
# Road Safety Audit:

Clinton Avenue,
20th Street to 11th Street
Newark City, Essex County

DEPARTMENT OF TRANSPORTATION
THE STATE OF NEW JERSEY

**December 2020**

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# Executive Summary

This document is the final report of the Road Safety Audit (RSA) conducted along Clinton Avenue from 20th Street to 11th Street in Newark City, Essex County. An RSA is an effective way of identifying crash-causing trends and appropriate countermeasures utilizing a nontraditional approach that promotes transportation safety while maintaining mobility.

The aforementioned roadway section was identified on NJTPA's Local Safety Program Network Screening list as high priority. According to the NJDOT crash database, there were 111 crashes from 2016 to 2018 along the study area section of Clinton Avenue excluding pedestrians/pedalcyclists. Additionally, 20 pedestrian crashes and 1 pedalcyclist crash occurred over the 5-year period from 2014 to 2018.

Due to the COVID-19 pandemic, the RSA was conducted entirely online on Wednesday, October 7, 2020. Representatives from NJDOT, FHWA, NJTPA, NJ Transit, and Newark City were in attendance during the online RSA.

The RSA site and crash history are described in Sections II and III of this report, respectively. Section II also identifies previous and on-going studies conducted by the agency representatives. Corridor-wide and site-specific issues and recommendations, organized by location, are discussed in Section V. These recommendations addressed pedestrian safety by investigating curb extensions at intersections, repairing sidewalks and ensuring ADA compliance. Additionally, many suggestions were made to upgrade traffic signals, improve, and simplify signage, and improve lighting.

The recommendations contained herein were developed collaboratively with the roadway owner and local stakeholders from the RSA Team (members listed in Appendix A). The study partners have expressed interest in implementing many of the recommendations as time and funds allow. Many of the maintenance items, which are typically low cost, can be addressed without additional engineering.

*Please note this RSA report does not constitute an engineering report. The agency responsible for design and construction should consult a licensed professional engineer in preparing the design and construction documents, to implement any of the safety countermeasures mentioned in this report.*

# I. Introduction

## A. Site Selection

This section of Clinton Avenue was identified on NJTPA's Local Safety Program (LSP) Network Screening list as a high priority location, as shown in the below rankings. Of note, these rankings are based on 2014-2016 vehicular and 2012-2016 pedestrian crash data.

***Table 1 – NJTPA LSP Ranking (Corridor)***

| Location | Ped Corridor | Regional Corridor |
|---|---|---|
| Clinton Avenue | **#8** County (MP 1.04-2.04) | **#28** MP 0.07-1.07 |

***Table 2 – NJTPA LSP Ranking (Intersection)***

| Location | Intersections | Pedestrian Intersections |
|---|---|---|
| Clinton Avenue | None in Top 100 | **#29** 13th St (MP 1.01) |

## B. What is a Road Safety Audit?

A Road Safety Audit (RSA) is a formal safety performance examination of an existing or future road or intersection by a multi-disciplinary audit team. It qualitatively estimates and reports on existing and potential road safety issues, as well as identifies opportunities for improvements in safety for all road users. RSAs can be used on any size project, from minor maintenance to mega-projects, and can be conducted on facilities with a history of crashes, or during the design phase of a new roadway or planned upgrade. RSAs consider all road users, account for human factors and road user capabilities, are documented in a formal report, and require a formal response from the road owner.

The RSA program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for, a high frequency of crashes, or an identifiable pattern of crash types. Recommendations range from low-cost, quick-turnaround safety improvements to more complex strategies. Implementation of improvement strategies identified through this process may be eligible for Local Federal Aid Safety Funds. Because the RSA process is adaptable to local needs and conditions, recommendations can be implemented incrementally as time and resources permit.

The RSA process, one of FHWAs proven safety countermeasures, is shown below.

### C. The RSA Event

Due to the COVID-19 pandemic, this RSA was conducted entirely online on Wednesday, October 7, 2020. Representatives from NJDOT, FHWA, NJTPA, NJ Transit, and Newark City were in attendance during the online RSA. A list of team members can be found in Appendix A.

## II. Corridor Description and Analysis

### A. Study Location

The study area consists of approximately ½-mile of Clinton Avenue. The adjacent land use is primarily residential and commercial retail, professional and service establishments. Residential properties consist of apartment buildings and single-family dwellings. Immediately west of the project limits is the Thurgood Marshall Elementary School and the Irvington Bus Terminal.

### B. Roadway and Intersection Characteristics

Clinton Avenue is an undivided urban minor arterial with a statutory speed limit of 25 mph based on land use. One lane is provided in each direction for the roadway section. There are three (3) signalized and seven (7) unsignalized intersections within the study area.

### C. Existing Bicycle/Pedestrian Accommodations

Sidewalk is provided along both sides and varies in width throughout the project area. Sidewalk and crosswalk conditions vary from newly installed to needing maintenance. The three (3) signalized intersections within the study area are outdated and lack pedestrian signal heads and/or push buttons.

### D. Traffic Volumes

Based on available data, the 2018 Annual Daily Traffic (ADT) along Clinton Avenue is approximately 12,000 – 13,000 vehicles per day. A copy of the available data can be found in Appendix C.

### E. Transit Service

NJ Transit operates Route 13 along Clinton Avenue with stops throughout the corridor. In addition, bus routes 27 and 96 utilize 20th Street and Clinton Avenue to access the Irvington Bus Terminal, located approximately ½ mile west of the western project limits.

### F. Community Profile

The American Community Survey (ACS) estimate, which updates the 2010 Census population and income characteristics, was used to identify minority and low-income populations surrounding the project limits. The latest ACS for this study area is a five-year estimate from 2014 through 2018. A summary of the demographics is listed below.

***Table 3 – Study Area Demographics***

| Characteristic | | Project Area | County Average |
|---|---|---|---|
| **Poverty** | | 21-48% | 16% |
| **Unemployment Rate** | | 17% | 9% |
| **Limited English Proficiency (LEP)** | | 6% | 15% |
| **Race/Ethnicity** | White | 1% | 31% |
| | Hispanic/Latino | 6% | 23% |
| | Asian American | 0% | 5% |
| | Black or African American | 92% | 39% |
| | American Indian/Alaskan | 0% | 0% |
| | Other[1] | 2% | 1% |
| **Use Public Transportation** | | 18% | 21% |
| **Walk/Bike to Work** | | 1% | 4% |
| **Homes with No Vehicle Available** | | 41% | 22% |

# III. Crash Findings

The analysis used in the RSA was based on reportable crashes found in the NJDOT crash database resulting in a fatality, injury and/or property damage. Corridor-wide crash characteristics and overrepresentations were compared to the 2018 statewide average for the county road system as further detailed below. All crashes were plotted onto collision diagrams, which can be found in Appendix D and E.

## A. Temporal Trends

According to the NJDOT crash database, 111 crashes occurred during the three-year period between January 1, 2016 and December 31, 2018 (excluding pedestrians/pedalcyclists) along the study area. Total crashes varied from the county average in May, June, November, and on Thursday and Sunday.

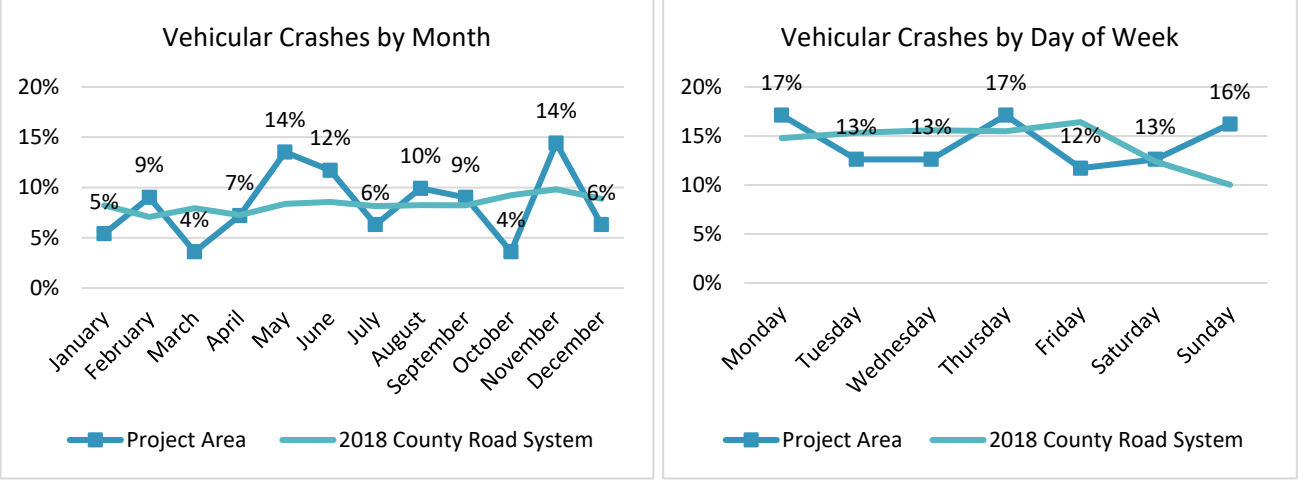



***Figure 1 – Vehicular Crashes by Month and Day of Week***

[1] Percentages may not equal 100% due to rounding. Other includes individuals who identified themselves as 'Native Hawaiian or Pacific Islander', 'Some Other Race Alone' or 'Two or More Races'

Additionally, 21 pedestrian crashes occurred over the 5-year period from 2014 to 2018; 1 was bicyclist and 20 were pedestrians. Collisions with pedestrians trended similar to county road averages.

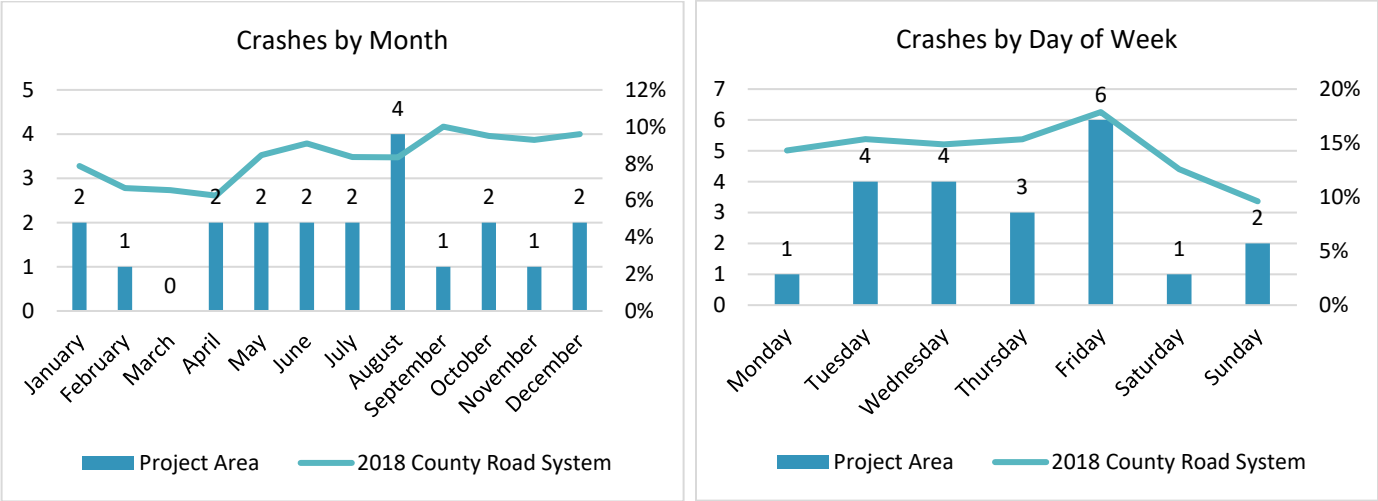



***Figure 2 – Pedestrian/Bicyclist Crashes by Month and Day of Week***

## B. Collision Types

Overrepresented crash types over the 2016 to 2018 period (excluding pedestrians/pedalcyclists) included struck parked vehicle, left turn/U turn, backing, and fixed object.

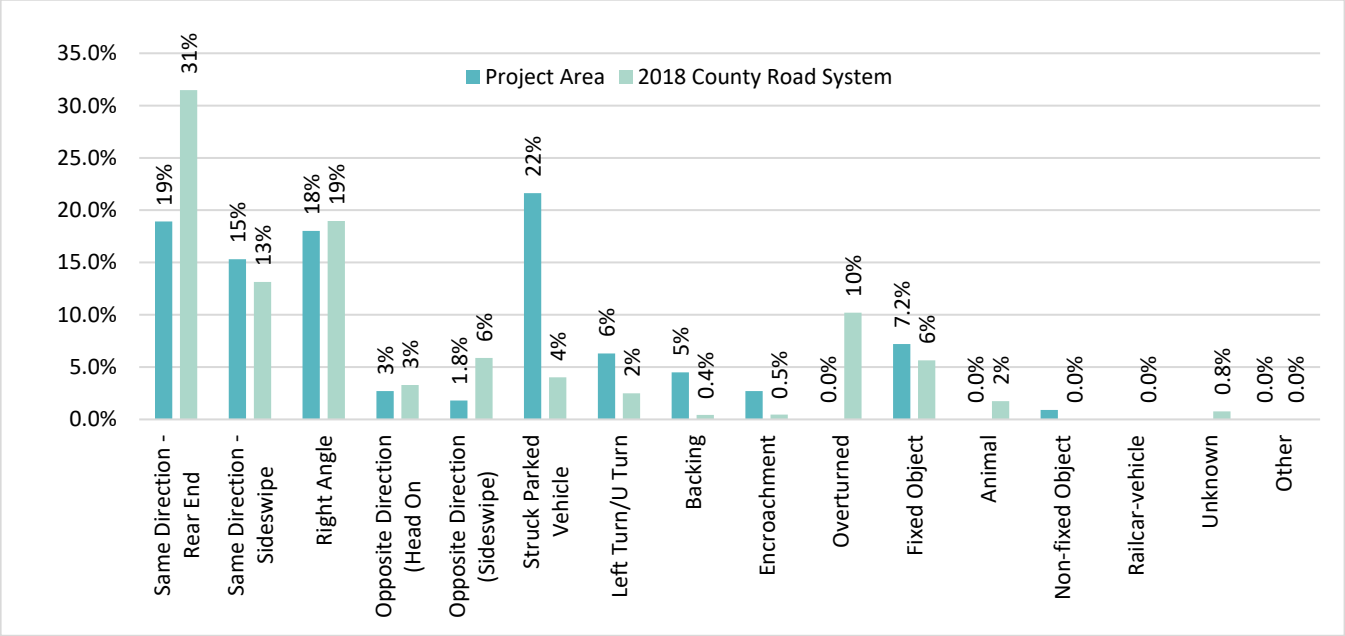



***Figure 3 – Vehicular Crash Type Breakdown***

The majority of pedestrian/bicycle crashes (excluded from Figure 3) included injuries, occurred at or near intersections, and happened during non-daytime hours.

## C. Severity

Vehicular crashes from 2016 to 2018 primarily reported property damage only.

Pedestrian crashes resulting in minor injuries were significantly overrepresented compared to the county road system from 2014 to 2018.

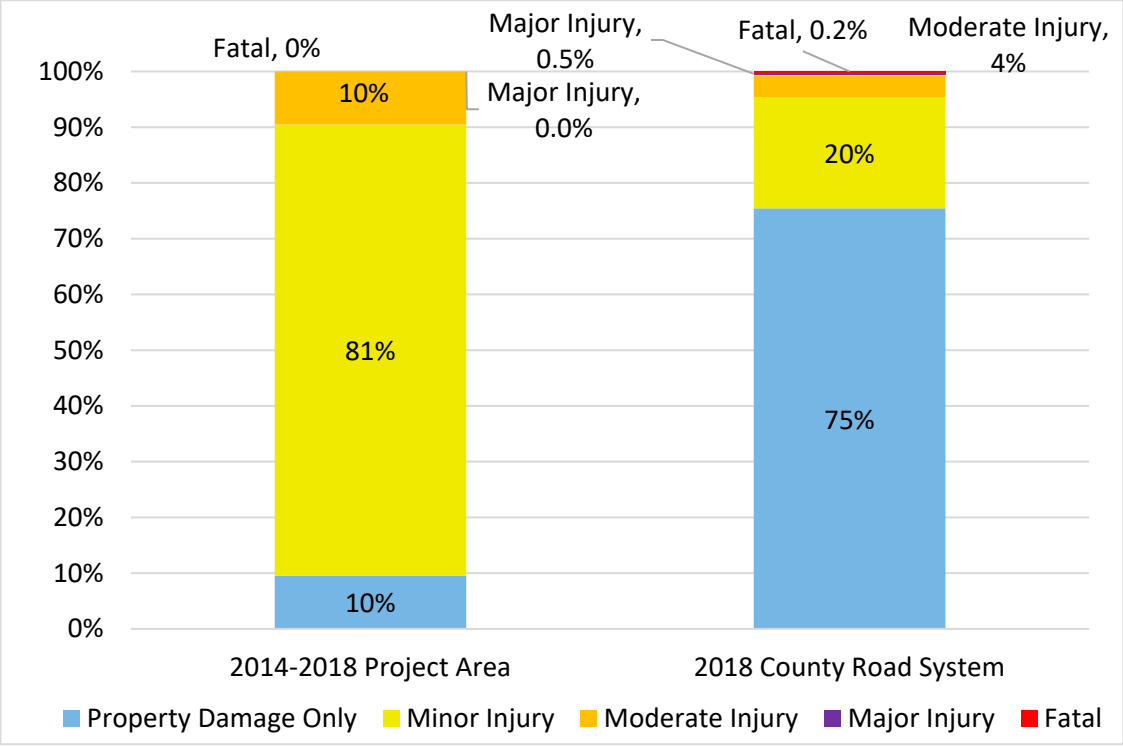



***Figure 4 – Severity (Pedestrian/Bicycle Crashes)***

## D. Roadway Surface & Light Condition

Dawn (5%) and nighttime conditions (31%) were overrepresented within the study area. Dry surface conditions accounted for approximately 80% of total crashes.

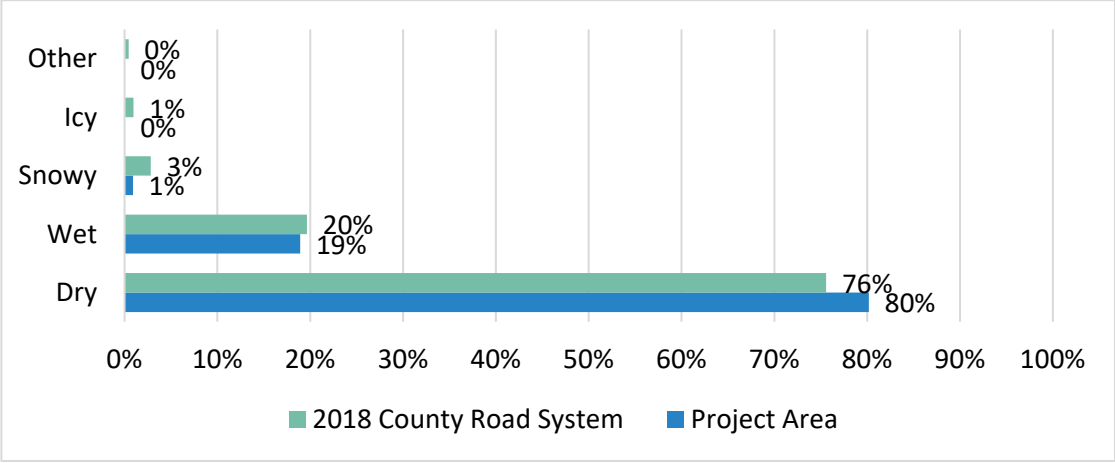



***Figure 5 – Surface Conditions (Vehicular Crashes)***

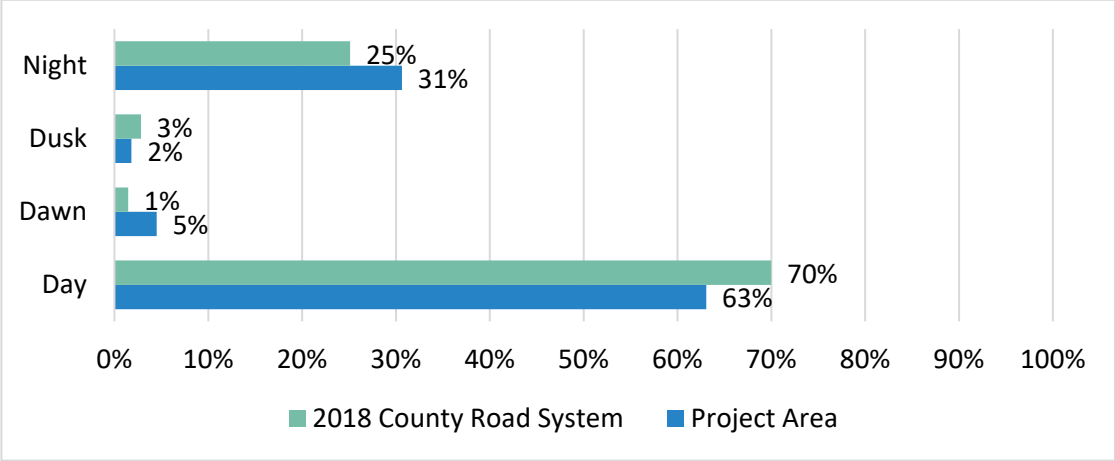



***Figure 6 – Light Conditions (Vehicular Crashes)***

Dry surface crashes involving pedestrians and bicyclists accounted for most of the crashes. In addition, 39% of pedestrian crashes occurred during non-daylight hours, all higher than the county road statewide averages.

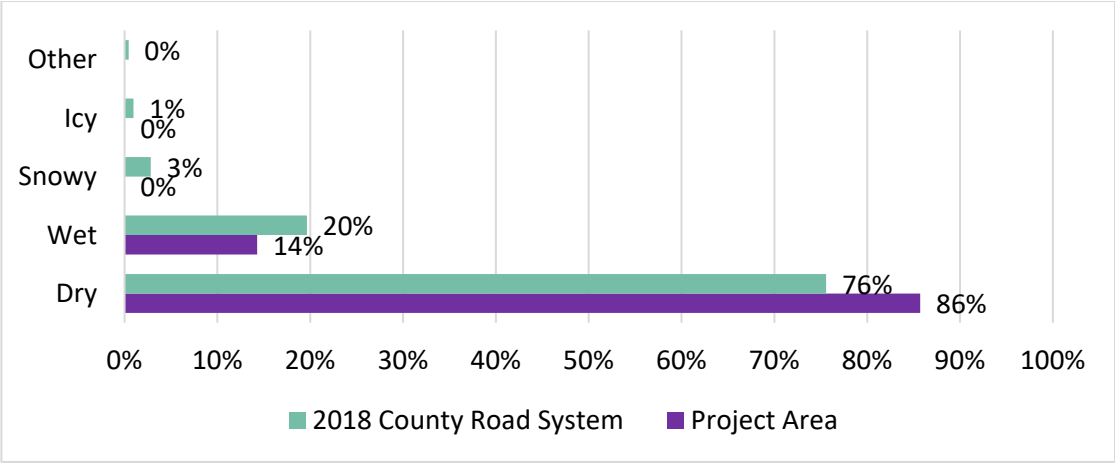



***Figure 7 – Surface Conditions (Pedestrian/Bicycle Crashes)***

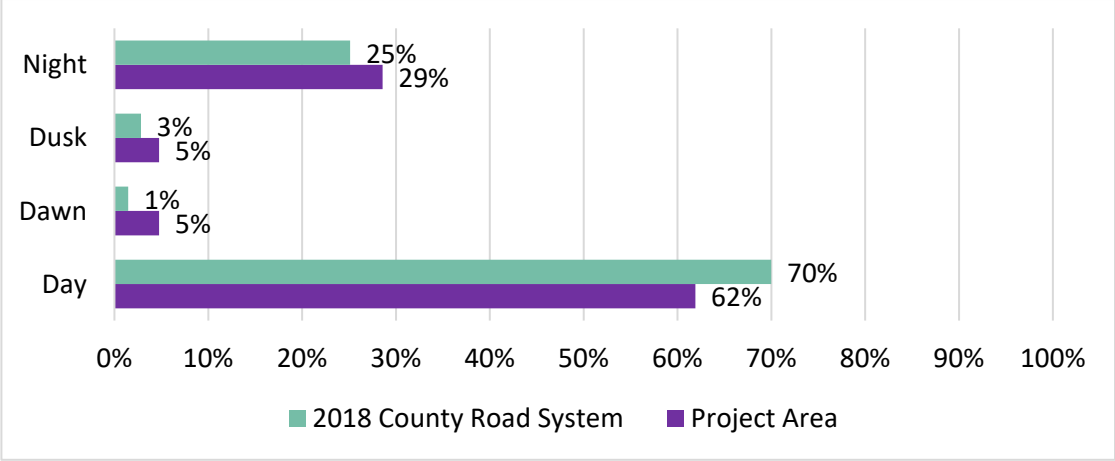



***Figure 8 – Light Conditions (Pedestrian/Bicycle Crashes)***

## E. Location

Crashes occurring between intersections were overrepresented compared to the county road system average. Seventy-four percent (74%) of crashes occurred between intersections compared to 64% on all county roads. In addition, eight of the 12 pedestrian/bicyclist crashes occurred at signalized intersections. Crash frequency, as shown in the following figures, shows the highest concentration of vehicular and pedestrian crashes. The histogram view is grouped by 0.1-mile segments and shows both crashes that could be geolocated and number of police crash reports where differences were noted.

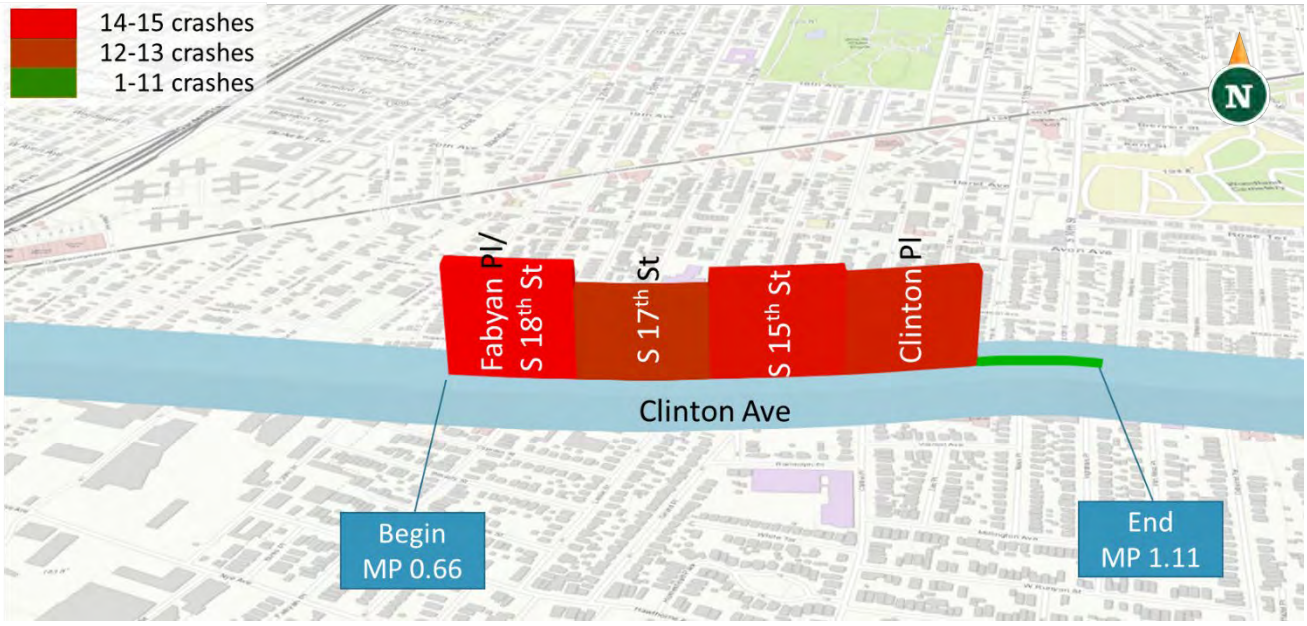


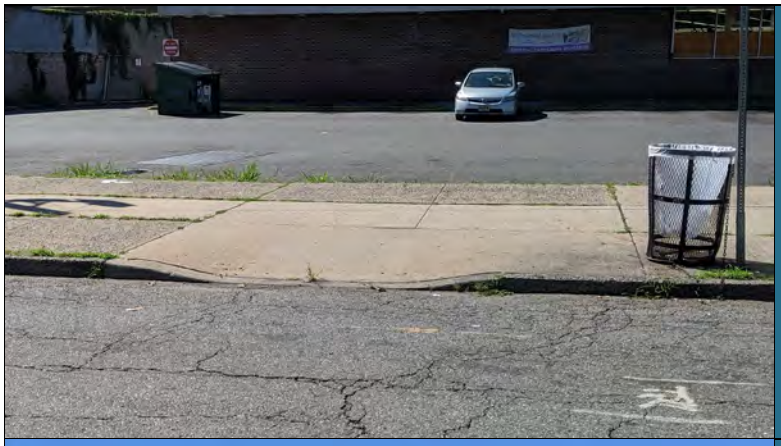

***Figure 9 – Total Crash Locations (2016-2018)***


***Figure 10 – Pedestrian Crash Locations (2014-2018)***

# IV. Identified Issues & Observations

This section summarizes the common corridor-wide safety issues and observations identified during the RSA. They are categorized into operations (including visibility) and maintenance issues, and pedestrian and bicyclist issues. Additional site-specific issues and photographs can be found in Appendix F.

## A. Pedestrian/Bicyclist



Curb ramp not ADA compliant and missing detectable warning surface (DWS). No marked crosswalk.

Adjacent to highest boarded bus stop within project limits.

*Clinton Ave at 11th St*

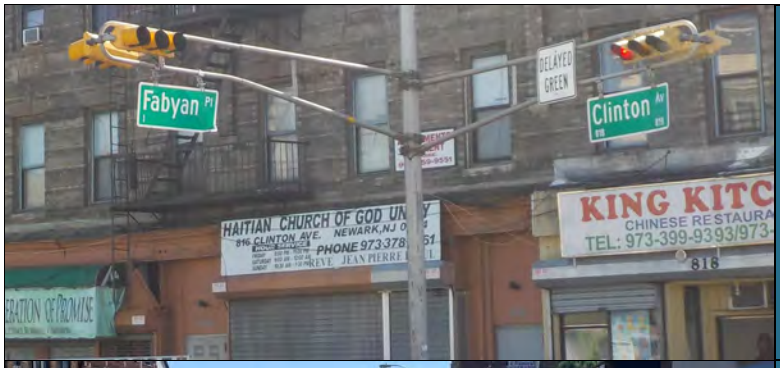
No defined bicyclist facilities. Transit bus stop locations not prominent.

*Clinton Ave WB at S. 14th St*

Sidewalk in poor condition. Cellar doors pose a tripping hazard.

*Clinton Ave near S. 17th St*

## B. Operations, Visibility, and Maintenance

| | |
|---|---|
|  | Outdated signal equipment and layouts (8" signal heads, no count-down pedestrian signal heads or pushbuttons)<br><br>*Clinton Ave at S 18th St/Fabyan Pl* |
|  | Vehicles parked on the sidewalk, which is in poor condition, and across from a 'T' intersection.<br><br>*Clinton Ave near 20th St* |
|  | Pavement condition varies through the corridor.<br>Crosswalk striping worn.<br><br>*Clinton Ave at S.16th St/Leslie St* |

City representatives also noted the following active groups for future outreach efforts:

- South Ward Special Improvement District
- South 17th & 18th Streets Neighborhood Association
- Clinton Hill Community Action (NJ Community Capital)

# V. Findings and Recommendations

This section summarizes the site-specific and corridor-wide safety issues, potential strategies, and recommendations to improve the same, safety benefit, time frame, cost, and jurisdiction. Ratings used in the recommendation tables are described as follows. N/A indicates safety benefit not determined.

| Symbol | Meaning | Definition |
|---|---|---|
| ✓ | Low safety benefit potential | May reduce total crashes by 1-25%[2] |
| ✓✓ | Low to moderate safety benefit potential | May reduce total crashes by 26-49%[2] |
| ✓✓✓ | Moderate safety benefit potential | May reduce total crashes by 50-74%[2] |
| ✓✓✓✓ | High safety benefit potential | May reduce total crashes by 75+%[2] |
| $ | Low cost | Could be accomplished through maintenance |
| $$ | Medium cost | May require some engineering or design and funding may be readily available |
| $$$ | High cost | Longer term; may require full engineering, ROW acquisition and new funding |
| ◔ | Short term | Could be accomplished within 1 year |
| ◑ | Medium term | Could be accomplished in 1 to 3 years; may require some engineering |
| ◕ | Long term | Could be accomplished in 3 years or more; may require full engineering |

## A. Recommendations

The following represents the specific findings and recommendations made by the RSA team. All recommendations and designs should be thoroughly evaluated with due diligence and designed as appropriate by the roadway owner and/or a professional engineer for conformance to all applicable codes, standards, and best practices.

***Table 4 – Corridor-Wide Recommendations***

| No. | Recommendation | Safety Benefit | Cost | Time Frame | Jurisdiction |
|---|---|---|---|---|---|
| | **Operations** | | | | |
| **1** | Consider upgrading all ramps for ADA compliance | ✓✓✓[3] | $$$ | ◕ | City |
| **2** | Consider corridor-wide signal upgrades (8” to 12” signal heads, install backplates with retroreflected border, evaluate clearance intervals, install countdown pedestrian signal heads, install push buttons for ADA compliance, signal timings, lighting, etc.) | ✓✓ | $$$ | ◕ | City |
| **3** | Consider conducting a lighting analysis for the corridor | ✓✓✓ | $$ | ◑ | City |
| **4** | Consider conducting a parking study to investigate on-street parking requirements and Title 39 conformance | ✓[3] | $$ | ◑ | City |

[2] Based on existing Crash Modification Factors (CMFs), the Highway Safety Manual (HSM), FHWA Proven Safety Countermeasures and current research, where applicable. All safety benefits are approximate.

[3] CMF/quantitative data not available for this type of roadway or treatment. Therefore, perceived safety benefit of the same was estimated relative to other similar treatments.

| No. | Recommendation | Safety Benefit | Cost | Time Frame | Jurisdiction |
|---|---|---|---|---|---|
| **5** | Investigate vertical traffic calming methods, such as speed humps, to reduce travel speed | ✓✓ | **$$** | ◑ | City |
| **6** | Consider edge lines and centerlines to delineate travel lanes from parking | ✓ | **$** | ◔ | City |
| **7** | Consider adding a bus lane and updating signage at existing bus stops | ✓[4] | **$$** | ◑ | NJ Transit/City |
| | **Bicycle/Pedestrian** | | | | |
| **8** | Inspect, repair and construct sidewalks in compliance with ADA as needed, including driveway aprons | ✓✓✓ | **$$** | ◑ | City |
| **9** | Examine inlets and install bicycle-safe grates | ✓[4] | **$$** | ◔ | City |
| **10** | Examine crosswalks status: check placement and alignment | ✓✓ | **$** | ◔ | City |
| **11** | Study implementation of curb extensions (bump outs) based on the site-specific recommendations to | ✓✓[4] | **$$** | ◕ | City |
| **12** | Consider a curb side bicycle lane on one or both sides of the roadway | ✓ | $ | ◑ | City |
| | **Maintenance** | | | | |
| **13** | Inspect existing striping for wear and restripe accordingly | ✓✓ | **$** | ◔ | City |
| **14** | Inspect and replace missing, faded, damaged or incorrect/outdated signage as needed (i.e. signs mounted below 7-ft, on non-breakaway posts or back-to-back signs that obscure shapes) | ✓ | **$** | ◔ | City |
| **15** | Inspect drainage facilities; ensure they are free of debris | ✓[4] | **$$** | ◑ | City |
| **16** | Consider adding street trees, planters, and other green infrastructure along this corridor in coordination with the Green Streets Initiative | N/A | **$$** | ◑ | City |
| **17** | Inspect and trim foliage/vegetation to improve sign visibility and sidewalk paths | ✓[4] | **$** | ◔ | City |
| | **Education** | | | | |
| **18** | Consider signal, sidewalk, crosswalk, multimodal education campaign and code enforcement (e.g. Street Smart, Stop on Red, etc.) | ✓[4] | **$** | ◑ | City |
| **19** | Investigate relationship between crime and crashes via GIS mapping | N/A | **$$** | ◑ | City |
| **20** | Consider installing speed feedback signs | ✓✓ | $$ | ◑ | City |

[4] CMF/quantitative data not available for this type of roadway or treatment. Therefore, perceived safety benefit of the same was estimated relative to other similar treatments.

Of note, PSE&G has plans to upgrade the existing lighting to LED fixtures along the corridor. School crossing guards to cross Clinton Avenue are present weekdays at 17th, 18th, and 19th Streets from 7:00-9:30a and 2:00-4:30p.

The following site-specific recommendations are in addition to the corridor-wide improvements, except where noted otherwise.

***Table 5 – Site-Specific Recommendations***

| No. | Recommendation | Safety Benefit | Cost | Time Frame | Jurisdiction |
|---|---|---|---|---|---|
| | **20th St** | | | | |
| **21** | Consider conducting a warrant analysis and installing a traffic signal (if warranted) | ✓✓ | $$$ | ◕ | City |
| **22** | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[5] | **$$$** | ◕ | City |
| **23** | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[5] | **$$** | ◕ | City |
| **24** | Consider relocating westbound bus stop so it is not between the 20th St approaches | ✓ | **$** | ◔ | NJ Transit/ City |
| **25** | Investigate ponding/drainage issues | ✓[5] | **$$** | ◑ | City |
| | **S. 19th St** | | | | |
| **26** | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[5] | **$$$** | ◕ | City |
| **27** | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[5] | **$$** | ◕ | City |
| **28** | Investigate ponding/drainage issues (frequent flooding) | ✓[5] | **$$** | ◑ | City |
| **29** | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | **$** | ◔ | City |
| | **S. 18th St/Fabyan Pl** | | | | |
| **30** | Consider corridor-wide recommendation 2 regarding signal upgrades | ✓✓ | **$$$** | ◕ | City |
| **31** | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[5] | **$$$** | ◕ | City |
| **32** | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[5] | **$$** | ◕ | City |
| **33** | Consider corridor-wide recommendation 18 on education programs | ✓[5] | **$** | ◑ | City |
| | **S. 17th St** | | | | |
| **34** | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[5] | **$$$** | ◕ | City |
| **35** | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[5] | **$$** | ◕ | City |

[5] CMF/quantitative data not available for this type of roadway or treatment. Therefore, perceived safety benefit of the same was estimated relative to other similar treatments.

| No. | Recommendation | Safety Benefit | Cost | Time Frame | Jurisdiction |
|---|---|---|---|---|---|
| 36 | Consider corridor-wide recommendation 10 and 11 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| | **S. 16th St/Leslie St** | | | | |
| 37 | Consider corridor-wide recommendation 2 regarding signal upgrades | ✓✓ | $$$ | ◕ | City |
| 38 | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| 39 | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[6] | $$ | ◕ | City |
| 40 | Consider corridor-wide recommendation 18 on education programs | ✓[6] | $ | ◑ | City |
| 41 | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| | **S. 15th St/Girard Pl** | | | | |
| 42 | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| 43 | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[6] | $$ | ◕ | City |
| 44 | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| | **S. 14th St** | | | | |
| 45 | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| 46 | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[6] | $$ | ◕ | City |
| 47 | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| | **S. 13th St/Clinton Pl** | | | | |
| 48 | Consider corridor-wide recommendation 2 regarding signal upgrades | ✓✓ | $$$ | ◕ | City |
| 49 | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| 50 | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[6] | $$ | ◕ | City |
| 51 | Consider corridor-wide recommendation 18 on education programs | ✓[6] | $ | ◑ | City |
| 52 | Consider adding a Lead Pedestrian Interval (LPI) at this traffic signal | ✓✓✓ | $ | ◔ | City |
| | **S. 12th St** | | | | |
| 53 | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| 54 | Consider curb extensions (corridor-wide recommendation 11) | ✓✓[6] | $$ | ◕ | City |

[6] CMF/quantitative data not available for this type of roadway or treatment. Therefore, perceived safety benefit of the same was estimated relative to other similar treatments.

| No. | Recommendation | Safety Benefit | Cost | Time Frame | Jurisdiction |
|---|---|---|---|---|---|
| **55** | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| | **S. 11th St** | | | | |
| **56** | Consider corridor-wide recommendation 1, 8 and 10 regarding crosswalks, sidewalk and ADA compliance | ✓✓✓[6] | $$$ | ◕ | City |
| **57** | Consider adding a left turn lane along Clinton Ave EB | ✓✓[7] | $$ | ◕ | City |
| **58** | Consider corridor-wide recommendation 13 and 14 regarding pavement markings and signing | ✓✓ | $ | ◔ | City |
| **59** | Investigate additional bus stop amenities | N/A | $ | ◑ | NJ Transit/ City |

## B. Road Owner Response

An important part of the RSA process is the road owner's response: an acknowledgment of the audit's findings and recommendations, and their planned follow-up. In responding to the RSA's findings, the road owner must bear in mind all the competing objectives involved when implementing the recommendations, and foremost among them is available resources. Because the audit process generated a long and wide-ranging list of improvements, the road owner is expected to implement these recommended improvements as time and funds allow in coordination with other projects and priorities. Newark City delivered their response following the finalization of the findings and recommendations table, a copy of which can be found in Appendix J.

## C. Recommendation Visualizations

Examples of some of the site-specific and corridor-wide safety recommendations identified in Tables 4 and 5 are shown below and are based on current practices and standards. Descriptions and images of each treatment are from the *2017 NJ Complete Street Design Guide* (CSDG), NACTO's *Urban Street Design Guide* (NACTO-US), *Urban Street Stormwater Guide* (NATCO-USG), and *Urban Bikeway Design Guide* (NACTO-UB), including sources contained therein. These are generic examples for informational purposes only.

### 1. Pedestrian Facilities

Curb extensions visually and physically narrow the roadway at intersections and midblock locations, creating safer and shorter pedestrian crossings, while increasing the available space for streetscape. They increase the overall visibility of pedestrians by aligning them with the shoulder or parking lane and help prohibit vehicles from parking in violation of Title 39. Crossing islands, or pedestrian refuge islands, reduce the exposure time of pedestrians to vehicular traffic. Pedestrians can cross in two stages — crossing one direction of vehicular travel lanes, pausing at the island, and then completing the crossing. While recommended for crossing three lanes of traffic in one or both directions, they may be implemented on smaller cross sections where space permits.

ADA standards specify a minimum 5-foot clear path width to accommodate two wheelchairs passing each other. In addition to providing a more accessible facility, this minimum width also creates a more comfortable environment for pedestrians to walk side-by-side and pass each other.

[7] CMF/quantitative data not available for this type of roadway or treatment. Therefore, perceived safety benefit of the same was estimated relative to other similar treatments.

Sidewalk width should support the surrounding street context, land uses, and current and future pedestrian demand. The design of driveways should provide a continuous and level pedestrian zone across the vehicular path, encouraging drivers to stop for pedestrians on the sidewalk. Driveways should not be designed where the sidewalk is interrupted by the driveway.

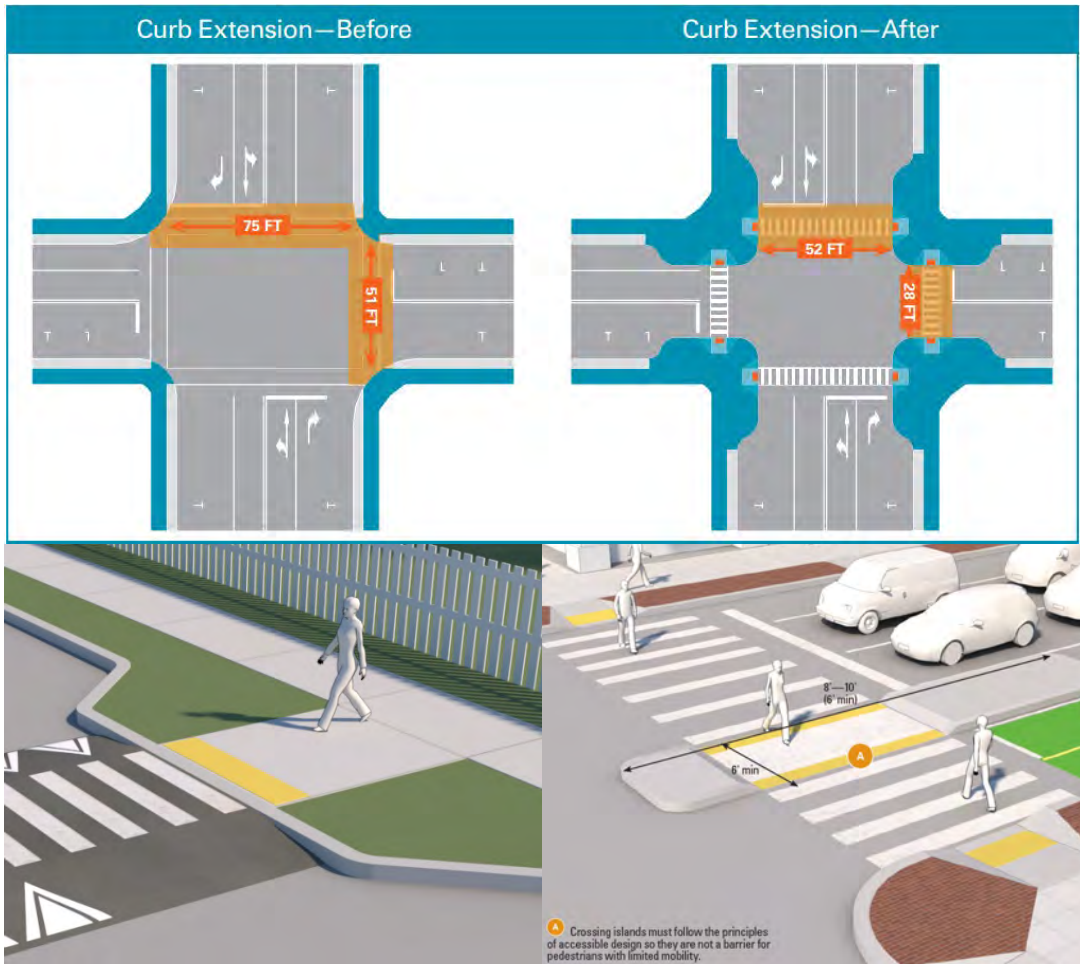



***Figure 11 – Pedestrian Facility Examples***

*Top: Curb Extension. Left: Midblock Curb Extension. Right: Crossing Island (Source: CSDG)*

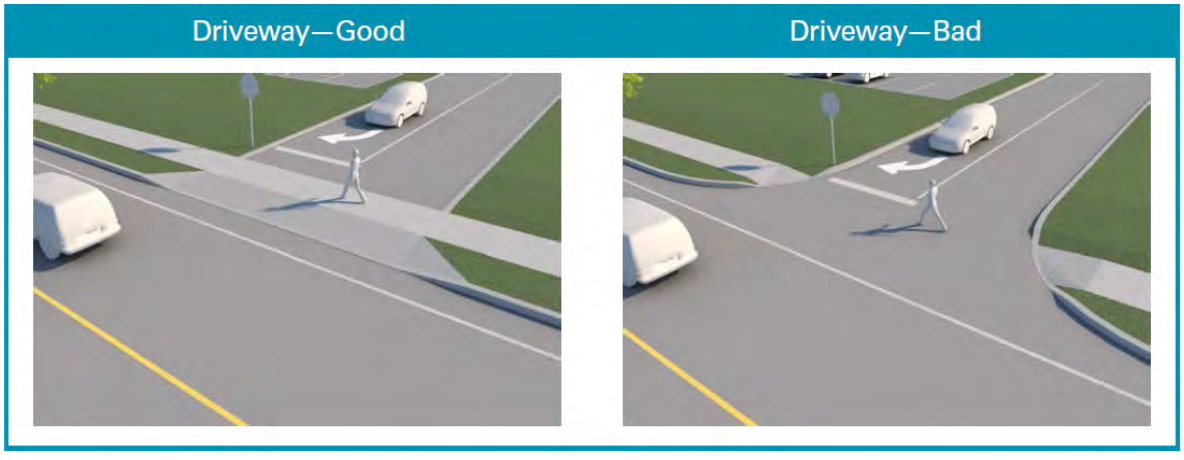



***Figure 12 – Sidewalk and Driveways (Source: CSDG)***

## 2. Bicycle Facilities

Bicycle lanes provide an exclusive space for bicyclists using pavement markings and signage. These lanes enable bicyclists to ride at their preferred speed, free from interference from motorists. Curbside protected bike lanes address conflicts with parking, bus stops, and other curbside activities. Where it is not feasible or appropriate to provide dedicated bicycle facilities, shared-lane markings (e.g. "sharrows") may be used to indicate a shared environment for bicycles and vehicles. Bicycle lanes and shared-lane markings should be extended through intersections and major driveways to enhance continuity, guide bicyclists through the intersection, and improve driver awareness of bicycle activity and movement.

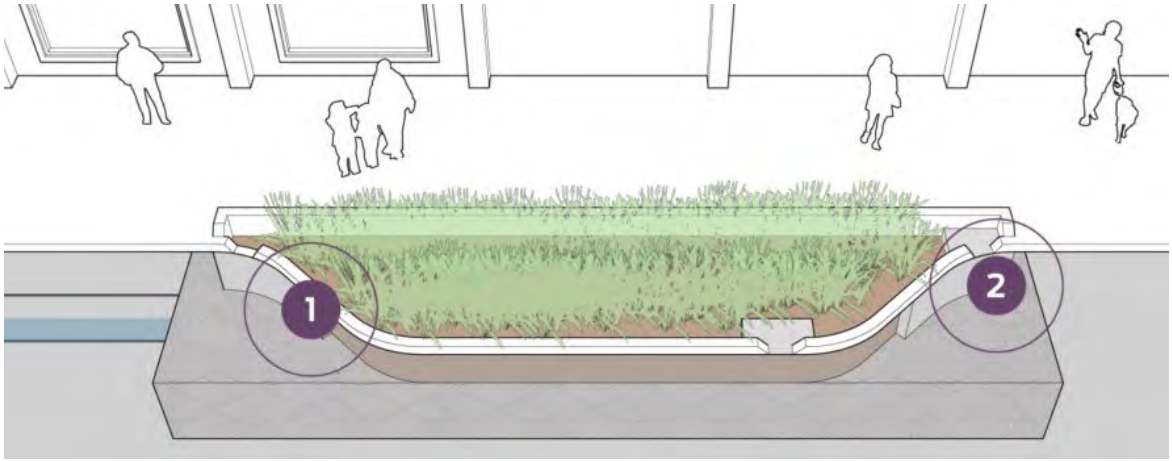

***Figure 13 – Bicycle Facility Examples***

*Left: Curbside bicycle lane (Source: NATCO: UBG). Right: Sharrow Markings (Source: Eric Gilliland/Flickr)*

## 3. Green Streets

Newark City completed an extensive green streets analysis in 2015 that summarizes research findings, presents best practices and recommendations, and includes a number of technical appendices to support site identification, implementation, and maintenance and monitoring of green infrastructure elements. Excerpts from this report are included in Appendix I; elements that may be applicable to this RSA are noted below.

Stormwater curb extensions are vegetated, bioretention facilities designed to capture, treat, and infiltrate stormwater runoff as it moves downstream. They are the most effective type of green infrastructure facility in slowing runoff velocity and cleansing water while recharging the underlying groundwater table. Bioretention facilities can also be integrated with medians and other public space or traffic calming strategies.




(1) The curb return from bump-out edge to original curb line should be designed to enable street sweeping along the curb edge. (2) Design inlets and outlets to resist incursions by vehicles and bicycles, as motor vehicle wheels may be prone to enter, especially during parking maneuvers.

***Figure 14 – Stormwater Curb Extension Example (Source: NACTO-USG)***

Another option, especially where space is limited, are flow-through planters. These planters are hard-edged stormwater management facilities with an impermeable base. Appropriate for infiltration-precluse or high-density urban areas, flow-through planters treat water by allowing runoff to soak through its soil matrix and filter into an underdrain system.

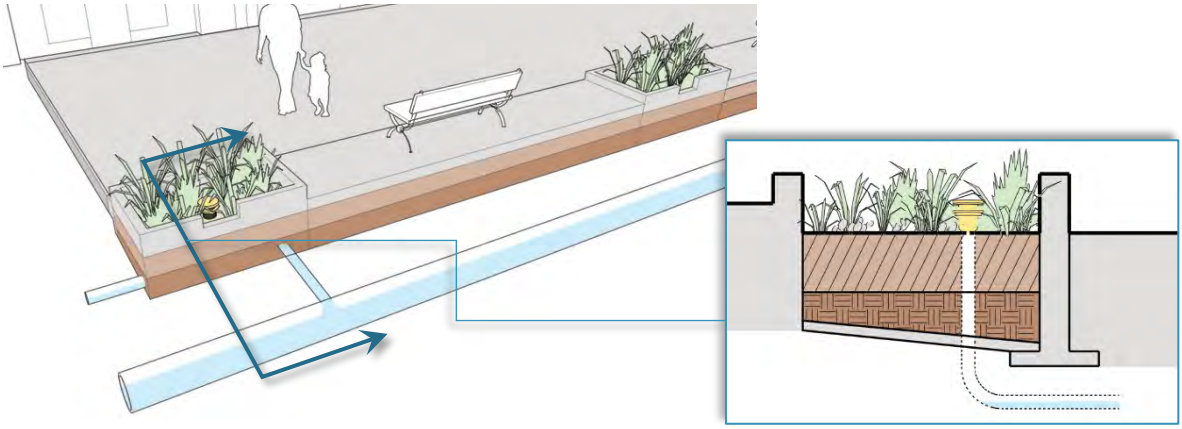


***Figure 15 – Flow-Through Planter Example (Source: NACTO-US)***

## 4. Roadway Reconfiguration

This treatment allows reallocation of existing street space (i.e. roadway cross section) to accommodate multi-modal users. Lane configuration and width for travel, turning movements, parking, and bicycle lanes can be adjusted to optimize use for vehicles, pedestrians, bicyclists, and transit. The most common roadway reconfiguration, known as a road diet, involves converting an existing four-lane undivided segment into a three-lane segment with two through lanes and a center two-way left turn lane (TWLTL). Other options are shown on the following pages.

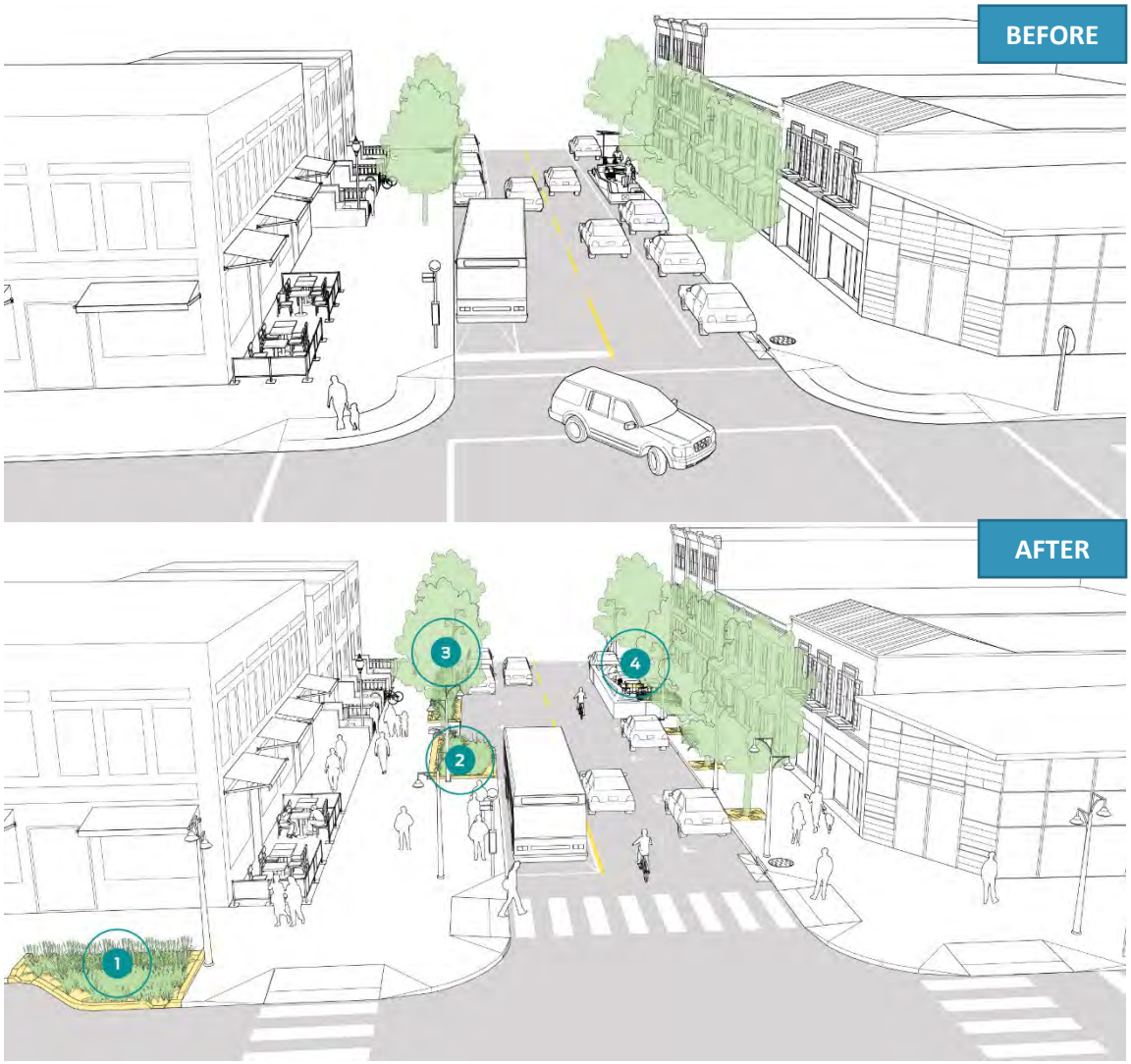



***Figure 16 – Example of a Green Neighborhood Street Typology (Source: NACTO-GI)***

*Top: Less dense than downtowns, neighborhood main streets serve local business activity and civic life and are characterized by high demand for a quality walking and bicycling environment, frequent parking turnover and freight access, and service by key transit routes.*

*Bottom: Green infrastructure enhances neighborhood main streets, creating more aesthetically pleasing public spaces even where the street is relatively narrow. (1) Curb extensions with bioretention facilities can be integrated at intersections and mid-block locations; (2) transit boarding bulbs are an important opportunity to integrate green infrastructure, since sidewalk space is often not available and curbsides are at a premium; (3) Smaller green infrastructure treatments, such as bioretention planters, stormwater tree wells, or tree trenches, can be used on neighborhood main streets with space constraints and high foot traffic along the sidewalk and between the curb and storefronts; (4) the bioretention facility wall can incorporate seating and placemaking elements in the planting or furnishing zone, especially on main streets with significant foot traffic and active storefronts.*


***Figure 17 – Example of a Two-Lane Downtown Street Typology (Source: NACTO-US)***

*<u>Top:</u> The above illustration depicts a 2-way street in a central business district that is congested by buses, bikes, people, and cars. Curbside bus stops may be undermined by double-parked vehicles and heavy rush-hour traffic. Double-parking also creates conflicts and safety hazards for all modes.*

*<u>Bottom:</u> Bus bulbs serve as dedicated waiting areas for transit users while decreasing pedestrian exposure during crossings and can connect to existing sidewalk or be designed as a bus-boarding island with a bicycle cut-through. Delineation in the roadway can be created using striping, cycle tracks, and narrow travel lanes. Restricting delivery, encouraging off-peak delivery, and/or dedicated loading zones are critical to eliminating double-parking obstructions.*

# VI. Conclusions

The Clinton Avenue RSA was conducted to identify safety issues and corresponding countermeasures that compromise multimodal use of the roadway. The team identified a long list of issues from the field visit, as well as many practical short-, mid-, and long-term improvements during the post-audit.

The recommendations documented in this report are designed to improve safety for all road users. Some of the strategies identified can be implemented through routine maintenance; all will be constrained by available time and budgetary priorities. The audit process and the resulting final document highlight the safety issues and present the needed improvements by location organized for systematic implementation by the roadway owner.

It is important to note that when it comes to improving safety, engineering strategies alone only go so far, especially in areas undergoing redevelopment. Education, with support from a targeted enforcement campaign, is an effective approach for addressing driver and pedestrian behaviors that lead to crashes. Employing a multipronged approach is an effective course of action to advance the goal of improved safety on the corridor.

# APPENDIX A

## RSA TEAM

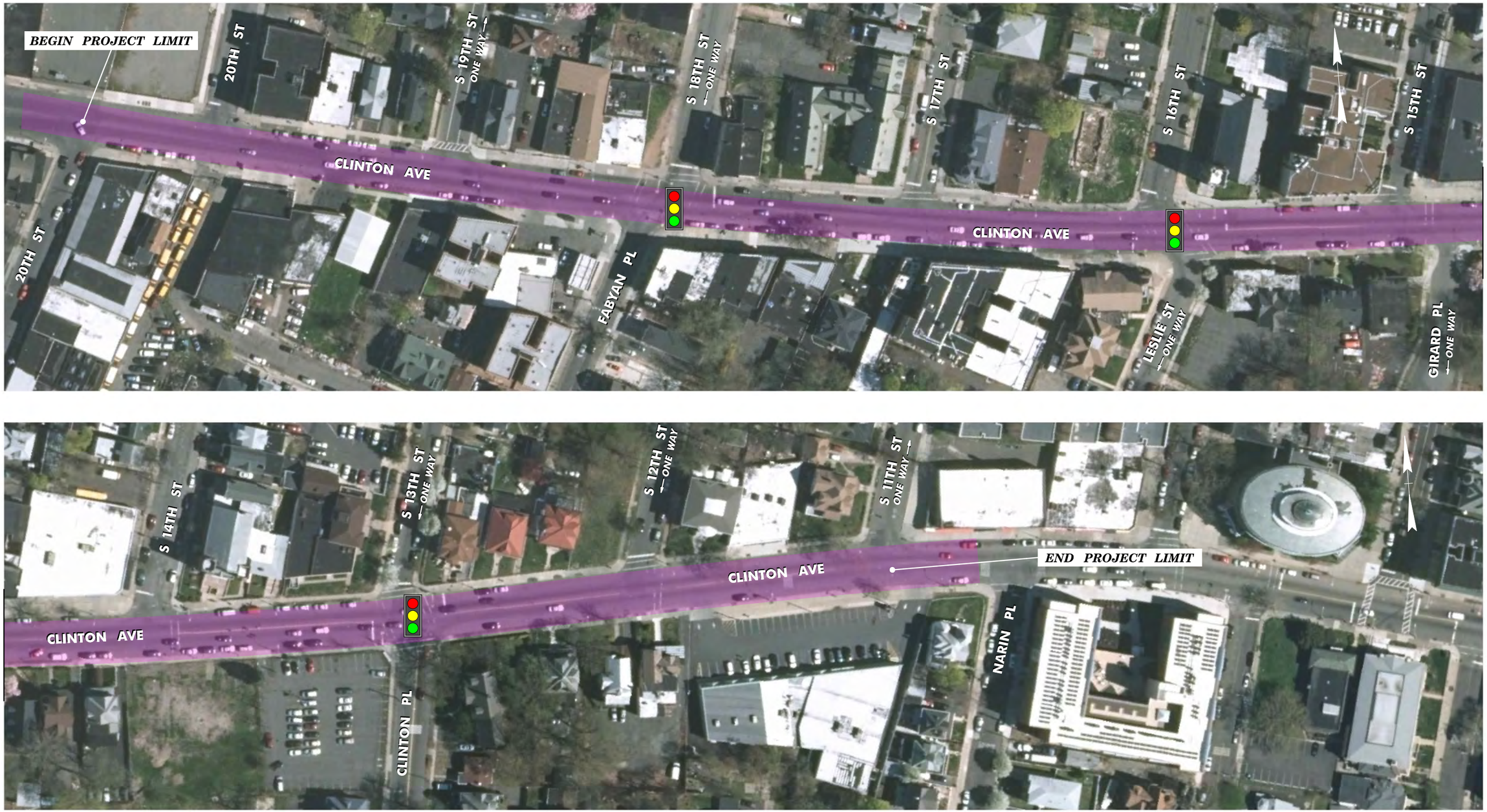
# Audit Team

| Name | Agency |
|---|---|
| Trevor Howard | Newark City Department of Engineering |
| Kareem Adeem | Newark City Department of Water & Sewer Utilities |
| Nathaly Agosto Filion | Newark City Office of Sustainability |
| Cpt. Christopher Gialanella | Newark City Police Department |
| Brendan Latimer | Newark City Department of Engineering |
| Halimah Shabazz | Newark City Department of Water & Sewer Utilities |
| Cpt. Matthew Spencer | Newark City Police Department |
| Elmira Buongiorno | NJ Transit, Bus Operations |
| Keith Skilton | FHWA |
| Amon Boucher | NJDOT – BSBPP |
| Joseph Rapp | NJDOT – BSBPP |
| Reba Oduro | NJDOT – BSBPP |
| Tina Wong | NJDOT – Bureau of Traffic Engineering |
| Aimee Jefferson | NJTPA |
| William Yarzab | NJTPA |
| Bernie Boerchers | Greenman-Pedersen, Inc. (NJDOT Consultant) |
| Andrew Halloran | Greenman-Pedersen, Inc. |
| Aidan Sheehan | Greenman-Pedersen, Inc. |
| Julia Steponanko | Greenman-Pedersen, Inc. |

*BSBPP – Bureau of Safety, Bicycle and Pedestrian Programs*

# APPENDIX B

## AREA MAP




**LEGEND**

SIGNALIZED INTERSECTION

PROJECT CORRIDOR

1 / 1

**NJDOT HSIP – ROAD SAFETY AUDIT**
**CLINTON AVENUE**

NEWARK CITY
ESSEX COUNTY

**PROJECT LOCATION**

GPI Engineering Design Planning Construction Management

**N.T.S.**

# APPENDIX C

## TRAFFIC DATA

# New Jersey Department of Transportation

## Short-term Hourly Traffic Volume for 03/05/2018 to 03/07/2018

Site names: 0611s8,Clinton Ave 0.17,07091881__
County: ESSEX
Funct Class: Urban Minor Arterial
Location: bet Sharon Ave and Howard St

Seasonal Factor Grp: rg1_4U
Daily Factor Grp: rg1_4U
Axle Factor Grp: rg1_4U
Growth Factor Grp: rg1_4U

| | Sun, Mar 4, 2018 | | | Mon, Mar 5, 2018 | | | Tue, Mar 6, 2018 | | | Wed, Mar 7, 2018 | | | Thu, Mar 8, 2018 | | | Fri, Mar 9, 2018 | | | Sat, Mar 10, 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W |
| 00:00 | | | | | | | 195 | 78 | 117 | 245 | 98 | 147 | | | | | | | | | |
| 01:00 | | | | | | | 128 | 48 | 80 | 160 | 67 | 93 | | | | | | | | | |
| 02:00 | | | | | | | 89 | 33 | 56 | 112 | 50 | 62 | | | | | | | | | |
| 03:00 | | | | | | | 81 | 23 | 58 | 81 | 37 | 44 | | | | | | | | | |
| 04:00 | | | | | | | 92 | 31 | 61 | 80 | 27 | 53 | | | | | | | | | |
| 05:00 | | | | | | | 156 | 53 | 103 | 123 | 53 | 70 | | | | | | | | | |
| 06:00 | | | | | | | 403 | 171 | 232 | 366 | 153 | 213 | | | | | | | | | |
| 07:00 | | | | | | | 968 | 509 | 459 | 929 | 475 | 454 | | | | | | | | | |
| 08:00 | | | | | | | 1,053 | 563 | 490 | 968 | 507 | 461 | | | | | | | | | |
| 09:00 | | | | | | | 829 | 395 | 434 | 772 | 364 | 408 | | | | | | | | | |
| 10:00 | | | | | | | 748 | 385 | 363 | 681 | 348 | 333 | | | | | | | | | |
| 11:00 | | | | | | | 805 | 413 | 392 | 730 | 372 | 358 | | | | | | | | | |
| 12:00 | | | | | | | 845 | 424 | 421 | 767 | 381 | 386 | | | | | | | | | |
| 13:00 | | | | | | | 876 | 450 | 426 | 858 | 431 | 427 | | | | | | | | | |
| 14:00 | | | | 1,002 | 465 | 537 | 961 | 437 | 524 | | | | | | | | | | | | |
| 15:00 | | | | 1,081 | 541 | 540 | 1,012 | 485 | 527 | | | | | | | | | | | | |
| 16:00 | | | | 1,168 | 558 | 610 | 1,064 | 566 | 498 | | | | | | | | | | | | |
| 17:00 | | | | 1,073 | 431 | 642 | 1,087 | 584 | 503 | | | | | | | | | | | | |
| 18:00 | | | | 1,006 | 431 | 575 | 1,051 | 503 | 548 | | | | | | | | | | | | |
| 19:00 | | | | 747 | 321 | 426 | 1,001 | 483 | 518 | | | | | | | | | | | | |
| 20:00 | | | | 622 | 216 | 406 | 738 | 341 | 397 | | | | | | | | | | | | |
| 21:00 | | | | 532 | 215 | 317 | 648 | 311 | 337 | | | | | | | | | | | | |
| 22:00 | | | | 359 | 145 | 214 | 495 | 203 | 292 | | | | | | | | | | | | |
| 23:00 | | | | 303 | 119 | 184 | 323 | 137 | 186 | | | | | | | | | | | | |
| Total | | | | 7,893 | 3,442 | 4,451 | 15,648 | 7,626 | 8,022 | 6,872 | 3,363 | 3,509 | | | | | | | | | |
| AM Peak Vol | | | | | | | 1,121 | 613 | 532 | 1,078 | 577 | 526 | | | | | | | | | |
| AM Peak Fct | | | | | | | .916 | .97 | .853 | .942 | .955 | .926 | | | | | | | | | |
| AM Peak Hr | | | | | | | 7: 15 | 7: 30 | 7: 15 | 7: 15 | 7: 30 | 7: 15 | | | | | | | | | |
| PM Peak Vol | | | | | | | 1,128 | 598 | 581 | | | | | | | | | | | | |
| PM Peak Fct | | | | | | | .865 | .94 | .886 | | | | | | | | | | | | |
| PM Peak Hr | | | | | | | 17: 15 | 17: 15 | 18: 30 | : | : | : | | | | | | | | | |
| Seasonal Fct | | | | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | | | | | | | | | |
| Daily Fct | | | | .876 | .876 | .876 | .882 | .882 | .882 | .876 | .876 | .876 | | | | | | | | | |
| Axle Fct | | | | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | | | | | | | | | |
| Pulse Fct | | | | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | | | | | | | | | |

Created 09/27/2018 9:39 AM

ROAD AADT 13,393 NDIR AADT 7,037 PDIR AADT 6,356

# New Jersey Department of Transportation

## Short-term Hourly Traffic Volume for 03/05/2018 to 03/07/2018

Site names: 0611s8,Clinton Ave 0.17,07091881__
County: ESSEX
Funct Class: Urban Minor Arterial
Location: bet Sharon Ave and Howard St

Seasonal Factor Grp: rg1_4U
Daily Factor Grp: rg1_4U
Axle Factor Grp: rg1_4U
Growth Factor Grp: rg1_4U

| | Sun, Mar 4, 2018 | | | Mon, Mar 5, 2018 | | | Tue, Mar 6, 2018 | | | Wed, Mar 7, 2018 | | | Thu, Mar 8, 2018 | | | Fri, Mar 9, 2018 | | | Sat, Mar 10, 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W |
| 00:00 | | | | | | | 195 | 78 | 117 | 245 | 98 | 147 | | | | | | | | | |
| 01:00 | | | | | | | 128 | 48 | 80 | 160 | 67 | 93 | | | | | | | | | |
| 02:00 | | | | | | | 89 | 33 | 56 | 112 | 50 | 62 | | | | | | | | | |
| 03:00 | | | | | | | 81 | 23 | 58 | 81 | 37 | 44 | | | | | | | | | |
| 04:00 | | | | | | | 92 | 31 | 61 | 80 | 27 | 53 | | | | | | | | | |
| 05:00 | | | | | | | 156 | 53 | 103 | 123 | 53 | 70 | | | | | | | | | |
| 06:00 | | | | | | | 403 | 171 | 232 | 366 | 153 | 213 | | | | | | | | | |
| 07:00 | | | | | | | 968 | 509 | 459 | 929 | 475 | 454 | | | | | | | | | |
| 08:00 | | | | | | | 1,053 | 563 | 490 | 968 | 507 | 461 | | | | | | | | | |
| 09:00 | | | | | | | 829 | 395 | 434 | 772 | 364 | 408 | | | | | | | | | |
| 10:00 | | | | | | | 748 | 385 | 363 | 681 | 348 | 333 | | | | | | | | | |
| 11:00 | | | | | | | 805 | 413 | 392 | 730 | 372 | 358 | | | | | | | | | |
| 12:00 | | | | | | | 845 | 424 | 421 | 767 | 381 | 386 | | | | | | | | | |
| 13:00 | | | | | | | 876 | 450 | 426 | 858 | 431 | 427 | | | | | | | | | |
| 14:00 | | | | 1,002 | 465 | 537 | 961 | 437 | 524 | | | | | | | | | | | | |
| 15:00 | | | | 1,081 | 541 | 540 | 1,012 | 485 | 527 | | | | | | | | | | | | |
| 16:00 | | | | 1,168 | 558 | 610 | 1,064 | 566 | 498 | | | | | | | | | | | | |
| 17:00 | | | | 1,073 | 431 | 642 | 1,087 | 584 | 503 | | | | | | | | | | | | |
| 18:00 | | | | 1,006 | 431 | 575 | 1,051 | 503 | 548 | | | | | | | | | | | | |
| 19:00 | | | | 747 | 321 | 426 | 1,001 | 483 | 518 | | | | | | | | | | | | |
| 20:00 | | | | 622 | 216 | 406 | 738 | 341 | 397 | | | | | | | | | | | | |
| 21:00 | | | | 532 | 215 | 317 | 648 | 311 | 337 | | | | | | | | | | | | |
| 22:00 | | | | 359 | 145 | 214 | 495 | 203 | 292 | | | | | | | | | | | | |
| 23:00 | | | | 303 | 119 | 184 | 323 | 137 | 186 | | | | | | | | | | | | |
| Total | | | | 7,893 | 3,442 | 4,451 | 15,648 | 7,626 | 8,022 | 6,872 | 3,363 | 3,509 | | | | | | | | | |
| AM Peak Vol | | | | | | | 1,121 | 613 | 532 | 1,078 | 577 | 526 | | | | | | | | | |
| AM Peak Fct | | | | | | | .916 | .97 | .853 | .942 | .955 | .926 | | | | | | | | | |
| AM Peak Hr | | | | | | | 7: 15 | 7: 30 | 7: 15 | 7: 15 | 7: 30 | 7: 15 | | | | | | | | | |
| PM Peak Vol | | | | | | | 1,128 | 598 | 581 | | | | | | | | | | | | |
| PM Peak Fct | | | | | | | .865 | .94 | .886 | | | | | | | | | | | | |
| PM Peak Hr | | | | | | | 17: 15 | 17: 15 | 18: 30 | : | : | : | | | | | | | | | |
| Seasonal Fct | | | | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | | | | | | | | | |
| Daily Fct | | | | .876 | .876 | .876 | .882 | .882 | .882 | .876 | .876 | .876 | | | | | | | | | |
| Axle Fct | | | | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | | | | | | | | | |
| Pulse Fct | | | | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | | | | | | | | | |

Created 09/27/2018 9:39 AM

ROAD AADT 13,393 NDIR AADT 7,037 PDIR AADT 6,356

# New Jersey Department of Transportation

## Short-term Hourly Traffic Volume for 03/12/2018 to 03/14/2018

Site names: 0621s8,Clinton Ave 2.16,07091881__
County: ESSEX
Funct Class: Urban Minor Arterial
Location: bet Milford Ave and Elizabeth Ave

Seasonal Factor Grp: rg1_4U
Daily Factor Grp: rg1_4U
Axle Factor Grp: rg1_4U
Growth Factor Grp: rg1_4U

| | Sun, Mar 11, 2018 | | | Mon, Mar 12, 2018 | | | Tue, Mar 13, 2018 | | | Wed, Mar 14, 2018 | | | Thu, Mar 15, 2018 | | | Fri, Mar 16, 2018 | | | Sat, Mar 17, 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W |
| 00:00 | | | | | | | 180 | 102 | 78 | 161 | 84 | 77 | | | | | | | | | |
| 01:00 | | | | | | | 101 | 48 | 53 | 117 | 56 | 61 | | | | | | | | | |
| 02:00 | | | | | | | 75 | 37 | 38 | 100 | 59 | 41 | | | | | | | | | |
| 03:00 | | | | | | | 49 | 29 | 20 | 63 | 39 | 24 | | | | | | | | | |
| 04:00 | | | | | | | 77 | 46 | 31 | 89 | 53 | 36 | | | | | | | | | |
| 05:00 | | | | | | | 136 | 82 | 54 | 129 | 82 | 47 | | | | | | | | | |
| 06:00 | | | | | | | 254 | 154 | 100 | 250 | 154 | 96 | | | | | | | | | |
| 07:00 | | | | | | | 576 | 363 | 213 | 600 | 383 | 217 | | | | | | | | | |
| 08:00 | | | | | | | 778 | 497 | 281 | 751 | 472 | 279 | | | | | | | | | |
| 09:00 | | | | | | | 471 | 264 | 207 | 489 | 294 | 195 | | | | | | | | | |
| 10:00 | | | | | | | 471 | 267 | 204 | 493 | 293 | 200 | | | | | | | | | |
| 11:00 | | | | | | | 537 | 266 | 271 | 477 | 256 | 221 | | | | | | | | | |
| 12:00 | | | | 573 | 316 | 257 | 607 | 294 | 313 | | | | | | | | | | | | |
| 13:00 | | | | 588 | 309 | 279 | 513 | 286 | 227 | | | | | | | | | | | | |
| 14:00 | | | | 651 | 348 | 303 | 568 | 306 | 262 | | | | | | | | | | | | |
| 15:00 | | | | 734 | 351 | 383 | 740 | 361 | 379 | | | | | | | | | | | | |
| 16:00 | | | | 848 | 365 | 483 | 729 | 344 | 385 | | | | | | | | | | | | |
| 17:00 | | | | 818 | 358 | 460 | 744 | 362 | 382 | | | | | | | | | | | | |
| 18:00 | | | | 740 | 343 | 397 | 640 | 322 | 318 | | | | | | | | | | | | |
| 19:00 | | | | 544 | 261 | 283 | 544 | 274 | 270 | | | | | | | | | | | | |
| 20:00 | | | | 430 | 218 | 212 | 469 | 225 | 244 | | | | | | | | | | | | |
| 21:00 | | | | 376 | 198 | 178 | 353 | 168 | 185 | | | | | | | | | | | | |
| 22:00 | | | | 297 | 158 | 139 | 285 | 146 | 139 | | | | | | | | | | | | |
| 23:00 | | | | 208 | 111 | 97 | 211 | 100 | 111 | | | | | | | | | | | | |
| Total | | | | 6,807 | 3,336 | 3,471 | 10,108 | 5,343 | 4,765 | 3,719 | 2,225 | 1,494 | | | | | | | | | |
| AM Peak Vol | | | | | | | 813 | 530 | 286 | 794 | 501 | 296 | | | | | | | | | |
| AM Peak Fct | | | | | | | .888 | .872 | .841 | .89 | .921 | .851 | | | | | | | | | |
| AM Peak Hr | | | | : | : | : | 7: 30 | 7: 30 | 7: 45 | 7: 45 | 7: 45 | 7: 30 | | | | | | | | | |
| PM Peak Vol | | | | 876 | 388 | 488 | 756 | 362 | 400 | | | | | | | | | | | | |
| PM Peak Fct | | | | .936 | .915 | .917 | .955 | .933 | .935 | | | | | | | | | | | | |
| PM Peak Hr | | | | 16: 15 | 16: 15 | 16: 15 | 15: 15 | 17: 00 | 15: 15 | : | : | : | | | | | | | | | |
| Seasonal Fct | | | | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | | | | | | | | | |
| Daily Fct | | | | .876 | .876 | .876 | .882 | .882 | .882 | .876 | .876 | .876 | | | | | | | | | |
| Axle Fct | | | | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | | | | | | | | | |
| Pulse Fct | | | | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | | | | | | | | | |

Created 09/27/2018 11:21 AM

ROAD AADT 9,085 NDIR AADT 4,284 PDIR AADT 4,801

# New Jersey Department of Transportation

## Short-term Hourly Traffic Volume for 03/12/2018 to 03/14/2018

Site names: 0621s8,Clinton Ave 2.16,07091881__
County: ESSEX
Funct Class: Urban Minor Arterial
Location: bet Milford Ave and Elizabeth Ave

Seasonal Factor Grp: rg1_4U
Daily Factor Grp: rg1_4U
Axle Factor Grp: rg1_4U
Growth Factor Grp: rg1_4U

| | Sun, Mar 11, 2018 | | | Mon, Mar 12, 2018 | | | Tue, Mar 13, 2018 | | | Wed, Mar 14, 2018 | | | Thu, Mar 15, 2018 | | | Fri, Mar 16, 2018 | | | Sat, Mar 17, 2018 | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W | Road | E | W |
| 00:00 | | | | | | | 180 | 102 | 78 | 161 | 84 | 77 | | | | | | | | | |
| 01:00 | | | | | | | 101 | 48 | 53 | 117 | 56 | 61 | | | | | | | | | |
| 02:00 | | | | | | | 75 | 37 | 38 | 100 | 59 | 41 | | | | | | | | | |
| 03:00 | | | | | | | 49 | 29 | 20 | 63 | 39 | 24 | | | | | | | | | |
| 04:00 | | | | | | | 77 | 46 | 31 | 89 | 53 | 36 | | | | | | | | | |
| 05:00 | | | | | | | 136 | 82 | 54 | 129 | 82 | 47 | | | | | | | | | |
| 06:00 | | | | | | | 254 | 154 | 100 | 250 | 154 | 96 | | | | | | | | | |
| 07:00 | | | | | | | 576 | 363 | 213 | 600 | 383 | 217 | | | | | | | | | |
| 08:00 | | | | | | | 778 | 497 | 281 | 751 | 472 | 279 | | | | | | | | | |
| 09:00 | | | | | | | 471 | 264 | 207 | 489 | 294 | 195 | | | | | | | | | |
| 10:00 | | | | | | | 471 | 267 | 204 | 493 | 293 | 200 | | | | | | | | | |
| 11:00 | | | | | | | 537 | 266 | 271 | 477 | 256 | 221 | | | | | | | | | |
| 12:00 | | | | 573 | 316 | 257 | 607 | 294 | 313 | | | | | | | | | | | | |
| 13:00 | | | | 588 | 309 | 279 | 513 | 286 | 227 | | | | | | | | | | | | |
| 14:00 | | | | 651 | 348 | 303 | 568 | 306 | 262 | | | | | | | | | | | | |
| 15:00 | | | | 734 | 351 | 383 | 740 | 361 | 379 | | | | | | | | | | | | |
| 16:00 | | | | 848 | 365 | 483 | 729 | 344 | 385 | | | | | | | | | | | | |
| 17:00 | | | | 818 | 358 | 460 | 744 | 362 | 382 | | | | | | | | | | | | |
| 18:00 | | | | 740 | 343 | 397 | 640 | 322 | 318 | | | | | | | | | | | | |
| 19:00 | | | | 544 | 261 | 283 | 544 | 274 | 270 | | | | | | | | | | | | |
| 20:00 | | | | 430 | 218 | 212 | 469 | 225 | 244 | | | | | | | | | | | | |
| 21:00 | | | | 376 | 198 | 178 | 353 | 168 | 185 | | | | | | | | | | | | |
| 22:00 | | | | 297 | 158 | 139 | 285 | 146 | 139 | | | | | | | | | | | | |
| 23:00 | | | | 208 | 111 | 97 | 211 | 100 | 111 | | | | | | | | | | | | |
| Total | | | | 6,807 | 3,336 | 3,471 | 10,108 | 5,343 | 4,765 | 3,719 | 2,225 | 1,494 | | | | | | | | | |
| AM Peak Vol | | | | | | | 813 | 530 | 286 | 794 | 501 | 296 | | | | | | | | | |
| AM Peak Fct | | | | | | | .888 | .872 | .841 | .89 | .921 | .851 | | | | | | | | | |
| AM Peak Hr | | | | : | : | : | 7: 30 | 7: 30 | 7: 45 | 7: 45 | 7: 45 | 7: 30 | | | | | | | | | |
| PM Peak Vol | | | | 876 | 388 | 488 | 756 | 362 | 400 | | | | | | | | | | | | |
| PM Peak Fct | | | | .936 | .915 | .917 | .955 | .933 | .935 | | | | | | | | | | | | |
| PM Peak Hr | | | | 16: 15 | 16: 15 | 16: 15 | 15: 15 | 17: 00 | 15: 15 | : | : | : | | | | | | | | | |
| Seasonal Fct | | | | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | 1.019 | | | | | | | | | |
| Daily Fct | | | | .876 | .876 | .876 | .882 | .882 | .882 | .876 | .876 | .876 | | | | | | | | | |
| Axle Fct | | | | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | .492 | | | | | | | | | |
| Pulse Fct | | | | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | 2.000 | | | | | | | | | |

Created 09/27/2018 11:21 AM

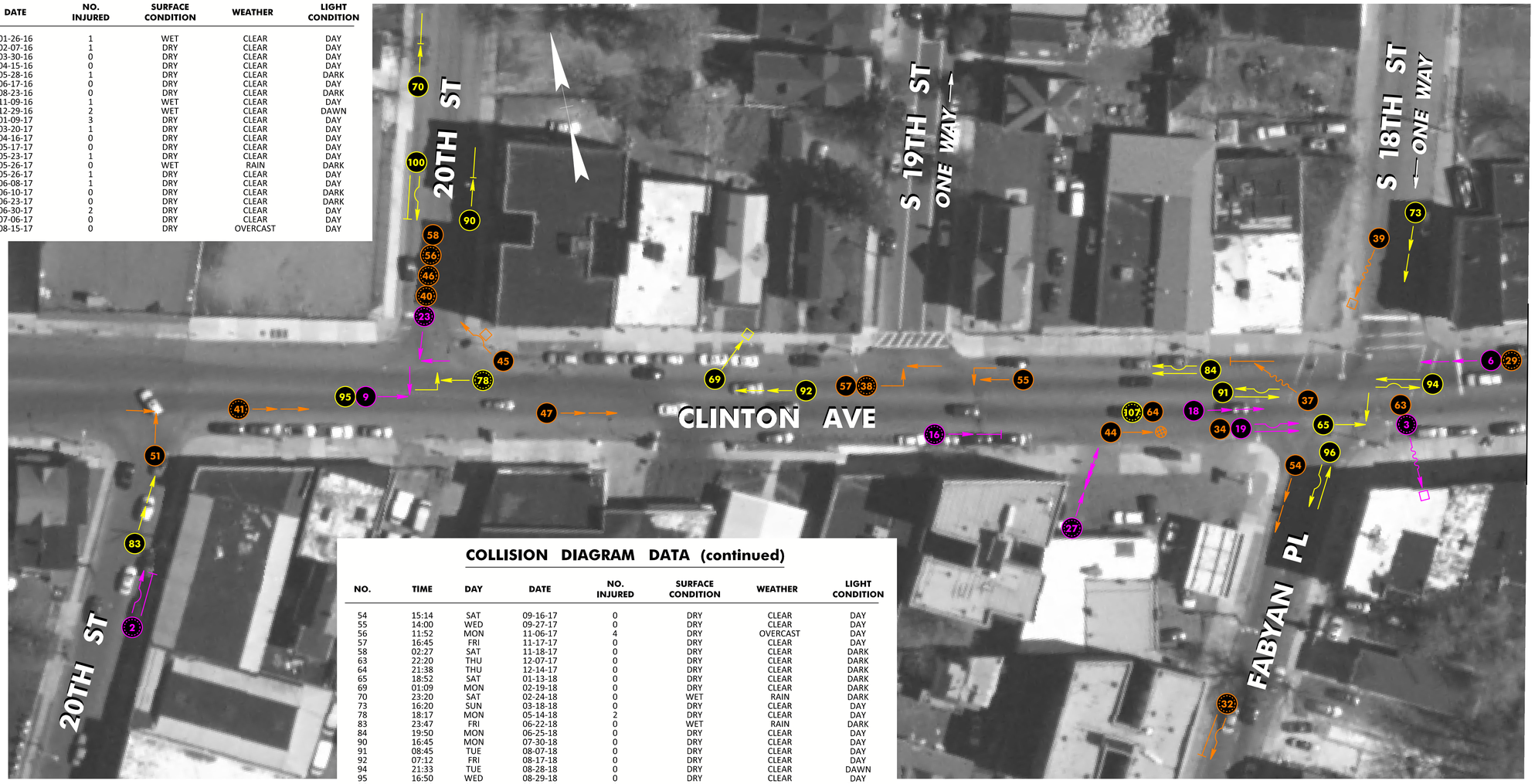
ROAD AADT 9,085 NDIR AADT 4,284 PDIR AADT 4,801

# APPENDIX D

## VEHICULAR CRASH DIAGRAMS

## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 2 | 15:37 | TUE | 01-26-16 | 1 | WET | CLEAR | DAY |
| 3 | 10:09 | SUN | 02-07-16 | 1 | DRY | CLEAR | DAY |
| 6 | 13:20 | WED | 03-30-16 | 0 | DRY | CLEAR | DAY |
| 9 | 14:30 | FRI | 04-15-16 | 0 | DRY | CLEAR | DAY |
| 16 | 22:00 | SAT | 05-28-16 | 1 | DRY | CLEAR | DARK |
| 18 | 08:18 | FRI | 06-17-16 | 0 | DRY | CLEAR | DAY |
| 19 | 03:20 | TUE | 08-23-16 | 0 | DRY | CLEAR | DARK |
| 23 | 10:44 | WED | 11-09-16 | 1 | WET | CLEAR | DAY |
| 27 | 07:00 | THU | 12-29-16 | 2 | WET | CLEAR | DAWN |
| 29 | 12:04 | MON | 01-09-17 | 3 | DRY | CLEAR | DAY |
| 32 | 14:41 | MON | 03-20-17 | 1 | DRY | CLEAR | DAY |
| 34 | 11:56 | SUN | 04-16-17 | 0 | DRY | CLEAR | DAY |
| 37 | 15:09 | WED | 05-17-17 | 0 | DRY | CLEAR | DAY |
| 38 | 17:10 | TUE | 05-23-17 | 1 | DRY | CLEAR | DAY |
| 39 | 01:18 | FRI | 05-26-17 | 0 | WET | RAIN | DARK |
| 40 | 11:12 | FRI | 05-26-17 | 1 | DRY | CLEAR | DAY |
| 41 | 08:44 | THU | 06-08-17 | 1 | DRY | CLEAR | DAY |
| 44 | 02:34 | SAT | 06-10-17 | 0 | DRY | CLEAR | DARK |
| 45 | 03:02 | FRI | 06-23-17 | 0 | DRY | CLEAR | DARK |
| 46 | 04:52 | FRI | 06-30-17 | 2 | DRY | CLEAR | DAY |
| 47 | 13:36 | THU | 07-06-17 | 0 | DRY | CLEAR | DAY |
| 51 | 09:01 | TUE | 08-15-17 | 0 | DRY | OVERCAST | DAY |




## COLLISION DIAGRAM DATA (continued)

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 54 | 15:14 | SAT | 09-16-17 | 0 | DRY | CLEAR | DAY |
| 55 | 14:00 | WED | 09-27-17 | 0 | DRY | CLEAR | DAY |
| 56 | 11:52 | MON | 11-06-17 | 4 | DRY | OVERCAST | DAY |
| 57 | 16:45 | FRI | 11-17-17 | 0 | DRY | CLEAR | DAY |
| 58 | 02:27 | SAT | 11-18-17 | 0 | DRY | CLEAR | DARK |
| 63 | 22:20 | THU | 12-07-17 | 0 | DRY | CLEAR | DARK |
| 64 | 21:38 | THU | 12-14-17 | 0 | DRY | CLEAR | DARK |
| 65 | 18:52 | SAT | 01-13-18 | 0 | DRY | CLEAR | DARK |
| 69 | 01:09 | MON | 02-19-18 | 0 | DRY | CLEAR | DARK |
| 70 | 23:20 | SAT | 02-24-18 | 0 | WET | RAIN | DARK |
| 73 | 16:20 | SUN | 03-18-18 | 0 | DRY | CLEAR | DAY |
| 78 | 18:17 | MON | 05-14-18 | 2 | DRY | CLEAR | DAY |
| 83 | 23:47 | FRI | 06-22-18 | 0 | WET | RAIN | DARK |
| 84 | 19:50 | MON | 06-25-18 | 0 | DRY | CLEAR | DAY |
| 90 | 16:45 | MON | 07-30-18 | 0 | DRY | CLEAR | DAY |
| 91 | 08:45 | TUE | 08-07-18 | 0 | DRY | CLEAR | DAY |
| 92 | 07:12 | FRI | 08-17-18 | 0 | DRY | CLEAR | DAY |
| 94 | 21:33 | TUE | 08-28-18 | 0 | DRY | CLEAR | DAWN |
| 95 | 16:50 | WED | 08-29-18 | 0 | DRY | CLEAR | DAY |
| 96 | 01:23 | SUN | 09-02-18 | 0 | DRY | CLEAR | DARK |
| 100 | 18:50 | WED | 09-19-18 | 0 | DRY | CLEAR | DUSK |
| 107 | 23:42 | THU | 11-01-18 | 3 | DRY | CLEAR | DARK |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 30 |
| INJURIES | 14 |
| FATALITIES* | 0 |
| TOTAL NO. OF CRASHES | 44 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

- 2016 CRASHES
- 2017 CRASHES
- 2018 CRASHES



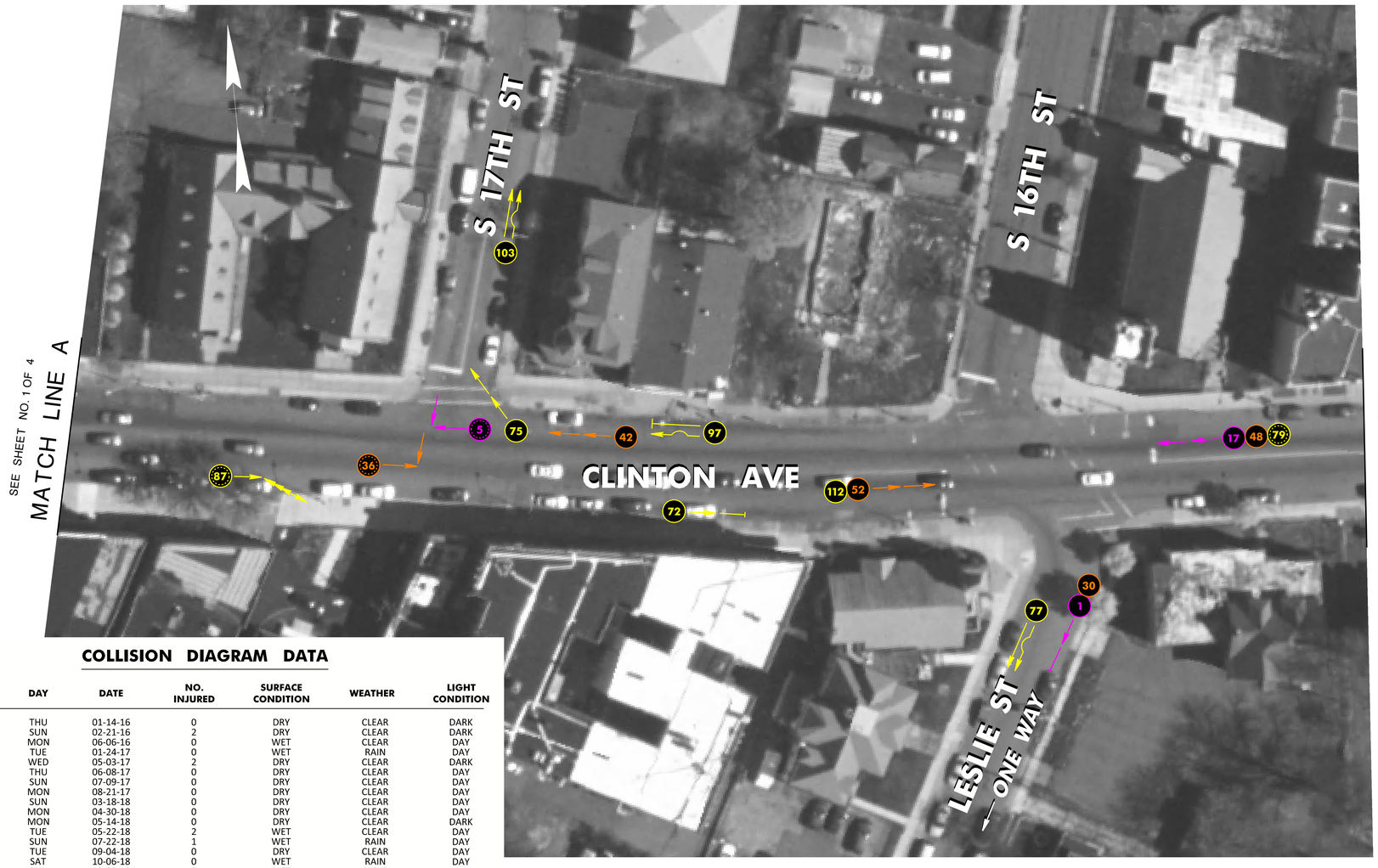
NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

# 2016 - 2018 COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE




## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 1 | 22:21 | THU | 01-14-16 | 0 | DRY | CLEAR | DARK |
| 5 | 00:00 | SUN | 02-21-16 | 2 | DRY | CLEAR | DARK |
| 17 | 10:24 | MON | 06-06-16 | 0 | WET | CLEAR | DAY |
| 30 | 12:04 | TUE | 01-24-17 | 0 | WET | RAIN | DAY |
| 36 | 20:36 | WED | 05-03-17 | 2 | DRY | CLEAR | DARK |
| 42 | 15:52 | THU | 06-08-17 | 0 | DRY | CLEAR | DAY |
| 48 | 16:45 | SUN | 07-09-17 | 0 | DRY | CLEAR | DAY |
| 52 | 17:21 | MON | 08-21-17 | 0 | DRY | CLEAR | DAY |
| 72 | 16:15 | SUN | 03-18-18 | 0 | DRY | CLEAR | DAY |
| 75 | 17:01 | MON | 04-30-18 | 0 | DRY | CLEAR | DAY |
| 77 | 00:57 | MON | 05-14-18 | 0 | DRY | CLEAR | DARK |
| 79 | 12:32 | TUE | 05-22-18 | 2 | WET | CLEAR | DAY |
| 87 | 18:00 | SUN | 07-22-18 | 1 | WET | RAIN | DAY |
| 97 | 09:04 | TUE | 09-04-18 | 0 | DRY | CLEAR | DAY |
| 103 | 15:37 | SAT | 10-06-18 | 0 | WET | RAIN | DAY |
| 112 | 20:54 | SUN | 12-02-18 | 0 | WET | CLEAR | DAWN |

# LEGEND

## NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 12 |
| INJURIES | 4 |
| FATALITIES* | 0 |
| TOTAL NO. OF CRASHES | 16 |

## SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- (0) PROPERTY DAMAGE ONLY CRASH
- (0) INJURY IN CRASH
- (0) FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

## TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

## COLORS

- (0) 2016 CRASHES
- (0) 2017 CRASHES
- (0) 2018 CRASHES



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

2016 - 2018 COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE

GREENMAN-PEDERSEN, INC. DATE: 9/9/2020 TIME: 9:42:43 AM FILE: L:\2017669 HSIP Program and Project Development Support\NJDOT HSIP Year 2\Cad\Hwy\05 Newark\Collision Diagram Sheets\Veh\Sheet 02.dgn

SEE SHEET NO. 2 OF 4
MATCH LINE B

SEE SHEET NO. 4 OF 4
MATCH LINE C


## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 4 | 20:30 | THU | 02-11-16 | 0 | DRY | CLEAR | DARK |
| 7 | 08:14 | SUN | 04-10-16 | 0 | DRY | CLEAR | DAY |
| 10 | 14:48 | THU | 05-12-16 | 0 | DRY | CLEAR | DAY |
| 11 | 13:41 | MON | 05-16-16 | 0 | DRY | CLEAR | DAY |
| 20 | 18:00 | SUN | 09-04-16 | 0 | DRY | CLEAR | DAY |
| 21 | 15:10 | MON | 09-05-16 | 1 | DRY | CLEAR | DAY |
| 22 | 06:35 | SUN | 10-30-16 | 0 | DRY | CLEAR | DAWN |
| 25 | 08:48 | WED | 11-30-16 | 0 | DRY | CLEAR | DARK |
| 26 | 08:04 | THU | 12-22-16 | 0 | DRY | CLEAR | DAY |
| 28 | 19:41 | MON | 01-02-17 | 0 | WET | RAIN | DARK |
| 35 | 13:22 | MON | 04-24-17 | 0 | DRY | CLEAR | DAY |
| 43 | 20:55 | THU | 06-08-17 | 0 | DRY | CLEAR | DARK |
| 50 | 16:27 | MON | 08-07-17 | 0 | WET | RAIN | DAY |
| 53 | 21:30 | FRI | 08-25-17 | 0 | DRY | CLEAR | DARK |
| 61 | 13:06 | SAT | 11-25-17 | 0 | DRY | CLEAR | DAY |
| 62 | 17:52 | THU | 11-30-17 | 2 | DRY | CLEAR | DARK |
| 66 | 09:15 | WED | 02-14-18 | 1 | DRY | CLEAR | DAY |
| 68 | 16:50 | SUN | 02-18-18 | 1 | DRY | CLEAR | DAY |
| 71 | 19:45 | MON | 02-26-18 | 0 | DRY | CLEAR | DARK |
| 74 | 03:00 | SAT | 04-07-18 | 0 | DRY | CLEAR | DARK |
| 76 | 17:03 | WED | 05-09-18 | 0 | DRY | CLEAR | DAY |
| 80 | 17:42 | TUE | 06-05-18 | 0 | DRY | CLEAR | DAY |
| 82 | 14:17 | THU | 06-21-18 | 0 | DRY | CLEAR | DAY |
| 86 | 08:56 | MON | 07-16-18 | 1 | DRY | CLEAR | DAY |
| 93 | 07:58 | SUN | 08-19-18 | 2 | WET | CLEAR | DAY |
| 101 | 17:50 | TUE | 09-25-18 | 2 | WET | RAIN | DARK |
| 105 | 15:16 | TUE | 10-23-18 | 0 | DRY | CLEAR | DAY |
| 106 | 15:22 | THU | 11-01-18 | 0 | DRY | CLEAR | DAY |
| 108 | 09:03 | TUE | 11-06-18 | 0 | WET | RAIN | DAY |
| 110 | 22:06 | SAT | 11-24-18 | 1 | WET | RAIN | DARK |
| 111 | 22:56 | SAT | 11-24-18 | 0 | WET | RAIN | DARK |
| 114 | 05:47 | TUE | 12-11-18 | 0 | DRY | CLEAR | DARK |
| | | FRI | | | | CLEAR | |
| | | MON | | | | | |

# LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 24 |
| INJURIES | 8 |
| FATALITIES* | 0 |
| TOTAL NO. OF CRASHES | 32 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

- 2016 CRASHES
- 2017 CRASHES
- 2018 CRASHES



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

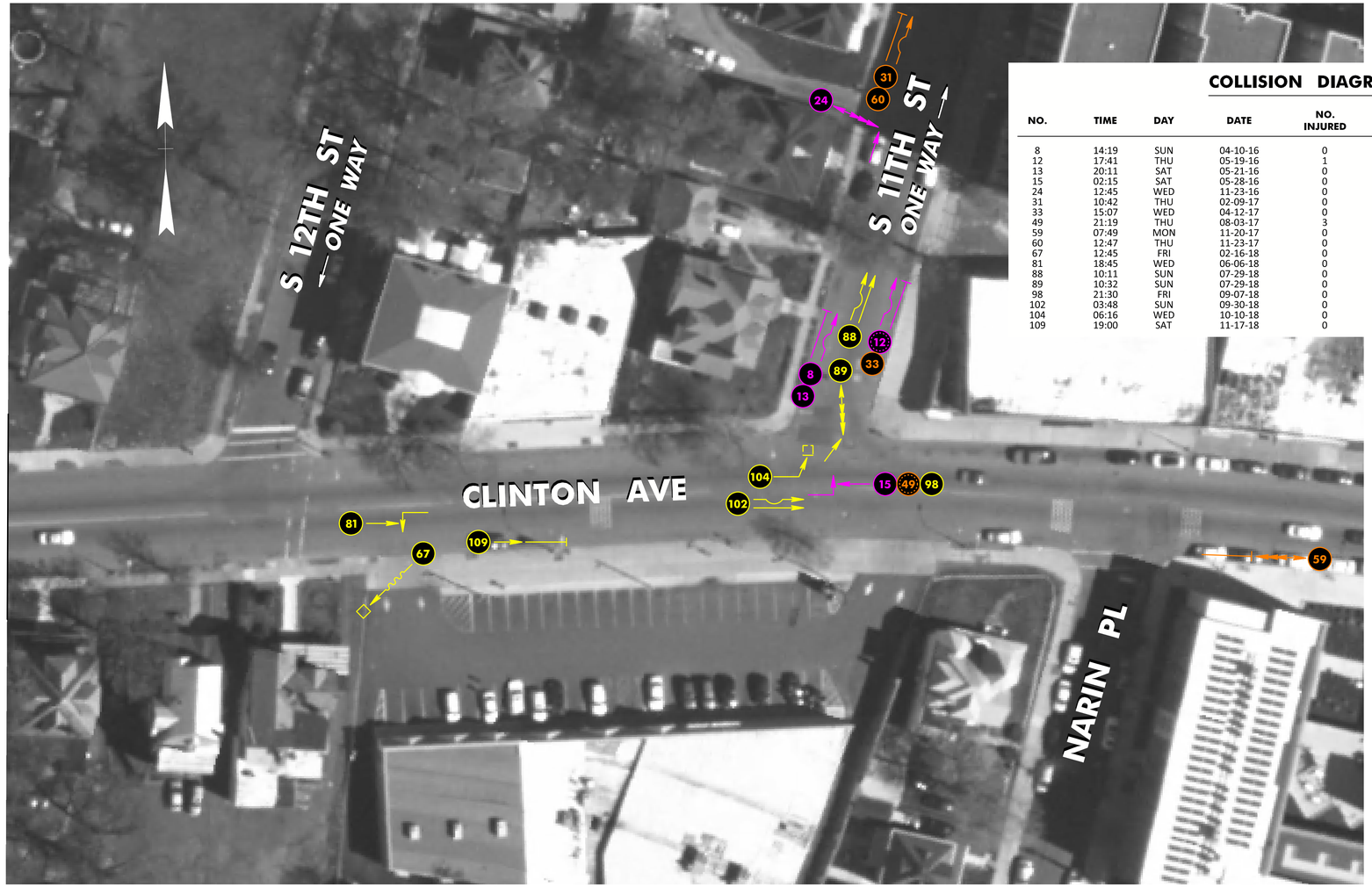
# 2016 - 2018 COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE

DATE: 3/9/2020 TIME: 9:36:49 AM FILE: L:\2017669 HSIP Program and Project Development Support\NJDOT HSIP Year 2\Cadd\hwy\05 Newark\Collision Diagram Sheets\Veh\Sheet 03.dgn
GREENMAN-PEDERSEN, INC.

SEE SHEET NO. 3 OF 4
MATCH LINE C




## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 8 | 14:19 | SUN | 04-10-16 | 0 | DRY | CLEAR | DAY |
| 12 | 17:41 | THU | 05-19-16 | 1 | DRY | CLEAR | DAY |
| 13 | 20:11 | SAT | 05-21-16 | 0 | WET | RAIN | DAY |
| 15 | 02:15 | SAT | 05-28-16 | 0 | DRY | CLEAR | DARK |
| 24 | 12:45 | WED | 11-23-16 | 0 | DRY | CLEAR | DAY |
| 31 | 10:42 | THU | 02-09-17 | 0 | SNOWY | SNOW | DAY |
| 33 | 15:07 | WED | 04-12-17 | 0 | DRY | OVERCAST | DAY |
| 49 | 21:19 | THU | 08-03-17 | 3 | WET | RAIN | DARK |
| 59 | 07:49 | MON | 11-20-17 | 0 | DRY | CLEAR | DAY |
| 60 | 12:47 | THU | 11-23-17 | 0 | DRY | CLEAR | DAY |
| 67 | 12:45 | FRI | 02-16-18 | 0 | DRY | RAIN | DAY |
| 81 | 18:45 | WED | 06-06-18 | 0 | DRY | CLEAR | DAY |
| 88 | 10:11 | SUN | 07-29-18 | 0 | DRY | CLEAR | DAY |
| 89 | 10:32 | SUN | 07-29-18 | 0 | DRY | CLEAR | DAY |
| 98 | 21:30 | FRI | 09-07-18 | 0 | DRY | CLEAR | DARK |
| 102 | 03:48 | SUN | 09-30-18 | 0 | DRY | CLEAR | DARK |
| 104 | 06:16 | WED | 10-10-18 | 0 | DRY | CLEAR | DAY |
| 109 | 19:00 | SAT | 11-17-18 | 0 | DRY | CLEAR | DAWN |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 16 |
| INJURIES | 2 |
| FATALITIES* | 0 |
| TOTAL NO. OF CRASHES | 18 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON–INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON–FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

- 2016 CRASHES
- 2017 CRASHES
- 2018 CRASHES



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

# 2016 - 2018 COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE

# APPENDIX E

## PEDESTRIAN CRASH DIAGRAMS


MATCH LINE A
SEE SHEET NO. 2 OF 4

## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 4 | 17:20 | FRI | 10-17-14 | 1 | DRY | CLEAR | DAY |
| 7 | 13:45 | FRI | 04-15-16 | 1 | DRY | CLEAR | DAY |
| 10 | 18:22 | THU | 02-02-17 | 1 | DRY | CLEAR | DARK |
| 12 | 21:00 | TUE | 07-18-17 | 1 | DRY | CLEAR | DARK |
| 14 | 14:31 | SAT | 10-28-17 | 1 | DRY | CLEAR | DAY |
| 16 | 09:40 | TUE | 01-30-18 | 2 | DRY | CLEAR | DAY |
| 18 | 18:04 | FRI | 06-08-18 | 1 | DRY | CLEAR | DUSK |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 0 |
| INJURIES | 7 |
| FATALITIES | 0 |
| TOTAL NO. OF CRASHES | 7 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

PEDESTRIAN CRASH



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

2014-2018 PEDESTRIAN COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE


SEE SHEET NO. 1 OF 4
MATCH LINE A

SEE SHEET NO. 3 OF 4
MATCH LINE B

## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 1 | 19:45 | FRI | 05-16-14 | 1 | WET | RAIN | DAWN |
| 8 | 17:40 | WED | 08-17-16 | 1 | DRY | CLEAR | DAY |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 0 |
| INJURIES | 2 |
| FATALITIES | 0 |
| TOTAL NO. OF CRASHES | 2 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

PEDESTRIAN CRASH

2/4

NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

# 2014-2018 PEDESTRIAN COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE

SEE SHEET NO. 2 OF 4
MATCH LINE B


SEE SHEET NO. 4 OF 4
MATCH LINE C

## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 2 | 22:19 | THU | 05-29-14 | 1 | DRY | CLEAR | DARK |
| 3 | 13:15 | FRI | 08-22-14 | 3 | DRY | CLEAR | DAY |
| 5 | 17:20 | WED | 12-17-14 | 1 | DRY | CLEAR | DARK |
| 6 | 14:33 | WED | 12-24-14 | 1 | WET | RAIN | DAY |
| 9 | 22:40 | SUN | 09-04-16 | 1 | DRY | CLEAR | DARK |
| 11 | 08:15 | WED | 06-07-17 | 1 | DRY | CLEAR | DAY |
| 13 | 21:24 | THU | 08-17-17 | 0 | DRY | CLEAR | DARK |
| 17 | 14:30 | TUE | 04-03-18 | 1 | DRY | CLEAR | DAY |
| 19 | 19:07 | FRI | 07-27-18 | 1 | WET | RAIN | DAY |
| 20 | 15:20 | MON | 08-06-18 | 1 | DRY | CLEAR | DAY |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 1 |
| INJURIES | 9 |
| FATALITIES | 0 |
| TOTAL NO. OF CRASHES | 10 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

PEDESTRIAN CRASH



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

# 2014-2018 PEDESTRIAN COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

NOT TO SCALE


SEE SHEET NO. 3 OF 4
MATCH LINE C

## COLLISION DIAGRAM DATA

| NO. | TIME | DAY | DATE | NO. INJURED | SURFACE CONDITION | WEATHER | LIGHT CONDITION |
|---|---|---|---|---|---|---|---|
| 15 | 12:25 | SUN | 01-07-18 | 1 | DRY | CLEAR | DAY |
| 21 | 15:11 | TUE | 11-27-18 | 1 | DRY | CLEAR | DAY |

## LEGEND

### NUMBER OF CRASHES WITH

| | |
|---|---|
| PROPERTY DAMAGE ONLY | 0 |
| INJURIES | 2 |
| FATALITIES | 0 |
| TOTAL NO. OF CRASHES | 2 |

### SYMBOLS

- MOVING VEHICLE
- BACKING VEHICLE
- NON-INVOLVED VEHICLE
- PEDESTRIAN
- BICYCLIST
- PROPERTY DAMAGE ONLY CRASH
- INJURY IN CRASH
- FATAL CRASH
- FIXED OBJECT
- ANIMAL
- NON-FIXED OBJECT
- POTHOLE

### TYPES OF CRASHES

- REAR END
- HEAD ON
- SIDE SWIPE
- OUT OF CONTROL
- OVERTURNED
- LEFT TURN
- RIGHT ANGLE
- STRUCK PARKED VEHICLE

### COLORS

PEDESTRIAN CRASH



NEW JERSEY DEPARTMENT OF TRANSPORTATION

CLINTON AVENUE
FROM 20TH STREET TO 11TH STREET
CITY OF NEWARK, ESSEX COUNTY

2014-2018 PEDESTRIAN COLLISION DIAGRAMS

GPI Engineering Design Planning Construction Management

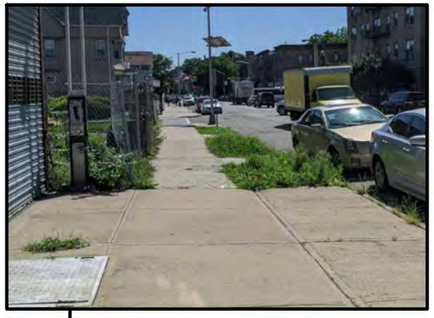
NOT TO SCALE

# APPENDIX F

## SITE PHOTOGRAPHS

Pedestrian crossing location unclear
Car possibly blocking ramp

Various sidewalk widths and conditions



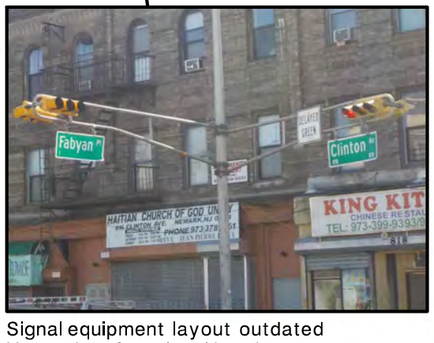
Damaged/ missing sidewalk may pose a tripping hazard

Pedestrians crossing between cars

Pedestrian crossing not clearly marked with striping; sign obscured


Vehicle parked on sidewak that is in poor condition

Area susceptible to flooding
Ponding along roadway




Signal equipment layout outdated
No pedestrian signal heads

Curb ramps not ADA compliant
Striping worn

**LEGEND**

SIGNALIZED INTERSECTION

PROJECT CORRIDOR

1/2

**NJDOT HSIP – ROAD SAFETY AUDIT**
**CLINTON AVENUE**

NEWARK CITY
ESSEX COUNTY

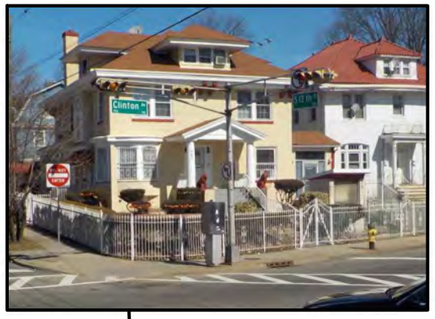
**SITE PHOTOGRAPHS**

GPI Engineering Design Planning Construction Management

**N.T.S.**

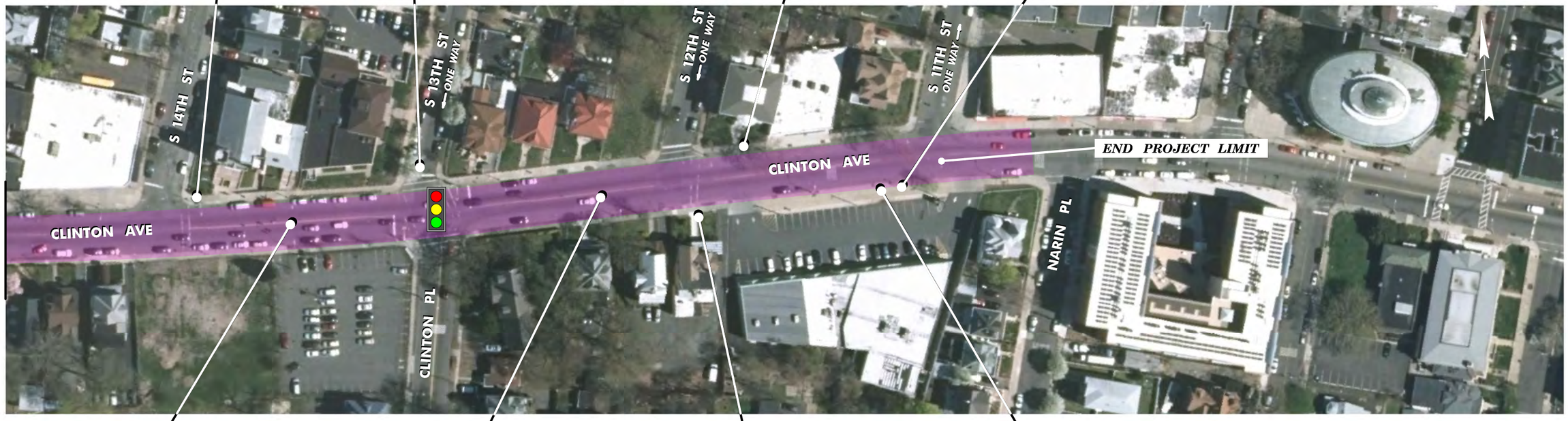
Ramps not ADA compliant
Vehicle parked too close to corner

Signal equipment layout outdated
No pedestrian signal heads



Damaged/ missing sidewalk may pose a tripping hazard; vegetation overgrown

Multiple curb cuts with ramps not clearly defined or ADA compliant

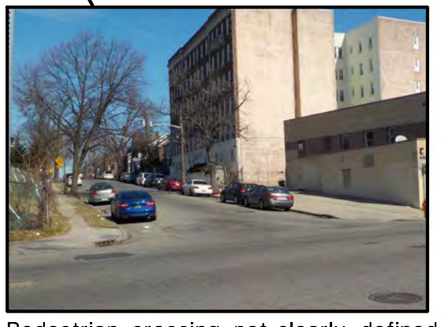



Some areas underutilized for on-street parking; wide pavement area

No defined bicyclist facilities

Ramps not ADA compliant
Crosswalk striping worn

Pedestrian crossing not clearly defined
Detectable warning surfaces blend with sidewalk



**LEGEND**

SIGNALIZED INTERSECTION

PROJECT CORRIDOR

2/2

**NJDOT HSIP – ROAD SAFETY AUDIT**
**CLINTON AVENUE**

NEWARK CITY
ESSEX COUNTY

**SITE PHOTOGRAPHS**

GPI Engineering Design Planning Construction Management

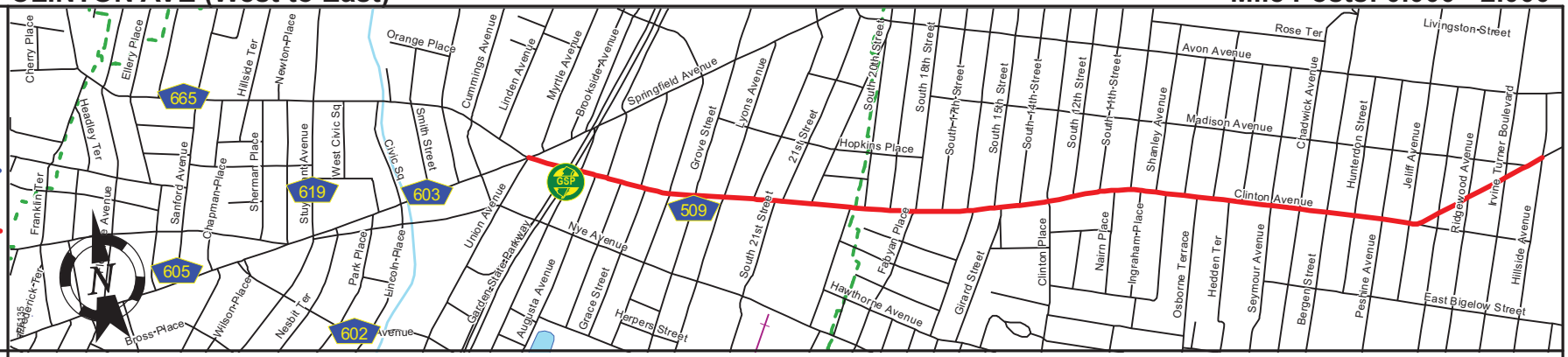
**N.T.S.**

# APPENDIX G

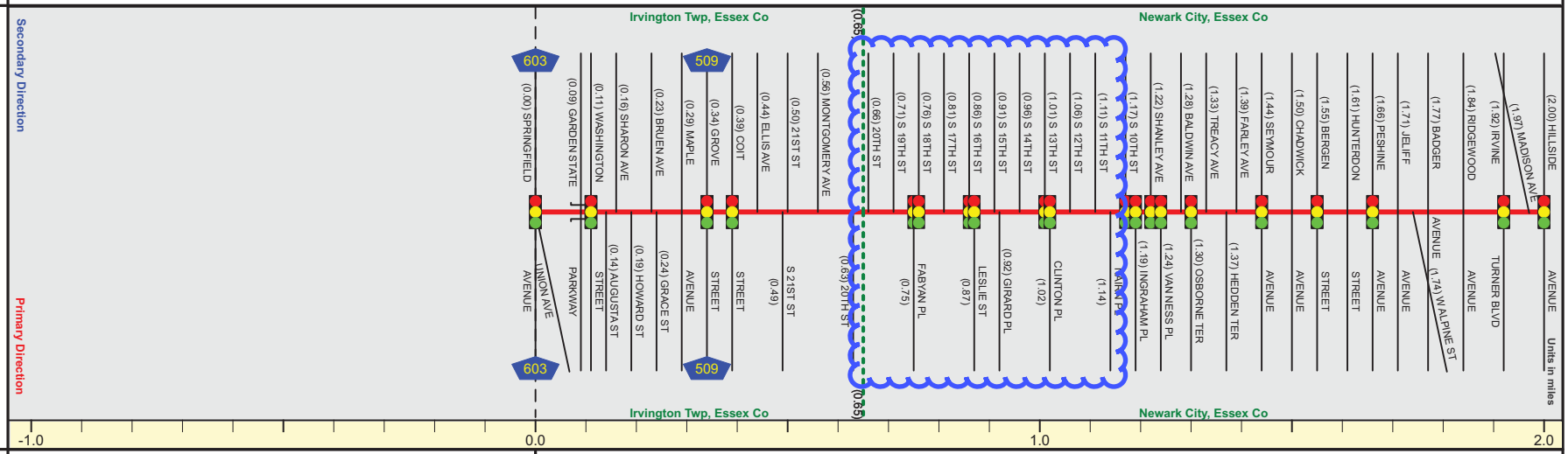
## STRAIGHT LINE DIAGRAMS

# CLINTON AVE (West to East)

**Mile Posts: 0.000 - 2.000**




| | |
|---|---|
| Pavement | |
| Shoulder | |
| Number of Lanes | |
| Speed Limit | |
| Street Name | |




| | |
|---|---|
| Street Name | Clinton Avenue |
| Jurisdiction | Municipal |
| Functional Class | Urban Minor Arterial |
| Federal Aid - NHS Sy | STP |
| Control Section | |
| Speed Limit | NOT POSTED |
| Number of Lanes | 2 + 4 |
| Med. Type | None |
| Med. Width | 0 |
| Pavement | 60 |
| Shoulder | 0 |
| Traffic Volume | 13,393 (2018) |
| Traffic Sta. ID | 0611s8 |
| Structure No. | 361447T |
| Enlarged Views | |

Begin Clinton Avenue MP=0.00

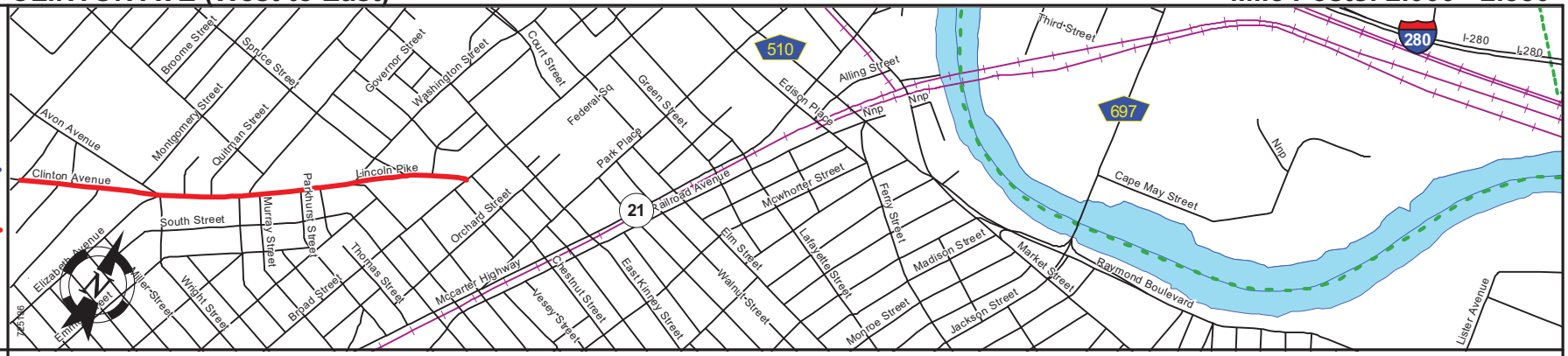
**SRI = 07091881__**

Date last inventoried: November 2015

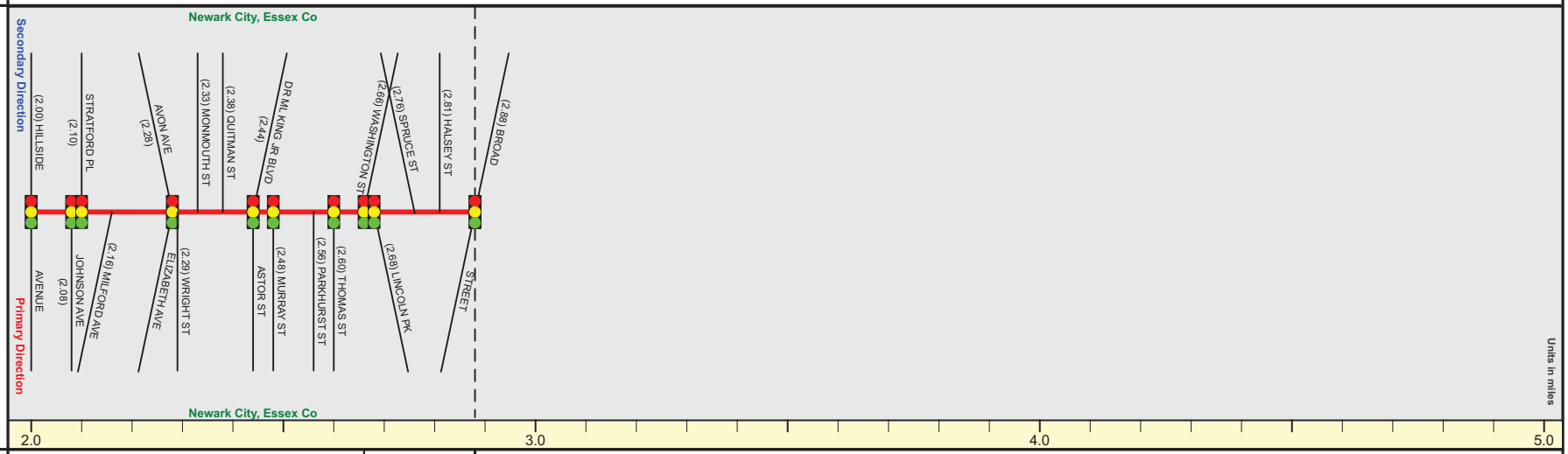
Page Created: March, 2019

# CLINTON AVE (West to East)

**Mile Posts: 2.000 - 2.880**




| | |
|---|---|
| Pavement | |
| Shoulder | |
| Number of Lanes | |
| Speed Limit | |
| Street Name | |




Interstate Route 287 · US Route 22 · NJ Route 33 · County Road 689 · Interchange Number 2 · Grade Separated Interchange · Traffic Signal · Traffic Monitoring Sites WIM AVC VOL · Road Underpass · Road Overpass

| | | | |
|---|---|---|---|
| Street Name | Clinton Avenue | Lincoln Pike | |
| Jurisdiction | Municipal | | |
| Functional Class | Urban Minor Arterial | | |
| Federal Aid - NHS Sy | STP | | |
| Control Section | | | End Clinton Avenue MP=2.88 |
| Speed Limit | NOT POSTED | | |
| Number of Lanes | 4 | 5 \| 3 | |
| Med. Type | None | | |
| Med. Width | 0 | | |
| Pavement | 60 | 72 | |
| Shoulder | 0 | | |
| Traffic Volume | 9,085 (2018) | | |
| Traffic Sta. ID | 0621s8 | | |
| Structure No. | | | |
| Enlarged Views | | | |

Page Created: March, 2019

**SRI = 07091881__**

Date last inventoried: November 2015

# APPENDIX H

## PRE-AUDIT PRESENTATION


# ONLINE ROAD SAFETY AUDIT

## CLINTON AVENUE
## 20TH STREET TO 11TH STREET

NEWARK CITY, ESSEX COUNTY

OCTOBER 7, 2020


# AUDIT TEAM

NJDOT

NJTPA

Newark City

FUNDED BY FEDERAL HIGHWAY ADMINISTRATION AND NJDOT

PRESENTED BY GREENMAN-PEDERSEN, INC., NJDOT CONSULTANT

# Today's Schedule

1
- Welcome and Introductions
- Safety Program Overview and RSA Process

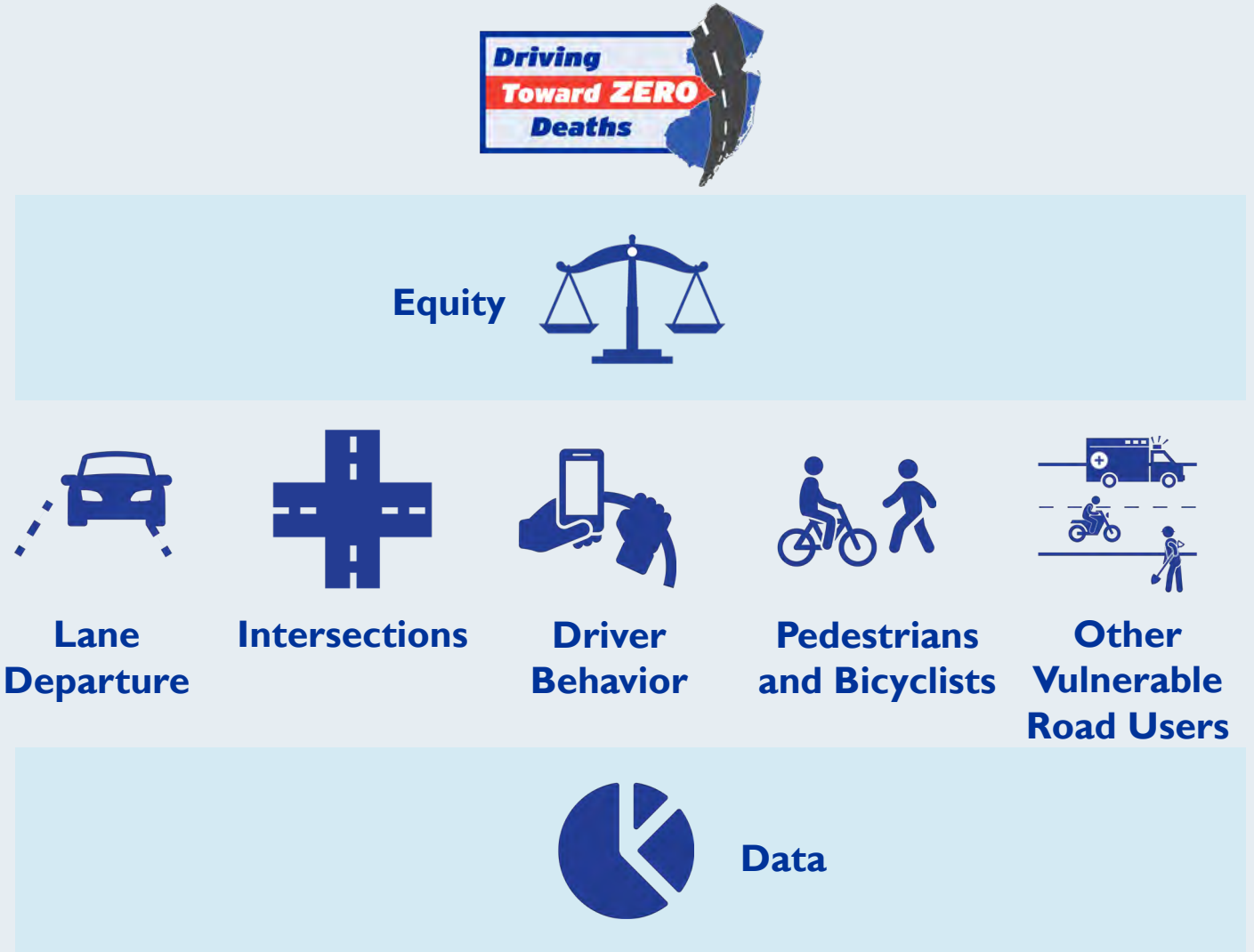
2
- FHWA Proven Safety Countermeasures
- Project Overview and Crash Data

3
- Online Field Visit and Observations

4
- Make Recommendations
- Next Steps

# HIGHWAY SAFETY IMPROVEMENT PROGRAM (HSIP)

- 7 Emphasis Areas (NJ 2020 Strategic Highway Safety Plan)
- Pedestrian Safety and Intersection Focus State
- 7 sub-programs including Local Safety Program
- Core Federal Aid Program, NJ receives about $57M




*Driver Behavior: Drowsy and Distracted Driving, Aggressive Driving, Impaired Driving, Unlicensed Driving, and Unbelted Drivers and Occupants*
*Other Vulnerable Road Users: Mature Drivers, Younger Drivers, Motorcyclists, Work Zone Workers and Other Road Workers.*

# HSIP/LOCAL SAFETY PROGRAM

**MAIN GOAL: Reduce serious injury and fatality (K+A) crashes on all of NJ's public roads**

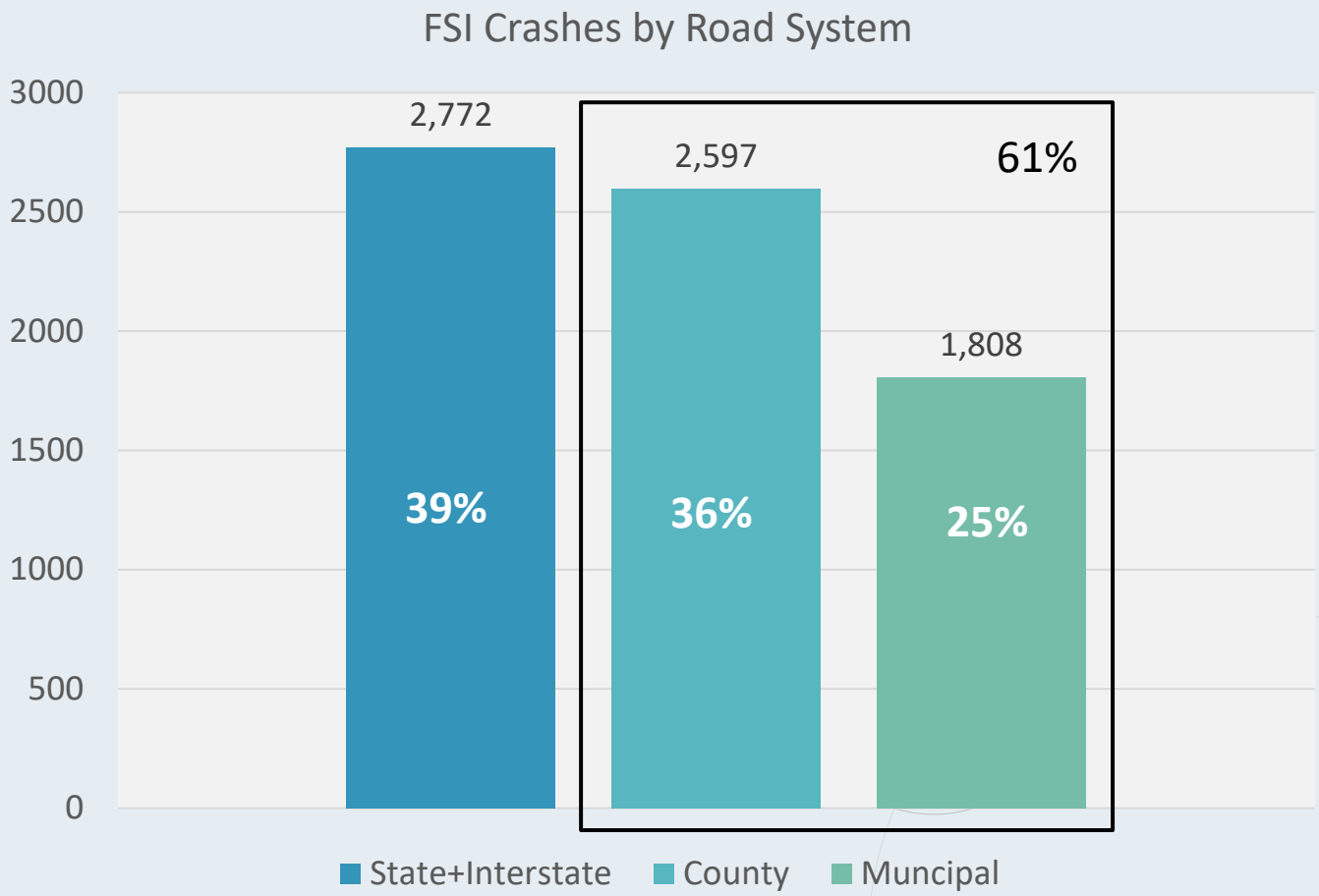
## Program Goals

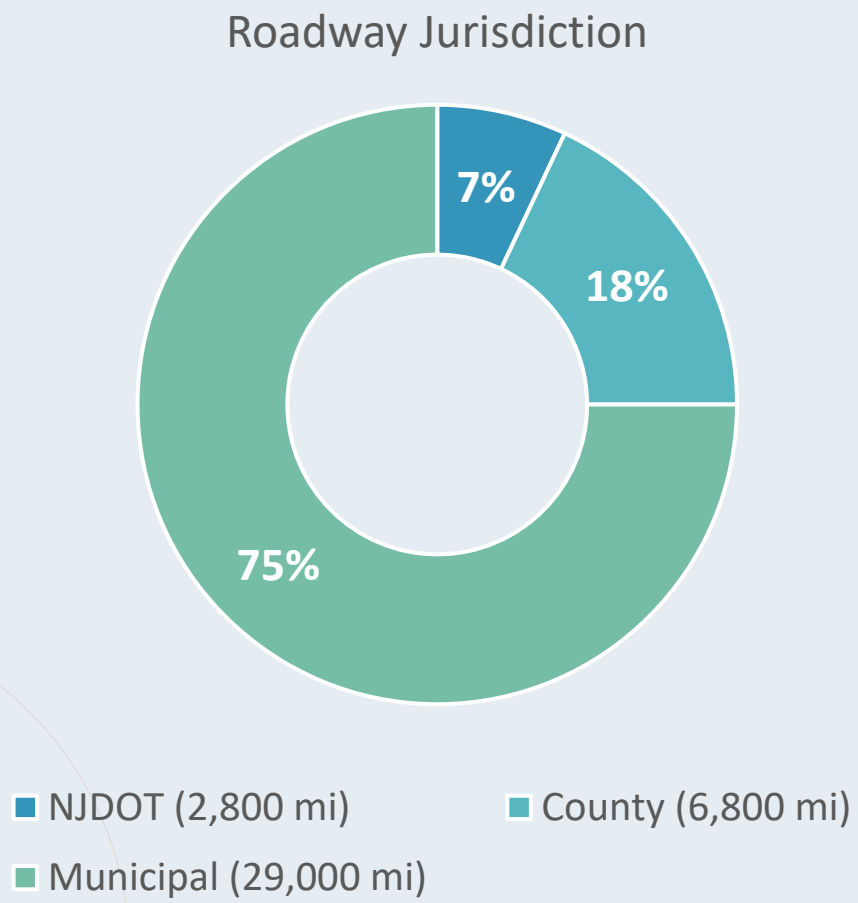
- Toward zero deaths on all public roads
- Performance-based goals consistent with SHSP
- Data-driven, strategic approach to improving highway safety

## Local Safety Program (LSP)

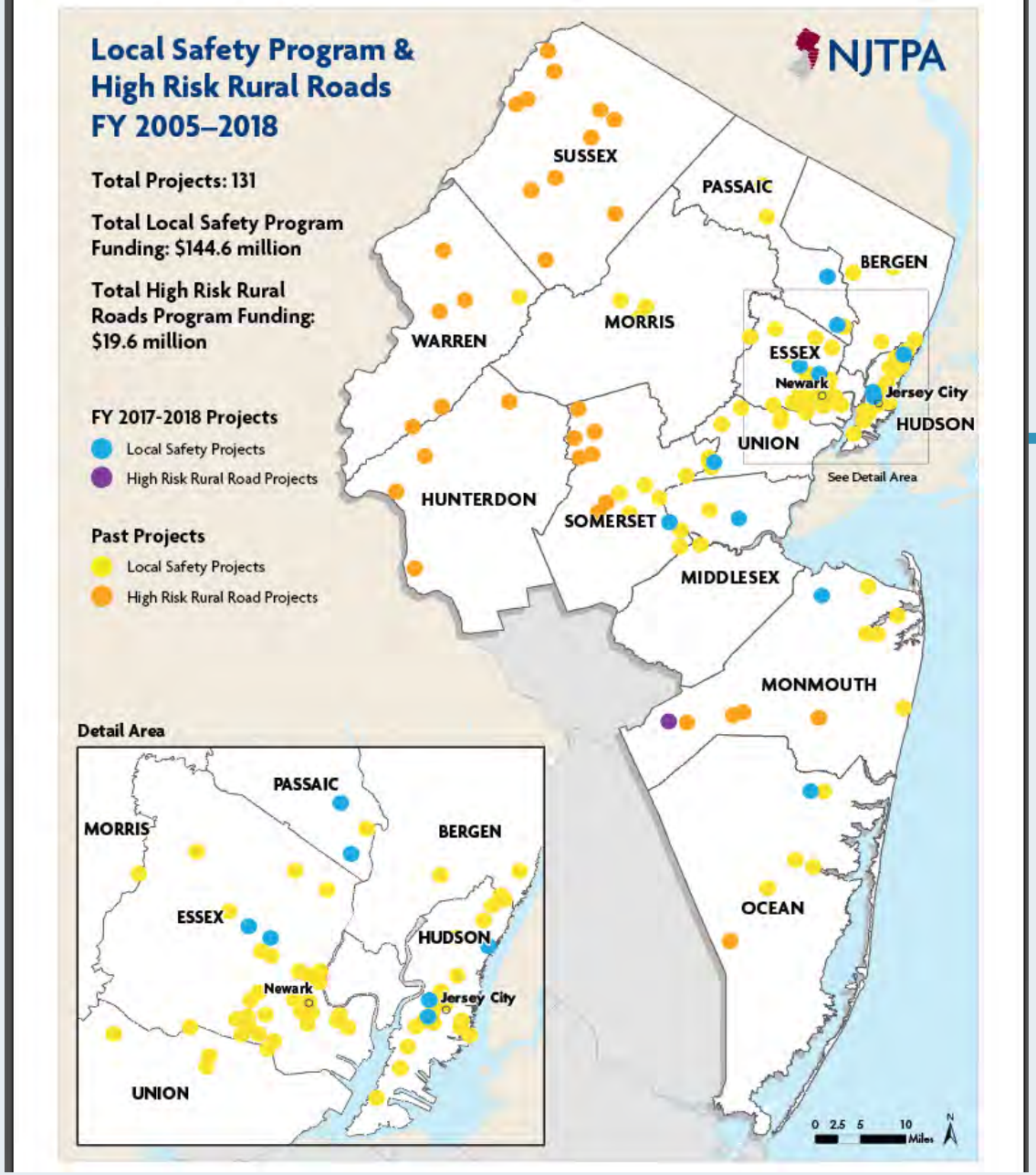
- NJDOT support
  - Dedication of HSIP funds
  - Technical assistance
  - Screening lists for MPOs
  - **Road Safety Audits**
- MPOs support
  - Local Road Safety
  - High Risk Rural Roads
  - CD/PE/FD Assistance Program

# FATAL & SERIOUS INJURIES BY ROADWAY SYSTEM (2014-2018)




https://www.nj.gov/transportation/refdata/accident/crash_summary_reports.shtm




# FEDERAL TRANSPORTATION FUNDING

- **Local Safety and High Risk Rural Roads Programs**
  - $145+ million in funding 2005-18 on County / Local Roadways
  - Relatively quick-fix safety improvements
- **HSIP funds –** emphasizes data-driven, strategic approach to improving highway safety
- **Network Screening** – identifies locations experiencing:
  - High crash frequencies
  - Severe crash injuries
  - Specific crash types such as right-angle or roadway departures
- **Community Outreach** – provides the public, local officials and stakeholders with opportunities to comment and ask questions

# RSA PURPOSE

**Formal safety performance examination by an independent, multidisciplinary audit team that identifies safety improvement opportunities for all road users.**

## Benefits

- Pro-actively address safety; reduce crashes
- Identify low-cost/high-value improvements
- Promote “safety culture”
- Provide continuous advancement of safety skills and knowledge
- Contribute feedback on safety issues for future projects
- Support optimized savings of lives, money and time

## Not meant to replace

- Design quality control
- Standard compliance
- Traffic or safety impact studies
- Safety conscious planning
- Road safety inventory programs
- Traffic safety modeling efforts


# RSA PROCESS

***Responsibilities:***

***Steps 1-2 & 7-8: Design Team/Road Owner***

***Steps 3-6: RSA Team***

# FHWA PROVEN SAFETY COUNTERMEASURES

20 countermeasures

Descriptions provided in handouts

# FHWA PROVEN SAFETY COUNTERMEASURES

- Clockwise from top:
  - Roundabout, Chesterfield Township, Burlington County
  - Backplates with Retroreflective Borders, Statewide
  - Road diet, Maplewood Township, Essex County
  - Pedestrian Hybrid Beacon (HAWK), Ocean City, Cape May County



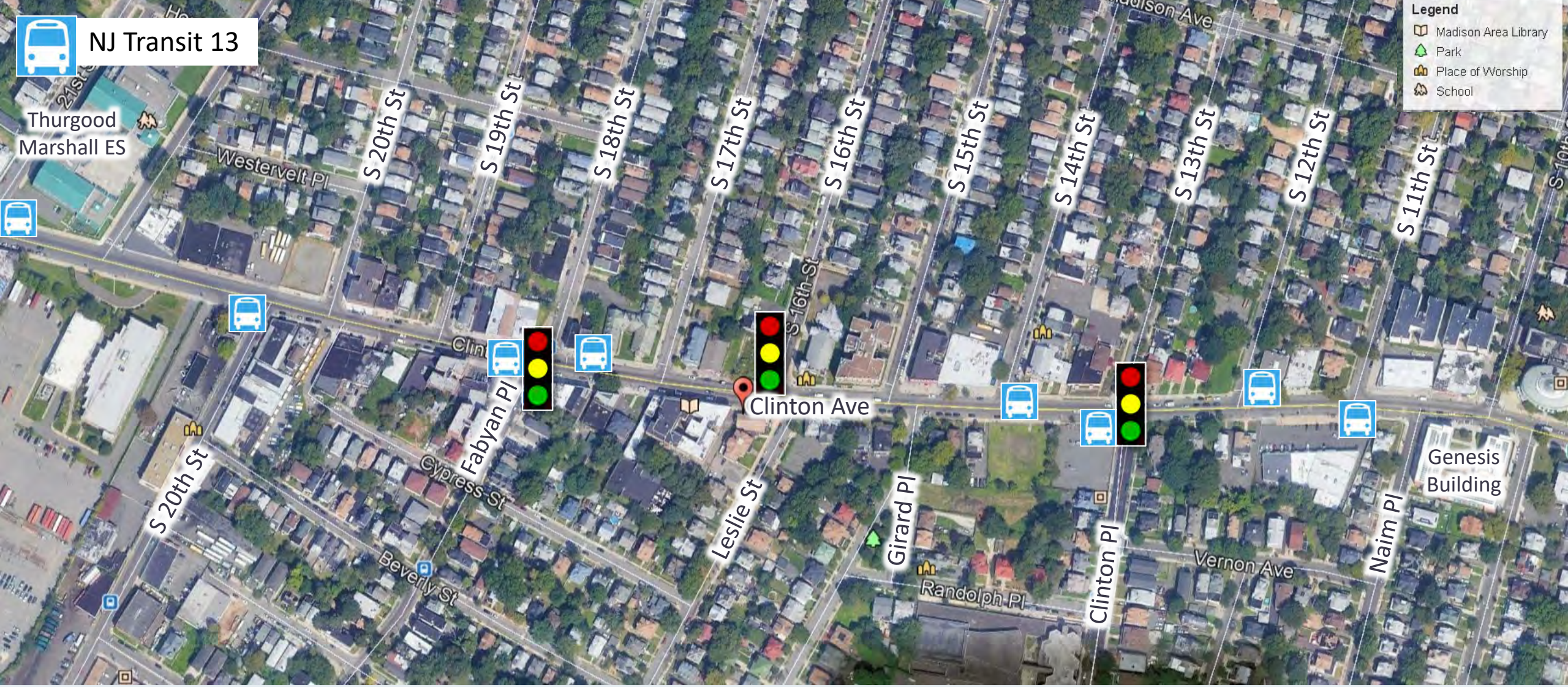
# ADDITIONAL CONSIDERATIONS

Curb Extensions

Hoboken City, Hudson County


Enhanced signing / pedestrian crossings

Bellevue City, WA




- Urban Minor Arterial
- Undivided, 2-lanes

# PROJECT AREA

- Sidewalk both sides
- Various crosswalk styles

# NETWORK SCREENING

## NJTPA County Ranking – 2012-2016 Data

### Top 100 Corridors

| Route | Regional | Pedestrian |
|---|---|---|
| Clinton Ave | #28: MP 0.07-1.07 | #8: MP 0.10-1.10 |

### Top 100 Intersections

| Location | All Crashes | Pedestrian |
|---|---|---|
| 13th St (MP 1.01) | - | #29 |

# CRASH DATA

2014-2018 Pedestrian/Bicyclist

- 21 crashes (20 Ped/1 Bike)
- Minor Injuries

2016-2018 Vehicular

- 111 crashes
- Primarily property damage only

## Overrepresentations

### Vehicular

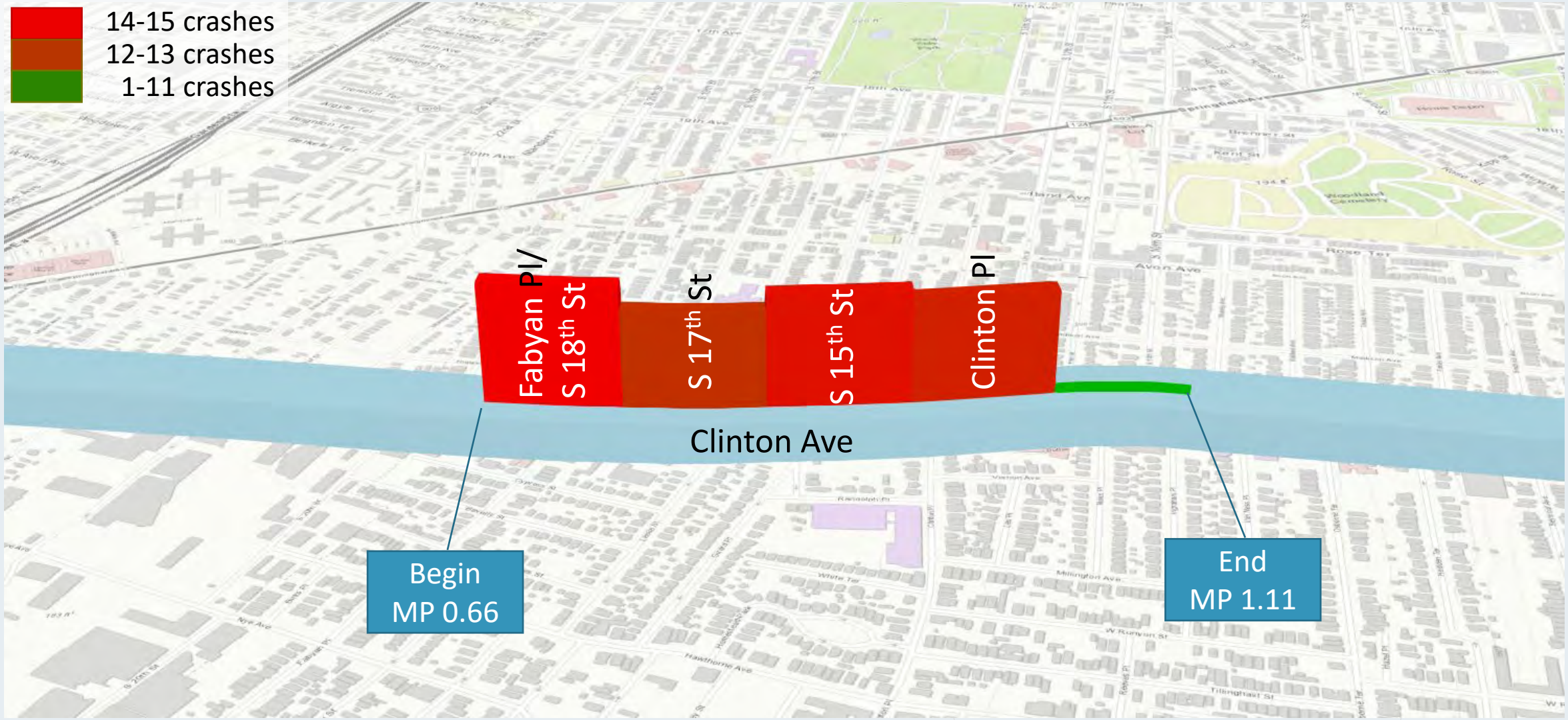
- Struck Parked Vehicle
- Left Turn
- Backing
- Fixed Object
- At Intersections
- Dry Surface
- Night

### Ped/Bike

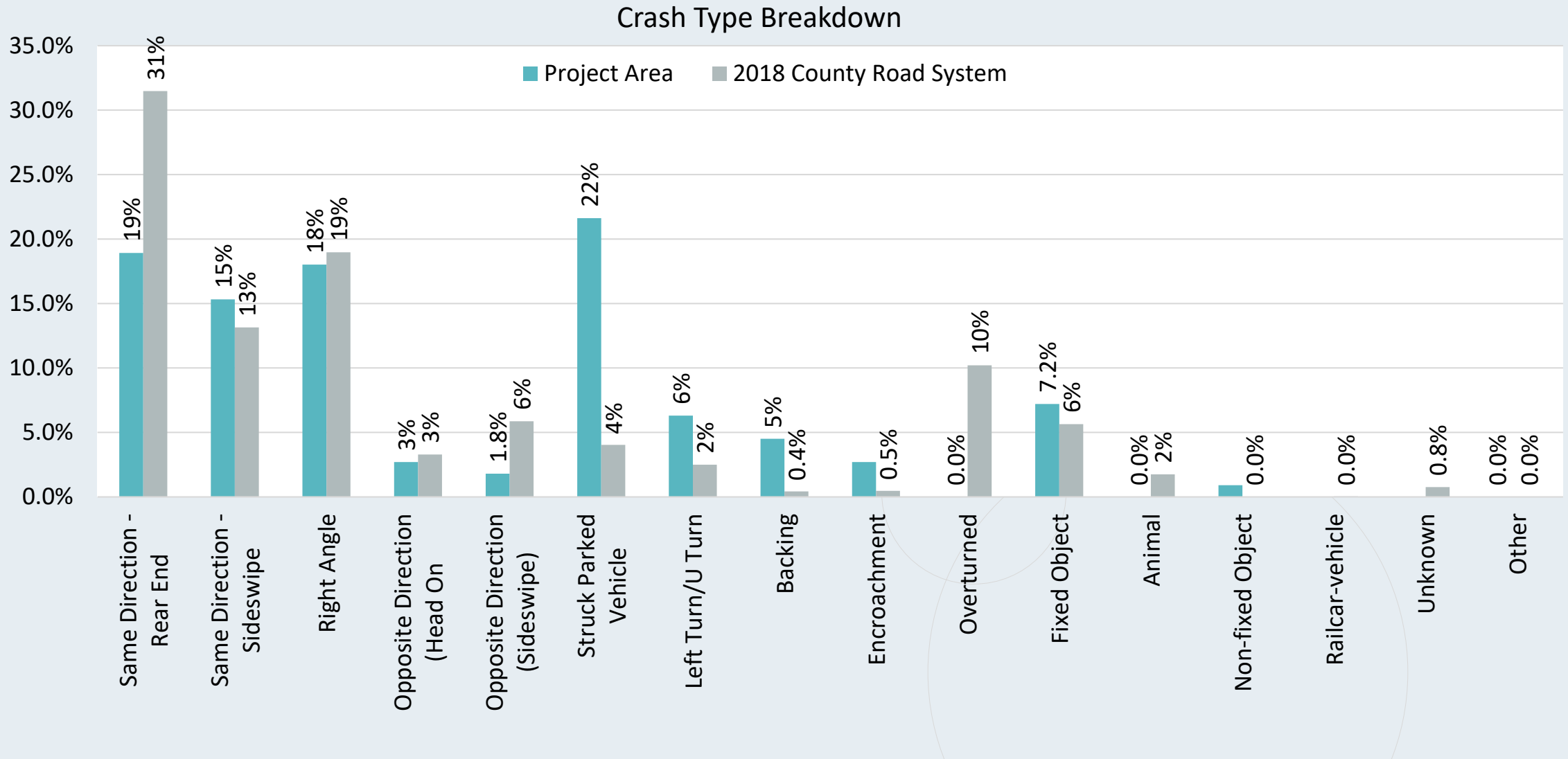
- Injury
- At Unsignalized Intersection
- Dry Surface
- Dawn/Dusk
- Night

# CRASHES: LOCATION IN RSA

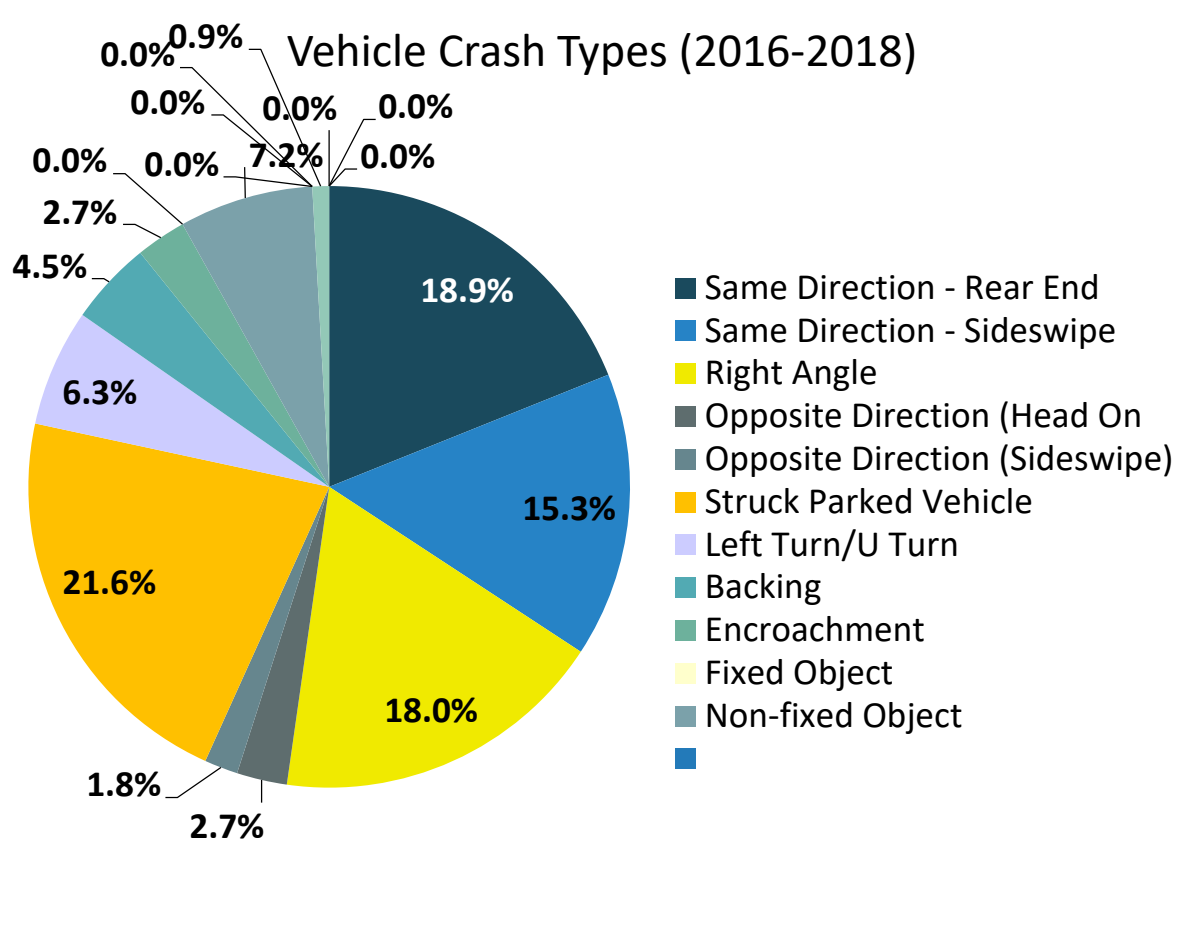
Histogram View by 0.1 Mile
Geocoded Crashes Only (2016-2018)

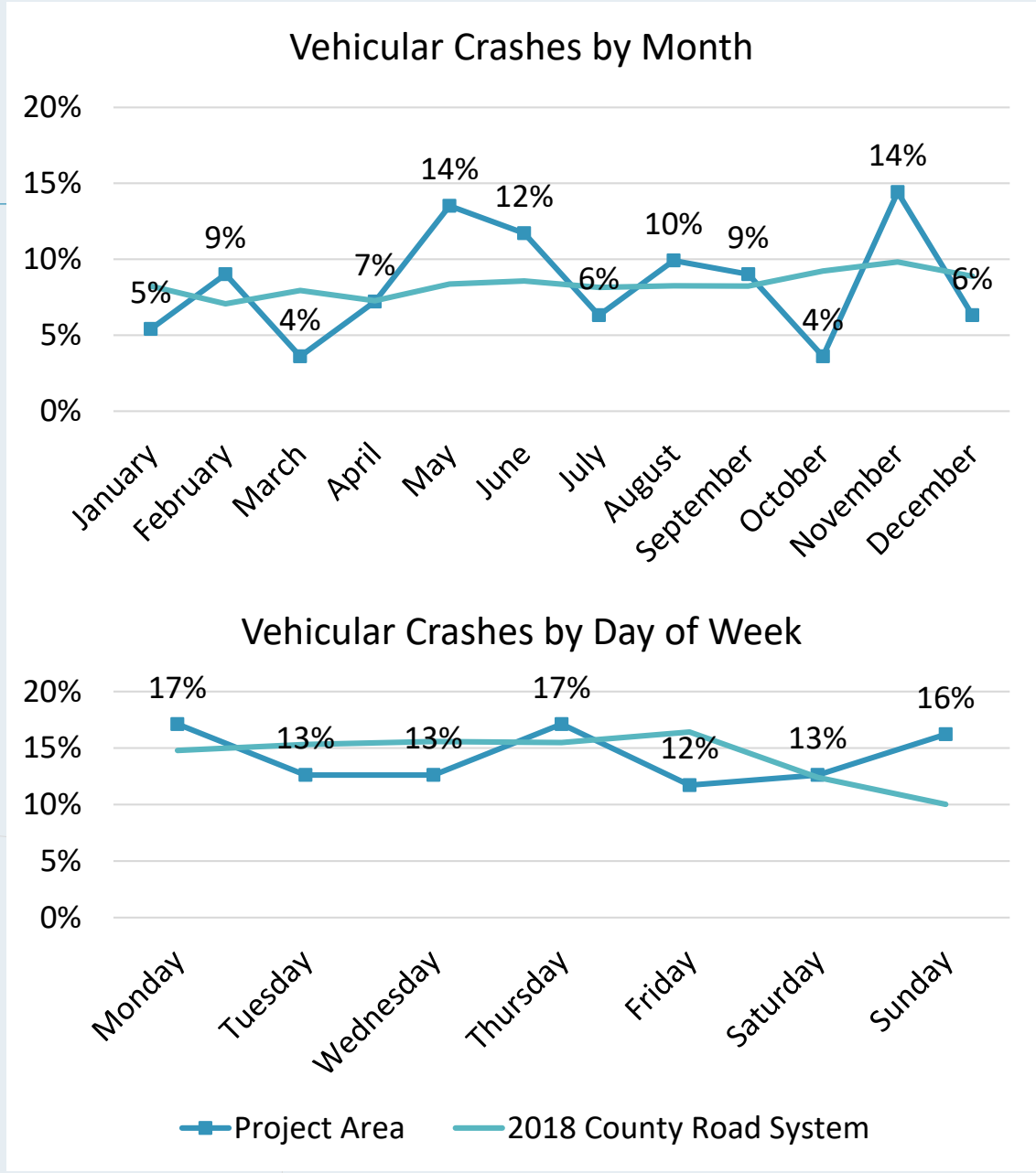


# CRASHES: RSA AREA v. COUNTY ROAD SYSTEM

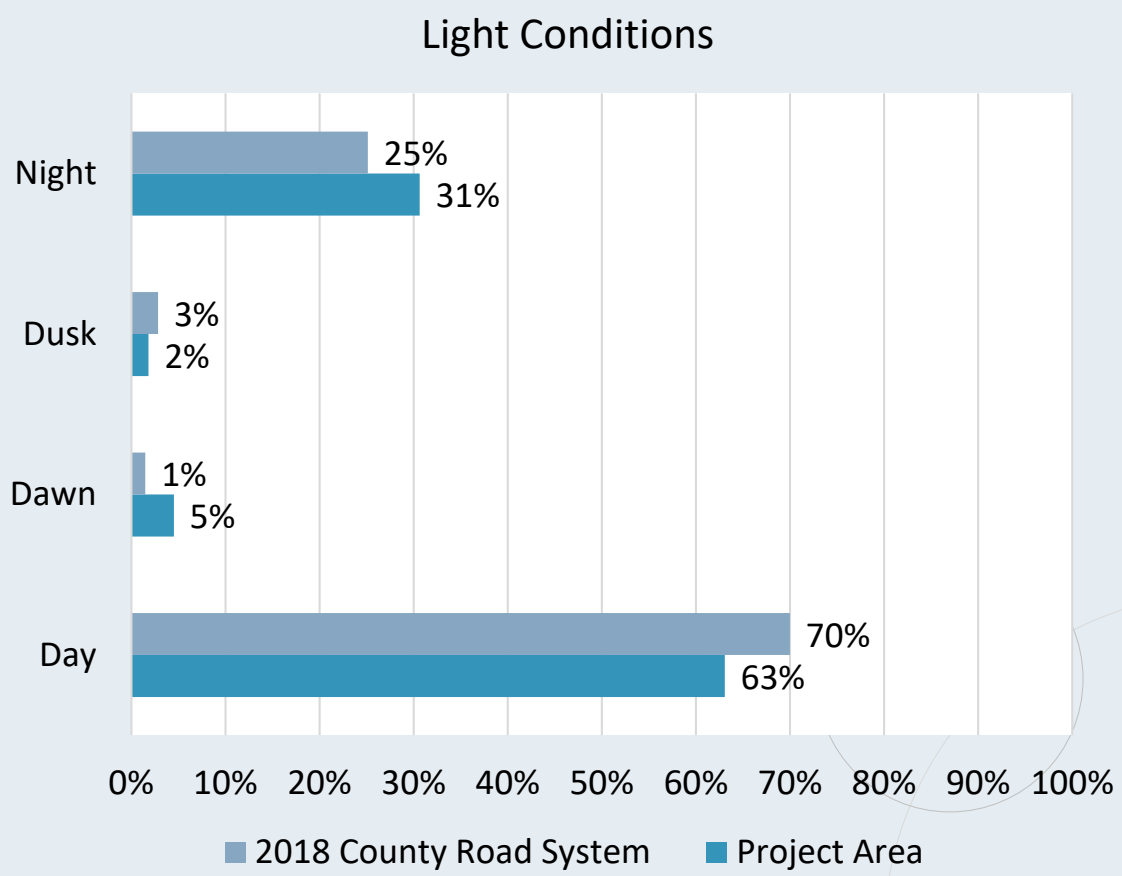


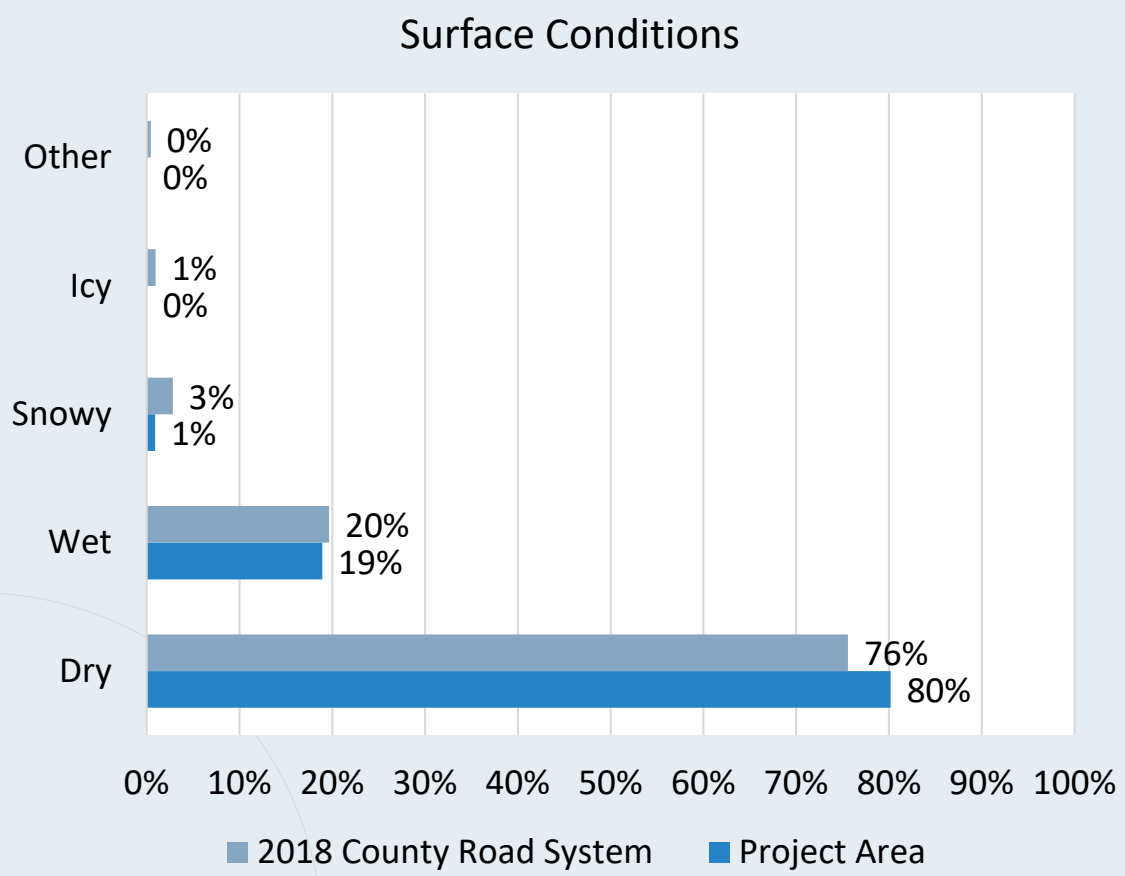
# CRASHES: TYPE & TIMES



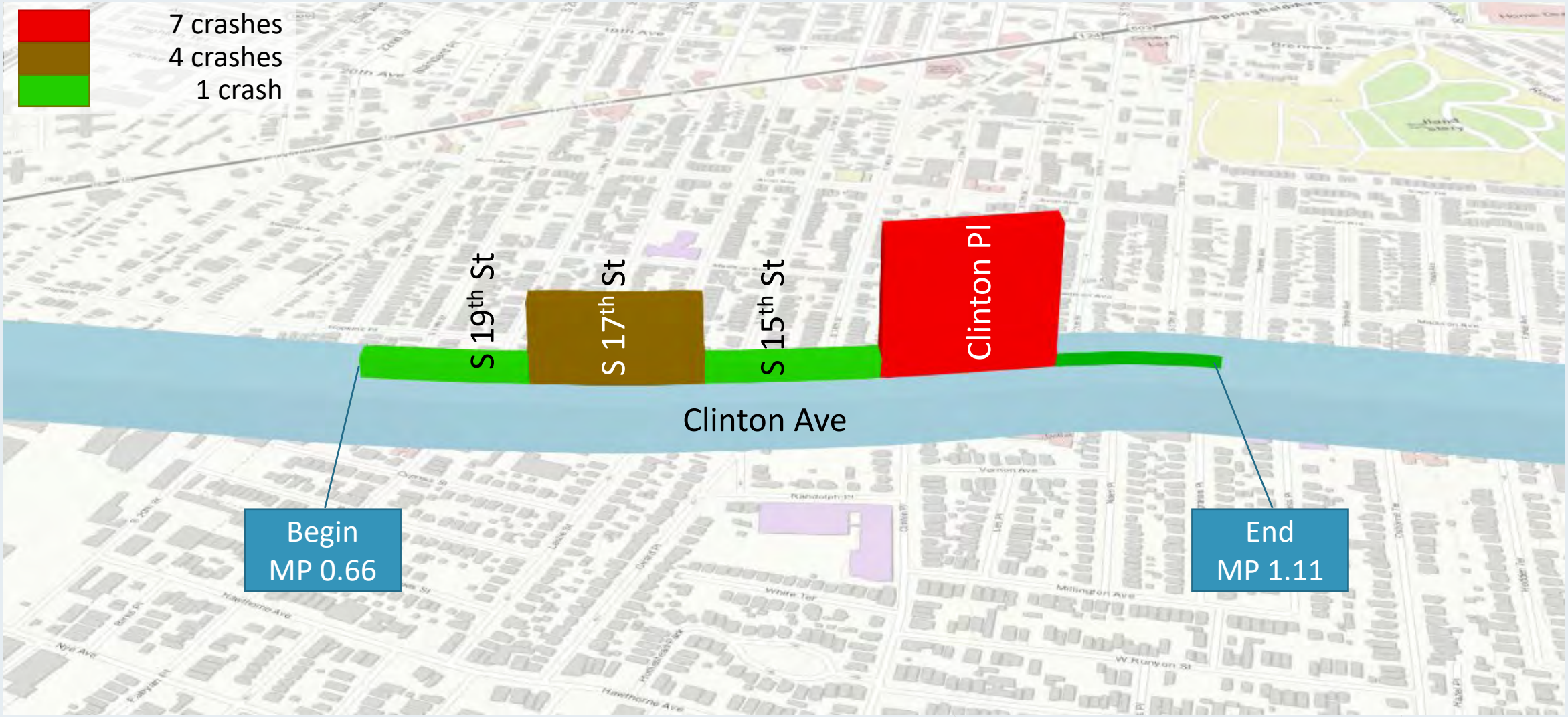
# CRASHES: LIGHT & SURFACE CONDITIONS



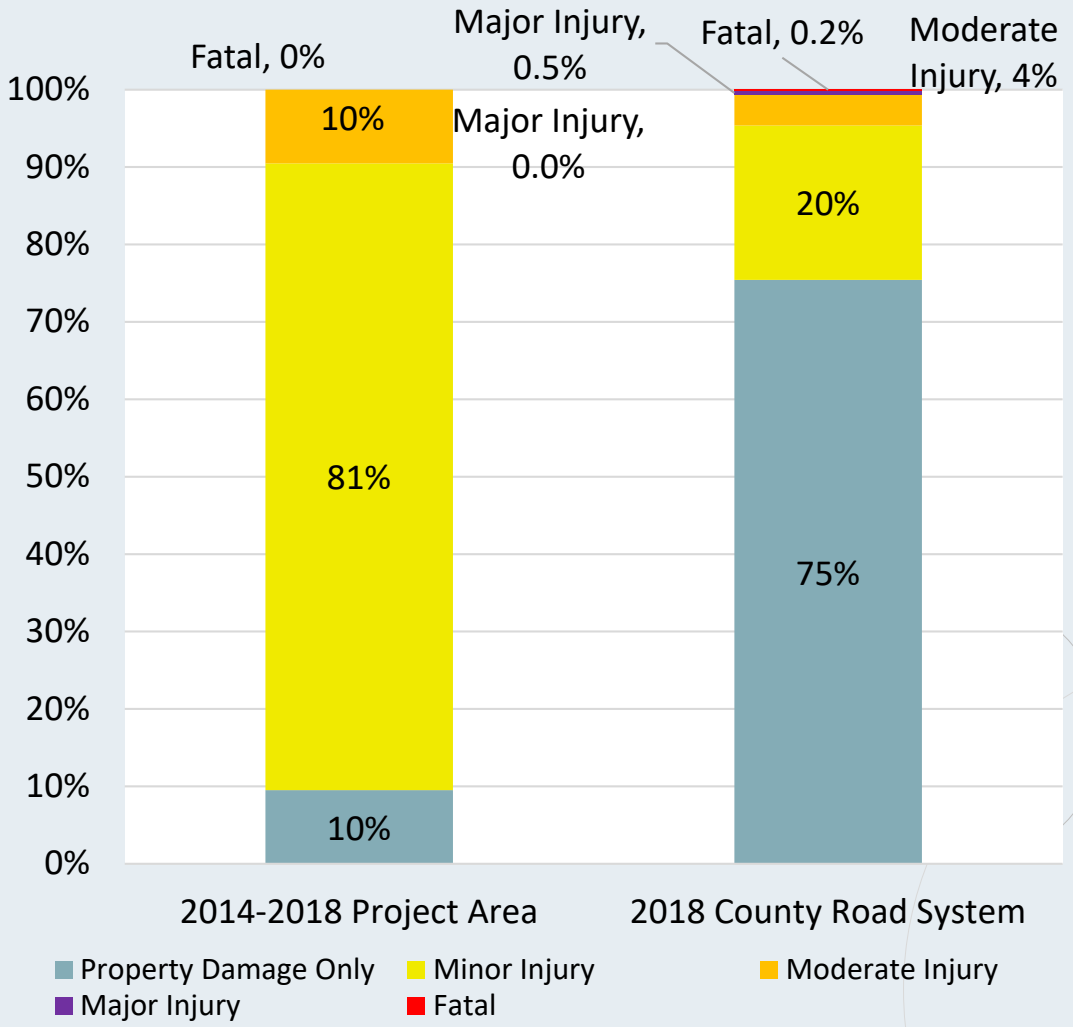



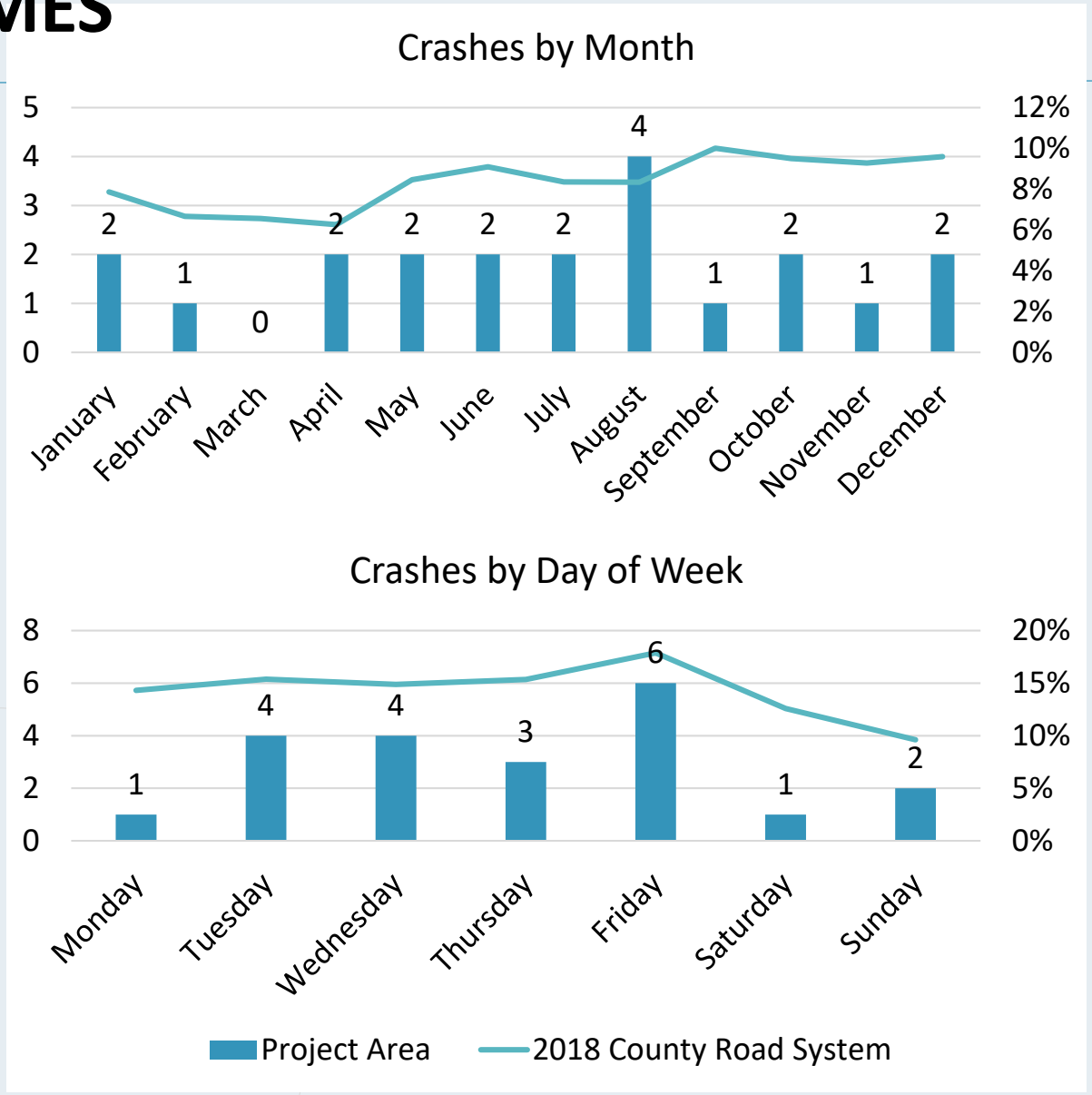
# PED/BIKE CRASHES: LOCATION IN RSA

Histogram View by 0.1 Mile
Geocoded Crashes Only (2014-2018)

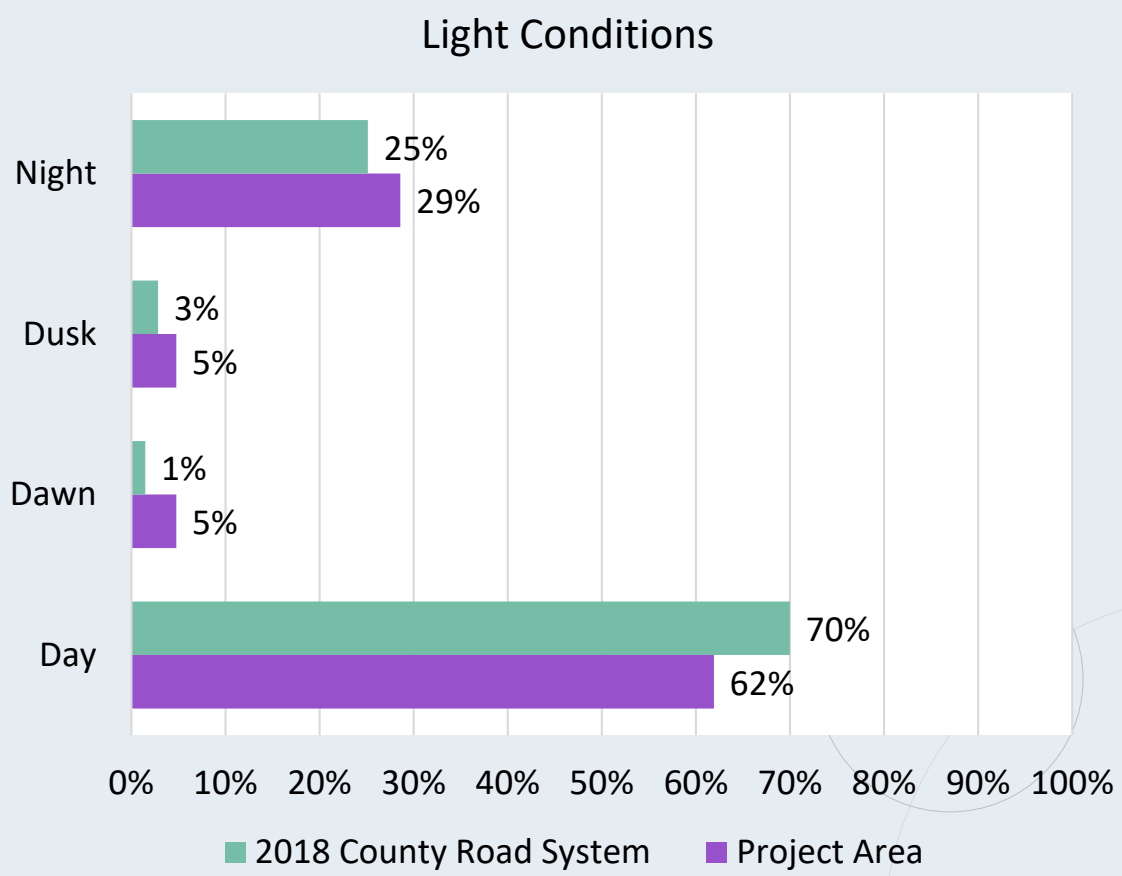


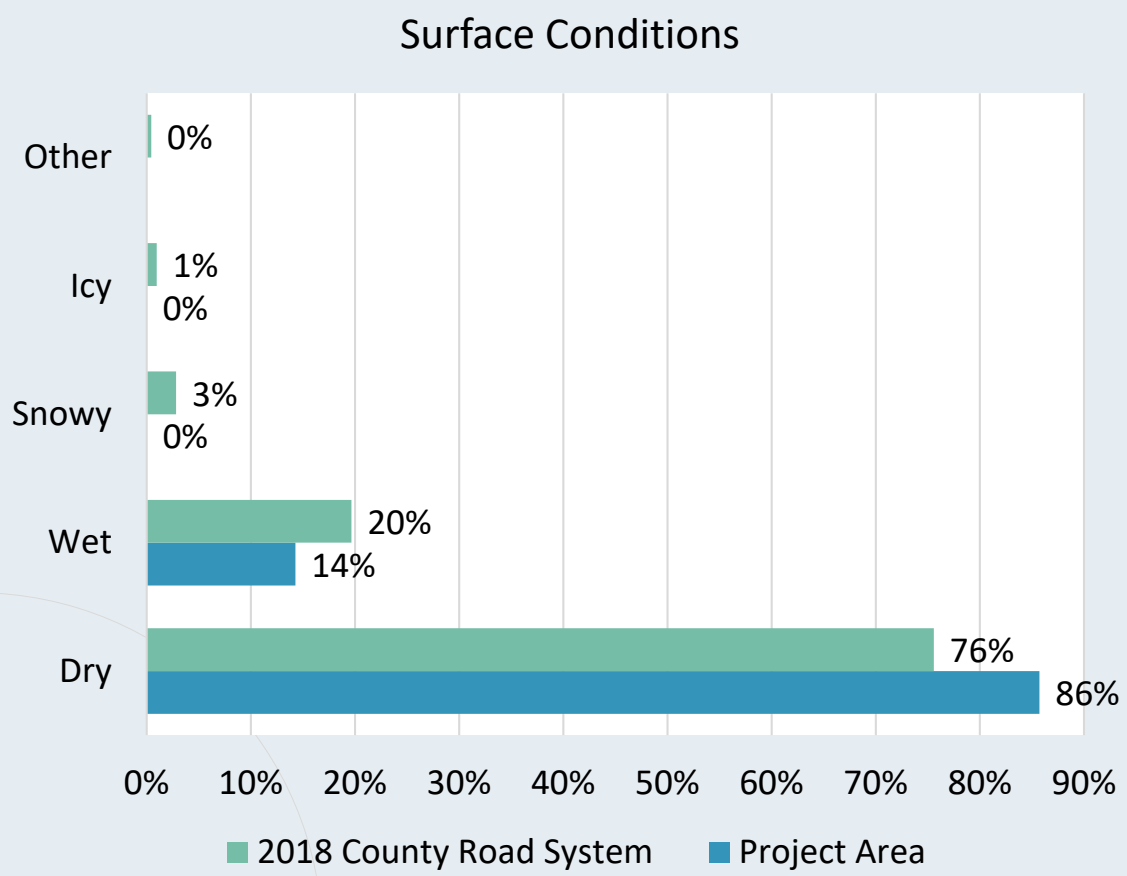
# PED/BIKE CRASHES: SEVERITY & TIMES

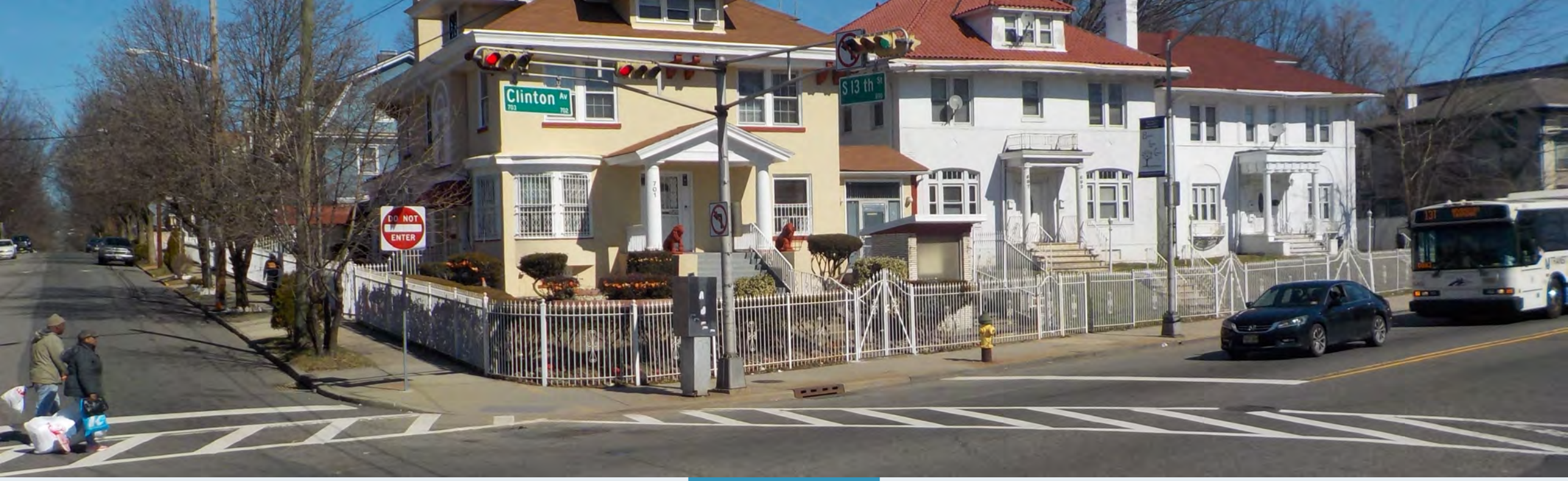


# PED/BIKE CRASHES: LIGHT & SURFACE CONDITIONS






# ONLINE FIELD VISIT & POST AUDIT

Photos and Video from August 18, 2020

# ONLINE FIELD VISIT & POST AUDIT

## Discussion

### Observations

- What elements of the road may present a safety concern?
- To what extent, to which road users, and under what circumstances?
- What corridor safety issues did you observe?
- What localized safety issues did you observe?

### Recommendations

- What opportunities exist to eliminate or mitigate identified safety concerns?
- What improvements would you make?
- Are any of the FHWA countermeasures beneficial?

# UNEVEN/CRACKED SIDEWALK

Examples:

- EB between 16th and 17th Sts (pictured)
- EB near Girard Pl
- WB near 12th St
- WB near S. 18th St

# UNMARKED PEDESTRIAN CROSSING; NOT ADA COMPLIANT

Examples:

- EB at 11th St (pictured)
- 12th St
- S. 14th St
- S. 18th St/Fabyan Pl
- S. 20th St

# NO BICYCLIST FACILITIES

- None observed during 2 field visits
- Typical pavement width = 50 feet


# PARKING VIOLATIONS

- Across from ‘T’ intersection
- Too close to corners, crosswalks, etc.
- Blocking driveways
- On sidewalk
- Blocking bus stops

# OUTDATED SIGNAL EQUIPMENT AND LAYOUTS

- 8” signal heads
- No countdown pedestrian signal heads
- No pushbuttons

# PEDESTRIANS CROSSING MIDBLOCK

- Not (or partially) at intersection or marked crossing
- Unexpected for vehicles


Clinton Ave
Newark
Masjid Fallahee
Minata Hair
Braiding Salon
Deliverance
Ecowest Food Market
North Porch Women
& Infants' Centers
0:00:00
0:02:17

# VIDEO

# NEXT STEPS

- Preparation of RSA Report
- Review/comments from RSA Team
- Preparation of Preliminary Final Report
- Road Owner Response
- Preparation of Final Report
- Approximate timeframe: 4 weeks


# THANK YOU

http://www.gpiprojects.com/HSIP/Essex

# APPENDIX I

## EXCERPTS FROM MUNICIPAL PLANS/REPORTS

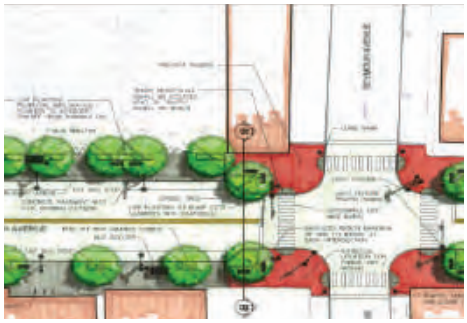
# NEWARK COMPLETE STREETS

EXCERPTS FROM

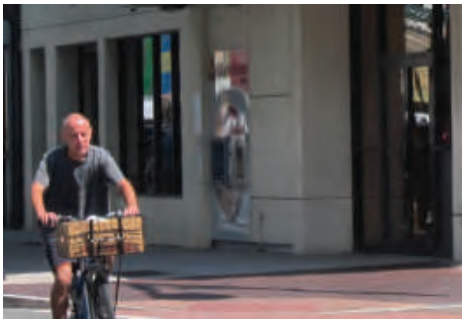
## DESIGN GUIDELINES and IMPLEMENTATION PLAN


**City of Newark, New Jersey**
**Department of Engineering**
**Division of Traffic and Signals**
**2016**

## Newark Complete Streets Policy Goals



1. Design All Streets as Complete Streets
   - Both new construction and reconstruction projects will be designed and built as complete streets



2. Create a Multi-Modal Network Connecting to Walk and Bike Trip Generators
   - Identify key walk and bike trip generators
   - Identify walk and bike corridors and network connections

3. Design for Safety
   - Safe walking, biking, transit and motor vehicle facilities

4. Establish a Checklist of Pedestrian, Bike and Transit Accommodation

5. Anticipate Future Demand for Walking and Biking

6. Design Intersections, Interchanges, and Bridges for use by Pedestrians and Bicycles

7. Design to Industry Standards


8. Make Provisions for Pedestrians and Bicycles when Closing Roads and During Construction

9. Design for Compliance with all ADA Requirements

## Sidewalk

The sidewalk plays a vital role in the movement of people throughout the streets of Newark. Sidewalk facilities enhance connectivity between people, businesses and employment centers. Designing sidewalks that are safe, accessible and well maintained can improve public health and maximize social capital by encouraging more people to take trips by walking. Newark's minimum sidewalk width is five feet; wide enough for two people to walk side by side. While five feet is the minimum, in many situations wider sidewalks may be desirable. A wider sidewalk is able to accommodate higher volumes of pedestrian traffic as well as streetside features such as sidewalk cafes, street furniture and street trees. Creating spaces where people can observe sidewalk activity, especially in retail or commercial areas, can foster a more vibrant and active streetscape. The AASHTO Guide for Planning, Design and Operation of Pedestrian Facilities provides a list of seven attributes of well-designed sidewalks.

Central Avenue - Street trees shade the sidewalk and buffer pedestrians from moving vehicles.

18th Avenue - Street trees shade the sidewalk and lower pedestrian volumes enable a thinner sidewalk width.

## Walking Zone

The walking zone or throughway zone is the primary pedestrian pathway within the sidewalk. This zone should be kept clear of all obstructions. In residential settings the walking zone should be a minimum of five feet wide; in downtown or commercial areas the walking zone should be a minimum of eight feet wide. The addition of streetside features such as trees or benches require additional sidewalk width beyond the five foot minimum. The Streetside Features section on page 48 provides more detail on the walking zone as well as other sidewalk elements.


Market Street - A wide walking zone or throughway zone accommodates high pedestrian volumes.

## Curb Ramps

Curb ramps provide access between the sidewalk and the street for people who use wheelchairs as well as people who may be pushing strollers or luggage. Accessible curb ramps are required by the Americans with Disabilities Act (ADA) at all crosswalks or intersections. Ramp orientation should be directly in line with the corresponding ramp on the opposite side of the intersection, this may require some corners to provide two ramps for each possible street crossing. The curb ramp slope should not exceed eight and one third percent, although there are exceptions in cases where achieving this grade is not technically possible. All ramps should include a detectable warning surface or truncated dome. These truncated domes are essential for guiding vision impaired people across the intersection and to the curb ramp.

Ferry Street - Curb ramps on Ferry Street ensure ADA compliance, providing access between the sidewalk and the street for people who use wheelchairs or with pushing strollers.

## Protected Bike Lanes

A protected bike lane is an exclusive bike facility that is a combination of a separated path and an on street bike lane. The protected bike lane is physically separated from both traffic and the sidewalk and can be one-way or two-way, at street level, sidewalk level or at an intermediate level. The protected bike lane can be separated from traffic and pedestrians by raised medians, on-street parking or bollards. Physically separating bicycles from traffic creates a safer bicycling experience that is more appealing to a wider audience.

Mt. Prospect Avenue - Parked vehicles create a protective barrier from traffic.

## Shared Use Path

Similar to cycle tracks, shared use paths are physically separated from motor vehicle traffic with an open space or barrier. Shared use paths differ from cycle tracks in that they are designed to include pedestrians and other recreational travel modes such as in-line skates and people with disabilities. Shared use paths often traverse through park or riverfront space and can provide connections between various neighborhoods. Rail trails and canal trails are examples of shared use paths that have been created from the right-of-way of abandoned railroad lines and canals. Shared use paths are well suited for installation along streets with high travel speeds, high traffic volumes, high volumes of truck traffic and along streets with extra lanes or lane width.

West Side Park - The shared use path can be used by bicyclists, pedestrians as well as in-line skaters and skateboarders.

## Speed Hump

Speed humps are vertical traffic calming devices designed to slow traffic speeds on low-volume low-speed roads. Speed humps should be three to four inches high and 12 to 14 feet wide with a ramp length of three to six feet. Speed humps are most appropriate on residential streets where traffic volumes are low and intended travel speeds are low. The decision to install a speed hump on any residential street should be made with the full participation and support of the local residents. Speed humps can effectively reduce vehicle speeds as much as 15 to 20 mph.

Somme Street - A speed hump slows travel speeds reinforcing the neighborhood character of the street.

## Speed Table

Speed tables are installed in mid-block locations and unlike speed humps raise the entire wheel base of a vehicle to reduce its travel speed. Typical height of a speed table is three to three and one half inches, with a length of 22 feet. Speed tables can be installed on streets with speeds ranging from 25 to 45 mph and are appropriate for a wider range of street types including residential and collector streets, as well as transit and emergency vehicle routes. Speed tables function well as a compliment to mid-block crossings which can be stripped on the flat top of the speed table.

A speed table creates an at grade mid-block street crossing while also slowing vehicle speeds. Source: NACTO.org

## Speed Cushion

Speed cushions are speed humps or speed tables that have wheel cutouts that allow large vehicles such as buses and emergency vehicles to pass unaffected but still effectively reduce automobile speeds. They are effective on emergency and transit routes where controlling speed is a concern but allowing unimpeded passage of larger vehicles is also important.

A speed cushion allows large vehicles such as buses and firetrucks to pass the speed hump unaffected. Source: NACTO.org

## Rumble Strips

Rumble strips are grooves in the roadway or rows of raised pavement markers placed on the roadway that produce sound and vibration when vehicle tires pass over them. In urban environments such as Newark these noise and vibration effects are intended to alert driver of upcoming roadway changes such as a stop sign or pedestrian crossing that require a reduction in speed. Rumble strips can interfere with bicycle travel, causing excessive vibration and potentially causing a bicyclist to lose control of their bicycle. For this reason rumble strips are not recommended on major bicycle thoroughfares and when installed care should be taken to leave adequate unobstructed pavement width for bicycle travel.

Bloomfield Avenue - Rumble strips alert drivers to an upcoming signal and reinforce slower speeds.

## Planters

Planter pots are aesthetically pleasing and help define the pedestrian environment. However, they are maintenance intensive and their use should be selective and limited to areas with sufficient maintenance programs. Planters can be installed as pots or containers which sit on the sidewalk. Raised planters are built into the streetside environment either in the furnishing or frontage zone. Raised planters 18 inches in height can also be used as seating.

Broad Street - Planters beautify the Furnishing Zone and buffer pedestrians from traffic.

## Green Stormwater Infrastructure

Green stormwater infrastructure is designed to collect, detain and slowly release runoff from storm events. An infiltration planter or rain garden is a green infrastructure improvement that can be incorporated into the streetside, these planters capture and filter storm water runoff from streets and sidewalks. They require annual maintenance and should only be installed in areas that have established maintenance programs. Infiltration planters can have raised sides or they can be shallow depressions. Both styles are planted with deep-rooted native plans and grasses that are both wet and dry tolerant. Gardens should be positioned near runoff sources such as downspouts, parking lots, driveways and other impervious surfaces.

Green stormwater infrastructure along Summit Street on NJIT's campus collects and filters rainwater, cleaning the water and slowing its entrance into the City's sewer system.

## Bump Outs

Bump outs, also known as curb extensions or bulb outs, are potions of sidewalk that protrude into and physically narrow the roadway. Bump outs create sidewalk space in areas of the roadway that were formerly used for parking or shoulder space. By narrowing the roadway bump outs reduce the amount of space and time that it takes for a pedestrian to cross the street. Additionally, the narrowed roadway creates a traffic calming effect, encouraging drivers slow down. These two factors lead to safer intersections with fewer pedestrian and vehicle crashes.

Corner bump outs can be designed in many ways. They can bump out into only one street or both streets of an intersection. Depending on need bump outs can be at the intersection or mid-block. Designs elements can include the addition of bus shelters, street trees, rain gardens, benches and other pedestrian amenities.

Ferry Street - Corner bump outs shorten the crossing distance and improve pedestrian visibility.

## Gateway

These are bump outs at the mouth of an intersection. This is referred to as a gateway treatment because it is intended to slow traffic entering the street, signal a pedestrian friendly environment and serve as the entrance to a new district or neighborhood. In this configuration the bump out should be at least as wide as the crosswalk but it can extend further depending on visual effect and the types of streetside features included in the design. The bump out should be designed one to two feet shorter than the parking lane to provide a clear demarcation between the two features.

Bloomfield Avenue - The gateway treatment slows traffic and signals to drivers that they are entering a special district.

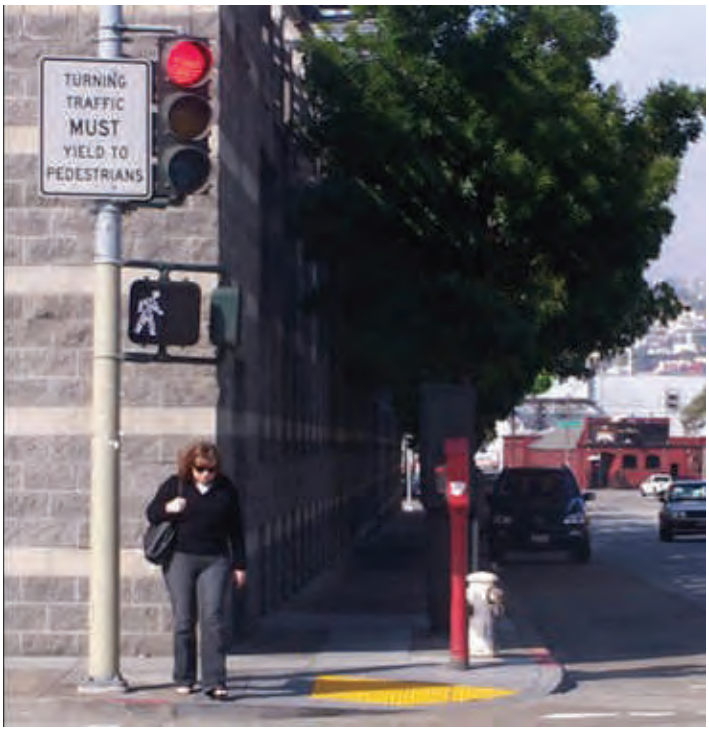
## Signals and Operations

Traffic signals play an important role in the overall functionality and quality of Newark's transportation system. Signal timing influences delay, compliance, safety and mode choice. Traffic signals that do not provide enough time for pedestrians to comfortably cross a street may create an unpleasant experience and discourage walking. Traffic signals that are too long may encourage pedestrians and bicyclists to enter the intersection before their turn creating a safety risk and disrupting vehicle traffic flow. The following signal treatments prioritize pedestrian movement through intersections. These signal treatments are designed for high pedestrian and high vehicle volume intersections where conflicts between pedestrians and vehicles are frequent.


Lock Street

## Leading Pedestrian Interval

A leading pedestrian interval gives pedestrians a three to seven second head start when entering an intersection with a corresponding green signal in the same direction of travel. Leading pedestrian intervals are appropriate for intersections that have high levels of right or left turning traffic and high level of pedestrians. Providing pedestrians with a head start increases visibility and gives them priority. This head start results in a reduction of pedestrian-vehicle conflicts as Fayish and Gross found in "Safety Effectiveness of Leading Pedestrian Intervals Evaluated by a Before-After Study with Comparison Groups". Installation of leading pedestrian intervals reduced pedestrian-vehicle conflicts by as much as 95 percent.




A leading pedestrian interval allows pedestrians to begin crossing the intersection before vehicles, improving pedestrian visibility and increases crossing time. Source: fhwa.gov

## Exclusive Pedestrian Phase

There are two types of pedestrian phasing; exclusive pedestrian phasing and concurrent pedestrian phases. During concurrent pedestrian phases pedestrian movements through the intersection become active at the same time as the associated through vehicle traffic, allowing pedestrians and vehicles to move at the same time. During exclusive pedestrian phasing no vehicles are allowed to move for the duration of the pedestrian crossing interval. This type of phasing provides maximum protection for pedestrian as no vehicle conflicts are possible. Unfortunately, adding an additional phase exclusively for pedestrians can result in significant delays for vehicles. For this reason exclusive pedestrian phasing should only be used where absolutely necessary, primarily high volume pedestrian traffic intersections that also have high rates of pedestrian-vehicle crashes.


An exclusive pedestrian phase stops all directions of traffic and allows all pedestrian to cross simultaneously, including diagonally. Source: buryinc.com

## Countdown Pedestrian Signal

Countdown pedestrian signals add an additional level of certainty to the walking person (Walk) and upraised hand (Don't Walk) signals by showing the number of seconds pedestrians have to safely cross the street. The clock reduces the chance of getting trapped in an intersection when a walk signal unexpectedly changes to "don't walk." By providing more information about the time remaining to cross, countdown pedestrian signals allow pedestrians to make more informed decisions about their ability to safely cross an intersection.

A minimum of seven seconds of walk interval should be provided during every pedestrian signal phase. Depending upon the width of the roadway and the presence of elderly or disabled pedestrians a longer walk interval may be appropriate. Average pedestrian speed is three and one half feet per second but this metric can be lowered to three feet per second if needed due to slower moving pedestrians.

Wilson Avenue - A countdown signal displays the time remaining to cross the intersection.

7R4-d 090612

# Resolution of the City of Newark, N.J.

NO. 7R4-D

Date of Adoption SEP 06 2012

## Title Page

**Dept/ Agency:** Engineering
**Action:** ( ) Ratifying (X) Authorizing ( ) Amending
**Type of Service:** Adopting a Policy
**Purpose:** Implementation of the New Jersey Department of Transportation (NJDOT)Complete Streets Policy #703)
**Additional Information:**
Provides a comprehensive, integrated, connected multi-modal network of transportation options for all City street projects, both construction and reconstruction, excluding maintenance

CITY CLERK'S OFFICE
NEWARK, N.J.
ROOM 309
2012 AUG 29 A 9 2

Approved as to Form and Legality on Basis of Facts Set Forth

Corporation Counsel

Factual contents certified by

Title

Council Member _____ presents the following Resolution:

FORM 2

# Resolution of the City of Newark, N.J.

NO. 7R4-D

Date of Adoption SEP 0 6 2012

Approved as to Form and Legality on Basis of Facts Set Forth

Corporation Counsel

Factual contents certified by

Title

Council Member Council of the Whole presents the following Resolution:

**WHEREAS**, the City of Newark is committed to creating street corridors and intersections that safely accommodate all users of all abilities; and

**WHEREAS**, the State Department of Transportation adopted a Complete Streets Policy (Policy No. 703), effective December 3, 2009, for all projects funded through the Department's Capital Program and strongly encouraged the adoption of similar policies by local jurisdictions, such as the City of Newark, that apply for funding through Local Aid Programs; and

**WHEREAS**, a Complete Street is defined as a means to provide safe access for all users by designing and operating a comprehensive, integrated, connected multi-modal network of transportation options; and

**WHEREAS**, the benefits of Complete Streets include the following:

· Improve safety for pedestrians, bicyclists, children, older citizens, non-drivers and the mobility challenged as well as those that cannot afford a car or choose to live car free;

· Provide connections to bicycling and walking trip generators such as employment, education, residential, recreation, retail centers and public facilities;

Promoting healthy lifestyles;

· Create more livable communities;

· Reduce traffic congestion and reliance on carbon fuels thereby reducing greenhouse gas emissions;

· Improving fiscal economy, by incorporating sidewalks, bike lanes, safe crossings and transit amenities into the initial design of a project, thus sparing the expense of retrofits later; and

**WHEREAS**, the City of Newark wishes to implement the Complete Streets Policy though the planning, design, construction, maintenance and operation of new and retrofit transportation facilities, enabling safe access and mobility of pedestrians, bicyclists, transit users of all ages and abilities; and

**WHEREAS**, it is the intent of the City of Newark, to the extent practicable and not otherwise exempted, to apply the City of Newark Complete Streets Policy to include all public () roadways,, bridges and building projects in the City of Newark.

**NOW, THEREFORE, BE IT RESOLVED BY THE MUNICIPAL COUNCIL OF THE CITY OF NEWARK, NEW JERSEY, THAT:**

The Municipal Council of the City of Newark formally adopts the Complete Streets Policy with the following goals and objectives:

No. 7R4-D

Date SEP 0 6 2012

1. All City of Newark public street projects, both new construction and reconstruction, shall be designed and constructed as "Complete Streets." The "Complete Street" accommodates all modes of transportation, including but not limited to, travel by pedestrians, bicyclists, public transit, and other motorized vehicles and their passengers.

2. Create a comprehensive, integrated, connected multi-modal network by facilitating connections to bicycling and walking trip generators such as employment, education, residential, recreational and public facilities, as well as retail and transit centers.

3. Provide safe and accessible accommodations for existing and future pedestrian, bicycle and transit facilities.

4. Establish a checklist of pedestrian, bicycle and transit accommodations such as accessible sidewalks curb ramps, crosswalks, countdown pedestrian signals, signs, curb extensions, pedestrian scale lighting, bike lanes, and shoulders for consideration in each project where City jurisdiction applies.

5. Transportation facilities constructed for long-term use shall anticipate likely future demand for bicycling and walking facilities and not preclude the provision of future improvements.

6. Designs shall address the need for bicyclists and pedestrians to cross corridors, as well as travel along them, in a safe, accessible and convenient manner; therefore, the design of intersections, interchanges and bridges shall anticipate use by bicyclists and pedestrians.

7. Bicycle and pedestrian facilities shall be designed and constructed to the best currently available standards and practices including the New Jersey Roadway Design Manual, the AASHTO Guide for the Development of Bicycle Facilities, AASHTO's Guide for the Planning, Design and Operation of Pedestrian Facilities, NACTO Urban Bikeway Design Guide and the Manual of Uniform Traffic Control Devices.

8. Provisions shall be made for pedestrians and bicyclists when closing roads, bridges or sidewalks for construction projects as outlined in NJDOT Policy #705 - Accommodating Pedestrian and Bicycle Traffic During Construction.

9. Improvements shall comply with Title VII Environmental Justice, Americans with Disabilities Act (ADA) and complement the context of the surrounding community.

10. Exemptions to the Complete Streets Policy shall be presented for final decision to the Director of Engineering in writing and documented with supporting data that indicates the reason for the decision and are limited to the following:

    a) Non-motorized users are prohibited on the roadway.

    b) Scarcity of population, travel and attractors, both existing and future, indicate an absence of need for such accommodations.

    c) Cost of accommodations is excessively disproportionate to cost of project, more than twenty (20%) percent of total costs.

SEP 0 6 2012

d) The safety or timing of a project is compromised by the inclusion of Complete Streets.

e) Detrimental environmental or social impacts outweigh the need for these accommodations.

An exemption other than those listed above must be documented with supporting data and must be approved by the Director of the Department of Engineering.

11. A fully executed copy of the Complete Streets Policy shall be filed with the Office of the City Clerk by the Director , Department of Engineering or his designee.

**STATEMENT**

The City of Newark formally adopts a Complete Streets Policy, which will require that all City of Newark public street projects, both new construction and reconstruction (not including maintenance), shall be designed and constructed as "Complete Streets." The "Complete Street" accommodates travel by pedestrians, bicyclists, public transit and other motorized vehicles and their passengers. ]

CERTIFIED TO
BY ME THIS
SEP 1 2 2012

Do not use space below this line

*RECORD OF COUNCIL VOTE ON FINAL PASSAGE*

| Council Member | AYE | NAY | NV | AB | Council Member | AYE | NAY | NV | AB | Council Member | AYE | NAY | NV | AB |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Amador | ✓ | | | | Gonzalez | ✓ | | | | Rice | ✓ | | | |
| Baraka | ✓ | | | | Quintana | ✓ | | | | Sharif | | | | ✓ |
| Crump | | | | ✓ | Ramos, Vice Pres. | ✓ | | | | Payne, President | | | | ✓ |

✓ Indicates Vote AB - Absent NV - Not Voting

Adopted at a meeting of the Municipal Council of the City of Newark, N.J., SEP 0 6 2012

Presidet of the Council

City Clerk

This Resolution when adopted must remain in the custody of the City Clerk. Certified copies are available.

12-1511

EXCERPTS FROM

# REPORT

# Newark Greenstreets Initiative

## Planning & Implementing Green Stormwater Infrastructure

**March 20, 2015**

**Prepared by:**

# 1 Introduction

The City of Newark seeks to create a more sustainable city environment, improving the urban design of neighborhoods, the infrastructure serving the City, and health and safety of residents and businesses. Implementation of Green Stormwater Infrastructure (GSI) is a key strategy by which Newark can both manage stormwater runoff more sustainably and promote sustainable community design and renewal. Greening the city through GSI can have positive effects on health and quality of life for Newark residents, as well as the vibrancy of Newark's business environment. Newark's Sustainability Action Plan identified the implementation of GSI as a major strategy available to the City to manage stormwater.

Newark's Sustainability Action Plan proposes a number of actions related to GSI, including:

- Double Newark's tree canopy and establish a stable source of revenue for tree maintenance.
- Implement a new Newark Stormwater Ordinance and promote GSI policies.
- Develop a stormwater infrastructure bank and explore options for funding stormwater Improvements through fees on runoff from impermeable surfaces.
- Integrate GSI standards into street maintenance and other city capital projects.
- Identify and implement new GSI pilot projects.
- Support neighborhood-based rain capture projects

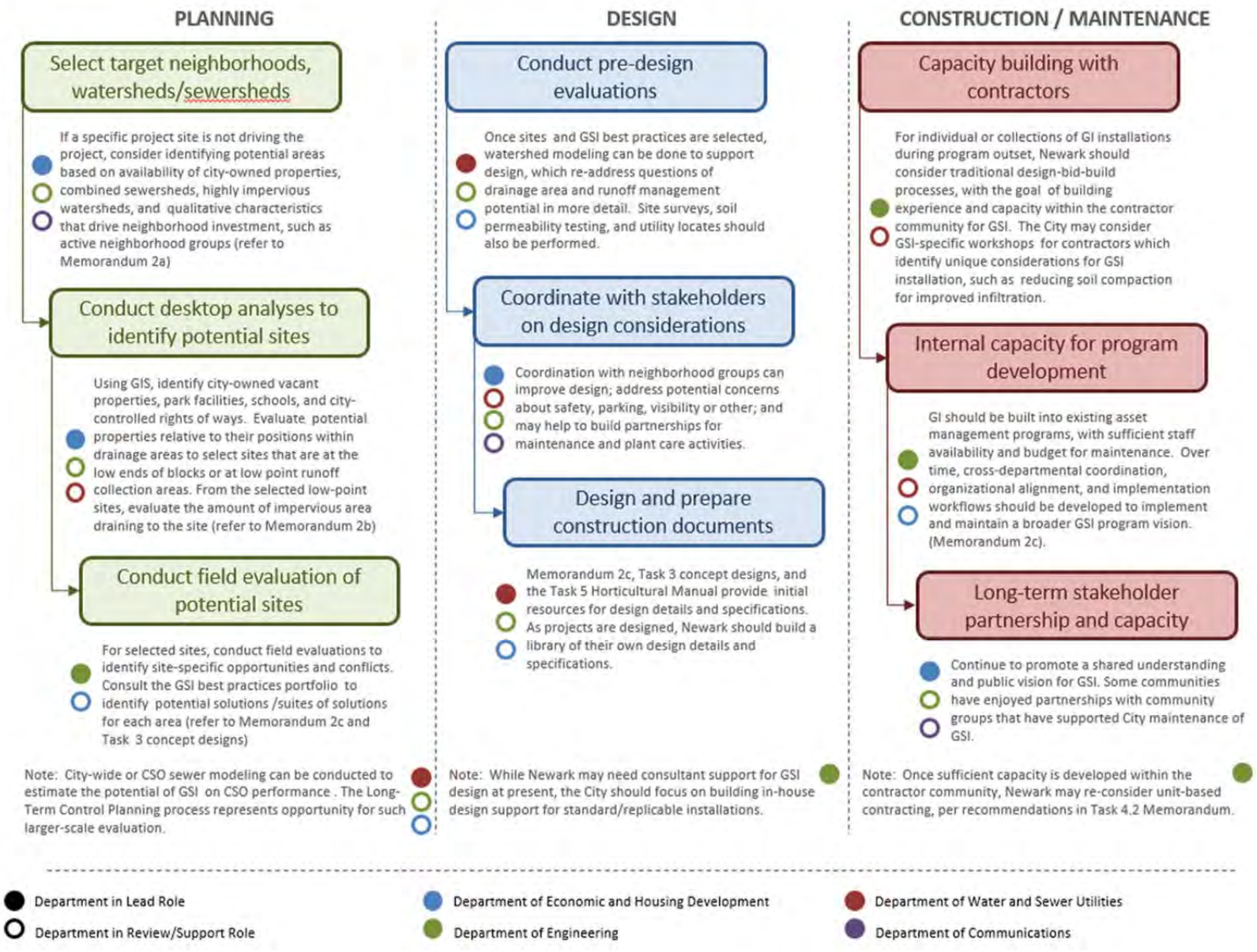
**Newark's Sustainability Action Plan, 2013**
**Vision Statement for Stormwater**

*Newark will use its land to absorb stormwater before it gets into the sewer system, and do that in ways that also cool and beautify its neighborhoods. Green infrastructure... will become a critical complement to the City's existing gray infrastructure of pipes and storage tanks. Strategically combining the two approaches will reduce instances of flooding and help prevent the sewer system from becoming overwhelmed. At the same time, Newark's use of green infrastructure will expand the network of green community spaces in order to cool and clean the air, beautify neighborhoods, and filter toxins and pollutants from the soil and water.*

## 1.1 Purpose of the Study

The City of Newark faces a range of challenges to sustainable development related to the combination of two features of its landscape: an impervious surface ratio of approximately 70 percent, and an old and overburdened combined sewer system. These factors contribute to urban heat island, stormwater run-off, and air pollution challenges, all of which affect health and quality of life for Newark residents and the vibrancy of Newark's business climate. Newark faces federal and state regulatory requirements to control combined sewer overflow (CSO) and to improve its stormwater management in order to prevent pollution from entering the Passaic River. The City is currently under an Administrative Consent Order issued by the New Jersey Department of Environmental Protection (NJDEP) to control CSOs. The

**Figure 18 – GSI Program Considerations**



# Appendix A: Task 2 Deliverables-Siting and Selection of Green Stormwater Infrastructure Pilots

## Technical Memo 2a

## Research and Discovery & Selection of Target Neighborhoods

CDM Smith

# Memorandum

*To:* *Stephanie Greenwood, Newark Sustainability Office*

*From:* *Matt Condiotti, Dave Spector, Bill Cesanek*

*Date:* *May 8, 2014*

*Subject:* *Newark Greenstreets Initiative Project*
*Task 2 - Research and Discovery & Selection of Target Neighborhoods*
*(Memorandum 2a) - FINAL*

The purpose of this memorandum is to summarize the research and discovery phase performed for the Newark Greenstreets Initiative project related to the subsequent planning and coordination process used for selecting and evaluating target neighborhoods that will be further assessed for specific green infrastructure opportunities during Task 3. A second Task 2 memorandum (Memorandum 2b), issued under separate cover, summarizes the research and discovery phase related to identification of potential green infrastructure site opportunities within the selected target neighborhoods. A third and final Task 2 memorandum (Memorandum 2c), issued under separate cover, summarizes the research and discovery phase as it relates to understanding the existing resources and challenges for green infrastructure in Newark and also summarizes best practices from comparable urban environments presented in the form of a green infrastructure best practices portfolio.

## Information Gathering

Information and data of key importance to the target neighborhood analysis includes the following:

- Target neighborhood boundaries and the City of Newark Sustainability Office's criteria for selecting the target neighborhoods
- Existing community partnerships between the Sustainability Office and groups within the target neighborhoods
- Newark's Master Plan, Our City Our Future (2012)
- Land use and land cover data as provided by the Sustainability Office

### Target Neighborhoods

The Sustainability Office identified seven target neighborhoods to be evaluated as part of the project which include:

- Fairmount

- Lower Broadway
- East Ferry
- North Broadway
- Upper Clinton
- Lincoln Park
- Dayton

The initial boundaries as provided by the Sustainability Office for these neighborhoods are shown in Figure 1. The Sustainability Office selected these neighborhoods based on 1) visibility to the public, 2) potential to reduce flow of stormwater to the sewer system (measurable, cost-effective, technically feasible), 3) locations where streetscape work or other city capital projects or private development are planned or possible so that suggested green infrastructure strategies can be layered into future specifications, and 4) local partner organization or relationships that may be available to assist with community engagement. Newark also ensured that the seven target neighborhoods represented at least one neighborhood per political ward.

## Community Partnerships

Based on discussion with the Sustainability Office, several important relationships have been established with various community groups. These include the following:

- Fairmount - Urban League of Essex County
- Lower Broadway - La Casa de Don Pedro
- East Ferry - Ironbound Community Corporation
- North Broadway - No designated community partner
- Upper Clinton - Block captains and Brick Academy
- Lincoln Park – No designated community partner. However, the Lincoln Park/Coast Cultural District is active in the area. Also, a private developer has approached the Sustainability Office to discuss the potential for stormwater "mitigation banking" for a particular site in Lincoln Park.
- Dayton - No designated community partner. However, Sustainability Office is working with the Housing Authority on a Choice Grant for a particular housing property in the area.

Based on discussions with the Sustainability Office, the neighborhoods with the most established relationships with a community partner that represents the entire neighborhood include Fairmount, Lower Broadway, and East Ferry. The relationships with the block captains and Brick Academy in Upper Clinton as well as the Housing Authority in Dayton are good relationships but are representative of specific sites rather than the entire neighborhood. Neither North Broadway nor Lincoln Park has a designated community partner at this time.

## Preliminary Neighborhood Analysis

Using the tree canopy assessment geodatabase provided by the Sustainability Office, CDM Smith performed an analysis of each target neighborhood's land use and coupled this with each neighborhood's percent impervious area. In addition, using CDM Smith's knowledge of the Newark sewer system, the percent of each neighborhood within the combined sewer area was determined. The analysis resulted in the statistics presented in Table 1 and 2 below.

| Neighborhood | Educational | Institutional | Open Space and Recreation | Vacant | Gov't | Transportation Utility | Commercial | Residential | Mixed Use | Industrial | Cemetery |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Dayton | 3% | 1% | 0.1% | 5% | 0.4% | 22.7% | 5.6% | 53.8% | 0.2% | 7.9% | 0.0% |
| East Ferry | 1% | 1% | 4.1% | 3% | 0.1% | 31.2% | 3.4% | 22.6% | 1.1% | 32.0% | 0.0% |
| Fairmont | 3% | 7% | 0.3% | 4% | 3.9% | 24.5% | 4.0% | 26.9% | 1.1% | 1.4% | 23.9% |
| Lincoln Park | 1% | 10% | 3.4% | 7% | 2.2% | 36.5% | 11.6% | 25.6% | 1.5% | 1.6% | 0.0% |
| Lower Broadway | 5% | 8% | 0.3% | 4% | 0.9% | 30.6% | 7.6% | 35.7% | 2.2% | 5.8% | 0.0% |
| North Broadway | 2% | 3% | 0.3% | 7% | 0.7% | 28.2% | 6.3% | 43.0% | 0.8% | 8.1% | 0.0% |
| Upper Clinton Hill | 2% | 3% | 0.8% | 5% | 1.1% | 35.2% | 2.6% | 48.0% | 1.2% | 1.0% | 0.0% |

Gov't: Represents consolidatation of "Governmental - City Owned Foreclosure", "Governmental - Civic and Cultural", and "Governmental - Other".
Transportation Utility: Represents consolidation of "Parking Facilities", "Transportation and Utility", and "Roadway".
Commercial: Represents consolidation of "Commercial - Office/Other" and "Commercial - Retail".
Residential: Represents consolidation of "1-2 Family Residential", "Multi-Family Residential – High-Rise", and "Multi-Family Residential – Low/Mid-Rise".

**Table 1: Preliminary Neighborhood Analysis Statistics (Land Use)**

| Neighborhood | % Impervious | %CSO |
|---|---|---|
| Dayton | 68% | 95% |
| East Ferry | 80% | 56% |
| Fairmont | 51% | 84% |
| Lincoln Park | 72% | 100% |
| Lower Broadway | 71% | 100% |
| North Broadway | 60% | 100% |
| Upper Clinton Hill | 52% | 82% |

**Table 2: Preliminary Neighborhood Analysis Statistics (%Imperviousness and CSO)**

In general, the intent of the analysis was to characterize the land use, imperviousness, and CSO nature of each neighborhood to see if each neighborhood was somewhat representative of citywide characteristics or were at least representative in aggregate. Also, the initial characterization analysis was to determine whether further analysis of the neighborhoods would lend itself to a more quantitative or qualitative comparison.

From the preliminary analysis, the following observations were made:

- Dayton, East Ferry, Fairmount, and Upper Clinton Hill included areas that were outside of the combined sewer area.
- There appeared to be clear discrepancies between the vacant parcel data included with the tree canopy geodatabase compared to the existing land use presented in the 2012 Newark Master Plan.
- The land use statistics did not provide the Sustainability Office with a clear picture of land use or properties under Newark ownership, particularly for vacant parcels, which the Sustainability Office expressed interest in seeing.

In response to the results of the preliminary analysis, further measures were taken moving forward. In particular, it was agreed that the neighborhood boundaries should be adjusted to include combined sewer areas only. The boundaries before and after adjustment relative to the combined sewer area are shown in Figures 2a and 2b, respectively. This decision was consistent with input from Newark's Department of Water and Sewer who indicated that any neighborhood area located within the combined sewer area would be a good area to target. In addition, the Sustainability Office provided CDM Smith with land use data from the 2012 Newark Master Plan, which Newark's Planning Department confirmed would be the best data to use for land use analysis.

## Updated Neighborhood Analysis

With the improved land use data from the 2012 Newark Master Plan and the revised neighborhood boundaries, an additional neighborhood analysis was performed in order to characterize each neighborhood. In particular, the analysis provided a more refined quantification of land use and identification of properties under Newark ownership. Neighborhood profile mapping was prepared that identified land use, land use under Newark ownership, and impervious area distribution. The neighborhood analysis maps for each neighborhood are provided in Appendix A.

The neighborhood analysis maps include a land use map in the upper left corner that shows the existing land use within the neighborhood and highlights properties owned by the City of Newark. An accompanying table is provided below the land use map that identifies the total acreage, number of parcels, and percent of each land use within the neighborhood study area. In addition, the table identifies the acreage, number of parcels, and percent of each land use within the neighborhood study area that is owned by the City of Newark. Shaded rows highlight land uses of particular interest for green infrastructure opportunities including educational, government, open space and

recreation, vacant, and right of ways. The maps also include an imperviousness map that shows the distribution of imperviousness that identifies the concentration of imperviousness and an accompanying table that identifies the total acreage and percent imperviousness of the study area.

## Neighborhood Selection Approach

Although CDM Smith and the Newark Sustainability office initially envisioned narrowing the seven target neighborhoods down to three using various area characteristics, after evaluating each neighborhood with the neighborhood profile mapping and through continued coordination with the Sustainability Office, it was determined that further analysis may not yield sufficient quantitative results to usefully narrow the neighborhood focus. In addition, CDM Smith understood that near term implementation potential as well as green infrastructure replicability is a particularly important goal for the Sustainability Office. As a result, a new approach to selecting the target neighborhoods was developed. Specifically, it was decided that the three neighborhoods with the most established civic relationships (Fairmount, Lower Broadway, and East Ferry) would be evaluated first since existing partnerships are critical to both the near-term and long-term success of green infrastructure implementation. These neighborhoods would be selected in order to identify potential sites/subareas for green infrastructure opportunities using the following approach:

- Locations will be identified and characterized that are relevant to specific typologies. Typology is defined here as a particular urban setting where green infrastructure would be implemented (e.g. streetscape, school, vacant parcel, residential block, etc). In this way, green infrastructure concepts will be developed for locations that are representative of Newark's forms of development and land use. Thus green infrastructure approaches identified as appropriate for a certain typology could potentially be replicated for similar typologies in other neighborhoods in Newark, and possibly city-wide.
- The green infrastructure typologies will represent areas that are within the City of Newark's control to the maximum degree possible, including green infrastructure interventions on rights-of-way, Newark-owned vacant lands (very high priority), and Newark-owned parks.
- Although the ownership/jurisdiction of schools is not exclusively under the City of Newark, some representative green infrastructure interventions for schools will be considered.
- If sufficiently representative typologies and/or sites are not identified within Fairmount, Lower Broadway, or East Ferry, additional typologies and/or sites can be identified in other neighborhoods, as needed.

While the neighborhood selection for the current project is proceeding with Fairmount, Lower Broadway, and East Ferry as the selected neighborhoods, the neighborhood profiles developed for all of the neighborhoods used in conjunction with the methodology discussed in Memorandum 2b (issued under separate cover) can be used in later phases of Newark's green infrastructure planning effort to identify green infrastructure opportunities.

# Summary

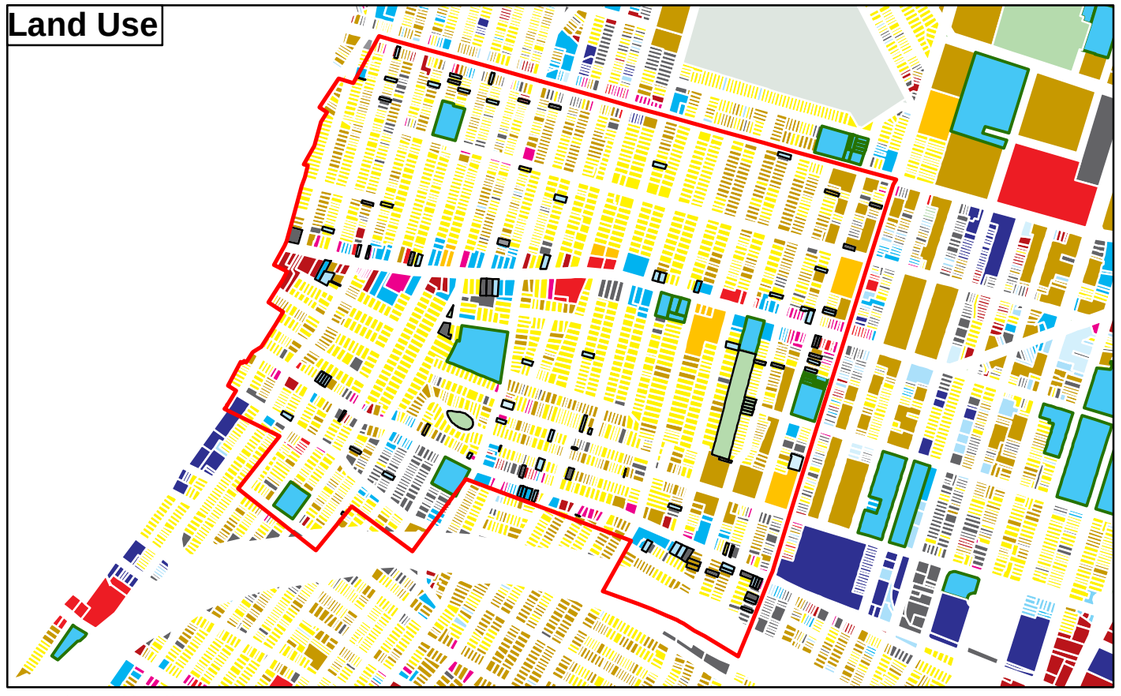
## Key Conclusions from this Step of the Pilot Process

The Sustainability Office identified seven target neighborhoods to be evaluated as part of the pilot project which include Fairmount, Lower Broadway, East Ferry, North Broadway, Upper Clinton, Lincoln Park, and Dayton. The Sustainability Office selected these neighborhoods based on 1) visibility to the public, 2) potential to reduce flow of stormwater to combined sewer systems, 3) potential for green infrastructure to compliment planned city capital projects or private developments, 4) local partner organization or relationships that may be available to assist with community engagement; and 5) representation across political wards. The intent of this stage of the study was to objectively select three of the seven neighborhoods for further evaluation. A quantitative geographic analysis was conducted to support neighborhood selection, which included land use distribution to identify sufficiently diverse urban forms; permeability to identify areas with potential for a greater amount of surface water to manage; and availability of city-owned parcels that could potentially be used for green infrastructure installations. This analysis concluded, however, that while there were certainly differences among neighborhoods, any one neighborhood has sufficient potential for green infrastructure application and benefits. Further, any combination of three neighborhoods would provide sufficient diversity among land uses and green infrastructure applications to be broadly representative of citywide characteristics for replicability and relevance across the city. Therefore, given that partnerships are critical to both the near-term and long-term success of green infrastructure implementation, a more qualitative selection was employed. Fairmount, Lower Broadway, and East Ferry, the neighborhoods with the most established community partner relationships, were selected for further investigation in this study.

## Key Conclusions for Expansion/Replicability Beyond the Pilot Planning Process

When prioritizing future green infrastructure investments, the mapping analysis can be replicated or even simplified if desired. However, it's important to note that green infrastructure can be applied in one form or another in almost any land use typology in the city, provided there is sufficient drainage area and based on further evaluation of site characteristics. Similar to the results of this study, a quantitative analysis of land use and permeability may not be the most compelling mechanism for prioritizing neighborhoods. Often it will be the more qualitative characteristics that drive neighborhood investment priorities. A more streamlined approach may be to identify city-owned properties in a given neighborhood, and then to determine which have sufficient drainage area/impervious potential. Alternatively, particular sites of interest to the City and community groups can be identified first and then evaluated specifically for green infrastructure opportunities. Once sites are identified, a green infrastructure intervention (or combination of interventions) can be selected that fits the land use characteristics. Concept plans from the project will be prepared to be broadly representative of urban form throughout Newark. Individual green infrastructure interventions will present replicability considerations, including appropriate land uses.

# Land Use



Source: Land Use/Newark Ownership

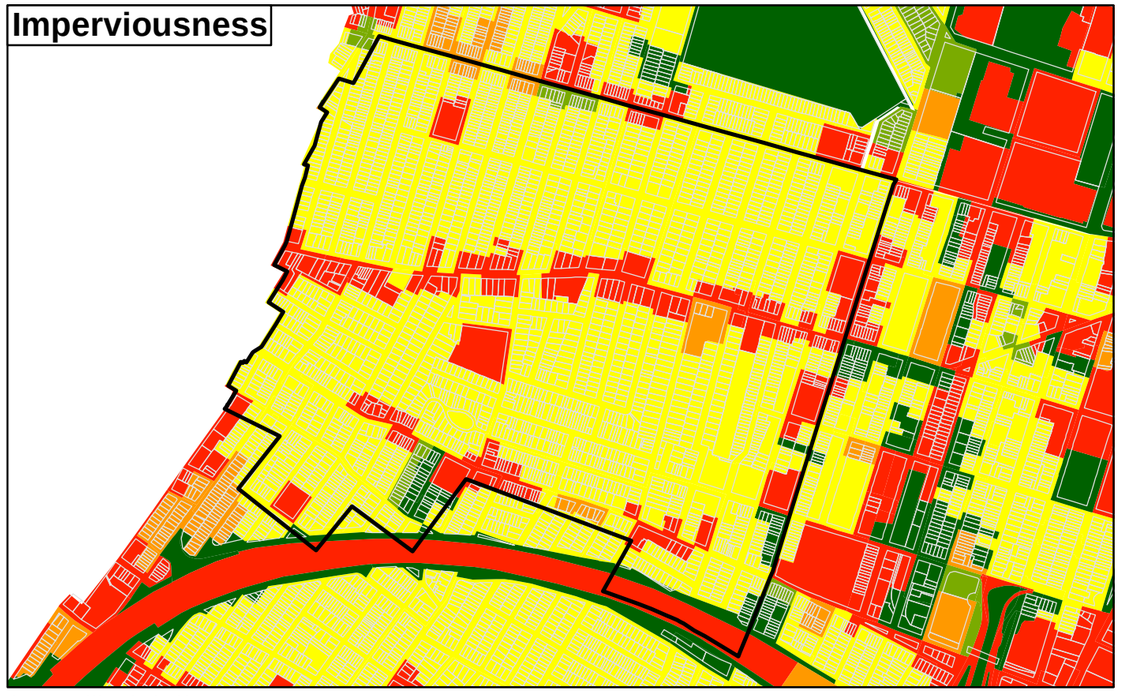
**Legend**

- Target Neighborhood
- Newark-Owned Parcels / Upper Clinton

Existing LandUse

- 1-2 Family Residential
- Cemetery
- Commercial -- Office/Other
- Commercial -- Retail
- Educational
- Governmental -- City-owned Foreclosure
- Governmental -- Civic and Cultural
- Governmental -- Other
- Industrial
- Institutional
- Mixed Use
- Multi-Family Residential -- High-Rise
- Multi-Family Residential -- Low/Mid-Rise
- Open Space and Recreation
- Parking Facilities
- Transportation and Utility
- Vacant

# Imperviousness



Soruce: NJDEP 2007 Land use/Land Cover

Percent Impervious

Target Neighborhood | Parcel Boundary | < 15% | 15% - 35% | 35% - 55% | 55% - 75% | > 75%

| Land Use | Total Study Area | | | Owned by City of Newark | | | |
|---|---|---|---|---|---|---|---|
| | Area (Acres) | No. of Parcels | % of Neighborhood Study Area | Area (acres) | No. of Parcels | % of Neighborhood Study Area | % of Land Use Area |
| 1-2 Family Residential | 152.53 | 1707 | 36.3% | 0.18 | 4 | 0.04% | 0.1% |
| Commercial -- Office/Other | 5.42 | 37 | 1.3% | 0.05 | 1 | 0.01% | 0.8% |
| Commercial -- Retail | 4.02 | 29 | 1.0% | | | | |
| Educational | 11.59 | 18 | 2.8% | | | | |
| Governmental -- City-owned Foreclosure | 4.66 | 62 | 1.1% | 4.27 | 56 | 1.02% | 91.5% |
| Governmental -- Civic and Cultural | 0.42 | 2 | 0.1% | 0.42 | 2 | 0.10% | 100.0% |
| Industrial | 0.78 | 7 | 0.2% | | | | |
| Institutional | 14.69 | 103 | 3.5% | 0.53 | 6 | 0.13% | 3.6% |
| Mixed Use | 5.87 | 70 | 1.4% | 0.004 | 1 | 0.00% | 0.1% |
| Multi-Family Residential -- High-Rise | 6.54 | 11 | 1.6% | | | | |
| Multi-Family Residential -- Low/Mid-Rise | 59.67 | 631 | 14.2% | 0.38 | 5 | 0.09% | 0.6% |
| Open Space and Recreation | 4.04 | 8 | 1.0% | 4.04 | 8 | 0.96% | 100.0% |
| Parking Facilities | 0.11 | 1 | 0.0% | 0.11 | 1 | 0.03% | 100.0% |
| Vacant | 21.45 | 260 | 5.1% | 2.29 | 26 | 0.55% | 10.7% |
| Right of Way (ROW) | 128.30 | - | 30.5% | 128.30 | - | 30.54% | 100.0% |
| **Totals** | **420.10** | **2946** | **100.0%** | **140.57** | **110.00** | **33.46%** | **33.5%** |

| Description | Area (Acres) | % of Neighborhood Study Area |
|---|---|---|
| Impervious | 207.19 | 49% |
| Pervious | 212.91 | 51% |
| **Totals** | **420.10** | **100%** |

**Notes on Process, Tables, and Analyses**

- Existing Land Use data set from the 2012 Newark Master Plan was used to map existing land use.

- Parcels under Newark ownership were identified by selecting all properties where "Ownersname" field in Existing Land Use data set were listed as "City of Newark". A few deviations of this terminology were identified and selected on a case by case basis. Any blanks, if encountered, were ignored. The properties under Newark ownership were symbolized by outlining them in black.

- GIS statistical analysis used to determine land use areas and percent distribution.

- Right of Way (ROW) land use, which includes the street and sidewalk area predominantly, was identified as the difference between total neighborhood area and the sum of all other land uses in the neighborhood area since this particular land use is not included in the Existing Land Use data set.

- There are ample vacant properties within the neighborhood boundary with 10 percent of those owned by Newark resulting in 26 properties and 2.29 acres that should be considered further for green infrastructure opportunities. Vacant properties offer good potential for green infrastructure since there are ample vacant sites in Newark, green infrastructure improvements on these properties help reduce blighted conditions, and since they offer open space that could potentially be used to manage stormwater from adjacent streets.

-Even though "Educational" land use does not include any properties under Newark ownership, these properties are still highlighted in the table due to good potential for synergistic collaboration with school entities as well as the potential to implement green infrastructure on or around properties that are used by children and families. These properties could be considered further for green infrastructure opportunities.

- There are a 8 parcels of "Open Space and Recreation" properties owned by Newark within the neighborhood boundary. Park sites offer good potential for synergistic collaboration with park entities as well as the potential to implement green infrastructure on or around properties that are used by children and families. These properties should be considered further for green infrastructure opportunities.

- There are ample "Governmental -- City-owned Foreclosure" properties in Newark. However, these properties are often occupied by a building, so are not high opportunity areas. But, since these properties are sometimes vacant when buildings have been demolished, they have been highlighted for possible further consideration for green infrastructure.

- In general, City ROW offers the greatest physical opportunity for green infrastructure to manage stormwater in terms of comprising the greatest area of any single land use within the neighborhood area, maximum impervious area since it is predominantly paved streets and sidewalks, and greatest geographical distribution. In addition, the City has the most jurisdictional ability within the right-of-way due to 100 percent ownership of this area. This area includes nearly all of the white area included on the land use map. While the right of way offers the greatest geographical and physical opportunity, other properties such as vacant parcels may offer other programmatic and cost benefits.

- For this neighborhood boundary, data suggests there is ample opportunity for green infrastructure potential since there is plenty of impervious area as well as ample ROW, several vacant and park properties under Newark Ownership, and several school sites.

- In the future, Newark can use the map to find properties under Newark ownership, which include all properties outlined in black and the majority of the white areas. Also the map can be used to identify park and school sites according to the land use legend. This process allows Newark to see public ownership as well as park and school properties that may offer opportunities for green infrastructure. These opportunities can be evaluated further taking into consideration community interest, drainage patterns, and site constraints (observed through site visits).

-The land use analysis could be simplified in the future by the City by consolidating land use that is typically under private ownership into a single land use called "Private Property". This would include the following land uses: 1-2 Family Residential, Cemetery, Commerical - Office/Other, Commercial - Retail, Industrial, Institutional, Mixed Use, Multi-Family Residential - High Rise, Multi-Family Residential - Low/Mid Rise, and Parking Facilities. While there may be a few properties within these land uses that are under Newark ownership, they are minimal. Newark can potentially begin to deal with private property opportunities on a case by case basis.

CDM Smith

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City of Newark
Newark Greenstreets Initiative Project
Neighborhood Analysis

## Upper Clinton

# Appendix A: Task 2 Deliverables-Siting and Selection of Green Stormwater Infrastructure Pilots

## Technical Memo 2b

## Research and Discovery & Subarea Identification

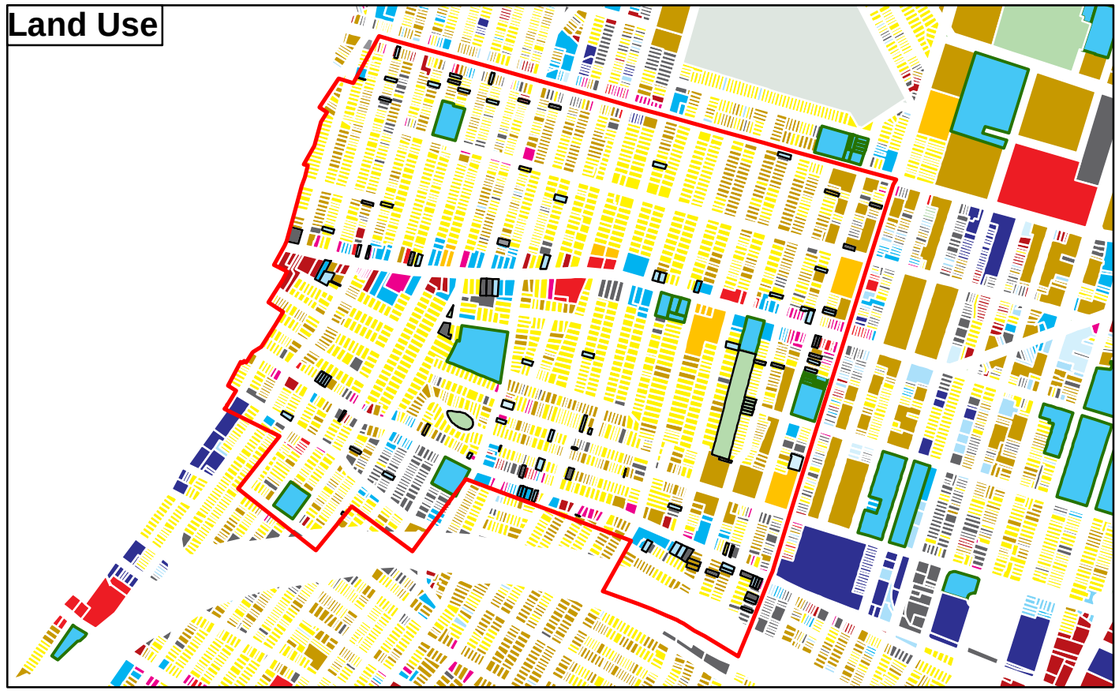
CDM Smith

# Appendix C

**Augmented Neighborhood Profile Mapping**

**(North Broadway, Upper Clinton, Lincoln Park, Dayton)**

## Land Use



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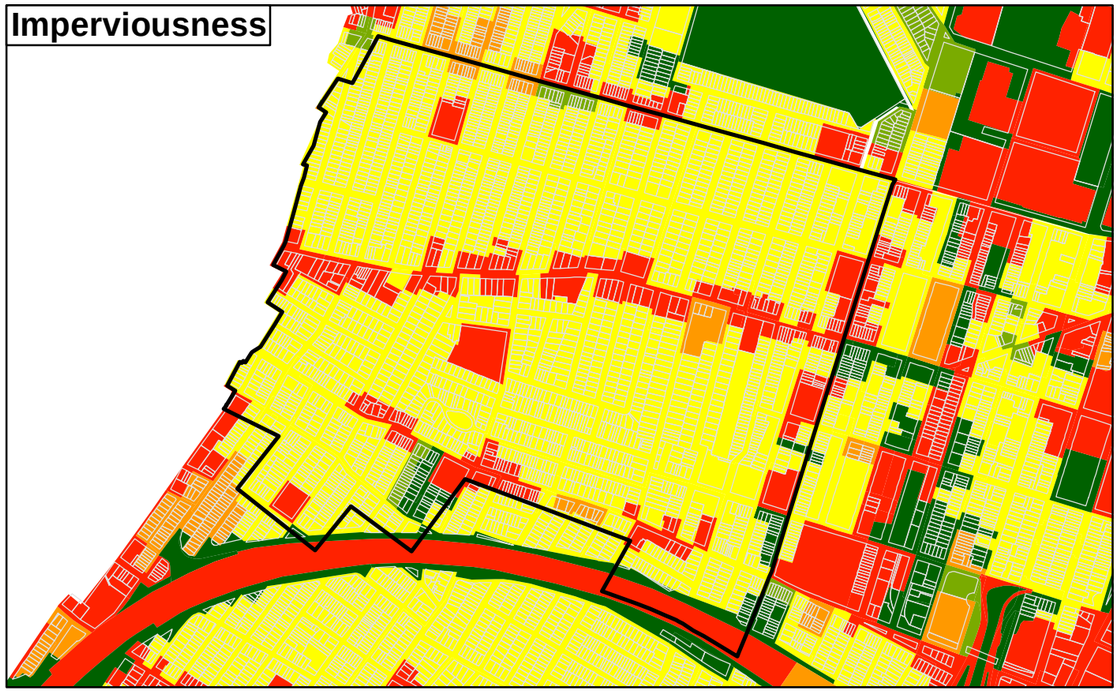

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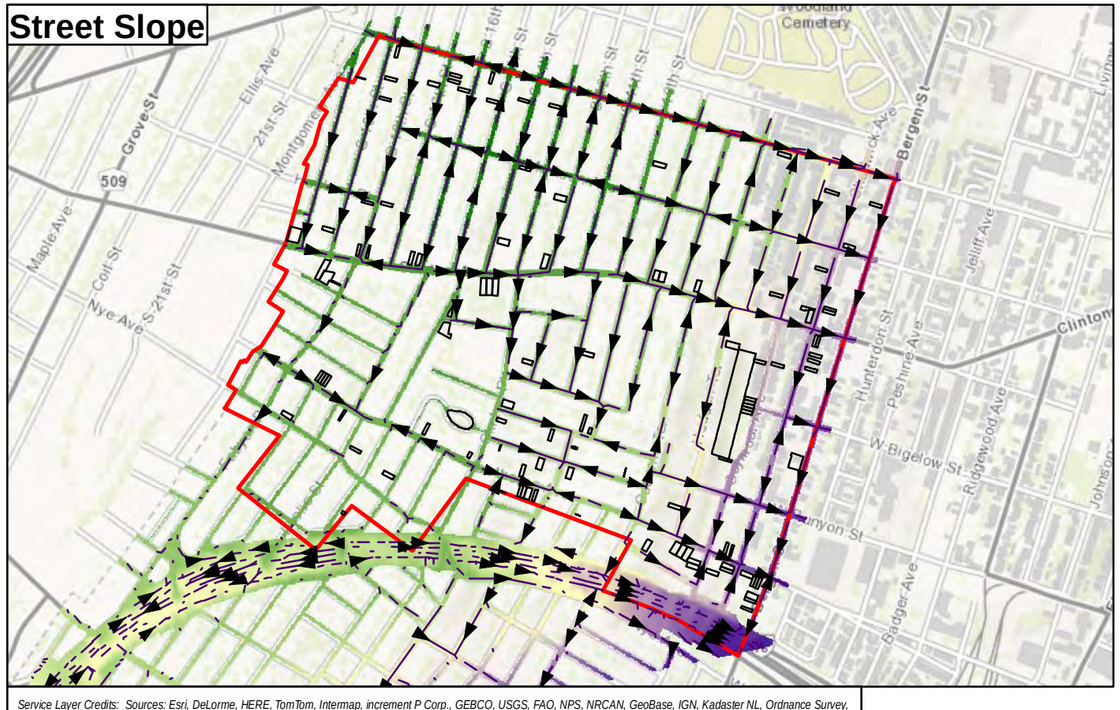
## Street Slope




- Flow Direction
- Newark-Owned Parcels / Upper Clinton
- Target Neighborhood

Elevation (ft)

High : 221

Low : 80

*Service Layer Credits: Sources: Esri, DeLorme, HERE, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community*

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City of Newark
Newark Greenstreets Initiative Project
Neighborhood Analysis

# Upper Clinton

# APPENDIX J

## ROAD OWNER RESPONSE

CITY OF NEWARK
Mayor Ras J. Baraka

**Department of Engineering**

920 Broad Street, Room 412
Newark, New Jersey 07102
Tel: 973-733-8520
Fax: 973-733-4772

**Phillip Scott, P.E., C.M.E.**
Director

Julia Steponanko, P.E.
Greenman-Penderson, Inc,
100 Corporate Drive, Suite 301
Lebanon, NJ 08833

Dear Julia Steponanko, P.E.:

The City of Newark thanks the Road Safety Audit team for conducting this important evaluation of traffic safety along Clinton Avenue in Newark. The team identified many recommendations for improving safety and better accommodating travel along these critical corridors. While we cannot commit to specific improvements presented in the report, the recommendations will be useful in future analyses as we seek to improve travel and safety.

This Road Safety Audit is an important first step for the City of Newark to apply for the NJTPA's Local Safety Program. The City of Newark generally agrees with many of the findings and recommendations. The City of Newark is committed to improving safety and implementing elements of our Complete Streets policy to our roads to better serve the traveling public.

Sincerely,

Phillip Scott

Phillip Scott, P.E., C.M.E.
Director of Engineering