



RSA facilitated by the Transportation Safety Resource Center (TSRC) at the Rutgers' Center for Advanced Infrastructure and Transportation (CAIT) in partnership with the North Jersey Transportation Planning Authority (NJTPA) and Township of Irvington with funding provided by FHWA and NJDOT

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>> INTRODUCTION

WHAT IS A ROAD SAFETY AUDIT (RSA)?

CAIT's Transportation Safety Resource Center (TSRC) and New Jersey Local Technical Assistance Program (NJ LTAP) offer a statewide Road Safety Audit (RSA) service at no charge to New Jersey towns and counties. Interested parties can request an RSA conducted by a team of engineers, planners, and law-enforcement officers to help municipalities and counties make cost-effective safety improvements.

A multidisciplinary team of professionals offers assessments on roadway issues such as pedestrian and bicycle safety, intersection analyses, rural roads, human factors, speed management, and sign visibility and retro-reflectivity standards.

RSAs include data-driven considerations and analysis of crashes. To determine the best safety solutions, RSA professionals perform incisive crash data evaluations on the target area using Plan4Safety, TSRC's award-winning crash database and software.

The RSA team provides a final report that includes long- and short-term countermeasure recommendations that fit within the requestor's budget. Furthermore, RSAs pay off. According to the Federal Highway Administration (FHWA), countermeasures applied after RSAs can reduce crashes by about 60 percent.

For more information, contact Senior Engineer Researcher Andy Kaplan at andy.kaplan@rutgers.edu.

DISCLAIMER

Road Safety Audit reports provided by the Center for Advanced Infrastructure and Transportation staff do not constitute an engineering report. The agency responsible for design and construction should consult a professional engineer licensed by the State of New Jersey in preparing construction documents to implement any of the safety countermeasures in the report.

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the New Jersey Department of Transportation or the Rutgers' Center for Advanced Infrastructure and Transportation. This report does not constitute a standard, specification, or regulation. Such document is disseminated under the sponsorship of the Department of Transportation, University Transportation Centers Program, in the interest of information exchange. The U.S. government assumes no liability for the contents or use thereof.

EXECUTIVE SUMMARY

The Road Safety Audit (RSA) at three intersections in the Township of Irvington was chosen as a result of an NJTPA network screening of crashes on county and municipal roadways. The intersection of Stuyvesant Avenue (CR#619) and Lyons Street (CR#602) ranked number one on the Essex County intersection list and number three on the NJTPA intersection list. Based on data from the three-year analysis period of 2010 to 2012, utilizing Plan4Safety of Rutgers Transportation Safety Resource Center, two additional intersections were chosen for the RSA: Lyons Avenue (CR#602) and Cordier Street, and Chancellor Avenue (CR#601) and Cordier Street. The RSA process helped to identify safety issues, evaluate risks, and suggest countermeasures. The audit process utilized a dynamic and intensive short-term approach that tapped into the collective knowledge of local and subject matter experts using crash data and a walking survey of the intersections. This document is the final report for the RSA conducted in the Township of Irvington. The result, detailed in this report, is a summary of the three intersections' safety history and a listing of recommended improvements.

Lyons Avenue is a heavily travelled roadway, used for local access, ramps to I-78, and the Garden State Parkway. Cordier Street, a short street connecting Lyons Avenue and Chancellor Avenue, has access to and from I-78 west. There are NJ Transit bus routes at all three intersections and a significant amount of pedestrians. There is a need to evaluate the traffic patterns, connectivity, and demands in the entire RSA area. Additional signage is recommended such as speed limit signs, street identification signs, signs alerting drivers of pedestrians, and improved directional signs to I-78.

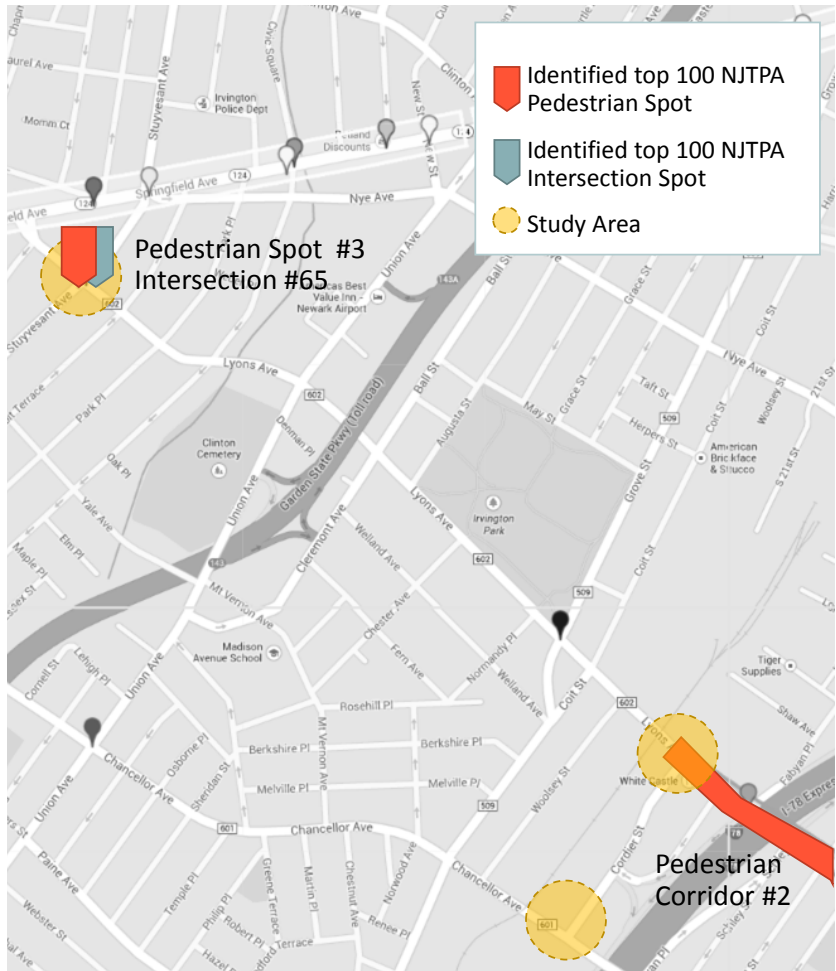
The intersection of Stuyvesant Avenue and Lyons Avenue is signalized and is primarily residential. Both roadways are one lane in each direction with no shoulders, but the lack of lane delineation causes safety issues. Of the 36 crashes, seven of them involved pedestrians. Lane delineation is recommended with the addition of left turn lanes and shoulder lines. The addition of bulb outs would benefit pedestrians and reduce speeding.

The intersection of Lyons Avenue and Cordier Street is in an area of industrial, retail, and commercial properties. It is a T-intersection with stop control; Lyons Avenue has two lanes in each direction with no shoulders. A significant amount of truck activity and parked trucks is generated by one of the businesses, which affects traffic operations. Another large concern is the difficulty in making left turns across multiple lanes of traffic. Pedestrians have difficulty crossing Lyons Avenue as there are no pedestrian accommodations. There were 31 crashes at this location. A road diet could help alleviate some of the above problems in the short term. For the longer range, evaluation of a traffic signal could be evaluated.

The intersection of Chancellor Avenue and Cordier Street is a T-intersection with stop control in an area of businesses. Chancellor Avenue is 47 feet wide at the intersection with two travel lanes; the lack of lane delineation creates confusion due to the wide cross section. There is significant bus activity between the bus stop and bus turnaround. There are no accommodations for pedestrians crossing Chancellor Avenue. The development of the Valley Fair Mall is an impetus for evaluation for future traffic demands.

>> 1.0 CORRIDOR DESCRIPTION AND ANALYSIS

1.1 SITE SELECTION



As a result of a network screening analysis completed by TSRC for NJTPA, Essex County requested support in conducting a Road Safety Audit at a high crash site. Multiple high crash locations were identified in the Township of Irvington. The county reviewed the high-crash sites, and noted that many of the identified locations were recently addressed through a safety project or are programmed for future safety improvements.

The intersection of Stuyvesant Avenue and Lyons Avenue was identified as not being currently programmed. This intersection was the highest ranked intersection within Essex County and the third highest crash intersection within the NJTPA region. Additionally, the intersection was the 65th highest ranked pedestrian spot location in the NJTPA region (36th within Essex County).

The intersection of Lyons Avenue and Cordier Street was also selected to be audited. This intersection is the 60th

highest ranked pedestrian spot location in the NJTPA region (32nd within Essex County). Additionally this intersection has been previously identified by NJDOT on statewide high-crash screenings. Specifically, this intersection ranked on the NJDOT Intersection Improvement Program screening as tied for 62nd statewide (2006–2008 crash data) and on the statewide “Right Angle” screening as tied for 123rd (2007–2009 crash data).

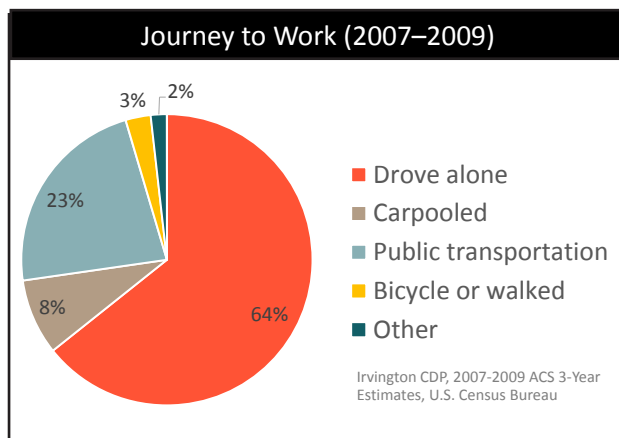
A third intersection of safety concern was included in the audit to leverage the RSA team’s time in the area. The intersection of Chancellor Avenue and Cordier Street is in the vicinity of Lyons Avenue and Cordier Street and is a stop-controlled T-intersection across from a major driveway to a bus turnaround and mall entrance. This intersection is also used by vehicles accessing ramps to/from I-78 westbound.

The rankings were as follows:

Stuyvesant Avenue & Lyons Avenue	NJTPA #	Essex County #	Irvington #
Intersection ranking	3	1	1
Pedestrian spot ranking	65	36	8
Pedestrian corridor ranking (Lyons Avenue)	65	30	7

1.2 TRAFFIC VOLUMES

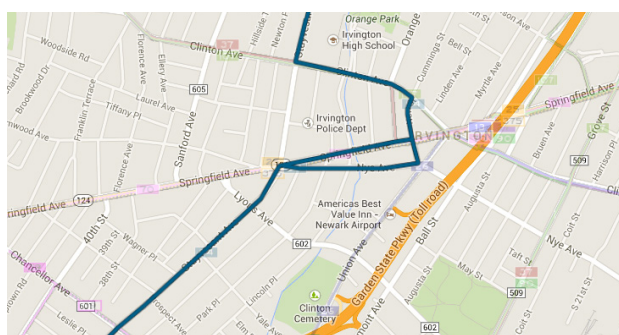
A traffic count was conducted by NJDOT along Lyons Avenue in the vicinity of Cordier Street indicating the AADT was 15,498 in 2004. Additionally, traffic counts were published by NJDOT for Lyons Avenue and Stuyvesant Avenue in the vicinity of the intersection. Specifically, AADT of Lyons Avenue was 26,451 (2009) collected a half mile from the study intersection. AADT of Stuyvesant Avenue was 13,126 (2009) collected a quarter mile from the study intersection. (See Appendix C for traffic volumes.)



1.3 TRANSIT SERVICE

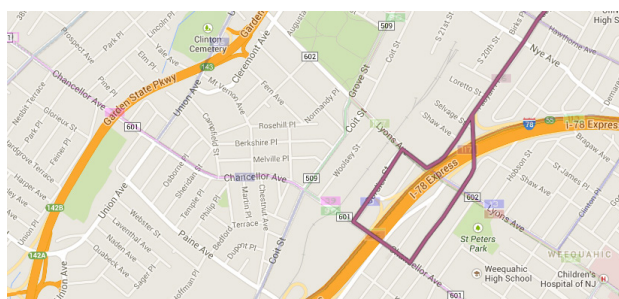
Stuyvesant Avenue and Lyons Avenue

NJ Transit 94 operates long Stuyvesant Avenue connecting Bloomfield to Linden. Connectivity is provided to four rail lines at Watsessing Avenue, Brick Church, Roselle Park, and Linden stations. The route operates through Bloomfield, Belleville, East Orange, Newark, Irvington, Union, Roselle Park, Roselle, and Linden.

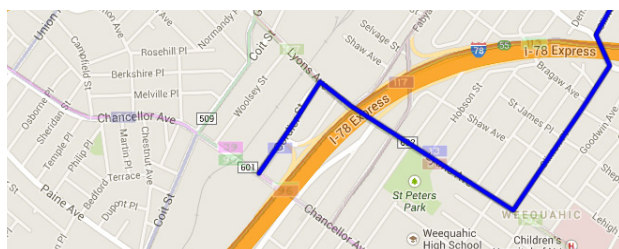


Lyons Avenue and Cordier Street

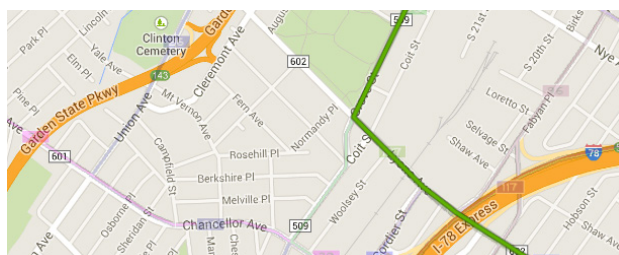
NJ Transit 96 turns left from Lyons Avenue to Cordier Street on its route to its terminus at the Valley Fair Mall. The route provides service to Bloomfield Avenue via Newark and Irvington.



NJ Transit 13 turns at Lyons Avenue and Cordier Street to reach its terminal at the Valley Fair Mall. NJT 13 services downtown Newark, Belleville, Nutley, and Clifton and provides connection to rail and light rail at the Newark Board Street Station.



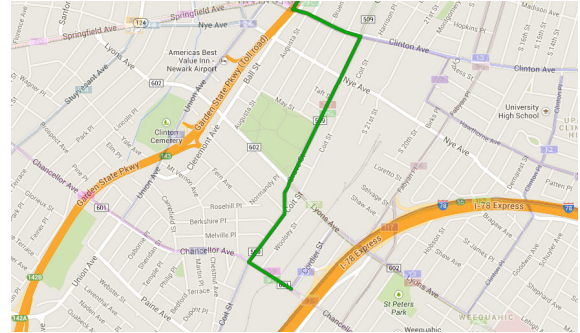
NJ Transit 107 provide major regional connectivity and runs along Lyons Avenue. NJT operates from South Orange to the PABT via the Newark Airport. The route also provides connectivity to the Irvington Bus Terminal, Maplewood, and Newark.



Chancellor Avenue and Cordier Street

NJ Transit operates four routes through this intersection. NJT utilizes the parking lot of the Valley Fair Mall across from Cordier Street as an off-street transfer point for busses. As such, there is significant turning movements of busses throughout the area.

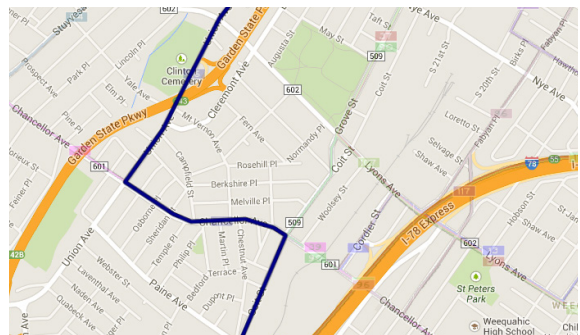
NJ Transit 90 originates at the Valley Fair Mall and proceeds to Belleville through Bloomfield, East Orange, and Newark. NJT 90 provides connections to the Newark Light Rail and Irvington Bus Terminal.



NJ Transit 96 originates at the Valley Fair Mall and provides service to Bloomfield Avenue via Newark and Irvington. (See map on previous page.)

Approximately half of NJ Transit 13 trips originate at the Valley Fair Mall. NJ Transit 13 services downtown Newark, Belleville, Nutley, and Clifton and provides connection to rail and light rail at the Newark Board Street Station. (See map on previous page.)

NJ Transit 26 operates along Chancellor Avenue connecting the Irvington Bus Terminal with Elizabeth via Hillside and Union. NJT 26 provides connections to Kean University and the Union Rail Station.



1.4 AREA CHARACTERISTICS

Lyons Avenue (CR#602) is a 2.2 mile east-west “Urban Minor Arterial” through Irvington, between Elizabeth Avenue in the east and Springfield Avenue (CR#603) in the west. It crosses, and has access to, I-78 and the Garden State Parkway. It is comprised of two lanes from Springfield Avenue to one tenth of a mile before Cordier Street where it transitions into a four lane road. There are no shoulders. There is a railroad crossing 200 feet west of the intersection of Lyons Avenue and Cordier Street. The speed limit is 25 MPH. In the vicinity of Cordier Street, there are commercial, retail, and industrial properties with many access points. The roadway transitions to residential at the intersection with Stuyvesant Avenue (CR#619). Stuyvesant Avenue is a 2.9 mile north-south “Urban Minor Arterial” that begins in Union and continues through Irvington terminating at South Orange Avenue (CR#510); it is a two-lane roadway with speed limit of 25 MPH.

Cordier Street, which connects two of the intersections in the RSA, provides access to and from I-78 southbound. The traffic from I-78 passes either the intersection with Lyons Avenue or the intersection with Chancellor Avenue.

1.5 INTERSECTION CHARACTERISTICS



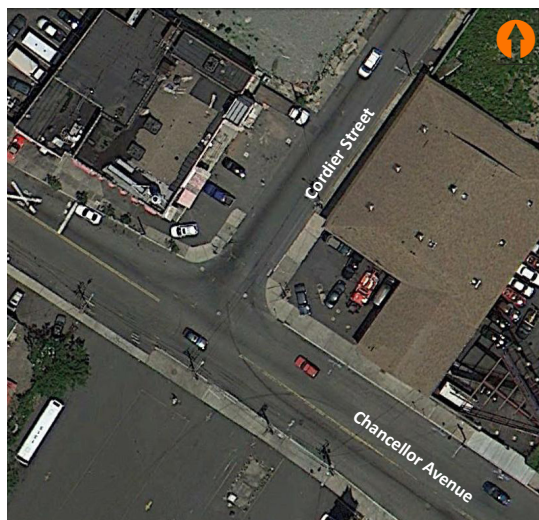
Stuyvesant Avenue and Lyons Avenue

- Signalized intersection
- Residential in nature
- Lyons Avenue one lane in each direction with parking restrictions
- Stuyvesant Avenue one lane in each direction with parking
- No pedestrian heads
- Active bus route on Stuyvesant



Lyons Avenue and Cordier Street

- Stop controlled on Cordier Street
- Lyons Avenue two lanes in each direction
- Burger King west of the intersection
- White Castle east of the intersection
- Access to Pathmark east of the intersection
- Commercial and industrial properties north of the intersection including truck traffic
- Railroad crossing northwest of the intersection
- No pedestrian accommodations
- Two bus routes make turning movement from/to Lyons Avenue and Cordier Street



Cordier Street and Chancellor Avenue

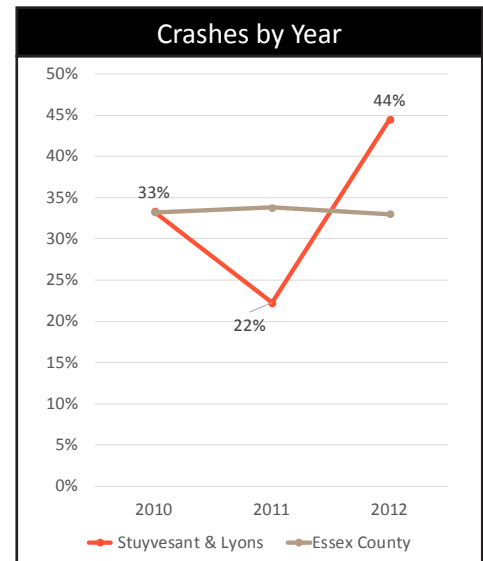
- Stop controlled on Cordier Street
- Chancellor Avenue one lane in each direction (although it appears to function as two lanes in each direction)
- Northbound bus stop at northeast corner
- Southbound bus stop directly across from Cordier Street, in intersection box
- Railroad crossing northwest of the intersection
- Wide access driveways on south side of roadway
- Commercial and retail properties
- No pedestrian accommodations across Chancellor Avenue

>> 2.0 CRASH FINDINGS – STUYVESANT AVENUE AND LYONS AVENUE

2.1 CHRONOLOGY

According to the NJDOT crash database, there were 36 reportable crashes during the three-year analysis period of 2010 to 2012. The percentage of crashes per year decreased in 2011 and peaked in 2012 as seen in the chart; when compared to crashes in Essex county, the crashes at the county level have remained relatively constant.

Examining concentrations by month over the three-year period, the total varied between zero crashes in June and seven crashes in May. By the day of the week, crash totals were also fairly evenly spread with a range of three and nine crashes. Tuesday and Friday had the lowest number of crashes and Monday had the highest. Regarding the hour of the day there were two peak periods, between 2 and 4 p.m. and between 10 p.m. to midnight; the period between 4 to 8 p.m. was close behind the peaks.



2.2 SEVERITY

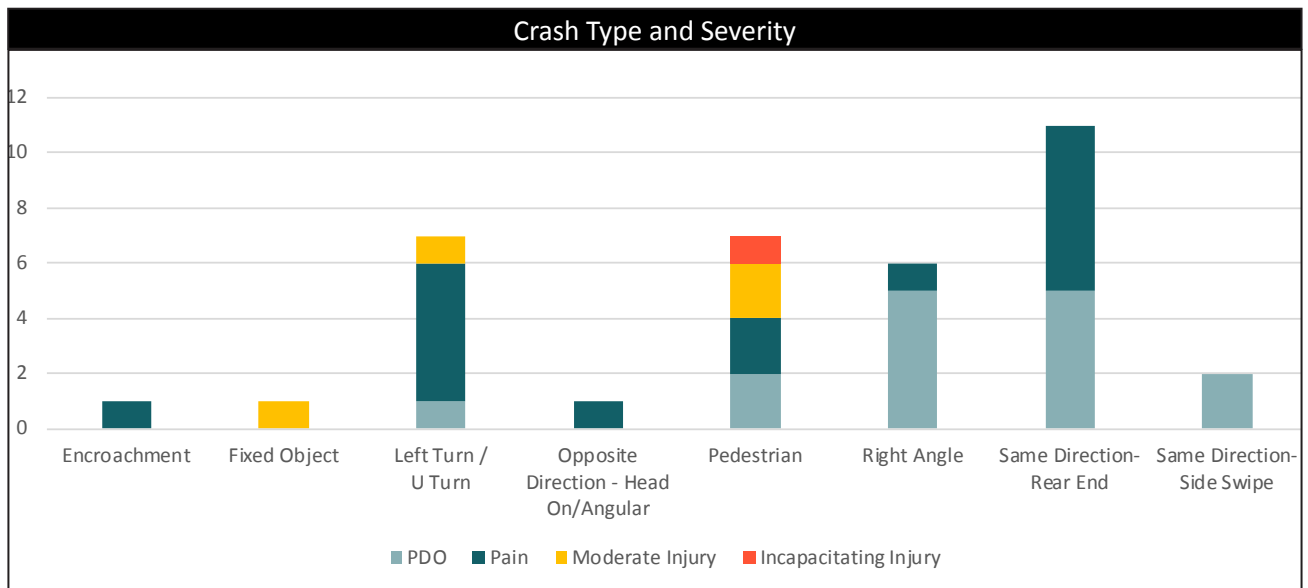
Severity	All People	Pedestrians	Bicyclists
Incapacitated	1	1	0
Moderate Injury	4	2	0
Complaint of Pain	16	2	0
PDO	15	2	0

More than half (52%) of the 36 crashes resulted in injury: 16 crashes with complaints of pain, four moderate injuries, and one incapacitating injury. There were 15 property damage only crashes and no fatal crashes.

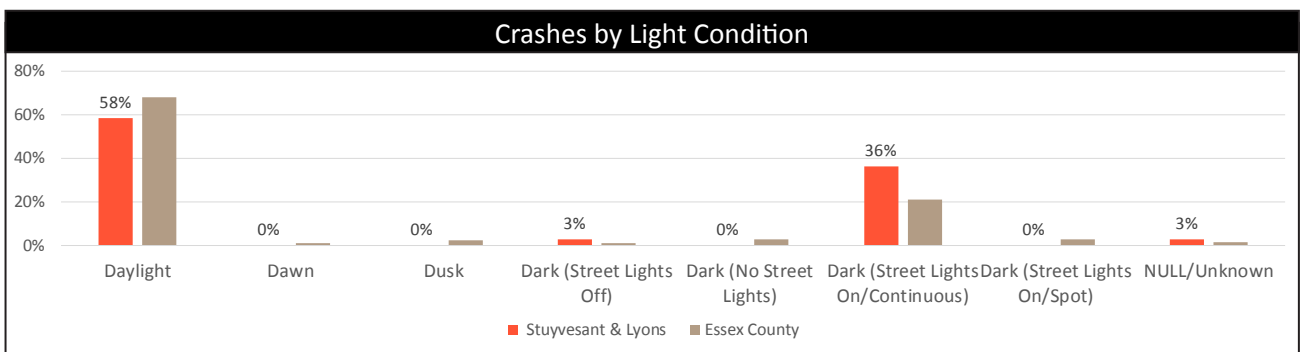
2.3 COLLISION TYPE

Out of the 36 crashes between the years of 2010 and 2012, 37 percent were same direction crashes, primarily rear end. Pedestrian crashes and left turn crashes each comprised 19 percent of the crashes. When compared to Essex county, the RSA area has a significant over-representation of left turn crashes and pedestrian crashes.

Crash Type	Count in RSA Area	% in Intersection	% in Essex County
Same Direction - Rear End	11	31%	23%
Same Direction - Side Swipe	2	6%	15%
Right Angle	6	17%	13%
Opposite Direction - Head On/Angular	1	3%	1%
Opposite Direction - Side Swipe	0	0%	1%
Struck Parked Vehicle	0	0%	18%
Left Turn / U-turn	7	19%	4%
Backing	0	0%	8%
Encroachment	1	3%	0%
Fixed Object	1	3%	10%
Animal	0	0%	1%
Pedestrian	7	19%	4%
TOTAL	36	100%	97%

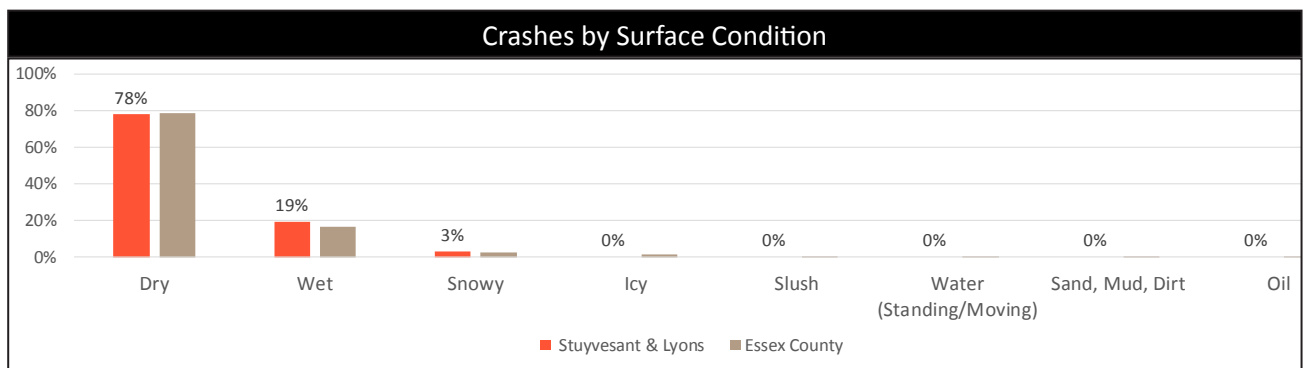


2.4 ROADWAY SURFACE AND LIGHTING CONDITIONS



Light condition is less typical in that only 58 percent occurred during daylight conditions and 42 percent occurred during dark or partial dark conditions. (See table for specific intersection in Appendix D: Crash Data and Crash Diagrams). According to the 2010–2012 statewide averages for county routes, daylight crashes typically account for 70 percent of all crashes.

Seventy-eight percent of the corridorwide crashes occurred in dry road conditions, which is identical to Essex County. Twenty-two percent in wet conditions and snowy conditions; this is also similar to the county data. The distribution suggests that road surface was not a factor contributing to crash frequency.



2.5 CROSS SECTION GEOMETRY

The cross section on Lyons Avenue is striped as two lanes but functions as four lanes at the intersection. According to the Straight Line Diagram (SLD), the width of Lyons Avenue is 48 feet. Stuyvesant Avenue is also striped as two lanes with the width given as 36 feet in the SLD.



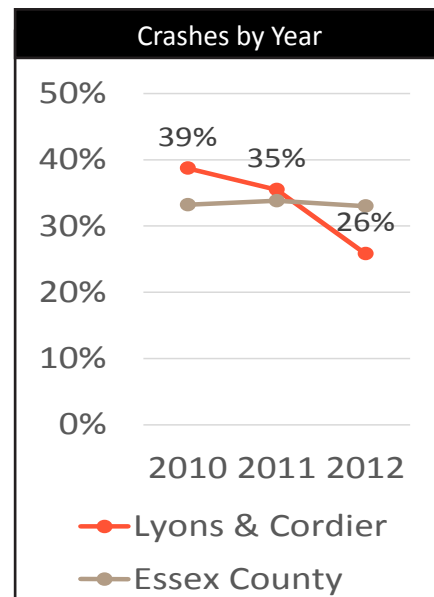
The right lane on Lyons Avenue appears wide enough for two lanes but it is striped as one lane.

>> 3.0 CRASH FINDINGS – LYONS AVENUE AND CORDIER STREET

3.1 CHRONOLOGY

According to the NJDOT crash database, there were 31 reportable crashes during the three-year analysis period of 2010 to 2012. The percentage of crashes per year decreased slightly over the three-year period as seen in the adjacent chart.

Examining concentrations by month over the three-year period, the total ranged between one and six crashes per month. The highest number of crashes (six) occurred in November followed by June (five crashes). There was only one crash in each of March and August. By the day of the week, crash totals were also fairly evenly spread with a range of two to seven crashes. Thursday had the highest number of crashes and Wednesday had the lowest. Regarding the hour of the day, there was one peak period with more than a third of the crashes occurring between 4 and 6 p.m.



3.2 SEVERITY

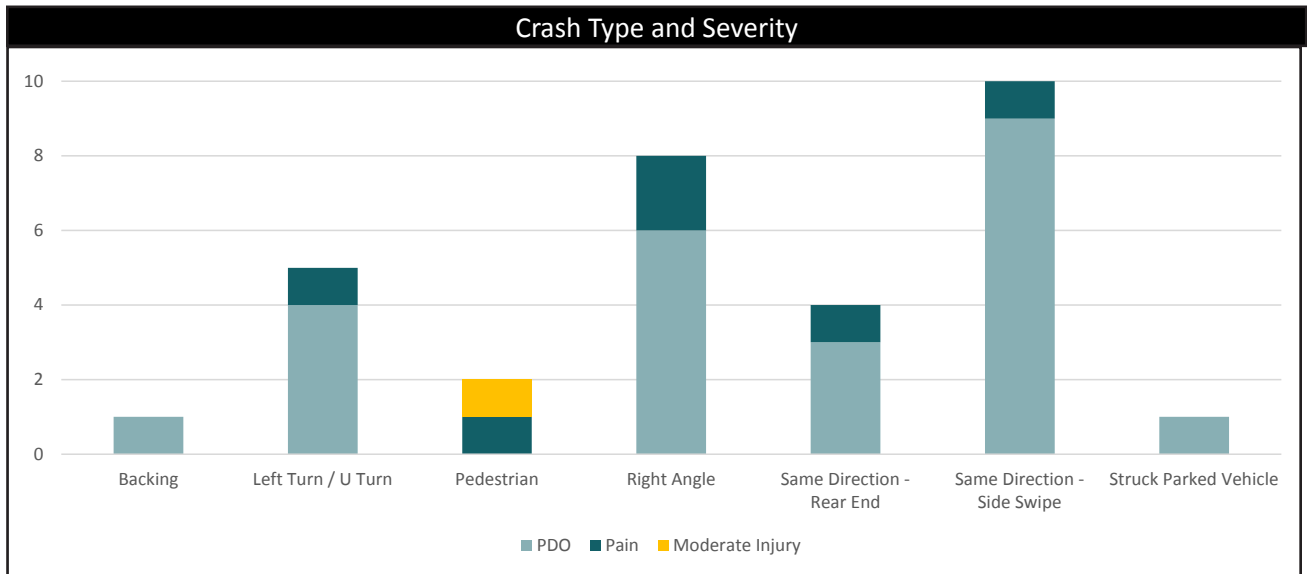
Severity	All People	Pedestrians	Bicyclists
Moderate Injury	1	1	0
Pain	6	1	0
PDO	24	0	0
TOTAL	31	2	0

There were 24 property damage only crashes out of a total of 31 crashes; seven of the crashes were complaints of pain and moderate injuries (23 percent). There were no fatal crashes.

3.3 COLLISION TYPE

Out of the 31 crashes between the years of 2010 and 2012, 45 percent were same direction, including both rear-end (four crashes) and side swipe (ten crashes). More than a quarter of the crashes were right angle crashes (eight crashes). When compared to Essex County, the RSA area has a significant over-representation of same direction - side swipe and right angle crashes.

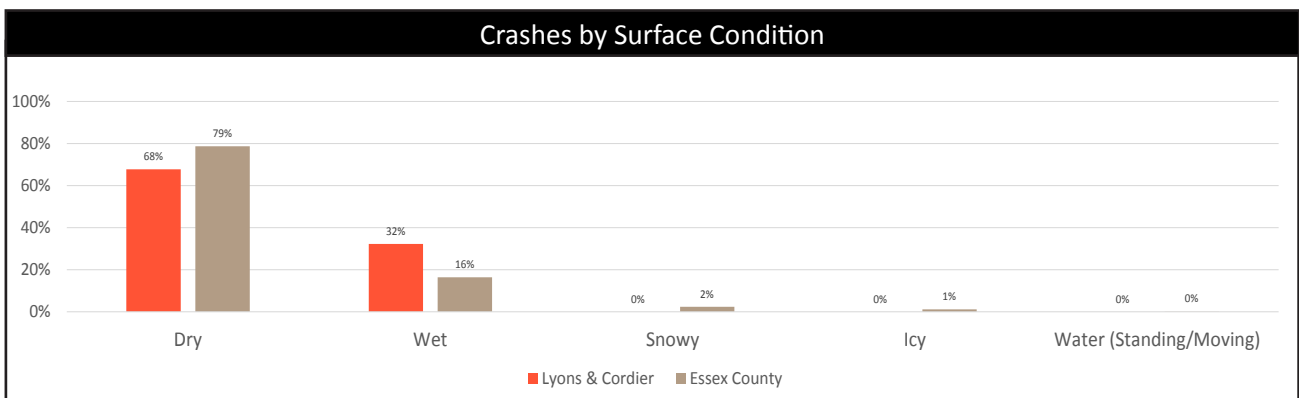
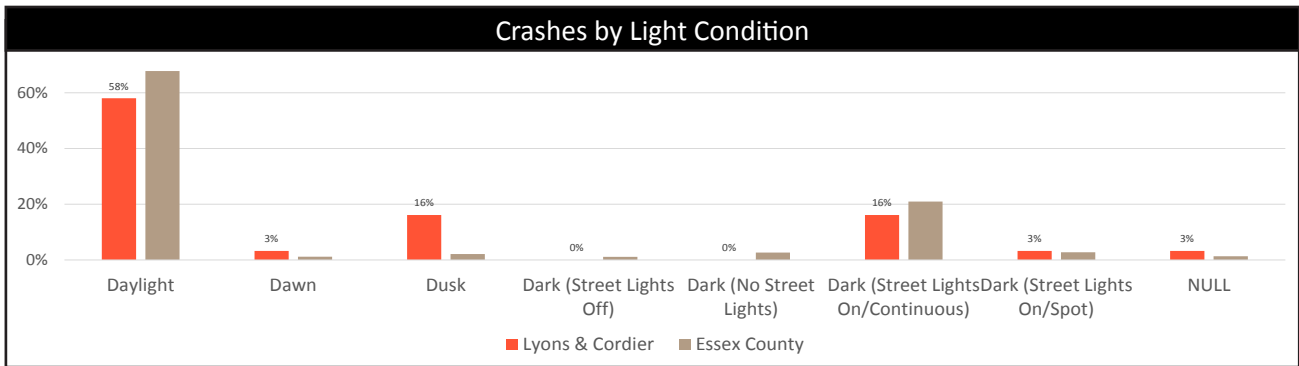
Crash Type	Count in RSA Area	% in Intersection	% Essex County
Same Direction - Rear End	4	13%	23%
Same Direction - Side Swipe	10	32%	15%
Right Angle	8	26%	13%
Opposite Direction - Head On/Angular	0	0%	1%
Opposite Direction - Side Swipe	0	0%	1%
Struck Parked Vehicle	1	3%	18%
Left Turn / U-turn	5	16%	4%
Backing	1	3%	8%
Encroachment	0	0%	0%
Fixed Object	0	0%	10%
Animal	0	0%	1%
Pedestrian	2	6%	4%
TOTAL	31	100%	97.5%



3.4 ROADWAY SURFACE AND LIGHTING CONDITIONS

Light condition is less typical in that only 58 percent occurred during daylight conditions and 39 percent occurred during dark or partial dark conditions, whereas daylight crashes in Essex County accounted for 79 percent of all county crashes (See table for specific intersection in Appendix D: Crash Data and Crash Diagrams).

Sixty-eight percent of the corridorwide crashes occurred in dry road conditions and 32 percent occurred in wet conditions. The percentage of crashes with wet conditions is twice as high as in Essex County of 16 percent



3.5 CROSS SECTION GEOMETRY



The cross section on Lyons Avenue is striped as four lanes with no designated left turn lane. According to the Straight Line Diagram (SLD), the width of Lyons Avenue is 48 feet. Cordier Street is approximately 30 feet wide, with one lane in each direction. There is no centerline striping.

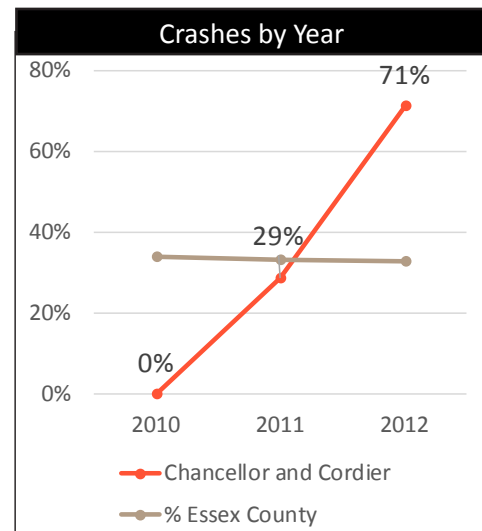
Two lanes in each direction, on Lyons Avenue facing west, just before Cordier Street.

>> 4.0 CRASH FINDINGS – CHANCELLOR AVENUE AND CORDIER STREET

4.1 CHRONOLOGY

According to the NJDOT crash database, there were seven reportable crashes during the three-year analysis period of 2010 to 2012. The percentage of crashes per year rose over the three-year period as seen in the graph.

Given the small number of crashes, it is not possible to see trends in the month, day of week, and hour of day.



4.2 SEVERITY

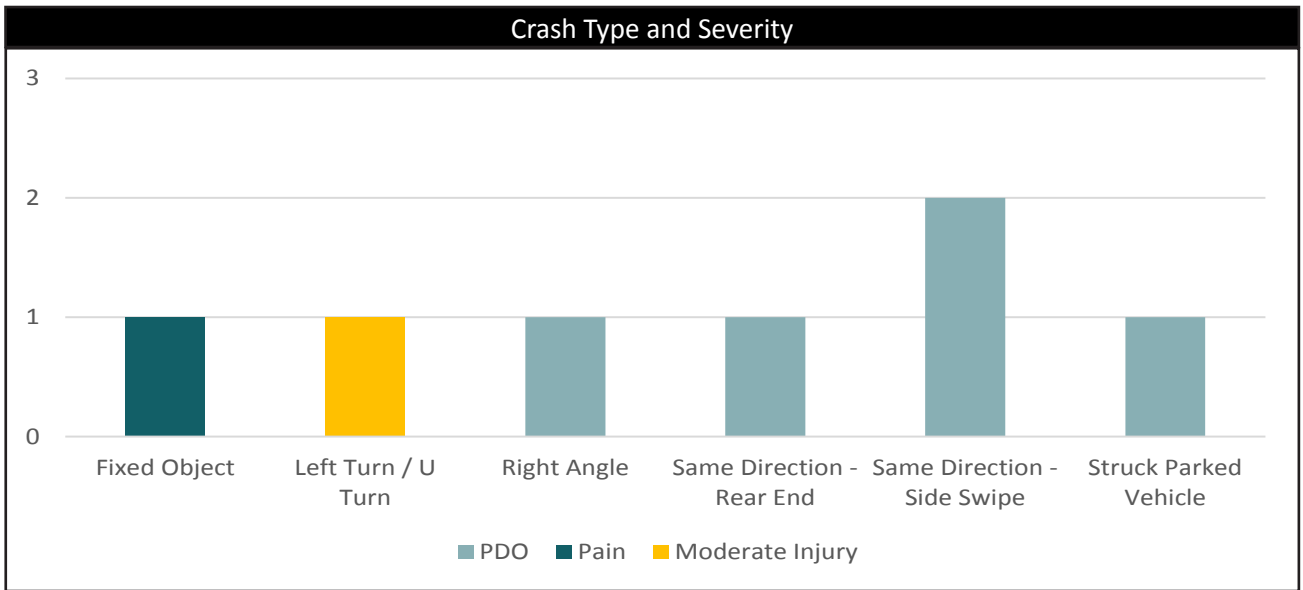
Severity	All People	Pedestrians	Bicyclists
Moderate Injury	1	0	0
Complaint of Pain	1	0	0
PDO	5	0	0

There were five property damage only crashes out of a total of seven crashes. One crash was a pain injury and one was a moderate injury.

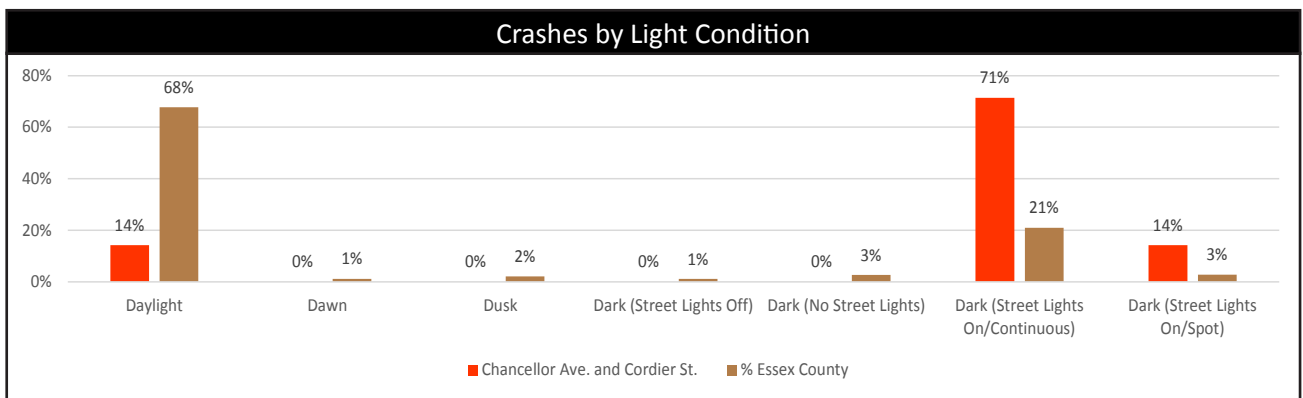
4.3 COLLISION TYPE

Out of the seven crashes between the years of 2010 and 2012, three of them were same direction crashes, two side swipe crashes, and one rear end. The other four crashes were right angle, struck parked vehicle, left turn, and fixed object.

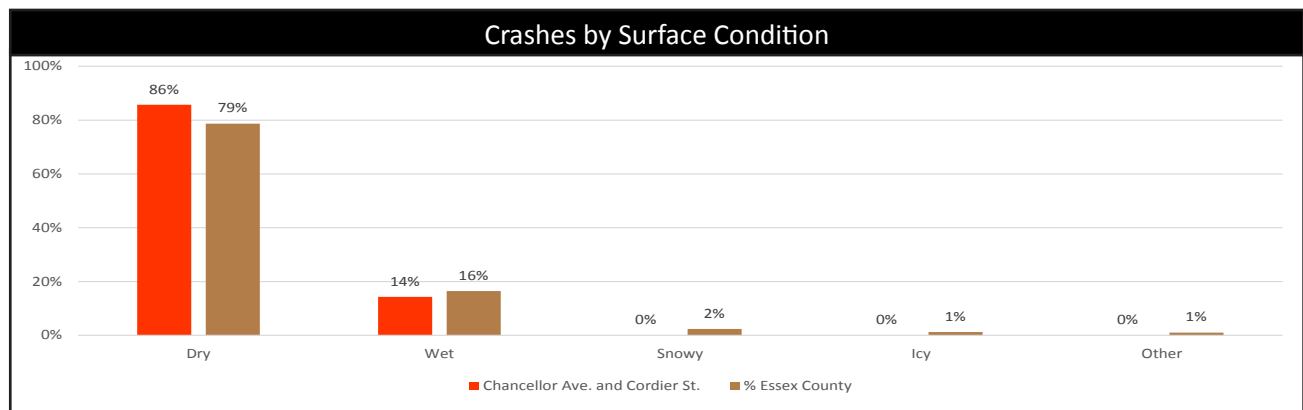
Crash Type	Count in RSA Area	% in Intersection	% Essex County
Same Direction - Rear End	1	14%	23%
Same Direction - Side Swipe	2	29%	15%
Right Angle	1	14%	13%
Opposite Direction - Head On/Angular	0	0%	1%
Opposite Direction - Side Swipe	0	0%	1%
Struck Parked Vehicle	1	14%	18%
Left Turn / U-turn	1	14%	4%
Backing	0	0%	8%
Fixed Object	1	14%	10%
Animal	0	0%	1%
Pedestrian	0	0%	4%
Other	0	0%	3%
TOTAL	7	100%	100%



4.4 ROADWAY SURFACE AND LIGHTING CONDITIONS



Six of the seven crashes (85 percent) occurred in dark conditions. According to the 2010–2012 Essex County crash numbers, daylight crashes accounted for 68 percent of all crashes. This suggests that lighting was a contributing circumstance in these crashes. Eighty-six percent of the crashes occurred in dry road conditions. The distribution suggests that road surface was not a factor contributing to crash frequency.



4.5 CROSS SECTION GEOMETRY



Looking west on Chancellor Avenue, adjacent to Cordier Street

The cross section on Chancellor Avenue is striped as two lanes but functions as four lanes at the intersection. According to the Straight Line Diagram (SLD), the width of Chancellor Avenue is 38 feet west of the intersection (it tapers approximately 130 feet west of the intersection) and 47 feet wide east of the intersection. Cordier Street is approximately 30 feet wide.

>> 5.0 IDENTIFIED ISSUES

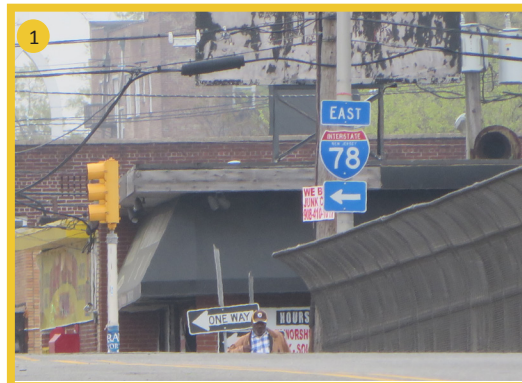
Ref #	Issues
General – RSA Area	
1	The RSA area is impacted by the presence of I-78 due to the significant traffic volume accessing the ramps, including driver confusion about ramp locations.
2	Speeding and aggressive driver behavior is a significant issue
3	There are few if any speed limit signs in the entire RSA area.
4	Some of the signs do not have breakaway posts.
Stuyvesant Avenue and Lyons Avenue	
Traffic Operations	
5	Lane alignment is an issue for vehicles travelling northeast on Stuyvesant Avenue. When trying to bypass a left turning vehicle, they are directed into the parking lane.
6	There are a significant number of crashes involving left turn movements.
Roadway	
7	The lanes are very wide on Lyons Avenue and there are minimal roadway markings for delineation.
8	The wide cross section may encourage speeding.
9	Large corner radius may encourage speeding.
10	There is ponding on the roadway adjacent to the curb.
Pedestrians	
11	There are a significant number of pedestrian crashes.
12	The pavement surface of the crosswalks is uneven and is may present a tripping hazard.
13	A number of pedestrians were observed running across live lanes to catch the NJ Transit #94 bus.
14	There are no countdown pedestrian heads.
Visibility	
15	Trees are blocking some of the signs.
16	Lighting may be insufficient as there were a significant number of crashes in non daylight conditions.
17	The vertical curve on eastbound Lyons Avenue reduces visibility of the pavement markings at the intersection.
18	The parking adjacent to the intersection limits visibility.
Signs	
19	There are no street name signs, only county route numbers and most drivers are not familiar with those.
Traffic Signal	
20	The green bulb is not working on northeast corner of intersection, crossing Stuyvesant Avenue.
21	The traffic signals have 8-inch heads.
Lyons Avenue and Cordier Street	
Traffic Operations	
22	There are many trucks accessing a business along westbound Lyons Avenue. The parked trucks block a live lane of traffic and trucks backing into the bays also block traffic and create a safety hazard.
23	There are a significant number of crashes involving left turn movements.
24	The existing lane delineation, with a lack of a designated left turn lane, does not meet traffic needs.

Ref #	Issues
25	Left turn queueing in through lanes, both at Cordier Street and at Pathmark create a safety issue as cars try to drive around them into the adjacent lane of traffic.
26	Left turns are difficult to make across two lanes of traffic as there are very few gaps.
Roadway	
27	There is ponding on the roadway adjacent to the curb.
28	Busses and trucks encroaching on curb when making right turn from Cordier Street.
29	It was observed that vehicles turning into Cordier Street frequently fail to stay in the right lane and the lack of a centerline may encourage this.
Pedestrians	
30	There are no curb ramps for pedestrians crossing Lyons Avenue.
31	There are no marked crosswalks across Lyons Avenue.
32	The crosswalk markings on Cordier Street are faded.
33	The lack of driver awareness to the presence of pedestrians makes crossing Lyons Avenue extremely difficult.
34	There are tripping hazards in the sidewalk on the northern side of Lyons Avenue.
Signs	
35	There are no street name signs for Lyons Avenue.
Bus	
36	The westbound NJ Transit bus #13 and #96 stop in front of Pathmark; the close proximity to Cordier Street force the bus to quickly merge into the left lane to make the turn.
Chancellor Avenue and Cordier Street	
Roadway	
37	The lanes are very wide and there are minimal roadway markings for delineation.
38	The wide cross section may encourage speeding
Pedestrians	
39	There are no curb ramps for pedestrians crossing Chancellor Avenue.
40	There are no marked crosswalks across Chancellor Avenue.
41	The lack of driver awareness to the presence of pedestrians makes crossing Chancellor Avenue extremely difficult.
42	A pole stub is a tripping hazard on the northeast corner.
Bus	
43	The westbound bus stop is in the intersection box.
Maintenance	
44	The curb piece of the catch basin is missing, creating a large hole, on the southeast corner of the intersection, on Cordier Street.
45	The inlet is full of garbage and could cause flooding.
Future Development	
46	There is confusion about the development of the Valley Fair Mall and how it will impact traffic patterns and traffic volumes.

VISUALIZING ISSUES – GENERAL



Access to I-78 west from Lyons Avenue



Access to I-78 east from Chancellor Avenue



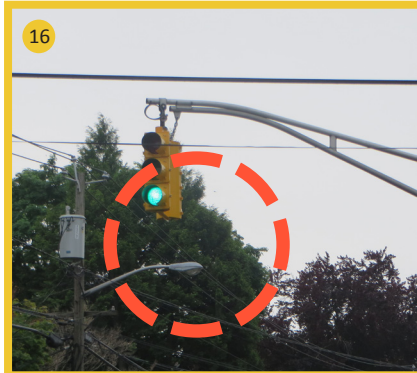
Access to I-78 west from Cordier Street

The various directional signs to Route 78 east and west are not sufficient or are confusing.

VISUALIZING ISSUES – STUYVESANT AVENUE AND LYONS AVENUE



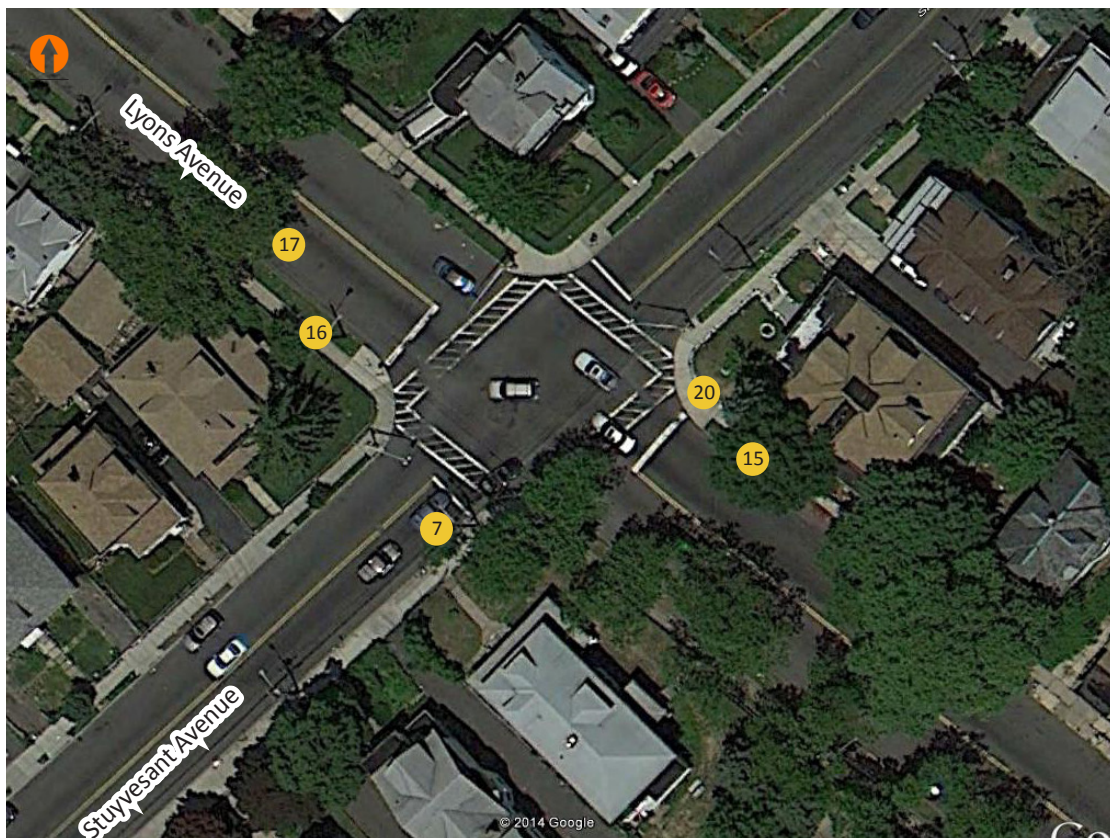
Two lanes form but the delineation is one lane.



Lighting does not appear to be for peds and vehicles.



The sign is obscured by foliage.



The vertical curve makes visibility of stop bar difficult.



Traffic signal bulbs are not functional on 8-inch heads.



Most of the pedestrian crashes involve turning vehicles.

VISUALIZING ISSUES – LYONS AVENUE AND CORDIER STREET



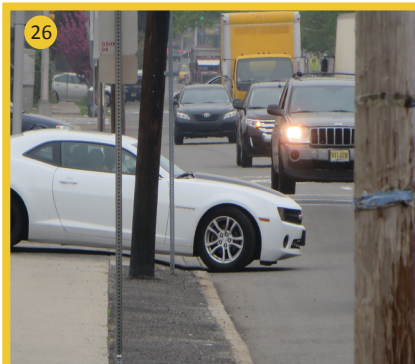
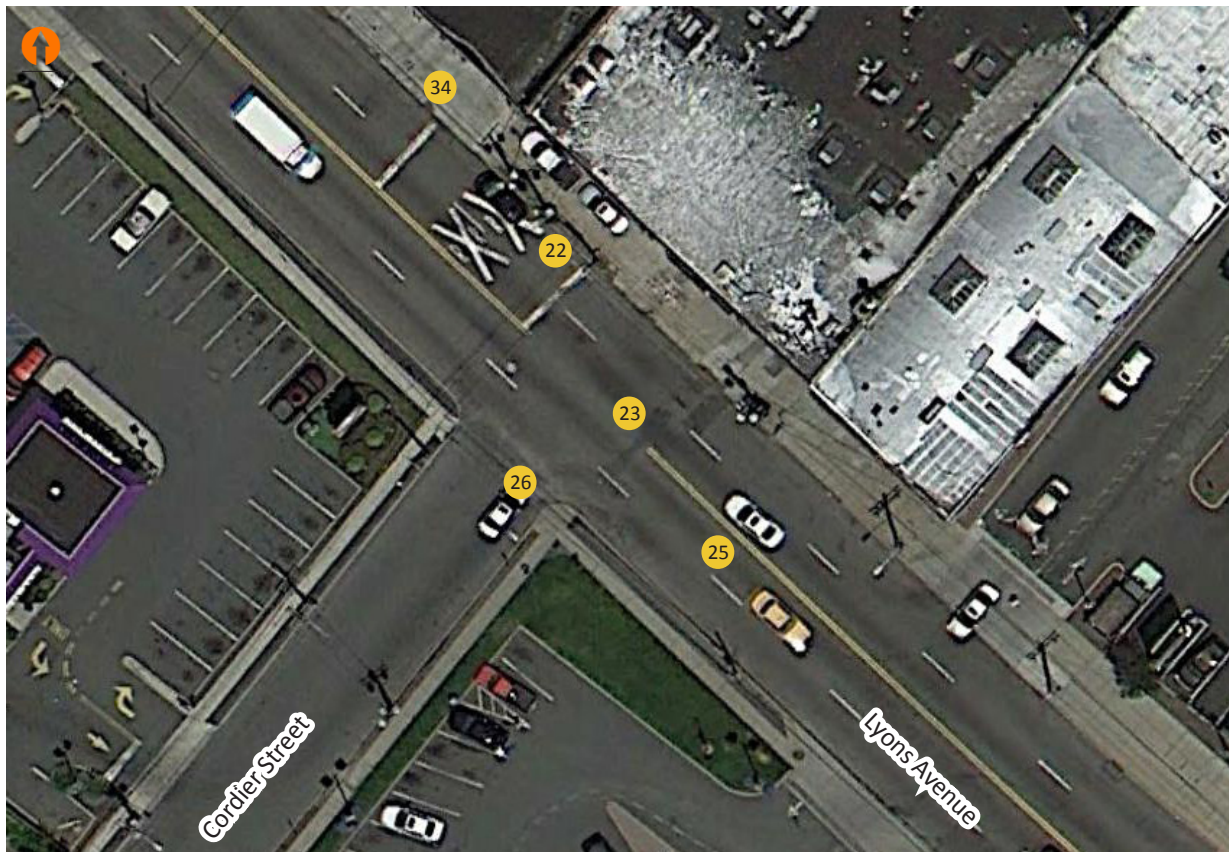
Lack of left turn lanes is a safety issue.



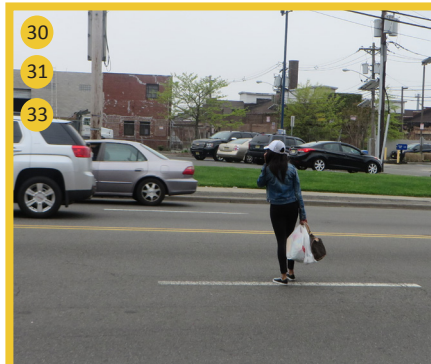
Numerous trucks on the north side of Lyons Avenue.



Queue to make left turn into Pathmark.



Vehicles encroach into lane to make left turn.



There are no pedestrian accommodations for crossing Lyons Avenue.

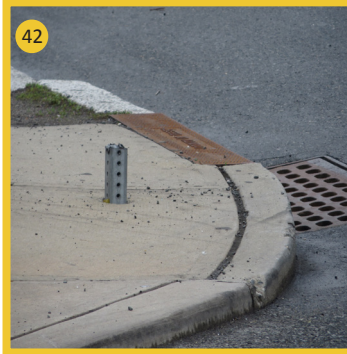


There are tripping hazards in the sidewalks on Lyons Avenue.

VISUALIZING ISSUES – CHANCELLOR AVENUE AND CORDIER STREET



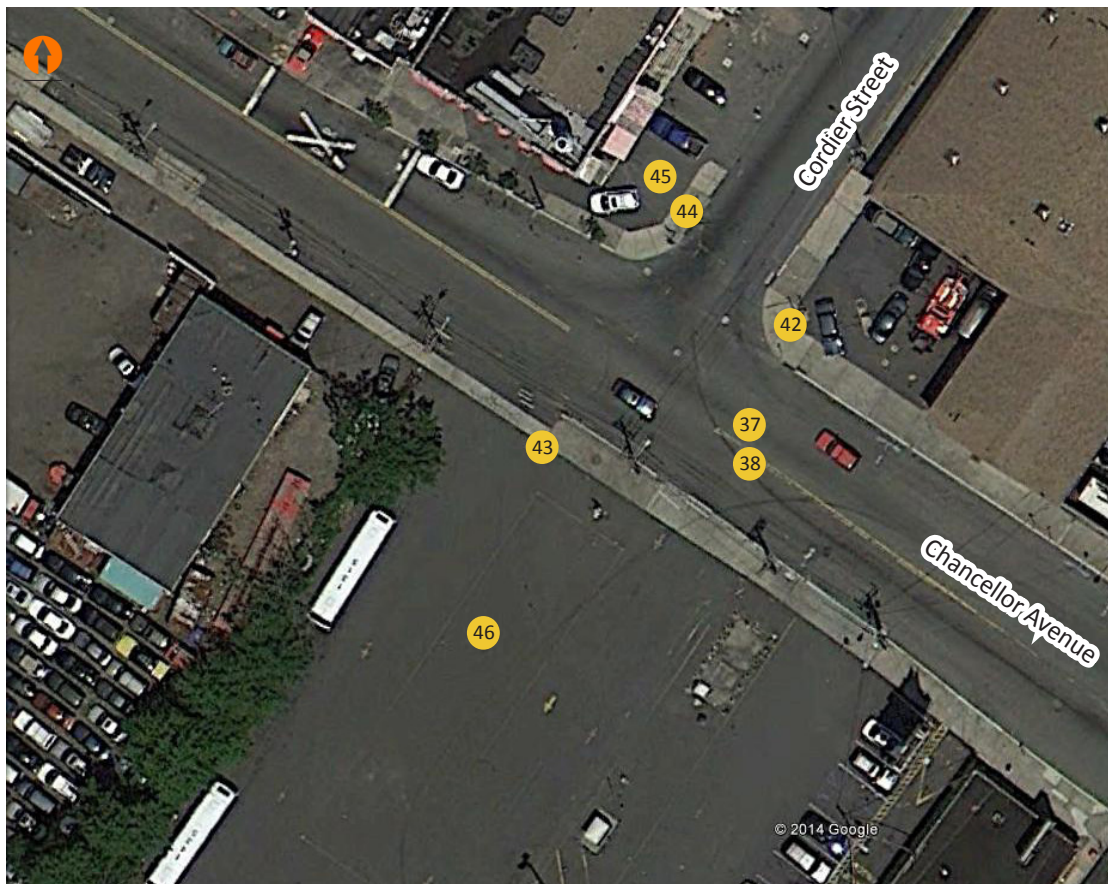
Wide cross section with no lane delineations.



There are tripping hazards in the sidewalk.



Pedestrian attempting to cross Chancellor Avenue.



Inlet with curb piece missing and full of garbage.



The bus stop is in the intersection box.



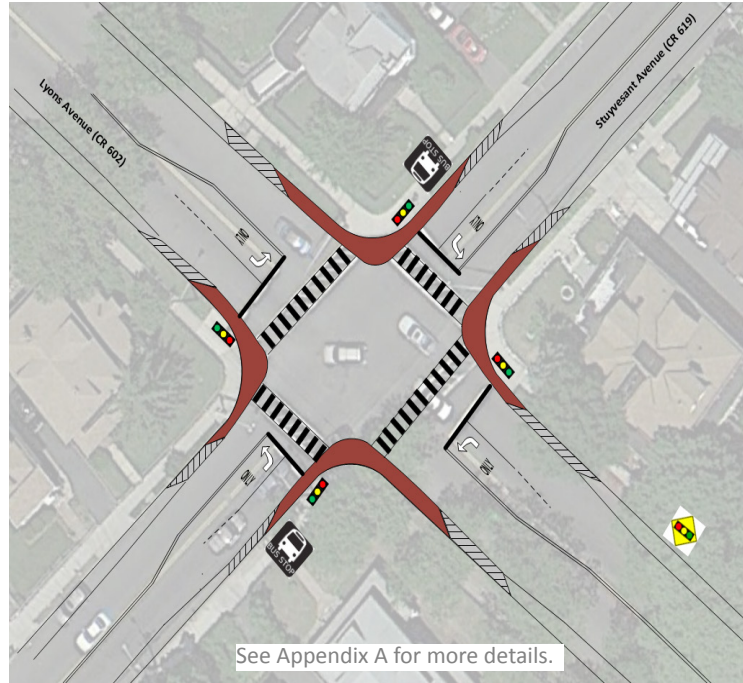
Current bus turnaround and Valley Fair Mall.

>> 6.0 RECOMMENDATIONS

Ref #	RECOMMENDATIONS FOR ENTIRE RSA AREA	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
Traffic Operations						
A-1	Consider applying for the Local Capital Project Delivery Program through NJTPA, and through the first phase, Concept Development, to identify regional traffic patterns, connectivity, and area needs, including:	High	Long	\$\$\$	Essex County	1
	<ul style="list-style-type: none"> • Access to I-78 • Some roadways could be modified into one-way pairs • Evaluate the impact of Beth Israel Hospital on area traffic • Impact from Springfield Avenue • Access to and impact from Garden State Parkway 					
Signs						
A-2	Replace all sign posts with breakaway posts that are not the breakaway type.	Medium/High	Short	\$	Essex County	4
A-3	Consider additional directional signage to I-78.	Medium/Low	Short	\$	Essex County	1
Education and Enforcement						
A-4	Beth Israel Hospital, as a large employer in the area and large generator of traffic, could be a target for educational outreach.	Medium	Medium	\$	Essex County	1, 2, 6, 33, 46
A-5	If feasible, increased enforcement of driver and pedestrian behavior may be effective; consider the Essex County police force for assistance.	High	Medium/Long	\$\$	Irvington PD	2, 3, 6, 33

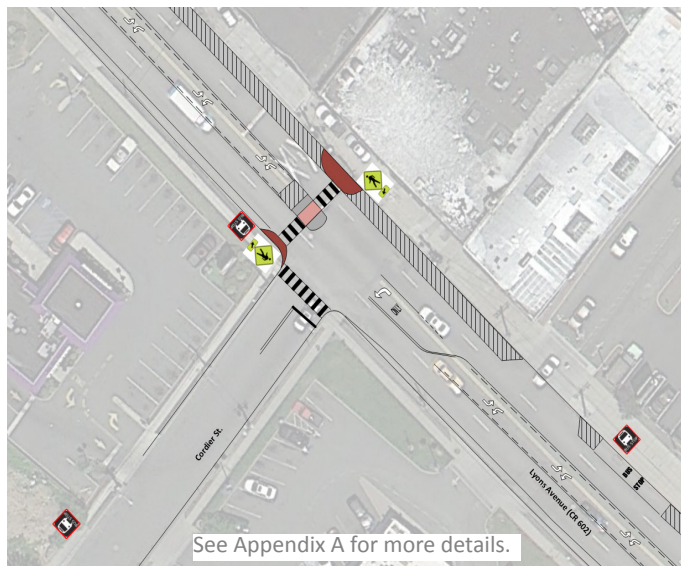
Ref #	STUYVESANT AVENUE AND LYONS AVENUE	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
Traffic Operations						
B-1	Installation of head-to-head left turn lanes on Lyons Avenue. In addition, consider installation of head-to-head left turn lanes on Stuyvesant Avenue.	High	Medium/Long	\$\$	Essex County	5, 6
Roadway						
B-2	Improvement to the geometry, by reducing the turning radius, would promote decreased turning speed.	Medium	Long	\$\$\$	Essex County	9
B-3	Consider installing pavement markings delineating permitted parking areas as well as shoulders.	Medium/High	Short	\$	Essex County	7, 8, 18
Pedestrians						
B-4	Consider adding countdown pedestrian heads as part of the signal upgrade.	Medium/High	Long	\$\$\$	Essex County	11, 14
B-5	Uneven pavement in crosswalk should be improved upon to meet ADA standards.	Medium	Medium	\$\$	Essex County	12
B-6	Consider the installation of bulbouts at each corner to shorten the crosswalk distance and improve corner visibility.	High	Long	\$\$\$	Essex County	11
Signs						
B-7	Consider installation of NO PARKING signs (R7-1); this will improve awareness of illegal parking.	Low	Short	\$	Essex County	18
B-8	The addition of street name signs will decrease driver confusion.	Medium	Short	\$	Essex County	19
Traffic Signal						
B-9	Consider a full traffic signal upgrade, including replacement of signal heads with 12-inch LED bulbs and the addition of retroreflective back plates.	High	Long	\$\$\$	Essex County	20, 21
Lighting						
B-10	Professional engineering staff should conduct a formal engineering review of existing lighting conditions to evaluate where both vehicle and pedestrian level lighting can be enhanced.	High	Medium	\$\$\$	Essex County	16
Visibility/Awareness of Intersection						
B-11	Improve visibility of signs by trimming the foliage.	Low/Medium	Short	\$	Irvington	15
B-12	Visibility of the stop bar for eastbound Lyons Avenue could be enhanced by an advance warning sign (W3-3) and/or a STOP HERE ON RED sign on hill. (R10-6).	Medium	Short	\$	Essex County	17
B-13	Installation of rumble strips on eastbound Lyons Avenue may help alert drivers to presence of intersection	Medium	Medium	\$	Essex County	17
Education and Enforcement						
B-14	Initiate the Be Street Smart program through advertising, grassroots public outreach, and law enforcements efforts.	High	Long	\$	NJTPA	6, 11, 13
B-15	Consider participation in the New Jersey Pedestrian Decoy Safety Program.	High	Long	\$	Essex Co. Sherriff's Office	11, 13

Ref #	STUYVESANT AVENUE AND LYONS AVENUE	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
	Drainage					
B-16	Consider the evaluation of drainage needs and make improvements accordingly.	Medium	Long	\$\$\$	Essex County	10



Ref #	LYONS AVENUE AND CORDIER STREET	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
	Road Diet					
C-1	Consider a road diet, allocating the westbound lane as a curb lane to accommodate the bus stop and for driveway space. (This will also improve operations for NJ Transit #13 and #96 merging into traffic before making a left turn on Cordier Street.)	High	Medium	\$\$	Essex County	22, 23, 24, 25, 26
C-2	Installation of left-turn lane for westbound Lyons Avenue traffic (in conjunction with the road diet.)	High	Medium	\$\$	Essex County	23, 24, 25, 26
C-3	Installation of a two-way left-turn lane for westbound Lyons Avenue (in conjunction with the road diet).	High	Medium	\$\$	Essex County	23, 24, 25, 26
C-4	Consider the addition of a left turn bay into Pathmark lot.	High	Medium	\$\$	Essex County	24, 25

Ref #	LYONS AVENUE AND CORDIER STREET	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
	Traffic Signal					
C-5	Consider the installation of a traffic signal with detection from Cordier Street.	High	Long	\$\$\$	Essex County	23, 33
	Roadway					
C-6	Consider the evaluation of drainage needs and make improvements accordingly.	Medium	Long	\$\$\$	Essex County	27
C-7	Consider revising the radius on the southeast corner in order to accommodate turning trucks and buses.	Low	Long	\$\$\$	Essex County	28
	Roadway Markings					
C-8	Consider installing short centerline on Cordier Street.	Low	Short	\$	Essex County	29
C-9	Consider repainting the faded crosswalk across Cordier Street with high visibility markings.	Medium	Short	\$	Essex County	32
	Pedestrians					
C-10	Consider the installation of a high visibility marked crosswalk across Lyons Avenue and other pedestrian accommodations to meet ADA standards.	High	Short	\$\$	Essex County	30, 31
C-11	Investigate the installation of active warning beacons, especially Rectangular Rapid Flashing Beacons or HAWK, or a pedestrian crossing sign (W11-2, W16-7) at non-signalized marked crossing locations where additional visibility is needed, if not signalized.	High	Long	\$\$	Essex County	33
C-12	Consider the installation of bulbouts on the western crossing of Lyons Avenue (in conjunction with a road diet).	High	Long	\$\$\$	Essex County	33
C-13	Consider the installation of a pedestrian refuge island in the western crossing of Lyons Avenue (in conjunction with a road diet.)	High	Medium	\$\$	Essex County	33
C-14	Remove tripping hazards in the sidewalk on the northern side of Lyons Avenue	Low	Short	\$	Irvington	34
	Signs					
C-15	Consider the installation of speed limit signs on Lyons Avenue (R2-1).	Medium	Short	\$	Essex County	2, 3
C-16	Add a Lyons Avenue street sign.	Medium/High	Short	\$	Irvington	35

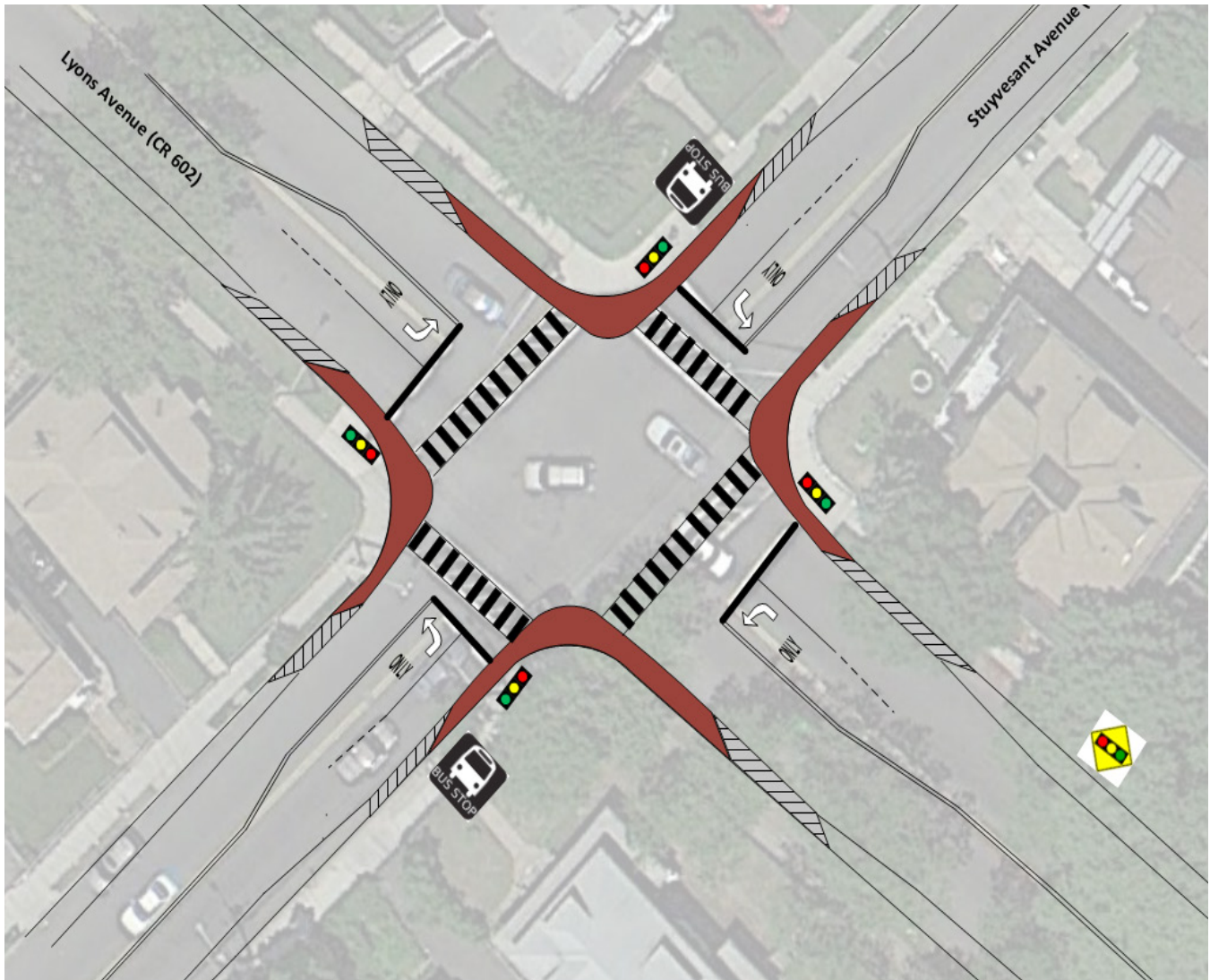


Ref #	CHANCELLOR AVENUE AND CORDIER STREET	Safety Benefit	Time Frame	Cost	Jurisdiction	Issue Ref #
Traffic Operations						
D-1	Consider the installation of a left turn lane or a two-way left turn lane on Chancellor Avenue as appropriate. In addition, narrowing the travel lane could improve driver behavior.	Medium	Medium	\$\$	Essex County	37, 38
D-2	Consider the installation of speed limit signs on Chancellor Avenue (R2-1).	Medium	Short	\$	Essex County	2, 3
Pedestrians						
D-3	Consider the installation of a high visibility marked crosswalk across Chancellor Avenue and other pedestrian accommodations to meet ADA standards.	High	Short	\$	Essex County	39, 40
D-4	Investigate the installation of active warning beacons, especially Rectangular Rapid Flashing Beacons or HAWK, or a pedestrian crossing sign (W11-2, W16-7).	High	Long	\$\$\$	Essex County	41
D-5	Remove the pole stub protruding from the sidewalk on the north-east corner.	Medium/Low	Short	\$	Essex County	42
Bus						
D-6	Lane delineation with a designated shoulder and a bus stop will alert drivers to presence of a bus stop.	Medium/High	Medium	\$	Essex County	43
Maintenance						
D-7	Replace the curb piece on the drainage inlet on the northwest corner on Cordier Street.	High	Medium	\$\$	Essex County	44
D-8	Regular maintenance should include cleaning out the drainage inlets.	Medium/Low	Short	\$	Essex County	45
Future Development						
D-9	Further study should be undertaken to determine the future needs of the area with full development of the Valley Fair Mall. This may include installation of a traffic signal.	Medium	Long	\$\$	Essex County	46
D-10	Ongoing coordination between the city, county, developer, NJ Transit, and other involved parties should be maintained.	Medium	Long	\$\$	Essex County	46



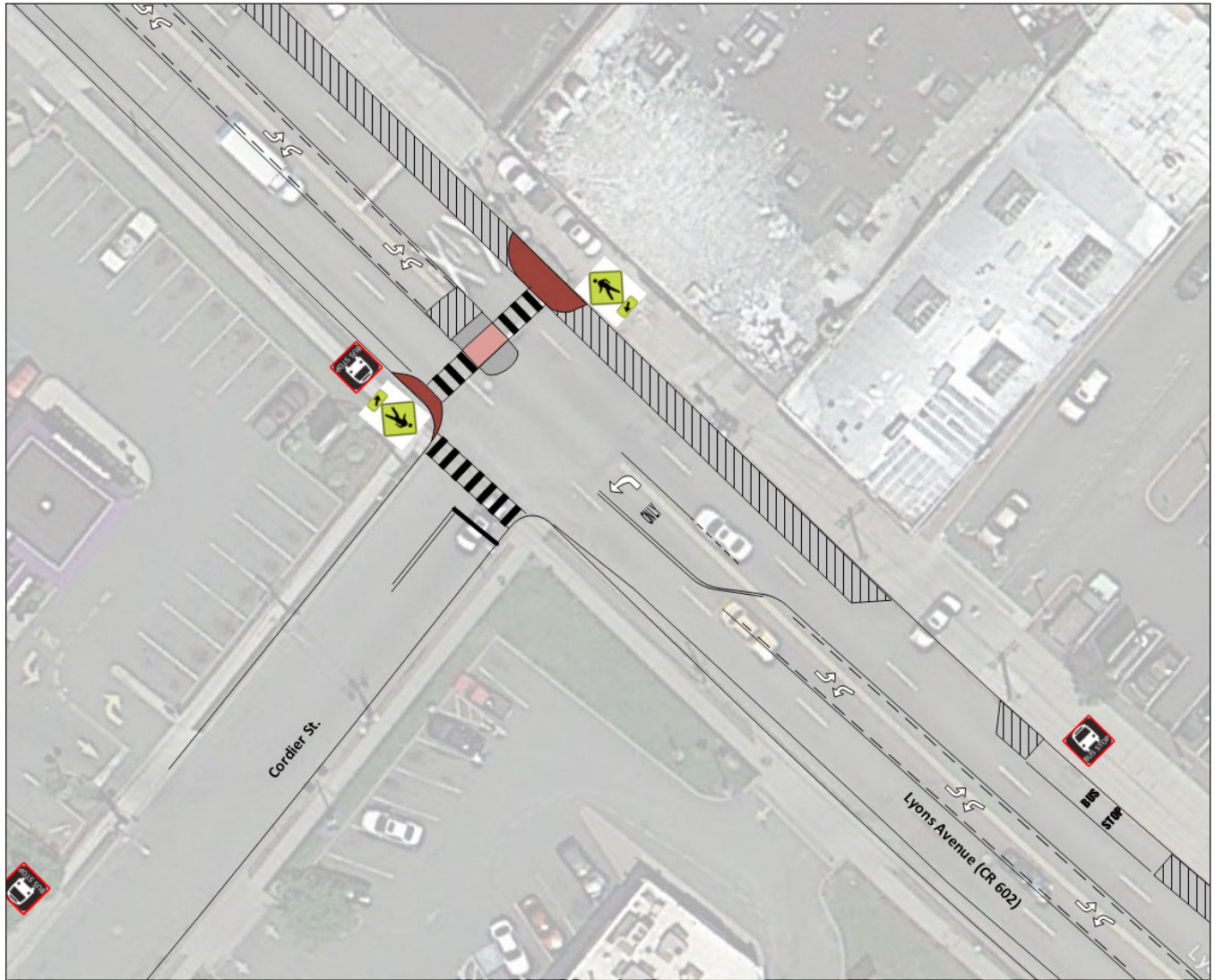
>> APPENDIX A – RECOMMENDATION GRAPHICS

STUYVESANT AVENUE AND LYONS AVENUE



- Bulbouts would shorten the crosswalk, better define the lanes.
 - Reducing the radius on the corner would help to reduce speed.
 - Addition of left turn lanes.
 - Restrict parking area adjacent to intersection.
- Signal ahead sign on vertical curve.

LYONS AVENUE AND CORDIER STREET



- Road diet reduces lanes from four to three.
- Left turn lane on Lyons Avenue westbound to Cordier Street.
- High visibility marked crosswalk across Lyons Avenue, with signage.
- Refuge island in crosswalk.
- Lane on north side of Lyons Avenue hatched as a driveway/bus lane.
- Pavement markings on Cordier Street.
- Two way left turn lane.
- Shoulder pavement markings.

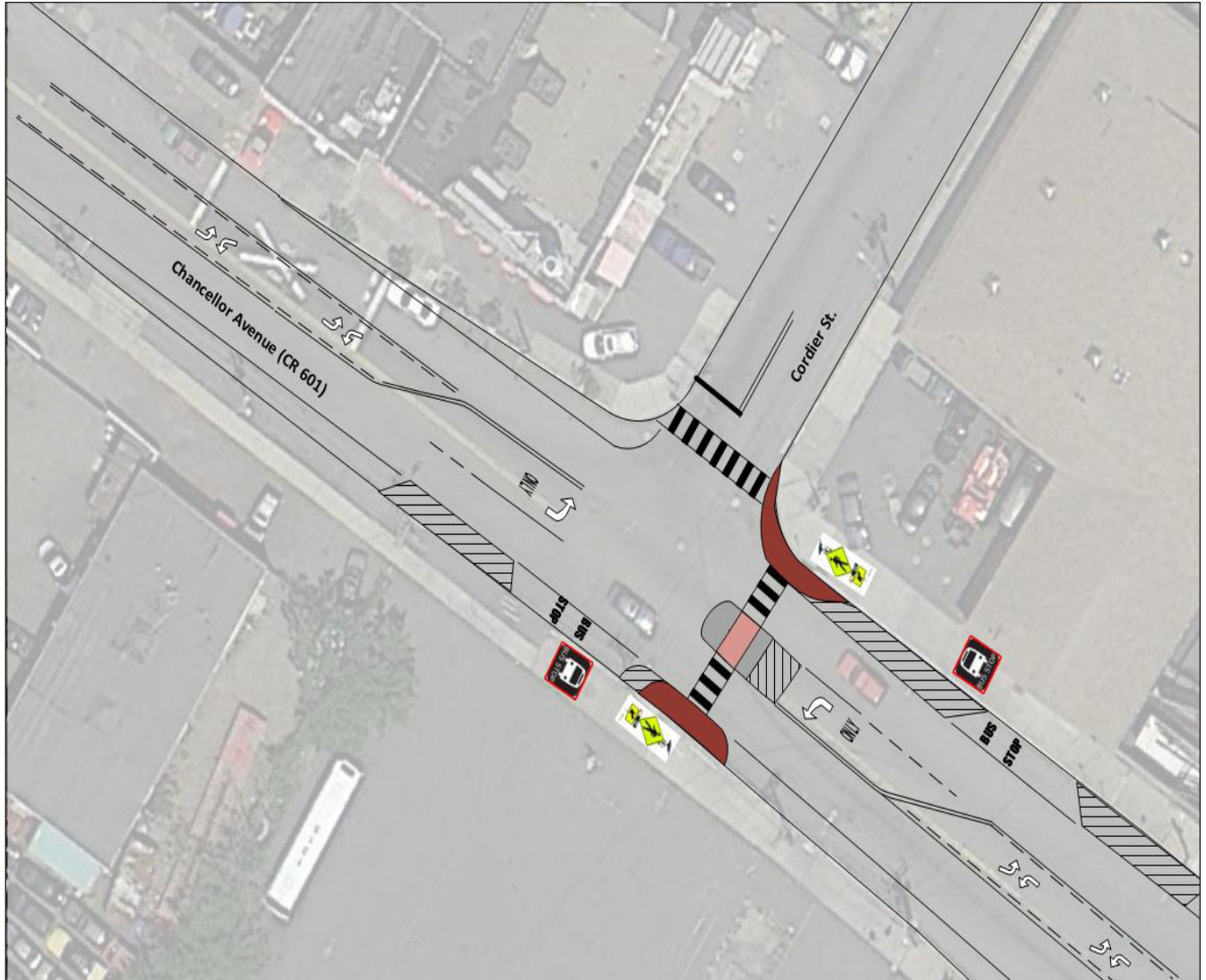


Existing conditions at Lyons Avenue looking west, at Cordier Street.



With improvements including left turn lane, hatched shoulder on Lyons Avenue westbound, marked crosswalk with bulbouts and pedestrian refuge island.

CHANCELLOR AVENUE AND CORDIER STREET



- Left turn lanes and two-way left turn lanes.
- Shoulder pavement marking.
- High visibility marked crosswalk across Chancellor Avenue.
- Bulbouts to decrease crosswalk length and define travelway.
- Pedestrian refuge island.
- Hatched area adjacent to bus stop to increase visibility.
- Pavement markings on Cordier Street.

>> APPENDIX B – RSA TEAM

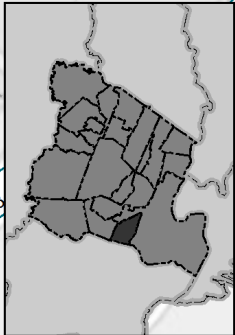
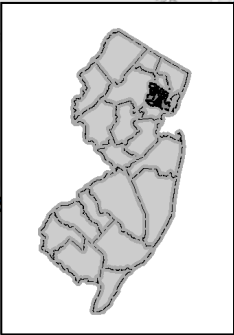
Name	E-mail	Representing
Asif Mahmood	amahmood@essexcountynj.org	Essex County - Engineering
David Antonio	dantonio@essexcountynj.org	Essex County - Planning
Chris Rodriguez	crodriguez@ezride.org	Meadowlink
Elmira C. Yasin	EYasin@njtransit.com	NJ TRANSIT
Amon Boucher	Amon.Boucher@dot.state.nj.us	NJDOT Data & Safety
Divya Kumar	Divya.Kumar@dot.state.nj.us	NJDOT Local Aid
Sascha Frimpong	SFrimpong@njtpa.org	NJTPA
Elizabeth Thompson	ethompson@njtpa.org	NJTPA
John Wiggins	wiggins@ADM.NJIT.EDU	Township of Irvington
Uffessa Mosley	umosley@irvingtonpolice.org	Irvington PD
Aimee Jefferson	aimee.jefferson@rutgers.edu	Rutgers - TSRC
Andy Kaplan	akaplan1@rutgers.edu	Rutgers - TSRC
Sally Karasov	sally.karasov@rutgers.edu	Rutgers - TSRC

>> APPENDIX C – AREA MAPS

STUDY AREA



AREA TRANSIT



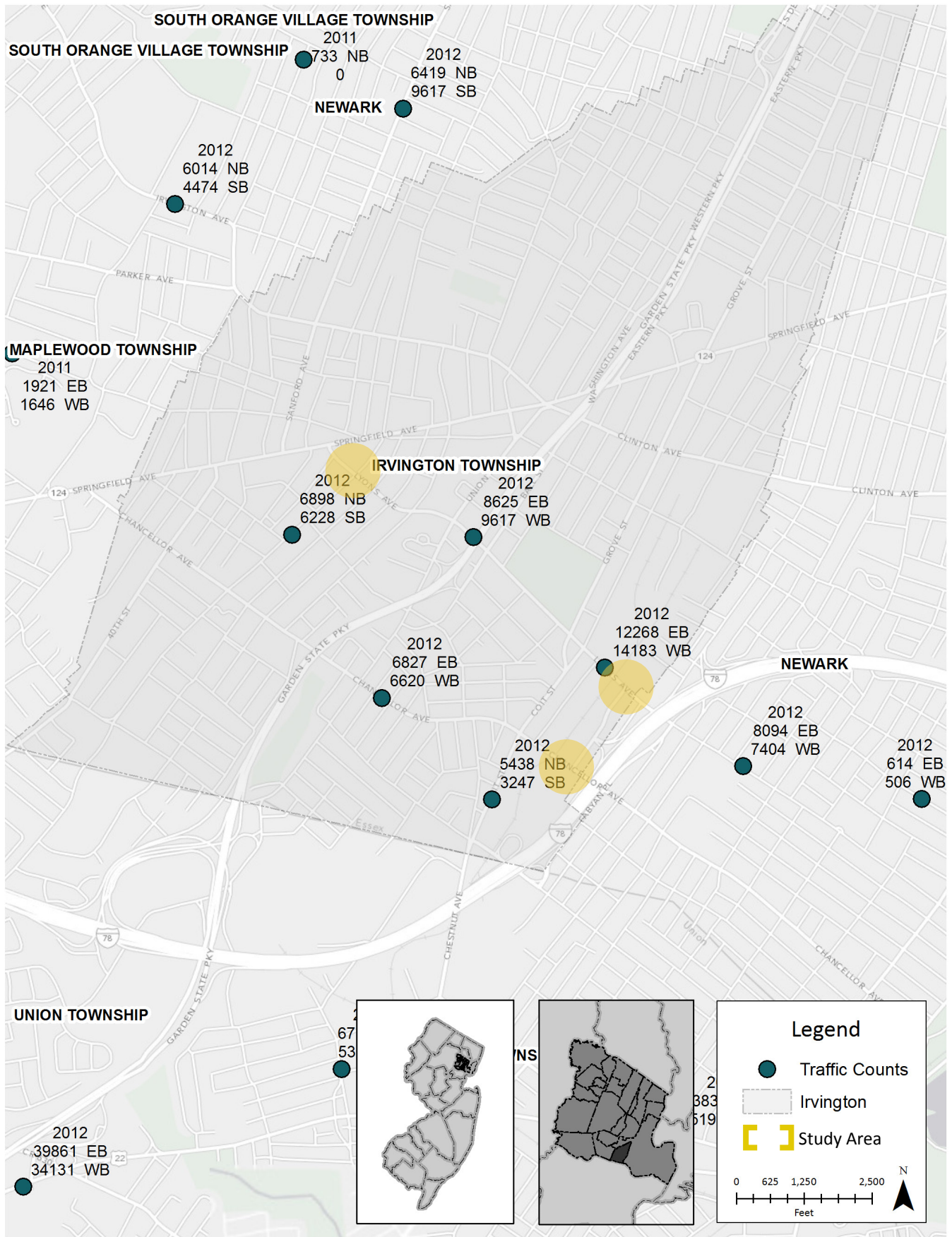
Legend

- NJ Transit Stops
- NJ Transit Buses
- ▭ Irvington
- Study Area

0 260 520 1,040
Feet

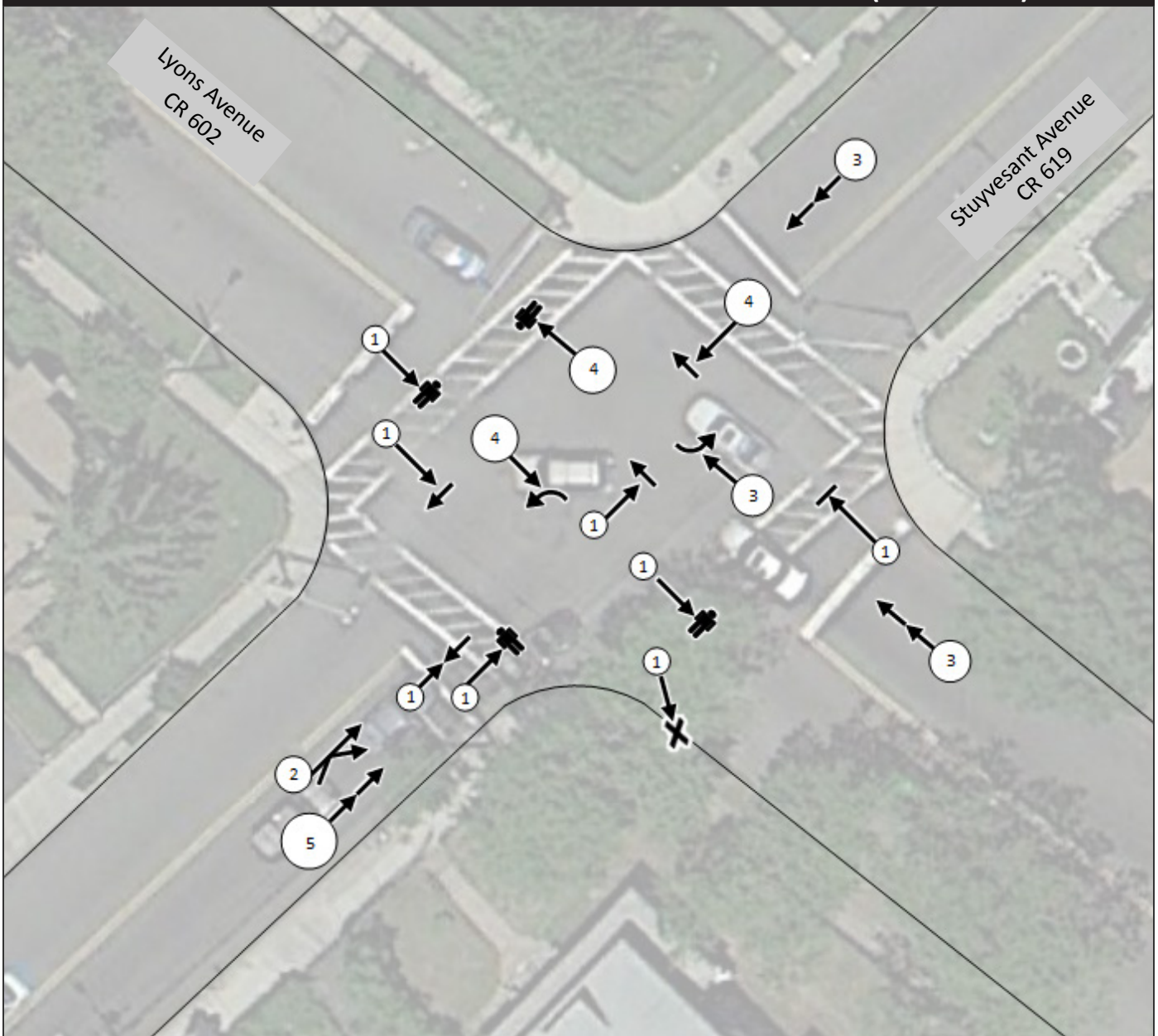
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TRAFFIC VOLUMES



>> APPENDIX D – CRASH DATA AND CRASH DIAGRAMS

STUYVESANT AVENUE AND LYONS AVENUE – CRASH DIAGRAM (2010–2012)



LEGEND

	Right angle		Same direction-side swipe
	Pedestrian		Same direction-rear end
	Encroachment		Fixed object
	Left turn		Opposite direction-head on/angular

0 25 50
feet

TSRC Imagry, 2014



STUYVESANT AVENUE AND LYONS AVENUE - CRASH SUMMARY (2010–2012)

Crash Type	#
Same Direction - Rear End	11
Same Direction - Side Swipe	2
Right Angle	6
Opposite Direction - Head On/ Angular	1
Opposite Direction - Side Swipe	0
Struck Parked Vehicle	0
Left Turn / U-turn	7
Backing	0
Encroachment	1
Overtaken	0
Fixed Object	1
Animal	0
Pedestrian	7
Pedalcyclist	0
Non-fixed Object	0
Railcar - Vehicle	0
Other	0
Total	36

Month	#
January	1
February	1
March	5
April	2
May	7
June	0
July	3
August	4
September	1
October	5
November	4
December	3
Total	36

Day	#
Monday	9
Tuesday	3
Wednesday	4
Thursday	6
Friday	3
Saturday	6
Sunday	5
Total	36

Light Condition	#
Daylight	21
Dawn	0
Dusk	0
Dark-No Street Lights	1
Dark-Street Lights On/ Continuous	13
Dark-Street Lights On/Spot	0
NULL	1
Total	36

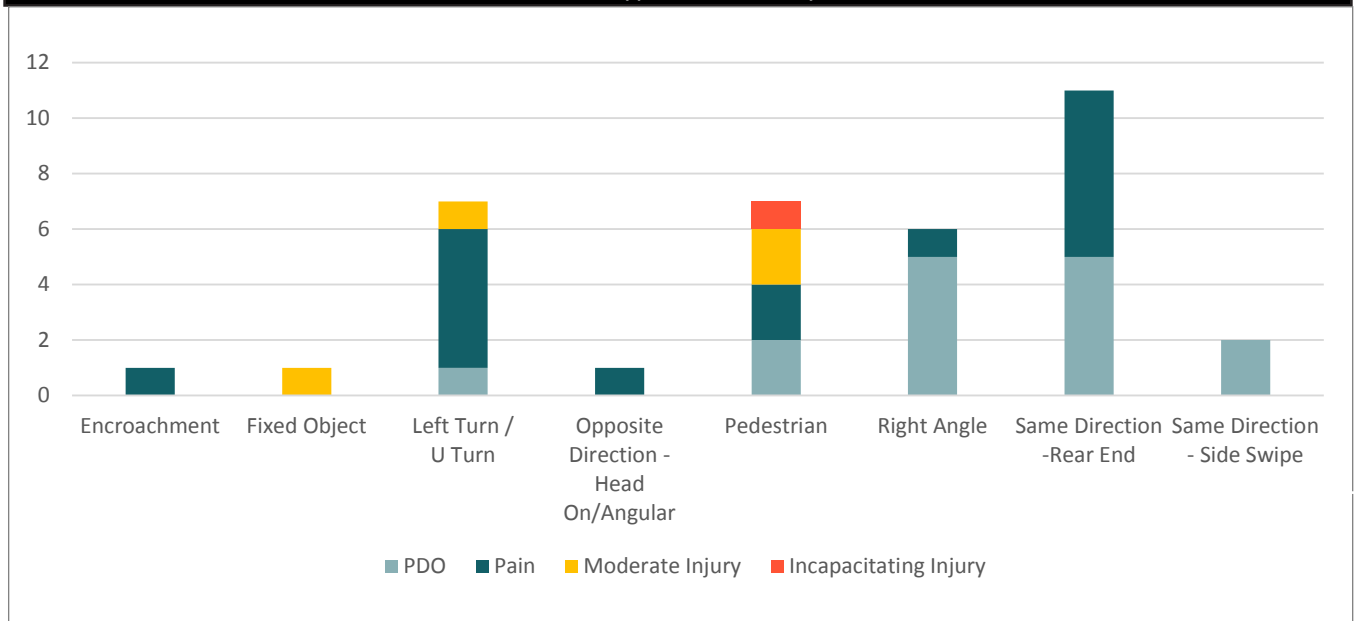
Surface Condition	#
Dry	28
Wet	7
Snowy	1
Icy	0
Slush	0
Water-Standing/Moving	0
Sand, Mud, Dirt	0
Oil	0
Total	36

Intersection	#
At intersection	32
Not at intersection	4
Total	36

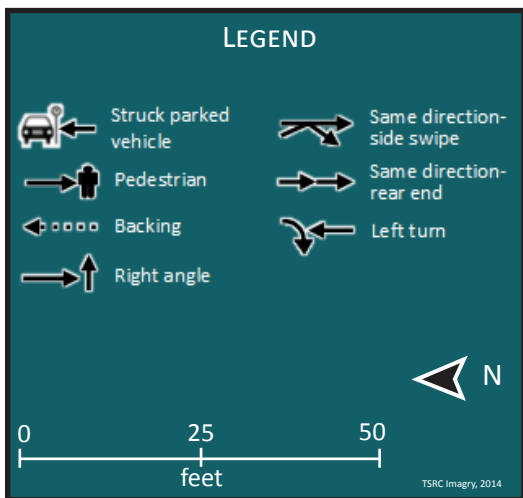
Severity	#
Property Damage Only	15
Pain	16
Moderate Injury	4
Incapacitating Injury	1
Fatal	0
Total	36

Crash Year	#
2010	12
2011	8
2012	16
Total	36

Crash Type and Severity



LYONS AVENUE AND CORDIER STREET – CRASH DIAGRAM (2010–2012)



LYONS AVENUE AND CORDIER STREET – CRASH SUMMARY (2010–2012)

Crash Type	#
Same Direction - Rear End	4
Same Direction - Side Swipe	10
Right Angle	8
Opposite Direction - Head On/ Angular	0
Opposite Direction - Side Swipe	0
Struck Parked Vehicle	1
Left Turn / U-turn	5
Backing	1
Encroachment	0
Overtaken	0
Fixed Object	0
Animal	0
Pedestrian	2
Pedalcyclist	0
Non-fixed Object	0
Railcar - Vehicle	0
Other	0
Total	31

Month	#
January	3
February	2
March	1
April	2
May	3
June	5
July	2
August	1
September	2
October	2
November	6
December	2
Total	31

Day	#
Monday	3
Tuesday	5
Wednesday	2
Thursday	7
Friday	5
Saturday	4
Sunday	5
Total	31

Light Condition	#
Daylight	18
Dawn	1
Dusk	5
Dark-No Street Lights	0
Dark-Street Lights On/ Continuous	5
Dark-Street Lights On/Spot	1
NULL	1
Total	31

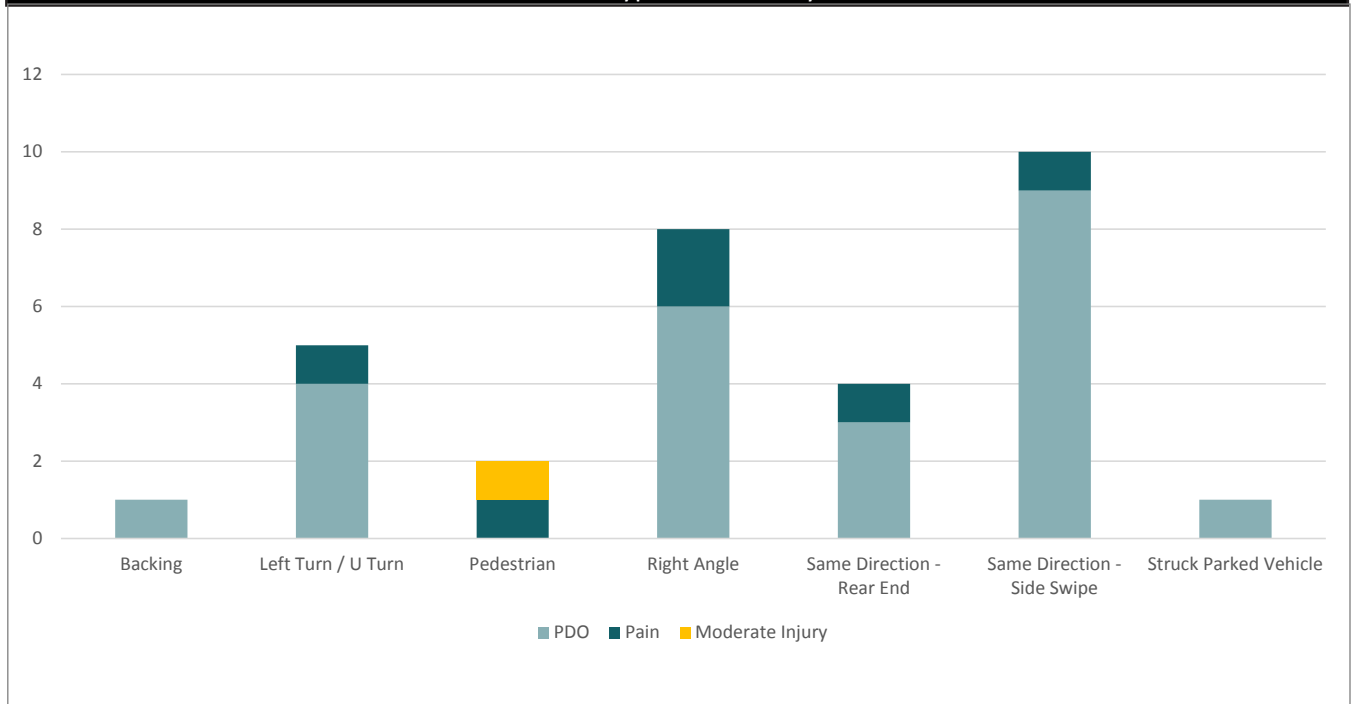
Severity	#
Property Damage Only	24
Pain	6
Moderate Injury	1
Incapacitating Injury	0
Fatal	0
Total	31

Surface Condition	#
Dry	21
Wet	10
Snowy	0
Icy	0
Slush	0
Water-Standing/Moving	0
Sand, Mud, Dirt	0
Oil	0
Total	31

Intersection	#
At intersection	18
Not at intersection	11
At or Near Railroad	2
Total	31

Crash Year	#
2010	12
2011	11
2012	8
Total	31

Crash Type and Severity



CHANCELLOR AVENUE AND CORDIER STREET – CRASH DIAGRAM (2010–2012)



LEGEND

	Struck parked vehicle		Same direction side-swipe
	Right angle		Same direction rear-end
	Left turn		Fixed object

0 25 50
feet

TSRC Imagry, 2014

N



CHANCELLOR AVENUE AND CORDIER STREET – CRASH SUMMARY (2010–2012)

Crash Type	#
Same Direction - Rear End	1
Same Direction - Side Swipe	2
Right Angle	1
Opposite Direction - Head On/ Angular	0
Opposite Direction - Side Swipe	0
Struck Parked Vehicle	1
Left Turn / U-turn	1
Backing	0
Encroachment	0
Overtaken	0
Fixed Object	1
Animal	0
Pedestrian	0
Pedalcyclist	0
Non-fixed Object	0
Railcar - Vehicle	0
Other	0
Total	7

Month	#
January	0
February	2
March	2
April	0
May	0
June	1
July	1
August	1
September	0
October	0
November	0
December	0
Total	7

Day	#
Monday	1
Tuesday	2
Wednesday	3
Thursday	0
Friday	0
Saturday	1
Sunday	0
Total	7

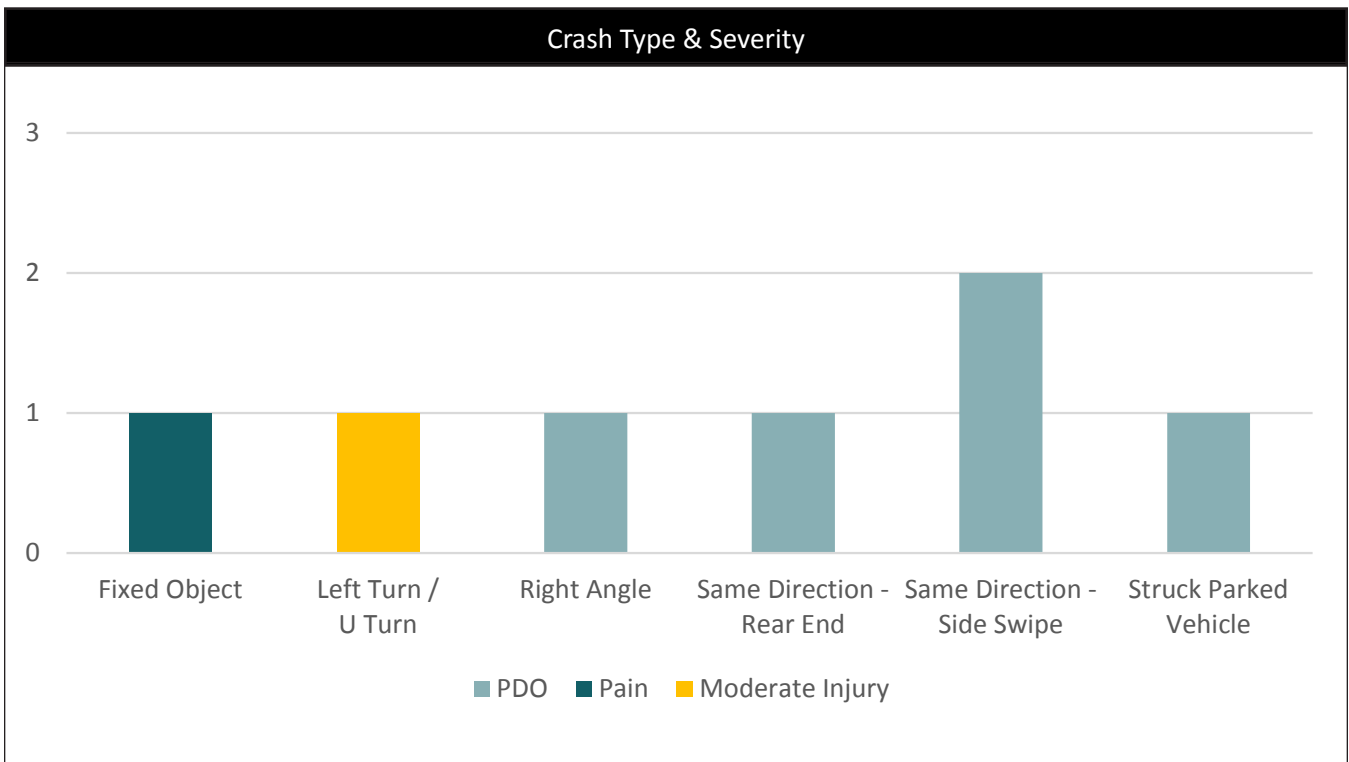
Light Condition	#
Daylight	1
Dawn	0
Dusk	0
Dark-No Street Lights	0
Dark-Street Lights On/ Continuous	5
Dark-Street Lights On/Spot	1
Total	7

Severity	#
Property Damage Only	5
Pain	1
Moderate Injury	1
Incapacitating Injury	0
Fatal	0
Total	7

Surface Condition	#
Dry	6
Wet	1
Snowy	0
Icy	0
Slush	0
Water-Standing/Moving	0
Sand, Mud, Dirt	0
Oil	0
Total	7

Intersection	#
At intersection	4
Not at intersection	2
At or near Railroad Crossing	1
Total	7

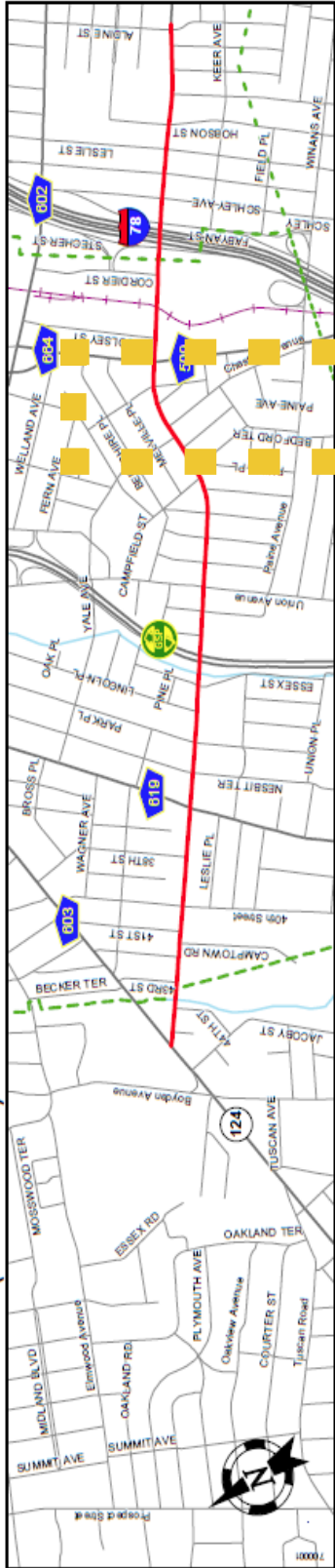
Crash Year	#
2010	0
2011	2
2012	5
Total	7



>> APPENDIX E – STRAIGHT LINE DIAGRAM

Mile Posts: 0.000 - 2.000

ESSEX COUNTY 601 (West to East)



Street Name	Jurisdiction	Functional Class	Federal Aid - NHS-Sy	Control Section	Speed Limit	Number of Lanes	Med. Type	Med. Width	Pavement	Shoulder	Traffic Volume	Traffic Sta. ID	Structure No.	Enlarged Views
SPRINGFIELD (0.00) AVENUE	Essex County	Urban Minor Arterial	601	NOT POSTED	2	None	0	0	0	0	38	MP=0.00		
44TH ST (0.06)	Essex County	Local Street												
45TH ST (0.11)	Essex County	Local Street												
43RD ST (0.14)	Essex County	Local Street												
42ND ST (0.21)	Essex County	Local Street												
41ST ST (0.26)	Essex County	Local Street												
40TH ST (0.35)	Essex County	Local Street												
38TH ST (0.45)	Essex County	Local Street												
STUYVESANT AVENUE (0.52)	Essex County	Urban Minor Arterial	618											
NESSBT TERRACE (0.58)	Essex County	Local Street												
PARK PLACE (0.63)	Essex County	Local Street												
LINCOLN PL (0.69)	Essex County	Local Street												
ESSSEX ST (0.74)	Essex County	Local Street												
GARDEN STATE PARKWAY (0.78)	Essex County	Local Street												
CORNELL ST (0.83)	Essex County	Local Street												
RUTGERS STREET (0.88)	Essex County	Local Street												
UNION AVENUE (0.97)	Essex County	Local Street												
OSBORNE PLACE (1.03)	Essex County	Local Street												
SHERIDAN STREET (1.07)	Essex County	Local Street												
CAMPFIELD ST (1.09)	Essex County	Local Street												
MT VERNON AVE (1.19)	Essex County	Local Street												
MARTIN PL (1.21)	Essex County	Local Street												
CHESTNUT AVE (1.26)	Essex County	Local Street												
VICTOR PL (1.30)	Essex County	Local Street												
NORWOOD AVENUE (1.30)	Essex County	Local Street												
WOOLSEY ST (1.45)	Essex County	Local Street												
RAILROAD	Essex County	Local Street												
CORDER ST (1.51)	Essex County	Local Street												
FABRYK PLACE (1.58)	Essex County	Local Street												
SOBER ST (1.66)	Essex County	Local Street												
SCHLEY STREET (1.71)	Essex County	Local Street												
WAINWRIGHT STREET (1.75)	Essex County	Local Street												
LESLIE STREET (1.80)	Essex County	Local Street												
HOBSON STREET (1.86)	Essex County	Local Street												
SUMMIT AVE (1.90)	Essex County	Local Street												
BAYVIEW AVE (1.96)	Essex County	Local Street												
CRESCENT AVE (1.99)	Essex County	Local Street												
ALDINE STREET (2.00)	Essex County	Local Street												

Date last inventoried: January 2001

SRI = 07000601

Mile Posts: 0.000 - 2.000

ESSEX COUNTY 619 (South to North)



Secondary Direction		Primary Direction	
287	22	21	689
Interstate Route	US Route	NJ Route	County Road
2			
Interchange Number	Grade	Separated Interchange	Traffic Signal
			Traffic Monitoring Sites
			Road Underpass
			Road Overpass
Street Name			
Jurisdiction			
Functional Class			
Federal Aid - NHS-Sy			
Control Section			
Speed Limit			
Number of Lanes			
Med. Type			
Med. Width			
Pavement			
Shoulder			
Traffic Volume			
Traffic Sta. ID			
Structure No.			
Enlarged Views			