2015

NJTPA
NORTH JERSEY TRANSPORTATION PLANNING AUTHORITY

Freehold Borough Road Safety Audit

Intersection Safety at CR 24 (Manalapan Avenue) and Broad Street

This publication has been prepared as part of the North Jersey Transportation Planning Authority's Road Safety Audit Program with financing by the Federal Transit Administration and the Federal Highway Administration of the U.S. Department of Transportation. This document is disseminated under the sponsorship of the U.S. Department of Transportation in the interest of information exchange. The NJTPA is solely responsible for its contents.

Final Report August 2017

Contents

Background

The North Jersey Transportation Planning Authority (NJTPA), the Metropolitan Planning Organization (MPO) for the 13 counties of northern and central New Jersey, conducts half-day mini-Road Safety Audits (RSA) with counties and municipalities to identify safety solutions to high crash intersections with stakeholder input and involvement. For each RSA, NJTPA staff coordinates with county and local representatives to include a broad range of stakeholders including county and local leaders, planners, engineers, local law enforcement, and residents. The RSA consists of four parts:

1) An introduction of the stakeholders;
2) An overview presentation by an NJTPA facilitator on the high crash location, crash data, NJTPA funding opportunities, and Federal Highway Administration (FHWA) recommended safety solutions;
3) A guided walking audit of the high crash location; and
4) A group session where safety recommendations for improvements are discussed and prioritized.

The objective is to identify and prioritize recommendations that will reduce the number and severity of crashes at the audited intersection and list these recommendations in a final report developed by the NJTPA and made available to the county and municipality. The RSA and accompanying final report serves as a catalyst for county and local communities' representatives to implement short-term safety improvements and to further refine the mid to long-term safety recommendations for implementation by other agencies such as the NJTPA's Local Safety Program.

Initiated by Monmouth County and facilitated by NJTPA, the Freehold Borough RSA was held on September 28, 2015, to assess vehicular, pedestrian, and bicycle safety at the intersection of CR 24 (Manalapan Avenue) and Broad Street **(*Figure 1 and 2)***. This skewed intersection is stop controlled with the intersection flashing beacons. CR 24 drivers have the right-of-way and Broad Street drivers have a stop sign on each approach to the intersection. Both roadways leading up to the intersection are bi-directional with one lane in each direction, though it should be noted that the Broad Street southbound approach has a left-turn lane as it nears the intersection. The posted speed limits are 35 mph along CR 24 and 25 mph on Broad Street. ***Table 1*** provides information on roadway characteristics and operations for CR24 according to the CR 24 straight line

Table 1: Roadway Characteristics and Operation

Road Characteristics	Manalapan Avenue (CR 24)	Broad Street
SRI	13000024	
Jurisdiction	County	Municipal
Functional Class	Urban Minor Arterial	Urban Local
Speed Limit	35 MPH	25 MPH
Number of Lanes	2	2
Median Type	0'	0'
Pavement	34'	43'
Shoulder	None	Yes (post RSA)
Study Milepost	0.1	

diagram in ***Appendix B*** of this report.

The CR 24 and Broad Street intersection had 18 crashes over a 3 year period from 2012-2014 with a majority of the right angle crashes. Anecdotal information from residents who live near the intersection spoke of much higher crash numbers with the argument that some of the crashes are not reported to the police. They also expressed concern for the number of "near-miss" crashes that occur at CR 24 and Broad Street. RSA stakeholders referred to Broad Street as a cut through since it's a wide roadway and runs parallel to Freehold Borough's Main Street. This street provides a connection from the Monmouth County Courthouse to Route 33 and to the Freehold Raceway Mall. Several churches, a Jewish center, and schools (including the Park Avenue Elementary School) are within walking distance of the intersection. The intersection has a crossing guard in the morning and afternoon to assist with school children crossings. The crossing guard attended the RSA meeting on September 28th and reported that he had been hit twice at the intersection while on-duty. Though crash reports could not be found to provide details on either crash, in conversations with the crossing guard, the first crash occurred in approximately 2012 and the second in 2014. Neither crash resulted in notable injury, and in both instances the vehicles were traveling southbound on Broad Street.

The intersection is ranked 43rd within Monmouth County in regards to safety. This ranking is based on 2011-2013 weighted crash data occurring at county and municipal intersections generated by Rutgers Transportation Safety Resource Center (TSRC) in partnership with the Federal Highway Administration, New Jersey Department of Transportation, and the NJTPA. The rankings only considered crashes resulting in injuries, using a weighted scale for severity based on modified crash costs as defined by best practices published in the Highway Safety Manual.

Figure 1: Road Safety Audit Intersection and Freehold Borough

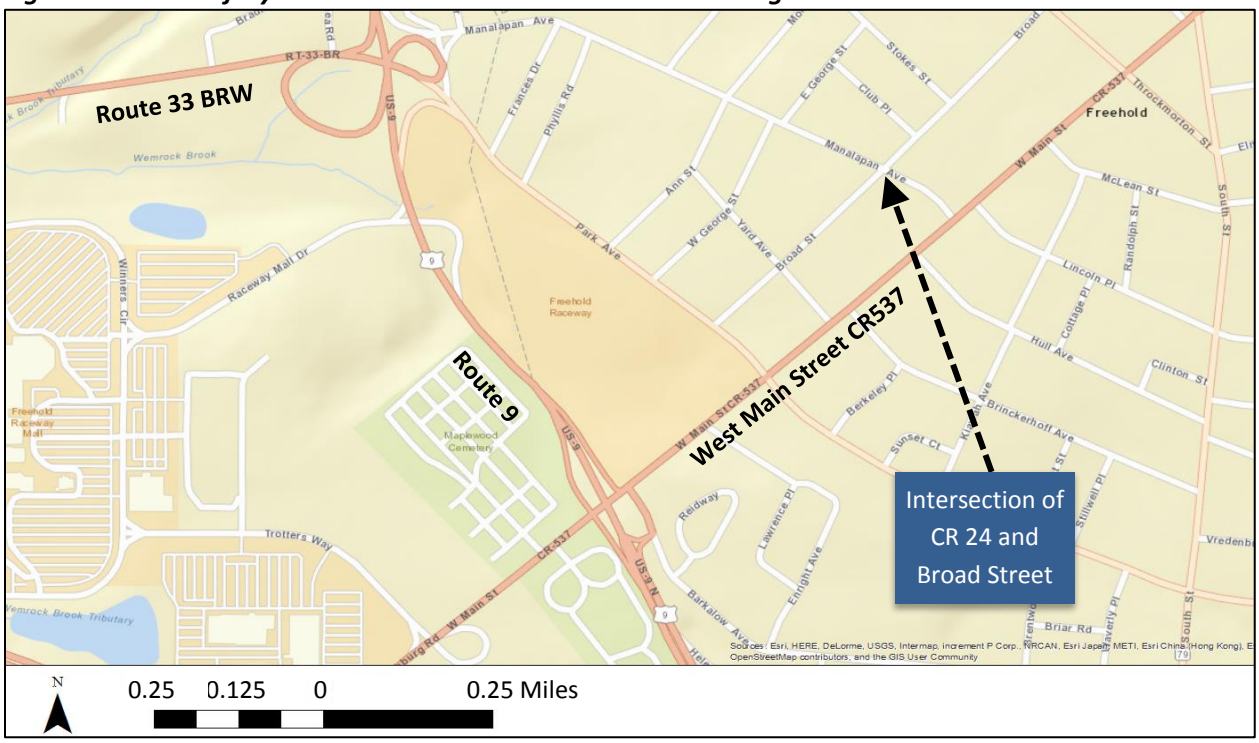
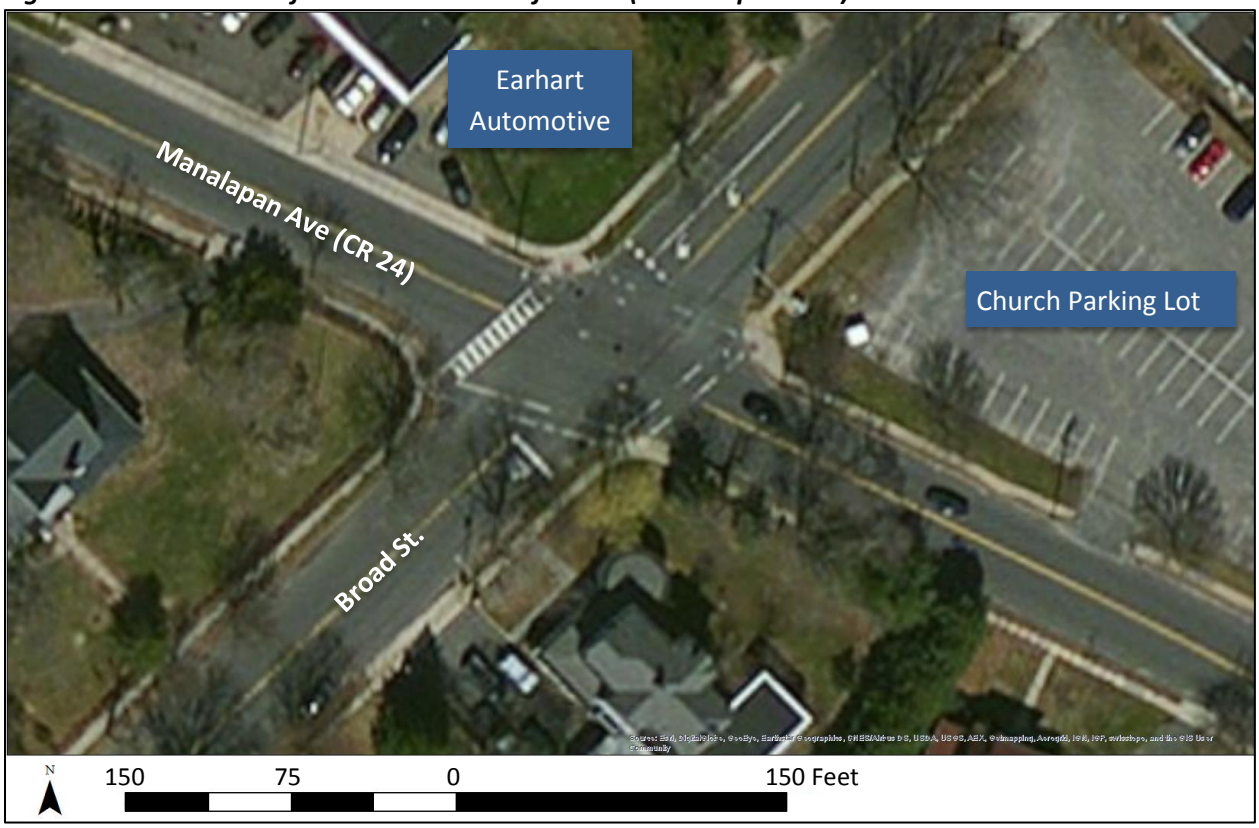


Figure 2: Aerial View of the Intersection of CR 24 (Manalapan Ave) and Broad Street



Crash Data Findings

The following charts compare the 18 crashes that occurred at the RSA intersection during 2012-2014 in order to give a frame of reference. Additional details about each crash, including the crash diagram and narrative, can be found in ***Appendix C*** of this report.

In terms of the time of day, crashes were over-represented at noon. Crashes occurred more frequently on Saturday, Sunday, and Monday, and crashes occurred more frequently during the month of July.

The crash frequency decreased from 2012 to 2014.

Figure 3: Crashes by Year

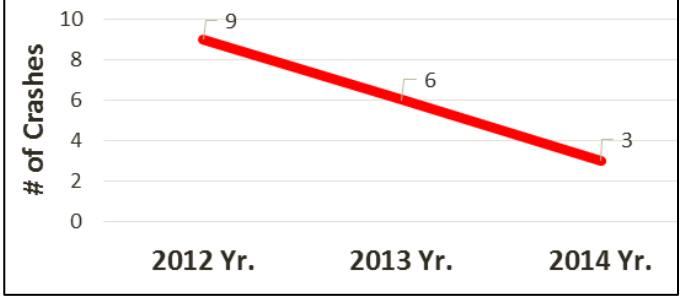


Figure 4: Crashes by Month

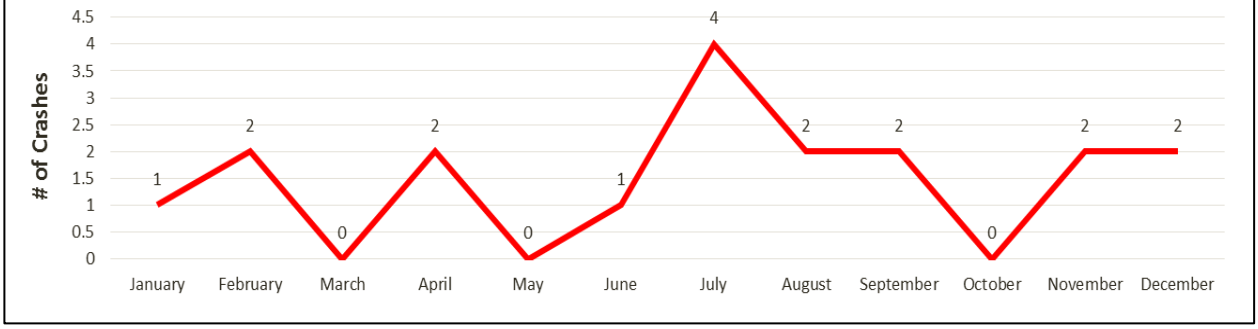


Figure 5: Crashes by Day of Week

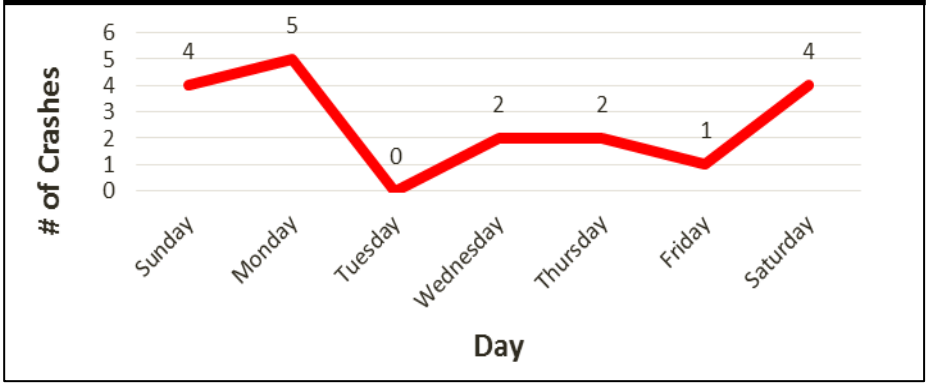
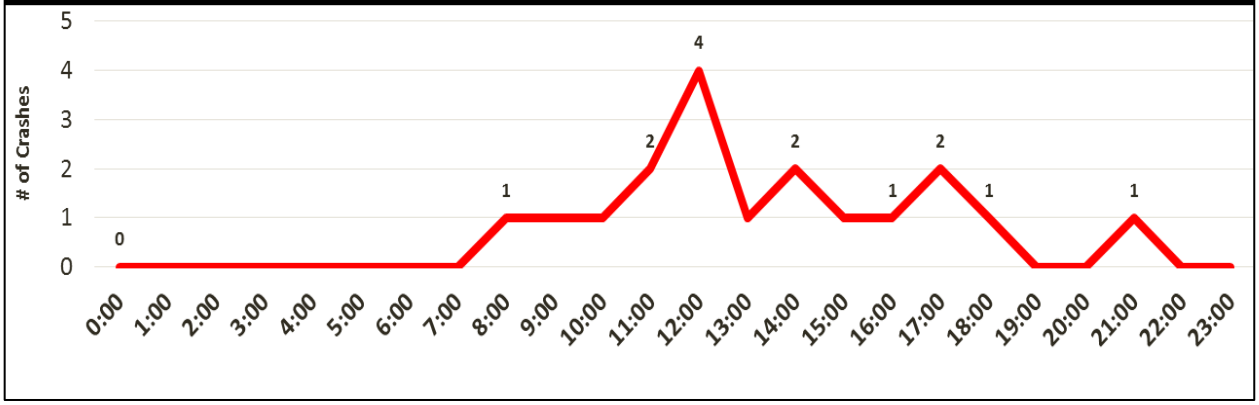
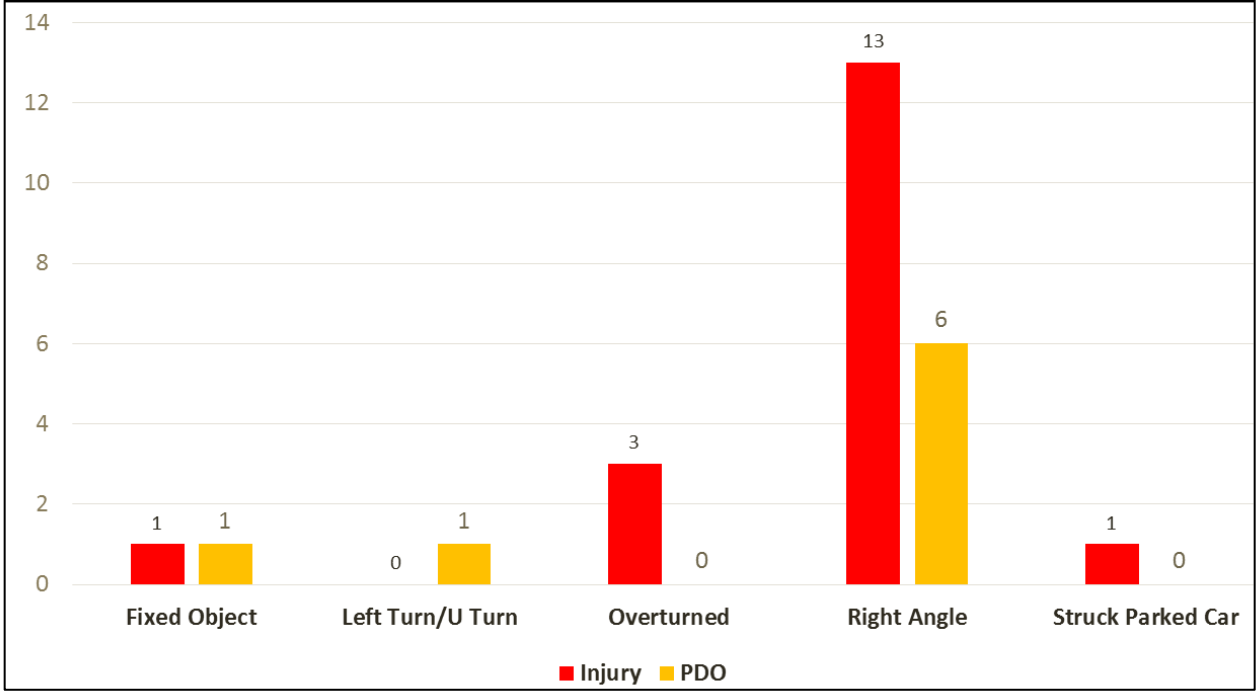


Figure 6: Crashes by Time of Day

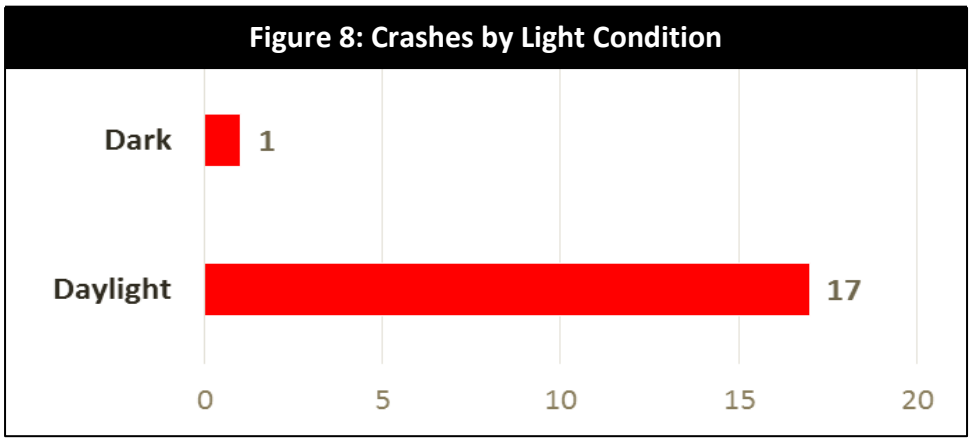


There was an over-representation of right angle crashes (13 of the 18) at the intersection. The additional five crashes included left turn, fixed object, overturned, and struck parked car. Although, the overturned crash was a right angle crash, it was reported as an overturn. As shown in ***Figure 7***, a large portion of the injuries were caused by right angle crashes. The most common "pre-crash action" was going straight (24 drivers) followed by making a left turn (4 drivers). The most common "contributing circumstance" that the police officers reported were: "driver inattention" (14 drivers) and "failed to yield ROW to vehicle" (8 drivers). There were no pedestrian and bicycle crashes.

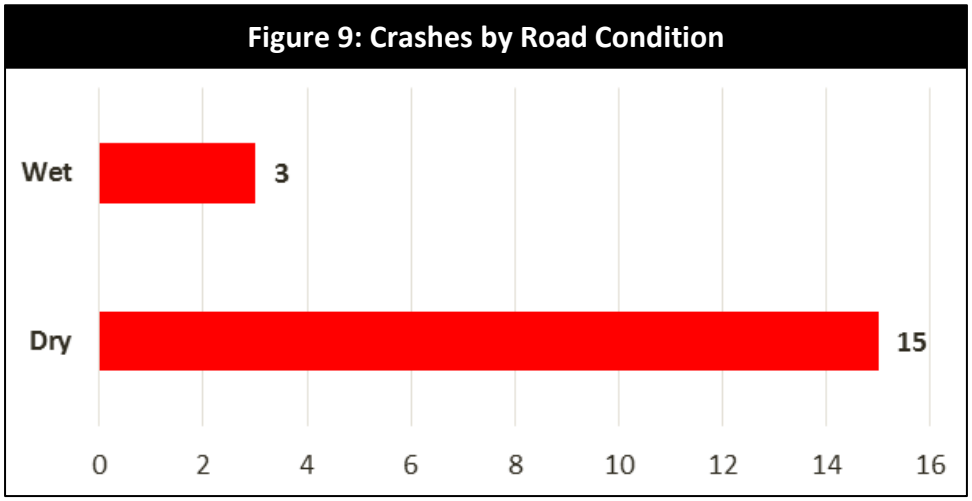
Figure 7: Crashes by Type & Severity



**Injury crashes includes all persons injured in a crash. For example, 3 injuries in 1 crash.*
***PDO means Property Damage Only*



A large number of crashes occurred during daylight hours (Figure 8) which may indicate that roadway lighting is not necessarily an issue. In addition, dry roadway conditions occurred more often than wet conditions (Figure 9).



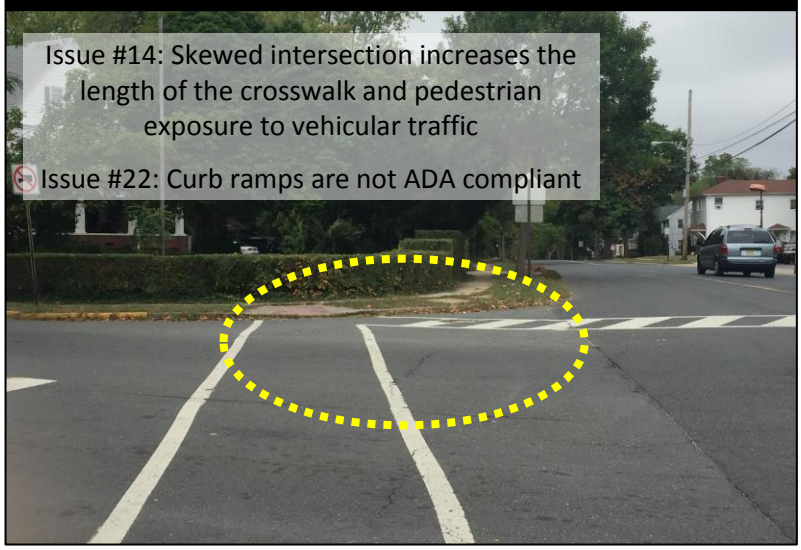
Identified Issues

Ref #	Issues List
	Traffic Operations
1	There is a history of right angle crashes.
2	Current intersection flashing beacons at the intersection are smaller in size than current standards and have two red indications facing Broad Street and two amber indications facing CR 24. A local resident indicated that this might be confusing to drivers at all four legs.
3	CR24 drivers who have the right-of-way while the Broad Street drivers have to stop. The local residents stated that the posting height of the existing stop sign on the southbound approach may contribute to the drivers not being able to see said stop sign.
4	The wide two lane cross section along Broad Street may be contributing to speeding leading up to the intersection.
5	Based on anecdotal information, Broad Street drivers are not stopping at the intersection.
24	Fairly wide CR 24 (34 feet) with no parking zone encourages speeding according to the local police officer.
	Signage
6	"Stop Ahead" sign on Broad Street traveling north is obstructed by vegetation.
8	There is a concern that the stop sign on Broad Street may not be visible to the driver due to its posted height and size.
25	There is a sign on CR 24 east of the intersection that prohibits truck traffic on CR 24 which is inappropriate and has to be removed. The school crossing signs are posted too low and far from the crosswalks.
26	An intersection ahead sign is missing.
	Visibility
9	Broad Street drivers coming from the south of the intersection have visibility issues due to vegetation. Existing shrubs makes it difficult for the driver to adequately see the approaching traffic on CR 24.
10	Based on anecdotal information from residents, street lighting is poor.
11	Utility poles are close to the roadway at the intersection.
	Geometry and Infrastructure
13	Wide turning radii may promote speeding and executing turning movements at the higher speed.
14	Skewed intersection increases the length of the crosswalk and pedestrian exposure to vehicular traffic.

Ref #	Issues List (Continued)
	Pavement and Pavement Markings
15	Pavement striping is faded or lacking (i.e. crosswalks, "STOP", left-turn lane, double yellow line). There is a passing zone in the westerly direction starting just west of the intersection.
16	There are no reflective pavement markers.
17	There is an exposed ductile iron drainage pipe at the northeast corner of the intersection.
18	Pavement condition could be improved, especially within the crosswalk areas; however there are no pot holes currently.
19	Drainage is poor and there is evidence of water ponding in the crosswalk at the southwest corner.
	Bicycle Facilities
20	Cyclists are present but there are no facilities for bicyclists.
	Pedestrians
21	There are sidewalk trip hazards, such as the cracked and uplifted sidewalk piece on the northwest corner.
22	There are curb ramps at all corners of the intersection but they are not ADA compliant.
23	One of the RSA team members, a crossing guard, had been hit by a car while on duty at the intersection. There is a concern for pedestrian safety, especially since it's used by elementary students on their way to and from the nearby school.

Visualizing Issues

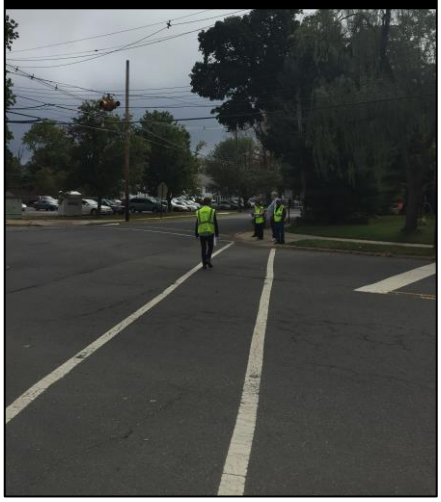
Southwest Corner of Intersection



Southwest Corner of Intersection

Southeast Corner of Intersection

Southeast Corner of Intersection



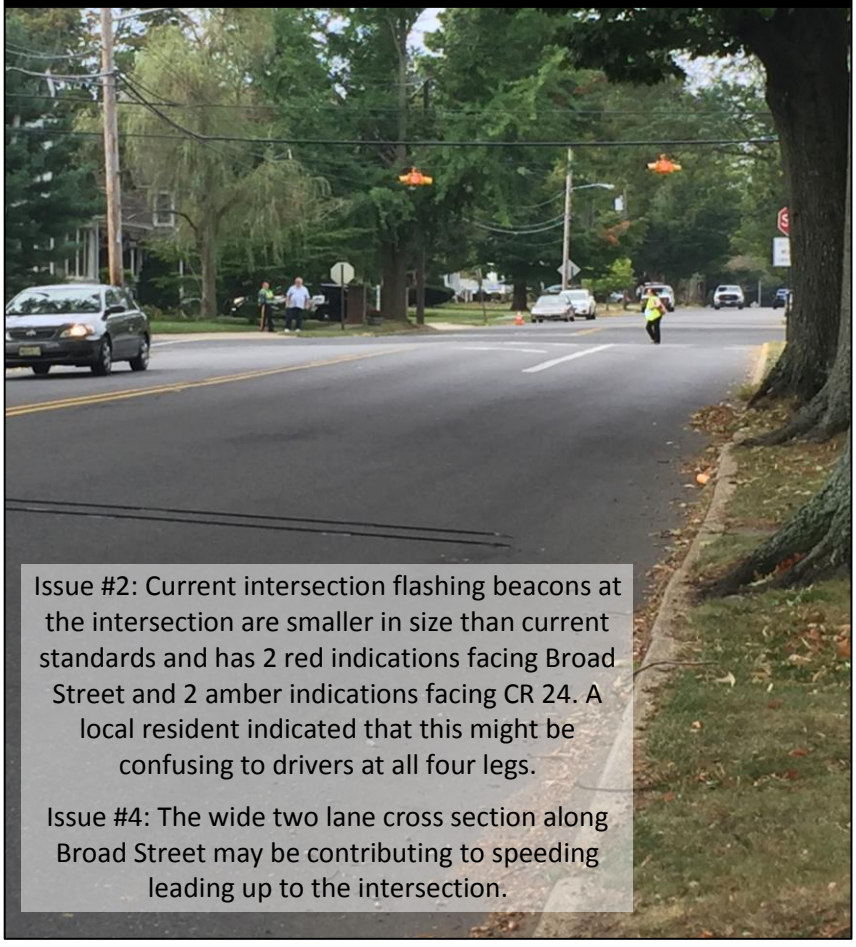
Northeast Corner of Intersection

Issue #17: Exposed ductile iron drainage pipe at the intersection
Issue #22: Curb ramps not ADA compliant

Northwest Corner of Intersection

Issue #15: Pavement striping is faded
Issue #22: Curbs not ADA compliant

Broad Street Approaching the Intersection from the North



Issue #2: Current intersection flashing beacons at the intersection are smaller in size than current standards and has 2 red indications facing Broad Street and 2 amber indications facing CR 24. A local resident indicated that this might be confusing to drivers at all four legs.

Issue #4: The wide two lane cross section along Broad Street may be contributing to speeding leading up to the intersection.

Broad Street Approaching the Intersection from the South

Issue #15: Pavement striping is faded

Broad Street Approaching the Intersection from the South

Issue #6: "Stop Ahead" sign on Broad Street traveling north is obstructed by vegetation.

Safety Recommendations

Ref #	Recommendations List	Safety Benefit	Time Frame	Cost	Issue Ref. #
	Traffic Operations				
1	Consider upgrading the current intersection flashing beacon to 12" LED indications.	Medium/Low	Medium	$	1,2,3
2	Move flashing beacon indications to center of approaching lane.	Medium	Medium	$$	1,2,3
3	If appropriate, install retroreflective back plates on the flashing beacon signal head.	Medium	Medium	$$	1,2,3
4	Consider a 4-way stop.	Medium	Short	$	1,3
	Signage				
5	Evaluate whether the placement and height of stop signs is affecting visibility and change if needed.	Medium	Short	$	1,5,8
6	Add speed limit sign to CR24 approaching the intersection.	Medium	Short	$	1,5
7	Provide in-road "Stop for Pedestrian" signage on both approaches of CR24 if desired by Borough.	Medium/High	Short	$	4,6,8
8	Remove the truck sign (CR24 south-bound).	Low	Short	$	
	Visibility				
9	Attach retro reflective wrap around strips to utility poles to improve visibility to driver upon approval from the utility company.	Low	Short	$	11
10	Street lighting maintenance is needed.	Medium	Short	$	10
11	Trim the vegetation on the south side of the intersection to improve sight distance.	High	Short	$	9
12	Trim the vegetation obstructing the "Stop Ahead" sign on Broad Street traveling north.	Medium/High	Short	$	6
13	Add retro reflective sheeting to sign posts.	Low	Short	$	3, 8
	Geometry and Infrastructure				
14	Consider a traffic calming treatment such as bump outs/curb extensions to increase pedestrian visibility and reduce their exposure to drivers.	Medium/High	Long	$$$	4, 23, 13

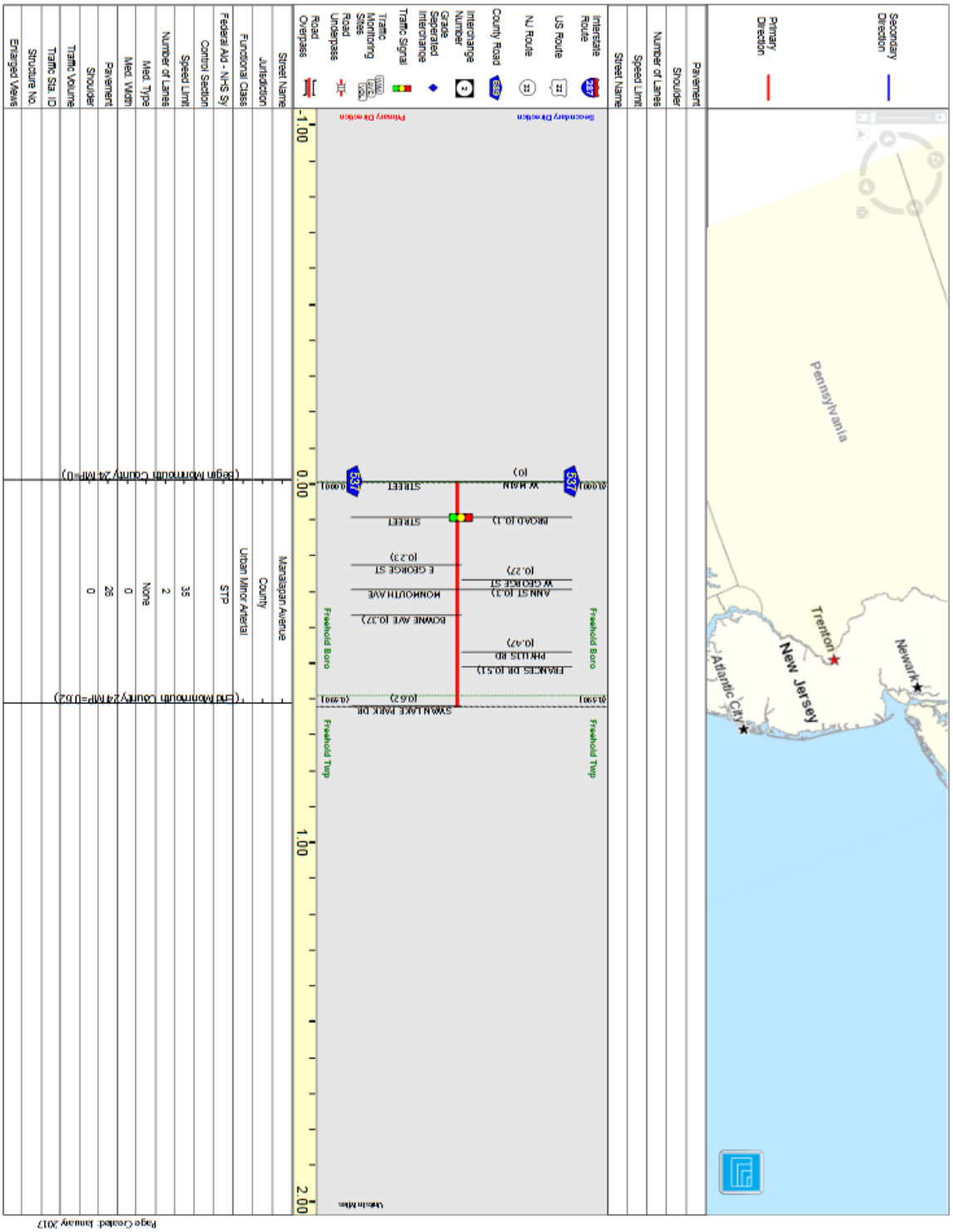
Ref #	Recommendations List	Safety Benefit	Time Frame	Cost	Issue Ref. #
15	Consider a raised intersection.	High	Long	$$$	4,6
16	Consider a mini-roundabout.	High	Long	$$$	1,2,3,5
	Pavement and Pavement Markings				
17	Restripe Broad Street to include edge striping to narrow the lane and delineate parking.	Medium	Short	$	4
18	Restripe CR24 with 11' wide lanes and striped shoulders.	Medium	Short	$	4
19	Restripe double yellow line and in-road "STOP" pavement markings on Broad Street northbound approach. Close the passing zone in westerly direction on CR 24.	Medium	Short	$	5
20	Repaint crosswalks with reflective striping. "Piano keys" or "Zebra" striping is recommended. Consider a colorized, stamped crosswalk.	Medium	Short	$	15, 16
21	Re-align the striping of the crosswalks to reduce pedestrian exposure. (This would need to be accompanied with ADA curb ramp compliance.)	Medium	Medium	$$	14
22	Left-turn approach restripe with improved demarcation is needed.	Medium	Short	$	15
27	Consider repaving this section of street and when repaving, address drainage issues.	Medium	Medium	$$	17, 18, 19
	Bicycle Facilities				
23	Consider adding bicycle accommodations.	Medium	Medium	$$	20
	Pedestrians				
24	Replace sections of sidewalk to eliminate tripping hazards.	Low	Medium	$$	21
25	Install ADA compliant ramps with detectable warning surfaces and a slope of less than 2%).	Medium	Medium	$$	22
	Enforcement				
26	Consider an enhanced enforcement campaign for the intersection.	High	Short	$	1

APPENDIX

Appendix A – RSA Team

Name		Title	Organization
Joseph	Bellina	Business Administrator	Freehold Borough
Eve	Chamberlain	Principal Planner	NJTPA
Renu	Chhonkar	Principal Engineer, Traffic	Monmouth County Engineering and Traffic Safety
Debbie	Compton	Traffic Engineer	Monmouth County Engineering and Traffic Safety
Sascha	Frimpong	Manager, Local Programs and Project Development	NJTPA
Ron	Griffiths	Councilman	Freehold Borough Council
Sean	Healey	Police Officer	Freehold Borough
Nolan	Higgins	Mayor	Freehold Borough
Joseph	Howe	Business Administrator	Freehold Borough School District
Daria	Jakimowska	Chief Engineer, Traffic Design	Monmouth County Engineering and Traffic Safety
Andy	Kaplan	Safety Program Manager	Rutgers TSRC
Frederick	Kish	Principal Engineer	Monmouth County
Christine	Mittman	Project Manager	NJTPA
Kathy	Mulholland	Resident	Freehold Borough
John	Mulholland	Resident	Freehold Borough
Glenn	Roberts	Chief	Freehold Police
Sharon	Shutzer	Councilwoman	Freehold Borough
LeRoy	Smith	Crossing Guard	Freehold Borough
Elizabeth	Thompson	Principal Planner	NJTPA
Bill	Wentzien	Freehold Borough Engineer	Freehold Borough

Appendix B – Straight Line Diagrams



Appendix C – Crash Data

Crash Type	Injury	PDO
Fixed Object	1	1
Left Turn/U Turn	0	1
Overturned	3	0
Right Angle	13	6
Struck Parked Car	1	0
Total	18	8

*The number of injuries in "crash type" is defined by individual injured and not by car crash.

Crash Year	#
2012 Yr.	9
2013 Yr.	6
2014 Yr.	3
Total	18

Month	#
January	1
February	2
March	0
April	2
May	0
June	1
July	4
August	2
September	2
October	0
November	2
December	2
Total	18

Time of Day	#
0:00	0
1:00	0
2:00	0
3:00	0
4:00	0
5:00	0
6:00	0
7:00	0
8:00	1
9:00	1
10:00	1
11:00	2
12:00	4
13:00	1
14:00	2
15:00	1
16:00	1
17:00	2
18:00	1
19:00	0
20:00	0
21:00	1
22:00	0
23:00	0
Total	18

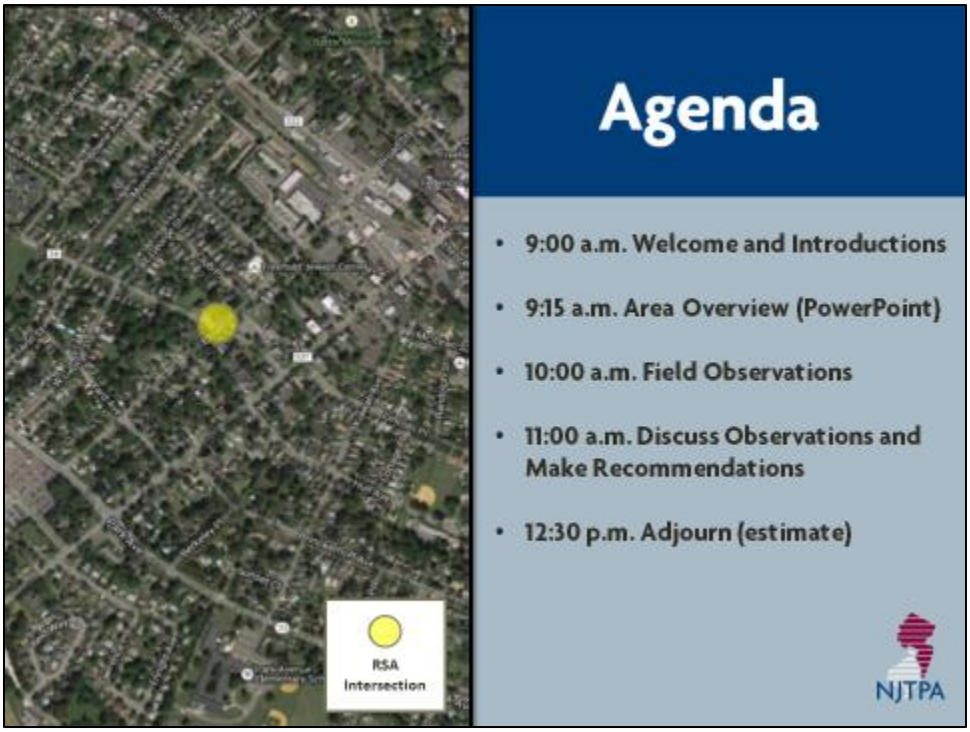
Road Condition	#
Dry	15
Wet	3
Total	18

Crash Severity	#
Property Damage Only (PDO)	8
Injury	10
Total	18

*The number of injuries in "crash severity" is defined by # of car crashes and not by individual injured.

Day	#
Sunday	4
Monday	5
Tuesday	0
Wednesday	2
Thursday	2
Friday	1
Saturday	4
Total	18

Appendix D – RSA Presentation



Presentation Outline

- Why this site for an RSA?
- RSA process overview
- NJTPA funding tie-in
- Study area overview and characteristics
- Crash statistics
- FHWA recommendations for non-signalized intersections

NJTPA

RSA Process

Select RSA team and conduct site visit

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Compile draft report

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Review and comment on draft report

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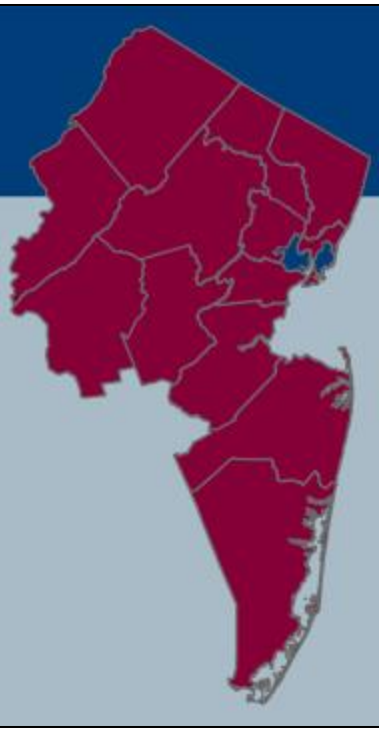
Revise draft, resend to RSA team

↓

Send final draft to Monmouth County

NJTPA

NJTPA Region



Bergen
Essex
Hudson
Hunterdon
Jersey City
Middlesex
Monmouth
Morris
Newark
Ocean
Passaic
Somerset
Sussex
Union
Warren

NJTPA

North Jersey Transportation Planning Authority

The Metropolitan Planning Organization for Northern New Jersey

STANDING COMMITTEES

Planning & Economic Development Committee
Project Prioritization Committee
Freight Initiatives Committee
Regional Transportation Advisory Committee

NJTPA

Road Safety Audits in the NJTPA Region

		Sponsor	Municipality	Location
1	2010	Bergen	Englewood	Grand Avenue (CR 501)
2	2011	Middlesex	Sayreville	Emston Road
3	2011	Middlesex	New Brunswick	Livingston Avenue (CR 691)
4	2011	Essex	Newark	Park Avenue (CR 658) & 4th Street *FY 2012 LSP
5	2011	Passaic	City of Passaic	Main Avenue (CR 601) *FY 2012 LSP
6	2012	Morris	Mendham	East Main Street (CR 510)
7	2012	Ocean	Long Beach Island	Long Beach Boulevard (CR 607)
8	2012	Newark	Newark	MLK Boulevard *FY 2013 LSP
9	2012	Middlesex	New Brunswick	New Brunswick Train Station
10	2013	Bergen	Carlstadt	Washington Avenue (CR 503) *FY 2013 LSP
11	2013	Essex	Newark	Bergen Street *FY 2015 LSP
12	2013	Somerset	Montgomery	Belle Mead-Blawenberg Road (CR 601)
13	2013	Jersey City	Jersey City	JFK Boulevard (CR 501) from Communipaw Sip Avenue *FY 2016 LSP
14	2013	Monmouth	Asbury Park	Memorial Drive (CR 404) *FY 2013 LSP
15	2014	Passaic	City of Paterson	Main Street (CR 601) (vicinity of St. Joseph's Children's Hospital)
16	2014	Essex	Irvington	Lyons (CR 602), Stuyvesant, Chancellor (CR 601) and Cordier
17	2014	Newark	Newark	Broad Street (Southern end)
18	2014	Hudson	Jersey City	JFK Boulevard (CR 501) from Bond Street to Journal Square
19	2014	Ocean	Lakewood	Dr. Martin Luthur King Road, Arlington and New Hampshire Avenues
20	2014	Union	Summit	Morris Avenue and Mountain Avenue (adjacent to Overlook Hospital)
21	2014	Jersey City	Jersey City	Marin Boulevard
22	2015	Somerset	Manville	Main Street
23	2015	Monmouth	Freehold	CR 24 (Manalapan Avenue) and CR 55 (Kozloski Road/Halls Mills Road)
24	2015	Hudson	Jersey City	JFK Boulevard (CR 501) from Pavonia Avenue to St. Pauls Avenue
25	2015	Newark	Newark	Ferry Street
26	2015	Morris	Randolph	Quaker Church Road
27	2015	Essex	Newark	Various Intersections
28	2015	Union	Linden	Wood Avenue
29	2015	Passaic	Clifton	Clifton Road

Highway Safety Improvement Program (HSIP)

Local Safety Program
Over $44 million in funding to date

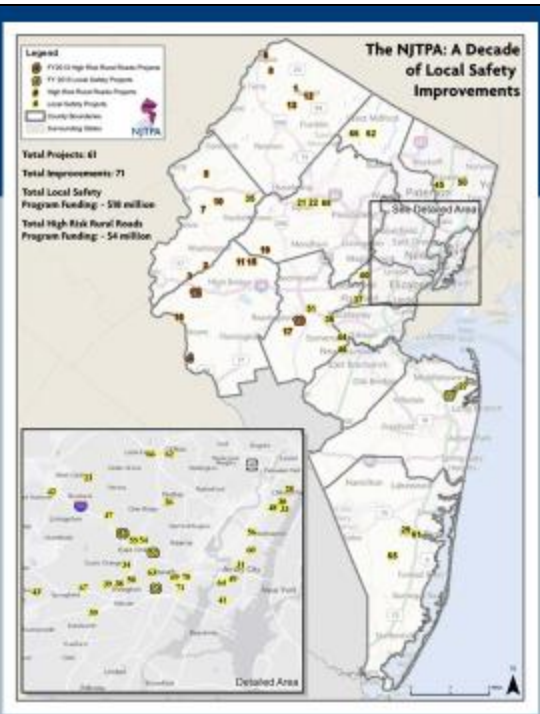
High Risk Rural Roads Program
Over $20 million in funding to date

Design Assistance Program
Over $4.5 million in funding to date

- Annual solicitations for both programs
- Projects selected under both programs are supported by crash data using Plan4Safety
- Only NJTPA member subregions can apply
- Funds for "quick-fix" construction-ready safety improvements and the construction phase of work only
- Project costs have ranged from $89,000 to $4.8 million per project
- Two applications per subregion, per program each year

A Decade of Improvements

- Traffic signal upgrades that include pedestrian countdown signals
- Flashing warning beacons
- Railroad bridge advanced warning signs and flashers
- Left turn lanes
- Road diets
- Crosswalks, median islands and curb bumpouts
- ADA-compliant curb ramps
- Reflective pavement markings
- Striping
- Signage
- High-friction surface treatments
- Shoulder and centerline rumble strips
- Bicycle safety grates



Local Safety Program Project Examples

Monmouth County Local Safety Projects:

Borough of Red Bank – CR 13 (Shrewsbury Ave) and West Bergen Place
$ 336,413
Selected in FY 2013, construction completed
Traffic signal replacement, high visibility crosswalks, ADA compliant curb ramps, signage and striping

City of Asbury Park – CR 40A Memorial Drive between Route 33 and Munroe Ave
$ 933,384
Selected in FY 2014
Road diet, high visibility crosswalks, sign upgrades, and pavement markings

Howell Township – CR 524A (Squankum Yellowbrook Road) and West Farm Road
$ 321,085
Selected in FY 2014
Intersection control beacon, center islands, sign and pavement marking upgrades, removal of pass zone, and resurfacing

NJTPA

Study Overview and Characteristics

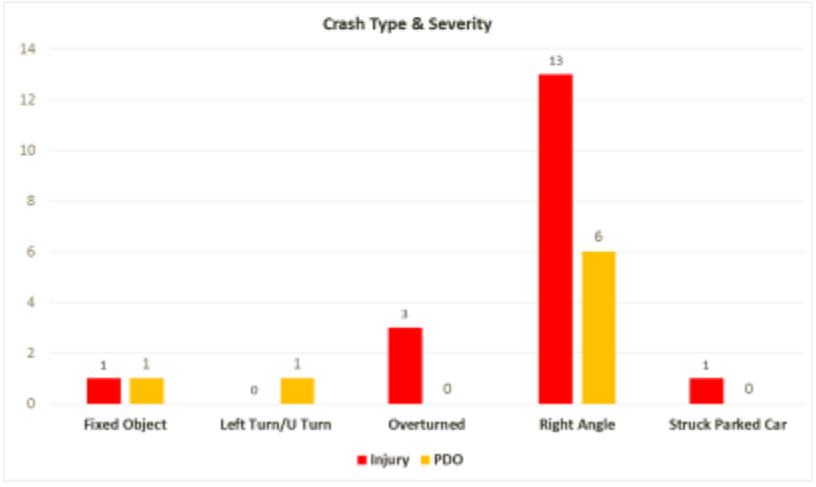
Roadway Characteristics & Operations

Road Characteristics	Manalapan Ave (CR 24)
SRI	13000024
Jurisdiction	County
Functional Class	Urban Minor Arterial
Speed Limit	35 MPH
Number of Lanes	2
Median Type	None
Medium Width	0
Pavement	26
Shoulder	None
Study Milepost	0.1

Network Screening Process

NJTPA Ranking List	NJTPA Ranking	Monmouth County Ranking
Intersection	813	43

Summary Statistic
(2012-2014)



*Injury crashes includes all persons injured in a crash. For example, there may be 3 injuries in 1 crash.

NJTPA

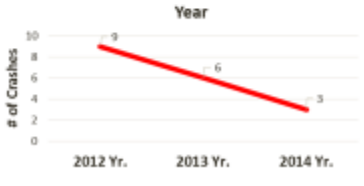
Summary Statistic
(2012-2014)

- Most common "pre-crash action" was:
  - Going straight (24 drivers)
  - Making left-turn (4 drivers)

- Most common "contributing circumstances" was:
  - Driver inattention (14 drivers)
  - Failed to obey traffic control device (2 drivers)
  - Failed to yield ROW to vehicle (8 drivers)

NJTPA

Summary Statistic
(2012-2014)



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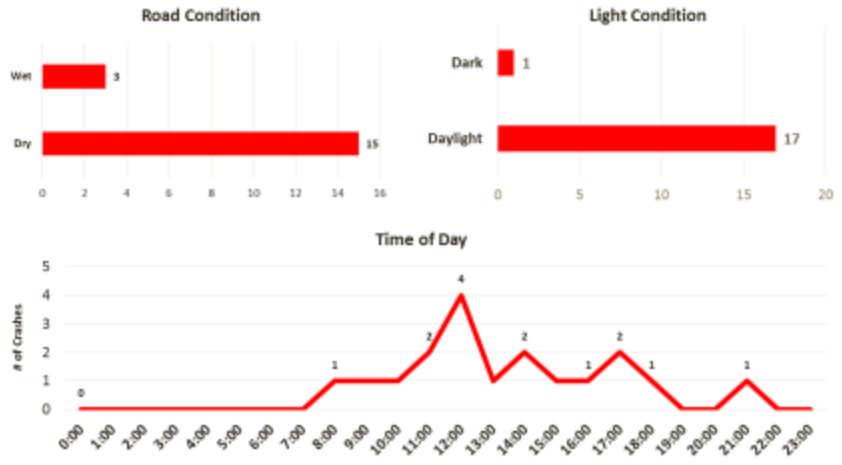
Summary Statistic
(2012-2014)



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Recommended Safety Improvements at Unsignalized Intersections (by FHWA)

- Clear sight distance
- Larger regulatory and warning signs
- Supplementary stop signs mounted over the roadway
- Double stop signs and/or flashing beacons
- Pavement markings
- Traffic calming at the intersection approaches and intersection through a combination of geometrics and traffic control devices
- Signalization at intersections
- Roundabouts

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Proven Safety Countermeasure:
Roundabouts
Yield at Entry:
• Entering traffic yields right-of-way to circulating traffic
Deflection:
• Entry and center island of roundabout deflects and slows entering traffic


Red Bank
CR 10 (East Front Street)
Traffic Calming