City of Boulder

DRIVE TIME 2014

Arapahoe Avenue • Valmont Road • Broadway

Prepared by:
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and
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1.0 Background

A drive time study measuring the time it takes to get across the City of Boulder during peak traffic hours (7:30am, 12:00pm, and 5:00 pm) has been performed each year since 1986. The purpose of these annual studies is to determine how congestion on the major arteries in Boulder is changing over time.

Historically, in even-numbered years, the north/south routes (Broadway, 28th Street, and recently Foothills Parkway) have been studied and in odd-numbered years, the east/west routes (Arapahoe Avenue, Valmont Road, and Pearl Street) have been studied (see **Methodology** section for exact routes). This report focuses on the results from 2014 for the following studied routes:

1. Arapahoe Avenue (east/west)
2. Valmont Road (east/west)
3. Broadway (north/south)

This year Pearl Street was under construction and the data would not be accurately representative if collected. Therefore, Pearl Street was replaced by Broadway. **Appendix I** contains comparison summaries of drive time information by street and direction for all years. **Appendix II** contains the results in detail for data collected in 2014. Refer to older reports for detailed results of past study years.

The frequency of travel time and delay studies in the City has been reduced in the past few years due to budgetary constraints. Thus, the previous east-west travel time evaluations were performed in 2010 and the north-south in 2012. Prior to 2004, these studies were performed by staff of the City of Boulder Audit and Evaluation Division. Since 2004, data has been collected by a consultant team consisting of Fox Tuttle Hernandez Transportation Group, LLC and Short Elliott Hendrickson, Inc.

In 2004, a significant change in study methodology was made: travel time runs were aborted any time there were conditions along the corridor that were considered atypical. This may have been due to construction, lane closures, traffic accidents, or severe weather. Since these runs, which are typically much longer and experience greater delays, were removed from the data set, the average trip times after 2004 are generally shorter than previous years and direct comparisons between new data and previous study years may not be relevant. This change was made to provide a more direct evaluation of the performance of the corridor signal system by only collecting data in typical conditions.

Note: Prior to 2004, the travel time and delay study areas on Broadway and Arapahoe Avenue were shorter than today's corridor. Broadway used to terminate at Violet Avenue on the north

end and has been extended to Lee Hill Road. Arapahoe Avenue used to terminate at 55th Street on the east end and has been extended to 65th Street. This year Arapahoe Avenue was extended even further east to 75th Street, which is included in the results of the full corridor. Throughout this report, where comparisons are made to pre-2004 data in this report, only the original study area segments were included in the calculations to provide a consistent basis for comparison. When tables are not comparing historical data, the results from the full corridor is reported.

2.0 Comparison of Drive Time by Street

The average trip times and average time spent stopped (or "stopped time") on Arapahoe Avenue, Valmont Road, and Broadway from 1986/87 to 2014 are displayed in **Figure 1**. In Summary:

- **Arapahoe Avenue:** The total travel times remained fairly constant between 1987 and 1999 and then experienced a dramatic spike in travel time in 2001. After a slight decrease in travel time in 2003, travel times on Arapahoe Avenue dropped significantly in 2005. This decrease may be partially attributable to the change in data collection methods discussed in previously in this report. Since 2005, travel times and stopped times have remained consistent.

  The 2001 report did not provide potential reasoning for the spike that occurred in that year along Arapahoe Avenue, though the Broadway construction project may have contributed to these results. The Broadway project heavily affected the Arapahoe Avenue / Broadway intersection and would have been expected to result in increased delays there. The Broadway project did not extend to the Valmont Road corridor. Considering that the Valmont Road corridor did not experience the same increases as the Arapahoe Avenue corridor did in 2001, the theory that the Broadway project contributed to the increased travel times on Arapahoe Avenue is plausible.

- **Valmont Road:** The total trip times have remained relatively constant, with the 2014 mean total trip time within seven seconds of the 1987 value. Stopped times have also remained relatively constant from 1987 to 2014 along Valmont Road with 2014 matching the stopped time from 1987.

- **Broadway:** The average trip times and stopped time on Broadway have increased steadily between 1986 and 1998, with a sharp increase between 1998 and 2000. After 2000, total trip times decreased steadily to a 12-year low-point in 2004. Recent data shows similar rates of increase in travel and stop times as pre-1998 data. There were no significant changes to travel or stopped times in 2014. The most recent travel time results are nearly identical to those reported in 2012.

As discussed in previous reports, the Skunk Creek underpass project on Broadway may have contributed to the spike in 2000. The dip in 2004 was most likely due to a change in the study methodology which excluded travel time runs during atypical conditions (construction, lane closures, traffic accidents, severe weather). The reduction in travel times in 2004 may also have been partially attributable to corridor signal timing and roadway improvements, completion of the Broadway reconstruction project between University Avenue & Pine Street (both from decreases in construction-related delays and some diversion of traffic to other parallel corridors), and overall decrease in traffic volumes on this corridor compared to previous years.

Figure 1. Comparison of Total Trip Time and Time Stopped (1986/87 to 2014)

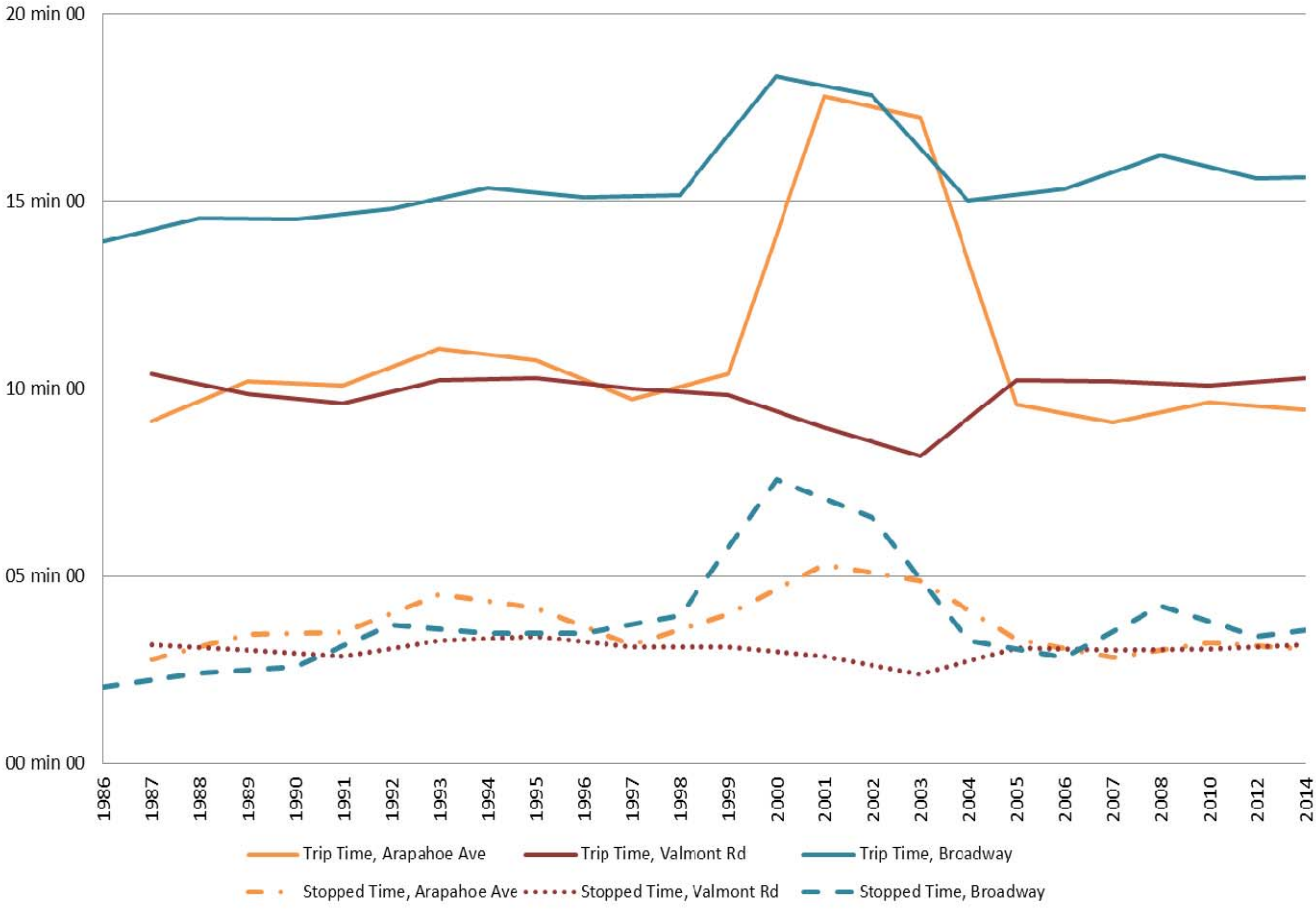


Table 1 (next page) shows the mean trip times, mean time spent stopped, and the mean percent of time spent stopped by year. Differences between each study year and the first year the corridor was studied (1987 for Arapahoe Avenue and Valmont Road, 1986 for Broadway) are presented as well.

Table 1. Comparison of Mean Total Trip Time, Mean Total Time Stopped, and Mean Percent of Time Stopped for Arapahoe Avenue, Valmont Road, and Broadway

Street	Year	Mean Total Trip Time		Mean Total Time Stopped		Mean % of Time Stopped	
		Trip Time	Difference from First Year of Data	Time Stopped	Difference from First Year of Data	Percent of Time Stopped	Difference from First Year of Data
Arapahoe Avennue	1987	09 min 07 sec	n/a	02 min 46 sec	n/a	30%	n/a
	1989	10 min 11 sec	+ 01 min 04 sec	03 min 27 sec	+ 00 min 41 sec	33%	+ 3%
	1991	10 min 04 sec	+ 00 min 57 sec	03 min 30 sec	+ 00 min 44 sec	34%	+ 4%
	1993	11 min 03 sec	+ 01 min 56 sec	04 min 31 sec	+ 01 min 45 sec	38%	+ 8%
	1995	10 min 45 sec	+ 01 min 38 sec	04 min 08 sec	+ 01 min 22 sec	37%	+ 7%
	1997	09 min 43 sec	+ 00 min 36 sec	03 min 10 sec	+ 00 min 24 sec	33%	+ 3%
	1999	10 min 23 sec	+ 01 min 16 sec	03 min 59 sec	+ 01 min 13 sec	36%	+ 6%
	2001	17 min 47 sec	+ 08 min 40 sec	05 min 18 sec	+ 02 min 32 sec	30%	- no change
	2003	17 min 14 sec	+ 08 min 07 sec	04 min 53 sec	+ 02 min 07 sec	29%	- 1%
	2005	09 min 35 sec	+ 00 min 28 sec	03 min 18 sec	+ 00 min 32 sec	33%	+ 3%
	2007	09 min 06 sec	- 00 min 01 sec	02 min 50 sec	+ 00 min 04 sec	30%	- no change
	2010	09 min 38 sec	+ 00 min 31 sec	03 min 13 sec	+ 00 min 27 sec	32%	+ 2%
	2014	09 min 26 sec	+ 00 min 19 sec	03 min 03 sec	+ 00 min 17 sec	31%	+ 1%
Valmont Road	1987	10 min 23 sec	n/a	03 min 10 sec	n/a	30%	n/a
	1989	09 min 52 sec	- 00 min 31 sec	03 min 02 sec	- 00 min 08 sec	30%	- no change
	1991	09 min 36 sec	- 00 min 47 sec	02 min 52 sec	- 00 min 18 sec	29%	- 1%
	1993	10 min 14 sec	- 00 min 09 sec	03 min 16 sec	+ 00 min 06 sec	31%	+ 1%
	1995	10 min 16 sec	- 00 min 07 sec	03 min 24 sec	+ 00 min 14 sec	32%	+ 2%
	1997	10 min 00 sec	- 00 min 23 sec	03 min 07 sec	- 00 min 03 sec	31%	+ 1%
	1999	09 min 50 sec	- 00 min 33 sec	03 min 07 sec	- 00 min 03 sec	31%	+ 1%
	2001	08 min 57 sec	- 01 min 26 sec	02 min 51 sec	- 00 min 19 sec	31%	+ 1%
	2003	08 min 12 sec	- 02 min 11 sec	02 min 23 sec	- 00 min 47 sec	25%	- 5%
	2005	10 min 13 sec	- 00 min 10 sec	03 min 05 sec	- 00 min 05 sec	29%	- 1%
	2007	10 min 12 sec	- 00 min 11 sec	03 min 02 sec	- 00 min 08 sec	28%	- 2%
	2010	10 min 04 sec	- 00 min 19 sec	03 min 03 sec	- 00 min 07 sec	29%	- 1%
	2014	10 min 16 sec	- 00 min 07 sec	03 min 10 sec	- 00 min 00 sec	30%	- no change
Broadway	1986	13 min 56 sec	n/a	02 min 02 sec	n/a	14%	n/a
	1988	14 min 33 sec	+ 00 min 37 sec	02 min 25 sec	+ 00 min 23 sec	16%	+ 2%
	1990	14 min 30 sec	+ 00 min 34 sec	02 min 35 sec	+ 00 min 33 sec	18%	+ 4%
	1992	14 min 47 sec	+ 00 min 51 sec	03 min 42 sec	+ 01 min 40 sec	24%	+ 10%
	1994	15 min 22 sec	+ 01 min 26 sec	03 min 28 sec	+ 01 min 26 sec	22%	+ 8%
	1996	15 min 06 sec	+ 01 min 10 sec	03 min 29 sec	+ 01 min 27 sec	23%	+ 9%
	1998	15 min 09 sec	+ 01 min 13 sec	03 min 57 sec	+ 01 min 55 sec	26%	+ 12%
	2000	18 min 20 sec	+ 04 min 24 sec	07 min 34 sec	+ 05 min 32 sec	38%	+ 24%
	2002	17 min 49 sec	+ 03 min 53 sec	06 min 33 sec	+ 04 min 31 sec	35%	+ 21%
	2004	15 min 01 sec	+ 01 min 05 sec	03 min 17 sec	+ 01 min 15 sec	21%	+ 7%
	2006	15 min 19 sec	+ 01 min 23 sec	02 min 50 sec	+ 00 min 48 sec	18%	+ 4%
	2008	16 min 14 sec	+ 02 min 18 sec	04 min 12 sec	+ 02 min 10 sec	25%	+ 11%
	2012	15 min 36 sec	+ 01 min 40 sec	03 min 24 sec	+ 01 min 22 sec	21%	+ 7%
	2014	15 min 38 sec	+ 01 min 42 sec	03 min 33 sec	+ 01 min 31 sec	22%	+ 8%

Figures 2 through 4 show the percent change in mean total trip times and stopped times since 1987 for each of the studied corridors. In summary:

- **Arapahoe Avenue:** The mean total trip time in 2014 is 2% less than 2010 and 3% more than 1987. The mean total time stopped decreased by 5% since 2012 and increased by 10% from 1987.

- **Valmont Road:** Both the total trip and stopped times are nearly the same as 1987 with the total trip time increasing by 1% and the stopped time being the exact same. Compared to 2010 the total trip time is roughly 2% more and the stopped time is roughly 4% more.

- **Broadway:** The mean total travel time and stopped time has consistently been greater than the reported results from 1986. Compared to 2012 the travel time is nearly the same with a 0.2% increase; however, the stopped time increased by 4%. The mean total trip time is 12% more than in 1987 and the mean stopped time has increased by 75%.

Figure 2. Arapahoe Avenue: Percent Change in Total Trip Times and Stopped Times from 1987

Figure 3. Valmont Road: Percent Change in Total Trip Times and Stopped Times from 1987

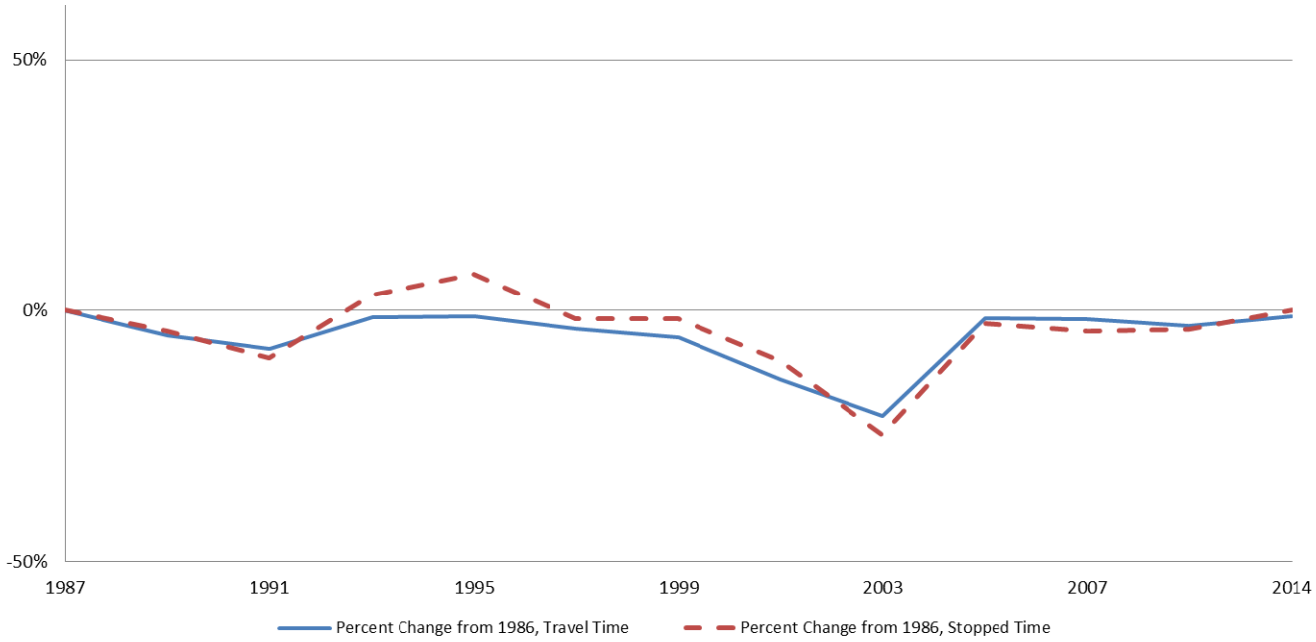
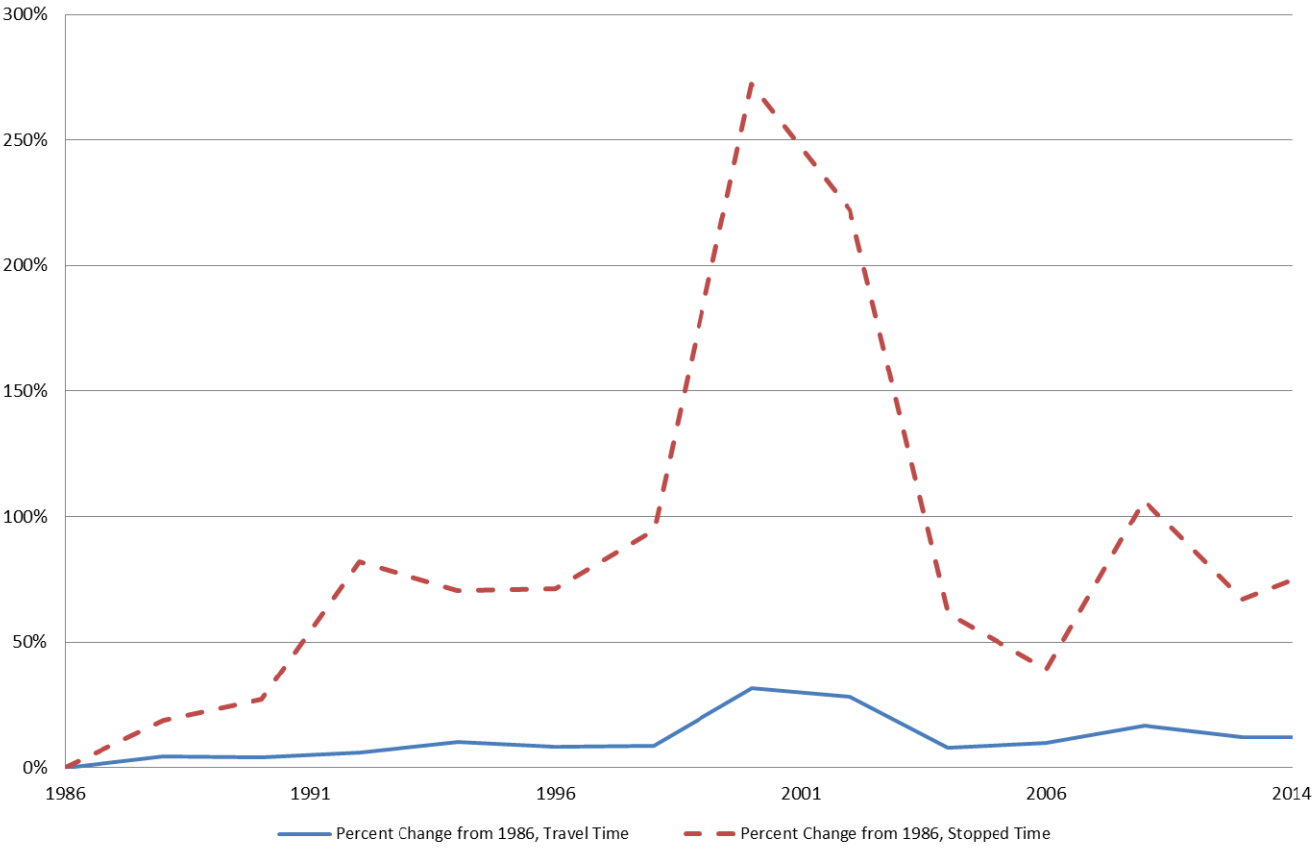


Figure 4. Broadway: Percent Change in Total Trip Times and Stopped Times from 1986



3.0 Comparison of Drive Times by Street and Direction

Mean trip time, time stopped, and percent of time stopped were examined for each street by direction. **Table 2** shows the eastbound and westbound directions on Arapahoe Avenue are fairly balanced year-to-year with respect to total trip and total stopped times. Neither direction has shown to be predominantly faster or slower over the study years. In 2014 the westbound direction became approximately one minute faster than eastbound, which is the largest difference since 1993. **Figures 5 and 6** (on the following page) provide an historic breakdown of mean travel times between nodes to provide some sense of where the changes in travel time have occurred within the corridor over time. *Note: node data is only available for years in which the GPS data collection has been used (2004 to present).*

Table 2. Comparison of Arapahoe Avenue, East and West
(Mean Total Trip Time, Mean Total Time Stopped, and Mean Percent of Time Stopped)

Street	Year	Mean Total Trip Time		Mean Total Time Stopped		Mean % of Time Stopped	
		Trip Time	Difference from 1987	Time Stopped	Difference from 1987	Percent of Time Stopped	Difference from 1987
Arapahoe Avenue East	1987	09 min 50 sec	n/a	03 min 00 sec	n/a	30%	n/a
	1989	10 min 18 sec	+ 00 min 28 sec	03 min 37 sec	+ 00 min 37 sec	33%	+ 3%
	1991	10 min 05 sec	+ 00 min 15 sec	03 min 35 sec	+ 00 min 35 sec	35%	+ 5%
	1993	10 min 00 sec	+ 00 min 10 sec	03 min 46 sec	+ 00 min 46 sec	38%	+ 8%
	1995	11 min 04 sec	+ 01 min 14 sec	04 min 23 sec	+ 01 min 23 sec	38%	+ 8%
	1997	09 min 49 sec	- 00 min 01 sec	03 min 28 sec	+ 00 min 28 sec	35%	+ 5%
	1999	10 min 30 sec	+ 00 min 40 sec	04 min 07 sec	+ 01 min 07 sec	36%	+ 6%
	2001	17 min 32 sec	+ 07 min 42 sec	05 min 12 sec	+ 02 min 12 sec	29%	- 1%
	2003	16 min 51 sec	+ 07 min 01 sec	04 min 57 sec	+ 01 min 57 sec	29%	- 1%
	2005	09 min 52 sec	+ 00 min 02 sec	03 min 40 sec	+ 00 min 40 sec	35%	+ 5%
	2007	09 min 19 sec	- 00 min 31 sec	03 min 05 sec	+ 00 min 05 sec	32%	+ 2%
	2010	09 min 48 sec	- 00 min 02 sec	03 min 28 sec	+ 00 min 28 sec	33%	+ 3%
	2014	09 min 58 sec	+ 00 min 08 sec	03 min 38 sec	+ 00 min 38 sec	34%	+ 4%
Arapahoe Avenue West	1987	08 min 24 sec	n/a	02 min 34 sec	n/a	30%	n/a
	1989	10 min 04 sec	+ 01 min 40 sec	03 min 18 sec	+ 00 min 44 sec	32%	+ 2%
	1991	10 min 03 sec	+ 01 min 39 sec	03 min 22 sec	+ 00 min 48 sec	32%	+ 2%
	1993	12 min 06 sec	+ 03 min 42 sec	05 min 00 sec	+ 02 min 26 sec	38%	+ 8%
	1995	10 min 26 sec	+ 02 min 02 sec	03 min 45 sec	+ 01 min 11 sec	35%	+ 5%
	1997	09 min 36 sec	+ 01 min 12 sec	02 min 53 sec	+ 00 min 19 sec	30%	0%
	1999	10 min 18 sec	+ 01 min 54 sec	03 min 51 sec	+ 01 min 17 sec	36%	+ 6%
	2001	18 min 01 sec	+ 09 min 37 sec	05 min 25 sec	+ 02 min 51 sec	29%	- 1%
	2003	17 min 37 sec	+ 09 min 13 sec	04 min 48 sec	+ 02 min 14 sec	29%	- 1%
	2005	09 min 15 sec	+ 00 min 51 sec	02 min 53 sec	+ 00 min 19 sec	30%	0%
	2007	08 min 51 sec	+ 00 min 27 sec	02 min 33 sec	- 00 min 01 sec	28%	- 2%
	2010	09 min 28 sec	+ 01 min 04 sec	02 min 59 sec	+ 00 min 25 sec	31%	+ 1%
	2014	08 min 55 sec	+ 00 min 31 sec	02 min 30 sec	- 00 min 04 sec	27%	- 3%

Figure 1. Historic Travel Time from Previous Node (Arapahoe Avenue, Eastbound)

*(2014 data in **Green**, Previous Years in **Grey**)*

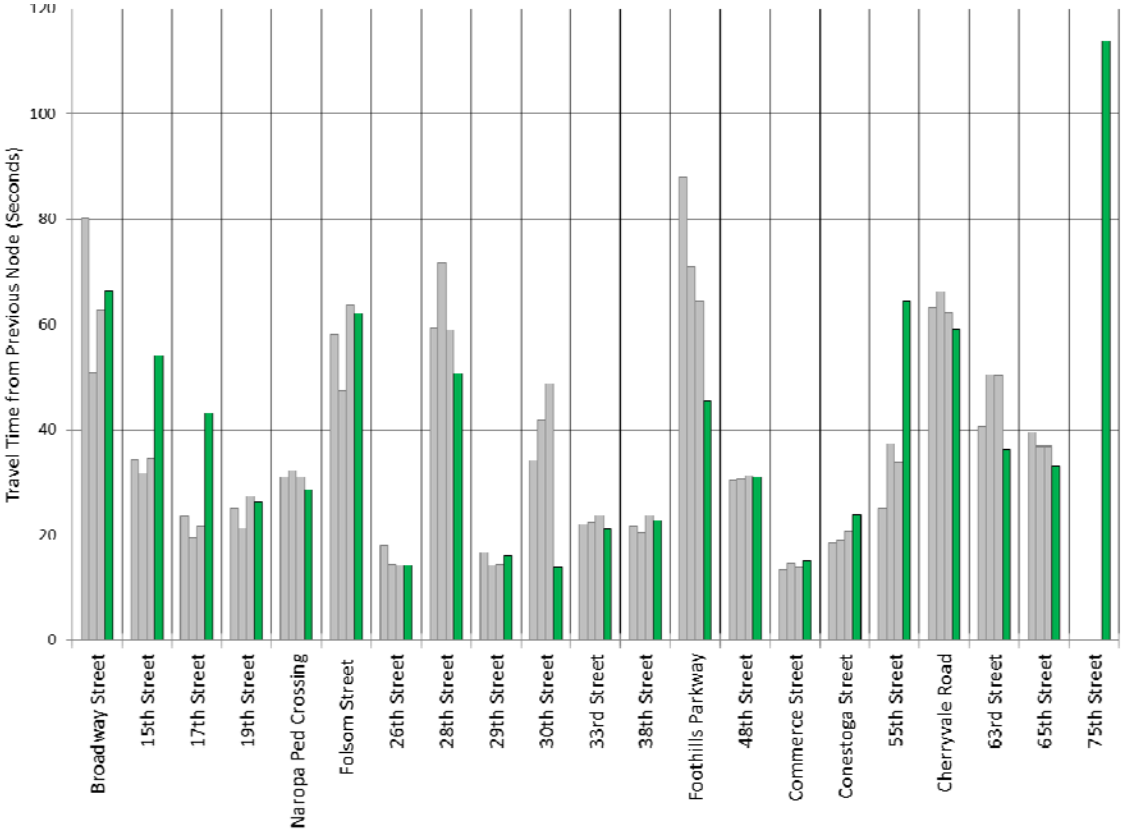
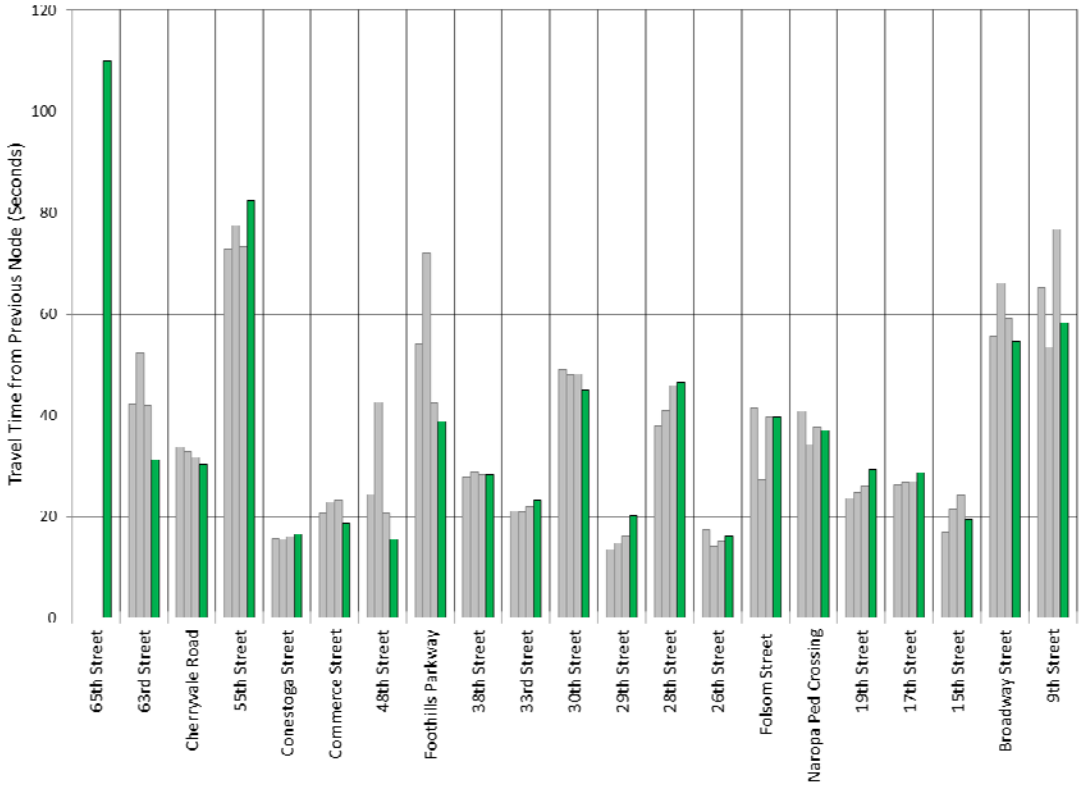


Figure 6. Historic Travel Time from Previous Node (Arapahoe Avenue, Westbound)

*(2014 data in **Green**, Previous Years in **Grey**)*



As shown on **Table 3** below, Valmont experienced minimal changes in eastbound and westbound total trip and stopped times between 2005 and 2014. **Figures 7 and 8** (on the following page) provide an historic breakdown of mean travel times between nodes, to provide some sense of where the changes in travel time have occurred within the corridor over time. *Note: node data is only available for years in which the GPS data collection has been used (2004 to present).*

Table 3. Comparison of Valmont Road, East and West
(Mean Total Trip Time, Mean Total Time Stopped, and Mean Percent of Time Stopped)

Street	Year	Mean Total Trip Time		Mean Total Time Stopped		Mean % of Time Stopped	
		Trip Time	Difference from 1987	Time Stopped	Difference from 1987	Percent of Time Stopped	Difference from 1987
Valmont Road East	1987	10 min 12 sec	n/a	02 min 31 sec	n/a	24%	n/a
	1989	09 min 54 sec	- 00 min 18 sec	02 min 58 sec	+ 00 min 27 sec	30%	+ 6%
	1991	09 min 14 sec	- 00 min 58 sec	02 min 41 sec	+ 00 min 10 sec	29%	+ 5%
	1993	10 min 03 sec	- 00 min 09 sec	03 min 02 sec	+ 00 min 31 sec	31%	+ 7%
	1995	10 min 27 sec	+ 00 min 15 sec	03 min 48 sec	+ 01 min 17 sec	35%	+ 11%
	1997	09 min 48 sec	- 00 min 24 sec	02 min 59 sec	+ 00 min 28 sec	30%	+ 6%
	1999	09 min 34 sec	- 00 min 38 sec	03 min 05 sec	+ 00 min 34 sec	32%	+ 8%
	2001	08 min 55 sec	- 01 min 17 sec	05 min 37 sec	+ 03 min 06 sec	32%	+ 8%
	2003	08 min 12 sec	- 02 min 00 sec	02 min 58 sec	+ 00 min 27 sec	31%	+ 7%
	2005	09 min 48 sec	- 00 min 24 sec	02 min 47 sec	+ 00 min 16 sec	27%	+ 3%
	2007	09 min 57 sec	- 00 min 15 sec	02 min 49 sec	+ 00 min 18 sec	27%	+ 3%
	2010	09 min 47 sec	- 00 min 25 sec	02 min 49 sec	+ 00 min 18 sec	27%	+ 3%
	2014	10 min 09 sec	- 00 min 03 sec	03 min 07 sec	+ 00 min 36 sec	30%	+ 6%
Valmont Road West	1987	10 min 34 sec	n/a	03 min 49 sec	n/a	35%	n/a
	1989	09 min 50 sec	- 00 min 44 sec	03 min 06 sec	- 00 min 43 sec	30%	- 5%
	1991	09 min 57 sec	- 00 min 37 sec	03 min 03 sec	- 00 min 46 sec	30%	- 5%
	1993	10 min 26 sec	- 00 min 08 sec	03 min 30 sec	- 00 min 19 sec	32%	- 3%
	1995	10 min 04 sec	- 00 min 30 sec	02 min 59 sec	- 00 min 50 sec	28%	- 7%
	1997	10 min 11 sec	- 00 min 23 sec	03 min 16 sec	- 00 min 33 sec	31%	- 4%
	1999	10 min 05 sec	- 00 min 29 sec	03 min 08 sec	- 00 min 41 sec	30%	- 5%
	2001	08 min 59 sec	- 01 min 35 sec	02 min 44 sec	- 01 min 05 sec	30%	- 5%
	2003	08 min 02 sec	- 02 min 32 sec	02 min 13 sec	- 01 min 36 sec	28%	- 7%
	2005	10 min 37 sec	+ 00 min 03 sec	03 min 23 sec	- 00 min 26 sec	30%	- 5%
	2007	10 min 28 sec	- 00 min 06 sec	03 min 17 sec	- 00 min 32 sec	30%	- 5%
	2010	10 min 20 sec	- 00 min 14 sec	03 min 16 sec	- 00 min 33 sec	30%	- 5%
	2014	10 min 24 sec	- 00 min 10 sec	03 min 13 sec	- 00 min 36 sec	30%	- 5%

Figure 7. Historic Travel Time from Previous Node (Valmont Road, Eastbound)

*(2014 data in **Green**, Previous Years in **Grey**)*

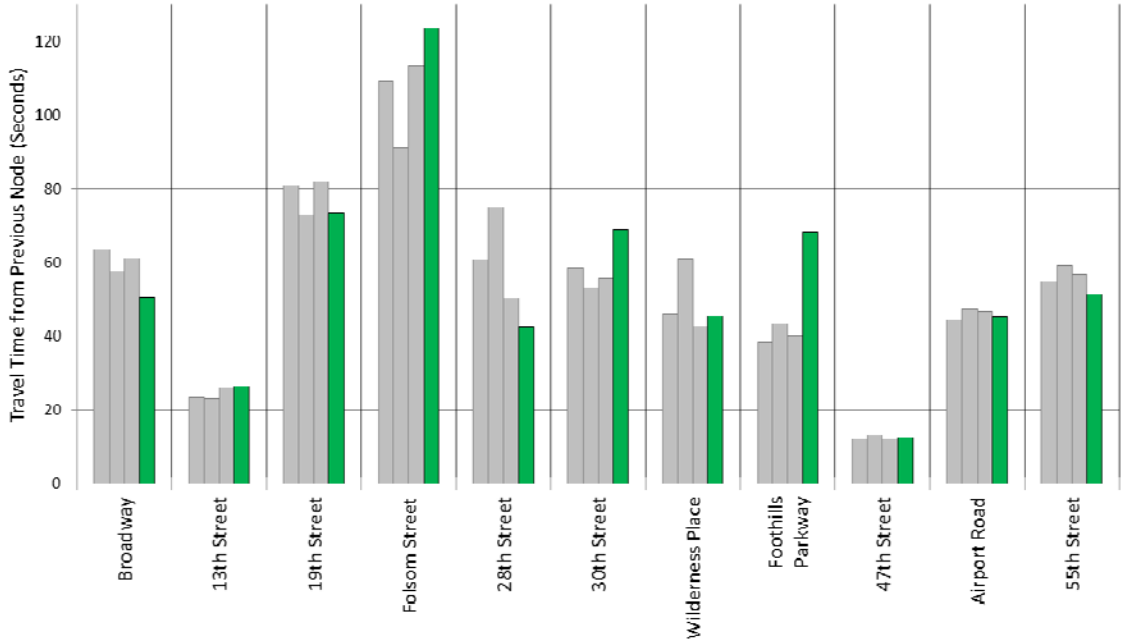
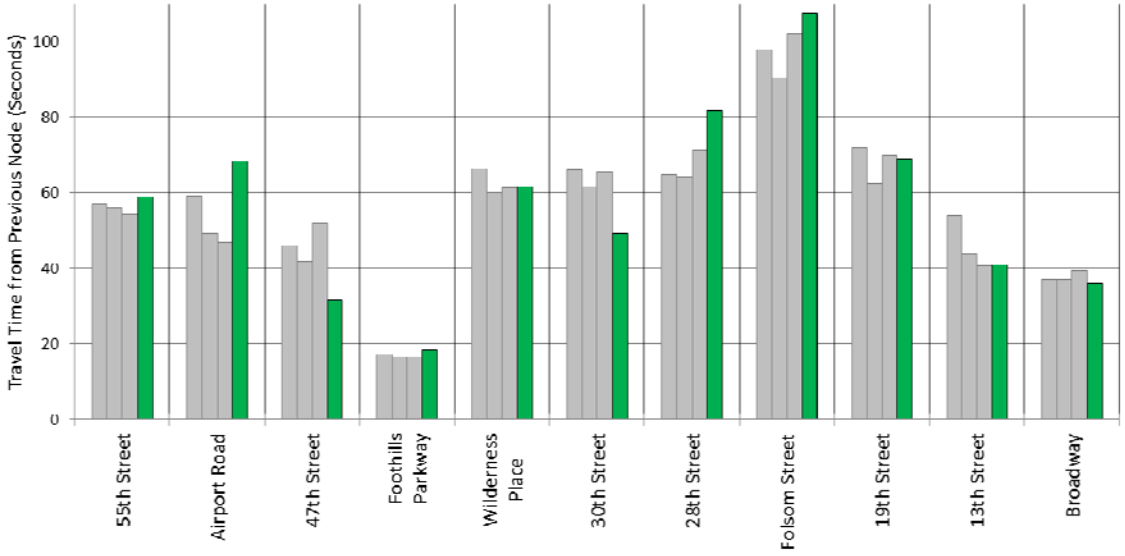


Figure 8. Historic Travel Time from Previous Node (Valmont Road, Westbound)

*(2014 data in **Green**, Previous Years in **Grey**)*



The directional data for the Broadway corridor is summarized in **Table 4**. Travel times, stopped times, and percent time stopped were all higher in 2014 than in 1986 for both directions along the Broadway corridor. The northbound direction times are slightly less than in 2012; however, southbound is slightly greater than in 2012. **Figures 9 and 10** provide an historic breakdown of mean travel times between nodes, to provide some sense of where the changes in travel time have occurred within the corridor data years. *Note: node data is only available for years in which the GPS data collection has been used (2004 to present).*

Table 4. Comparison of Broadway, East and West
(Mean Total Trip Time, Mean Total Time Stopped, and Mean Percent of Time Stopped)

Street	Year	Mean Total Trip Time		Mean Total Time Stopped		Mean % of Time Stopped	
		Trip Time	Difference from 1986	Time Stopped	Difference from 1986	Percent of Time Stopped	Difference from 1986
Broadway North	1986	13 min 43 sec	n/a	01 min 46 sec	n/a	12%	n/a
	1988	15 min 24 sec	+ 01 min 41 sec	02 min 57 sec	+ 01 min 11 sec	18%	+ 6%
	1990	14 min 53 sec	+ 01 min 10 sec	02 min 50 sec	+ 01 min 04 sec	19%	+ 7%
	1992	15 min 20 sec	+ 01 min 37 sec	03 min 51 sec	+ 02 min 05 sec	23%	+ 11%
	1994	15 min 52 sec	+ 02 min 09 sec	03 min 46 sec	+ 02 min 00 sec	23%	+ 11%
	1996	15 min 39 sec	+ 01 min 56 sec	03 min 52 sec	+ 02 min 06 sec	24%	+ 12%
	1998	15 min 09 sec	+ 01 min 26 sec	04 min 02 sec	+ 02 min 16 sec	27%	+ 15%
	2000	18 min 29 sec	+ 04 min 46 sec	07 min 26 sec	+ 05 min 40 sec	37%	+ 25%
	2002	18 min 45 sec	+ 05 min 02 sec	07 min 02 sec	+ 05 min 16 sec	37%	+ 25%
	2004	15 min 51 sec	+ 02 min 08 sec	03 min 46 sec	+ 02 min 00 sec	23%	+ 11%
	2006	16 min 00 sec	+ 02 min 17 sec	03 min 06 sec	+ 01 min 20 sec	19%	+ 7%
	2008	17 min 08 sec	+ 03 min 25 sec	05 min 08 sec	+ 03 min 22 sec	28%	+ 16%
	2012	16 min 20 sec	+ 02 min 37 sec	04 min 03 sec	+ 02 min 17 sec	24%	+ 12%
	2014	16 min 06 sec	+ 02 min 23 sec	03 min 45 sec	+ 01 min 59 sec	23%	+ 11%
Broadway South	1986	14 min 08 sec	n/a	02 min 19 sec	n/a	16%	n/a
	1988	13 min 42 sec	- 00 min 26 sec	01 min 54 sec	- 00 min 25 sec	14%	- 2%
	1990	14 min 08 sec	- 00 min 00 sec	02 min 20 sec	+ 00 min 01 sec	16%	- 0%
	1992	14 min 15 sec	+ 00 min 07 sec	03 min 33 sec	+ 01 min 14 sec	25%	+ 9%
	1994	14 min 52 sec	+ 00 min 44 sec	03 min 10 sec	+ 00 min 51 sec	21%	+ 5%
	1996	14 min 34 sec	+ 00 min 26 sec	03 min 05 sec	+ 00 min 46 sec	21%	+ 5%
	1998	15 min 10 sec	+ 01 min 02 sec	03 min 53 sec	+ 01 min 34 sec	25%	+ 9%
	2000	18 min 11 sec	+ 04 min 03 sec	07 min 43 sec	+ 05 min 24 sec	40%	+ 24%
	2002	16 min 59 sec	+ 02 min 51 sec	06 min 04 sec	+ 03 min 45 sec	34%	+ 18%
	2004	14 min 05 sec	- 00 min 03 sec	02 min 43 sec	+ 00 min 24 sec	19%	+ 3%
	2006	14 min 33 sec	+ 00 min 25 sec	02 min 32 sec	+ 00 min 13 sec	17%	+ 1%
	2008	15 min 19 sec	+ 01 min 11 sec	03 min 16 sec	+ 00 min 57 sec	21%	+ 5%
	2012	14 min 51 sec	+ 00 min 43 sec	02 min 46 sec	+ 00 min 27 sec	18%	+ 2%
	2014	15 min 07 sec	+ 00 min 59 sec	03 min 19 sec	+ 01 min 00 sec	21%	+ 5%

Figure 9. Historic Travel Time from Previous Node (Broadway, Northbound)

*(2014 data in **Green**, Previous Years in **Grey**)*

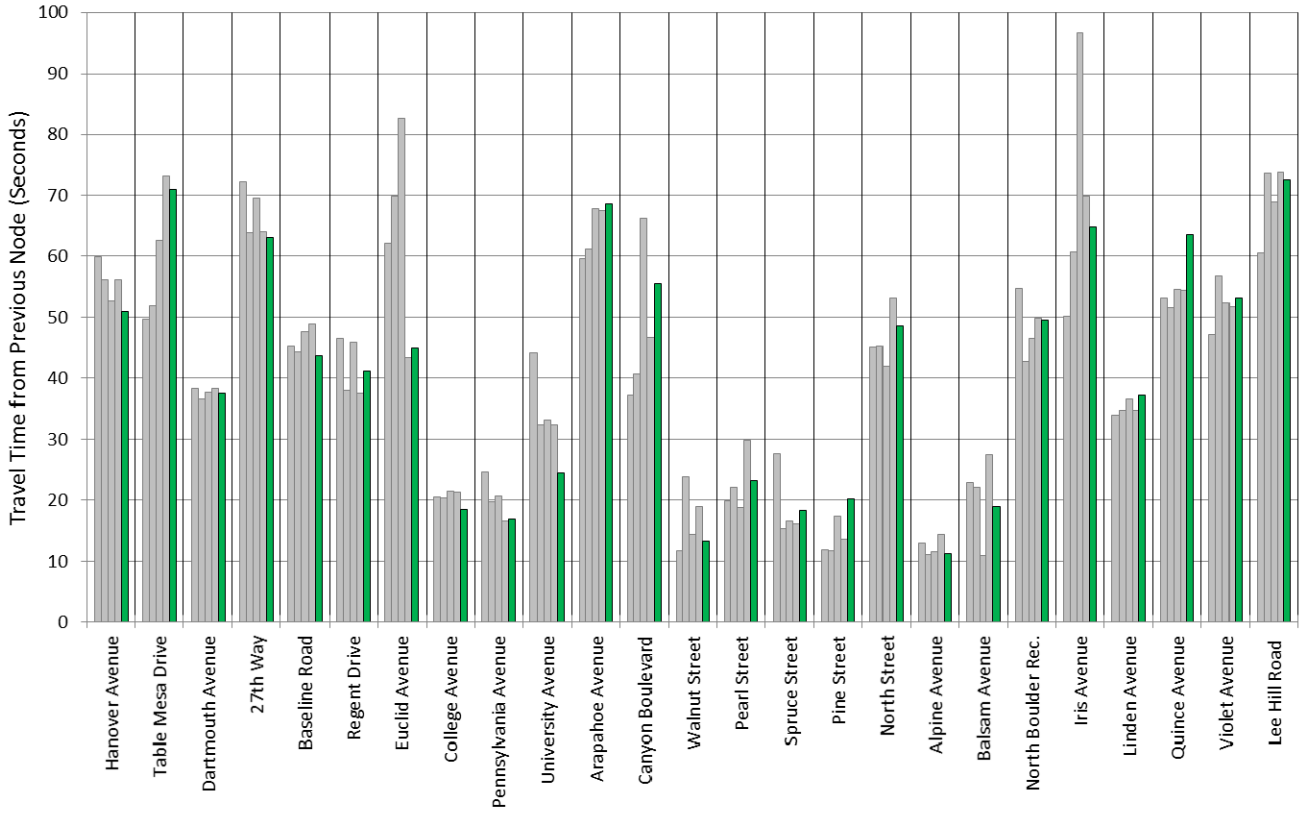
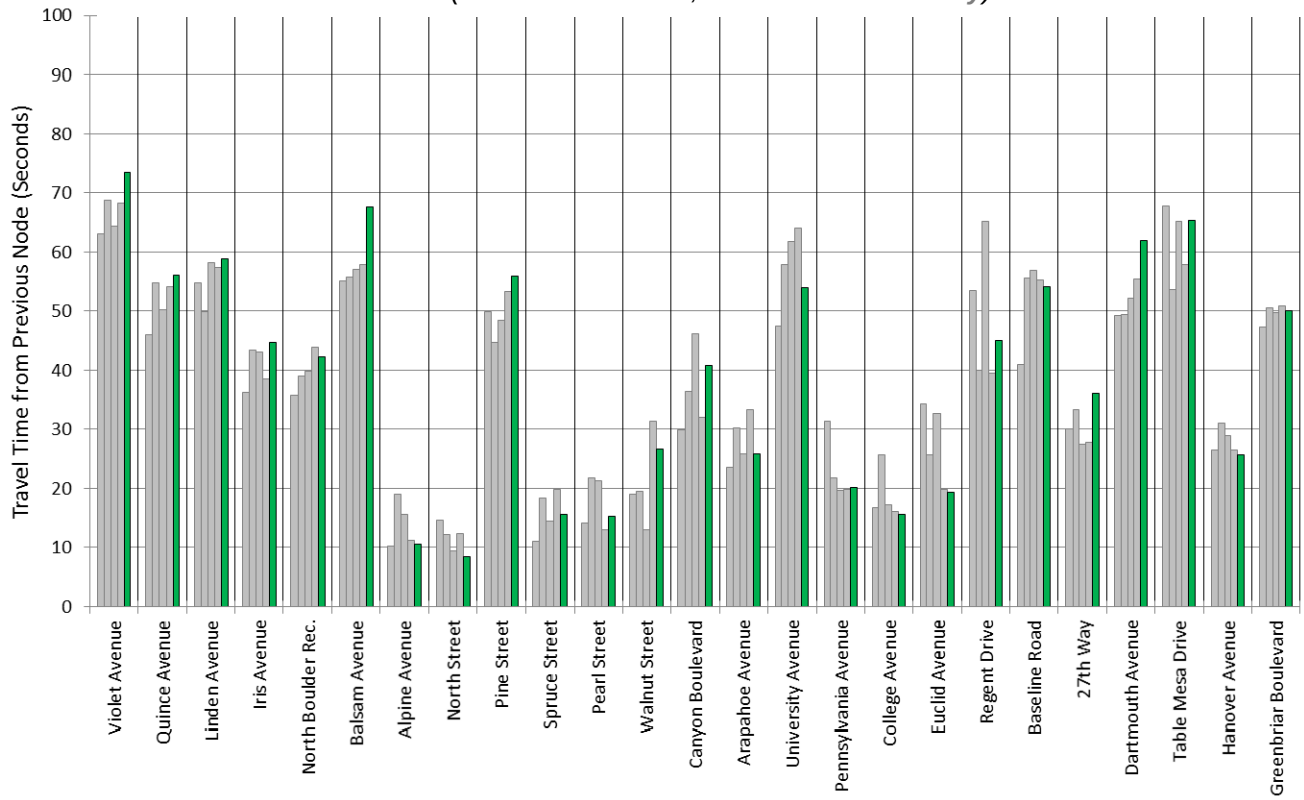


Figure 10. Historic Travel Time from Previous Node (Broadway, Southbound)

*(2014 data in **Green**, Previous Years in **Grey**)*



4.0 "Worst" Lights

Each year, the data collected in the Drive Time study are used to determine the ten most frequently stopped-at traffic signals in a given year. These results are categorized into a "ten worst" lights list (worst lights by chance of hitting the red traffic light). **Appendix II** displays the complete list along with lists of the "ten best" lights.

As shown in **Table 5** below, a red light was experienced during all westbound runs at the Arapahoe Avenue at 28th Street and Valmont Road at Folsom Street and during all eastbound runs at Valmont Road at 30th Street.

Table 5. "Worst" Lights

Worst Lights by Chance of Hitting the Traffic Light	
Intersection, Direction	**Mean Chance in 2014**
Arapahoe Ave at 28th St, Westbound	100%
Valmont St at 30th St, Eastbound	100%
Valmont St at Folsom St, Westbound	100%
Valmont St at 19th St, Eastbound	93%
Valmont St at 19th St, Westbound	87%
Arapahoe Ave at Broadway, Eastbound	86%
Valmont St at Foothills Pkwy, Westbound	80%
Arapahoe Ave at Folsom St, Eastbound	79%
Arapahoe Ave at 55th St, Eastbound	79%
Broadway at Iris Ave, Northbound	73%

5.0 Methodology

A similar methodology is used each year for the drive time studies, although the routes alternate from north/south to east/west. In 2004, a new data collection methodology was adopted which utilizes a hand-held GPS device, a laptop computer, and Tru-Traffic software (formerly known as TS-PP Draft) to record the travel time and delay data. This replaced the manual stop-watch method previously used by City staff from 1986 to 2003. Both the old and new methods involve one person who operates the vehicle and performs the data collection simultaneously. In contrast to the old method, however, the new GPS/laptop method does not require any effort on the part of the driver once the study has begun.

GPS coordinates for each traffic signal were mapped into the Tru-Traffic software prior to beginning travel time runs for the new year. Since there is an inherent margin of error in the GPS locations, several mapping runs were performed along each of the corridors to provide the

most accurate locations possible. Even so, there is generally a margin of error of 15 feet in all calculations. However, over many runs, the significance of these errors is diminished.

In 2014, 30 total runs were performed on each of the three study corridors per year (15 runs per direction per corridor per year). Trips are made at 7:30 am, 12:00pm, or 5:00pm to correspond with peak traffic periods. During an outing, a trip is made in one direction and then back in the opposite direction on the same corridor. During the 2014 data processing, it was discovered that there was one run during the noon period in the eastbound direction on Arapahoe Avenue and one morning run in the southbound direction on Broadway that had missing data and were removed from the evaluation. Prior to 2006, 60 runs were performed on each corridor per year. Standard deviation calculations indicate that the reduced number of runs has not affected annual result tabulations.

Previous to 2004, it is believed that travel time runs were collected by the City of Boulder on each corridor regardless of roadway construction, traffic accidents, severe weather, and all other factors. Travel time runs were not aborted under any of these conditions. Since 2004, this practice was changed. Now, travel time runs are aborted if there are any uncommon conditions that would cause delays typically not experienced along the corridor. This change was made to provide a more useful evaluation of the corridor signal system under the conditions it is designed to operate. Since lane closures, construction, accidents, etc. are special circumstances which significantly affect traffic flow, speeds, and delays, incorporating these conditions into the data set disables the ability to effectively evaluate corridor timing plans.

Routes

The east-west streets were historically studied in odd years (between 1987 and 2007). Due to recent budgetary considerations, the east-west streets were not studied in 2009, but were in 2010 and 2014. The north-south streets historically were studied in even years (up to 2008). Due to the budgetary considerations, they were not studied in 2010, but were in 2012 and 2014. The endpoints of the studied corridors are as follows:

- **Arapahoe Avenue**: 9th Street on the west and 65th Street on the east[1].
- **Valmont Road:** 9th Street on the west to 55th Street on the east.
- **Broadway:** Greenbriar Boulevard on the south and Lee Hill Road on the north[2].

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[1] The section from 55th Street to 65th Street was removed from any historical comparisons in this report since the Arapahoe corridor studies did not include the Cherryvale, 63rd, and 65th Street intersections prior to 2005.

[2] Prior to 2004, the north end of the timing runs terminated at Violet Avenue. For this reason, the data from Violet Avenue to Lee Hill Road is excluded from historical comparisons.

Figure 11 provides a map showing the study corridor limits and indicates the traffic control per intersections. **Figure 12** illustrates the traffic control at every control point per corridor.

Figure 11. Corridor Map

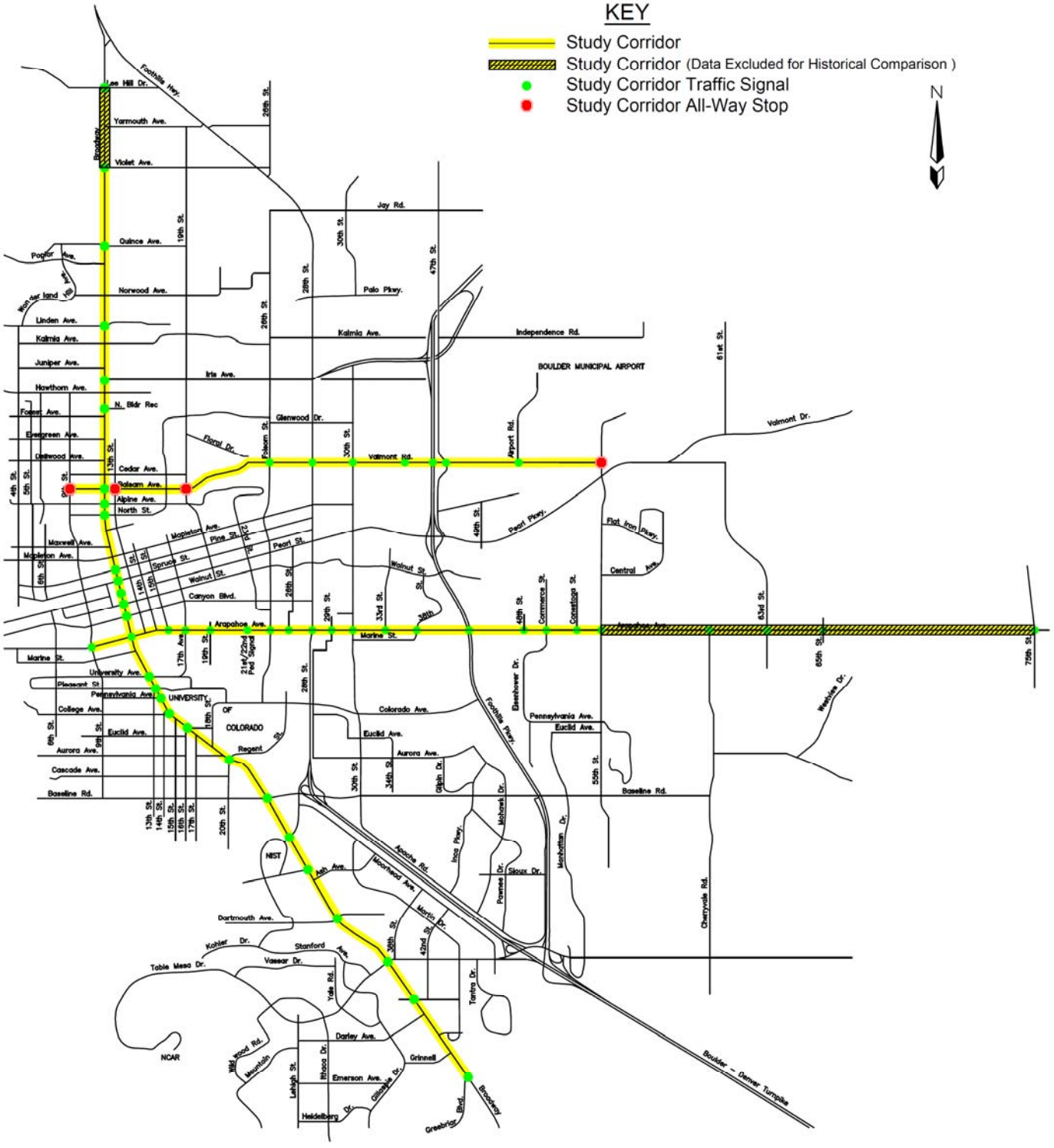
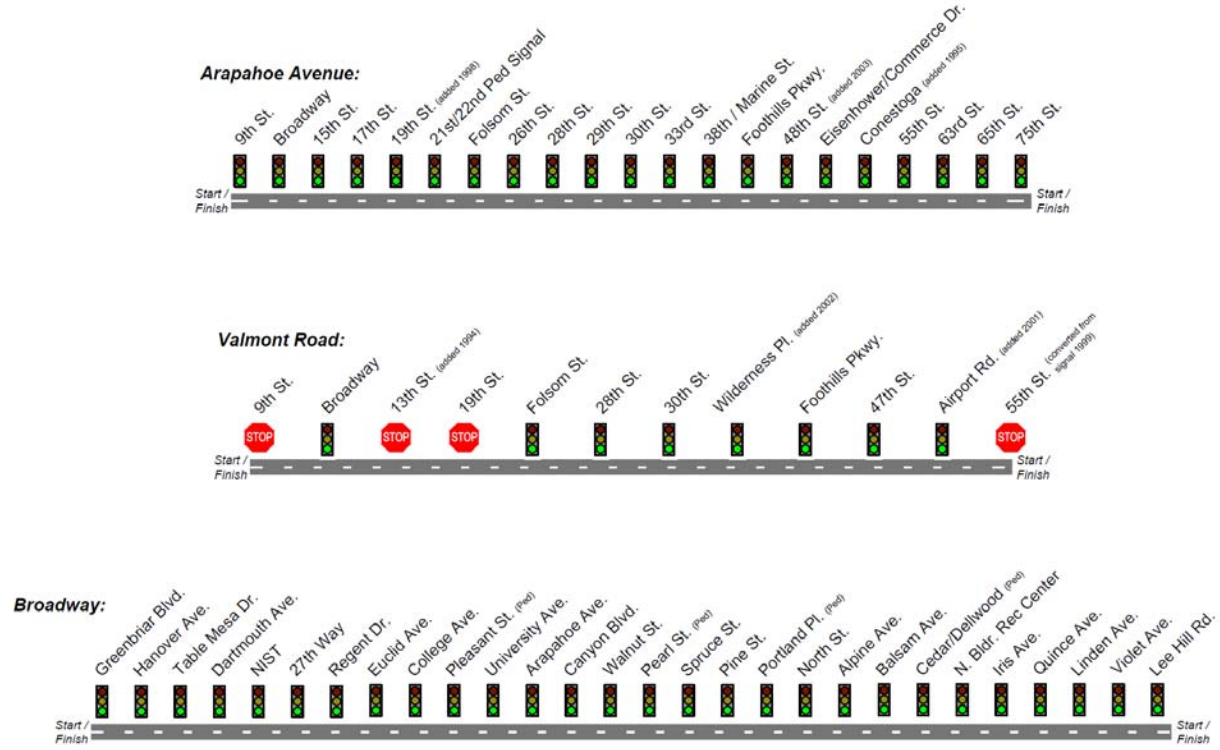


Figure 12. Drive Time Map for Study Routes



Note: Historical comparisons in this report were compiled with the Arapahoe Avenue corridor terminating at 55th Street on the east end to be consistent with previous years. However, between 2005 and 2010, travel time runs have extended east to 65th Street and in 2014 it was extended to 75th Street. Historical comparisons for the Broadway corridor terminated at Violet Avenue on the north end to be consistent with previous years. However, since 2004, travel time runs have extended north to Lee Hill Road. Travel time data for the Arapahoe Avenue from 55th Street to 75th Street nodes and Broadway north of Violet Avenue is included in the ***Appendix****.*

Weighting

In 1992, 1993, and 2004 not all the scheduled drive time trips for the year were completed. In 1992 there was a major construction project on Broadway which if included in the study would unfairly bias the results for 1992. In 1993, misunderstandings with research assistants resulted in missed trips. In 2004, budget constraints resulted in no data collected for the first four months of the year. Thus, to compensate for the missing data, the results were weighted statistically.

The data were weighted by street driven, direction of trip, and start time so that there were an equal number of trips in each direction on each street for each time of day across all the years. This counterbalances the effect these variables may have had on the average trip time.

Appendix I:

Drive Time Comparison for All Studied Years

Table I-1
Comparison of Drive Time by Street Across all Years [SHORT]

Street	Year	Distance	Mean Total Trip Time	Mean Speed (mph)	Total Stops Possible	Mean Number of Stops	Mean Total Time Stopped	Mean Percent of Time Stopped	Number of Trips
Arapahoe Avenue	1987	3.1 miles	09 min 07 sec	20.1	13	5.8	02 min 46 sec	30%	42
	1989	3.1 miles	10 min 11 sec	18.2	13	5.6	03 min 27 sec	33%	48
	1991	3.1 miles	10 min 04 sec	18.3	14	5.9	03 min 30 sec	34%	59
	1993	3.1 miles	11 min 03 sec	17.0	14	6.0	04 min 31 sec	38%	26
	1995	3.1 miles	10 min 45 sec	17.3	15	6.3	04 min 08 sec	37%	61
	1997	3.1 miles	09 min 43 sec	18.9	15	5.2	03 min 10 sec	33%	59
	1999	3.1 miles	10 min 23 sec	18.1	16	4.8	03 min 59 sec	36%	58
	2001	3.1 miles	17 min 47 sec	10.4	16	8.8	05 min 18 sec	30%	60
	2003	3.1 miles	17 min 14 sec	10.5	17	8.3	data not avail.	29%	60
	2005	3.1 miles	09 min 35 sec	19.4	17	5.1	03 min 18 sec	33%	49
	2007	3.1 miles	09 min 06 sec	20.2	17	4.6	02 min 50 sec	30%	31
	2010	3.1 miles	09 min 38 sec	19.9	17	5.0	03 min 13 sec	32%	30
	2014	3.1 miles	09 min 26 sec	20.3	17	4.6	03 min 03 sec	31%	29
Valmont Road	1987	3.2 miles	10 min 23 sec	18.9	8	6.0	03 min 10 sec	30%	42
	1989	3.2 miles	09 min 52 sec	19.9	8	5.5	03 min 02 sec	30%	48
	1991	3.2 miles	09 min 36 sec	20.3	8	5.3	02 min 52 sec	29%	59
	1993	3.2 miles	10 min 14 sec	19.2	8	5.6	03 min 16 sec	31%	22
	1995	3.2 miles	10 min 16 sec	19.1	9	6.7	03 min 24 sec	32%	62
	1997	3.2 miles	10 min 00 sec	19.5	9	6.0	03 min 07 sec	31%	60
	1999	3.2 miles	09 min 50 sec	19.9	9	5.5	03 min 07 sec	31%	58
	2001	3.2 miles	08 min 57 sec	21.8	10 / 11	5.0	02 min 51 sec	31%	60
	2003	3.2 miles	08 min 12 sec	23.5	11	4.7	02 min 23 sec	25%	60
	2005	3.2 miles	10 min 13 sec	19.5	11	6.8	03 min 05 sec	29%	52
	2007	3.2 miles	10 min 12 sec	21.6	11	6.6	03 min 02 sec	28%	31
	2010	3.2 miles	10 min 04 sec	22.2	11	6.3	03 min 03 sec	29%	30
	2014	3.2 miles	10 min 16 sec	21.7	11	6.4	03 min 10 sec	30%	30
Broadway	1986	6.0 miles	13 min 56 sec	26.2	22	6.4	02 min 02 sec	14%	54
	1988	6.0 miles	14 min 33 sec	25.3	22	6.1	02 min 25 sec	16%	41
	1990	6.0 miles	14 min 30 sec	25.1	22	5.9	02 min 35 sec	18%	57
	1992	6.0 miles	14 min 47 sec	25.0	22 / 21	6.5	03 min 42 sec	24%	47
	1994	6.0 miles	15 min 22 sec	23.7	21 / 22 / 23	6.7	03 min 28 sec	22%	57
	1996	6.0 miles	15 min 06 sec	24.2	24 / 23	6.9	03 min 29 sec	23%	59
	1998	6.0 miles	15 min 09 sec	24.0	22 / 23	7.1	03 min 57 sec	26%	61
	2000	6.0 miles	18 min 20 sec	21.4	23	10.2	07 min 34 sec	38%	59
	2002	6.0 miles	17 min 49 sec	28.1	24	8.6	06 min 33 sec	35%	60
	2004	6.2 miles	15 min 01 sec	25.1	24 / 25	7.6	03 min 17 sec	21%	28
	2006	6.2 miles	15 min 19 sec	24.9	24 / 25	7.1	02 min 50 sec	18%	28
	2008	6.2 miles	16 min 14 sec	26.2	24 / 25	7.5	04 min 12 sec	25%	30
	2012	6.2 miles	15 min 36 sec	26.1	26*	7.5	03 min 24 sec	21%	30
	2014	6.2 miles	15 min 38 sec	26.2	26*	7.1	03 min 33 sec	22%	29

* Additional signals (potential stops) at 18th (NB and SB), 17th (NB & SB), and Euclid (NB only) were added in 2012 with the completion of the Broadway (Euclid to 18th) transportation improvements project.

Table I-2a
Comparison of Drive Time by Street and Direction Across all Years [SHORT]

Street	Year	Distance	Mean Total Trip Time	Mean Speed (mph)	Total Stops Possible at Signals	Mean Number of Stops	Mean Total Time Stopped	Mean Percent of Time Stopped	Number of Trips
Arapahoe Avenue East	1987	3.1 miles	09 min 50 sec	18.5	13	6.1	03 min 00 sec	30%	21
	1989	3.1 miles	10 min 18 sec	18.2	13	5.8	03 min 37 sec	33%	27
	1991	3.1 miles	10 min 05 sec	18.1	14	6.3	03 min 35 sec	35%	28
	1993	3.1 miles	10 min 00 sec	18.1	14	6.2	03 min 46 sec	38%	15
	1995	3.1 miles	11 min 04 sec	16.8	15	6.8	04 min 23 sec	38%	28
	1997	3.1 miles	09 min 49 sec	18.6	15	5.5	03 min 28 sec	35%	34
	1999	3.1 miles	10 min 30 sec	18.0	16	4.6	04 min 07 sec	36%	29
	2001	3.1 miles	17 min 32 sec	10.6	16	8.9	05 min 12 sec	29%	30
	2003	3.1 miles	16 min 51 sec	10.7	17	8.2	04 min 57 sec	29%	30
	2005	3.1 miles	09 min 52 sec	18.8	17	5.4	03 min 40 sec	35%	26
	2007	3.1 miles	09 min 19 sec	19.7	17	4.4	03 min 05 sec	32%	16
	2010	3.1 miles	09 min 48 sec	20.0	17	4.7	03 min 28 sec	33%	15
	2014	3.1 miles	09 min 58 sec	19.4	17	4.4	03 min 38 sec	34%	14
Arapahoe Avenue West	1987	3.1 miles	08 min 24 sec	21.8	13	5.6	02 min 34 sec	30%	22
	1989	3.1 miles	10 min 04 sec	18.2	13	5.4	03 min 18 sec	32%	21
	1991	3.1 miles	10 min 03 sec	18.4	14	5.5	03 min 22 sec	32%	31
	1993	3.1 miles	12 min 06 sec	16.0	14	5.8	05 min 00 sec	38%	9
	1995	3.1 miles	10 min 26 sec	17.9	15	5.8	03 min 45 sec	35%	33
	1997	3.1 miles	09 min 36 sec	19.2	15	4.9	02 min 53 sec	30%	25
	1999	3.1 miles	10 min 18 sec	18.1	16	5.1	03 min 51 sec	36%	29
	2001	3.1 miles	18 min 01 sec	10.1	16	8.7	05 min 25 sec	29%	30
	2003	3.1 miles	17 min 37 sec	10.4	17	8.5	04 min 48 sec	29%	30
	2005	3.1 miles	09 min 15 sec	20.0	17	4.8	02 min 53 sec	30%	23
	2007	3.1 miles	08 min 51 sec	20.7	17	4.9	02 min 33 sec	28%	15
	2010	3.1 miles	09 min 28 sec	19.9	17	5.2	02 min 59 sec	31%	15
	2014	3.1 miles	08 min 55 sec	21.1	17	4.7	02 min 30 sec	27%	15

Table I-2b
Comparison of Drive Time by Street and Direction Across all Years

Street	Year	Distance	Mean Total Trip Time	Mean Speed (mph)	Total Stops Possible	Mean Number of Stops	Mean Total Time Stopped	Mean Percent of Time Stopped	Number of Trips
Valmont Road East	1987	3.2 miles	10 min 12 sec	19.0	8	5.1	02 min 31 sec	24%	22
	1989	3.2 miles	09 min 54 sec	19.7	8	5.5	02 min 58 sec	30%	21
	1991	3.2 miles	09 min 14 sec	20.9	8	5.2	02 min 41 sec	29%	31
	1993	3.2 miles	10 min 03 sec	19.3	8	5.7	03 min 02 sec	31%	8
	1995	3.2 miles	10 min 27 sec	18.6	9	7.0	03 min 48 sec	35%	33
	1997	3.2 miles	09 min 48 sec	19.8	9	6.2	02 min 59 sec	30%	24
	1999	3.2 miles	09 min 34 sec	20.4	9	5.3	03 min 05 sec	32%	28
	2001	3.2 miles	08 min 55 sec	21.8	10	5.0	05 min 37 sec	32%	30
	2003	3.2 miles	08 min 12 sec	23.4	11	4.1	02 min 58 sec	31%	30
	2005	3.2 miles	09 min 48 sec	20.2	11	6.5	02 min 47 sec	27%	26
	2007	3.2 miles	09 min 57 sec	22.2	11	6.4	02 min 49 sec	27%	16
	2010	3.2 miles	09 min 47 sec	22.6	11	6.5	02 min 49 sec	27%	15
	2014	3.2 miles	10 min 09 sec	22.2	11	5.9	03 min 07 sec	30%	15
Valmont Road West	1987	3.2 miles	10 min 34 sec	18.9	8	6.9	03 min 49 sec	35%	21
	1989	3.2 miles	09 min 50 sec	20.0	8	5.6	03 min 06 sec	30%	27
	1991	3.2 miles	09 min 57 sec	19.6	8	5.3	03 min 03 sec	30%	28
	1993	3.2 miles	10 min 26 sec	19.0	8	5.6	03 min 30 sec	32%	14
	1995	3.2 miles	10 min 04 sec	19.5	9	6.4	02 min 59 sec	28%	29
	1997	3.2 miles	10 min 11 sec	19.2	9	5.8	03 min 16 sec	31%	36
	1999	3.2 miles	10 min 05 sec	19.4	9	5.6	03 min 08 sec	30%	30
	2001	3.2 miles	08 min 59 sec	21.8	10 / 11	4.9	02 min 44 sec	30%	30
	2003	3.2 miles	08 min 02 sec	23.8	11	4.3	02 min 13 sec	28%	30
	2005	3.2 miles	10 min 37 sec	18.8	11	7.0	03 min 23 sec	30%	26
	2007	3.2 miles	10 min 28 sec	21.0	11	6.9	03 min 17 sec	30%	15
	2010	3.2 miles	10 min 20 sec	21.7	11	6.1	03 min 16 sec	30%	15
	2014	3.2 miles	10 min 24 sec	21.1	11	6.8	03 min 13 sec	30%	15

Table I-2c
Comparison of Drive Time by Street and Direction Across all Years [SHORT]

Street	Year	Distance	Mean Total Trip Time	Mean Speed (mph)	Total Stops Possible at Signals	Mean Number of Stops	Mean Total Time Stopped	Mean Percent of Time Stopped	Number of Trips
Broadway North	1986	6.0 miles	13 min 43 sec	26.6	22	5.5	01 min 46 sec	12%	27
	1988	6.0 miles	15 min 24 sec	24.0	2	6.6	02 min 57 sec	18%	19
	1990	6.0 miles	14 min 53 sec	24.5	22	6.0	02 min 50 sec	19%	30
	1992	6.0 miles	15 min 20 sec	24.1	22 / 21	6.2	03 min 51 sec	23%	28
	1994	6.0 miles	15 min 52 sec	23.0	21 / 22	7.1	03 min 46 sec	23%	30
	1996	6.0 miles	15 min 39 sec	23.4	23	7.1	03 min 52 sec	24%	29
	1998	6.0 miles	15 min 09 sec	24.0	23	7.0	04 min 02 sec	27%	33
	2000	6.0 miles	18 min 29 sec	20.8	24	10.0	07 min 26 sec	37%	31
	2002	6.0 miles	18 min 45 sec	26.8	24	9.2	07 min 02 sec	37%	30
	2004	6.2 miles	15 min 51 sec	24.2	24	8.8	03 min 46 sec	23%	15
	2006	6.2 miles	16 min 00 sec	24.8	24	8.2	03 min 06 sec	18%	15
	2008	6.2 miles	17 min 08 sec	25.7	24	8.3	05 min 08 sec	28%	15
	2012	6.2 miles	16 min 20 sec	25.4	26	8.1	04 min 03 sec	24%	15
	2014	6.2 miles	16 min 06 sec	25.9	26	7.4	03 min 45 sec	23%	15
Broadway South	1986	6.0 miles	14 min 08 sec	25.8	22	7.3	02 min 19 sec	16%	27
	1988	6.0 miles	13 min 42 sec	26.5	22	5.6	01 min 54 sec	14%	22
	1990	6.0 miles	14 min 08 sec	25.7	22	5.7	02 min 20 sec	16%	27
	1992	6.0 miles	14 min 15 sec	25.9	22	6.8	03 min 33 sec	25%	19
	1994	6.0 miles	14 min 52 sec	24.5	22 / 23	6.3	03 min 10 sec	21%	27
	1996	6.0 miles	14 min 34 sec	24.9	24	6.7	03 min 05 sec	21%	30
	1998	6.0 miles	15 min 10 sec	24.1	24	7.3	03 min 53 sec	25%	28
	2000	6.0 miles	18 min 11 sec	22.0	24	10.4	07 min 43 sec	40%	28
	2002	6.0 miles	16 min 59 sec	29.3	24	7.6	06 min 04 sec	34%	30
	2004	6.2 miles	14 min 05 sec	26.1	25	6.2	02 min 43 sec	19%	13
	2006	6.2 miles	14 min 33 sec	25.0	25	5.8	02 min 32 sec	17%	13
	2008	6.2 miles	15 min 19 sec	26.7	25	6.5	03 min 16 sec	21%	15
	2012	6.2 miles	14 min 51 sec	26.7	26	7.0	02 min 46 sec	18%	15
	2014	6.2 miles	15 min 07 sec	26.5	26	6.9	03 min 19 sec	21%	14

Table I-3
Mean Time Stopped at Four Boulder Intersections

Intersection	Direction	Mean Time Spent Stopped at Intersection (seconds)																									
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2012	2014	Mean
Broadway and Arapahoe Ave	East		45		41		45		34		41		40		75		37		35		54		26		47		36	43
	West		44		38		46		46		36		36		61		37		34		35		39		36		33	40
	North	7		27		35		56		22		32		47		54		74		38		29		52		38	50	40
	South	31		20		21		18		34		43		42		55		69		41		45		35		49	34	38
Broadway and Balsam Ave	East		28		23		31		25		29		30		31		33		32		39		42		37			32
	West		30		30		32		30		29		36		34		30		31		41		36		36			33
	North	12		22		28		26		27		28		29		31		51		33		19		0		28	19	25
	South	13		11		31		26		28		22		28		29		64		23		17		29		15	41	27
28th St and Arapahoe Ave	East		38		54		43		51		39		52		66		46		43		58		62		58		71	52
	West		61		64		62		66		48		48		64		49		47		40		49		53		27	52
	North	27		27		37		38		50		38		52		51		65		50		84		70		77		51
	South	38		36		65		71		56		58		61		61		59		29		50		38		31		50
28th St and Valmont Rd	East		39		50		40		30		41		34		59		39		37		48		79		38		23	43
	West		41		54		39		64		42		47		56		41		40		55		74		60		30	49
	North	20		21		37		47		43		43		72		71		56		38		47		33		58		45
	South	26		26		37		39		34		36		47		47		53		37		44		39		40		39

Table I-4
Probability of Being Stopped at Four Boulder Intersections

Intersection	Direction	Chance of Stopping at the Intersection (percent)																									
		1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2010	2012	2014	Mean
Broadway and Arapahoe Ave	East		90%		81%		82%		87%		82%		97%		62%		45%		43%		76%		50%		53%		86%	72%
	West		77%		86%		77%		56%		70%		88%		93%		42%		41%		67%		93%		73%		67%	72%
	North	15%		42%		13%		54%		27%		59%		61%		66%		77%		80%		80%		67%		80%	53%	55%
	South	26%		36%		37%		47%		33%		60%		61%		88%		76%		15%		23%		20%		27%	21%	41%
Broadway and Balsam Ave	East		77%		76%		65%		38%		76%		79%		68%		28%		27%		85%		63%		80%			64%
	West		81%		93%		79%		71%		83%		75%		80%		28%		26%		88%		93%		67%			72%
	North	26%		26%		33%		36%		33%		31%		30%		36%		27%		33%		40%		0%		53%	27%	31%
	South	41%		9%		41%		42%		56%		50%		50%		28%		23%		62%		38%		40%		60%	50%	42%
28th St and Arapahoe Ave	East		33%		52%		68%		73%		71%		68%		69%		43%		41%		72%		88%		73%		50%	62%
	West		18%		48%		58%		78%		64%		48%		38%		43%		40%		50%		53%		53%		100%	53%
	North	75%		61%		81%		75%		65%		71%		77%		86%		70%		33%		80%		40%		67%		68%
	South	93%		82%		67%		67%		77%		75%		77%		67%		56%		53%		63%		47%		47%		67%
28th St and Valmont Rd	East		68%		81%		84%		100%		88%		83%		71%		25%		24%		54%		50%		47%		33%	62%
	West		90%		81%		82%		64%		72%		75%		57%		32%		31%		65%		53%		60%		60%	63%
	North	61%		22%		44%		40%		54%		58%		65%		81%		86%		40%		55%		60%		47%		55%
	South	89%		71%		67%		63%		74%		50%		54%		86%		83%		13%		19%		13%		33%		55%

Appendix II:

Drive Time 2014

Table II.1: Time Traveled (2014)

	Mean Total Trip Time	Shortest Trip Time	Longest Trip Time	Trip Distance (miles)	Average Speed (mph)
Arapahoe Ave					
East	14 min 00 sec	10 min 27 sec	17 min 43 sec	5.6	28.4
West	13 min 09 sec	11 min 30 sec	16 min 08 sec	5.6	28.8
Valmont Rd					
East	10 min 09 sec	08 min 36 sec	11 min 30 sec	3.2	22.2
West	10 min 24 sec	08 min 42 sec	16 min 42 sec	3.2	21.1
Broadway					
North	17 min 17 sec	14 min 43 sec	20 min 21 sec	6.7	25.9
South	16 min 21 sec	13 min 44 sec	19 min 21 sec	6.7	27.1

Note :
Arapahoe Avenue - The above data includes 63rd, 65th, and 75th Streets intersections whereas ***Table 1*** *within the report text does not extend east of 55th Street, for historical comparison purposes.The extension to 75th Street was added in 2014, which added 1.2 miles to the corridor length.*
Broadway - The above data includes Lee Hill Drive whereas Table 1 does not extend north of Violet Avenue, for historical comparison purposes.

Table II.2: Number of Stops (2014)

	Total Stops Possible	Mean Number of Stops	Fewest Stops	Most Stops	Mean Chance of Stopping	Number of Trips
Arapahoe Ave						
East	21	6.2	2	12	30%	14
West	21	5.9	3	9	28%	15
Valmont Rd						
East	11	5.9	3	11	54%	15
West	11	6.8	4	11	62%	15
Broadway						
North	26	7.7	4	12	31%	15
South	26	6.9	4	11	27%	14

Note :
Arapahoe Avenue - The above data includes 63rd, 65th, and 75th Streets intersections whereas Table 1 within the report text does not extend east of 55th Street, for historical comparison purposes.The extension to 75th Street was added in 2014, which added 1.2 miles to the corridor length.
Broadway - The above data includes Lee Hill Drive whereas Table 1 does not extend north of Violet Avenue, for historical comparison purposes.

Table II.3: Time Stopped (2014)

	Mean Percent of Time Stopped	Mean Total Time Stopped	Shortest Time Stopped	Longest Time Stopped
Arapahoe Ave				
East	27%	04 min 01 sec	01 min 22 sec	07 min 18 sec
West	22%	03 min 02 sec	01 min 36 sec	05 min 17 sec
Valmont Rd				
East	30%	03 min 07 sec	01 min 40 sec	04 min 24 sec
West	30%	03 min 13 sec	01 min 36 sec	09 min 14 sec
Broadway				
North	22%	03 min 51 sec	02 min 03 sec	06 min 03 sec
South	20%	03 min 19 sec	01 min 10 sec	05 min 57 sec

Note:
Arapahoe Avenue - The above data includes 63rd, 65th, and 75th Streets intersections whereas ***Table 1*** *within the report text does not extend east of 55th Street, for historical comparison purposes.The extension to 75th Street was added in 2014, which added 1.2 miles to the corridor length.*
Broadway - The above data includes Lee Hill Drive whereas Table 1 does not extend north of Violet Avenue, for historical comparison purposes.

Table II.4: Drive Time by Time of Day (2014)

	Mean Total Trip Time	Mean Number of Stops	Mean Time Stopped
Arapahoe Ave, East			
7:30 AM	12 min 19 sec	4.6	02 min 59 sec
12:00 Noon	12 min 53 sec	5.0	02 min 46 sec
5:00 PM	16 min 35 sec	8.8	06 min 02 sec
Arapahoe Ave, West			
7:30 AM	12 min 36 sec	5.5	02 min 34 sec
12:00 Noon	12 min 25 sec	5.8	02 min 22 sec
5:00 PM	14 min 29 sec	6.4	04 min 13 sec
Valmont Rd, East			
7:30 AM	09 min 58 sec	6.6	03 min 00 sec
12:00 Noon	09 min 48 sec	4.6	02 min 45 sec
5:00 PM	10 min 40 sec	6.6	03 min 35 sec
Valmont Rd, West			
7:30 AM	09 min 54 sec	6.0	02 min 48 sec
12:00 Noon	09 min 29 sec	6.6	02 min 24 sec
5:00 PM	11 min 48 sec	7.8	04 min 28 sec
Broadway, North			
7:30 AM	15 min 57 sec	6.2	02 min 52 sec
12:00 Noon	16 min 53 sec	7.0	03 min 37 sec
5:00 PM	19 min 00 sec	10.0	05 min 05 sec
Broadway, South			
7:30 AM	17 min 49 sec	8.5	04 min 11 sec
12:00 Noon	14 min 59 sec	5.8	02 min 20 sec
5:00 PM	16 min 31 sec	6.6	03 min 37 sec

Note:
Arapahoe Avenue - The above data includes 63rd, 65th, and 75th Streets intersections whereas Table 1 within the report text does not extend east of 55th Street, for historical comparison purposes.The extension to 75th Street was added in 2014, which added 1.2 miles to the corridor length.
Broadway - The above data includes Lee Hill Avenue whereas Table 1 does not extend north of Violet Avenue, for historical comparison purposes.

Table II.5: Ten Worst Intersections by Chances of Being Stopped (2014)

Intersection	Direction	Chances of Being Stopped
Arapahoe Ave at 28th St	Westbound	100%
Valmont St at 30th St	Eastbound	100%
Valmont St at Folsom St	Westbound	100%
Valmont St at 19th St	Eastbound	93%
Valmont St at 19th St	Westbound	87%
Arapahoe Ave at Broadway	Eastbound	86%
Valmont St at Foothills Pkwy	Westbound	80%
Arapahoe Ave at Folsom St	Eastbound	79%
Arapahoe Ave at 55th St	Eastbound	79%
Broadway at Iris Ave	Northbound	73%

Note: List above does not include all-way stop intersections.

Table II.6a: Ten Worst Intersections by Length of Stop (2014)*

Intersection	Direction	Mean Length of Stop
Arapahoe Ave at 30th St	Westbound	01 min 15 sec
Arapahoe Ave at 28th St	Eastbound	01 min 11 sec
Valmont St at Foothills Pkwy	Eastbound	01 min 10 sec
Arapahoe Ave at Foothills Pkwy	Westbound	01 min 06 sec
Arapahoe Ave at 15th St	Eastbound	01 min 04 sec
Arapahoe Ave at 63rd St	Eastbound	01 min 02 sec
Arapahoe Ave at Folsom St	Westbound	01 min 00 sec
Arapahoe Ave at 55th St	Eastbound	00 min 58 sec
Valmont St at Folsom St	Eastbound	00 min 58 sec
Broadway at Canyon Blvd	Northbound	00 min 53 sec

Table II.6b: Ten Worst Intersections by Length of Stop (2014)**

Intersection	Direction	Mean Length of Stop
Valmont St at Foothills Pkwy	Eastbound	00 min 47 sec
Valmont St at Folsom St	Westbound	00 min 46 sec
Arapahoe Ave at 55th St	Eastbound	00 min 46 sec
Valmont St at Folsom St	Eastbound	00 min 42 sec
Valmont St at 30th St	Eastbound	00 min 38 sec
Broadway at Canyon Blvd	Northbound	00 min 36 sec
Arapahoe Ave at 28th St	Eastbound	00 min 35 sec
Broadway at Table Mesa Drive	Northbound	00 min 35 sec
Arapahoe Ave at Folsom	Eastbound	00 min 31 sec
Arapahoe Ave at Broadway	Eastbound	00 min 30 sec

** Table II.6a calculations include stopped time only for runs where a stop at this intersection occurred.*

*** Table II.6b includes ALL runs in averaged stopped times, including runs where no stop occurred (thus 0:00 stopped time included in mean calculation)*

Table II.7: Ten Best Intersections by Chances of Being Stopped (2014)

Intersection	Direction	Chances of Being Stopped
Arapahoe Ave at 26th St	East and West	0%
Arapahoe Ave at 29th St	Eastbound	0%
Arapahoe Ave at 30th St	Eastbound	0%
Arapahoe Ave at 33rd St	Eastbound	0%
Arapahoe Ave at 48th St	Eastbound	0%
Arapahoe Ave at Eisenhower Dr	East and West	0%
Arapahoe Ave at Conestoga St	Westbound	0%
Arapahoe Ave at 38th St	Westbound	0%
Broadway at College Ave	North and South	0%
Broadway at Pennsylvania Ave	Northbound	0%
7 others tied	-	0%

Table II.8: Ten Best Intersections by Length of Stop (2014)

Intersection	Direction	Mean Length of Stop
Arapahoe Ave at 26th St	East and West	00 min 00 sec
Arapahoe Ave at 29th St	Eastbound	00 min 00 sec
Arapahoe Ave at 30th St	Eastbound	00 min 00 sec
Arapahoe Ave at 33rd St	Eastbound	00 min 00 sec
Arapahoe Ave at 48th St	Eastbound	00 min 00 sec
Arapahoe Ave at Eisenhower Dr	East and West	00 min 00 sec
Arapahoe Ave at Conestoga St	Westbound	00 min 00 sec
Arapahoe Ave at 38th St	Westbound	00 min 00 sec
Broadway at College Ave	North and South	00 min 00 sec
Broadway at Pennsylvania Ave	Northbound	00 min 00 sec
7 others tied	-	00 min 00 sec

Table II.9: Drive Time and Speed Between Intersections, Arapahoe Avenue (2014)

Street	Intersection	Mean Speed From Previous Intersections (mph)	Mean Time from Previous Intersection
Arapahoe Avenue East	9th Street	n/a	n/a
	Broadway	16.0	00 min 16 sec
	15th Street	18.3	00 min 18 sec
	17th Street	13.5	00 min 13 sec
	19th Street	21.3	00 min 21 sec
	Naropa Ped Crossing	22.4	00 min 22 sec
	Folsom Street	14.6	00 min 15 sec
	26th Street	30.6	00 min 31 sec
	28th Street	19.2	00 min 19 sec
	29th Street	28.5	00 min 29 sec
	30th Street	31.7	00 min 32 sec
	33rd Street	34.3	00 min 34 sec
	38th Street	36.2	00 min 36 sec
	Foothills Parkway	29.2	00 min 29 sec
	48th Street	36.1	00 min 36 sec
	Commerce St/Eisenhower Dr	37.8	00 min 38 sec
	Conestoga Street	36.8	00 min 37 sec
	55th Street	14.3	00 min 14 sec
	Cherryvale Road	41.2	00 min 41 sec
	63rd Street	38.5	00 min 38 sec
	65th Street	37.3	00 min 37 sec
	75th Street	39.2	00 min 39 sec
Arapahoe Avenue West	75th Street	n/a	n/a
	65th Street	39.9	00 min 40 sec
	63rd Street	36.8	00 min 37 sec
	Cherryvale Road	41.1	00 min 41 sec
	55th Street	32.0	00 min 32 sec
	Conestoga Street	33.3	00 min 33 sec
	Commerce St/Eisenhower Dr	41.8	00 min 42 sec
	48th Street	40.1	00 min 40 sec
	Foothills Parkway	34.4	00 min 34 sec
	38th Street	36.1	00 min 36 sec
	33rd Street	34.1	00 min 34 sec
	30th Street	25.3	00 min 25 sec
	29th Street	28.7	00 min 29 sec
	28th Street	10.1	00 min 10 sec
	26th Street	27.2	00 min 27 sec
	Folsom Street	19.9	00 min 20 sec
	Naropa Ped Crossing	21.7	00 min 22 sec
	19th Street	21.5	00 min 22 sec
	17th Street	19.8	00 min 20 sec
	15th Street	23.4	00 min 23 sec
	Broadway	17.6	00 min 18 sec
	9th Street	19.9	00 min 20 sec

Table II.10: Drive Time and Speed Between Intersections, Valmont Road (2014)

Street	Intersection	Mean Speed From Previous Intersections (mph)	Mean Time from Previous Intersection
Valmont Road East	9th Street	n/a	n/a
	Broadway	16.2	00 min 51 sec
	13th Street	14.2	00 min 26 sec
	19th Street	20.1	01 min 14 sec
	Folsom Street	17.2	02 min 04 sec
	28th Street	24.9	00 min 42 sec
	30th Street	13.6	01 min 09 sec
	Wilderness Place	27.3	00 min 46 sec
	Foothills Parkway	12.5	01 min 08 sec
	47th Street	28.3	00 min 12 sec
	Airport Road	35.3	00 min 45 sec
	55th Street	34.6	00 min 51 sec
Valmont Road West	55th Street	n/a	n/a
	Airport Road	30.5	00 min 59 sec
	47th Street	29.7	01 min 08 sec
	Foothills Parkway	13.7	00 min 32 sec
	Wilderness Place	29.0	00 min 19 sec
	30th Street	23.3	01 min 02 sec
	28th Street	21.8	00 min 49 sec
	Folsom Street	11.7	01 min 22 sec
	19th Street	19.3	01 min 48 sec
	13th Street	21.5	01 min 09 sec
	Broadway	12.5	00 min 41 sec
	9th Street	19.8	00 min 36 sec

Table II.11: Drive Time and Speed Between Intersections, Broadway (2014)

Street	Intersection	Mean Speed From Previous Intersections (mph)	Mean Time from Previous Intersection
Broadway North	Greenbriar Boulevard	n/a	n/a
	Hanover Avenue	37.8	00 min 56 sec
	Table Mesa Drive	19.4	01 min 08 sec
	Dartmouth Avenue	38.1	00 min 42 sec
	27th Way	34.2	01 min 02 sec
	Baseline Road	27.7	00 min 44 sec
	Regent Drive	29.6	00 min 44 sec
	Euclid Avenue	23.7	00 min 44 sec
	College Avenue	31.4	00 min 18 sec
	Pennsylvania Avenue	24.8	00 min 20 sec
	University Avenue	23.0	00 min 27 sec
	Arapahoe Avenue	20.0	01 min 01 sec
	Canyon Boulevard	12.0	00 min 58 sec
	Walnut Street	24.0	00 min 13 sec
	Pearl Street	19.8	00 min 22 sec
	Spruce Street	21.1	00 min 20 sec
	Pine Street	18.4	00 min 22 sec
	North Street	25.5	00 min 45 sec
	Alpine Avenue	27.7	00 min 12 sec
	Balsam Avenue	23.7	00 min 19 sec
	North Boulder Rec.	27.9	00 min 49 sec
	Iris Avenue	19.3	01 min 06 sec
	Linden Avenue	30.9	00 min 39 sec
	Quince Avenue	28.8	01 min 04 sec
	Violet Avenue	32.0	00 min 51 sec
	Lee Hill Road	26.7	01 min 11 sec
Broadway South	Lee Hill Road	n/a	n/a
	Violet Avenue	25.7	01 min 13 sec
	Quince Avenue	30.9	00 min 55 sec
	Linden Avenue	31.0	00 min 59 sec
	Iris Avenue	27.4	00 min 44 sec
	North Boulder Rec.	28.2	00 min 40 sec
	Balsam Avenue	23.4	01 min 07 sec
	Alpine Avenue	29.0	00 min 11 sec
	North Street	30.8	00 min 09 sec
	Pine Street	23.8	00 min 55 sec
	Spruce Street	23.4	00 min 14 sec
	Pearl Street	22.0	00 min 16 sec
	Walnut Street	17.1	00 min 28 sec
	Canyon Boulevard	12.7	00 min 38 sec
	Arapahoe Avenue	21.9	00 min 26 sec
	University Avenue	19.9	00 min 56 sec
	Pennsylvania Avenue	25.1	00 min 20 sec
	College Avenue	27.5	00 min 16 sec
	Euclid Avenue	29.8	00 min 20 sec
	Regent Drive	25.1	00 min 46 sec
	Baseline Road	25.5	00 min 53 sec
	27th Way	32.8	00 min 34 sec
	Dartmouth Avenue	35.4	01 min 02 sec
	Table Mesa Drive	28.9	01 min 04 sec
	Hanover Avenue	38.9	00 min 26 sec
	Greenbriar Boulevard	40.8	00 min 50 sec