MALIBU

SAFETY ADAPTIVE SIGNAL SYSTEM:
Enhancing Traffic Safety on PCH

Greg Barlow, Ph.D.

Kimley»Horn

Expect More. Experience Better.

Excessive Speeding

How much does excessive speeding contribute to an unsafe corridor?

(Source: Portland.gov - Top Contributing Factors to Traffic Deaths).

"Speed was reported to play a role in **at least 42%** of deadly crashes between 2017 and 2021, including either driving over the speed limit or driving too fast for road conditions. When serious injuries are factored in with traffic deaths, **at least 28%** of crashes involve the driver's speed. In five years, 471 people who died or suffered life-altering injuries due to speed. The percentages above are the crashes with speed reported as a factor, however the role that speed plays in fatal and serious injury crashes is often **undercounted**. "

Excessive Speeding

How much does excessive speeding contribute to an unsafe corridor?

(Source: Portland.gov - Top Contributing Factors to Traffic Deaths).

What Factors Contribute to an Unsafe Corridor?

1. Driver behavior:

1. Distracted drivers
2. Impaired drivers

2. Corridor characteristics:

1. Conditions that facilitate excessive speeding – light traffic, good signal timings, wide roadways, high speed limits, sparsely spaced intersections
2. Visibility – most pedestrian fatalities occur at night
3. Proximity to high-volume pedestrian areas (e.g. schools, malls, venues, etc.)

What Factors Contribute to an Unsafe Corridor?

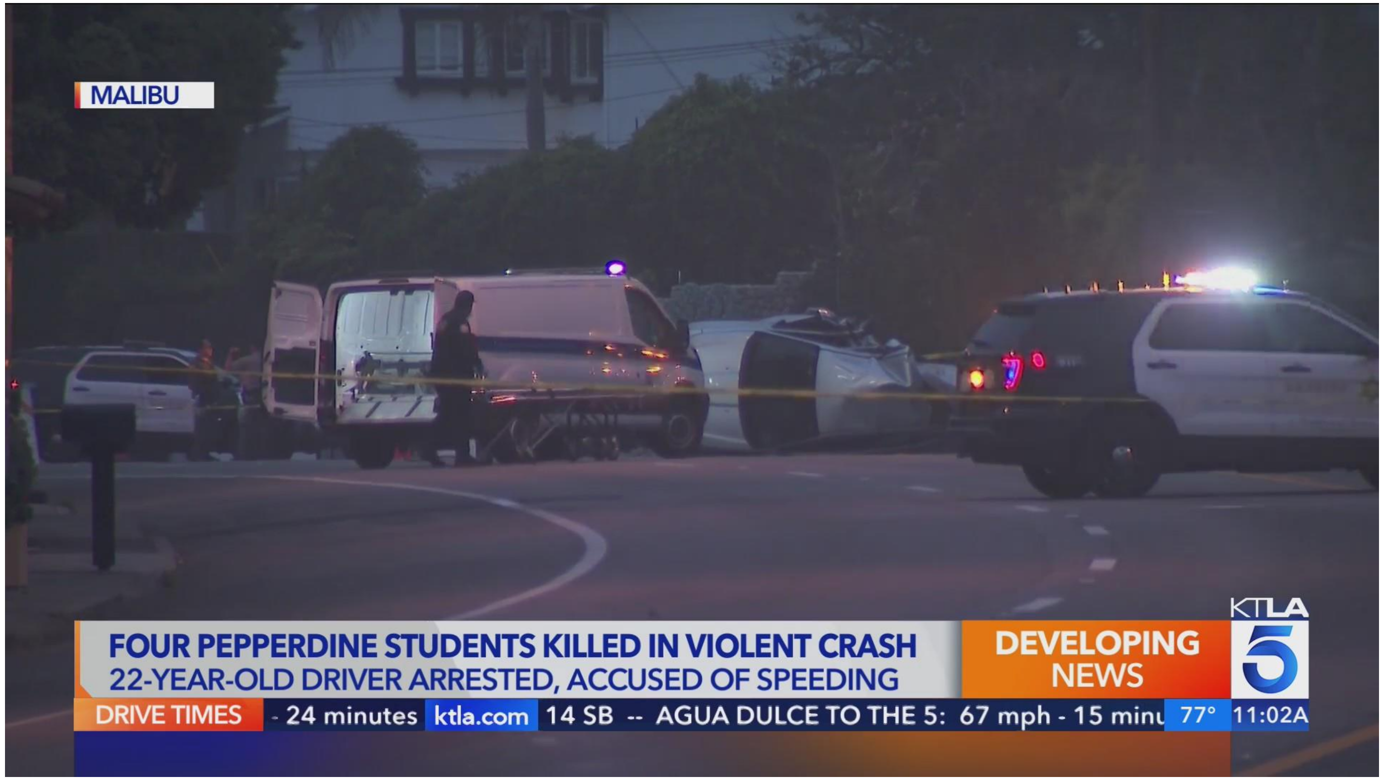
1. Driver behavior:
   1. Distracted drivers
   2. Impaired drivers
2. Corridor characteristics:
   1. Conditions that facilitate excessive speeding – light traffic, good signal timings, wide roadways, high speed limits, sparsely spaced intersections
   2. Visibility – most pedestrian fatalities occur at night
   3. Proximity to high-volume pedestrian areas (e.g. schools, malls, venues, etc.)

What is within our power to change within a reasonable budget and timeframe?

Challenges

- **Perceived tradeoff between safety and mobility**
- **Some of our tools don't work across the day**
  - Rest in Red
  - Timing to reduce speeding opportunities
- **Most of our strategies are binary**

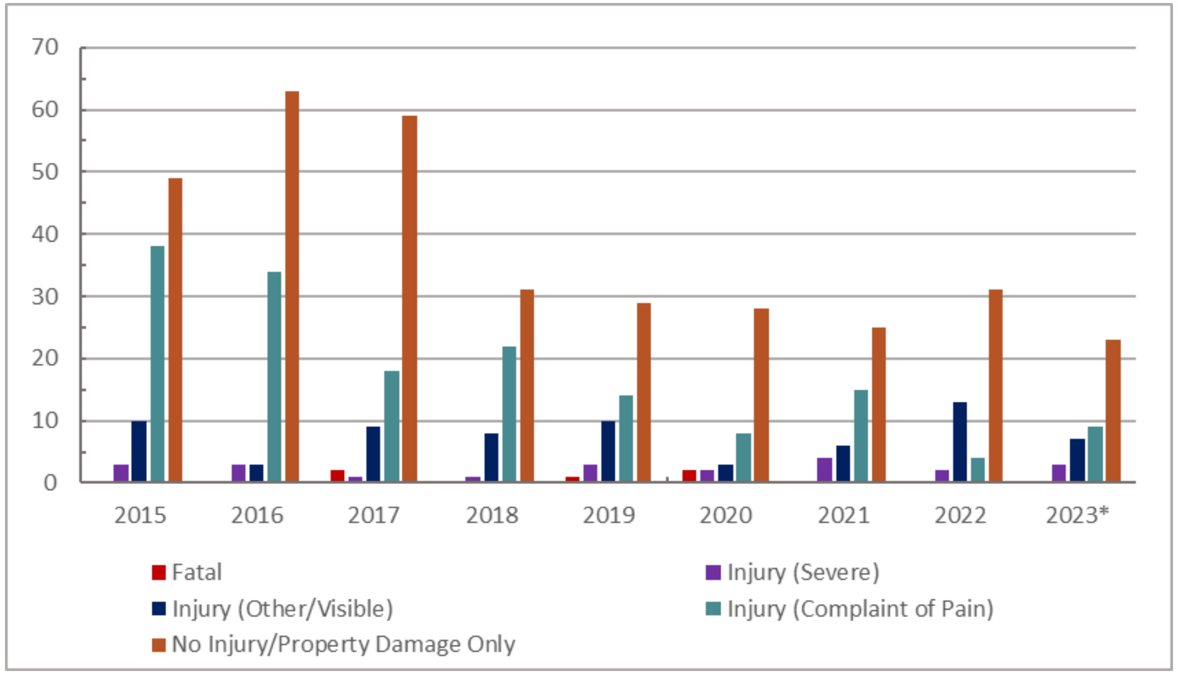
Speed-related Collisions



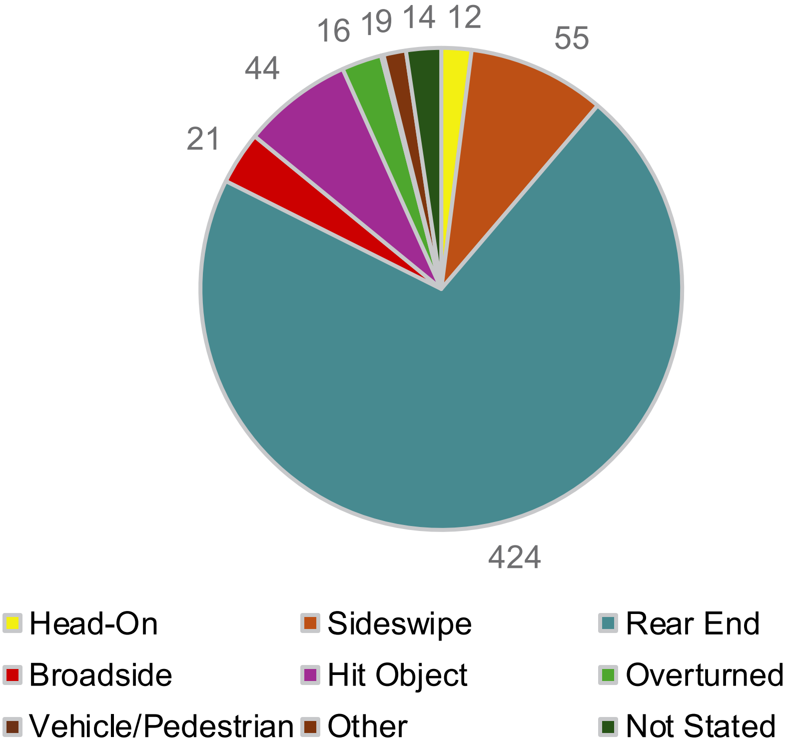
THE CITY OF MALIBU – SAFETY ASSESSMENT

PCH Speed-Related Collisions by Year	
Year	**Number of Collisions**
2015	100
2016	103
2017	89
2018	62
2019	57
2020	43
2021	50
2022	50
2023*	42
Total	**596**

PCH 2015-2023 Speed-Related Collisions by Type



PCH 2015-2023 Speed-Related Collisions by Cause



Safety Adaptive Approach

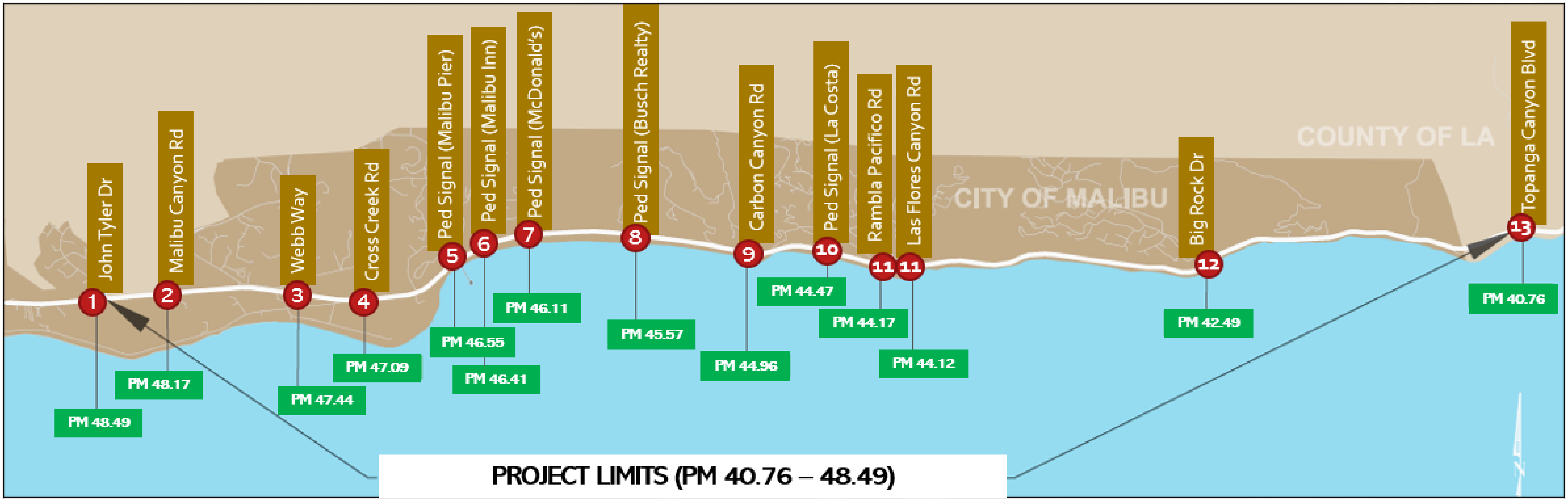
What is *"Safety Adaptive"*?

Technology designed to take real-time vehicle speeds as an input and, when unsafe driving conditions (i.e. motorists speeding) are detected, adjust the signal timings to stop motorists at more red lights until the unsafe condition is no longer detected.

This allows a "**dynamic speed bump**" on major roadways that only activates when you need it.

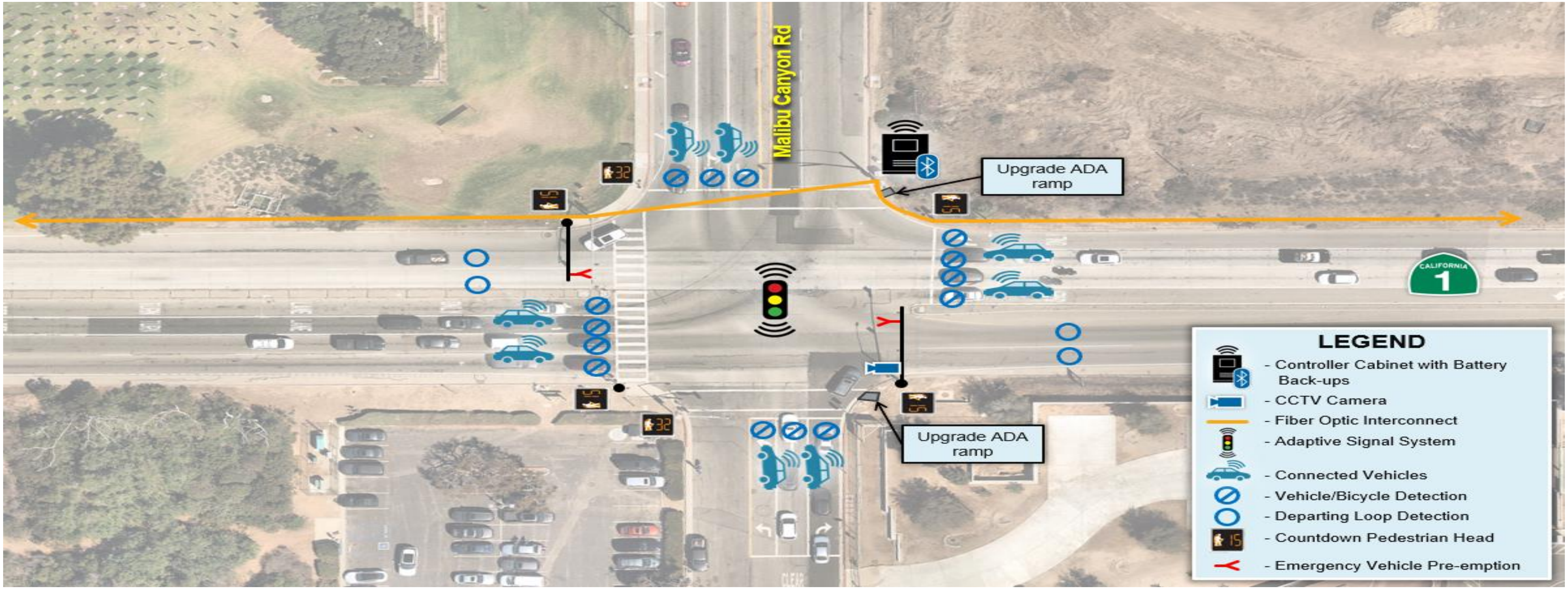
Project Overview

- SR-1/PCH from **John Tyler Dr** to **Topanga Canyon Blvd**
- Approximately 8 miles with 13 signalized intersections



PROJECT OVERVIEW – PCH SIGNAL SYNCHRONIZATION

PROJECT OVERVIEW – INTERSECTION ENHANCEMENTS



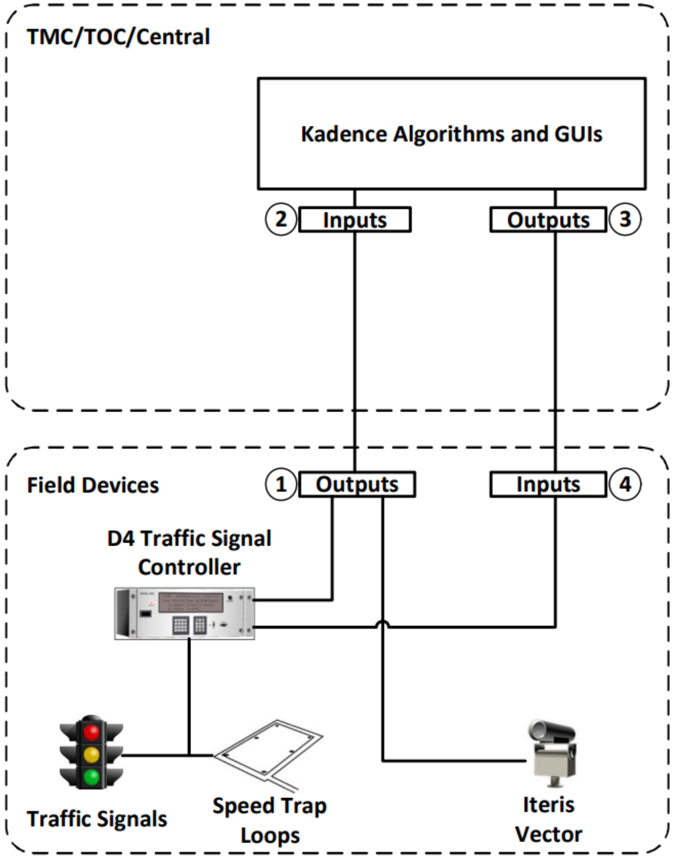
SAFETY ADAPTIVE APPROACH

Kadence Adaptive Traffic Control System (ATCS) Software:

- Centralized adaptive traffic control
  - *No equipment in the cabinet*
- Controllers polled once per second
- Coordination parameters modified every couple cycles
- Works with all modern traffic signal controllers
- Works with all detection technologies
- Safety-based adjustments possible where speed sensing instrumentation is available

Kadence Safety Adaptive Process Flow

Malibu PCH



Process Steps

1. D4 traffic signal controller sends second-by-second detector and phasing info + minute-by-minute binned vehicle speeds from speed trap loops to Kadence. Iteris Vector Camera sends minute-by-minute binned vehicle speeds to Kadence.

2. Kadence receives the phasing and detector data from field devices and the safety adaptive algorithm processes data to determine appropriate timing and safety optimizations.

3. Kadence safety adaptive algorithm generates timing plan optimizations designed to either improve traffic flow or, if unsafe speeding is detected, increase the occurrence of red lights. These optimizations are typically generated every 3 cycles (e.g. ~4-6 minutes).

4. Kadence sends the new optimized timing to the traffic signal controller and initiates a central command to make the controller run this plan.

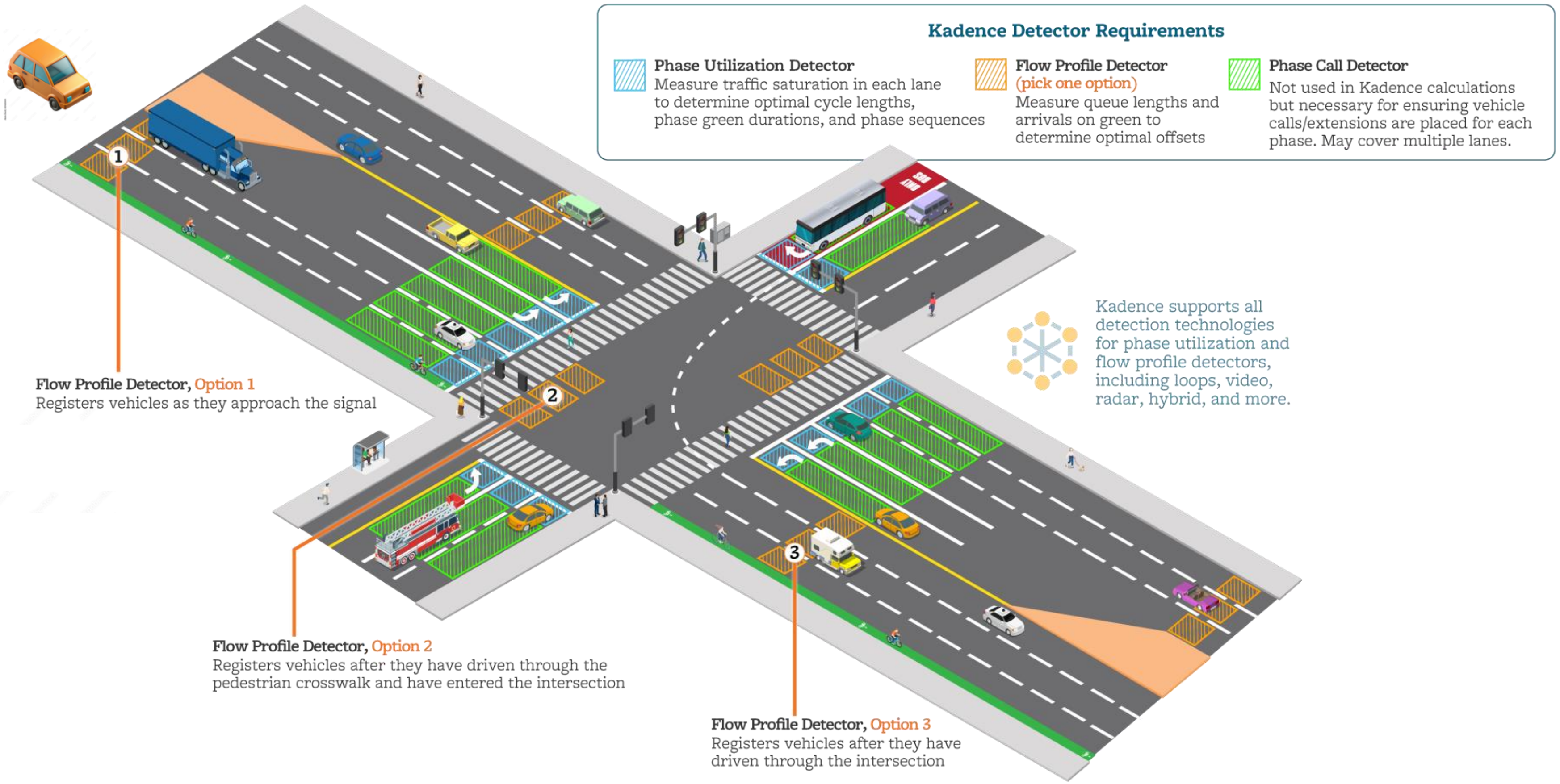
(1) The process repeats starting again at step 1.

Prepared by:

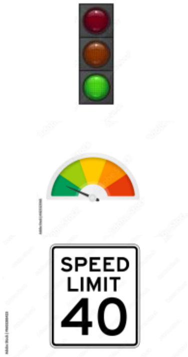
Kimley»Horn

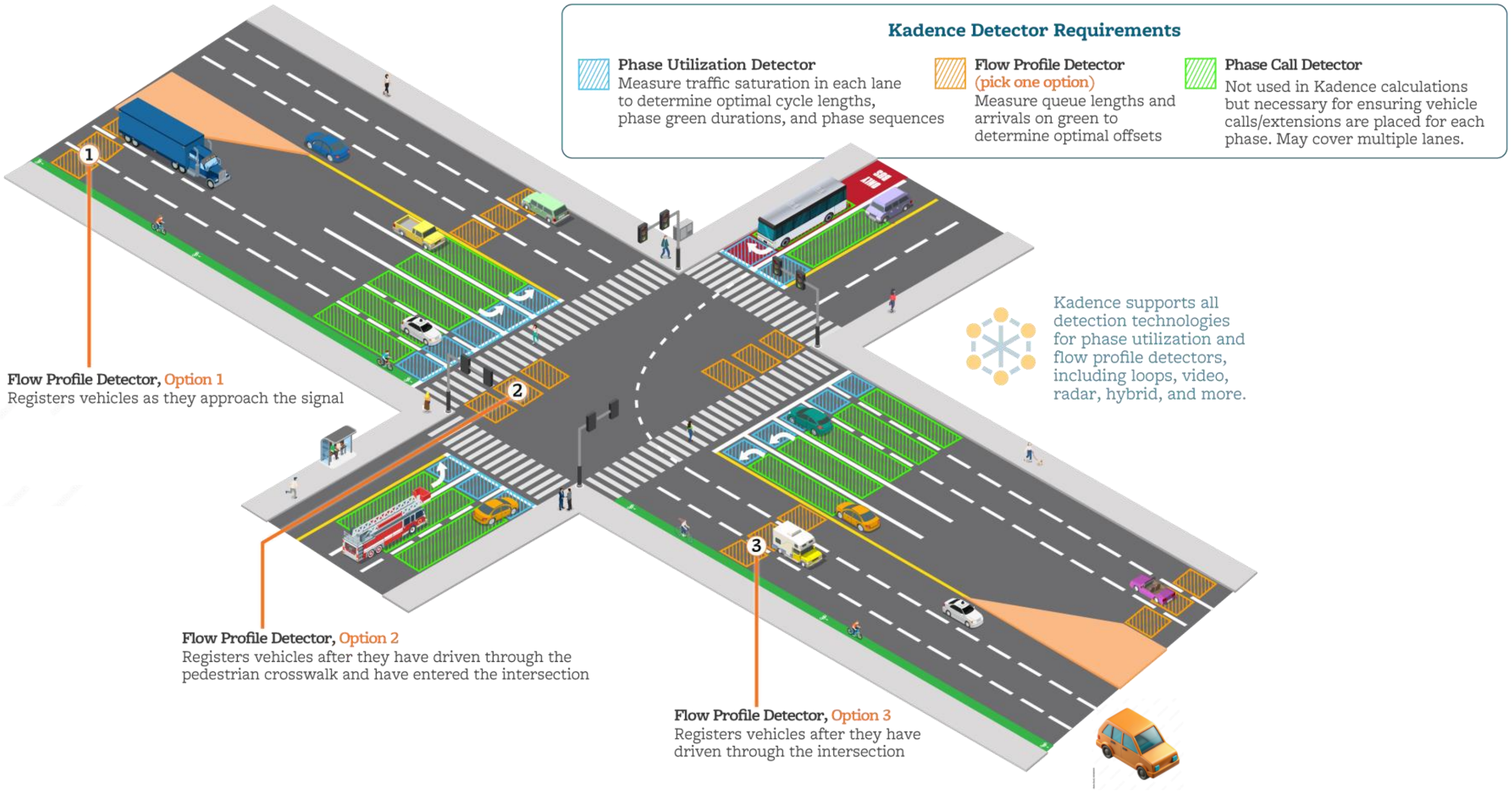
Aug 2025

Traditional Adaptive Approach

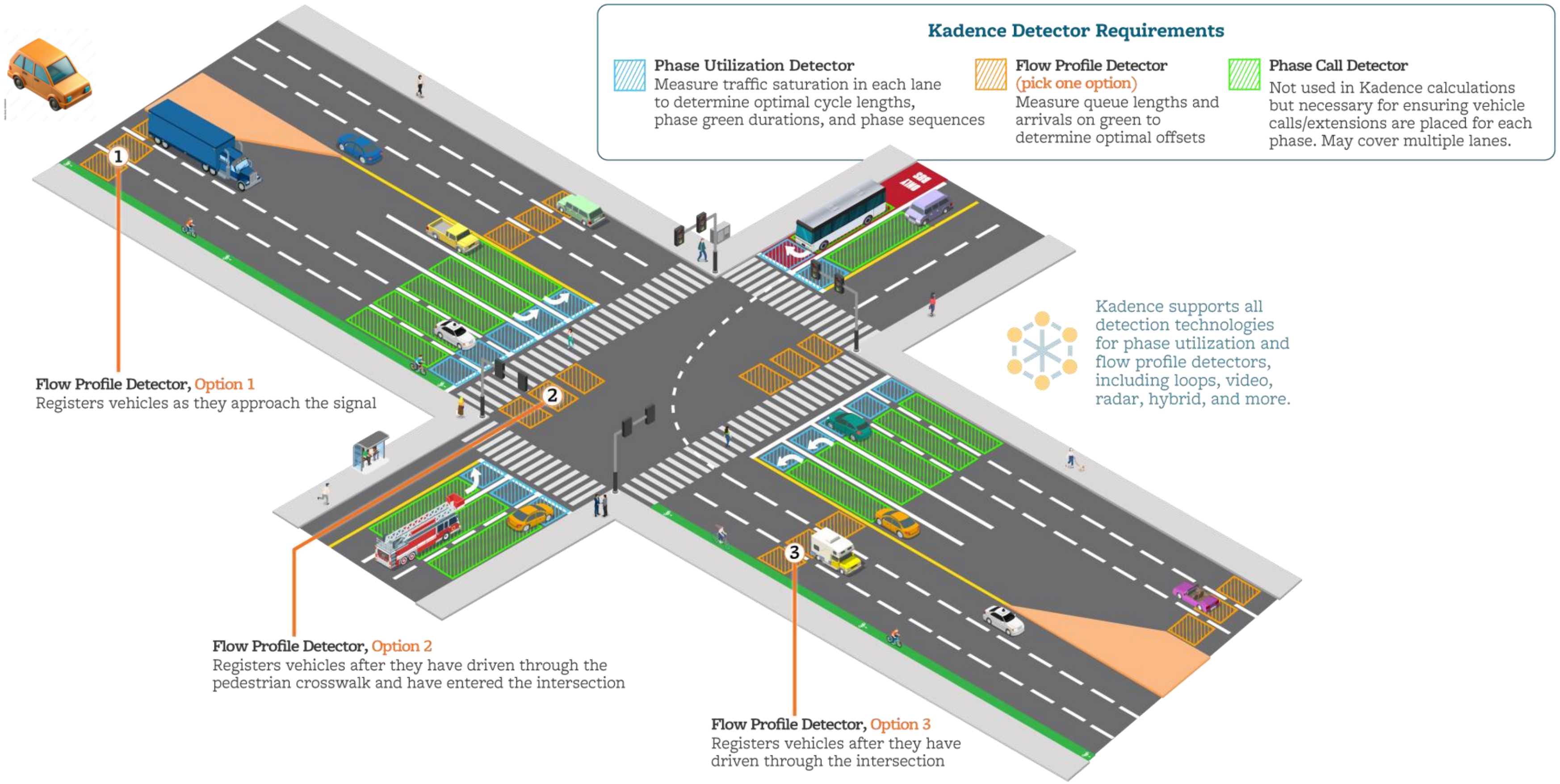


Traditional Adaptive Approach

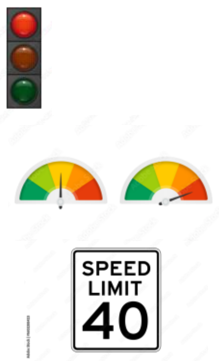


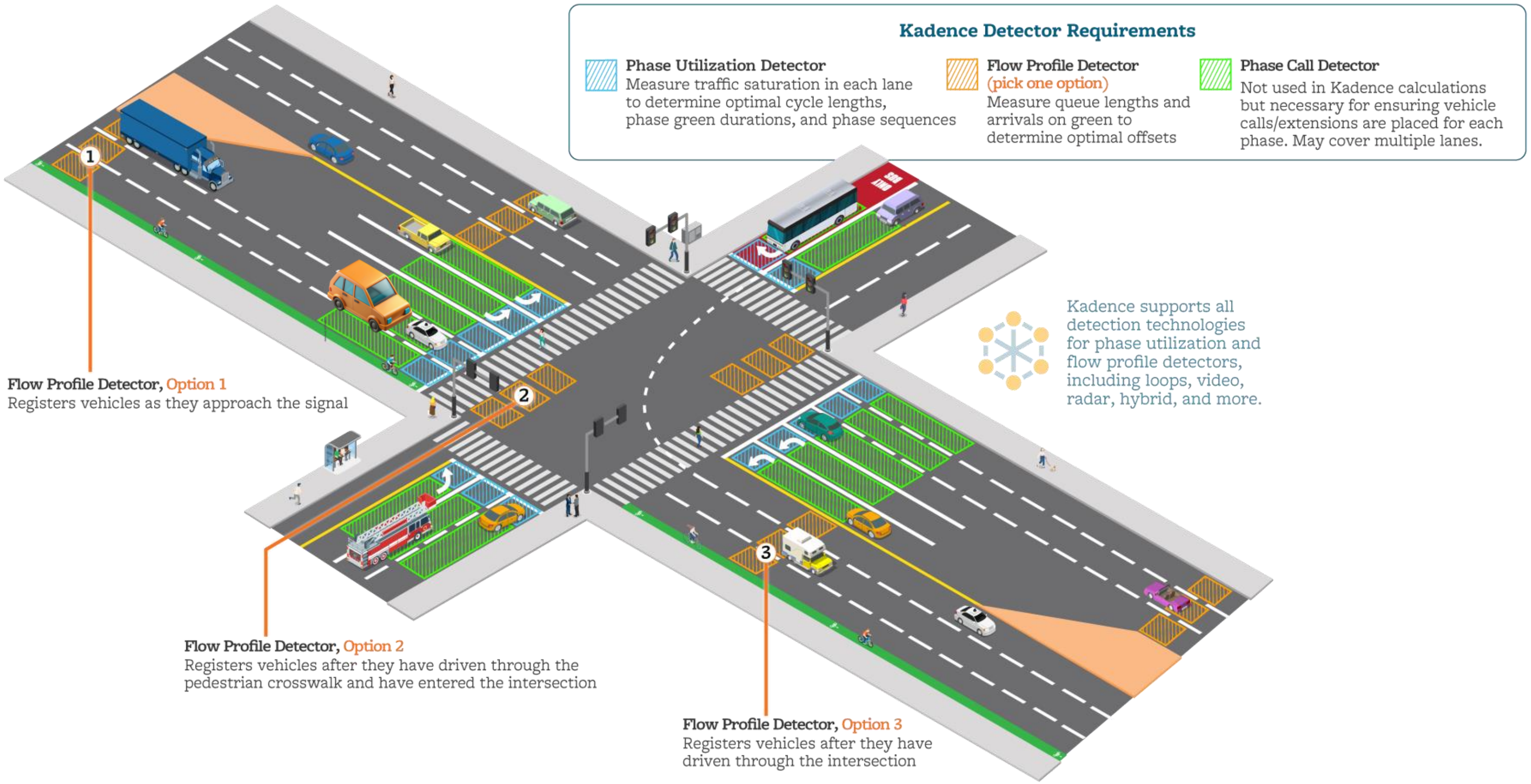


SAFETY ADAPTIVE APPROACH

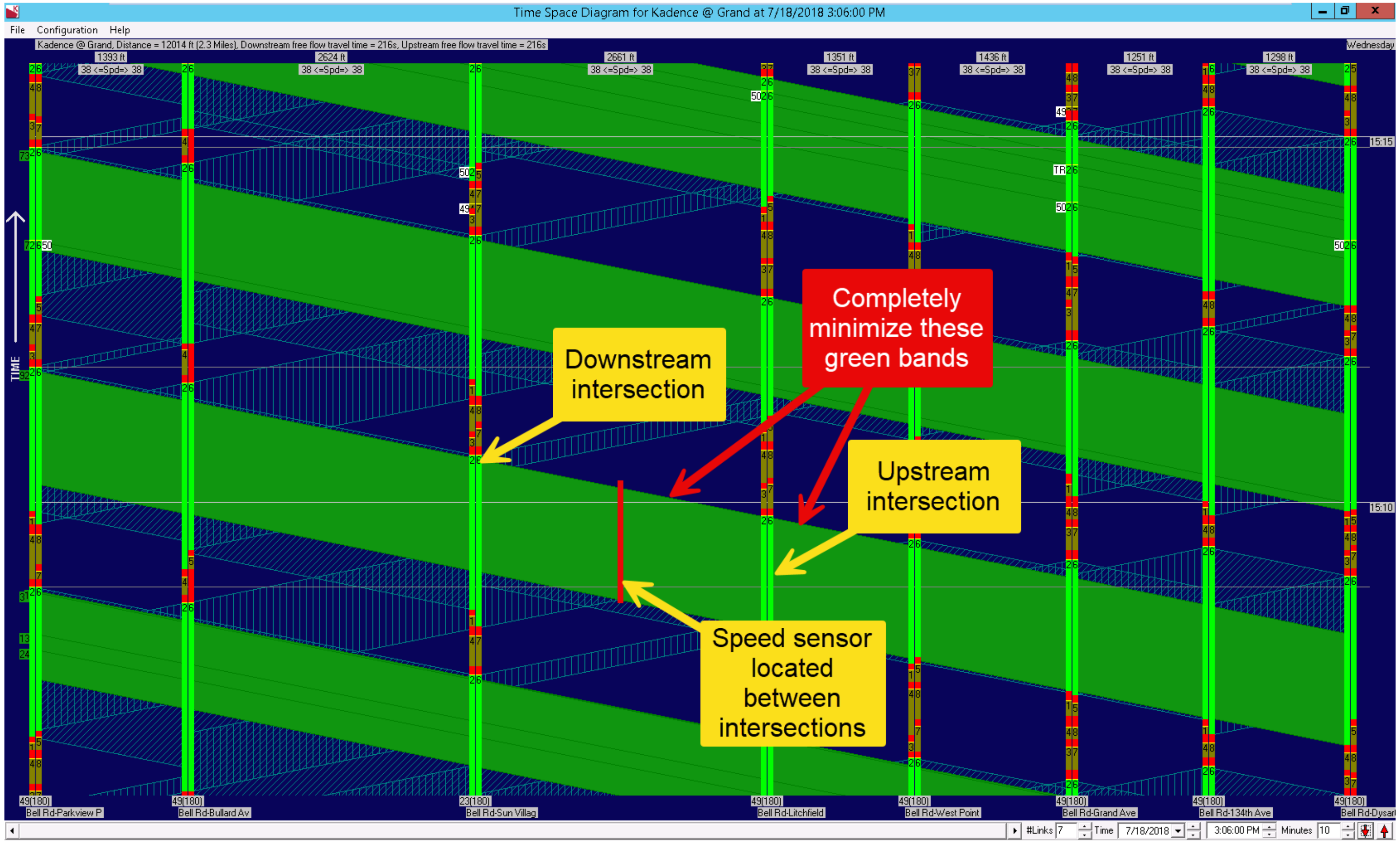


SAFETY ADAPTIVE APPROACH

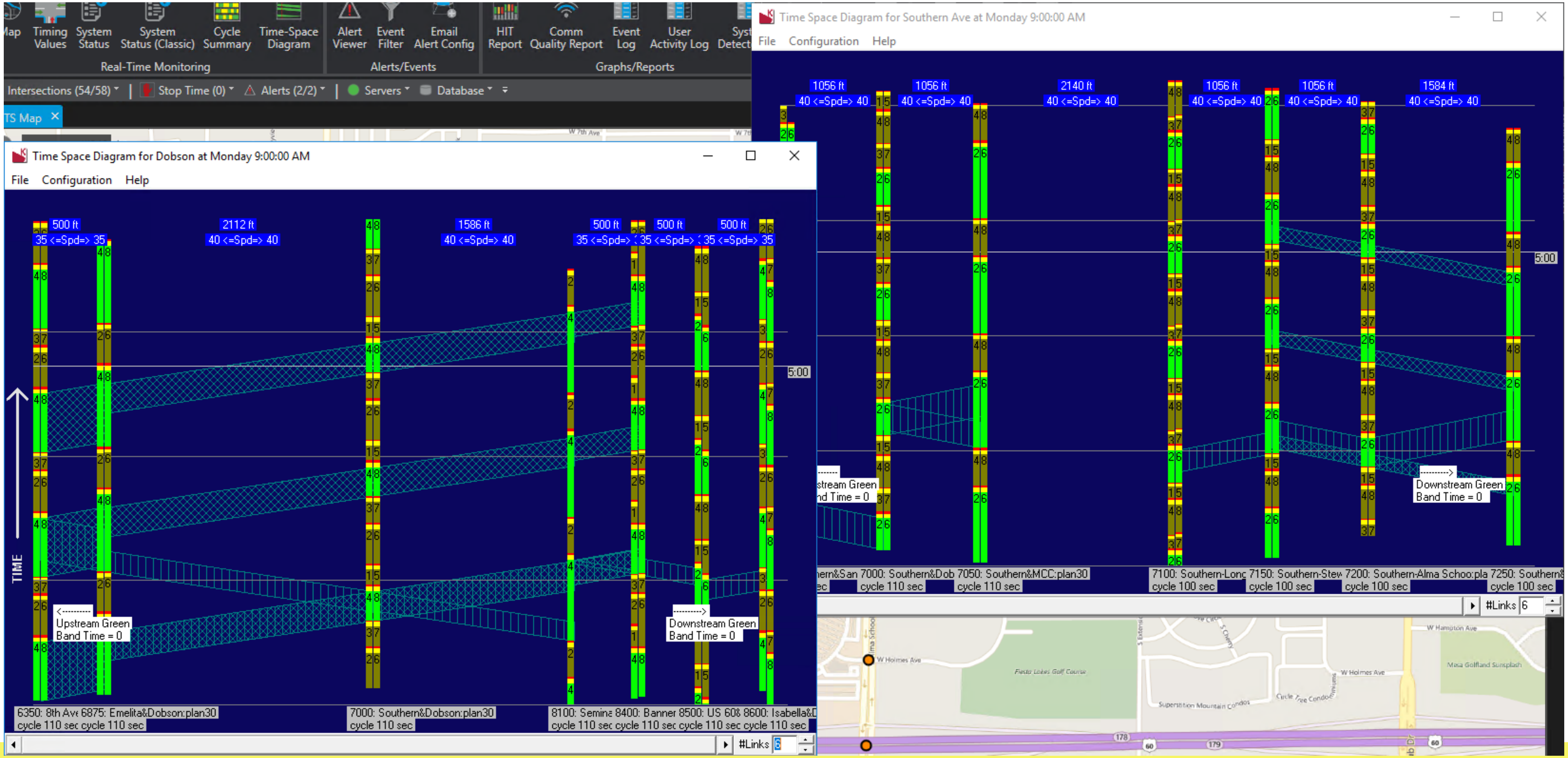




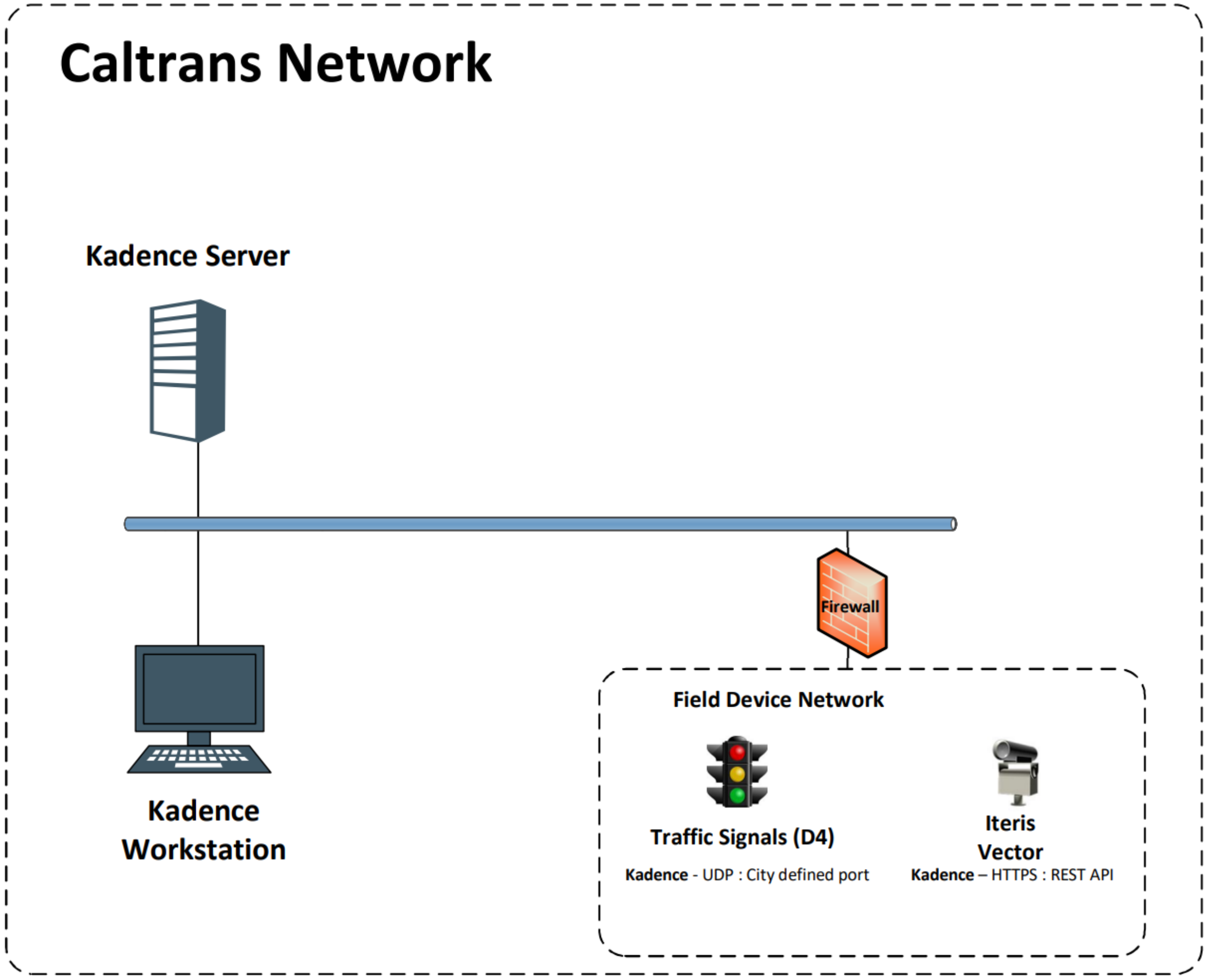
Green Band De-Optimizations



GREEN BAND DE-OPTIMIZATIONS



Kadence Safety Adaptive Network Diagram

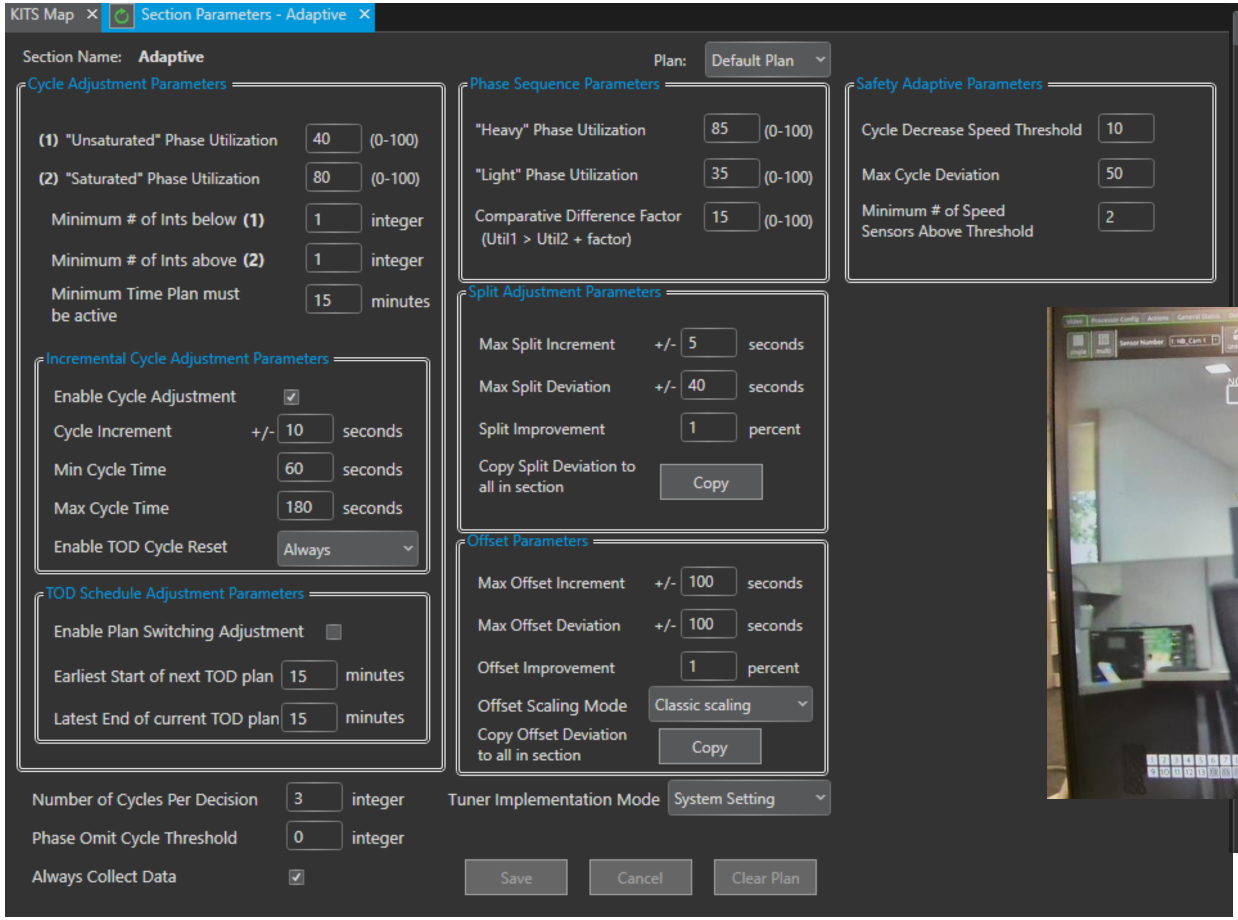


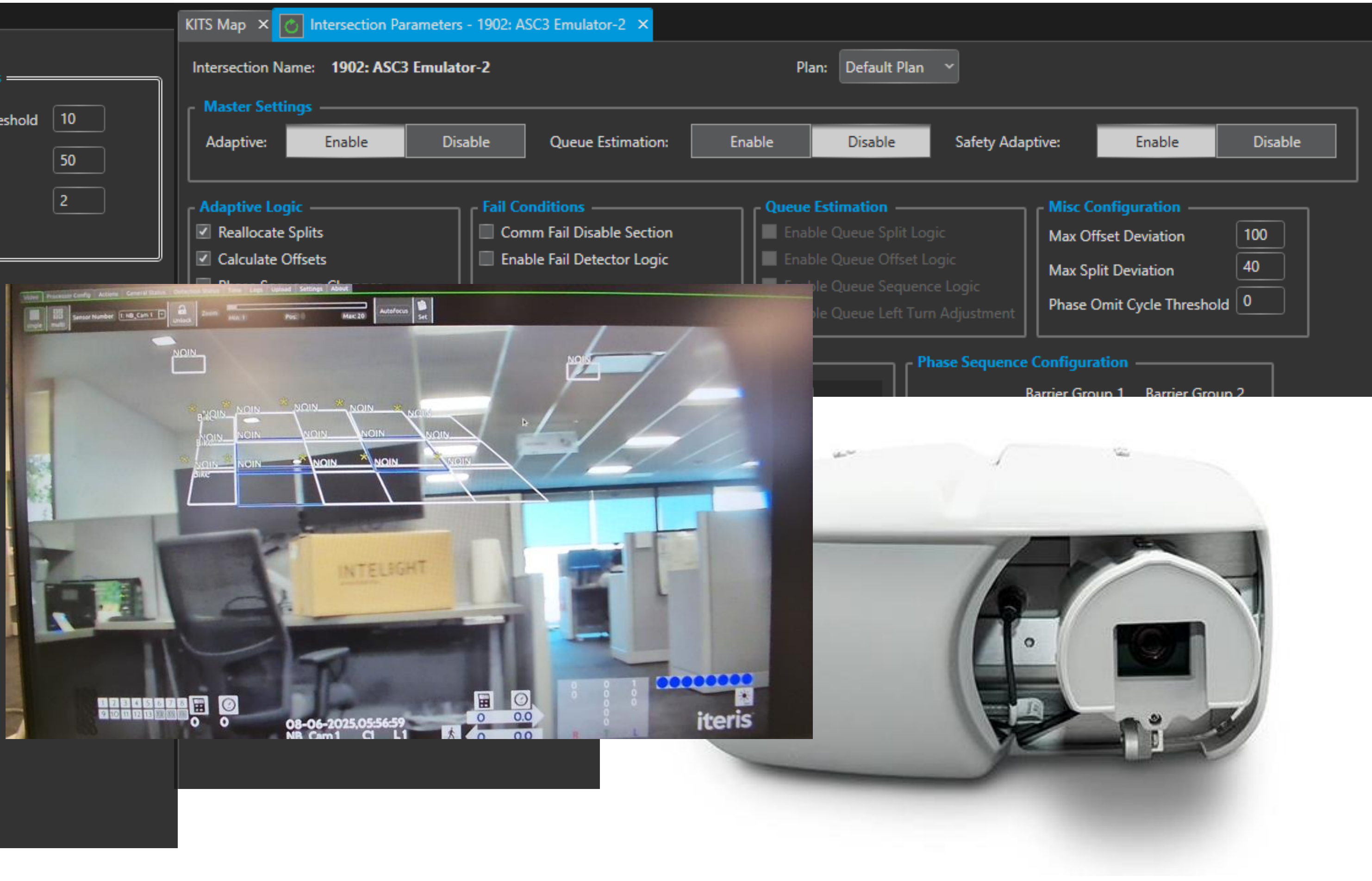
Prepared by:

Kimley»Horn

Aug 2025

CURRENT STATUS – TESTING AND ALGORITHM REFINEMENT





PROJECT STATUS & NEXT STEPS

- Finalize Safety Adaptive System development
- Deploy and Monitor
- Addition of per vehicle actions


MALIBU
SAFETY ADAPTIVE SIGNAL SYSTEM:
Enhancing Traffic Safety on PCH
QUESTIONS?
AUGUST 2025

FUTURE PCH SAFETY PROJECTS

- *Speed enforcement cameras*
- *Roundabouts*
- *Raised medians*
- *New pedestrian crossings*
- *Full intersection redesign for improved safety*
- *Redlight enforcement cameras*

Safety Adaptive Approach

Why does excessive speeding contribute to an unsafe corridor?

Because as we move faster, we need more time to react to an object in front of us.

The average human reaction time is about 250 milliseconds.

- At 20 mph (29.3 ft/sec) – 7.3 ft travelled before a reaction can even begin
- At 40 mph (58.7 ft/sec) – 14.7 ft travelled before a reaction can even begin
- At 60 mph (88 ft/sec) – 22 ft travelled before a reaction can even begin

SAFETY ADAPTIVE APPROACH

To react, take action, and come to a complete stop (with perfect weather/roadway conditions)

- At 20 mph (29.3 ft/sec) – 40 ft to come to a complete stop
- At 40 mph (58.7 ft/sec) – 120 ft to come to a complete stop
- At 60 mph (88 ft/sec) – 240 ft to come to a complete stop

PROJECT OVERVIEW – INTERSECTION ENHANCEMENTS