



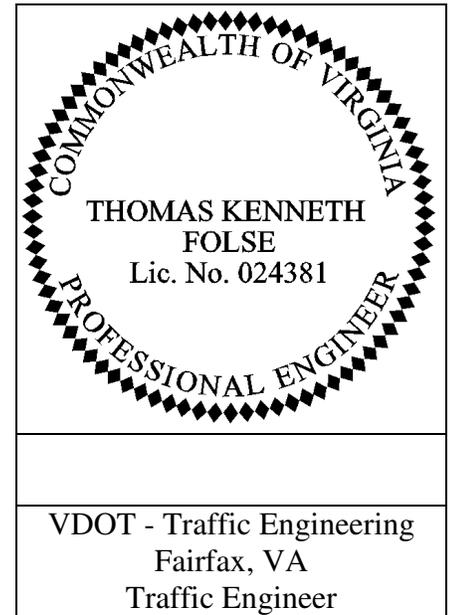
VDOT Speed Limit Study

Northern Region Traffic Engineering

Date 02/22/19

Study area:

Route # 235
Street name Mount Vernon Memorial Highway
Jurisdiction: Fairfax County
From: Richmond Highway, Route 1
To: 0.16 Miles East of Old Mount Vernon Road,
 Route 623
Length: 2.62 miles



Functional Class

The roadway is presently classified as an Urban Principal Arterial in the study area.

Speed Limit for Study Roadway

Mount Vernon Memorial Highway, Rte. 235 has a posted speed limit of 45 MPH from Richmond Highway, Rte. 1 to 0.16 miles east of Old Mount Vernon Road, Rte. 623. This speed limit was established by a resolution dated 8/28/1992.

The eastern terminus is a four-leg intersection (all-way stop control) with Mount Vernon Highway and has a posted speed limit of 35 MPH which was established by resolution on 08/28/1992.

Origin and Nature of Request

The speed study for this section of roadway was initiated by The Mount Vernon Council of Citizens Associations, Inc. (made up of forty one associations among civic, community, property owner and homeowner) to consider lowering the speed limit due to speeding, crashes, increased traffic volume and pedestrian crossing concerns. A preliminary review including crash data analysis concluded that the existing conditions warranted a more thorough analysis on the roadway.

Study Results and Recommendation

The 2.62 mile section of Mount Vernon Memorial Highway (Rte. 235) under study is a roadway with a posted speed limit of 45 MPH. The average 85th percentile speed recorded for the entire study area is approximately 44.5 mph, the median speed is 39.8 mph and the pace range is 34.8 – 44.8 mph. The existing 45 mph speed limit is approximately 0.5 mph above the measured 85th percentile speed and the median speed is significantly below the current 45 MPH speed limit.

Based on the speed data, AADT, crash data, surrounding development, roadway characteristics / geometry and access points density; we recommend the establishment of the following speed zone:

In summary, we recommend the establishment of the following speed zone:

Street Name: Mount Vernon Memorial Highway
Route #: 235
Speed limit: 45 mph
From: Richmond Highway, Route 1
To: 0.08 Miles West of Cherrytree Drive, Route 3533
Length: 2.02 miles

Street Name: Mount Vernon Memorial Highway
Route #: 235
Speed limit: 40 mph
From: 0.08 Miles West of Cherrytree Drive, Route 3533
To: 0.16 Miles East of Old Mount Vernon Road, Route 623
Length: 0.6 miles

- “Studies have shown crash rates are lowest at around the 85th percentile speed. Drivers traveling significantly faster or slower than this speed are at a greater risk for being in a crash. It is not high speed alone that relate to crash risk; it is the variation of speed within the traffic stream (Institute of Transportation Engineers, ITE)”.
- The speed reduction from 45 MPH to 40 MPH in the 0.6-mile section is within 5 MPH of the 85th percentile speed per MUTCD (the 85th percentile average for stations # 3/3A located between Rte. 624 and Rte. 623 is 42.2 MPH). The proposed speed reduction falls into 10mph pace speed which is the ten mile-per-hour range of speeds containing the greatest number of observed speeds
- Mount Vernon Council of Citizens Associations, Inc., which represents the entire community, supports any speed limit reduction in the study area.
- A gradual speed reduction is appropriate while approaching the George Washington’s Mount Vernon.
- The 85th percentile average for station 1/1A and for station 2/2A is 44.1 and 47.8 MPH respectively which are consistent with the existing posted speed limit. Therefore, no changes are proposed for the segment between Rte. 1 and 0.08 miles west of Cherrytree Drive.
- The 85th percentile speed reflects the collective judgment of the vast majority of drivers as to a reasonable speed for given traffic and roadway conditions. It is important to note that setting speed limits lower than 85th percentile speed does not encourage compliance with the posted speed limit.
- “Reducing the speed limit will slow the speed of traffic, decrease the number of crashes and increase safety represents public common misconceptions (ITE)”.
- Experience has shown that most motorists tend to drive at speeds that are reasonable and appropriate for the conditions that they experience, and that simply reducing the speed limit on a roadway does not necessarily lower operating speeds.
- **TE section would recommend the placement of pole-mounted speed display signs** (at 0.16 miles west of Ferry Landing Road / Old Mill Road, Rte. 623 for eastbound motorists and at 0.03 miles west of Peartree Landing, Route 7068 for westbound motorists) based on the following:
 - a) 41.6% of motorists (2896 vehicles) for eastbound at station # 2 and 26.6% (1793 vehicles) for westbound at station # 2A (1793 vehicles) exceeded the 45 MPH posted speed limit.
 - b) The lack of turn lanes at the signal at Ferry Landing Road / Old Mill Road, the trip generation due to the Grist Mill Park and the record of four (4) rear-end crashes at Forest Haven Drive in the study period which are related to either speeding or/and drivers distraction.
 - c) This the section with higher injury rate in the study area (**Appendix A, Figure 2**).

Study Details

A. Speed Data

Three (3) Metrocount tube counter units were placed to collect the speed data in the eastbound and westbound directions. The data was collected for a 24 hour period from 10:00 AM Tuesday, October 2, 2018 to 10:00 AM Wednesday October 3, 2018. The data for stations 1, 2 and 3 was collected for the eastbound direction and the data for stations 1A, 2A and 3A was collected for the westbound direction. The results are shown in **Table 1** below.

TABLE 1 – SPEED DATA SUMMARY

Station Number	Location	85 th % Speed	Median Speed	10 MPH Pace Speed	Volume
EB 1	885 feet west of Patton Boulevard, Rte. 1169	42.5 mph	38.5 mph	33 - 43 mph	7565
WB 1A	885 feet west of Patton Boulevard, Rte. 1169	45.6 mph	41.2 mph	36 - 46 mph	7403
EB 2	670 feet east of Forest Haven Drive, Rte. 3108	48.3 mph	44.1 mph	39 - 49 mph	6957
WB 2A	670 feet east of Forest Haven Drive, Rte. 3108	46.8 mph	42.5 mph	37 - 47 mph	6732
EB 3	650 feet west of Old Mount Vernon Road, Rte. 623	42.5 mph	37.4 mph	33 - 43 mph	7323
WB 3A	650 feet west of Old Mount Vernon Road, Rte. 623	41.8 mph	35.6 mph	31 - 41 mph	7247
	Weighted Average	44.5 mph	39.8 mph	34.8 - 44.8 mph	

Note: The AADT of 12782 from 2017 (VDOT Traffic Engineering Linked Count Database) is consistent with the 14,968 vehicles counted in this study (from station 1 / 1A which represent the highest volume).

- Highest 85th percentile was collected from station EB 2/WB 2A located 670 feet east of Forest Haven Drive, Rte. 3108. It should be noted that the station in question was located near the lowest elevation in a sag vertical curve as shown in **Appendix B-Figure 4**, which explains the highest operating speeds to a certain extent.
- “The greater the variation in speed of any vehicle from the average speed of all traffic, the greater its chance of being involved in a crash, **Figure 1** (Source: Highway Safety Manual, First Edition, Volume 1).

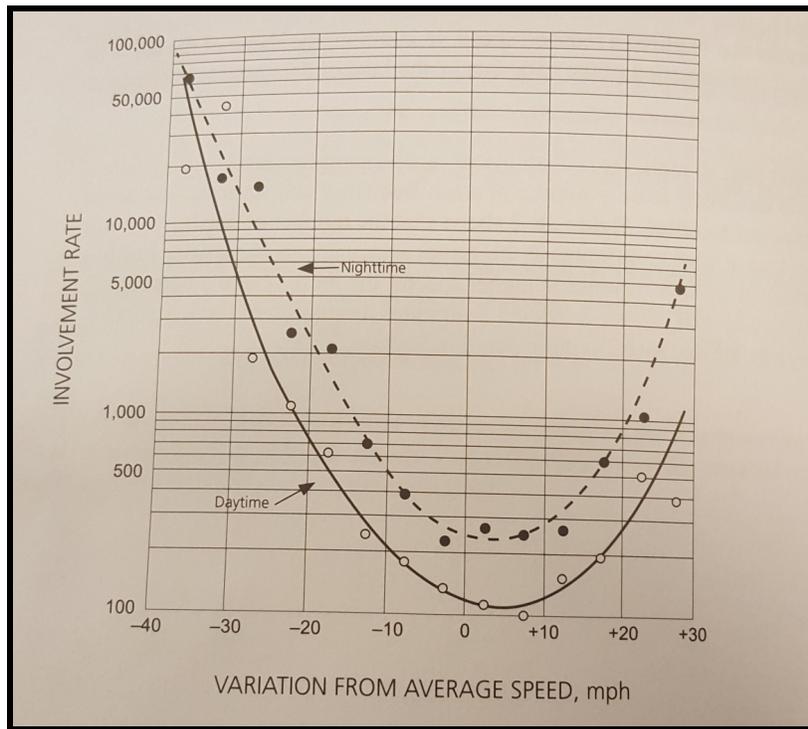


Figure 1 - Crash Involvement Rate by Variation from Average Speed

In fact, the Standard Deviations are as follow:

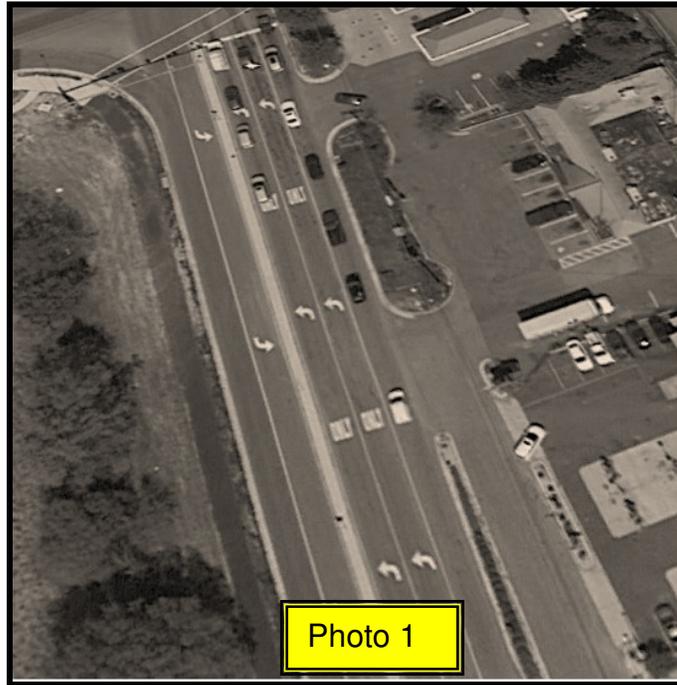
- Station 1 Eastbound = 4.73
- Station 1A Westbound = 4.61
- Station 2 Eastbound = 5.13
- Station 2A Westbound = 4.73

B. Road Characteristics

Physical Roadway:

The section of Mount Vernon Memorial Highway from Richmond Highway, Rte. 1 to 0.16 miles east of Old Mount Vernon Road, Rte. 623, classified as an Urban Principal Arterial roadway with an AADT of 12782 vehicles, is primarily a two-lane, non-divided roadway (except at the intersection with Rte. 1, **Photo 1**) with left and right turn lanes at some intersections. The typical existing lane width for through and turn lanes in each direction is 12 feet. The existence of curb & gutter, paved/unpaved shoulder and fixed object attachment with guardrail are summarized below:

- From Richmond Highway to Grist Mill Woods Court, the roadway has a barrier curb & gutter (CG-6) along the outside edge.
- From Grist Mill Woods Court to 0.16 miles east of Old Mount Vernon Road, the roadway has unpaved/paved shoulder with variable widths.
- There is a parapet with guardrail over Dogue Creek.



The pavement surface is asphalt which is in very good condition. In fact, the section of the study area was repaved in 2017. The terrain is mostly flat with only two considerable changes in vertical alignment (sag vertical curve with the lowest elevation located ~ 265 feet west of Peartree Landing and ~ 200 feet west of Patton Boulevard respectively as shown in **Appendix B**) and moderate changes in horizontal alignment.

The minimum required intersection sight distance, in accordance with “A Policy on Geometric Design of Highways and Streets, 2011 Edition – Case B Intersections with stop control on the minor road –”, with a speed limit of 45 mph is 500 feet for the left turn and 430 feet for the right turn. There are no sight distance limitations noted within the study area, except at the signalized intersections at Old Mill Road / Ferry Landing Road and at Old Mount Vernon Road on which a right turn on red is not permitted. It should however be noted that the minimum sight distance for signal visibility (460 feet for a speed limit of 45 mph) at Old Mount Vernon Road on eastbound approach is below the threshold (**Photo 2**). “Traffic Signal Ahead” warning sign and a yellow flashing beacon are in place in both directions to permit the road user to respond to the traffic signal device.



Objects located adjacent to the roadway are primarily limited to trees, guardrails, signs and utility poles. There are a total of eleven (11) access points throughout the study area excluding signalized /unsignalized intersections.

There are a few spots in the study area with street light poles.

Traffic Control Devices:

There are four (4) traffic signals within the study area at:

- Richmond Highway at the western end of the study area (*)
- Ferry Landing Rd. / Old Mill Rd. (*)
- Old Mill Rd. (**)
- Old Mount Vernon Rd. (**)

Notes: (*) The signals on all approaches are supported by mast arm
(**) The signals on all approaches are supported by span wire

Also, there is an advance-warning flasher approaching Old Mount Vernon Road in both directions.

There are nine (9) unsignalized intersections controlled by stop signs for the side streets.

The pavement markings within the study area are generally in good condition (repaved and restriped in 2017) and include white edge lines, double yellow center lines with raised pavement markers, hatchings, arrows, solid/skip lines for turn lanes, crosswalks, stop bars and bike markings.

Roadside ground-mounted regulatory, warning and guide signs in both directions include:

- Speed limit 45 MPH
- Route
- Keep Right
- Deer (non-vehicular)
- Pedestrian with Ahead or Arrow supplementary plaque
- Recreational and Culture Interest Area
- Destination
- Cross Road
- Side Road
- Right Lane Must Turn Right
- Stop Here On Red
- No Turn On Red
- Curve
- No parking with Right Arrow supplementary plaque
- No parking with Double Arrow supplementary plaque
- Traffic Signal Ahead
- WMATA Bus Stop
- Fairfax Connector Bus Stop
- Snow Route
- Object markers

It should also be noted that shared lane or “sharrow” symbols pavement markings were added in the study area during the repaving project in 2017(**Photo 3**). This effort was jointly coordinated with Fairfax County DOT as this roadway is in the Countywide Bicycle Master Plan.



Photo 3

C. Roadside Development and Environment

Land use within the study area is mostly residential, with one elementary school located off Rte. 235 at the eastern end of the study (as reported by Fairfax County Public Schools, no students cross Mount Vernon Memorial Highway) and homes accessed mainly from intersecting side streets. In fact, there are only seven (7) driveways in the entire section. Another roadside development along Mount Vernon Memorial Highway is a recreational park named Grist Mill Park.

There are also a few undeveloped parcels at the western end of the study section and just next to the recreational park described above.

D. Parking Practices and Pedestrian Activity

There is no on-street parking along Mount Vernon Memorial Highway in the study area as the two lanes are marked for travel (vehicles and bicyclists).

There is a shared use path on both sides of the roadway at the western end of the study. Also, the asphalt trail continues just east of Grist Mill Park up to Peartree Landing and then east of Old Mill Road up to the eastern end of the study area. It should also be noted that the Fairfax County DOT is currently working on a project named Potomac Heritage National Scenic Trail which will complete missing links of trails near Washington’s Mill Historic State Park to Grist Mill Park including the bridge over Dogue Creek. Furthermore, pedestrian crossings at Southwood Drive, Forest Haven Drive, Grist Mill Park and Old Mill Road will be enhanced with this project. At Southwood Drive, the proposed improvements would add Rectangular Rapid Flashing Beacons (RRFB) and the installation of curb and gutter to reduce the crosswalk distance.

Pedestrian activity along Rte. 235 is light to moderate throughout the day which increases during scheduled sports at Grist Mill Park. There are several high-visibility crosswalks and just one standard crosswalk at unsignalized intersections in the study area. The signals at Ferry Landing Rd. / Old Mill Rd., Old Mill Rd. and Old Mount Vernon Rd. provide signalized crossings for the main line.

E. Reported Crash Experience for Most Recent 3-year Period

Crash records for the section of roadway under study have been examined and obtained from the state maintained system "RNS" for the following period:

From: May 1, 2015

To; April 30, 2018 (**Appendix C**)

Length of period: Three years

Note: Only crashes involving an injury or fatality or property damage exceeding \$1,500 are reportable and available through the Department of Motor Vehicles (DMV). Also, due to the time required for DMV to process and code reported crashes, data for the previous six (6) months may not be available.

According to our records, the total number of reported **crashes** for this section of highway is: **42**

And, the total number of reported **injuries** for this section of highway is: **30**

And, the total number of reported **fatalities** for this section of highway is: **0**

The **crash** rate for this section of highway is: **114.53** per 100 million VMT.

The **injury** rate for this section of highway is: **81.81** per 100 million VMT.

The **fatality** rate for this section of highway is: **0.00** per 100 million VMT.

Note: Above rates were calculated by using the AADT (equivalent to 12,782 vehicles) and the study section length (2.62 mile-section).

For Primary highways:

The state-wide average **crash** rate is: **126.45** per 100 million VMT.

The state-wide average **injury** rate is: **67.37** per 100 million VMT.

The state-wide average **fatality** rate is: **1.11** per 100 million VMT.

Discussion of crash experience and relevant information:

As the summary indicates, a total of forty two (42) crashes were recorded within the study area between May 1, 2015 and April 30, 2018 resulting in a total of twenty nine (29) non-pedestrian injuries, one (1) pedestrian injury and zero (0) fatalities. A complete breakdown of crashes by type is as follows: twenty four (24) of the reported crashes (57.1%) were rear-end, eleven (11) were angle (26.2%), three (3) were fixed object-off road (7.1%) and there was one (1) pedestrian, one (1) side-swipe same direction, one (1) fixed object in road and one (1) non-collision (2.4 % each).

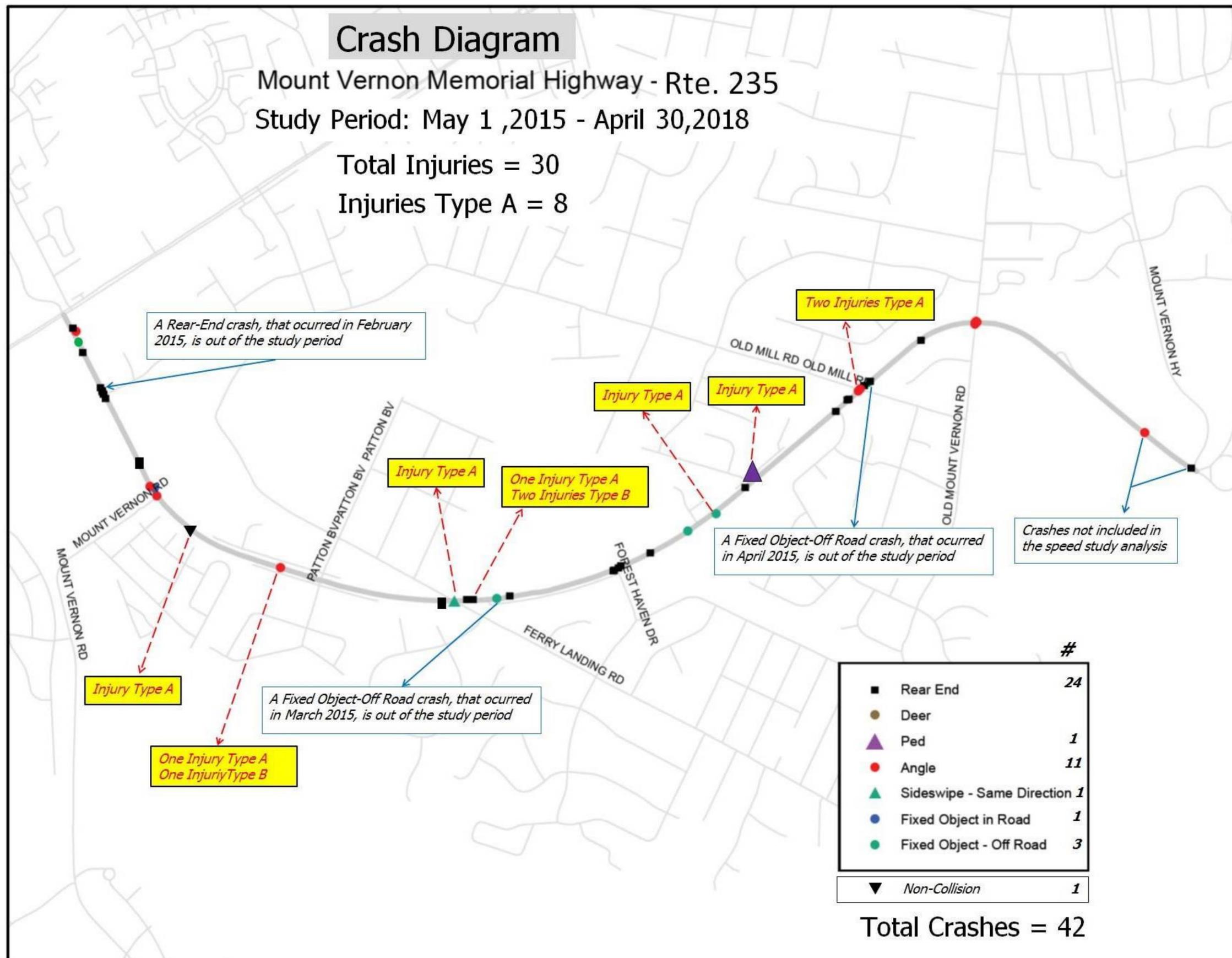
The total crash rate is slightly below the state-wide average. However, the total injury rate is slightly above the state-wide average. It should be noted that 31% of the crashes were recorded in the proposed speed reduction section which represents the section with higher crash rate (**Appendix A, Figure 3**).

The number of rear end crashes may be attributed to the pedestrian crossings or lack of turn lanes at unsignalized intersections and inappropriate approach speeds, unexpected stops/signal heads on approach as well as the lack of turn lanes at signalized intersections.

The following low-cost safety improvements have been identified and will be implemented in the short term:

- *35 MPH Advisory Speed plaque* beneath the existing Signal Ahead Warning sign at Old Mount Vernon Road for the eastbound approach.
- *Watch for Turning Vehicles Warning* sign to be placed north of Grist Mill Woods Court for eastbound approach.

An aerial map depicting the approximate location for all crash sites is attached in **Figure 5**.



F. Enforcement Consensus

The recommended change in speed limit has been reviewed by Officer Neil Johnson of the Virginia State Police and Officer Jason Long of the Fairfax County Police Department. The state and local enforcement officer's responses concerning these recommendations are recorded below:

The State Police Officer:

- Concurs
- Opposes
- No Response

The Fairfax County Police Officer:

- Concurs
- Opposes
- No Response

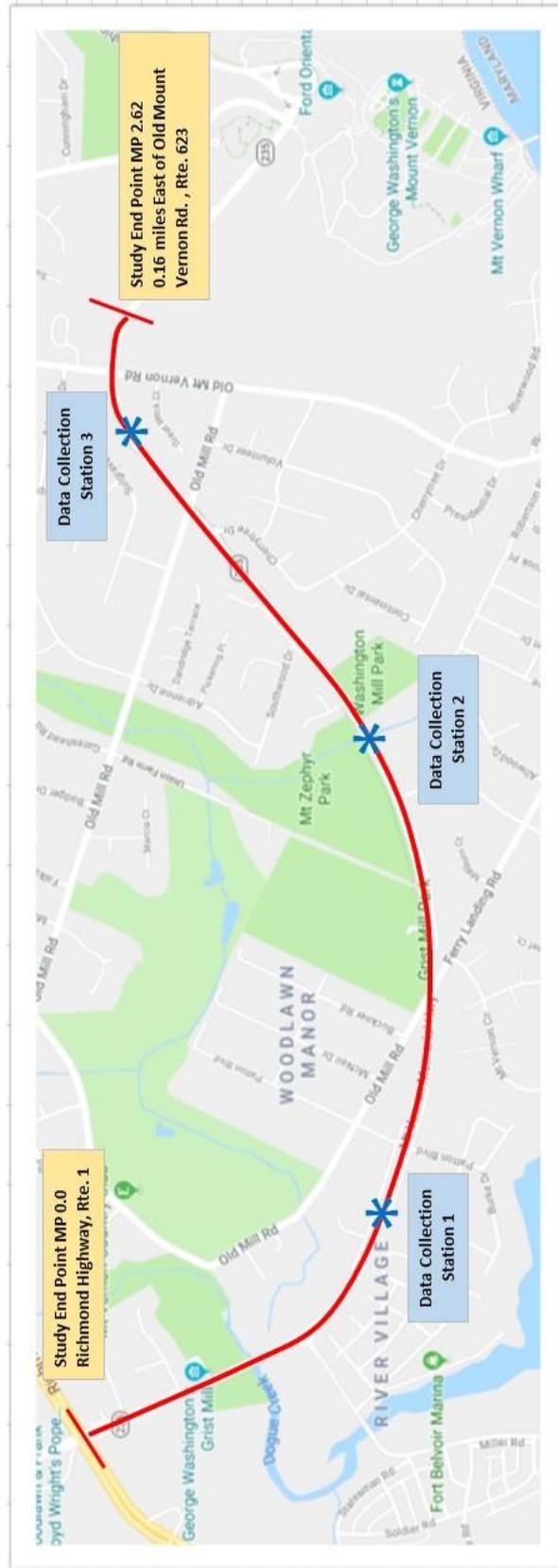
G. Additional comments: NA

Study Area Map

Mount Vernon Memorial Highway (Rte. 235)

From: Richmond Highway, Rte. 1

To: 0.16 Miles East of Old Mount Vernon Road, Rte.623



NOTE: Map is provided for illustrative purposes and may not accurately depict the most recent roadway conditions.

APPENDIX A

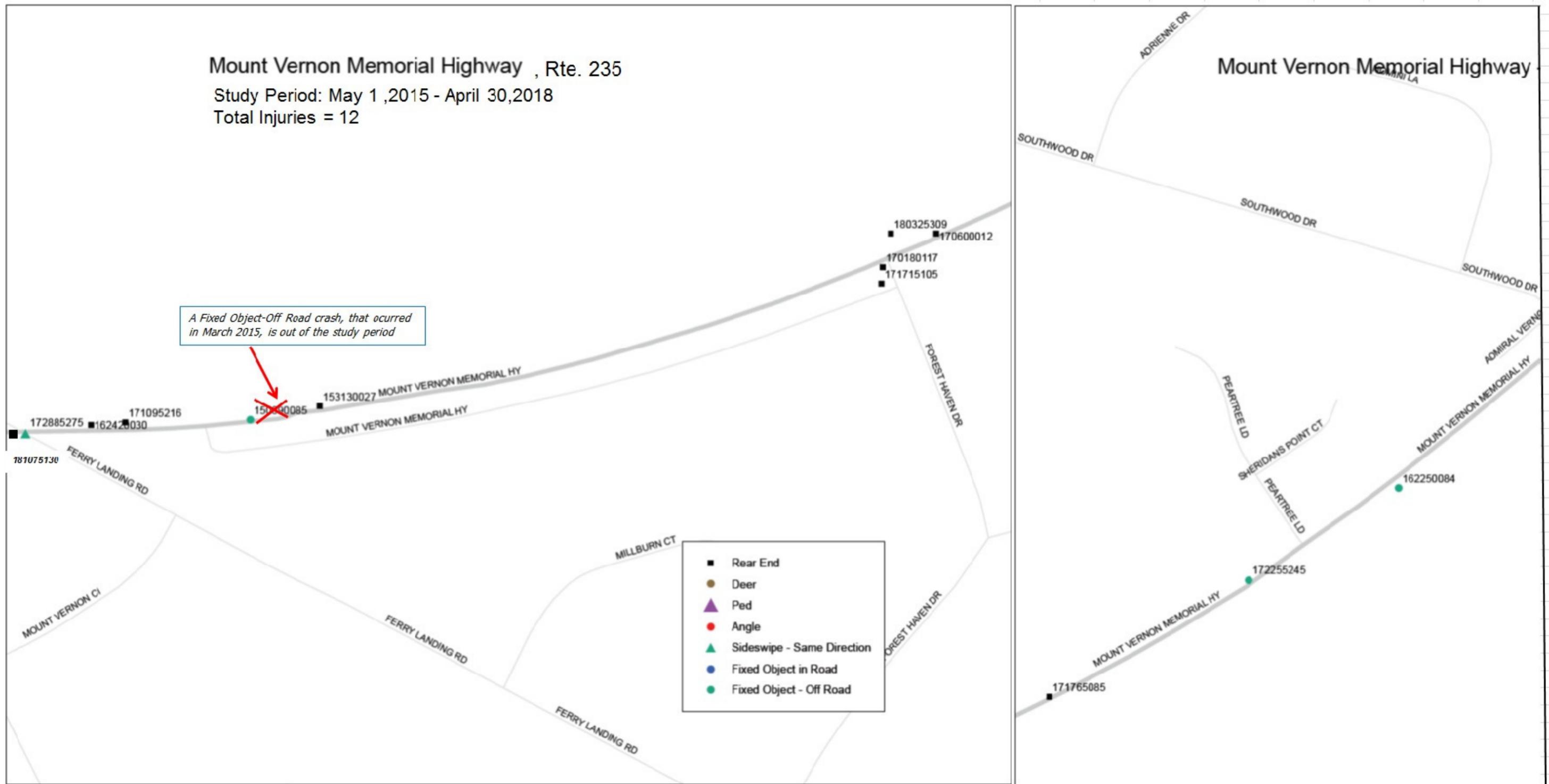


Figure 2

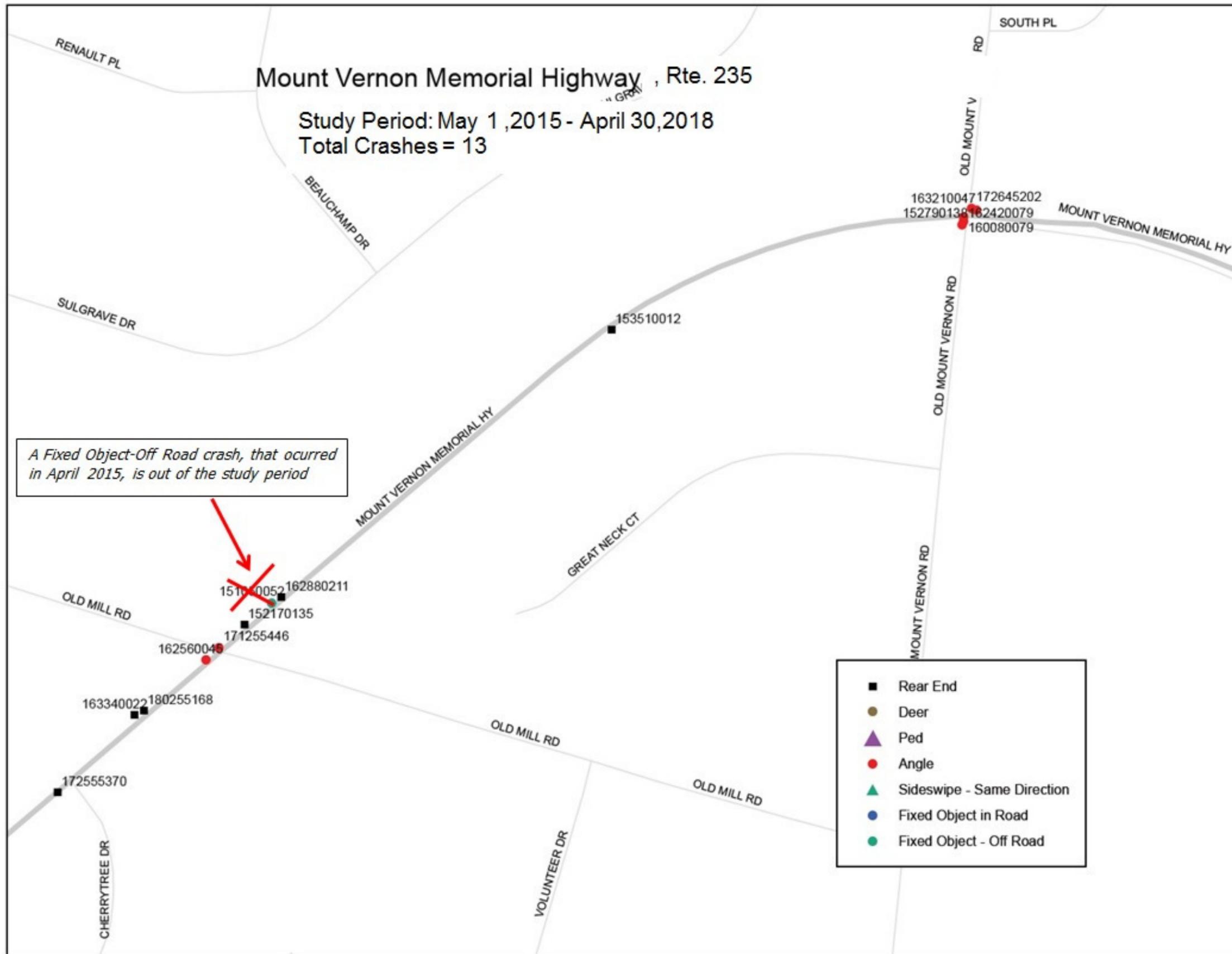


Figure 3

APPENDIX B

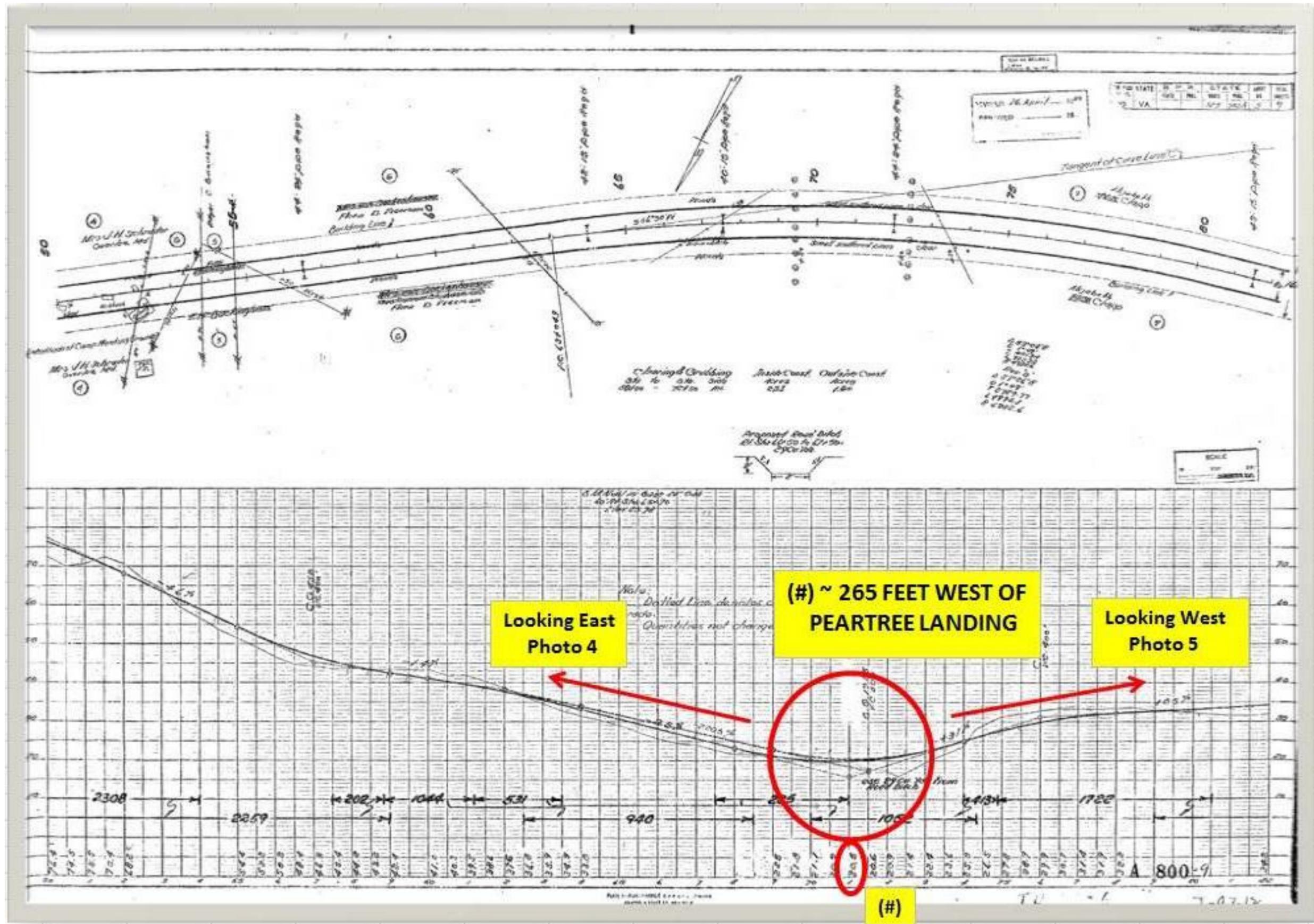


Figure 4

Looking East



Photo 4

Looking West



Photo 5

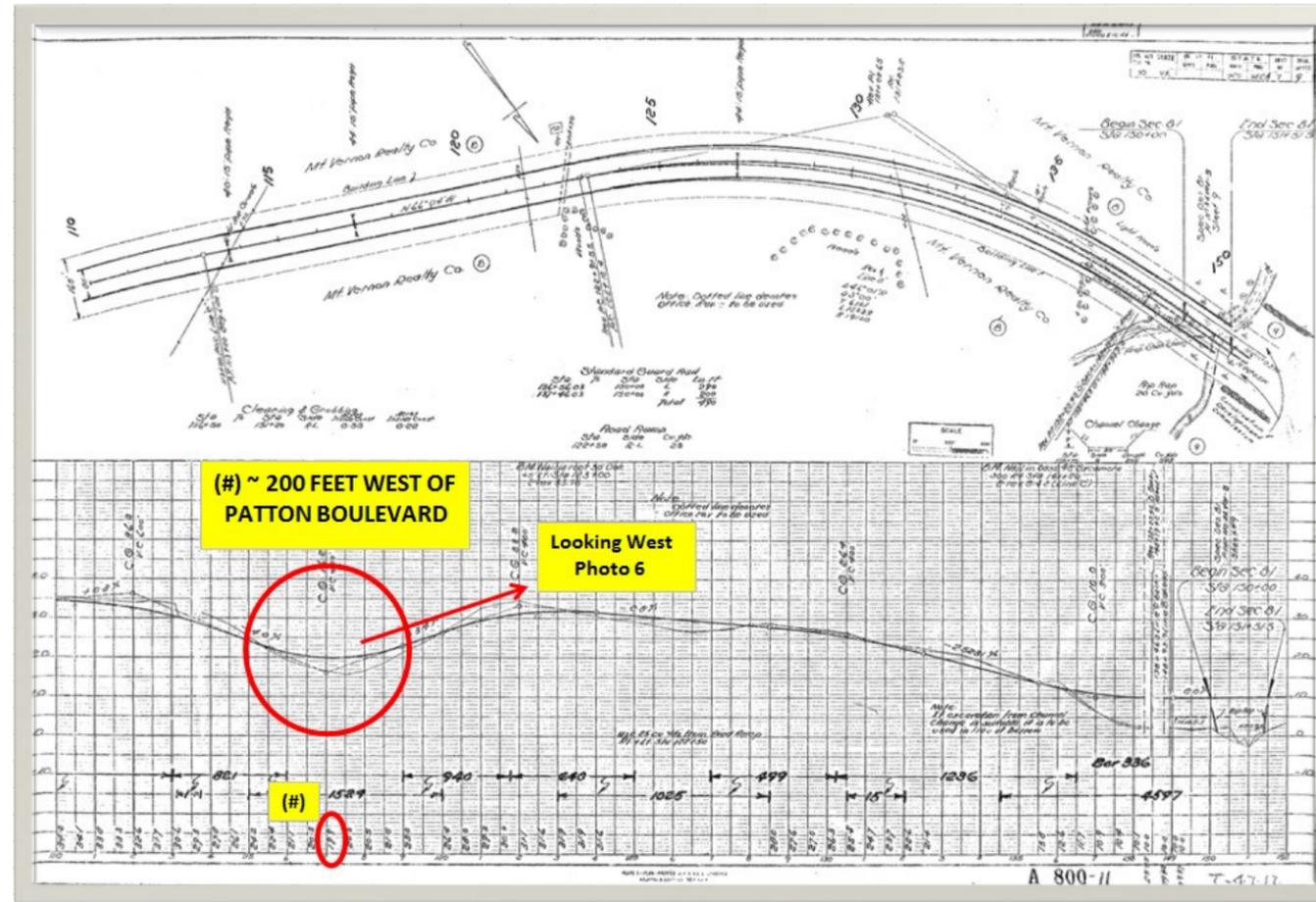


Figure 6

Looking West



Photo 6

APPENDIX C

Mount Vernon Memorial Highway, Rte. 235 between Richmond Highway, Rte. 1 and Old Mount Vernon Road, Rte. 623

#	Document Number	Crash Date	Crash Time	Collision Type	Secondary Location	Crash Severity	# of Injuries
1	151910229	6/25/2015	18:00	1. Rear End	GRIST MILL WOODS WAY	Injury (C)	1
2	151950035	6/30/2015	16:33	2. Angle	MOUNT VERNON RD / RT 4279	Injury (C)	2
3	152170135	7/16/2015	5:37	1. Rear End	RT 624 OLD MILL RD	Injury (C)	1
4	152790138	9/28/2015	8:48	2. Angle	OLD MOUNT VERNON RD	Property damage	0
5	153130027	9/30/2015	7:42	1. Rear End	OLD MILL RD	Property damage	0
6	153090065	10/13/2015	9:58	9. Fixed Object - Off Road	RICHMOND HWY	Injury (C)	1
7	153510012	10/30/2015	16:32	1. Rear End	624/OLD MILL RD	Property damage	0
8	160080079	12/27/2015	15:40	2. Angle	623 OLD MOUNT VERNON RD	Property damage	0
9	160200062	1/5/2016	15:23	1. Rear End	MOUNT VERNON MEM HWY	Property damage	0
10	162560052	5/3/2016	18:35	2. Angle	RICHMOND HWY	Property damage	0
11	161470387	5/16/2016	17:23	1. Rear End	GRIST MILL RD.	Injury (C)	1
12	161550125	5/23/2016	19:48	6. Fixed Object in Road	MOUNT VERNON RD/FORT	Property damage	0
13	161820080	6/1/2016	15:53	1. Rear End	GRIST MILL WOODS WAY	Property damage	0
14	161610090	6/1/2016	15:53	1. Rear End	GRIST MILL WOODS WAY /NRN	Property damage	0
15	162560045	6/1/2016	16:54	2. Angle	OLD MILL RD / RT 624	Incapacitating Injury (A)	2
16	162210044	7/13/2016	15:09	1. Rear End	RT 4232 / SOUTHWOOD DR	Injury (C)	1
17	162420030	7/26/2016	13:18	1. Rear End	MOUNT VERNON MEMORIAL	Property damage	0
18	162250084	8/2/2016	6:37	9. Fixed Object - Off Road	PEARTREE LNDG	Incapacitating Injury (A)	1
19	162420079	8/12/2016	18:07	2. Angle	OLD MOUNT VERNON RD/RT	Injury (C)	1
20	162650032	9/7/2016	15:47	1. Rear End	RT235 / MOUNT VERNON	Property damage	0
21	162880211	10/6/2016	17:23	1. Rear End	624 / OLD MILL RD	Property damage	0
22	163050107	10/17/2016	15:32	1. Rear End	RICHMOND HWY	Injury (C)	2
23	163210047	11/1/2016	8:03	2. Angle	OLD MOUNT VERNON RD / RT 235	Property damage	0
24	163340022	11/14/2016	7:20	1. Rear End	OLD MILL RD	Property damage	0
25	170180117	1/5/2017	16:53	1. Rear End	x	Injury (C)	1
26	170600012	2/2/2017	17:08	1. Rear End	FOREST HAVEN DR	Injury (C)	2
27	171095216	3/31/2017	18:15	1. Rear End	MOUNT VERNON MEMORIAL HWY	Incapacitating Injury (A)	3
28	171255446	5/4/2017	15:25	2. Angle	OLD MILLRD	Property damage	0
29	171715105	6/20/2017	7:45	1. Rear End	FOREST HAVEN DR	Injury (B)	2

Case No.	Case No.	Date	Time	Description	Location	Injury Type	Count
30	171765085	6/24/2017	11:30	1. Rear End	FOREST HAVEN DR	Property damage	0
31	172255245	8/13/2017	19:00	9. Fixed Object - Off Road	235/MT VERNON MEMORIAL HWY	Property damage	0
32	172555370	9/12/2017	18:30	1. Rear End	CHERRYTREE DR	Property damage	0
33	172645202	9/20/2017	15:50	2. Angle	MOUNT VERNON MEMORIAL HIGHWAY	Property damage	0
34	172885275	10/1/2017	15:04	4. Sideswipe - Same Direction	FERRY LANDING RD	Incapacitating Injury (A)	1
35	173055342	10/24/2017	19:30	1. Rear End	GRIST MILL WAY	Property damage	0
36	173395175	11/7/2017	12:20	2. Angle	PATTON BV	Incapacitating Injury (A)	2
37	173565233	12/22/2017	16:46	2. Angle	MOUNT VERNON ROAD	Property damage	0
38	180255168	1/25/2018	8:37	1. Rear End	CHERRYTREE DRIVE	Injury (B)	1
39	180325309	2/1/2018	16:14	1. Rear End	RT308/FOREST HAVEN DR	Injury (B)	1
40	181355191	2/15/2018	16:53	Ped	SOUTHWOOD DR.	Incapacitating Injury (A)	1
41	181075130	4/6/2018	15:10	1. Rear End	FERRY LANDING RD	Non-Incapacitating Injury (B)	2
42	181345455	4/21/2018	18:11	Non collision	MOUNT VERNON RD.	Incapacitating Injury (A)	1
						Total	30