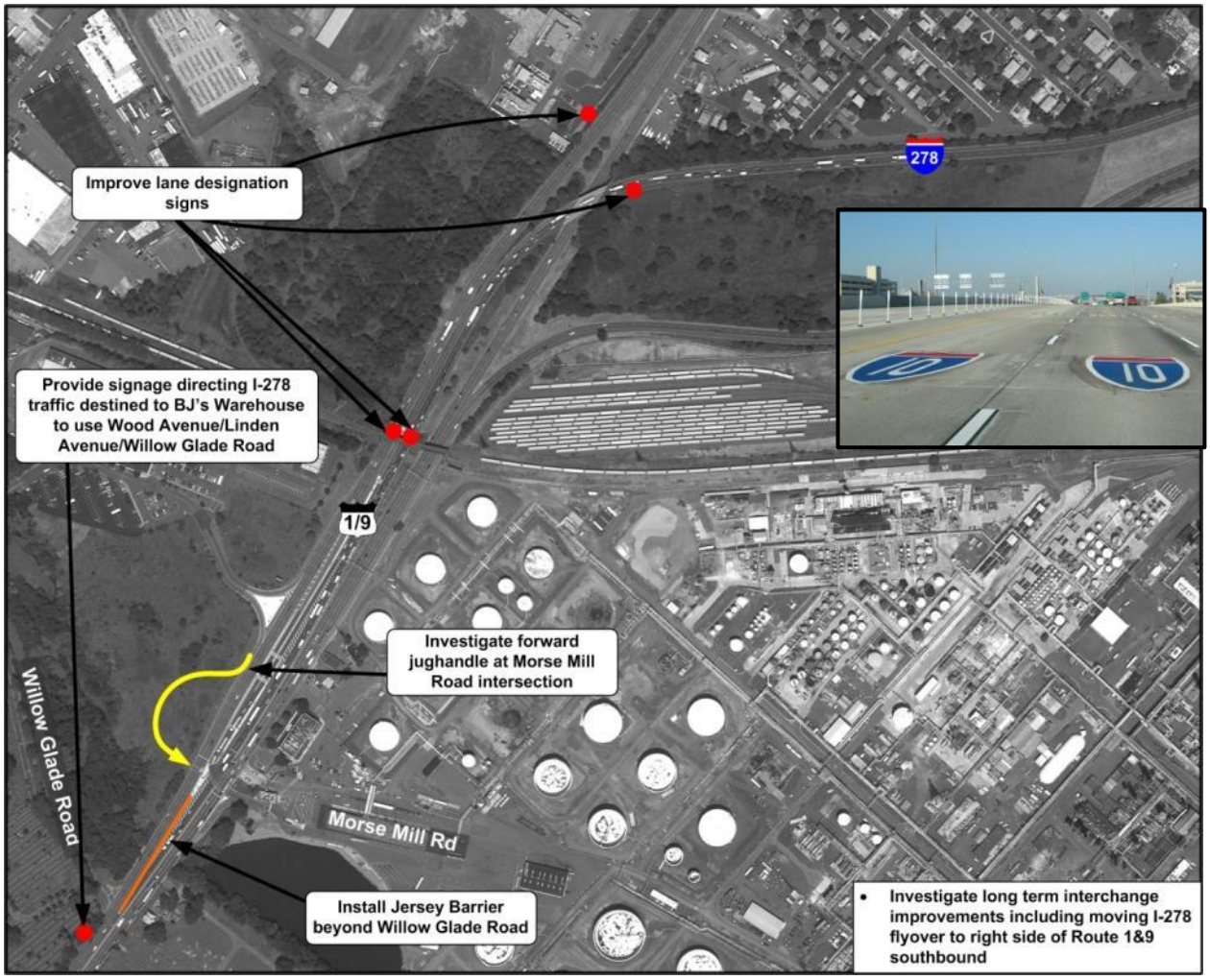


Figure 13 – Route 1&9 and I-278 Interchange Improvements

Bacheller Avenue, Linden

"Don't block the box" pavement markings and signage should be installed at the intersection, as backups at this location often extend through the intersection.

Figure 14 – Route 1&9 at Bacheller Avenue Improvements

Park Avenue, Linden

In order to address lighting concerns, a detailed lighting study should be completed, including a review of operability and maintenance of existing fixtures. To address the higher than average fixed object crashes at this location, a review of fixed object crashes should be undertaken to identify any similar cause or location of those crashes.

South of Bayway Circle, Elizabeth

The intersection of Edgar Road, Spofford Avenue, and Urbanowitz Avenue with Route 1&9 is a wide expanse of pavement that creates numerous potential traffic conflict points. Given the number of alternative access points to Route 1&9 located north (Myrtle Avenue) and south (Ashton Avenue) of this intersection, the removal of access to Route 1&9 at this intersection is recommended. This would allow for the extension of a sidewalk along Route 1&9 and provide for improved pedestrian access through this portion of the study area. Further study of this concept would be required, including a review of available cross-section width to allow for two-way traffic to be maintained between Edgar Road and Urbanowitz Avenue. The NJ Transit Route 56 currently traverses Edgar Road southbound to Route 1&9. If this improvement is implemented this route would need to be re-routed to make a right turn onto Myrtle Avenue, then make a right turn onto Route 1&9 in order to complete this concept.

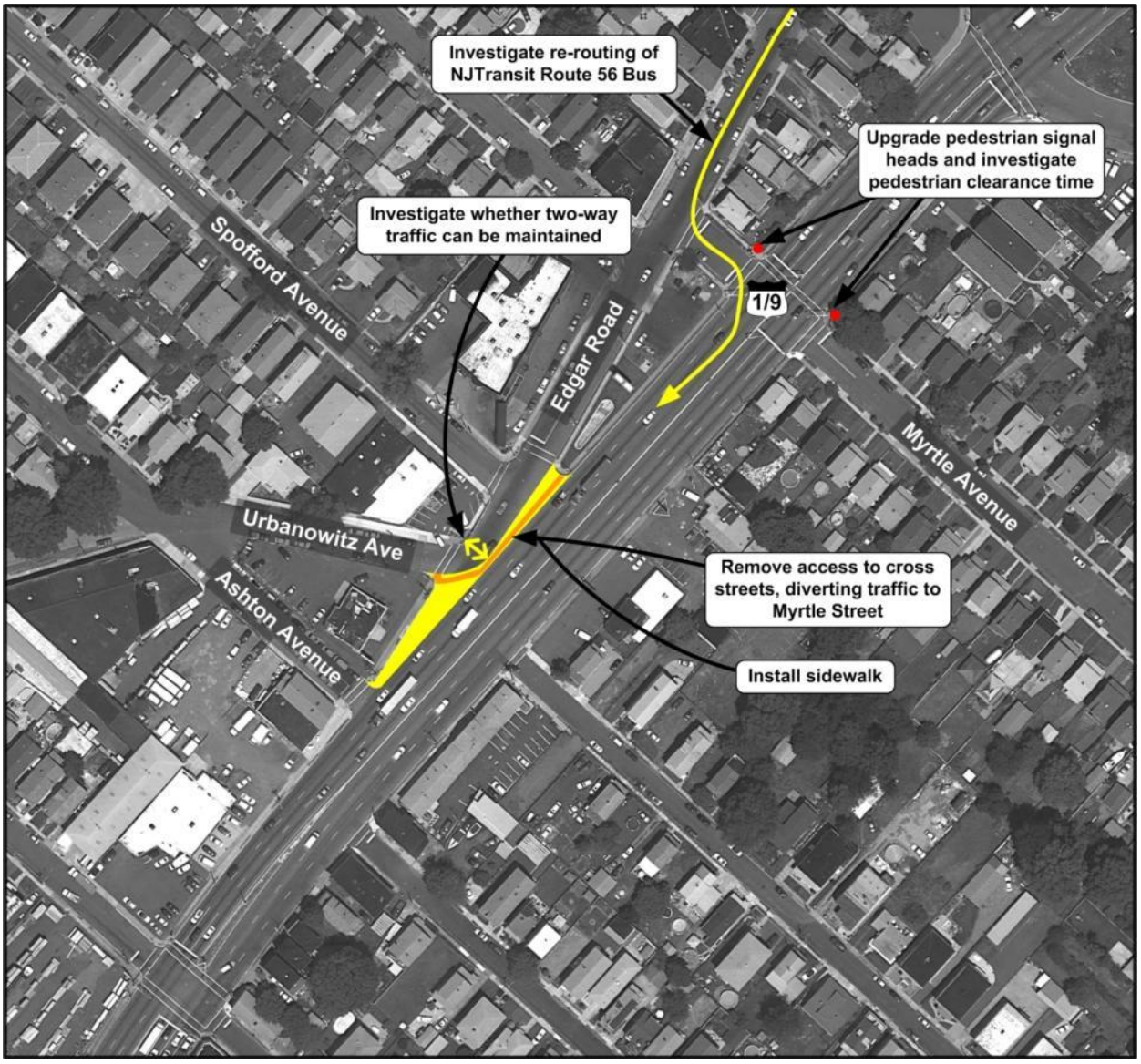


Figure 15 – Route 1&9 south of Bayway Circle and Myrtle Avenue Improvements

Myrtle Avenue, Elizabeth

The existing signalized intersection at Myrtle Avenue provides a pedestrian crossing only. The field visit to this location indicated that the existing pedestrian signal heads do not conform to current MUTCD standards, as they lack countdown timers. Further, no clearance time is given following the actuated pedestrian phase, as Route 1&9 is given a green signal immediately following the end of the Flashing Don't Walk phase. Given that this is a heavily used pedestrian crossing, the existing signal heads should be upgraded to include countdown timers and the pedestrian phase should include a minimum of two seconds of solid Don't Walk time prior to the green signal for Route 1&9.

Grier Avenue, Elizabeth

Several issues were identified at the signalized intersection of Route 1&9 and Grier Avenue. The skew of the intersection forces pedestrians to make lengthy crossings of the state highway, while the fifth leg of the intersection (Gibbons Court) a one-way street (to Route 1&9) south of the signal, forces pedestrians to traverse a long and unmarked section of pavement. Pedestrian crossings are particularly important here given the proximity of Reilly Middle School located on Grier Avenue two blocks west of Route 1&9.

In order to improve pedestrian conditions at the intersection continental style crosswalks and median refuges are recommended for the northbound and southbound approaches. A review of pedestrian crossing times should be undertaken as well, and ultimately the extension of the existing pedestrian phase at this intersection should be considered.

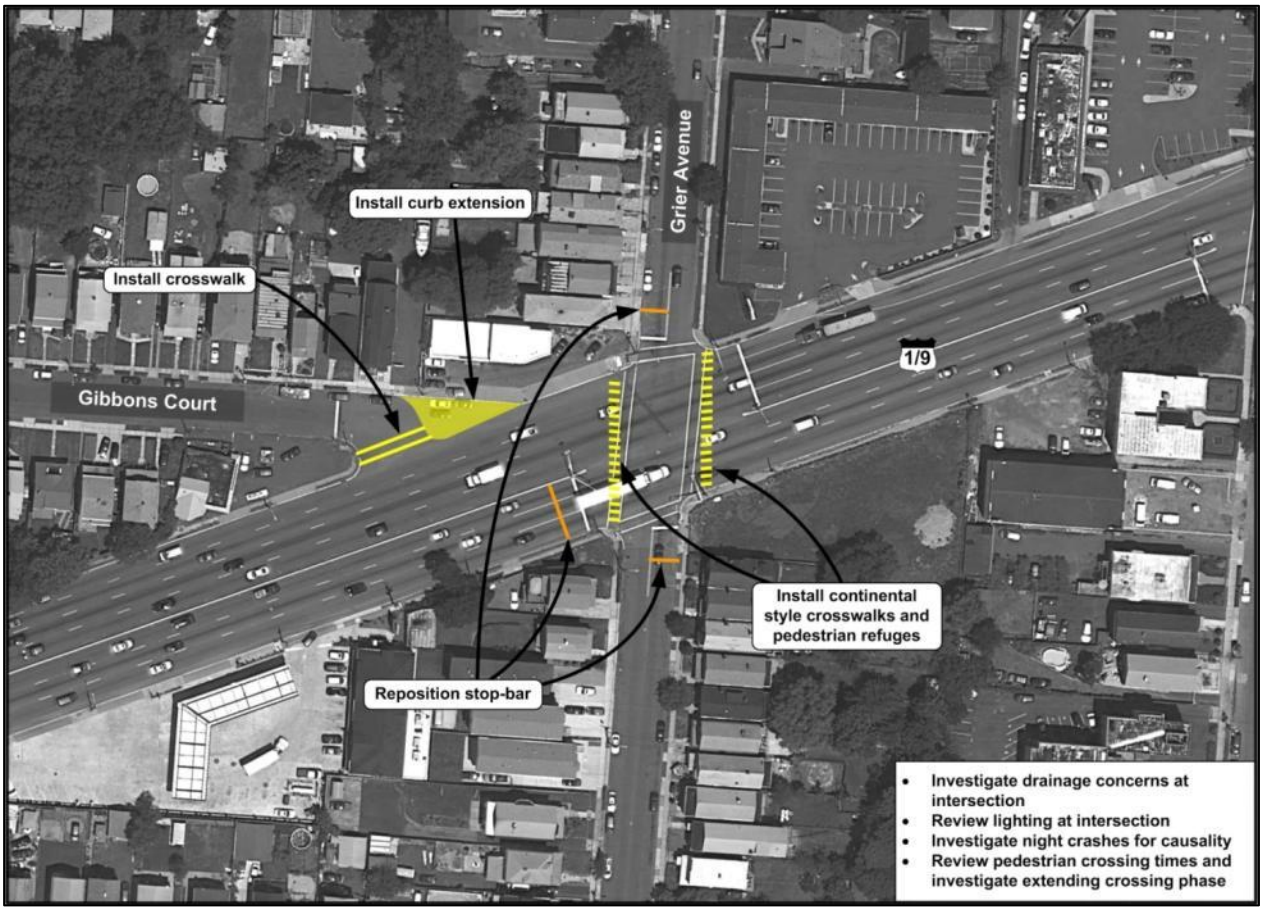


Figure 16 – Route 1&9 at Grier Avenue Improvements

At the skewed leg with Gibbons Court, a curb extension is recommended to shorten the pedestrian crossing and lessen the skew of the intersection. This would require the installation of a crosswalk along this leg as well as revisions to the existing driveway access for the business on the northwestern corner of the intersection.

Lighting and drainage concerns should be addressed as well following further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Existing stop bars on the Grier Avenue approaches should be repositioned away from the intersection to allow heavy vehicles to more easily turn right from Route 1&9.

South Broad Street, Elizabeth

The signalized intersection at South Broad Street and Route 1&9 was identified as one of the critical intersections within the study area in terms of pedestrian and crash concerns. This intersection is particularly important for pedestrians as it serves as the only direct connection between southeastern Elizabeth and the Elizabeth Central Business District. Another concern at this intersection is the used car business on the northeastern corner that routinely encroaches on the sidewalk with parked vehicles. Also, vehicles were observed parked in the right lane of the westbound approach of South Broad Street, which restricts the flow of through and left-turning traffic at the intersection.

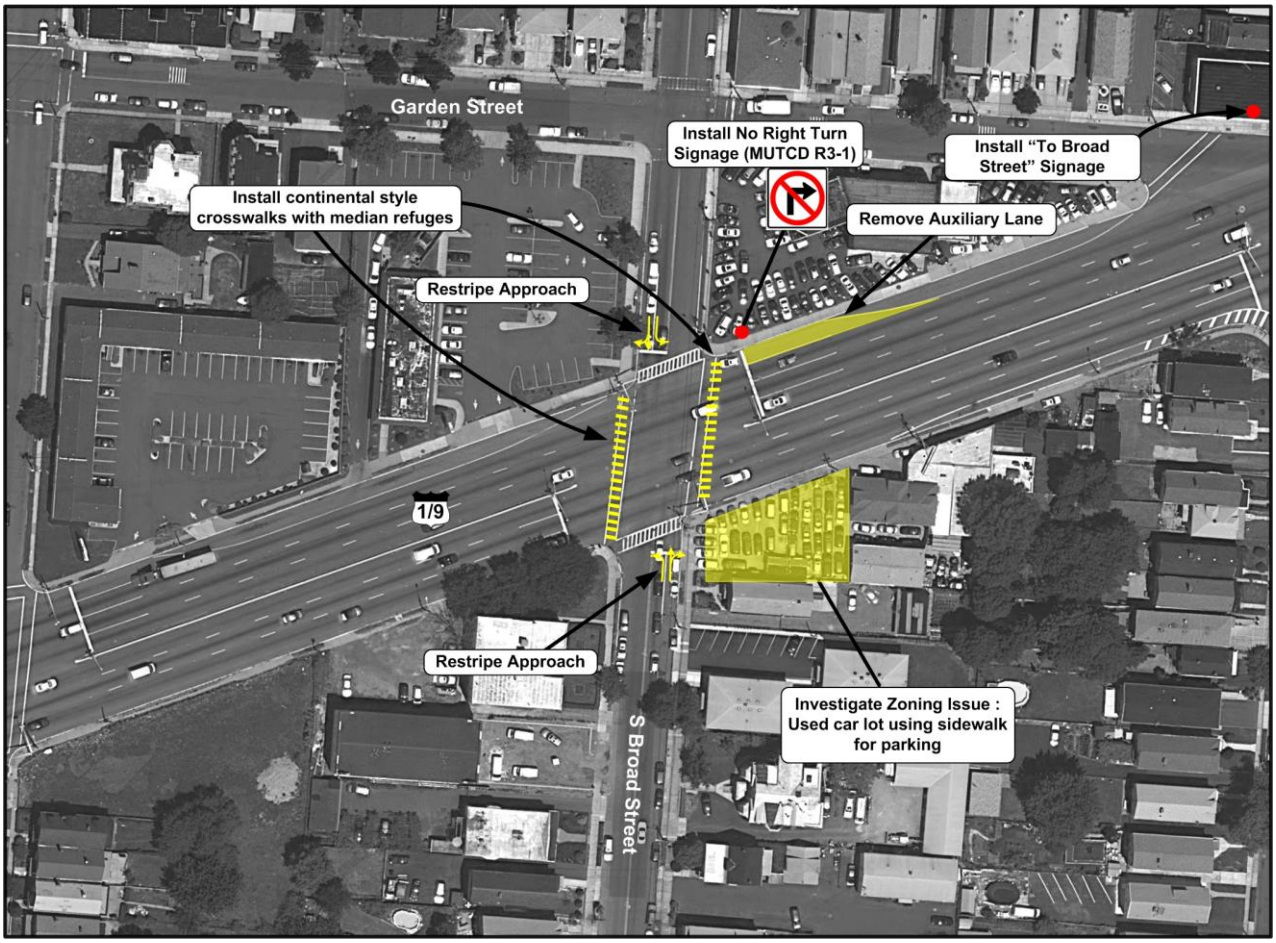


Figure 17 – Route 1&9 at South Broad Street Improvements

To highlight the presence of pedestrians in this area, and to denote this location as a transitional area between arterial and urban areas, street trees, narrowed lanes, striped shoulders, and/or improved sidewalks should be considered.

In order to improve pedestrian conditions at this intersection, continental style crosswalks with median refuges are recommended. These would provide safer crossing opportunities for pedestrians including those who cannot complete the crossing within a single cycle.

Vehicular movements can be improved at the intersection by eliminating right turns from Route 1&9 southbound to South Broad Street. This movement can be made by turning right from Route 1&9 onto Garden Street (just north of South Broad Street) to access South Broad Street from Garden Street. Proper advance signage directing traffic to Garden Street would be required for this recommendation. This would allow the removal of the existing auxiliary lane on Route 1&9 southbound approaching the intersection.

In order to improve traffic flow for westbound vehicles the current two-lane approach should be re-striped to provide a dedicated left-turn lane and shared through-right turn lane. Similar striping should be provided for the eastbound approach as well.

Lighting and drainage concerns should be addressed as well via further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Finally, the City of Elizabeth along with NJDOT should enforce no parking on the sidewalks at the used car dealership which would allow for pedestrians to more easily travel north of the intersection.

Maple Avenue, Elizabeth

The signalized intersection at Maple Avenue includes legs to Garden Street north and south of the intersection. The Garden Street leg south of the intersection is one-way (from Route 1&9 southbound) and provides access to South Broad Street. North of the intersection, Garden Street is two way (to/from Route 1&9 northbound) and primarily serves as a link to Green Street. The pedestrian crossings on the northbound and southbound approaches of Route 1&9 are among the longest in the corridor and are challenging for the many pedestrians that use this intersection, particularly those who are traveling to and from the Edison Vocational School located just east of the intersection. For southbound vehicular traffic, the intersection is challenging as the recently reconstructed Elizabeth River Viaduct- allows for higher travel speeds, while the signalized intersection at Maple Avenue appears around a somewhat blind curve with minimal advance warning.

To highlight the presence of pedestrians in this area, and to denote this location as a transitional area between arterial and urban areas, street trees, narrowed lanes, striped shoulders, and/or improved sidewalks should be considered.

In order to improve conditions at this intersection, several treatments similar to those used at Grier Avenue are recommended. First, continental style crosswalks with median refuges would provide safer crossing opportunities for pedestrians including those who cannot complete the crossing within a single cycle. In order to reduce the skew of the Garden Street westbound leg at the intersection, a curb extension should be constructed to slow traffic turning to Garden Street. This

would also shorten the crosswalk, allowing pedestrians traveling along Route 1&9 to do so more easily. Finally, existing crossing times at the intersection should be reviewed, including an analysis of an extended pedestrian crossing phase.

In order to improve driver expectations for southbound traffic, advance flashing "Red Signal Ahead" signage should be installed at an appropriate distance approaching the intersection. Further, advance signage directing traffic to Maple Avenue or Garden Street should be provided.

To address the higher than average fixed object crashes at this location, a review of fixed object crashes should be undertaken to identify any similar cause or location of those crashes.

Lighting and drainage concerns should be addressed as well via further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken.

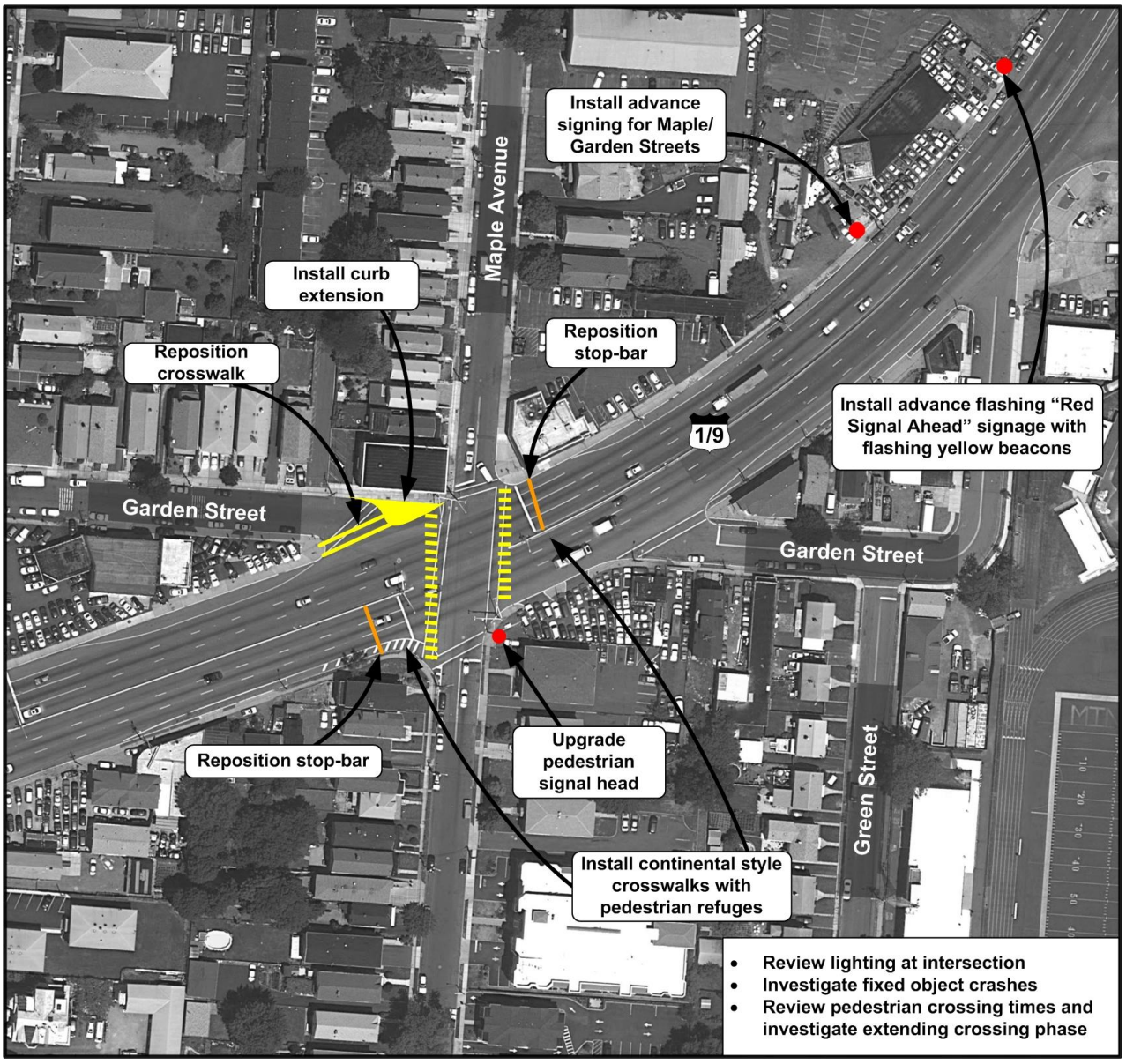


Figure 18 – Route 1&9 at Maple Avenue Improvements

A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Jersey Avenue, Elizabeth

The signalized intersection of Route 1&9 and Jersey Avenue was recently improved as part of the Elizabeth River Viaduct improvement. However, the intersection remains challenging for pedestrians who must cross the approximately 130-foot crosswalk on the northbound approach of Route 1&9. Crash data further indicates the problems pedestrians have at this intersection, as six crashes (including one fatality) involving pedestrians were reported during the three year analysis period. Further intensifying the pedestrian concerns at this intersection is the fact that pedestrian push buttons on the northwest and southwest corners of the intersection were not functioning during a field visit. Like Route 1&9 southbound traffic approaching Maple Avenue, northbound Route 1&9 traffic approaching Jersey Avenue can travel at higher rates of speed due to the recent improvements to the Elizabeth River Viaduct, and drivers unfamiliar with the area may not expect a signalized intersection at the foot of the bridge.

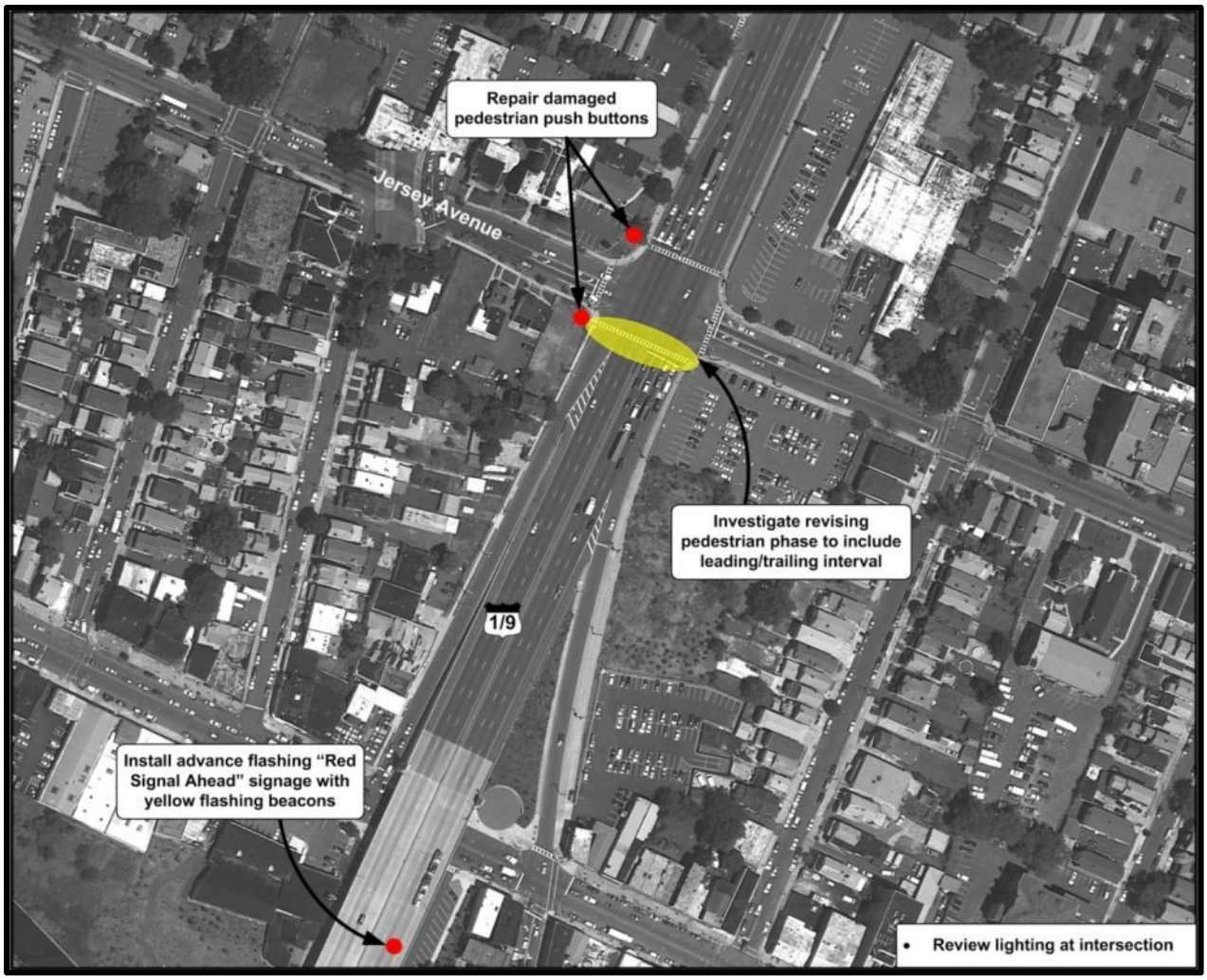


Figure 19 – Route 1&9 at Jersey Avenue Improvements

Due to the unique lane configuration of Route 1&9 at the intersection, including ramps to and from Elizabeth Avenue, additional pedestrian crossing time in the form of leading (prior to the release of turning traffic) or trailing (prior to the release of Route 1&9 traffic) time should be provided. Pedestrian countdown signal heads should be installed for all crossings at the intersections. Finally, the damaged pedestrian push buttons should be repaired to ensure pedestrians are provided adequate crossing time for the extremely long crossings of Route 1&9.

In order to improve driver expectations for northbound traffic, advance flashing "Red Signal Ahead" signage should be installed at an appropriate distance approaching the intersection.

Lighting and drainage concerns should be addressed as well via further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Finally, wayfinding signage should be installed at and approaching this intersection to ensure drivers are aware of linkages to the Elizabeth CBD and other points of interest.

East Grand Street, Elizabeth

The signalized intersection at Route 1&9 and East Grand Street was the only intersection within the study area to experience multiple pedestrian fatalities during the analysis period. A fatality involving a fixed object also occurred at this intersection. This intersection has drainage and pavement issues, most notably on the eastbound approach of East Grand Street, where deteriorating pavement has rendered the crosswalk nearly invisible. For vehicular traffic traveling southbound on Route 1&9, the overpasses of Magnolia Avenue and the railroad in addition to the vertical curvature of the road, all reduce the visibility of the approaching signal at East Grand Street.

An analysis of the causality of the fatalities should be completed and appropriate countermeasures developed. To highlight the presence of pedestrians in this area, and to denote this location as a transitional area between arterial and urban areas, street trees, narrowed lanes, striped shoulders, and/or improved sidewalks should be considered.

In order to improve conditions for pedestrians, the drainage issue on the southwestern corner of the intersection should be addressed prior to any pavement or striping repairs. Pedestrian countdown signal heads should be installed for all crossings at the intersections.

In order to improve driver expectations for southbound traffic, advance flashing "Red Signal Ahead" signage and pedestrian crossing ahead signage should be installed in front of the Magnolia Avenue overpass approaching the intersection.

Lighting and drainage concerns should be addressed following further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

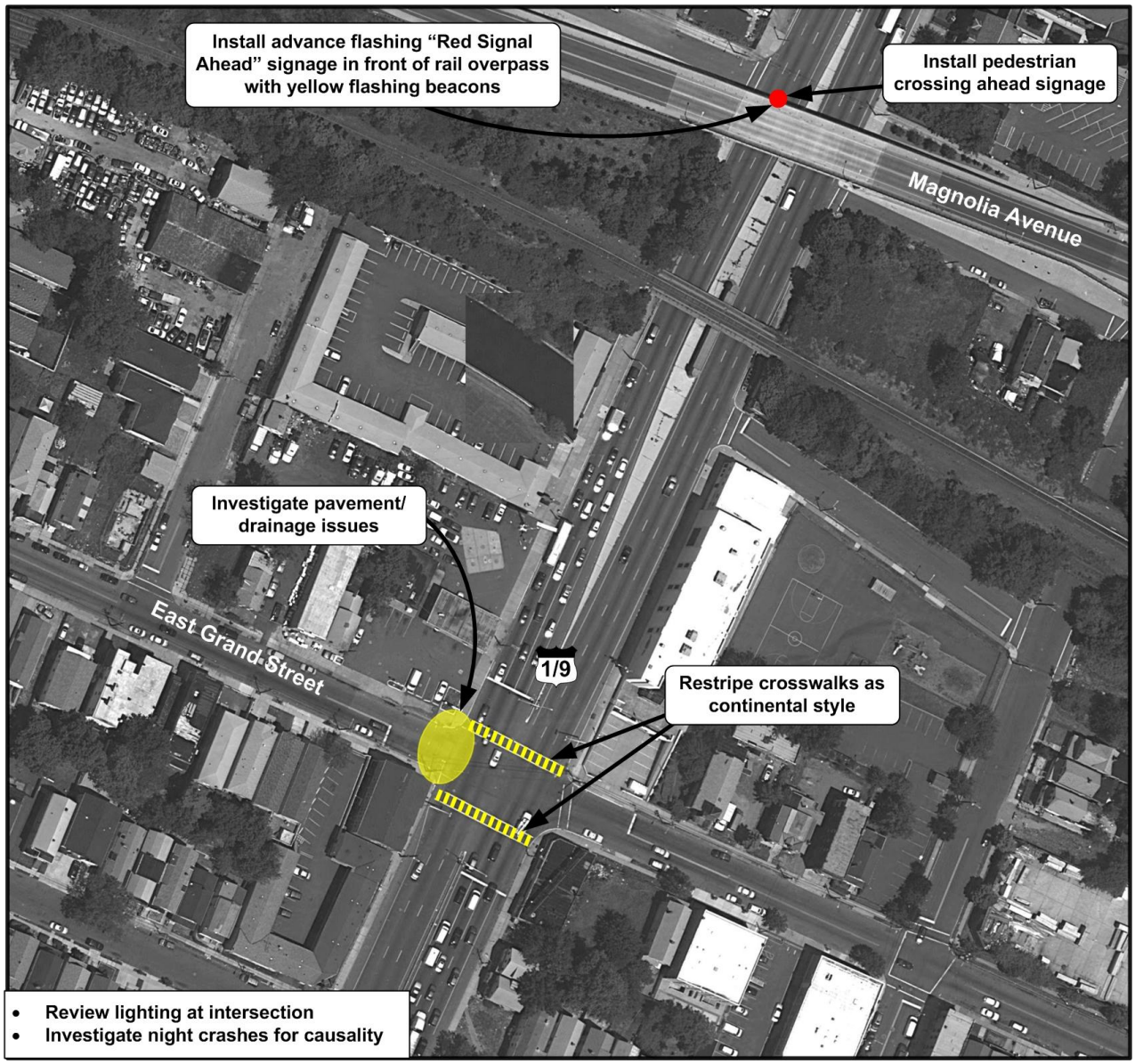


Figure 20 – Route 1&9 at East Grand Street Improvements

Bond/Anna/Flora/Olive Streets, Elizabeth

The signalized intersections at Bond, Anna, Flora, and Olive Streets are located within an approximately 1,100 foot section of the study area.

Improvements to the signalized intersections at Bond, Anna, Flora, and Olive Streets should be investigated to improve vehicular circulation through this section of the study area while providing an environment where pedestrians can easily cross Route 1&9.

Lighting and drainage concerns should be addressed following further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Finally, bus stops located near the intersections should be upgraded to include a shelter and/or seating, as well as increased route and connections information.

Figure 21 – Route 1&9 at Bond/Anna/Flora Street Improvements

Fairmount Avenue, Elizabeth

Fairmount Avenue serves as a major freight route for traffic, ultimately connecting NJ Route 27 with the freight uses along Division Street adjacent to the New Jersey Turnpike. Several improvements to this intersection are aimed at improving the flow of heavy vehicles turning at this intersection.

First, the stop bars along the Fairmount Avenue approaches should be moved back from the intersection to allow heavy vehicles turning right from Route 1&9 to do so without encroaching on vehicles queued along Fairmount Avenue. With the repositioning of the stop bars on the Fairmount Avenue approaches, the existing left-turn bays on Fairmount Street should be extended to allow for increased storage, especially given the high volumes of heavy vehicles on these approaches. A longer-term solution for traffic turning right from Route 1&9 northbound to Fairmount Avenue would be to provide a dedicated right-turn only lane along Route 1&9, requiring a widening of the state highway. Finally, split phasing should be considered for the Fairmount Avenue approaches, given the high number of left turn and right angle crashes.

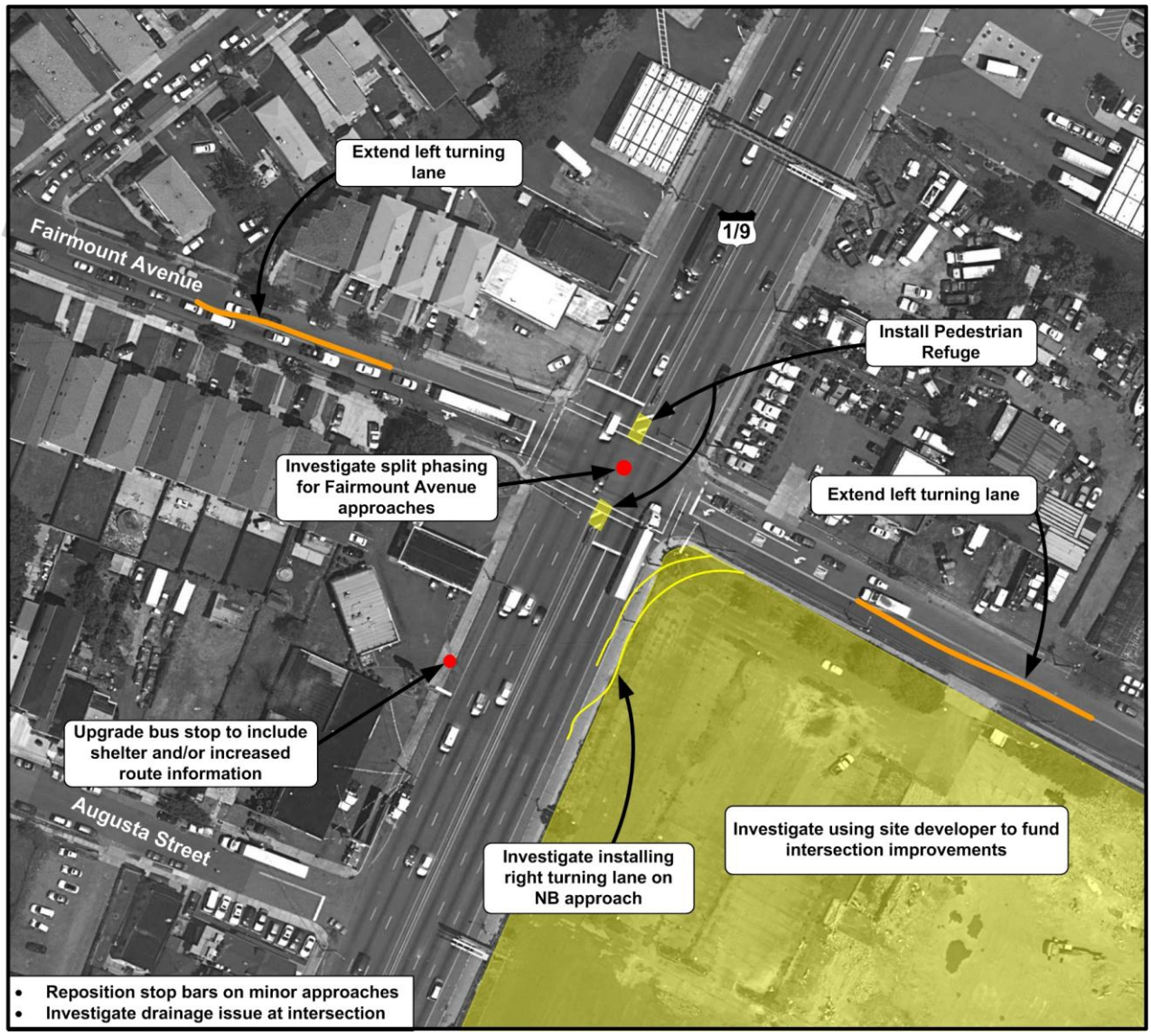


Figure 22 – Route 1&9 at Fairmount Avenue Improvements

Funding for improvements to the Fairmount Avenue intersection may be leveraged by making them a contingency of the proposed Commerce Oakmont Center redevelopment on the southeastern corner of the intersection.

Lighting and drainage concerns should be addressed as well via further detailed analysis. A review of drainage and improvements aimed at fixing existing documented drainage issues should be undertaken. A lighting study would include a review of operability and maintenance of existing fixtures and targeted improvements for pedestrian scaled lighting. Finally, a detailed review of crashes occurring at night should be undertaken to identify any similar cause of those crashes.

Finally, the bus stop located near the intersection should be upgraded to include a shelter and/or seating, as well as increased route and connection information.

North Avenue, Elizabeth

Improvements to the intersection of Route 1&9 at North Avenue completed in early 2007 upgraded and reconfigured approaches of the intersection. Therefore recommendations at this intersection are limited to transit and pedestrian-focused improvements.

The existing bus stop located on the southeastern corner of the intersection should be repositioned to improve pedestrian access, which currently is deficient. Any repositioned bus stop should include a shelter and/or seating, as well as increased route and connection information. The existing sidewalk along the northbound jughandle, which serves as the primary access way to North Avenue from Route 1&9 was overgrown during a field visit and should be cleared and maintained more consistently.

Given the length of the crossing of Route 1&9, a long-term solution at this intersection may be a pedestrian overpass to allow pedestrians to traverse the numerous lanes and more than 200 foot long crosswalk.

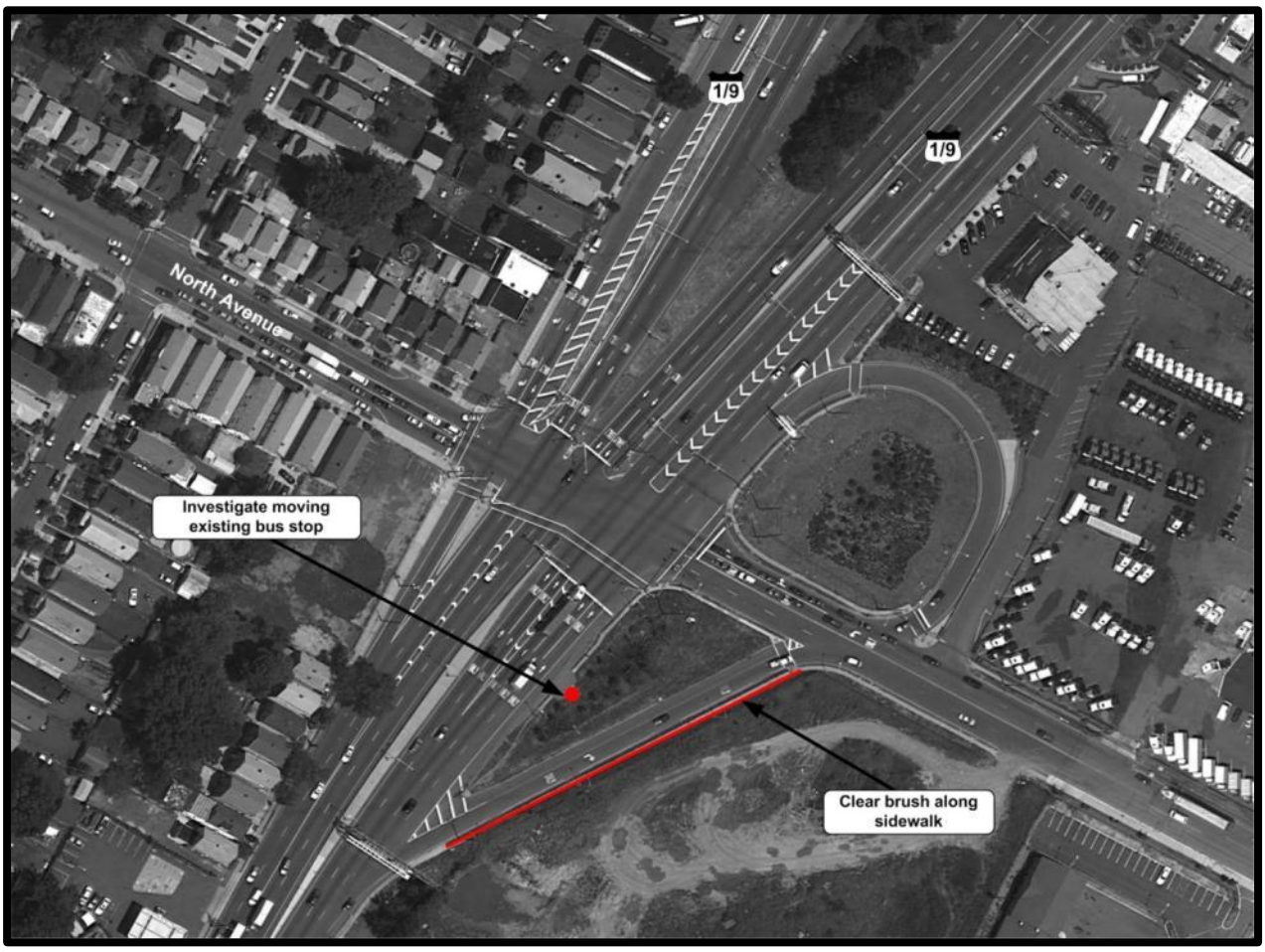


Figure 23 – Route 1&9 at North Avenue Improvements

C. Implementation

Highway construction and improvements often impact economic development and real estate values. Sometimes the principal goal of highway improvements is to help spur economic development, while other times projects are more focused on safety and traffic alleviation. The planned highway improvements along the Route 1&9 Corridor in Union County, New Jersey fall into the latter category. These proposed enhancements are not driven primarily by economic development goals. However, the roadway improvements still have the potential to create positive indirect and induced impacts in the surrounding area.

The project team reviewed a number of studies on the link between highway improvements and local economic development and real estate values. A cursory analysis of existing businesses within the Route 1&9 Corridor to evaluate the potential impact of highway improvements to existing businesses on an order-of-magnitude scale was also completed.

Highway improvements have the potential to impart several measurable benefits for the local and/or regional economy. Finding revealed that there are several potential benefits including:

- Time savings (cost savings) for businesses and commuter trips,
- Higher employment and wage levels
- Decreased costs for most industries
- Safety and geometric improvements facilitate freight commodity flows and production schedules,
- Enhanced visitor and tourist travel
- Local rehabilitation and maintenance projects improve access and traffic flow for local businesses and help to attract new business to the region
- Cost savings and lower per unit costs help businesses grow and may be passed on to consumers
- Increased adjacent property values and development densities

However, the literature suggests that the extent to which there are indirect and induced benefits from highway improvements is dependent on a number of variables and conditions. Put another way, not every highway improvement project will necessarily spur across-the-board, measurable economic development. For example, industries that are freight-intensive (such as retail and manufacturing) generally likely will benefit more from highway improvements than other industries. Highway development also can contribute to decentralization and lower density development patterns, which could negate some of the economic benefits. However, there is a consensus that highway improvements are sometimes necessary but not sufficient on their own to promoting economic development.

Route 1&9 currently serves a substantial number of commercial and industrial businesses along the corridor. Based on empirical research concerning highways, nationally, the safety, traffic, and access improvements proposed for along the corridor passing through Linden, Rahway and Elizabeth would likely yield meaningful local and regional economic benefits through increased efficiency, easier customer access, and decreased operating costs.

An analysis of existing businesses within the corridor was conducted on a quarter-mile area or buffer around Route 1&9 between Randolph Avenue in Rahway and McLellan Street in Elizabeth. It is reasonable to assume that most businesses located within the quarter-mile buffer area rely on the highway to some extent (shipment or receiving of goods, access by customers and employees,

etc.), and, therefore, would likely benefit, to varying degrees, from the planned safety improvements.

This area contains an estimated 1,206 commercial and industrial businesses. As of May 2011, these businesses employed over 12,000 workers and generated estimated total local annual sales of approximately $2.5 billion (in 2011 dollars). Many of the most frequently found businesses within the buffer area, including full-service restaurants (63 businesses), supermarkets and grocery stores (26), automotive repair (25), used car dealers (21), and several others, would likely benefit from proposed highway safety improvements. For example, if the gains in business efficiency, lower operating costs and increased accessibility resulting from proposed improvements along Routes1 & 9 resulted in a five percent increase over current sales and employment metrics attributable to corridor businesses, an additional $1.25 million in annual sales (in 2011 dollars) and over 600 new jobs could be realized.

The project team has completed research on various funding mechanisms for improvements along the corridor. Based on the research, the team recommends that Union County officials, in collaboration with officials from the Cities of Elizabeth, Linden, and Rahway, explore the ability to negotiate whole improvements with various developers along the seven-mile Route 1&9 Corridor, as a means of helping fund prospective urban design improvements along the corridor. Either the creation of a Transportation Development District or, less likely, establishing a Tax Increment Financing scheme is worthy of further consideration. However, the challenges to pursuing funding from these mechanisms may be too arduous to warrant their pursuit.

The following implementation matrix summarizes these concepts improvement concepts. The matrix identifies potential responsible and supporting agencies/entities, timeframe, order of magnitude cost, and potential environmental barriers in the project vicinity. The majority of the concepts fall under NJDOT jurisdiction, however in order for projects to advance, support must be provided by the local governments including Union County and the Cities. In order to achieve these improvements the implementing and supporting jurisdictions should work together with the development community to negotiate cost sharing of improvements as benefits will be received by all parties.

The project team has developed problem statements to submit to NJDOT in order to advance the concepts which fall under NJDOT jurisdiction. Union County and the NJTPA will work with the other responsible agencies to advance the remaining concepts. The matrix is included on the following 11 pages.

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Maintenance (Corridor-Wide)	Streamline maintenance requests and provide consistent contact for ongoing landscaping or street-cleaning issues.	NJDOT	Rahway/Linden/Elizabeth	Short	Low	
	Enforce lighting and maintenance with PSE&G	NJDOT	Rahway/Linden/Elizabeth	Short	Low	
Pavement (Corridor-Wide)	Resurface corridor within Linden and Elizabeth using modern pavement design or concrete to handle the high volumes of traffic, including heavy vehicles.	NJDOT		Mid	Med	
	Replace existing striping and pavement markings with thermoplastic markings to extend lifespan of markings and reduce maintenance needs.	NJDOT		Mid	Low/Med	
	Upgrade on-street pavement markings to further distinguish bus stop areas from other roadway areas along the route.	NJDOT	NJ Transit	Long	Low/Med	
Lighting (Corridor-Wide)	Review existing lighting conditions within the corridor, including the identification of damaged or non-operating fixtures.	NJDOT		Short	Low	
	Provide pedestrian scale lighting at locations where pedestrian traffic is highest.	NJDOT		Mid	Med	
	Measure luminance levels for roadway, including vertical luminance levels	NJDOT		Short	Low	
	Develop lighting ordiance to address off-roadway lighting issues	Rahway/Linden/ Elizabeth		Short	Low	
Signage (Corridor-Wide)	Develop signature wayfinding signage for the corridor. Focus signage on points of interest to reduce U-Turns and use of local streets	NJDOT/Rahway/Linden/ Elizabeth	Union County	Mid	Med	
	Install backlit cross-street signage at all signalized intersections.	NJDOT		Mid	Med	
	Improve signage to and from transit stops and points of interest	NJ Transit	Rahway/Linden/Elizabeth	Short/Mid	Low/Med	
	Consistently sign Route 1&9 throughout corridor as Route 1&9	NJDOT	Union County/Rahway/Linden/ Elizabeth	Short/Mid	Low/Med	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Sidewalks and Pedestrian Crossings (Corridor-Wide)	Move traffic stop bars on Route 1&9 further back at intersections where appropriate	NJDOT	Rahway/Linden/Elizabeth	Mid	Low	
	Investigate new technologies in pedestrian detection/activation	NJDOT	Rahway/Linden/Elizabeth	Short	Low	
	Provide missing sidewalk links	NJDOT	Rahway/Linden/Elizabeth	Short/Mid	Low	
	Restripe crosswalks as continental style in transition areas	NJDOT	Rahway/Linden/Elizabeth	Short/Mid	Low	
	Improve sidewalk access to transit stops	NJDOT/NJ Transit	Rahway/Linden/Elizabeth	Short/Mid	Low	
	Ensure sidewalks to bus stops get snow clearance priorty	NJDOT/NJ Transit	Rahway/Linden/Elizabeth	Short	Low	
Transit (Corridor-Wide)	Investigate feasibility of shuttle service to major destinations within corridor	NJ Transit	Union County/Rahway/Linden/ Elizabeth	Short/Mid	Med	
	Improve lighting at bus stops to provide additional security and further designate their location for users and bus drivers.	NJDOT	Rahway/Linden/Elizabeth NJTransit	Mid	Med	
	Upgrade existing bus stops to provide additional information regarding service frequency and connections.	NJ Transit	Rahway/Linden/Elizabeth	Mid	Low	
	Make physical improvements including bus shelters and/or seating as space permits.	NJ Transit	Rahway/Linden/Elizabeth	Mid/Long	Low/Med	
	Provide pedestrian scale lighting in different spectrum to further denote bus stop areas	NJDOT	Rahway/Linden/Elizabeth NJTransit	Long	Med	
Bicycle Access (Corridor-Wide)	Consider potential alternate parallel routes.	Union County/Rahway/ Linden/Elizabeth		Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Milton Avenue/Paterson Street	Reposition stop bar on southbound approach	NJDOT	Union County/Rahway	Mid	Low	Known potentially contiminated site, Flood hazard area, Groundwater contamination
	Install sidewalk north of the intersection to allow pedestrian movements between Milton Avenue and East Grand Avenue.	NJDOT	Union County/Rahway	Short/Mid	Low	
	Reposition existing crosswalk on southbound approach and restripe as continental-style.	NJDOT	Union County/Rahway	Mid	Low	
	Install advance flashing "red signal ahead" signage along northbound approach	NJDOT	Union County/Rahway	Mid	Low/Med	
	Investigate/Improve drainage	NJDOT	Union County/Rahway	Short/Mid	Low/Med	
	Improve pedestrian scale lighting.	NJDOT	Union County/Rahway	Mid	Med	
	Ensure lighting is operable and maintained.	NJDOT	Union County/Rahway	Short	Low	
	Install advance warning signing regarding pedestrians.	NJDOT	Union County/Rahway	Short	Low	
	Investigate configuring as transitional area – sidewalks, street trees, reduce lane widths.	NJDOT	Union County/Rahway	Mid	Low/Med	
	Investigate narrowing lanes or striped shoulder along newly constructed structure south of intersection	NJDOT	Union County/Rahway	Mid	Med	
	Investigate night crashes for causality.	NJDOT	Union County/Rahway	Short	Low	
	Review pedestrian crossing times and investigate extending crossing phase	NJDOT	Union County/Rahway	Short	Low	
East Grand Avenue	Install sidewalk north of intersection along northbound approach.	NJDOT	Union County/Rahway	Short/Mid	Low	Known potentially contiminated site, Flood hazard area, Wetlands
	Investigate extending left turn lane storage on Grand Avenue.	NJDOT	Union County/Rahway	Short/Mid	Low	
	Improve pedestrian scale lighting.	NJDOT	Union County/Rahway	Mid	Med	
	Ensure lighting is operable and maintained.	NJDOT	Union County/Rahway	Short	Low	
	Investigate configuring as transitional area – sidewalks, street trees, reduced lane widths.	NJDOT	Union County/Rahway	Mid	Low/Med	
	Improve signage directing traffic to Route 1&9 from Lower Road – via Lincoln Avenue (NB) and Grand Avenue (SB)	Union County/Rahway	NJDOT	Short	Low	
Lincoln Avenue	Perform signal warrant analysis for potential new signal at intersection	NJDOT	Rahway	Mid	Low	Known potentially contaminated site, Flood hazard area, Wetlands

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Avenue C/Sylvan Road	Investigate and reconfigure pedestrian access under Conrail Bridge, along with improved lighting.	NJDOT/CSX	Linden	Mid	High	Known potentially contimated site
	Review posted Conrail bridge clearance, including impact of pavement resurfacing on clearance	NJDOT/CSX	Linden	Short	Low/Med	
	Widen Route 1&9 when railroad bridge is replaced	NJDOT/CSX	Linden	Long	High	
	Investigate access to Safety Kleen via Airport Road.	Linden/Saftey Kleen/Magnaplate	NJDOT/Union County	Short	Low	
	Investigate vehicular cross access between Magnaplate and Sylvan Road.	Linden/Saftey Kleen/Magnaplate	NJDOT/Union County	Short	Low/Med	
	Improve lane designations and mast arm locations at Avenue C intersection.	NJDOT	Linden	Mid	Low/Med	
	Review lane widths.	NJDOT	Linden	Short	Low	
	Install sidewalk on northeast corner of intersection	NJDOT	Linden	Short	Low	
	Investigate installing advance signage for traffic turning left onto Pleasant Street.	NJDOT	Linden	Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Wood Avenue	Improve pedestrian scale lighting.	NJDOT	Linden	Mid	Med	Known potentially contaminated site, Contaminated groundwater
	Investigate night crashes for causality.	NJDOT	Linden	Short	Low	
	Ensure lighting is operable and maintained.	NJDOT	Union County/Linden	Short	Low	
	Review geometric concerns – Wood Avenue approaches; Southeast corner turning radius	NJDOT	Union County/Linden	Short	Low	
	Provide additional all-red phase time to increase vehicle clearance	NJDOT	Union County/Linden	Short	Low	
	Investigate mast arm and signal head placement	NJDOT	Union County/Linden	Short	Low/Med	
	Review lane widths.	NJDOT	Union County/Linden	Short	Low	
	Install/upgrade countdown pedestrian signal heads.	NJDOT	Union County/Linden	Short/Mid	Low/Med	
	Extend left turn storage for southbound approach	NJDOT	Union County/Linden	Mid	Med	
	Prohibit on-street parking along westbound approach of Wood Avenue.	NJDOT	Union County/Linden	Short	Low	
	Install pedestrian fence along Route 1&9 between Wood Avenue and Stiles Street.	NJDOT	Linden	Mid	Med	
	Improve advance signage for left-turn to Wood Avenue from Route 1&9 Southbound.	NJDOT	Union County/Linden	Short	Low	
	Investigate removing signal at Clinton Street to lengthen southbound left turn storage	NJDOT	Linden	Long	High	
	Address capacity concerns through traffic pattern change or intersection expansion	NJDOT	Union County/Linden	Mid	High	
	Install crosswalk on northbound approach	NJDOT	Union County/Linden	Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Stiles Street to Woodlawn Avenue	Install wayfinding signing for u-turns.	NJDOT/Union County/Linden		Short	Low	Known potentially contimated site
	Install advance signage for traffic destined to Industrial Way and Commerce Road along Wood Avenue/Linden Avenue/Willow Glade Road.	NJDOT/Union County/Linden		Short	Low	
	Install advance signage to Cemetery for northbound traffic.	NJDOT/Union County/Linden		Short	Low	
	Investigate alternative access to Cemetery via Woodlawn Avenue for southbound traffic on Route 1&9.	NJDOT/Union County/Linden		Short	Low	
	Investigate opportunities to increase turning radii at Industrial Way.	NJDOT	Linden	Short	Low/Med	
	Investigate "split phasing" for Woodlawn Avenue approaches.	NJDOT	Linden	Short	Low	
	Install countdown pedestrian signal heads at Woodlawn Avenue	NJDOT	Linden	Mid	Low/Med	
	Realign Woodlawn Avenue at interesction	NJDOT	Linden	Long	High	
	Install don't block the box pavement markings at signage at Stiles Street/Wood Avenue/Woodlawn Avenue intersections	NJDOT	Union County/Linden	Short	Low	
Clinton Street	Install don't block the box pavement markings and signage	NJDOT	Linden	Short	Low	Known potentially contaminated site
Tremley Point Circulation	Investigate new connections to Tremley Point via Avenue C/Airport Road/Lower Road	Linden	NJDOT/CSAO	Long	High	Known potentially contaminated site, Flood hazard area, Wetlands, Historic features (Inch Lines Linear Multistate Historic District)

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
ConocoPhillips Entrance/Morse Mill Road/BJ's Entrance	Install sidewalk along Route 1&9 southbound between BJ's Warehouse and Morse Mill Road	NJDOT	Linden	Mid	Low	Flood hazard area, Wetlands
	Install crosswalks on BJ's Warehouse ramps	NJDOT	Linden	Mid	Low	
	Install sidewalk along BJ's Warehouse driveway	BJ's Property Owner	Linden	Mid	Low	
	Investigate relocating bus stop to BJ's Warehouse island within a "cut out" area.	NJ Transit/ Linden/NJDOT		Mid	Med	
	Install Jersey barrier beyond Willow Glade Road on Route 1&9.	NJDOT	Linden	Short/Mid	Med	
	Restripe crosswalk at Morse Mill Road as Continental style	NJDOT	Linden	Mid	Low	
	Improve signage directing I-278 traffic destined to BJ's Warehouse to use Wood Avenue/Linden Avenue/Willow Glade Road.	NJDOT	Linden/Union County	Short	Low	
ConocoPhillips Entrance/Morse Mill Road/I-278 Interchange	Investigate reconfiguring access to ConocoPhilips via I-278 and improve signage.	NJDOT/PANYNJ	Linden	Long	High	Wetlands, Known potentially contaminated site
	Improve lane designation signage for I-278 ramp and Route 1&9 southbound.	NJDOT/PANYNJ	Linden	Short/Mid	Low	
	Improve signage directing I-278 traffic on how to access ConocoPhillips refinery.	NJDOT/PANYNJ	Linden	Short/Mid	Low	
	Investigate long-term interchange improvements including relocating I-278 flyover to right side of Route 1&9 southbound.	NJDOT/PANYNJ	Linden	Long	High	
	Investigate feasibility of jughandle for Route 1&9 southbound movements to Morse Mill Road	NJDOT	Linden	Mid/Long	Mid	
	Continue to advance the Missing Moves project	NJDOT/PANYNJ	Linden	Short	High	
Bacheller Avenue	Install "Don't Block the Box" pavement markings and signage.	NJDOT	Linden	Short	Low	
Park Avenue	Ensure lighting is operable and maintained	NJDOT	Linden/Union County	Short	Low	Groundwater contamination, Known potentially contaminated
	Review fixed object crashes	NJDOT	Linden/Union County	Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Myrtle Avenue/Edgar Road/Spofford Avenue/Urbanowitz Avenue	Upgrade pedestrian signal heads at Myrtle Avenue intersection.	NJDOT	Linden/Elizabeth	Short/Mid	Low/Med	Historic feature (US Routes 1&9 Historic District)
	Investigate pedestrian clearance time at Myrtle Avenue intersection.	NJDOT	Linden/Elizabeth	Short	Low	
	Remove access to cross streets at Urbanowitz Avenue and Edgar Road and divert traffic to Myrtle Street.	NJDOT	NJ Transit/Linden/Elizabeth	Mid/Long	High	
	Install sidewalk on southbound side of Route 1&9.	NJDOT	Linden/Elizabeth	Mid/Long	Low	
	Investigate whether two-way traffic can be maintained at Urbanowitz Avenue.	NJDOT	Linden/Elizabeth	Short	Low	
	Review impact of improvement on bus route circulation.	NJDOT	NJ Transit/Linden/Elizabeth	Short	Low	
Grier Avenue	Investigate drainage concerns at intersection	NJDOT	Elizabeth	Short	Low	Known potentially contaminated site, Historic Feature (US Routes 1&9 Historic District)
	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Install curb extension at Gibbons Court.	NJDOT	Elizabeth	Mid	Med	
	Install crosswalk at Gibbons Court.	NJDOT	Elizabeth	Mid	Low	
	Reposition traffic stop bars on Route 1&9 and Grier Avenue.	NJDOT	Elizabeth	Mid	Low	
	Install continental style crosswalks and pedestrian refuges across Route 1&9.	NJDOT	Elizabeth	Mid	Low/Med	
	Investigate causality of night time crashes.	NJDOT	Elizabeth	Short	Low	
	Review pedestrian crossing times and investigate extending crossing phase	NJDOT	Elizabeth	Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
South Broad Street	Improve pedestrian scale lighting.	NJDOT	Union County/Elizabeth	Mid	Med	Historic feature (US Routes 1&9 Historic District)
	Ensure lighting is operable and maintained.	NJDOT	Union County/Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Union County/Elizabeth	Short	Low	
	Install "No Turn on Red" signage on southbound side of Route 1&9 at intersection.	NJDOT	Union County/Elizabeth	Short/Mid	Low	
	Install continental style crosswalks and pedestrian refuges across Route 1&9.	NJDOT	Union County/Elizabeth	Mid	Low/Med	
	Investigate removal of auxiliary lane on southbound Route 1&9 at intersection.	NJDOT	Union County/Elizabeth	Short/Mid	Low	
	Restripe South Broad Street approaches to include designated left-turn and shared through/right-turn lanes	NJDOT	Union County/Elizabeth	Short/Mid	Low	
	Improve signage directing traffic to Broad Street via Garden Street.	Union County/Elizabeth	NJDOT	Short/Mid	Low	
	Enforce sidewalk clearance zoning ordinance in front of used car lot on Route 1&9.	Union County/Elizabeth	NJDOT	Short	Low	
Maple Avenue	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	Historic feature (US Routes 1&9 Historic District)
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Elizabeth	Short	Low	
	Install advance signage for Maple and Garden Streets.	NJDOT	Elizabeth	Short	Low	
	Reposition crosswalk and install curb extension at Garden Street.	NJDOT	Elizabeth	Mid	Med	
	Reposition traffic stop bars on Route 1&9.	NJDOT	Elizabeth	Mid	Low	
	Install advance flashing "Red Signal Ahead" signage with flashing yellow beacons on southbound Route 1&9.	NJDOT	Elizabeth	Mid	Low/Med	
	Upgrade pedestrian signal heads.	NJDOT	Elizabeth	Mid	Low/Med	
	Install continental style crosswalks and pedestrian refuges across Route 1&9.	NJDOT	Elizabeth	Mid	Low/Med	
	Review pedestrian crossing times and extending crossing phase.	NJDOT	Elizabeth	Short	Low	
	Investigate configuring as a transitional area with sidewalks, street trees and reduced shoulders.	NJDOT	Elizabeth	Mid	Low/Med	
	Investigate fixed object crashes	NJDOT	Elizabeth	Short	Low	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
East Jersey Street	Repair damaged pedestrian push buttons on northeast and southeast corners.	NJDOT	Elizabeth	Short	Low	Known potentially contaminated site, Historic Feature (US Routes 1&9 Historic District)
	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Elizabeth	Short	Low	
	Upgrade pedestrian signal heads with count down.	NJDOT	Elizabeth	Mid	Low/Med	
	Provide wayfinding signage to Elizabeth CBD.	NJDOT	Elizabeth	Mid	Low/Med	
	Review pedestrian crossing times and extending crossing phase to include leading or trailing interval.	NJDOT	Elizabeth	Short	Low	
	Install advance flashing "Red Signal Ahead" signage with flashing yellow beacons on northbound Route 1&9.	NJDOT	Elizabeth	Mid	Low/Med	
East Grand Street	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	Known potentially contaminated site, Historic Feature (US Routes 1&9 Historic District)
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Upgrade pedestrian signal heads with count down.	NJDOT	Elizabeth	Mid	Low/Med	
	Install advance flashing "Red Signal Ahead" signage with flashing yellow beacons on southbound Route 1&9.	NJDOT	Elizabeth	Mid	Low/Med	
	Install "Pedestrian Crossing Ahead" signage on southbound Route 1&9.	NJDOT	Elizabeth	Short	Low	
	Consider installation of "continental-style" crosswalk across Route 1&9.	NJDOT	Elizabeth	Mid	Low	
	Review causality of night time crashes.	NJDOT	Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Elizabeth	Short	Low	
Bond/Anna/Flora Streets	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	Known potentially contaminated site near Bond Street, Historic Feature (US Routes 1&9 Historic District)
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Elizabeth	Short	Low	
	Investigate improvements to signals at Bond, Anna, and Flora Streets.	NJDOT	Elizabeth	Mid/Long	High	
	Upgrade bus stops to include shelters and/or increased route information.	NJ Transit	Elizabeth	Short/Mid	Low/Med	

Issue	Recommendation	Lead Agency	Supporting Agencies	Timeframe	Order of Magnitude Cost	Environmental Screening
Fairmount Avenue	Improve pedestrian scale lighting.	NJDOT	Elizabeth	Mid	Med	Groundwater contamination, Historic Feature (US Route 1&9 Historic District)
	Ensure lighting is operable and maintained.	NJDOT	Elizabeth	Short	Low	
	Investigate drainage issue.	NJDOT	Elizabeth	Short	Low	
	Investigate split phasing for Fairmount Avenue approaches.	NJDOT	Elizabeth	Short/Mid	Low	
	Extend left turning lanes on Fairmount Avenue approaches.	NJDOT	Elizabeth	Mid	Low/Med	
	Reposition traffic stop bars on Fairmount Avenue approaches.	NJDOT	Elizabeth	Mid	Low	
	Investigate installing right turning lane to Fairmount Avenue from northbound Route 1&9.	NJDOT	Elizabeth	Mid	Med/High	
	Investigate using site developer to fund intersection improvements.	NJDOT	Elizabeth/Site Developer	Mid	Low	
	Upgrade bus stops to include shelters and/or increased route information.	NJ Transit	Elizabeth	Short/Mid	Low/Med	
North Avenue	Investigate repositioning bus stop along Route 1&9 northbound	NJ Transit	NJDOT/Elizabeth/Union County	Short/Mid	Low/Med	Known potentially contaminated site, Historic Feature (US Routes 1&9 Historic District)
	Improve signage and information at bus stop	NJ Transit/ Elizabeth/NJDOT		Short/Mid	Low	
	Clear brush on sidewalk along Route 1&9 northbound jughandle to North Avenue	NJDOT	Elizabeth	Mid	Low	

IV. EXISTING CONDITIONS ANALYSIS

This section summarizes the analysis of the available data collected and establishes the existing deficiencies identified within the corridor. Information is provided on the traffic, crashes, bicycle and pedestrian conditions, available NJDOT management systems data, and transit. Additionally, data is provided on the existing land use, socioeconomic, labor and industry, and environmental constraints.

A. Traffic Conditions

The project team reviewed existing traffic counts from readily available sources including NJDOT's traffic count repository and counts related to previously completed traffic studies within the corridor. Figure 24 depicts the locations of traffic data available throughout the corridor. In total, 11 count locations have been collected and reviewed from various sources, from a four year period between 2007 and 2010. Five of these locations provide average AADT volumes, summarized in Table 1, while six provide turning movement counts (TMC), summarized in Table 2 (morning), Table 3(midday), Table 4(evening), and Table 5 (midday Saturday).

Route 1&9 Northbound north of Fairmount Avenue, approaching the transition to the freeway portion of Route 1&9

Table 1: AADT Count Locations

ID	Year	Location	Direction of Travel	AADT		
				Total	N/E	S/W
1	2009	Route 1&9, between NJ Route 81 & McClellen St.	N/S	118,791	56,052	62,739
1	2007	Route 1&9, between NJ Route 81 & McClellen St.	N/S	106,124	45,298	60,826
2	2007	Route 1&9, between North Avenue & Fanny Street	N/S	71,997	43,682	28,315
3	2007	Route 1&9, north of ramp - NB lanes to I-278 East	N/S	46,759	24,116	22,643
4	2008	Route 1&9, between Stiles Street & Wood Avenue	N/S	58,342	29,403	28,939
5	2007	I-278, east of Route 1&9	E/W	26,603	13,194	13,409
6	2009	Route 1&9 and East Grand Street	N/S	71,720	35,910	35,810
7	2009	Route 1&9 and East Jersey Street	N/S	70,750	37,390	33,360
8	2009	Route 1&9 and Fairmount Avenue	N/S	N/A	41,755	N/A
9	2009	Route 1&9 and Maple Avenue	N/S	N/A	N/A	30,600
12	2009	Route 1&9 (Local) and North Avenue	N/S	N/A	N/A	24,050
13	2009	Route 1&9 (Express) and North Avenue	N/S	N/A	N/A	16,830
14	2009	Route 1&9 and Bond Street	N/S	N/A	N/A	36,115
15	2009	Route 1&9 and Olive Street	N/S	N/A	35,735	N/A
17	2009	Summer Street, East of Bayway Circle	E/W	3,525	1,995	1,570
18	2009	Bayway Avenue, East of Bayway Circle	E/W	13,720	7,640	6,080
23	2009	Route 1&9 and Bayway Circle	N/S	N/A	28,570	N/A
24	2009	Route 1&9 and Myrtle Avenue	N/S	N/A	N/A	27,170
28	2009	Route 1&9 and Bacheller Avenue	N/S	53.270	26,890	26,380
29	2009	Route 1&9 and Park Avenue	N/S	N/A	N/A	25,430

Source: NJDOT (2007 and 2008 Counts); Engineering and Construction Services (2009 Counts, with exception of ID No. 1)

Table 2: TMC Count Locations (Morning)

ID	Year	Location	Total Volume (Route 1&9)		Heavy Vehicles (Route 1&9)		Peak
			North	South	North	South	
6	2009	Route 1&9 at East Grand Street	2,660	1,910	*5.2%*	*7.4%*	7:15
6	2010	Route 1&9 at East Grand Street	2,720	1,760	9.2%	12.6%	7:15
7	2009	Route 1&9 at East Jersey Street	2,280	1,625	*4.7%*	*6.8%*	7:00
7	2010	Route 1&9 at East Jersey Street	3,270	1,845	7.7%	13.0%	7:15
8	2009	Route 1&9 at Fairmount Avenue	2,590	1,580	*N/A*	*6.7%*	7:15
8	2010	Route 1&9 at Fairmount Avenue	2,590	1,655	9.0%	12.5%	7:15
9	2009	Route 1&9 at Maple Avenue	2,070	1,585	*7.4%*	*9.6%*	7:00
9	2010	Route 1&9 at Maple Avenue	2,845	1,835	8.8%	12.5%	7:15
12	2009	Route 1&9 at North Avenue	2,585	1,535	*4.6%*	*7.3%*	7:30
14	2009	Route 1&9 at Bond Street	2,320	1,925	*7.3%*	*7.1%*	7:15
15	2009	Route 1&9 at Olive Street	2,405	2,005	*5.5%*	*N/A*	7:15
19	2009	Route 1&9 at S Broad Street	1,995	1,490	*5.9%*	*8.9%*	7:15
20	2009	Route 1&9 at Grier Avenue	1,950	1,580	*6.1%*	*6.8%*	7:00
21	2009	Route 1&9 at Bayway Circle N	1,755	1,690	*7.5%*	*9.4%*	7:15
22	2009	Route 1&9 at Bayway Circle S	1,755	1,385	*5.2%*	*8.2%*	7:15
25	2009	S Elmora Ave at Edgar Road	670 (West)	665 (East)	*1.7% (West)*	*1.2% (East)*	7:30
26	2009	Route 1&9 at Flora Street	2,645	1,845	*5.0%*	*6.8%*	7:15
27	2009	Route 1&9 at Anna Street	2,365	1,870	3.7%	7.1%	7:15
28	2009	Route 1&9 at Bacheller Avenue	1,650	1,420	*8.6%*	*8.3%*	7:15
29	2009	Route 1&9 at S. Park Avenue	1,600	1,450	*6.3%*	*7.3%*	7:15

Source: TechniQuest Corporation (2010 Counts); Engineering and Construction Services (2009 Counts)
Note: Italicized text denotes percentage of heavy trucks, not heavy trucks and buses.

Table 3: TMC Count Locations (Midday)

ID	Year	Location	Total Volume (Route 1&9)		Heavy Vehicles (Route 1&9)		Peak
			North	South	North	South	
6	2009	Route 1&9 at East Grand Street	1,800	1,680	*9.1%*	*9.8%*	13:00
6	2010	Route 1&9 at East Grand Street	1,920	1,765	16.9%	16.0%	12:00
7	2009	Route 1&9 at East Jersey Street	1,570	1,575	*8.4%*	*9.4%*	13:00
7	2010	Route 1&9 at East Jersey Street	2,125	1,830	14.9%	16.1%	11:45
8	2009	Route 1&9 at Fairmount Avenue	1,925	1,630	*N/A*	*8.0%*	13:00
8	2010	Route 1&9 at Fairmount Avenue	1,915	1,685	16.4%	16.9%	12:00
9	2009	Route 1&9 at Maple Avenue	1,440	1,520	*14.7%*	*11.7%*	13:00
9	2010	Route 1&9 at Maple Avenue	1,840	1,785	14.7%	14.2%	11:30
12	2009	Route 1&9 at North Avenue	1,850	1,620	*7.4%*	*9.4%*	13:00
14	2009	Route 1&9 at Bond Street	1,745	1,710	*13.3%*	*8.8%*	13:00
15	2009	Route 1&9 at Olive Street	1,660	1,670	*14.1%*	*13.0%*	13:00
19	2009	Route 1&9 at S Broad Street	1,355	1,455	*9.9%*	*10.7%*	13:00
20	2009	Route 1&9 at Grier Avenue	1,470	1,435	*14.2%*	*8.6%*	12:00
21	2009	Route 1&9 at Bayway Circle N	1,400	1,740	*12.1%*	*10.9%*	12:15
22	2009	Route 1&9 at Bayway Circle S	1,340	1,395	*11.0%*	*11.9%*	11:45
25	2009	S Elmora Ave at Edgar Road	515 (West)	550 (East)	*3.2% (West)*	*2.4% (East)*	13:00
26	2009	Route 1&9 at Flora Street	1,780	1,750	*9.2%*	*8.5%*	13:00
27	2009	Route 1&9 at Anna Street	1,670	1,725	8.6%	8.9%	13:00
28	2009	Route 1&9 at Bacheller Avenue	1,210	1,495	*10.3%*	*12.9%*	13:00
29	2009	Route 1&9 at S Park Avenue	1,295	1,390	*10.3%*	*9.6%*	12:15

Source: TechniQuest Corporation (2010 Counts); Engineering and Construction Services (2009 Counts)
Note: Italicized text denotes percentage of heavy trucks, not heavy trucks and buses.

Table 4: TMC Count Locations (Evening)

ID	Year	Location	Total Volume (Route 1&9)		Heavy Vehicles (Route 1&9)		Peak
			North	South	North	South	
6	2009	Route 1&9 at East Grand Street	2,260	2,480	*4.4%*	*4.7%*	16:15
6	2010	Route 1&9 at East Grand Street	2,460	2,505	7.4%	6.8%	16:15
7	2009	Route 1&9 at East Jersey Street	1,930	2,585	*2.9%*	*4.4%*	16:30
7	2010	Route 1&9 at East Jersey Street	2,635	2,570	6.3%	6.8%	16:15
8	2009	Route 1&9 at Fairmount Avenue	2,365	2,350	*N/A*	*3.9%*	16:30
8	2010	Route 1&9 at Fairmount Avenue	2,185	2,435	7.6%	7.4%	16:45
9	2009	Route 1&9 at Maple Avenue	2,090	2,570	*4.7%*	*5.6%*	16:30
9	2010	Route 1&9 at Maple Avenue	2,205	2,810	6.8%	6.1%	16:45
12	2009	Route 1&9 at North Avenue	2,400	2,240	*3.1%*	*4.5%*	16:45
14	2009	Route 1&9 at Bond Street	2,270	2,510	*7.6%*	*4.7%*	16:00
15	2009	Route 1&9 at Olive Street	2,035	2,430	*4.8%*	*6.6%*	16:30
19	2009	Route 1&9 at S Broad Street	2,230	2,380	*3.3%*	*5.3%*	16:45
20	2009	Route 1&9 at Grier Avenue	1,715	2,560	*4.2%*	*3.1%*	16:45
21	2009	Route 1&9 at Bayway Circle N	1,810	2,445	*5.7%*	*4.8%*	16:00
22	2009	Route 1&9 at Bayway Circle S	1,825	1,945	*4.4%*	*5.1%*	16:00
25	2009	S Elmora Ave at Edgar Road	875 (West)	635 (East)	*1.9% (West)*	*0.6% (East)*	16:00
26	2009	Route 1&9 at Flora Street	2,400	2,590	*3.5%*	*4.0%*	17:15
27	2009	Route 1&9 at Anna Street	2,150	2,460	4.8%	4.6%	16:00
28	2009	Route 1&9 at Bacheller Avenue	1,655	1,905	*5.4%*	*5.9%*	16:00
29	2009	Route 1&9 at S Park Avenue	1,655	1,950	*3.7%*	*3.6%*	16:00

Source: TechniQuest Corporation (2010 Counts); CMX (2008 Counts); Engineering and Construction Services (2009 Counts)
Note: Italicized text denotes percentage of heavy trucks, not heavy trucks and buses.

Table 5: TMC Count Locations (Midday Saturday)

ID	Year	Location	Total Volume (Route 1&9)		Heavy Trucks (Route 1&9)		Peak
			North	South	North	South	
6	2009	Route 1&9 at East Grand Street	2,090	2,070	1.3%	1.6%	13:00
7	2009	Route 1&9 at East Jersey Street	2,175	2,600	0.9%	1.1%	14:00
8	2009	Route 1&9 at Fairmount Avenue	2,010	1,980	0.0%	0.0%	13:45
9	2008	Route 1&9 at Maple Avenue	2,020	2,255	1.1%	1.2%	13:45
12	2009	Route 1&9 at North Avenue	2,095	1,905	0.6%	1.0%	14:00
14	2008	Route 1&9 at Bond Street	1,915	2,130	0.2%	0.0%	12:15
15	2009	Route 1&9 at Olive Street	2,140	2,225	0.0%	0.5%	13:00
19	2008	Route 1&9 at S Broad Street	1,895	2,065	0.7%	0.5%	14:00
20	2008	Rout 1&9 at Grier Avenue	1,840	2,245	1.4%	1.5%	14:00
21	2009	Route 1&9 at Bayway Circle N	1,695	2,105	1.5%	1.3%	13:45
22	2009	Route 1&9 at Bayway Circle S	1,785	1,860	0.0%	1.1%	14:00
25	2009	S Elmora Ave at Edgar Road	630 (West)	585 (East)	1.1% (West)	0.7% (East)	12:15
26	2008	Route 1&9 at Flora Street	2,090	2,275	0.5%	1.0%	13:45
27	2009	Route 1&9 at Anna Street	1,945	2,070	1.3%	0.0%	14:00
28	2009	Route 1&9 at Bacheller Avenue	1,905	1,855	1.4%	0.3%	13:00
29	2009	Route 1&9 at S Park Avenue	1,725	1,950	0.0%	1.1%	13:30

Source: Engineering and Construction Services

The data indicates that overall AADT flow ranges from approximately 60,000 within the southern section of the study area in Linden to nearly 120,000 in the freeway section at the northernmost portion of the study area near the boundary of Newark and Elizabeth. While AADT flows south of Bayway Circle are nearly balanced between the northbound and southbound directions, traffic flow shifts dramatically in the vicinity of NJ Route 81. North of NJ Route 81, traffic flows are heavier in the southbound direction, with a significant drop in volumes south of NJ 81 indicating a significant portion of southbound traffic flows from points north of the study area are destined to NJ Route 81 and likely ultimately the New Jersey Turnpike. Just south of NJ Route 81, traffic flows are skewed heavily in the northbound direction with only a small drop north of NJ Route 81. Therefore it is likely most traffic headed north of the study area uses Route 1&9 as opposed to NJ Route 81/New Jersey Turnpike.

A further review of AADT on Route 1&9 north of NJ Route 81 from 2007 and 2009 indicate a significant increase (nearly 25 percent) in daily volume over a two year period in the northbound direction, while southbound traffic increased approximately three percent over the same period. Unfortunately this is the only location where comparative data was available at the same site, so it is unclear whether this increase in volume exists throughout the corridor.

A review of total volumes at turning movement count (TMC) sites indicates typical commuter patterns within the study corridor, with heaviest northbound hourly volumes occurring during the AM peak hour and heaviest southbound hourly volumes occurring during the PM peak hour. Midday peak hour counts indicate higher traffic flows in the northbound direction, but the gap between northbound and southbound flows is less pronounced than in the AM and PM peak hours.

Heavy vehicle percentages during the peak hours range from 6 to 17 percent with the heaviest percentages traveling during the midday periods. During the AM peak period heavy vehicle percentages are higher in the southbound direction ranging between 12 and 13 percent, but are still high in the northbound direction at about 9 percent. These high percentages have an impact on traffic flow. During the midday peak period heavy vehicles make up a significant percentage of travel along the corridor, accounting for between 14 and 17 percent of the traffic both northbound and southbound. The PM peak period has a lower, yet still significant heavy vehicle presence with nearly 7 percent of traffic both northbound and southbound.

A more detailed review of specific TMC sites illustrates two major entry/exit points for traffic traveling along the study corridor. During the AM peak hour, a nearly 20 percent drop in traffic throughput (1,000 vehicles) between TMC sites at Jersey Street and Grand Street indicates that a significant portion of traffic is destined to Elizabeth, with the likelihood that this traffic is destined for the Elizabeth Central Business District. A similar, yet less pronounced phenomenon is apparent during the midday and PM peak hours, where nearly 10 percent of the overall traffic flow northbound leaves Route 1&9 between these two locations. Traveling southbound, traffic throughput in Elizabeth is fairly consistent through the TMC sites within this section. However, during the PM peak hour, Route 1&9 adds approximately 10 percent (500 vehicles) from the local street network, likely coming from Elizabeth's Central Business District.

A review of traffic volumes in the central portion of the study area (north of Interstate 278) indicates that significant traffic volumes enter or leave the study corridor via Bayway Circle, including traffic originating from or destined to the New Jersey Turnpike.

The project team was provided arterial 2010 Level of Service (LOS) data at signalized intersections throughout the corridor based on the ongoing NJDOT Signal Optimization Projects

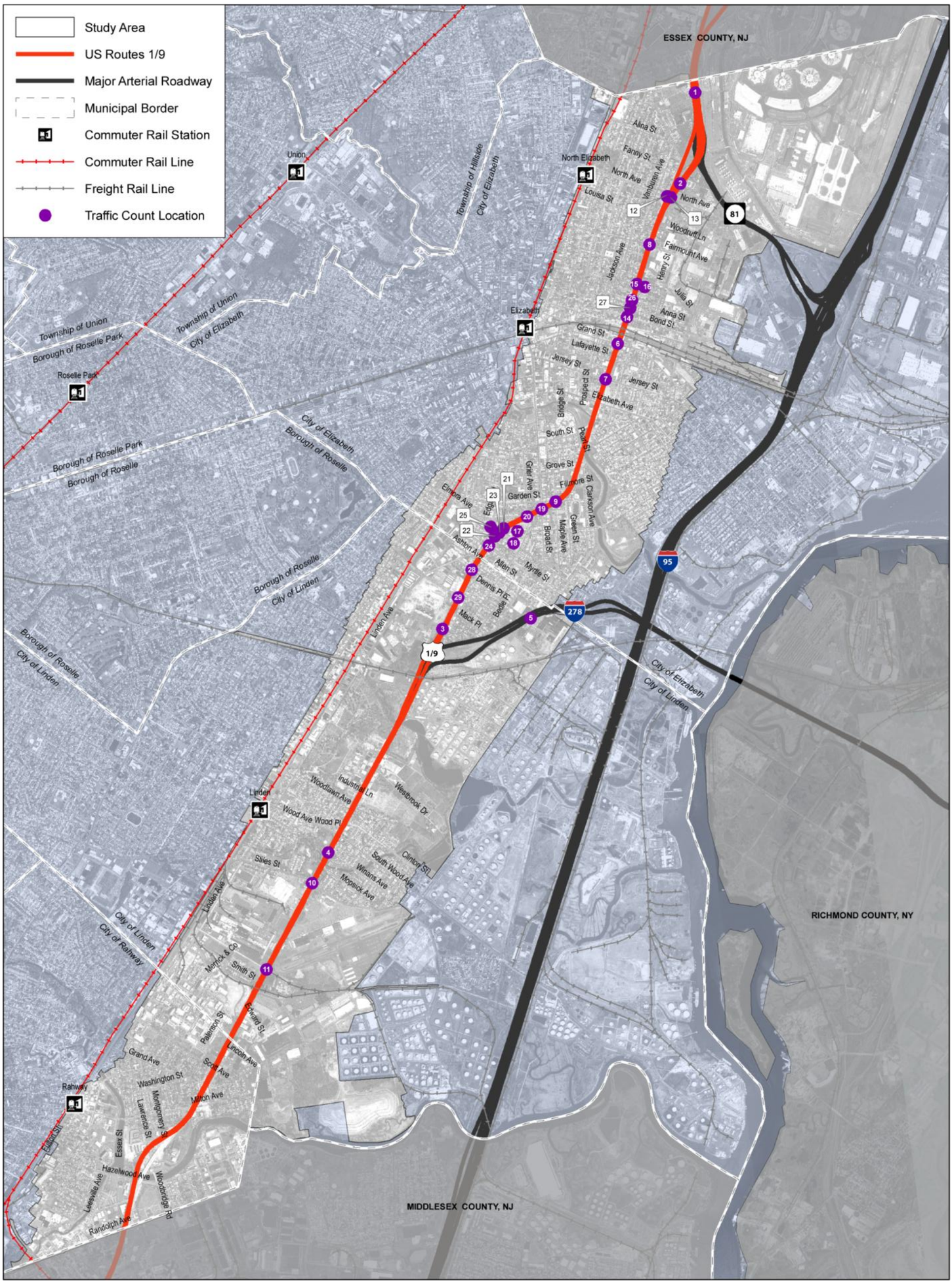
underway within the study area. This data was provided for three peak hours – AM, PM, and midday. While the corridor generally operated at a LOS A-E, several locations exhibited a failing level of service during one or more peak periods. Figure 25 illustrates the LOS conditions throughout the study corridor, by direction, for all three periods.

During the AM peak hour, traveling northbound, three locations exhibited a failing level of service: Woodlawn Avenue, Grier Street, and Fairmount Street. Traveling southbound, only one location (Wood Avenue) experiences a failing level of service, likely due to the heavy left turn movement providing access to Tremley Point.

During the midday peak hour, traveling northbound, only one location (South Broad Street) experiences a failing level of service. Traveling southbound, two locations exhibit a failing level of service: Park Avenue and Wood Avenue.

During the PM peak hour, traveling northbound, two locations experience a failing level of service: Bayway Circle and Maple Avenue. Traveling southbound, four locations experience a failing level of service: North Avenue, Grand Street, South Broad Street, and Wood Avenue.

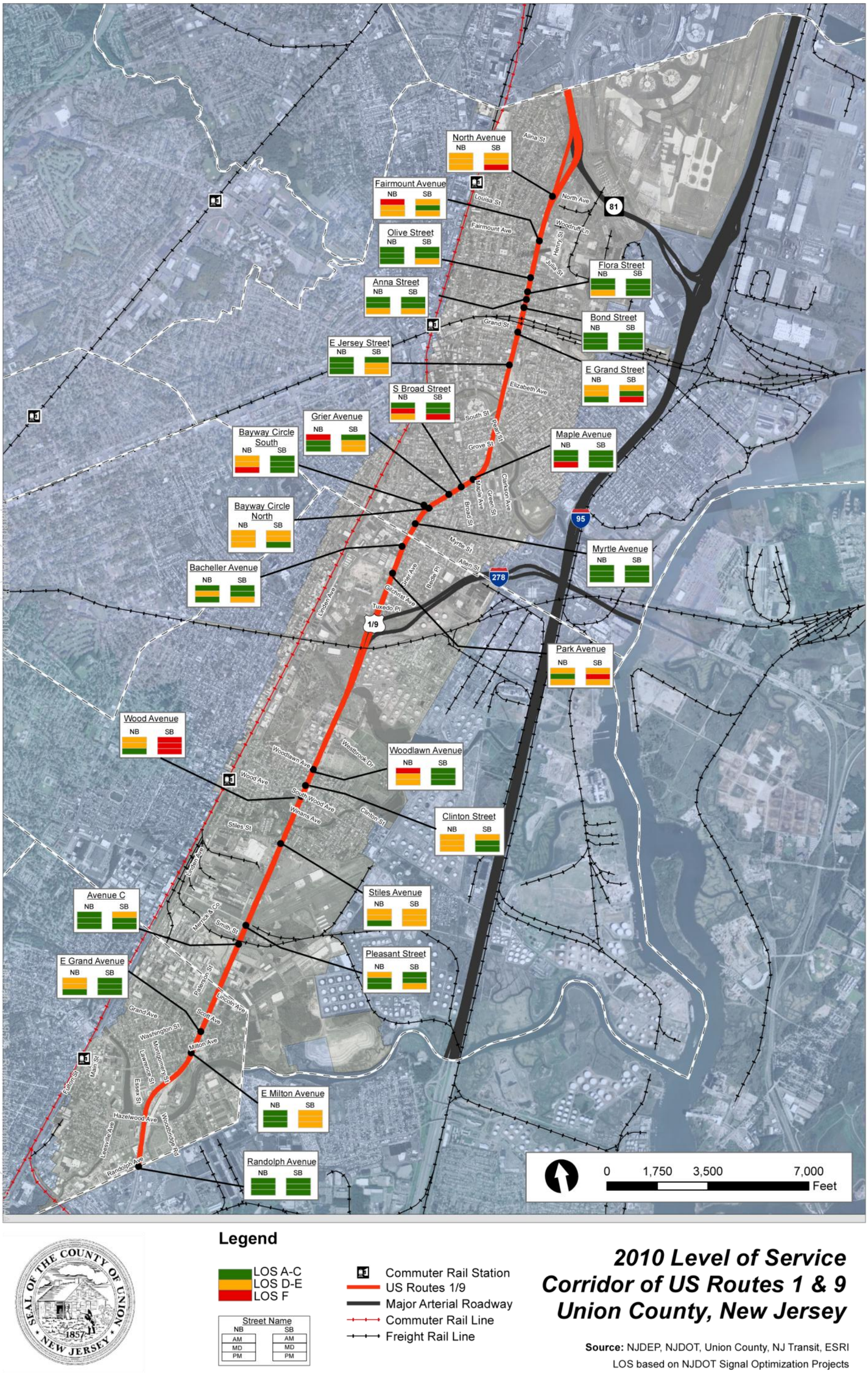
Only one location (Wood Avenue southbound) exhibits a failing level of service in multiple periods. Wood Avenue southbound operates poorly due to the left turn movement and large percentage of trucks traveling through this location.



Traffic Count Locations
Corridor of US Routes 1 & 9
Union County, New Jersey

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: Numbers of traffic count locations correspond with Data Assessment Technical Memorandum.
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Figure 24- Traffic Count Locations, Route 1&9 Corridor



Legend

- LOS A-C
- LOS D-E
- LOS F

Street Name

NB	SB
AM	AM
MD	MD
PM	PM

- Commuter Rail Station
- US Routes 1/9
- Major Arterial Roadway
- Commuter Rail Line
- Freight Rail Line

2010 Level of Service Corridor of US Routes 1 & 9 Union County, New Jersey

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
LOS based on NJDOT Signal Optimization Projects

Figure 25 – 2010 Level of Service, Route 1&9 Corridor

B. Crash Data

Crash data was accessed from NJDOTs online database (http://www.state.nj.us/transportation/refdata/accident/). In total, NJDOT's crash record database for 2007 through 2009 contained 4,458 individual crash records with complete geographic coordinate information falling within the limits of the study area. These crash records were associated with a total of 4,450 discrete incidents at 1,229 locations. They include all types of crashes, including those involving trucks and pedestrians. NJDOT's Bureau of Safety Programs has provided crash summaries for Route 1&9 in the study area, along with a comparison of crash rates to statewide averages for the study area, shown in Table 6.

Table 6: Study Area Crash Rates

Milepost	Cross-Section	Actual Crash Rate (crashes/mvm)	Statewide Average Crash Rate – 2009 (crashes/mvm)	Percentage over Statewide Average
38.34 – 39.39	4 Lanes, barrier median, without shoulder	2.66	2.86	-
39.39 – 41.26	4 Lanes, grass median, without shoulder	3.75	4.42	-
41.26 – 42.28	4 Lanes, barrier median, without shoulder	3.60	2.86	25.9%
42.28 – 42.80	4 Lanes, grass median, without shoulder	3.10	4.42	-
42.80 – 43.62	4 Lanes, barrier median, without shoulder	3.65	2.86	27.6%

Source: NJDOT (2007-2009)

Study area crash locations (Figure 26), truck crash locations (Figure 27), and pedestrian crash locations (Figure 28) are shown on their respective maps. These figures highlight crashes along Routes 1&9 as well as along surrounding roadways with parcels located within one-half mile of Route 1&9, as well as associated rights-of-way.

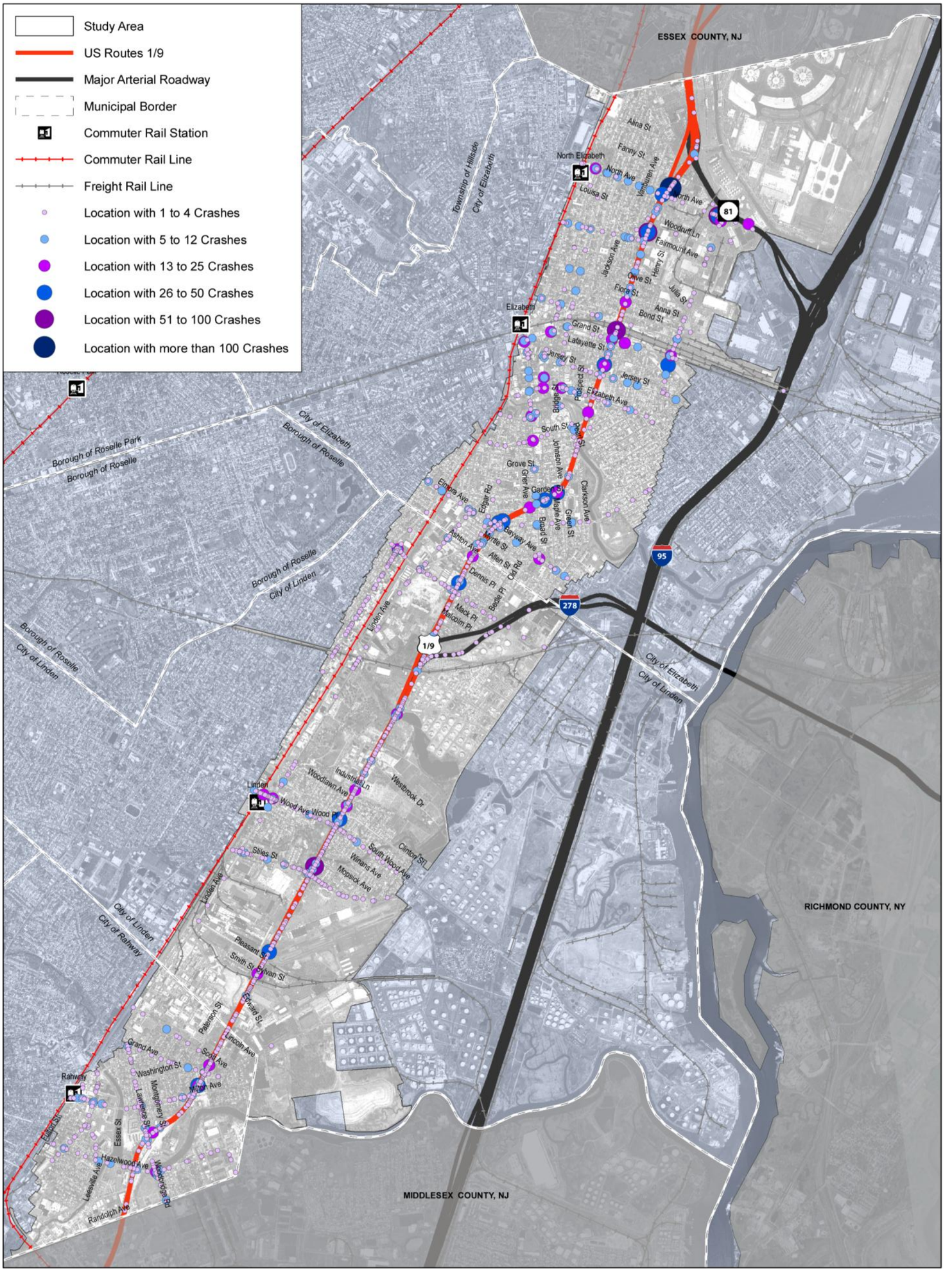
The total crash records for the study area are summarized in Table 7. Overall incidences of crashes in the study area have decreased, as has the number of crashes involving trucks, however total fatalities and pedestrian fatalities have increased.

Table 7: Study Area Crash Records (General Information)

	2007	2008	2009	Total (2007-2009)
Total Crash Records	1,695	1,591	1,172	4,458
Truck Crash Records	370	329	242	941
Total Fatalities	1	5	5	11
Pedestrian Fatalities	0	4	3	7
Most Frequent Crash Type	Same Direction-Rear	Same Direction-Rear	Same Direction-Rear	Same Direction-Rear

Source: NJDOT (2007-2009)

Of the 4,458 crashed in the study area, a total of 1,963 crashes were reported on Route 1&9 between 2007 and 2009. Of these, 751 occurred in 2007, 670 occurred in 2008, and the remaining 542 occurred in 2009. Thus, there has been a downward trend in the total number of crashes during the three year study period. However, over the same period, the number of fatal crashes, including pedestrian fatal crashes, has increased.

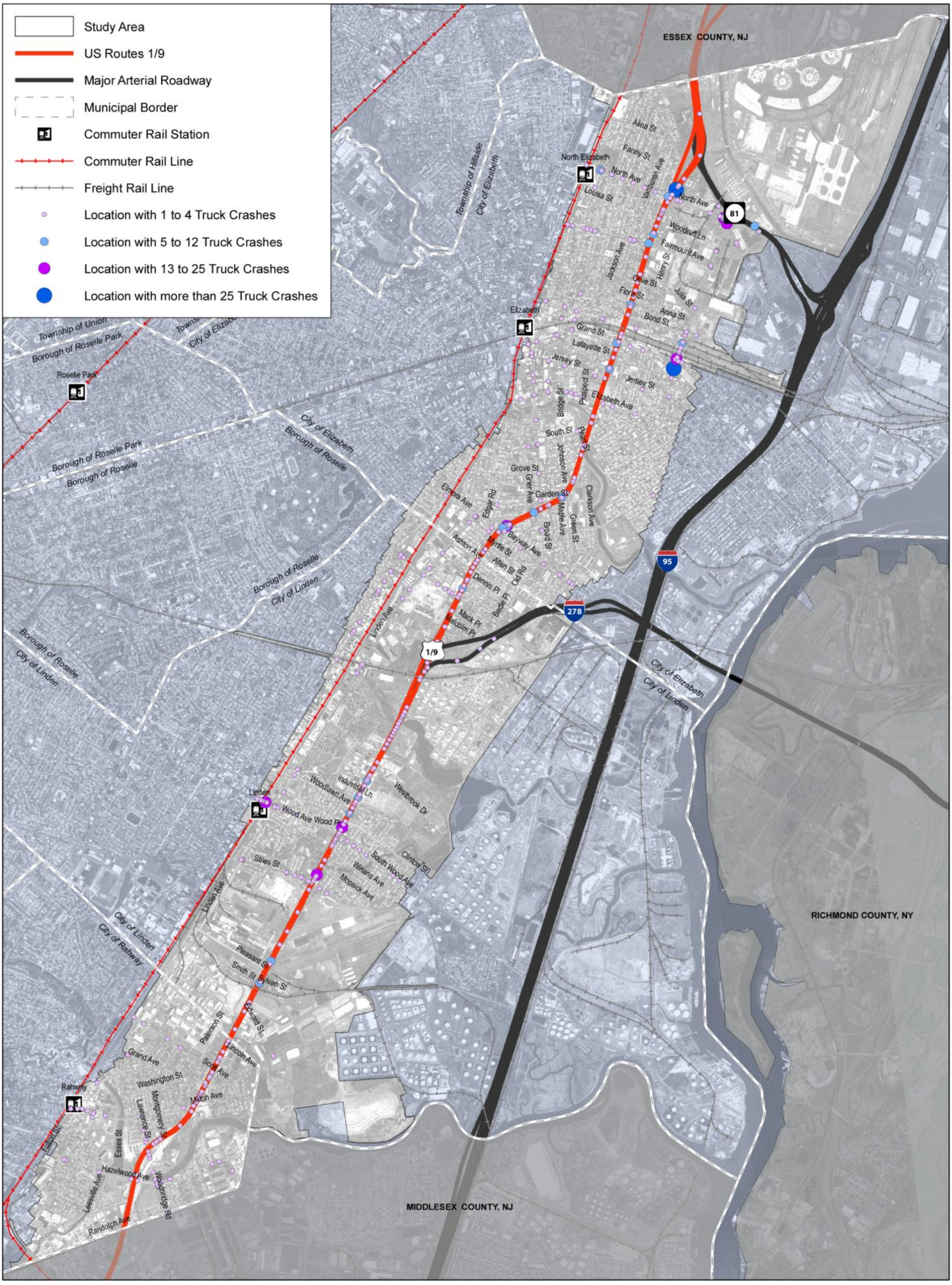


Crash Locations
Corridor of US Routes 1 & 9
Union County, New Jersey

0 1,400 2,800 5,600 Feet

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: This map was prepared with NJDOT Crash Records for 2007-2009
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Figure 26 - Crash Locations, Route 1&9 Corridor

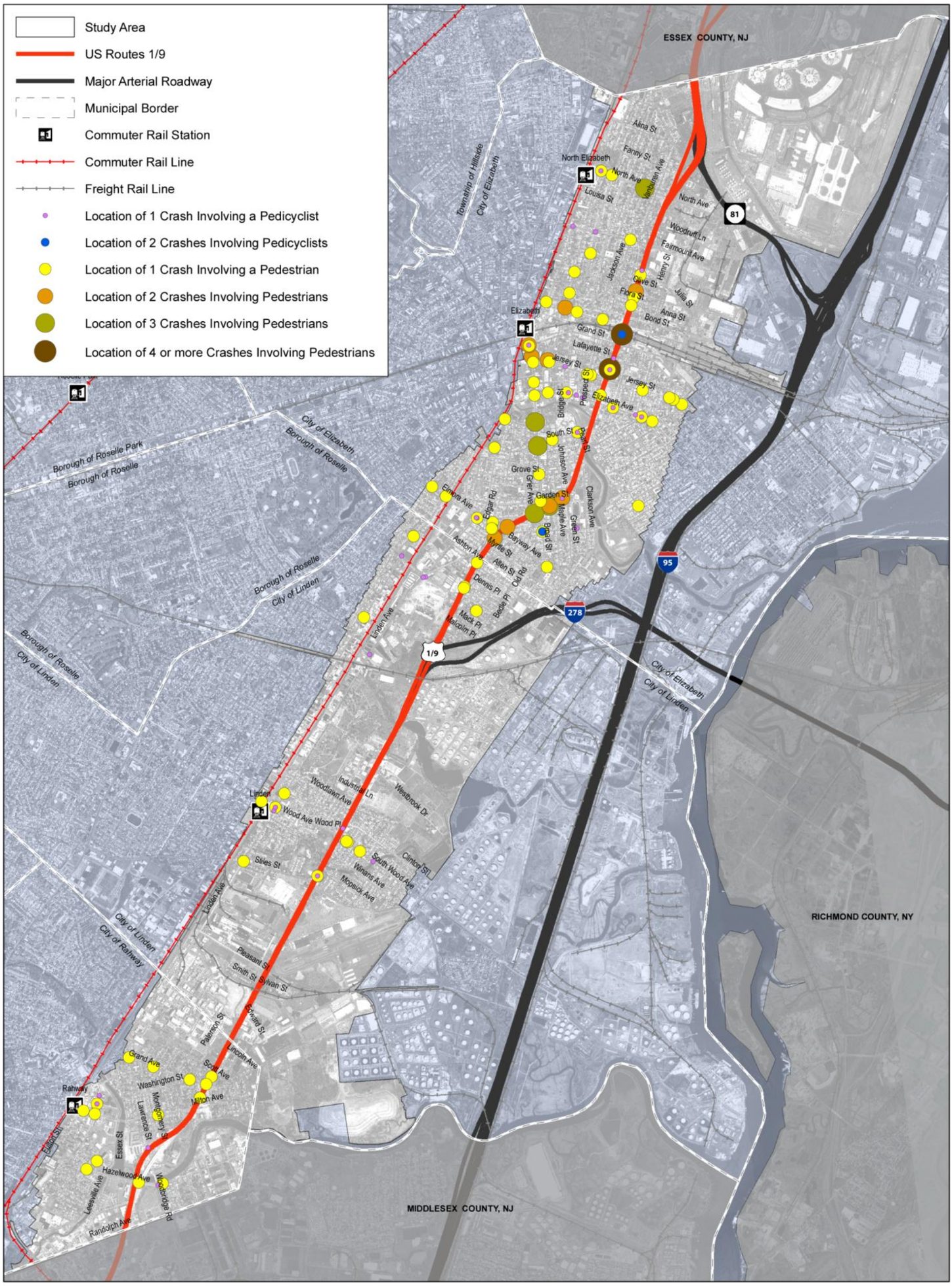


Truck Crash Locations
Corridor of US Routes 1 & 9
Union County, New Jersey

0 1,400 2,800 5,600 Feet

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: This map was prepared with NJDOT Crash Records for 2007-2009
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Figure 27 - Crashes Involving Trucks, Route 1&9 Corridor



Pedestrian and Pedicycle Crashes
Corridor of US Routes 1 & 9
Union County, New Jersey

0 1,400 2,800 5,600 Feet

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: This map was prepared with NJDOT Crash Records for 2007-2009
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Figure 28 - Pedestrian and Bicycle Crashes, Route 1&9 Corridor

Table 8 outlines the data for the overall Route 1&9 study corridor and the five intersections with the most crashes. Of particular note is the fact that all six locations exhibited overrepresentations for crashes during dawn, dusk, or night, indicating that lighting may be a concern throughout the corridor.

Table 8: Crashes at Intersections of Route 1&9 (2007-2009)

	Route 1&9 (Overall Corridor)	Route 1&9 & North Ave.	Route 1&9 & Fairmount	Route 1&9 & Stiles Ave.	Route 1&9 & E. Jersey St.	Route 1&9 & S. Elmora	*Statewide Average*
General Information							
Total Crashes	1,963	150	83	74	73	71	
Vehicles Involved	4,011	307	177	150	142	153	
Crash Severity							
Property Damage	**69.0%**	67.3%	65.1%	**74.3%**	67.1%	**78.9%**	*68.2%*
Injury	30.5%	**32.7%**	**33.7%**	25.7%	**31.5%**	19.7%	*31.4%*
Fatality	**0.5%**	0.0%	**1.2%**	0.0%	**1.4%**	**1.4%**	*0.4%*
Injuries							
Total Injured	933	82	54	23	36	23	
Pedestrians Injured	32	0	0	1	6	1	
Fatalities							
Total Fatalities	10	0	1	0	1	1	
Pedestrian Fatalities	6	0	0	0	1	1	
Surface Conditions*							
Dry	**77.4%**	**79.3%**	63.9%	71.6%	**80.8%**	**77.5%**	*73.0%*
Wet	19.1%	18.0%	**34.9%**	**27.0%**	16.4%	22.5%	*23.6%*
Snow/Ice	**2.9%**	2.0%	1.2%	1.4%	**2.7%**	0.0%	*2.7%*
Light Conditions*							
Daylight	59.9%	66.7%	50.6%	48.6%	56.2%	70.4%	*70.7%*
Dark/Dawn/Dusk	**39.5%**	**32.7%**	**49.4%**	**51.4%**	**43.8%**	**29.6%**	*29.0%*
Environmental Conditions*							
Clear	79.1%	81.3%	67.5%	77.0%	84.9%	81.7%	
Rain	14.9%	14.0%	30.1%	21.6%	11.0%	14.1%	
Snow	1.5%	1.3%	0.0%	0.0%	0.0%	0.0%	
Overcast	3.6%	2.0%	1.2%	1.4%	4.1%	2.8%	
Crash Types*							
Rear End	**47.3%**	34.7%	**61.4%**	**47.3%**	**52.1%**	33.8%	*36.0%*
Side Swipe	**26.5%**	**28.7%**	13.3%	**29.7%**	**20.5%**	**46.5%**	*14.7%*
Right Angle	8.8%	**27.3%**	21.7%	8.1%	8.2%	14.1%	*25.1%*
Fixed Object	**8.9%**	6.0%	1.2%	1.4%	4.1	0.0%	*7.8%*
Pedestrian	**1.9%**	0.0%	0.0%	1.4%	**8.2%**	**2.8%**	*1.5%*

**This is a summary table focused on top crash factors. Total percentages may not equal 100%.*

Locations in bold represent values above the statewide average at intersections for state roadways in 2009

Source: NJDOT (2007-2009)

Figure 26, Figure 27, and Figure 28 provide a detailed overview of the intersections that are shown in Table 8.

In addition to the locations noted in Table 8, there are several locations with multiple crashes that are not located directly at a signalized intersection. A more detailed analysis of these locations may reveal specific issues where safety improvements are necessary. These locations are detailed in Table 9 and Figure 26, Figure 27, and Figure 28.

Table 9: Important Crash Sites along Route 1&9 (2007-2009)

	Route 1&9 North between Stiles St. & Mopsick Ave.	Route 1&9 North between Wood Ave. & Clinton St.	Route 1&9 North between McCandless Pl. & McGillvray Pl.	Route 1&9 North between E. Jersey St. & Lafayette St.	Route 1&9 North between North Ave. & NJ Route 81
General Information					
Total Crashes	68	49	46	25	144
Vehicles Involved	137	100	88	47	293
Crash Severity					
Property Damage	72.1%	69.4%	71.7%	**76.0%**	68.8%
Injury	27.9%	**30.6%**	28.3%	24.0%	**31.9%**
Fatality	0.0%	0.0%	0.0%	0.0%	0.0%
Injuries					
Total Injured	23	22	24	9	78
Pedestrians Injured	1	0	0	1	0
Fatalities					
Total Fatalities	0	0	0	0	0
Pedestrian Fatalities	0	0	0	0	0
Surface Conditions*					
Dry	**73.5%**	**79.6%**	**78.3%**	72.0%	**80.6%**
Wet	25.0%	16.3%	17.4%	20.0%	17.4%
Snow/Ice	1.5%	4.1%	2.2%	**8.0%**	2.1%
Light Conditions*					
Daylight	47.1%	42.9%	65.2%	56.0%	68.1%
Dark/Dawn/Dusk	**52.9%**	**57.1%**	**34.8%**	**44.0%**	31.9%
Environmental Conditions*					
Clear	79.4%	81.6%	82.6%	76.0%	82.6%
Rain	19.1%	14.3%	13.0%	16.0%	13.2%
Snow	0.0%	0.0%	0.0%	0.0%	1.4%
Overcast	1.5%	4.1%	4.3%	8.0%	2.1%
Crash Types*					
Rear End	48.5%	44.9%	41.3%	44.0%	34.0%
Side Swipe	**27.9%**	**26.5%**	**19.6%**	**32.0%**	**29.2%**
Right Angle	7.4%	10.2%	8.7%	4.0%	**28.5%**
Pedestrian	**1.5%**	0.0%	0.0%	4.0%	0.0%

**This is a summary table. Total percentages may not equal 100%.*

Source: NJDOT (2007-2009)

As noted in Table 7, seven pedestrian fatalities occurred during the three-year study period along within the study area. Six of these occurred on Route 1&9 at signalized intersections. Further, 32 pedestrians were injured along the Route 1&9 corridor. Intersections with pedestrian injuries or fatalities are detailed in Table 10. Figure 28 illustrates the location of crashes at signalized intersections that involved pedestrians.

Table 10: Intersections of Route 1&9 with Pedestrian Injuries or Fatalities

Intersection	Pedestrian Fatalities	Pedestrian Injuries
Route 1&9 at East Milton Avenue	0	1
Route 1&9 at East Grand Avenue	0	1
Route 1&9 at Stiles Avenue	0	1
Route 1&9 at Park Avenue	0	1
Route 1&9 at Bacheller Avenue	0	1
Route 1&9 at Myrtle Avenue	0	2
Route 1&9 at South Elmora Avenue	1	1
Route 1&9 at Grier Avenue	1	2
Route 1&9 at South Broad Street	0	5
Route 1&9 at Maple Avenue	0	2
Route 1&9 at East Jersey Avenue	1	6
Route 1&9 at East Grand Street	2	1
Route 1&9 at Bond Street	0	1
Route 1&9 at Anna Street	0	1
Route 1&9 at Flora Street	1	1
Route 1&9 at Olive Street	0	1

Source: NJDOT (2007-2009)

A total of 8 crashes involving bicyclists were reported on Route 1&9 during the three year study period. Only one location, the signalized intersection of Route 1&9 at East Grand Street, experienced multiple crashes involving bicyclists during the three year study period. Of the remaining six crashes, four occurred at signalized intersections and two occurred at mid-block locations.

A review of corridor-wide crash statistics indicates a significant drop in overall crashes (nearly 25 percent) between 2007 and 2009, and a similar drop in crashes involving injuries over the same period. However, a notable increase in crashes involving fatalities (1 in 2007 versus 5 in 2009), including crashes involving pedestrian fatalities (0 in 2007 versus 3 each in 2008 and 2009), was observed. Nearly all crash types are trending down, as would be expected given the overall reduction in crash incidence within the corridor. However, the percentage of crashes occurring on wet pavement has increased significantly, from approximately 17 percent in 2007 to 22 percent in 2009.

The most significant environmental factor overrepresented within the corridor is crashes occurring during dawn, dusk, or night. Nearly 40 percent of all crashes occur during dawn, dusk, or night, which is more than 35 percent higher than the statewide average (29 percent), indicating that lighting is likely a concern throughout the corridor. Several crash types were overrepresented corridor-wide, most notably same direction-rear (47 percent versus 36 percent),

and same direction-side (27 percent versus 15 percent). These crash types are often a result of congestion and often result in property damage only.

The project team also identified situations where specific crash types or other factors were overrepresented both within the corridor and at specific hot spots in comparison to statewide averages for the state roadway network. This review of specific intersection crash incidences indicated several locations with potential lighting, drainage, or pavement issues. The high number of pedestrian crashes, particularly those in Elizabeth, indicates that improvements to pedestrian circulation may be needed to improve the movement of non-motorized traffic across Route 1&9. Several intersections experienced high numbers of right angle crashes, indicating a review of geometric and/or signalization may be appropriate. A summary of key crash issues by intersection can be found in Section J.

C. Bicycle/Pedestrian Conditions

The team reviewed bicycle compatibility based on guidelines provided by NJDOT's *Bicycle Compatible Roadways and Bikeways*. NJDOT's guidelines indicate that a roadway with an AADT greater than 10,000 should provide a minimum shoulder width of 8 feet to be considered bicycle compatible.[1]

Review of the existing conditions inventory for bicyclists and pedestrians revealed numerous existing deficiencies which restrict the circulation of non-motorized traffic along and more importantly, across Route 1&9. Pedestrian crossings of Route 1&9 are challenging throughout the corridor not only due to the number of travel lanes along the highway but also due to the many skewed crossings which make the already lengthy crosswalks even longer. Pedestrian signals vary throughout the corridor and in many cases are not compliant with the current MUTCD, because it requires countdown pedestrian signals for all crossings within the study corridor. There are numerous crossings within the corridor that include pedestrian signal heads that do not meet this current standard. While pedestrian activity is greatest in the section of the corridor within Elizabeth, pedestrians were observed throughout the corridor in Linden and Rahway.

Route 1&9 Northbound between Milton Avenue and Patterson Street. The heavily worn path indicates significant pedestrian traffic along this gap in the sidewalk network.

An initial review of crashes involving bicyclists indicated that 8 crashes (0 fatal) occurred during the three year study period. Of these eight crashes, multiple crashes occurred at only one location – the signalized intersection at East Grand Street in Elizabeth

Most of the corridor was determined to not be bicycle compatible based on NJDOT's guidelines for bicycle compatibility, largely due to the high AADT and large volume of heavy vehicles. However, parallel bicycle compatible routes exist adjacent to the corridor. Improvements to bicycle circulation along available parallel routes, including the use of on-street bicycle lanes, share the road and/or wayfinding signage, and shared lane markings (sharrows) can improve circulation for bicyclists and dissuade them from using Route 1&9, which is currently not an optimal route for their use.

[1] *NJDOT Bicycle Compatible Roadways and Bikeways*, New Jersey Department of Transportation, April 1996, p.7

A review of pedestrian crash incidence within the corridor indicated that 38 crashes involving pedestrians (including 6 involving fatalities) occurred at signalized intersections during the three year period between 2007 and 2009. Of these crashes, 29 occurred within the 2.5 mile section within Elizabeth, including all six involving fatalities. This rate confirms the high demand for pedestrian accommodations within this section of the study area but also illustrates the difficulty that pedestrians have crossing Route 1&9.

A summary of key pedestrian issues at each intersection can be found in Section J.

D. Pavement Management System Data

NJDOT supplied the 2010 Pavement Management System (PMS) data for the study corridor. It includes the International Roughness Index which measures the roughness of road surfaces as well as the Surface Distress Index (SDI) which indicates the level of surface distress and the average rut depth for one-tenth mile segments in both directions. IRI is a measurement of ride comfort, while SDI is a visual measurement of surface distress. This data indicates that the study corridor exhibits numerous areas of deficient roughness and/or surface distress, and excessive rutting. The PMS data and a measurement key for each measurement type are detailed in Table 11 below. Locations highlighted in black indicate a deficient condition for that measurement type.

Table 11: NJDOT 2010 PMS Data

		Northbound			Southbound		
MP Start	MP End	IRI	SDI	Rut Depth	IRI	SDI	Rut Depth
Rahway City							
38.40	38.50	112	3.88	0.2	187	3.88	0.2
38.50	38.60	105	3.84	0.2	104	3.88	0.1
38.60	38.70	119	3.88	0.2	168	3.88	0.1
38.70	38.80	133	3.88	0.2	158	3.88	0.1
38.80	38.90	87	3.88	0.2	203	3.88	0.1
38.90	39.00	83	3.88	0.2	97	3.88	0.1
39.00	39.10	89	3.72	0.3	108	4.72	0.1
39.10	39.20	126	3.57	0.4	119	3.98	0.1
39.20	39.30	106	3.21	0.4	175	3.64	0.1
39.30	39.40	100	2.70	0.2	128	3.64	0.2
39.40	39.50	92	2.76	0.2	131	3.66	0.2
39.50	39.60	90	4.22	0.1	143	3.39	0.2
39.60	39.70	85	5.00	0.2	140	0.90	0.5
Linden City							
39.70	39.80	115	5.00	0.2	146	0.90	0.5
39.80	39.90	133	2.19	0.2	154	0.93	0.4
39.90	40.00	195	1.08	0.2	182	0.89	0.5
40.00	40.10	128	0.96	0.2	260	1.01	0.2
40.10	40.20	113	1.41	0.2	178	1.01	0.2
40.20	40.30	187	1.54	0.2	135	1.04	0.2
40.30	40.40	108	1.54	0.2	205	1.18	0.2
40.40	40.50	98	1.73	0.2	222	1.13	0.3
40.50	40.60	92	2.69	0.3	204	0.98	0.5
40.60	40.70	200	2.66	0.3	214	1.00	0.5
40.70	40.80	174	2.72	0.2	308	1.12	0.3
40.80	40.90	177	2.06	0.2	279	1.07	0.4
40.90	41.00	197	1.37	0.2	143	1.18	0.1
41.00	41.10	175	1.27	0.3	140	1.16	0.2
41.10	41.20	173	1.30	0.2	164	1.15	0.3

IRI Guidelines
0-59: Excellent
60-95: Good
95-170: Fair
> 170: Deficient

SDI Guidelines
0-1.0: Very Poor
1.0 – 2.0: Poor
2.0 – 3.0: Fair
3.0 – 4.0: Good
4.0 – 5.0: Very Good

		Northbound			Southbound		
MP Start	MP End	IRI	SDI	Rut Depth	IRI	SDI	Rut Depth
41.20	41.30	121	1.32	0.2	143	1.16	0.2
41.30	41.40	90	1.26	0.3	110	1.17	0.2
41.40	41.50	130	1.11	0.5	105	1.18	0.2
41.50	41.60	130	1.08	0.6	87	1.18	0.2
41.60	41.70	115	1.23	0.3	104	1.18	0.1
41.70	41.80	172	1.23	0.3	105	1.18	0.1
41.80	41.90	107	1.32	0.1	97	1.18	0.2
41.90	42.00	105	1.32	0.1	124	1.18	0.2
42.00	42.10	114	1.31	0.2	136	1.14	0.3
42.10	42.20	94	1.23	0.3	98	1.14	0.3
42.20	42.30	98	1.29	0.3	104	1.14	0.3
42.30	42.40	86	1.32	0.2	120	1.07	0.4
42.40	42.50	104	1.32	0.2	135	1.14	0.3
42.50	42.60	141	1.26	0.3	130	1.89	0.5
42.60	42.70	221	1.18	0.2	177	1.98	0.5
42.70	42.80	304	1.15	0.3	140	1.95	0.5
42.80	42.90	104	1.20	0.2	306	2.23	0.4
Elizabeth City							
42.90	43.00	116	1.20	0.2	163	2.77	0.2
43.00	43.10	98	1.20	0.2	217	3.41	0.3
43.10	43.20	122	1.18	0.2	177	3.50	0.2
43.20	43.30	227	1.20	0.1	164	3.47	0.2
43.30	43.40	167	1.20	0.1	173	3.47	0.2
43.40	43.50	169	1.20	0.1	188	3.43	0.2
43.50	43.60	173	1.20	0.1	138	3.44	0.3
43.60	43.70	142	1.13	0.2	169	3.58	0.2
43.70	43.80	181	1.06	0.1	192	3.64	0.2
43.80	43.90	128	1.06	0.1	137	3.64	0.1
43.90	44.00	119	1.06	0.1	111	3.64	0.1
44.00	44.10	169	1.06	0.1	123	3.64	0.1
44.10	44.20	134	1.06	0.2	176	3.64	0.1
44.20	44.30	174	1.15	0.2	304	3.64	0.2
44.30	44.40	145	1.20	0.1	179	3.54	0.2
44.40	44.50	382	1.15	0.3	280	3.38	0.3
44.50	44.60	254	0.99	0.6	301	2.90	0.6
44.60	44.70	463	1.20	0.2	294	3.52	0.3
44.70	44.80	206	1.16	0.3	227	3.88	0.2
44.80	44.90	258	1.12	0.3	175	4.56	0.2
44.90	45.00	249	1.20	0.2	234	4.95	0.2
45.00	45.10	184	3.82	0.2	123	3.81	0.4
45.10	45.20	98	1.13	0.2	123	4.90	0.2
45.20	45.30	129	1.13	0.2	149	4.42	0.3
45.30	45.40	127	1.10	0.3	86	3.15	0.1
45.40	45.50	166	1.07	0.3	182	2.62	0.1
45.50	45.60	180	0.87	0.2	348	1.32	0.2
45.60	45.70	107	0.91	0.3	121	0.56	0.2
45.70	45.80	122	1.10	0.3	100	1.93	0.2
45.80	45.90	146	0.74	0.3	127	2.09	0.2
45.90	46.00	165	0.85	0.3	155	2.11	0.3
46.00	46.10	138	1.13	0.2	133	2.23	0.2
46.10	46.20	217	1.11	0.2	140	2.04	0.4

Source: NJDOT (2010)

IRI Guidelines
0-59: Excellent
60-95: Good
95-170: Fair
> 170: Deficient

SDI Guidelines
0-1.0: Very Poor
1.0 – 2.0: Poor
2.0 – 3.0: Fair
3.0 – 4.0: Good
4.0 – 5.0: Very Good

E. Drainage Management System (DMS)

The project team reviewed 2010 Drainage Management System (DMS) data[2] from NJDOT to identify recurring drainage problems within the study corridor.

As shown in Table 12, three segments of the study corridor are included in the 2010 DMS rankings, all of which are located in Elizabeth. The worst segment is ranked 20th in the state system and stretches over a half mile from the Elizabeth River Bridge north to Bond Street. In addition to the DMS rankings, NJDOT flood records from the past three years were reviewed. These records indicate a total of 15 flood events occurred within the study corridor and multiple flooding events occurred at two additional locations not included in the DMS rankings – at Lawrence Avenue in Rahway and at Willow Glade in Linden.

Table 12: NJDOT DMS rankings

DMS ranking	Milepost	Approx. Cross Street Limits	Municipality	Flood Events 2007 - 2009
20	44.1 – 44.7	Elizabeth Ave – Bond St	Elizabeth	3
84	43.11 – 43.39	S. Elmora Ave – S. Broad St	Elizabeth	0
133	45.44 – 45.45	North Avenue	Elizabeth	1
unranked	38.85	Lawrence Ave	Rahway	4
unranked	41.8	Willow Glade	Linden	2

Source: 2010 NJDOT Drainage Management System Rankings and NJDOT Flooding Records 2007 - 2009

Recurring drainage issues are a major concern for traffic flow through the corridor, as flood events are a safety hazard and may result in the closure of one or more traffic lanes, temporarily reducing roadway capacity.

F. Transit

A review of the transit service within the study corridor reveals that the study corridor has fourteen bus routes that operate along, across, or in the vicinity of Route 1&9, including Routes 26, 52,56, 57, 58, 24, 40, 59, 62, 94, 111, 112, 113, and 115. NJ Transit's Northeast Corridor and North Jersey Coast Line commuter rail lines also operate in close proximity via stations at Avenel, Rahway, Linden, Elizabeth, North Elizabeth, and Newark Liberty International Airport

Bus Service

There is no single local bus route that operates along the entire length of Route 1&9 within the study corridor.

Instead, two NJ TRANSIT bus routes operate along partial segments of the study corridor. In the northern portion of the study corridor, the Route 62 provides local bus service between south of Newark Liberty International Airport to East Jersey Street in Elizabeth. South of Elizabeth, Route 56 provides local bus service along Route 1&9 between Edgar Road and Clinton Street.

Route 62

NJT's Route 62 operates with multiple service and route variations which can be confusing for new customers. The full length version of Route 62 runs from Newark Penn Station to Perth Amboy. However, there are multiple service variations (patterns) operated by the Route 62 with

[2] NJDOT determines the DMS rankings based on the frequency of flood events and the average daily traffic (ADT) of the roadway. The DMS is re-ranked each year to account for recent flood events. There are 200 roadway segments statewide in the 2010 DMS rankings.

different southern route terminals and street routings. Some Route 62 trips operate between Newark Penn Station and Newark Liberty Airport only. Other trips are operate via Route 1&9 from south of Newark Airport to East Jersey Street in Elizabeth, while approximately alternate Route 62 trips operate to the east to serve IKEA and Jersey Gardens Mall. Certain Route 62 trips terminate in Midtown Elizabeth (downtown Elizabeth), other Route 62 trips terminate at Woodbridge Center Mall and still other trips terminate in Perth Amboy.

Route 62 provides intermodal connections to NJ Transit train service at Newark Penn Station, Elizabeth Station and Linden Station.

Overall, Route 62 operates 24 hours each day. However the portion along Route 1&9 within the study corridor operates from approximately 4:00 AM to about 12:45 AM the following day. While bus headways (frequencies) along the combined portions of Route 62 range from one bus per hour during overnight periods to every 10-15 minutes during the peak periods, the frequency of service along the Route 1&9 alignment is considerably less. Again this is due to certain trips avoiding Route 1&9 to run along an alternate and parallel route serving IKEA and the Jersey Gardens Mall.

Service frequency of the Route 62 operates on an irregular headway, with some service intervals changing from hour to hour during the service day, with headways of 50 minutes, 60 minutes, 65 minutes and 30 minutes listed in that sequence on the timetable during the AM period for the southbound direction.

The Route 62 provides a link between Midtown Elizabeth (to the west of the study corridor) and Newark Liberty Airport, a major employment destination.

Ridership on Route 62 is high for a suburban route. Available ridership numbers for the entire route, which includes both the alignment along Route 1&9 as well as the alternate alignment via IKEA and the Jersey Gardens Mall, were provided by NJ Transit. Weekday, Saturday and Sunday median ridership gives a good indication of the level of usage for the entire route. September 2009 weekday ridership was 9,607 riders per weekday, while in November 2009 weekday ridership was 7,092 riders per weekday. Saturday ridership reached a high of 7,180 passengers in September 2009 falling to 4,783 two months later in November 2009. Sunday ridership for the same time periods ranged from 5,362 riders in September 2009 to 3,471 in November 2009.

One possible reason for the dramatic ridership drop offs in November 2009 and continuing to April 2010 (the last month for which data was provided) may be due to the start of NJ Transit's new Route 28 Go Bus service which provides Bus Rapid Transit (BRT) service between Bloomfield, downtown Newark and Newark Liberty International Airport with fewer stops and faster running times. Go Bus 28 started service on October 17, 2009.

As Go Bus 28 competes against the Route 62 between downtown Newark and Newark Airport, it appears that some Route 62 ridership may have shifted to the quicker service provided by Go Bus 28. As part of the introduction of Go Bus Route 28, bus trips on Route 62 were cut to avoid providing duplicative service.

Route 56

South of Midtown Elizabeth, NJ Transit's Route 56 provides local bus service along Route 1&9 from Edgar Road to Clinton Street. The overall Route 56 runs between Elizabeth and Winfield. Service along this corridor operates six day per week, from Monday through Saturday. During

weekdays, the span of service runs approximately from 5:30 AM to 8:00 PM on a 30 minute AM peak period headway with a generally 60 minute off peak and PM peak headway. On Saturdays, the span of service runs from approximately 6:00 AM to approximately 8:00 PM on a 120 minute (2 hour) headway.

NJ Transit schedules the Route 56 to coordinate with their Route 57 bus service which shares a common alignment along South Broad Street in Elizabeth, north of the Route 1&9 study corridor.

Route 56 bus service along Route 1&9 is focused along providing connections between Winfield and downtown (Midtown) Elizabeth.

Both Route 56 and 57 provide intermodal connections to NJT train service at North Elizabeth Station, Elizabeth Station and Linden Station.

The bus ridership in the southern portion of the study corridor is considerably less than in the portion served by NJ Transit's Route 62. In September 2009, the Route 56 ridership was 779 riders per weekday, while in November 2009 ridership was 755 riders per weekday. On Saturdays the ridership on Route 56 is low, with a September 2009 ridership of 158 passengers per day and a November 2009 ridership of 185 passengers per day. The highest month of Saturday ridership from the time period of April 2009 to April 2010 was in January 2010, which had 219 riders per Saturday.

Route 57

As mentioned above, this route is shown on the printed public bus timetables as twinned with the Route 56, as they share a common routing between the North Elizabeth train station and Washington Avenue and Lidgewood Avenue. South of that point the two routes diverge to serve different southern terminals.

Route 57 crosses Route 1&9 at Wood Avenue where connections to the Route 56 are possible. Route 57 also operates in a one way northbound loop along Route 1&9 for a short distance in the vicinity of Linden Airport and Stiles Street.

From Monday through Saturday, this route operates on a 60-70 minute headway. There is no Sunday service.

Route 58

This route operates between Cranford and Elizabeth. It crosses Route 1&9 at South Broad Street, but does not provide any connection to NJT bus routes along Route 1&9 because there are no NJ Transit bus routes along this portion of Route 1&9. During weekdays, this route operates on irregular headways of approximately every 35-45 minutes throughout the day. On Saturdays a consistent hourly service is offered. There is no Sunday service.

Route 112

The Route 112 is an express bus service between Scotch Plains and New York City. It crosses Route 1&9 at North Avenue where it offers a connection to NJT Route 62. During weekdays, this route operates approximately every 20-30 minutes during peak periods and then changes to hourly service during off peak times. Saturday and Sunday hourly service is provided.

Bus Infrastructure along Route 1&9

Bus stop related infrastructure along NJT's Route 56 and 62 is minimal. Bus stops are designated by pole mounted signs displaying the route number and the NJT information telephone number. Bus schedule information and a route strip map are not provided; both items would be useful amenities given the irregular service headways and route patterns of Route 62.

At one time bus stop shelters existed at Fairmount Avenue, at North Avenue and at Anna Street, but these shelters have been removed.

The absence of consistent bus headways and travel information at bus stops emphasizes the need for NJT's website to provide good travel information, as customers waiting at bus stops could use web enabled devices such as cell phones to access NJT's on line information. More accurate strip maps showing all bus routes would be helpful additions to NJT's website.

Bus-Specific Pedestrian and Bicycle Issues

Many of the same issues mentioned earlier in this report concerning pedestrians and bicyclists apply to bus customers as well, since bus customers become pedestrians once they alight from a bus or when they need to get to a bus stop. Bus customers need a safe and convenient method of getting to and from corridor bus stops day and night. Bus customers who are struck or killed by vehicles are a concern, and NJTPA is currently studying this issue at representative bus stop types within their region.

The characteristics of the roadway greatly influence the degree bus stops are pedestrian friendly or passenger friendly. If access to a bus stop is dangerous or inconvenient, this will serve as a disincentive to riding the bus within the Route 1&9 study corridor.

Rail Service

The Northeast Corridor (NEC) runs parallel and to the west of Route 1&9. While Amtrak and NJ Transit use this corridor, only NJ Transit provides service to the four stations located within the study corridor. The four stations are:

- North Elizabeth
- Elizabeth (Midtown Elizabeth)
- Linden
- Rahway

NJ Transit provides service to these stations on the Northeast Corridor and North Jersey Coast Line (NJCL) service. Train frequencies operate on irregular headways, but match periods of demand to New York City, with trains from both the NEC and the NJCL operating to provide a combined frequency of up to every 10 minutes during the peak period and approximately three trains per hour during midday off peak times and two trains per hour during the night.

On weekends, NJT's NJCL and NEC services operate on the same schedule for both Saturday and Sunday. During the weekend there is very limited train service to North Elizabeth Station; only two morning trains and two late afternoon trains call at that station.

For travel to New York City from the Elizabeth, Linden and Rahway stations, there are essentially three trains per hour on irregular headways from morning to just past noon, transitioning to two trains per hour for the rest of the service day. The service ends just before 2:00 AM. This schedule reflects greater inbound to New York City demand during the morning and midday hours.

Outbound from New York City to Elizabeth, Linden and Rahway stations the scheduling pattern is the opposite. From New York City, weekend morning service starts at two trains per hour, transitioning to three trains per hour around 4:00 PM to 9:00 PM. Thereafter two trains per hour operate to the end of the service day (just before 2:00 AM).

Travel information provided at stations is generally good. Each station displays train schedules, train route and network maps, and often a rider's guide to services (or how to ride guide). Only Elizabeth Station has a staffed ticket office open at least part of the day to provide travel information, sell tickets and to provide a staffed presence that adds to station security.

While the Route 56 and 62 buses tend to serve local trips along the study corridor, NJT's Northeast Corridor and North Jersey Coast Line trains tend to serve regional trips to Newark, New York and points south of the study corridor, such as to New Brunswick and Trenton.

G. Summary of Existing Conditions

In addition to the information gathered in the sections A-I, field investigations and input from the Technical Advisory Committee identified accessibility and mobility concerns for pedestrians at signalized intersections, lighting concerns, and way finding issues throughout the corridor. A brief summary for the overall corridor as well as key intersections is included below.

Corridor-wide Issues

Several concerns were repeatedly observed throughout the corridor. Based on crash incidence and local stakeholder input, corridor lighting was frequently cited as an issue within the study area. Further, the generally congested traffic flow and poor signal progression leads to challenging conditions for vehicular traffic. During non-congested periods, high travel speeds create challenging conditions for vehicular and non-motorized traffic corridor-wide.

Pavement Management Systems data and field investigations indicated generally poor pavement and frequent rutting throughout the study area. Poor overall roadway maintenance was common throughout the corridor, including street sweeping, brush clearing, and lighting.

The corridor lacks sufficient U-Turns for traffic that miss their destination(s). Further exacerbating the U-Turn issue is poor and inconsistent signing, as well as sign pollution that leads to driver confusion.

The corridor has limited bicycle compatibility due to high traffic volumes and the overall roadway design. Pedestrian signal treatments are inconsistent and often not MUTCD compliant, as they lack countdown timers that are now required by the MUTCD. Existing crosswalks are poorly or inconsistently striped. Transit information is insufficient, and deficient rider accommodations, including a lack of shelters, was noted throughout the corridor.

Milton Avenue, Rahway

This intersection is the first signalized intersection north of the freeway-like section in Woodbridge approaching Rahway.

This intersection is awkward for pedestrians given the irregular configuration which creates an excessively long crossing of Route 1&9. North of the sidewalk along Route 1&9 in both directions, worn paths were noted, illustrating unmet pedestrian demand. Countdown pedestrian signal heads were installed when the intersection was recently upgraded.

The total number of annual crashes at this intersection has remained consistent (23 each in 2007 and 2008, 22 in 2009) however the number of crashes occurring on wet pavement has increased significantly (6 in 2007, 1 in 2008, and 11 in 2009). Over the same period, the number of crashes occurring during dawn, dusk, or night has decreased significantly (12 each in 2007 and 2008, 5 in 2009).

Grand Avenue, Rahway

This intersection has seen a reduction in the total number of annual crashes (17 in 2007, 20 in 2008, 13 in 2009), but has maintained a high percentage of crashes occurring at night (more than 40 percent over the three year analysis period).

Worn paths were noted along Route 1&9 northbound and southbound between Milton and Grand Avenues.

Avenue C, Linden

This intersection lacks a sidewalk connection between the existing sidewalk and crosswalk located on the westbound approach of Avenue C. Access from the adjacent development (Sears) is not provided.

It was noted during the outreach process that the rail bridge north of this intersection is often hit by trucks. It is posted with a 13 foot 6 inch clearance, which should be sufficient for trucks within this corridor. There is limited pedestrian accessibility along Route 1&9 under this bridge, where activity was observed and persons walking here must squeeze between the bridge abutment and the guiderail.

The total number of annual crashes at this intersection has dropped significantly (14 in 2007, 5 in 2008, and 7 in 2009). However, the number of crashes occurring during dawn, dusk, or night has increased over the same period (3 in 2007, 2 in 2008, and 6 in 2009). Further, same direction-side crashes account for more than 40 percent of all crashes at this intersection, which is nearly triple the statewide average for same direction-side crashes on the state highway network.

Pleasant Street, Linden

This intersection is located adjacent to a small pocket of residential properties, but lacks crosswalks on the minor approaches at the intersection. The former GM property is located on the northwestern corner of the intersection and is currently being redeveloped.

East Gate, Linden

This intersection is located at the southern end of the Target/Home Depot Plaza and across the street from the former GM site. Pedestrian access between the Home Depot and the intersection is not provided. Also, a crosswalk is not installed on the westbound approach of the intersection.

Gordon District, Linden

This intersection is located at the central entrance of the Target/Home Depot Plaza and across the street from the former GM site. Pedestrian access between the shopping plaza and the intersection is not provided. No crosswalks are currently provided at this intersection.

Stiles Street, Linden

This intersection is located adjacent to Wheeler Park, a County facility that includes a pool, skate park, and numerous ball fields. This intersection does not include countdown pedestrian signal heads, but does have red light running cameras installed. Several vehicles were observed triggering the cameras during our initial field view. Given the presence of dedicated left and right turn lanes for

both Route 1&9 approaches, the crossing time needed for pedestrians are among the longest experienced within the corridor, given the extreme length of the existing crosswalk (135 feet).

This intersection has seen a significant reduction in the total number of annual crashes (34 in 2007, 18 in 2008, 22 in 2009), but still exhibits several issues of note. The number of crashes occurring during dawn, dusk, or night is trending down throughout the three year period, but still accounts for approximately half of all crashes at the intersection. Same direction-side crashes account for nearly thirty percent of all crashes at the intersection, which is more than double the statewide average for this crash type on the state highway network. A significant number of angle crashes (6 right angle, 7 left turn) were noted during the three year analysis period. Further, a cluster of crashes involving heavy vehicles was noted to the north of this intersection.

There are plans to upgrade this intersection as part of the GM site redevelopment.

Wood Avenue, Linden

This intersection is located adjacent to Wheeler Park, a county facility that includes a pool, skate park, and numerous ball fields. The crosswalk along the eastbound approach of Wood Avenue lacks pedestrian signal heads, while the crosswalk along the westbound approach of Wood Avenue has only a standard three-ball signal head. Many pedestrians were observed crossing the northbound approach of Route 1&9, even though no crosswalk is provided for that approach.

Local officials in Linden noted that the Wheeler Park skate park is located midblock between Stiles and Wood Avenues and across the street from a fast food restaurant. Many youths have been observed by local officials jumping the park fence and crossing Route 1&9 midblock to go the fast food restaurant. It was noted that there is another fast food restaurant on Wood Avenue that would not require crossing Route 1&9, but is not utilized as frequently.

This intersection has seen a significant reduction in the total number of annual crashes (24 in 2007, 15 in 2008, and 16 in 2009). The number of crashes occurring during dawn, dusk, or night is trending down throughout the three year period, but still accounts for approximately half of all crashes at the intersection. A significant number of angle crashes (5 right angle, 4 left turn) were noted during the three year analysis period. A cluster of crashes involving heavy vehicles was noted at the intersection extending north to Interstate 278.

Clinton Street, Linden

At this intersection, both approaches of Clinton Street lack pedestrian signal heads. St. Theresa of the Child Jesus Church is located on the northwest corner of the intersection. Many pedestrians were observed crossing the northbound approach of Route 1&9, even though no crosswalk is provided for that approach.

Route 1&9 at Woodlawn Avenue looking east from the southwest corner of the intersection. The skew of the minor approaches at this intersection may account for the high number of angle crashes at this location.

Woodlawn Avenue, Linden

At this intersection, no pedestrian signal heads are provided for pedestrians crossing Route 1&9. North of the intersection along Route 1&9 northbound, a worn path was noted adjacent to Rose Hill Cemetery, though it is not evident why pedestrian traffic would be significant in this area given the lack of generators or marked crossing locations along this portion of the corridor. This

path does not continue as Route 1&9 passes Mount Cavalry Cemetery, where a steep grade adjacent to Route 1&9 limits pedestrian movement.

The total number of annual crashes at this intersection has remained consistent (15 in 2007, 11 in 2008, and 16 in 2009), while the number of crashes occurring during dawn, dusk, or night has been trending down. However, the number of crashes during dawn, dusk, or night still accounts for nearly 40 percent of all crashes at the intersection. Further, a significant number of angle crashes (7 right angle, 6 left turn) was noted during the three year analysis period. The side street approaches are offset from one another.

Morse Mill Road, Linden

While overall crash incidence at this intersection was not particularly high (6 crashes in 3 years), anecdotal input from Linden officials and the Linden Industrial Association indicated that the approach to this intersection from Interstate 278 experiences a high number of crashes due to the unconventional lane configuration for traffic wishing to access the Bayway Refinery. Further, the entrance to the Bayway Refinery from Route 1&9 southbound is poorly marked, given that it is a left lane exit. Advance signage from Route 1&9 and from Interstate 278 in this area are insufficient for those destined to Route 1&9 or the refinery.

It was observed that vehicles merging from Interstate 278 often do so at a high rate of speed, as there is little transition from the interstate highway section to Route 1&9. A cursory review of NJDOT crash summaries indicated a significant number of fixed object (7) and same direction-side (5) crashes occurring along Route 1&9 southbound approaching this intersection, however the exact location of these crashes cannot be determined without a more detailed review of individual crash reports.

Park Avenue, Linden

The total number of crashes at this intersection has dropped significantly (32 in 2007, 15 in 2008, 10 in 2009), but the percentage of crashes occurring during dawn, dusk, or night has remained consistent during the three year analysis period (approximately 35 percent). The number of crashes involving a fixed object has dropped significantly as well, from 7 in 2007 to 0 in 2009. 8 fixed object crashes were reported at this intersection within the three year study period.

Myrtle Avenue, Elizabeth

This intersection only provides a pedestrian actuated crossing. It was noted that no buffer interval is provided between the end of the flashing don't-walk phase and the release of traffic along Route 1&9.

Elmora Avenue/Bayway Ave/ NJ Route 439, Elizabeth

A review of crashes occurring at the signalized intersections on Route 1&9 within Bayway Circle indicated that the total number of crashes is trending down slightly (28 in 2007, 21 in 2008, and 22 in 2009). The percentage of crashes occurring at night has increased significantly over the same period (32% in 2007, 14% in 2008, and 41% in 2009). The total number of right angle crashes is trending down, but still accounts for a significant number of crashes over the three year analysis period. A cluster of crashes involving heavy vehicles was noted at the circle.

Grier Avenue, Elizabeth

This intersection is generally indistinguishable from numerous other signalized intersections along Route 1&9, but the adjacent intersection of Gibbons Court to the south lacks a crosswalk.

While the total number of crashes at this intersection is low compared to the rest of the corridor intersections, three pedestrian crashes, all resulting in injuries, were noted at this intersection over the three year analysis period.

South Broad Street, Elizabeth

This intersection is similar to several other signalized intersections within Elizabeth and includes pedestrian signal heads. Continental style crosswalk markings are included on the approaches of South Broad Street, while standard longitudinal markings exist on the approaches of Route 1&9. South Broad Street serves as a primary connection between a large residential community in the southern portion of Elizabeth and downtown Elizabeth, and heavy pedestrian activity at this intersection was noted during field investigations.

This intersection has seen an increase in total crashes as well as several specific crash factors. The number of crashes involving injuries is trending up (2 in 2007, 7 each in 2007 and 2008). Crashes occurring during dawn, dusk, or night have increased as well (1 in 2007, 8 in 2008, and 7 in 2009). A significant number of right angle crashes was noted during the three year analysis period, and an over-representation of same direction-side intersections was noted as well. Five (5) pedestrian crashes were observed at this intersection over the three year analysis period, all resulting in injuries.

Drainage issues were noted in the vicinity of this intersection, as this section is ranked 84th on NJDOT's Drainage Management System. Further, eight crashes occurring on wet pavement were noted during the three year analysis period.

Maple Avenue, Elizabeth

This intersection is made challenging for pedestrians due to the presence of Garden Street immediately to the south of the signal. The angle of the intersection allows for vehicles turning from Route 1&9 to Garden Street to do so at a high rate of speed. Further, the curve of Route 1&9 as it approaches the intersection with Maple Avenue/Garden Street obscures vehicular traffic from the view of pedestrians crossing Garden Street.

The total number of crashes involving injuries at this intersection has increased significantly (3 each in 2007 and 2008, 11 in 2009). The percentage of crashes occurring during dawn, dusk, or night has remained steady, accounting for approximately 55 percent of all crashes at this intersection over the three year analysis period. An increase in fixed object crashes was noted as well (1 each in 2007 and 2008, 5 in 2009). Further, two pedestrian crashes, both involving injuries, occurred at this intersection over the three year analysis period.

Jersey Street, Elizabeth

This intersection is located directly north of the recently reconstructed Elizabeth River Viaduct. The vertical curve of the structure traveling northbound limits advance warning of the signalized intersection. Also, the width of the structure exhibits characteristics of a freeway, as opposed to the actual context of the roadway through densely populated areas within this portion of the corridor. Pedestrian conditions at the intersection are made challenging due to the extreme length of the crossings, most notably on the Route 1&9 northbound approach. Ladder style crosswalks are striped on all four approaches

at this intersection, as opposed to the longitudinal markings generally found along Route 1&9 within Elizabeth. During an initial field investigation, push buttons installed on the northwest and southwest corners of the intersection were not functioning properly as pedestrians were unable to actuate the signal to provide sufficient crossing time. This intersection is critical for pedestrian circulation at is provides a key link to the Elizabeth Central Business District.

This intersection has seen an overall reduction in the total number of crashes (23 in 2007, 29 in 2008, 21 in 2009), but the percentage of crashes involving injuries has increased over the same period (22% in 2007, 35% in 2008, 38% in 2009). The percentage of crashes occurring during dawn, dusk, or night has remained consistent through the three year period, accounting for more than 40 percent of all crashes at the intersection. Six pedestrian crashes, including one involving a fatality and five involving injuries, were noted during the three year study period.

East Grand Street, Elizabeth

This intersection lacks a crosswalk on the westbound approach of the intersection, but is otherwise typical of the intersection design within the study corridor in Elizabeth. This intersection is critical for pedestrian circulation at is provides a key link to the Elizabeth Central Business District.

While the overall number of total crashes at the intersection has trended down (19 in 2007, 21 in 2008, 15 in 2009), crashes involving injuries still account for more than one third of all crashes. Further, this intersection experienced three crashes involving fatalities over the three year study period, including two in 2009. The percentage of crashes occurring during dawn, dusk, or night has remained consistent at more than 40 percent through the three year analysis period. Four pedestrian crashes, including two involving fatalities and two involving injuries, and two pedacycle crashes were noted at the intersection.

Drainage issues were noted in the vicinity of this intersection, as this section is ranked 20th on NJDOT's Drainage Management System.

Bond Street, Elizabeth

The total number of annual crashes has declined significantly (16 in 2007, 12 in 2008, 9 in 2009), but the percentage of crashes involving injuries has remained near 40 percent throughout the three year study period. Crashes on wet pavement account for nearly 30 percent of all crashes, while crashes occurring during dawn, dusk, or night account for nearly 40 percent of all crashes. Three crashes involving parked vehicles were noted at this intersection, which is the first incidence of on-street parking for vehicles traveling northbound within the corridor.

Drainage issues were noted in the vicinity of this intersection, as this section is ranked 20th on NJDOT's Drainage Management System.

Flora Street, Elizabeth

While the total number of crashes at this intersection was low compared to other intersections within the study corridor, the intersection did experience two pedestrian crashes, both involving injuries, within the three year analysis period.

Three traffic lights (at Bond, Anna, and Flora Streets) are installed along Route 1&9 within a 1,100 foot segment of the study area. The NJDOT recommends a minimum of 1,500 feet between signalized intersections.

Fairmount Avenue, Elizabeth

A spike in crashes at this intersection was noted during 2008 (42 crashes versus 20 in 2007 and 21 in 2009). A similar spike in crashes on wet pavement was observed as well (16 crashes in 2008 versus 4 in 2007 and 8 in 2009). Over the three year analysis period, nearly half of all crashes occurred during dawn, dusk, or night. While same direction-rear crashes are the most prevalent crash type at the intersection, 18 Right Angle crashes occurred during the three year analysis period.

North Avenue, Elizabeth

This intersection serves as a transition from the freeway section of Route 1&9 to the north of the study corridor. The extreme length of the crossing of Route 1&9 makes it a challenging environment for pedestrians. The existing bus stop located in the island on the southeast corner of the intersection has not been maintained and was cluttered with garbage during an initial field visit. Also, a worn path south of the bus stop was evident. While a connection to this bus stop from points south is currently provided along the jughandle ramp, it is circuitous and overgrown.

Route 1&9 Northbound approaching North Avenue looking north. The heavily worn path indicates a gap in the sidewalk network approaching an existing bus stop

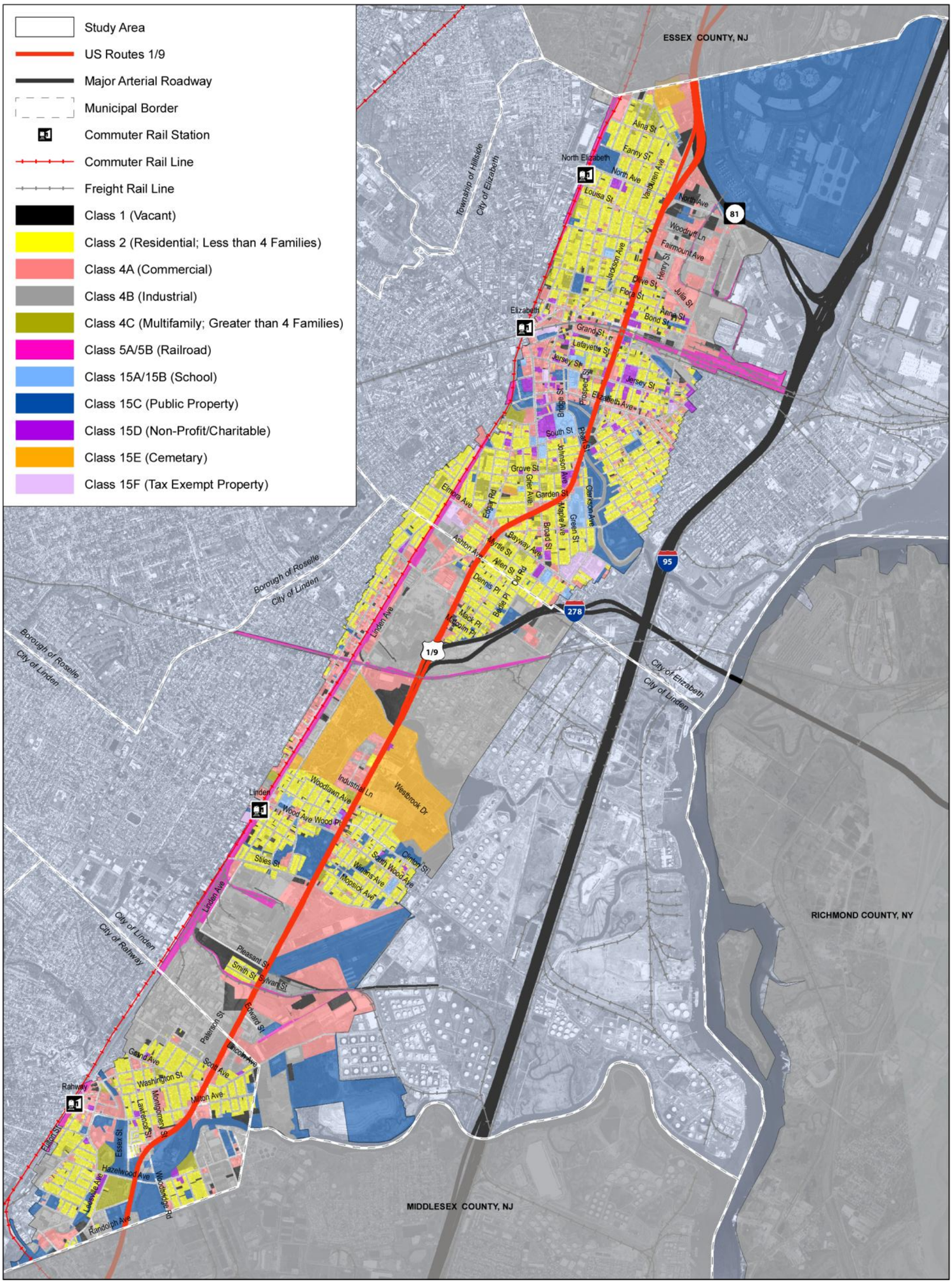
Drainage issues were noted in the vicinity of this intersection, as this section is ranked 133rd on NJDOT's Drainage Management System. Further, 27 crashes were reported on wet pavement during the three year analysis period.

This intersection experienced a significant decline in total crashes over the three year period (52 in 2007, 68 in 2008, and 30 in 2009) however the number of overall crashes remains high. Improvements were made to the intersection in 2007. Several declining trends for crash factors were noted as well: crashes involving injuries declined significantly (16 in 2007, 28 in 2008, 5 in 2009), and crashes occurring during dawn, dusk, or night trended down as well (19 in 2007, 22 in 2008, 8 in 2009). The number of right angle crashes is trending down as well (15 in 2007, 18 in 2008, 8 in 2009), but still remains higher than the statewide average.

H. Land Use

The study team reviewed and mapped the existing land use patterns using local property tax classification data (Figure 29). The tax classification data provides insight into the current uses along the study area by their tax code.

The study area has a diverse mix of land uses and densities. The corridor communities are among the densest in New Jersey. Each of the cities that Route 1&9 passes through has a downtown area (within one mile of Route 1&9) with northeast corridor rail stations, multi-modal options and compact mixed use developments. Along Route 1&9 the mix of uses includes a variety of non-residential land uses, including commercial, industrial, and recreational parcels, as well as a substantial residential community located on or within walking distance of Route 1&9. While the study area is bisected by Route 1&9, maintaining this mix, providing a balanced mix of complementary land uses, and providing the appropriate network connectivity for all modes should be an important part of any development or redevelopment plan. It is also important to consider this mix of uses when developing improvements to Route 1&9. The roadway design needs to fit within the context of the residential areas, allow for pedestrian connections in the residential, business and community areas and allow for trucking movements to and from the industrial sites.



Property Tax Classification Corridor of US Routes 1 & 9 Union County, New Jersey

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI, MOD-IV
Note: Property tax classifications are obtained from MOD-IV assessment records dated 09/30/10. They provide a general indicator of land use.
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

0 1,400 2,800 5,600 Feet

Figure 29 - Local Property Tax Land Use Classification, Route 1&9 Corridor

I. Socioeconomic/Demographic, Labor, and Industry

Socioeconomic and demographic data was generated by 4Ward Planning's proprietary census-based software, while industry and labor trend data were obtained from the US Census Bureau's *On The Map* program.

Socioeconomic and demographic data for each municipality within the study area as well as the Newark Metropolitan Statistical Area (MSA) (Essex, Union, Morris, Sussex, and Hunterdon Counties, NJ; and Pike County, PA) were collected. The years analyzed included 2000, 2010, and 2015 (projected).

Trend analyses included the following:

- Overall population
- Population age
- Household income
- Educational attainment
- Housing tenure
- Overall labor trends

Labor and industry trend data were also obtained. The three geographies that data exists for include:

- The Corridor Study Area (identified by Union County as extending roughly 2,000 feet on either side of Route 1&9 in Linden, Rahway, and Elizabeth)
- Linden, Rahway, and Elizabeth Cities
- Union County

For all three geographies, trends in primary jobs by age of worker, income, and industry type, as well as total employers were examined. In addition, labor shed analyses that identify the cities, counties, and states where workers in each geography reside were completed. The most recent data available are from 2008, while trends were evaluated using data from 2004 and 2006.

Demographic Analysis

The Route 1&9 Corridor Demographic, Labor, and Industry Trend Analysis illustrated several trends within the corridor in terms of population and employment.

2000 Census population data in Elizabeth indicates more than 120,500 persons (8,800 persons per square mile), while Linden and Rahway have much lower overall populations and densities at approximately 39,400 (3,500 per square mile) and 26,500 (6,500 per square mile) respectively.

In terms of population, all three cities and the Newark MSA exhibited a significant graying of their total population, with the 55 to 74 year age group showing significant growth, while all other age groups either declined or showed minimal growth. This graying population tends to be more pedestrian or transit dependent.

In terms of total population, the City of Elizabeth grew at a rate double that of the Newark MSA, while Linden and Rahway experienced minimal growth. All three cities experienced significant population growth of college educated adults however that growth was significantly lower than the Newark MSA as a whole.

All three cities experienced a significant growth in housing vacancies, with numbers in Linden and Rahway both nearly doubling between 2000 and 2010. Similarly, owner-occupied units declined in Linden and Rahway, while Elizabeth experienced minimal growth. During the same period, the growth in median household incomes lagged in the three study area cities when compared to the Newark MSA as a whole.

An analysis of travel patterns and journey to work data indicated that Elizabeth had a significantly higher percentage of households without access to a motor vehicle compared to Rahway or Linden. As would be expected, a significantly higher percentage of population within Elizabeth either walks, bicycles, or uses another (non-vehicle or transit) mode of transportation when compared to Linden or Rahway. All three cities exhibited a similar transit share, between 8 and 9 percent. Those without access to a vehicle or those who rely on transit also depend on reasonable bicycle and pedestrian facilities to make daily work and shop trips.

Employment within the study corridor municipalities increased between 2006 and 2008 by more than 15 percent, which is significant considering a decline of more than 4 percent over the same period within Union County as a whole. Even more importantly, higher paying jobs ($40,000 or more annually) grew by more than 30 percent between 2006 and 2008, whereas Union County saw a 3 percent decline in higher paying jobs over that same period. Journey to work data showed similar commute patterns for those working within the Route 1&9 study corridor compared to those working in Union County as a whole, with the predominant counties of residence being Union, Essex, or Middlesex County.

This data further illustrates the importance of improving pedestrian circulation along and across Route 1&9, which bisects all three communities it passes through within the study area. Further, improving access to transit and the overall rider experience is important given the lack of access to a motor vehicle for a significant portion of the population within these three municipalities.

J. Environmental Screening

An environmental screening was performed based on existing GIS mapping to identify potential sensitive areas within the study area. This analysis indicated several potential environmental constraints located along the project corridor. Specific environmental sensitivities are outlined by type below and are illustrated in Figure 30.

NJDEP Wetlands

Several types of wetlands exist within the corridor, including emergent wetlands, forested wetlands and scrubs/shrub wetlands. Based on the Landscape v2.1 habitat assessment, emergent wetlands within the study area are associated with Threatened and Endangered (T&E) Species. It is anticipated that wetlands associated with T&E species are likely to have 150’ buffers and 50’ buffers are expected for wetlands without T&E species. In addition, grasslands mapped within the study area are associated with the Upland Sandpiper (*Bartramia longicauda*), which is listed as an endangered species.

Known Contaminated Sites

A review of the NJDEP Known Contaminated Site List for New Jersey (Non-Homeowner) GIS Layer, Edition 200908, revealed that there are 146 Known Contaminated Sites located within a one-half mile radius of the Route 1&9 Corridor.

10 Superfund sites were identified within the study corridor municipalities:

- Rahway
    - Merck & Company Incorporated
- Linden
    - Aristech Chemical Corporation
    - Cytec Industries Incorporated - Warners
    - Exxon Bayway Refining Company
    - GM Assembly Division Linden Plant
    - LCP Chemicals Inc.
    - Safety-Kleen Corporation Linden RC
    - Standard T Chemical Company Incorporated
- Elizabeth
    - Chemical Control
    - Cycle Chem Incorporated

Groundwater Contamination Area (Classification Exception Areas)

A review of the NJDEP Classification Exception Areas/Well Restriction Areas Polygon maps for New Jersey GIS Layer revealed that there are 20 Ground Water Contamination Sites located within a one-half mile radius of the Route 1&9 Corridor.

Historic Districts/Properties/Archaeological Sites

In order to identify historically significant properties in the vicinity of the project area, two databases maintained by the New Jersey Department of Environmental Protection (NJDEP) were reviewed. The NJDEP Historic Districts and Historic Properties of New Jersey (Edition 20080422) GIS layers were assessed to identify historic districts and properties located within the study area. In addition, the New Jersey Historic Preservation Office's website (http://www.nj.gov/dep/hpo/) was also consulted to further determine if any additional historic properties and districts exist in the study area. The assessments revealed that there are four historic districts and three historic properties located within a one-half mile radius of the Route 1&9 Corridor. A review of the NJDEP Archaeological Site Grid of New Jersey (Edition 20080422) revealed that no archaeological sites are located within a one-half mile radius of the Route 1&9 Corridor. The seven historic properties located within the project study area are noted as follows:

- *Central Railroad of New Jersey Main Line Corridor Historic District, (ID#3500)* - Railroad Right-of-way from Phillipsburg to Bayonne, including all associated features. SHPO Opinion: 7/19/1991 DOE: 11/30/1995 (Historic district extends through 29 municipalities in 5 counties.)
- *Inch Lines Linear Multistate Historic District (ID#1914)* - SHPO Opinion: 8/31/1993. This resource passes through 12 municipalities and three counties in New Jersey. The Inch Lines Multistate Historic district is a World War 11-era oil pipeline constructed to bring oil from Texas to the East Coast. In New Jersey it passes through nine municipalities and three counties.
- *Regina Historic District (ID#4048)* - is located within Union County and contains portions of Esterbrook, Jaques, Central, Maple, Milton avenues, Irving and Broad streets. SHPO Opinion: 2/14/1992

- *Elizabeth River Viaduct (ID#4216)* - Route 1&9 over Elizabeth River and local streets. SHPO Opinion: 9/11/1991
- *828 - 842 Grove Street (ID#4273*) - 828 - 842 Grove Street. SHPO Opinion: 4/15/2004

Upper Wetland Limits (Also known as Coastal Wetland Line)

A review of the NJDEP Upper Wetlands Boundary/Upper Wetlands Limit for New Jersey Coastal GIS layer (1st edition) revealed that wetlands intersect the corridor at the southern portion of the study area near Hazelwood Avenue and are also located adjacent to the Rahway River. They also intersect the study area to the north of Broadway Avenue from Rahway Avenue to Trenton Avenue.

Floodplains

The National Flood Hazard GIS Layer was consulted to determine the location of 100-year and 500-year floodplains within the study area. 100-year and 500-year floodplains are located adjacent to the Rahway River in the southern portion of the study area. Additionally, 100-year and 500-year floodplains can also be found near several other locations within a one-half mile radius of the Route 1&9 corridors including the Rose Hill, Mt. Calvary, Rosedale and Linden Park Cemeteries; Wheeler Park; an area adjacent to Elizabeth River near the Mattano and Elizabeth River Parks; and near Earthart Drive in the northern portion of the study area.

Head of Tide

The NJDEP Head of Tide Points for Watercourses of New Jersey GIS layer (Edition 1986) was consulted to determine if there were any Head of Tide locations existing within the project study area. Three Head of Tide points are located within a one-half mile radius of the Route 1&9 Corridor. Two of these are located in the southern portion of the study area; adjacent to Route 1&9 near Capobianco Plaza, and South of Barnett Street approximately 1.1 mile northeast from the point located near Capobianco Plaza. The third Head of Tide point is located in the vicinity of Elizabeth River near Rahway Avenue and Burnett Street.

Tidelands and Areas Formerly Flowed by Tides

The NJDEP Tidelands (Raritan-Hudson - Edition 200407) GIS layer revealed that tidelands intersect the corridor at the southern portion of the study area near Hazelwood Avenue and are also located adjacent to the Rahway River.

Open Space

According to the NJDEP State Owned, Protected Open Space and Recreation Areas in New Jersey GIS Layer, there are 26 Green Acres parks located within the one-half mile project radius of the Route 1&9 corridor. [3]

Surface Water Quality Standards

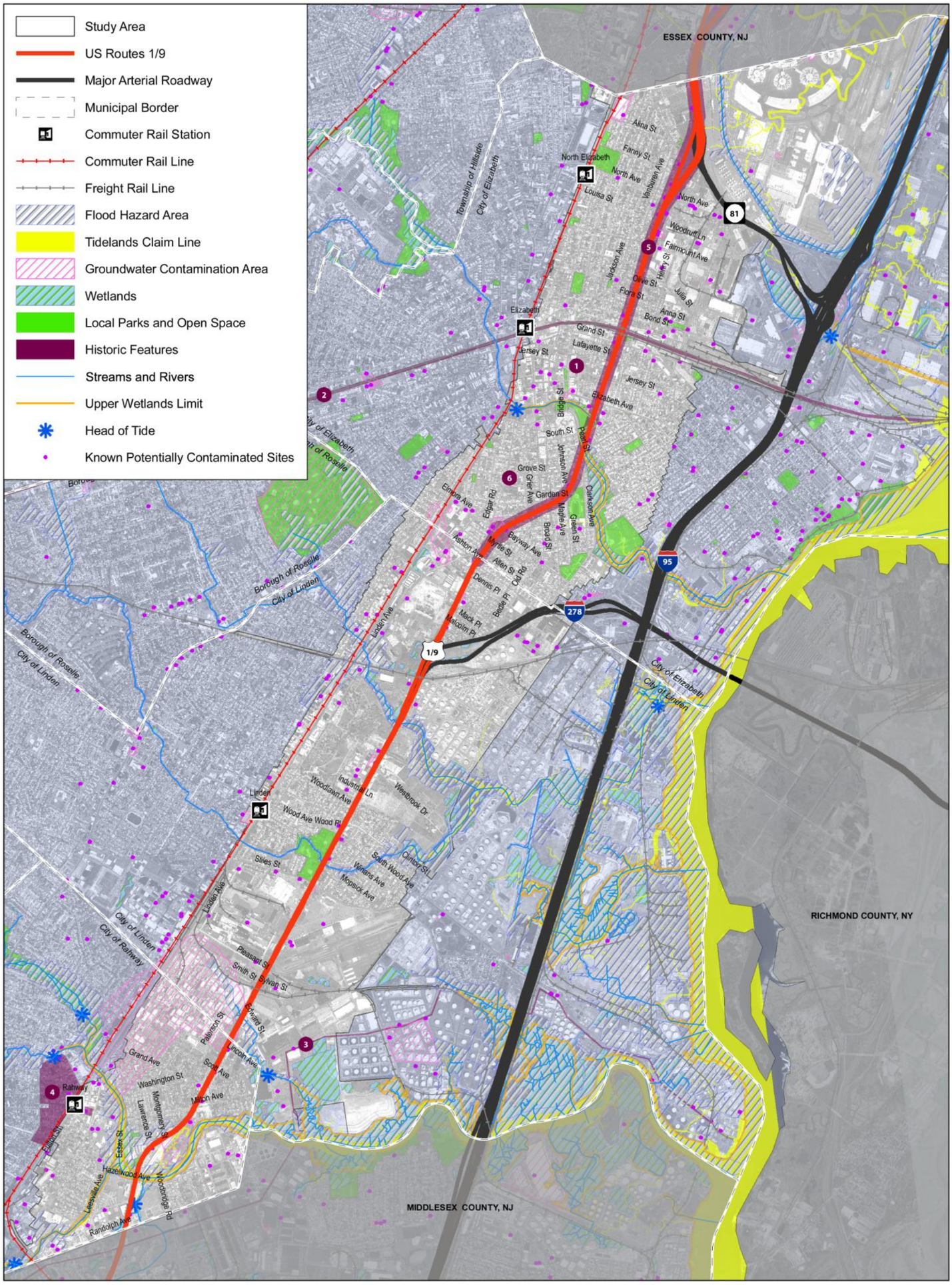
All waters in the project area have been classified as either Saline Estuarine 3 (SE3) or Freshwater 2 Non-Trout producing waters (FW2-NT)/estuarine 3 (FW2-NT/SE3). These waters are not identified as having species that are critically dependent on the waterways. Additionally,

[3] This GIS Layer contains protected open space and recreation areas owned in fee simple interest by the State of New Jersey Department of Environmental Protection (NJDEP). Due to the varied mapped sources and methods of data capture, this data set is limited in its ability to portray all open space lands accurately, particularly the parcels purchased prior to 1991.

there are no acid-producing soils associated with these waterways; therefore a Riparian buffer of 50 feet is anticipated. The streams in the project area along with their classification are listed below:

- *Elizabeth River - SE3*
- *Peach Orchard Brook - FW2-NT/SE3*
- *West Brook Reservoir - FW2-NT/SE3*
- *Morses Creek - FW2-NT/SE3*
- *Kings Creek - SE3*
- *Rahway River – SE3*
- *Rahway River UNT – SE3*

Given the proximity of the study area to several waterways and wetlands, appropriate levels of permitting will be necessary to advance projects within the corridor.



1. Boxwood Hall
2. Central Railroad of NJ Mainline Historic District
3. Inch Lines Linear Multistate Historic District
4. Regina Historic District
5. US Routes 1 & 9 Historic District (incl. Elizabeth River Viaduct)
6. 828-842 Grove Street

0 1,400 2,800 5,600 Feet

Source: NJDEP, NJDOT, Union County, NJ Transit, ESRI
Note: This map was developed using NJDEP GIS data, but this secondary product has not been verified by the NJDEP and is not State-authorized.

Environmental Constraints Corridor of US Routes 1 & 9 Union County, New Jersey

Figure 30 - Environmental Constraints, Route 1&9 Corridor

V. STAKEHOLDER INVOLVEMENT

The study's goal is to balance the many functions of the corridor so that local residents, pedestrians, commuters, and industrial entities can coexist safely, while allowing the corridor to support and complement local redevelopment plans in a sustainable manner. Accordingly, the outreach and involvement activities were crucial to the success of the project. The Route 1&9 Corridor Study actively involved public agencies, municipal representatives, key private businesses, and the general public in identifying the issues and developing the recommended actions.

Outreach activities included:

- One-on-one meetings with the representatives from the Cities of Elizabeth, Linden and Rahway.
- Meeting with the Linden Industrial Association, held at the ConocoPhillips Bayway refinery.
- Field visit and meeting with General Magnaplate and Safety-Kleen to view specific concerns at their properties along Sylvan Avenue.
- Formation and conduct of two meetings of a Technical Advisory Committee (TAC).
- Presentation to and discussion with the Union County Transportation Advisory Board (TAB).
- Development of a one-page description of the project

A. One-on-One Meetings with the Municipalities

As part of the overall community outreach program, the project team interviewed key municipal stakeholders from Linden, Rahway, and Elizabeth. These interviews provided the project team with important local information as well as additional contacts within each municipality. A summary of each interview is included below.

The meetings with the municipalities were held early in the project. The meetings provided an opportunity to introduce the project, identify key issues and develop the context for the study.

Elizabeth

Team officials met with City of Elizabeth stakeholders on August 10, 2010 via conference call. A summary of key findings is noted below.

Elizabeth officials cited numerous pedestrian safety concerns within their section of the Route 1&9 corridor. Jaywalking is a major concern, but even crossings at signalized intersections are challenging due to high congestion, aggressive driving, and a general unsafe feeling for pedestrians.

Pedestrian traffic is highest at the signalized intersections at East Grand and East Jersey Avenues. These intersections are particularly difficult for pedestrians to cross due to their proximity to the newly improved viaduct. This area transitions from a highway to a densely developed area quickly and without warning for drivers unfamiliar with the area.

A problem was noted with signalized intersections within northern Elizabeth, where existing signals are closely spaced.

Local officials noted that high truck traffic volumes within the study area are due to trucks avoiding tolls on the New Jersey Turnpike. The addition of high truck volumes to an already

congestion roadway often results in a large number of same direction-rear end and angle truck crashes.

It was also mentioned that the city applied to the state for red light cameras to be installed at Fairmount Street and East Grand, East Jersey and Maple Avenues.

Finally, the group noted that limousines often idle within the study area parking lots waiting to pick up customers at Newark Airport, which does not provide a waiting area for these vehicles.

Linden

Team officials met with City of Linden stakeholders on September 15, 2010 at Linden City Hall. A summary of key findings is noted below.

Linden officials noted that safety concerns were their top priority, including traffic crashes, pedestrian and bicycle movements, and missing sidewalks. Traffic congestion is also a major concern, both for local residents, and industrial trucking as well.

U-Turns through residential neighborhoods were also cited, most notably along Woodlawn Avenue near Wood Avenue. Trucks often miss a poorly marked terminal entrance and are forced to backtrack through Linden to access this area. Truck traffic was also identified as being a concern along Stiles and Wood Avenues, which provide a direct access way between Route 1&9 and points west.

Linden officials also noted that the corridor is confusing for visitors and drivers unfamiliar with Route 1&9, including cemetery visitors, truck operators, and shopping traffic.

Local police discussed speeding issues throughout the corridor, with average speeds often exceeding the posted speed limit by more than 20 miles per hour. A particular problem is traffic coming from Interstate 278, as the design of the interchange allows for high speed travel onto Route 1&9.

A pedestrian issue was noted in the vicinity of the Skate Park between Wood Avenue and Stiles Street. Children often cross Route 1&9 midblock to access the McDonalds along the northbound side of Route 1&9.

Finally, maintenance and lighting issues were noted throughout the corridor. The city would like to be provided consistent relationships with NJDOT staff to aid in getting a timely response from NJDOT when issues arise.

Rahway

Team members met with City of Rahway stakeholders on September 21, 2010 at Rahway City Hall. Key discussion points are summarized below.

Rahway officials noted that a major issue along the Route 1&9 corridor was the lack of maintenance within the study area. This included several comments about the excessive amount of debris and litter that clutters the route, particularly the area near Hazelwood Avenue.

The realignment of Route 1&9 in Rahway was noted as a success in reducing overall crashes, however it has resulted in a significant increase in speeding. The city has been diligent in enforcement within this area, but travel speeds often reach double the posted 45 mile per hour speed limit.

Two remaining key problem signalized intersections were noted, at East Grand and Milton Streets, while Rahway officials requested that a review of the signal timing at Aviation Plaza be part of this study.

Ultimately, Rahway officials agreed that a boulevard treatment with street trees and scaled lighting would be the preferred vision for the corridor, but understand that the right of way impacts would be too great to allow such a plan to materialize.

B. Meeting with Linden Industrial Association

The Linden Industrial Association includes many of the key businesses located in the Route 1&9 Corridor, including many of the major employers and truck generators and users. The meeting was held on December 16, 2010 at the Bayway refinery. The County provided copies of the one-page project summary to the participants.

Key points that emerged from this discussion included:

Area along Route 1&9 from the entrance to the ConocoPhillips Domestic Sales Terminal to Park Avenue

- The configuration at the front of the terminal entrance is a long down ramp from westbound Interstate 278 to southbound Route 1&9 that is two lanes wide. The right lane merges into the left lane of southbound route 1&9 and the ramp left lane veers to an at-grade crossing of Route 1&9 northbound. This crossing is protected by a traffic light. After crossing Route 1&9 the ramp leads directly into a jug handle like turn into the domestic sales terminal of ConocoPhillips. There is a raised island with markers at the base of the Interstate 278 ramp designed to direct traffic around the curve away from northbound Route 1&9.
- This location has been the scene of numerous accidents, of which some may have had fatal outcomes as vehicles traveling at unsafe speeds hit the raised island and became airborne. Cars speed down the ramp and have become airborne when hitting the raised island at the bottom. Cars hit the island and crash onto northbound Route 1&9.
- Cars traveling down the Interstate 278 westbound ramp have to enter the fast lane of Route 1&9 and must immediately cross over three-to-four lanes to exit by the cemetery on southbound Route 1&9. This weaving pattern has caused accidents for those unfamiliar with the area.
- Between 400 and 500 tank trucks a day enter Bayway Terminal at this location. They enter from northbound Route 1&9 as well as from the westbound Interstate 278 ramp.
- Signage identifying the left lane of the ramp as an entrance only to the refinery may be inadequate for those unfamiliar with the area. Cars then have to swiftly change lanes to continue southbound on Route 1&9.
- Trucks traveling northbound on Route 1&9 cannot easily make the right angle turn at Park Avenue. They must make a wide swing. The geometry at this corner needs to be improved, especially if the missing northbound ramp from Interstate 278 is constructed and additional truck traffic from the Goethals Bridge uses this location to access eastbound Park Avenue.
- Speeding tends to occur between Park and Woodlawn Avenues along this 1.5 mile stretch of Route 1&9. There are no traffic signals between these two points.

Area along Route 1&9 between Stiles Street, the entrance to Safety-Kleen and the GM Property at Pleasant Avenue south to Rahway

- There is a lack of jug handles in this stretch of Route 1&9. One was removed on the southbound side and became part of the Merck Property. Pleasant Avenue also used to have a jug handle.
- If drivers miss their turn, they go down to Woodlawn and then go through residential neighborhoods.
- Participants noted that the queue lane on the northbound side into Sam's Club and Kohl's is not sufficient in length.
- Trucks pick up loads at Safety-Kleen, Magnaplate and other industrial businesses between 2 and 4 PM. This causes significant traffic in this area on the Corridor between Bayway Circle and Wood.
- It was noted that Duke Properties will take part of Klein Automotive to add another left lane as part of their redevelopment of the GM property. NJDOT has already issued the permits related to this redevelopment. Housing is anticipated for this site in the old parking lot areas.
- The CSAO (Conrail Shared Assets Organization) railroad overpass is a low clearance bridge by today's standards. Trucks have hit this bridge. It restricts truck traffic on this stretch of Route 1&9.
- The traffic light signals on the armatures over the roadway at the turn off lanes to the mall are not clearly positioned over lanes causing confusion for motorists. This has caused rear end collisions. It was suggested that the team and County look at the signalization at Woodbridge Mall as a model.
- Signage along the complete length of the corridor is confusing and needs to be improved to guide motorists and truckers. Also, Route 1&9 is identified as Spring Street in Elizabeth and Edgar Road in Linden – this causes driver confusion.
- Red light violation cameras are located at Stiles Street and Route 1&9 and at Park Avenue and Route 1&9. This has led to a considerable reduction in accidents, according to the City of Linden.
- In this section south into Rahway there are no shoulders, along with roadway geometry issues. Trucks have to make wide swings to exit or enter adjoining properties. Patrol cars have to be positioned on adjoining private properties when monitoring the roadway.
- Traffic back-ups occur on Route 1&9 northbound from the Aviation Plaza Mall south into Rahway during mid-day between 2:00 PM and 4:00 PM. This may coincide with the mid-afternoon truck pick-up period. Trucks usually drop off in the morning and pick up in the afternoon before heading back to home terminals.
- The Stiles Street left hand turning lane on northbound Route 1&9 may not be long enough to handle traffic queuing, thereby blocking northbound traffic.

Access to Route 1&9 corridor via public transit and non-motorized vehicles

- There are no sidewalks under the CSAO railroad overpass forcing people to walk on Route 1&9 traffic lanes. The Complete Streets program requires this accommodation.
- There is no bus service into the corridor from any of the six bus routes that serve Linden.
- Employees at the retail centers are walking or biking from the NJ Transit railroad station on Wood Avenue to their destinations along Route 1&9. A shuttle van could be useful.

- Bayway and Infineum employees come by car because transit service is not convenient to the work shifts.
- There needs to be a way to provide shuttle services to and from the retail clusters for customers. One person cited how Disney World in Florida uses shuttles to move people from parking areas to the main entranceway as an example that might be applied to connecting current and future retail development areas.

Overall issues impacting traffic flow in Route 1&9 Corridor

- Participants noted that the timing of lights along Route the Route 1&9 Corridor could affect traffic movement on the side roads.
- It was noted that toll rates on the turnpike particularly at Interchanges 12, 13, 13A forces diversion of trucks moving into and out of the port area onto Route 1&9.
- It was explained that revenues derived from the state's Safe Corridor program and recently installed cameras at two intersections flows back to the state. New Jersey retains one half of the revenue and the other half is returned to the municipalities to make additional improvements. It was noted that the state has been extremely slow in returning these funds to the municipalities.
- Police cannot enforce regulations in this area because no space exists to safely park their vehicles to monitor and respond to traffic.
- The City of Linden has applied for grant funds for improvements (applications were made to NJ Transit/NJDOT Transit Village Program and to Tiger II federal funding program for example) but has not secured any funding to date.
- Participants anticipate the construction of the proposed connector road from the New Jersey Turnpike at exit 12 into Tremley Point area to alleviate truck traffic on Route 1&9 in general; and specifically at the Stiles Street and Wood Avenue intersections.
- Infineum Corporation noted that the economy has impacted the type of freight conveyances used by its customers. Customers are currently ordering materials in smaller quantities- in the range of 5,000 gallon instead of in the 23,000 gallon range. The smaller quantities are more conducive to truck haulage since 23,000 gallon orders are more economical by rail. Accordingly, more is currently being shipped by truck and less by rail car. This adds to the traffic in the Route 1&9 Corridor.
- It was noted that a warehouse developed by Joe Morris that abuts Linden Airport has been leased. Trucks serving this facility will likely use Wood Avenue and/or Lower Road to access Route 1&9 corridor.
- Significant warehousing and industrial facilities exist along W. Blanke Street, Elizabeth Avenue, and Stiles Street. Truck traffic enters and exits the Route 1&9 corridor via Stiles Street.
- Linden has a high level of industrial and distribution activities and intends to continue to encourage these types of land uses.
- Five separate companies are now co-located at the Bayway Refinery area.

C. Field Visit and Meeting

As a result of the meeting with the Linden Industrial Association, the team scheduled a field visit and meeting with Safety-Kleen and General Magnaplate on February 24, 2011 to view firsthand issues that included pedestrian access, truck turns/access, turn lanes and signals, and rail bridge clearance.

The key points emerging from the field meeting and visit included:

- Some employees from each company, as well as the surrounding retail and industrial facilities bicycle or walk to work. There is a need to provide a safer environment for pedestrian and bicycle access to the sites in the vicinity of the rail bridge. There is a lack of sidewalks, crosswalks and/or bike/pedestrian connections. In particular, the available space for a walkway/bikeway under the Conrail Bridge is exceptionally narrow.
- The turning radius at Sylvan Street does not easily accommodate trucks. Larger trucks have to use all three travel lanes when entering or exiting to/from Sylvan St., interrupting traffic flow. Trucks serving Safety-Kleen and neighboring businesses use Sylvan St. for egress and ingress. The security gate for Safety-Kleen is located on Sylvan St.; Magnaplate trucks use Airport Road.
- Vertical clearance is posted at (13'6") at Conrail bridge (Structure No. 2001153). However, the local businesses indicated that trucks have struck this structure repeatedly, causing damage to the concrete on the bottom of the overpass. The team took photos of the bridge and transmitted the photos to the New Jersey Department of Transportation and the North Jersey Transportation Planning Authority to investigate further.
- The traffic lights at the Aviation Plaza entrance way appear not to be synchronized with upstream or downstream traffic lights.
- The cycle time at the Stiles St and Route 1&9 intersection does not appear to meet demand; there are constant traffic queues.
- The Route 1&9 northbound left-turn lane at Pleasant Street backs up constantly, blocking other travel lanes and sometimes causing accidents.
- There are just a few U-Turns along the corridor where trucks can turn. Often, trucks reportedly use back roads through residential and/ or retail areas to turn back. Members of the project team witnessed such a truck move during the field visit.
- The U-Turn at "Avenue C" has been prohibited recently - a "No U-Turn" sign has been installed to warn motorists.
- Some employees at General Magnaplate have adapted their work schedule to avoid congestion.
- There is a great concern that the proposed redevelopment at the old GM site will significantly increase traffic in the area, potentially impacting the operations of neighboring industries.
- There is concern that with the construction of the shopping plaza on the GM Property there will be increased pedestrian traffic between the GM site, Aviation Plaza, and Linden Shopping Plaza and the surrounding industries.

D. Technical Advisory Committee

The County, with input from the Consultant Team, established a Technical Advisory Committee (TAC) for this project. The Committee's role was to provide insight and feedback, helping to ensure that the products and actions that emerge from this Study reflect the needs, concerns and priorities of the municipalities, communities and businesses along the Corridor.

The County held two meetings of the TAC. The first occurred on March 30, 2011. The second and final meeting of the TAC occurred on June 1, 2011.

March 30, 2011 TAC Meeting

The purpose of the March 30 meeting was to discuss the specific corridor issues and next steps for the Route 1&9 Corridor Study. Participants included public agencies (Port Authority, the

North Jersey Transportation Planning Authority, New Jersey Transit and New Jersey Department of Transportation), representatives and elected officials from the municipalities, and ConocoPhillips.

The overview provided to the participants included:

- Identification of key study tasks being undertaken and the time line for completion of the effort.
- The corridor overview, including key functions, physical conditions, operating conditions.
- Identification of recent improvements in the corridor, including the complete replacements of the Elizabeth River and Rahway River viaducts.
- Summary of the findings to date, including mixed land use issues, heavy traffic volumes, significant freight movement, pedestrian issues, lighting issues, U-turn issues, signage and traffic light placement issues, and high crash areas.
- The concerns, considerations and ideas that emerged from the outreach conducted with municipalities and stakeholders. These included wayfinding, pavement conditions, lighting, signing, aggressive driving, pedestrian and bicycle constraints, truck access to several industrial facilities, and trucks hitting a Conrail bridge in Linden.
- The existing conditions at key intersections and corridor sections including but not limited to accident data as well as pavement, turning, pedestrian and truck movement issues.

The key points from the discussion included:

- Insufficient or inoperable street lighting is a concern for pedestrian and vehicular movements. This issue may be correlated with the number of accidents in some locations and should be investigated further.
- There appears to be a need to address the issue of slow turning tractor-trailer trucks at intersections. This impacts queuing at intersections and reduces the effective cycle times at key intersections.
- It appears that traffic signals at Route 1&9 intersections in Linden are not coordinated whereas Route 1&9 intersections in Elizabeth appear to be synchronized. It was suggested that the installation of “smart lights” be considered, along with devising plans for better coordination and synchronization.
- The length of “green light time” at some intersections should be investigated further in terms of impact on traffic flow.
- The consultant team was asked if it considered how overall corridor congestion is impacting levels of service and capacity. Has there or can there be a value placed on lost time and how does this factor into the economic impact of corridor congestion?
- The capacity of left turning lanes seems to be an issue from Stiles Street to Park Avenue in the City of Linden.
- It was reported by Todd Poole (4Ward Planning) that approximately 2,400 employees were added in the retail sector in the Corridor from 2007-2009. Data indicates that approximately 36% of employees live and work in the same corridor. Together with the approved major retail development on the GM site, traffic will continue to grow in this corridor. This job growth in this corridor is counter to the overall New Jersey economy.
- Concern was voiced over the significant number of fatal accidents in the section between Park Avenue and Woodlawn Avenues, which includes the entranceway to the

ConocoPhillips Domestic Sales Terminal. It was suggested that ice and water flows from the BJ's Warehouse property be investigated. In addition, this is a location where vehicles traveling on I-278 weave across three lanes of traffic to reach Willow Glade (access to Sam's Club property).

- Participants noted that because of changes made by the developers of the Sam's Club property, the older traffic and crash data may no longer be relevant. Participants indicated that the issues have changed.
- At Maple Avenue, a long straight away exists without many traffic lights. Vehicles tend to pick up speed on the viaduct.
- The City of Linden noted that it is cost prohibitive to purchase property to create jughandles and suggested that the team focus on improving left turn lanes in the area.
- It was noted that lighting issues may be a contributing factor, rather than the only factor, in certain crash locations. The other factors include the volume and speed of the traffic at the time.
- NJDOT noted that the acquisition of property to create sidewalks was unlikely in the current fiscal environment.
- Corridor wide congestion is a concern seven days a week from ConocoPhillips to Rahway. Many driveways are blocked regularly due to congestion.
- Rosehill Cemetery traffic can back up all the way to Wood and Stiles streets.
- It was noted that pedestrian traffic will continue to grow in this area.
- Bayway Circle has a drainage issue that has been identified on the NJDOT list of drainage problem areas (ranked #84).
- How bicyclists and pedestrians co-exist with vehicular traffic in the corridor remains an issue. The Union County Bike Map identifies parallel routes.
- The offset alignments of intersecting roadways were identified as an overall corridor issue.

June 1, 2011 TAC Meeting

The purpose of the June 1 TAC meeting was to discuss the specific recommendations for both corridor-wide and location specific improvements. The comments and ideas from the outreach activities were inputs in the development of the recommendations.

Similar to the first TAC meeting, the participants included representatives from public agencies, municipalities and ConocoPhillips.

The first portion of the discussion focused on seven corridor-wide recommendations in response to the concerns, considerations and ideas that emerged from the outreach conducted with municipalities and stakeholders as well as comments and discussions from the first TAC meeting.

The seven corridor-wide potential action areas included:

- Maintenance responsibilities along the Corridor need to be defined and maintenance requests need to be streamlined.
- Pavement improvements may be required, including resurfacing in Linden and Elizabeth and new striping and pavement markings.
- Existing lighting needs to be checked in terms of maintenance and service conditions, the overall level of lighting should be reviewed, and pedestrian scale lighting where activity is highest should be considered.

- A way-finding signage program for the corridor should be developed, along with the possibility of using backlit cross-street signage at signalized intersections.
- Sidewalks/Crosswalks need to be addressed including missing sidewalks, adding sidewalks in certain locations, restriping crosswalks, improving access to bus stops, and providing countdown timers for pedestrians.
- Transit facilities could be improved by having pedestrian scale lighting, better information at bus stops and installation of bus shelters.
- Alternate parallel bicycle routes should be established to access the corridor and provide way-finding signage to direct cyclists to new routes.

The second portion of the meeting was a discussion of the proposed recommendations for improvements at key intersections and corridor sections. In addition, two longer-term improvements were recommended by the Consultant team for consideration:

- To improve access to and from Tremley Point primarily for trucks, as well as address concerns regarding access to Safety-Kleen and General Magnaplate, it was suggested that 21st street between Stiles and Wood Avenues could be used to link to a new access road to run parallel along the eastern border of Linden Airport. This improvement would take pressure off of Wood and Stiles.
- A proposal to improve access to Industrial Lane, Linden Avenue, and the ConocoPhillips facility by having a ramp connect to the southbound route 1&9 on the BJ 's Warehouse side of the roadway, along with a turning loop and traffic light in the vicinity of Willow Glade Road as a new roadway arrangement to access ConocoPhillips. The traffic light would slow down traffic in an area where SAC members have expressed concern about speeding and accidents.

Key comments from this meeting included:

- In response to a participant question, it was noted that the responsibility for bus shelter maintenance is negotiated between New Jersey Transit and the local municipality, with advertising at the bus stops often used as a revenue source to offset maintenance expenses.
- Several questions were raised regarding the placement of bus shelters, along with the prioritization of bus shelter improvements.
- In Linden, it was noted that an increase in pedestrian traffic would occur in around Sylvan Street and Route 1&9 pursuant to the redevelopment of the GM property.
- It was noted that NJDOT has just finished synchronizing the traffic lights and should have the lights optimized by year-end.
- Some participants observed parents dropping off children in front of the McDonald's on northbound Route 1&9 opposite the Skate Board Facility in Wheeler Park. The children would then hop the divider separating the southbound and northbound lanes to access the Park. It was suggested that a higher fence on the divider could be needed.
- At the intersection of Wood and Woodlawn Avenues, it was noted that the pedestrian issue is related to the Church at this location; there appears to be a timing issue for pedestrians crossing at Woodlawn Avenue, Clinton Street, Wood Avenue, and Stiles Street to access Saint Teresa's Church.
- Some TAC members noted that trucks continually miss the turn for Industrial Lane going southbound on Route 1&9, then backtracking through local neighborhoods to correct the mistake. Clear identification and access improvements are needed.

- East Jersey Street and East Grand Streets in Elizabeth have heavy pedestrian usage and need to be upgraded to reflect the need of the local neighborhoods. Participants noted that the issue may involve the timing of the lights for pedestrians.
- Participants asked whether a pedestrian-sensitive light would affect the traffic light optimization along Route 1&9.
- Discussion ensued about possible elimination of on street parking along Route 1&9 in the vicinity of Fairmount Avenue and Bond/Anna/Flora Streets in Elizabeth. There seem to have been several incidents of cars being struck and damaged by passing traffic. It was also noted that it may be possible to develop off-street parking in the area.
- SAC members inquired about the construction of a pedestrian overpass at North Avenue in Elizabeth. There is pedestrian activity 24/7.
- It was noted the installation of red light cameras has significantly reduced the accident rate at key intersections.
- Participants noted that the I-278 interchange is a "legacy" situation and the proposed improvement involves property already owned by NJDOT. The proposed longer-term improvement also supports the missing moves project.

E. Union County Transportation Advisory Board

As part of the public outreach for the project, County staff and members of the Consultant team presented and discussed the project at the May 4, 2011 meeting of the Union County Transportation Advisory Board (TAB). The TAB includes representatives from all of the Union County communities. The TAB meetings are published in newspapers and open to the general public.

The County and Consultant team presented the project, along with some of the initial draft recommendations for improvements. The comments and discussion were summarized by the TAB Secretary. TAB members were also provided with copies of the one-page project summary.