CHERRY HILLS VILLAGE

TRAFFIC STUDY

Prepared for:

Cherry Hills Village

Prepared by:

Felsburg Holt & Ullevig
6300 South Syracuse Way, Suite 600
Centennial, CO 80111
(303) 721-1440

Project Manager: Todd Frisbie, PE, PTOE

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TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF FIGURES

LIST OF TABLES

ES-1. EXECUTIVE SUMMARY

Existing traffic conditions along Cherry Hills Village roads and at intersections were evaluated in this study. The focus of this effort was to collect traffic speed data, volume data, and travel pattern data at key locations throughout the City. This section summarizes the major findings and recommendations developed based on this data.

A. Roadway Traffic Characteristics Study (Speed and Volume)

A speed study was conducted along Quincy Avenue, Colorado Boulevard, Mansfield Avenue, Dahlia Street, Holly Street, Clarkson Street and Franklin Street. At all locations, the 85th percentile speed was within traffic engineering practice limits except for northbound Colorado Boulevard and Franklin Street. These two streets showed the 85th percentile speed more than 5 miles per hour (mph) above the posted speed to suggest that speeding was an issue.

Based on speed and volume studies, the following traffic calming treatments such as speed monitoring displays, neighborhood traffic circles, and speed humps were reviewed for Colorado Boulevard and Franklin Street.

B. Intersection Operations Study

Based on an analysis of traffic operations at study intersections, the following describe intersections that experience operational issues and solutions to mitigate these issues.

University Boulevard/Quincy Avenue

Recommendation: Work with the Colorado Department of Transportation (CDOT) to ensure Quincy Avenue receives its appropriate share of green time.

Quincy Avenue/Happy Canyon Road

Recommendation: Change traffic control to a roundabout.

Quincy Avenue/Colorado Boulevard

Recommendation: Change traffic control to a traffic signal. Another option to consider is to realign the school access to intersect Quincy Avenue at this intersection and change the traffic control to a traffic signal.

C. *Origin/Destination Study*

Vehicle travel patterns through Cherry Hills Village were evaluated through license plate recognition technology to record how vehicles entered and exited the City at five strategic locations in the City: Quincy Avenue west of Happy Canyon Road, Quincy Avenue east of University Boulevard, Colorado Boulevard south of Hampden Avenue, Holly Street south of Quincy Avenue, and Dahlia Street north of Quincy Avenue. Major findings of this effort are described below:

- During the peak periods about 50 percent of vehicles entering the City could be considered a pass-through trip. In other words, 50 percent of traffic on Village Streets might be considered cut-through traffic.
- About 45 percent of the traffic on Colorado Avenue is cut-through traffic.
- In the PM peak period, nearly two-thirds of the vehicles on Quincy Avenue and on Holly Street are vehicles likely cutting through the City.

I. ROADWAY TRAFFIC CHARACTERISTICS

Existing traffic conditions within the City of Cherry Hills Village were evaluated through an extensive data collection effort. This effort included speed and volume data collection along seven key roadway links. These seven roadways include: Quincy Avenue, Colorado Boulevard, Mansfield Avenue, Dahlia Street, Holly Street, Clarkson Street, and Franklin Street.

A. Speed

Figure 1 compares speed data against posted speed limits for seven key Cherry Hills Village streets. The speed data represents the 85th percentile speed recorded on these streets. This means that approximately 85 percent of vehicles are traveling at or under this speed while the remaining 15 percent are traveling over this speed. Standard traffic engineering practice is to determine the 85th percentile speed when evaluating speed conditions along a roadway. As shown on **Figure 1**, the speed studies show that 85th percentile speeds exceed the posted speed limit by 1 to 9 mph.

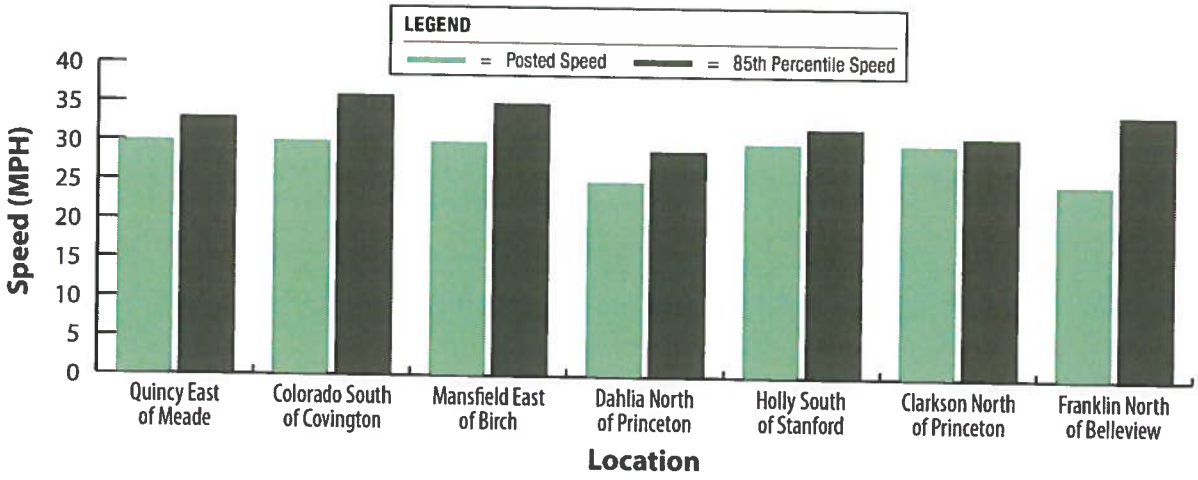

Figure 1. Posted Speed vs. 85th Percentile Speed

Table 1 provides more detail about the vehicle speed and volume characteristics of the studied streets. At most locations, the 85th percentile speed is about the same in each direction except at one location. On Colorado Avenue, the 85th percentile speed in the northbound direction exceeds the southbound speed by 4 mph.

Table 1. Traffic and Speed Characteristics of Studies Streets

Street and Location	85th Percentile Speed		Posted Speed Limit	Classification
Quincy - e/o Meade	EB	33	30	Minor Arterial / Collector
	WB	33		
Colorado - s/o Covington	NB	38	30	Minor Arterial / Collector
	SB	34		
Mansfield - e/o Birch	EB	35	30	Local
	WB	35		
Dahlia - n/o Princeton	NB	29	25	Local
	SB	28		
Holly - s/o Stanford	NB	31	30	Minor Arterial / Collector
	SB	33		
Clarkson - n/o Princeton	NB	31	30	Minor Arterial / Collector
	SB	31		
Franklin - n/o Belleview	NB	35	25	Local
	SB	33		
	Highlighted cells are locations where the 85th percentile speed exceeds the posted speed by more than 5 mph.			

The common practice when defining whether a street has a speeding issue is to consider more than just whether the 85th percentile speed exceeds the posted speed limit. Many jurisdictions have established minimum threshold criteria before they will consider measures to implement traffic calming on a street. Common criteria that are applicable to Cherry Hills Village streets could be:

- Road must be classified as a local or residential street. (Note: arterial and collector streets could be considered for traffic calming but not all engineering measures should be applied to these streets.)
- The 85th percentile speed must be greater than 5 mph.
- The average daily traffic should exceed 2,500 vehicles per day.
- Roadway design (i.e., sidewalks, curb/gutter, drainage features, etc.)
- Pedestrian usage

Several traffic calming measures are available to control speeds on city streets. **Appendix C** provides a list of applicable measures for Cherry Hills Village. Measures fall into two general categories: non-physical measures such as enforcement and education, and physical or engineered measures.

Based on the street and speed characteristics provided in **Table 1**, and the traffic calming threshold criteria describe above, **Table 2** provides an assessment of whether a street has an issue with speeding and/or traffic volumes. Based on the analysis, Colorado Avenue and Franklin Street most likely have an issue with speeding while other streets do not. Both Mansfield Avenue and Dahlia Street seem to have more traffic volume than expected and it is likely due to cut-through traffic.

Table 2. Traffic and Speed Characteristics of Studied Streets

Street and Location	Local or Residential Street	Exceeds 2500 VPD	85th Percentile Speed 5 mph over speed limit	Speed or Volume Issue
Quincy - e/o Meade	No	Yes	No	None
Colorado - s/o Covington	No	Yes	Yes	Speed for northbound vehicles
Mansfield - e/o Birch	Yes	No	No	None
Dahlia - n/o Princeton	Yes	No	No	None
Holly - s/o Stanford	No	Yes	No	None
Clarkson - n/o Princeton	No	Yes	No	None
Franklin - n/o Belleview	Yes	No	Yes	Speed

Based on the evaluation presented in **Table 2**, the following describe preliminary recommendations for next steps and traffic calming measures to implement along impacted streets.

Colorado Boulevard – Colorado Boulevard is a minor arterial/collector street, so speed control measures such as speed humps and neighborhood traffic circles should not be used to control speed. If the City desires to mitigate speeding for northbound Colorado Boulevard, the following is recommended.

Possible Traffic Calming Measures:

- Speed Monitoring Display northbound north of Mansfield

Franklin Street – Of the studied streets Franklin Street likely has a neighborhood street speeding issue. If the City pursues efforts to mitigate speeding on Franklin Street, the following next steps and possible traffic calming measures are recommended:

Next Steps:

- Further speed studies north of Cherry Vale Drive to understand the extent of the speeding issues.

- Possible meetings with residents and City Council to develop a traffic calming plan.

Possible Traffic Calming Measures:

- Continuous increased police enforcement
- Speed monitor displays at key mid-block locations depending on speed study findings
- Speed humps at key mid-block locations depending on speed study findings and work with Fire Department
- Neighborhood traffic circle at Layton Drive
- Neighborhood traffic circle at Tufts Avenue

B. Traffic Volumes

Figure 2 provides the existing peak hour traffic volumes at intersections in the study area, as well as daily traffic volumes on the roadways. **Appendix A** provides traffic count data. As expected, the state highways bordering and running through Cherry Hills Village carry the most traffic with more than 50,000 vehicles per day (VPD) on Hampden Avenue and more than 30,000 VPD on University Boulevard and Belleview Avenue. On Cherry Hills Village streets, the major streets (such as Clarkson Street, Colorado Boulevard, Quincy Avenue, and Holly Street) carry significantly less traffic, between 4,000 and 6,500 VPD. On a few of the more minor streets, daily traffic volumes are even lower. For example, Franklin Street has a daily traffic volume of about 900 VPD, Dahlia Street north of Quincy Avenue has a daily traffic count of 1,600 vehicles, and Mansfield Avenue east of Colorado Boulevard has a daily count of 2,100 vehicles. Based on these daily traffic counts; the following conclusions can be made.

- Roadways such as Hampden Avenue, Belleview Avenue, and University Boulevard are part of the state highway system and given their regional connectivity have expressway and principal arterial functional classifications. As expected for these higher functional classifications, these roadways carry the highest levels of daily traffic through the Cherry Hills Village area.
- Roadways such as Colorado Boulevard, Holly Street, Quincy Avenue, and Clarkson Street, which provide connections between residential areas within Cherry Hills Village and provide connections to surrounding communities, have minor arterial and collector functional classifications. From a transportation planning perspective, minor arterials and collectors are intended to carry between 1,500 and 10,000 VPD. Existing counts on Colorado Boulevard, Quincy Avenue, Holly Street, and Clarkson Street are within the intended range of traffic volumes for minor arterials and collectors; suggesting that these roadways should continue to operate as two-lane roadways.
- Franklin Street, Mansfield Avenue, and Dahlia Street, given their lack of connectivity with the surrounding communities and the density of adjacent residential uses, could best be classified as local or residential streets. For streets such as these, the intended daily traffic volume is less than 2,500 VPD.

Key Map

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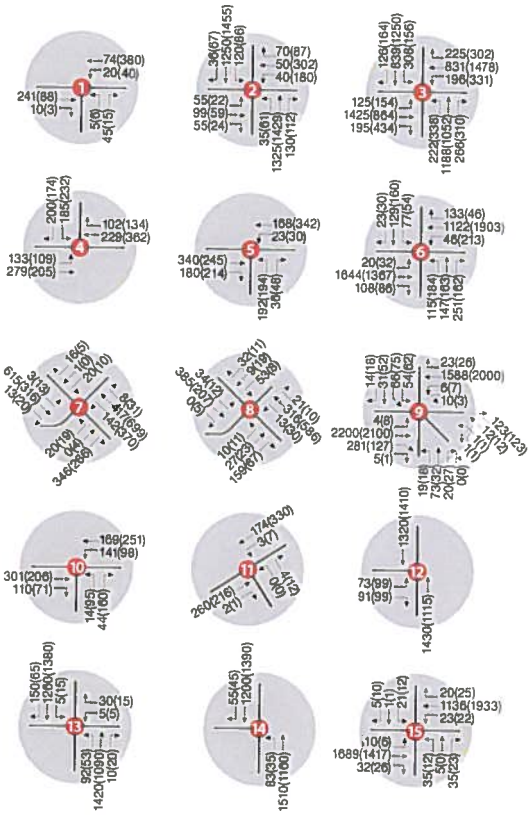

Figure 2
Traffic Volumes

Figures 3 through **5** show diurnal 24-hour traffic volumes by 15-minute period for Quincy Avenue, Colorado Boulevard, and Mansfield Avenue, respectively. Diurnal patterns for other streets are available in **Appendix B**. The traffic volume pattern for Quincy Avenue shown on **Figure 3** represents a typical 24-hour pattern for an **urban** street. As shown, there are two peaks in the traffic volumes that represent the morning and evening commutes. Traffic volumes are typically higher in one direction than the other direction in the morning commute and this pattern is reversed in the evening commute. Also, during the off-peak times between the morning and evening commutes, traffic volumes are typically equal in both directions.

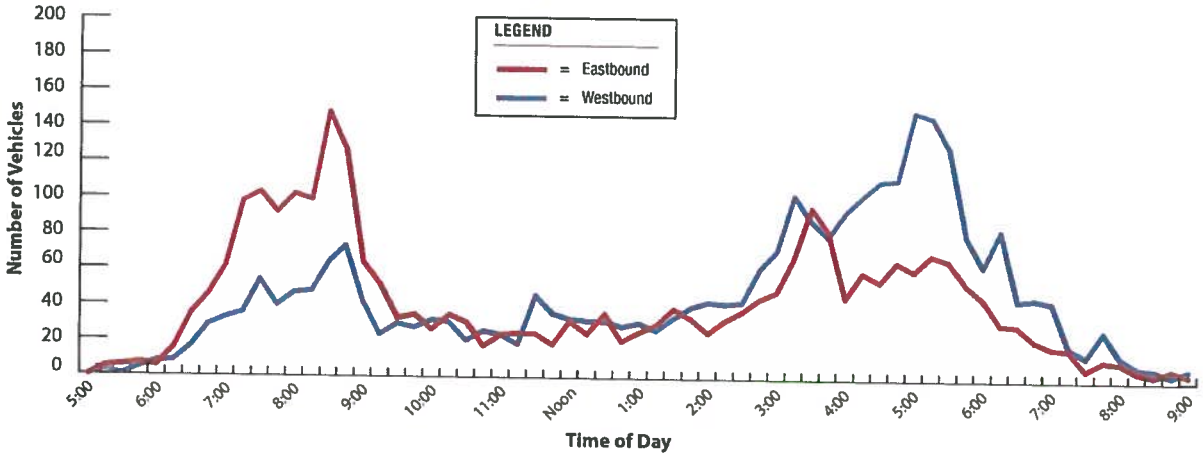

Figure 3. **Quincy Avenue (typical) 24-hour Traffic Patterns**

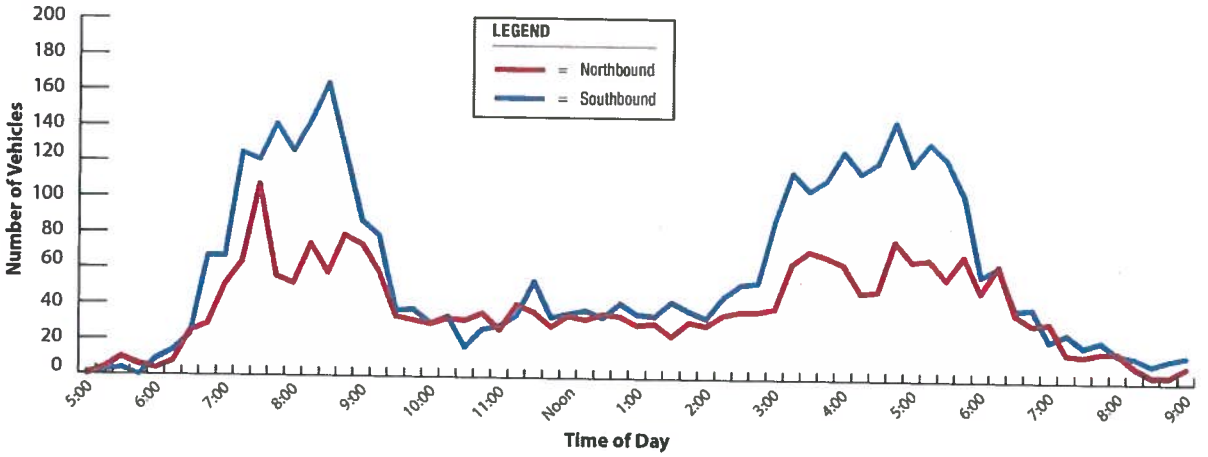

Figure 4. **Colorado Boulevard 24-hour Traffic Patterns**

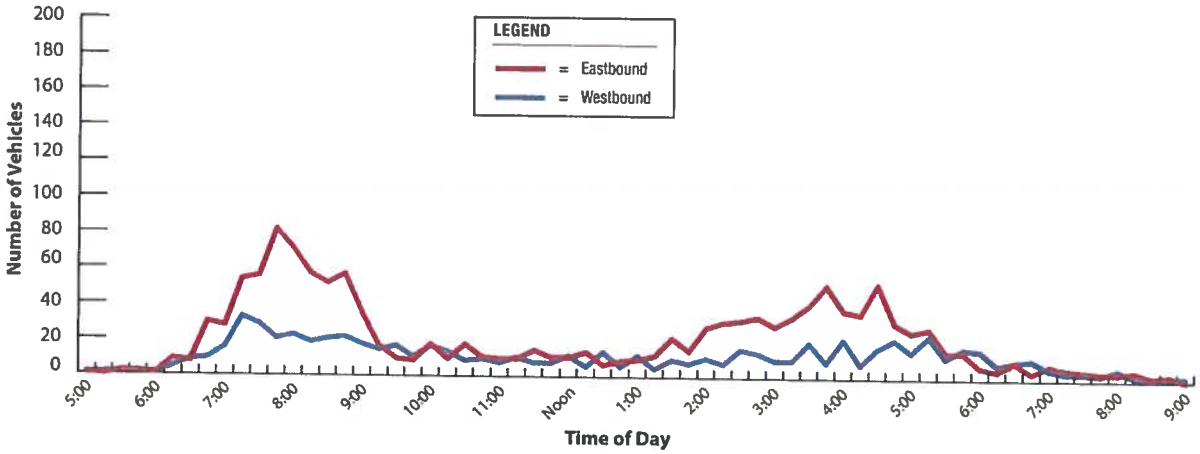

Figure 5. Mansfield Avenue 24-hour Traffic Patterns

As mentioned, the 24-hour traffic volumes for Quincy Avenue follow patterns expected for an urban street. Franklin, Holly, Clarkson, and Dahlia streets all have similar traffic patterns to those observed on Quincy Avenue. However, traffic counts on Colorado Boulevard and Mansfield Avenue show that traffic volumes do not conform to typical travel patterns for urban streets. Note that both streets show peak traffic volumes during the morning and evening commutes but these volumes generally only peak in one direction of travel. For example, traffic volumes peak only in the southbound direction for Colorado Boulevard and only in the eastbound direction on Mansfield Avenue.

Daily traffic volumes and the 24-hour traffic patterns discussed in this section lead to the following conclusions:

- Daily traffic patterns along Cherry Hills Village streets generally follow patterns expected for urban roadways, except along Colorado Boulevard and Mansfield Avenue.
- The atypical travel patterns seen in the Colorado Boulevard and Mansfield Avenue counts suggest that drivers may be avoiding congestion on Hampden Avenue by traveling south on Colorado Boulevard and then traveling east on Mansfield Avenue.
- The atypical travel pattern on Mansfield Avenue has not created a speeding issue nor a volume issue. Therefore, there are no recommendations for this street at this time.
- The previously recommended traffic calming measure for northbound Colorado Boulevard could have a slight impact on traffic patterns and volume. There are no further recommendations at this time.

II. INTERSECTION TRAFFIC OPERATIONS

A. Levels of Service

Peak hour volumes and traffic flows were used to evaluate traffic operations at intersections where peak traffic counts were recorded. Traffic operations were evaluated per techniques documented in the Highway Capacity Manual (HCM) 2010 (Transportation Research Board, 2010) using the existing traffic volumes and intersection geometry. The evaluation techniques of the HCM result in a Level of Service (LOS), which is a qualitative measure of traffic operational conditions based on roadway capacity and vehicle delay. LOS is described by a letter designation ranging from A to F, with LOS A representing almost free-flow travel, while LOS F represents congested conditions. Typically, in urban areas LOS D is considered an acceptable level of traffic operations.

Figure 6 and **Table 3** show the LOS of each approach and of each intersection studied in this effort. Highlighted cells in **Table 3** indicate turn movements operating at a poor LOS during either the AM or the PM peak hour. Blank cells are movements that do not exist at the intersection or they are turn movements that operate under a free condition (e.g., main street through movements that do not stop at stop-controlled intersections).

Table 3 shows that most intersections have at least one movement with a LOS E or F. The major findings and conclusions of this analysis are as follows:

- The AM peak for the University Boulevard/Belleview Avenue intersection is from 7:00 to 8:00 AM and the PM peak is from 4:45 to 5:45 PM. As expected, the traffic signals on University Boulevard, Belleview Avenue, and Hampden Avenue have many turn movements operating at LOS E or F during the peak hours. At the University Boulevard/ Belleview Avenue (#3) and the Hampden Avenue/Happy Canyon Road (#9) intersections, most turn movements are LOS E or F, suggesting that volumes entering the intersections likely exceed the intersection's capacity.
- As expected, at stop-controlled intersections along University Boulevard and Belleview Avenue, vehicles turning from the stop-controlled approaches operate at LOS F.
- The AM peak for the Quincy Avenue/Colorado Boulevard intersection is from 7:15 to 8:15 AM and the PM peak is from 4:30 to 5:30 PM. For the Quincy Avenue/Colorado Boulevard intersection, the AM peak is from 8:00 to 9:00 AM and the PM peak is from 4:45 to 5:45 PM. Unexpected results include the LOS E and F conditions at the Quincy Avenue/Colorado Boulevard (#4) intersection and the LOS F conditions for the eastbound right-turn movement at the Quincy Avenue/Happy Canyon Road intersection (#7).

Table 3. Intersection Level of Service During Peak Hour

Location	Intersection # & Traffic Control		EB			WB			NB			SB			NWB		
			LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
Quincy/Franklin	1 AWSC	AM	a			a			a								
		PM	a			b			a								
University/Quincy	2 Signal	AM	e	d		e	d		a	b	b	b	b	a			
		PM	e	c		d	d		c	c	c	c	c	b			
University/Belleview	3 Signal	AM	e	f	c	f	c	c	e	f	a	f	d	a			
		PM	f	d	e	e	f	c	f	d	a	f	f	a			
Quincy/Colorado	4 AWSC	AM	f			d						c		c			
		PM	c			e						c		b			
Quincy/Holly	5 AWSC	AM	d			b			c								
		PM	c			c			c								
Belleview/Holly	6 Signal	AM	c	d	b	c	b	b	e	d		e	d				
		PM	c	c	b	d	d	b	e	d		e	d				
Happy Canyon/Quincy	7 TWSC	AM	f	e		f	c		a			b					
		PM	f	c		f	b		a			a					
Happy Canyon/Mansfield	8 AWSC	AM	c			c			e			f					
		PM	b			b			e			b					
Hampden/Happy Canyon/Dahlia	9 Signal	AM	c	f	b	e	c		e			f	d		e		d
		PM	c	d	b	d	d		e			f	e		f		e
Quincy/Kent Access	10 TWSC	AM				a			c		b						
		PM				a			e		b						

Location	Intersection # & Traffic Control		EB			WB			NB			SB			NWB		
			LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
Quincy/Meade	11 TWSC	AM	a			a			b			b					
		PM	a			a			b			b					
University/N. St. Mary's	12 TWSC	AM	f		c												
		PM	f		d												
University/Cherry Ridge	13 TWSC	AM				f			b			b					
		PM				f			b			c					
University/S. St. Mary's	14 None	AM							b								
		PM							c								
Belleview/Franklin	15 TWSC	AM	a			b			f			f					
		PM	b			b			f			f					

Signal = Traffic signal control
AWSC = All way stop control
TWSC = Two way stop control
LT = Left turn
T = Thru
RT = Right Turn

1 – Quincy/Franklin
2 – University/Quincy
3 – University/Belleview
4 – Quincy/Colorado
5 – Quincy/Holly
6 – Belleview/Holly
7 – Happy Canyon/Quincy
8 – Happy Canyon/ Mansfield
9 – Hampden/Happy Canyon
10 – Quincy/Kent access
11 – Quincy/Meade
12 – University/N. St. Mary's
13 – University/Cherry Ridge
14 – University/S. St. Mary's
15 – Belleview/Franklin

Level of Service Delay Thresholds for Stop Signs

LOS A	0 – 10 sec/veh
LOS B	>10 – 15 sec/veh
LOS C	>15 – 25 sec/veh
LOS D	>25 – 35 sec/veh
LOS E	>35 – 50 sec/veh
LOS F	>50 sec/veh

Level of Service Delay Threshold for Signals

LOS A	≤ 10 sec/veh
LOS B	> 10 – 20 sec/veh
LOS C	> 20- 35 sec/veh
LOS D	> 35 – 55 sec/veh
LOS E	> 55 – 80 sec/veh
LOS F	> 80 veh/sec

Indicates an intersection on a CDOT state highway and if signalized, then the traffic signal is maintained by CDOT

Indicates that the approach to the intersection is outside of City boundaries

Key Map

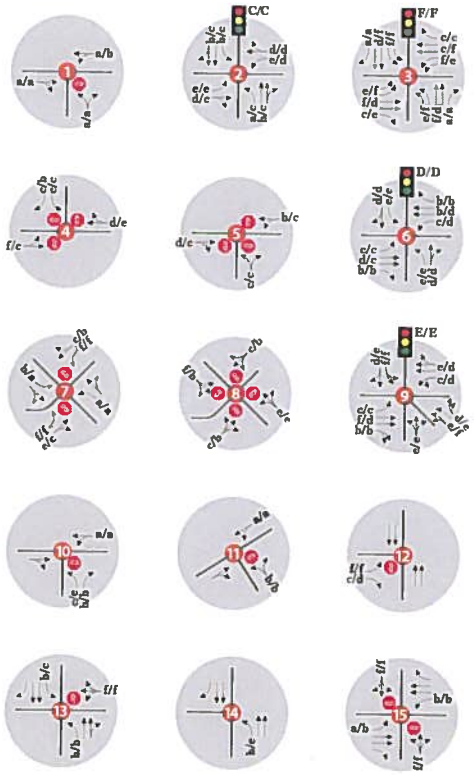

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Figure 6
Levels of Service

B. Volume/Capacity Ratios

As discussed in the previous section, LOS is one way to measure the quality of operations at an intersection. The LOS is a measure of delay at an intersection; however, a poor LOS does not necessarily indicate that a turn movement at an intersection is an issue. For example, a stop controlled approach to a high-volume roadway most likely will experience poor LOS, but the volume to capacity ratio is less than 1.0 because only a few vehicles experience this high delay. Therefore, increasing the capacity to reduce delay is not a prudent action because capacity is not an issue. On the other hand, for an intersection or a turn movement with a poor LOS and a high volume to capacity ratio, typically it is prudent to explore options to increase capacity and reduce delay.

Table 4 shows the volume to capacity for turn movements at intersections. The table clearly shows that most turn movements at study intersections are below capacity. Not surprisingly, near capacity and over-capacity issues are at the intersections of University Boulevard and Belleview Avenue (intersection #3) and Hampden Avenue and Happy Canyon Road. Other turn movements near or over capacity occur at the intersections of Belleview Avenue / Holly Street (#6), Happy Canyon Road / Quincy Avenue (#7), and the stop approaches at the Belleview Avenue / Franklin Street (#15) intersection.

C. Operational Analysis Summary

Based on the operational analysis and the volume-capacity ratios, the following summarizes the key points and conclusions:

Intersections under the control of other jurisdictions

Intersection approaches along University Boulevard, Belleview Avenue, and Hampden Avenue, especially approaches to these facilities, have turn movements operating at LOS E or F and/or experience over capacity conditions during peak hours. The intersection approaches that experience these conditions and fall within the jurisdictional control of the City are as follows:

Signalized Intersections:

- University / Belleview – southbound and westbound approaches
- University / Quincy – eastbound and westbound approaches
- Belleview / Holly – southbound approach
- Hampden / Happy Canyon – northbound approach

There are several constraints associated with improving operations on these approaches. Improvements would require coordination with other jurisdictions such as CDOT and/or the City of Denver. Improvements needed could require widening of existing roadways which could impact right-of-way and would be beyond the fiscal capabilities of the City. Signal timing changes to improve operations on these approaches are difficult because it would impact operations on approaches controlled by other jurisdictions.

Stop-Controlled Intersections:

- University / N. Saint Mary's access – eastbound approach
- University / Cherry Ridge – westbound approach
- Belleview / Franklin – southbound approach

Realistically improving operations on these approaches would require signalization. However, traffic counts indicate that volumes are not sufficient to meet warrants for signalization at these intersections.

Intersections mostly under the control of the City

Of the intersections under the control of the City, traffic operations are generally LOS D or better for intersection approaches. Intersection approaches that are within city limits and experience LOS E or F conditions during the peak hours are as follows:

- Quincy / Colorado – eastbound and westbound approaches
- Happy Canyon / Mansfield – southbound approach
- Quincy / Kent Access – northbound approach

The Quincy / Colorado and Happy Canyon / Mansfield intersections have all-way stop control. The approaches at these intersections do not exceed capacity and therefore improvements such as additional lanes or a change in traffic control at these intersections are not recommended. If future operational improvements are desired, then consideration should be given to a roundabout or a traffic signal at these intersections.

The Kent access operations are related to school traffic. Since the volume to capacity ratio is low and uniformed traffic control in currently provided during school hours, then changes in traffic control or intersection lanes are currently not recommended.

Table 4. Intersection Volume/Capacity

Location	Intersection # & Traffic Control		EB			WB			NB			SB			NWB		
			LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
Quincy/Franklin	1 AWSC	AM															
		PM															
University/Quincy	2 Signal	AM															
		PM															
University/Belleview	3 Signal	AM															
		PM															
Quincy/Colorado	4 AWSC	AM															
		PM															
Quincy/Holly	5 AWSC	AM															
		PM															
Belleview/Holly	6 Signal	AM															
		PM															
Happy Canyon/Quincy	7 TWSC	AM															
		PM															
Happy Canyon/Mansfield	8 AWSC	AM															
		PM															
Hampden/Happy Canyon/Dahlia	9 Signal	AM															
		PM															
Quincy/Kent Access	10 TWSC	AM															
		PM															
Quincy/Meade	11 TWSC	AM															
		PM															

Location	Intersection # & Traffic Control		EB			WB			NB			SB			NWB		
			LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT	LT	T	RT
University/N. St. Mary's	12 TWSC	AM															
		PM															
University/Cherry Ridge	13 TWSC	AM															
		PM															
University/S. St. Mary's	14 None	AM															
		PM															
Belleview/Franklin	15 TWSC	AM															
		PM															

Signal = Traffic signal control
AWSC = All way stop control
TWSC = Two way stop control

Over Capacity - V/C >= 1.00
At Capacity - V/C >= 0.95
Near Capacity - V/C >= 0.85
Below Capacity – V/C < 0.85

1 – Quincy/Franklin
2 – University/Quincy
3 – University/Belleview
4 – Quincy/Colorado
5 – Quincy/Holly
6 – Belleview/Holly
7 – Happy Canyon/Quincy
8 – Happy Canyon/Mansfield
9 – Hampden/Happy Canyon
10 – Quincy/Kent access
11 – Quincy/Meade
12 – University/N. St. Mary's
13 – University/Cherry Ridge
14 – University/S. St. Mary's
15 – Belleview/Franklin

Indicates an intersection on a CDOT state highway and if signalized, then the traffic signal is maintained by CDOT

Indicates that the approach to the intersection is outside of City boundaries

III. ORIGIN / DESTINATION PATTERNS

Another aspect of the existing conditions analysis was an attempt to study travel patterns of drivers using Cherry Hills Village streets. This effort included setting up license plate recognition cameras at five strategic locations within Cherry Hills Village to track vehicles as they entered and exited the City. **Figure 7** generally shows camera locations and the volumes recorded in and out at those locations during the morning (6:30 to 9:30) period and the evening (3:30 to 6:30) period. For the purposes of this evaluation, the green arrows represent the volumes entering the City and the blue arrows represent the volumes leaving the City, and camera locations will be referred to as gates. For example, Gate 1 represents the camera location on Quincy Avenue just west of Happy Canyon Road. The exact locations of the other gates are listed on **Figure 7**.

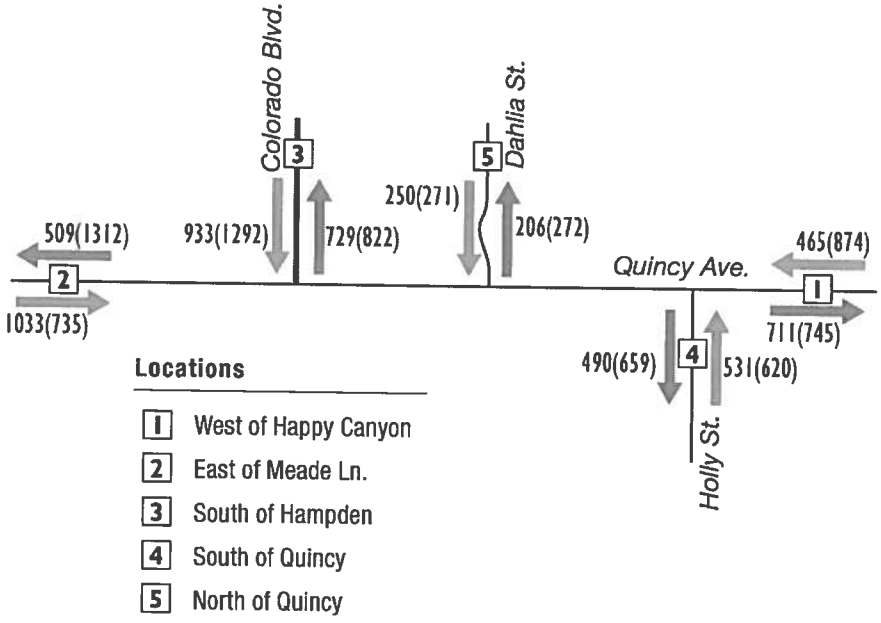


Figure 7. AM (6:30 to 9:30) and PM (3:30 to 6:30) Period Volumes at License Plate Survey Gates

Figure 8 shows the destination of vehicles entering the City by period. As shown, during the morning period 55 percent of the vehicles entering the City have a destination within the City. While during the afternoon period, only 40 percent of vehicles entering the City have a destination within the City. This data suggests that during the peak periods of travel on a weekday, anywhere from 45 to 60 percent of vehicles entering the City are only passing through the City.

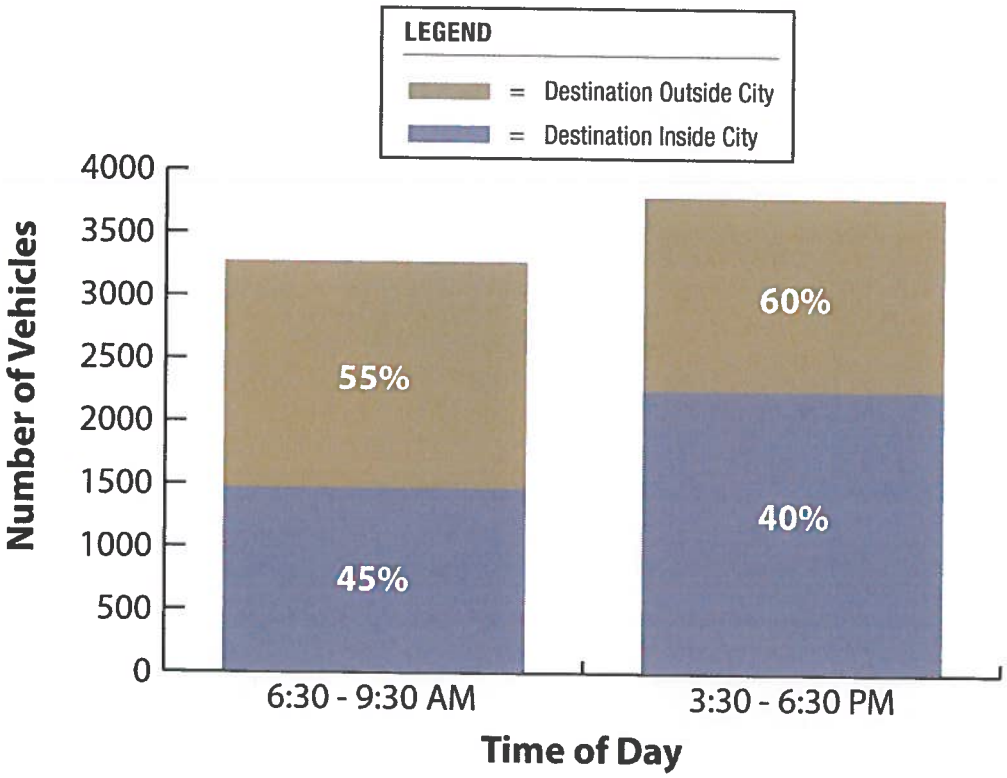


Figure 8. Destinations of Inbound Vehicles

The origin destination data can be further broken down by gate. **Figures 9** and **10** provide a graphic representation of the morning and afternoon travel patterns, respectively. The graphics display all O-D pairs and percentages at each gate. For example, on **Figure 9** at Gate 1, which was at the east end of Quincy Avenue, the O-D study shows that in the westbound direction 26 percent of vehicles passed Gate 2 at the west end of Quincy Avenue. Also on **Figure 9** at Gate 3, 73 percent of southbound vehicles on Colorado Avenue in the AM peak were not recorded at another gate and therefore were assumed to end their trip at a location within the City.

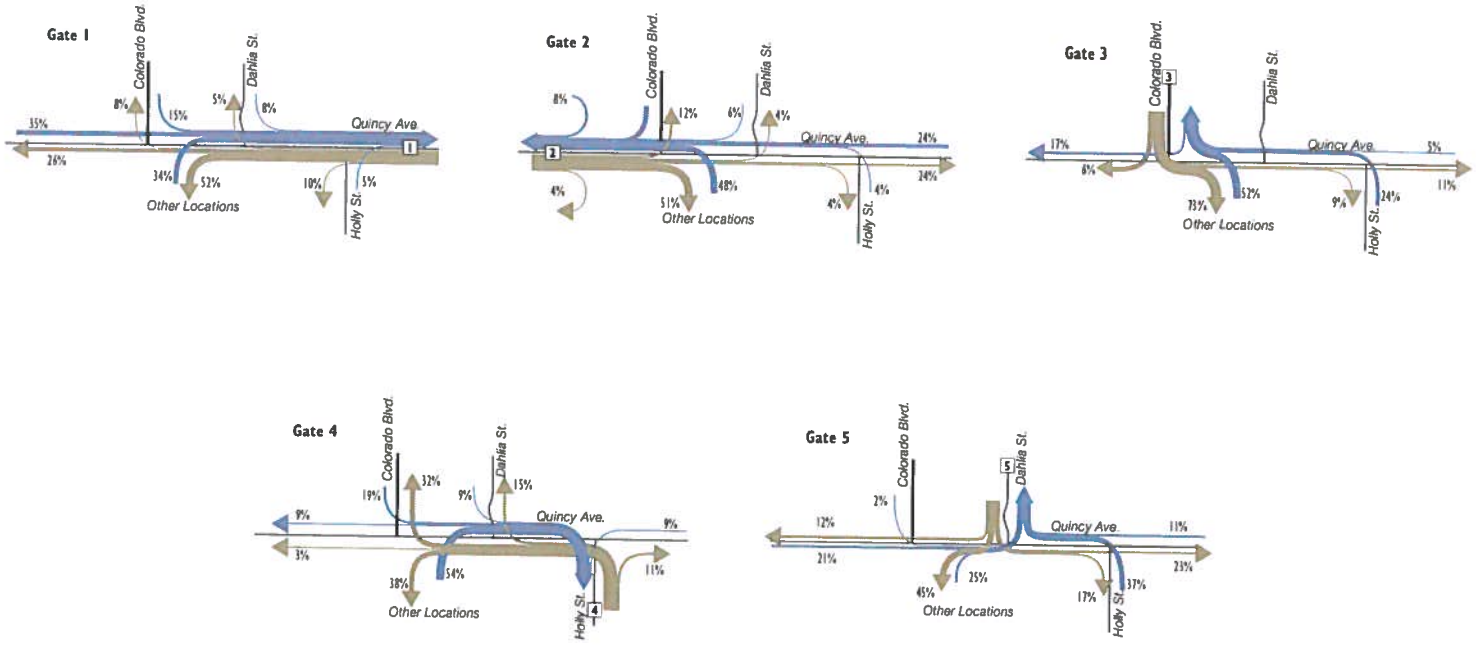


Figure 9
AM Orgin Destination Data

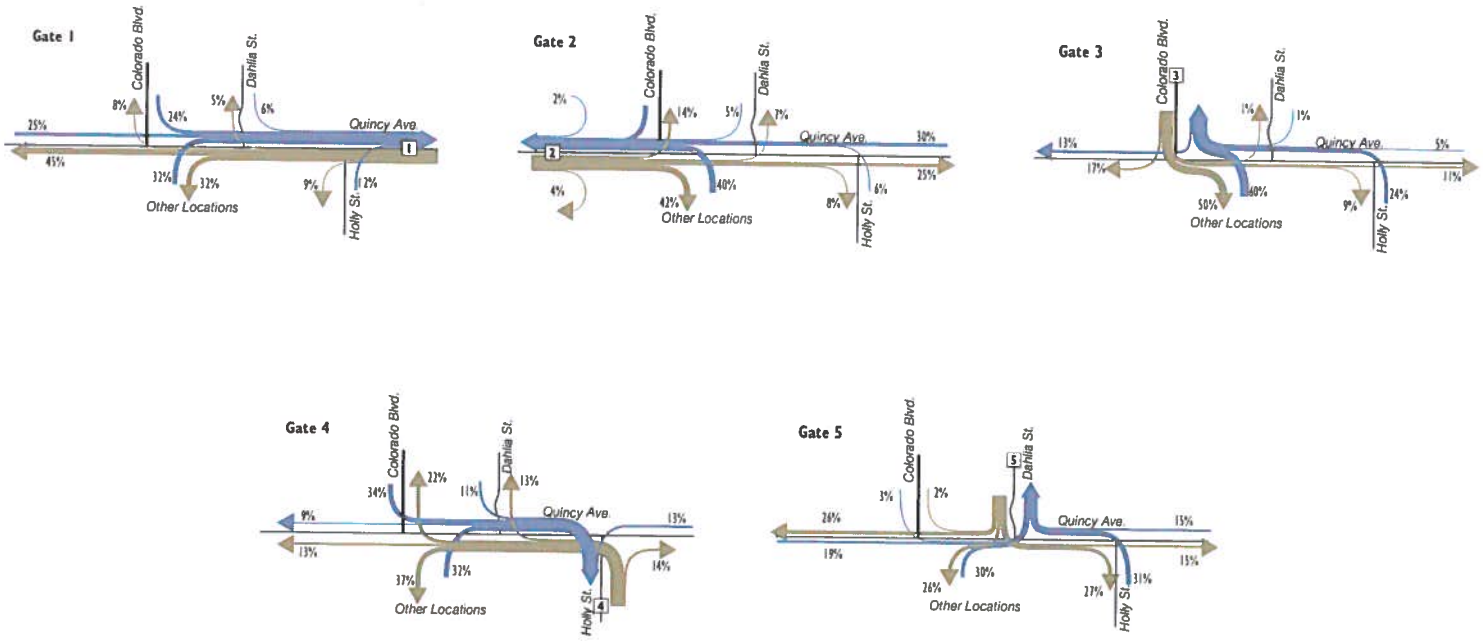


Figure 10
PM Orgin Destination Data

The following two figures combine the entering vehicle data of **Figure 8** with the percentages of **Figures 9** and **10**. **Figures 11** and **12** graph the distribution of the entering volume (green arrow in **Figure 8**) at each gate and among the other gates in the study area. For example, at Gate 1, of the 465 vehicles entering at Gate 1 in the AM peak 121 vehicles showed up at Gate 2 within 10 minutes or less of being recorded at Gate 1. Similarly, of the 465 vehicles entering at Gate 1, 36 vehicles exited at Gate 3 on Colorado Boulevard, 46 at Gate 4 on Holly Street, and 22 at Gate 5 on Dahlia Street. The 240 remaining vehicles that were not recorded at another gate within 10 minutes of passing through Gate 1 were assumed to be a trip that ended at a location within Cherry Hills Village.

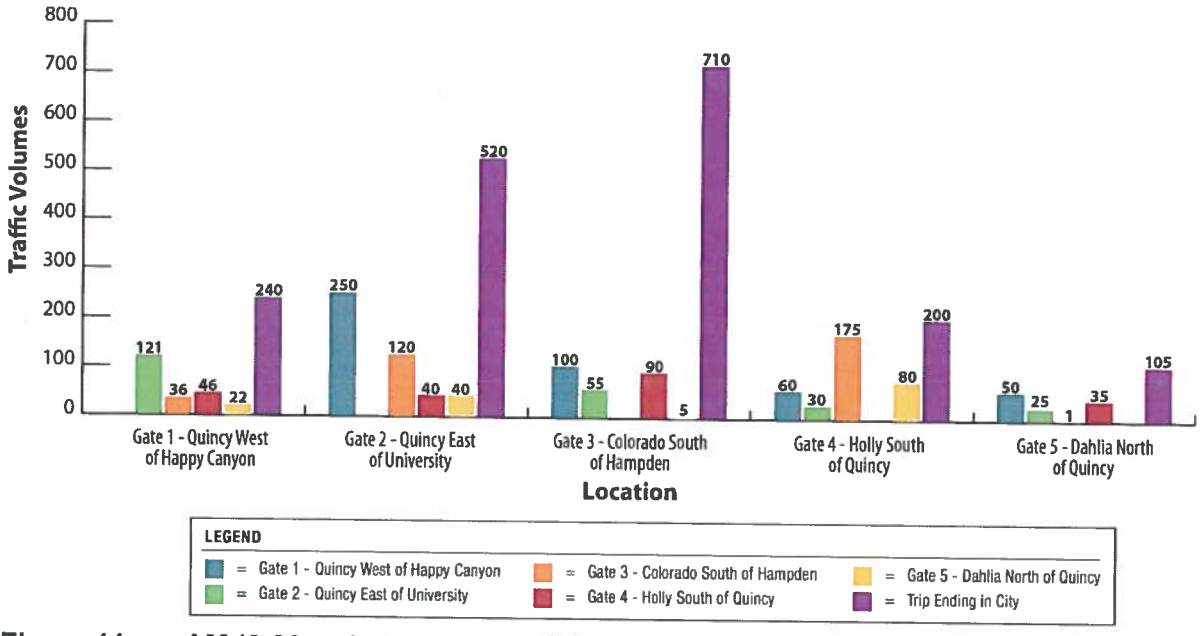


Figure 11. AM (6:30 to 9:30) Period Origin and Destination of Inbound Vehicle Trips at Each Gate

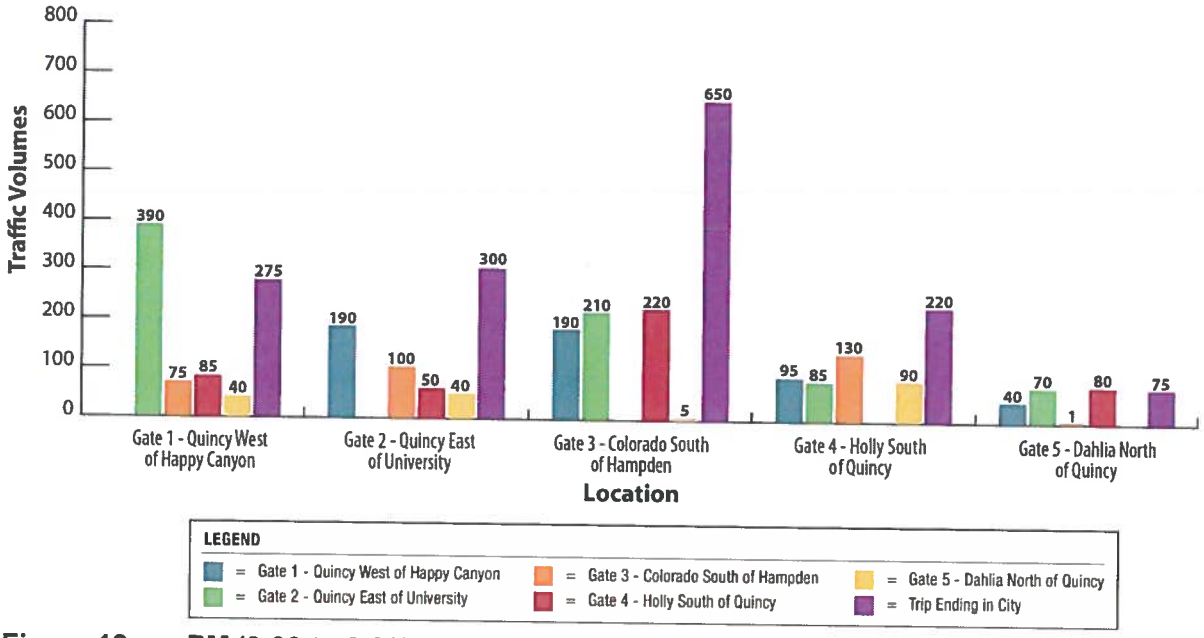


Figure 12. PM (3:30 to 6:30) Period Origin and Destination of Inbound Vehicle Trips at Each Gate

Based on the AM origin-destination patterns at each gate, the following observations can be made.

- At Gates 1, 2, and 3, most vehicles entering the gate have a destination within Cherry Hills Village. This is especially the case at Gate 2 on Quincy Avenue east of University Boulevard and Gate 3 on Colorado Boulevard.
- Based on the traffic volumes on Mansfield Avenue east of Colorado Boulevard and the eastbound to southbound right-turn volume at the Mansfield Avenue/Happy Canyon Road intersection, some of the inbound vehicle-trips at Gate 3 (Colorado Boulevard) are likely using Mansfield Avenue to cut over to Happy Canyon Road and therefore may not have been a trip that ended in the City.
- Nearly one-third of the vehicle-trips entering at Gate 4 (Holly Street) use Gate 3 (Colorado Boulevard) to exit the City.
- Approximately 25 percent of the vehicle-trips on either end of Quincy Avenue (Gates 1 and 2) are vehicles cutting through the City

The PM period data suggest the following travel patterns.

- In the PM period, there are about 1,545 vehicle-trips entering the City at either end of Quincy Avenue (see data for Gate 1 and Gate 2 in **Figure 12**). The data show that of these vehicle-trips about 970 or 63 percent have an origin and destination outside of the City. In other words, nearly two-thirds of vehicles on Quincy Avenue in the evening are trips cutting through the City.

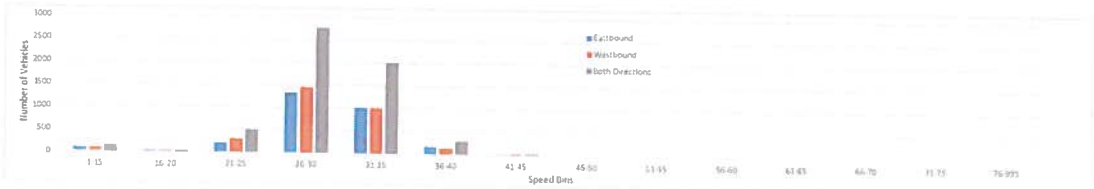
- On southbound Colorado Boulevard, 400 vehicle trips were recorded exiting through Gates 1 and 2 on Quincy Avenue and 220 vehicle-trips were recorded exiting through Gate 4 on Holly Street. These 620 vehicle-trips would be considered a vehicle cutting through the City and are about 50 percent of the nearly 1,300 vehicle-trips recorded on southbound Colorado Boulevard.
- The data suggest that approximately two-thirds (65 percent) of vehicle-trips entering the system at Holly Street are vehicle-trips that are cutting through the City.

The origin-destination study confirms the prevailing thought that many of the vehicle-trips on City roadways such as Quincy Avenue and Colorado Boulevard are vehicle-trips cutting through the City. This data suggests that during the peak periods of the day, 44 to 60 percent of the traffic in the City might be a vehicle passing through the City.

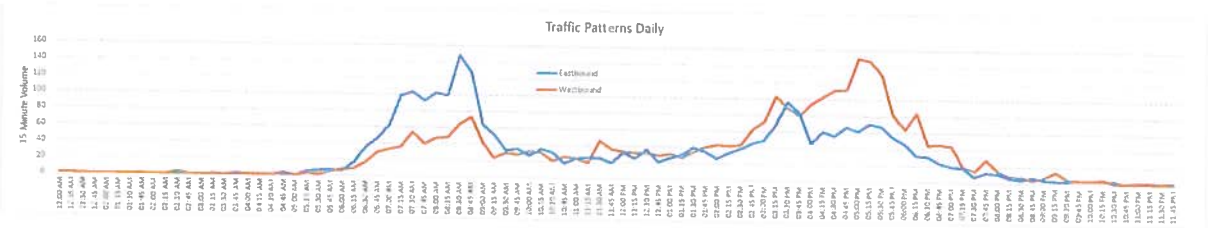
APPENDIX A TRAFFIC COUNTS AND SPEED DATA

Quincy

Speed Data	Eastbound		Westbound	
15th Percentile	25	MPH	25	MPH
50th Percentile	29	MPH	28	MPH
85th Percentile	33	MPH	33	MPH
95th Percentile	35	MPH	35	MPH
Mean Speed	29	MPH	29	MPH
10 MPH Pace Speed	26-35	MPH	26-35	MPH
Number in Pace	2321		2441	
Percent in Pace	16400.0%		15500.0%	
Vehicles over 55 MPH	10		22	
Vehicles over Posted				40.31%

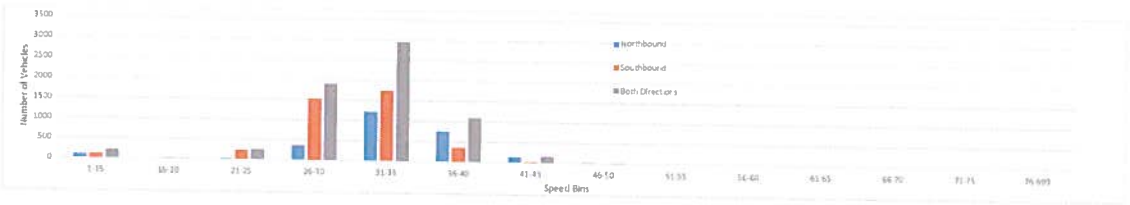


Volume Data	Number	Percent
Eastbound Total	2750	47.98%
Westbound Total	2982	52.02%
Total	5732	100.00%
Passenger Cars	5548	96.79%
Single Unit	99	1.73%
Combination Trucks	20	0.35%
Bicycles	28	0.49%
Buses	37	0.65%

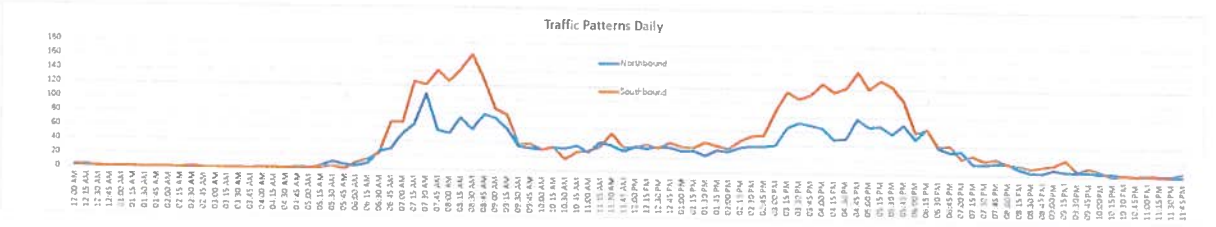


Colorado

Speed Data	Northbound		Southbound	
15th Percentile	28	MPH	25	MPH
50th Percentile	33	MPH	30	MPH
85th Percentile	38	MPH	34	MPH
95th Percentile	40	MPH	37	MPH
Mean Speed	33	MPH	30	MPH
10 MPH Pace Speed	31-40	MPH	26-35	MPH
Number in Pace	1951		3271	
Percent in Pace	89800.0%		37100.0%	
Vehicles over 55 MPH	153		26	
Vehicles over Posted				64.11%

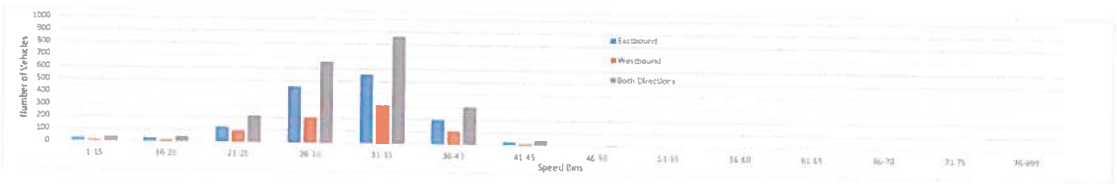


Volume Data	Number	Percent
Northbound Total	2589	39.37%
Southbound Total	3987	60.63%
Total	6576	100.00%
Passenger Cars	6344	96.47%
Single Unit	142	2.16%
Combination Trucks	27	0.41%
Bicycles	31	0.47%
Buses	32	0.49%

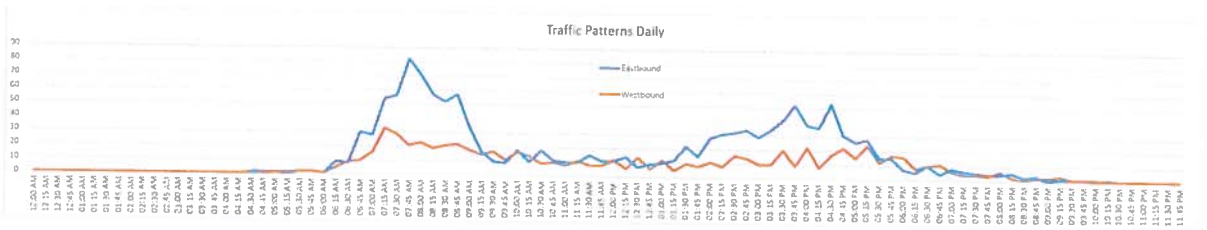


Mansfield

Speed Data	Eastbound		Westbound	
15th Percentile	25	MPH	24	MPH
50th Percentile	30	MPH	30	MPH
85th Percentile	35	MPH	35	MPH
95th Percentile	38	MPH	38	MPH
Mean Speed	31	MPH	31	MPH
10 MPH Pace Speed	26-35	MPH	26-35	MPH
Number in Pace	1007		510	
Percent in Pace	22600.0%		68.0%	
Vehicles over 55 MPH	1		1	
Vehicles over Posted				56.17%

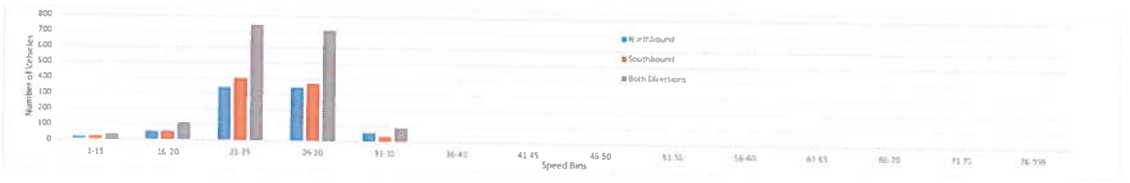


Volume Data	Number	Percent
Eastbound Total	1376	64.72%
Westbound Total	750	35.28%
Total	2126	100.00%
Passenger Cars	2050	96.43%
Single Unit	51	2.40%
Combination Trucks	7	0.33%
Bicycles	7	0.33%
Buses	11	0.52%

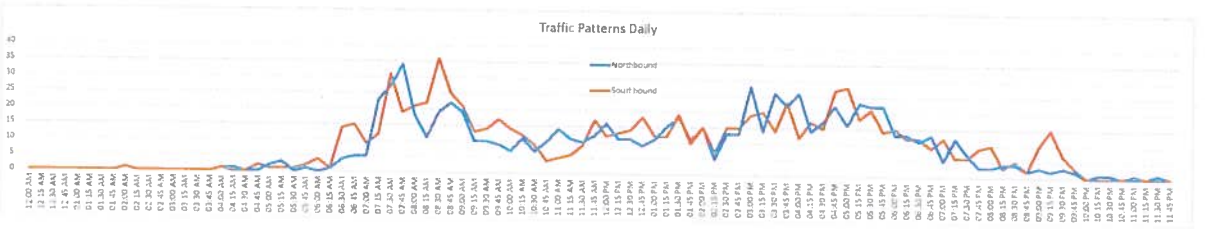


Dahlia

Speed Data	Northbound		Southbound	
15th Percentile	20	MPH	20	MPH
50th Percentile	24	MPH	24	MPH
85th Percentile	29	MPH	28	MPH
95th Percentile	31	MPH	29	MPH
Mean Speed	25	MPH	25	MPH
10 MPH Pace Speed	21-30	MPH	21-30	MPH
Number in Pace	684		773	
Percent in Pace	5600.0%		3600.0%	
Vehicles over 55 MPH	1		2	
Vehicles over Posted				47.38%

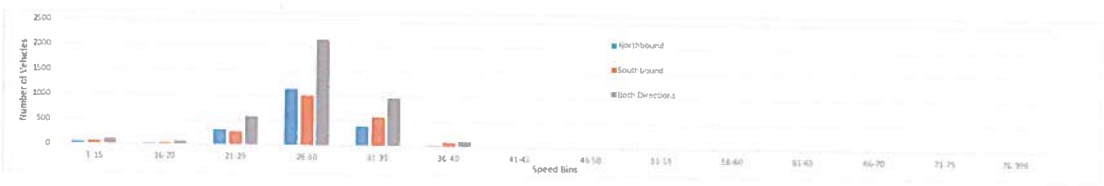


Volume Data	Number	Percent
Northbound Total	811	47.79%
Southbound Total	886	52.21%
Total	1697	100.00%
Passenger Cars	1586	93.46%
Single Unit	73	4.30%
Combination Trucks	17	1.00%
Bicycles	8	0.47%
Buses	13	0.77%

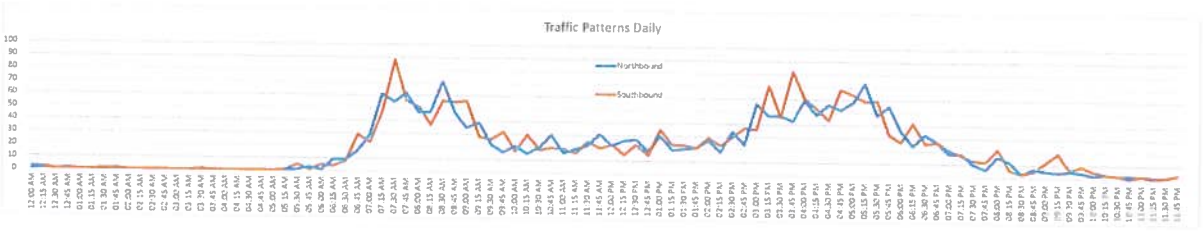


Holly

Speed Data	Northbound		Southbound	
15th Percentile	23	MPH	23	MPH
50th Percentile	27	MPH	28	MPH
85th Percentile	31	MPH	33	MPH
95th Percentile	34	MPH	34	MPH
Mean Speed	28	MPH	28	MPH
10 MPH Pace Speed	26-35	MPH	26-35	MPH
Number in Pace	1522		1579	
Percent in Pace	19		9300.0%	
Vehicles over 55 MPH	1		9	
Vehicles over Posted				27.39%

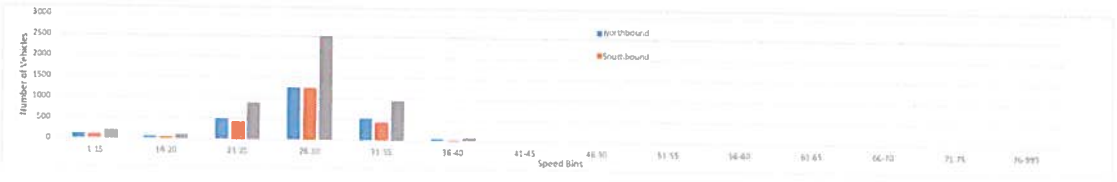


Volume Data	Number	Percent
Northbound Total	1918	48.51%
Southbound Total	2036	51.49%
Total	3954	100.00%
Passenger Cars	3837	97.04%
Single Unit	58	1.47%
Combination Trucks	13	0.33%
Bicycles	20	0.51%
Buses	26	0.66%

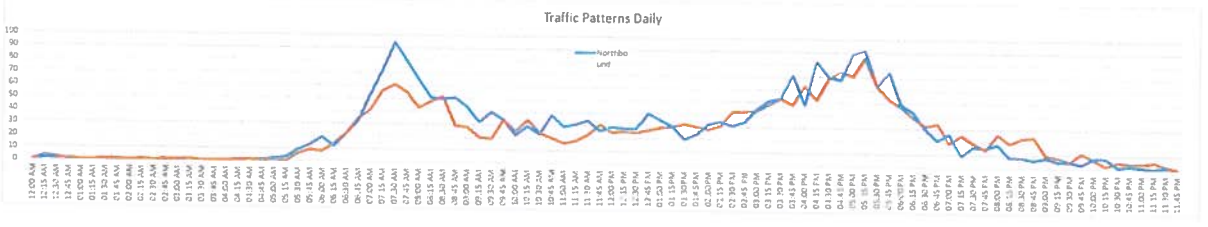


Clarkson

Speed Data	Northbound		Southbound	
15th Percentile	20	MPH	21	MPH
50th Percentile	27	MPH	27	MPH
85th Percentile	31	MPH	31	MPH
95th Percentile	34	MPH	34	MPH
Mean Speed	26	MPH	26	MPH
10 MPH Pace Speed	24-33	MPH	24-33	MPH
Number in Pace	1686		1605	
Percent in Pace	4500.0%		2700.0%	
Vehicles over 55 MPH	3		2	
Vehicles over Posted				21.85%

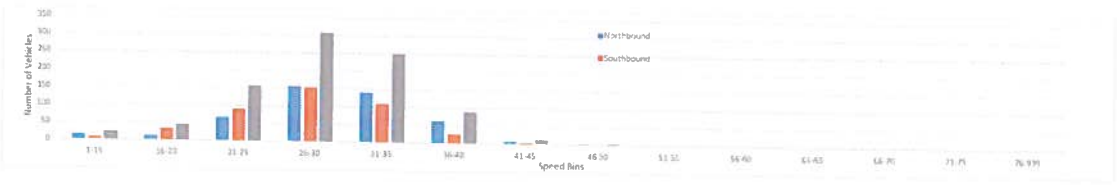


Volume Data	Number	Percent
Northbound Total	2478	52.36%
Southbound Total	2255	47.64%
Total	4733	100.00%
Passenger Cars	4456	94.15%
Single Unit	171	3.61%
Combination Trucks	48	1.01%
Bicycles	38	0.80%
Buses	20	0.42%

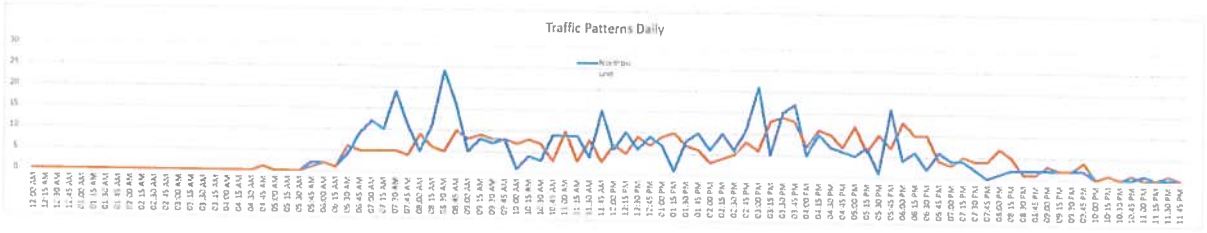


Franklin

Speed Data	Northbound		Southbound	
15th Percentile	22	MPH	19	MPH
50th Percentile	29	MPH	27	MPH
85th Percentile	35	MPH	33	MPH
95th Percentile	38	MPH	36	MPH
Mean Speed	29	MPH	27	MPH
10 MPH Pace Speed	26-35	MPH	24-33	MPH
Number in Pace	265		240	
Percent in Pace	21100.0%		14000.0%	
Vehicles over 55 MPH	71		31	
Vehicles over Posted				74.52%



Volume Data	Number	Percent
Northbound Total	459	51.98%
Southbound Total	424	48.02%
Total	883	100.00%
Passenger Cars	807	91.39%
Single Unit	49	5.55%
Combination Trucks	14	1.59%
Bicycles	8	0.91%
Buses	5	0.57%



APPENDIX B ORIGIN DESTINATION SUMMARY

AM Traffic										
Gate Location	Gate No.	# of vehicles entering	# of vehicles exiting Gate 1	# of vehicles exiting Gate 2	# of vehicles exiting Gate 3	# of vehicle exiting Gate 4	# of vehicles exiting Gate 5	Terminated in City	total exiting or terminated in City	% Terminated in City
QUINCY/Happy Canyon	Gate 1	465	-	121	36	46	22	240	465	51.6%
QUINCY/University	Gate 2	1033	250	-	120	40	40	520	970	50.3%
COLORADO/Hampden	Gate 3	933	100	55	-	90	5	710	960	76.1%
HOLLY/Quincy	Gate 4	490	50	10	175	-	80	200	515	40.8%
DAHLIA/Quincy	Gate 5	250	50	25		35	-	105	215	42.0%
		3171						1775		
Percentage of vehicles terminating in City				56.0%						
Percentage of vehicles passing through				44.0%						

PM Traffic										
Gate Location	Gate No.	# of vehicles entering	# of vehicles exiting Gate 1	# of vehicles exiting Gate 2	# of vehicles exiting Gate 3	# of vehicle exiting Gate 4	# of vehicles exiting Gate 5	Terminated in City	total exiting or terminated in City	% Terminated in City
QUINCY/Happy Canyon	Gate 1	874	-	390	75	85	40	275	865	31.5%
QUINCY/University	Gate 2	735	190	-	100	50	40	300	680	40.8%
COLORADO/Hampden	Gate 3	1292	190	210	-	220	5	650	1275	50.3%
HOLLY/Quincy	Gate 4	620	95	85	130	-	90	220	620	35.5%
DAHLIA/Quincy	Gate 5	271	40	70	1	80	5	75	271	27.7%
		3792						1520		
Percentage of vehicles terminating in City				40.1%						
Percentage of vehicles passing through				59.9%						

APPENDIX C TRAFFIC CALMING MEASURES LIST

	Traffic Mitigation Measures	Application	
		Local/Residential	Arterial/Collector
Education, Enforcement, And Non-Physical Treatments	Neighborhood Education Programs	X	X
	Speed Limit Signing	X	X
	Restricted Movement Signing	X	X
	Truck Restriction Signing	X	X
	Enhanced At-Grade Pedestrian Crossing	X	X
	Striping/Visual Narrowing	X	X
	Speed Monitoring Display	X	X
	Traditional Police Enforcement	X	X
Physical (Engineering) Treatments	Entry Islands	X	X
	Entrance Barrier	X	X
	Speed Hump	X	
	Raised Pedestrian Crossing	X	X
	Curb Extensions	X	X
	Partial (not full-block) Medians	X	X
	Traffic Circles	X	
	Restricted Movement Barrier	X	
	Raised Intersection		X
	Full-Block Medians	X	X