October 28-29, 2025
Orlando, FL

TRANSPORTATION SYMPOSIUM

AI and Crash Mitigation in Work Zones

Tracy Joseph, D7 Safety Studies Engineer
Hossein Amiri, D7 Safety Studies Consultant

Transportation Symposium Website
SCAN ME

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Presenters:

Tracy Joseph
FDOT D7, Safety Office

Hossein Amiri, MSCE, EI
ELEMENT Engineering Group

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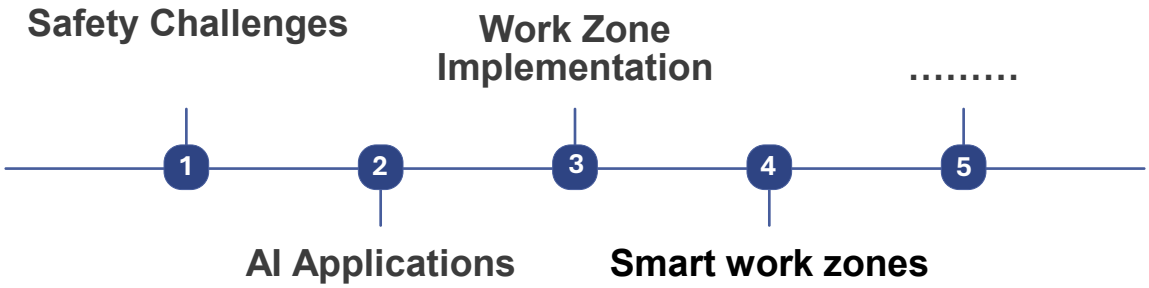
2

Roadmap



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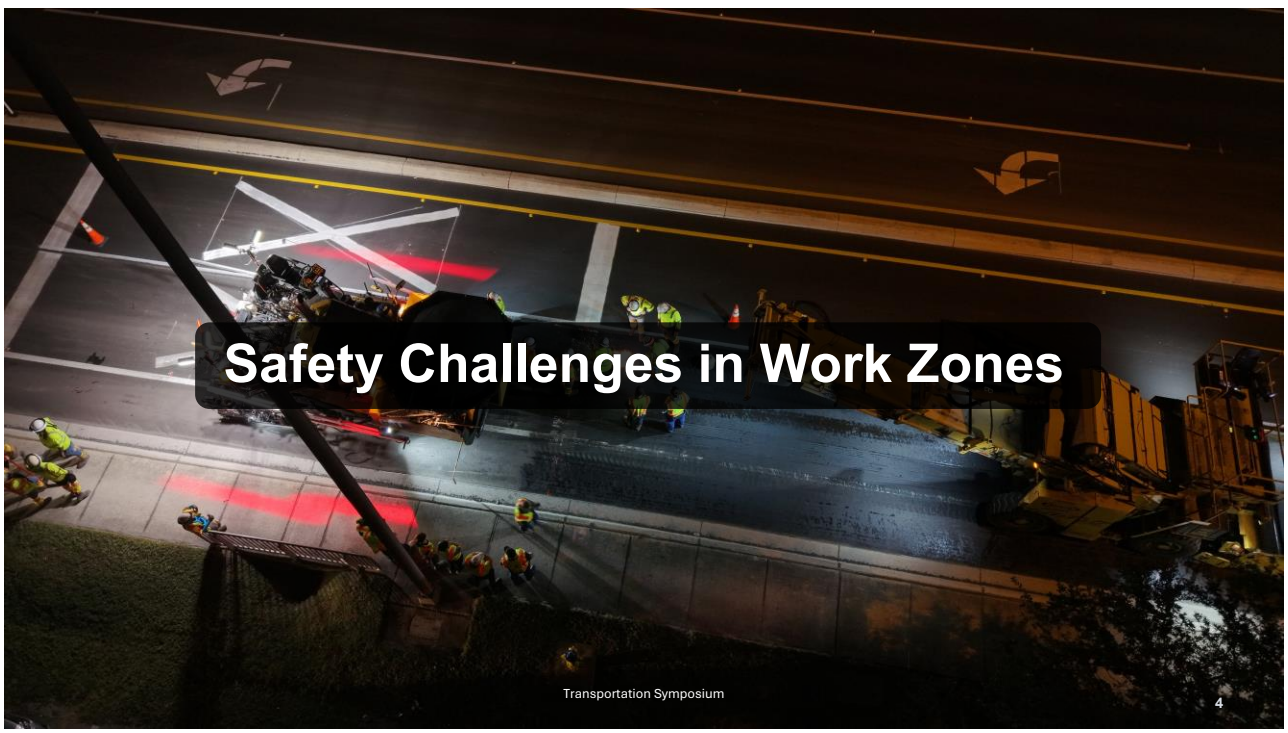

4

Physical TTC Changes

Channelizing Devices

Barrels, cones, and barriers guide traffic through work zones

Lane Shifts

Temporary geometry changes demand driver attention

Shoulder Closures

Reduced recovery space increases risk

Temporary Pavement

Surface changes affect vehicle handling characteristics

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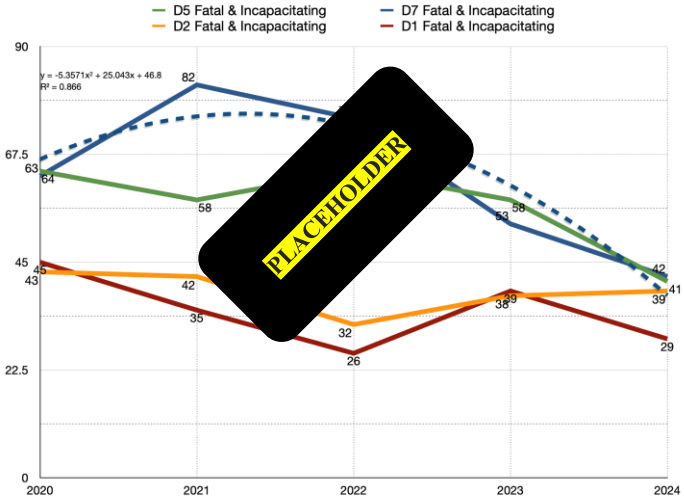
Work Zone Fatal and Incapacitating Crashes



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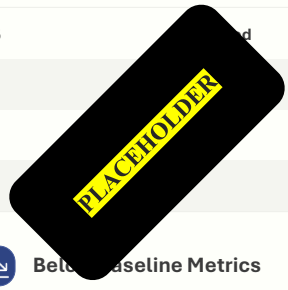
Tampa Bay Work Zone Safety Progress (2025)

Early 2025 data shows promising trends in the Tampa Bay area, outperforming national averages.

Metric	Jan-May 2025	[illegible]d	Progress
Total Crashes	510		Below baseline
Fatalities	3		Below baseline
Incapacitating Injuries	14		Below baseline



Outperforming Trends

On track to match and exceed 2024's declines in fatalities and incapacitating injuries.

Bel[illegible]aseline Metrics

All three key measurements trending below historical baseline levels.

Continued Vigilance Needed

Efforts must continue to sustain this decline to reach our Target Zero goal for severe injuries and fatalities.

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D7 Work Zone Crash Analysis

Work zone crashes remain a significant safety challenge for District 7, particularly on Interstate highways.

716

Rear-End Crashes

Total rear-end crashes in D7 work zones last year

470

Interstate Incidents

Rear-end crashes occurring specifically on Interstate highways

38.4%

Fatal Crash Rate

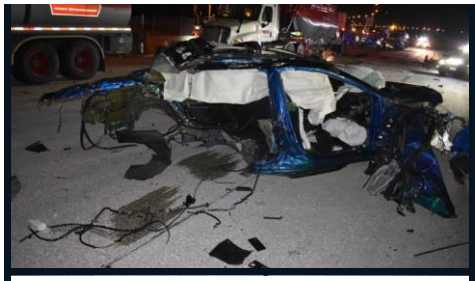
D7 Interstate fatal work zone crashes as percentage of all D7 fatal work zone crashes

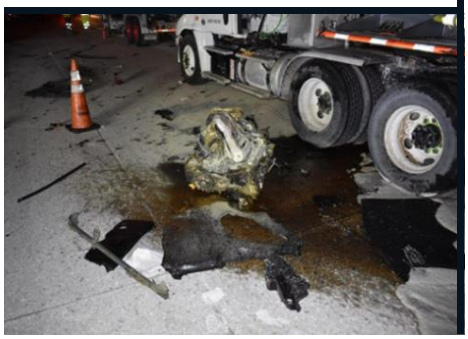
884

2024 Interstate Total

Total work zone crashes on Interstate highways in 2024

8





Major crash in I-4 construction zone on April 2024

9

5 injured after car going over 100 mph in I-4 construction zone causes major crash: FHP

April 2024

> The Florida Highway Patrol said a trooper witnessed a sedan traveling west on I-4 at 102 mph. When troopers attempted to initiate a traffic stop, the driver attempted to flee, reaching 130 mph.

> Troopers said the car continued west until reaching an active construction zone, where all lanes except for one were closed off. It then entered the closed portion of the work zone and collided with two tractor-trailers inside the construction zone.

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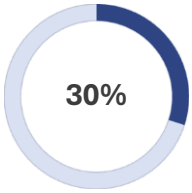
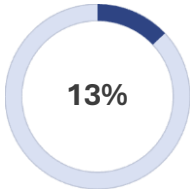
Work Zone Safety: Injuries & Potential Solutions

According the Associated General Contractors of America **(AGC)** Survey released May 2025, Nationally:



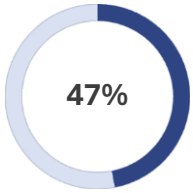
Injury Statistics

30% of contractors experienced worker injuries from collisions. 71% reported driver or passenger injuries.



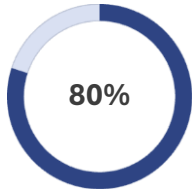
Fatality Reports

13% of contractors reported at least one worker fatality. 24% noted driver or passenger deaths.



Increasing Risk

47% of contractors believe work zones are more dangerous than a year ago.



Recommended Solutions

- Greater police presence (80%)
- Stricter enforcement of existing laws (70%)

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The Project Lifecycle

Planning

Intelligent pavement management, safety studies tools, systemic analysis

Design

Planning tools, TTC design tools, safety reviews

Post-Construction

Safety monitoring, before after studies, generate reports

Project Inception

GIS analytics, intelligent estimates based on historic data, draft scheduling

Construction

Work zone AI, tools and strategies for construction monitoring

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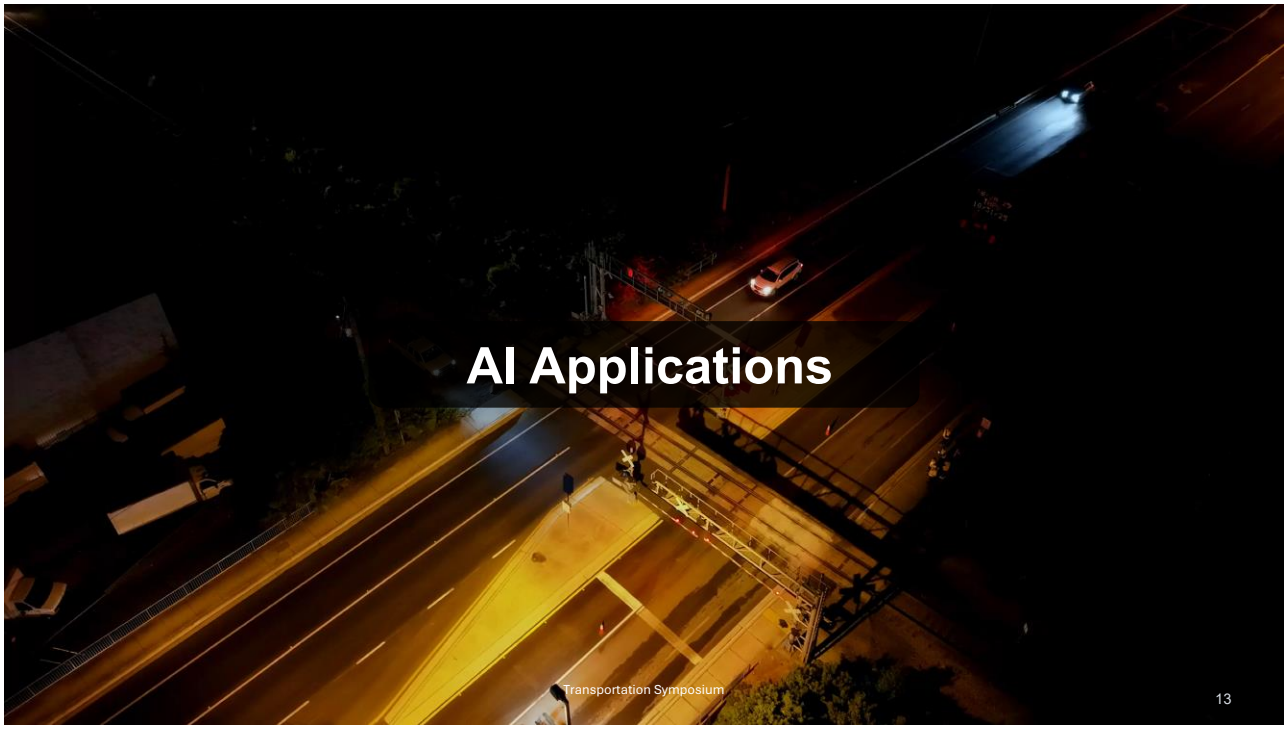

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FDOT's AI Policy - Overview

Human in the loop	Transparency and Accountability	Ethics	Privacy and Data Protection	Security
Must supplement or complement work accomplished by human Must engage human throughout the process Human are fully responsible for the work and product involving AI	Must be transparent and disclose if the products are generated partially or fully by an AI tool	Must be ethical and comply with all applicable laws, rules, regulations, and policies	Must protect people's privacy and comply with all applicable data protection regulations Human validation of the AI data and output Must protect information that is exempt from public disclosure per FL public records laws	Employees, vendors, consultants, and contractors are prohibited from attempting to gain access to AI applications not approved by the Department

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Some Common Terminology

Learning from Examples = Machine Learning

Layered Pattern-Finding = Deep Learning

Seeing the World = Computer Vision

Reading & Writing Like Humans = NLP and LLMs

Learning by Practice = Reinforcement Learning

Task-Chaining Helpers = AI Agents

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Camera and Sensor Deployment Types

Static Cameras and Sensors

Portable Camera Systems

Smart Work Zone Systems

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Where is the data processed?

Processing Services

TMC-Side Processing

Devices with Edge Processing

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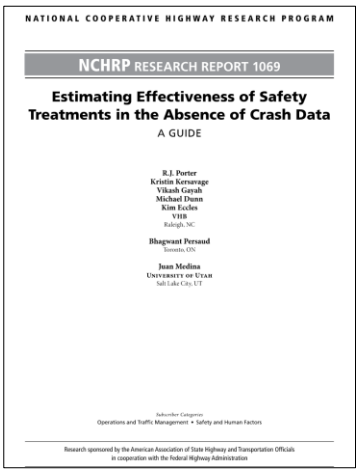
Surrogate Safety Use

What Are Surrogate Measures?

Quantifiable “near-miss” indicators (e.g., Time-to-Collision, Post-Encroachment Time, speed variance) that identify potential conflicts or hazardous behaviors before an actual crash occurs.

Why Not Rely Solely on Crash Data?

Work zones often have low crash frequencies and rapidly changing layouts, making multi-year crash analyses impractical. Surrogates provide early, behavior-based insights when crash counts are insufficient.


NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

NCHRP RESEARCH REPORT 1069

Estimating Effectiveness of Safety Treatments in the Absence of Crash Data

A GUIDE

R.J. Porter
Kristin Kersavage
Vikash Gayah
Michael Dunn
Kim Eccles
VHB
Raleigh, NC

Bhagwant Persaud
Toronto, ON

Juan Medina
University of Utah
Salt Lake City, UT

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AI Applications

SPEED

VOLUME

PLACEHOLDER

CHMENT

CONSTRUCTION ENTRANCE

UNSAFE BEHAVIOR

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Trajectory Recording & Heatmaps

Traffic Monitoring & Flow Analysis

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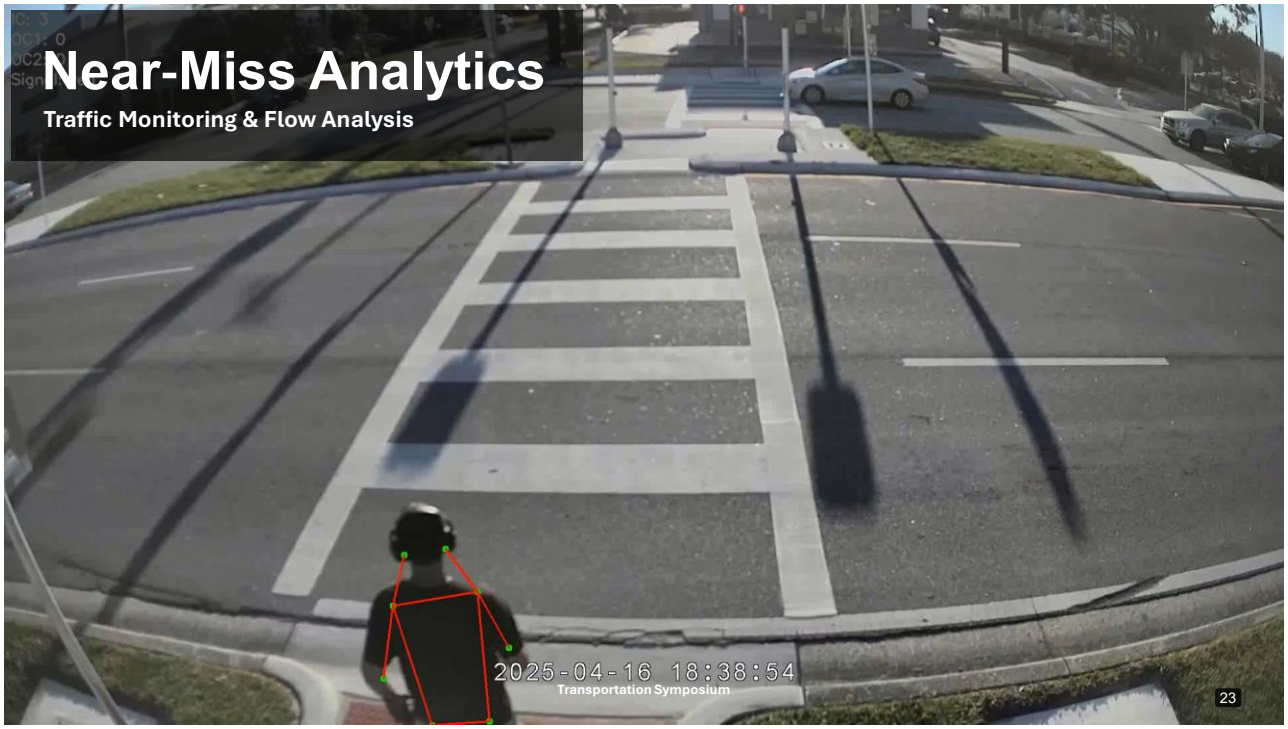
Near-Miss Analytics
Traffic Monitoring & Flow Analysis
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Transportation Symposium
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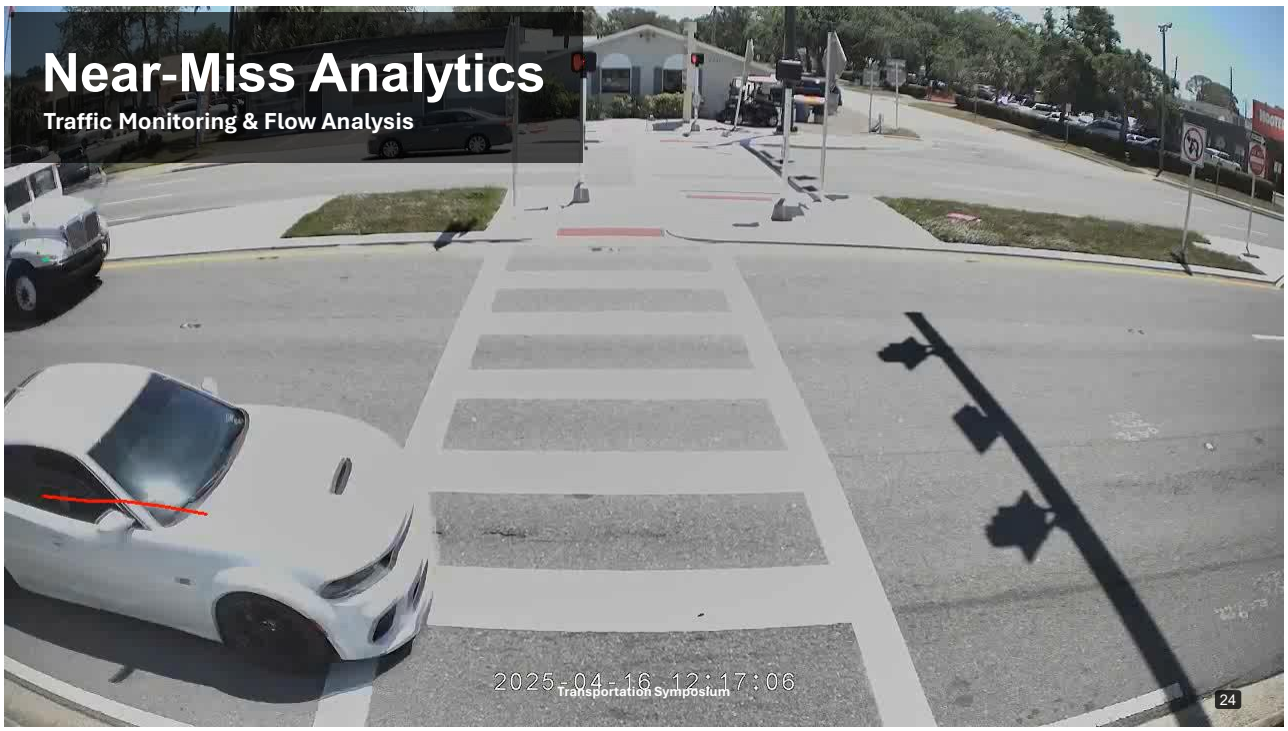
Near-Miss Analytics
Traffic Monitoring & Flow Analysis
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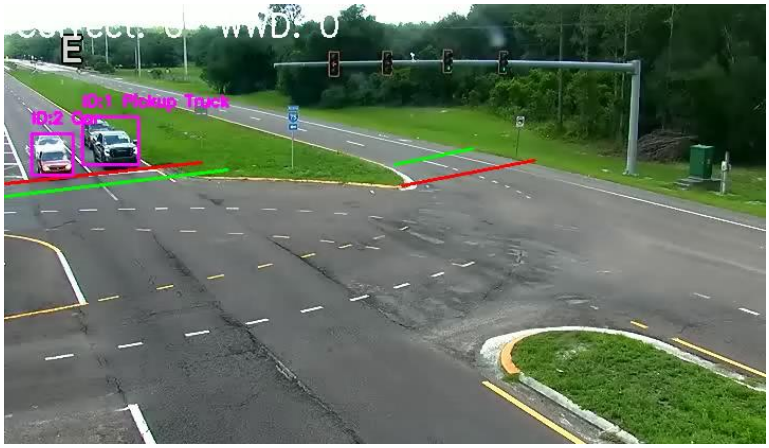
Wrong Way Driving & Work Area Violations

Work Zone and Worker Monitoring



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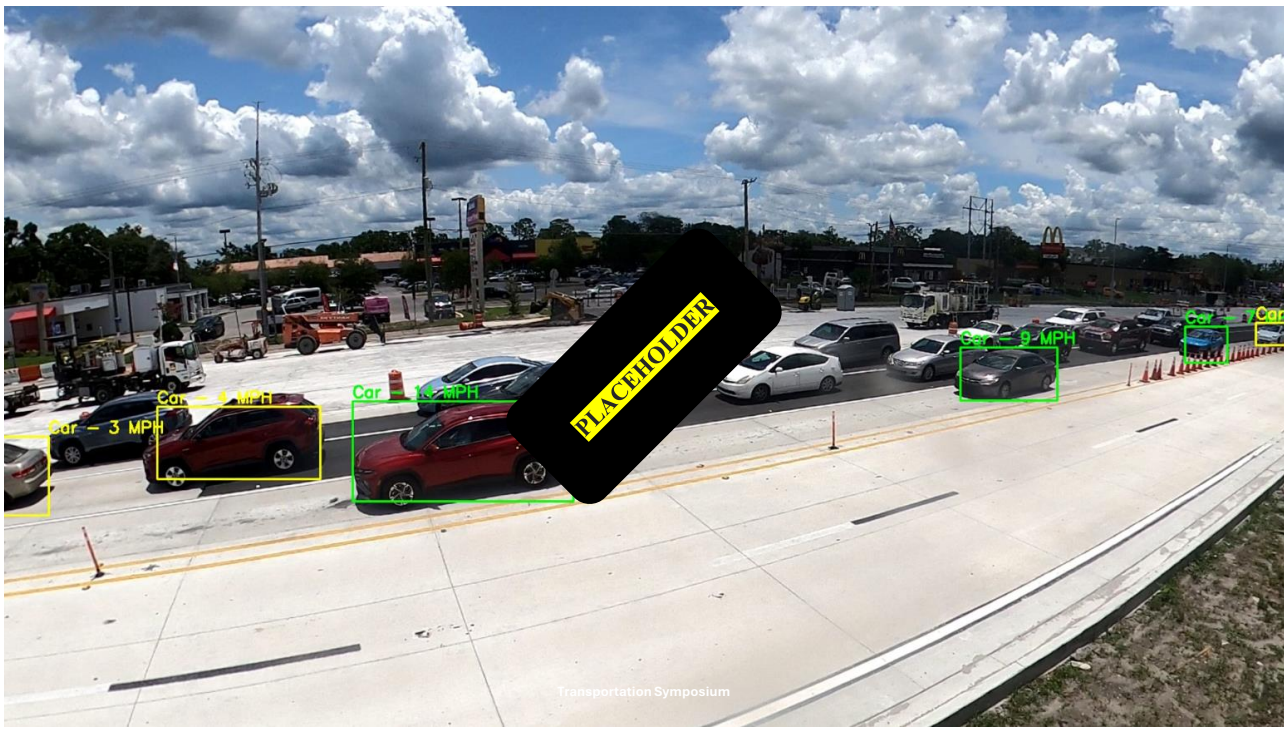

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Identifying Unsafe Behavior

Traffic Monitoring & Flow Analysis

US 301 CL Analysis

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Entrance/Exit of Construction Equipment

Work Zone and Worker Monitoring

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AI Applications Work Zones: Examples
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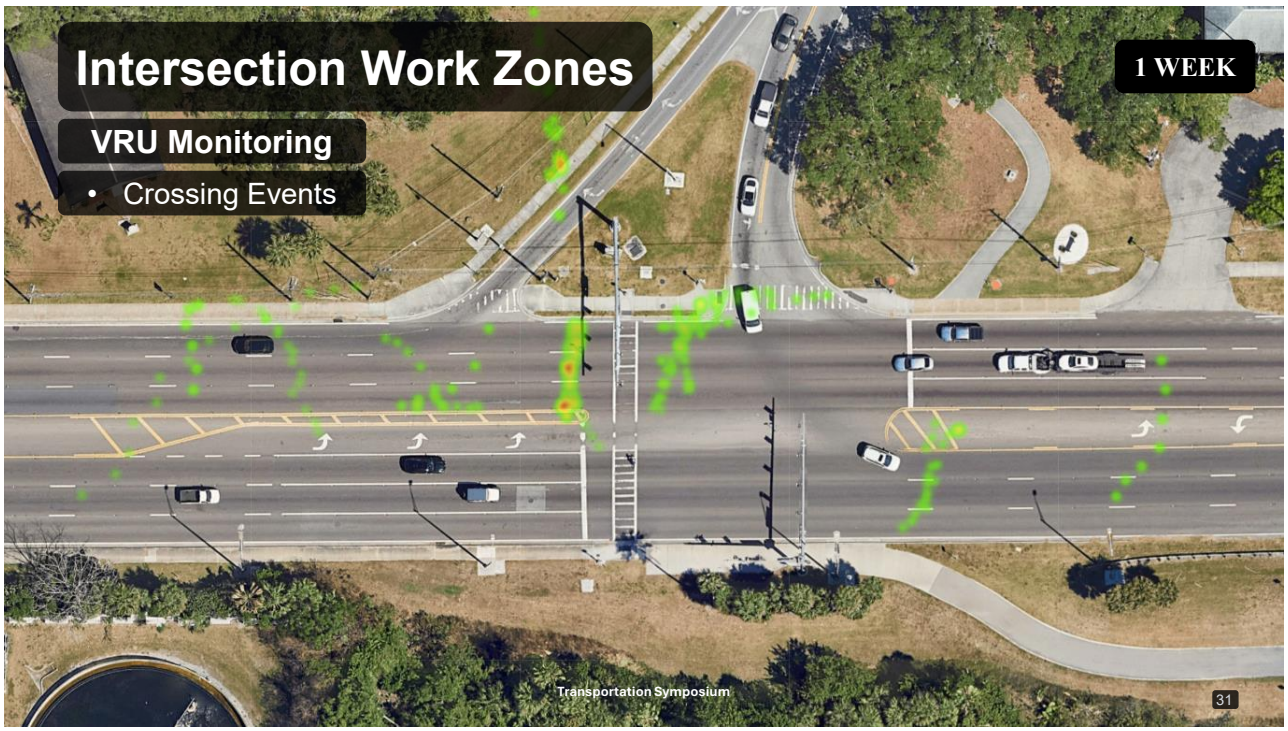
Intersection Work Zones
VRU Monitoring
• Crossing Events
1 WEEK
Transportation Symposium
31

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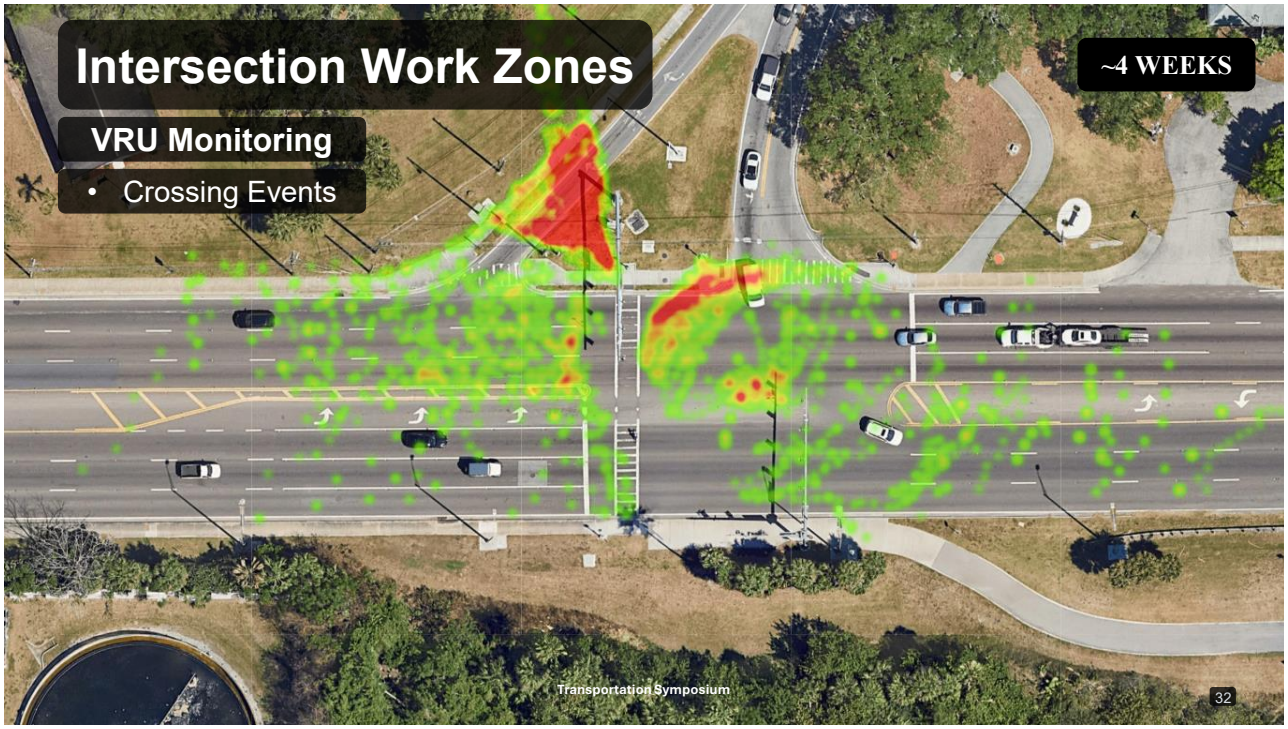
Intersection Work Zones
~4 WEEKS
VRU Monitoring
• Crossing Events
Transportation Symposium
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Pedestrian Crossing Outside X-Walk
Pedestrian Crossing Outside X-Walk
VRU Near-Miss
VRU Near-Miss
33

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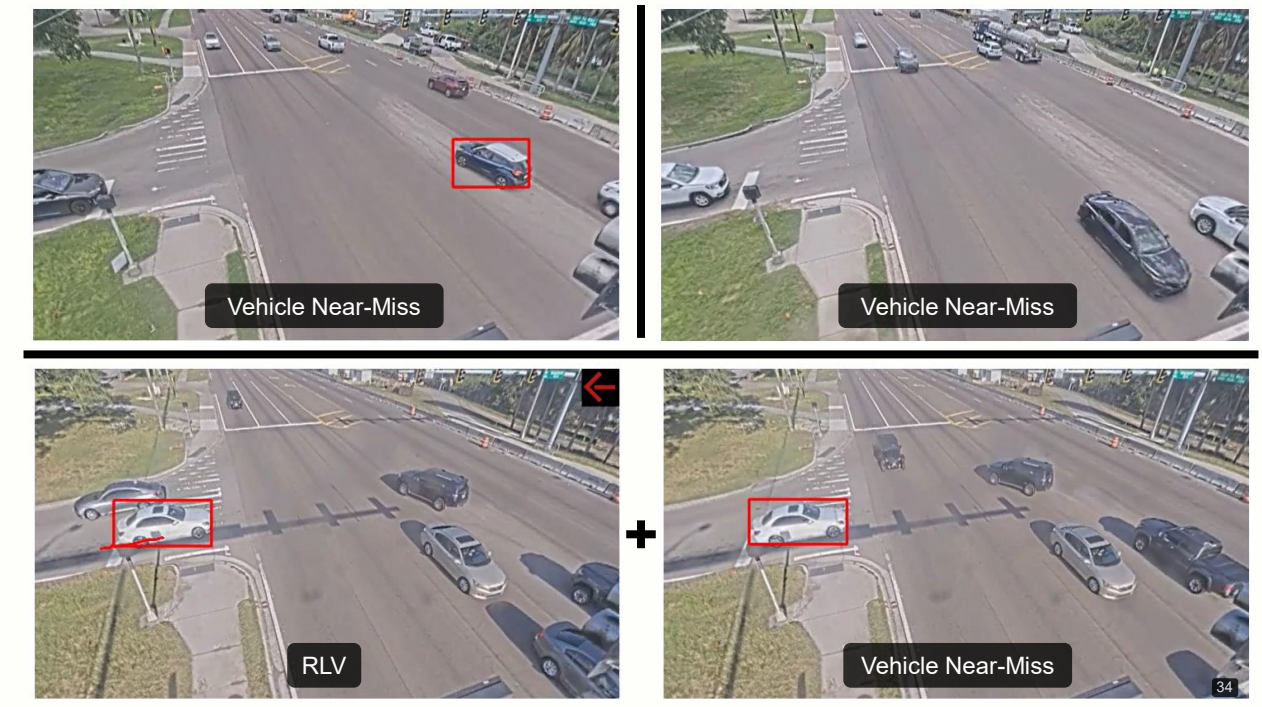
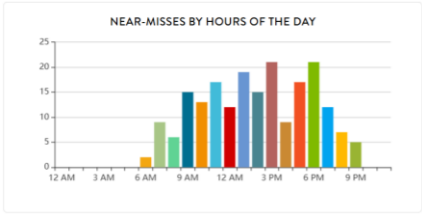

Vehicle Near-Miss
Vehicle Near-Miss
RLV
Vehicle Near-Miss
34

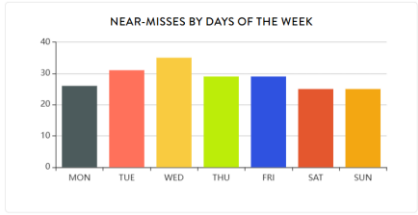
34

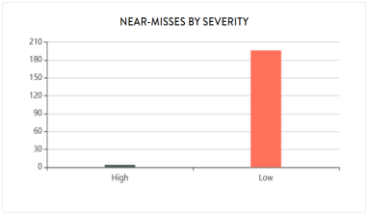

RLV
Vehicle Near-Miss
WWD
WWD?
35

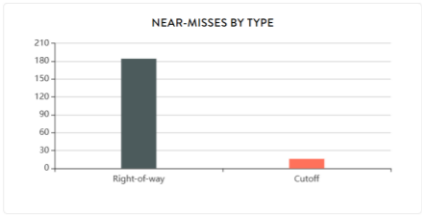
35

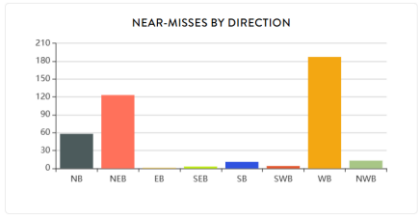
Intersection Work Zones – VRU Near-Miss

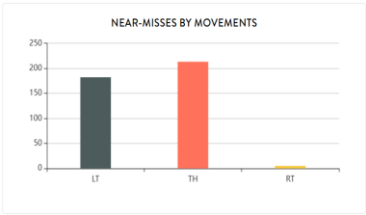












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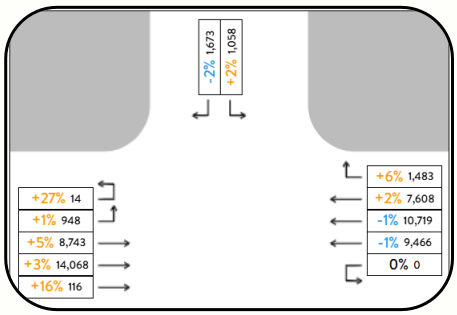

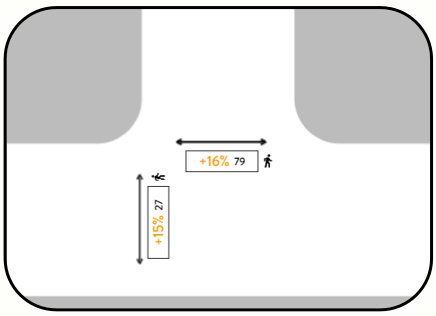

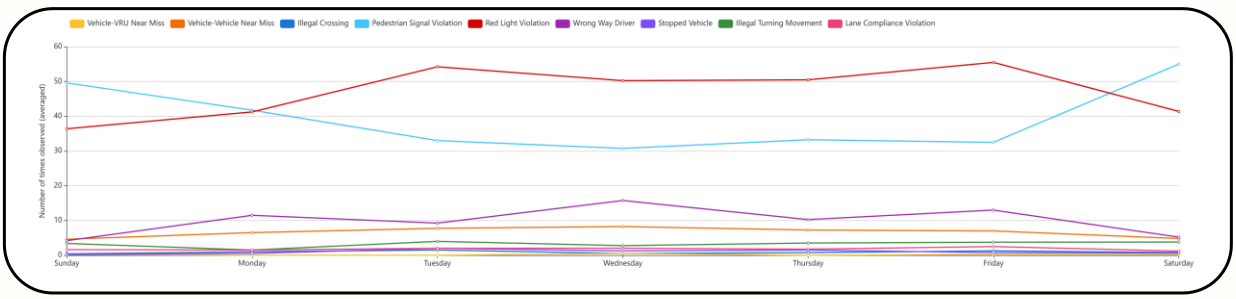

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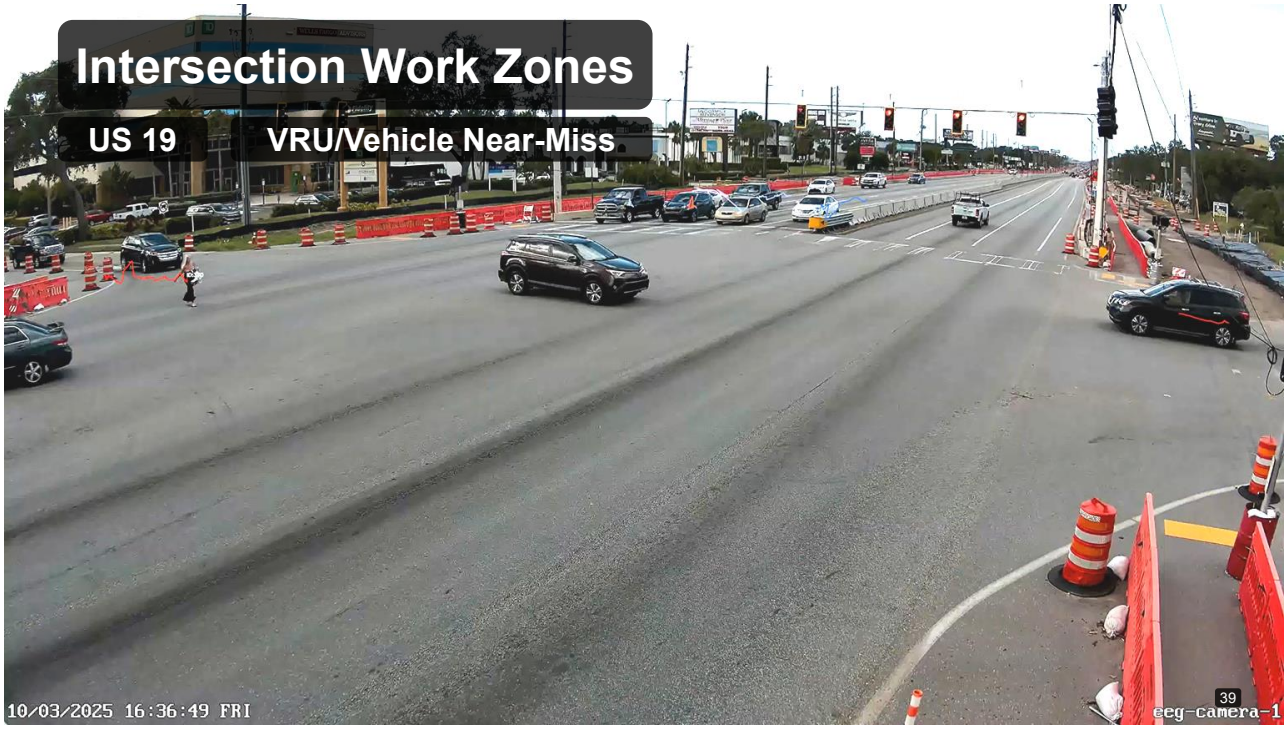
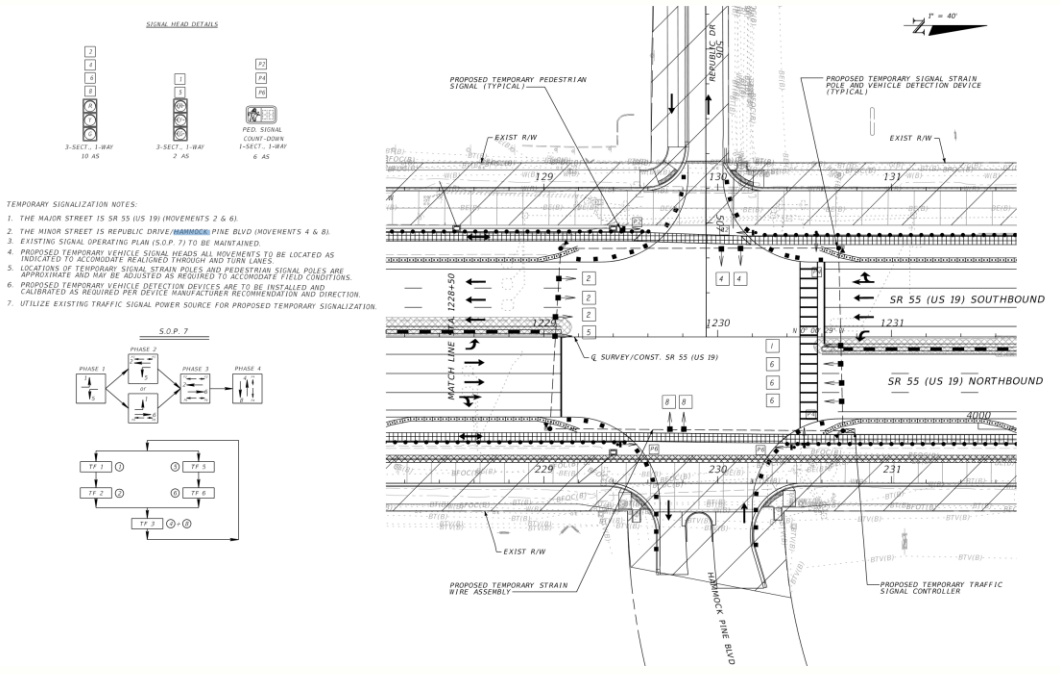

Intersection Work Zones
US 19
VRU/Vehicle Near-Miss
10/03/2025 16:36:49 FRI
39
eeg-camera-1

39

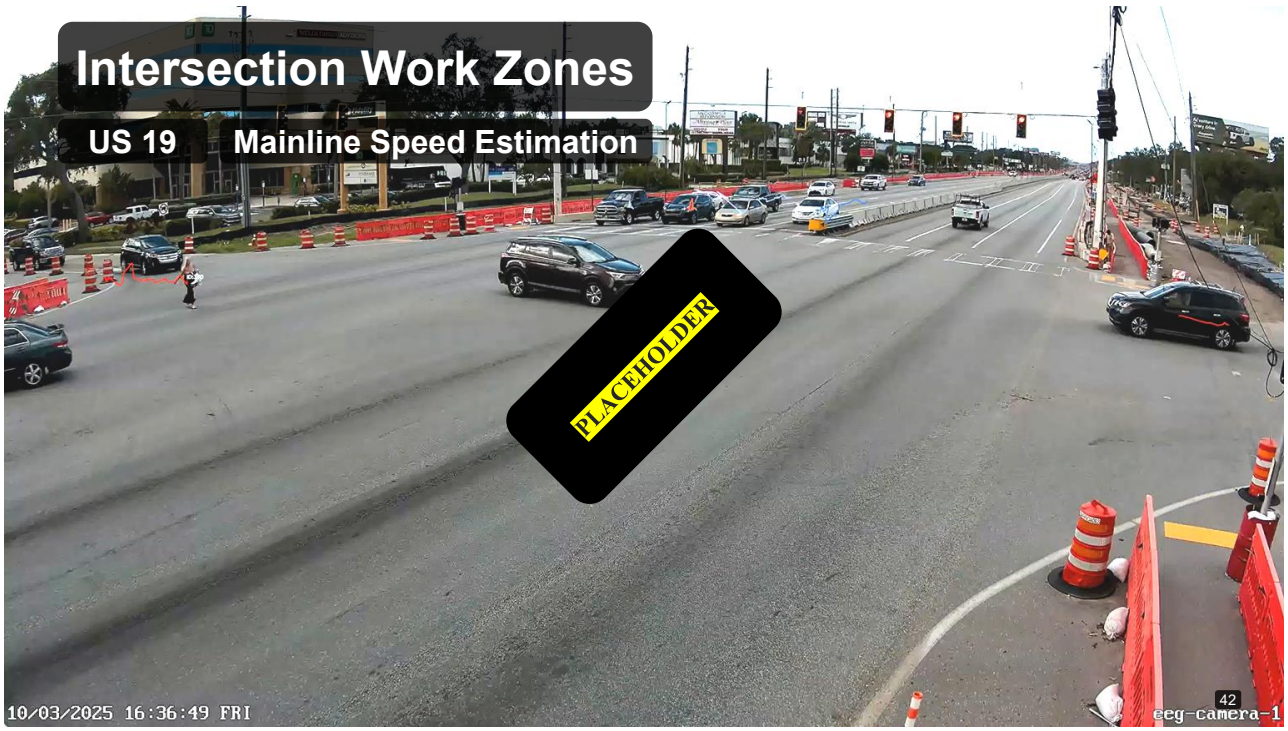

SIGNAL HEAD DETAILS
3-SECT., 1-WAY
10 AS
3-SECT., 1-WAY
7 AS
PED. SIGNAL
COUNT-DOWN
1-SECT., 1-WAY
6 AS
TEMPORARY SIGNALIZATION NOTES:
1. THE MAJOR STREET IS SR 55 (US 19) (MOVEMENTS 2 & 6).
2. THE MINOR STREET IS REPUBLIC DRIVE/HAMMOCK PINE BLVD (MOVEMENTS 4 & 8).
3. EXISTING SIGNAL OPERATING PLAN (S.O.P. 7) TO BE MAINTAINED.
4. PROPOSED TEMPORARY VEHICLE SIGNAL HEADS ALL MOVEMENTS TO BE LOCATED AS INDICATED TO ACCOMODATE REALIGNED THROUGH AND TURN LANES.
5. LOCATIONS OF TEMPORARY SIGNAL STRAIN POLES AND PEDESTRIAN SIGNAL POLES ARE APPROXIMATE AND MAY BE ADJUSTED AS REQUIRED TO ACCOMODATE FIELD CONDITIONS.
6. PROPOSED TEMPORARY VEHICLE DETECTION DEVICES ARE TO BE INSTALLED AND CALIBRATED AS REQUIRED PER DEVICE MANUFACTURER RECOMMENDATION AND DIRECTION.
7. UTILIZE EXISTING TRAFFIC SIGNAL POWER SOURCE FOR PROPOSED TEMPORARY SIGNALIZATION.
S.O.P. 7
PHASE 1
PHASE 2
PHASE 3
PHASE 4
TF 1
TF 2
TF 3
TF 5
TF 6
1" = 40'
REPUBLIC DR.
PROPOSED TEMPORARY PEDESTRIAN SIGNAL (TYPICAL)
PROPOSED TEMPORARY SIGNAL STRAIN POLE AND VEHICLE DETECTION DEVICE (TYPICAL)
EXIST R/W
SR 55 (US 19) SOUTHBOUND
SR 55 (US 19) NORTHBOUND
℄ SURVEY/CONST. SR 55 (US 19)
MATCH LINE
1228+50
129
130
131
1229
1230
1231
229
230
231
400'
EXIST R/W
PROPOSED TEMPORARY STRAIN WIRE ASSEMBLY
HAMMOCK PINE BLVD
PROPOSED TEMPORARY TRAFFIC SIGNAL CONTROLLER

40

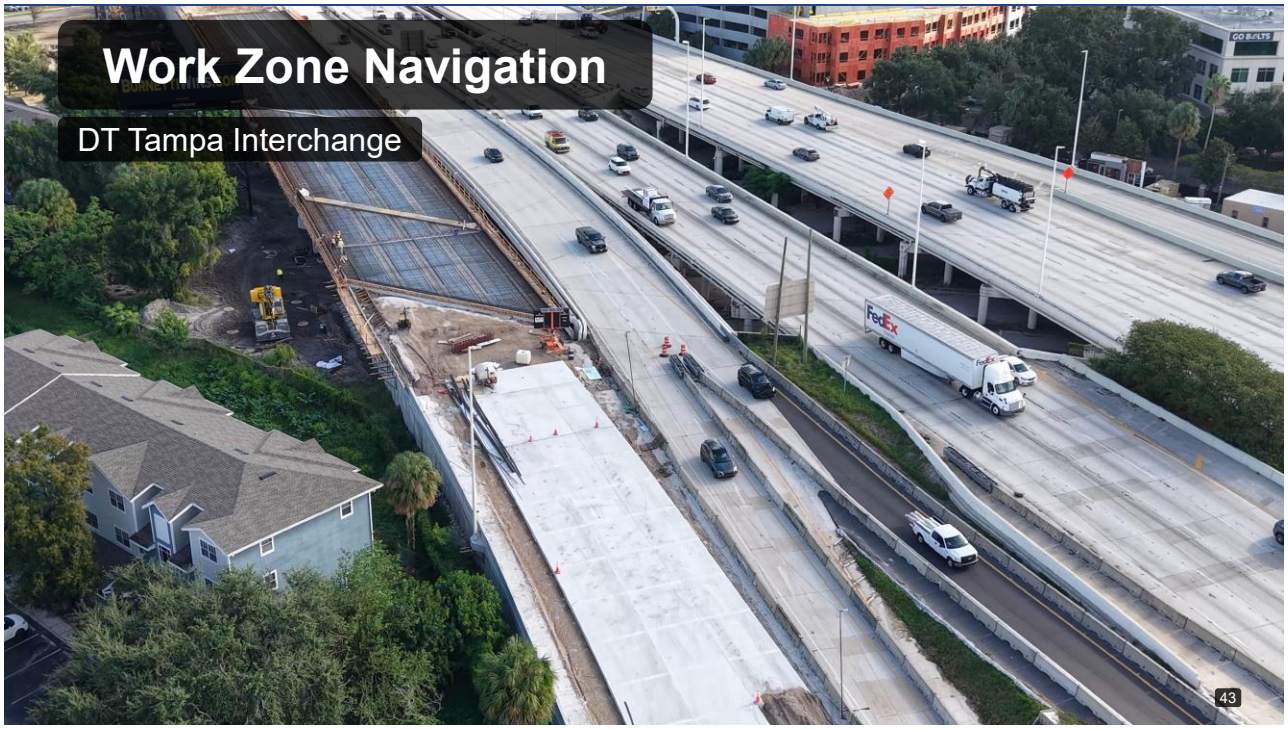
40


Intersection Work Zones
US 19
Minor Side Ped Crossing
PLACEHOLDER
10/03/2025 16:36:49 FRI
41
eeg-camera-1

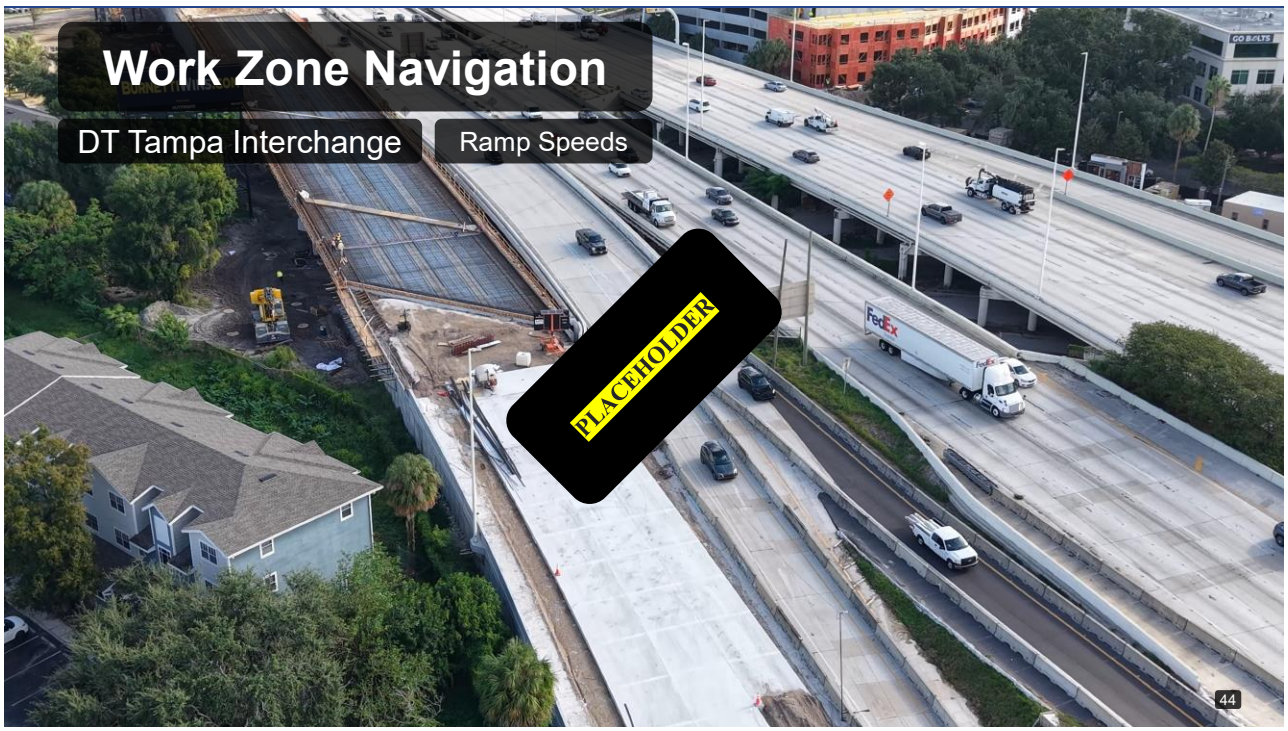
41


Intersection Work Zones
US 19
Mainline Speed Estimation
PLACEHOLDER
10/03/2025 16:36:49 FRI
42
eeg-camera-1

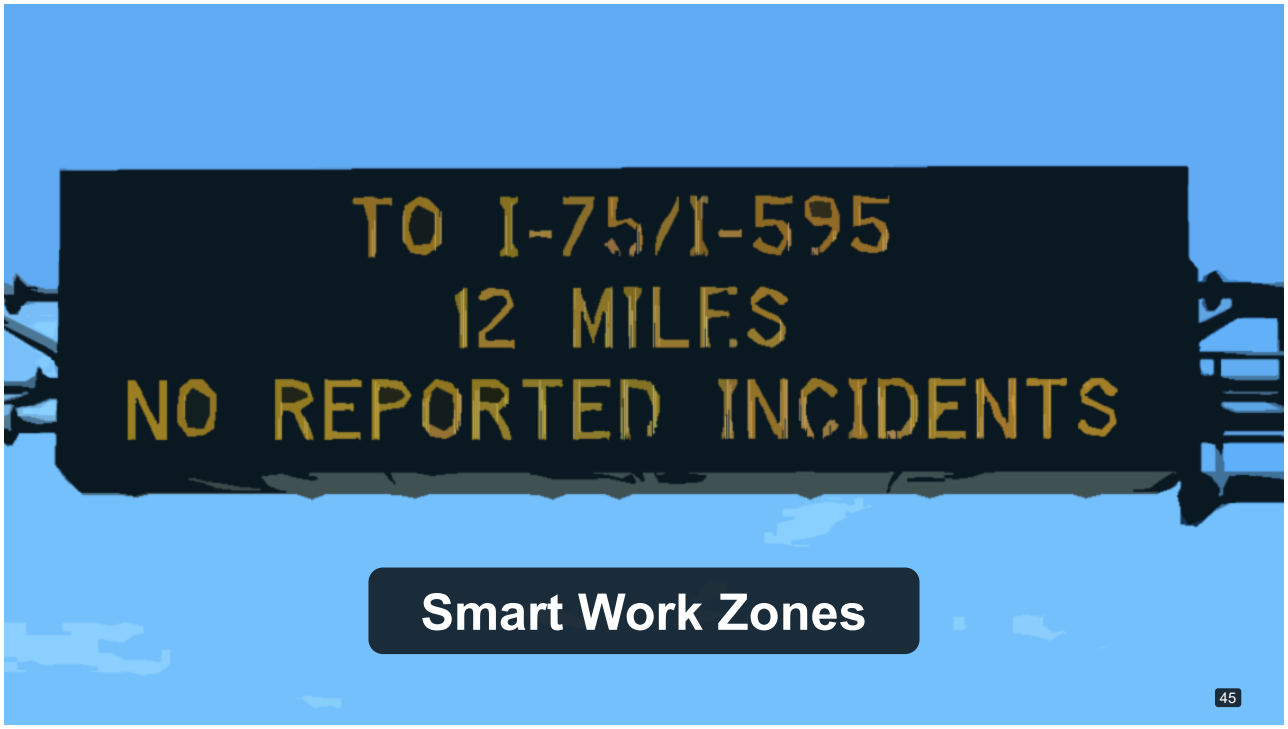
42


Work Zone Navigation
DT Tampa Interchange
43

43


Work Zone Navigation
DT Tampa Interchange
Ramp Speeds
PLACEHOLDER
44

44



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Smart Work Zones Overview

1. Dynamic Lane Merge
2. Queue Detection and Warning
3. Speed Harmonization
4. Variable Speed Limit
5. CV & AV Operations in Work Zones
6. Speed Safety Cameras

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Variable Speed Limit (VSL)

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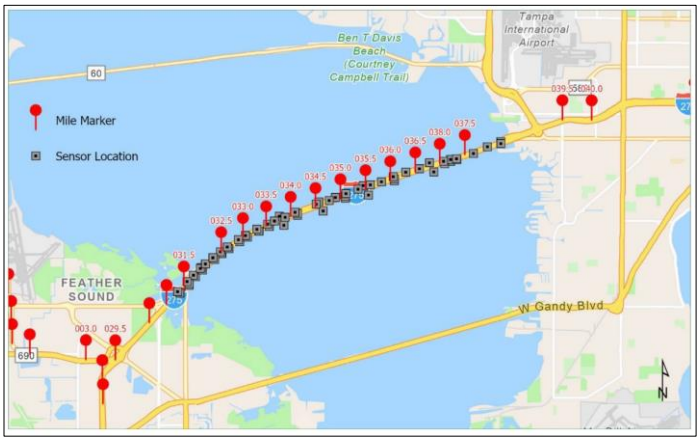
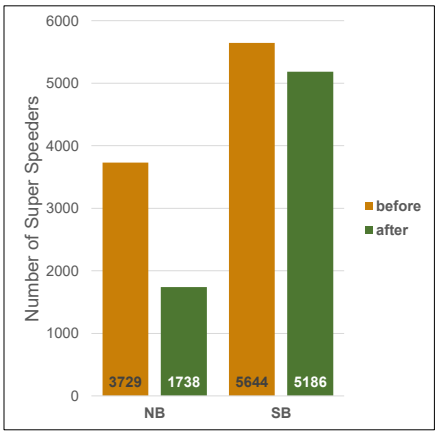
HFB Project Speed Data Analysis



MVDS sensors and milepost locations on the Howard Frankland Bridge



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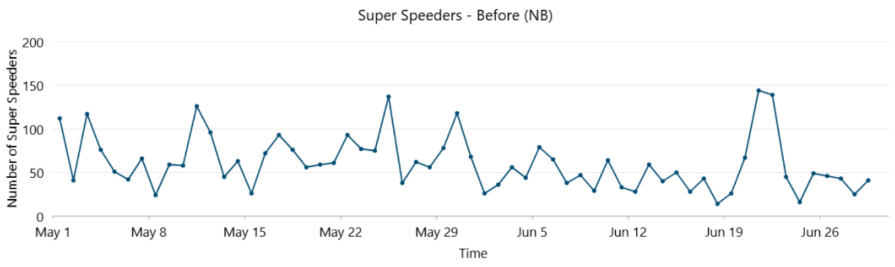
Super Speeder Law Evaluation: Howard Frankland Bridge Case Study

A



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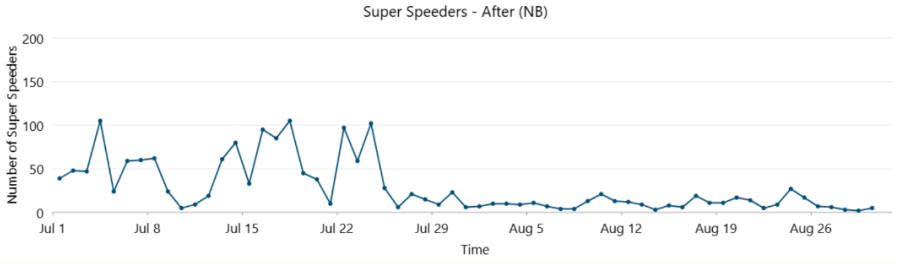


Super Speeder Law Evaluation: Howard Frankland Bridge Case Study

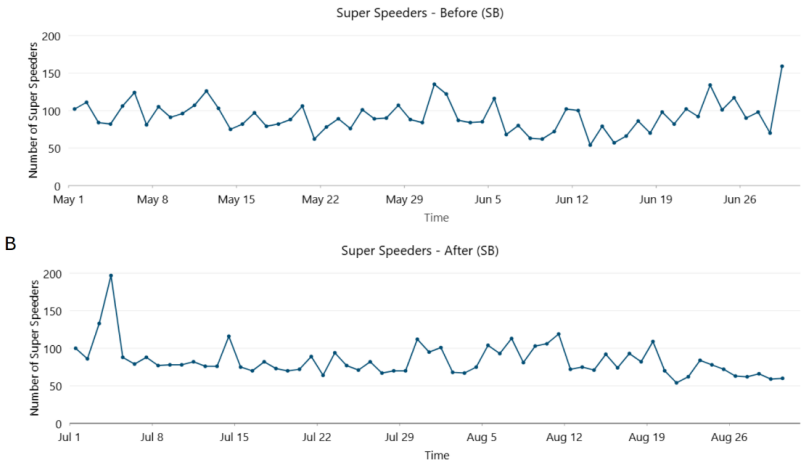
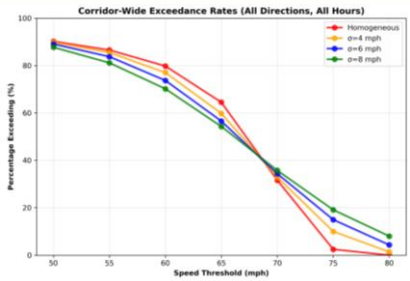
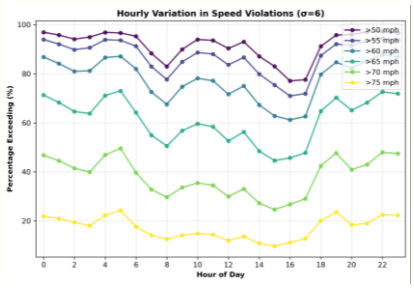


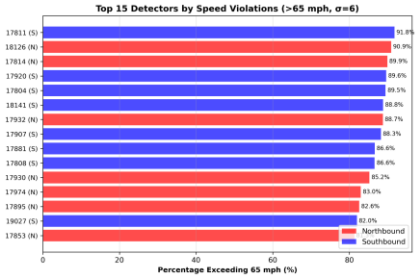
Figure 8. Before-after comparison of super speeders over time (SB)

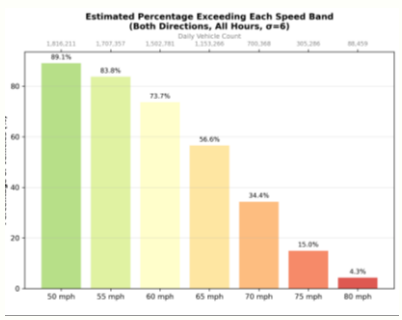
I-275 Widening + HFB Speed Data Analysis

I-275 Speed Analysis Overview (V1 - With Quality Filter)
August 20-28, 2025 (9 days, 18,345,626 vehicles)



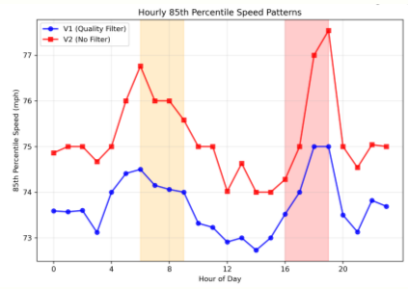


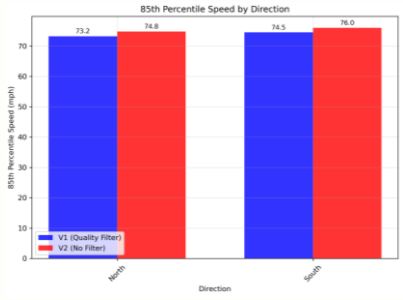


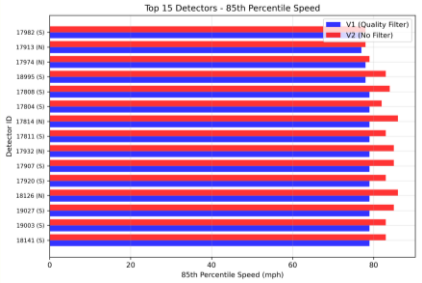


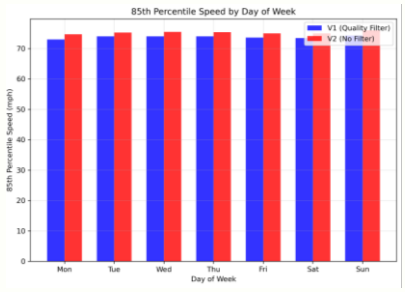
I-275 Widening + HFB Speed Data Analysis

85th Percentile Speed Analysis - Overview Dashboard
I-275 Corridor Analysis (August 20-28, 2025)



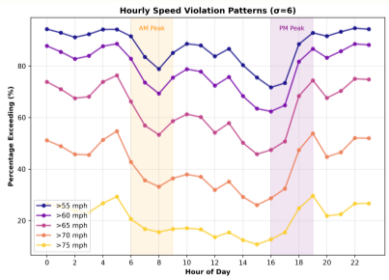


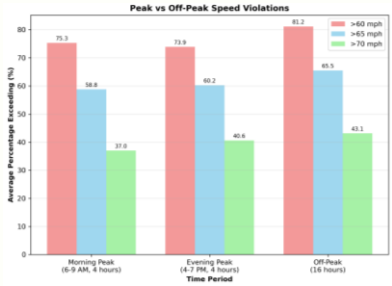


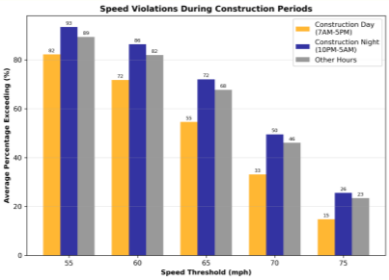


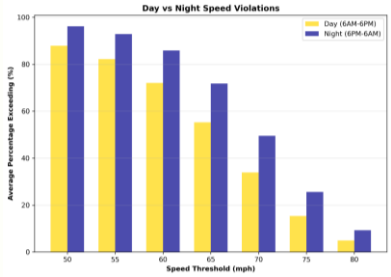
I-275 Widening + HFB Speed Data Analysis

Temporal Patterns Analysis (V2 - No Quality Filter)









I-275 Widening + HFB Probe Data Dashboard

Speed Table

Corridor	Average Speed Differential	Average Speed Current	Average Speed Historical	Travel Time Differential	Travel Time Current	Travel Time Historical
I-275 NB between 38TH AVE/EXIT 25 and SR-...	▲ 5	69 mph	64 mph	0	7 m	7 m
I-275 SB between 38TH AVE/EXIT 25 and SR-6...	▲ 2	68 mph	66 mph	0	7 m	7 m

Data source: HERE TMC — Updated Oct 20, 2025 1:19 PM (12s ago)

Ranked Bottleneck Comparison

2025 May	Jun	Jul	Aug	Sep	Current Month Oct	Location
1	1	2	1	1	1	I-275 S @ 38TH AVE/EXIT 25
5	3	4	4	3	2	I-275 S @ HOWARD FRANKLIN BRG
3	2	1	2	2	3	I-275 N @ HOWARD FRANKLIN BRG
-	-	7	-	-	4	I-275 S @ SR-60/CYPRESS ST/EXIT 39
6	7	5	3	7	5	I-275 S @ 54TH AVE/EXIT 26
10	-	-	-	-	6	I-275 S @ KENNEDY BLVD/EXIT 39
-	-	8	7	10	7	I-275 N @ 38TH AVE/EXIT 25
7	6	9	8	5	8	I-275 N @ 54TH AVE/EXIT 26
2	4	3	6	6	9	I-275 N @ KENNEDY BLVD/EXIT 39
4	9	6	10	4	10	I-275 N @ SR-694/EXIT 28
Ranking	1	2	3			

Data source: HERE — Updated Oct 20, 2025 8:32 AM (286m 38s ago)

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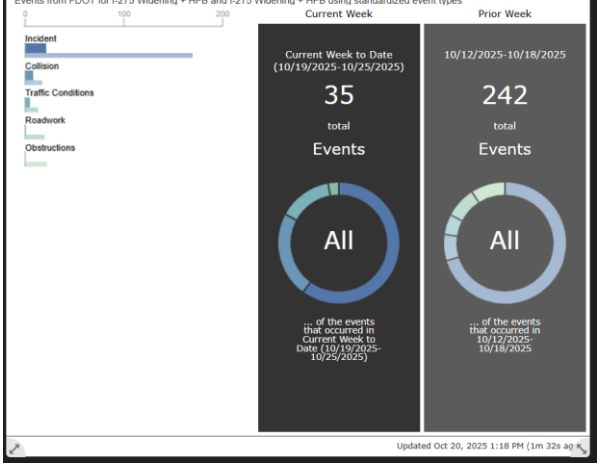
I-275 Widening + HFB Probe Data Dashboard

Event Count for I-275 Widening + HFB and I-275 Widening + HFB

FDOT

Events from FDOT for I-275 Widening + HFB and I-275 Widening + HFB using standardized event types

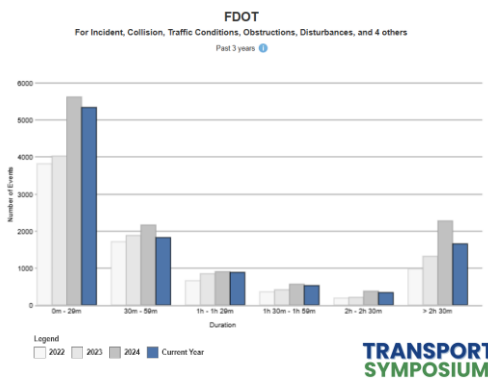


Updated Oct 20, 2025 1:18 PM (1m 32s ago)

Reliability during the AM Peak (8-9am) for I-275 Widening + HFB

Planning Time Index: Free Flow Speed Differential	Current Week to D...	10/20/2024-10/26...	Planning Time Index: Posted Speed Limit Differential	Current Week to D...	10/20/2024-10/26...
▼ 0.61	1.25	1.86	▼ 0.19	1.18	1.37

Data source: HERE — Updated Oct 20, 2025 12:35 PM (43m 49s ago)



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Key Takeaways

AI Technologies Offer New Solutions

Computer vision, sensors, and AI analytics can detect issues in real-time, providing valuable data for safety improvements in work zones.

Smart Work Zone Systems Show Promise Promise

Dynamic queue detection, speed harmonization, harmonization, and variable speed limits help help manage traffic flow and reduce crash risks in risks in construction areas.

Agentic Workflows Enhance Data Processing

LLMs and intelligent systems can analyze crash data, generate reports, and identify problem areas more areas more efficiently than traditional methods.

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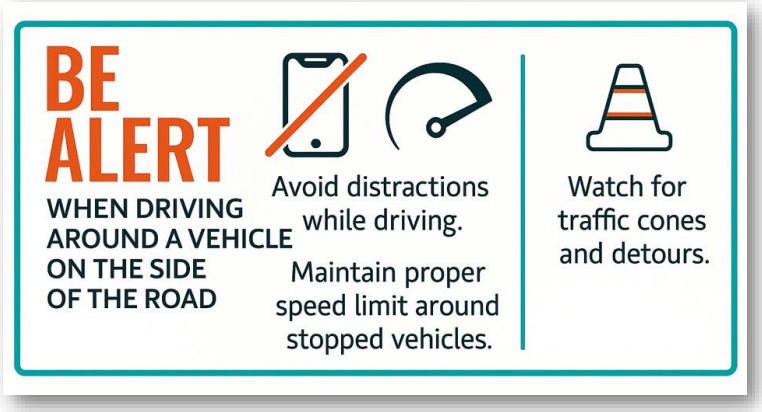
Safety Message



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Questions & Answers

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