



Department of
Transportation

Enhancing Pedestrian Safety Through Video Analytics & Connected ITS Technologies

Panel 1A- Next-Gen ITS: Unlocking Real-Time Mobility with Edge Technology and Analytics



33rd Annual Meeting

June 17, 2026

Outline

Context & Safety Challenge

Pilot Design & Deployment

Data & Insights

Replicability

PDH Questions

Project Context & Location

High-Risk Vulnerable Road User (VRU) Crossing near Citi Field.

- Ramp from WB Grand Central Parkway → Northern Blvd (Exit 9E)
- Subway 7 train; Q90 bus
- Heavy event-driven surges (Mets, NYCFC, concerts)
- VRUs include pedestrians, bicyclists, e-bikes, and mobility-aid users



The Safety Challenge (Geometry)



Horizontal Curvature Limits Sight Distance

- ➡ Ramp from GCP diverges before merging with ramp from Shea Road upstream of crosswalk
- ➡ Shea Road (yield) limited sight distance and grade

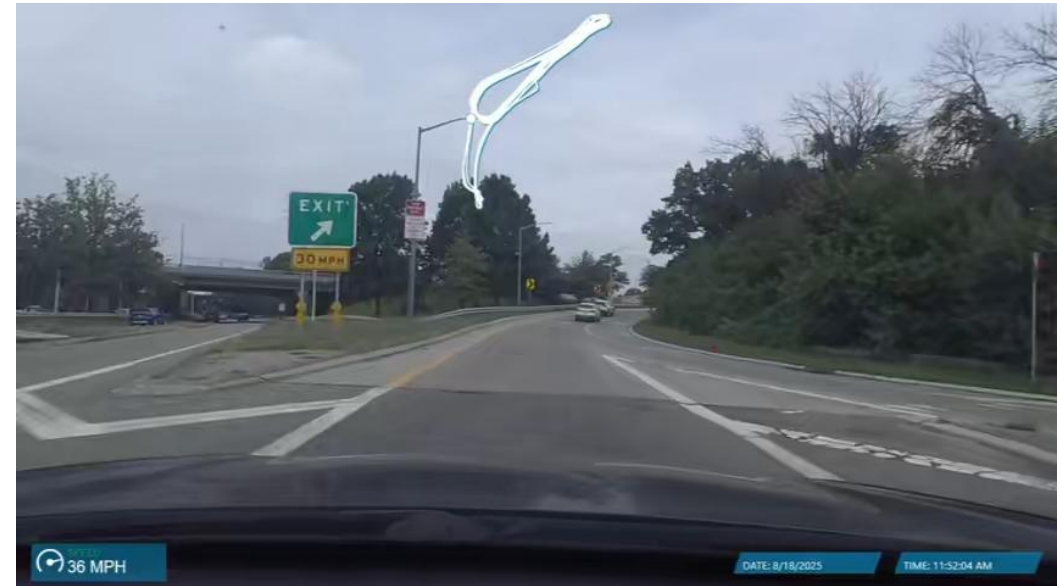
The Safety Challenge (Visibility)

Limited visibility for both Vehicles and Vulnerable Road Users (VRUs)

Camera View of Crosswalk



Driver's View of Crosswalk



The Safety Challenge (Near-Miss)

Concerns from NYPD and Citi Field



What we Needed to Measure

- ➔ Traditional Crash Data was not sufficient to highlight underlying safety issues
- ➔ Leverage existing Intelligent Transportation System (ITS) infrastructure to collect data



**Quantifiable metrics
to measure safety performance**

Vehicle and VRU counts
Vehicle speeds
Near misses



**Evaluate effectiveness
of proposed countermeasures**

Yielding Behavior
Speed Compliance

Concept Overview



Detect VRU

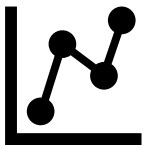
Use Video Analytics to detect pedestrian in cross walk



Alert Motorist

Trigger Rectangular Rapid Flashing Beacons (RRFB) to provide alerts to approaching motorists

Activate PVMS to provide additional alert to motorists



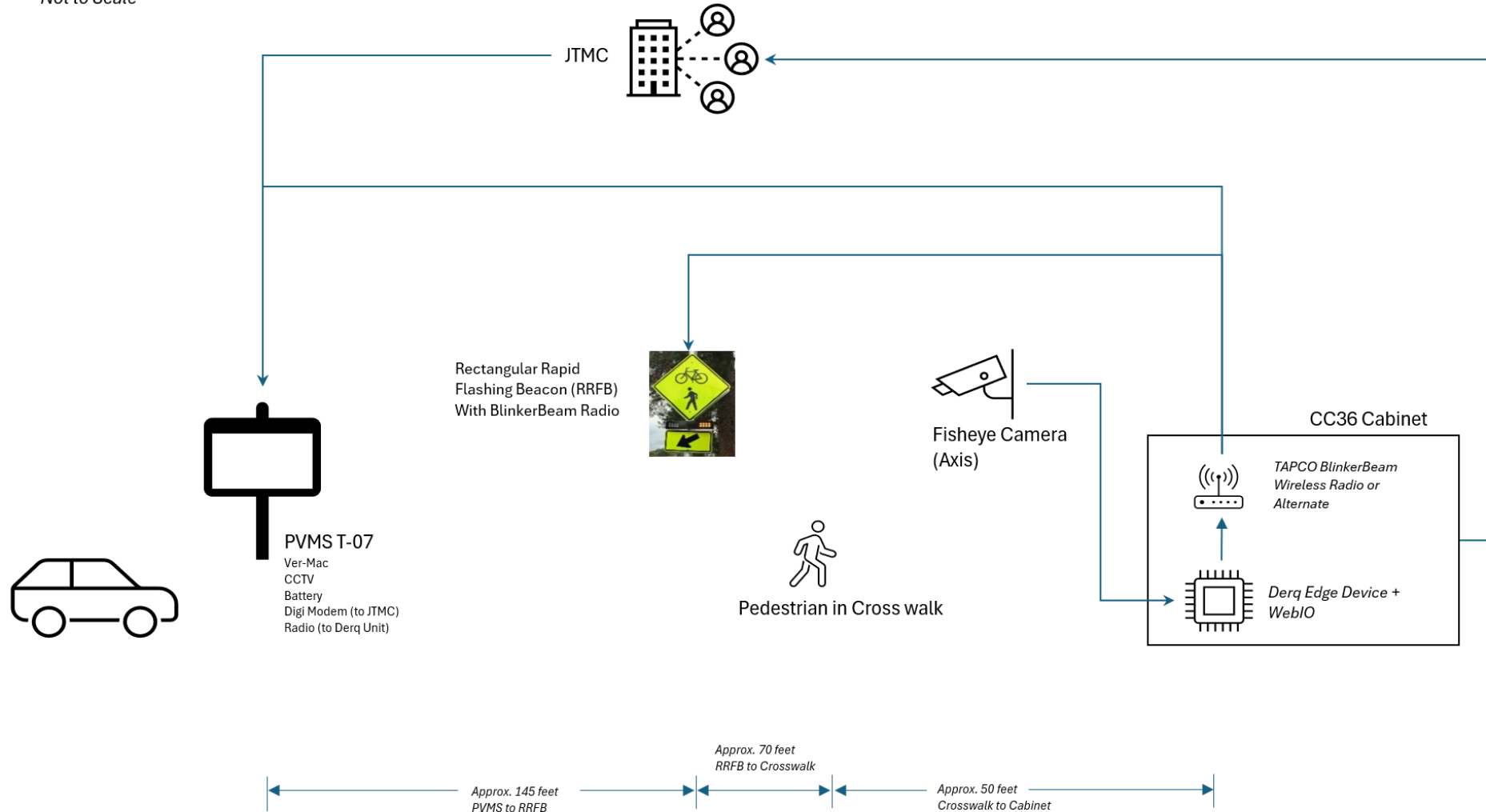
Collect Metrics

Use ML/AI Edge device to extract metrics at the crosswalk

- Mobility – motorists (count, type) and VRU (count, type)
- Safety – near miss, points of conflict

Schematic Diagram

Not to Scale



Field Deployment Layout

Phase 1 (complete)

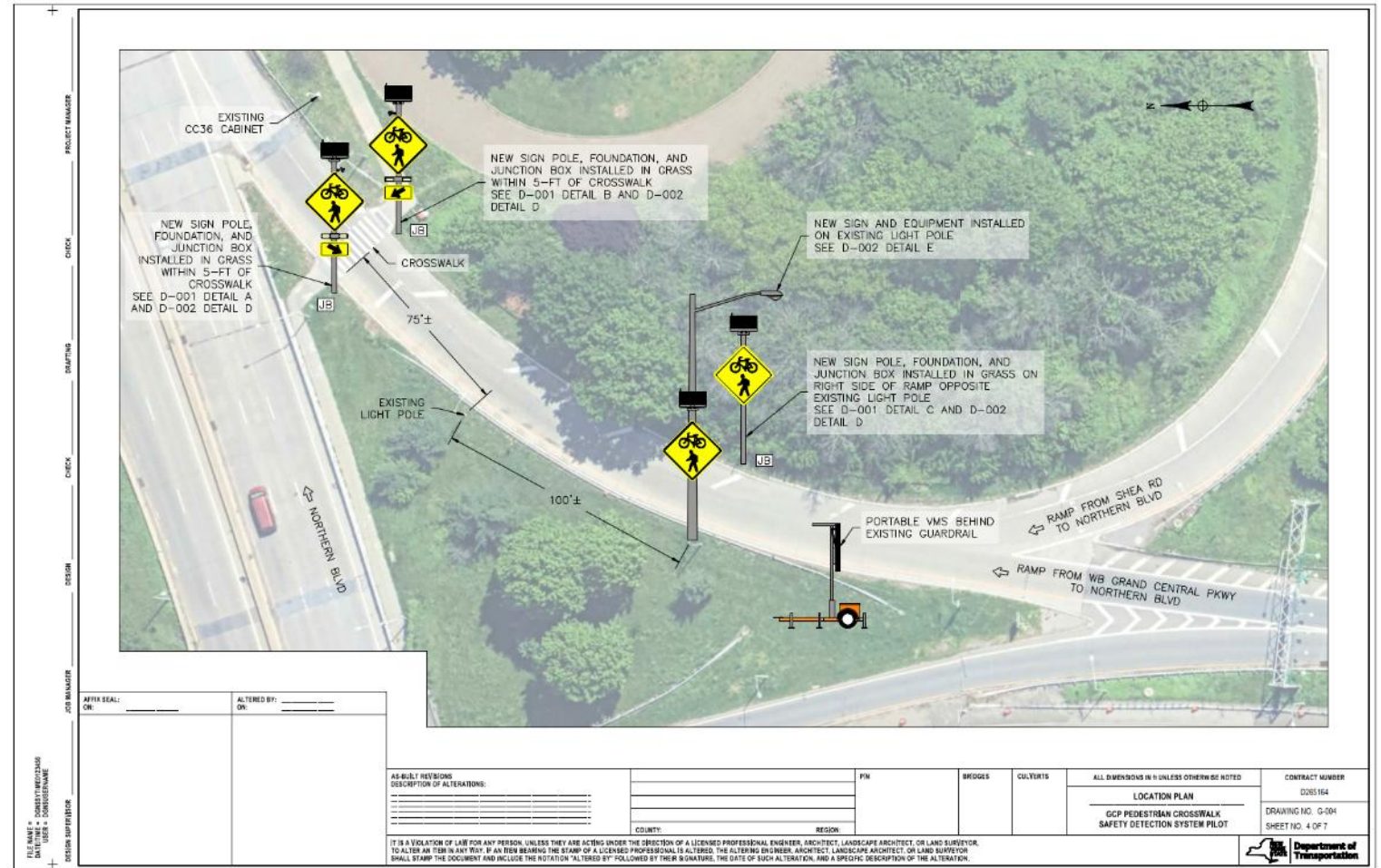
- Collect baseline metrics
- Installed Edge unit & camera

Phase 2 (complete)

- Implement Countermeasures
- Installed RRFBs and PVMS

Beyond MUTCD minimum

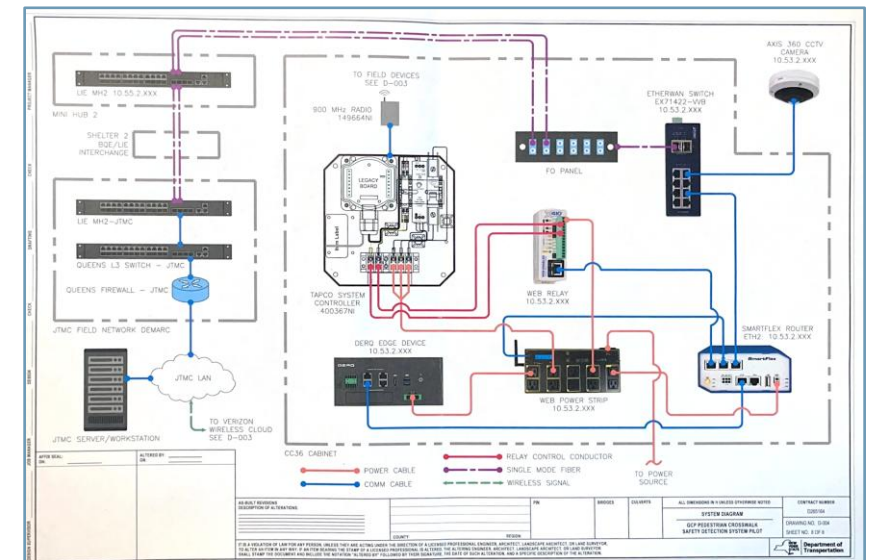
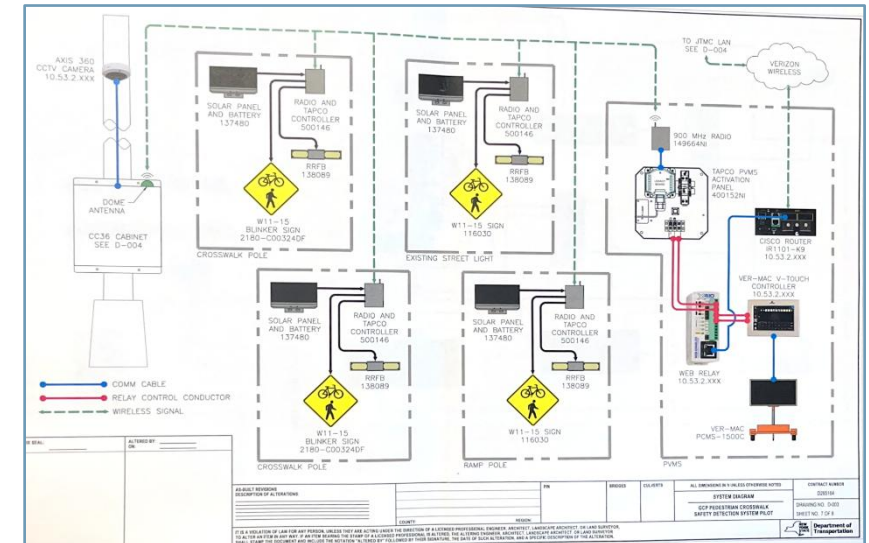
- AI Driven/ Event-Triggered
- Real-time Warning System



Field Deployment

Roadside Components

- ❑ IP Camera
- ❑ AI/ML Edge unit
- ❑ Pedestrian Warning Signs (W11-15)
- ❑ RRFB assemblies
- ❑ Flashing beacon controller
- ❑ Solar Panels and Battery
- ❑ Portable Variable Message Sign (PVMS)
- ❑ Wireless Radio
- ❑ Control Cabinet (CC36)
- ❑ Ethernet Switch



Field Deployment



Data & Insights

Literature Review

Reviewed research papers and publications (before/after studies) related to RRFBs and PVMS and Safety assessments (15 publications)

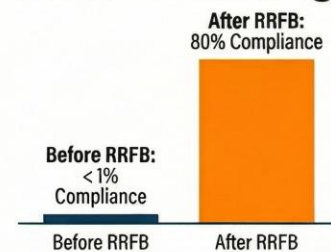
Summary graphic generated Google Notebook LM

Intelligent Traffic Systems: Proven Strategies for Roadway Safety

Enhancing Pedestrian Safety with RRFBs



80x Increase
in Driver Yielding



Effective Without Crossing Guards

RRFBs achieved high yielding rates during non-school hours when human guards were absent



Near-Crash Identification (TDPI)

Risks are identified when the Time Difference to Point of Intersection is < 2.5 seconds

Intelligent Work Zone Management (AQD)



3.5 to 7 MPH
Speed Reduction



Drivers significantly reduced speeds in response to automated "Slow Traffic Ahead" warning messages



99.3%
System Reliability

AQD systems demonstrated high operational accuracy with error rates as low as 0.7%



Proactive Queue Warning

Real-time speed sensors trigger portable message signs to prevent rear-end collisions in highway work zones

NotebookLM

Baseline Metrics

Events at Citi Field

- Log special events
- Concerts
- NYCFC Soccer matches
- Mets baseball games

The image displays three overlapping calendar cards for the years 2026, showing the months of March, April, and May. Each card is a weekly layout with columns for the days of the week and rows for the dates. The cards are partially overlapping, with May in the foreground, April in the middle, and March in the background.

Calendar Card 1 (Top):

- Month:** 2026 MARCH
- Days:** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
- Events:**
 - 03: Soccer (3:00 PM)
 - 06: Soccer (7:30 PM)
 - 10: RFRB & PVMS units were installed on the site
 - 14: RFRB activated on site
 - 16: PVMS operational on site

Calendar Card 2 (Middle):

- Month:** 2026 APRIL
- Days:** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
- Events:**
 - 04: Soccer (7:10 PM)
 - 07: Soccer (7:10 PM)
 - 10: Soccer (7:10 PM)
 - 13: Soccer (7:10 PM)
 - 16: Soccer (7:10 PM)
 - 19: Soccer (7:10 PM)
 - 22: Soccer (7:10 PM)
 - 25: Soccer (7:10 PM)
 - 28: Soccer (7:10 PM)

Calendar Card 3 (Bottom):

- Month:** 2026 MAY
- Days:** Sunday, Monday, Tuesday, Wednesday, Thursday, Friday, Saturday
- Events:**
 - 03: Soccer (3:00 PM)
 - 06: Soccer (7:30 PM)
 - 10: RFRB & PVMS units were installed on the site
 - 14: RFRB activated on site
 - 16: PVMS operational on site

Baseline Metrics

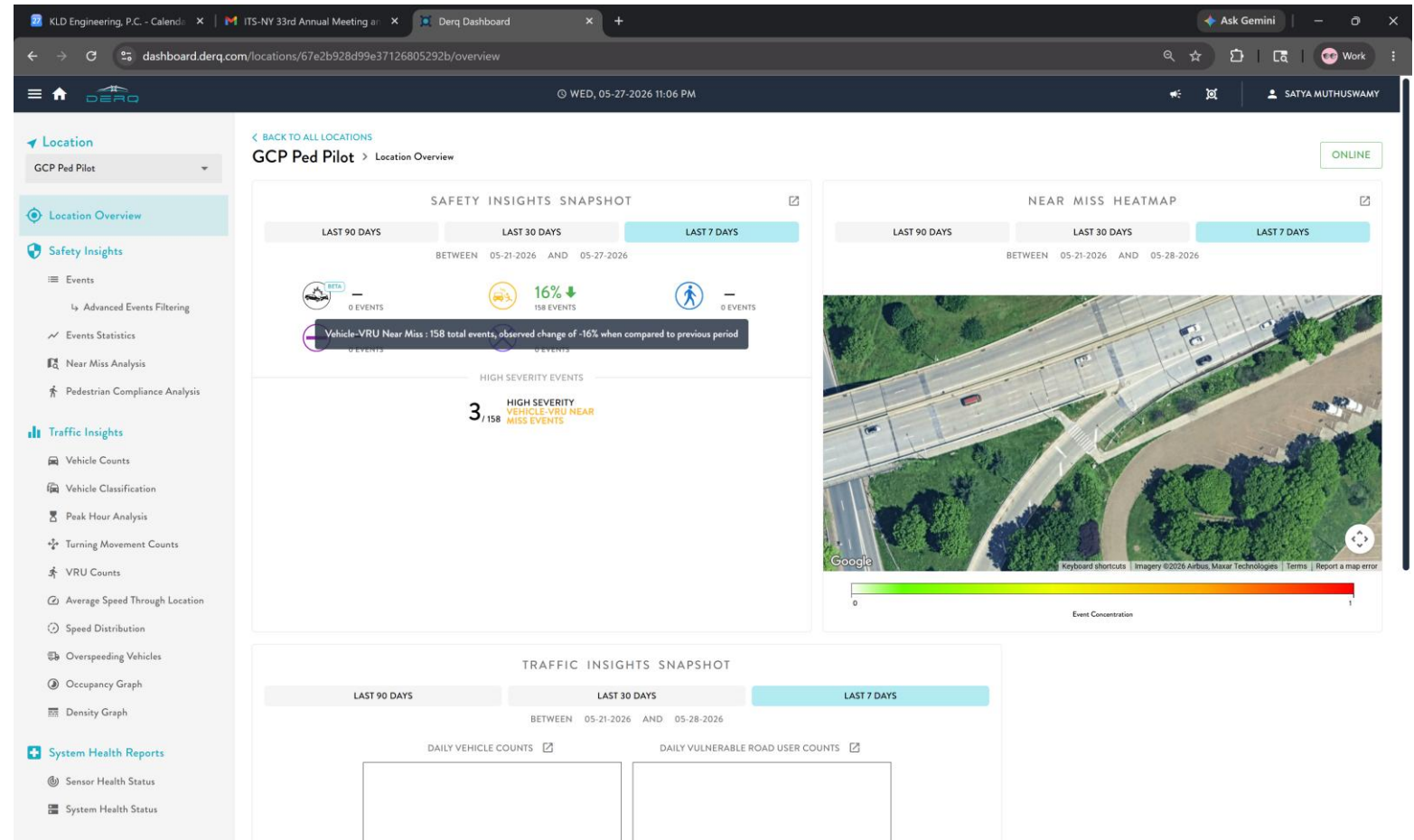
Dashboard

➔ Traffic Insights

- ❑ Vehicle flow/classification
- ❑ Ped/Bike flow at the cross walk
- ❑ Speed distribution

➔ Safety Insights:

- ❑ Events (Near Miss)
- ❑ Average speed
- ❑ Surrogate Safety measures



Baseline Metrics

Surrogate Safety measures

- ❑ Near Miss Event
- ❑ PET (Post Encroachment Time)
- ❑ TTC (Time to Collision)

POST ENCROACHMENT TIME EVENT 3/4



Event Detail

Time: 10/18/2025 - 11:33:08
Location: 40°45'27.07"N 73°51'4.61"W
PET value: 1.5 s
PET distance: 2.7 m
Min. Distance: 2.7 m
Angle: 82 degrees

Interacting objects

	1st object	2nd object
Class:	PERSON	CAR
Movement:	-	-
Conflict speed:	8 km/h	16 km/h
Average speed:	5 km/h	20 km/h

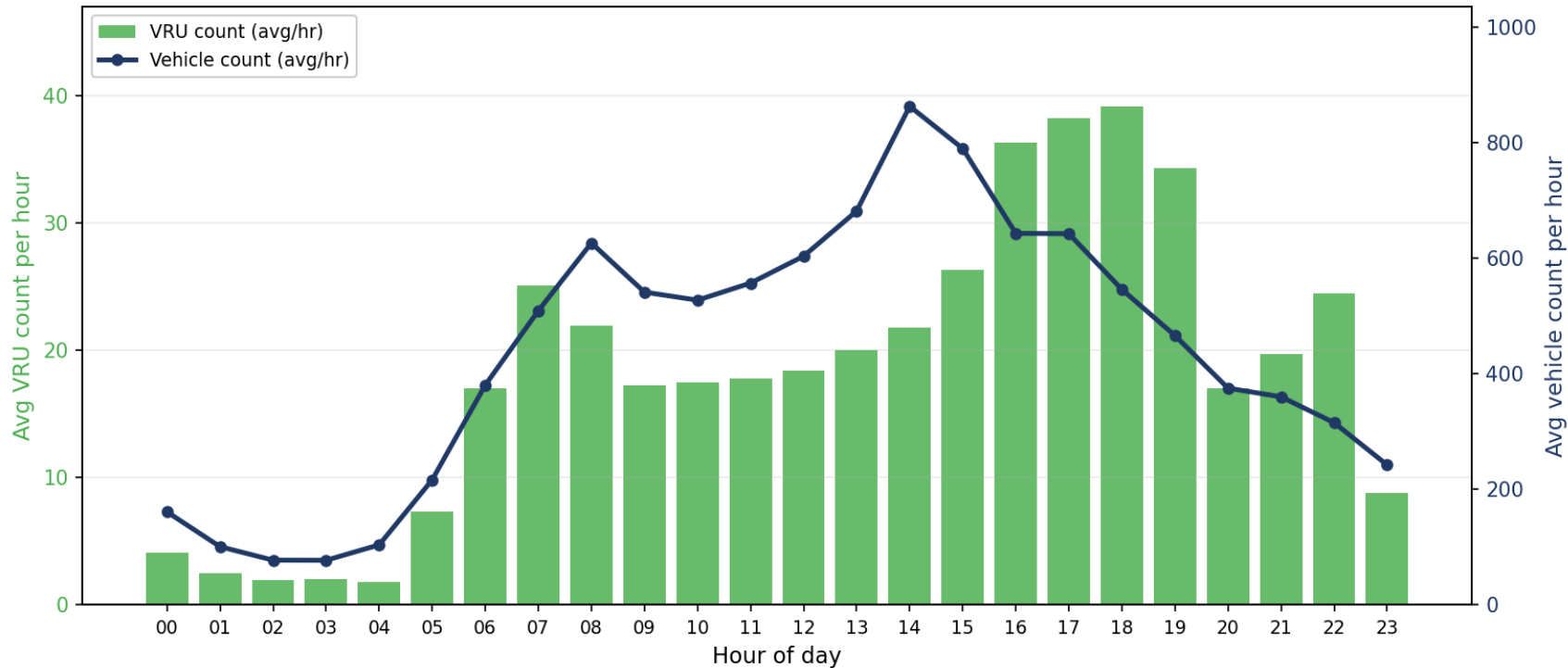
Event Notes

Add notes about this near-collision event to keep important context for future reference.

Save note

Insights: Baseline Data

GCP Pedestrian Pilot — Average Hourly Vehicle & VRU Counts
365-day baseline (May 2025 - May 2026), Lane 2 upstream



VRU/ Vehicle Distribution per Hour of day

Note:

1. VRU counts: pedestrians, bicyclists, e-bikes, and mobility-aid users

No of Vehicles on Ramp

- ~10,200 vehicles/day

No of VRUs Crossing

- ~420 VRUs/day

Speed

- 72% of vehicles > 25 mph

Event Day Vs Non-Event Peak hour

- 1,785 vs 900 vehicles
- 398 vs 39 VRUs

Insights: Near Miss

Edge Unit Dashboard

- ❑ Vehicle and VRU- speed and movement
- ❑ Calculates surrogate safety measures like PET and Gap Time.

 Vehicle-VRU Near Miss

Event ID : 698e01d83dbe240012b242c4   

 GO TO ALL EVENTS

Location
GCP Ped Pilot

Detected on
02-12-2026 11:37:39 AM

Speed
36 mph

Near Miss Type
Right-of-way

Detection Area
South Leg



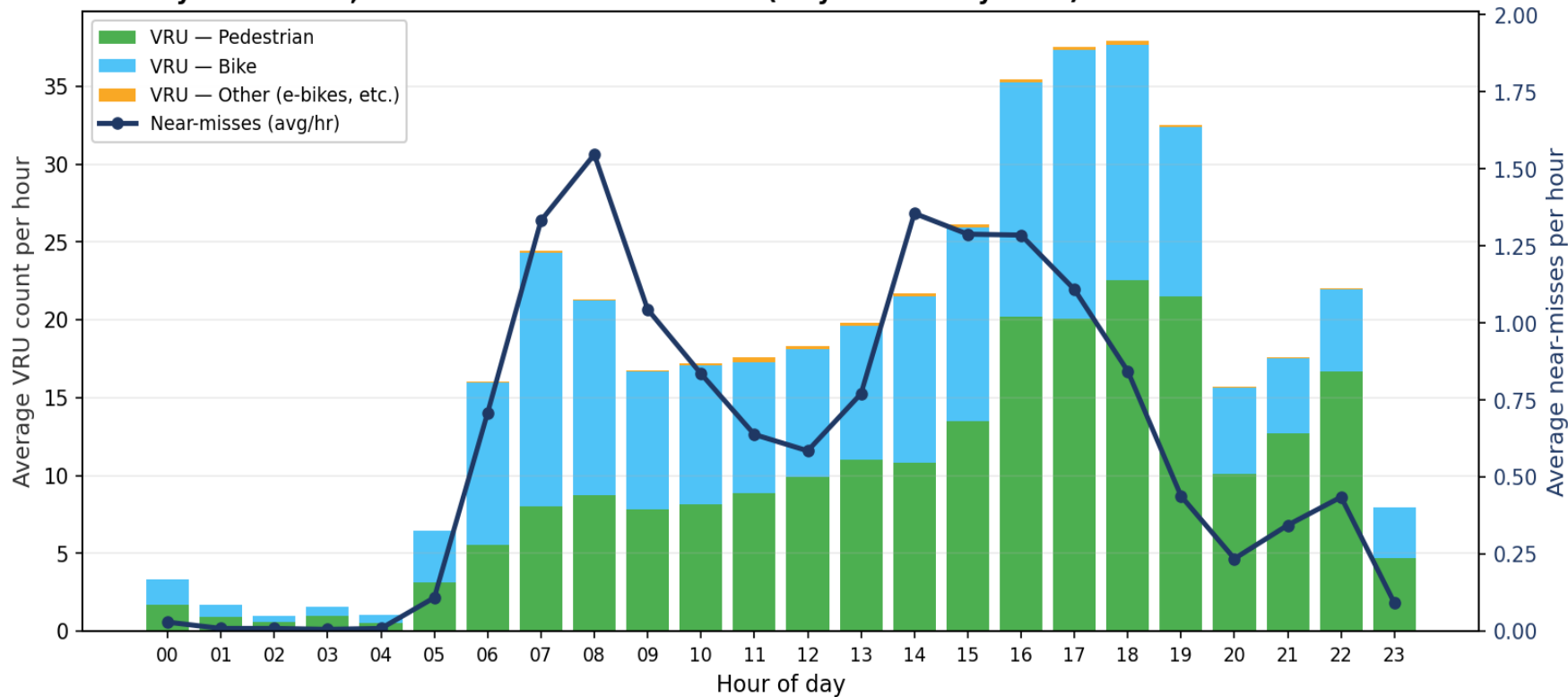
Road User A
Class: Passenger Vehicle
Speed: 36 mph
Movement: RT
Direction: NEB

Road User B
Class: Pedestrian
Speed: 4 mph
Movement: TH
Direction: SEB

Surrogate Safety Measures
PET [?] : 0.7s
TTC [?] : N/A
Gap Time [?] : N/A
Severity [?] : High
Max Speed [?] : 36 mph

Insights: Near Miss

GCP Pedestrian Pilot — Hourly Near-Misses & VRU Counts
365-day baseline: 5,120 vehicle-VRU near-misses (May 2025 - May 2026)



At least one near-miss almost every hour

Note:
Near-miss events captured by the Derq edge unit (Vehicle-VRU conflicts)

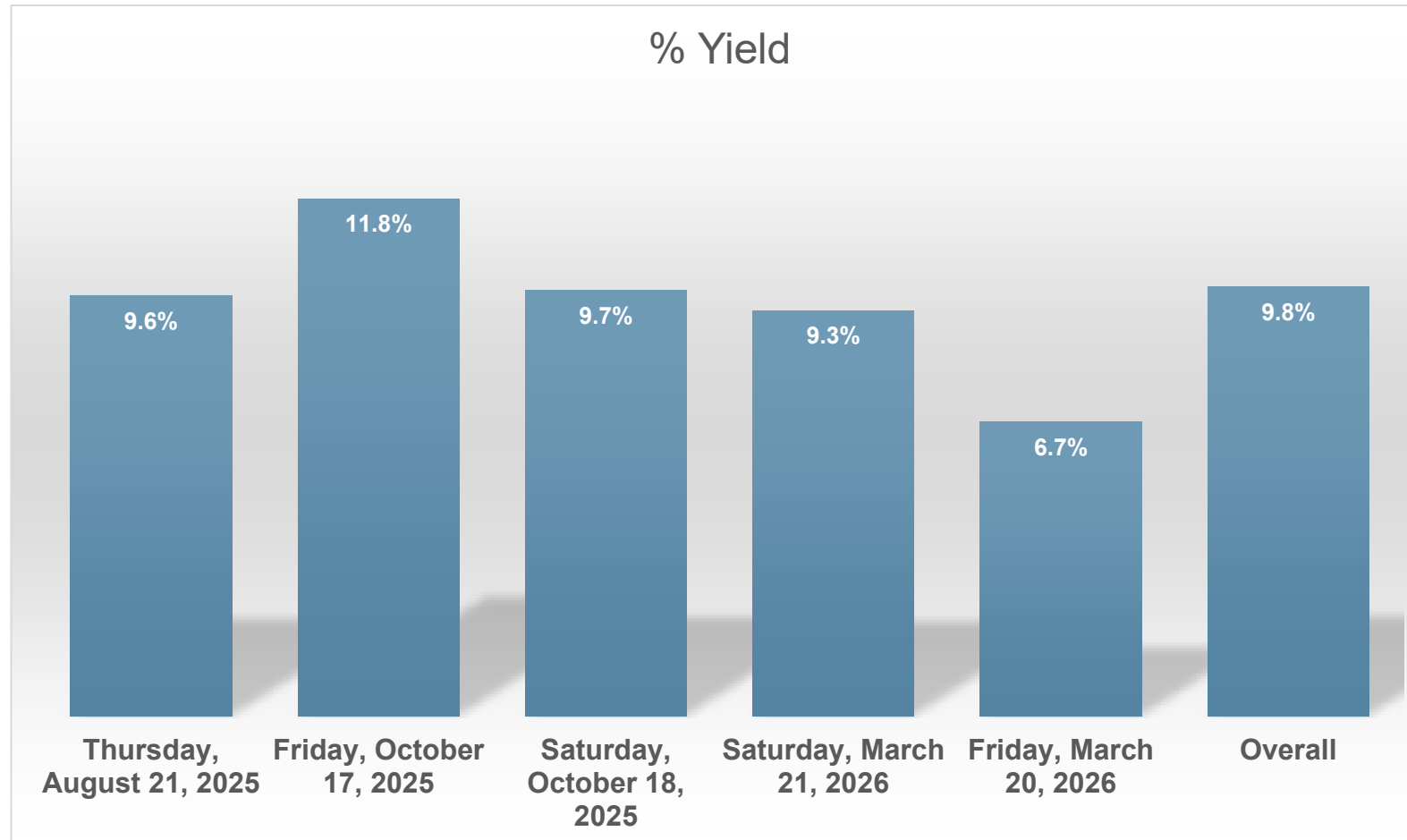
365-day Near-miss Data

- 5,120 total near-misses
- ~14 per day average
- 67% bicyclists;
- 32% pedestrians
- Event day effect ~2x non-event baseline rate

✓ **The data confirmed a quantifiable safety risk that crash data alone did not reveal.**

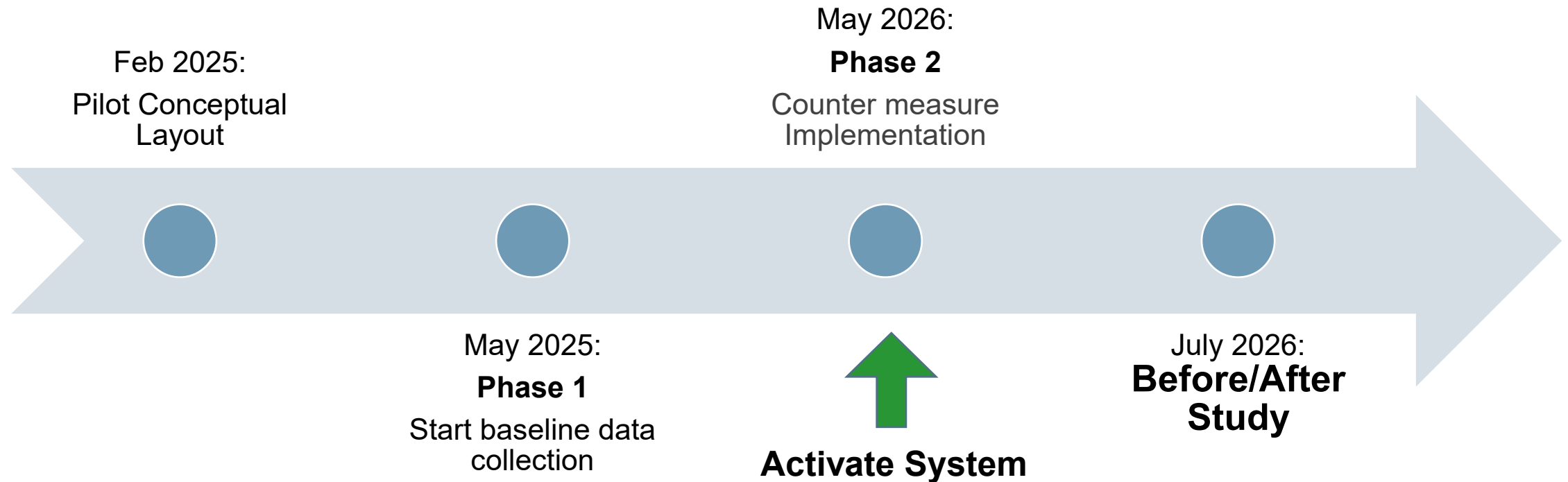
Insights: Yielding Behavior

- Manually sample video to estimate yielding behavior



What's Next

The risk is measured; the system is live — next is the before/after evaluation



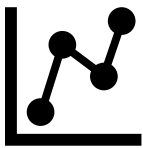
Significance & Replicability

A replicable, low-cost model for VRU safety:



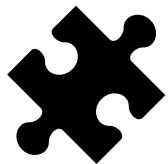
Innovation

Real-time, AI-driven, event-triggered warnings that exceeds MUTCD minimums.



Quantifiable Safety Case

Pre-treatment data; Before/after evaluation to quantify reductions in conflict frequency, severity, and speeds.



Replicability

Built from commercially available components;
Scalable to ramps, mid-block crossings, school zones, and event venues.

Project Team

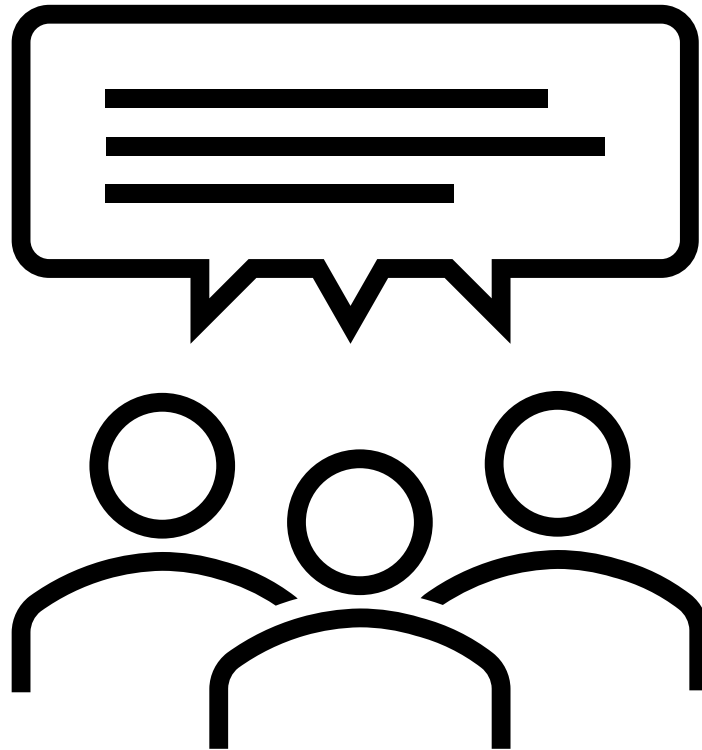
- ❑ New York State Department of Transportation, Region 11
- ❑ ATANE Engineers, Architects, and Land Surveyors
- ❑ PBS Engineering
- ❑ Fortis Consulting Services Corp.
- ❑ KLD Engineering
- ❑ Derq



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Q&A



PDH Questions

1. Name some of the safety challenges at this location?
 - *Horizontal Curvature Limits Sight Distance*
 - *Shea Road (yield) limited sight distance and grade*
 - *Limited visibility for both Vehicles and Vulnerable Road Users (VRUs)*

PDH Questions

2. Which surrogate safety metrics were used to quantify conflict severity?

- *Near miss events*
- *Time to Collision (TTC)*
- *Post Encroachment Time (PET)*

PDH Questions

3. What counter measures were deployed as part of the pilot?

- *Rectangular Rapid Flashing Beacon (RRFB)*
- *Portable Variable Message Signs (PVMS)*
- *Signage*

PDH Questions

4. What are some of the benefits or outcomes demonstrated by this Pilot?

- *Quantifiable safety*
- *Replicability*
- *Innovation*

PDH Questions

5. Name some special events that affect the project location?





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