



**I-25/Arapahoe Interchange**

*Environmental Assessment*



# **Walnut Hills Neighborhood Traffic Study**

*July 2011*



# Walnut Hills Neighborhood Traffic Study

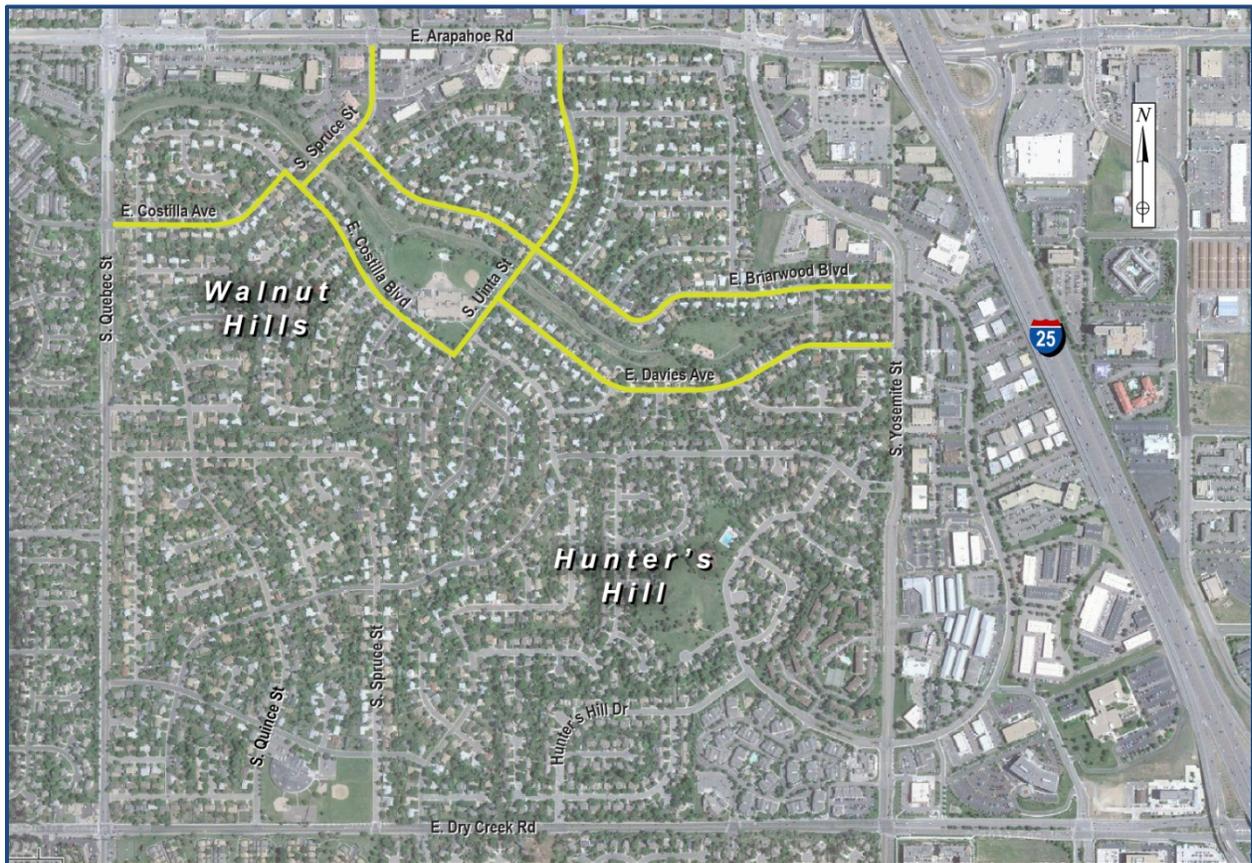
## 1 Introduction

A traffic study was conducted to obtain baseline data regarding existing traffic volumes and cut-through traffic circulation within the Walnut Hills neighborhood.

The purpose of this study is to quantify the amount of traffic cutting through the Walnut Hills neighborhood during peak commuting hours. The existing data will be used as a basis for estimating the potential for increase or decrease in No Action and Action alternatives to be analyzed in the I-25/Arapahoe Road Interchange Environmental Assessment. Data collection and analysis methodology were discussed with City of Centennial and Arapahoe County staff on June 2, 2010 and with neighborhood representatives and City and County staff on June 7, 2010. These discussions helped define the locations for data collection considering the identified routes of potential cut-through traffic concern.

The Walnut Hills neighborhood is located south of Arapahoe Road between Quebec Street and Yosemite Street, in the City of Centennial. The neighborhood streets included in the study are shown in **Figure 1**.

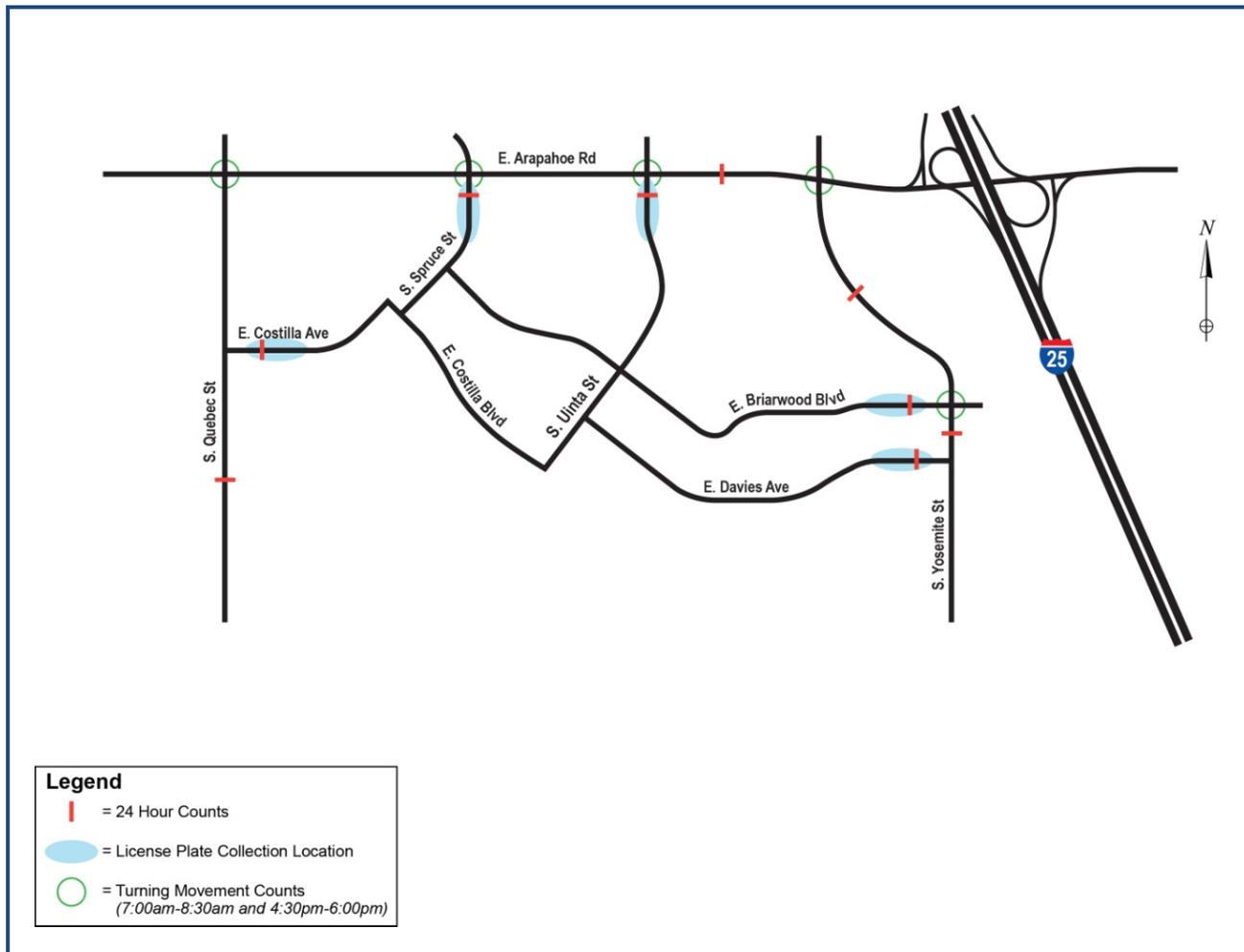
Figure 1. Study Area



## 2 Methodology

The locations and types of data collection conducted for this neighborhood study are illustrated in **Figure 2**.

Figure 2. Data Collection Locations



### 2.1 Origin-Destination Data

The definition of a neighborhood cut-through trip is a trip entering or exiting the neighborhood with no origin or destination within the neighborhood. In order to measure the cut-through traffic traveling through the Walnut Hills neighborhood, license plate data of vehicles entering and exiting the neighborhood were recorded via digital video cameras. The data collection occurred during the morning and evening peak hours of Wednesday, April 6, 2011 at the following locations and during the following times:

- Time periods:
  - AM peak 7:00 to 8:30 am
  - PM peak 4:30 to 6:00 pm

- Locations:
  - Davies Avenue west of Yosemite Street
  - Briarwood Blvd. west of Yosemite Street
  - Uinta Street south of Arapahoe Road
  - Spruce Street south of Arapahoe Road
  - Costilla Avenue east of Quebec Street

The time and license plate of each vehicle entering and exiting the neighborhood at the study locations were recorded via video cameras, such as shown to the right.



As part of a separate but coordinated study to identify cut-through trips from Arapahoe Road to Dry Creek Road, the City of Centennial collected license plate data by observation during the same time periods at several accesses to the Walnut Hills and Hunters Hill neighborhoods north of Dry Creek Road at Quince Street, Spruce Street and Hunters Hill Drive. The City of Centennial’s additional data collection was not detailed in the June 2010 meeting with neighborhood representatives. A summary of the City’s study is provided in **Appendix B**.

## 2.2 Traffic Volumes

Directional traffic volume data were collected at the locations listed above on Wednesday, April 6, 2011 for the full day (24 hours) that the license plate data collection occurred. Directional counts were also collected along the segments of Yosemite Street, Arapahoe Road, and Quebec Street adjacent to the neighborhood for the full day (24 hours) that the license plate data collection occurred within the neighborhood.

Intersection turning movement traffic data were collected at the following locations on the same day and times as the license plate data:

- Davies Avenue and Yosemite Street
- Briarwood Blvd. and Yosemite Street
- Arapahoe Road and Yosemite Street
- Uinta Street and Arapahoe Road
- Spruce Street and Arapahoe Road

## 2.3 Walnut Hills Elementary

Walnut Hills Elementary is located at Uinta Street and Costilla Boulevard, in the center of the Walnut Hills neighborhood. Because the school is a destination within the neighborhood, school-related trips that originate outside the neighborhood are not considered cut-through traffic. In order to identify school-related trips that may otherwise be considered cut-through traffic, license plate data were recorded by observation at the Walnut Hills Elementary School student drop-off area during the AM peak data collection period (7:00am – 8:30am).

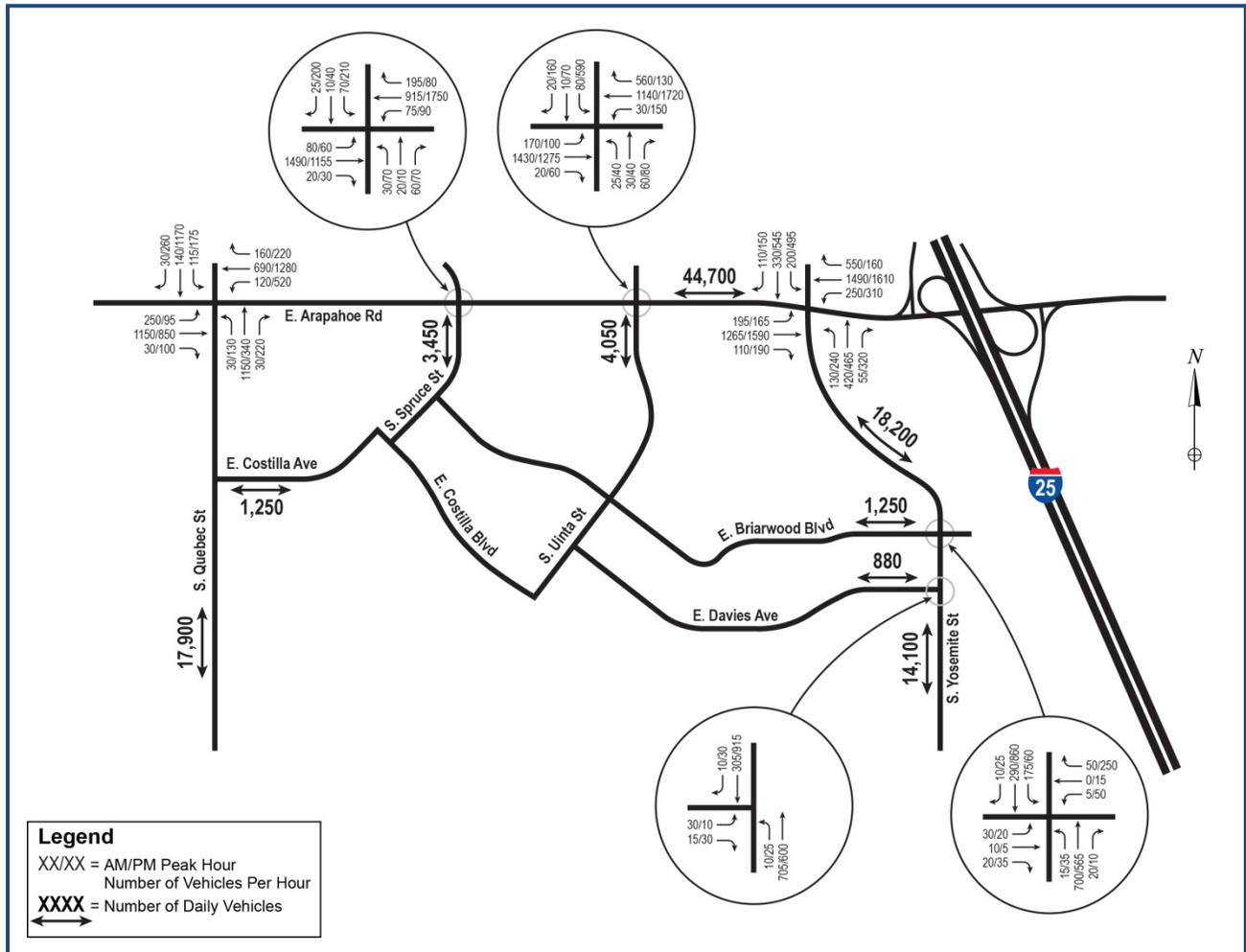
It should be noted that school began at 9:00am and the peak traffic volumes for student drop-off typically occurred 8:45am – 9:00am, so the data collection for this study did not coincide with peak school ingress. Regardless, trips bound for the school are not considered cut-through traffic.

The Cherry Creek School District provided information on the location of the 328 current Walnut Hills Elementary School students' home addresses as input to understand the magnitude of school-related traffic entering the neighborhood. The information indicates that 192 (59%) of the students attending the school reside within the Walnut Hills neighborhood. The other 136 students (41%) reside outside the neighborhood and contribute to the amount of student drop-off/pick-up traffic.

### 3 Existing Traffic Conditions

The existing daily and peak hour traffic volumes are shown in **Figure 3**. In order to capture potential cut-through traffic for all routes, the cameras and counters on Spruce Street and Uinta Street were placed immediately south of Arapahoe Road. Therefore, the daily traffic volumes shown at those locations include some non-residential traffic accessing the commercial businesses along Arapahoe Road. It is expected that volumes on Spruce Street and Uinta Street within the neighborhood are substantially lower.

Figure 3. Existing Traffic Volumes



### 3.1 Travel Times

Travel times were collected for the relevant routes through the neighborhood. Times were recorded while traveling at approximately the speed limit on each roadway. These travel times, as the time that a person drives the route without stopping within the neighborhood, were established as the cut-through travel time for each route. To be conservative, the actual travel times were rounded up to capture vehicles that traveled slower than the speed limit or stopped longer at interior intersections. [Note: A driver entering the neighborhood to pick up someone for carpooling would not be considered cut-through traffic since the driver had a destination and reason to be in the neighborhood.] The travel times are shown in **Table 1**.

**Table 1. Travel Times through Neighborhood**

Route	Actual Travel Time	Cut-Through Travel Time
Costilla Ave – Spruce St	1 min 15 sec	2 minutes
Costilla Ave – Uinta St	2 min 45 sec	3 minutes
Costilla Ave – Briarwood Ave	2 min 55 sec	4 minutes
Costilla Ave – Davies St	3 min 5 sec	4 minutes
Spruce St – Briarwood Ave	2 min 11 sec	3 minutes
Uinta St – Briarwood Ave	2 min 15 sec	3 minutes

### 3.2 License Plate Matches

The license plates of vehicles entering the neighborhood were matched to vehicles exiting the neighborhood. The license plate survey data is included in Appendix A. At the five study locations, a total of 37 vehicles entered and exited the neighborhood during the AM peak period and a total of 138 vehicles entered and exited the neighborhood during the PM peak period, regardless of the time spent within the neighborhood. For example, these totals include vehicles that entered the neighborhood at Uinta Street, remained within the neighborhood for 20 minutes, and exited at Uinta Street. This type of trip is not neighborhood cut-through traffic, but was recorded as a license plate match during data collection.

The license plates of vehicles recorded at the Walnut Hills Elementary school drop-off were compared with the license plates of vehicles that entered and exited the neighborhood during the AM peak period. Six of the 60 vehicles that dropped off children during the AM peak study period were recorded entering the neighborhood, dropping off a child at the elementary school, and then leaving the neighborhood. Most of these six vehicles destined for the elementary school from outside the neighborhood utilized Uinta Street to either enter or exit the Walnut Hills neighborhood.

Vehicles that traveled at or under the defined cut-through time (normal driving time at the posted speed limit) for each route through the neighborhood were identified as cut-through traffic. A total of ten vehicles during the AM peak period and 33 vehicles during the PM peak period were identified as cut-through traffic along the various study routes through the neighborhood.

The numbers of license plate matches for cut-through traffic are summarized in **Tables 2 and 3**.

**Table 2. Existing Cut-Through Traffic Volumes – AM Peak Period (7:00am – 8:30am)**

Entering	Exiting					Total Cut-Through
	Costilla Ave	Spruce St	Uinta St	Briarwood Blvd	Davies Ave	
Costilla Ave	-	2	0	3	0	5
Spruce St	0	-	0	0	0	0
Uinta St	0	0	-	5	0	5
Briarwood Blvd	0	0	0	-	0	0
Davies Ave	0	0	0	0	-	0
Total Cut-Through	0	2	0	8	0	10

**Table 3. Existing Cut-Through Traffic Volumes – PM Peak Period (4:30pm – 6:00pm)**

Entering	Exiting					Total Cut-Through
	Costilla Ave	Spruce St	Uinta St	Briarwood Blvd	Davies Ave	
Costilla Ave	-	7	0	0	0	7
Spruce St	3	-	0	0	0	3
Uinta St	0	0	-	18	0	18
Briarwood Blvd	4	1	0	-	0	5
Davies Ave	0	0	0	0	-	0
Total Cut-Through	7	8	0	18	0	33

The license plate survey shows most routes through the neighborhood experienced no cut-through traffic during the data collection for this study. The route that experienced the most cut-through traffic during the AM and PM peak period was from Uinta Street to Briarwood Boulevard.

### 3.3 Levels of Service

Intersection operations for the intersections surrounding the Walnut Hills neighborhood were evaluated using the existing peak hour traffic volumes and the existing intersection lane geometry and traffic control. The level of service (LOS) and delay results for the overall intersection and relevant approaches/movements are shown in **Tables 4 and 5**.

Under existing conditions, including the improvements recently completed at the I-25 interchange and Arapahoe Road and Yosemite Street intersection, the intersections operate at LOS D or better during the AM and PM peak hours. However, the eastbound Arapahoe Road approach to Yosemite Street operates with substantial delay during the PM peak hour, which may contribute to the cut-through traffic traveling through the neighborhood between Uinta Street and Briarwood Avenue. Drivers traveling eastbound on Arapahoe Road or southbound on Greenwood Plaza Boulevard may be entering the neighborhood at Uinta Street and exiting to southbound Briarwood Avenue to avoid the eastbound congestion to turn right at Yosemite Street. This is

consistent with the relatively high PM peak hour traffic volume leaving versus entering this residential neighborhood (65 vehicles entering and 60 vehicles exiting).

**Table 4. Existing Intersection Level of Service and Delay – AM Peak Hour**

Intersection	LOS	Delay (sec/veh)	Relevant Approach / Movement	LOS	Delay (sec/veh)
Briarwood/Yosemite	B	15.6	Eastbound	D	51.1
Davies/Yosemite	B	14.0	Eastbound Left	B	14.0
Arapahoe/Yosemite	C	32.5	Eastbound	C	24.8
Uinta/Arapahoe	B	13.9	Southbound Left	D	44.3
Spruce/Arapahoe	A	7.9	Northbound	D	51.2

**Table 5. Existing Intersection Level of Service and Delay – PM Peak Hour**

Intersection	LOS	Delay (sec/veh)	Relevant Approach / Movement	LOS	Delay (sec/veh)
Briarwood/Yosemite	B	17.4	Eastbound	D	51.9
Davies/Yosemite	C	15.2	Eastbound Left	C	15.2
Arapahoe/Yosemite	D	53.7	Eastbound	E	63.7
Uinta/Arapahoe	C	21.3	Southbound Left	D	37.2
Spruce/Arapahoe	B	17.6	Northbound	D	50.2

## 4 Findings

The license plate survey results show most routes through the neighborhood experienced no cut-through traffic during the data collection for this study. The cut-through traffic routes with any volume are illustrated in **Figures 4 and 5**. The route that experienced the most cut-through traffic during the AM and PM peak period was from Uinta Street to Briarwood Avenue.

Figure 4. Existing Cut-Through Route Evaluation – AM Peak Period (7:00am – 8:30am)

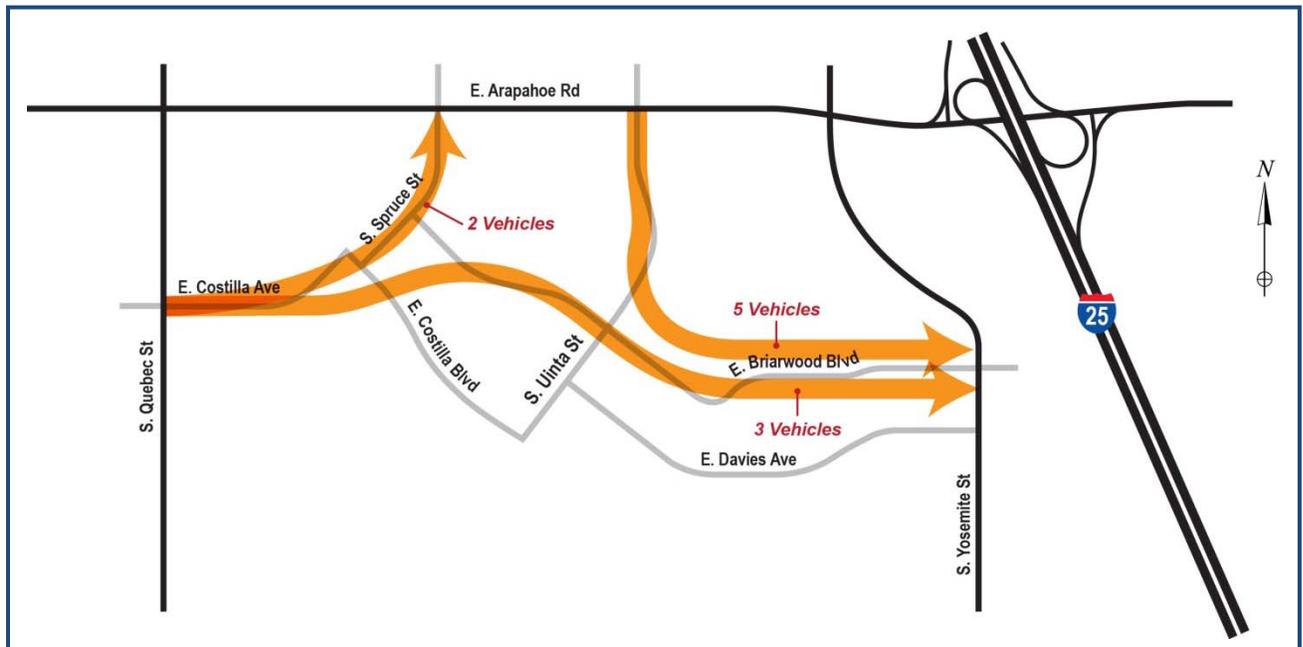
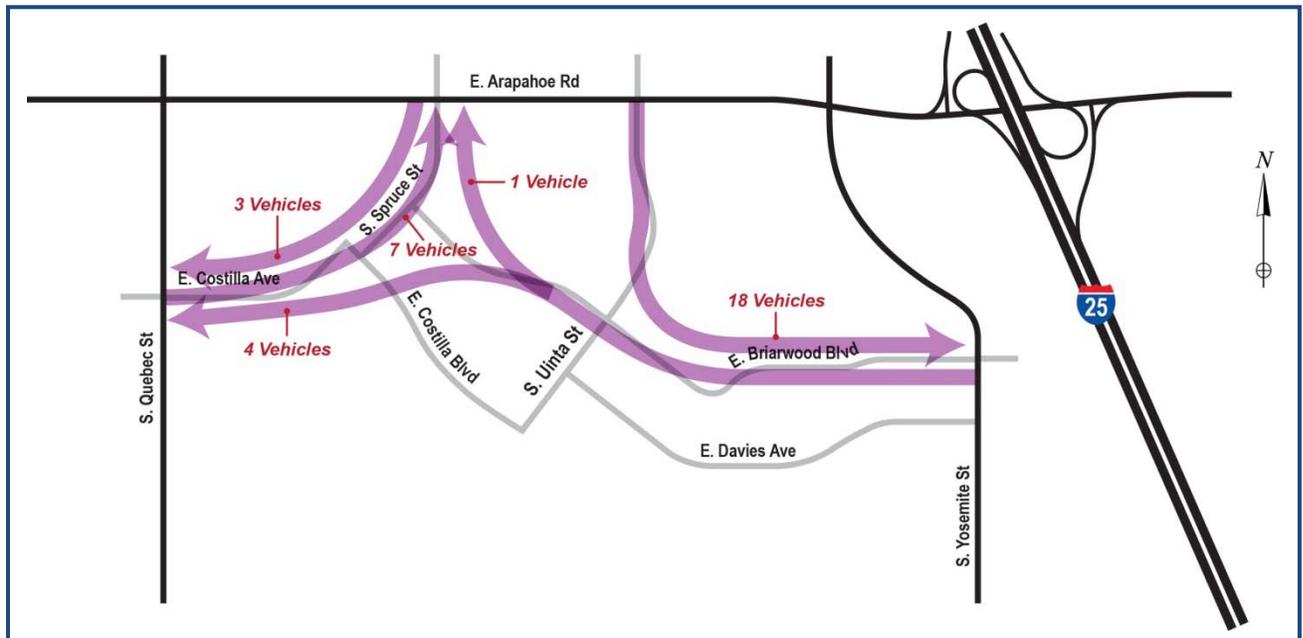


Figure 5. Existing Cut-Through Route Evaluation – PM Peak Period (4:30pm – 6:00pm)



## 5 Conclusions

Under existing conditions, including the improvements recently completed at the I-25 interchange and Arapahoe Road and Yosemite Street intersection, the intersections surrounding the neighborhood operate at LOS D or better during the AM and PM peak hours. However, the eastbound Arapahoe Road approach to Yosemite Street operates with substantial delay during the PM peak hour, which may contribute to the cut-through traffic traveling through the neighborhood between Uinta Street and Briarwood Avenue. Drivers traveling eastbound on Arapahoe Road or southbound on Greenwood Plaza Boulevard may be entering the neighborhood at Uinta Street and exiting to southbound Yosemite via Briarwood Avenue to avoid the eastbound congestion to turn right at Yosemite Street.

## 6 Next Steps

Year 2035 peak hour level of service and delay will be calculated at the relevant neighborhood intersections for the interchange no action and action alternatives evaluated in the I-25/Arapahoe Road Interchange Environmental Assessment.

The existing intersection volume and delay will be compared with year 2035 volume and delay for specific movements providing neighborhood ingress and egress. The potential for future cut-through traffic increase or decrease for the interchange no action and action alternatives will be estimated based on these evaluations and engineering judgment. If the proposed action is anticipated to result in a significant impact due to increase in cut-through traffic, the interchange project would identify options for mitigation. Cut-through traffic unrelated to the interchange action would be a City of Centennial responsibility.



## **APPENDIX A**

### **Origin and Destination Report – License Plate Matches**



# APPENDIX A

## Origination and Destination Report

Study Name: WALNUT HILLS

LICENSE PLATE MATCHES – TOTAL

AM PEAK PERIOD

Site (In → Out) COSTILLA E/O QUEBEC to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-908XXX	7:40	4/6/2011	7:41	4/6/2011	1	

Total Number of Matches: 1

Site (In → Out) COSTILLA E/O QUEBEC to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-213XXX	7:16	4/6/2011	7:18	4/6/2011	2	
CO-456XXX	7:49	4/6/2011	7:51	4/6/2011	2	
CO-250XXX	8:00	4/6/2011	8:08	4/6/2011	8	
CO-897XXX	8:05	4/6/2011	8:10	4/6/2011	5	
CO-976XXX	8:24	4/6/2011	8:34	4/6/2011	10	
CO-731XXX	8:24	4/6/2011	8:33	4/6/2011	9	

Total Number of Matches: 6

Site (In → Out) COSTILLA E/O QUEBEC to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-660XXX	7:15	4/6/2011	7:18	4/6/2011	3	
CO-008XXX	8:05	4/6/2011	8:07	4/6/2011	2	
CO-685XXX	8:25	4/6/2011	8:27	4/6/2011	2	

Total Number of Matches: 3

Site (In → Out) SPRUCE S/O ARAPAHOE to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-863XXX	7:52	4/6/2011	8:31	4/6/2011	39	

Total Number of Matches: 1

Site (In → Out) SPRUCE S/O ARAPAHOE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-288XXX	7:31	4/6/2011	8:28	4/6/2011	57	
CO-626XXX	7:48	4/6/2011	8:29	4/6/2011	41	
CO-731XXX	7:51	4/6/2011	8:33	4/6/2011	42	
CO-343XXX	8:00	4/6/2011	8:08	4/6/2011	8	

Total Number of Matches: 4

Site (In → Out) SPRUCE S/O ARAPAHOE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-512XXX	7:42	4/6/2011	8:34	4/6/2011	52	

Total Number of Matches: 1

Site (In → Out) UINTA S/O ARAPAHOE to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-668XXX	7:58	4/6/2011	8:06	4/6/2011	8	

Total Number of Matches: 1

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

Site (In → Out) UINTA S/O ARAPAHOE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-386XXX	7:48	4/6/2011	8:00	4/6/2011	12	

Total Number of Matches: 1

Site (In → Out) UINTA S/O ARAPAHOE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-969XXX	7:25	4/6/2011	7:48	4/6/2011	23	
CO-381XXX	7:40	4/6/2011	7:49	4/6/2011	9	
CO-308XXX	7:41	4/6/2011	8:15	4/6/2011	34	
CO-661XXX	7:44	4/6/2011	7:54	4/6/2011	10	
CO-969XXX	7:47	4/6/2011	7:48	4/6/2011	1	
CO-108XXX	7:53	4/6/2011	8:11	4/6/2011	18	
CO-6EQXXX	8:03	4/6/2011	8:11	4/6/2011	8	
CO-962XXX	8:05	4/6/2011	8:11	4/6/2011	6	
CO-911XXX	8:11	4/6/2011	8:21	4/6/2011	10	
CO-364XXX	8:16	4/6/2011	8:19	4/6/2011	3	

Total Number of Matches: 10

Site (In → Out) UINTA S/O ARAPAHOE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-558XXX	7:38	4/6/2011	7:40	4/6/2011	2	
CO-822XXX	7:48	4/6/2011	7:50	4/6/2011	2	
CO-NIXXX	8:00	4/6/2011	8:02	4/6/2011	2	
CO-402XXX	8:09	4/6/2011	8:11	4/6/2011	2	
CO-563XXX	8:19	4/6/2011	8:21	4/6/2011	2	

Total Number of Matches: 5

Site (In → Out) BRIARWOOD W/O YOSEMITE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-PCBXXX	8:09	4/6/2011	8:13	4/6/2011	4	

Total Number of Matches: 1

Site (In → Out) BRIARWOOD W/O YOSEMITE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-PBUXXXX	7:56	4/6/2011	7:59	4/6/2011	3	

Total Number of Matches: 1

Site (In → Out) BRIARWOOD W/O YOSEMITE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-612XXX	7:00	4/6/2011	7:37	4/6/2011	37	

Total Number of Matches: 1

Site (In → Out) DAVIES W/O YOSEMITE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-807XXX	7:56	4/6/2011	8:02	4/6/2011	6	

Total Number of Matches: 1

Total Number of Matches: 37

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

## Origination and Destination Report

Study Name: WALNUT HILLS

LICENSE PLATE MATCHES – TOTAL

PM PEAK PERIOD

Site (In → Out) COSTILLA E/O QUEBEC to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-074XXX	16:35	4/6/2011	16:43	4/6/2011	8	
CO-887XXX	16:43	4/6/2011	16:46	4/6/2011	3	
CO-668XXX	17:07	4/6/2011	17:07	4/6/2011	0	
CO-501XXX	17:36	4/6/2011	17:39	4/6/2011	3	
CO-070XXX	17:39	4/6/2011	17:39	4/6/2011	0	
CO-316XXX	17:44	4/6/2011	17:46	4/6/2011	2	
CO-533XXX	17:56	4/6/2011	17:56	4/6/2011	0	
CO-255XXX	17:58	4/6/2011	17:58	4/6/2011	0	

Total Number of Matches: 8

Site (In → Out) COSTILLA E/O QUEBEC to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-207XXX	16:27	4/6/2011	16:29	4/6/2011	2	
CO-566XXX	16:27	4/6/2011	17:28	4/6/2011	61	
CO-298XXX	16:31	4/6/2011	16:33	4/6/2011	2	
CO-339XXX	16:37	4/6/2011	16:39	4/6/2011	2	
CO-762XXX	16:50	4/6/2011	16:57	4/6/2011	7	
CO-102XXX	16:56	4/6/2011	18:12	4/6/2011	76	
CO-215XXX	17:01	4/6/2011	17:39	4/6/2011	38	
CO-863XXX	17:23	4/6/2011	17:25	4/6/2011	2	
CO-805XXX	17:23	4/6/2011	17:25	4/6/2011	2	
CO-299XXX	17:43	4/6/2011	17:45	4/6/2011	2	
CO-907XXX	17:50	4/6/2011	17:52	4/6/2011	2	

Total Number of Matches: 11

Site (In → Out) COSTILLA E/O QUEBEC to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-668XXX	17:07	4/6/2011	17:18	4/6/2011	11	

Total Number of Matches: 1

Site (In → Out) COSTILLA E/O QUEBEC to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-340XXX	17:20	4/6/2011	17:25	4/6/2011	5	

Total Number of Matches: 1

Site (In → Out) SPRUCE S/O ARAPAHOE to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-762XXX	16:37	4/6/2011	16:43	4/6/2011	6	
CO-833XXX	16:56	4/6/2011	16:56	4/6/2011	0	
CO-244XXX	17:12	4/6/2011	17:15	4/6/2011	3	
CO-EIFXXX	17:20	4/6/2011	17:21	4/6/2011	1	
CO-596XXX	17:30	4/6/2011	17:46	4/6/2011	16	
CO-007XXX	17:32	4/6/2011	17:33	4/6/2011	1	

Total Number of Matches: 6

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

Site (In → Out) SPRUCE S/O ARAPAHOE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-044XXX	16:32	4/6/2011	17:18	4/6/2011	46	
CO-762XXX	16:37	4/6/2011	16:57	4/6/2011	20	
CO-639XXX	16:40	4/6/2011	16:50	4/6/2011	10	
CO-377XXX	16:41	4/6/2011	18:10	4/6/2011	89	
CO-044XXX	16:42	4/6/2011	17:20	4/6/2011	38	
CO-059XXX	16:46	4/6/2011	17:09	4/6/2011	23	
CO-125XXX	16:54	4/6/2011	18:08	4/6/2011	74	
CO-102XXX	16:54	4/6/2011	18:12	4/6/2011	78	
CO-158XXX	16:56	4/6/2011	17:18	4/6/2011	22	
CO-014XXX	16:58	4/6/2011	17:40	4/6/2011	42	
CO-616XXX	16:59	4/6/2011	18:23	4/6/2011	84	
CO-667XXX	16:59	4/6/2011	17:23	4/6/2011	24	
CO-741XXX	17:00	4/6/2011	18:18	4/6/2011	78	
CO-220XXX	17:02	4/6/2011	17:33	4/6/2011	31	
CO-022XXX	17:02	4/6/2011	17:20	4/6/2011	18	
CO-403XXX	17:04	4/6/2011	17:11	4/6/2011	7	
CO-261XXX	17:08	4/6/2011	17:37	4/6/2011	29	
CO-871XXX	17:11	4/6/2011	17:37	4/6/2011	26	
CO-678XXX	17:11	4/6/2011	17:33	4/6/2011	22	
CO-ACXXXXX	17:12	4/6/2011	17:17	4/6/2011	5	
CO-124XXX	17:23	4/6/2011	17:25	4/6/2011	2	
CO-777XXX	17:26	4/6/2011	17:39	4/6/2011	13	
CO-501XXX	17:32	4/6/2011	17:58	4/6/2011	26	
CO-645XXX	17:32	4/6/2011	17:34	4/6/2011	2	

Total Number of Matches: 24

Site (In → Out) SPRUCE S/O ARAPAHOE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-290XXX	16:30	4/6/2011	17:30	4/6/2011	60	
CO-752XXX	16:35	4/6/2011	16:39	4/6/2011	4	
CO-205XXX	16:54	4/6/2011	17:31	4/6/2011	37	
CO-302XXX	17:07	4/6/2011	17:08	4/6/2011	1	
CO-968XXX	17:41	4/6/2011	17:48	4/6/2011	7	

Total Number of Matches: 5

Site (In → Out) SPRUCE S/O ARAPAHOE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-362XXX	16:48	4/6/2011	17:15	4/6/2011	27	
CO-118XXX	17:08	4/6/2011	17:12	4/6/2011	4	

Total Number of Matches: 2

Site (In → Out) SPRUCE S/O ARAPAHOE to DAVIES W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-290XXX	16:30	4/6/2011	17:22	4/6/2011	52	

Total Number of Matches: 1

Site (In → Out) UINTA S/O ARAPAHOE to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-656XXX	16:37	4/6/2011	17:05	4/6/2011	28	
CO-539XXX	17:00	4/6/2011	17:52	4/6/2011	52	
CO-902XXX	17:08	4/6/2011	17:18	4/6/2011	10	
CO-283XXX	17:25	4/6/2011	17:35	4/6/2011	10	

Total Number of Matches: 4

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

Site (In → Out) UINTA S/O ARAPAHOE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-993XXX	16:56	4/6/2011	16:56	4/6/2011	0	
CO-192XXX	17:15	4/6/2011	17:26	4/6/2011	11	
CO-297XXX	17:44	4/6/2011	17:44	4/6/2011	0	

Total Number of Matches: 3

Site (In → Out) UINTA S/O ARAPAHOE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-290XXX	16:27	4/6/2011	17:30	4/6/2011	63	
CO-196XXX	16:31	4/6/2011	16:36	4/6/2011	5	
CO-694XXX	16:42	4/6/2011	17:10	4/6/2011	28	
CO-770XXX	16:44	4/6/2011	17:55	4/6/2011	71	
CO-951XXX	16:49	4/6/2011	17:10	4/6/2011	21	
CO-870XXX	17:06	4/6/2011	17:14	4/6/2011	8	
CO-101XXX	17:13	4/6/2011	17:33	4/6/2011	20	
CO-049XXX	17:21	4/6/2011	17:41	4/6/2011	20	
CO-560XXX	17:23	4/6/2011	17:31	4/6/2011	8	

Total Number of Matches: 9

Site (In → Out) UINTA S/O ARAPAHOE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-932XXX	16:26	4/6/2011	16:28	4/6/2011	2	
CO-012XXX	16:26	4/6/2011	16:38	4/6/2011	12	
CO-579XXX	16:27	4/6/2011	17:11	4/6/2011	44	
CO-511XXX	16:34	4/6/2011	16:36	4/6/2011	2	
CO-063XXX	16:35	4/6/2011	16:37	4/6/2011	2	
CO-PAXXXXX	16:36	4/6/2011	17:04	4/6/2011	28	
CO-185XXX	16:39	4/6/2011	16:45	4/6/2011	6	
CO-504XXX	16:46	4/6/2011	17:17	4/6/2011	31	
CO-678XXX	16:52	4/6/2011	16:54	4/6/2011	2	
CO-748XXX	16:52	4/6/2011	16:54	4/6/2011	2	
CO-601XXX	16:56	4/6/2011	16:58	4/6/2011	2	
CO-903XXX	16:58	4/6/2011	17:01	4/6/2011	3	
CO-021XXX	17:00	4/6/2011	17:02	4/6/2011	2	
CO-446XXX	17:01	4/6/2011	17:03	4/6/2011	2	
CO-267XXX	17:05	4/6/2011	17:07	4/6/2011	2	
CO-549XXX	17:07	4/6/2011	17:09	4/6/2011	2	
CO-096XXX	17:10	4/6/2011	17:12	4/6/2011	2	
CO-PAWXXXX	17:14	4/6/2011	17:16	4/6/2011	2	
CO-885XXX	17:17	4/6/2011	17:19	4/6/2011	2	
CO-296XXX	17:18	4/6/2011	17:20	4/6/2011	2	
CO-982XXX	17:22	4/6/2011	17:24	4/6/2011	2	
CO-PCCXXXX	17:22	4/6/2011	17:24	4/6/2011	2	
CO-496XXX	17:36	4/6/2011	17:38	4/6/2011	2	
CO-052XXX	17:50	4/6/2011	17:52	4/6/2011	2	
CO-PBFXXXX	17:51	4/6/2011	17:54	4/6/2011	3	

Total Number of Matches: 25

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

Site (In → Out) UINTA S/O ARAPAHOE to DAVIES W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-290XXX	16:27	4/6/2011	17:22	4/6/2011	55	
CO-661XXX	16:47	4/6/2011	16:50	4/6/2011	3	
CO-256XXX	17:06	4/6/2011	17:09	4/6/2011	3	
CO-790XXX	17:13	4/6/2011	17:16	4/6/2011	3	
CO-911XXX	17:37	4/6/2011	17:39	4/6/2011	2	
CO-304XXX	17:48	4/6/2011	18:05	4/6/2011	17	
CO-285XXX	18:00	4/6/2011	18:03	4/6/2011	3	

Total Number of Matches: 7

Site (In → Out) BRIARWOOD W/O YOSEMITE to COSTILLA E/O QUEBEC

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-419XXX	16:25	4/6/2011	16:29	4/6/2011	4	
CO-628XXX	16:38	4/6/2011	16:42	4/6/2011	4	
CO-656XXX	17:02	4/6/2011	17:05	4/6/2011	3	
CO-337XXX	17:12	4/6/2011	17:16	4/6/2011	4	

Total Number of Matches: 4

Site (In → Out) BRIARWOOD W/O YOSEMITE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-118XXX	16:29	4/6/2011	17:10	4/6/2011	41	
CO-553XXX	16:29	4/6/2011	16:33	4/6/2011	4	
CO-331XXX	16:35	4/6/2011	16:40	4/6/2011	5	
CO-694XXX	16:37	4/6/2011	16:40	4/6/2011	3	
CO-246XXX	16:43	4/6/2011	16:48	4/6/2011	5	
CO-221XXX	17:31	4/6/2011	17:35	4/6/2011	4	

Total Number of Matches: 6

Site (In → Out) BRIARWOOD W/O YOSEMITE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-803XXX	17:28	4/6/2011	17:31	4/6/2011	3	
CO-169XXX	17:36	4/6/2011	17:39	4/6/2011	3	

Total Number of Matches: 2

Site (In → Out) BRIARWOOD W/O YOSEMITE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-439XXX	16:29	4/6/2011	16:30	4/6/2011	1	
CO-553XXX	16:29	4/6/2011	16:30	4/6/2011	1	
CO-392XXX	16:31	4/6/2011	16:31	4/6/2011	0	
CO-694XXX	16:37	4/6/2011	16:38	4/6/2011	1	
CO-860XXX	16:44	4/6/2011	17:11	4/6/2011	27	
CO-950XXX	16:49	4/6/2011	16:55	4/6/2011	6	
CO-617XXX	16:50	4/6/2011	16:50	4/6/2011	0	
CO-259XXX	16:51	4/6/2011	17:20	4/6/2011	29	
CO-947XXX	16:54	4/6/2011	17:00	4/6/2011	6	
CO-877XXX	16:57	4/6/2011	17:22	4/6/2011	25	
CO-725XXX	17:09	4/6/2011	17:10	4/6/2011	1	
CO-288XXX	17:12	4/6/2011	17:31	4/6/2011	19	
CO-803XXX	17:28	4/6/2011	17:29	4/6/2011	1	

Total Number of Matches: 13

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

Site (In → Out) DAVIES W/O YOSEMITE to SPRUCE S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-417XXX	17:25	4/6/2011	17:31	4/6/2011	6	

Total Number of Matches: 1

Site (In → Out) DAVIES W/O YOSEMITE to UINTA S/O ARAPAHOE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-807XXX	17:01	4/6/2011	17:03	4/6/2011	2	
CO-999XXX	17:19	4/6/2011	17:30	4/6/2011	11	

Total Number of Matches: 2

Site (In → Out) DAVIES W/O YOSEMITE to BRIARWOOD W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-564XXX	16:34	4/6/2011	17:05	4/6/2011	31	
CO-543XXX	17:09	4/6/2011	17:10	4/6/2011	1	

Total Number of Matches: 2

Site (In → Out) DAVIES W/O YOSEMITE to DAVIES W/O YOSEMITE

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time	Vehicle
CO-302XXX	17:04	4/6/2011	17:56	4/6/2011	52	

Total Number of Matches: 1

Total Number of Matches: 138

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

## Walnut Hills Elementary School Drop-off Vehicles AM Peak Period

<b>Time:</b>	<b>License Plate Number:</b>
7:05	CO-392XXX
7:08	CO-304XXX
7:08	CO-402XXX
7:15	CO-832XXX
7:15	CO-817XXX
7:17	CO-560XXX
7:18	CO-630XXX
7:19	CO-902XXX
7:25	CO-HOCKXXX
7:27	CO-408XXX
7:27	CO-767XXX
7:27	CO-772XXX
7:28	CO-612XXX
7:28	CO-161XXX
7:31	CO-596XXX
7:31	CO-612XXX
7:35	CO-709XXX
7:35	CO-251XXX
7:37	CO-969XXX
7:37	CO-859XXX
7:38	CO-445XXX
7:39	CO-500XXX
7:39	CO-405XXX
7:40	CO-854XXX
7:41	CO-457XXX
7:43	CO-494XXX
7:43	CO-381XXX
7:43	CO-426XXX
7:46	CO-014XXX
7:46	CO-072XXX
7:46	CO-697XXX
7:49	CO-590XXX

**NOTE:** Last digits of license plates concealed for privacy.

# APPENDIX A

## Walnut Hills Elementary School Drop-off Vehicles AM Peak Period

<b>Time:</b>	<b>License Plate Number:</b>
7:50	CO-975XXX
7:52	CO-053XXX
7:54	CO-453XXX
7:54	CO-149XXX
7:56	CO-108XXX
7:57	CO-951XXX
7:57	CO-299XXX
7:58	CO-526XXX
7:58	CO-812XXX
7:58	CO-816XXX
7:58	CO-809XXX
7:59	CO-386XXX
8:00	CO-818XXX
8:00	CO-030XXX
8:01	CO-535XXX
8:02	CO-668XXX
8:03	CO-174XXX
8:04	CO-250XXX
8:05	CO-AAAXXXX
8:05	CO-944XXX
8:06	CO-FIDXXX
8:10	CO-909XXX
8:12	CO-919XXX
8:20	CO-JSHXXX
8:20	CO-917XXX
8:22	CO-553XXX
8:23	CO-182XXX
8:29	CO-125XXX

**NOTE:** Last digits of license plates concealed for privacy.



## **APPENDIX B**

### **City of Centennial Supplemental Information to the Walnut Hills Neighborhood Traffic Study**



# APPENDIX B

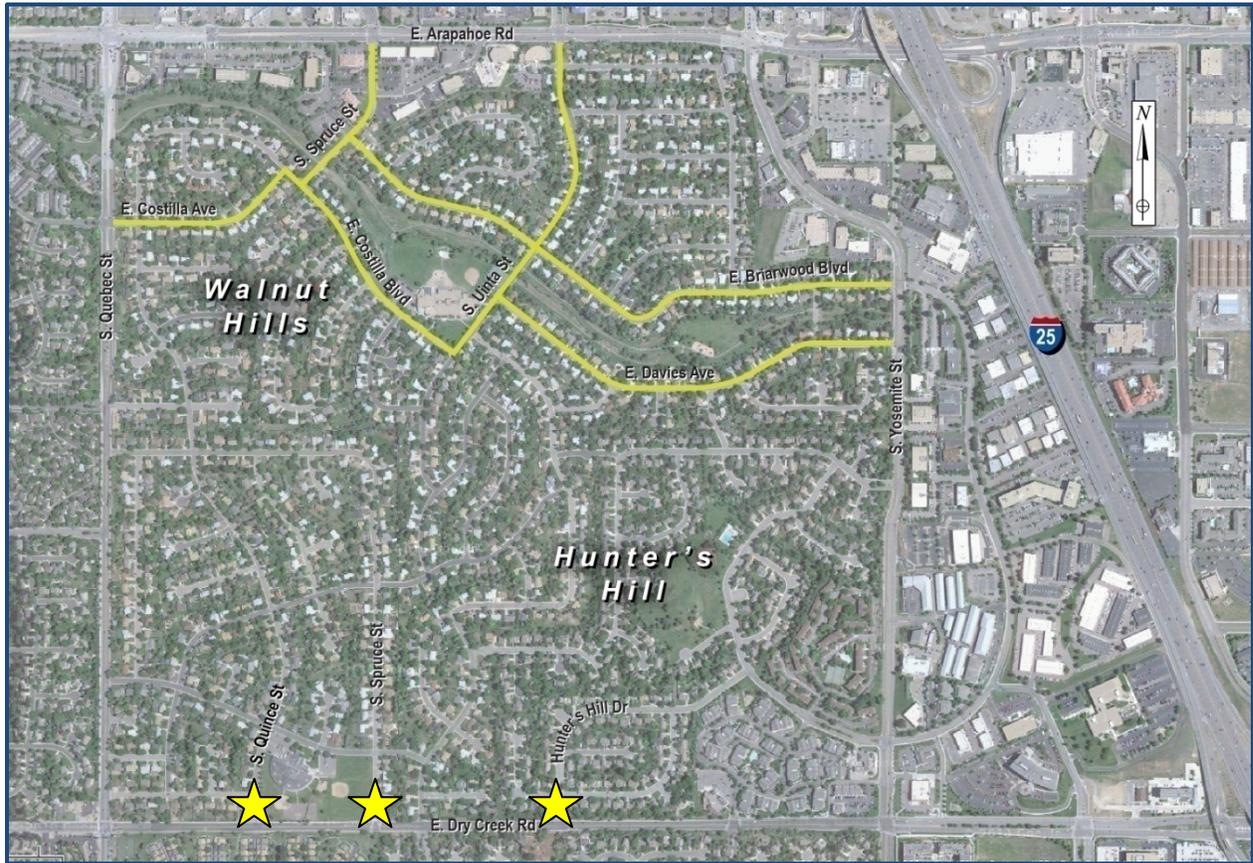
## City of Centennial Supplemental Information to the Walnut Hills Neighborhood Traffic Study

### 1 Introduction

As part of a separate but coordinated study to identify cut-through trips between Arapahoe Road and Dry Creek Road, the City of Centennial collected license plate data by observation during the same time periods. Data was collected from the following three intersections along Dry Creek Road within the Walnut Hills and Hunters Hill neighborhoods: Quince Street, Spruce Street, and Hunters Hill Drive. This data was then compared with license plate data collected from the Walnut Hills study to identify license plate matches and trips meeting the timeframe requirements established for a cut-through trip from Arapahoe Road to Dry Creek Road, and also in the reverse direction.

The intersection locations for the supplemental study are identified in **Figure B-1**.

Figure B-1. Study Area and Intersection Locations for the Supplemental Study



★ - Supplemental Study Locations

## 2 Origin-Destination Data

The definition of a neighborhood cut-through trip is a trip coming from and going to outside the neighborhood, with no purpose/destination in the neighborhood. In order to measure the cut-through traffic traveling through the Walnut Hills and Hunters Hill neighborhoods, license plate data of vehicles entering and exiting the neighborhood were manually recorded. The data collection occurred during the morning and evening peak hours of April 6, 2011 at the following locations and during the following times:

- Time periods:
  - AM peak 7:00 to 8:30 am
  - PM peak 4:30 to 6:00 pm
- Locations:
  - Quince Street north of Dry Creek Road
  - Spruce Street north of Dry Creek Road
  - Hunters Hill Drive north of Dry Creek Road

The time and license plate of each vehicle entering and exiting the neighborhood at the study locations were manually recorded.

## 3 License Plate Matches

The license plates of vehicles entering and exiting the neighborhood at Dry Creek Road were matched to vehicles entering and exiting the neighborhood at the five study locations in the Walnut Hills study. At the three locations along Dry Creek Road, a total of 273 vehicles entered and exited the neighborhood during the AM peak period and a total of 377 vehicles entered and exited the neighborhood during the PM peak period, regardless of the time spent within the neighborhood.

Because of the number of potential routes a motorist could use to travel from Arapahoe Road to Dry Creek Road, and in the reverse direction, a conservative estimate of eight (8) minutes was used for the cut-through travel time from Arapahoe Road to Dry Creek Road. This estimate is an average of several routes considered as potential cut-through routes. Vehicles that traveled at or under this estimated cut-through time (normal driving time at the posted speed limit) were identified as cut-through traffic. A total of zero (0) vehicles during the AM peak period and eight (8) vehicles during the PM peak period were identified as cut-through traffic.

The numbers of license plate matches for cut-through traffic during the PM peak period are summarized in **Table B-1**. The route that experienced the most cut-through traffic during the PM peak period was from Uinta Street to Spruce Street (S).

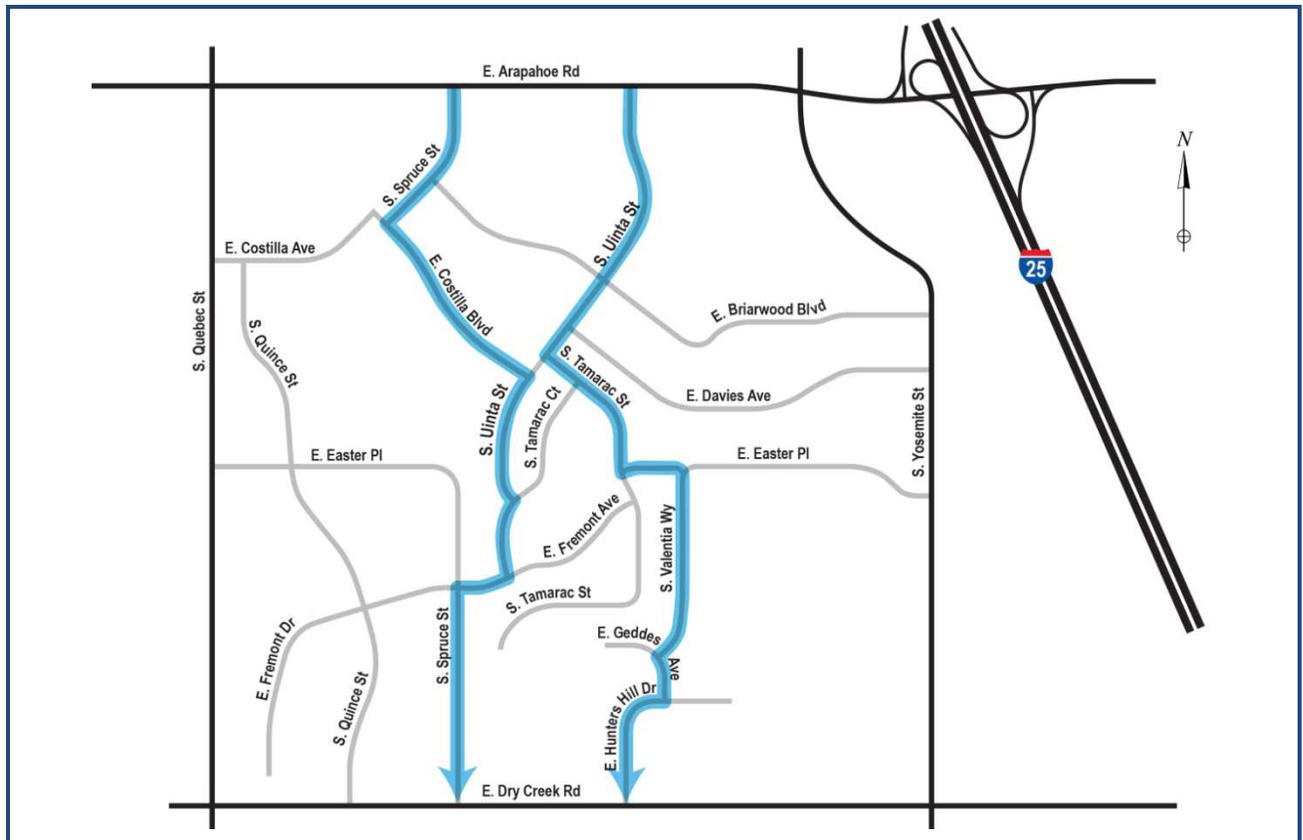
Table B-1. Existing Cut-Through Traffic Volumes – PM Peak Period (4:30pm – 6:00pm)

Entering	Exiting					Total Cut-Through
	Quince St	Spruce St (S)	Hunters Hill Dr	Uinta St	Spruce St (N)	
Quince St	-	0	0	0	0	0
Spruce St (S)	0	-	0	0	0	0
Hunters Hill Dr	0	0	-	0	0	0
Uinta St	0	5	2	-	0	7
Spruce St (N)	0	1	0	0	-	1
Total Cut-Through	0	6	2	0	0	8

## 4 Findings

The license plate survey results show most routes through the neighborhood experienced no cut-through traffic during the data collection for this study. During the AM peak period, no cut-through trips were identified from Arapahoe Road to Dry Creek Road, and in the reverse direction. During the PM peak period, the “approximate” cut-through traffic routes with any volume are illustrated in **Figure B-2**. Since there are a myriad of routes available to use to travel from Arapahoe Road to Dry Creek Road, this graphic illustrates the routes based on the most direct route.

Figure B-2. Existing Cut-Through Route Evaluation – PM Peak Period (4:30pm – 6:00pm)



## Origination and Destination Report

Study Name: WALNUT HILLS

LICENSE PLATE MATCHES – TOTAL

PM PEAK PERIOD

Site (In – Out) UINTA S/O ARAPAHOE to SPRUCE N/O DRY CREEK

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time
CO-644XXX	16:34	4/6/2011	16:42	4/6/2011	8
CO-850XXX	16:59	4/6/2011	17:04	4/6/2011	5
CO-142XXX	17:18	4/6/2011	17:24	4/6/2011	6
CO-112XXX	17:21	4/6/2011	17:29	4/6/2011	8
CO-946XXX	17:24	4/6/2011	17:30	4/6/2011	6

Site (In – Out) UINTA S/O ARAPAHOE to HUNTERS HILL N/O DRY CREEK

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time
CO-290XXX	16:27	4/6/2011	16:33	4/6/2011	6
CO-492XXX	17:32	4/6/2011	17:39	4/6/2011	7

Site (In – Out) SPRUCE S/O to SPRUCE N/O DRY CREEK

Plate Number	Time In	Date In	Time Out	Date Out	Travel Time
CO-ADBXXX	17:02	4/6/2011	17:09	4/6/2011	7