Road Diet Feasibility Study

West Street, San Pablo Avenue to 52nd Street

Safe Streets Division
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OakDOT
Oakland Department of Transportation

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The City of Oakland's Department of Transportation (OakDOT) completed this study to investigate cost-effective ways to improve safety and access for all roadway users. Specifically, the study addresses speeding; safety for pedestrians, bicyclists, and motorists; and traffic congestion. The study evaluates the feasibility of a "road diet" – reducing the number of travel lanes to match traffic volumes and to improve safety. Reallocating travel lanes to other purposes may create a better match with how a street is designed, how it is used, and how people would like it to be used. National research shows that typical road diet projects reduce the number of crashes by 28 percent. Road diets can be inexpensive to implement, particularly when coordinated with paving, because they can be as simple as re-striping the roadway. To determine if a road diet would be feasible and beneficial, this study examines the existing conditions at the project location and how the proposed project would affect traffic safety and circulation.

This study was completed by David Pené, Assistant Engineer, Bicycle & Pedestrian Program (dpene@oaklandca.gov, 510-238-3347), and Jason Patton, Bicycle & Pedestrian Program Manager (OakDOT Safe Streets Division). The study uses the City's Methodology for Road Diet Feasibility Studies (2019).

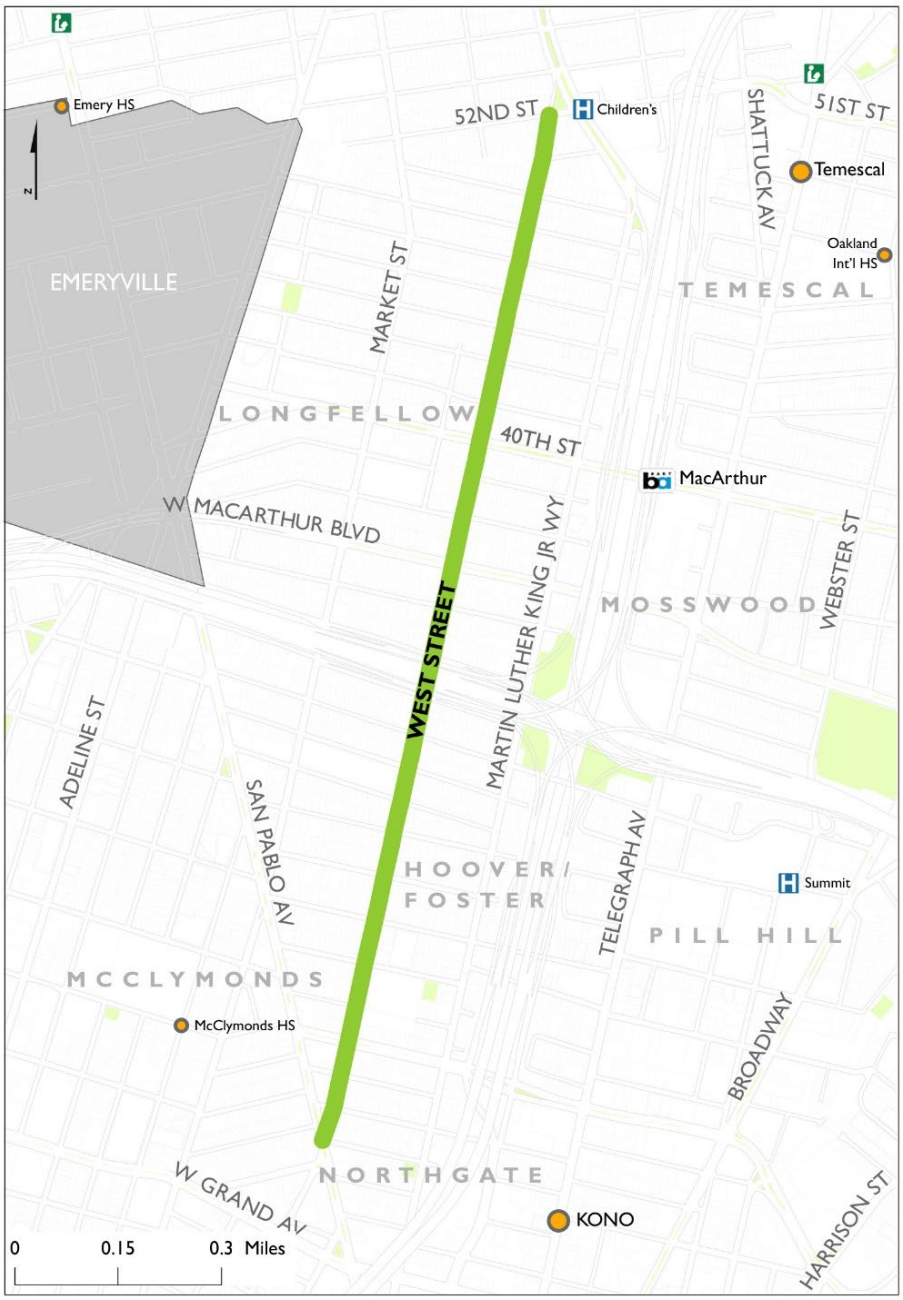
Purpose & Planning Context

West Street from San Pablo Avenue to 52nd Street is a major collector roadway, 1.5 miles in length, connecting Oakland's Hoover-Foster, Longfellow, and Santa Fe neighborhoods. It is a two-way street with one lane and basic bike lanes in each direction, and a two-way center turn lane. The City's Bike Plan (2019) proposes buffered bike lanes on this segment. To the north, it connects to the 52nd Street/Genoa Street Neighborhood Bike Route (Bicycle Boulevard). It intersects with existing bikeways on San Pablo Avenue, 27th Street, W MacArthur Boulevard, and 40th Street, as well as proposed bikeways at 42nd Street and 45th Street. Several school crosswalks serve OUSD's "The Center", Hoover Elementary, The Oakland Military Institute, and Yu Ming Charter School.

There is no AC Transit bus service on West Street. Existing traffic volumes are well below the capacity of the existing three-lane roadway. These factors create an opportunity for the road diet project which will result in a key low-stress bike network connection between West Oakland and North Oakland.

West Street was not identified on the High Injury Network in the City's Pedestrian Plan Update (Oakland Walks!, 2017, Oakland Department of Transportation). West Street was identified in the City's 2017-2019 Capital Improvement Program as a bikeway paving project, eligible for bond funding through the "Bicycle Master Plan Implementation Program" project. The street was also identified on the City's 3-year pavement prioritization plan.

Figure 1: Context Map

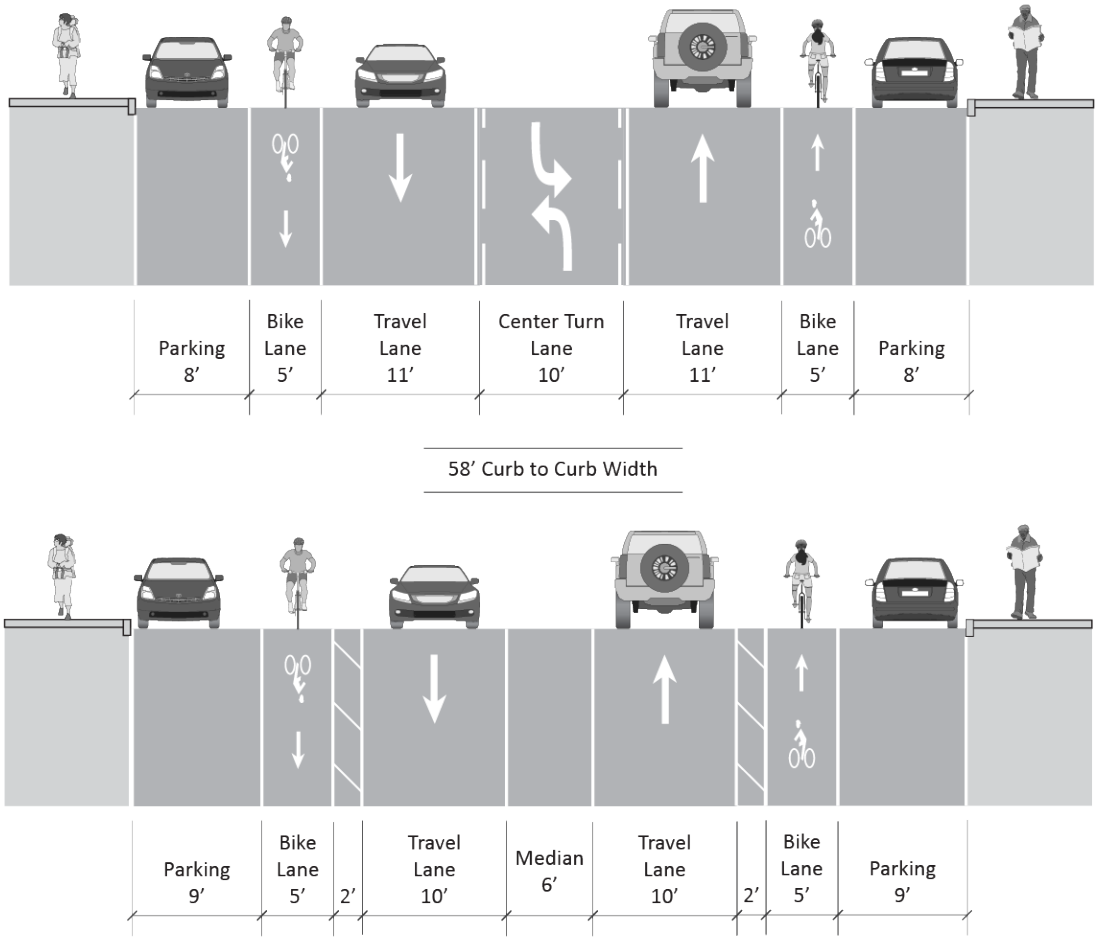


Description of Proposed Project

The proposed project will reconfigure the three-lane street to one travel lane and buffered bike lanes in each direction, and add pedestrian safety islands, left turn pockets, protected intersections, and other crossing improvements at selected locations. New marked crosswalks will be installed along the corridor, and crosswalks will be upgraded to the high visibility "continental" marking style. The project will be implemented as part of a citywide paving project. It is funded through the City's paving budget, with additional funds from the City's Capital Improvement Program covering the costs of the pedestrian

safety islands, protected intersections, and other raised crossing improvements. Figure 2 illustrates the typical existing and proposed cross-sections for the corridor.

Figure 2: Existing and Proposed Cross-Sections



Summary & Recommendations

Based on the findings explained below, this study recommends reconfiguring the lanes on West Street from San Pablo Avenue to 52nd Street, removing the two-way center turn lane, providing striped buffers for the existing bike lanes, and providing a 6' wide striped median with raised pedestrian safety islands at select locations. The key findings are:

- There were 76 injury crashes of 157 total crashes during the five-year study period, including seven pedestrian and 24 bicyclist involved crashes.
- Approximately 32% of motorists exceed the speed limit.
- One travel lane per direction is sufficient to accommodate current motor vehicle traffic.

- The proposed project would improve pedestrian safety and access with new high-visibility crosswalks, pedestrian safety islands, and one less lane to cross.
- If the proposed project reduces prevailing motor vehicle speeds from 33 mph to 30 mph (as expected), it would make West Street suitable for bicycling by Most Adults, whereas the current street is only suitable for Experienced Commuter Bicyclists.
- In the future, motor vehicle traffic could increase by over 300% and still be accommodated by the proposed project.

Study Topics

OakDOT evaluates the feasibility of road diets using methods that respond directly to the lived experiences of people who travel on the roadway and those who live or work along the corridor. This study investigates the following topics:

- **Traffic Crashes:** What traffic crashes were reported in the past five years? Who was injured or killed? What are the causes of these crashes?
- **Traffic Speeds:** How fast are motorists driving? How many motorists are driving faster than the speed limit?
- **Traffic Volumes:** How many motor vehicles use the street? With the current configuration, how many vehicles could use the street? With the proposed configuration, how many vehicles could use the street?
- **Pedestrian Safety:** How challenging is it for pedestrians to cross the street? Would the proposed project make it safer and easier to cross?
- **Bicyclist Safety:** Do people feel safe bicycling on the street? Would the proposed project make more people feel safe bicycling?
- **Future Traffic Growth:** If the project were implemented, could the street accommodate more motor vehicle traffic in the future?
- **Left Turns:** It is not always possible to provide left turn lanes at every intersection. At which locations would left turn lanes provide the greatest benefit?

Study Findings

This section summarizes the findings of the Study Topics listed above. Technical documentation on the findings is provided in the appendices to this study.

Traffic Crashes

The City of Oakland is seeking to eliminate all fatal and severe traffic crashes. Over the ten-year period from 2007 through 2016, 205 people died in Oakland traffic crashes and over 800 people were severely injured. At a fundamental level, these deaths and injuries are preventable by designing, building, and maintaining safe streets.

From 2012 to 2016, there were 157 traffic crashes on this section of West St. This included seven crashes involving pedestrians, six of which resulted in injuries, and 24 crashes involving bicyclists, 21 of

which resulted in injuries. There were 126 crashes involving vehicles only during the study period, 49 of which resulted in injuries. The remaining crashes resulted in damaged property (either to the vehicle, personal property, or both). During the study period, there were no crashes that resulted in fatalities.

Figure 3 presents the locations and number of crashes involving pedestrians and bicyclists on West Street from San Pablo Avenue to 52nd Street during the study period. **Figure 4** presents the locations and number of crashes involving only motor vehicles.

Figure 3: Pedestrian- and Bicyclist-involved Crashes

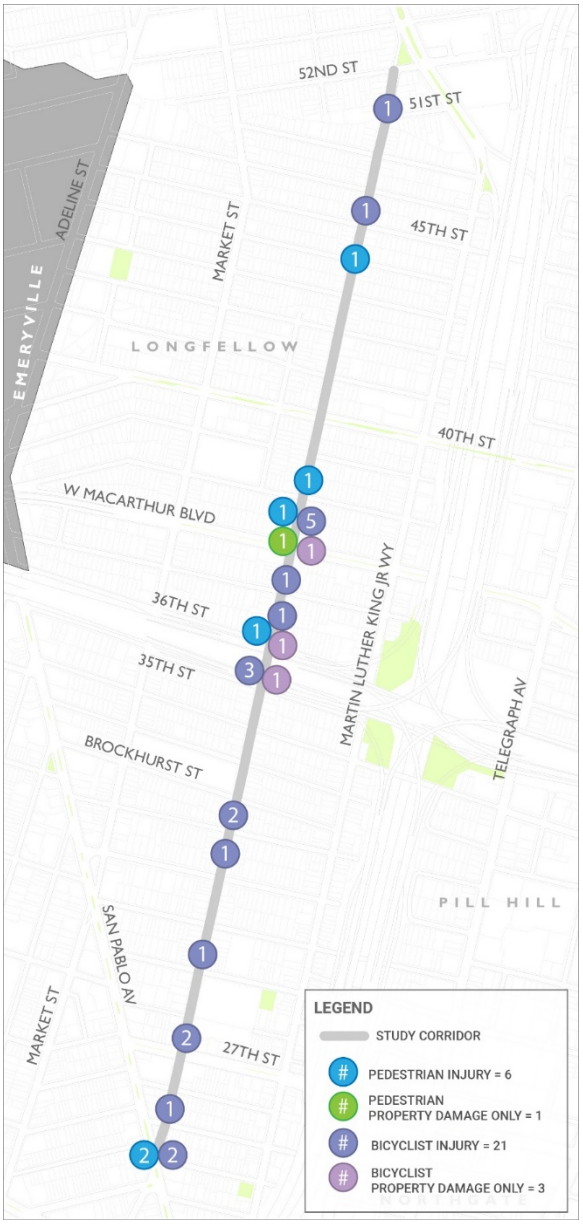
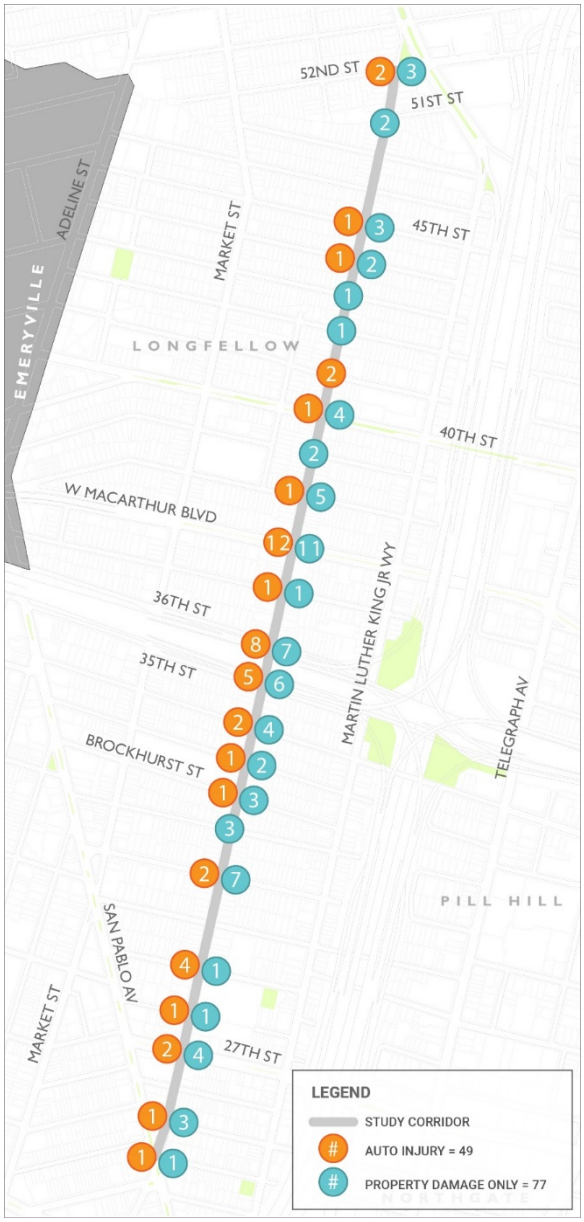


Figure 4: Vehicle-only Crashes



Broadside crashes – collisions with the side of a vehicle or bicycle – were the most common crashes resulting in injuries (35 crashes, four of which involved bicycles), followed by crash types categorized as “Other" (14, 12 of which involved bicycles), followed by sideswipe crashes (eight crashes, two of which involved bicycles), followed by vehicle-pedestrian crashes (seven crashes), followed by both rear-end crashes (six crashes, one of which involved a bicycle), and head-on crashes (six crashes, one of which involved a bicycle). Overall, 27 out of the 76 injury crashes reported involved bicyclists or pedestrians.

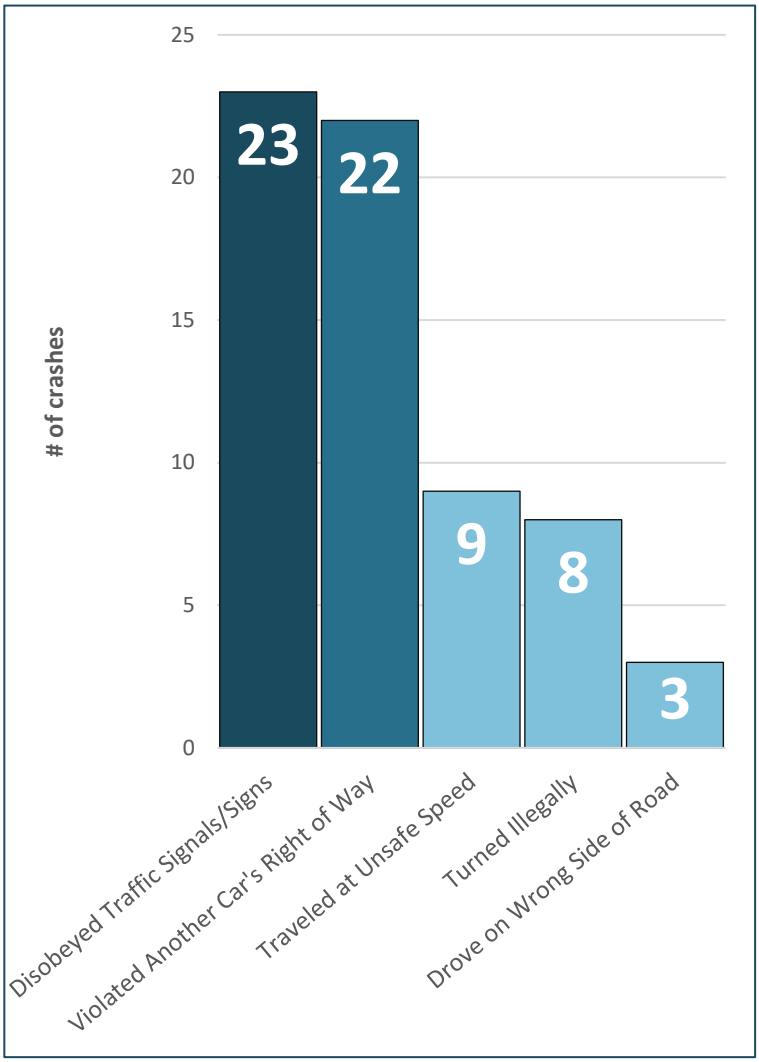
Figure 5 summarizes the number of injury-crashes for each crash type reported during the analysis period.

The most common reason for injury crashes was motorists not yielding right-of-way when they were supposed to (30%, or 23 injury crashes), followed by motorists not following traffic signals and signs (29%, or 22 injury crashes), followed by motorists travelling at unsafe speed (12%, or 9 injury crashes). The five most common reasons for injury crashes on the corridor during the analysis period are illustrated **in Figure 6**.

Figure 5: Injury Crashes by Type

Crash Type		# of Injury Crashes
Broadside	→ ↑	35
Other	?	14
Sideswipe	→ ↗	8
Vehicle/ped	→ ↑	7
Head On	→ ←	6
Rear End	→ →	6

Figure 6: Top Five Reasons for Injury Crashes



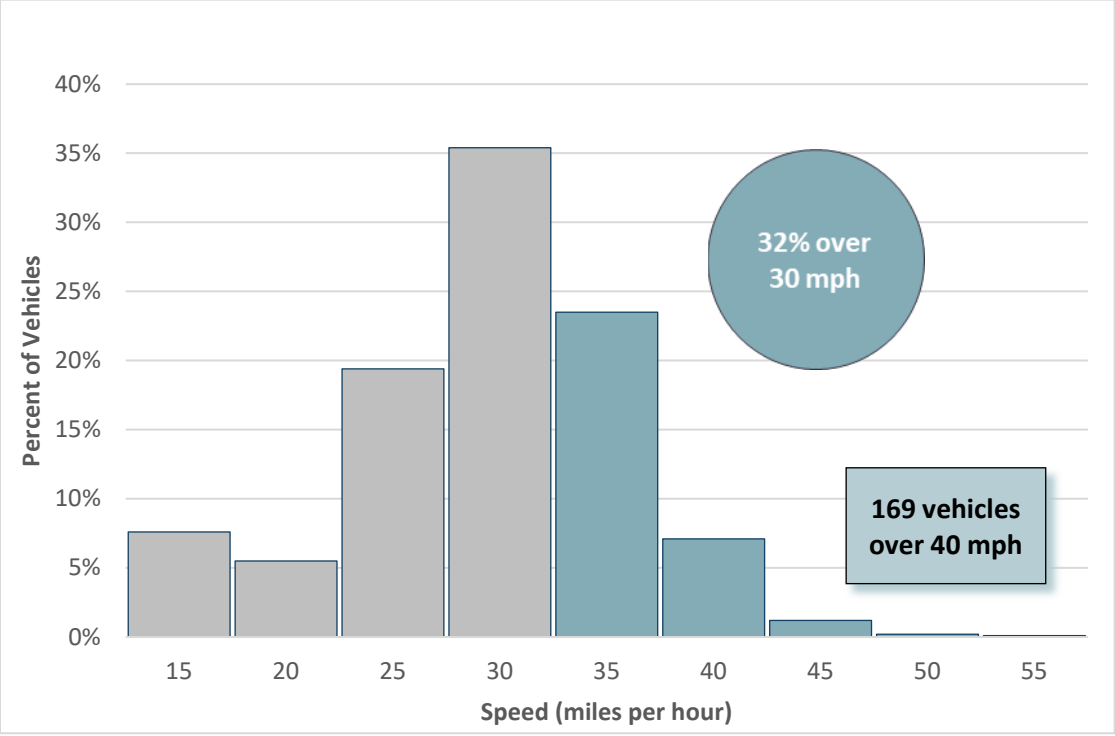
The high number of broadside crashes, crashes involving bicyclists, and crashes involving pedestrians, suggest that the current roadway configuration does not clearly reinforce proper yielding behavior and the rules of the road.

Traffic Speeds

Higher speeds result in more crashes and more severe crashes. Cars traveling faster require longer distances to stop, resulting in a greater risk of crashes. Research by the National Highway Traffic Safety Administration (NHTSA) shows that 5% of pedestrians are killed when struck by a vehicle traveling at 20 miles per hour (mph). In contrast, 40%, 80%, and nearly 100% of pedestrians die when struck by a vehicle going 30, 40, and 50 mph, respectively.

The posted speed limit on West Street is 30 mph. The City collected 24-hour vehicle speed data along the corridor for three consecutive days from September 11-13, 2018. The average speed of motorists traveling along the corridor was observed to be 26 mph. However, 32% of motorists were observed to be exceeding the speed limit. The 85th percentile speed, or the speed that 15% of drivers exceeded, was 33 mph. 169 vehicles were observed exceeding 40 mph. **Figure 7** graphs the speeds observed on the corridor.

Figure 7: Motorist Speeds

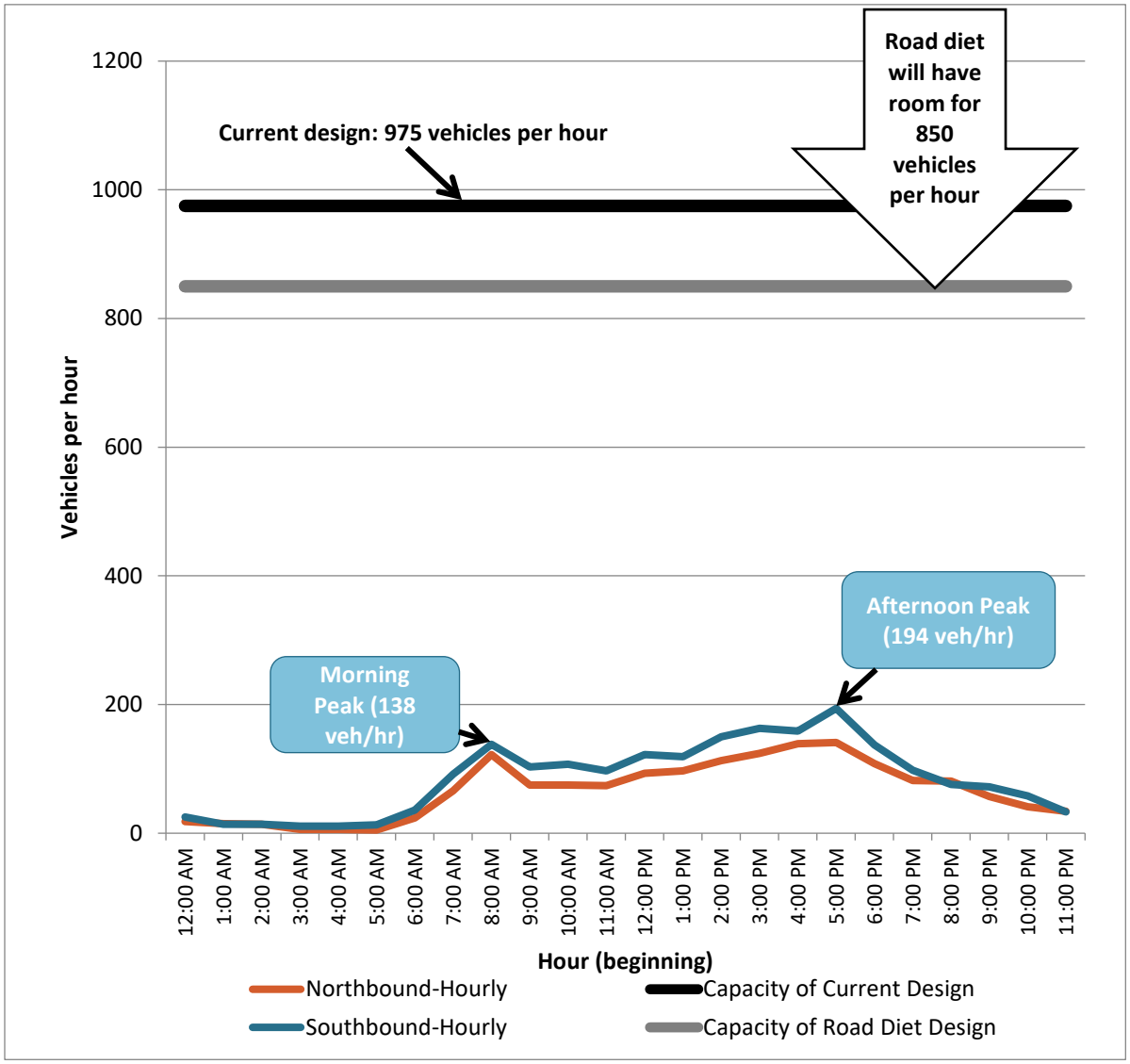


Traffic Volumes

Most streets are the busiest during the morning and evening commutes, with less traffic during the day and little traffic at night. Historically, many streets were designed to accommodate the busiest one hour (or even 15 minutes) of the day, resulting in streets being under-used for the other 23 hours (or 23 hours and 45 minutes). Extra travel lanes may encourage speeding and make it challenging for pedestrians to cross. These are unintended consequences of designing for the busiest time of day. By examining traffic volumes throughout the entire day, a project's benefits and costs can be evaluated more fairly.

Traffic counts were collected on Tuesday through Thursday, September 11-13, 2018 on West Street between 30th Street and 31st Street. On average, there were 3,652 vehicles per day. The busiest hour was between 5:00 and 6:00 PM, with 194 vehicles traveling southbound. The existing cross-section with one travel lane per direction and a two-way center turn lane has the capacity to carry 975 vehicles per hour (vph) per direction. The proposed cross-section will have the capacity to carry 850 vph per direction. **Figure 8** graphs the directional traffic volumes and the directional capacity of the existing and proposed cross-sections.

Figure 8: Traffic Volumes



Pedestrian Safety

Pedestrians are especially vulnerable to being hit when crossing streets with more than one travel lane in each direction. A pedestrian crossing at a typical intersection along the corridor needs up to three drivers to yield, one in each travel lane and one in the left turn lane. If the driver in the first travel lane yields, that vehicle may block the view for the driver in the left turn lane. This scenario – where the pedestrian and the second driver cannot see each other – is such a severe problem that it has its own name: a *multiple threat crash*. Additionally, speeds on such streets are higher, and speeding drivers are less likely to yield to pedestrians.

This analysis examines how long pedestrians must wait for a safe opportunity to cross the street at crosswalks without traffic signals or stop signs. This method is useful for understanding pedestrian

safety because longer wait times result in people taking risks. Without safe opportunities to cross, pedestrians attempt to force drivers to yield. In California, drivers are required to yield to pedestrians at both marked and unmarked crosswalks, but not all drivers do so. With fewer lanes and lower speeds, drivers are more likely to yield to people crossing the street, improving safety and access for pedestrians.

In the project area, there are 28 intersections, six with traffic signals, 10 with marked crosswalks across West Street and all-way or side-street only stop signs, and 12 with unmarked crosswalks across West St and stop signs on the side streets only.

Under existing conditions, pedestrians cross a three-lane undivided road, 58 to 60 feet in width. During commute hours, it is estimated that 10%-20% of motorists yield to pedestrians at the average uncontrolled crosswalk location (depending on the presence of a marked crosswalk). By installing high-visibility crosswalks, it is estimated that 40% of motorists will yield to pedestrians at the average uncontrolled crosswalk location. This yielding rate would be further increased, up to an estimated 60%, if the proposed project reduces prevailing motor vehicle speeds from 33 mph to 30 mph, as expected.

During commute times in the existing condition, pedestrians need less than 40 seconds to find a safe gap in traffic to cross (considered a fair condition). In the project condition, it is expected that pedestrian crossing wait times would be reduced to around 21 seconds or less in the AM peak hour and 28 seconds or less in the PM peak hour (a good condition). At school crosswalks, where the project will install pedestrian safety islands in the median, the expected pedestrian crossing wait times will be reduced to less than 6 during commute hours.

Overall, the project will greatly increase the safe and comfortable crossing opportunities for pedestrians along the corridor. The pedestrian delays discussed above could be even shorter if the road diet reduces motor vehicle speeds as expected. This is because driver yielding rates increase and the probability of a suitable gap in traffic increases as motorists speeds go down.

Bicyclist Safety

The City of Oakland is moving bicycling into the mainstream by making it a safe, enjoyable, and practical means of travel. Bicycling has the most opportunities for growth in the Oakland Flatlands, and in proximity to downtown, BART stations, and the waterfront. Many Oaklanders are interested in bicycling but concerned about riding in traffic. OakDOT groups people who are willing to bicycle into four categories based on their level of comfort and concern with riding in traffic.

(1) **Youth:** For young people (and their parents) to feel comfortable biking, Youth should be separated from all but the slowest and lightest traffic. Youth are served by bicycle paths, bicycle boulevards, and – in some instances – buffered bike lanes and separated bike lanes.
(2) **Most Adults:** This is the largest portion of the population who is interested in biking (or biking more), but is often discouraged by motor vehicle traffic. Most Adults will feel comfortable biking on streets with wide, buffered, and/or separated bike lanes and low traffic speeds.

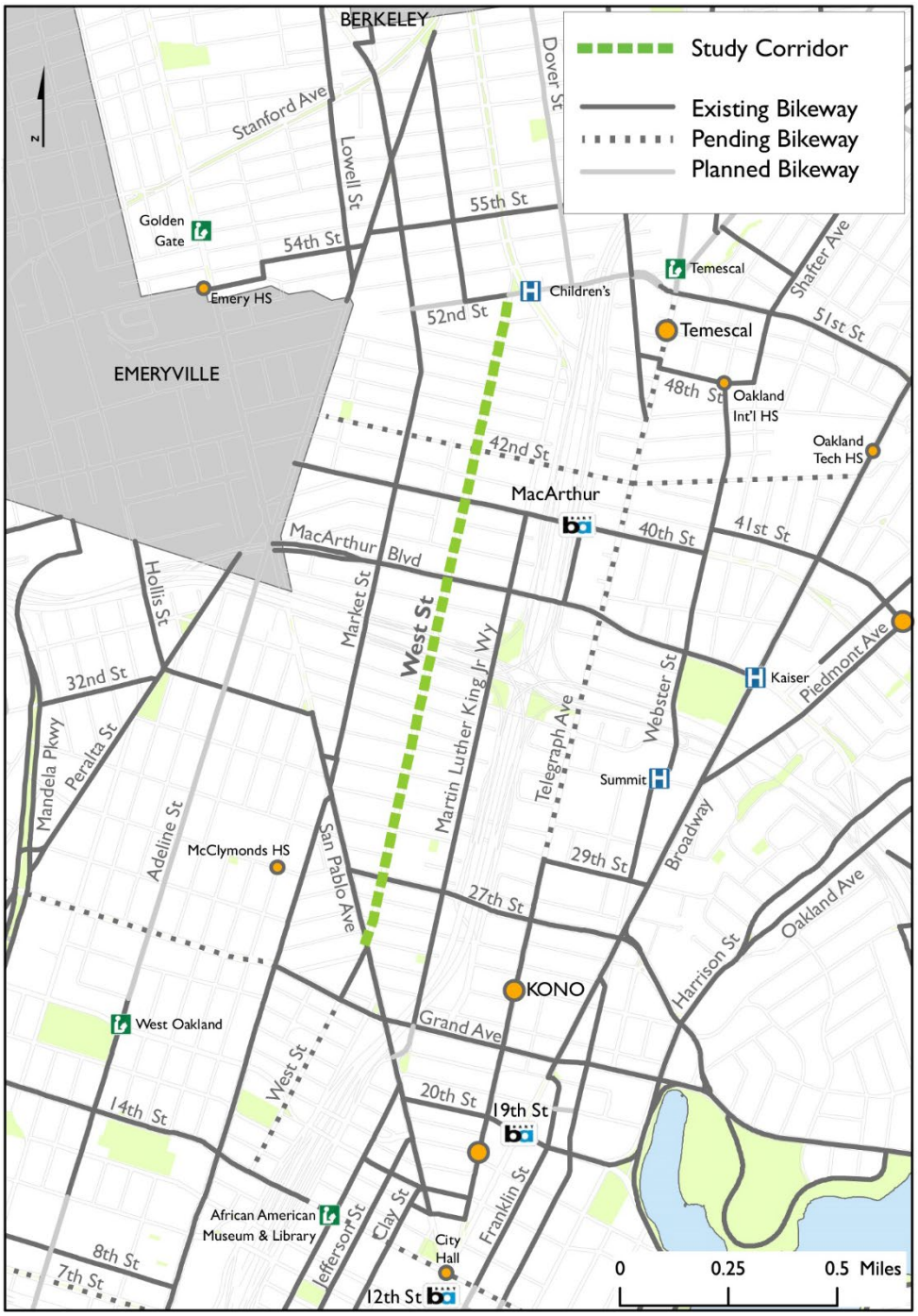
(3) **Experienced Commuter Bicyclists:** This type of bicyclist has ridden in Oakland for years and is generally comfortable riding on streets with basic bike lanes. While a small percentage of the overall population, this group has an important role in growing the culture of bicycling.
(4) **Strong & Fearless:** This very small percentage of the population has little to no concern with riding in traffic, and generally little interest in dedicated bikeways.

To attract more people to bicycling, OakDOT is working to create more space for bicyclists on Oakland's streets and thereby serve Most Adults and Youth, while growing the pool of Experienced Commuter Bicyclists.

West Street in the project corridor has existing basic bike lanes (Oakland's second oldest bike lanes, and the oldest Oakland bike lanes in existence today). The project would widen and add striped buffers to the existing bike lanes, as well as provide key crossing improvements at San Pablo Avenue, 27th St, and W MacArthur Blvd.

The current conditions on West Street are suitable for Experienced Commuter Bicyclists because the bike and travel lanes are narrow, and there is no buffer between the bike and travel lane. In the project condition, the street is suitable for a much larger group of Oaklanders who are interested in bicycling. If speeds are reduced to 30 mph, the street will be suitable for Most Adults.

Figure 10: Bicyclist Suitability

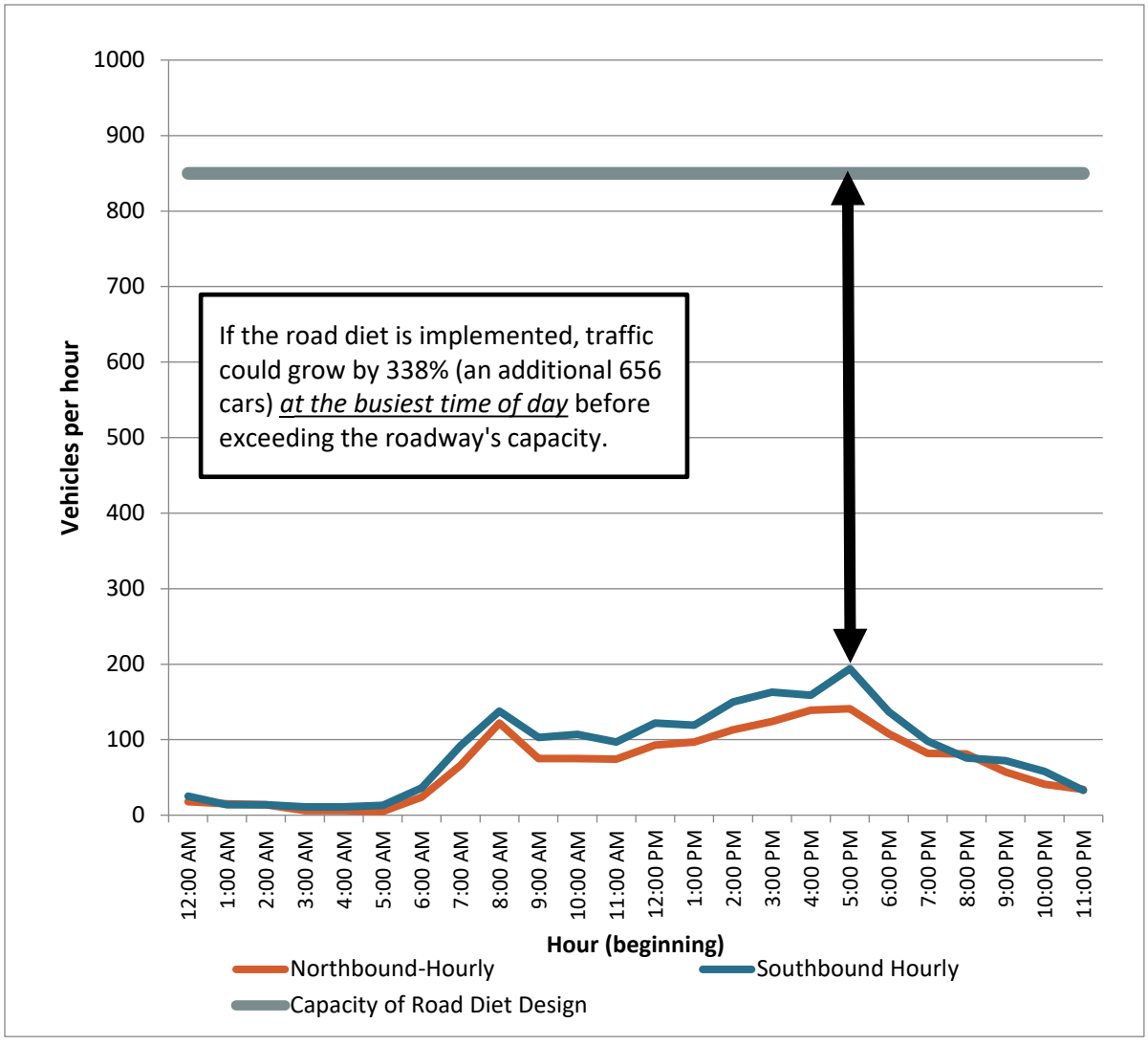


Future Traffic Growth

As Oakland builds housing and creates jobs, more people are using Oakland's streets. The City of Oakland's policies seek to shift more people from driving to transit, walking, and biking. These modes make more efficient use of street space and improve public health and the environment. Across the United States, and particularly in metropolitan areas, young people are less interested in driving than their parents' and grandparents' generations. Yet traffic congestion remains a concern. If the City reduced the number of travel lanes on this street now, and more people drove in the future, what would happen?

The proposed project, with one lane per direction, could accommodate 850 vehicles per hour in each direction. The current peak hour directional volume is 194 per hour between 5:00 PM and 6:00 PM in the southbound direction. This volume could increase by 338% – an addition of 656 vehicles – before reaching the capacity of the road diet configuration. This is illustrated in **Figure 11**.

Figure 11: Available Capacity for Future Growth



Left Turns

Left turn lanes are beneficial to motorists and bicyclists by providing a place to wait that is separated from overtaking traffic. Left turn lanes also allow for protected left turn phases at traffic signals. The green arrow for the left turn improves pedestrian safety by having turning motorists and crossing pedestrians go at different times. However, the space for turn pockets could also be used for pedestrian safety islands or to add buffers to bike lanes. The purpose of this analysis is to investigate the locations that would benefit the most from left turn lanes. This benefit can then be weighed against the competing demands of pedestrian safety and bicyclist safety.

The proposed project will remove the two-way left turn lane and left turn pockets along the corridor, except at the southbound approach to 35th Street, the northbound approach to 36th Street, and the northbound approach to 40th Street. The volume of southbound motorists turning left onto 35th Street and the volume of northbound motorists turning left onto 40th Street suggest that maintaining left turn pockets on these approaches will help traffic operations. A left turn pocket will also be maintained on the northbound approach to 36th Street. Despite a lower volume of left turning motorists at this approach, the left turn pocket will be maintained to provide a consistent and predictable roadway cross-section under the I-580 overpass. Because the Caltrans right-of-way under I-580 does not support crosswalks at either the southbound approach to 35th Street or the northbound approach to 36th Street, maintaining the left turn pockets on both approaches is not expected to have a negative impact on pedestrian safety. In fact, maintaining the left turn pockets may present an opportunity for future pedestrian safety improvements by adding protected left turn phasing to the signal and separating the left turn movement from the pedestrian crossing phase along West St.

Appendix

A. Traffic Crash Summary and Data
B. Speed Survey, Average Daily Traffic Counts
C. Pedestrian Level of Service
D. Bicyclist Level of Traffic Stress (LTS) Analysis
E. Left Turn Pocket Analysis