

Via Appia Corridor Safety Improvement Project

Traffic Study Summary

Date:	February 22, 2024
Prepared By:	Mary Hamann, P.E., Civil Engineer III
Purpose:	Analyze treatments along Via Appia to improve safety and comfort for both pedestrians crossing Via Appia and cyclists riding along the road, evaluate the benefit or impact of these treatments on vehicular through traffic and traffic on side streets
Recommendations:	<ol style="list-style-type: none">(1) Expand existing bike lanes to 6-feet wide with a 3-foot buffer(2) Reduce through travel lanes to one lane in each direction between Eldorado Lane and South Boulder Road (NB Via Appia after Via Capri will become one left turn and one, longer right turn)(3) Remove three right turn lanes along the corridor, eastbound at Pine Street should remain(4) Continue to monitor traffic at Pine Street after implementation of above recommendations and evaluate the need for a roundabout or other intersection improvements(5) Construct directional curb ramps and median refuge islands at existing marked crosswalks along the corridor

Background

The City's Transportation Master Plan (TMP) was adopted by City Council in 2019. Engineering staff has successfully implemented many projects from the TMP and staff continues to review recommended projects for implementation. Staff reviewed potential projects along Via Appia that could be completed as part of the City's 2023 biannual pavement marking program. Via Appia is considered a key corridor within the City and is described in the TMP as,

...a central roadway that connects many neighborhoods to South Boulder Road, McCaslin Boulevard and Downtown [Louisville] via Pine Street. There are two vehicle lanes and a bike lane in each direction of the very wide roadway. The roadway is served by both the Dash and 228. Travel speeds are high given the surrounding context of mostly single-family homes and the Rec Center.

The TMP recommended multiple projects along Via Appia to enhance safety for all users, including:

- **Project CP4:** reduce lane widths, extend (widen) bike lanes, extend refuges, and remove right turn lanes (evaluated with this study)
- **Project BK19:** buffer existing bike lanes (evaluated with this study)

- **Project AG24:** reconfigure the intersection of Via Appia and Pine Street (2024 Median Project improved sight visibility and further evaluated with this study)
- **Project AG25:** shorten crossing distance on Via Appia at Tyler Avenue (evaluated with this study)
- **Project AG9:** upgrade the beacon at the Power Line Trail crossing on Via Appia (RRFB remains)
- **Project SW2:** sidewalk improvements on Via Appia near Cottonwood Park (future project)
- **Project GS6:** pedestrian underpass on South Boulder Road at Via Appia (future project)
- **Project AG7:** flashing beacon crosswalk on Via Appia at Sagebrush Way (completed)
- **Project AG10:** enhanced crossing markings at the Coyote Run crossing on Via Appia (RRFB and markings installed).

As noted above, many of these projects have already been constructed, and staff identified additional TMP projects that could be fully or partially implemented using only pavement markings to continue to further the goals of the adopted TMP.

The posted speed limit on Via Appia is currently 30 mph from South Boulder Road to Lafayette Street and 35 mph from Lafayette Street to McCaslin Boulevard. As documented in the TMP, Via Appia connects many single-family neighborhoods and provides access to the Louisville Recreation and Senior Center. Additionally, there are multiple trail crossings and parks, the Louisville Police Station, and Fire Station 2 along Via Appia.

During the Marshall Fire, Via Appia was used as one of the primary evacuation routes. In addition to the Police and Fire Stations being located along Via Appia, the use of this roadway as an evacuation route was evaluated as an important part of any recommended changes to the configuration of the roadway.

Guidance

The U.S. Department of Transportation (U.S. DOT) has adopted a Safe System Approach as a guiding model to address roadway safety. A Safe System Approach incorporates many principles that are a shift from a conventional safety approach because it focuses on both human mistakes and human vulnerability to design a system with many redundancies in place to protect all users. Figure 1 below shows an image of the principles and objectives of a Safe System Approach.



Figure 1. Safe System Approach principles and objectives (Source, U.S. DOT)

The Federal Highway Administration (FHWA) has published Proven Safety Countermeasures, which are a collection of countermeasures and strategies effective in reducing roadway fatalities and serious injuries designed for all road users and all classifications of roads. One of the Proven Safety Countermeasures are road diets, also called roadway reconfigurations. The FHWA states that roadway reconfigurations are typically implemented on roadways with current and future average daily traffic of 25,000 vehicles or less and also lists the benefits of roadway reconfigurations, including:

- *Fewer lanes for pedestrians to cross.*
- *Traffic calming and more consistent speeds.*
- *A more community-focused, Complete Streets environment that better accommodates the needs of all road users.*

The FHWA also funds the Crash Modification Clearinghouse, which is a database of published crash modification factors (CMFs) with information about the study that produces each CMF along with a star rating to indicate the quality of each CMF.

In 2020, the Colorado Department of Transportation (CDOT) issued a document titled “Urban Arterial Safety Strategies” as a part of the Safer Main Streets Initiative, which is now called the Revitalizing Main Streets program. This document is a list of strategies that may mitigate specific safety issues collected from a variety of sources that supports CDOT’s vision of zero deaths for users of Colorado’s transportation network. Relevant strategies that are included in this document are road diets; geometric

changes, like narrowing roadway cross-section; pavement markings, including bike lane improvements; and road narrowing and traffic calming measures.

The City of Louisville TMP sets eight goals for Louisville's transportation network. The projects included in the TMP are intended to work towards reaching these goals. The applicable goals for the Via Appia project are:

1. ***Operate efficiently and safely for all users.*** *Louisville's transportation system must function efficiently, delivering people to their destinations in a timely manner. Whether someone is driving, walking, or cycling the transportation network must be convenient and enhance their ability to move around the city and the region. The transportation network must also be safe for all users. It should be designed in a way that minimizes crashes, and also in a way that functions well year-round, throughout inclement weather.*
2. ***Be a cohesive and layered system of streets and trails for walking, biking, transit, driving, and recreation.*** *Louisville's transportation system must be a well-connected network that links together the network for all transportation modes. This means that key destinations and routes must be accessible for all that use the network and that people can move seamlessly between destinations and modes.*
5. ***Increase mobility options and access for people of all ages, abilities, and income levels.*** *The system must be inclusive in its accommodation for all needs within the community. It must improve mobility and remove barriers for drivers and non-drivers, younger and older people, families and individuals, regardless of income.*
6. ***Provide complete streets that are inviting, enhance livability and reflect the City's small-town atmosphere.*** *Streets should be designed to work for all modes of transportation. Complete streets are functional and inviting to a variety of users, whether they be on foot, on bike, or in a car. They should be designed to feel safe, promote use by all modes, and reflect Louisville's small-town character.*

Section 2B.12 of the *Manual on Uniform Traffic Control Devices (MUTCD)* provides support and guidance for right-of-way at intersections. The following *MUTCD* guidance was considered for analyzing the operations at major side streets along Via Appia,

Warrants are not a substitute for engineering judgment. The fact that a warrant for a particular traffic control device is met is not conclusive justification to install or not install all-way stop control. Because each intersection will have unique characteristics that affect its operational performance or safety, it is the engineering study for a given intersection that is ultimately the basis for a decision to install or not install all-way stop control.

The *MUTCD* guidance in Sections 2B.13 through 2B.17 were evaluated. The attached multi-way stop evaluation details the specific criteria evaluated for each intersection.

Chapter 4C of the *MUTCD* provides support and guidance for studies and factors for justifying traffic control signals. Warrants 1 through 3 were evaluated as a part of this traffic study for the intersection of Via Appia and Pine Street. It is important to note that Section 4C.01 of the *MUTCD* states,

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Existing Conditions

Summary

The existing posted speed limit on Via Appia is currently 30 mph from South Boulder Road to Lafayette Street and 35 mph from Lafayette Street to McCaslin Boulevard. Speed data collected in December 2023 measured the 85th percentile speeds in the 30 mph section of Via Appia at 36 mph and 42 mph in the 35 mph portion.

The existing typical cross section consists of two 12-foot through travel lanes in each direction with a 5-foot bike lane. The sidewalks are separated from the roadway and are 6-foot wide on both sides. Right turn lanes exist at the following locations:

- eastbound Via Appia at Pine Street
- eastbound Via Appia at Church Lane
- eastbound Via Appia at Tyler Avenue
- westbound Via Appia at Tyler Avenue.

The average daily traffic collected in December 2023 ranges between 4,100 and 5,800 vehicles per day in one direction, depending on the location the count was taken (see Table 1 for data collected on Via Appia in December 2023).

Crash History

Traffic crash data for Via Appia between South Boulder Road and McCaslin Boulevard between 2021 and 2023 was reviewed as a part of this analysis. There were 23 total crashes during that period, with four resulting in injuries. Eight of the crashes were rear-end collisions at the intersections with South Boulder Road or McCaslin Boulevard. Two crashes, which both resulted in injuries, involved cyclists crossing at marked crosswalks (one at South Boulder Road and one at Pine Street). Three of the crashes were rear-end collisions at the marked mid-block crosswalks where there are rectangular rapid flashing beacons (RRFBs) along the corridor where a driver rear-ended another vehicle that was yielding to pedestrians in the crosswalks. Three of the crashes occurred because of a failure to yield or stop from side streets or driveways before entering Via Appia.

While the crashes did not result in serious injuries or fatalities, other crashes on roadways within Louisville have had more serious outcomes. By approaching this project using a Safe System Approach, improvements will be made to Via Appia to proactively address safety before crashes occur by creating a safer road for all users and promoting safer speeds. This shift from a conventional safety approach to a Safe System Approach allows for projects to be based on proactively identifying and addressing risks rather than reacting based on a crash history.

Data Collection

Traffic speed and volume data were collected on Wednesday, December 6, 2023 on Via Appia near intersections with major side streets and on Wednesday, December 13, 2023 on Pine Street, Tyler Avenue, and Lafayette Street near their intersections with Via Appia. Turning movement counts during the AM, mid-day, and PM peak hours were collected on Wednesday, December 6, 2023 at the intersections of Via Appia with Pine Street, Tyler Avenue, and Lafayette Street and are included at the end of this study. Summaries of the collected speed and volume data are in Tables 1 and 2 below.

Table 1. Measured speeds and volumes on Via Appia on Wednesday, December 6, 2023

Location on Via Appia	Average Daily Traffic	Average Speed (mph)	85 th % Speed (mph)
EB, west of Pine St	5,804	38.0	43.1
WB, east of Pine St	4,165	36.7	41.7
EB, west of Tyler Ave	4,542	36.3	42.0
WB, east of Tyler Ave	4,379	36.9	41.4
EB, west of Lafayette St	4,701	32.5	36.5
WB, east of Lafayette St	4,300	33.3	36.6

Table 2. Measured speeds and volumes on Pine, Tyler, and Lafayette on Wednesday, December 13, 2023

Location	Average Daily Traffic	Average Speed (mph)	85 th % Speed (mph)
Pine St (SB, north of Via Appia)	391	18.8	21.4
Pine St (NB, south of Via Appia)	3,505	26.2	29.3
Tyler Ave (SB, north of Via Appia)	1,323	28.5	32.1
Tyler Ave (NB, south of Via Appia)	2,069	23.3	27.2
Lafayette St (SB, north of Via Appia)	238	14.7	18.0
Lafayette St (NB, south of Via Appia)	2,336	21.6	24.4

For comparison, the average daily traffic counts on various arterials in Louisville collected in 2022 are in Table 3 below.

Table 3. Measured volumes on arterials in Louisville from 2022.

Location	Average Daily Traffic
McCaslin Blvd (NB, north of Via Appia)	6,016
McCaslin Blvd (SB, north of Via Appia)	6,562
McCaslin Blvd (NB, south of Via Appia)	8,535
McCaslin Blvd (SB, south of Via Appia)	8,755
Cherry St (EB, east of Madison Ave)	3,001
Cherry St (WB, east of Madison Ave)	3,315
Dillon Rd (EB, east of 96 th St)	8,780
Dillon Rd (WB, east of 96 th St)	8,220
South Boulder Rd (EB, west of Via Appia)	6,661
South Boulder Rd (WB, west of Via Appia)	6,718

Site Investigation

Multiple site investigations were completed in November and December 2023 during the AM and PM peak hours to evaluate intersection operations, specifically at the intersections of Via Appia with Pine Street, Tyler Avenue, and Lafayette Street. Observations showed an acceptable level of delay at the side streets at the intersections with Via Appia without queues extending outside of any marked turn lanes.

In November 2023, the inside lanes of Via Appia were closed for construction on the median near Pine Street from Monday, November 13 to Friday, November 17. This effectively reduced the travel lanes from 2-lanes in each direction to one lane in each direction as this project recommends. Engineering staff conducted multiple observations during this construction period to determine the impact of the single lane closure in each direction on the delay on Pine Street, including using a drone to capture traffic operations from above. Figure 2 below shows an image from the drone video collected during the AM peak hour during the lane closure on Friday, November 17, 2023. The image shows vehicles travelling in both directions on Via Appia and three vehicles in the left turn lane on northbound Pine Street.

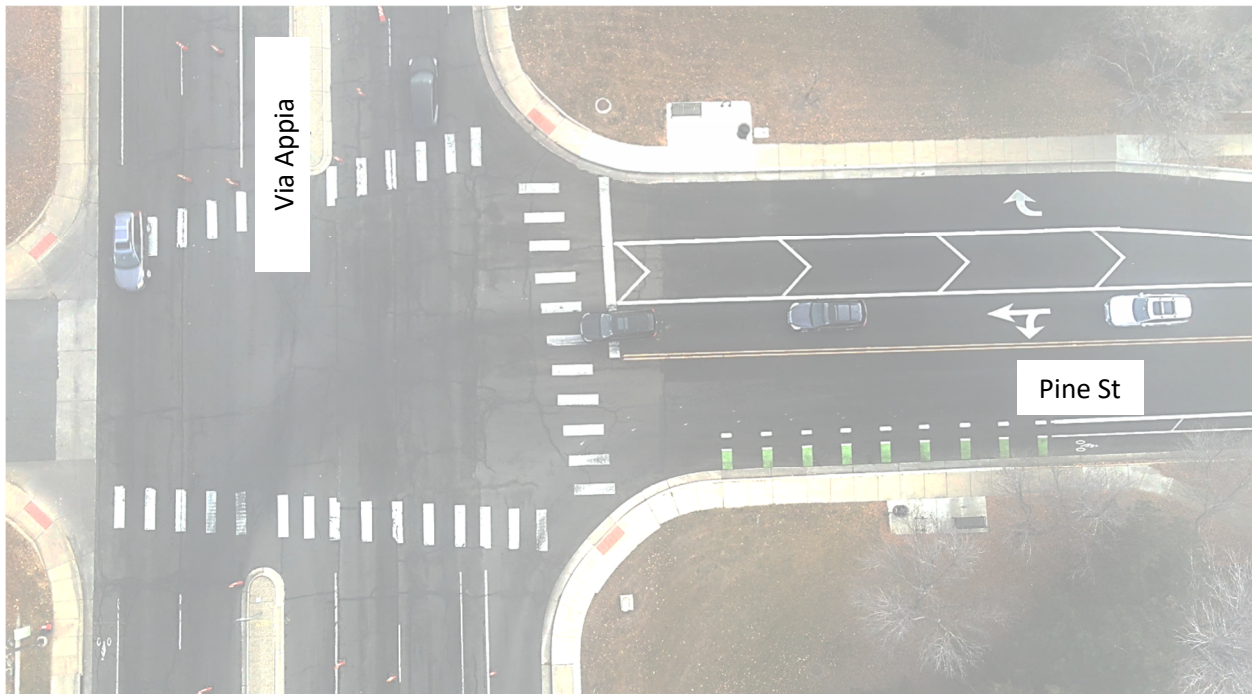


Figure 2. Image from drone video taken Friday, November 17, 2023 during lane closure for median construction

After the median construction was completed and traffic control was removed, Engineering staff collected more drone footage of the intersection of Via Appia and Pine Street. Figure 3 below shows an image from the drone video collected during the AM peak hour on Friday, December 1, 2023. The image shows vehicles in both travel lanes and the left turn lane on Via Appia and vehicles on both legs of Pine Street.

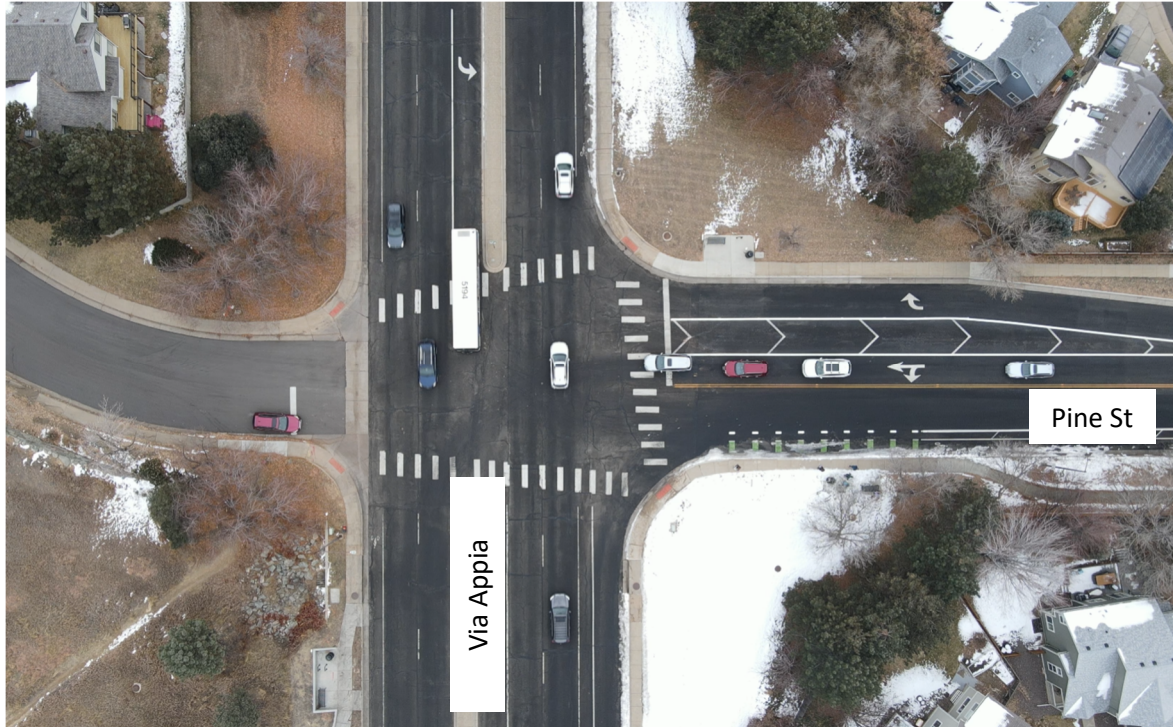


Figure 3. Image from drone video taken Friday, December 1, 2023 without lane closure on Via Appia

Analysis

Buffered Bike Lanes and Reducing Through Lanes

One proven method to reduce speeds is to reduce the lane widths. On Via Appia, the lane widths can be reduced from the existing 12-foot to 10-foot wide. Additionally, based on the guidance from the FHWA and CDOT regarding roadway reconfigurations and the measured volume of traffic on Via Appia, a lane reduction is recommended for this roadway. The Crash Modification Clearinghouse lists highly rated crash modification factors for both bike lanes and lane reduction projects. Figures 4 and 5 below show the typical existing and proposed ultimate cross-section of Via Appia with a lane reduction, respectively. This lane reduction would reduce the existing four-lane section with 12-foot vehicular travel lanes to a two-lane section with 10-foot travel lanes. The existing 5-foot bike lane would be expanded to a 6-foot width, and a 3-foot buffer would be added. The inner buffer would be 10-foot wide, which will still allow for emergency vehicle use or in the case of evacuations.

The proposed roadway reconfiguration treatment would begin on the south end of Via Appia after the intersection with Eldorado Street and continue to South Boulder Road. The buffered bike lanes would be for the entire length of the corridor.

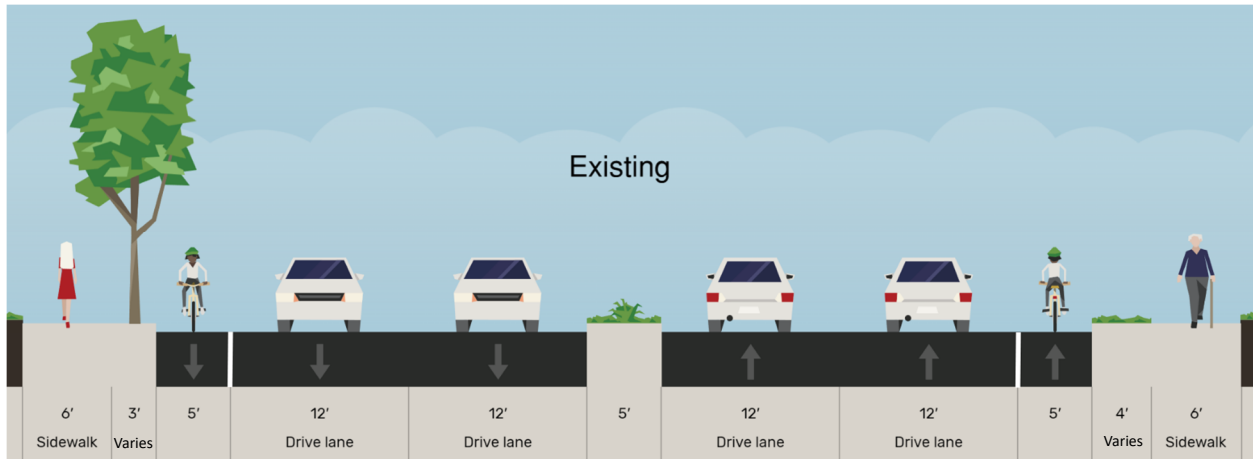


Figure 4. Existing typical cross-section of Via Appia

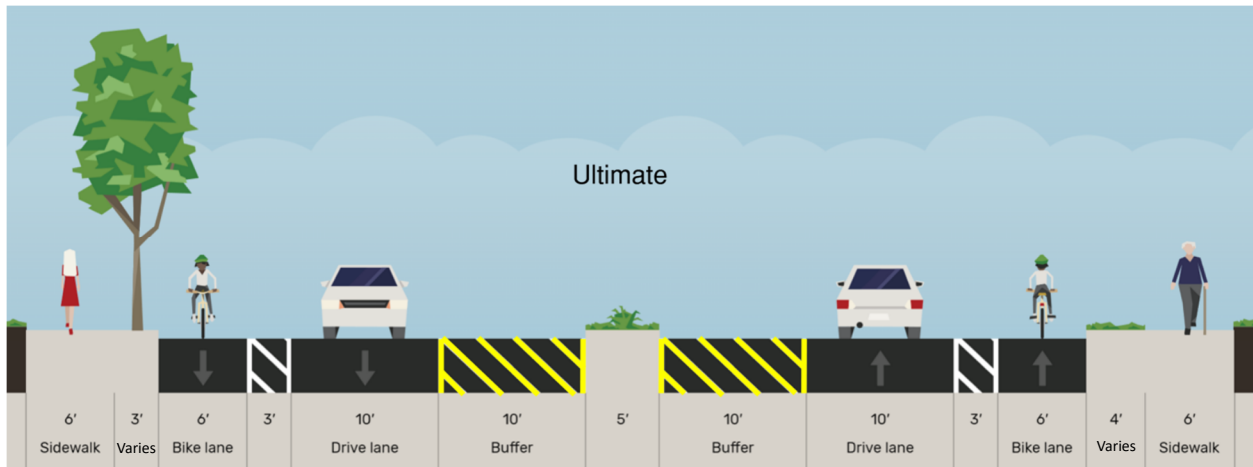


Figure 5. Proposed ultimate typical cross-section of Via Appia

Narrowing the travel lanes along Via Appia would complete a portion of TMP Project CP4 (reduce lane widths, extend bike lanes, extend refuges, and remove right turn lanes). Additionally, the roadway reconfiguration would meet the intent of TMP Project AG25 (shortened crossing distance on Via Appia at Tyler Avenue). The reduction of a vehicular through lane in each direction provides the space needed to widen and buffer the bike lanes and extend pedestrian refuges at marked crossings without significantly impacting the travel time for drivers on Via Appia.

If an interim treatment is desired before constructing the ultimate cross-section due to installation costs or scarring of the asphalt from removal of existing pavement markings, the existing 5-foot bike lane could remain, and a 2-foot buffer could be added. Figure 6 below shows the interim typical cross section of Via Appia. The ultimate section could then be implemented after the completion of annual pavement maintenance work on Via Appia so that funding could be specifically allocated for the improvements and there would not be any pavement scarring from the moving of the lane markings.

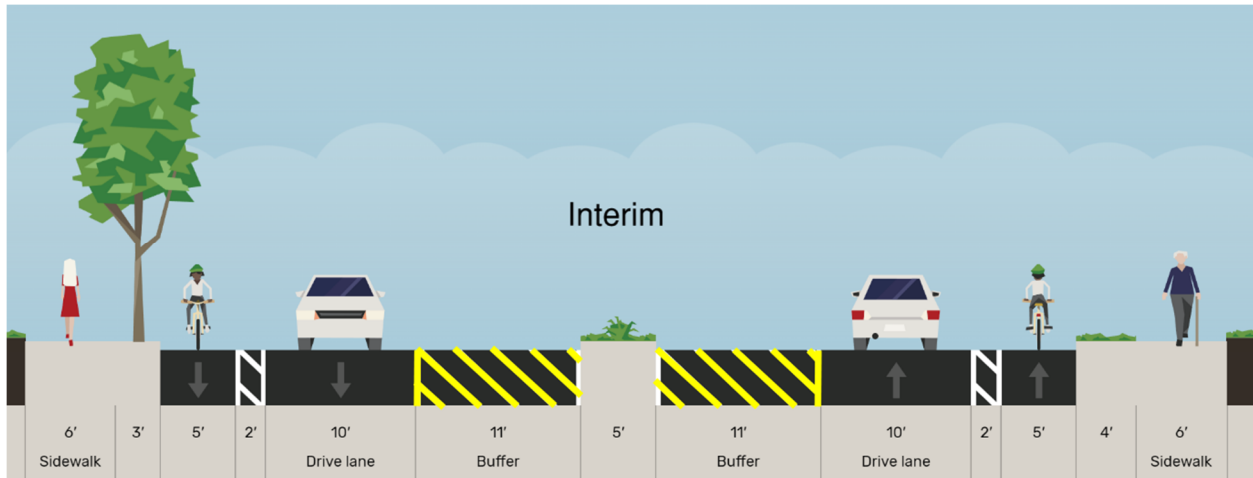


Figure 6. Optional interim typical cross-section of Via Appia

Turn Lanes

The existing right turn lane at South Boulder Road would be increased to 400 feet in length from the existing 100-foot length to allow for greater storage at this intersection. This increase is based on modeling conducted by Fehr & Peers in 2021 for improvements that have been implemented along South Boulder Road. The increase to 400 feet should accommodate the PM peak hour right turn queue based on this modeling.

The eastbound right turn lane at Pine Street would remain due to the volume of right turns in this direction, but three right turn lanes in the proposed lane reduction area would be removed. The proposed right turn lane configuration is based on the peak hour turning movement count data collected in December 2023.

If the lane reduction were implemented, existing left turn lanes would be maintained throughout the corridor and new left turn lanes would be created in the former through lane at the following intersections along Via Appia:

- Griffith Street
- Harper Street
- Via Capri.

These additional left turns allow for safer, more predictable left turn movements at those intersections reducing the chances of rear end collisions.

Removing three of the four existing right turn lanes along Via Appia would complete another part of TMP Project CP4 (reduce lane widths, extend bike lanes, extend refuges, and remove right turn lanes), except for maintaining the eastbound right turn lane at Pine Street due to the volume of right turns in this direction. Additionally, the removal of the right turn lanes at the Tyler Avenue intersection would meet the intent of TMP Project AG25 (shortened crossing distance on Via Appia at Tyler Avenue) by reducing the number of vehicular travel lanes that a pedestrian must cross by one lane at either crosswalk on Via Appia at Tyler Avenue.

Intersection Traffic Control

Using the traffic data collected in December 2023, the crash history, and existing intersection sight distance as of December 2023, all-way stop warrants from the *MUTCD* were analyzed at the intersections of Via Appia with Pine Street, Tyler Avenue, and Lafayette Street. Traffic signal warrants from the *MUTCD* were analyzed at the intersection of Via Appia with Pine Street.

Via Appia and Tyler Avenue

The intersection of Via Appia and Tyler Avenue did not meet any of the all-way stop warrants from the *MUTCD*.

Via Appia and Lafayette Street

The intersection of Via Appia and Lafayette Street did meet Warrant B for the intersection sight distance for the minor road based on the intersection sight distance criteria from AASHTO's *A Policy on Geometric Design of Highways and Streets*. The intersection with Lafayette is where the speed limit transition between 30 mph and 35 mph currently occurs, and the intersection sight distance evaluation is conservatively based on the 35 mph speed limit. The only recent crash involving this intersection was not caused by restricted intersection sight distance. Because of this data, it is not recommended to install an all-way stop at this intersection based solely on the restricted intersection sight distance.

Via Appia and Pine Street

The intersection of Via Appia and Pine Street met the all-way stop Warrant D for the 8-hour volume because the measured 85th percentile speed on Via Appia was greater than 40 mph. However, Section 2B.12 of the *MUTCD* states,

The satisfaction of an all-way stop control warrant or warrants shall not in itself require the installation of all-way stop control at an unsignalized intersection.

A traffic signal warrant evaluation was completed for the intersection of Via Appia and Pine Street with warrants 1, 2, and 3 being evaluated. The criteria were met for warrants 1 and 2 for the installation of the traffic signal at this intersection. These warrants were met because the measured 85th percentile speed on Via Appia was greater than 40 mph. Similar to the all-way stop analysis, Section 4C.01 of the *MUTCD* states,

The satisfaction of a traffic signal warrant or warrants shall not in itself require the installation of a traffic control signal.

Because the only warrants that were met are due to travel speeds over the posted speed limit of 35 mph on Via Appia, it is not recommended to install all-way stop control or a traffic signal at this intersection at this time. A more appropriate method of improving the function and comfort of the intersection of Pine Street at Via Appia would be to install traffic calming measures with increased traffic enforcement. Additionally, the installation of an all-way stop or traffic signal would increase noise and air pollution from idling and accelerating vehicles for the nearby residences.

The *MUTCD* includes alternatives to all-way stop control to control right-of-way at intersections in Section 2B.08, which include installing measures designed to reduce speeds on the approaches to the intersection or installing a circular intersection. Similarly, alternatives to the installation of traffic control signals are included in Section 4B.03 of the *MUTCD*, which include installation of a roundabout or installing measures to reduce speeds on approaches to the intersection.

Alternative intersection geometry, such as a circular intersection or roundabout, should be considered at the intersection of Pine Street and Via Appia to improve the operations and safety at this intersection. The installation of a roundabout would be best accomplished with a lane reduction on Via Appia to reduce the number of through lanes to one lane in each direction because of the need for additional right-of-way with a two-lane roundabout. This project would meet the goals of TMP Project AG24 (reconfigure the intersection of Via Appia and Pine Street) to reconfigure the layout of this intersection.

Intersection Level of Service (at Pine Street)

The level of service (LOS) during the PM peak of 4:45-5:45 PM at the intersection of Via Appia and Pine Street was evaluated with various intersection treatments and number of through lanes on Via Appia. Intersection LOS is a method of quantifying the quality of service at an intersection, with a scale of A-F, with LOS A representing the least amount of delay and LOS F the maximum delay. An acceptable intersection LOS within the City of Louisville is up to LOS D, which is up to a 35 second delay per vehicle at a stop-controlled or roundabout intersection.

Tables 4 and 5 below show a summary of the LOS and delay in each scenario analyzed. Note that if stop control is not present on all approaches to an intersection, the LOS for the stop-controlled approaches the determining LOS where at all-way stop controlled and roundabout intersections the LOS is for the intersection as a whole.

Based on the traffic counts collected in December 2023, the PM peak intersection LOS of Via Appia and Pine Street is assumed to be the worst-case scenario of the major internal intersections along Via Appia (Pine Street, Tyler Avenue, and Lafayette Street) and is the only intersection analyzed for LOS with this study.

Table 4. Intersection LOS summary for PM peak hour at Via Appia and Pine Street with various traffic control

Via Appia 4 Lanes, All-Way Stop		Via Appia 2 Lanes, All-Way Stop		Via Appia 2 Lanes, Roundabout	
LOS	Delay (s)	LOS	Delay (s)	LOS	Delay (s)
A	7.9	B	14.0	A	7.1

Table 5. Individual Controlled LOS summary for PM peak hour at Via Appia and Pine Street with stop control on Pine Street

Pine Street Direction	Via Appia 4 Lanes, Side Street Stop		Via Appia 2 Lanes, Side Street Stop	
	LOS	Delay (s)	LOS	Delay (s)
NBL	C	15.6	C	15.7
NBT	E	36.6	C	17.0
NBR	A	9.0	A	5.4
SBT	B	11.7	B	13.5
SBR	A	5.0	A	5.6

*Note that a southbound left turn is not shown on this table as this move did not occur during the time period analyzed

Although the intersection LOS for an all-way stop is LOS A or LOS B as shown in Table 4, the delay per vehicle for the Via Appia approaches to the intersection will experience an increase in delay by 7 seconds per vehicle with the installation of an all-way stop, which extends to an increase in delay by 11 seconds per vehicle with the reduction in travel lanes on Via Appia from four to two. During the PM peak, this increase in delay per vehicle will result in an overall 3,985 seconds (66 minutes) of delay over the peak hour for eastbound traffic on Via Appia with the installation of an all-way stop, and the overall delay increases to 6,708 seconds (112 minutes) with the reduction in the number of through lanes from four to two on Via Appia with an all-way stop. This increase in delay will result in additional emissions and noise from braking and acceleration at the new stop signs on Via Appia, which is especially important given the residential uses of the surrounding land.

Staff Recommendations

Buffered Bike Lanes and Reducing Through Lanes

Based on the guidance from the federal and state departments of transportation, the volume of traffic on Via Appia, the recommended projects from the City's TMP, staff recommends the following:

- add 3-foot buffer to the existing bike lanes
- reduce the number of through lanes from four to two on Via Appia between Eldorado Street to South Boulder Road as shown in Figure 5 with an interim option shown in Figure 6.

The temporary lane reduction from the traffic control related to the median project allowed for a demonstration of the function of Via Appia with two lanes in each direction.

Turn Lanes

With the number of through lanes reduced from four to two on Via Appia, additional left turn lanes can be installed along the corridor, increasing safety for turning vehicles. Additionally, the right turn lane can be extended at the intersection with South Boulder Road to allow for storage during the peak periods for right turns onto South Boulder Road.

The traffic counts collected in December 2023 indicate that the portion of TMP Project CP4 to remove right turn lanes along Via Appia is a viable project, with the exception of the eastbound right turn onto Pine Street. The volume of right turns at this location indicate the need for a dedicated right turn lane.

Additional Improvements

Staff recommends shifting the 35 mph speed limit transition from south of Lafayette Street to north of the intersection with Tyler Avenue. As noted above, Via Appia connects many single-family neighborhoods and has multiple trail crossings. This change will improve the intersection sight distance at the intersections of Lafayette Street and Sagebrush Way and improve the safety and comfort of pedestrians crossing the road.

As additional funding allows, concrete work to reconfigure curb ramps and create improved pedestrian refuges midway across Via Appia should be completed at existing marked crossings without pedestrian refuges to further enhance pedestrian safety and comfort and achieve a goal of TMP Project CP4 (extend refuges). The reconfiguration of curb ramps to directional will further shorten the crossing distance and bring the crossings into compliance with current ADA guidelines.

Staff recommends the installation of bicycle boxes at the intersections with South Boulder Road and McCaslin Boulevard. Bicycle boxes consist of green pavement markings that allow cyclists to make left turn movements in a safer manner than from the vehicular travel lane or bike lane (see Figure 7 for an example of a bicycle box). A similar treatment has been installed in Louisville on southbound Dahlia Street at the intersection with Cherry Street.



Figure 7. Example of bicycle box

Attachments

- Multi-Way Stop Evaluation – Via Appia and Pine Street
- Multi-Way Stop Evaluation – Via Appia and Tyler Avenue
- Multi-Way Stop Evaluation – Via Appia and Lafayette Street
- Traffic Signal Warrant Evaluation – Via Appia and Pine Street
- Peak Turning Movement Count Data – AM, Mid-Day, and PM
- Synchro Level of Service and Queue Length Calculations for Various Intersection Treatments – Via Appia and Pine Street PM Peak

Multi-Way Stop Application Evaluation

Pine Street at Via Appia Way – December 2023

Sections 2B.12 through 2B.17 of the Manual on Uniform Traffic Control Devices (MUTCD) provide support and guidance for the application of all-way stop applications. Table 1 provides the warrant guidance criteria and current traffic data, and Table 2 provides other warrant criteria that may be considered in the engineering study.

Table 1. All-way Stop Warrant Guidance Criteria (TMUTCD Sections 2B.13 through 2B.16)

Warrant	Minimum Values	Current Values	Warrant Met?
A. Crash Experience			
<ul style="list-style-type: none"> • Reported crashes susceptible to correction with all-way stop control 	-	-	-
Four-leg intersection, 12-month period	5	0	No
Four-leg intersection, 36-month period	6	0	No
Three-leg intersection, 12-month period	4	-	No
Three-leg intersection, 36-month period	5	-	No
B. Sight Distance			
<ul style="list-style-type: none"> • Intersection sight distance for minor road 	438 ft	603 ft	No
C. Traffic signal or Circular Intersection			
<ul style="list-style-type: none"> • Interim measure for the installation of a traffic signal or circular intersection. 	-	-	No
D.A. Major street volume			No
<ul style="list-style-type: none"> • Total of both approaches • Average of any 8 hours of a typical day; and 	300	772	
D.B. Minor street volume			
<ul style="list-style-type: none"> • Total of both approaches • Average of same 8 hours of major street; but 	200	149	
D. High-speed criteria	Major street 85 th -percentile approach speed = 42 mph		
<ul style="list-style-type: none"> • 85th-percentile approach speed of the major street traffic exceeds 40 mph. 			
• 70 percent of major street volume	210	772	Yes
• 70 percent of minor street volume	140	149	

Table 2. All-way Stop Other Criteria (TMUTCD Section 2B.17)

Warrant	Warrant Met?
A. The need to control left-turn conflicts	No
B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection	No
C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control	No

Multi-Way Stop Application Evaluation

Tyler Avenue at Via Appia Way – December 2023

Sections 2B.12 through 2B.17 of the Manual on Uniform Traffic Control Devices (MUTCD) provide support and guidance for the application of all-way stop applications. Table 1 provides the warrant guidance criteria and current traffic data, and Table 2 provides other warrant criteria that may be considered in the engineering study.

Table 1. All-way Stop Warrant Guidance Criteria (TMUTCD Sections 2B.13 through 2B.16)

Warrant	Minimum Values	Current Values	Warrant Met?
A. Crash Experience	-	-	-
• Reported crashes susceptible to correction with all-way stop control			
Four-leg intersection, 12-month period	5	0	No
Four-leg intersection, 36-month period	6	0	No
Three-leg intersection, 12-month period	4	-	No
Three-leg intersection, 36-month period	5	-	No
B. Sight Distance	438 ft	615 ft	No
• Intersection sight distance for minor road			
C. Traffic signal or Circular Intersection	-	-	No
• Interim measure for the installation of a traffic signal or circular intersection.			
D.A. Major street volume	300	681	No
• Total of both approaches • Average of any 8 hours of a typical day; and			
D.B. Minor street volume	200	125	
• Total of both approaches • Average of same 8 hours of major street; but			
D. High-speed criteria	Major street 85 th -percentile approach speed = 42 mph		
• 85th-percentile approach speed of the major street traffic exceeds 40 mph.			
• 70 percent of major street volume	210	681	No
• 70 percent of minor street volume	140	125	

Table 2. All-way Stop Other Criteria (TMUTCD Section 2B.17)

Warrant	Warrant Met?
A. The need to control left-turn conflicts	No
B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection	No
C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control	No

Multi-Way Stop Application Evaluation

Lafayette Street at Via Appia Way – December 2023

Sections 2B.12 through 2B.17 of the Manual on Uniform Traffic Control Devices (MUTCD) provide support and guidance for the application of all-way stop applications. Table 1 provides the warrant guidance criteria and current traffic data, and Table 2 provides other warrant criteria that may be considered in the engineering study.

Table 1. All-way Stop Warrant Guidance Criteria (TMUTCD Sections 2B.13 through 2B.16)

Warrant	Minimum Values	Current Values	Warrant Met?
A. Crash Experience			
<ul style="list-style-type: none"> • Reported crashes susceptible to correction with all-way stop control 	-	-	-
Four-leg intersection, 12-month period	5	0	No
Four-leg intersection, 36-month period	6	0	No
Three-leg intersection, 12-month period	4	-	No
Three-leg intersection, 36-month period	5	-	No
B. Sight Distance			
<ul style="list-style-type: none"> • Intersection sight distance for minor road 	438 ft	319 ft	Yes
C. Traffic signal or Circular Intersection			
<ul style="list-style-type: none"> • Interim measure for the installation of a traffic signal or circular intersection. 	-	-	No
D.A. Major street volume			No
<ul style="list-style-type: none"> • Total of both approaches • Average of any 8 hours of a typical day; and 	300	703	
D.B. Minor street volume			
<ul style="list-style-type: none"> • Total of both approaches • Average of same 8 hours of major street; but 	200	86	
D. High-speed criteria	Major street 85 th -percentile approach speed = 36 mph		
<ul style="list-style-type: none"> • 85th-percentile approach speed of the major street traffic exceeds 40 mph. 			
<ul style="list-style-type: none"> • 70 percent of major street volume 	210	703	No
<ul style="list-style-type: none"> • 70 percent of minor street volume 	140	86	

Table 2. All-way Stop Other Criteria (TMUTCD Section 2B.17)

Warrant	Warrant Met?
A. The need to control left-turn conflicts	No
B. An intersection of two residential neighborhood collector (through) streets of similar design and operating characteristics where all-way stop control would improve traffic operational characteristics of the intersection	No
C. Where pedestrian and/or bicyclist movements support the installation of all-way stop control	No

City of Louisville, Colorado

Traffic Signal Warrant Summary Worksheet

70%

The Worksheet(s) attached are provided as an attachment to the Engineering Investigation Study for:

Intersection: Via Appia Way and Pine Street

County: Boulder

City: Louisville

Major Street: Via Appia Way

Minor Street: Pine Street

Critical Approach Speed: 42 mph

Critical Approach Speed: 30 mph

Lanes: 2 or more lanes

Lanes: 1 lane

% Right Turns Included

In built-up area of isolated community of < 10,000 population? No

From North (SB) 100%

Total number of approaches at intersection? 4 or more

From East (WB) 50%

If it is a "T" intersection, inflate minor threshold to 150%?

From South (NB) 0%

Manually set volume level? No

From West (EB) 0%

Analysis based on EXISTING volume data.

Date	Day of the Week	Time (HH:MM)			
		From	AM / PM	To	AM / PM
12/13/2023	Wednesday				

Warrant Evaluation Summary	Warrant Met:
Warrant 1: Eight - Hour Vehicular Volume	Yes
Condition A: Minimum Vehicular Volume	No
Condition B: Interruption of Continuous Traffic	No
Condition C: Combination: 80% of A and B	Yes
Warrant 2: Four-Hour Volume	Yes
Warrant 3: Peak Hour Volume	No
Warrant 4: Pedestrian Volume	N/A
Criterion A: Four-Hour	
Criterion B: Peak-Hour	
Warrant 5: School Crossing	N/A
Warrant 6: Coordinated Signal System	N/A
Warrant 7: Crash Experience	N/A
Warrant 8: Roadway Network	N/A
Warrant 9: Intersection Near a Grade Crossing	N/A

Warrant Analysis Conducted By:

Name: Mary Hamann, P.E.

Agency: City of Louisville

Date: 12/21/2023

Warrant 1: Eight - Hour Vehicular Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To:

Condition A : Min. Veh. Volume		
Volume Level	70%	56%
Major Rd. Req	420	336
Minor Rd. Req	105	84
Number of Hours	6	9

Satisfied? No

Condition B: Interruption of Continuous Traffic		
Volume Level	70%	56%
Major Rd. Req	630	504
Minor Rd. Req	53	42
Number of Hours	5	11

Satisfied? No

Condition C: Combination of A & B at 56%		
---	--	--

Satisfied? Yes

Time Period	6:00 AM		Enter Start Time (Military Time) (HH:MM)		Total
	From	To	Major Road: Both App. (VPH)	Minor Road: High App. (VPH)	
1	6:00	7:00	225	45	270
2	7:00	8:00	443	88	531
3	8:00	9:00	650	138	788
4	9:00	10:00	578	127	705
5	10:00	11:00	511	73	584
6	11:00	12:00	580	98	678
7	12:00	13:00	662	87	749
8	13:00	14:00	562	106	668
9	14:00	15:00	577	84	661
10	15:00	16:00	655	124	779
11	16:00	17:00	830	105	935
12	17:00	18:00	799	106	905
13	18:00	19:00	535	75	610
14	19:00	20:00	355	39	394
15	20:00	21:00	235	30	265
16	21:00	22:00	144	26	170

Warrant 2: Four-Hour Volume

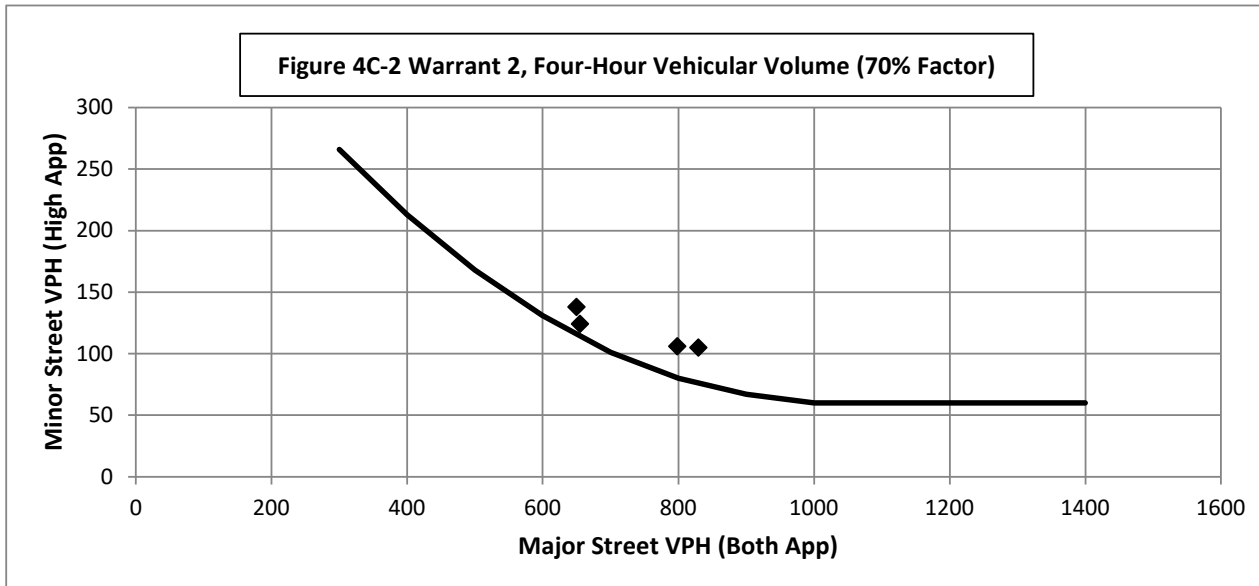
70%

Warrant Evaluated? Yes

Warrant Satisfied? Yes

Manually Set To:

Hour Start	16:00	17:00	8:00	15:00
Major Road Vol.	829.5	798.5	650	654.88
Minor Road Vol.	105	106	138	124.08



Warrant 3: Peak Hour Volume

70%

Warrant Evaluated? Yes

Warrant Satisfied? No

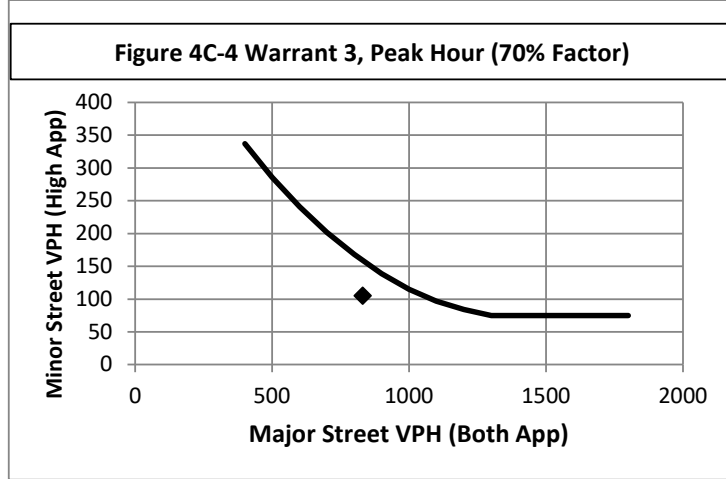
Manually Set To:

Condition justifying use of warrant:

Criteria		Met?
Delay on Minor Approach	4	No
Volume on Minor Approach	100	Yes
Total Entering Volume (veh/h)	800	

Manually Set Peak Hour? No

Peak Hour	Major Road Vol. (Both App.)	Minor Road Vol. (High App.)
16:00	829.5	105



Warrant 4: Pedestrian Volume

70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

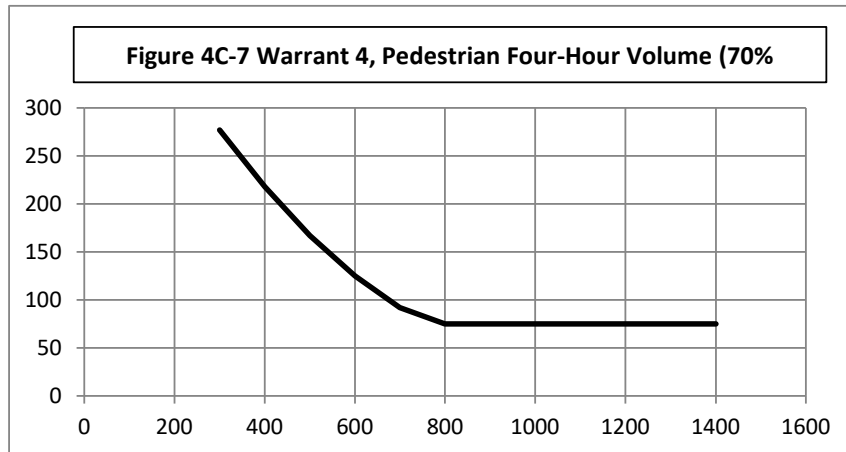
Criterion A: Four Hour

Hour (Start)	Pedestrian Volume	Major Road Vol.
		0
		0
		0
		0

Manually Set Major Rd Vol?

Avg. walk speed less than 3.5 ft/s?

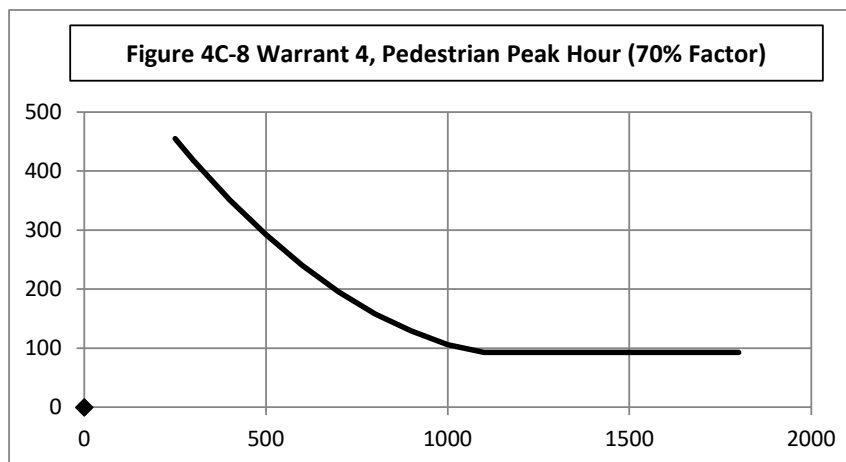
Criterion A Satisfied?



Criterion B: Peak Hour

Peak Hour	Pedestrian Vol.	Major Road Vol.
0:00	0	0

Criterion B Satisfied?



Warrant 5: School Crossing

70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Fulfilled?
1	There are a MINIMUM of 20 school children during the highest crossing hour.	
2	There are fewer adequate gaps in the major road traffic stream during the period when the school children are using the crossing than the number of minutes in the same period.	
3	The nearest traffic signal along the major road is located more than 300 ft away. Or, the nearest traffic signal is within 300 ft but the proposed traffic signal will not restrict the progressive movement of traffic.	

Warrant 6: Coordinated Signal System

70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Fulfilled?
1	Signal spacing > 1000 ft	
2	On a one-way road or a road that has traffic predominantly in one direction, the adjacent signals are so far apart that they do not provide the necessary degree of vehicle platooning.	
3	On a two-way road, adjacent signals do not provide the necessary degree of platooning and the proposed and the adjacent signals will collectively provide a progressive operation.	

Warrant 7: Crash Experience

70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Met?	Fulfilled?												
1	Adequate trial of other remedial measures has failed to reduce crash frequency.														
	Measures Tried:														
2	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 20%;"># Crashes in 1 yr:</th> <th style="width: 20%;">Angle & Ped</th> <th style="width: 20%;">Fatal/Injury Angle & Ped</th> <th style="width: 20%;"># Crashes in 3 yrs:</th> <th style="width: 20%;">Angle & Ped</th> <th style="width: 20%;">Fatal/Injury Angle & Ped</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> </tr> </table>	# Crashes in 1 yr:	Angle & Ped	Fatal/Injury Angle & Ped	# Crashes in 3 yrs:	Angle & Ped	Fatal/Injury Angle & Ped								No
# Crashes in 1 yr:	Angle & Ped	Fatal/Injury Angle & Ped	# Crashes in 3 yrs:	Angle & Ped	Fatal/Injury Angle & Ped										
3	Warrant 1, Condition A (80%)	Yes													
	Warrant 1, Condition B (80%)	Yes													
	Warrant 4, Criterion A (80%)	No													
	Warrant 4, Criterion B (80%)	No													

Warrant 8: Roadway Network

70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

Criteria		Met?	Fulfilled?								
1	Total entering volume of at least 1,000 veh/h during typical weekday peak hour	934.5	No								
	Five-year projected volumes that satisfy one or more of Warrants 1, 2, or 3.		No								
2	Total entering vol. of at least 1,000 veh/h for each of any 5 hrs of non-normal business day (Sat. or Sun.)										
	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <th style="width: 15%;">Hour</th> <th style="width: 15%;">Volume</th> <th style="width: 15%;">Met?</th> <th style="width: 15%;">Fulfilled?</th> </tr> <tr> <td></td> <td></td> <td></td> <td></td> </tr> </table>	Hour	Volume	Met?	Fulfilled?						
Hour	Volume	Met?	Fulfilled?								

Characteristics of Major Routes - Select yes if all intersecting routes have characteristic		Fulfilled?
1	Part of the road or highway system that serves as the principal roadway network for through traffic flow	
2	Rural or suburban highway outside of, entering, or traversing a city	
3	Appears as a major route on an official plan	

Warrant 9: Intersection Near a Grade Crossing

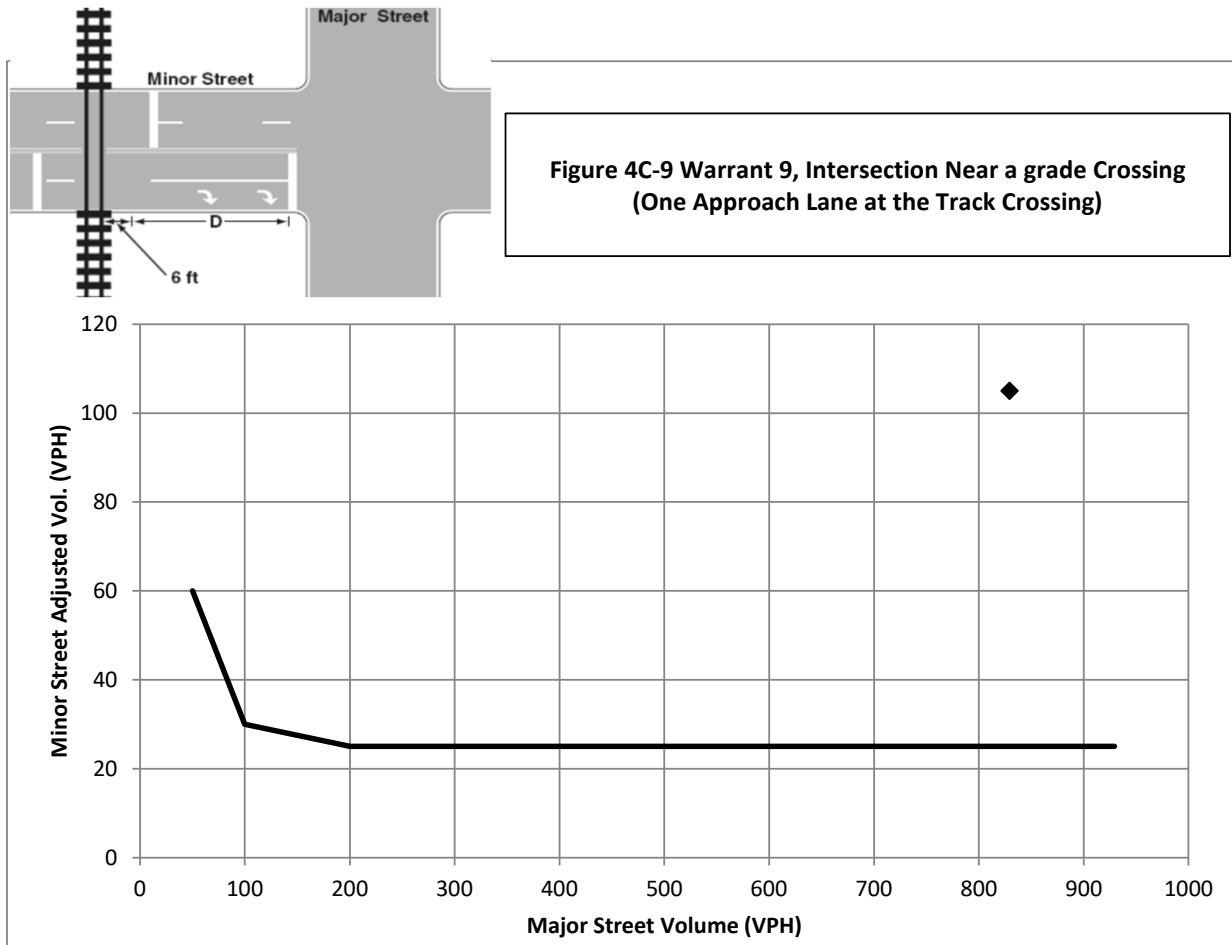
70%

Warrant Evaluated? No

Warrant Satisfied? N/A

Manually Set To:

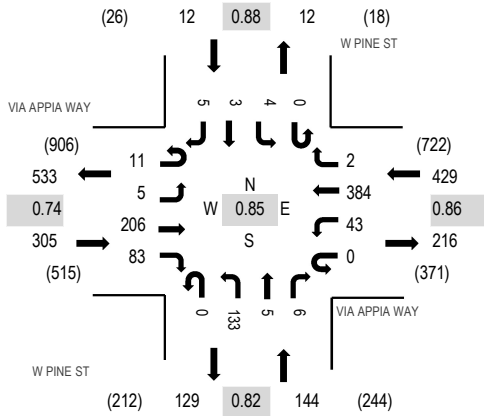
Adjustment Factors			Manually Set Peak Hour?				
Rail Traffic per Day	% High Occupancy Buses on Minor Road	% Tractor-Trailer Trucks on Minor Road	D	Peak Hour	Major Road Vol.	Minor Road Vol.	Adjusted Minor Vol.
				16:00	829.5	105	105



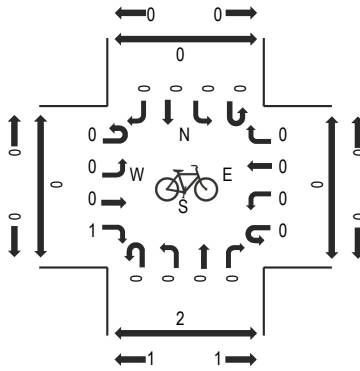
Conclusions/Comments:

Updated: 12/21/2023

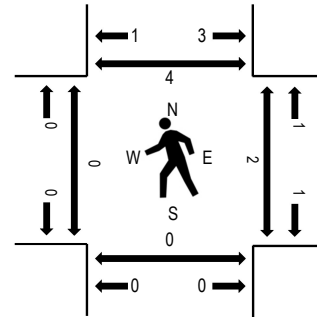
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W PINE ST Northbound				W PINE ST Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	2	0	24	11	0	3	53	0	0	10	0	4	0	0	1	2	110	617	0	1	0	3
7:15 AM	0	0	41	18	0	3	62	0	0	19	0	2	0	0	2	1	148	692	1	0	1	0
7:30 AM	2	2	33	14	0	5	76	0	0	34	1	2	0	1	1	2	173	743	0	1	2	1
7:45 AM	1	2	43	17	0	7	83	1	0	24	0	4	0	1	1	2	186	831	0	0	0	0
8:00 AM	2	0	37	10	0	15	88	0	0	29	1	1	0	0	0	2	185	890	0	0	0	0
8:15 AM	2	0	42	19	0	4	98	0	0	30	0	0	0	1	1	2	199		0	2	0	1
8:30 AM	3	3	62	22	0	17	106	2	0	40	2	2	0	2	0	0	261		0	0	0	1
8:45 AM	4	2	65	32	0	7	92	0	0	34	2	3	0	1	2	1	245		0	0	0	2
Count Total	16	9	347	143	0	61	658	3	0	220	6	18	0	6	8	12	1,507		1	4	3	8
Peak Hour	11	5	206	83	0	43	384	2	0	133	5	6	0	4	3	5	890		0	2	0	4

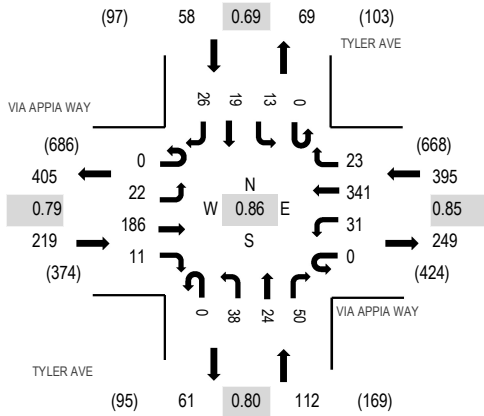
Location: 2 TYLER AVE & VIA APPIA WAY AM

Date: Wednesday, December 6, 2023

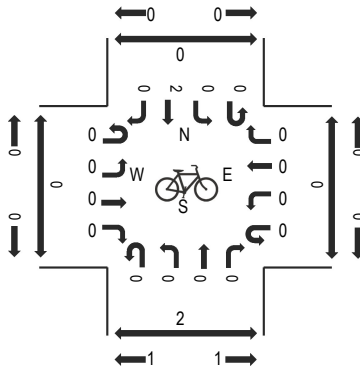
Peak Hour: 08:00 AM - 09:00 AM

Peak 15-Minutes: 08:30 AM - 08:45 AM

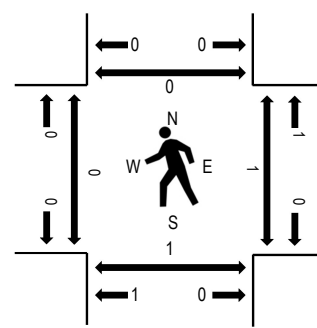
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians

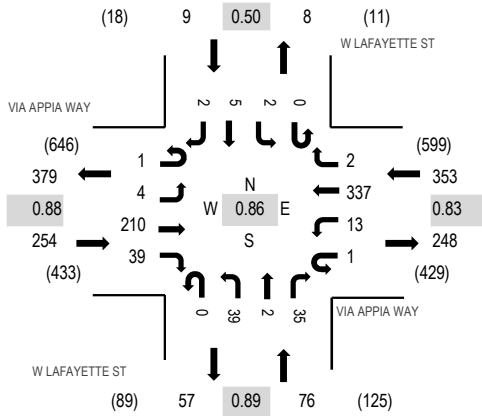


Note: Total study counts contained in parentheses.

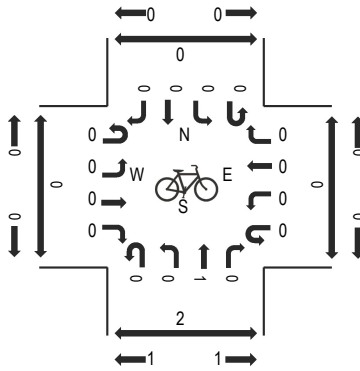
Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				TYLER AVE Northbound				TYLER AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	1	29	0	0	2	46	2	0	2	2	8	0	2	2	4	100	524	0	0	0	1
7:15 AM	0	3	34	3	0	5	51	3	0	5	2	6	0	1	2	5	120	580	0	0	1	0
7:30 AM	0	5	32	2	0	0	69	1	0	5	6	6	0	4	3	2	135	643	1	0	0	0
7:45 AM	0	3	42	1	0	7	83	4	1	4	2	8	0	3	6	5	169	736	0	0	0	0
8:00 AM	0	2	36	1	0	0	80	10	0	7	5	6	0	2	5	2	156	784	0	0	0	0
8:15 AM	0	3	43	1	0	7	81	3	0	11	5	19	0	2	1	7	183		0	0	0	0
8:30 AM	0	8	54	2	0	12	99	5	0	11	9	10	0	4	6	8	228		0	1	1	0
8:45 AM	0	9	53	7	0	12	81	5	0	9	5	15	0	5	7	9	217		0	0	0	0
Count Total	0	34	323	17	0	45	590	33	1	54	36	78	0	23	32	42	1,308		1	1	2	1
Peak Hour	0	22	186	11	0	31	341	23	0	38	24	50	0	13	19	26	784		0	1	1	0

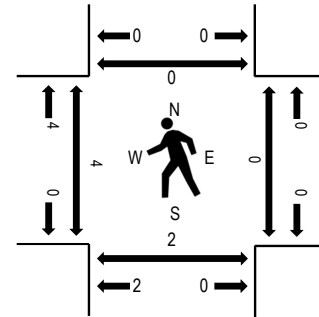
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W LAFAYETTE ST Northbound				W LAFAYETTE ST Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
7:00 AM	0	1	32	4	0	2	41	1	0	7	0	1	0	0	1	1	91	483	0	0	0	0
7:15 AM	0	0	42	3	0	1	50	0	0	3	0	4	0	2	0	0	105	538	0	0	0	0
7:30 AM	0	0	36	8	0	1	68	1	0	6	0	6	0	0	0	0	126	599	0	0	0	0
7:45 AM	0	0	44	9	1	2	78	0	0	11	0	11	0	2	1	2	161	651	0	0	0	0
8:00 AM	0	0	38	8	0	5	76	0	0	8	0	11	0	0	0	0	146	692	2	0	0	0
8:15 AM	0	2	54	11	0	3	75	1	0	9	0	7	0	1	3	0	166		0	0	1	0
8:30 AM	0	0	57	12	1	1	84	1	0	11	2	8	0	0	1	0	178		0	0	1	0
8:45 AM	1	2	61	8	0	4	102	0	0	11	0	9	0	1	1	2	202		2	0	0	0
Count Total	1	5	364	63	2	19	574	4	0	66	2	57	0	6	7	5	1,175		4	0	2	0
Peak Hour	1	4	210	39	1	13	337	2	0	39	2	35	0	2	5	2	692		4	0	2	0

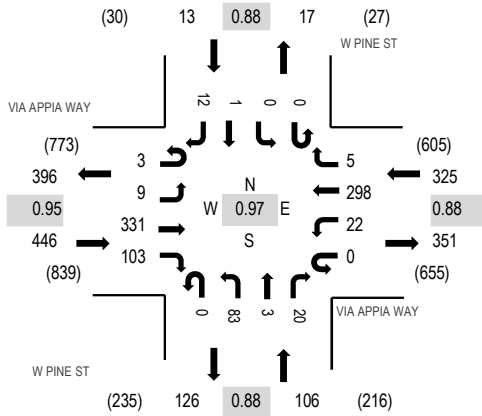
Location: 1 W PINE ST & VIA APPIA WAY Noon

Date: Wednesday, December 6, 2023

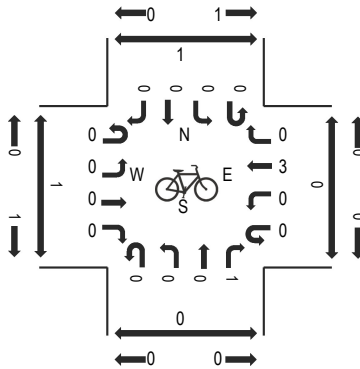
Peak Hour: 11:45 AM - 12:45 PM

Peak 15-Minutes: 12:00 PM - 12:15 PM

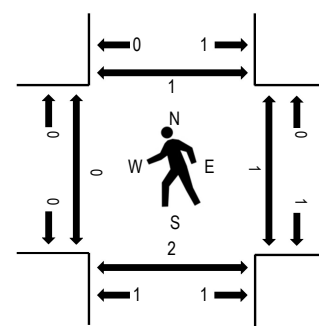
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians

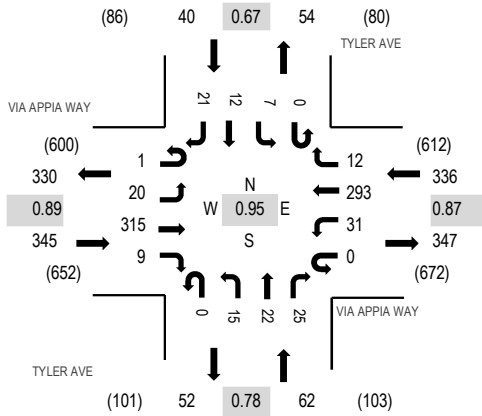


Note: Total study counts contained in parentheses.

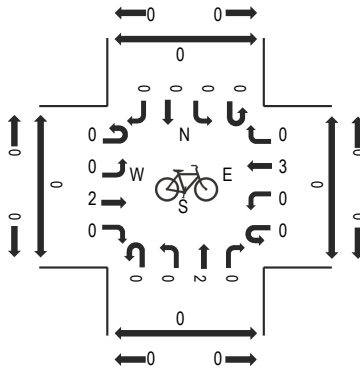
Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W PINE ST Northbound				W PINE ST Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
11:00 AM	1	2	67	16	0	1	61	1	0	11	2	4	0	2	0	2	170	808	0	0	3	1
11:15 AM	0	0	70	30	0	4	68	2	0	25	0	3	0	0	0	3	205	868	0	0	0	1
11:30 AM	2	2	74	26	0	7	65	0	0	32	0	2	0	1	0	5	216	877	0	0	0	0
11:45 AM	1	4	84	25	0	5	60	0	0	27	1	4	0	0	1	5	217	890	0	0	0	0
12:00 PM	0	1	82	21	0	9	85	0	0	19	2	5	0	0	0	6	230	882	0	1	1	0
12:15 PM	2	2	72	35	0	2	83	1	0	12	0	4	0	0	0	1	214		0	0	0	1
12:30 PM	0	2	93	22	0	6	70	4	0	25	0	7	0	0	0	0	229		0	0	1	0
12:45 PM	0	1	78	24	0	1	70	0	0	29	0	2	0	1	0	3	209		0	0	0	0
Count Total	6	14	620	199	0	35	562	8	0	180	5	31	0	4	1	25	1,690		0	1	5	3
Peak Hour	3	9	331	103	0	22	298	5	0	83	3	20	0	0	1	12	890		0	1	2	1

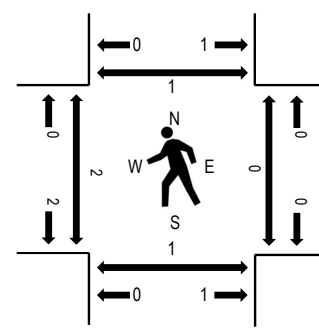
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound			TYLER AVE Northbound				TYLER AVE Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North
11:00 AM	0	2	66	4	0	6	58	1	0	1	2	6	0	7	1	4	158	670	0	0	1	1
11:15 AM	0	2	68	2	0	7	68	2	0	3	4	3	0	2	4	2	167	717	0	0	0	1
11:30 AM	0	3	71	2	0	5	60	2	0	5	1	6	0	6	5	6	172	741	0	1	1	0
11:45 AM	0	4	80	3	0	8	57	2	0	1	1	8	0	2	2	5	173	771	0	0	0	1
12:00 PM	0	7	75	3	0	7	88	2	0	4	8	7	0	1	0	3	205	783	0	0	1	0
12:15 PM	0	3	76	1	0	6	72	6	0	4	2	3	0	4	7	7	191		0	0	0	1
12:30 PM	1	3	92	3	0	9	69	2	0	3	4	7	0	1	1	7	202		2	0	0	0
12:45 PM	0	7	72	2	0	9	64	2	0	4	8	8	0	1	4	4	185		0	0	0	0
Count Total	1	31	600	20	0	57	536	19	0	25	30	48	0	24	24	38	1,453		2	1	3	4
Peak Hour	1	20	315	9	0	31	293	12	0	15	22	25	0	7	12	21	783		2	0	1	1

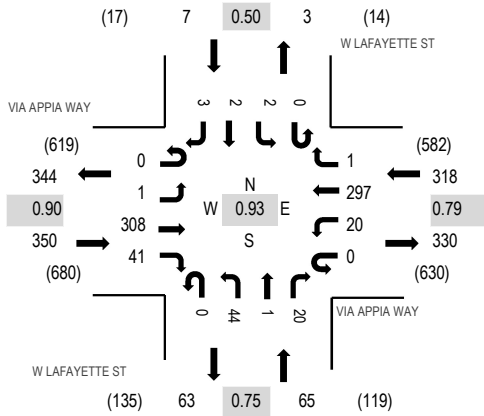
Location: 3 W LAFAYETTE ST & VIA APPIA WAY Noon

Date: Wednesday, December 6, 2023

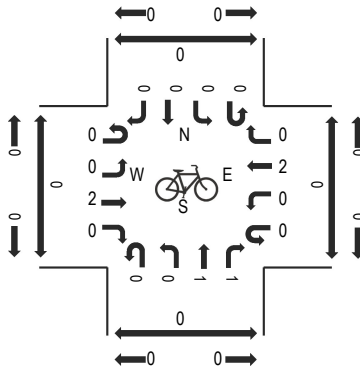
Peak Hour: 12:00 PM - 01:00 PM

Peak 15-Minutes: 12:00 PM - 12:15 PM

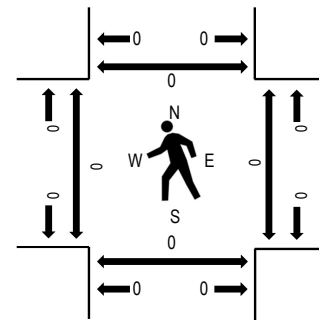
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians

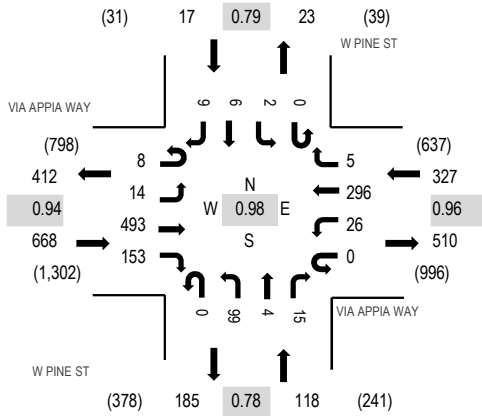


Note: Total study counts contained in parentheses.

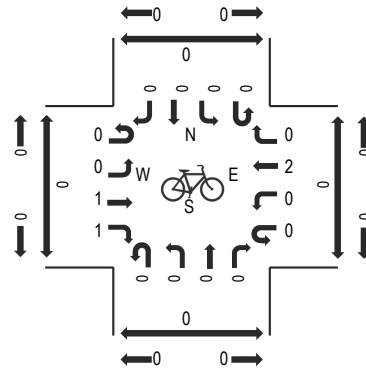
Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W LAFAYETTE ST Northbound				W LAFAYETTE ST Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
11:00 AM	0	2	61	13	0	5	56	1	0	9	2	7	0	3	0	0	159	658	0	0	0	0
11:15 AM	0	0	64	12	0	4	69	0	0	9	0	6	0	1	0	0	165	699	0	0	0	0
11:30 AM	0	2	73	15	0	8	56	0	0	5	0	4	0	1	2	2	168	710	1	0	0	0
11:45 AM	0	2	78	8	0	4	60	1	0	9	1	2	0	0	1	0	166	730	0	0	0	0
12:00 PM	0	0	72	9	0	5	96	0	0	9	1	6	0	1	0	1	200	740	0	0	0	0
12:15 PM	0	0	70	13	0	4	66	0	0	15	0	7	0	0	1	0	176		0	0	0	0
12:30 PM	0	0	85	12	0	7	66	1	0	14	0	2	0	0	0	1	188		0	0	0	0
12:45 PM	0	1	81	7	0	4	69	0	0	6	0	5	0	1	1	1	176		0	0	0	0
Count Total	0	7	584	89	0	41	538	3	0	76	4	39	0	7	5	5	1,398		1	0	0	0
Peak Hour	0	1	308	41	0	20	297	1	0	44	1	20	0	2	2	3	740		0	0	0	0

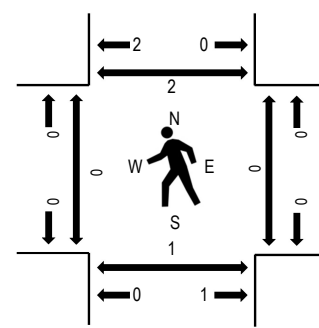
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W PINE ST Northbound			W PINE ST Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North
4:00 PM	1	0	143	28	0	13	63	2	0	33	2	5	0	0	1	3	294	1,115	0	2	1	2
4:15 PM	2	3	120	41	0	5	68	1	0	20	0	6	0	0	0	2	268	1,110	0	0	0	0
4:30 PM	3	3	95	46	0	12	77	0	0	26	1	4	0	1	2	2	272	1,118	0	1	2	1
4:45 PM	2	1	134	30	0	6	75	4	0	21	2	4	0	1	1	0	281	1,130	0	0	1	1
5:00 PM	2	3	121	40	0	9	75	0	0	28	0	5	0	0	2	4	289	1,096	0	0	0	1
5:15 PM	1	3	116	37	0	6	76	0	0	24	2	5	0	1	3	2	276		0	0	0	0
5:30 PM	3	7	122	46	0	5	70	1	0	26	0	1	0	0	0	3	284		0	0	0	0
5:45 PM	0	1	110	38	0	7	60	2	0	25	1	0	0	2	0	1	247		0	0	1	0
Count Total	14	21	961	306	0	63	564	10	0	203	8	30	0	5	9	17	2,211		0	3	5	5
Peak Hour	8	14	493	153	0	26	296	5	0	99	4	15	0	2	6	9	1,130		0	0	1	2

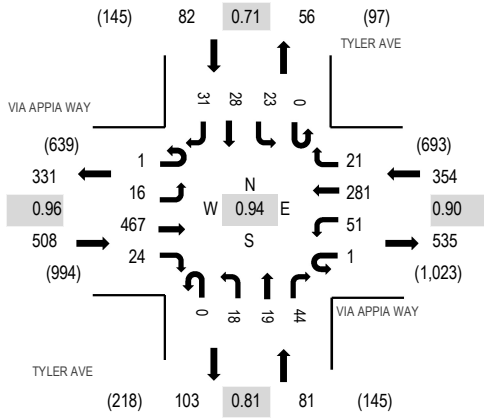
Location: 2 TYLER AVE & VIA APPIA WAY PM

Date: Wednesday, December 6, 2023

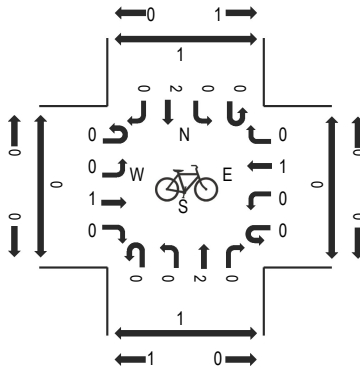
Peak Hour: 04:00 PM - 05:00 PM

Peak 15-Minutes: 04:45 PM - 05:00 PM

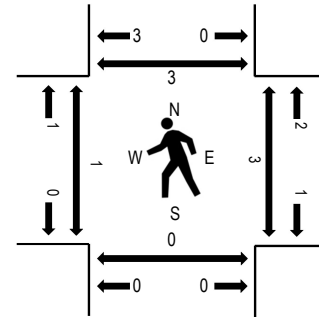
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians

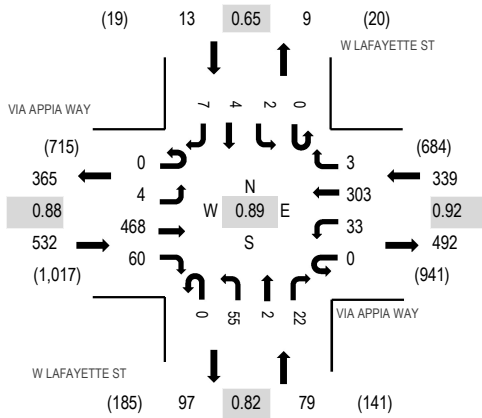


Note: Total study counts contained in parentheses.

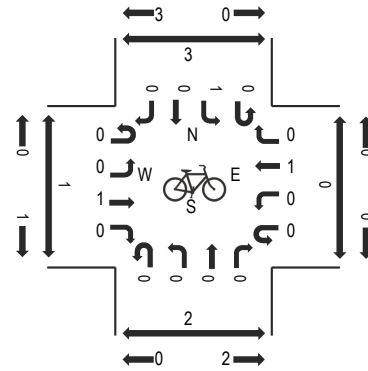
Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				TYLER AVE Northbound				TYLER AVE Southbound				Total	Rolling Hour	Pedestrian Crossings			
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right			West	East	South	North
4:00 PM	0	5	135	9	0	12	56	2	0	8	4	10	0	8	9	12	270	1,025	0	3	0	2
4:15 PM	1	3	110	7	0	13	63	5	0	3	4	9	0	6	7	8	239	1,007	0	0	0	0
4:30 PM	0	1	99	5	0	9	85	9	0	3	7	8	0	3	7	6	242	1,009	0	0	0	0
4:45 PM	0	7	123	3	1	17	77	5	0	4	4	17	0	6	5	5	274	1,003	1	0	0	1
5:00 PM	0	4	120	5	0	13	70	4	0	4	2	10	0	5	8	7	252	952	0	0	0	1
5:15 PM	0	5	106	12	0	15	67	0	0	5	5	9	0	5	5	7	241		0	0	0	1
5:30 PM	0	4	111	9	1	18	67	2	0	6	2	7	0	3	4	2	236		0	0	0	0
5:45 PM	0	7	96	7	0	15	63	4	0	2	2	10	0	5	4	8	223		1	0	0	0
Count Total	1	36	900	57	2	112	548	31	0	35	30	80	0	41	49	55	1,977		2	3	0	5
Peak Hour	1	16	467	24	1	51	281	21	0	18	19	44	0	23	28	31	1,025		1	3	0	3

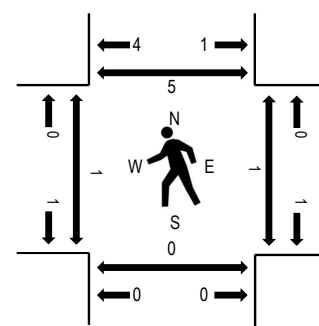
Peak Hour - Motorized Vehicles



Peak Hour - Bicycles



Peak Hour - Pedestrians



Note: Total study counts contained in parentheses.

Traffic Counts - Motorized Vehicles

Interval Start Time	VIA APPIA WAY Eastbound				VIA APPIA WAY Westbound				W LAFAYETTE ST Northbound			W LAFAYETTE ST Southbound				Total	Rolling Hour	Pedestrian Crossings				
	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru	Right	U-Turn	Left	Thru			Right	West	East	South	North
4:00 PM	0	1	135	15	0	8	57	1	0	12	0	4	0	0	1	1	235	963	0	0	0	0
4:15 PM	0	2	111	11	0	8	73	1	0	11	1	8	0	0	2	1	229	963	1	1	0	3
4:30 PM	0	0	94	11	0	7	91	1	0	13	1	5	0	1	1	3	228	950	0	0	0	2
4:45 PM	0	1	128	23	0	10	82	0	0	19	0	5	0	1	0	2	271	952	0	0	0	0
5:00 PM	0	0	116	13	0	8	82	2	0	7	0	7	0	0	0	0	235	898	0	0	0	0
5:15 PM	0	0	112	7	0	4	73	3	0	11	1	3	0	0	0	2	216		0	0	0	0
5:30 PM	0	2	110	13	0	8	80	1	0	11	0	3	0	0	2	0	230		0	0	0	0
5:45 PM	0	1	89	22	0	11	72	1	0	10	0	9	0	0	0	2	217		0	0	0	0
Count Total	0	7	895	115	0	64	610	10	0	94	3	44	0	2	6	11	1,861		1	1	0	5
Peak Hour	0	4	468	60	0	33	303	3	0	55	2	22	0	2	4	7	963		1	1	0	5

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:40	4:40	4:40	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20	20	20	20
Time Recorded (min)	15	15	15	15	15	15	15
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	803	833	801	779	804	816	850
Vehs Exited	803	806	771	732	750	800	829
Starting Vehs	121	95	94	80	66	118	120
Ending Vehs	121	122	124	127	120	134	141
Denied Entry Before	0	0	1	0	1	0	3
Denied Entry After	0	0	2	1	1	1	2
Travel Distance (mi)	739	693	687	672	659	721	746
Travel Time (hr)	32.5	30.2	30.6	29.2	28.5	31.6	32.5
Total Delay (hr)	7.5	6.7	7.6	6.6	6.5	7.3	7.3
Total Stops	589	575	538	535	534	571	601
Fuel Used (gal)	21.0	19.7	19.7	19.0	18.8	20.8	21.6

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20
Time Recorded (min)	15	15	15	15
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	810	733	805	800
Vehs Exited	792	739	801	781
Starting Vehs	88	106	113	95
Ending Vehs	106	100	117	119
Denied Entry Before	1	1	1	1
Denied Entry After	1	0	2	1
Travel Distance (mi)	675	632	694	692
Travel Time (hr)	29.6	26.9	30.3	30.2
Total Delay (hr)	7.0	5.8	6.8	6.9
Total Stops	576	502	594	560
Fuel Used (gal)	19.3	18.1	19.7	19.8

Interval #0 Information Seeding

Start Time	4:40
End Time	4:45
Total Time (min)	5
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	2	3	4	5	6	7
Vehs Entered	803	833	801	779	804	816	850
Vehs Exited	803	806	771	732	750	800	829
Starting Vehs	121	95	94	80	66	118	120
Ending Vehs	121	122	124	127	120	134	141
Denied Entry Before	0	0	1	0	1	0	3
Denied Entry After	0	0	2	1	1	1	2
Travel Distance (mi)	739	693	687	672	659	721	746
Travel Time (hr)	32.5	30.2	30.6	29.2	28.5	31.6	32.5
Total Delay (hr)	7.5	6.7	7.6	6.6	6.5	7.3	7.3
Total Stops	589	575	538	535	534	571	601
Fuel Used (gal)	21.0	19.7	19.7	19.0	18.8	20.8	21.6

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	8	9	10	Avg
Vehs Entered	810	733	805	800
Vehs Exited	792	739	801	781
Starting Vehs	88	106	113	95
Ending Vehs	106	100	117	119
Denied Entry Before	1	1	1	1
Denied Entry After	1	0	2	1
Travel Distance (mi)	675	632	694	692
Travel Time (hr)	29.6	26.9	30.3	30.2
Total Delay (hr)	7.0	5.8	6.8	6.9
Total Stops	576	502	594	560
Fuel Used (gal)	19.3	18.1	19.7	19.8

1: Pine St & Via Appia Way Performance by movement

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	4.1		0.1
Total Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	3.1	3.0	1.7	2.7	6.5	1.2	1.0	15.6	36.6	9.0		11.7
Travel Dist (mi)	0.6	0.9	33.2	10.6	1.2	17.0	0.4	2.4	0.1	0.4	0.0	0.2
Travel Time (hr)	0.0	0.0	1.2	0.4	0.1	0.6	0.0	0.2	0.0	0.0	0.0	0.0
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

1: Pine St & Via Appia Way Performance by movement

Movement	SBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.3
Total Del/Veh (s)	5.0	3.2
Travel Dist (mi)	0.2	67.3
Travel Time (hr)	0.0	2.6
Denied Entry Before	0	0
Denied Entry After	0	0

Intersection: 1: Pine St & Via Appia Way

Movement	EB	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	UL	T	T	R	L	T	LT	R	LTR
Maximum Queue (ft)	36	3	12	12	38	3	94	44	33
Average Queue (ft)	8	0	2	2	13	0	47	14	15
95th Queue (ft)	33	6	17	16	39	5	89	46	41
Link Distance (ft)		1294	1294			1033	495		437
Upstream Blk Time (%)									
Queuing Penalty (veh)									
Storage Bay Dist (ft)	80			100	85			45	
Storage Blk Time (%)							10	0	
Queuing Penalty (veh)							2	0	

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:40	4:40	4:40	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20	20	20	20
Time Recorded (min)	15	15	15	15	15	15	15
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	800	839	802	829	795	821	821
Vehs Exited	795	825	779	812	760	803	792
Starting Vehs	120	114	100	104	92	116	101
Ending Vehs	125	128	123	121	127	134	130
Denied Entry Before	1	1	1	0	1	0	1
Denied Entry After	0	0	0	0	0	1	0
Travel Distance (mi)	697	730	717	662	678	694	696
Travel Time (hr)	30.6	32.2	31.8	28.9	29.4	30.8	30.7
Total Delay (hr)	7.2	7.6	7.8	6.9	6.7	7.5	7.3
Total Stops	841	904	850	782	774	840	818
Fuel Used (gal)	20.1	21.1	21.2	19.2	19.1	20.7	20.2

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20
Time Recorded (min)	15	15	15	15
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	773	785	833	810
Vehs Exited	771	781	807	789
Starting Vehs	112	108	106	103
Ending Vehs	114	112	132	121
Denied Entry Before	1	0	1	0
Denied Entry After	0	0	0	0
Travel Distance (mi)	667	664	722	693
Travel Time (hr)	29.6	29.3	32.1	30.6
Total Delay (hr)	7.2	7.2	7.9	7.3
Total Stops	773	810	862	825
Fuel Used (gal)	20.2	19.4	21.4	20.3

Interval #0 Information Seeding

Start Time	4:40
End Time	4:45
Total Time (min)	5
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	2	3	4	5	6	7
Vehs Entered	800	839	802	829	795	821	821
Vehs Exited	795	825	779	812	760	803	792
Starting Vehs	120	114	100	104	92	116	101
Ending Vehs	125	128	123	121	127	134	130
Denied Entry Before	1	1	1	0	1	0	1
Denied Entry After	0	0	0	0	0	1	0
Travel Distance (mi)	697	730	717	662	678	694	696
Travel Time (hr)	30.6	32.2	31.8	28.9	29.4	30.8	30.7
Total Delay (hr)	7.2	7.6	7.8	6.9	6.7	7.5	7.3
Total Stops	841	904	850	782	774	840	818
Fuel Used (gal)	20.1	21.1	21.2	19.2	19.1	20.7	20.2

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	8	9	10	Avg
Vehs Entered	773	785	833	810
Vehs Exited	771	781	807	789
Starting Vehs	112	108	106	103
Ending Vehs	114	112	132	121
Denied Entry Before	1	0	1	0
Denied Entry After	0	0	0	0
Travel Distance (mi)	667	664	722	693
Travel Time (hr)	29.6	29.3	32.1	30.6
Total Delay (hr)	7.2	7.2	7.9	7.3
Total Stops	773	810	862	825
Fuel Used (gal)	20.2	19.4	21.4	20.3

1: Pine St & Via Appia Way Performance by movement

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	4.3		0.1
Total Delay (hr)	0.0	0.0	0.3	0.1	0.0	0.2	0.0	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	2.9	5.2	8.7	6.0	7.0	8.5	4.7	6.6	4.8	3.9		7.1
Travel Dist (mi)	0.3	1.0	32.8	9.4	1.5	16.9	0.3	2.6	0.1	0.4	0.0	0.2
Travel Time (hr)	0.0	0.0	1.4	0.4	0.1	0.8	0.0	0.2	0.0	0.0	0.0	0.0
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

1: Pine St & Via Appia Way Performance by movement

Movement	SBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.7
Total Del/Veh (s)	3.2	7.9
Travel Dist (mi)	0.2	65.7
Travel Time (hr)	0.0	3.0
Denied Entry Before	0	0
Denied Entry After	0	0

Intersection: 1: Pine St & Via Appia Way

Movement	EB	EB	EB	EB	WB	WB	WB	NB	NB	SB
Directions Served	UL	T	T	R	L	T	TR	LT	R	LTR
Maximum Queue (ft)	32	73	88	63	41	74	78	61	32	32
Average Queue (ft)	16	53	62	43	19	43	49	36	12	16
95th Queue (ft)	42	79	86	68	46	75	79	63	36	41
Link Distance (ft)		1294	1294			1033	1033	495		437
Upstream Blk Time (%)										
Queuing Penalty (veh)										
Storage Bay Dist (ft)	80			100	85				45	
Storage Blk Time (%)		0	0			0		3	0	
Queuing Penalty (veh)		0	0			0		0	0	

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:40	4:40	4:40	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20	20	20	20
Time Recorded (min)	15	15	15	15	15	15	15
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	776	902	799	784	811	796	840
Vehs Exited	771	866	776	750	775	785	810
Starting Vehs	104	109	97	97	90	97	100
Ending Vehs	109	145	120	131	126	108	130
Denied Entry Before	1	2	3	0	1	1	1
Denied Entry After	1	1	0	0	0	0	0
Travel Distance (mi)	687	791	676	652	675	646	727
Travel Time (hr)	30.3	36.8	30.1	29.1	30.7	27.8	33.6
Total Delay (hr)	7.1	10.3	7.5	7.3	8.0	6.1	9.3
Total Stops	561	742	631	580	623	519	679
Fuel Used (gal)	19.6	22.6	19.7	19.0	19.5	18.3	21.2

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20
Time Recorded (min)	15	15	15	15
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	806	806	829	813
Vehs Exited	771	779	823	788
Starting Vehs	102	99	132	100
Ending Vehs	137	126	138	126
Denied Entry Before	0	0	0	1
Denied Entry After	0	0	0	0
Travel Distance (mi)	711	710	745	702
Travel Time (hr)	32.7	31.9	33.7	31.7
Total Delay (hr)	8.8	8.2	8.8	8.2
Total Stops	689	619	704	631
Fuel Used (gal)	20.5	20.5	21.6	20.2

Interval #0 Information Seeding

Start Time	4:40
End Time	4:45
Total Time (min)	5
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	2	3	4	5	6	7
Vehs Entered	776	902	799	784	811	796	840
Vehs Exited	771	866	776	750	775	785	810
Starting Vehs	104	109	97	97	90	97	100
Ending Vehs	109	145	120	131	126	108	130
Denied Entry Before	1	2	3	0	1	1	1
Denied Entry After	1	1	0	0	0	0	0
Travel Distance (mi)	687	791	676	652	675	646	727
Travel Time (hr)	30.3	36.8	30.1	29.1	30.7	27.8	33.6
Total Delay (hr)	7.1	10.3	7.5	7.3	8.0	6.1	9.3
Total Stops	561	742	631	580	623	519	679
Fuel Used (gal)	19.6	22.6	19.7	19.0	19.5	18.3	21.2

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	8	9	10	Avg
Vehs Entered	806	806	829	813
Vehs Exited	771	779	823	788
Starting Vehs	102	99	132	100
Ending Vehs	137	126	138	126
Denied Entry Before	0	0	0	1
Denied Entry After	0	0	0	0
Travel Distance (mi)	711	710	745	702
Travel Time (hr)	32.7	31.9	33.7	31.7
Total Delay (hr)	8.8	8.2	8.8	8.2
Total Stops	689	619	704	631
Fuel Used (gal)	20.5	20.5	21.6	20.2

1: Pine St & Via Appia Way Performance by movement

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.5	3.9		0.1
Total Delay (hr)	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0
Total Del/Veh (s)	4.5	4.9	2.9	2.8	7.9	1.8	1.4	15.7	17.0	5.4		13.5
Travel Dist (mi)	0.7	1.0	33.3	10.1	1.5	17.5	0.2	2.5	0.1	0.5	0.0	0.2
Travel Time (hr)	0.0	0.0	1.2	0.4	0.1	0.6	0.0	0.2	0.0	0.0	0.0	0.0
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

1: Pine St & Via Appia Way Performance by movement

Movement	SBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	0.3
Total Del/Veh (s)	5.6	4.0
Travel Dist (mi)	0.2	67.7
Travel Time (hr)	0.0	2.7
Denied Entry Before	0	0
Denied Entry After	0	0

Queuing and Blocking Report
Baseline

02/13/2024

Intersection: 1: Pine St & Via Appia Way

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	UL	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	30	15	4	43	3	79	46	34
Average Queue (ft)	6	2	1	15	0	45	15	15
95th Queue (ft)	28	25	8	44	5	79	47	41
Link Distance (ft)		1294			1035	507		449
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	80		100	85			45	
Storage Blk Time (%)		0				10	0	
Queuing Penalty (veh)		0				2	0	

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:40	4:40	4:40	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20	20	20	20
Time Recorded (min)	15	15	15	15	15	15	15
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	826	838	838	817	826	831	876
Vehs Exited	801	794	792	799	778	804	829
Starting Vehs	109	103	101	113	86	104	98
Ending Vehs	134	147	147	131	134	131	145
Denied Entry Before	0	1	2	1	1	1	1
Denied Entry After	1	2	1	0	0	2	1
Travel Distance (mi)	732	741	728	728	664	688	735
Travel Time (hr)	33.9	33.9	34.2	33.3	29.8	32.0	33.8
Total Delay (hr)	9.3	9.0	9.9	8.8	7.8	8.8	9.3
Total Stops	963	933	957	897	819	860	951
Fuel Used (gal)	21.4	21.4	21.1	21.3	19.1	20.8	21.5

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20
Time Recorded (min)	15	15	15	15
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	867	840	802	834
Vehs Exited	831	824	777	800
Starting Vehs	111	113	109	103
Ending Vehs	147	129	134	134
Denied Entry Before	2	0	1	1
Denied Entry After	1	3	1	1
Travel Distance (mi)	732	743	680	717
Travel Time (hr)	35.1	34.7	32.7	33.3
Total Delay (hr)	10.6	9.8	9.9	9.3
Total Stops	988	937	878	915
Fuel Used (gal)	21.9	22.0	20.4	21.1

Interval #0 Information Seeding

Start Time	4:40
End Time	4:45
Total Time (min)	5
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	2	3	4	5	6	7
Vehs Entered	826	838	838	817	826	831	876
Vehs Exited	801	794	792	799	778	804	829
Starting Vehs	109	103	101	113	86	104	98
Ending Vehs	134	147	147	131	134	131	145
Denied Entry Before	0	1	2	1	1	1	1
Denied Entry After	1	2	1	0	0	2	1
Travel Distance (mi)	732	741	728	728	664	688	735
Travel Time (hr)	33.9	33.9	34.2	33.3	29.8	32.0	33.8
Total Delay (hr)	9.3	9.0	9.9	8.8	7.8	8.8	9.3
Total Stops	963	933	957	897	819	860	951
Fuel Used (gal)	21.4	21.4	21.1	21.3	19.1	20.8	21.5

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	8	9	10	Avg
Vehs Entered	867	840	802	834
Vehs Exited	831	824	777	800
Starting Vehs	111	113	109	103
Ending Vehs	147	129	134	134
Denied Entry Before	2	0	1	1
Denied Entry After	1	3	1	1
Travel Distance (mi)	732	743	680	717
Travel Time (hr)	35.1	34.7	32.7	33.3
Total Delay (hr)	10.6	9.8	9.9	9.3
Total Stops	988	937	878	915
Fuel Used (gal)	21.9	22.0	20.4	21.1

1: Pine St & Via Appia Way Performance by movement

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.6	3.4		0.1
Total Delay (hr)	0.0	0.0	0.6	0.1	0.0	0.3	0.0	0.2	0.0	0.0	0.0	0.0
Total Del/Veh (s)	7.2	8.8	14.8	7.8	9.1	12.9	12.1	21.6	20.6	40.7		10.1
Travel Dist (mi)	0.5	0.9	34.8	10.7	1.5	17.1	0.3	2.7	0.1	0.3	0.0	0.1
Travel Time (hr)	0.0	0.0	1.8	0.5	0.1	0.9	0.0	0.3	0.0	0.1	0.0	0.0
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

1: Pine St & Via Appia Way Performance by movement

Movement	SBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.1
Total Delay (hr)	0.0	1.3
Total Del/Veh (s)	4.1	14.0
Travel Dist (mi)	0.2	69.2
Travel Time (hr)	0.0	3.7
Denied Entry Before	0	0
Denied Entry After	0	0

Intersection: 1: Pine St & Via Appia Way

Movement	EB	EB	EB	WB	WB	NB	NB	SB
Directions Served	UL	T	R	L	TR	LT	R	LTR
Maximum Queue (ft)	36	164	93	50	169	108	25	31
Average Queue (ft)	17	115	46	21	91	53	11	13
95th Queue (ft)	43	176	99	62	163	144	34	37
Link Distance (ft)		1294			1035	507		449
Upstream Blk Time (%)								
Queuing Penalty (veh)								
Storage Bay Dist (ft)	80		100	85			45	
Storage Blk Time (%)		21	0		9	9	6	
Queuing Penalty (veh)		39	1		2	1	6	

Summary of All Intervals

Run Number	1	2	3	4	5	6	7
Start Time	4:40	4:40	4:40	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20	20	20	20
Time Recorded (min)	15	15	15	15	15	15	15
# of Intervals	2	2	2	2	2	2	2
# of Recorded Intervals	1	1	1	1	1	1	1
Vehs Entered	777	846	772	801	750	746	832
Vehs Exited	751	837	750	772	721	745	822
Starting Vehs	106	115	101	100	92	117	115
Ending Vehs	132	124	123	129	121	118	125
Denied Entry Before	0	1	0	0	1	0	1
Denied Entry After	1	0	0	0	0	1	1
Travel Distance (mi)	678	746	658	735	636	668	724
Travel Time (hr)	30.9	34.3	29.2	33.9	28.6	30.2	33.0
Total Delay (hr)	8.1	9.1	7.1	9.0	7.0	7.7	8.7
Total Stops	652	749	538	710	536	579	639
Fuel Used (gal)	19.8	21.7	19.1	21.4	18.5	19.9	21.4

Summary of All Intervals

Run Number	8	9	10	Avg
Start Time	4:40	4:40	4:40	4:40
End Time	5:00	5:00	5:00	5:00
Total Time (min)	20	20	20	20
Time Recorded (min)	15	15	15	15
# of Intervals	2	2	2	2
# of Recorded Intervals	1	1	1	1
Vehs Entered	867	766	807	794
Vehs Exited	838	756	800	778
Starting Vehs	106	109	98	105
Ending Vehs	135	119	105	119
Denied Entry Before	0	1	1	0
Denied Entry After	2	1	0	0
Travel Distance (mi)	786	691	696	702
Travel Time (hr)	36.5	31.2	31.6	31.9
Total Delay (hr)	10.0	7.9	8.2	8.3
Total Stops	737	636	624	637
Fuel Used (gal)	23.0	20.1	20.8	20.6

Interval #0 Information Seeding

Start Time	4:40
End Time	4:45
Total Time (min)	5
Volumes adjusted by Growth Factors.	
No data recorded this interval.	

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	1	2	3	4	5	6	7
Vehs Entered	777	846	772	801	750	746	832
Vehs Exited	751	837	750	772	721	745	822
Starting Vehs	106	115	101	100	92	117	115
Ending Vehs	132	124	123	129	121	118	125
Denied Entry Before	0	1	0	0	1	0	1
Denied Entry After	1	0	0	0	0	1	1
Travel Distance (mi)	678	746	658	735	636	668	724
Travel Time (hr)	30.9	34.3	29.2	33.9	28.6	30.2	33.0
Total Delay (hr)	8.1	9.1	7.1	9.0	7.0	7.7	8.7
Total Stops	652	749	538	710	536	579	639
Fuel Used (gal)	19.8	21.7	19.1	21.4	18.5	19.9	21.4

Interval #1 Information Recording

Start Time	4:45
End Time	5:00
Total Time (min)	15
Volumes adjusted by PHF, Growth Factors.	

Run Number	8	9	10	Avg
Vehs Entered	867	766	807	794
Vehs Exited	838	756	800	778
Starting Vehs	106	109	98	105
Ending Vehs	135	119	105	119
Denied Entry Before	0	1	1	0
Denied Entry After	2	1	0	0
Travel Distance (mi)	786	691	696	702
Travel Time (hr)	36.5	31.2	31.6	31.9
Total Delay (hr)	10.0	7.9	8.2	8.3
Total Stops	737	636	624	637
Fuel Used (gal)	23.0	20.1	20.8	20.6

1: Pine St & Via Appia Way Performance by movement

Movement	EBU	EBL	EBT	EBR	WBL	WBT	WBR	NBL	NBT	NBR	SBL	SBT
Denied Delay (hr)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Denied Del/Veh (s)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.2	0.2		0.1
Total Delay (hr)	0.0	0.0	0.3	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
Total Del/Veh (s)	9.8	7.3	7.9	6.9	6.4	7.0	5.1	4.5	5.4	4.3		3.4
Travel Dist (mi)	0.6	0.7	33.0	11.0	1.5	17.5	0.2	2.4	0.1	0.3	0.0	0.1
Travel Time (hr)	0.0	0.0	1.4	0.5	0.1	0.8	0.0	0.1	0.0	0.0	0.0	0.0
Denied Entry Before	0	0	0	0	0	0	0	0	0	0	0	0
Denied Entry After	0	0	0	0	0	0	0	0	0	0	0	0

1: Pine St & Via Appia Way Performance by movement

Movement	SBR	All
Denied Delay (hr)	0.0	0.0
Denied Del/Veh (s)	0.1	0.0
Total Delay (hr)	0.0	0.6
Total Del/Veh (s)	3.8	7.1
Travel Dist (mi)	0.2	67.6
Travel Time (hr)	0.0	2.9
Denied Entry Before	0	0
Denied Entry After	0	0

Intersection: 1: Pine St & Via Appia Way

Movement	EB	WB	NB	SB
Directions Served	ULTR	LTR	LTR	LTR
Maximum Queue (ft)	119	101	56	16
Average Queue (ft)	40	39	29	5
95th Queue (ft)	134	103	63	24
Link Distance (ft)	1275	1023	500	433
Upstream Blk Time (%)				
Queuing Penalty (veh)				
Storage Bay Dist (ft)				
Storage Blk Time (%)				
Queuing Penalty (veh)				