



TO: John Marc-Aurele, P.E.
Engineering Manager
MassDevelopment – Devens

DATE: December 28, 2018

FROM: Keri Pyke, P.E., PTOE
Melissa Restrepo

HSH PROJECT NO.: 2018079.01

SUBJECT: Traffic Data Collection Program – Devens, MA

Introduction

Howard Stein Hudson (HSH) has prepared this technical memorandum for MassDevelopment – Devens to present the results of the traffic counting program. The intent of the traffic study was to obtain a comprehensive and up-to-date set of traffic data for the area around and including the Buena Vista neighborhood between Jackson Road and Saratoga Boulevard. Some of the primary concerns that have been raised by local residents have included the volume of cut-through traffic, speed of vehicles on neighborhood roads, and continued truck traffic on Auman Street.

Previously, MassDevelopment made changes to address these issues by:

- Posting the truck exclusion;
- Repainting crosswalks to increase visibility;
- Installing new crosswalk identification signs;
- Adding removable pedestrian crossing signs in the middle of the road;
- Adding additional street trees; and
- Installing a speed feedback sign on Buena Vista Street.

However, concerns continue to arise. HSH collected traffic data for a week-long period to capture weekday commuter peak hours and understand the overall traffic flow in the area.

Data Collection

To establish baseline transportation conditions, HSH collected traffic count data for the area in concerned as shown in *Figure 1* and as outlined in the following sections.



Figure 1. Study Area





Turning Movement Counts

Turning Movement Counts (TMCs) represent the various approach movements that pass through an intersection over a given period of time and collect vehicle classification including car, heavy vehicle, pedestrian, and bicycle movements. Two of the most common methods in which TMCs are collected are manually with a traffic count board and/or by installing cameras at each intersection.

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 Wednesday, September 12, 2018, 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.

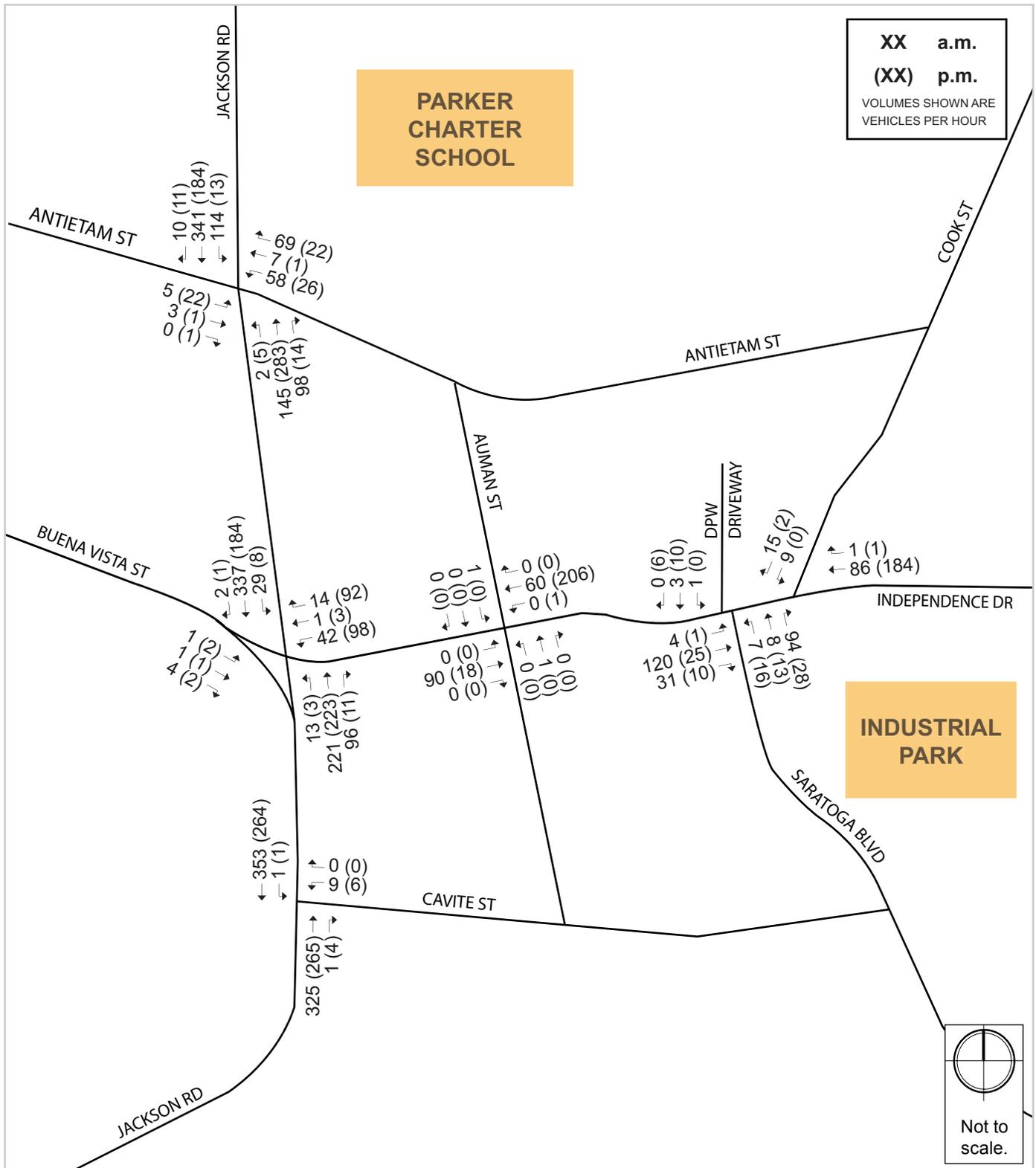
The volumes shown in *Figure 2* include car and heavy vehicle volumes during the morning and evening peak hours. During the morning peak, the highest turning volumes from Jackson Road were onto Antietam Street. As very little of this traffic reappeared at the other count locations, it is assumed that the majority of this turning volumes is associated with the Parker Charter School.

The majority of vehicles turning onto Buena Vista Street from Jackson Road during the morning peak are coming from the south (northbound on Jackson Road) and then continue onto Independence Drive. During the evening peak, most of the traffic traveling west on Buena Vista Street is coming from Independence Drive.

During both peak periods, the intersection of Buena Vista Street at Auman Street experiences moderate through traffic and very little traffic turning onto Auman Street. Jackson Road experiences the highest vehicle volumes. As the primary connection to Route 2, this is consistent with expectations.



Figure 2. Existing (2018) Condition Traffic Volumes, Weekday Peak Hours





Automatic Traffic Recorder Counts

An Automatic Traffic Recorder (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 10, 2018, to Friday, September 14, 2018, 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 existing 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. Average daily traffic variations for each roadway are shown in *Figure 3* through *Figure 9*. Daily traffic variation for Buena Vista Street only is shown in *Figure 10*.

Based on the ATR data summarized in *Table 1*, the roadways that experience high volume of traffic are Jackson Road, Saratoga Boulevard, and Buena Vista Street, specifically during the commuter peak hours of 7:00 – 8:00 a.m. and 4:00 – 5:00 p.m. During peak hours, traffic volumes on Jackson Road are in the range of 300 – 400 vehicles per hour. During the same periods, traffic volumes on Buena Vista Street are between 100 – 150 vehicles per hour. During the remainder of the day, traffic on Buena Vista Street is less than 60 – 75 vehicles per hour. While traffic on Saratoga Boulevard has lower peak hour traffic volumes, there is less of a drop-off during the remainder of the day.



Table 1. Average Weekday Traffic Data, September 10-14, 2018

Approach	ADT	K (%)	T (#/%)	85 th Percentile Speed (mph)
Jackson Road north of Antietam Street				
Northbound	3,210	10.8%	128/4.0%	37
Southbound	2,841	8.2%	105/3.7%	37
TOTAL	6,051	9.6%	233/3.9%	
Jackson Road between Antietam Street and Buena Vista Street				
Northbound	2,982	10.5%	299/10.0%	43
Southbound	2,682	8.7%	293/10.9%	42
TOTAL	5,664	9.7%	592/10.5%	
Jackson Road between Buena Vista Street and Cavite Street				
Northbound	3,188	9.3%	103/3.2%	37
Southbound	2,896	9.6%	136/4.7%	40
TOTAL	6,084	9.4%	239/3.9%	
Jackson Road south of Cavite Street				
Northbound	3,239	9.2%	112/3.5%	38
Southbound	2,942	9.4%	118/4.0%	37
TOTAL	6,181	9.3%	230/3.7%	
Antietam Street between Jackson Road and Cook Street				
Eastbound	234	17.1%	11/4.7%	31
Westbound	248	15.3%	11/4.4%	30
TOTAL	482	16.2%	22/4.6%	
Buena Vista Street west of Saratoga Boulevard				
Eastbound	980	16.1%	40/4.1%	26
Westbound	1,020	5.8%	51/5.0%	28
TOTAL	2,000	10.9%	91/4.6%	
Saratoga Boulevard between Buena Vista Street and Cavite Street				
Northbound	1,085	10.0%	325/30.0%	37
Southbound	1,055	9.0%	327/31.0%	34
TOTAL	2,140	9.5%	652/30.5%	

ADT = Average Daily Traffic; K = Peak-hour Percentage; T = Truck Volume and Percentage.



TRUCK TRAFFIC DATA

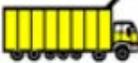
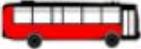
Based on the Federal Highway Administration (FHWA) information, there are 13 categories currently used that serves as the basis for vehicle classification and are shown in *Table 2*.

Table 2. FHWA Vehicle Classification

Class Group	Class Definition/Includes (see Table 3 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 3. 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	
			
			
			

Source: Federal Highway Administration



As shown in *Table 4*, the study area experiences highest truck volumes from classification 4 – 6, which includes buses and three-axle single unit trucks, and classification 9, which includes five-axle tractor semitrailer. The Buena Vista neighborhood between Jackson Road and Saratoga Boulevard experienced mostly classification 6 vehicles, at an average of approximately 40 vehicles per day (4.1%) traveling eastbound and approximately 28 vehicles per day (2.7%) traveling westbound. The ATR data shows that these average vehicle volumes, along Buena Vista Street, traveling eastbound occurred between 4:00 – 8:00 a.m. and 12:00 – 4:00 p.m. While the average vehicle volumes traveling westbound occurred between 4:00 – 8:00 a.m. and 4:00 – 8:00 p.m. In addition to classifying vehicles based on the FHWA categories shown in *Table 2* and *Table 3*, trucks are also classified based on the weight of the vehicle. In order to obtain truck exclusion in Massachusetts, a variety of warrants must be met and traffic data submitted to MassDOT for review and approval. It cannot be confirmed if the trucks identified in *Table 4* are in violation of a typical truck exclusion without knowing both the weight and class of the vehicles.

Table 4. Average Daily Truck Volumes by Classification¹

Location	Direction	Classification									
		4	5	6	7	8	9	10	11	12	13
Jackson Road <i>north of Antietam Street</i>	NB	27	57	23	3	1	15	1	0	0	1
	SB	24	50	19	0	0	11	0	0	0	0
Jackson Road <i>between Antietam Street and Buena Vista Street</i>	NB	43	215	22	3	2	14	1	0	0	0
	SB	44	220	16	1	1	11	0	0	0	0
Jackson Road <i>between Buena Vista Street and Cavite Street</i>	NB	28	33	23	3	1	13	1	0	0	0
	SB	36	66	23	1	0	10	0	0	0	0
Jackson Road <i>south of Cavite Street</i>	NB	29	40	22	2	1	18	0	0	0	0
	SB	32	53	20	1	0	13	1	0	0	0
Antietam Street <i>between Jackson Road and Cook Street</i>	EB	2	9	0	0	0	0	0	0	0	0
	WB	1	9	0	0	0	0	0	0	0	0
Buena Vista Street <i>west of Saratoga Boulevard</i>	EB	0	0	40	0	0	1	0	0	0	0
	WB	1	23	28	0	0	0	0	0	0	0
Saratoga Boulevard <i>between Buena Vista Street and Cavite Street</i>	NB	65	42	115	5	4	90	4	0	0	1
	SB	51	44	120	0	3	104	5	0	0	1

Numbers provided correspond to the average daily truck volumes.

1. See Table 2 and Table 3 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.

As show in *Table 1*, 85% of vehicles travel within 5 mph of the posted speed limit on all roadways, with the exception of Buena Vista Street where the posted speed had recently been lowered to 20 mph. However, along Jackson Road between Antietam Street and Cavite Street, speeds were recorded to be higher than those on the surrounding roads. *Table 5* shows the average speeds during the weekday a.m. and p.m. peak hours.

Table 5. Average Speeds During Weekday Peak Hours

Location	Direction	Average Speed (mph)	
		a.m. Peak Hour	p.m. Peak Hour
Jackson Road <i>north of Antietam Street</i>	NB	34	35
	SB	35	35
Jackson Road <i>between Antietam Street and Buena Vista Street</i>	NB	40	40
	SB	40	40
Jackson Road <i>between Buena Vista Street and Cavite Street</i>	NB	33	36
	SB	37	39
Jackson Road <i>south of Cavite Street</i>	NB	37	37
	SB	35	35
Antietam Street <i>between Jackson Road and Cook Street</i>	EB	29	27
	WB	30	24
Buena Vista Street <i>west of Saratoga Boulevard</i>	EB	25	25
	WB	28	25
Saratoga Boulevard <i>between Buena Vista Street and Cavite Street</i>	NB	35	35
	SB	32	34



Findings

Based on the ATR data, Jackson Road experiences higher traffic than the surrounding roadways, with an average of 5,999 of vehicles per day (vpd) along the corridor. Antietam Street experiences the least traffic with approximately 482 vpd. The Federal Highway Administration (FHWA) classifies a low-volume road as one that experiences 400 – 2,000 vpd. This is equivalent to approximately one vehicle per minute in the busiest hour of the day. At 2,000 vpd, the traffic volumes on Buena Vista are at the limit of a “low-volume” road.

The TMCs demonstrate that the Buena Vista residential neighborhood experiences through traffic of approximately two vehicles per minute traveling eastbound and approximately one vehicle per minute traveling westbound during the morning peak hour. During the evening peak hour, the eastbound direction experiences less than one vehicle per minute and approximately three vehicles per minute traveling westbound. However, it should be noted that most of this traffic corresponds to passenger cars.

In Massachusetts, the prevailing speed limit in thickly settled areas is 30 mph in absence of other posted regulations. In residential areas, vehicle speeds tend to be below 30 mph as drivers adjust to narrower streets and the possibility of children and pets in the vicinity. On Buena Vista Street, we observed average speeds of 25-28 mph, which are in keeping with the typical speeds for residential streets, in spite of the 20-mph posted speed limit.

Based on the result of the traffic counts, the primary concern in the study area would appear to be the traffic volumes on Buena Vista Street, especially during the peak hours. At 2,000 vpd, the traffic volumes on Buena Vista Street are at the limit of a “low-volume” road. During peak hours, the traffic volume on Buena Vista Street is exceeding the traffic on Saratoga Boulevard, a roadway specifically designed for high traffic volumes.



Recommendations

In addition to the measures already in place, MassDevelopment could pilot other measures to redirect traffic away from Buena Vista Street during the peak hours. A “No Right Turn 4:00 – 9:00 A.M.” sign could be installed on Jackson Road northbound at Buena Vista Street for the morning hours to discourage cut-through traffic to the industrial zone. Similarly, a “Do Not Enter 4:00 – 6:00 P.M.” sign could be installed on Buena Vista Street facing Independence Drive westbound, forcing vehicles to turn left onto Saratoga Boulevard during the evening peak hours. Both of these restrictions would require enforcement to be effective.

Alone, the above measures may only serve to push traffic onto other roadways within the Buena Vista neighborhood. MassDevelopment could also consider simplifying the wayfinding to the industrial zone. New wayfinding could reinforce that the preferred route into the industrial zone from Route 2 is to use Jackson Road to Patton Road or Barnum Road.

Additionally, the timing and sequence of the traffic light at Barnum Road/Patton Road/Saratoga Boulevard should also be reviewed and adjusted as necessary.



Figure 3. *Jackson Road North of Antietam Street, September 10-14, 2018*

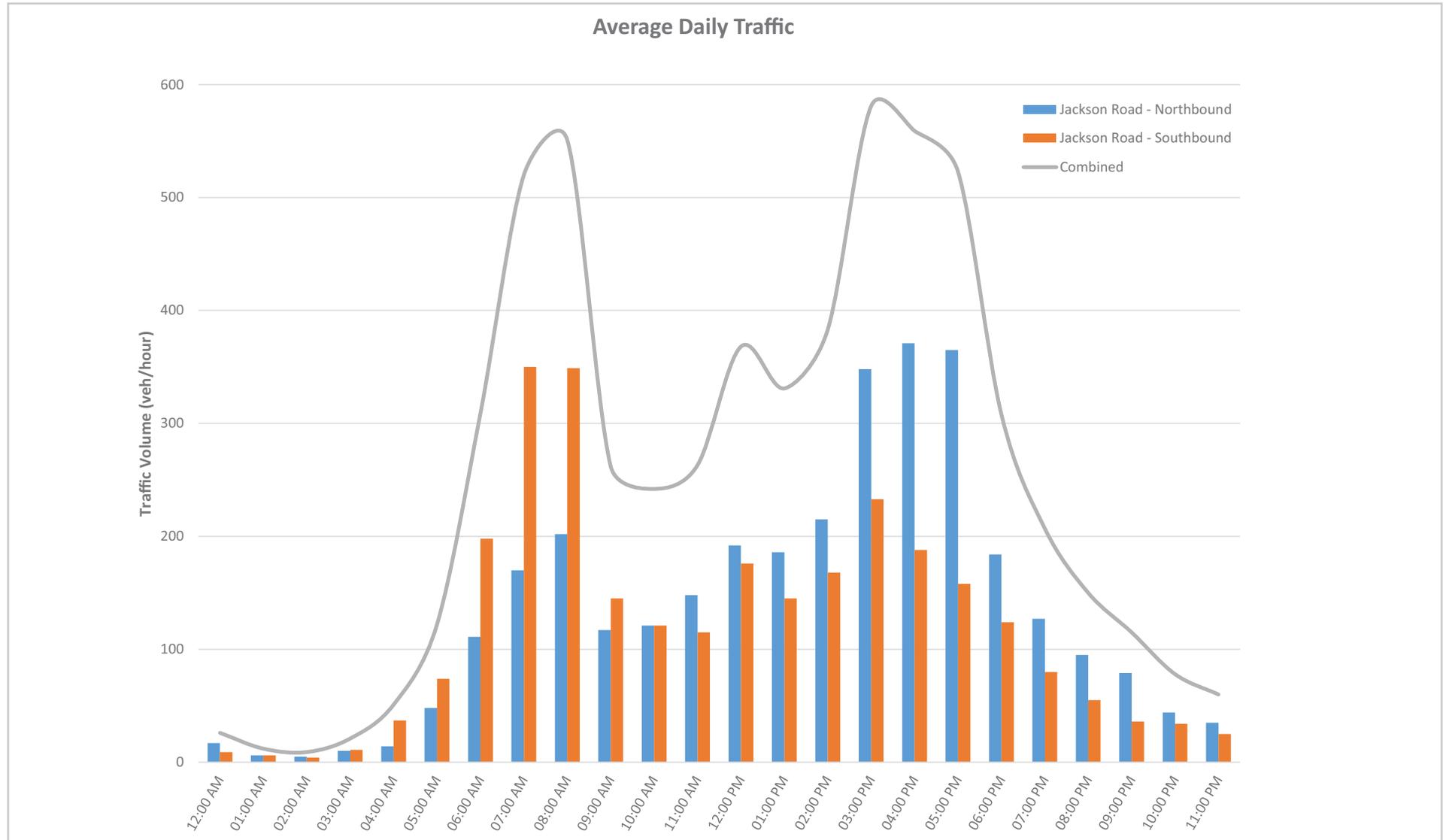




Figure 4. *Jackson Road Between Antietam Street and Buena Vista Street, September 10-14, 2018*

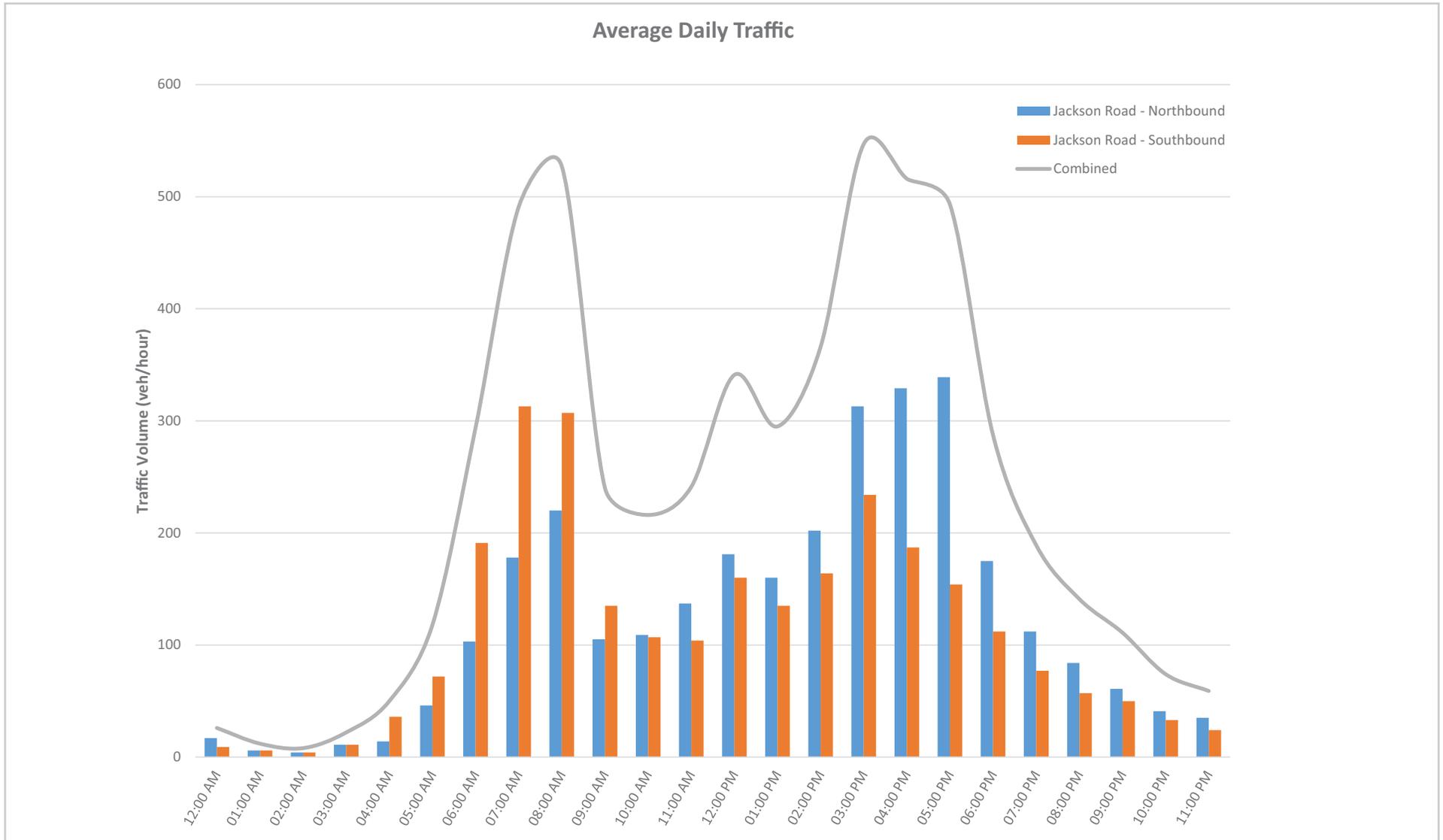




Figure 5. Jackson Road Between Buena Vista Street and Cavite Street, September 10-14, 2018

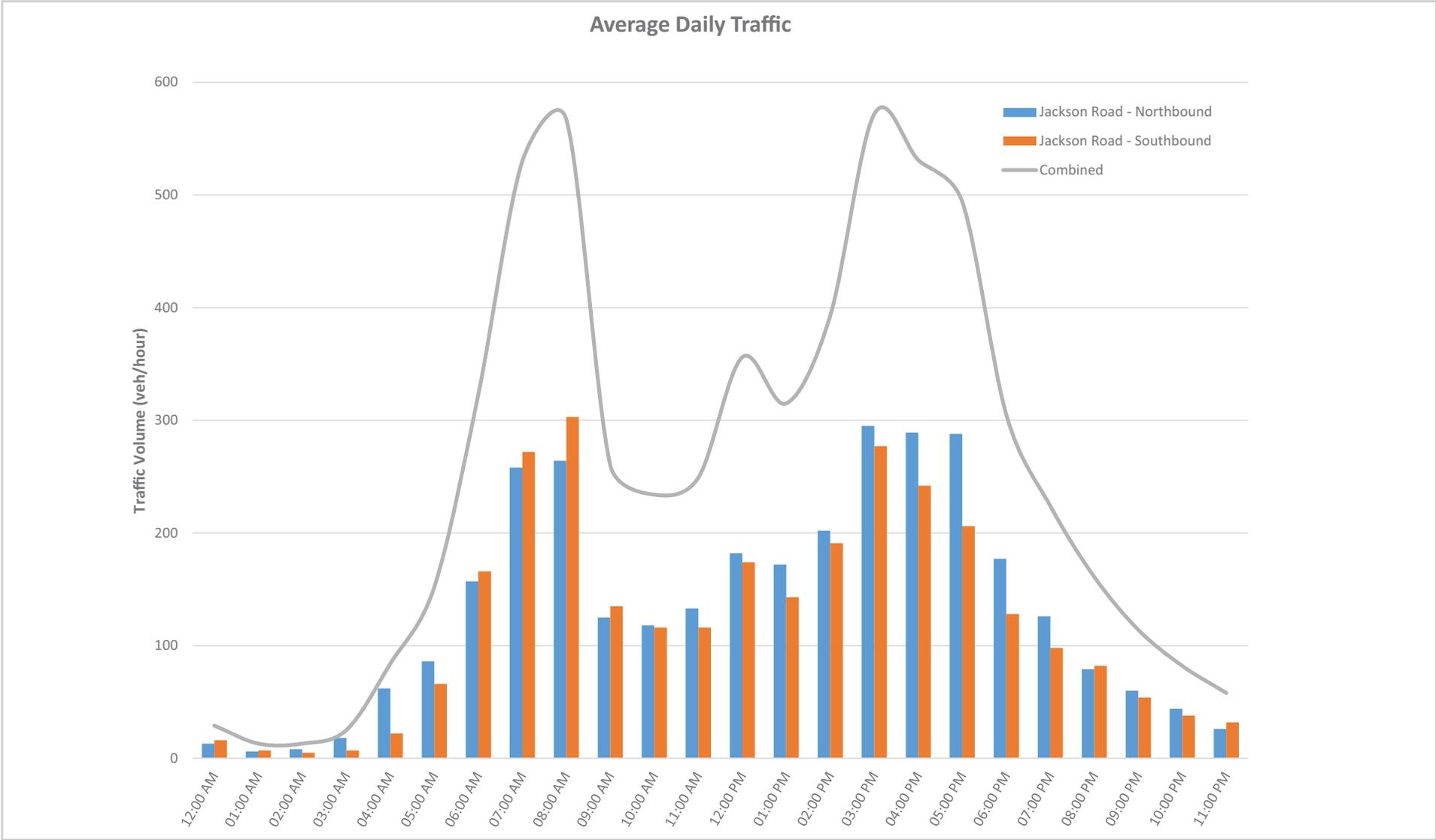




Figure 6. *Jackson Road South of Cavite Street, September 10-14, 2018*

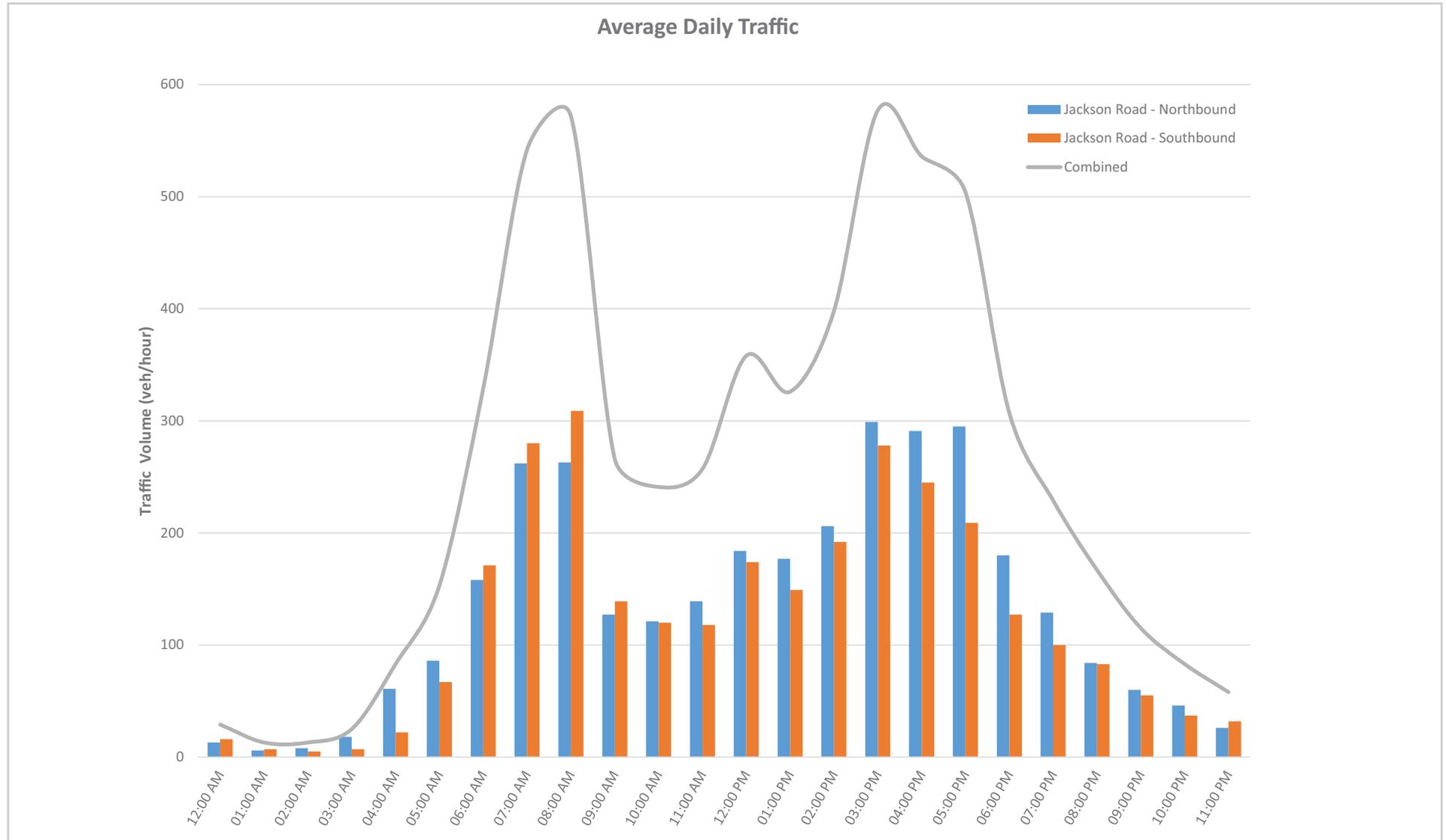




Figure 7. *Antietam Street, September 10-14, 2018*

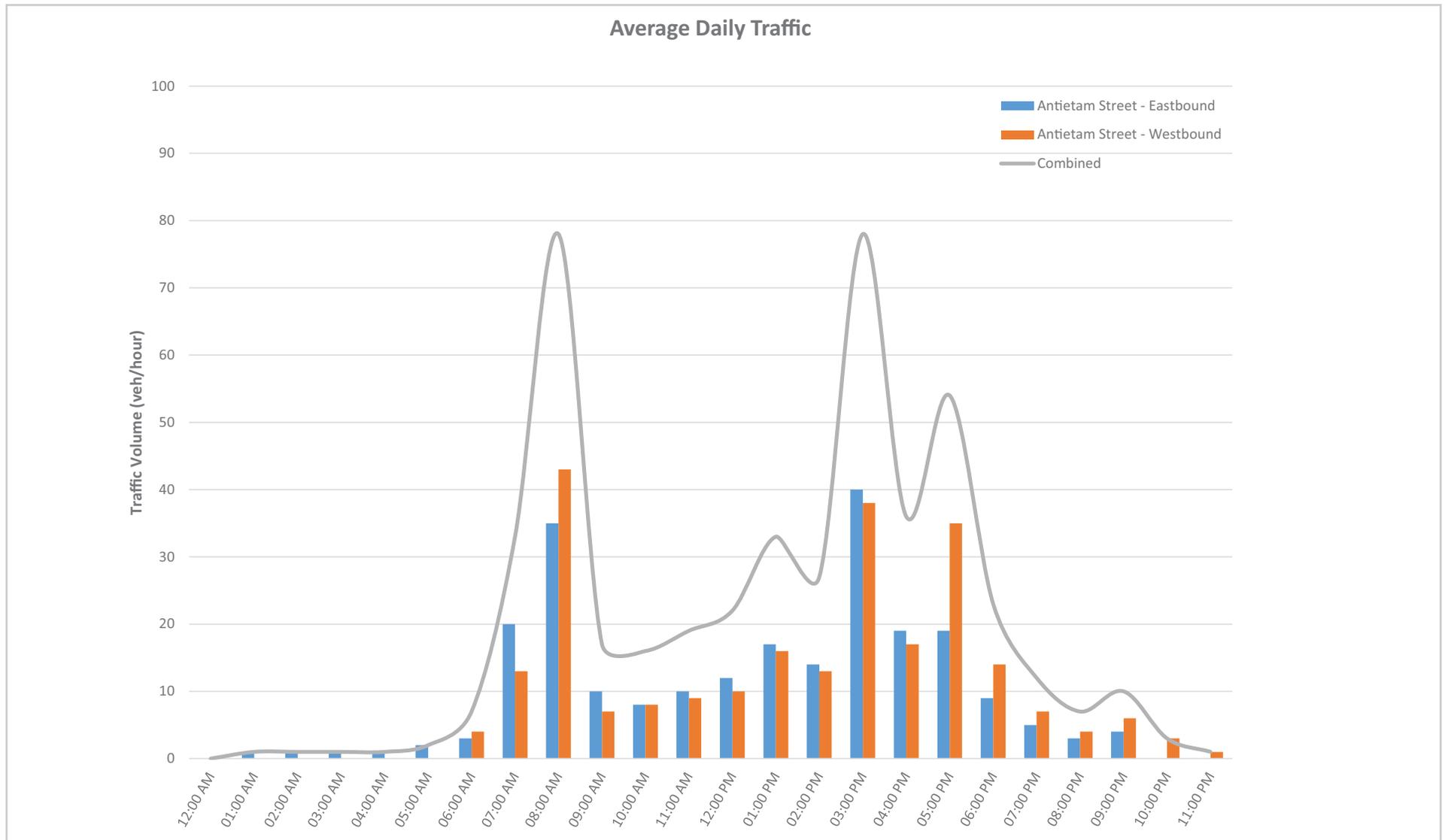




Figure 8. *Buena Vista Street, September 10-14, 2018*

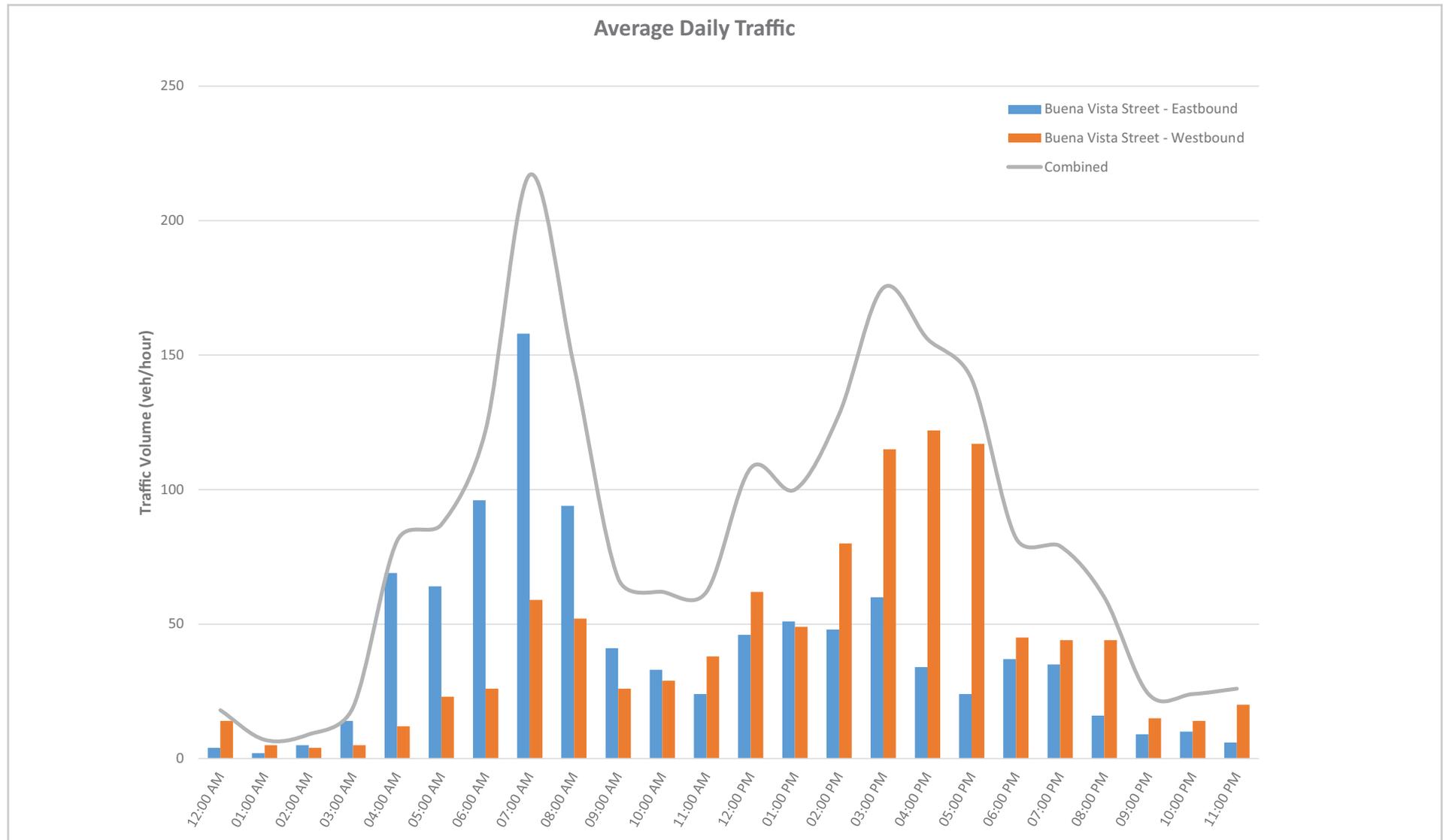




Figure 9. *Saratoga Boulevard, September 10-14, 2018*

