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SUBJECT:	Buena Vista Street Traffic Study Follow-Up – Devens, MA		

Introduction

Howard Stein Hudson (HSH) prepared a technical memorandum in December 2018 for MassDevelopment to present the results of the traffic counting program, conducted the week of September 10-14, 2018, in order to assess concerns raised by local residents and recommend “potential solutions.” Some of the primary concerns that were raised by local residents included the volume of cut-through traffic, speed of vehicles on neighborhood roads, and continued truck traffic on Buena Vista Street.

Based on the result of the traffic counts, the primary concern in the study area was the traffic volumes on Buena Vista Street, especially during the peak periods. Following these results, HSH made recommendations to install “No Right Turn” signs during a.m. peak periods and “Do Not Enter” signs during p.m. peak periods at intersections that access the Buena Vista neighborhood. The objective of the installation was to deter vehicle traffic from Buena Vista Street. Following the 2018 traffic study, MassDevelopment implemented several the recommendations presented in the original memo, namely:

- A “No Right Turn” sign on Jackson Road at Buena Vista Street from 4:00 a.m. – 9 a.m.;
- A “No Right Turn” sign on Jackson Road at Cavite Street from 4:00 a.m. – 9 a.m.;
- A “Do Not Enter” sign on Buena Vista Street at Saratoga Boulevard from 2:00 p.m. – 6:00 p.m.; and
- New wayfinding signage.

To evaluate the impact of these interventions, HSH collected traffic count data for the same locations for the same week-long period in September 2019 to determine the effects of the mitigation efforts on vehicle traffic flow in the Buena Vista neighborhood.



Summary of Findings

The count data demonstrates that the Buena Vista residential neighborhood has seen a reduction in vehicle traffic turning from Jackson Road onto Cavite Street and Buena Vista Street and in the average daily traffic (ADT) through the neighborhood. Current traffic levels on both Buena Vista and Antietam Streets are well below 2,000 vehicle per day (vpd) rate for a “low volume road”, as classified by the Federal highway Administration (FHWA).

Based on the 2019 automatic traffic recorder (ATR) data, there was a 47% decrease in vehicle traffic on Buena Vista Street between Jackson Road and Saratoga Boulevard, shown in **Figure 5**. Antietam Street between Jackson Road and Cook Street had a 91% increase in vehicle traffic volumes and Saratoga Boulevard had a 21% increase in vehicle traffic, shown in **Figure 6** and **Figure 7**. Jackson Road between Antietam Street and Buena Vista Street has seen a significant reduction in average speeds in the a.m. and p.m. peak periods. Saratoga Boulevard between Buena Vista Street and Cavite Street, the road to which vehicle traffic is diverted during the p.m. peak period, experienced the highest average daily truck volumes.

The results of the ATR and TMC data suggests that, while a portion of the traffic that previously went through the Buena Vista neighborhood has shifted north to Antietam Street, the overall traffic through the residential area has decreased. Vehicle traffic has significantly decreased on Buena Vista Street during the times when the new turn restrictions are applicable.

Data Collection

HSH collected traffic count data for the area as shown in **Figure 1** and as outlined in the following sections. **Figure 2** shows the signage installation locations.



Figure 1. Study Area





Figure 2. Sign Installation Locations





Turning Movement Counts

TMCs were manually collected during the morning peak period (6:00 – 10:00 a.m.) and evening peak period (3:00 – 7:00 p.m.) on Tuesday, September 10, 2019, at the following study intersections:

- Antietam Street/Jackson Road;
- Buena Vista Street/Jackson Road;
- Cavite Street/Jackson Road;
- Buena Vista Street/Independence Drive/Saratoga Boulevard; and
- Buena Vista Street/Auman Street.

Figure 3 and **Figure 4** show vehicle turning movements during the a.m. and p.m. peak hours. Total vehicles turning eastbound onto Buena Vista Street, from the north and south bound directions on Jackson Road, have decreased in the a.m. peak period; peak hour vehicle volumes have increased for traffic from Jackson Road in both the northbound and southbound directions turning eastbound onto Antietam Street. This confirms that some of the vehicle traffic that was previously on Buena Vista Street has moved to Antietam Street.

The volume of vehicles entering Buena Vista Street westbound from Independence Drive has decreased from 145 to eight vehicles during p.m. peak hours. Vehicles turning onto Saratoga Boulevard have increased from 41 to 143. During the a.m. peak period, the volume of vehicles turning onto Buena Vista Street from Jackson Road has decreased from 96 to 10 for vehicles traveling northbound on Jackson Road and has decreased from 29 to three for vehicles traveling southbound. This indicates that most drivers are adhering to the new restrictions. Overall, vehicle traffic has decreased on Buena Vista Street from September 2018 to September 2019 during the periods in which the “No Right Turn” and “Do Not Enter” restrictions are applicable. The Average Annual Weekday Traffic (AAWT) volume decreased from 2,000 vehicles per day (vpd) to 1,044 vpd from 2018 to 2019.

During both peak hours, the intersection of Buena Vista Street at Auman Street experiences moderate traffic from both directions on Buena Vista Street. In the a.m. peak hour, vehicle volumes have decreased from 60 to 35 in the westbound direction and from 90 to 54 in the eastbound direction. In the p.m. peak hour, vehicle volumes have decreased from 206 to 17 in the westbound direction and increased from 18 to 41 in the eastbound direction. Very little traffic turns onto Auman Street. Jackson Road experiences the highest vehicle volumes. As the primary connection to Route 2, this is consistent with 2018 count data.



Figure 3. 2018 and 2019 Traffic Volumes, Weekday a.m. Peak Hour

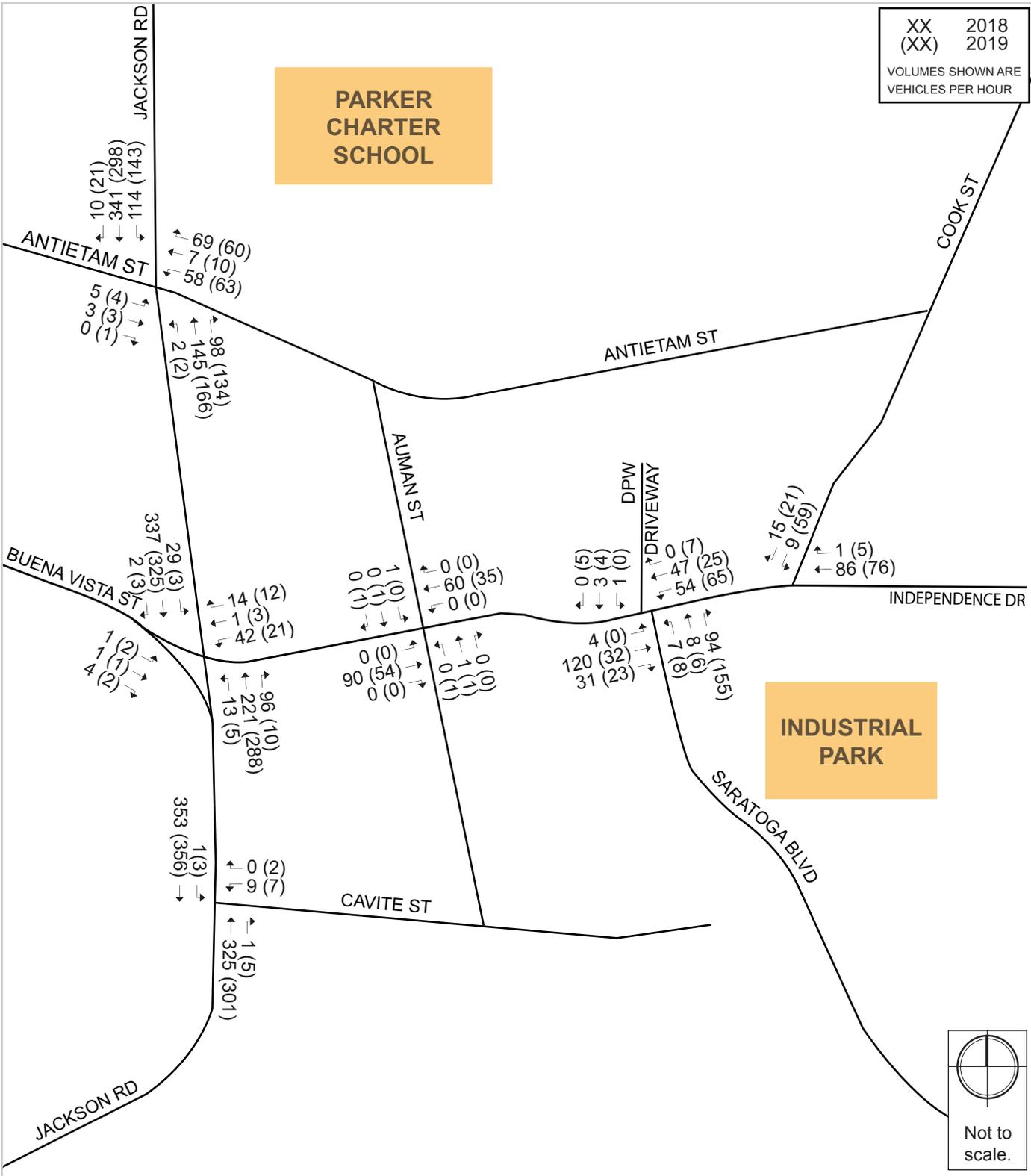
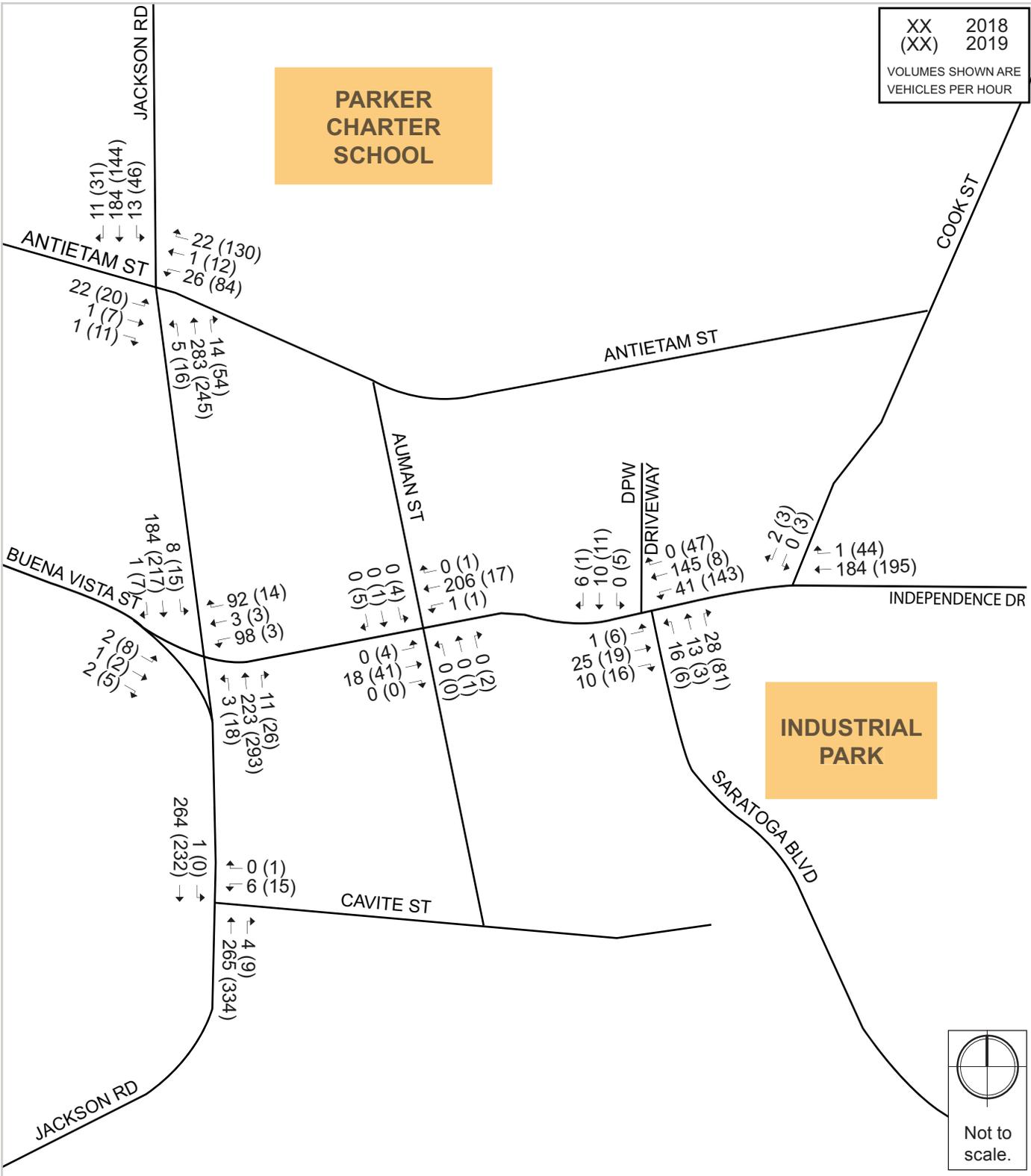




Figure 4. 2018 and 2019 Traffic Volumes, Weekday p.m. Peak Hour





Automatic Traffic Recorder Counts

An ATR is a device that continuously records the passage of vehicles, vehicle speed and classification, and direction of traffic flow. ATRs are used to gather larger amounts of traffic data over an extended period of time by installing pneumatic tubes across the desired location. ATR counts were recorded for five (5) days from Monday, September 9, 2019, to Friday, September 13, 2019, at the following locations:

- Jackson Road north of Antietam Street;
- Jackson Road between Antietam Street and Buena Vista Street;
- Jackson Road between Buena Vista Street and Cavite Street;
- Jackson Road south of Cavite Street;
- Antietam Street between Jackson Road and Cook Street;
- Buena Vista Street west of Saratoga Boulevard; and
- Saratoga Boulevard south of Buena Vista Street.

Table 1 summarizes 2019 traffic data including Average Daily Traffic (ADT), the proportion of daily traffic occurring during the peak hour (K-factor, %), percent heavy vehicles (% T), and daily average 85th percentile speeds and shows changes from 2018 traffic data. Average daily traffic variations for each roadway are shown in **Figure 5** through **Figure 8** and compared to 2018 data. **Figure 9** shows the hourly volumes on both Buena Vista Street and Saratoga Boulevard in September 2018. **Figure 10** shows the hourly volumes on both streets in September 2019.



Table 1. Average Weekday Traffic Data, 2018 and 2019

Approach	2018				2019				Change			
	ADT	K (%)	T (#/%)	85th Percentile Speed (mph)	ADT	K (%)	T (#/%)	85th Percentile Speed (mph)	ADT	K (%)	T (#/%)	85th Percentile Speed (mph)
Buena Vista Street, west of Saratoga Boulevard												
Eastbound	980	16.1%	40/4.1%	26	560	8.0%	10/1.8%	27	-420	-8.1%	-30/-2.3%	+1
Westbound	1020	5.8%	51/5.0%	28	484	3.9%	11/2.3%	26	-536	-1.9%	-40/-2.7%	-2
TOTAL	2,000	10.9%	91/4.6%		1044	6.1%	21/2.0%		-956	-4.7%	-70/-2.6%	
Antietam Street, between Jackson Road and Cook Street												
Eastbound	234	17.1%	11/4.7%	31	436	11.5%	12/2.8%	31	+202	-5.6%	1/-1.9%	0
Westbound	248	15.3%	11/4.4%	30	485	18.1%	21/4.3%	29	+237	+2.8%	10/-0.1%	-1
TOTAL	482	16.2%	22/4.6%		921	15.0%	33/3.6%		+439	-1.2%	11/-1.0%	
Saratoga Boulevard, south of Buena Vista Street												
Northbound	1085	10.0%	325/30.0%	37	1194	7.0%	351/29.4%	41	+109	-3.0%	26/-20.6%	+4
Southbound	1,055	9.0%	327/31.0%	34	1402	10.2%	410/29.2%	34	+347	+1.2%	83/-21.8%	0
TOTAL	2140	9.5%	652/30.5%		2596	8.7%	761/29.3%		+456	-0.8%	109/-21.2%	
Jackson Road, south of Cavite Street												
Northbound	3,239	9.2%	112/3.5%	38	3110	10.2%	137/4.4%	38	-129	+1.0%	25/0.9%	0
Southbound	2,942	9.4%	118/4.0%	37	2852	7.5%	97/3.4%	35	-90	-1.9%	-21/-0.6%	-2
TOTAL	6,181	9.3%	230/3.7%		5962	8.9%	234/3.9%		-219	-0.4%	4/0.2%	
Jackson Road, between Buena Vista Street and Cavite Street												
Northbound	3,188	9.3%	103/3.2%	37	3067	10.2%	130/4.2%	39	-121	+1.0%	27/1.0%	+2
Southbound	2,896	9.6%	136/4.7%	40	2811	7.4%	115/4.1%	38	-85	-2.1%	-21/-0.6%	-2
TOTAL	6,084	9.4%	239/3.9%		5878	8.9%	245/4.2%		-206	-0.5%	6/0.3%	
Jackson Road, between Antietam Street and Buena Vista Street												
Northbound	2982	10.5%	299/10.0%	43	2944	9.90%	133/4.5%	36	-38	-0.6%	-166/-5.5%	-7
Southbound	2682	8.7%	293/10.9%	42	2725	7.60%	133/4.9%	36	+43	-1.1%	-160/-6.0%	-6
TOTAL	5664	9.7%	592/10.5%		5669	8.80%	266/4.7%		+5	-0.9%	-326/-5.8%	
Jackson Road, north of Antietam Street												
Northbound	3210	10.8%	128/4.0%	37	3232	11.0%	124/3.8%	35	+22	+0.2%	-4/-0.2%	-2
Southbound	2841	8.2%	105/3.7%	37	2955	7.1%	123/4.2%	35	+114	-1.1%	18/0.5%	-2
TOTAL	6051	9.6%	233/3.9%		6187	9.1%	247/4.0%		+136	-0.5%	14/0.1%	

Legend

ADT = Average Daily Traffic;

K = Peak-hour Percentage;

T = Truck Volume and Percentage



Figure 5. Comparison of Average Daily Traffic, Buena Vista Street, September 2018 to September 2019

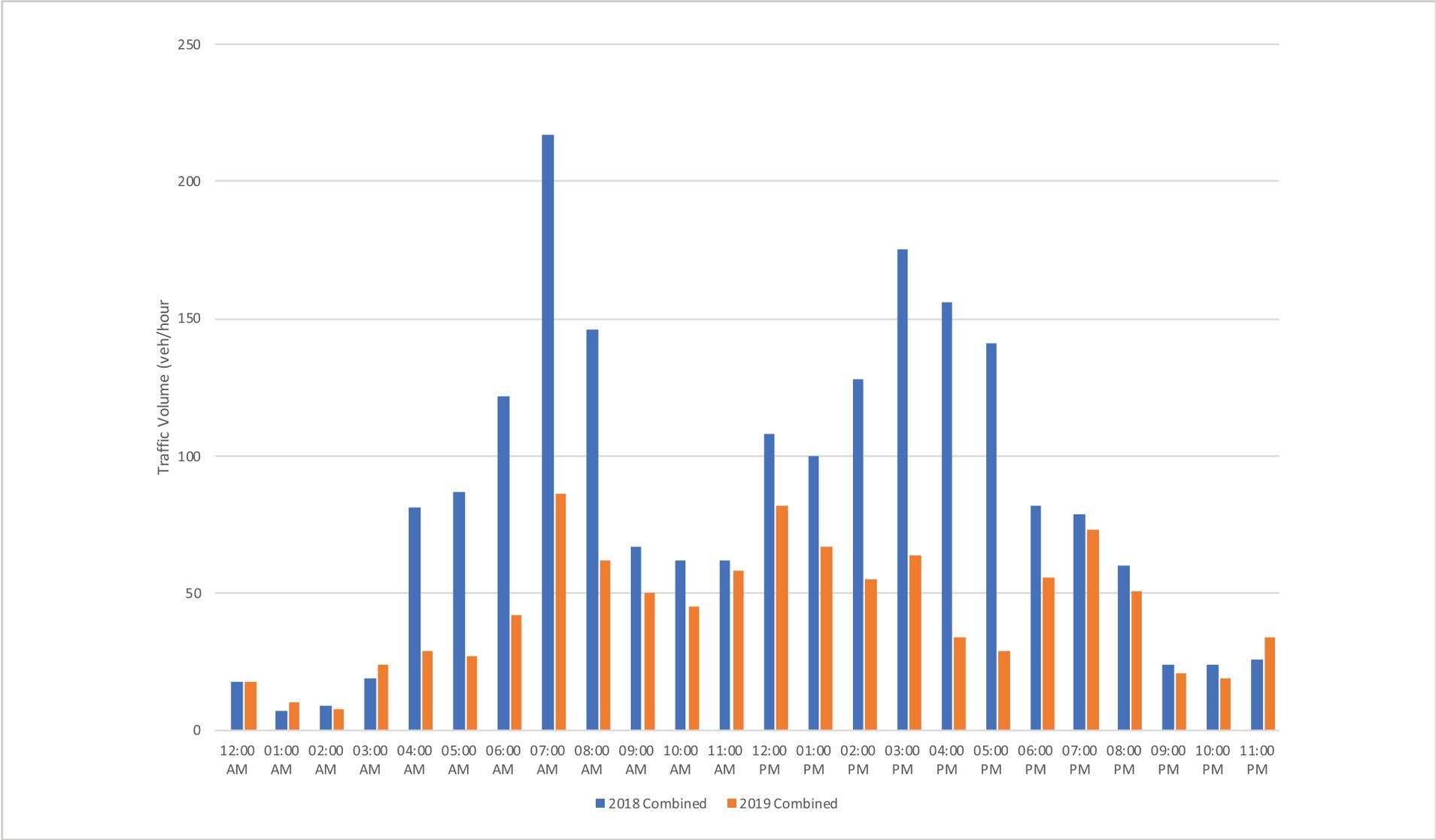




Figure 6. Comparison of Average Daily Traffic, Antietam Street, September 2018 to September 2019

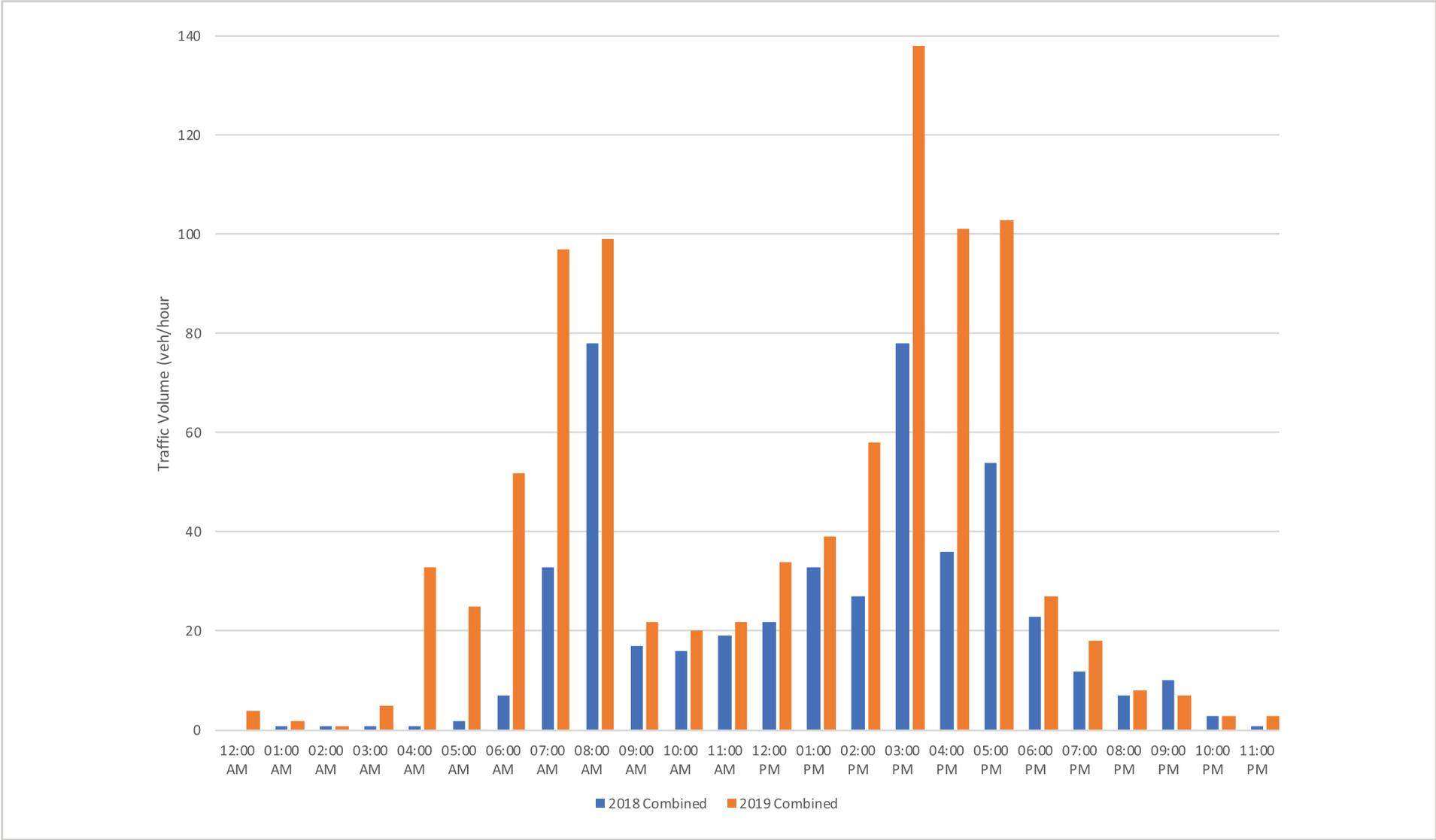




Figure 7. Comparison of Average Daily Traffic, Saratoga Boulevard, September 2018 to September 2019

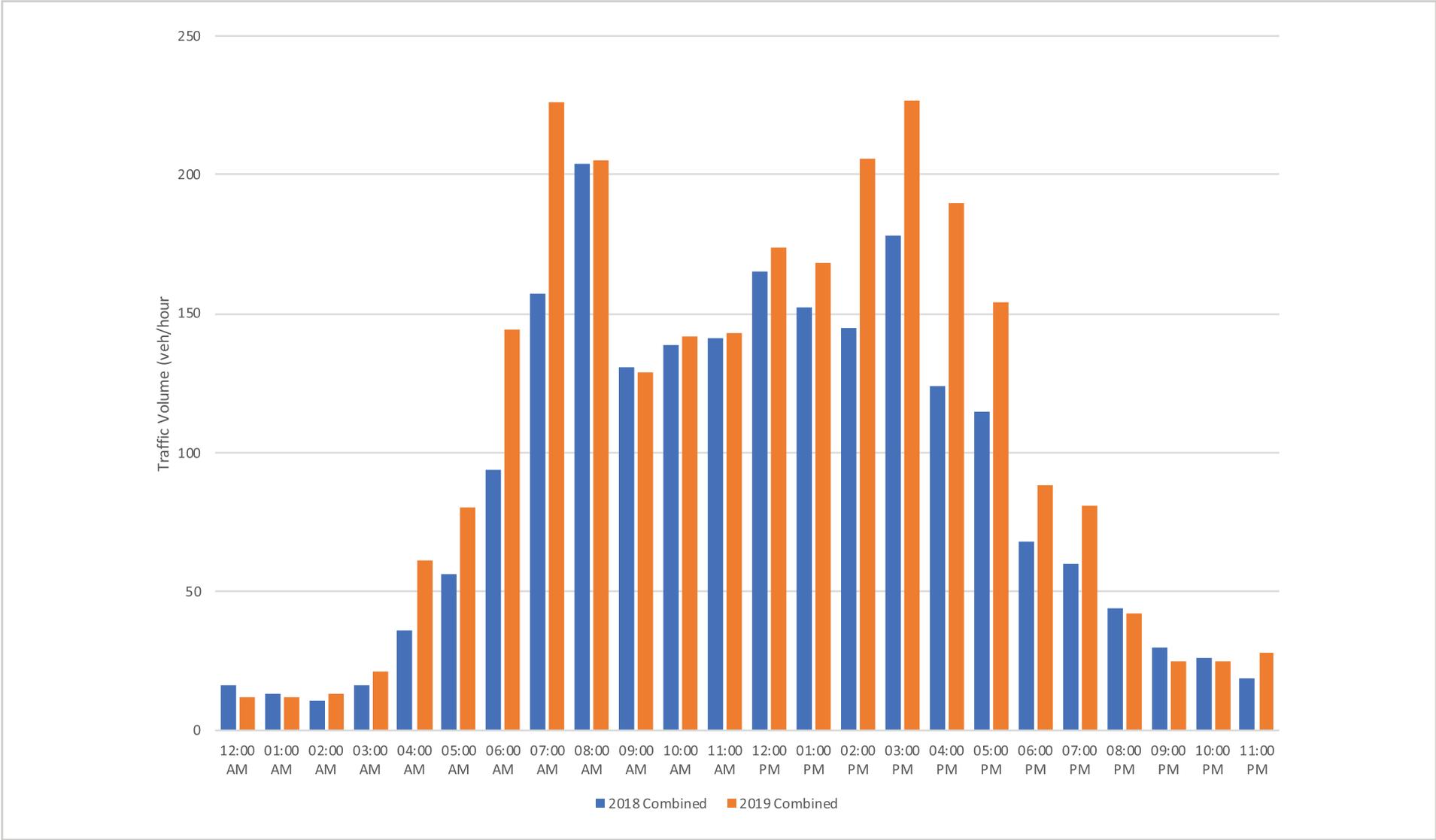




Figure 8. Comparison of Average Daily Traffic, Jackson Road, between Antietam Street and Buena Vista Street, September 2018 to September 2019

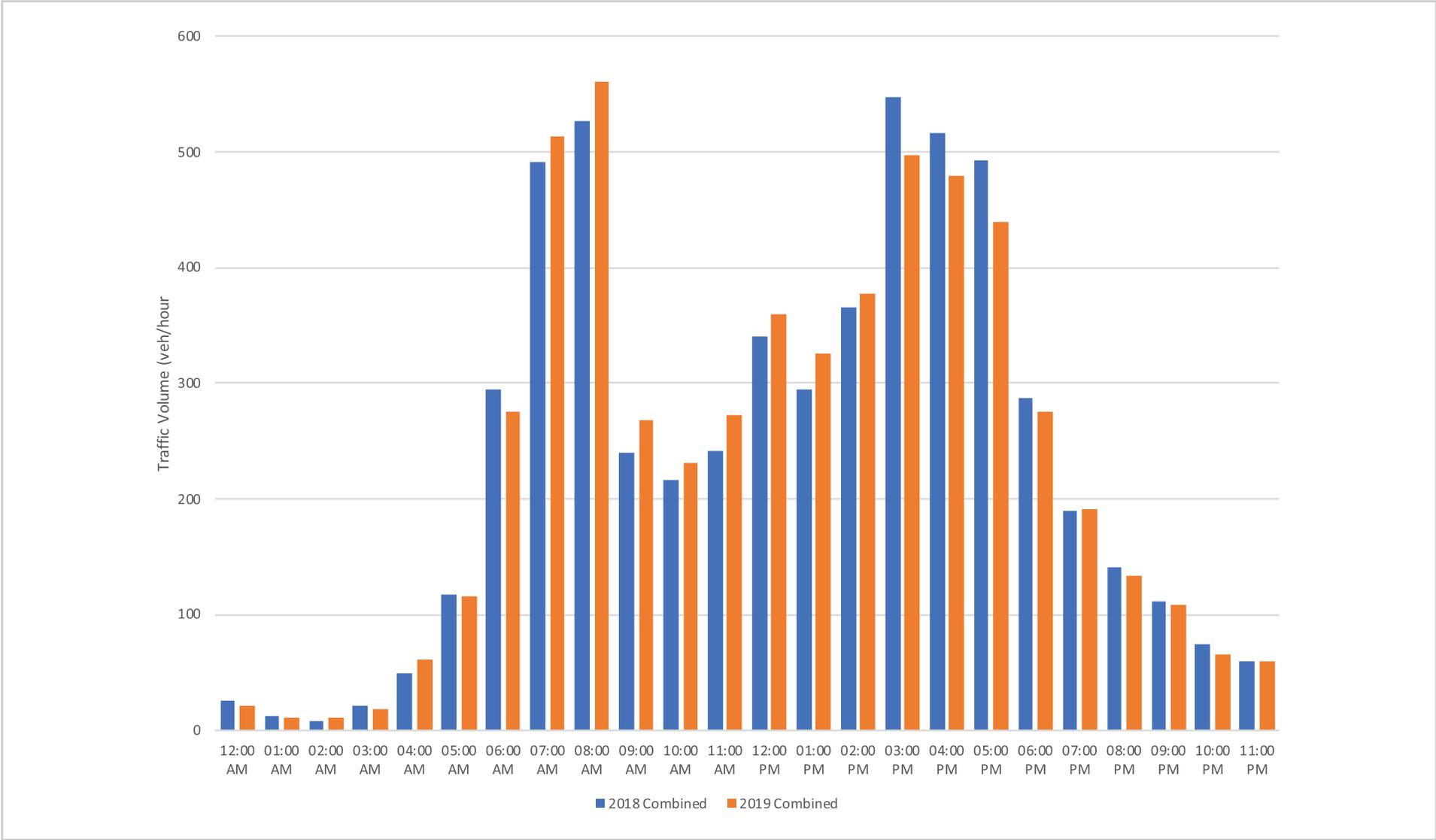




Figure 9. *Average Daily Traffic, Buena Vista Street and Saratoga Boulevard, September 2018*

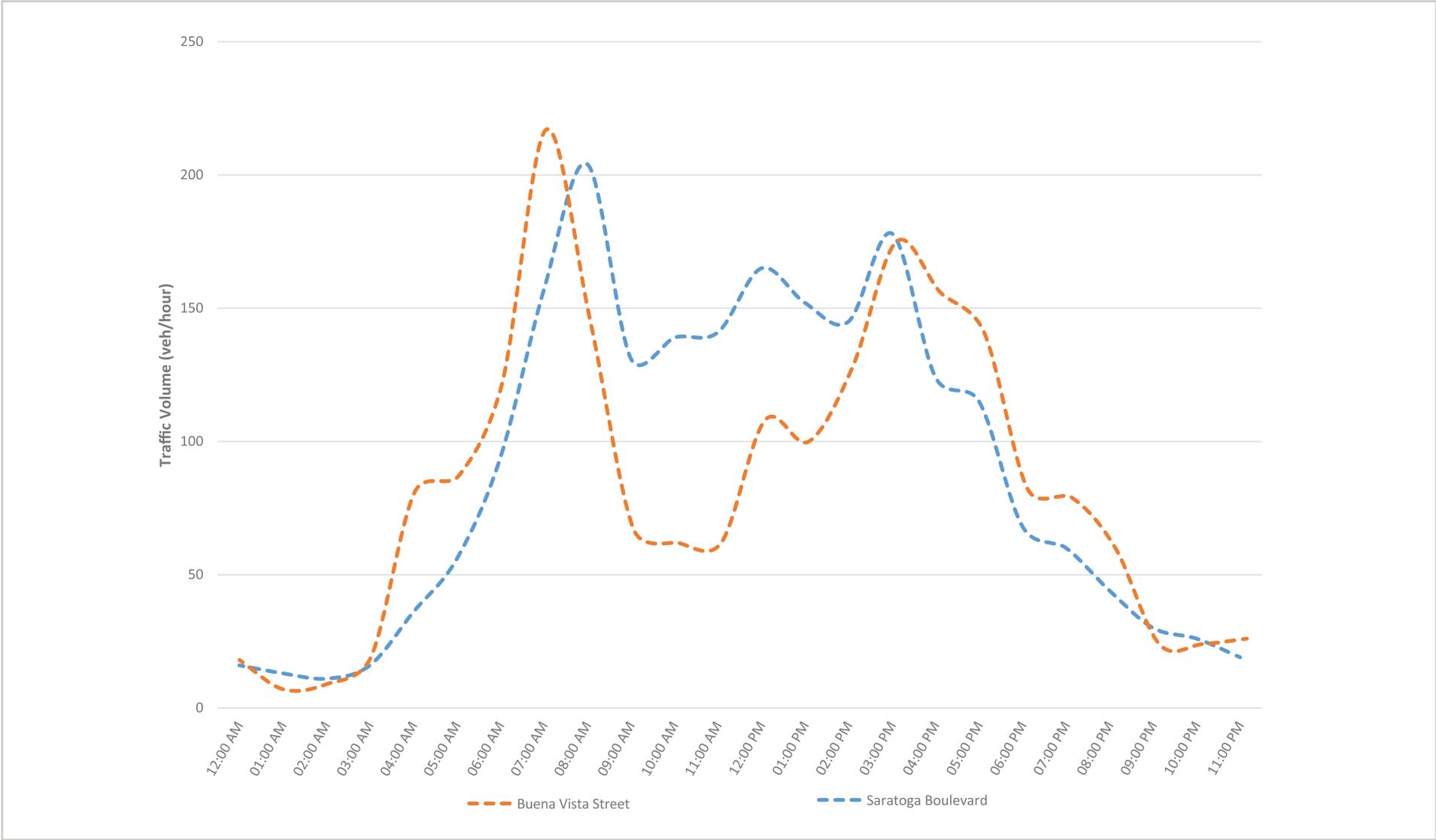
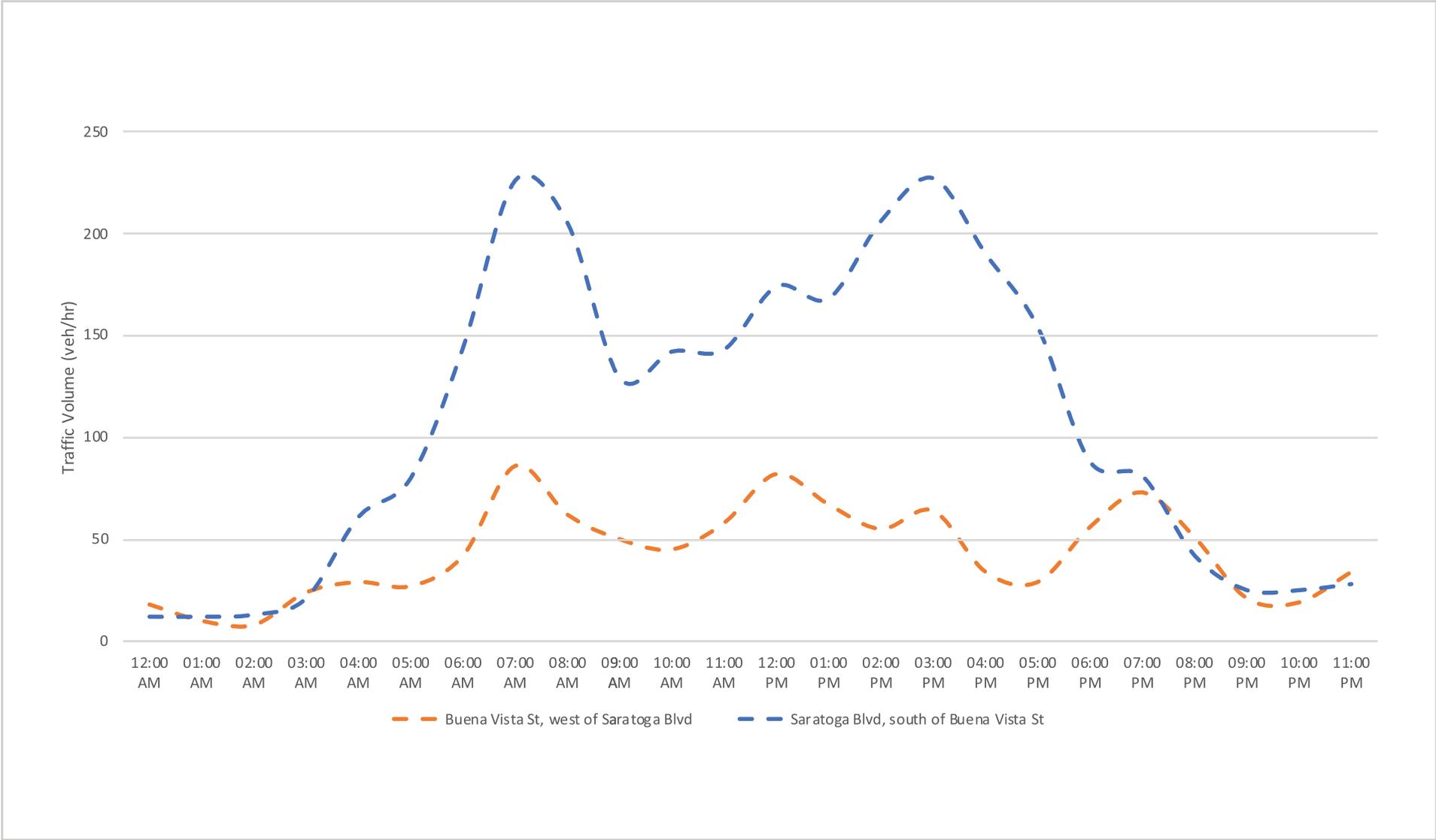




Figure 10. *Average Daily Traffic, Buena Vista Street and Saratoga Boulevard, September 2019*





TRUCK TRAFFIC DATA

Table 2 shows the change in average traffic volumes by classification from September 2018 to September 2019. Saratoga Boulevard south of Buena Vista Street experienced the highest average daily truck volumes. The installation of the “Do Not Enter” sign on Buena Vista Street during the p.m. peak period along with the previously installed truck exclusion sign forces vehicles to turn southbound onto Saratoga Boulevard. TMC data recorded an increase in Classification 9 vehicles turning onto Saratoga Boulevard from Independence Drive. ATR counts recorded only two vehicles higher than Classification 6 on Buena Vista Street. As shown previously in **Table 1**, heavy vehicle traffic has decreased from 4.6% to 2%. In comparison with 2018 data, traffic on Buena Vista has decreased in both the eastbound and westbound direction; with a significant decrease in Classification 6 vehicles. Vehicle classifications can be found in the Appendix.

Table 2. *Average Daily Truck Volumes by Classification¹, 2018 and 2019*

Location		Buena Vista Street, west of Saratoga Boulevard (vpd)				Antietam Street, between Jackson Road and Cook Street (vpd)				Saratoga Boulevard, south of Buena Vista Street (vpd)			
		EB		WB		EB		WB		NB		SB	
Year		2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Classification	4	0	2	1	5	2	5	1	5	65	84	51	28
	5	0	6	23	4	9	7	9	16	42	83	44	65
	6	40	2	28	1	0	1	0	1	115	88	120	122
	7	0	0	0	0	0	0	0	0	5	11	0	2
	8	0	0	0	0	0	0	0	0	4	6	3	6
	9	1	1	0	1	0	0	0	0	90	73	104	181
	10	0	0	0	0	0	0	0	0	4	4	5	6
	11	0	0	0	0	0	0	0	0	0	0	0	0
	12	0	0	0	0	0	0	0	0	0	0	0	0
	13	0	0	0	0	0	0	0	0	0	1	2	1

Numbers provided correspond to the average daily truck volumes in vehicles per day (vpd).

1. See appendix for more detailed description of truck classifications.

85TH PERCENTILE SPEEDS

It is standard practice to utilize the 85th percentile speed as a guide to set a roadway speed limit at a safe speed to minimize crashes and promote uniform traffic flow. The 85th percentile speed refers to the speed at or below which 85% of all vehicles travel or at which only 15% of vehicles travel faster. According to Devens traffic regulations, the speed limit established on the roadways in the study area is 35 miles per hour (mph), except for Auman Street, Buena Vista Street, and Cavite Street, which have a regulatory speed limit of 25 mph. Buena Vista Street has a posted speed limit of 20



mph. **Table 3** shows the average speeds during the weekday a.m. and p.m. peak hours from September 2018 to September 2019. Average speeds on Jackson Road have decreased, between Antietam Road and Buena Vista Street during both morning and afternoon peak hours. Speeds on Saratoga Boulevard were recorded to be higher than surrounding streets (as would be expected) and have seen an increase in average speed between the two time periods in the northbound direction.

Table 3. *Change in Average Speeds During Weekday Peak Hours, 2018 to 2019*

Location	Direction	a.m. Peak Hour			p.m. Peak Hour		
		2018	2019	Change	2018	2019	Change
Jackson Road north of Antietam Street	NB	34	31	-3	35	33	-2
	SB	35	30	-5	35	31	-4
Jackson Road between Antietam Street and Buena Vista Street	NB	40	31	-9	40	34	-6
	SB	40	34	-6	40	35	-5
Jackson Road between Buena Vista Street and Cavite Street	NB	33	35	+2	36	36	0
	SB	37	35	-2	39	36	-3
Jackson Road south of Cavite Street	NB	37	35	-2	37	37	0
	SB	35	35	0	35	35	0
Antietam Street between Jackson Road and Cook Street	EB	29	30	+1	27	23	-4
	WB	30	28	-2	24	23	-1
Buena Vista Street west of Saratoga Boulevard	EB	25	25	0	25	25	0
	WB	28	25	-3	25	23	-2
Saratoga Boulevard south of Buena Vista Street	NB	35	37	+2	35	40	+5
	SB	32	31	-1	34	32	-2



Appendix

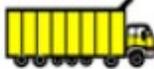
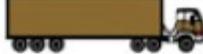
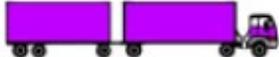
Based on the Federal Highway Administration (FHWA) information, there are 13 categories currently used that serves as the basis for vehicle classification and are shown in **Table 4** and **Table 5**.

Table 4. *FHWA Vehicle Classification*

Class Group	Class Definition/Includes (see Table 4 for images of typical vehicles in each class)		Number of Axles
1	Motorcycles	Motorcycles	2
2	Passenger Cars	All cars, Cars with one- and two-axle trailers	2,3, or 4
3	Other Two Axle Four-Tire Single-Unit Vehicles	Pick-ups and vans Pick-ups and vans with one- and two-axle trailers	2,3, or 4
4	Buses	Two- and three-axle buses	2 or 3
5	Two-Axle, Six-Tire, Single-Unit Trucks	Two-axle trucks	2
6	Three-Axle Single-Unit Trucks	Three-axle trucks Three-axle tractors without trailers	3
7	Four or More Axle Single-Unit Trucks	Four-, five-, six- and seven-axle single-unit trucks	4 or more
8	Four or Fewer Axle Single-Trailer Trucks	Two-axle trucks pulling one- & two-axle trailers Two-axle tractors pulling one- and two-axle trailers Three-axle tractors pulling one-axle trailers	3 or 4
9	Five-Axle Single-Trailer Trucks	Two-axle tractors pulling three-axle trailers Three-axle tractors pulling two-axle trailers Three-axle trucks pulling two-axle trailers	5
10	Six or More Axle Single-Trailer Trucks	Multiple configurations	6 or more
11	Five or Fewer Axle Multi-Trailer Trucks	Multiple configurations	4 or 5
12	Six-Axle Multi-Trailer Trucks	Multiple configurations	6
13	Seven or More Axle Multi-Trailer Trucks	Multiple configurations	7 or more



Table 5. FHWA Vehicle Classification Images by Class

Class 1 Motorcycles		Class 7 Four or more axle, single unit	
Class 2 Passenger cars		Class 8 Four or less axle, single trailer	
			
			
			
Class 3 Four tire, single unit		Class 9 5-Axle tractor semitrailer	
			
			
Class 4 Buses		Class 10 Six or more axle, single trailer	
		Class 11 Five or less axle, multi trailer	
			
Class 5 Two axle, six tire, single unit		Class 12 Six axle, multi-trailer	
		Class 13 Seven or more axle, multi-trailer	
			
Class 6 Three axle, single unit			
			
			

Source: Federal Highway Administration