Gaining Wait?

Analyzing the Congestion Impacts of Road Diets in Los Angeles

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16. Abstract

As part of the City's Vision Zero policy goal put forth by Mayor Eric Garcetti in 2015 to eliminate traffic related deaths on city streets, the Los Angeles Department of Transportation (LADOT) has reconfigured a number of stretches of roadway in the city, removing lanes and installing what are commonly known as "road diets." While numerous studies have shown road diets can greatly reduce the number and severity of collisions, especially for pedestrians and cyclists, the public response to many of the changes implemented in Los Angeles has been quite negative. The Active Transportation and Special Programs (ATSP) team of the Southern California Association of Governments (SCAG), the Metropolitan Planning Organization for the Southern California region, has a strong interest in improving traffic safety in the region, and seeks research to determine if the proven safety improvement measures known as road diets cause the delays and increases in congestion that many opponents claim. To examine this issue I survey existing literature on road diets and their congestion impacts, analyze before and after LADOT daily traffic volume data for four street segments where the city installed road diets and nearby parallel segments where no change was made, and observe current conditions of ten intersections within the selected street segments to assess potential ongoing delay and congestion in the study corridors. This analysis finds an overall increase in traffic volumes of 8 percent on the selected road diet corridors, while volumes decreased very slightly on nearby parallel control corridors. Supplemental field observations of representative intersections for each of the four road diet corridors and their respective control corridors suggest that current lane configurations have not negatively affected peak-hour traffic flow or level of service on either the road diet or control corridor.

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Analyzing the Congestion Impacts of Road Diets in Los Angeles

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A comprehensive project submitted in partial satisfaction of the requirements for the degree Master of Urban and Regional Planning

Disclaimer: This report was prepared in partial fulfillment of the requirements for the Master in Urban and Regional Planning degree in the Department of Urban Planning at the University of California, Los Angeles. It was prepared at the direction of the Department and of [insert client name] as a planning client. The views expressed herein are those of the authors and not necessarily those of the Department, the UCLA Luskin School of Public Affairs, UCLA as a whole, or the client

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Executive Summary

As part of the City's Vision Zero policy goal put forth by Mayor Eric Garcetti in 2015 to eliminate traffic related deaths on city streets, the Los Angeles Department of Transportation (LADOT) has reconfigured a number of stretches of roadway in the city, removing lanes and installing what are commonly known as "road diets." While numerous studies have shown road diets can greatly reduce the number and severity of collisions, especially for pedestrians and cyclists, the public response to many of the changes implemented in Los Angeles has been quite negative. Angry residents and commuters have organized protests of the roadway changes, initiated campaigns to recall city councilmembers who have supported the changes and even successfully lobbied to have road diets undone and converted back to their previous state. This negative response has largely centered on claims of large increases in congestion and travel times along the streets where the LADOT has removed lanes.

The Active Transportation and Special Programs (ATSP) team of the Southern California Association of Governments (SCAG), the Metropolitan Planning Organization for the Southern California region, has a strong interest in improving traffic safety in the region, and seeks research to determine if these proven safety improvement measures cause the delays and increases in congestion that opponents claim. To examine this issue I survey existing literature on road diets and their congestion impacts, analyze before and after LADOT daily traffic volume data for a number of street segments where the city installed road diets and nearby parallel segments where no change was made, and observe current conditions of ten intersections within the selected street segments to assess potential ongoing delay and congestion in the study corridors.

With limited congestion data available, I focus on analyzing traffic volume data for four road diet corridors, using nearby, parallel corridors where lane configuration remained unchanged as controls for examining changes in volumes before and after the road diets were installed. The analysis finds an overall increase in traffic volumes on the selected road diet corridors of 8 percent, while volumes decreased very slightly on nearby parallel corridors. While the limitations of using daily traffic volume data to estimate congestion mean that these results do not disprove the possibility of increased congestion after road diet installations, the fact that more vehicles passed through road diet corridors without corresponding increases in volumes on nearby streets suggests that drivers did not divert to nearby streets as might be expected with increases in congestion and delay. Field observations of representative intersections for each of the four road diet corridors and their respective control corridors suggest that current lane configurations have not negatively affected peak-hour traffic flow or level of service on either the road diet or control corridor.

Both the findings and limitations of this study indicate there is considerable need for additional research into road diets and congestion. In particular, extensive, targeted data collection before and after installations is needed to support future analysis, and permit transparent public performance tracking of future road diet projects to better inform the public of their impacts.

Chapter 1: Introduction

Background

Traffic safety is a major issue for the City of Los Angeles. Every year, over 200 traffic-related deaths take place on the city's streets, with nearly half of those deaths being cyclists or pedestrians ("Vision Zero LA," n.d.). In 2015, Mayor Eric Garcetti signed an executive order calling on the city to implement a Vision Zero policy, with the intent of eliminating all traffic deaths by 2025 (City of Los Angeles, 2015). A key piece of this Vision Zero plan involved installing so-called road diets on some of Los Angeles' especially dangerous streets, a process that involves removing through traffic lanes and adding turning and bike lanes to reduce vehicle turning and lane change collisions, improve pedestrian and bicycle infrastructure, and "calm" high-speed traffic by reducing vehicle speeds (Tinoco, 2017). These road diets have proven effective at improving safety outcomes in Los Angeles (Martinez, 2016), but claims of increased congestion and terrible traffic along the reconfigured roads have prompted public outcry, recall campaigns and even lawsuits against the city (Tinoco, 2017).

Objective

In the interest of having more information about the effects of road diets in Los Angeles, the Active Transportation and Special Programs team at the Southern California Association of Governments (SCAG) requested a study of congestion on road diet corridors before and after the travel lanes were removed. This report presents four case studies of road diet corridors and respective nearby parallel control corridors to estimate changes in traffic flow and congestion along these routes after the lane configuration changes were made.

Method

The research for this study consisted of an analysis of the Average Daily Traffic[1] (ADT) count data made publicly available by the Los Angeles Department of Transportation (LADOT). Four road diet corridors were selected as case studies for analysis, each of which had available traffic counts before and after implementation of the road diet segment, as well as parallel corridor(s) with before and after traffic counts for comparison. This analysis determines whether traffic volumes changed along the road diet corridors and, by comparing them with nearby parallel corridors, seeks to explain how the road diets may have influenced traffic flow in the area.

In addition to comparing traffic volumes on road diet corridors and nearby comparison corridors before and after road diet implementation, I observed current conditions of representative intersections within the road diet and comparison corridors. These

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[1] The US Department of Transportation defines ADT as "the average 24 hour [traffic] volume, being the total volume during a stated period divided by the number of days in that period"

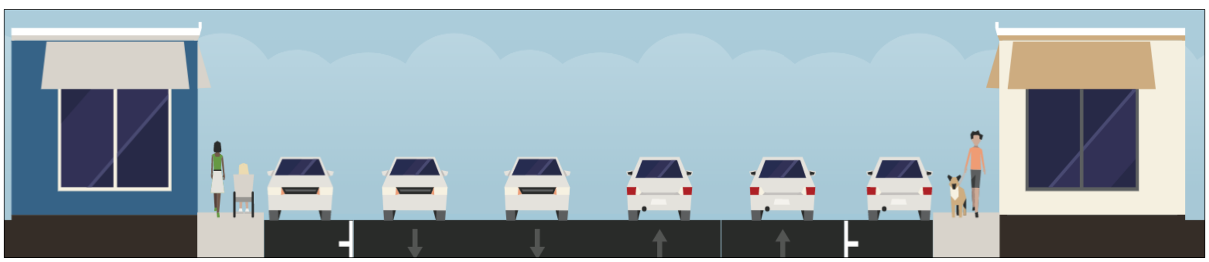
current conditions assessments serve to provide more context than can be obtained through ADT analysis alone, by presenting current measurements of traffic volumes and observations of peak-hour traffic movements in the case study corridors as well as information about the land use and context through which these corridors run.

Chapter 2: What do we know about road diets?

What Is a Road Diet?

Road diets, also known as “roadway reconfigurations,” “rechannelizations,” or “lane reductions” (Martinez, 2016), are a popular and well-documented method for improving pedestrian and bicycle safety, reducing the overall number of collisions, and calming[2] traffic on dangerous streets. A typical road diet involves repurposing some through traffic lanes on a segment of a street for bike lanes, parking, pedestrian infrastructure, and medians or center turn lanes (Martinez, 2016).

Before: Two Travel Lanes in Each Direction



After: One Travel Lane in Each Direction, Center Turn Lane and Bike Lanes

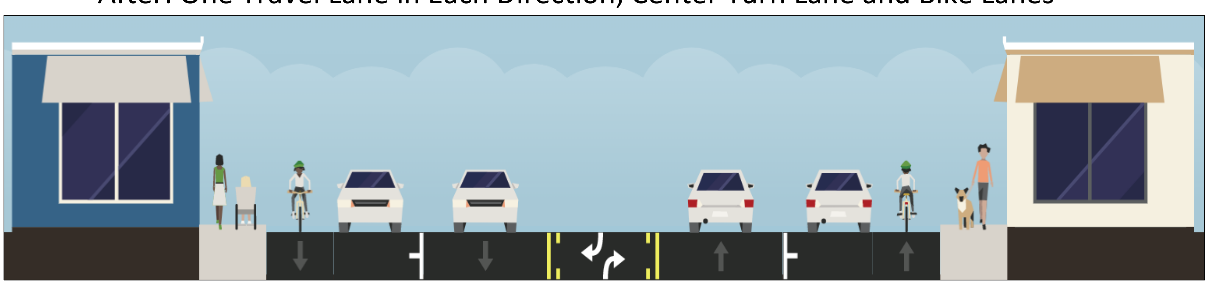


Figure 1. Example of a Road Diet Lane Reconfiguration[3]

[2] Traffic calming is defined by the US Federal Highway Administration (FHWA) as “A full range of methods to slow cars but not ban them, as they move through commercial and residential neighborhoods.” (FHWA, 2006)

[3] All street cross-section figures made using Streetmix

Road diets can be an important and effective tool for transportation planners and engineers tasked with making roadway safety improvements. These street design changes can face loud opposition, however, from local residents and motorists who complain of added congestion and increased travel times brought about by the reduction in the number of lanes available for through traffic. The backlash from motorists can lead to complications in implementing these purported safety improvements or lead to them being removed completely as has happened recently on the Westside of Los Angeles (Zahniser, 2017). While the safety benefits of road diets have been well established in the literature, there is considerably less research has been done regarding how road diet implementation affects traffic congestion and vehicle travel times. This review will briefly examine what the literature has to say regarding the background of road diets, the forms that road diets generally take, and the impacts of road diets on traffic congestion.

Background

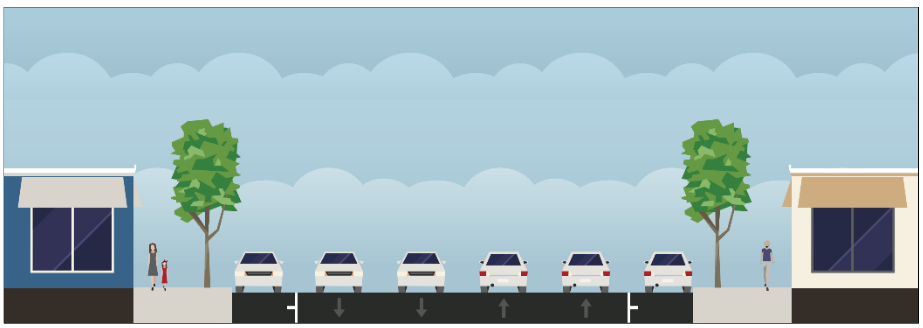
While the first implementation of road diets on US streets is not well documented, the use of the term "road diet" can be traced back to Dan Burden and Peter Lagerway, who in 1996 used the term to refer to the conversion of wide, dangerous roads into safer, narrower roads with fewer lanes by removal of a traffic lane (Burden and Lagerway, 1999). The process of repurposing unneeded travel lanes to increase safety, reduce complexity of movement, and improve access and mobility for transportation modes other than personal automobile has existed for quite some time, with Seattle making such changes as far back as 1972 and other major cities following suit throughout the 1980s and 1990s (Burden and Lagerway, 1999). Research throughout the 1990s and 2000s has shown that road diets are effective in improving safety for drivers, cyclists and pedestrians alike. A 1999 study of lane conversions by Thomas Welch showed that converting a four lane road to a three lane road with a center turn lane had the potential of reducing crashes by 20 to 30 percent, while also providing pedestrians a refuge of sorts in the center turn lane (Welch, 1999). Welch also describes the safety improvements brought about by reducing the number of conflict and friction points present in four lane roadways – especially those present due to the need to change lanes and from drivers waiting to turn from a travel lane and blocking traffic – when the number of travel lanes is reduced to two and a dedicated center turn lane is added (Welch, 1999).

In recent years, road diets have gained in popularity, with more cities looking at these conversions as a way to reduce the number of traffic fatalities and improve safety. Since 2010, Los Angeles has installed more than 60 miles of road diets, according to research by Severin Martinez, with an increased focus on road safety coming about since the 2015 adoption of Los Angeles' Vision Zero initiative (Martinez, 2016) – which aims to end all traffic deaths and serious injuries in the city by 2025 ("Vision Zero Los Angeles", n.d.). While it has resulted in safety improvements on a number of street corridors, the increased focus on road diets in Los Angeles has unfortunately also brought about significant backlash, with residents of the city's Westside going so far in 2017 as to threaten a recall of City Councilmember Mike Bonin over the reduction of car lanes and addition of bike lanes in the Playa Del Rey neighborhood (Zahsiner, 2017).

Types of Road Diets

Road diets can take different forms, but two of the most common are conversions of four-lane undivided roadways into three-lane roads with a center, two-way left turn lane (Russell & Mandavilli, 2003) as shown in Figure 2, and conversions of four-lane roads into two-lane roads with bike lanes and enhanced pedestrian infrastructure (Gudz, Fang, & Handy, 2017) as shown in Figure 3.

Before: Two Travel Lanes in Each Direction



After: Two Travel Lanes and Bike Lanes in Each Direction with Center Turn Lane

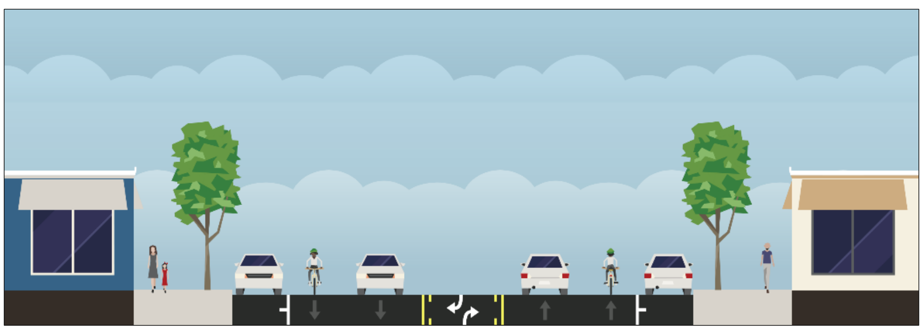
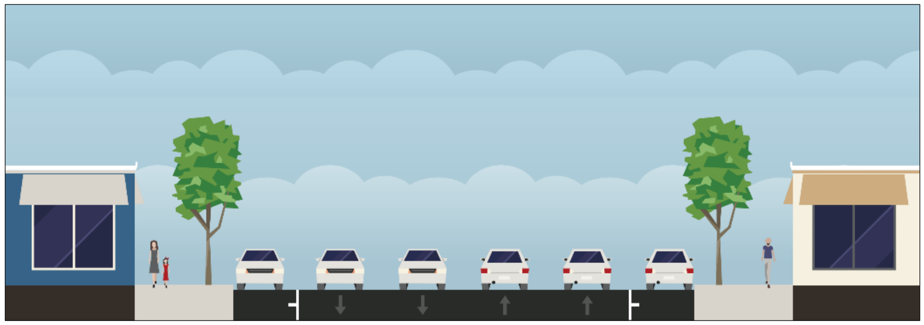


Figure 2. Four Lane to Three Lane Conversion

Before: Two Travel Lanes in Each Direction



After: One Travel Lane in Each Direction with Protected Bike Lanes and Pedestrian Improvments

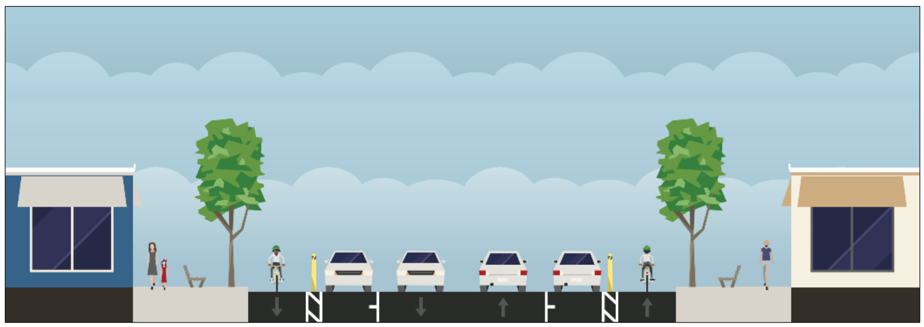


Figure 3: Four Lane to Two Lane Conversion with Bicycle and Pedestrian Infrastructure

Often these methods are combined, adding both a center turn lane and bicycle lanes while removing travel lanes from a four lane road. The benefit of adding a center turn lane while removing two travel lanes from a four lane road is the reduction of conflict points for motorists. As I previously mention, Welch finds that the three-lane layout reduced the chances of conflict brought about by cars changing lanes or turning from a travel lane and blocking the traffic behind them. He also highlights that this street layout is much friendlier for older drivers as it reduces the number of decisions that need to be made and simplifies the driving experience (Welch, 1999). Making the road friendlier for elderly drivers presumably will make it friendlier and simpler for all other drivers as well, which will lead to fewer decisions and conflict for motorists across the board.

Less research is available regarding the safety impacts for cyclists and pedestrians when road diets are installed, in large part due to the lesser availability of data for bicycle and pedestrian involved collisions, as noted by Gudz et al (Gudz et al, 2017). A study of a road diet conversion in Davis, California that included the addition of five- to seven-foot bike lanes each way did, however, show a243 percent increase in the number of cyclists present on the road (Gudz et al, 2017). This study suggests that the addition of bicycle-only infrastructure as part of a road diet can encourage more people to travel by bicycle and that this factor should be taken into consideration when road diets are being installed.

Road Diets and Congestion

Much of the literature on road diets focuses on the safety improvements they bring or on the access that they can provide to travel modes other than private motor vehicles. Less of a focus in most of the literature is the impact that road diet implementation has on congestion. Burden and Lagerway mention efficiency as a potential benefit of road diets, and they discuss suggested ADT at which lanes can be removed from a road without negatively affecting traffic flow – about 12,000 to 25,000 vehicles, depending on the road (Burden and Lagerway, 1999). There is little mention, however, of the congestion impacts or lack thereof on roads where these changes have been made. Welch describes the capacity of a three lane road with center turn lane as being very near that of a four lane road, noting that in his observations much of the peak traffic along four lane roads with no designated turn lane is confined to the outer travel lanes to avoid getting stuck behind vehicles waiting to turn left in the inner travel lanes. He states that while an increase in travel delay may occur with a reduction in travel lanes, the overall level of service should remain similar with the addition of a center turn lane (Welch, 1999). Gudz et al. finds in their study that automobile travel times along the road they examined did not increase and in fact perhaps even fell. They also note, however, that the study did not control for the possibility of automobile traffic diverting to other nearby parallel roads, meaning that it is inconclusive whether the road diet increased congestion in the area overall (Gudz et al, 2017).

The most detailed examination of traffic flow impacts of a road diet implementation examined for this literature review comes from a 2003 study by Russell and Mandavilli. They examined an intersection where a four-lane undivided roadway was converted to a three-lane roadway with a two-way center turn lane and bike lanes on either side of the roadway (Russell and Mandavilli, 2003). They find no statistically significant change in average intersection delay for the three-lane versus the four-lane condition, a significant decrease in the average queue length[4] in the three-lane condition, no significant increase in the degree of vehicle saturation and a statistically significant decrease in the proportion of vehicles stopped after the conversion. The results imply that some changes took place in congestion and traffic delays after the four-lane roadway was converted to a three-lane roadway, but that most negative impacts were not statistically significant and that some of the changes were in the positive direction for efficiency. They conclude that operational performance for the three-lane condition was nearly equal to that of the four-lane condition.

Key Takeaways

While there is some research on the congestion effects and operational performance of roadways after the implementation of road diets, most of the road diet literature focuses elsewhere. When it comes to Los Angeles in particular, there is a gap in the

[4] Defined by the FHWA as the "number of vehicles stopped in a lane behind the stopline at a traffic signal"

research on the traffic impacts of road diets. Recent studies have examined the economic impacts of road diet implementation on York Boulevard (McCormick, 2012) and the impacts that road diets have on collision rates and safety (Martinez, 2016). However, considering that much of the backlash to recent road diets has focused on perceptions of increased travel times and ballooning congestion, there would appear to be a need for further examination of how these conversions impact the flow of traffic in the Greater Los Angeles area.

Chapter 3: The Design of This Study

Research Question and Approach

This research focuses on road diets in Los Angeles and their impacts on traffic flow and auto congestion. Specifically, the project aims to answer the following research question: How have road diets in Los Angeles affected congestion and traffic flow where they have been installed? I address this question by performing a case-study analysis of before and after traffic data for four road diet corridors in Los Angeles and comparing any changes in traffic levels to changes on parallel "control" corridors. This data analysis is supplemented by in-person observations of current conditions and traffic counts performed at representative intersections for each of the road diet and comparison corridors.

Data Collection

This report relies mostly on secondary data, supplemented by some primary observations and collected data. The secondary data used include the following: information on locations and lengths of installed road diets, type of road diets installed (e.g. addition of a middle turn lane, conversion to dedicated bicycle lanes, addition or expansion of medians or sidewalks), pretest and posttest ADT levels for implementation sites, locations and distances of "control" sites similar to implementation sites where no changes were made to road design, and pretest and posttest ADT levels for these control sites. The primary data collected include traffic counts at representative intersections and observations of traffic queuing and surrounding land uses at study sites.

The data used for this analysis were obtained from three main sources: 1) Locations, dates of implementation, and configurations of road diets comes from the exhaustive list of Los Angeles road diets documented by Severin Martinez in the report *Who Wins When Streets Lose Lanes? An Analysis of Safety on Road Diet Corridors in Los Angeles*, 2) Los Angeles Department of Transportation (LADOT) ADT count data comes from public records on the LADOT website and through the web service NavigateLA and 3) Current manual traffic counts and intersection traffic queuing and land use information come from personal observation

Method of Analysis

To analyze changes in traffic levels after road diets were installed, I first looked at the traffic counts available for the road diet corridors themselves, before and after the installations were completed. I averaged the pre-installation traffic levels of the four road diet corridors to determine a composite mean. I then followed the same process with the four corridors' traffic counts from after installation to produce a composite mean for post-installation traffic levels. Once the pre- and post-installation composite means were calculated, I compared the two values to determine the overall percent change in traffic levels for the road diet corridors.

Examining the changes in traffic levels along the road diet corridors themselves presents only a partial picture of potential congestion impacts, however, as the corridors are part of a broader, interconnected road network. An increase or decrease in traffic along the corridor that had lanes removed does not necessarily indicate that congestion improved or got worse along that corridor. In order to get a better idea of the overall traffic impact, and to better infer whether the changes made to the road diet corridors caused a change in congestion levels, I also examined nearby parallel corridors whose lane configurations remained unchanged. I followed essentially the same process for these corridors as the road diet corridors, averaging traffic counts from before and after the adjacent road diet implementations to determine composite means for these nearby control corridors pre- and post-road diet installations. I then compared the two values to determine the overall percent change in traffic levels for the control corridors.

In addition to examining changes in traffic volumes before and after the road diet conversions, I took current measurements of traffic volumes at representative intersections along the treatment and control corridors. I then used the traffic counts to estimate the Level of Service (LOS)[5] for each intersection. To estimate Level of Service I measured the number of vehicles travelling through the intersection on the corridor in question in both directions over a fifteen minute period. This measurement was done during peak travel hours in Los Angeles (typically 7 AM to 9 AM and 4 PM to 6 PM) and included all through traffic, left turn traffic and right turn traffic. I then multiplied the fifteen minute totals by four to determine an estimated hourly traffic flow for each

[5] The Los Angeles Metropolitan Transit Authority defines Level of Service as "a qualitative measure describing operational conditions within a traffic stream. Generally described in terms of such factors as speed and travel time, freedom to maneuver, traffic interruptions, comfort, convenience, and safety." (Los Angeles County Metropolitan Transit Authority, 2010)

movement. Using these hourly volumes I then found the Volume to Capacity Ratio[6] (V/C) for each movement[7] by dividing the traffic volume for each movement by the theoretical capacity of the road for each movement. Following the Los Angeles County Metropolitan Transit Authority's *2010 Congestion Management Program* as a guide, I used 1,600 vehicles per lane as the hourly capacity for all through and turn lanes and 2,880 vehicles per lane for dual turn lanes (Los Angeles County Metropolitan Transit Authority, 2010). I then found the critical V/C ratio for the intersection, taking the through traffic direction with the highest V/C ratio and adding it to the left turn V/C ratio of the opposite direction. Finally, as I only measured the traffic volumes along the treatment and control corridors and not their cross-streets, in order to estimate a V/C ratio for the full intersection I multiplied the sum of critical V/C ratios by two and added an adjustment for lost time of 0.100 (Los Angeles County Metropolitan Transit Authority, 2010). Using the calculated full V/C ratio estimate for the intersection I compared it against the chart in Table 1 and determined the LOS rating for the intersection.

LOS	Max V/C	Description	Traffic Diversion
A	0.6	Free Flow	No Traffic Diversion
B	0.7	Stable Flow (Slight Delays)	No Traffic Diversion
C	0.8	Stable Flow (Acceptable Delays)	Traffic Diversion Unlikely
D	0.9	Approaching Unstable Flow (Tolerable Delay)	Traffic Diversion Possible
E	1	Unstable Flow (Intolerable Delay)	Traffic Diversion Likely
F	N/A	Forced Flow (Jammed)	Diversion

Table 1. Intersection Level of Service Rating Based on V/C Ratio[8]

This methodology for determining LOS is not strictly the industry standard, but is employed to estimate current congestion levels at representative intersections along the treatment and control corridors, in the interest of providing additional context for the ADT analysis that forms the bulk of this study.

Potential Outcomes and Interpretations of the ADT Analysis

With the study limited primarily to examining ADT data, which do not directly measure congestion, it is important to examine the potential outcomes when analyzing before

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[6] The Los Angeles Metropolitan Transit Authority defines Volume to Capacity Ratio as "The relationship between the number of vehicle trips operating on a transportation facility, versus the number of vehicle trips that can be accommodated by that facility." (Los Angeles County Metropolitan Transit Authority, 2010)

[7] For the purposes of this study "movement" is defined as each different motion a vehicle makes through the intersection, i.e. straight, left turn, right turn.

[8] Table based on criteria presented in *Highway Capacity Manual 2010* (Transportation Research Board, 2010)

and after traffic volumes and comparing changes on treatment and control corridors, and consider what can be inferred by these scenarios:

Scenario 1: Traffic volumes (ADT) remain the same, but delays increase because the corridor now processes traffic more slowly.

This scenario indicates that the same number of vehicles are able to move through the treatment corridors after the road diet is installed as they were before. However, what may have been free-flow traffic before the lanes were repurposed has given way to some level of delay.

Scenario 2: Traffic volumes (ADT) remain the same, but delays decrease because the new configuration processes traffic more effectively.

This scenario is the inverse of Scenario 1. The same number of vehicles are able to move through the corridor, but are able to move more freely and with less delay. No new vehicle trips shift to the treatment corridor take advantage of the decrease in delay, meaning that delay on the control corridors is likely low as well.

Scenario 3: Traffic volumes (ADT) decrease in the treatment corridor, but increase in the control corridor, suggesting that the treatment corridor is processing traffic so much more slowly than before, that it is pushing traffic to alternative routes.

Decreases in volume along the treatment corridor with corresponding increases along the control corridors are a strong indication that delays are occurring along the treatment corridor and causing drivers to divert onto the nearest reasonable alternative routes.

Scenario 4: Traffic volumes (ADT) increase in the treatment corridor, but hold steady or decrease in the control corridors, suggesting that traffic is being processed much more effectively in the treatment corridor as a result of the road diet.

Increased volumes on the treatment corridor with no change or decreases in volumes along the control corridors indicate suggest no delays occur on the treatment corridor and that the treatment corridor is potentially processing traffic more efficiently, likely due to a decrease in conflicts between vehicles changing lanes or waiting to turn in a travel lane and blocking through traffic behind them. This more efficient corridor may even draw vehicles from nearby corridors due to its increased ability to process traffic.

Scenario 5: Traffic volumes (ADT) increase on both the treatment corridor and the control corridors, suggesting an overall increase in area traffic volumes.

Increases on both treatment and control corridors suggest that more vehicles are travelling throughout the area in general and therefore that any potential changes in delay are not limited to the treatment corridor. Rather, delay is likely distributed across the treatment and control corridors to varying degrees.

Scenario 6: Traffic volumes (ADT) decrease on both the treatment corridor and the control corridors, suggesting an overall decrease in area traffic volumes.

The inverse to Scenario 5. Decreased traffic volumes on both treatment and control corridors suggest that the area in general experiences lower traffic volumes. This could be either due to increases in delay across all of the corridors, or due to fewer drivers choosing to drive through the area. It is unlikely that this scenario would be caused solely by changes made to the number of lanes along the treatment corridor.

While other interpretations of the above scenarios are possible, these are the likeliest explanations and they deal the most directly with changes in delay along the treatment and control corridors.

Limitations of the Methods Used in this Study

The biggest limitation to the selected approach was a lack of available traffic delay data. LADOT does not provide public data on any industry standard measures of delay or congestion. The only available data source that relates to traffic on Los Angeles city streets was historical ADT counts. While ADT provides a count of how many cars travel through a specific corridor on any given day, it does not directly quantify congestion or traffic delay. Therefore, using this measure to estimate changes in congestion levels along road diet corridors requires the inferential method outlined above. Additional data measuring peak hour traffic speeds or vehicle density before and after road diets were installed would allow for a more precise measurement of the potential congestion or service impacts of the reconfigurations.

Even when only using ADT to estimate congestion changes, the available data were limited. The LADOT ADT Current Count Data website provides data for counts taken from 2001 through January of 2013, which provides at most an 11 year span during which road diets could have been installed and have before and after traffic data available. Based purely on the dates of installation, this ADT data date range limited the possible road diet corridors for the study to 86 of the 193 total road diets Los Angeles has installed since 1980 (the year of the earliest documented road diet installation). Determining changes in traffic levels from before the road diets were installed to post-installation required traffic counts to be available both before and after the road diets were installed. Limiting potential road diet corridors for the study to only those where traffic counts were available both before and after installation reduced the list of possible corridors to only 23 of the 193 total corridors. Further restricting the test cases to only those with more than one traffic count both pre- and post-installation limited the sample size to only eight total corridors. Finally, out of the eight corridors with multiple available traffic counts both before and after installation, only four also had sufficient traffic data available for nearby parallel corridors, a necessity for the inferential analysis used in this study. While data for additional corridors would have allowed for a broader and more comprehensive study, there is still value in examining the four corridors chosen for this report and the findings of this analysis may still help to inform future city-level transportation planning decisions.

Chapter 4: Analysis and Findings

Establishing Corridors for Analysis

Between 1980 and 2015 LADOT installed 193 road diets on the streets of Los Angeles, totaling just over 112 center-line miles of roads. For the purposes of this report I have chosen to focus on four of these road diet corridors, limiting my analysis to corridors for which there were at least three (3) available traffic counts before and after installation and for which there were parallel corridors that had at least three (3) available traffic counts before and after installation of the road diet. The four selected corridors were:

- 2nd Street, between Spring Street and Alameda Street
- Tujunga Avenue, between Sherman Way and Saticoy Street
- York Boulevard, between Eagle Rock Boulevard and Avenue 55
- Main Street, between 92nd Street and 99th Street

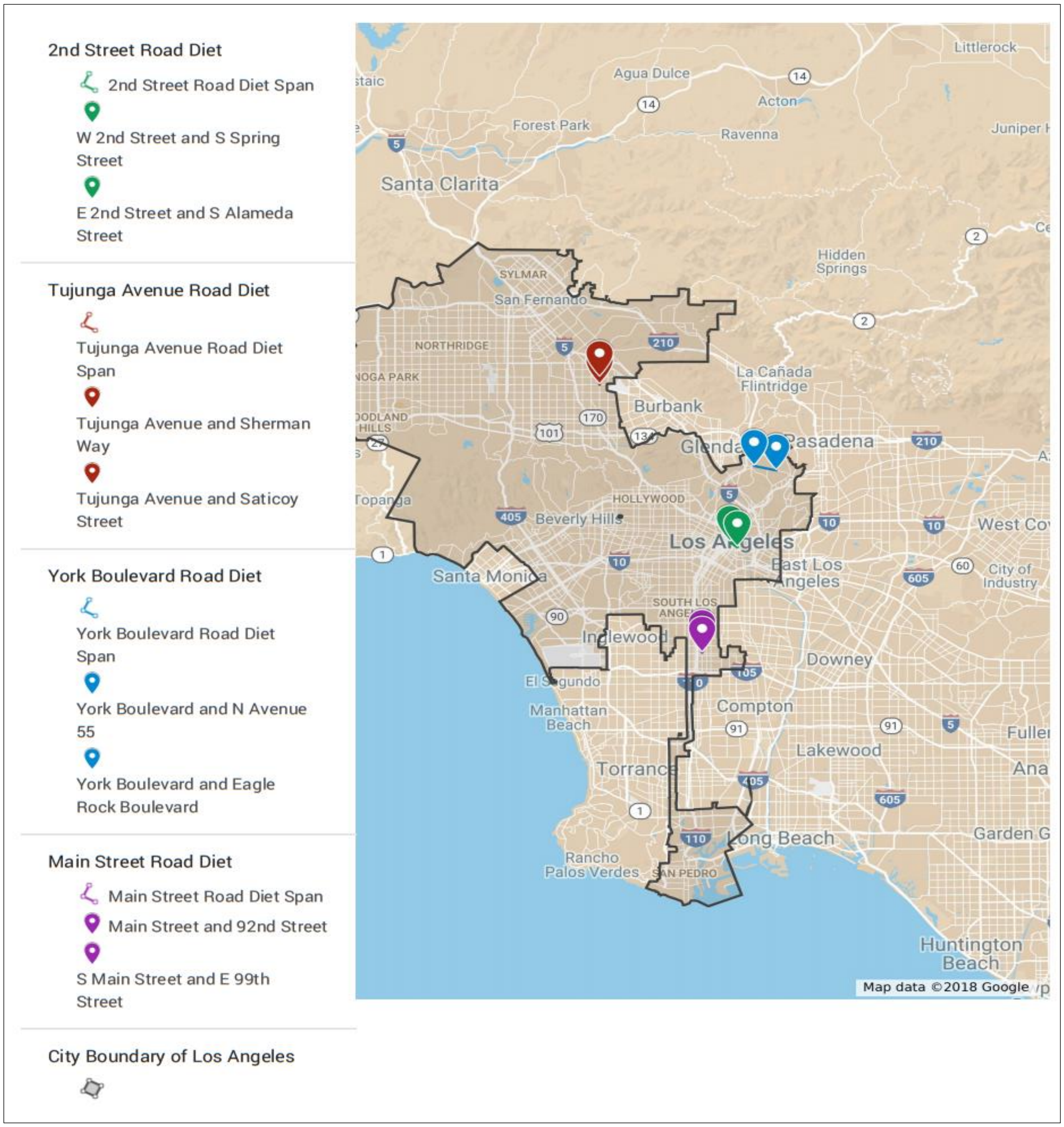

Figure 4: Map of Road Diet Case Study Segment Locations

For each of the selected road diet corridors I also selected adjacent, parallel corridors to serve as control comparisons for analyzing changes in traffic levels along the road diet corridors. Two (2) of the road diet corridors I analyzed (2nd Street and Main Street) had multiple parallel corridors for comparison, as they were located within a clear street grid layout and the nearby streets had ample traffic counts available. The other two (2) corridors were limited to only one parallel corridor for comparison due either to limited parallel roads with available traffic count data (Tujunga Avenue), or to being located in an area with very few clear parallel roads that could be conceivably seen as alternate routes to the road diet corridor (York Boulevard). The parallel streets chosen as control corridors were:

- For 2nd Street – 1st Street and Temple Street
- For Main Street – Broadway and San Pedro Street
- For Tujunga Avenue – Lankershim Boulevard
- For York Boulevard – Yosemite Drive

In the interest of having relatively comparable data across all corridors, I removed traffic counts that had taken place on weekends – Saturdays and Sundays – from the analysis. While there is still some variability in traffic levels by day of the week across weekdays, I reason that removing weekend counts from the analysis should provide more consistency in the data being analyzed.

Further details regarding the locations of each corridor, what was changed as part of the road diet conversions, when the conversions took place, and current traffic and land use conditions at representative intersections on each corridor are included in the Case Studies section that follows.

Case Studies

There was considerable variation in traffic level changes across the individual corridors and their respective nearby control corridors, so it is necessary to view the results for each corridor on an individual basis. Three of the four road diet corridors showed an increase in traffic volumes after the road diet was installed compared to pre-installation. The only corridor that experienced a decrease in traffic volumes was the Tujunga Avenue corridor, which experienced a 5 percent traffic volume decrease post-road diet installation. Each of the treatment corridors and their respective control corridors are examined in further depth on a case by case basis below.

2nd Street Corridor

Context

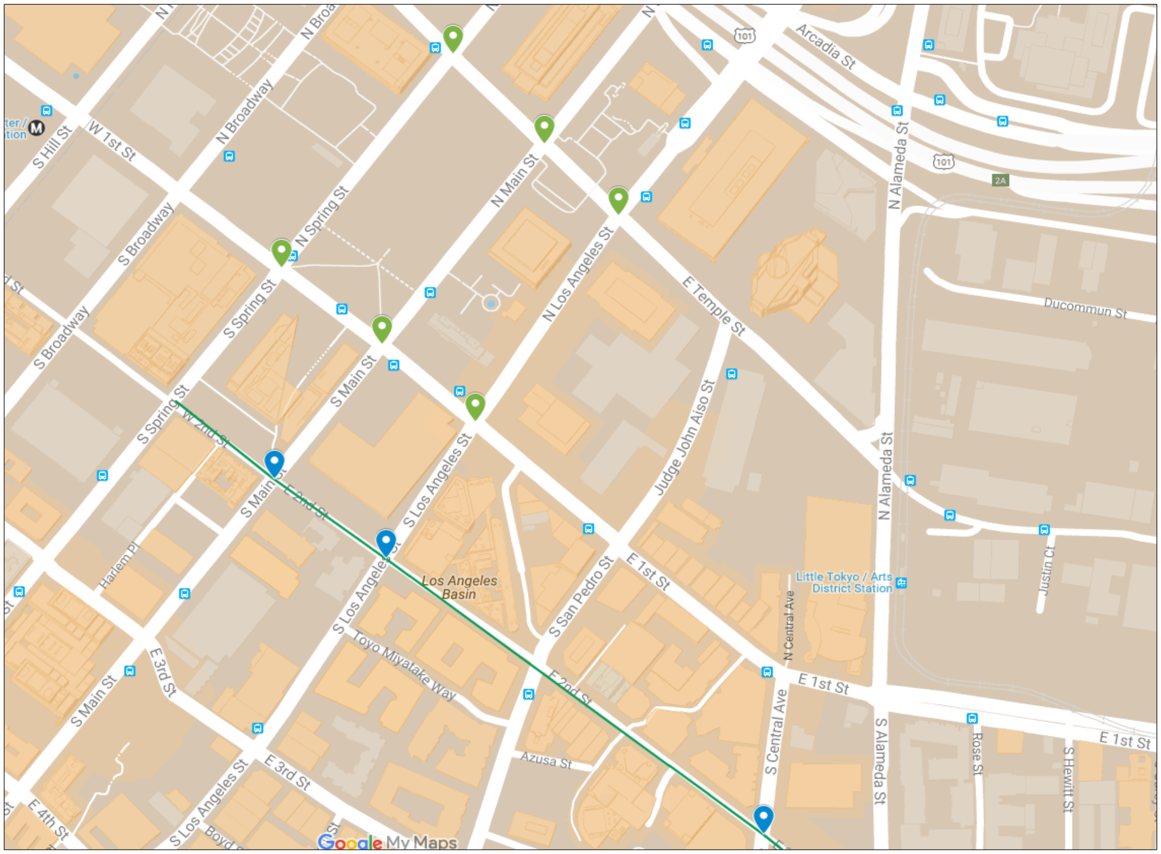

Figure 5: Map of 2nd Street Treatment Intersections and 1st Street and Temple Street Control Intersections. Line segment indicates Treatment Corridor, with markers indicating intersections with available ADT data

The 2nd Street road diet corridor is located in the northeast of Downtown Los Angeles, extending just over one half mile between South Spring Street and South Alameda Street, as shown in Figure 5. The downtown location of the segment means it travels through an area of relatively high density with office and government buildings lining much of the span. Figures 6 and 7 show the intersection of 2nd Street and Main Street, from the northeast corner looking south and from the southeast corner looking north, respectively.

Figure 6. Intersection of 2nd Street and Main Street Looking South

Figure 7. Intersection of 2nd Street and Main Street Looking North

The current configuration of the road as shown at the 2nd Street and Main Street intersection in Figures 6 and 7 is one travel lane in each direction with a center turn lane at most intersections and a parking lane along most midblock segments. Table 1 provides more information about the 2nd Street road diet conversion which created this current configuration.

Treatment Street	From	To	Length (mi)	Installation Date	Old Configuration	New Configuration
2nd Street	Spring Street	Alameda Street	0.51	11/21/2005	1 lane in each direction with 2nd lane during peak hours	1 lane in each direction with curbside parking along some portions and center turn lane

Table 2. 2nd Street Road Diet Conversion Information

1st Street and Temple Street run parallel and to the north of 2nd Street, and are presented in this case study as control corridors, potential alternate routes for 2nd street for which there are ADT data available and on which no lane reconfiguration took place.

Where it runs parallel to the 2nd Street road diet segment, 1st Street comprises two travel lanes in each direction with a center turn lane, unprotected bicycle lanes, and parking lanes. This section of 1st Street is, much like 2nd, lined with multi-story office buildings and a number of large government buildings including the Los Angeles Police Department Headquarters and the regional headquarters for the California Department of Transportation. 1st Street is a larger arterial than 2nd Street and runs much further, extending northwest of Downtown Los Angeles and connecting to the 101 and I-10 Freeways to the southeast before continuing well into East Los Angeles. 2nd Street, meanwhile runs for just less than two miles, existing almost exclusively in Downtown Los Angeles. Figures 8 and 9 show the intersection of 1st Street and Main Street, giving perspective of the relative difference in size between 1st Street and 2nd Street and providing some sense of the surrounding land use.

Figure 8. Intersection of Main Street and 1st Street Looking North

Figure 9. Intersection of 1st Street and Main Street Looking South

Temple Street also runs parallel to 2nd Street, two blocks to the north. Much like 1st Street, the section of Temple Street that runs parallel to the 2nd Street road diet segment comprises two travel lanes in each direction with a center turn lane and street parking. While not as long-running or well-connected as 1st Street, Temple Street is still a larger arterial and could conceivably be used as an alternate route to 2nd Street if the road diet conversion resulted in increased congestion on 2nd Street. The land use along Temple Street is similar to 1st Street and 2nd Street, with office buildings, plazas and large government buildings, including Los Angeles' City Hall. Figures 10 and 11 show the intersection of Temple Street and Main Street looking south and north from the northwest corner, respectively.

Figure 10. Intersection of Temple Street and Main Street Looking South

Figure 11. Intersection of Temple Street and Main Street Looking North

Findings: ADT Analysis

The 2nd Street road diet corridor experienced the largest change of any street included in the four case studies, showing a 35 percent ADT increase after the road diet was installed. . This large increase in traffic volumes indicates that the street processed traffic much more effectively after the road diet conversion than it did before. When we view the 35 percent increase on 2nd Street in the context of the nearby parallel corridors of 1st Street and Temple Street, however, we see that 1st Street experienced a *decrease* in traffic volume of 6 percent and while Temple Street did experience increased ADT, it was relatively modest at 3 percent, far below the increase on 2nd Street. The fact that the road diet corridor of 2nd Street experienced a major increase in traffic volumes and that neither of these nearby parallel corridors did suggests that the changes made to 2nd Street have allowed more traffic to flow through the corridor without causing backups or pushing motorists to find other routes. The full average before and after traffic volumes for 2nd Street and the adjacent control corridors are shown in Table 2.

Treatment Corridor	Mean Traffic Count Before	Mean Traffic Count After	Percent Change
2nd Street	10,688	14,376	+35%
Control Corridors			
1st Street	23,305	21,809	-6%
Temple Street	15,888	16,383	+3%

Table 3. 2nd Street Treatment and Control Corridors Before and After Mean Traffic Volumes

Findings: Current Condition Observation

To supplement the ADT analysis, I performed traffic counts at representative intersections on the treatment and control corridors in the PM peak travel period on Wednesday, May 9th. I then used those counts to estimate the Level of Service (LOS) for each observed intersection. The calculated LOS and observed traffic conditions provide additional context to the ADT analysis and allow for better interpretation of the ADT analysis findings.

For the 2nd Street treatment corridor, I performed a traffic count and observed traffic conditions at 2nd Street and Main Street between 4:55 and 5:10 PM. The volume of traffic I observed was fairly light with little to no queuing and basically free-flow traffic conditions. The LOS calculation shown in Table 4 supports these observations as well.

2nd Street and Main Street					
Movement	**Volume**	**Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
EB Left	77	1	1600	0.0481	x
EB Thru	288	1	1600	0.1800	
EB Right	0	0	0	0.0000	
WB Left	0	0	0	0.0000	
WB Thru	228	1	1600	0.1425	x
WB Right	92	1	1600	0.0575	
Sum of Critical V/C					0.1906
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.4813
Level of Service (LOS)					A

Table 4. 2nd Street and Main Street V/C and LOS Calculation

I observed traffic at intersections on the control corridors as well. For the 1st Street corridor I performed a traffic count at the intersection of 1st Street and Main Street from 5:15 to 5:30 PM. I observed heavier volumes of traffic than on 2nd Street and some occasional queuing but traffic moved for the most part at free flow on 1st Street as well. The calculations for 1st Street and Main Street are shown in Table 5, and support the observations that traffic volumes were heavier but still moving relatively effectively through the intersection.

1st Street and Main Street					
Movement	**Volume**	**Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
EB Left	168	1	1600	0.1050	x
EB Thru	594	2	3200	0.1856	
EB Right	0	0	0	0.0000	
WB Left	0	0	0	0.0000	
WB Thru	498	2	3200	0.1556	x
WB Right	77	1	1600	0.0481	
Sum of Critical V/C					0.2606
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.6213
Level of Service (LOS)					B

Table 5. 1st Street and Main Street V/C and LOS Calculation

I performed traffic counts and observations at the intersection of Temple Street and Main Street from 5:30 to 5:45 PM. The calculations based on the data I collected indicate a LOS of C, an acceptable level of service with relatively stable traffic flow, with occasional queuing and some minor backups. I did observe a relatively high volume of traffic passing through the intersection but the street seemed to process the traffic effectively without much visible delay. Table 6 displays the calculated V/C and Level of Service for the intersection.

Temple Street and Main Street					
Movement	**Volume**	**Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
EB Left	150	1	1600	0.09375	x
EB Thru	498	2	3200	0.155625	
EB Right	0	0	0	0	
WB Left	0	0	0	0	
WB Thru+Right	762	2	3200	0.238125	x
WB Right	0	0			
Sum of Critical V/C					0.3319
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.7638
Level of Service (LOS)					C

Table 6. Temple Street and Main Street V/C and LOS Calculation

Tujunga Avenue Corridor

Context

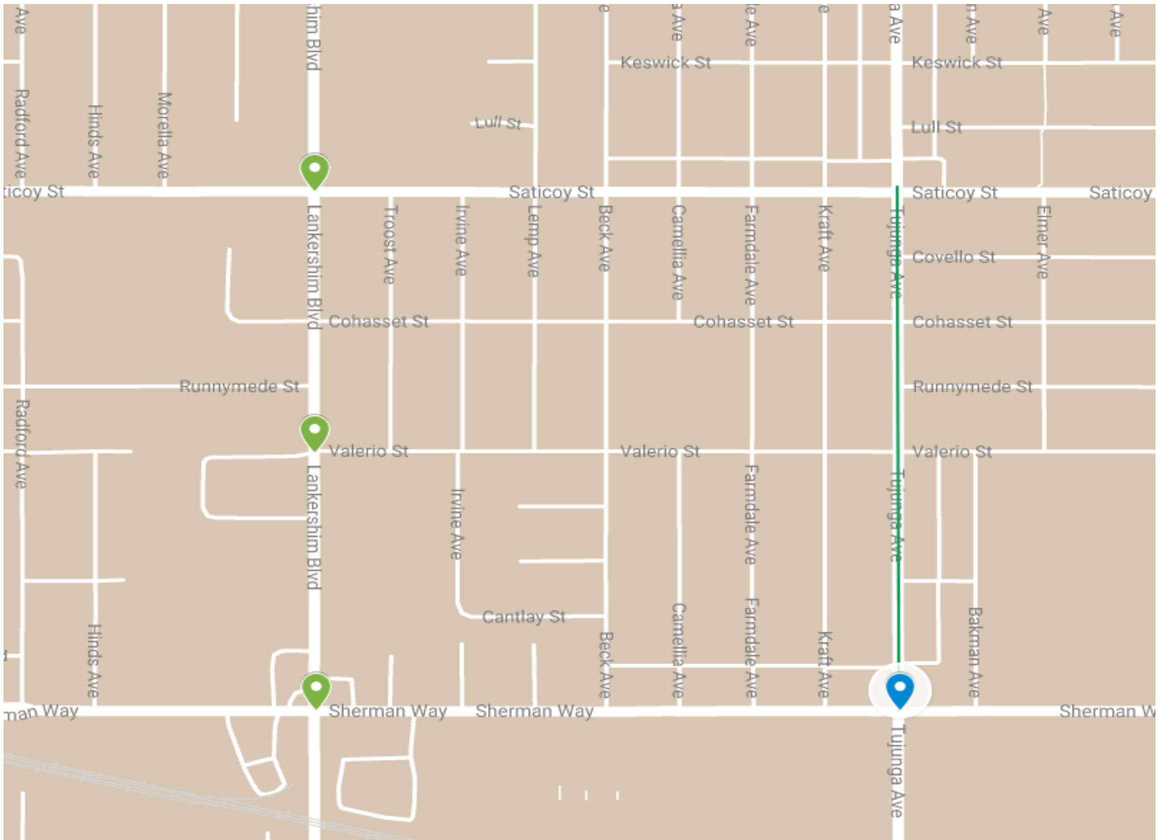

Figure 12. Map of Tujunga Avenue Treatment Intersections and Lankershim Boulevard Control Intersection. Line segment indicates Treatment Corridor, with markers indicating intersections with available ADT data

The Tujunga Avenue road diet corridor is located in the North Hollywood neighborhood of Los Angeles, in the San Fernando Valley region. The corridor runs north-south for nearly one half mile between Sherman Way and Saticoy Street, through a largely suburban, low-density area. The low commercial and residential land use of the area can be seen in Figures 13 and 14, showing the intersection of Tujunga Avenue and Sherman way looking south from the northeast corner and north from the southwest corner, respectively.

Figure 13 Intersection of Tujunga Avenue and Sherman Way Looking South

Figure 14. Intersection of Tujunga Avenue and Sherman Way Looking North

The current configuration throughout most of the Tujunga road diet corridor is one travel lane in each direction with a center turn lane and parking along the curb, although some intersections, such as Tujunga Avenue and Sherman Way, include two travel lanes in one direction or a right turn lane in addition to the center turn lane. Further information about the road diet conversion is provided in Table 7 below.

Treatment Street	From	To	Length (mi)	Installation Date	Old Configuration	New Configuration
Tujunga Avenue	Sherman Way	Saticoy Street	0.48	5/1/2008	2 lanes in each direction with curbside parking	1 lane in each direction with center turn lane and curbside parking

Table 7. Tujunga Avenue Road Diet Conversion Information

For the purposes of this study, Lankershim Boulevard serves as the control corridor for the Tujunga Avenue treatment corridor. Lankershim Boulevard runs parallel to Tujunga Avenue, about a half mile to the west. Lankershim is a large arterial street, with two travel lanes each direction, a center turn lane, bicycle lanes in each direction and curbside parking on both sides of the street for most of the stretch that runs parallel to the Tujunga Avenue road diet corridor. In the event of increased congestion on Tujunga Avenue, Lankershim Boulevard could be used as an alternative route, as it runs parallel, runs relatively close to Tujunga Avenue and connects to similar cross streets and destinations. Unlike the Tujunga Avenue corridor, which is mostly lined with residential land uses, considerable commercial development lines Lankershim Boulevard. Figures 15 and 16 give a sense of the road configuration and land uses at the intersection of Lankershim Boulevard and Sherman Way.

Figure 15. Intersection of Lankershim Boulevard and Sherman Way Looking North

Figure 16. Intersection of Lankershim Boulevard and Sherman Way Looking South

Findings: ADT Analysis

Tujunga Avenue was the only one of the four study corridors that experienced a decline in traffic levels after the installation of the road diet. ADT along the installation corridor of Tujunga Avenue decreased by 5 percent after the changes were implemented, from an average of 14,722 vehicles per day before, to an average of 14,032 after. Lankershim Boulevard, the nearest major parallel corridor for which traffic data were available experienced an 8 percent increase in ADT after the road diet was installed on Tujunga Avenue. The decrease in traffic on the road diet corridor, examined in conjunction with the increase in traffic on the nearby parallel control corridor suggest the possibility that some traffic diverted from Tujunga Avenue to Lankershim Boulevard after lanes were removed from Tujunga. While the changes in traffic volumes are not directly attributable to the road diet conversion alone, the data indicate that this scenario is at least possible.

Treatment Corridor	Mean Traffic Count Before	Mean Traffic Count After	Percent Change
Tujunga Avenue	14,722	14,032	-5%
Control Corridor			
Lankershim Boulevard	25,815	27,867	8%

Table 8. Tujunga Avenue Treatment and Control Corridors Before and After Mean Traffic Volumes

Findings: Current Condition Observation

I performed a traffic count and traffic condition observation at the intersection of Tujunga Avenue and Sherman Way on Thursday, May 10th, using the intersection as representative of the Tujunga Avenue road diet corridor. The traffic count was completed between 4:40 PM and 4:55 PM and the resulting calculations displayed in Table 9 showed a Level of Service of C. While I observed expectedly high volumes of traffic, there was minimal queuing and no vehicles were observed waiting through multiple red lights.

Tujunga Avenue and Sherman Way					
Movement	**Volume**	**Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
NB Left	156	1	1600	0.0975	
NB Thru	440	1	1600	0.275	x
NB Right	88	1	1600	0.055	
SB Left	72	1	1600	0.045	x
SB Thru+Right	296	2	3200	0.0925	
SB Right					
Sum of Critical V/C					0.3200
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.7400
Level of Service (LOS)					C

Table 9. Tujunga Avenue and Sherman Way V/C and LOS Calculation

I also performed a traffic count at Lankershim Boulevard and Sherman Way between 5:10 PM and 5:25 PM, as representative of the Lankershim Boulevard control corridor. While the calculated LOS was D, as displayed in Table 10, I did not perceive the traffic flow or queuing to be any worse than I observed on the Tujunga Avenue corridor. Lines of traffic that developed at red lights cleared within one signal cycle and the street appeared to have little trouble processing the peak hour traffic volume.

Lankershim Boulevard and Sherman Way					
Movement	**Volume**	**Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
NB Left	80	1	1600	0.05	
NB Thru	784	2	3200	0.245	x
NB Right	168	1	1600	0.105	
SB Left	176	1	1600	0.11	x
SB Thru	372	2	3200	0.11625	
SB Right	64	1	1600	0.04	
Sum of Critical V/C					0.3550
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.8100
Level of Service (LOS)					D

Table 10. Lankershim Boulevard and Sherman Way V/C and LOS Calculation

York Boulevard Corridor

Context

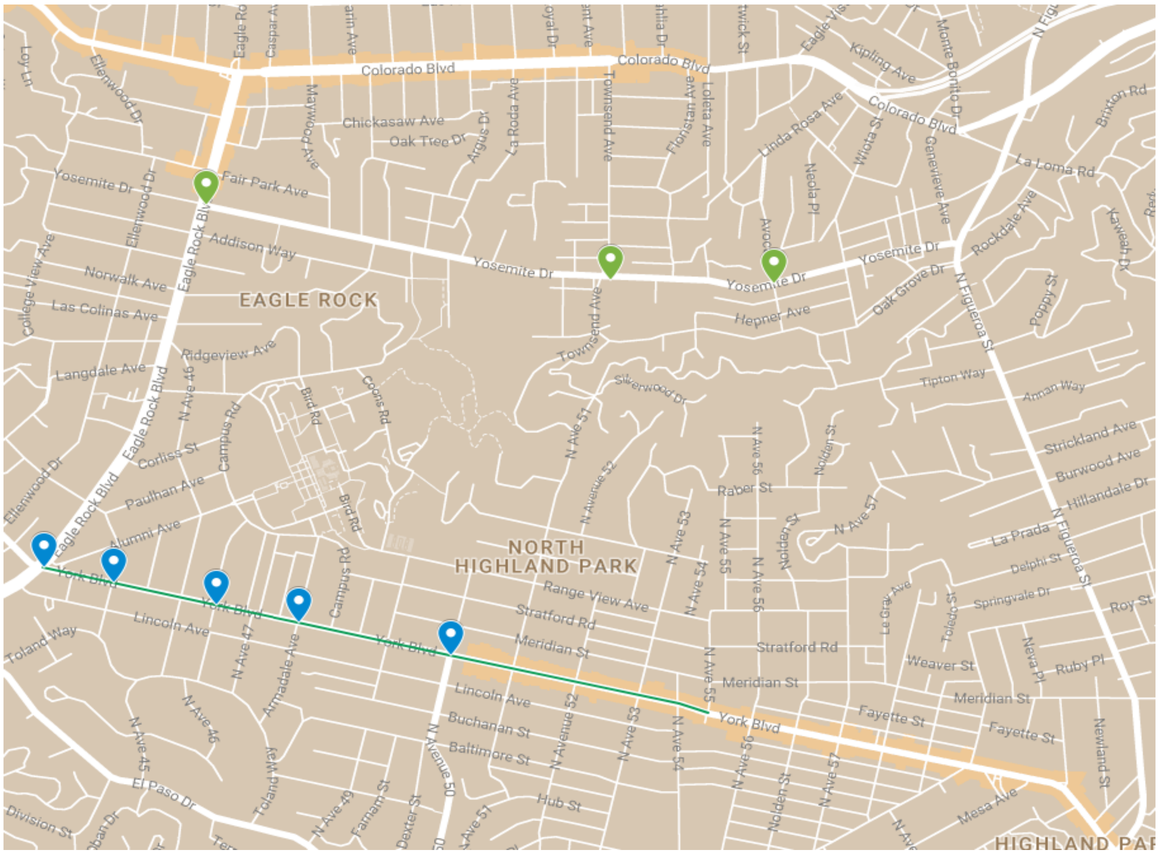

Figure17. Map of York Boulevard Treatment Intersections and Yosemite Drive Control Intersection. Line segment indicates Treatment Corridor, with markers indicating intersections with available ADT data

The York Boulevard road diet corridor is the longest span examined in the study, running over one mile through the North Highland Park neighborhood in northeast Los Angeles. The corridor runs east-west through suburban but largely commercial development including a number of restaurants and shops along much of its extent. Figure 18 and 19 show the intersection of York Boulevard and Eagle Rock Boulevard, the western end of the road diet corridor, and give some sense of the commercial land use as the corridor moves to the east.

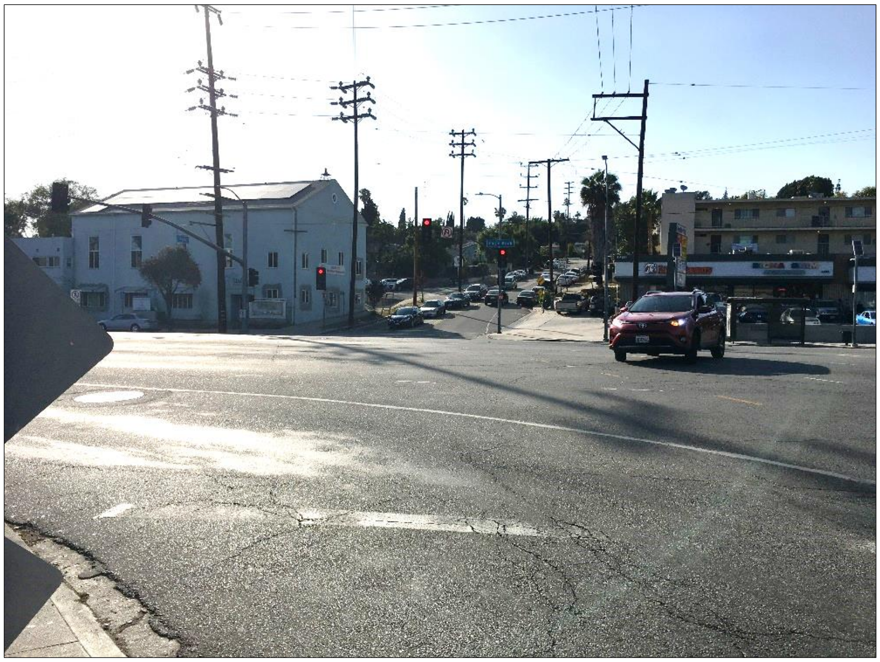

Figure 18. Intersection of York Boulevard and Eagle Rock Boulevard Looking West

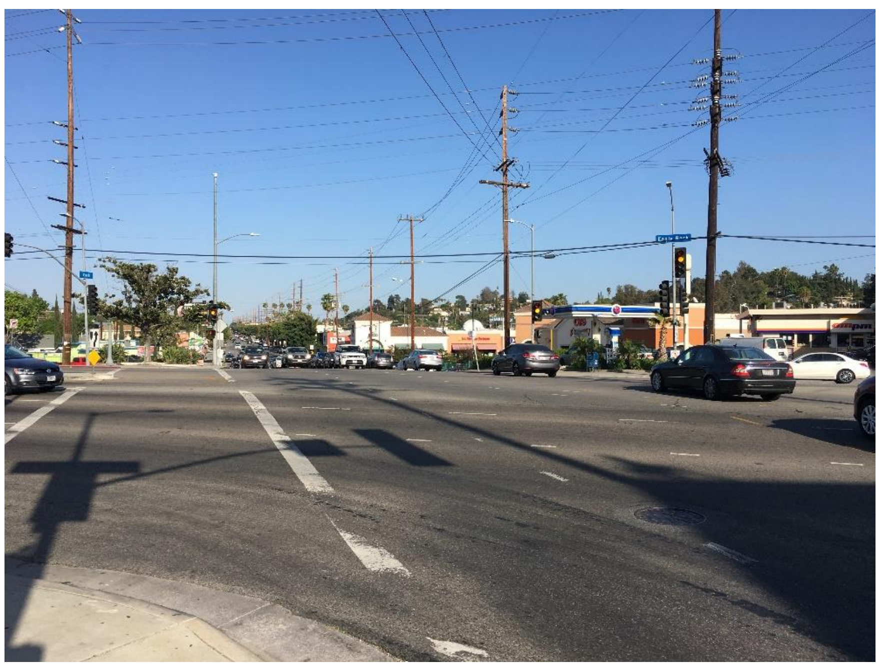

Figure 19. Intersection of York Boulevard and Eagle Rock Boulevard Looking East

The current configuration of York Boulevard throughout the corridor is one travel lane in each direction with a center turn lane, bicycle lanes in each direction and curbside parking on each side of the street for large sections of the corridor. Further details about the road diet conversion are presented in Table 11.

Treatment Street	From	To	Length (mi)	Installation Date	Old Configuration	New Configuration
York Boulevard	Eagle Rock Boulevard	Avenue 55	1.3	3/16/2006	2 lanes in each direction with curbside parking	1 lane in each direction with center turn lane and curbside parking

Table 11. York Boulevard Road Diet Conversion Information

York Boulevard is unique among the four study corridors as it carries by far the most daily traffic of the four both before and after the road diet installation, and has very few nearby parallel corridors that could conceivably carry overflow traffic in the case of increased congestion. Yosemite Drive is somewhat close to York Boulevard and could conceivably be used to reach similar destinations if drivers found York Boulevard to be too congested to reasonably use for East-West travel in the area. However, it is an imperfect comparison corridor as it is nearly one mile north of York Boulevard and turns slightly north as it moves east while York Boulevard turns slightly south as it moves east, meaning that the two streets do not provide direct access to the same destinations without considerable rerouting. With this consideration, for the purposes of this study, I selected Yosemite Drive as the control corridor, due to both geographical limitations in possible alternative routes for York Boulevard and limitations in the available ADT data. Yosemite Drive is a considerably smaller street than York Boulevard, with only one travel lane in each direction and curbside parking on each side of the street for most of its span. Figures 20 and 21 display the intersection of Yosemite Drive and Eagle Rock Boulevard, giving a sense of the difference in scope between Yosemite Drive and York Boulevard.

Figure 20. Intersection of Yosemite Drive and Eagle Rock Boulevard Looking East

Figure 21. Intersection of Yosemite Drive and Eagle Rock Boulevard Looking West

Findings: ADT Analysis

York Boulevard experienced a large increase in traffic levels post-road diet installation, with 25 percent more ADT than before the change was made. Yosemite Drive saw a 9 percent increase in ADT after the road diet was installed on York Boulevard. As stated before, drivers who travelled using York Boulevard before the road diet was installed likely had few alternate options after installation in the case of increased congestion. However, the fact that York Boulevard experienced such a large increase in ADT, Yosemite did not could be an indication that the new lane configuration on York Boulevard did not adversely affect congestion in a meaningful way.

Treatment Corridor	Mean Traffic Count Before	Mean Traffic Count After	Percent Change
York Boulevard	18,614	23,236	25%
Control Corridor			
Yosemite Drive	7,867	8,588	9%

Table 12. York Boulevard Treatment and Control Corridors Before and After Mean Traffic Volumes

Findings: Current Condition Observation

To measure current conditions along the York Boulevard treatment corridor, I performed a traffic count at the intersection of York Boulevard and Eagle Rock Boulevard, between 5:40 PM and 5:55 PM on Monday, May 14th. I observed some minor queuing for eastbound through traffic and left turns but overall the street appeared to process traffic well even during peak periods. The calculated LOS for the intersection was C, which compares well to what I observed. Detailed calculations are displayed in Table 13 below.

York Boulevard and Eagle Rock Boulevard					
Movement	**Volume**	**Number of Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
EB Left	0	0	0		
EB Thru+Left	292	1	1600	0.1825	x
EB Right	12	1	1600	0.0075	
WB Left	400	2	2880	0.138889	x
WB Thru+Right	224	1	1600	0.14	
WB Right	0	0	0		
Sum of Critical V/C					0.3214
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.7428
Level of Service (LOS)					C

Table 13. York Boulevard and Eagle Rock Boulevard V/C and LOS Calculation

I also performed a traffic count at the control corridor intersection of Yosemite Drive and Eagle Rock Boulevard, between 5:15 PM and 5:30 PM. This control corridor was a much smaller street and my observations indicated that it experienced much lower traffic volumes as well. Yosemite Drive processed what traffic it did experience quite well as there was little to no queuing and essentially free-flow movement. The calculated level of service was an A, with detailed calculations displayed in Table 14.

Yosemite Drive and Eagle Rock Boulevard					
Movement	**Volume**	**Number of Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
EB Left	72	1	1600	0.045	x
EB Thru+Right	156	1	1600	0.0975	
EB Right	56	0	0		
WB Left	132	1	1600	0.0825	
WB Thru+Right	164	1	1600	0.1025	x
WB Right	0	0	0		
Sum of Critical V/C					0.1475
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.3950
Level of Service (LOS)					A

Table 14. Yosemite Drive and Eagle Rock Boulevard V/C and LOS Calculation

Main Street Corridor

Context

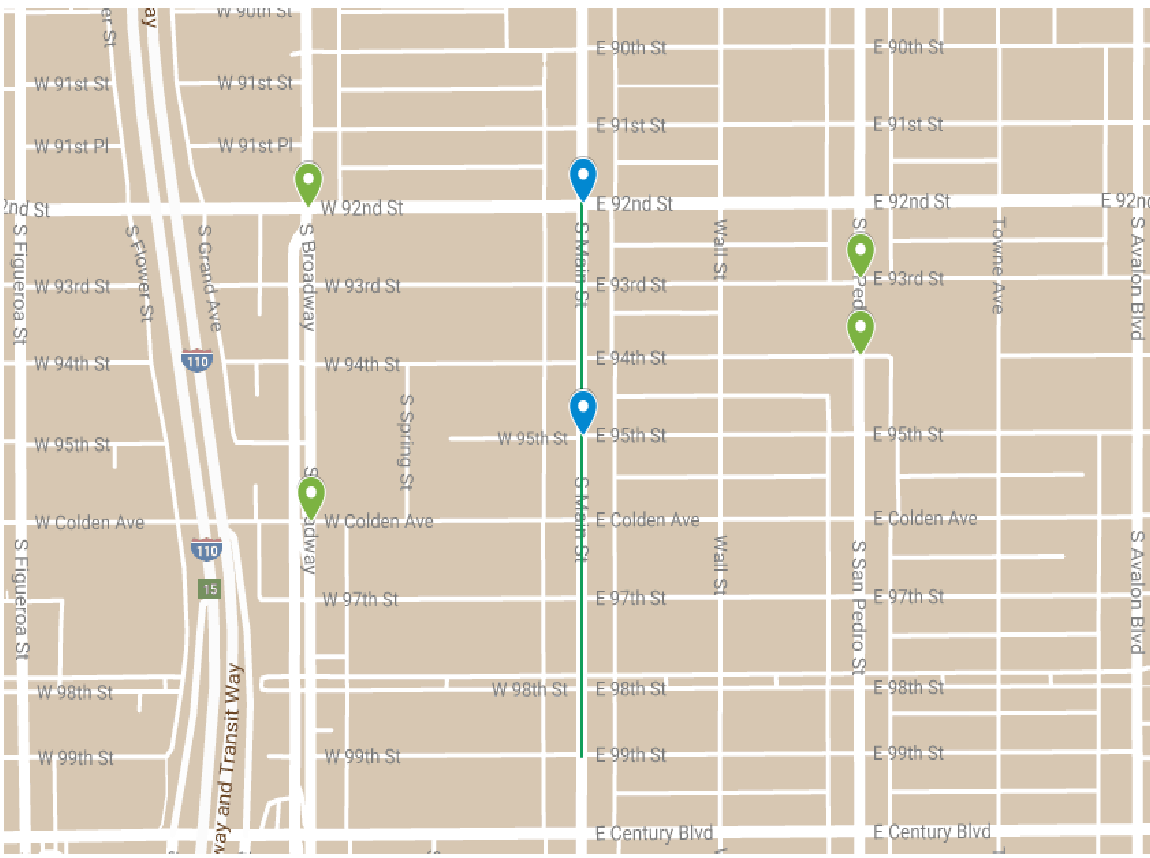

Figure 22. Map of Main Street Treatment Intersections and Broadway and San Pedro Street Control Intersections. Line segment indicates Treatment Corridor, with markers indicating intersections with available ADT data

The Main Street road diet corridor is located in the Avalon Gardens neighborhood of south Los Angeles. The road diet segment spans just under one-half mile and travels north-south, primarily through low-density commercial and industrial development. Figures 23 and 24 depict the intersection of Main Street and 92nd Street and give a sense of the typical development and land use along the treatment corridor.

Figure 23. Intersection of Main Street and 92nd Street Looking North

Figure 24. Intersection of Main Street and 92nd Street Looking South

The current lane configuration on the Main Street road diet segment is one travel lane in each direction with a center turn lane, an unprotected bicycle lane, and curbside parking on each side of the street. Table 15 displays additional details of the road diet conversion for the Main Street corridor.

Treatment Street	From	To	Length (mi)	Installation Date	Old Configuration	New Configuration
Main Street	92nd Street	99th Street	0.42	2/28/2009	2 lanes in each direction with curbside parking	1 lane in each direction with center turn lane and curbside parking

Table 15. Main Street Road Diet Conversion Information

There are two streets that could serve as reasonable alternative routes to Main Street: Broadway to the west of Main Street and San Pedro Street to the East. This study uses both streets as control corridors as both Broadway and San Pedro Street have available ADT data and no lane reconfigurations were made on either street.

Broadway, where it runs parallel to the Main Street road diet segment, is a large arterial with three travel lanes in each direction, a center turn lane, and parking along both curbs. It is the largest of the three parallel corridors examined for this case study, both by number of lanes and by width of the right of way. The size of the road and the easy access it provides to the 110 Freeway to the west both make Broadway the likely first choice for most drivers traversing the area, and make it a strong candidate for an alternate route in the event of congestion on Main Street. Figures 25 and 26 show the intersection of Broadway and 92nd Street looking south from the northeast corner and looking north from the southeast corner, respectively.

Figure25. Intersection of Broadway and 92nd Street Looking South

Figure 26. Intersection of Broadway and 92nd Looking North

San Pedro Street is a relatively smaller street than Broadway and very similar in size to Main Street, with one travel lane in each direction, a center turn lane, and bicycle and parking lanes on each side of the street. San Pedro Street is lined with mostly residential development although there are a number of commercial buildings along the section of the road parallel to the Main Street road diet segment, as well as schools and churches.

Figures 27 and 28 show the intersection of San Pedro Street and 93rd street looking south and then north, respectively, and show some examples of both the residential and commercial development along the span.

Figure 27. Intersection of San Pedro Street and 93rd Street Looking South

Figure 28. Intersection of San Pedro Street and 93rd Street Looking North

Findings: ADT Analysis

The Main Street corridor experienced very small change in traffic levels after the road diet was installed, seeing only a 1 percent increase in ADT. This small change would seem to be an indication that the road diet did not negatively impact the ability of traffic to move through the corridor, but in order to confidently make that inference, parallel corridors must be examined as well. Nearby Broadway along the same stretch where the road diet was installed on Main Street saw a 6 percent drop in traffic levels after the changes were made on Main. At the same time, San Pedro Street, experienced a 6 percent increase in traffic levels. The decrease on Broadway and the increase on San Pedro Street cannot be seen as offsetting changes in any way, however, as Broadway carries a considerably higher daily volume of traffic than San Pedro Street both before and after the road diet was installed on Main Street. Broadway's 6 percent decrease in traffic represents nearly 1,000 fewer vehicles passing through the corridor after the Main Street road diet, while the 6 percent increase in ADT on San Pedro Street represents fewer than 600 additional vehicles. Considering that the number of daily vehicles using the Main Street corridor increased and the overall number of vehicles on the parallel corridors decreased, it is reasonable to infer that the installation of the road diet on Main Street had a negligible, if any, impact on congestion and did not cause drivers to divert from Main Street onto parallel streets to avoid congestion. The full before and after counts for Main Street and the adjacent control corridors are shown in Table 16.

Treatment Corridor	Mean Traffic Count Before	Mean Traffic Count After	Percent Change
Main Street	11,814	11,923	1%
Control Corridors			
Broadway	15,202	14,225	-6%
San Pedro Street	9,948	10,523	6%

Table 16.Main Street Treatment and Control Corridors Before and After Mean Traffic Volumes

Findings: Current Condition Observation

I performed a traffic count for the Main Street treatment corridor on Monday, May 14th, between 7:20 AM and 7:35 AM, collecting data and observing during the morning peak travel period. I chose to observe the intersection of Main Street and 92nd Street and I observed close to free-flow traffic with very little delay in either direction. The calculated LOS for this intersection based on the traffic count I gathered was a C, which indicates good service overall with some minor delays expected. While this calculation suggests slightly more congestion than observed, the observations were not wholly incompatible with this calculation. Full V/C and LOS calculations for Main Street at 92nd Street are shown in Table 17.

Main Street and 92nd Street					
Movement	**Volume**	**Number of Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
NB Left	4	1	1600	0.0025	
NB Thru	484	1	1600	0.3025	x
NB Right	32	1	1600	0.02	
SB Left	20	1	1600	0.0125	x
SB Thru	280	1	1600	0.175	
SB Right	28	1	1600	0.0175	
Sum of Critical V/C					0.3150
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.7300
Level of Service (LOS)					C

Table 17. Main Street and 92nd Street V/C and LOS Calculation

To measure traffic flow along the Broadway control corridor I performed a traffic count at the intersection of Broadway and 92nd Street between 7:40 AM and 7:55 AM. I observed a high volume of traffic, but with three travel lanes in each direction the street appeared quite capable of processing this volume, with very little delay and no queuing. The calculated LOS based on the traffic count I performed was an A, indicating total free-flow with no delay. This calculation is consistent with my observation of the traffic conditions at the intersection and is shown in full in Table 18 below.

Broadway and 92nd Street					
Movement	**Volume**	**Number of Lanes**	**Capacity**	**V/C Ratio**	**Critical V/C**
NB Left	36	1	1600	0.0225	
NB Thru	780	3	4800	0.1625	x
NB Right	28	1	1600	0.0175	
SB Left	28	1	1600	0.0175	x
SB Thru+Right	532	3	4800	0.110833	
SB Right	0	0	0		
Sum of Critical V/C					0.1800
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.4600
Level of Service (LOS)					A

Table 18. Broadway and 92nd Street V/C and LOS Calculation

In addition to counts on the Main Street treatment corridor and Broadway control corridor, I performed a manual traffic count on the San Pedro Street corridor at the intersection of San Pedro Street and 93rd Street, from 8:05 AM to 8:20 AM. The calculated peak hour LOS based on this traffic count was a C, which is largely consistent with the observed conditions of mostly free-flow traffic, with some very minor delays for vehicles turning left off of San Pedro Street in either direction. Full Level of Service calculations for San Pedro Street at 93rd Street are shown in Table 19.

San Pedro Street and 93rd Street					
Movement	Volume	Number of Lanes	Capacity	V/C Ratio	Critical V/C
NB Left	0	1	1600	0	
NB Thru	444	1	1600	0.2775	x
NB Right	12	1	1600	0.0075	
SB Left	60	1	1600	0.0375	x
SB Thru	356	1	1600	0.2225	
SB Right	4	1	1600	0.0025	
Sum of Critical V/C					0.3150
Adjustment for Lost Time					0.1000
Full Calculated V/C					0.7300
Level of Service (LOS)					C

Table 19. San Pedro Street and 93rd Street V/C and LOS Calculation

Summary of Findings

In aggregate, the four road diet corridors examined showed an 8 percent% increase in traffic volumes after installation of their respective road diets as compared to before installation, going from a mean ADT of 15,333 to 16,597 across all four case study treatment corridors. Traffic volumes on the parallel control corridors showed a very slight decline in aggregate, dropping from an ADT of 17,605 to 17,494 post-installation for a change of -0.6 percent. These changes in traffic volumes suggest that, in aggregate, the road diet corridors became more efficient and were able to process more traffic than before without pushing traffic onto the nearby control corridors. However, even if the treatment corridors are able to process more traffic after the lane reconfigurations, the ADT data alone do not give a clear indication of whether the vehicles traveling along the treatment corridors experienced delay. To better estimate whether the lane reconfigurations caused delays or added congestion, I supplemented the ADT data with traffic observations and Level of Service calculations. My observations were single time period counts and by no means exhaustive or conclusive, though they are instructive. A full analysis of the chosen intersections would require measurements to be taken consistently across a number of days or weeks, rather than once at each representative intersection. Acknowledging there are limitations to this approach however, the traffic flow observations and Level of Service calculations I performed can still be used to give further insight into the ADT data analysis.

As noted in the *Current Condition Observations* sections of each case study, my observations of traffic flow revealed very little delay or congestion at any of the representative intersections during peak travel times. These observations are supported by the fact that the lowest Level of Service calculation across all intersections included in the study was a D, at Lankershim Boulevard and Sherman Way, which is widely seen by traffic engineers as acceptable performance for an urban road. It is worth noting that the most recently implemented road diet examined in this study – the Main Street corridor – is now over nine years old, so it is possible that congestion impacts occurred immediately after installation but have dissipated over time as driver behavior has adapted to the new roadway configurations. However, the lack of delay present at these intersections a decade or more post-installation suggests negligible long-term congestion impacts due to the road diet conversions.

Chapter 5: Conclusion and Recommendations

Conclusion

Because road diets eliminate through lanes of traffic, it is a short intuitive leap to assume that they necessarily slow traffic and increase congestion. But as described above, road diets – in addition to reducing vehicle collisions – also tend to smooth traffic flows in the remaining lanes by shifting left- and (sometimes) right-turning vehicles out of through lanes and into turn pockets. But traffic flows and delays are not always intuitive: depending on existing traffic-volume-to-road-capacity ratios, road diets may reduce traffic delays, increase them, or have no effect at all. Using available data, in this analysis I sought to test this question by looking at four case studies of road diet treatment and control corridors and analyzing the traffic volumes (ADT) on these corridors before and after the road diets were installed. As traffic volumes alone do not indicate whether congestion occurred along the study corridors, I supplemented my ADT analysis with field observations of traffic flow and Level of Service calculations for representative intersections along each of the treatment and control corridors.

The ADT analysis shows that, in aggregate, the road diet corridors processed more traffic after lane reconfigurations took place, and that the control corridors did not experience a corresponding increase in traffic flow, which one might expect if delay increased on the treatment corridors and pushed the traffic to nearby routes. The supplemental observations and LOS calculations support the suggestion that the road diet installations did not cause congestion or increased delay along the streets on which they were installed or on nearby parallel streets.

The analysis provided in this report is limited by a number of factors. First, due to limitations of available data, this study was not able to directly measure the variable of interest, congestion. ADT data measures only total traffic volume for a 24 hour period and does not give an indication of how efficiently the street processes the volumes it experiences. The field observations performed to supplement the ADT analysis were constrained as well, as they were based on one-time, 15 minute samples which were used to glean a snapshot of peak-hour conditions. A more robust field study would include many observations taken over a number of weeks or months to determine a truly representative data set; this was, unfortunately, beyond the scope of this project. Finally, due to the case study nature of the analysis, which focused only on four road diet treatment corridors and their respective control corridors, the findings are necessarily circumstantial. A more robust study of the congestion impacts of road diets would include many more intersections to better determine general trends rather than attempting to draw general conclusions based on a small sample of case studies. But because of the unevenness of historical traffic count data, I was limited to analyzing road diet and adjacent control corridors where before and after ADT count data were available. With these limitations in mind, I provide below recommendations on how to improve future congestion impact studies of road diet reconfigurations.

Recommendations

Collect More Data

In light of the controversies that often surround the implementation of road diets, it would be in the best interest of transportation departments to take frequent traffic counts at implementation sites both before and after the road diets are installed. By having ample before and after data available, DOTs will be better positioned to make the case for future road reconfigurations or perhaps to reconsider whether the benefits of these changes outweigh the costs in reduced capacity and increased congestion. Data collection will give these DOTs more information to communicate impacts to affected community members and a better ability to adjust new road configurations as needed. If traffic data post-implementation indicate negative impacts on congestion on both the dieted road and adjacent streets, using those data to adjust the street design as needed could greatly benefit the DOT.

City DOTs would also benefit from tracking more comprehensive congestion measures such as peak hour volumes and level of service. While ADT can offer merely some suggestive information about congestion when assessed at a broader neighborhood level, DOTs can measure congestion along a road diet corridor more directly by using common measures like Volume to Capacity Ratio and Level of Service. These measurements should give DOTs a clearer picture of the impacts that lane reductions and roadway reconfigurations can have on congestion, and by following the same evaluation process for every road diet installed, cities will be able to track changes in traffic patterns and travel times in a consistent manner.

Communicate with Transparency

With consistent and thorough analysis of road diet impacts on both safety and congestion, city transportation planning agencies will have plenty of information available to communicate to local residents and those impacted by the changes. Sharing more information about why road diets are being implemented, existing safety and congestion conditions before the road diets are installed, and changes in safety and congestion conditions post-installation can provide transparency and help engender community trust in the planning agency responsible for the changes. While there will be community members who oppose road diet changes regardless of the reality of their impacts and what the data show, updating the public on the changes in conditions post-installation could help community members to see the benefits and drawbacks of road diets, backed up by real-world, local data. Cities could experiment with providing online dashboards that track key metrics surrounding installed road diets, such as collisions pre- and post-installation, changes in traffic counts after installation, travel time before and after the changes were made, and average vehicle speeds before and after the road diet implementation.

This public performance tracking is not without precedent as the City of Seattle has produced publicly available reports evaluating conditions before and after a number of roadway reconfiguration projects the Seattle Department of Transportation (SDOT) has undertaken (Reports and Studies, n.d.), and LADOT created a website to provide performance tracking and updates for a road diet and street improvement project in the Mar Vista neighborhood (Venice Boulevard Mar Vista, n.d.). Providing this information in an easy to access, easy to digest format could help community members to feel more informed about changes happening on their local streets and feel more involved in the transportation planning process in their city.

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