

The background features a blue-tinted aerial view of a multi-lane highway with traffic. Overlaid on this are various data visualization elements, including a world map, bar charts, and circular gauges, suggesting a focus on data-driven mobility intelligence.

MICHELIN

MOBILITY INTELLIGENCE

SAFER ROADS

California GHSA Grant Project

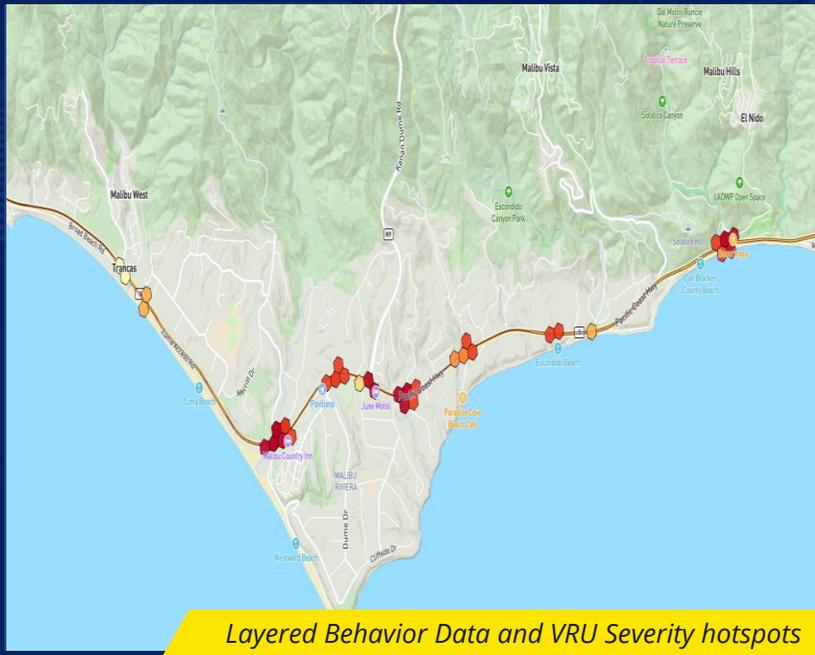
***PACIFIC COAST HIGHWAY
ANALYSIS***

October 9th, 2024



MICHELIN

MOBILITY INTELLIGENCE



LEVERAGING DATA FOR SAFER MOBILITY



Road fatalities are increasing, and **crash data is only part of the story**. Manual safety assessments are **long, expensive** and represent a **moment in time**. It is difficult to prove road improvements have resulted in improved safety.

1.35M FATALITIES
on roadways around
the world each year.

(Source: CDC)

40M
connected
drivers

50 STATES
Data collected in
all US states

~1B
miles captured
each day

5 YEARS
of research &
development

We provide innovative, meaningful and equitable data insights to help transportation professionals identify risky areas before more crashes occur



Understand
Driving Behavior



Identify **Risky Areas** in all
community types



Prioritize
Actions & Resources

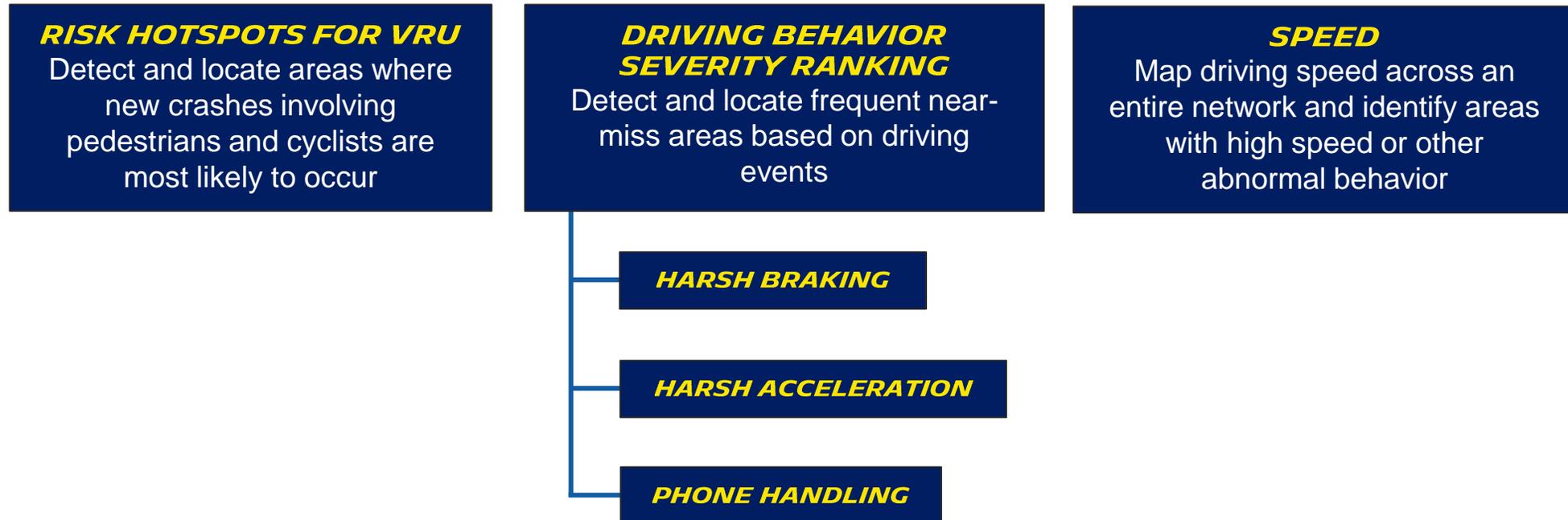


Evaluate
the **Impact**

We provide transportation experts with the **insights** they need to make **data-driven decisions** and promote **safer** driving habits.

OUR SOLUTIONS

*Safety Oriented.
Based on driving behavior.*





California Office of Traffic Safety (OTS), California Highway Patrol (CHP) and Michelin Mobility Intelligence leveraged driving behavior insights to:

- Analyze the data collected to establish correlations between intensified enforcement measures and improvements in traffic safety metrics
- Utilize the insights derived from this analysis to make informed decisions regarding future enforcement strategies

This presentation will analyze the impact of various features on the Pacific Coast Highway (PCH) in the Malibu area

DATA TIME FRAME

Before : February - April 2023
After : January - March 2024

- **MALIBU RIVIERA**, **MALIBU CITY**, and **LAS FLORES** are the areas with the **HIGHEST RISK** on Pacific Coast Highway.
- There has been a **DECREASE** of **7%** in average **SPEED** on the Pacific Coast Highway after the implementation of additional law enforcement
- When analyzing the extreme speeds, **45%** of drivers who drive over **100 MPH** occur between **8 PM AND 6 AM**
 - **24%** of drivers who drive over **100 MPH** occur between **10AM AND 3 PM**
- The number of **HARSH BRAKING EVENTS** has **DECREASED** by **14%**
- There has been **NO SIGNIFICANT** changes in **SPEED** at **PEPPERDINE UNIVERSITY** and **V85 IS HIGHER** than the speed limit



MICHELIN

MOBILITY INTELLIGENCE

1

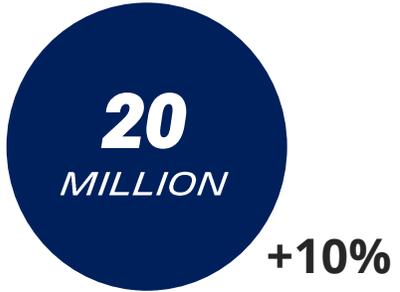
OVERALL ANALYSIS



| | |
|---------------|--------------|
| Before | After |
| 02-04/2023 | 01-03/2024 |

KEY NUMBERS

DATA USED IN THE STUDY



Total Driving Hours

Trip Points Collected

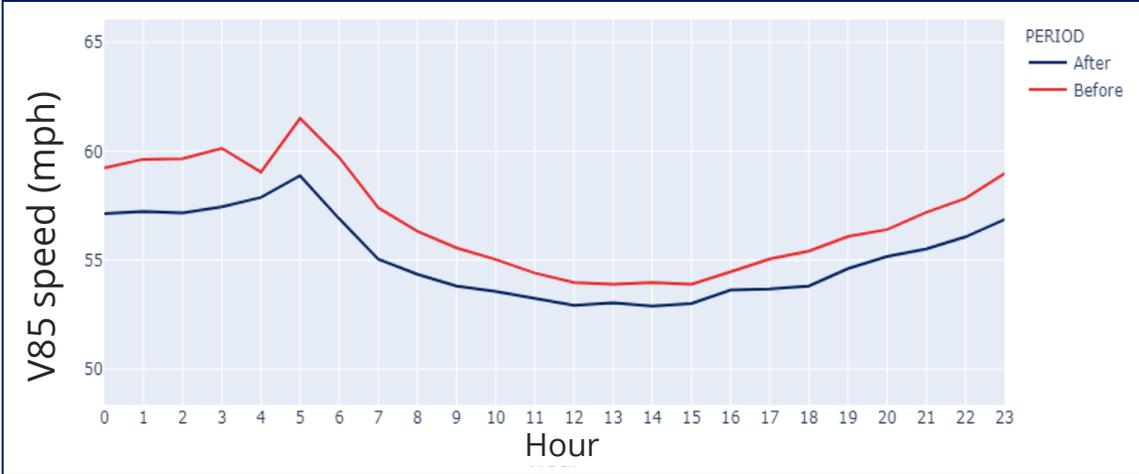
Harsh Acceleration Events

Harsh Braking Events

Phone Handling Events

SPEED ANALYSIS BASED ON TIME AND DAY

V85 (MPH) BY HOUR



V85 (MPH) BY DAY

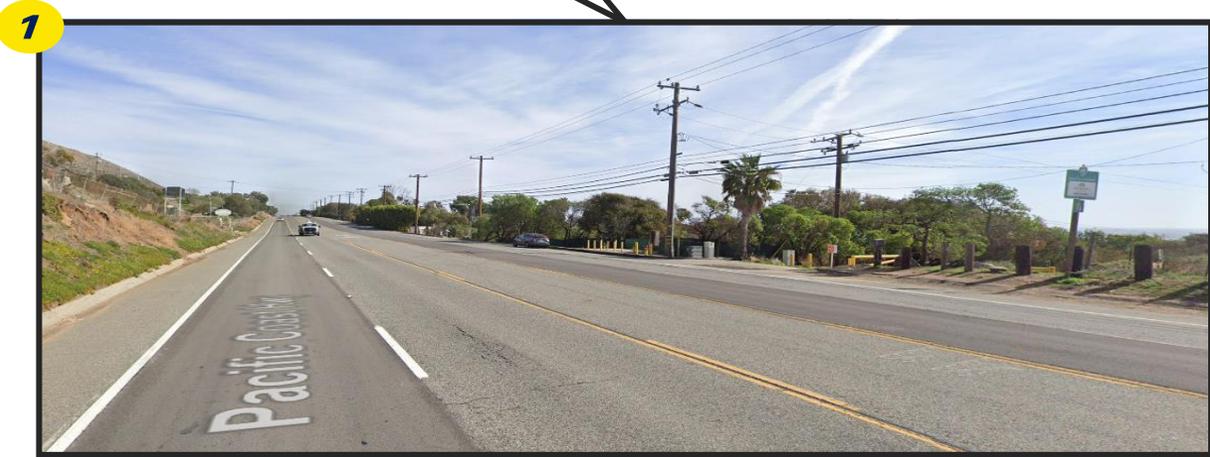


INSIGHTS

- There has been a **7% decrease in average speed** on the Pacific Coast Highway, as extreme instances of speeding have decreased

| Period | Mean Speed (mph) | Median speed (mph) | V85 Speed (mph) |
|----------------|------------------|--------------------|-----------------|
| Before | 38.8 | 44.1 | 55 |
| After | 36.1 | 42.4 | 53.4 |
| Difference | -2.7 | -1.7 | -1.6 |
| Percent Change | -7% | -3.9% | -2.9% |

IMPROVEMENTS IN V85 SPEED ON PCH



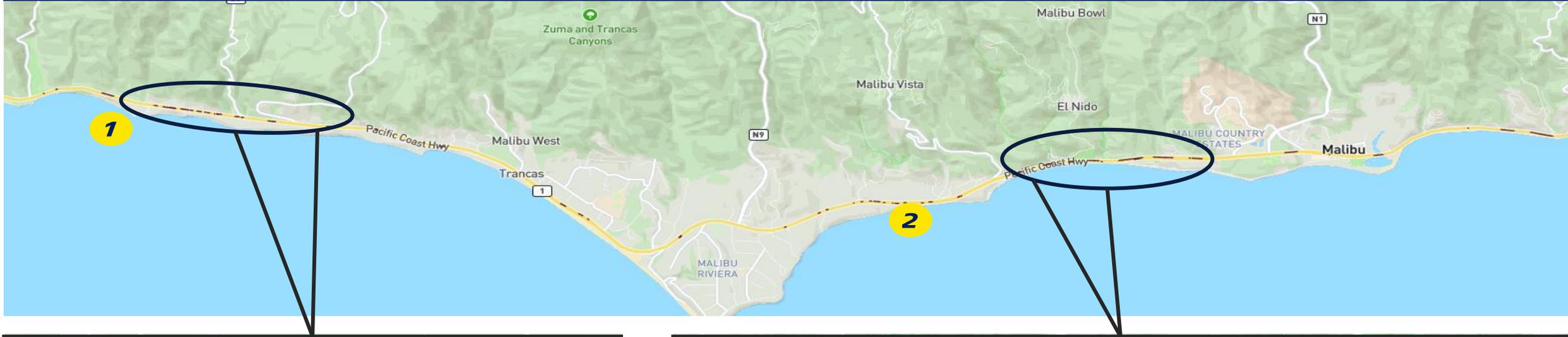
V85 speed decreased by 4.9% between Wishtoyo Foundation's Chumash Discovery Village and El Matador Beach from 65.6 MPH to 62.4 MPH



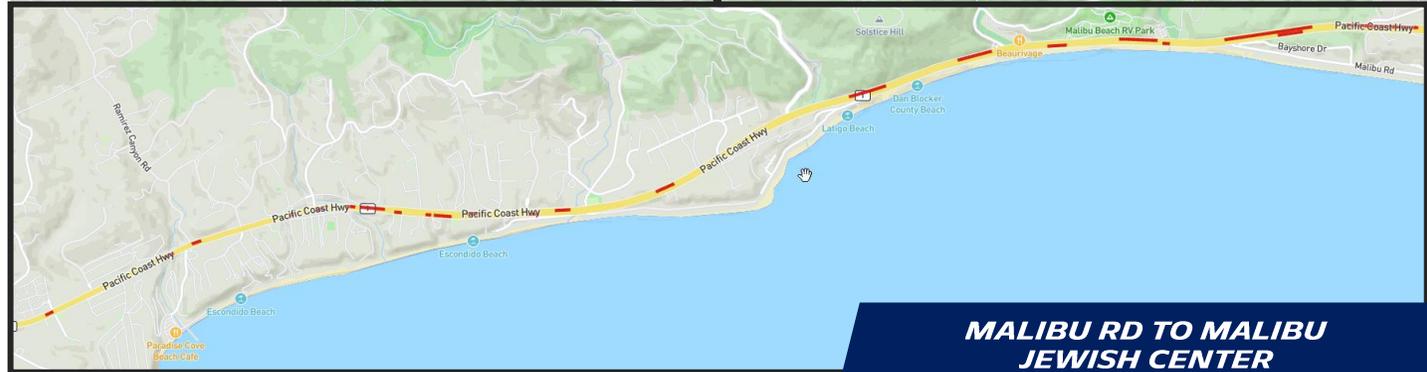
V85 speed decreased by 6.1% between Winding Way East and Corral Canyon Rd from 60.2 MPH to 56.5 MPH

EXTREME SPEEDS ON PCH

V85 MAX SPEED ABOVE 120 MPH



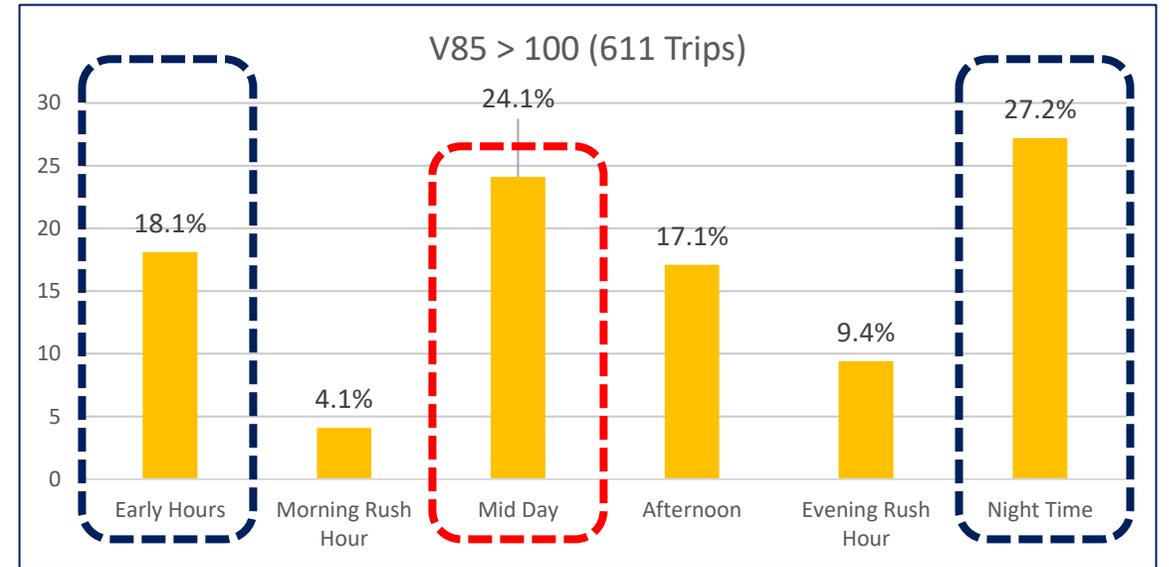
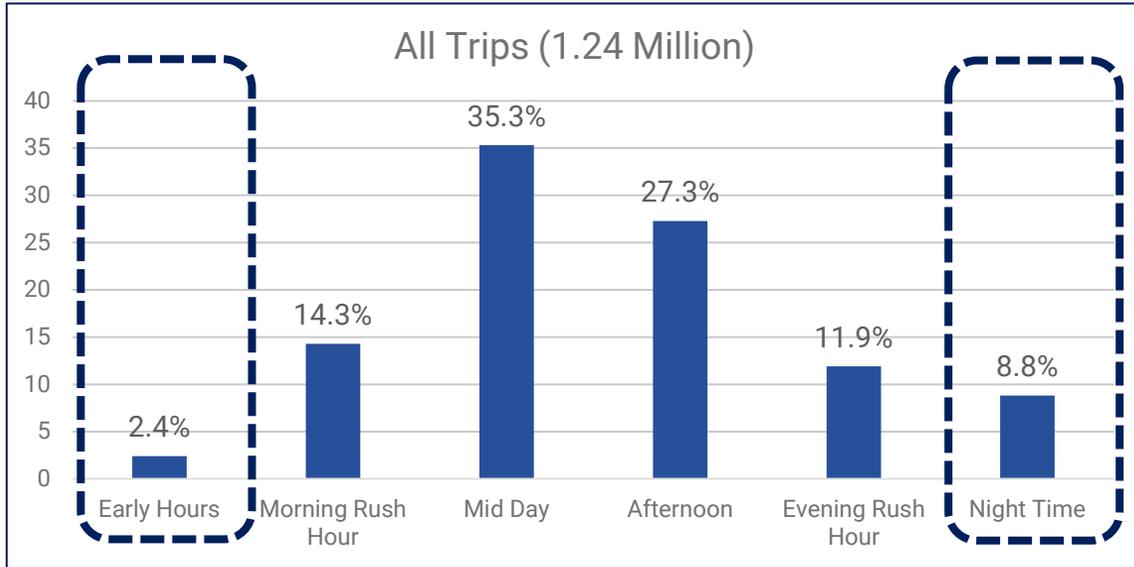
MALIBU RIDING CLUB TO MATADOR PARKING LOT



MALIBU RD TO MALIBU JEWISH CENTER

| Time Frame | Total Trips | Trips over 120 MPH | Trips over 100 MPH | Trips over 80 MPH |
|------------|--------------|--------------------|--------------------|-------------------|
| Before | 1.24 Million | 58 | 611 | 5,900 |
| After | 1.31 Million | 31 | 308 | 3,812 |

TIME OF DAY FOR EXTREME SPEEDS



INSIGHTS

- At speeds exceeding 100 MPH, ~45% of trip points occur during Night (8PM – 12AM) and Early Morning (12AM-6AM)
- Surprisingly the third highest speeding time is Midday (10am – 3pm), where 24% of all 100+ MPH trips occur

2 *FOCUS AREA ANALYSIS*

ATYPICAL DRIVING BEHAVIOR EVENTS



A **PHONE HANDLING EVENT** is identified using the phone's gyroscope, accelerometer as well as unlocking function



A **HARSH BRAKING** event is a decrease in accelerometry above a certain threshold for a certain time. Detected when decelerations falls below -7.1 mph/s



A **HARSH ACCELERATION** event is a sudden increase in speed beyond a certain threshold for a certain time. Detected when acceleration exceeds 7.1 mph/s

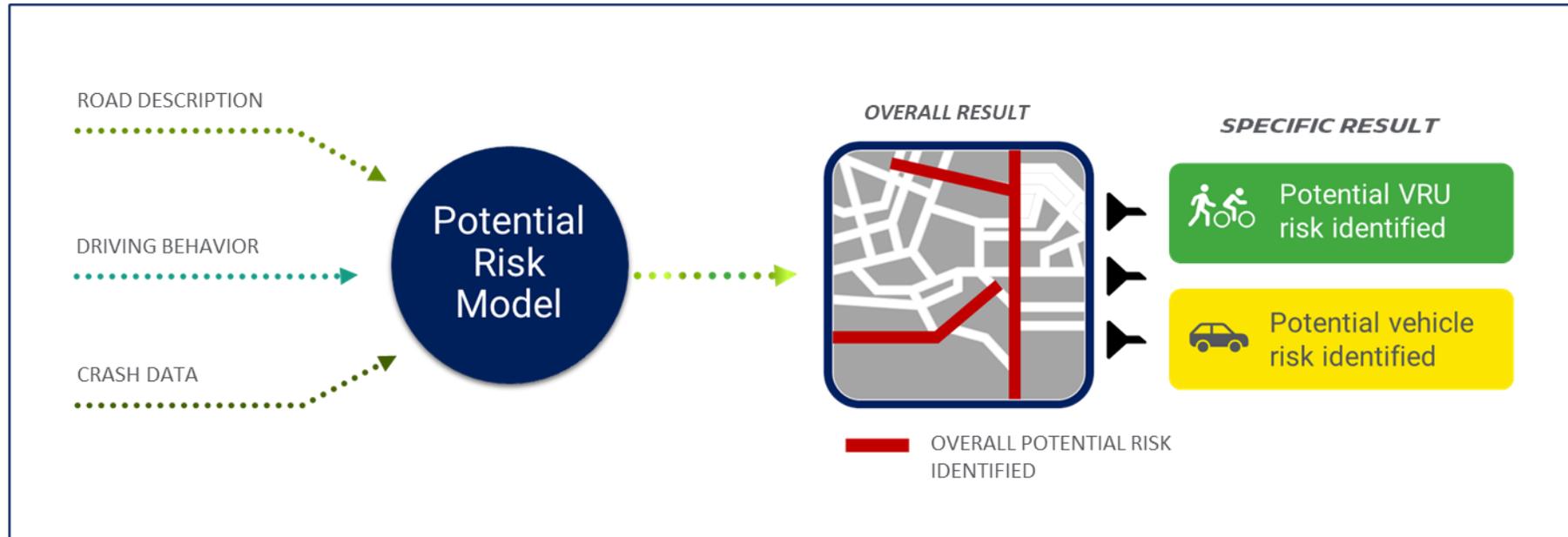


V85 SPEED is the speed at or below which 85 percent of the drivers travel on a road segment

VULNERABLE ROAD USER (VRU) RISK ANALYSIS



Systemic approach to assess the probability of areas which could be risky using road features and historical crash data



Vulnerable Road Users (VRU) risk analysis provides insights into the risks to Pedestrians & Cyclists. It provides an understanding of road segments where there is a high probability of VRU presence and where they might be at risk.

Michelin Mobility Intelligence uses the systemic approach to road safety to highlight the road segments where there is high probability of VRU presence and where there is high probability of interaction between VRUs and motorized vehicles. The road segments are identified using Michelin's proprietary machine learning model, which creates a location signature based on (road infrastructure, points of interest, traffic volumes and speeds, past VRU crash data, etc.) and applies this signature to other matching road segments within the area of focus.

When combined with driving behavior insights, these VRU insights assist in identification of VRU risk hotspots where VRUs might be at a greater risk of a near-miss or crash with a motorized vehicle.



FOCUS AREA SEVERITY RANKING

| Rank | Area Name | Total Severity Score |
|------|-----------------------|----------------------|
| 1 | Malibu Riviera | 27 |
| 2 | Malibu City | 25 |
| 3 | Las Flores | 23 |
| 4 | Pepperdine University | 18 |
| 5 | Central Malibu | 16 |
| 6 | Big Rock | 14 |
| 7 | Western Malibu | 11 |
| 8 | Zuma Beach | 11 |

FOCUS AREA CRITERIA

- Speeding
- Vehicle Crash Risk
- Pedestrian Crash Risk
- Crashes
- Harsh Braking Behavior
- Harsh Acceleration Behavior
- Phone Handling Behavior



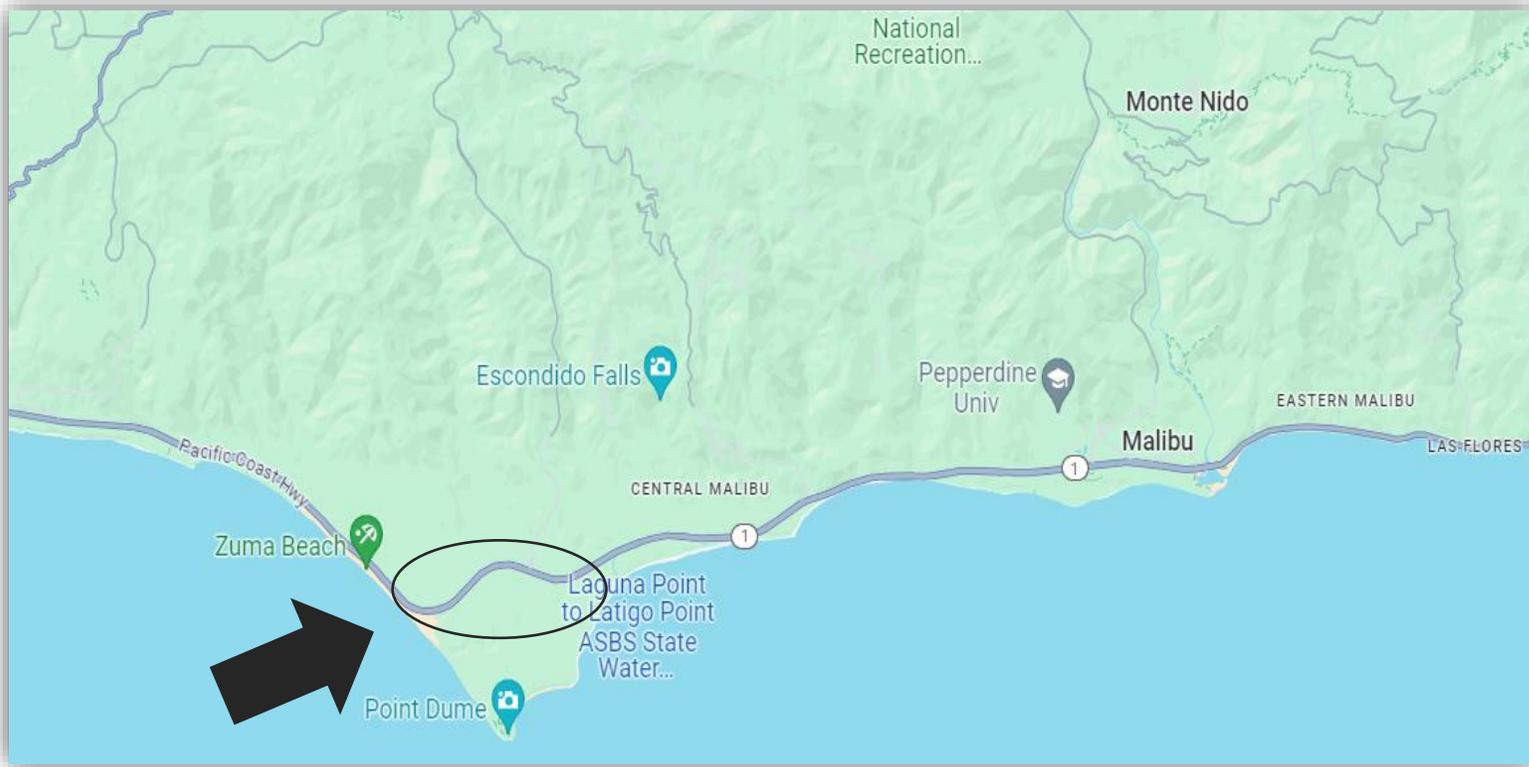
FOCUS AREA DETAILED BREAKDOWN

| Rank | Area Name | Braking Behavior Severity | Acceleration Behavior Severity | Phone Handling Behavior Severity | Speeding | Vehicle Crash Risk | Pedestrian Crash Risk | Crashes (since 2020) | Severity Score |
|------|-----------------------|---------------------------|--------------------------------|----------------------------------|----------|--------------------|-----------------------|----------------------|----------------|
| 1 | Malibu Riviera | 5 | 5 | 2 | 3 | 4 | 4 | 4 | 27 |
| 2 | Malibu City | 2 | 4 | 5 | 2 | 4 | 4 | 4 | 25 |
| 3 | Las Flores | 3 | 2 | 4 | 2 | 5 | 4 | 3 | 23 |
| 4 | Pepperdine University | 2 | 3 | 3 | 5 | 1 | 2 | 2 | 18 |
| 5 | Central Malibu | 3 | 1 | 1 | 4 | 1 | 3 | 3 | 16 |
| 6 | Big Rock | 0 | 1 | 4 | 4 | 3 | 0 | 2 | 14 |
| 7 | Western Malibu | 0 | 1 | 0 | 4 | 3 | 0 | 3 | 11 |
| 8 | Zuma Beach | 0 | 0 | 0 | 3 | 3 | 2 | 3 | 11 |

Driving Events

Speeding

Crash Risk



KEY INSIGHTS AND TAKEAWAYS

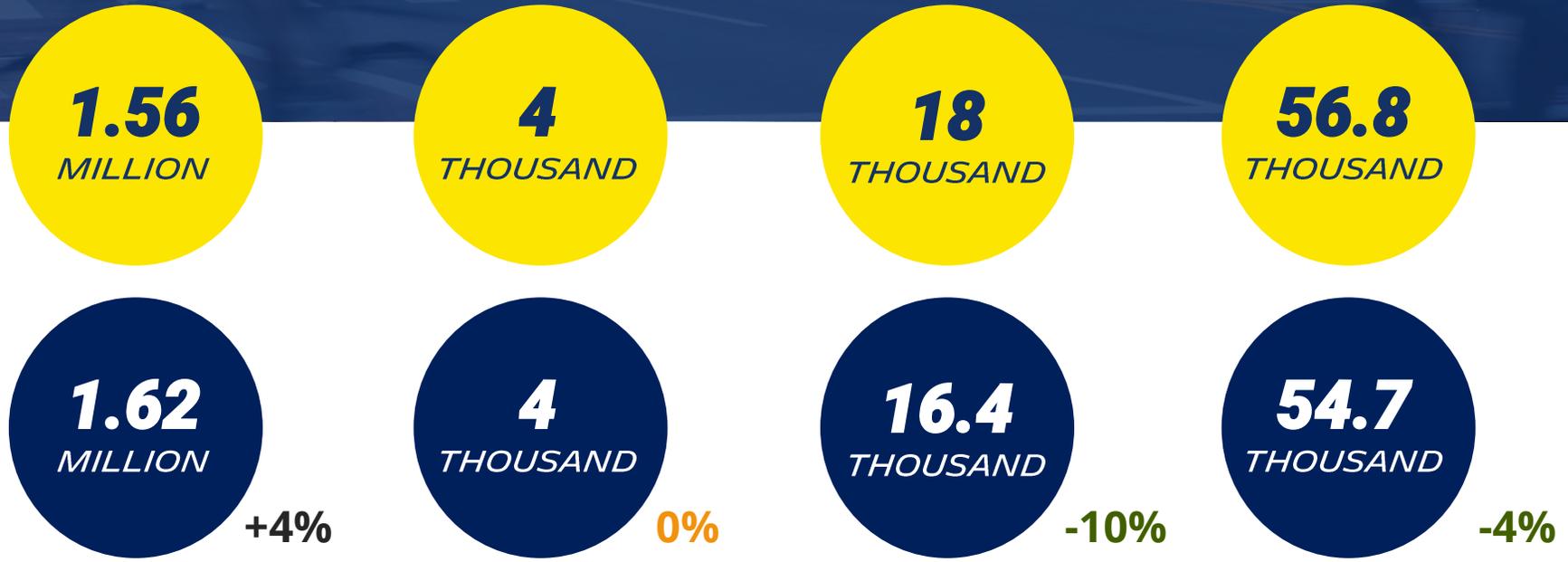
- Additional law enforcement details can be used between Busch Dr and Heathercliff Rd. This stretch of road contains V85 speeds above the limit, large amounts of braking events, and overlaps with vulnerable road users

| Area Name | Braking Behavior Severity | Acceleration Behavior Severity | Phone Handling Behavior Severity | Speeding | Vehicle Crash Risk | Pedestrian Crash Risk | Crashes (since 2020) | Severity Ranking |
|----------------|---------------------------|--------------------------------|----------------------------------|----------|--------------------|-----------------------|----------------------|------------------|
| Malibu Riviera | 5 | 5 | 2 | 3 | 4 | 4 | 4 | 27 |



| | |
|---------------|--------------|
| Before | After |
| 02-04/2023 | 01-03/2024 |

KEY NUMBERS MALIBU RIVIERA



Trip Points Collected

Harsh Acceleration Events

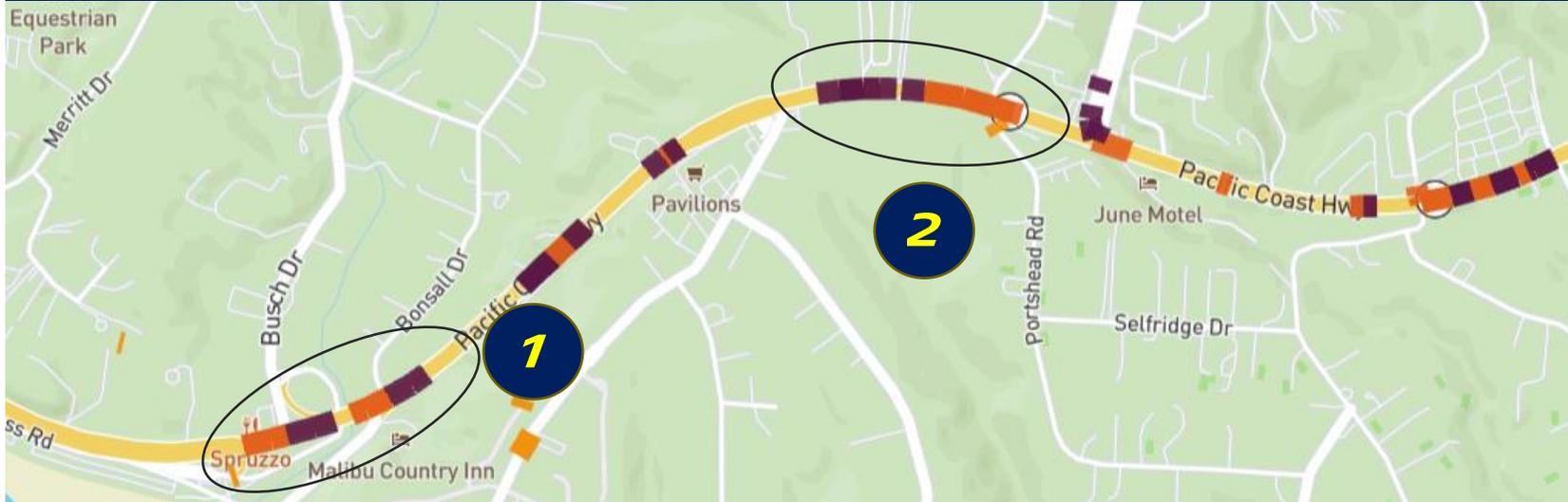
Harsh Braking Events

Phone Handling Events

MALIBU RIVIERA – VRU RISK HOTSPOTS



ROAD SEGMENTS WITH VEHICLE CRASH RISK



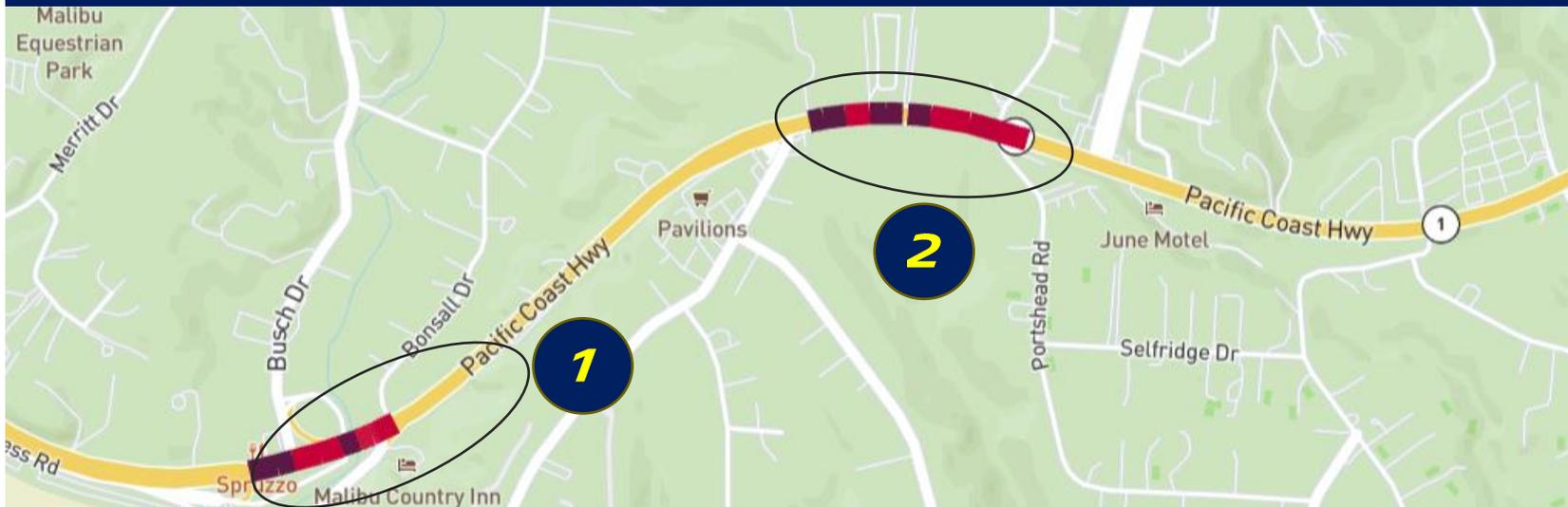
VULNERABLE ROAD USERS

- 1** PCH between Busch Dr. and Westward Beach Rd.
- 2** PCH between Heathercliff Rd. and Cavalleri Rd.

VRU



ROAD SEGMENTS WITH PEDESTRIAN AND BICYCLE CRASH RISK



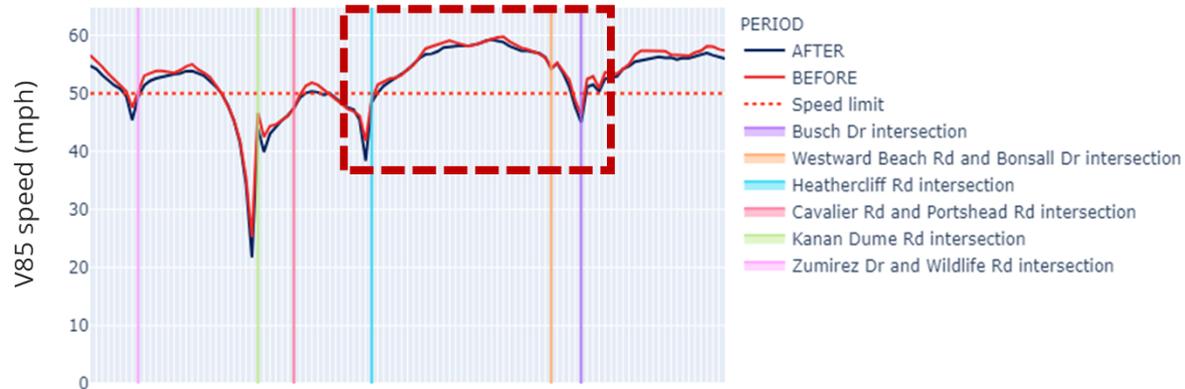
LEGEND

Severity Risk

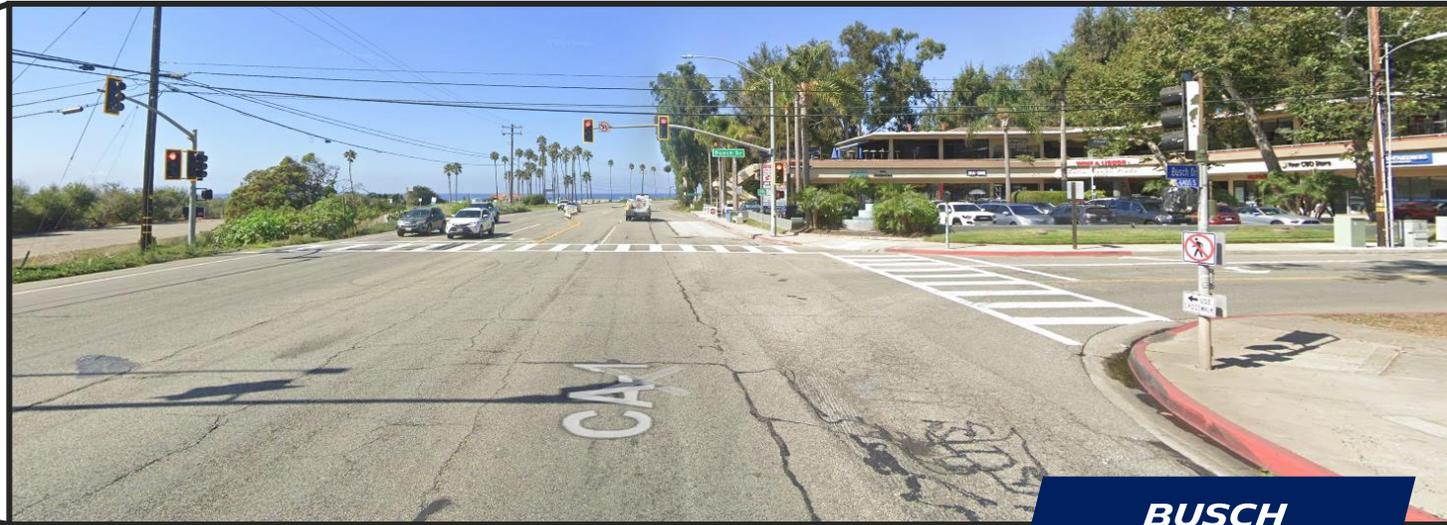
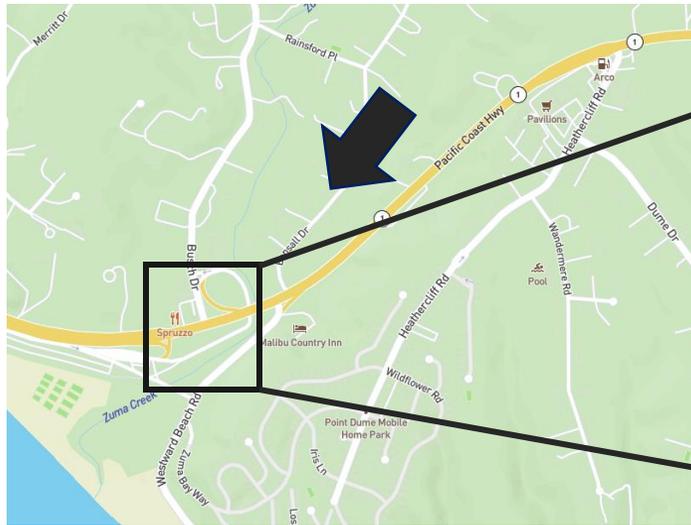
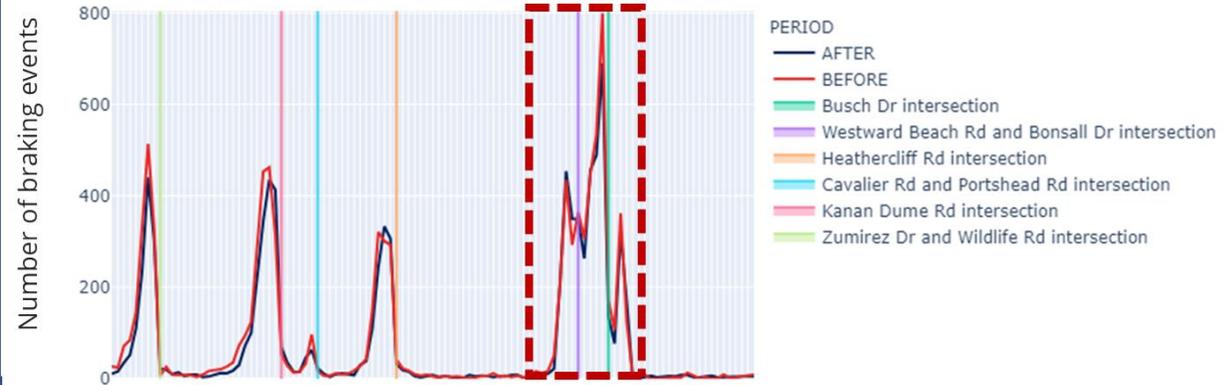
-  Class 1 – Potential Risk
-  Class 2 – Low Risk
-  Class 3 – Medium Risk
-  Class 4 – High Risk
-  Class 5 – Severe Risk

DRIVING BEHAVIOR EVENTS AT BUSCH DRIVE

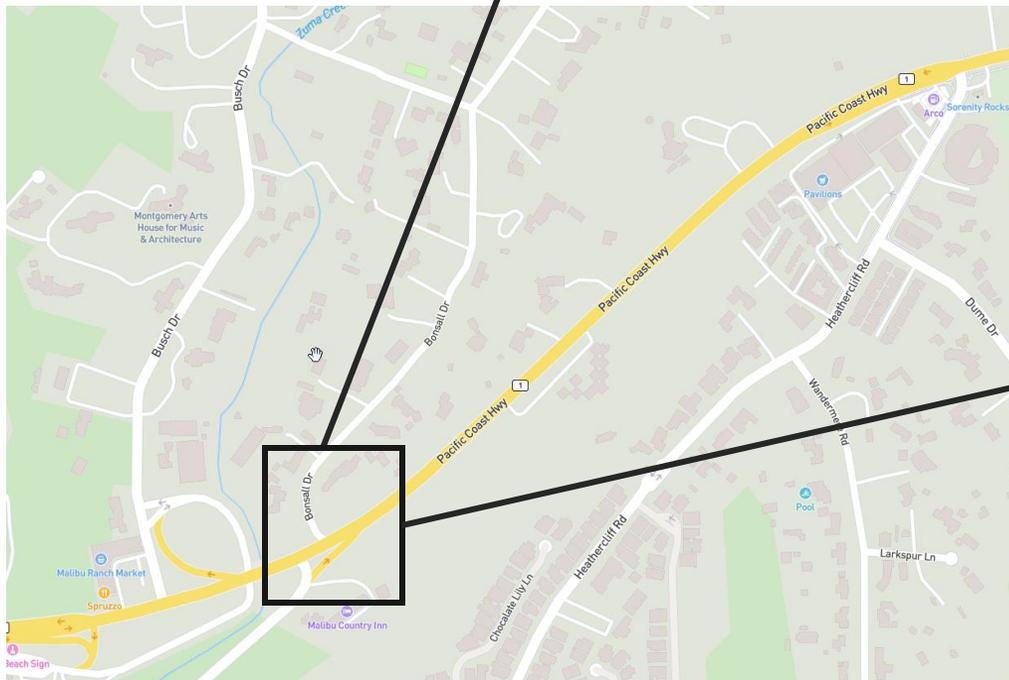
V85 SPEED



BRAKING



**BUSCH
DRIVE**

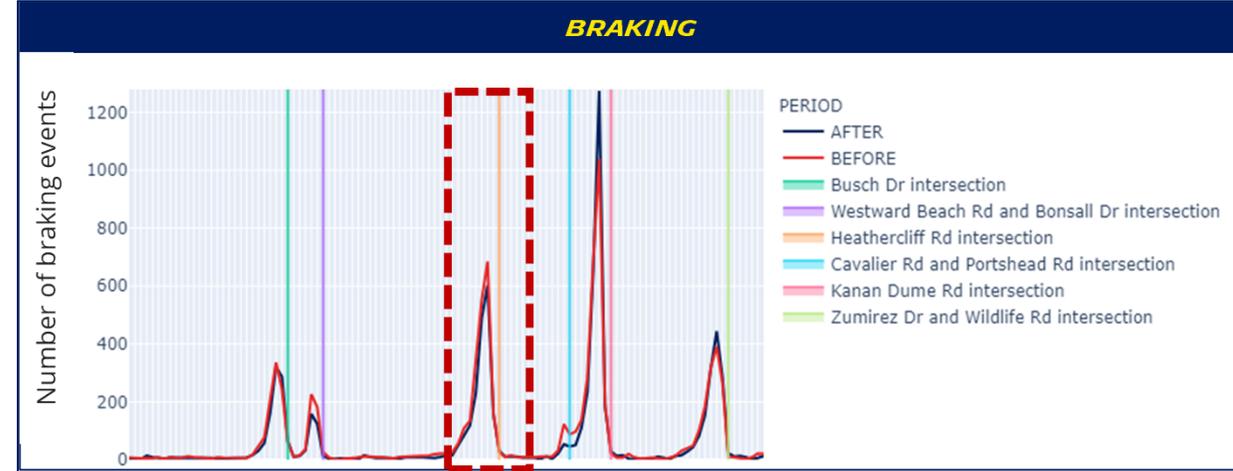
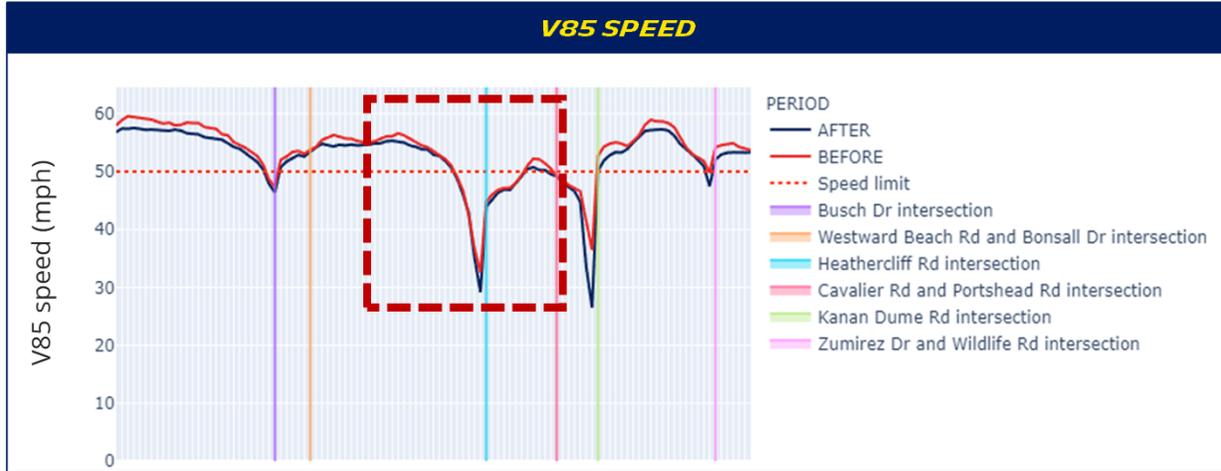


KEY INSIGHTS

- 1,100 FT between the Traffic Light Signal to Traffic Light at Busch Dr
- V85 is 58 MPH from Heathercliff Rd to Bonsall DR. This is 8 MPH over the limit
- Harsh braking starts 500 ft before Bonsall Dr and continues until Busch Drive



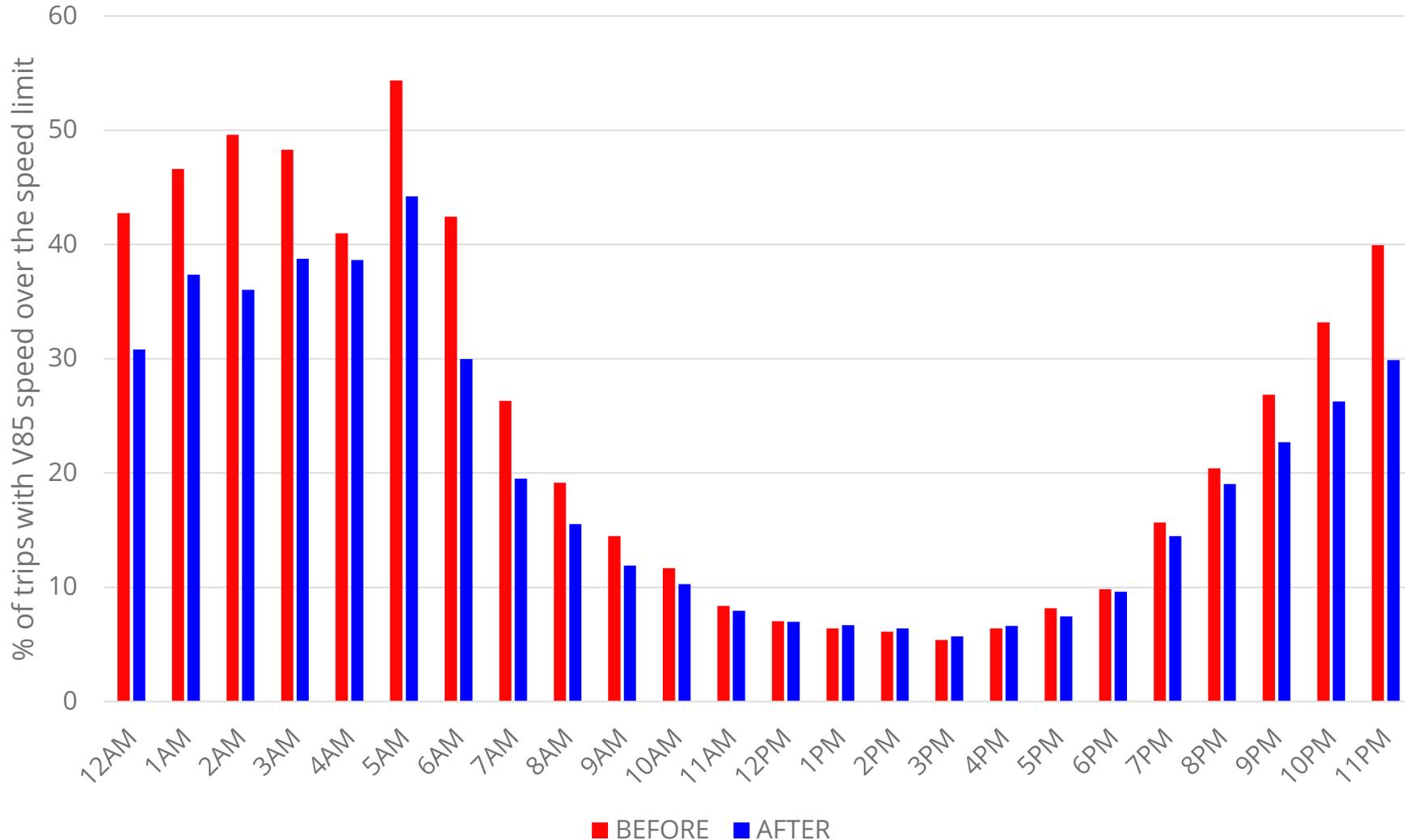
DRIVING BEHAVIOR AT HEATHERCLIFF ROAD



HEATHERCLIFF ROAD

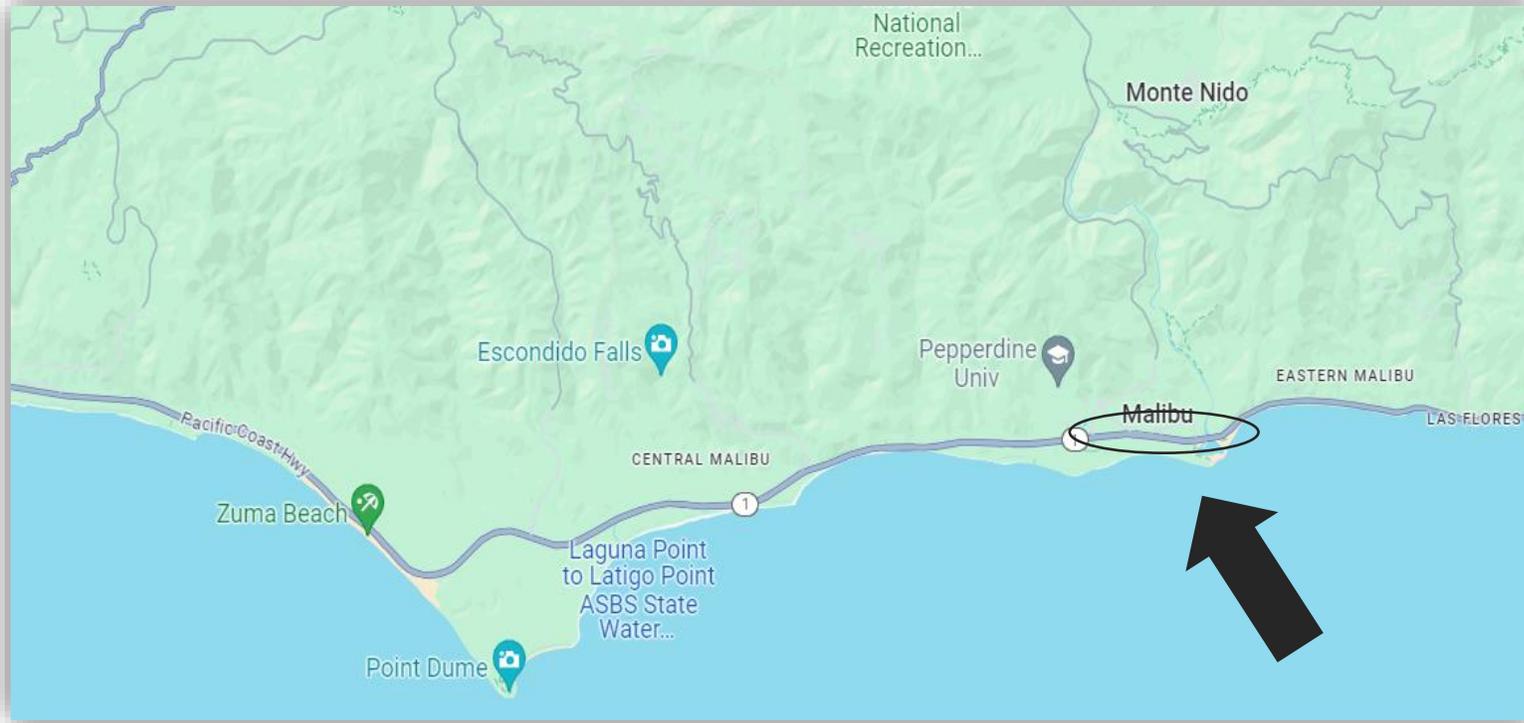
SPEEDING OVER THE LIMIT AT MALIBU RIVIERA

TRIPS OVER THE SPEED LIMIT



INSIGHTS

- Reduction in speeding per hour has had a direct correlation with decrease in the braking events



KEY INSIGHTS AND TAKEAWAYS

- Additional law enforcement details could be used at the intersection of Webb Way due to the high speeds and number of acceleration events as driver drive into Malibu City

| Area Name | Braking Behavior Severity | Acceleration Behavior Severity | Phone Handling Behavior Severity | Speeding | Vehicle Crash Risk | Pedestrian Crash Risk | Crashes (since 2020) | Severity Ranking |
|-------------|---------------------------|--------------------------------|----------------------------------|----------|--------------------|-----------------------|----------------------|------------------|
| Malibu City | 2 | 4 | 5 | 2 | 4 | 4 | 4 | 25 |



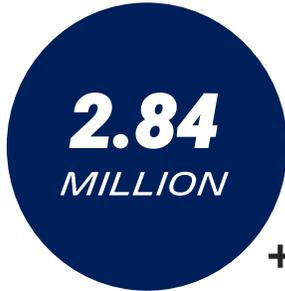
KEY NUMBERS MALIBU CITY



02-04/2023



01-03/2024



+3%



-9%



-17%



-12%

GPS points
collected

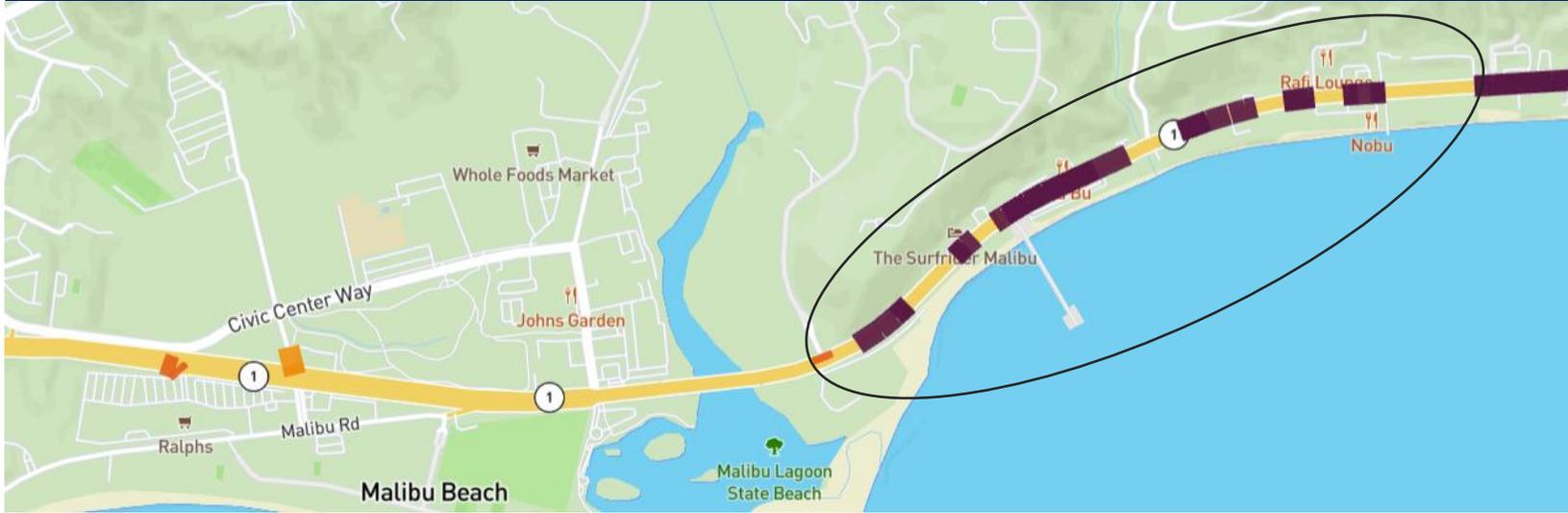
Acceleration
Events

Braking Events

Phone Handling
events

MALIBU CITY – VRU RISK HOTSPOTS

ROADS SEGMENTS WITH VEHICLE CRASH RISK



VRU

- Risky area to the east of Malibu Lagoon
- Busy area with beach, shops, hotels, restaurants, etc.

VRU

ROADS SEGMENTS WITH PEDESTRIAN AND BICYCLE CRASH RISK

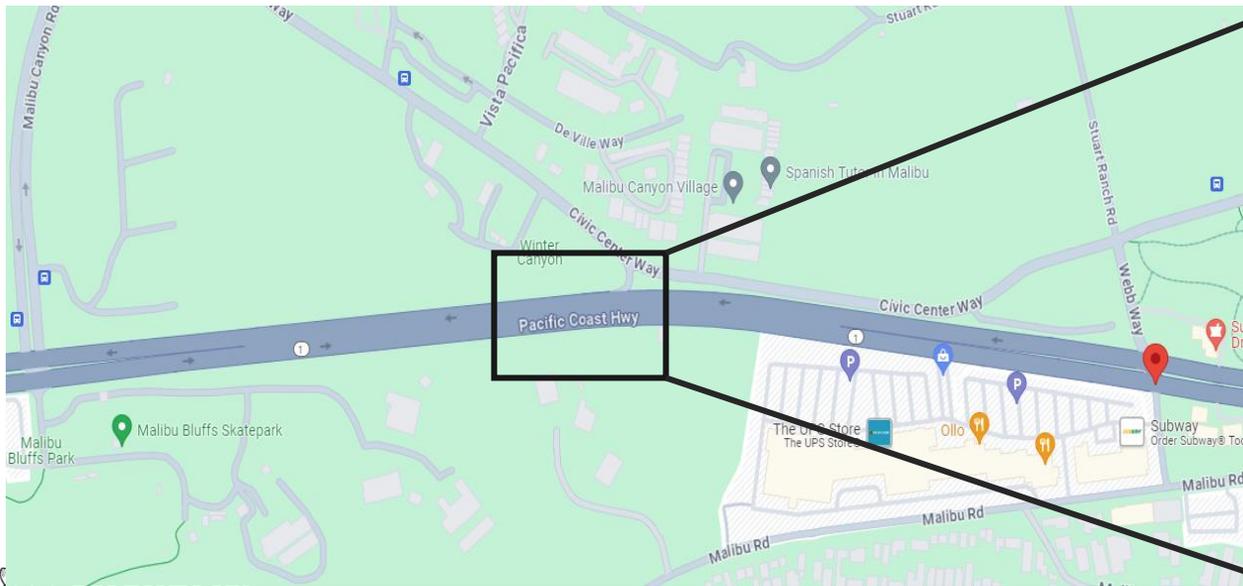
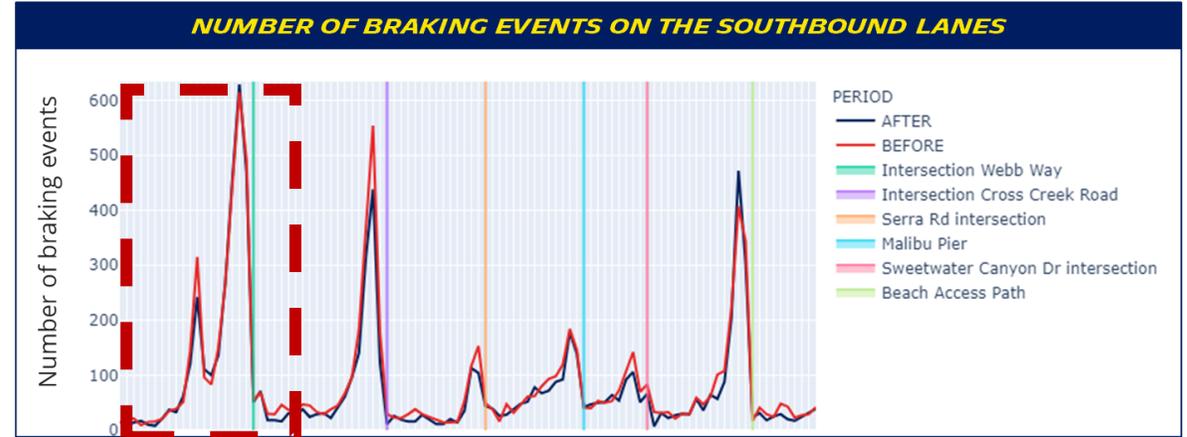
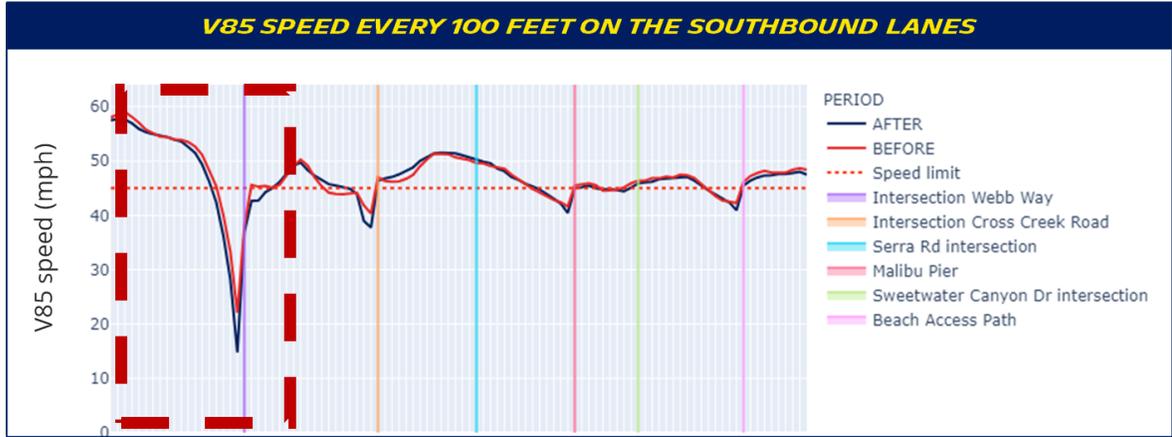


LEGEND

Severity Risk

- Class 1 – Potential Risk
- Class 2 – Low Risk
- Class 3 – Medium Risk
- Class 4 – High Risk
- Class 5 – Severe Risk

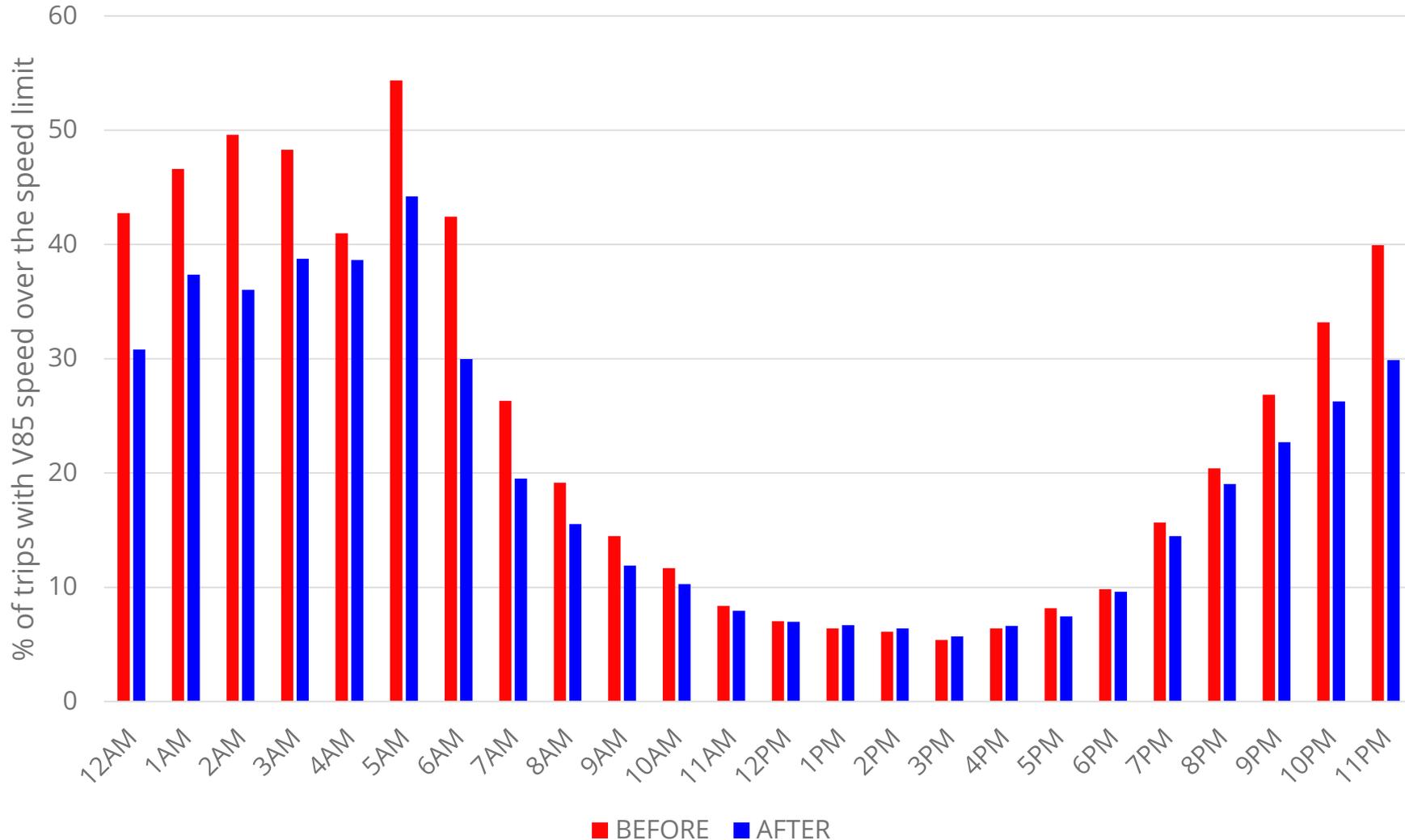
DRIVING EVENTS AT MALIBU CITY



APPROACHING WEBB WAY INTERSECTION

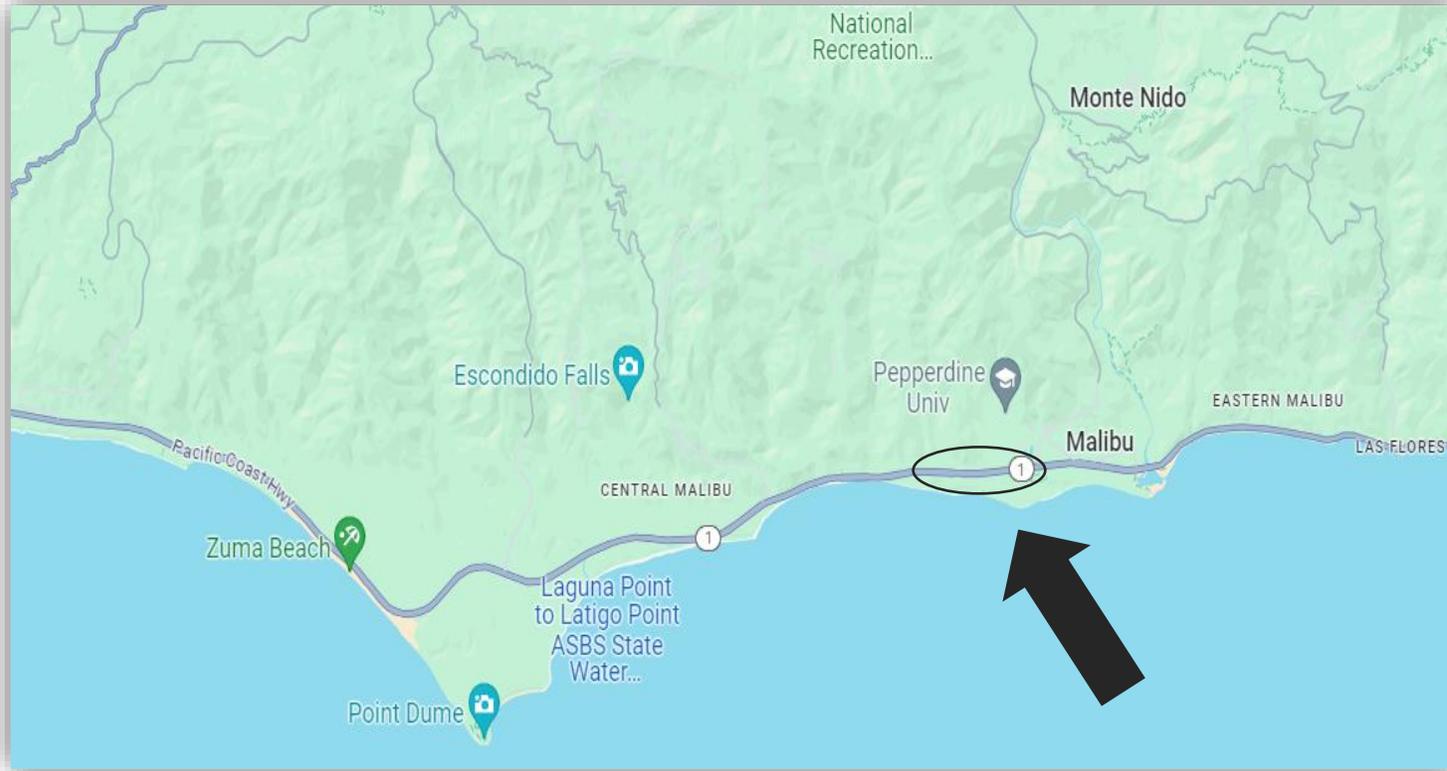
SPEEDING OVER THE LIMIT AT MALIBU CITY

TRIPS OVER THE SPEED LIMIT



INSIGHTS

- Large reduction in speeding during the Night (8PM-12PM) and (12AM-6AM)
- There has been no change in speeding behavior between the Midday (10AM-3PM) and Afternoon (3-6PM)



KEY INSIGHTS AND TAKEAWAYS

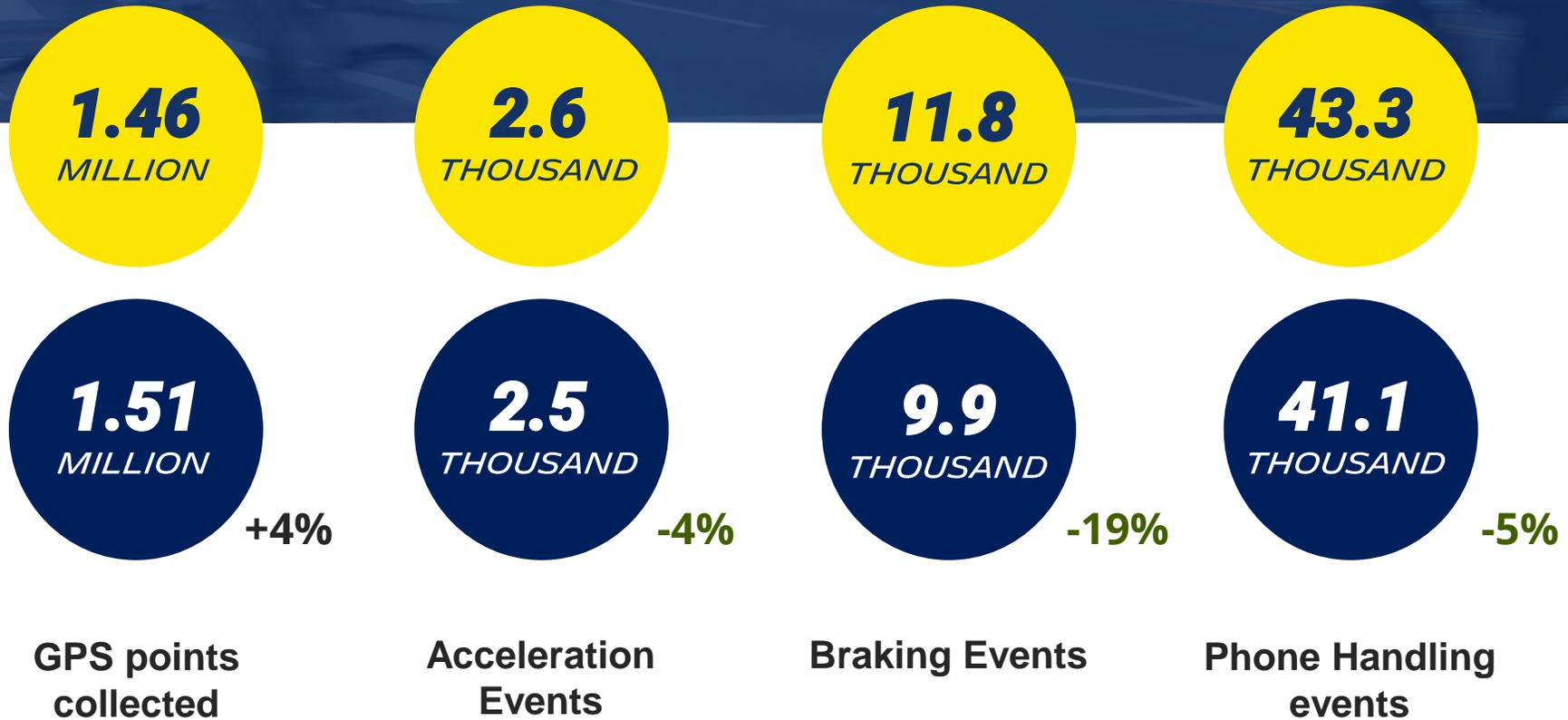
- Additional law enforcement details could be used between John Tyler Dr and Puerco Canyon Rd due to the high V85 speed

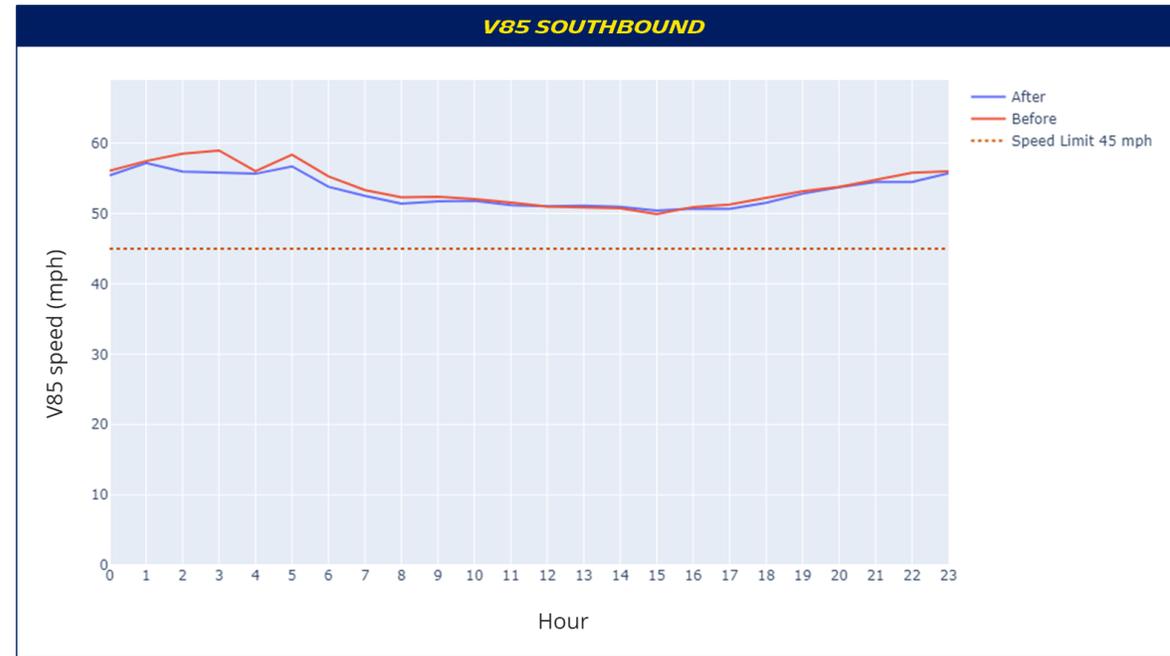
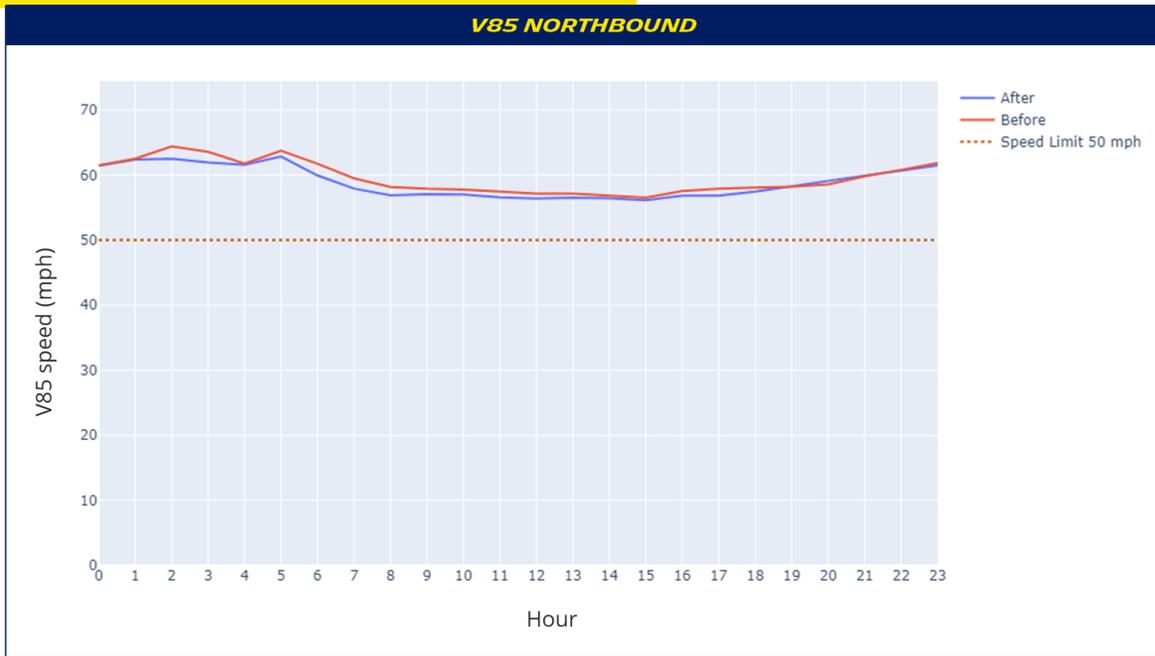
| Area Name | Braking Behavior Severity | Acceleration Behavior Severity | Phone Handling Behavior Severity | Speeding | Vehicle Crash Risk | Pedestrian Crash Risk | Crashes (since 2020) | Severity Ranking |
|-----------------------|---------------------------|--------------------------------|----------------------------------|----------|--------------------|-----------------------|----------------------|------------------|
| Pepperdine University | 2 | 3 | 3 | 5 | 1 | 2 | 2 | 18 |



| | |
|---------------|--------------|
| Before | After |
| 02-04/2023 | 01-03/2024 |

KEY NUMBERS PEPPERDINE UNIVERSITY CAMPUS



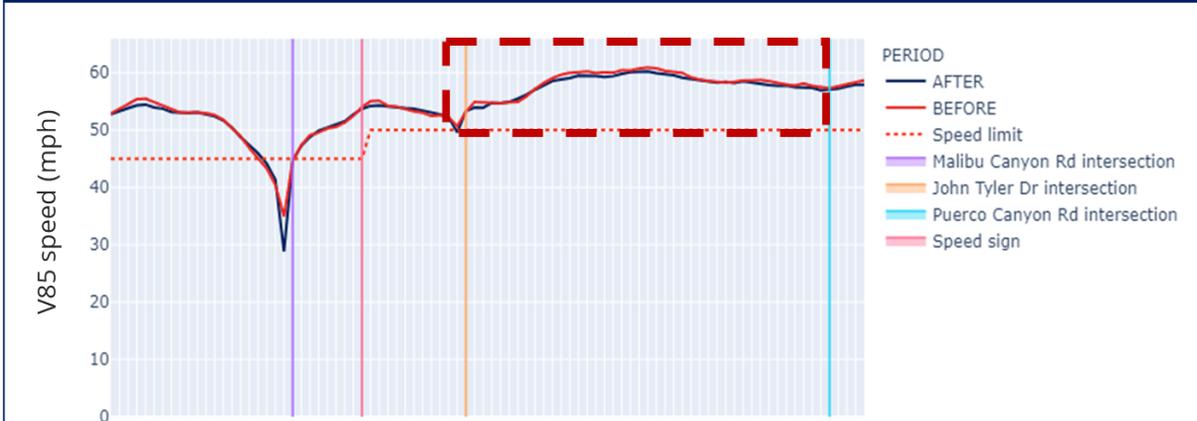


INSIGHTS

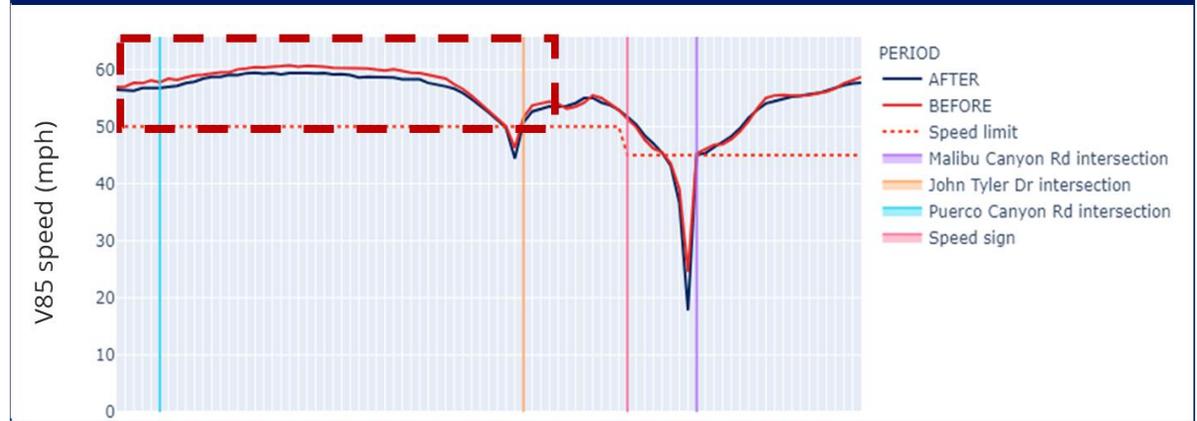
- V85 speed on this section is significantly higher (10%+) than the speed limit
- When analyzing V85 speeds Northbound and Southbound, there has been no change in the V85 speeds

SPEEDING AT PEPPERDINE UNIVERSITY

V85 SPEED NORTHBOUND



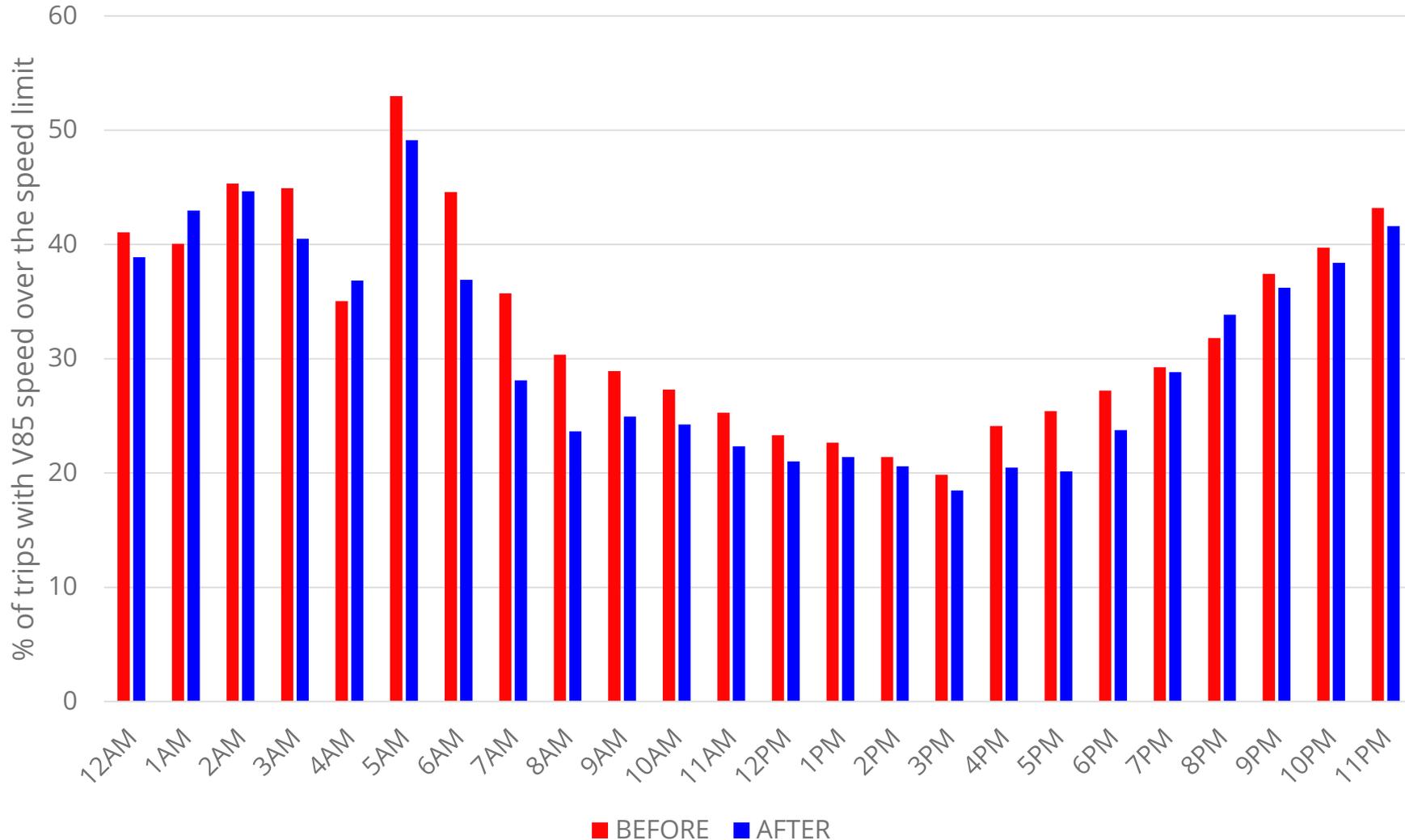
V85 SPEED SOUTHBOUND



PCH AROUND PEPPERDINE UNIVERSITY

SPEEDING OVER THE LIMIT AT PEPPERDINE UNIVERSITY

TRIPS OVER THE SPEED LIMIT



INSIGHTS

- No significant change in the amount of speeding at Pepperdine University
- Compared to other focus areas, Pepperdine has much higher ratios at Early Hours (12AM-6AM)



LADOT has made **critical safety improvements** on Anaheim St. in Wilmington County to improve traffic safety and connectivity for everyone who uses the street.

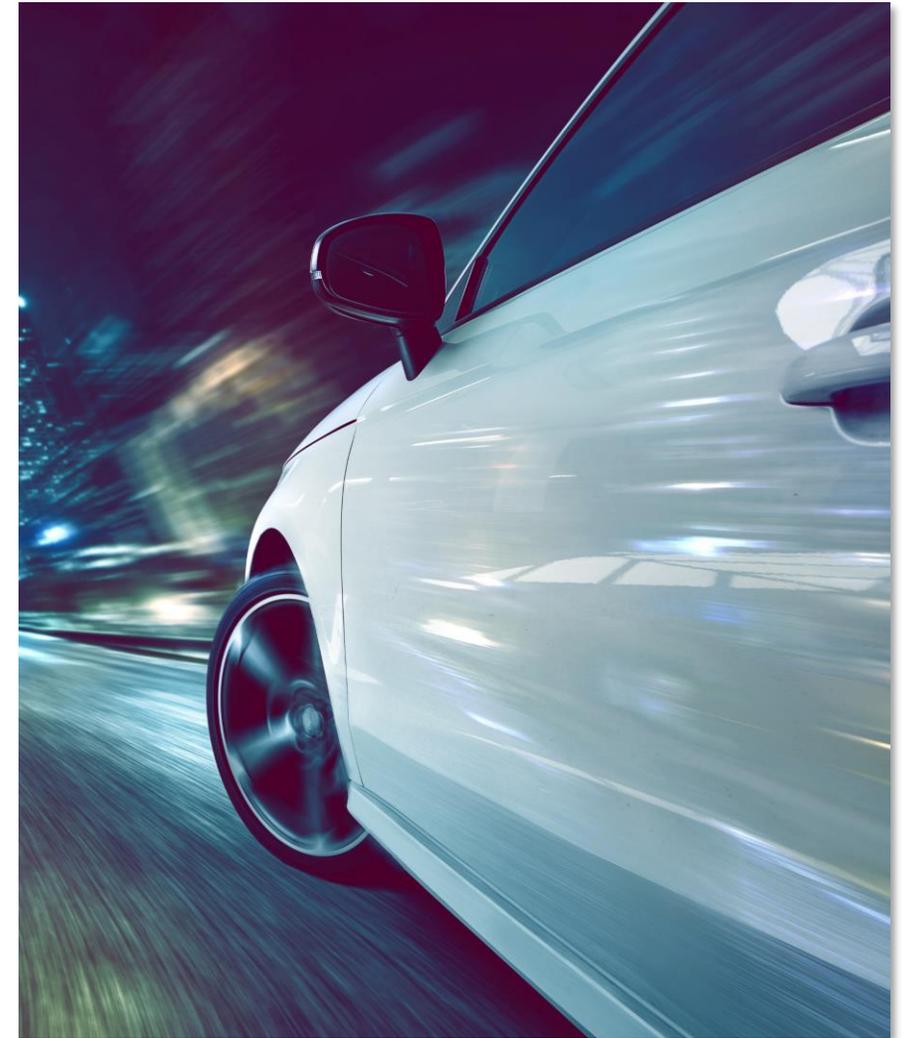
This presentation will analyze impact of the various features on Anaheim St.

DATA TIME FRAME

September - October 2022
March - April 2023

ANAHEIM STREET SAFETY IMPROVEMENTS

- 1** Installation of the Bike Lane features has had a ***GREATER IMPACT*** on the one-lane portion of Anaheim Street with a ***7.4% DECREASE (2.6 MPH)*** in V85 Speed
- 2** Speed Feedback Signs have had a ***POSITIVE IMPACT*** on driving behavior ***BOTH BEFORE AND AFTER*** approaching the sign
- 3** ***INTERSECTION TIGHTENING*** led to a ***DECREASE*** in the number of ***BRAKING EVENTS BY 16%***

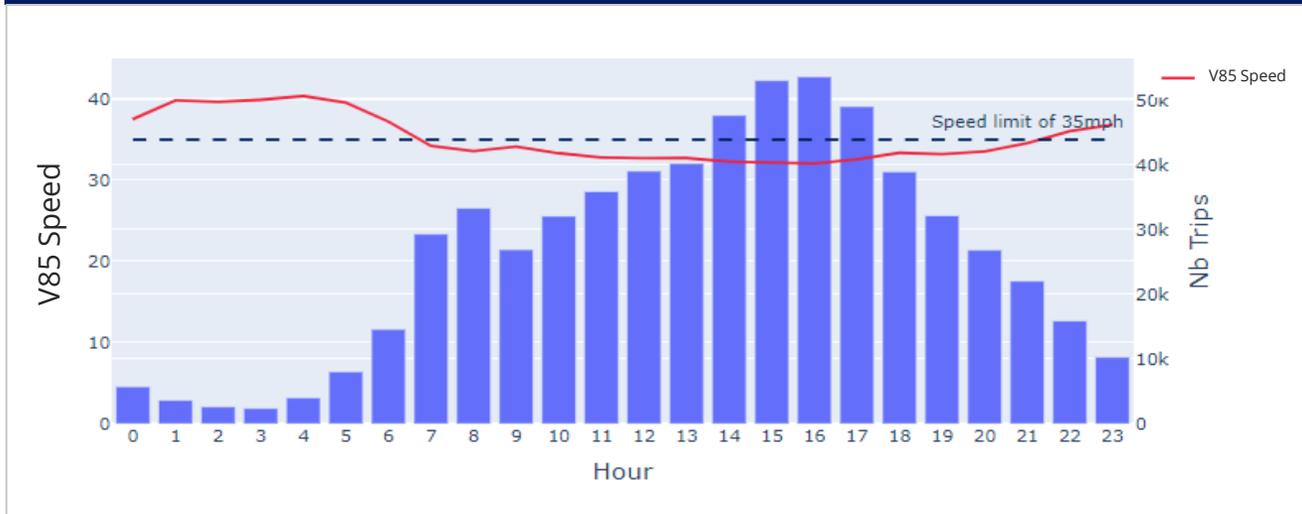


ANAHEIM STREET – V85 BEFORE AND AFTER

BEFORE

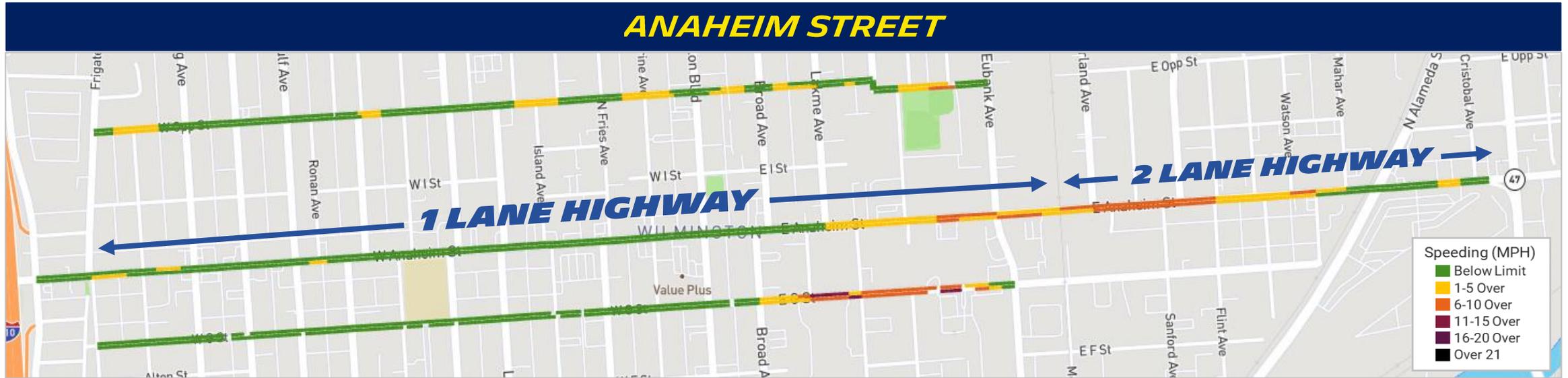


AFTER



OBSERVATION

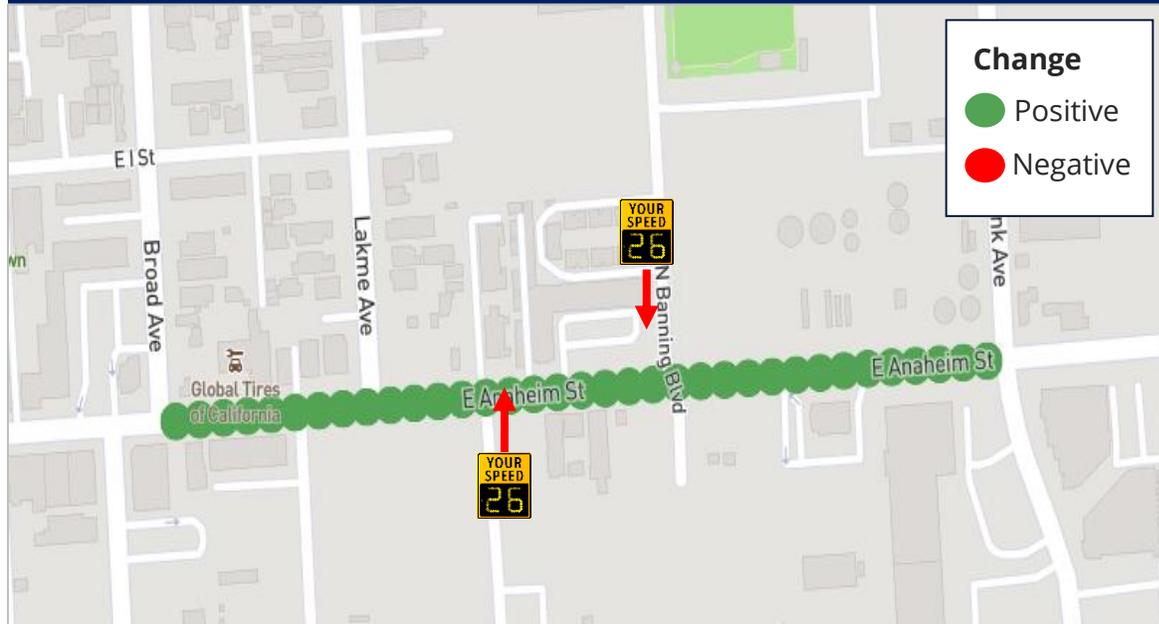
- The V85 speed on Anaheim Street is below the limit during peak traffic hours (7:00 AM to 9:00 PM) and has decreased by 6.6% (2.3 MPH) following the infrastructure changes. However, between 9:30 PM and 6:30 AM, drivers are exceeding the speed limit.



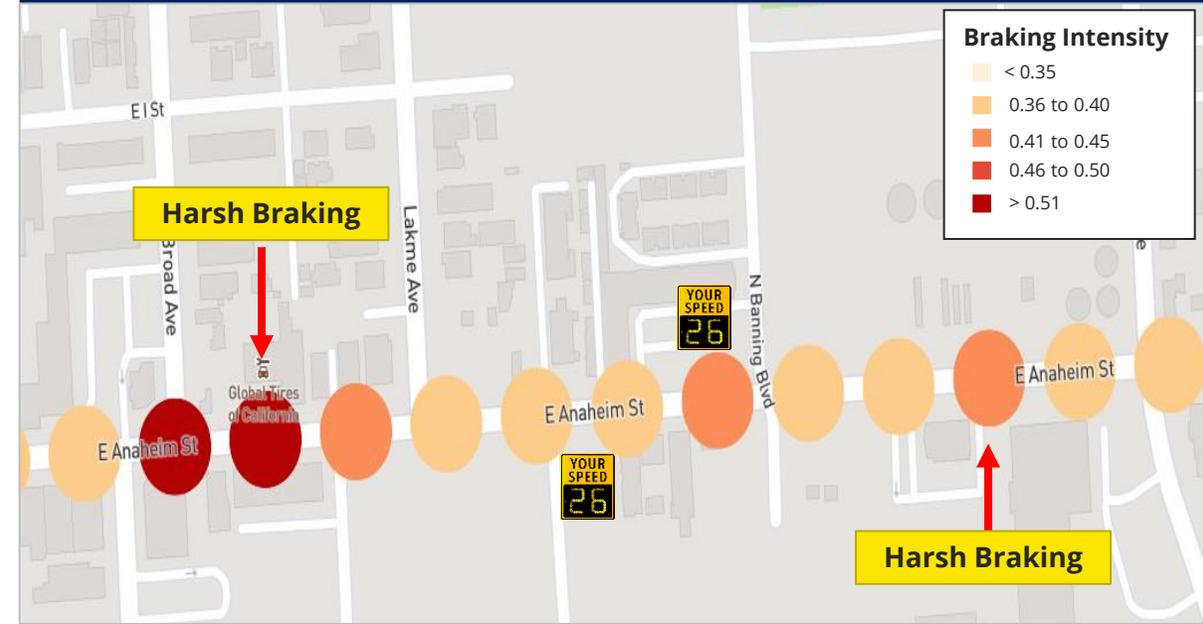
OBSERVATION

- V85 has decrease by 9.4 % (3.4 MPH) from Figueroa Street to Lakme Ave (1 Lane Highway)
- V85 has decreased by 2.9 % (1.1 MPH) from Lakme to Mahar Avenue (2 Lane Highway)

LAKME AVE TO BANNING BLVD AFTER (SPEED)



LAKME AVE TO BANNING BLVD AFTER (BRAKING)



OBSERVATION

- Decrease of V85 by 4.1 MPH over the 1250 FT Lakme Ave to Banning Blvd
- Increase in Braking Intensity by 500 FT from Speed Feedback Sign in both directions
- Drivers are maintaining their lower speeds after driving past the speed feedback sign



ROADS WITH HIGHER SPEEDING PERCENTAGE

- 1** Marine Ave
- 2** Lagoon Ave
- 3** McDonald Ave

OBSERVATION

- Due to reduced speeds on Anaheim Street, drivers are having to brake less frequently and brake less intensely when approaching an intersection containing Intersection Tightening.
- **16% decrease** in Braking Events at location of Intersection Tightening with a slight decrease in braking intensity
- Another Key observation is that drivers, accelerate once they exit the Intersection Tightening surface area.
- There is a higher percentage of speeding on residential roads after a driver turns right after the intersection

MICHELIN

MOBILITY INTELLIGENCE

QUESTIONS



MICHELIN

MOBILITY INTELLIGENCE

THANK YOU!

