

CALHOUN STREET

Road Safety Audit

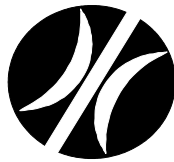


January 2008



**DELAWARE VALLEY REGIONAL
PLANNING COMMISSION**

Created in 1965, the Delaware Valley Regional Planning Commission (DVRPC) is an interstate, intercounty and intercity agency that provides continuing, comprehensive and coordinated planning to shape a vision for the future growth of the Delaware Valley region. The region includes Bucks, Chester, Delaware, and Montgomery counties, as well as the City of Philadelphia, in Pennsylvania; and Burlington, Camden, Gloucester and Mercer counties in New Jersey. DVRPC provides technical assistance and services; conducts high priority studies that respond to the requests and demands of member state and local governments; fosters cooperation among various constituents to forge a consensus on diverse regional issues; determines and meets the needs of the private sector; and practices public outreach efforts to promote two-way communication and public awareness of regional issues and the Commission.



Our logo is adapted from the official DVRPC seal, and is designed as a stylized image of the Delaware Valley. The outer ring symbolizes the region as a whole, while the diagonal bar signifies the Delaware River. The two adjoining crescents represent the Commonwealth of Pennsylvania and the State of New Jersey.

DVRPC is funded by a variety of funding sources including federal grants from the U.S. Department of Transportation's Federal Highway Administration (FHWA) and Federal Transit Administration (FTA), the Pennsylvania and New Jersey departments of transportation, as well as by DVRPC's state and local member governments. The authors, however, are solely responsible for its findings and conclusions, which may not represent the official views or policies of the funding agencies.

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CALHOUN STREET ROAD SAFETY AUDIT

1.0 BACKGROUND

This document represents the final report for the City of Trenton - Calhoun Street Road Safety Audit. This project represents a step towards the implementation of the Delaware Valley Regional Planning Commission (DVRPC) Regional Safety Action Plan. Improving the design and operation of intersections is a priority area for both engineering and enforcement disciplines as documented in the Plan. DVRPC has been coordinating with Pennsylvania Department of Transportation to address corridors on the District 6 Safety Plan since Fiscal Year 2007. In Fiscal Year 2008, intersection road safety audits are being conducted in New Jersey under Transportation Safety Planning in DVRPC's planning work program. The New Jersey road safety audits will concentrate on intersections located on county and/or local roads. Implementation of improvement strategies identified through this process may be eligible for Local Federal Safety funds.

Whereas, the goal of this project is to improve and promote transportation safety on the region's roadways while maintaining mobility, the main objective is to address the safe operation of the roadway and ensure a high level of safety for all road users. The road safety audit program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The emphasis is placed on identifying low cost, quick turnaround safety projects to address the issues where possible but will not exclude the more complex projects.

1.1 The Audit

A road safety audit (RSA) is a formal safety performance examination of an existing or future road or intersection by an audit team. Road safety audits can be used on any size project, from minor maintenance to mega-projects. There are eight major steps involved in conducting a road safety audit but these can be simplified in a three step process – identify the corridor/intersection and audit team; conduct the RSA and report on the findings; and follow-up on RSA findings where feasible.

Major benefits of road safety audits include – it is a proactive tool, not solely dependent on crash data; a planning tool to identify safety issues to be considered in improvement projects; can determine if the needs of all road users are adequately met; adaptable to local needs and conditions; and recommendations can be implemented in small stages as time and resources permit.

Prior to the road safety audit activities on site, DVRPC collected, reviewed and analyzed relevant data (video of roadway under different conditions, traffic volume data, turning movement counts, maps, aerial photographs, and crash data). Using the crash data, collision diagrams were produced which showed the crashes and types for locations where they occurred.

The Road Safety Audit was conducted on November 29, 2007. The day began with a Pre-Audit meeting that involved the definition of road safety audit and how it differs from the corridor study process; the required steps of an audit; presentation of the site issues and an exchange of ideas and knowledge of the roadway. A video showing the site under night time conditions was also shown. The field view followed where the audit team made up of state and local officials and other stakeholders walked the site and identified transportation safety issues. See **Appendix A** for the list of audit team members. The post-audit meeting followed and was spent discussing the findings from the field view, identifying strategies to address issues and determining priorities.

1.2 Overview of the Study Area

The study area consists of a portion of Calhoun Street (CR 653) (Reverend Howard Woodson, Jr. Way) comprising four intersections from Hanover Street to Summer Street; see **Appendix B** for *Study Area Map*. Calhoun Street is functionally classified as an urban minor arterial. Calhoun Street runs in a north to south direction. It provides direct access to the Calhoun Street Bridge to the south which crosses the Delaware River into Pennsylvania. To the north it changes to Princeton Avenue after crossing over Olden Avenue and ends at US 206. Throughout its length Calhoun Street has a mix of residential, commercial, warehousing and institutional land uses, but in the section under study the land use is predominantly residential. The housing units are row homes and small retail businesses occupy the corners of many intersections. Overall, the area is urban in character.

The study area is included in the City of Trenton's Redevelopment Plans. This area is included in both the Central West and the Canal Banks redevelopment areas. The study area sits adjacent to the central business district of this capital city.

Calhoun Street, at the study location, has two lanes; one travel lane in each direction. Parking is allowed on the southbound side of Calhoun Street. There are sidewalks throughout the study area on both sides of the street. These accommodate a high level of pedestrian activity. The study area consists of three signalized intersections; Hanover Street, Passaic Street and Spring Street. The traffic signals are not coordinated.

Traffic volume recorded in 2006, just south of Church Street, show an average annual daily traffic (AADT) volume of 10,106; see **Appendix B** for *Traffic Volume Map*. Turning movement counts were taken in November 2007. These showed that the morning peak hour is 7:45AM to 8:45AM and afternoon peak hour varied by intersection; see **Appendix C**. The through movement on Calhoun Street carries the major traffic at the intersections during the peak periods. At Hanover Street there is a heavy right turn movement from northbound Calhoun Street during the morning peak and a heavy left turn movement from westbound Hanover Street during the afternoon peak. The speed limit in the study area is 25 MPH.

New Jersey Transit bus route 606 serves the study area. This bus goes from Princeton Township to Washington Township serving Princeton Borough, Lawrence Township, City of Trenton, Hamilton Township and Washington Township. The route provides

service to Princeton University, Rider College, Mercer County College and the Education Testing Center. It also serves the Trenton and Hamilton Rail stations as well as a number of shopping centers and office parks. The Route 606 headway varies from 16 minutes to 71 minutes depending on the time of day.

1.3 Crash Data




According to New Jersey Department of Transportation crash data there were 82 reportable crashes between 2004 and 2006 in the study area. Reportable crashes are crashes which may result in a fatality, injury and/or property damage of five hundred dollars or more. A comprehensive analysis of the crash data is shown in **Appendix C**. Of the reportable crashes, there were 35 crashes in 2004 (42%); 25 crashes in 2005 (30%); and 22 crashes in 2006 (28%). When analyzing crash frequency by month, June had the highest number of crashes with 14 (17%), May and September were next with 9 crashes each. Crashes occurred in every month of the year with February having the lowest number of crashes at 2.

Angle (24), rear end (20) and same direction sideswipe (13) crashes represented 69% of the 82 reportable crashes. Angle (29%) and same direction sideswipe (16%) were higher than 2006 New Jersey statewide county road averages of 18.09% and 11.45%, respectively. There were five crashes involving pedestrians representing 6% of the total number of crashes; much higher than the 2006 statewide county road average of 1.89%. There were no fatal crashes during the study period. There were 48 (58%) property damage only crashes and 32 injury crashes of varying levels of severity. The majority of the crashes occurred during fair weather (70%) with the remaining occurring during rainy conditions. In an analysis of roadway surface conditions during the occurrence of crashes, 81% occurred on dry road surface. Seventy percent of the crashes occurred during daylight hours.






2.0 FINDINGS AND RECOMMENDATIONS



The following represents the findings and recommendations of the Calhoun Street Road Safety Audit. All photographs were taken by DVRPC staff. Shaded areas represent recommended strategies requiring low level of effort for implementation with high potential safety benefits.

Corridor-Wide Issues





	<p>Signals</p> <ul style="list-style-type: none"> • Traffic signals outdated (8" heads) • Traffic signals do not have pedestrian man/hand or countdown heads <p>Possible Improvement Strategies</p> <ul style="list-style-type: none"> • Upgrade signals with 12" heads and include pedestrian heads with either man/hand or countdown. <p>Level of Effort Potential Safety Benefit Medium High</p>
	<p>Signals</p> <ul style="list-style-type: none"> • Traffic signals along Calhoun Street are not coordinated <p>Possible Improvement Strategies</p> <ul style="list-style-type: none"> • Re-time signals for coordination along Calhoun Street <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>Pavement Markings</p> <ul style="list-style-type: none"> • Stop bars are missing at intersection approaches • Pavement markings are faded or missing in areas on both Calhoun Street and side streets <p>Potential Improvement Strategies</p> <ul style="list-style-type: none"> • Re-stripe or add pavement markings as appropriate to guide motorists <p>Level of Effort Potential Safety Benefit Low High</p>


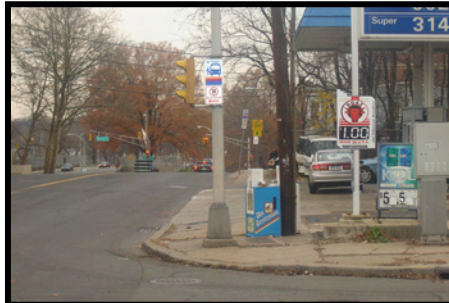

	<p>Drainage inlets</p> <ul style="list-style-type: none"> • Drainage inlets are clogged with debris – result in pooling of water when it rains <p>Potential Improvement Strategies</p> <p>Coordinate with Sanitation Department to clean drainage inlets</p>				
<table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>Medium</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	Medium	
Level of Effort	Potential Safety Benefit				
Low	Medium				
	<p>Signage</p> <ul style="list-style-type: none"> • Several warning and regulatory signs are faded • Inconsistent “No Parking” signs on the southbound side of Calhoun Street • Street name signs are small and hardly visible • Bicycle activity in the area; there are no “Share the Road” signs • There is only one speed limit sign in the study area. This is located on the northbound side of Calhoun Street, south of Summer Street <p>Potential Improvement Strategies</p> <ul style="list-style-type: none"> • Replace existing warning and regulatory signs as appropriate • Replace existing "No Parking" signs as appropriate in accordance with City of Trenton parking regulations • Upgrade street name signs using clear view font to make them easier to read by motorists • Install “ Share the Road” signs on both sides of the road • Install 25 MPH speed limit signs north and south of the study area on the southbound and northbound sides of Calhoun Street. 				
<table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High	
Level of Effort	Potential Safety Benefit				
Low	High				





	<p>Signage</p> <ul style="list-style-type: none"> • Heavy pedestrian traffic in the area, only one pedestrian warning sign located at the northbound end of the study area. <p>Potential Improvement Strategies Install pedestrian signs north and south of the study area on the southbound and northbound sides of Calhoun Street. Install pedestrian crossing signs as appropriate at crosswalks.</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
	<p>Curb Ramps Curb ramps are missing or are not ADA standards</p> <p>Potential Improvement Strategies Upgrade or construct curb ramps to ADA standards</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
 	<p>Parking</p> <ul style="list-style-type: none"> • Parking is allowed on one side of Calhoun Street, the southbound side. Parked cars encroach on the travel way. • Vehicles parked on the side streets are too close to the intersection – this makes turning movements difficult <p>Potential Improvement Strategies Re-stripe Calhoun Street with the northbound lane narrower to provide excess right of way on the southbound side for parking</p> <p>Install no parking zones around the intersections with painted curb and appropriate signage</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
	<p>Utility Poles Many utility poles are within the clear zone</p> <p>Potential Improvement Strategies Relocate utility poles outside the clear zone</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>High</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	High	High
Level of Effort	Potential Safety Benefit				
High	High				


	<p>Sidewalks In general the sidewalk is in poor condition except for north of Spring Street</p> <p>Potential Improvement Strategies Upgrade sidewalk for the entire length of Calhoun Street from State Street to Spring Street.</p> <table><tr><td>Level of Effort</td><td>Potential Safety Benefit</td></tr><tr><td>Medium</td><td>High</td></tr></table>	Level of Effort	Potential Safety Benefit	Medium	High
Level of Effort	Potential Safety Benefit				
Medium	High				
	<p>Cut-off sign posts Large number of cut-off sign posts sticking out in the sidewalk through out the study area</p> <p>Potential Improvement Strategies Remove stubs from sidewalk to prevent pedestrians tripping.</p> <table><tr><td>Level of Effort</td><td>Potential Safety Benefit</td></tr><tr><td>Low</td><td>High</td></tr></table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				





Site Specific Issues

Hanover Street Intersection					
	<p>Pavement markings are lacking or faded There are no crosswalks visible</p> <p>Potential Improvement Strategies Add or re-stripe pavement markings as appropriate on Calhoun Street and Hanover Street – centerline, stop bars, pedestrian crosswalk</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
	<p>According to the turning movement counts 67% of the westbound traffic on Hanover Street makes left turns during the afternoon peak hour. Angle crash was also the most frequent crash type for the period study</p> <p>Potential Improvement Strategies Add a left turn lane for the westbound Hanover Street approach Restrict parking on Hanover Street westbound approach from Calhoun Street approximately 100 feet Re-time signal with protected/permissive left turns for the Hanover Street westbound approach during the afternoon peak period Add an all-red phase to the traffic signal timing.</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
	<p>Sidewalks are in poor condition</p> <p>Potential Improvement Strategies Upgrade sidewalk. Replace northbound depressed curb sidewalk with straight curb</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Medium</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Medium	High
Level of Effort	Potential Safety Benefit				
Medium	High				
	<p>Mail storage box on northeast corner is located in the clear zone – hazard</p> <p>Potential Improvement Strategies Relocate mail storage box</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				

	<p>Pavement on Hanover Street is in poor condition. Pavement adjacent to curb ramp on the southeast corner of the intersection is rutted</p> <p>Potential Improvement Strategies Re-pave Hanover Street</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Medium</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Medium	High				
Level of Effort	Potential Safety Benefit								
Medium	High								
	<p>Southbound bus stop is located at the gas station access/egress.</p> <p>Potential Improvement Strategies Consider relocating bus stop.</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table> <p>Potential Improvement Strategies <i>Long Term</i> - Close gas station driveway nearest the intersection and widen the other on Calhoun Street</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Medium</td> <td>High</td> </tr> </table> <p>See corridor wide section for signal and pedestrian signal head issues</p>	Level of Effort	Potential Safety Benefit	Low	High	Level of Effort	Potential Safety Benefit	Medium	High
Level of Effort	Potential Safety Benefit								
Low	High								
Level of Effort	Potential Safety Benefit								
Medium	High								
<p>Between Hanover Street and Passaic Street</p>									
	<p>Signs on the southbound side of Calhoun Street are faded</p> <p>Potential Improvement Strategies Replace signs as appropriate</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High				
Level of Effort	Potential Safety Benefit								
Low	High								
	<p>Utility pole obstruction – pole number 66290TN</p> <p>Potential Improvement Strategies Relocate utility pole north of intersection</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Medium</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Medium	High				
Level of Effort	Potential Safety Benefit								
Medium	High								

Passaic Street Intersection	
	<p>There are no pavement markings on Passaic Street</p> <p>Potential Improvement Strategies Add pavement markings as appropriate on Passaic Street – centerline, stop bars, pedestrian crosswalk</p> <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>There are no crosswalks or stop bars at the Calhoun Street approaches</p> <p>Potential Improvement Strategies Add stop bars and “continental” crosswalk to the Calhoun Street approaches</p> <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>High pedestrian traffic, lack of pedestrian amenities</p> <p>Potential Improvement Strategies Add pedestrian crossing warning signs at crosswalk</p> <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>At the westbound approach of the intersection, vehicles are parked too close to intersection; this further compromises an already tight turning radius</p> <p>Potential Improvement Strategies Restrict parking at the intersection using appropriate signage and painted curb</p> <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>There are no “one-way” signs for west leg of Passaic Street</p> <p>Potential Improvement Strategies Install back to back “one-way” signs at the intersection</p> <p>Level of Effort Potential Safety Benefit Low Medium</p>

	<p>Drainage clogged with debris</p> <p>Potential Improvement Strategies Clean drainage inlet</p> <p>Level of Effort Potential Safety Benefit Low Medium</p>
<p>See corridor wide section for signal and pedestrian signal head issues</p>	
<p><i>Between Passaic Street and Spring Street</i></p>	
	<p>No curb ramps at alley intersection with Calhoun Street</p> <p>Potential Improvement Strategies Construct curb ramp per ADA standards</p> <p>Level of Effort Potential Safety Benefit Low High</p>
<p><i>Spring Street Intersection</i></p>	
	<p>There are no curb ramps</p> <p>Potential Improvement Strategies Construct curb ramps at all corners of the intersection according to ADA standards</p> <p>Level of Effort Potential Safety Benefit Low High</p>
	<p>Fire hydrant is too close to the intersection</p> <p>Potential Improvement Strategies Relocate fire hydrant</p> <p>Level of Effort Potential Safety Benefit Medium Medium</p>
	<p>No centerline along Spring Street west of Calhoun Street</p> <p>Potential Improvement Strategies Stripe centerline to guide motorists; especially those turning on to Spring Street</p> <p>Level of Effort Potential Safety Benefit Low High</p>

	<p>Poor pavement condition on Spring Street east of Calhoun Street</p> <p>Potential Improvement Strategies Re-pave and stripe as appropriate including centerline, stop bar and “continental” crosswalk</p> <p>Level of Effort Potential Safety Benefit Medium High</p>
	<p>Over head horizontal signal with no post mounted signals for pedestrians</p> <p>Potential Improvement Strategies Re-pave and stripe as appropriate including centerline, stop bar and “continental” crosswalk</p> <p>Level of Effort Potential Safety Benefit Medium High</p>
	<p>Utility pole 4881xTN is located too close to the intersection</p> <p>Potential Improvement Strategies Relocate utility pole</p> <p>Level of Effort Potential Safety Benefit High High</p>
	<p>Utility pole 67948TN is located too close to the traffic signal pole on the southwest corner</p> <p>Potential Improvement Strategies Relocate utility pole</p> <p>Level of Effort Potential Safety Benefit High Medium</p>
	<p>137 to 141, street light is too dim, lens and bulb missing</p> <p>Potential Improvement Strategies Replace lens and bulbs</p> <p>Level of Effort Potential Safety Benefit Low Medium</p>
<p>See corridor wide section for signal and pedestrian signal head issues</p>	

<i>Between Spring Street and Church Street/Summer Street</i>					
	<p>On the northbound side of Calhoun Street there are three signs on one post (“No parking”, “pedestrian”, “speed limit” signs). The “pedestrian” sign is posted too low and protrudes into the travel-way and sidewalk.</p> <p>Potential Improvement Strategies Remove the pedestrian sign and relocate on its own pole</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>High</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	High
Level of Effort	Potential Safety Benefit				
Low	High				
	<p>On the northbound side of Calhoun Street there are several signs on one post (“No parking”, “no loitering” signs); signs are posted too low</p> <p>Potential Improvement Strategies Remove the “No Loitering” sign</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>Medium</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	Medium
Level of Effort	Potential Safety Benefit				
Low	Medium				
<i>Church Street/Summer Street Intersection</i>					
	<p>Double sided “one-way” signs for both Church and Summer Street are missing</p> <p>Potential Improvement Strategies Add double-sided “one-way” signs</p> <table border="0"> <tr> <td>Level of Effort</td> <td>Potential Safety Benefit</td> </tr> <tr> <td>Low</td> <td>Medium</td> </tr> </table>	Level of Effort	Potential Safety Benefit	Low	Medium
Level of Effort	Potential Safety Benefit				
Low	Medium				

3.0 CONCLUSION

As discussed earlier, the road safety audit program is conducted to generate improvement recommendations and countermeasures for roadway segments demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The safety issues identified during the audit and documented in this report along with the recommended strategies should improve the overall safety of the study area. The congestion issues identified, attributed to the Calhoun Street Bridge, also needs to be addressed to realize the full impact of some of the improvement strategies. These remedial strategies should be implemented as time and budget limitations permit. Many of the strategies identified can be implemented through routine maintenance.

Engineering strategies alone cannot eliminate the traffic safety issues identified along the corridor. Therefore, enforcement and education are also necessary components of an overall safety program, to address the human behavioral aspects, to effectively reduce the number of crashes occurring. This requires coordination and communication between appropriate stakeholders.

APPENDIX A
Audit Team

PA 663 – Road Safety Audit

Audit Team

Name	Organization
Rosemarie Anderson	Delaware Valley Regional Planning Commission
Irving Bradley, Jr	City of Trenton Police Department
Andrew Carten	City of Trenton Planning Department
Cheryl Kastrenakes	Greater Mercer Transportation Management Association
Matthew Lawson	Mercer County Planning Department
Regina Moore	Delaware Valley Regional Planning Commission
Kevin Murphy	Delaware Valley Regional Planning Commission
Derrick Sexton	Delaware Valley Regional Planning Commission
Al Tindall	New Jersey Division of Highway Traffic Safety
Thomas Zim	New Jersey Department of Transportation

APPENDIX B

Maps

Calhoun Street Road Safety Audit

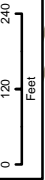
Study Area

MERCER COUNTY
Trenton

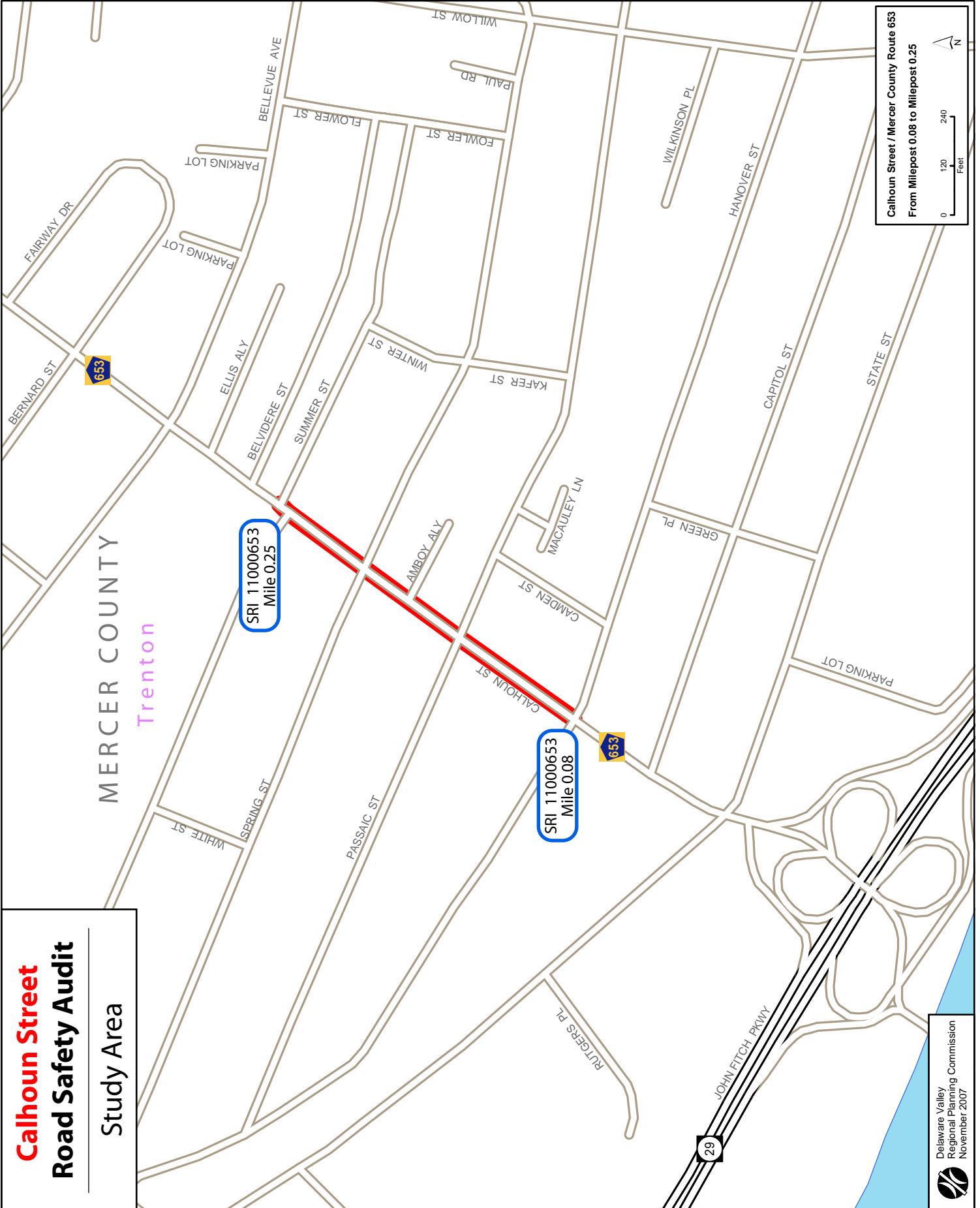
SRI 11000653
Mile 0.25

SRI 11000653
Mile 0.08

Calhoun Street / Mercer County Route 653
From Milepost 0.08 to Milepost 0.25



Delaware Valley
Regional Planning Commission
November, 2007



Calhoun Street Road Safety Audit

Traffic Volume

DVRPC Traffic Count

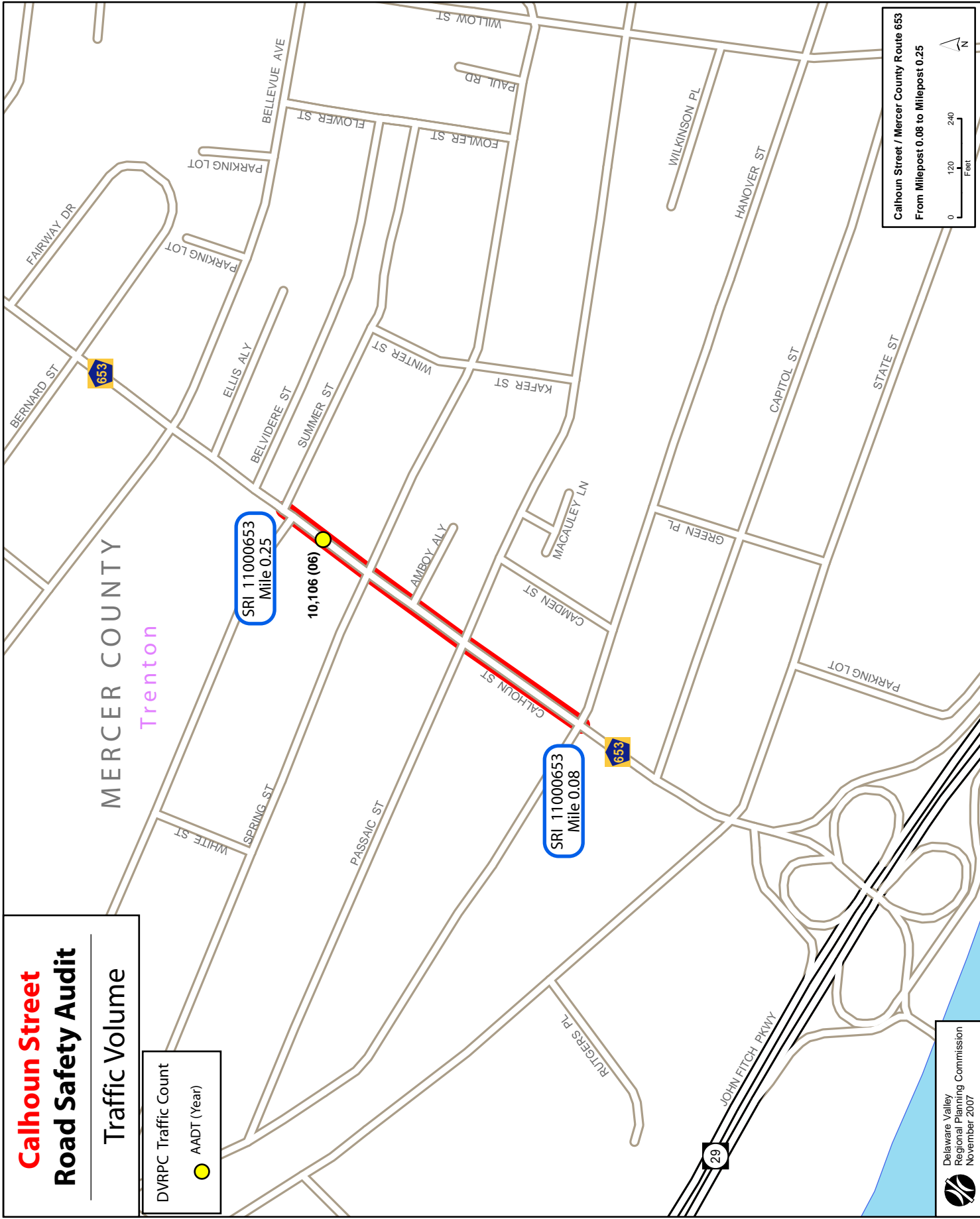
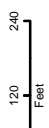
● AADT (Year)

SRI 11000653
Mile 0.25

10,106 (06)

SRI 11000653
Mile 0.08

Calhoun Street / Mercer County Route 653
From Milepost 0.08 to Milepost 0.25



APPENDIX C

Traffic Data

1. Calhoun Street CR 653, Southern Section
 Milepost 0.08 to Milepost 0.18



COLLISION TYPE	
Angle	15
Rear End	14
Pedestrian	5
Same Direction Side Swipe	5
Fixed Object	2
Left/U Turn	2
Other	2
Backing	1
Head-On	1
Parked Vehicle	1
Total	48
LIGHT CONDITION	
Daylight	32
Dark	15
Dusk	1
Total	48
SURFACE CONDITION	
Dry	38
Wet	9
Icy	1
Total	48
SEVERITY	
Fatal	0
Major Injury	3
Moderate Injury	2
Minor Injury	11
Property Damage Only	32
Total	48

Crash Location

Delaware Valley
Regional Planning Commission
November 2007

**Road Safety Audit
Southern Section
Calhoun St**

**Collision Diagram
Crash Data Year 2004**

Crash Type

Legend

① = # crashes

→ Rear-End

↔ Same Direction Sideswipe

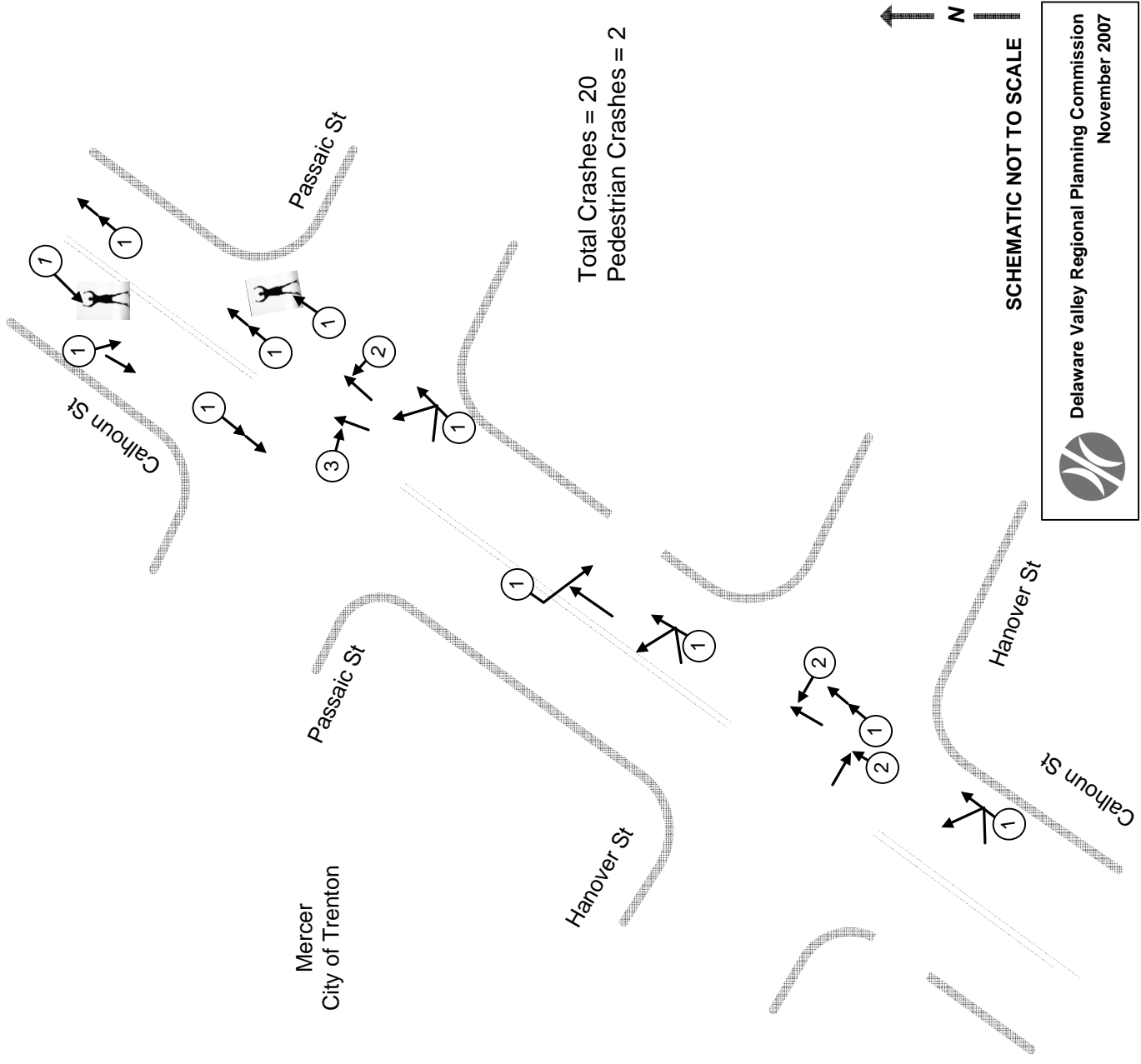
→↔ Head-On

↘↙ Angle

↕↘ Angle

↔↘ Left Turn

→↘ Hit Pedestrian



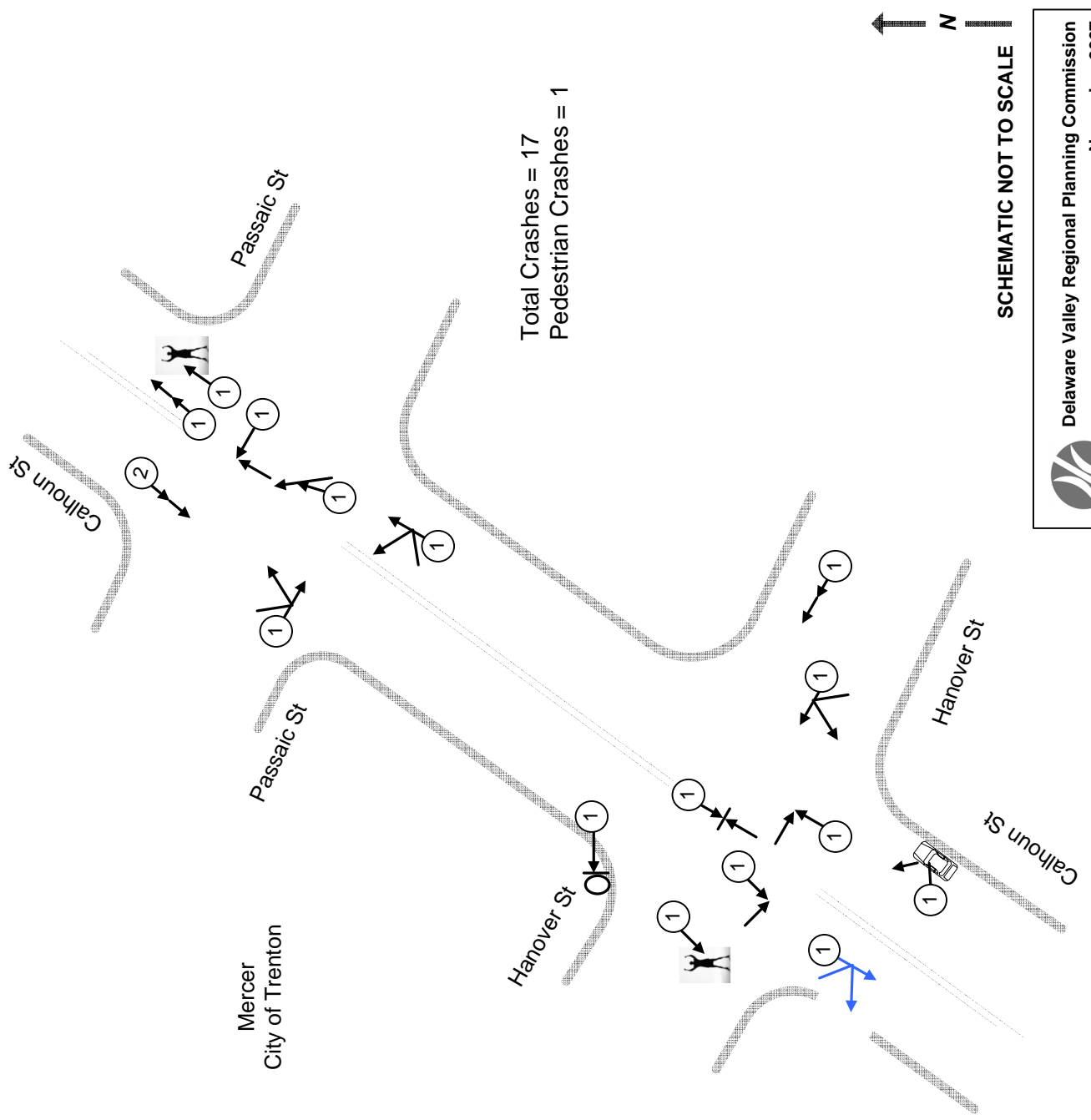
Mercer
City of Trenton

**Road Safety Audit
Southern Section
Calhoun St**

**Collision Diagram
Crash Data Year 2005**

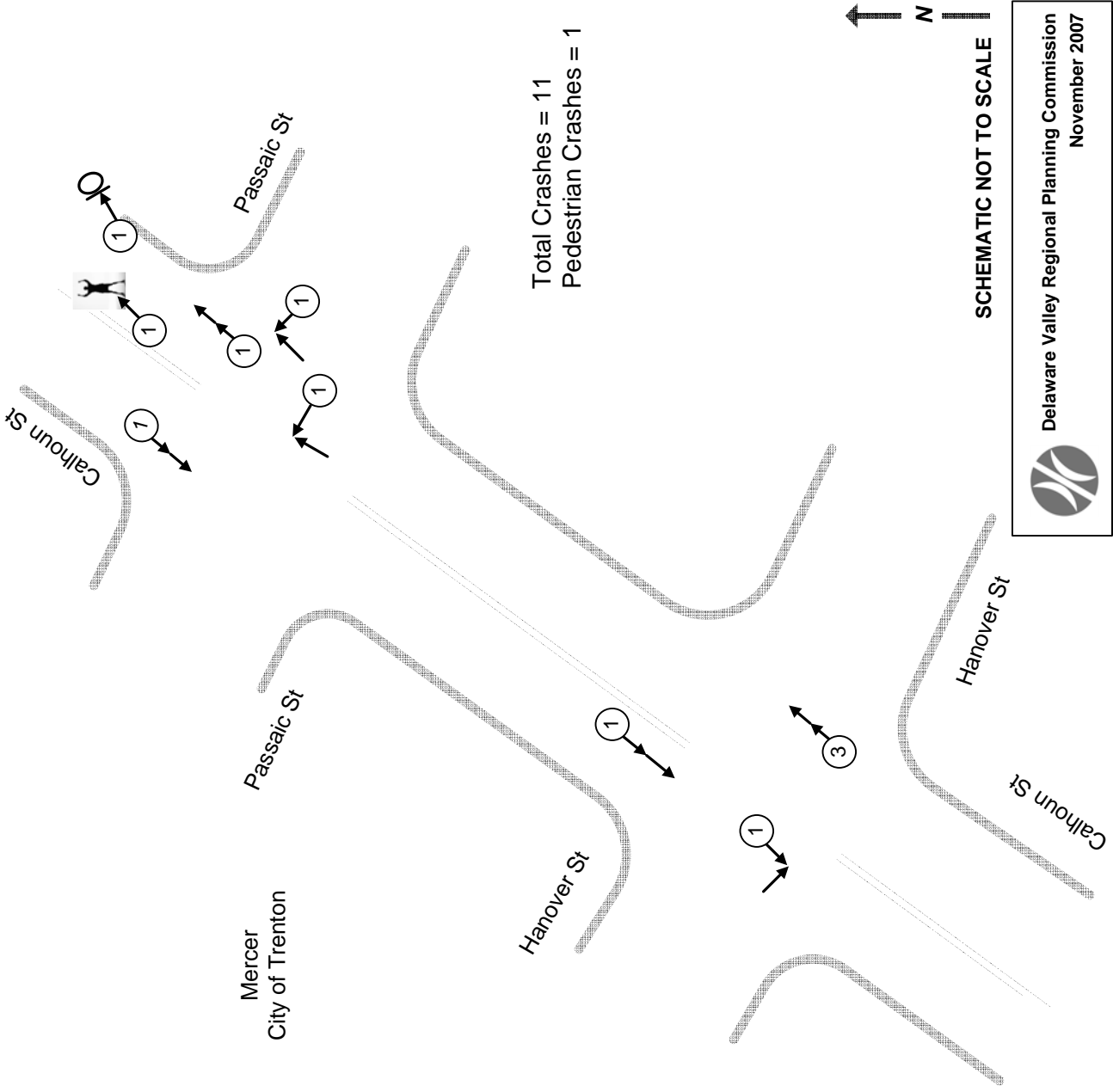
**Crash Type
Legend**

- ① = # crashes
- Rear-End
- ↘ Hit Parked Vehicle
- ↔ Same Direction Sideswipe
- ⊥ Head-On
- ↘ Angle
- ↗ Angle
- Hit Fixed Object
- ↘ Hit Pedestrian
- Possible Miscoding**
- ↔ Sideswipe "Angle"



SCHEMATIC NOT TO SCALE

**Road Safety Audit
Southern Section
Calhoun St
Collision Diagram
Crash Data Year 2006**



Legend

- ① = # crashes
- Rear-End
- ↙↘ Angle
- Hit Fixed Object
- 🚶 Hit Pedestrian

SCHEMATIC NOT TO SCALE



Delaware Valley Regional Planning Commission
November 2007

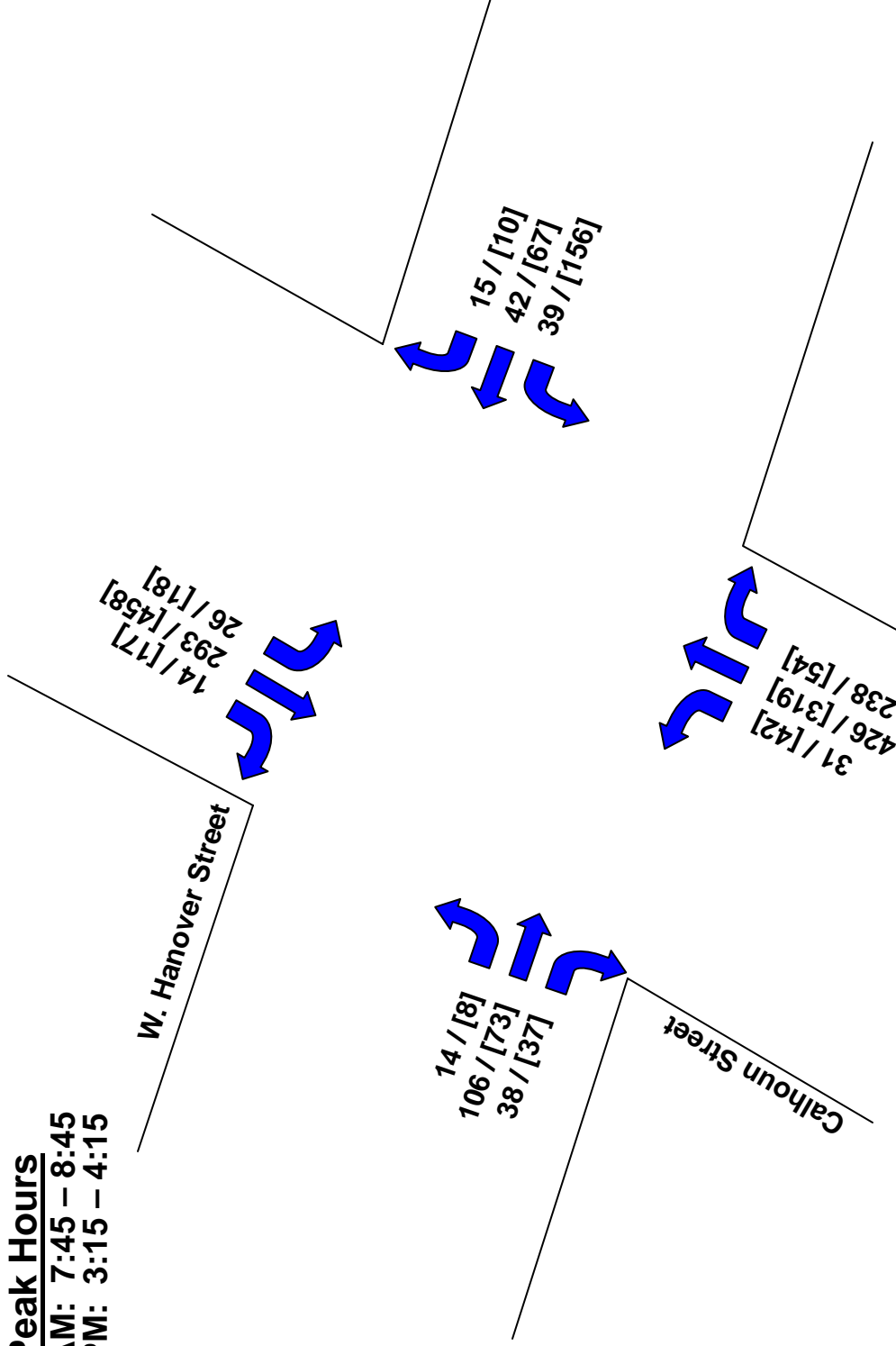
Calhoun Street and W. Hanover Street

Existing Peak Hour Turning Movement Counts AM / [PM]

Peak Hours

AM: 7:45 – 8:45

PM: 3:15 – 4:15



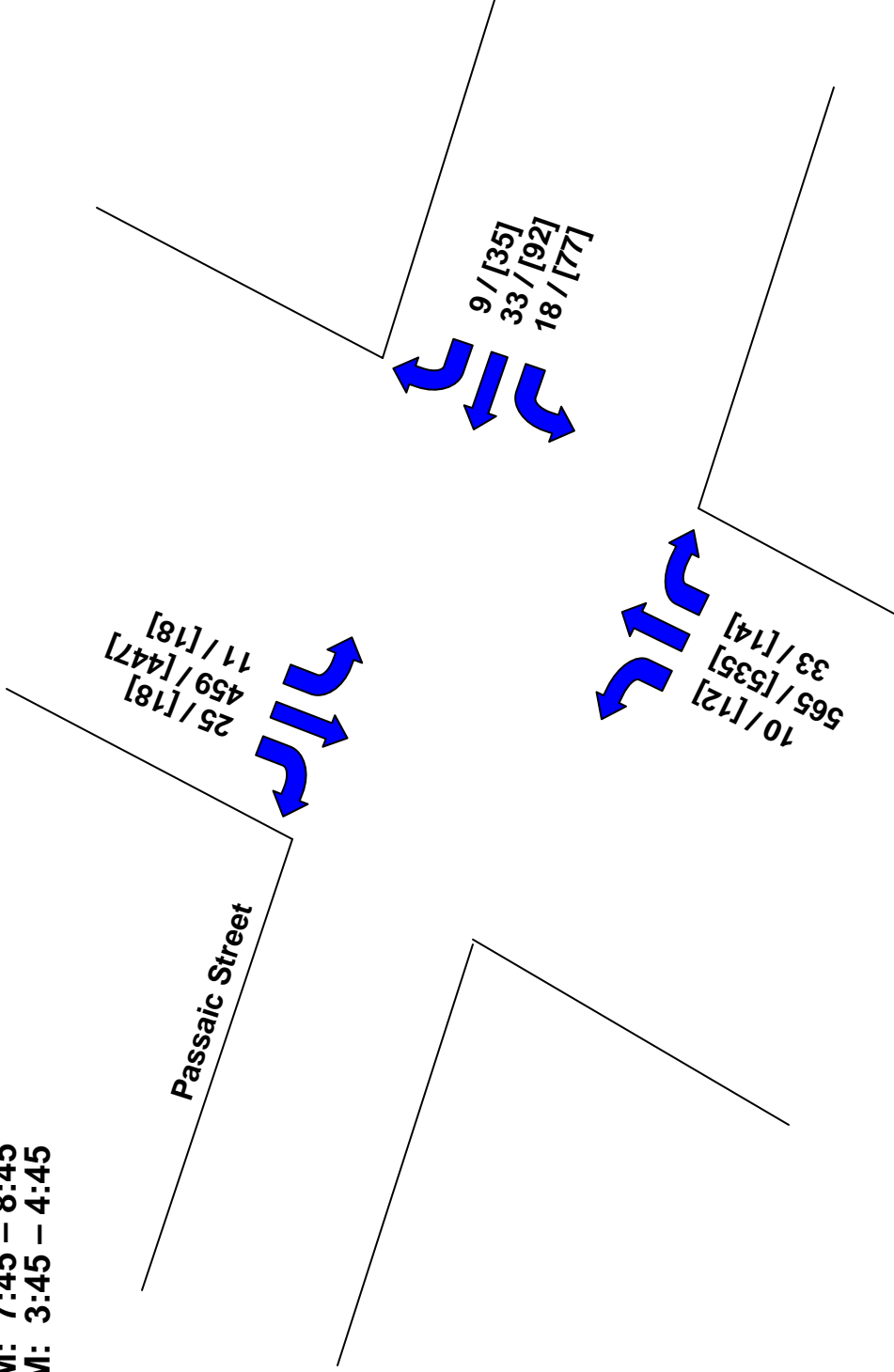
Calhoun Street and Passaic Street

Existing Peak Hour Turning Movement Counts AM / [PM]

Peak Hours

AM: 7:45 – 8:45


PM: 3:45 – 4:45




2. Calhoun Street CR 653, Northern Section
 Milepost 0.20 to Milepost 0.30




COLLISION TYPE	
Angle	9
Same Direction Side Swipe	8
Rear End	6
Left/U Turn	4
Parked Vehicle	4
Other	2
Head-On	1
Total	34
LIGHT CONDITION	
Daylight	25
Dark	6
Dawn	1
Dusk	1
N/A	1
Total	34
SURFACE CONDITION	
Dry	28
Wet	6
Total	34
SEVERITY	
Fatal	0
Major Injury	0
Moderate Injury	3
Minor Injury	15
Property Damage Only	16
Total	34





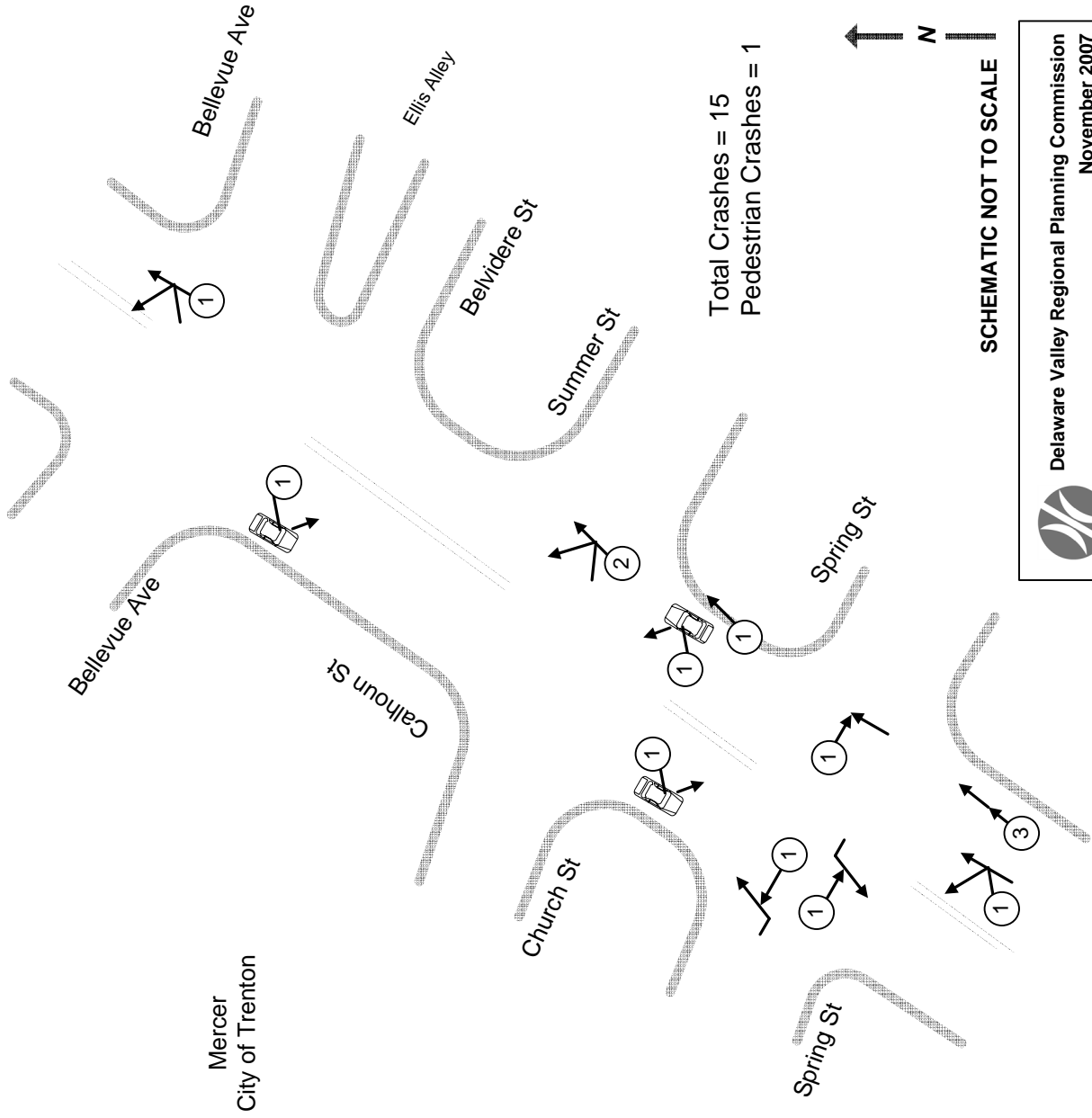
Crash Location



Delaware Valley
 Regional Planning Commission
 November 2007

**Road Safety Audit
Northern Section
Calhoun St**

**Collision Diagram
Crash Data Year 2004**



Mercer
City of Trenton

Delaware Valley Regional Planning Commission
November 2007

Crash Type

Legend

① = # crashes

Rear-End

Hit Parked Vehicle

Same Direction Sideswipe

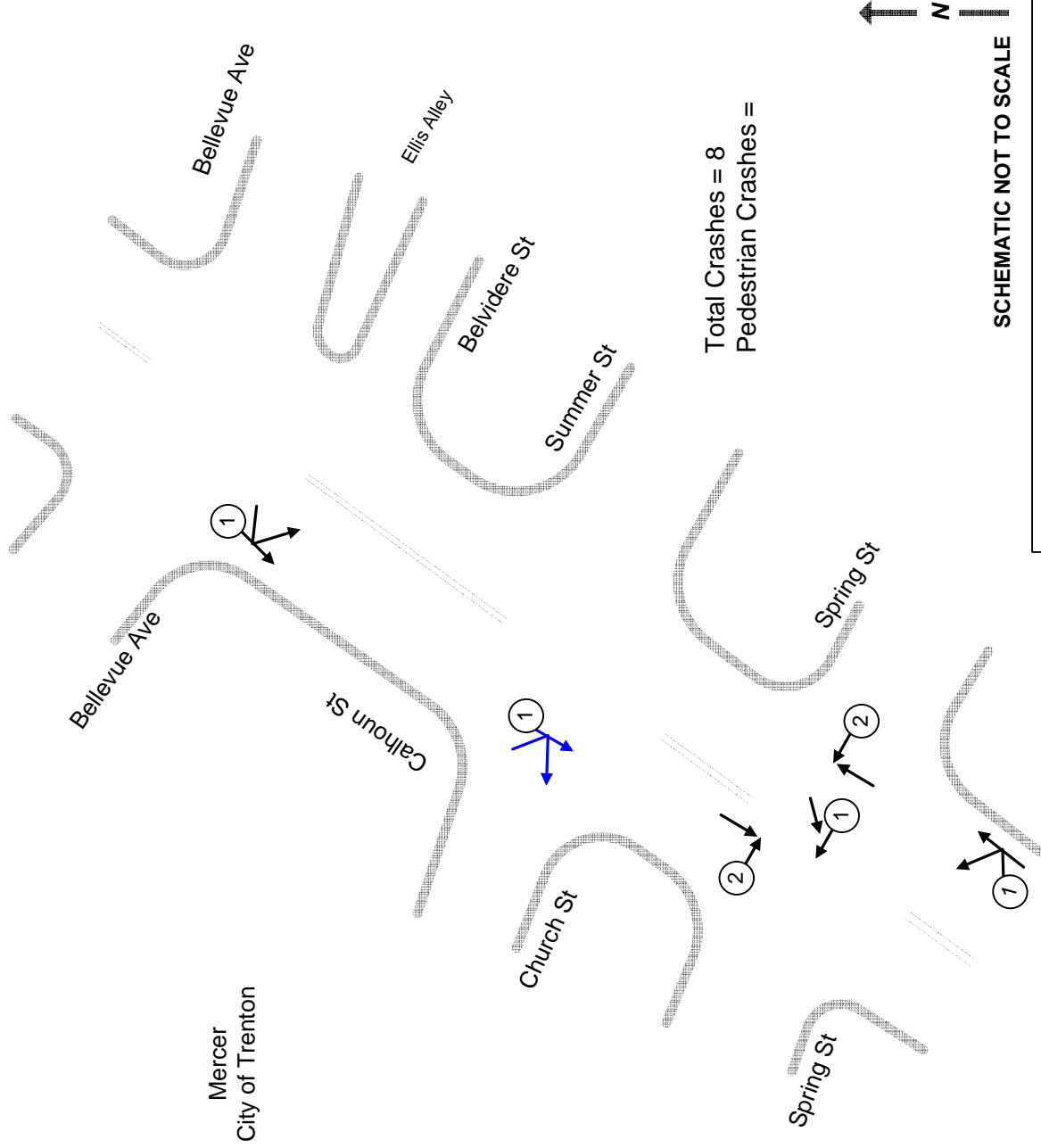
Angle

Left Turn

Other



Road Safety Audit
Northern Section
Calhoun St
Collision Diagram
Crash Data Year 2005



Crash Type

Legend

① = # crashes

Same Direction
Sideswipe

Angle

Angle

Possible Misencoding

Sideswipe
“Left Turn”

SCHEMATIC NOT TO SCALE

**Road Safety Audit
Northern Section
Calhoun St**

**Collision Diagram
Crash Data Year 2006**

Total Crashes = 11
Pedestrian Crashes = 0

**Crash Type
Legend**

① = # crashes

→ Rear-End

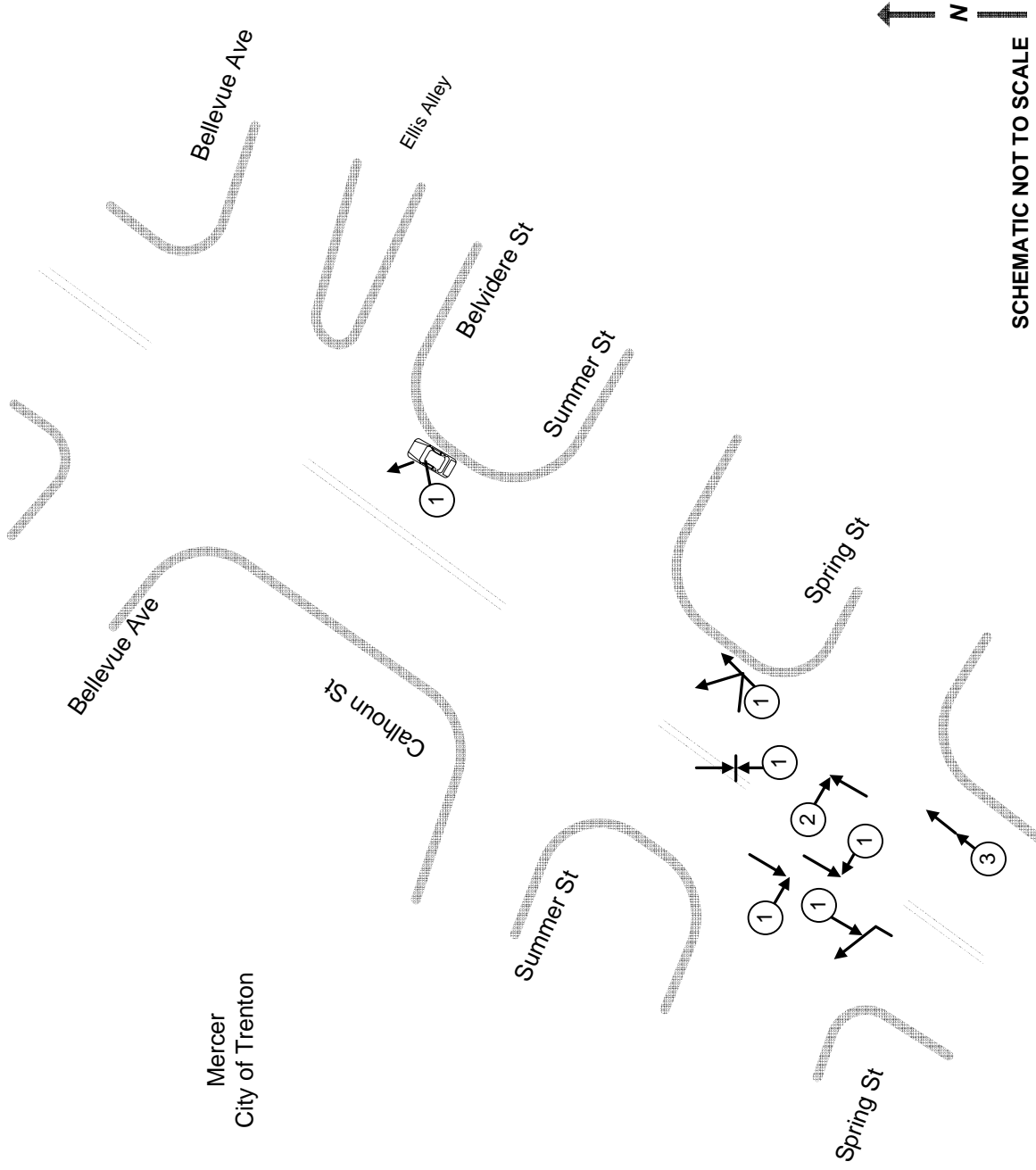
↘ Hit Parked Vehicle

↘ Same Direction Sideswipe

↔ Head-On

↘ Angle

↘ Left Turn



SCHEMATIC NOT TO SCALE



Delaware Valley Regional Planning Commission
November 2007

Calhoun Street and Church Street/Summer Street

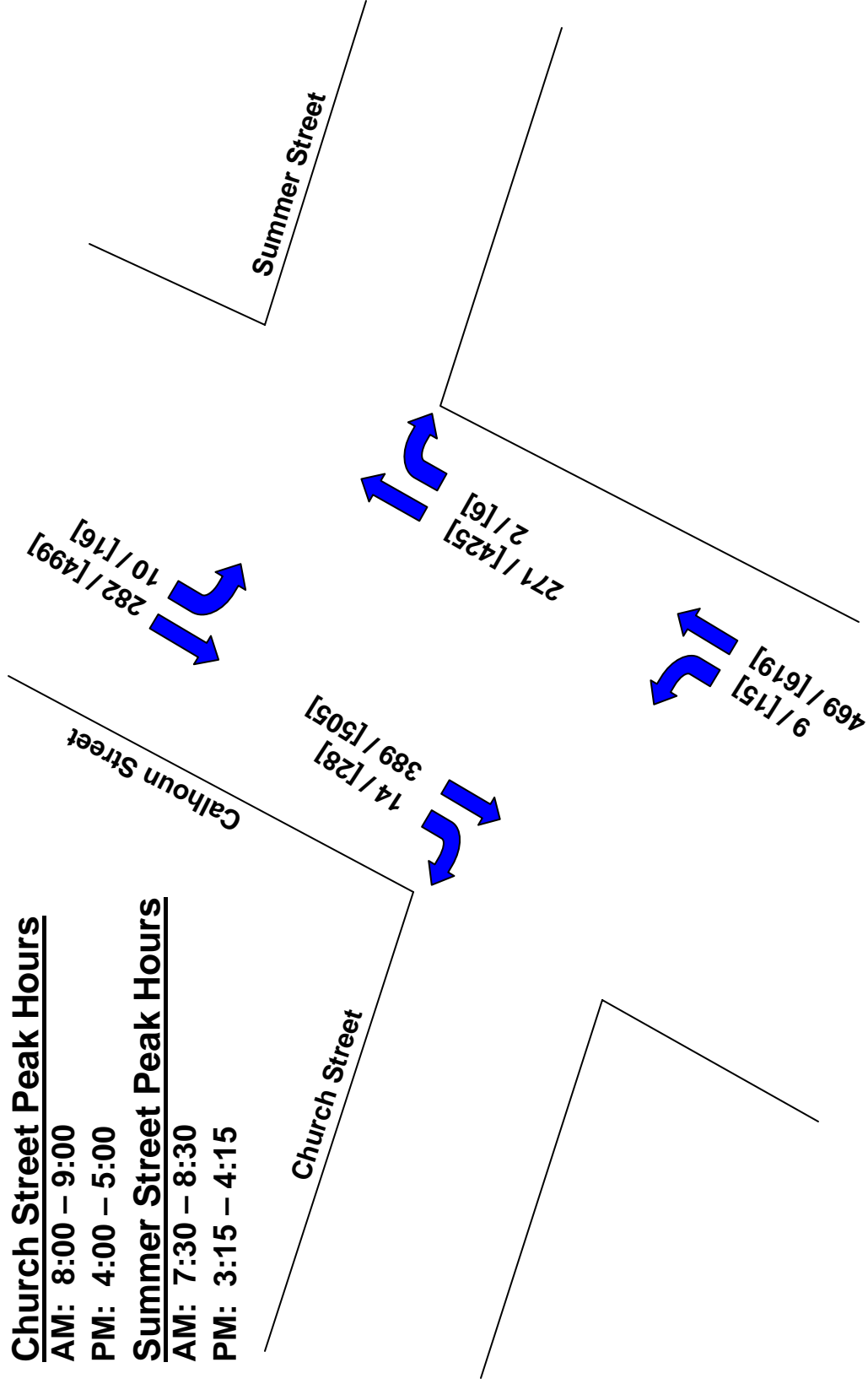
Existing Peak Hour Turning Movement Counts AM / [PM]

Church Street Peak Hours

AM: 8:00 – 9:00
 PM: 4:00 – 5:00

Summer Street Peak Hours

AM: 7:30 – 8:30
 PM: 3:15 – 4:15



Schematic not to scale

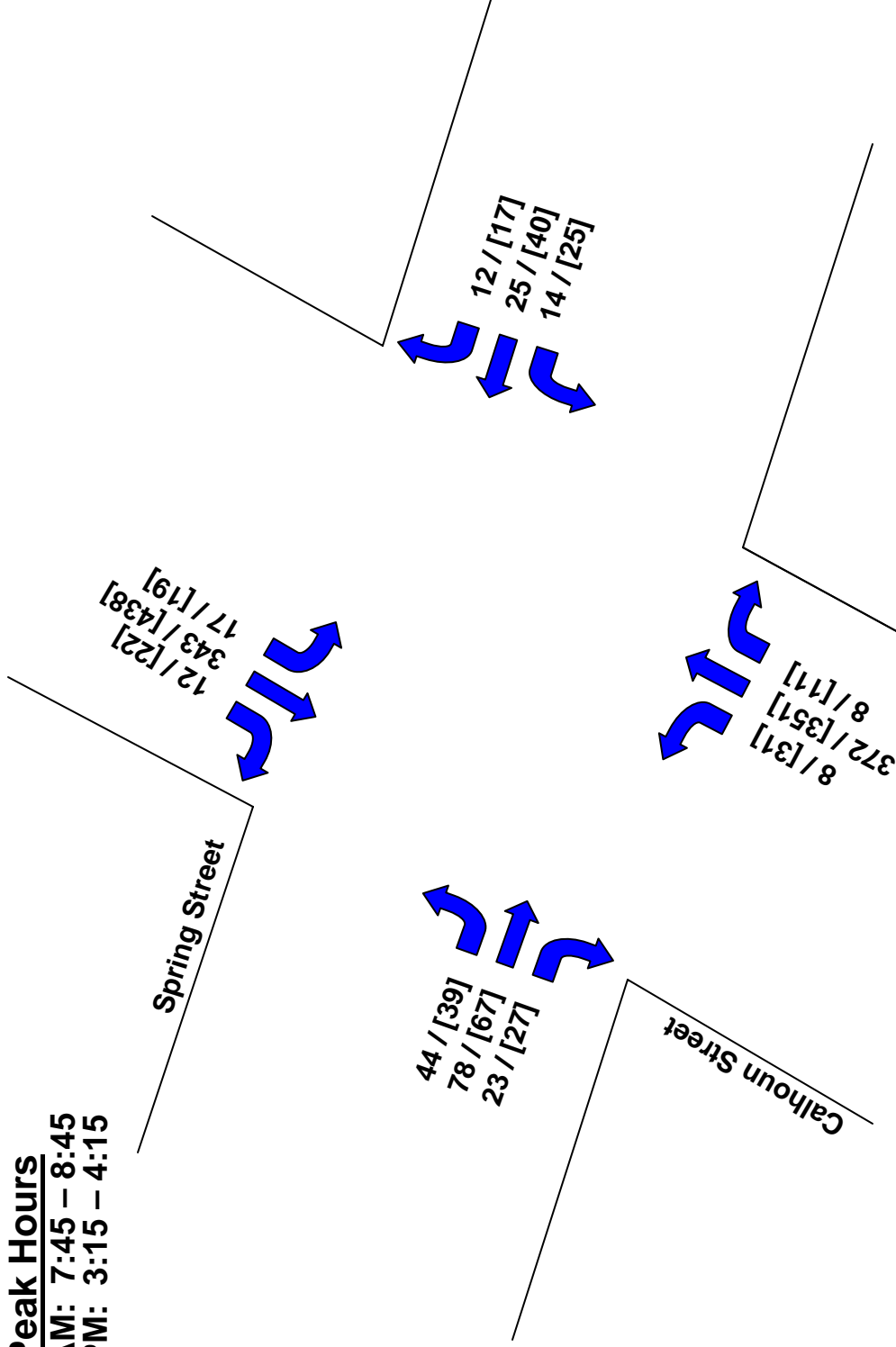
Calhoun Street and Spring Street

Existing Peak Hour Turning Movement Counts AM / [PM]

Peak Hours

AM: 7:45 – 8:45

PM: 3:15 – 4:15



Schematic not to scale



APPENDIX D

Checklist

CHECKLIST

Audit Team Member _____

GENERAL ISSUES

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Drainage	Do drainage items seem to be adequate?		
	Are drainage items clear of debris?		
2 Landscaping	Is landscaping in accordance with guidelines (sight distance, clearances etc.)		
3 Public Utilities	Are boxes, poles, and/or posts located in a safe position?		
	Do the above items interfere with sight distance?		
4 Access Management	Are there locations where access management is problematic?		
5 Lighting	Is lighting needed in specific locations?		

ALIGNMENT AND CROSS SECTION

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Visibility	Are sight distances adequate for the speed of traffic on Calhoun Street?		
	Is adequate sight distance provided at intersections?		
2 Driver expectation	Are there any sections of the roadway which may cause driver confusion such as:		
	a. Is alignment of roadway clearly defined?		
	b. Are crossroads or hidden driveways properly signed along corridor?		
	c. Are bicycle lanes clearly defined?		
	d. Do streetlight and tree lines conform		

	with the road alignment?		
3 Widths	Are all the traffic lanes and roadway widths adequate?		

INTERSECTIONS

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Location	Are there any roadside objects nearby which would intrude on driver's line of sight?		
	Are the intersections adequate for all vehicular movements?		
2 Controls	Are pavement markings and intersection control signing satisfactory?		
	Are there any pedestrian signals?		
3 Signage	Is the intersection appropriately signed?		
	Are there advance warning signs indicating the intersection?		
	Are signs appropriately located and of the appropriate size?		
4 Layout	Is the intersection layout obvious to all users?		
	Is the alignment of curbs satisfactory?		
	Are turning radii and tapers appropriate?		
	Are there driveways located at or near the intersections?		
5 Visibility, sight distance	Is sight distance adequate for all movements and all users?		
6 Transit	Are there bus stops located near the intersections?		
	a. If so are the bus stops near side or far side?		
7 Turn Lanes	Do the turning lanes have sufficient storage?		

	Are there locations where a left turn lane is needed?		

TRAFFIC SIGNALS

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Signal Operation	Are traffic signals operating correctly? (Example clearance time)		
2 Visibility	Are traffic signals clearly visible to approaching motorists?		

PEDESTRIANS

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Land Use Factors	Are there schools, transit stations or other pedestrian generators nearby?		
2 Sidewalks	Are sidewalks continuous throughout the corridor?		
	Are the sidewalks in good conditions (uneven, cracked, etc.)?		
	Are the sidewalks wide enough to accommodate persons using mobility aides?		
3 Facilities at Intersections	Are crosswalks provided at intersections?		
	Are the pedestrian ramps adequate?		
	Is there any pedestrian refuge islands needed at key intersections?		
	Are there pedestrian signals located at intersections?		
	Is the intersection clearly delineated for the visually impaired?		
	Are there adequate drainage at the intersection?		

4 Calhoun Street	Is the speed limit appropriate for all road users?		
	Is there on street parking that would impede pedestrian visibility?		
	Are there safety concerns for pedestrian crossings at unsignalized intersection?		
5 Lighting	Is the sidewalk adequately lit for pedestrians to see and feel safe?		
	Are there dark places or hiding places which represent a personal security issue?		
	Are the pedestrian crosswalks adequately lit for pedestrians and motorists?		
6 Fencing	Are there locations where a fence should be provided?		
7 Visibility and Sight Distance	Are pedestrians waiting to cross visible to motorists?		
	Can pedestrians see approaching vehicles?		
	Are there temporary or permanent obstructions near crosswalks (parked vehicles, vegetation, fences, etc.)		

BICYCLISTS

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
	Are there share the road signs posted?		
	Is the road surface of suitable quality for bicyclists?		
	Are drainage grates bicycle friendly?		
	Are parked vehicles an obstruction to bicyclists?		
	Is the bicycle lane continuous?		

TRANSIT

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Buses	Are bus stops located at the far side or near side of the intersection?		
	Are bus stops signed appropriately?		
	Are bus stop locations near existing driveways?		
	Are there adequate waiting areas for pedestrians around bus stops (shelter or bench)?		
	Are bus stop locations safe for passengers boarding and unboarding the bus?		
	Is fencing needed at transit facilities?		
	Are vehicles illegally parked at bus stops?		

ON STREET PARKING

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Parking	Are there time parking restriction signs posted?		
	Does parking obstruct bicycle or through lane traffic?		
	Is parking located at the edge of intersections which could cause conflict for right turning traffic?		
	Does parking obstruct vehicular or pedestrian movement?		

SIGNAGE, PAVEMENT MARKINGS, DELINEATION AND LIGHTING

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Signage	Are there signs missing from key locations?		
	Are signs easy to understand?		
	Are the correct signs used for each situation, and is each sign necessary?		
	Are signs effective for all likely conditions (i.e. day, night, oncoming headlights etc)?		
	Are there locations where there is sign clutter?		
	Are all necessary regulatory, warning, and direction signs (including detours) in place? Are they conspicuous?		
	Are they redundant?		
	Are traffic signs in their correct locations, and properly positioned with respect to lateral clearance and height?		
	Are signs placed so as to restrict sight distance, particularly for vehicles?		
	Do signs supports conform to guidelines?		
2 Pavement Markings and Delineation	Does existing pavement markings need to be re-painted?		
	Have raised pavement markers been installed?		
	Are pavement markings easily visible and effective for all likely conditions (i.e. at night, day, inclement weather etc.)?		
	Are guide posts correctly placed, clean, and visible?		

PAVEMENT

<u>Item #</u>	<u>Description</u>	<u>Check</u>	<u>Comments</u>
1 Pavement defects	Is the pavement free of defects (i.e. excessive roughness, potholes) which could result in safety problems?		
2	Is the pavement free of areas where		

Ponding	ponding may occur resulting in a safety problem?		
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APPENDIX E
Response Sheet

Calhoun Street (CR 653) – RSA Response Sheet

Corridor-Wide Issues

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<p><i>Signals</i></p> <ul style="list-style-type: none"> Traffic signals outdated (8" heads) Traffic signals do not have pedestrian man/hand or countdown heads Traffic signals along Calhoun Street are not coordinated 	<ul style="list-style-type: none"> Upgrade signals with 12" heads and include pedestrian heads with either man/hand or countdown. Re-time signals for coordination along Calhoun Street 			
<p><i>Pavement Markings</i></p> <ul style="list-style-type: none"> Stop bars are missing at intersection approaches Pavement markings are faded or missing in areas on both Calhoun Street and side streets 	<ul style="list-style-type: none"> Re-stripe or add pavement markings as appropriate to guide motorists 			
<p><i>Drainage inlets</i></p> <ul style="list-style-type: none"> Drainage inlets are clogged with debris – result in pooling of water when it rains 	<ul style="list-style-type: none"> Coordinate with Sanitation Department to clean drainage inlets 			
<p><i>Signage</i></p> <ul style="list-style-type: none"> Several warning and regulatory signs are faded 	<ul style="list-style-type: none"> Replace existing warning and regulatory signs as appropriate 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<p>Signage (continued)</p> <ul style="list-style-type: none"> • Inconsistent “No Parking” signs on the southbound side of Calhoun Street • Street name signs are small and hardly visible • Bicycle activity in the area; there are no “share the road” sign • There is only one speed limit sign in the study area. This is located on the northbound side of Calhoun Street, south of Summer Street • Heavy pedestrian traffic in the area, only one pedestrian warning sign located at the northbound end of the study area. 	<ul style="list-style-type: none"> • Replace existing “No Parking” signs as appropriate in accordance with City of Trenton parking regulations • Upgrade street name signs using clear view font to make them easier to read by motorists • Install “ Share the Road” signs on both sides of the road • Install 25 MPH speed limit signs north and south of the study area on the southbound and northbound sides of Calhoun Street. • Install pedestrian signs north and south of the study area on the southbound and northbound sides of Calhoun Street. • Install pedestrian crossing signs as appropriate at crosswalks. 			
<p>Curb Ramps</p> <ul style="list-style-type: none"> • Curb ramps are missing or are not ADA standards 	<ul style="list-style-type: none"> • Upgrade or construct curb ramps to ADA standards 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<p>Parking</p> <ul style="list-style-type: none"> • Parking is allowed on one side of Calhoun Street, the southbound side. Parked cars encroach on the travel way. • Vehicles parked on the side streets are too close to the intersection – this makes turning movements difficult 	<ul style="list-style-type: none"> • Re-stripe Calhoun Street with the northbound lane narrower to provide excess right of way on the southbound side for parking • Install no parking zones around the intersections with painted curb and appropriate signage 			
<p>Utility Poles</p> <ul style="list-style-type: none"> • Many utility poles are within the clear zone 	<ul style="list-style-type: none"> • Relocate utility poles outside the clear zone 			
<p>Sidewalks</p> <ul style="list-style-type: none"> • In general the sidewalk is in poor condition except for north of Spring Street 	<ul style="list-style-type: none"> • Upgrade sidewalk for the entire length of Calhoun Street from State Street to Spring Street. 			
<p>Cut-off sign posts</p> <ul style="list-style-type: none"> • Large number of cut-off sign posts sticking out in the sidewalk through out the study area 	<ul style="list-style-type: none"> • Remove stubs from sidewalk to prevent pedestrians tripping. 			

Specific Locations

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<i>Hanover Street Intersection</i>				
<ul style="list-style-type: none"> Pavement markings are lacking or faded There are no crosswalks visible 	<ul style="list-style-type: none"> Add or re-stripe pavement markings as appropriate on Calhoun Street and Hanover Street – centerline, stop bars, pedestrian crosswalk 			
<ul style="list-style-type: none"> According to the turning movement counts 67% of the westbound traffic on Hanover Street makes left turns during the afternoon peak hour. Angle crash was also the most frequent crash type for the period study 	<ul style="list-style-type: none"> Add a left turn lane for the westbound Hanover Street approach Restrict parking on Hanover Street westbound approach from Calhoun Street approximately 100 feet Re-time signal with protected/permissive left turns for the Hanover Street westbound approach during the afternoon peak period Add an all-red phase to the traffic signal timing. 			
<ul style="list-style-type: none"> Sidewalks are in poor condition 	<ul style="list-style-type: none"> Upgrade sidewalk. Replace northbound depressed curb sidewalk with straight curb 			
<ul style="list-style-type: none"> Mail storage box on northeast corner is located in the clear zone – hazard 	<ul style="list-style-type: none"> Relocate mail storage box 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<i>Hanover Street Intersection (continued)</i>				
<ul style="list-style-type: none"> Pavement on Hanover Street is in poor condition. Pavement adjacent to curb ramp on the southeast corner of the intersection is rutted 	<ul style="list-style-type: none"> Re-pave Hanover Street 			
<ul style="list-style-type: none"> Southbound bus stop is located at the gas station access/egress. 	<ul style="list-style-type: none"> Consider relocation bus stop. Long Term - Close gas station driveway nearest the intersection and widen the other on Calhoun Street 			
	See corridor wide section for signal and pedestrian signal head issues			
<i>Between Hanover Street and Passaic Street</i>				
<ul style="list-style-type: none"> Signs on the southbound side of Calhoun Street are faded 	<ul style="list-style-type: none"> Replace signs as appropriate 			
<ul style="list-style-type: none"> Utility pole obstruction – pole number 66290TN 	<ul style="list-style-type: none"> Relocate utility pole north of intersection 			
<i>Passaic Street Intersection</i>				
<ul style="list-style-type: none"> There are no pavement markings on Passaic Street 	<ul style="list-style-type: none"> Add pavement markings as appropriate on Passaic Street – centerline, stop bars, pedestrian crosswalk 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<i>Passaic Street Intersection (continued)</i>				
<ul style="list-style-type: none"> There are no crosswalks or stop bars at the Calhoun Street approaches 	<ul style="list-style-type: none"> Add stop bars and “continental” crosswalk to the Calhoun Street approaches 			
<ul style="list-style-type: none"> High pedestrian traffic, lack of pedestrian amenities 	<ul style="list-style-type: none"> Add pedestrian crossing warning signs at crosswalk 			
<ul style="list-style-type: none"> At the westbound approach of the intersection, vehicles are parked too close to intersection; this further compromises an already tight turning radius 	<ul style="list-style-type: none"> Restrict parking at the intersection using appropriate signage and painted curb 			
<ul style="list-style-type: none"> There are no “one-way” signs for west leg of Passaic Street 	<ul style="list-style-type: none"> Install back to back “one-way” signs at the intersection 			
<ul style="list-style-type: none"> Drainage clogged with debris 	<ul style="list-style-type: none"> Clean drainage inlet 			
<i>Between Passaic Street and Spring Street</i>				
<ul style="list-style-type: none"> No curb ramps at alley intersection with Calhoun Street 	<ul style="list-style-type: none"> Construct curb ramp per ADA standards 			
<i>Spring Street Intersection</i>				
<ul style="list-style-type: none"> There are no curb ramps 	<ul style="list-style-type: none"> Construct curb ramps at all corners of the intersection according to ADA standards 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<i>Spring Street Intersection (continued)</i>				
<ul style="list-style-type: none"> • Fire hydrant is too close to the intersection 	<ul style="list-style-type: none"> • Relocate fire hydrant 			
<ul style="list-style-type: none"> • No centerline along Spring Street west of Calhoun Street 	<ul style="list-style-type: none"> • Stripe centerline to guide motorists; especially those turning on to Spring Street 			
<ul style="list-style-type: none"> • Poor pavement condition on Spring Street east of Calhoun Street 	<ul style="list-style-type: none"> • Re-pave and stripe as appropriate including centerline, stop bar and “continental” crosswalk 			
<ul style="list-style-type: none"> • Over head horizontal signal with no post mounted signals for pedestrians 	<ul style="list-style-type: none"> • Re-pave and stripe as appropriate including centerline, stop bar and “continental” crosswalk 			
<ul style="list-style-type: none"> • Utility pole 4881xTN is located too close to the intersection 	<ul style="list-style-type: none"> • Relocate utility pole 			
<ul style="list-style-type: none"> • Utility pole 67948TN is located too close to the traffic signal pole on the southwest corner 	<ul style="list-style-type: none"> • Relocate utility pole 			
<ul style="list-style-type: none"> • 137 to 141, street light is too dim, lens and bulb missing 	<ul style="list-style-type: none"> • Replace lens and bulbs 			
	<ul style="list-style-type: none"> • See corridor wide section for signal and pedestrian signal head issues 			

SAFETY ISSUES	Solution	Decision Agree/Reject	Planned Completion Date	Comments
<i>Between Spring Street and Church Street/Summer Street</i>				
<ul style="list-style-type: none"> On the northbound side of Calhoun Street there are three signs on one post (“No parking”, “pedestrian”, “speed limit” signs). The signs “pedestrian” sign is posted too low and protrudes into the travel-way and sidewalk. 	<ul style="list-style-type: none"> Remove the pedestrian sign and relocate on its own pole 			
<ul style="list-style-type: none"> On the northbound side of Calhoun Street there are several signs on one post (“No parking”, “no loitering” signs); signs are posted too low 	<ul style="list-style-type: none"> Remove the “No Loitering” sign 			
<i>Church Street/Summer Street Intersection</i>				
<ul style="list-style-type: none"> Double sided “one-way” signs for both Church and Summer Street are missing 	<ul style="list-style-type: none"> Add double-sided “one-way” signs 			

Title of Report: ***CALHOUN STREET - ROAD SAFETY AUDIT***

Publication No.: **08003**

Date Published: January 2008

Geographic Area Covered:

The study area includes a section of Calhoun Street in the City of Trenton, New Jersey. It comprises four intersections from Hanover Street to Summer Street.

Key Words:

Road, safety, audit, potential, fatalities, injuries, reportable, crashes, issues, strategies, coordination, engineering, enforcement, education, prioritize, intersection, speed limit, traffic volumes, stakeholders, audit team, clear zone, geometry, pavement markings, signs, traffic signals, crosswalk, sidewalk, curb ramp, drainage.

ABSTRACT: This is a documentation of the process and findings of the Calhoun Street Road Safety Audit (RSA) undertaken by Delaware Valley Regional Planning Commission (DVRPC). The goal of the audit is to generate improvement recommendations and countermeasures for intersections demonstrating a history of, or potential for a high incidence of motor vehicle crashes. The emphasis is placed on identifying low cost, quick turnaround safety projects to address the issues where possible. This project represents a step towards implementation of the Delaware Valley Regional Planning Commission (DVRPC) Regional Safety Action Plan. Improving the design and operation of intersections is a priority area for both engineering and enforcement discipline as documented in the Plan.

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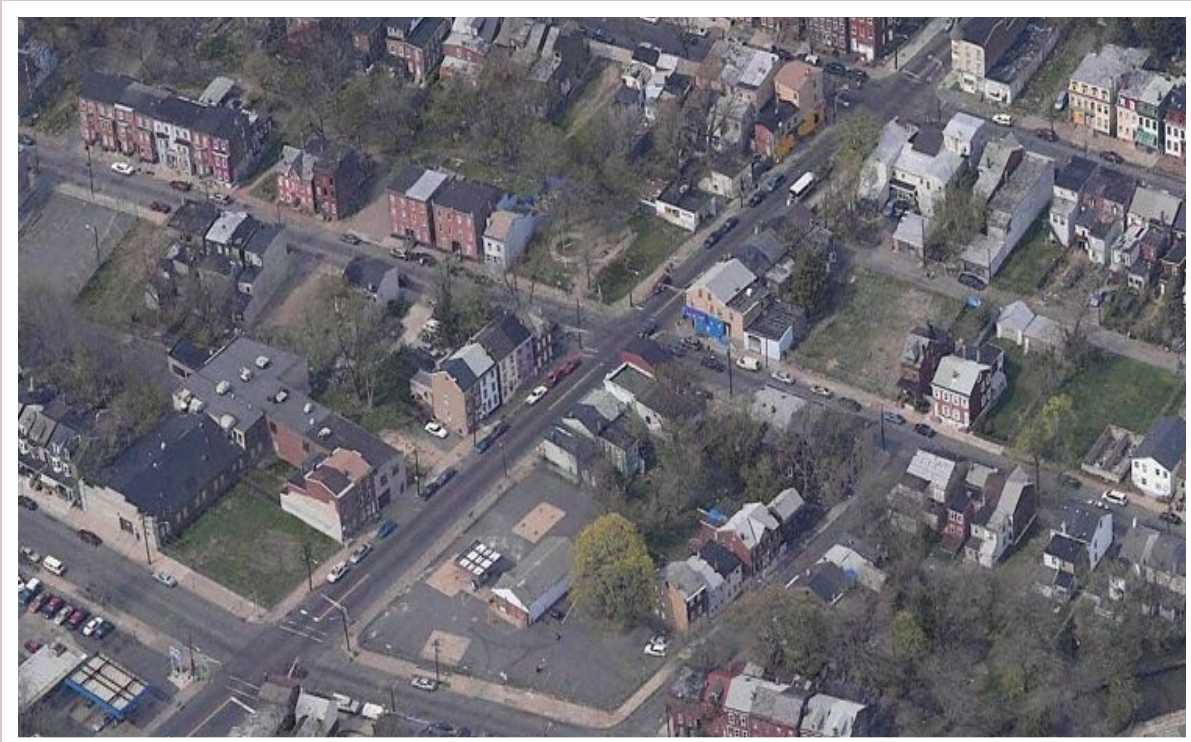
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CALHOUN STREET

Road Safety Audit



January 2008



**DELAWARE VALLEY REGIONAL
PLANNING COMMISSION**

