

Optimizing Video-as-a-Sensor (VaaS) Deployments

Presented by CTRMA & AtkinsRéalis

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CENTRAL TEXAS REGIONAL
MOBILITY AUTHORITY



AGENDA

- 01 Project Details
- 02 Incident Detection Platform
- 03 Infrastructure Requirements
- 04 Verification Testing
- 05 Conclusion

Video-as-a-Sensor (VaaS) Timeline

01

VaaS Pilot on 183A

Objective

Assess the feasibility of video analytics for incidents detection on CTRMA roadways.

Goals

1. Enhance traffic operations through proactive incident management strategies.
2. Minimize the likelihood of secondary incidents and mitigate impacts on other drivers by ensuring faster response times.

Results

1. Pilot effort was successful!

Task Complete

02

Camera Vendor Showdown

Objective

Evaluate camera vendors & models for the best options for CTRMA's CCTV network.

Goals

1. Evaluate camera performance on an objective & subjective (image processing) basis.
2. Select a preferred supplier for all future camera needs.

Results

1. **Hanwha Vision** beat out Bosch, CostarHD, & WTI.

Task Complete

03

Schematic Design & Report

Objective

Develop a strategic plan for establishing a VaaS network across all CTRMA roadways. Utilize tier rating to help quantify level of effort for each site.

Currently

Working on analysis for 183A Phase 3 & 183N schematics & report update.

Next Steps - In Progress

1. Create PS&E packages for installation of VaaS network across two CTRMA roadways.

In Progress - 75% Complete

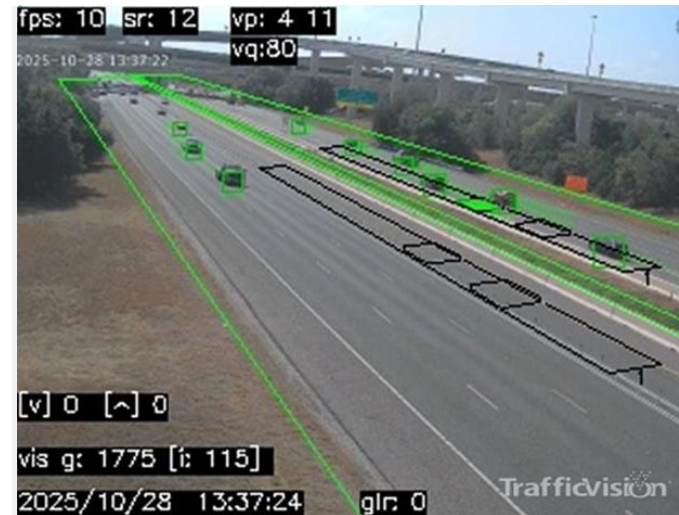
TrafficVision provides CTRMA with a video analytics system to analyze live camera feeds to identify incidents and dangerous conditions in real time.

CTRMA is using video analytics for the following:

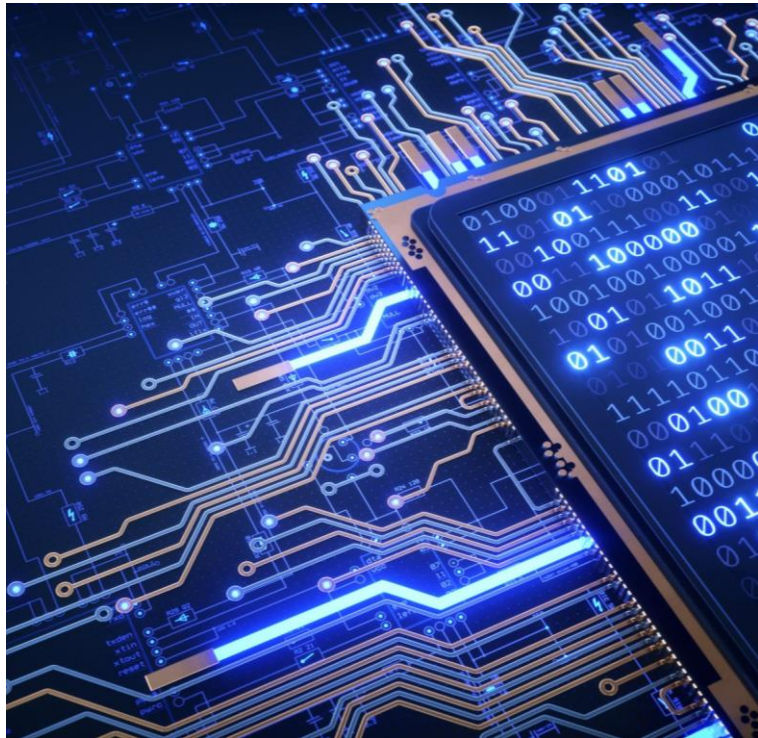
- Vehicle Detection
- Lane Tracking
- Speed Detection
- Congestion Detection
- Stopped/Stalled Vehicles

CTRMA Incident Detection Process

1. Incident detected by TrafficVision.
2. TrafficVision sends alert to Rekor.
3. CTRMA operators verify the incident via Rekor interface.
4. CTRMA operators start standard procedures for managing incidents.



Centralized vs. Edge Computing

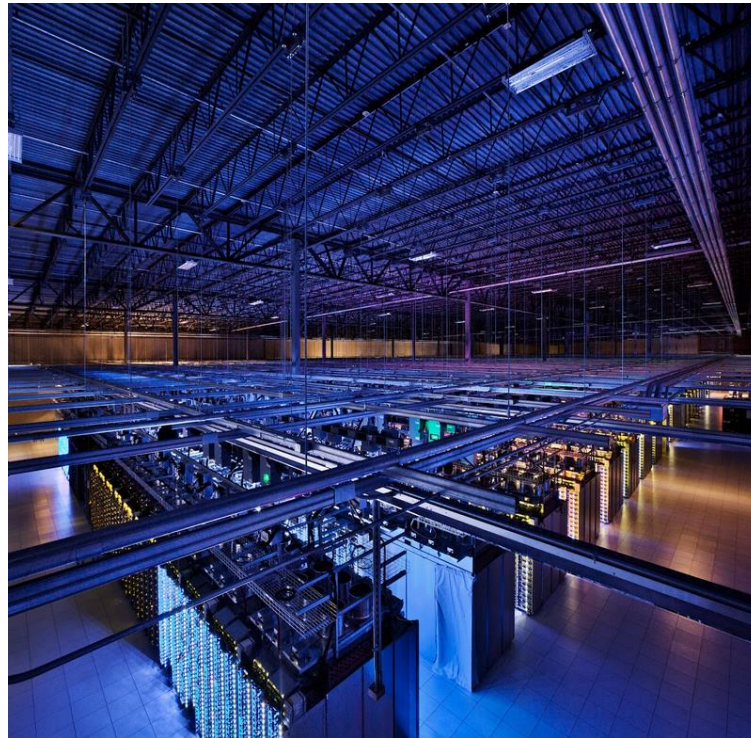


Centralized Computing

Processing video stream at a data center

- Fiber optic network access is highly recommended
- Lower hardware costs due climate-controlled data center environment

Latency between camera and incident detection is approximately 1.5 to 2 seconds for CTRMA.



Edge Computing

Processing video stream on-device or with computer in the field.

- Ideal for rural applications where fiber is lacking
- Higher hardware cost due to need to meet NEMA TS2 environmental requirements (-29.2°F ~ 165.2°F)
- Rely on cellular network to transmit alerts to TMC operators

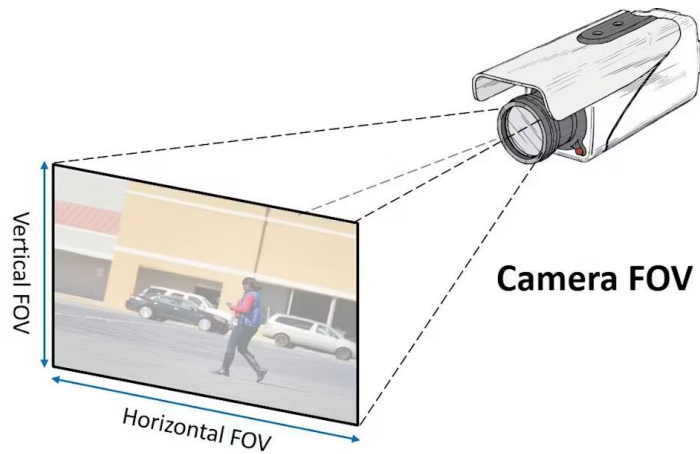
Expected latency between camera and incident detection is less than 0.5 seconds



Camera Technology Glossary

Field of View

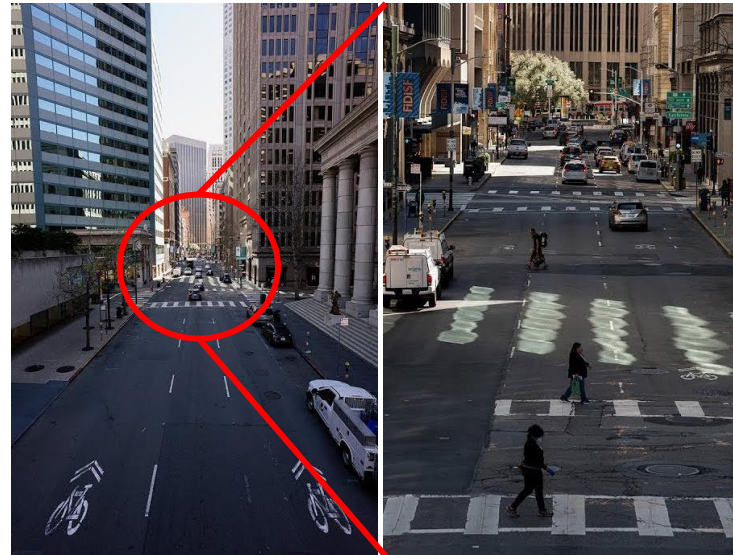
The observable area visible at any given moment is known as the field of view, which is directly influenced by the sensor resolution and lens configuration. This area is also commonly referred to as the coverage area.



Wide View vs. Telephoto View

Wide View is the view that provides largest field of view.

Telephoto View is the “zoomed in” view allows for observation over a distance but limits the field of view.



IEC/EN 62676-4: 2015

A standard that defines pixel densities for CCTV cameras called visualization zones. The zones are measured in Pixels Per Foot (PPF) or Pixels Per Meter (PPM)

- Monitoring – 4 PPF / 12 PPM
- **Detection – 8 PPF / 25 PPM**
- Observation – 19 PPF / 62 PPM
- Recognition – 38 PPF / 125 PPM
- Identification – 76 PPF / 250 PPM

As of October 9th, 2025, a new standard was officially approved called IEC/EN 62676-4: **2025**.

- It establishes even higher minimum pixel densities and two additional visualization zones.

Camera Technology Glossary (cont'd)

Pan, Tilt, Rotate, & Zoom (PTRZ)

- Remote pan, tilt, rotate, and zoom capabilities for camera field of view adjustments facilitate quicker on-site installation.
- Remote adjustments post-installation to accommodate minor shifts in the mounting position from wind or temperature changes.
- The motors are not designed for touring operations and have a limited number of adjustment cycles typically under 200 cycles



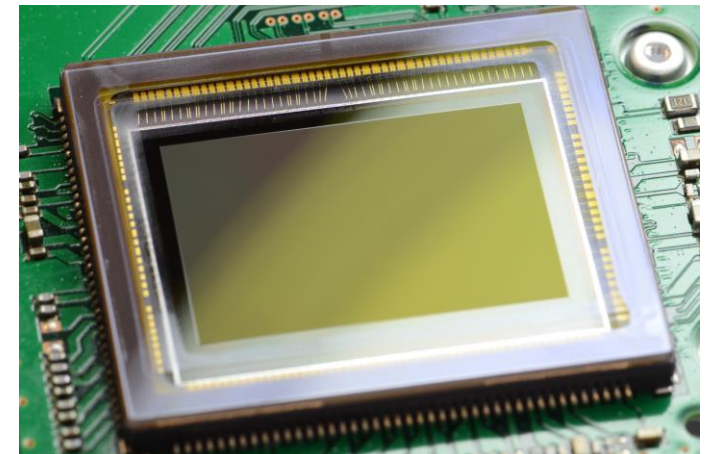
Sensor Resolution vs. Sensor Size

Typically, the sensor resolution has a direct correlation to the size of the sensor

- 2 MP (1080p) - 1/2.8" - 20.17 mm²
- 5 MP (1920p) - 1/1.8" - 38.20 mm²
- 8 MP (2160p) - 1/1.8" - 38.20 mm²

A larger sensor collects more light, improving image quality both day and night, even in low-light areas.

However, it is a balancing act between sensor size & resolution, lighting conditions, and pixel density goals



Camera Detection Area Modeling

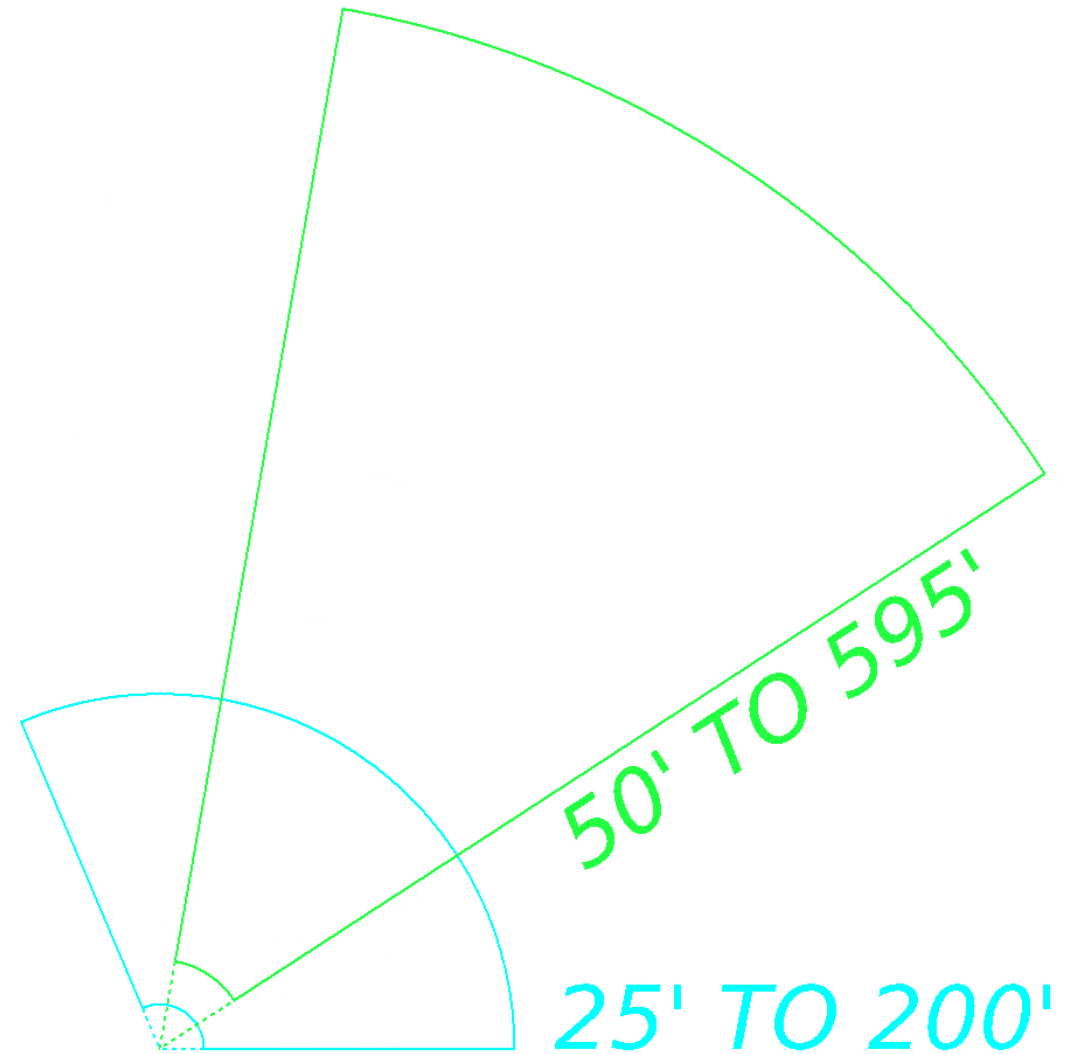
Based on the camera specifications, we can model the estimated useable detection area for each camera.

The example on the right shows two shapes:

- The solid lines show the field of view of the camera.
- The dashed lines are areas that will be outside the field of view of the camera.
- The cyan shape is showing the coverage area when using the wide view of the camera.
- The bright green shape is showing the coverage area when using the telephoto view of the camera.

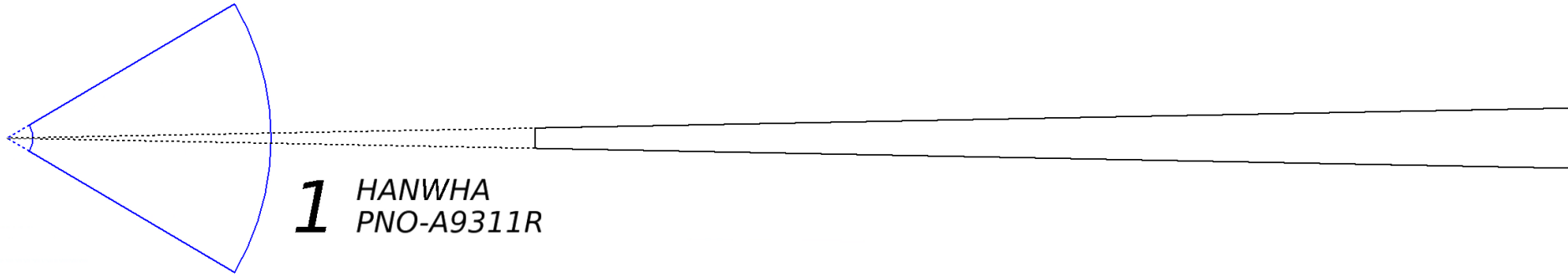
As part of the analysis, five different camera models were analyzed and compared to each other. From the modeling effort, a few lessons were learned:

- Placing cameras more than 45' above the roadway surface reduces the usable detection area.
- The telephoto view was typically the most effective when the field of view angle exceed 45 degrees.

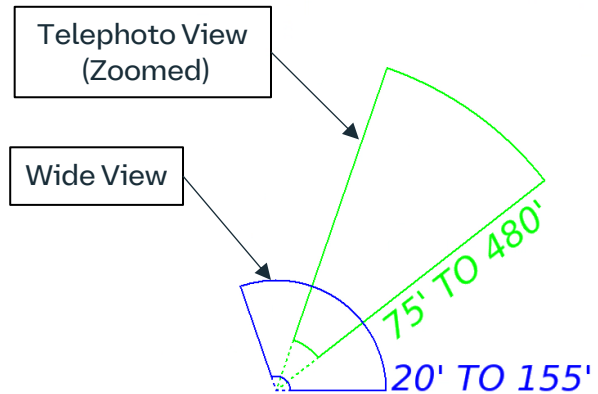


**5 HANWHA
XVN-9083RZ**

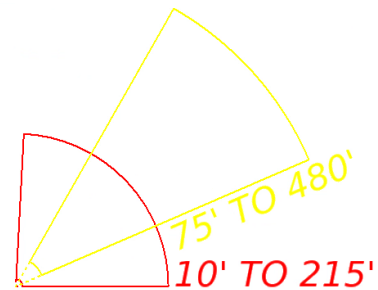
Camera Detection Area Modeling (cont'd)



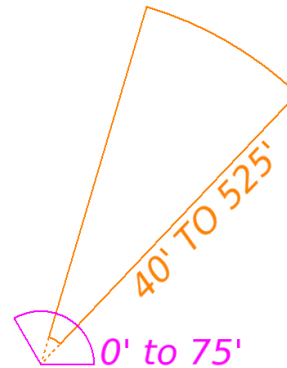
1 HANWHA
PNO-A9311R



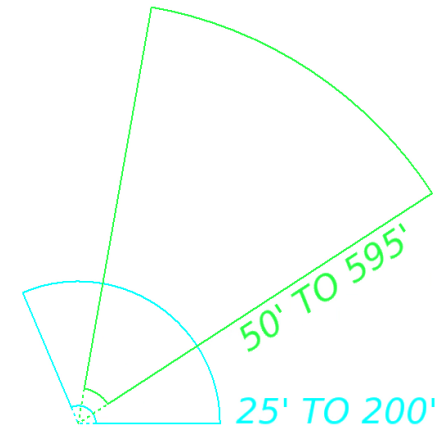
2 HANWHA
PNM-9084RQZ1



3 HANWHA
PNM-9085RQZ1

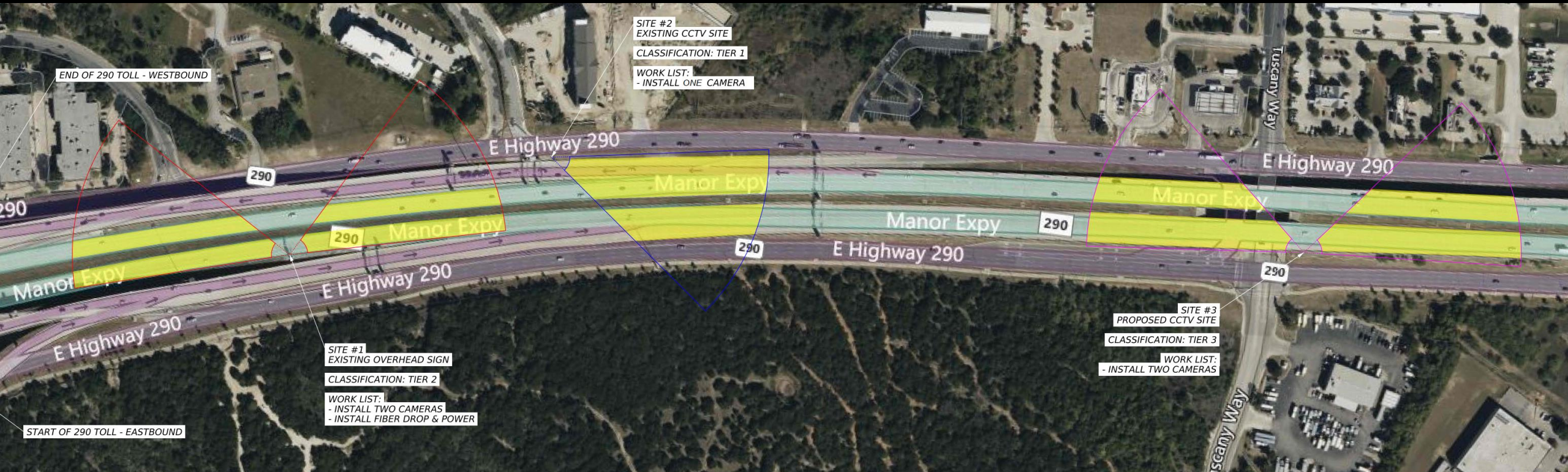


4 HANWHA
XVN-6083RZ

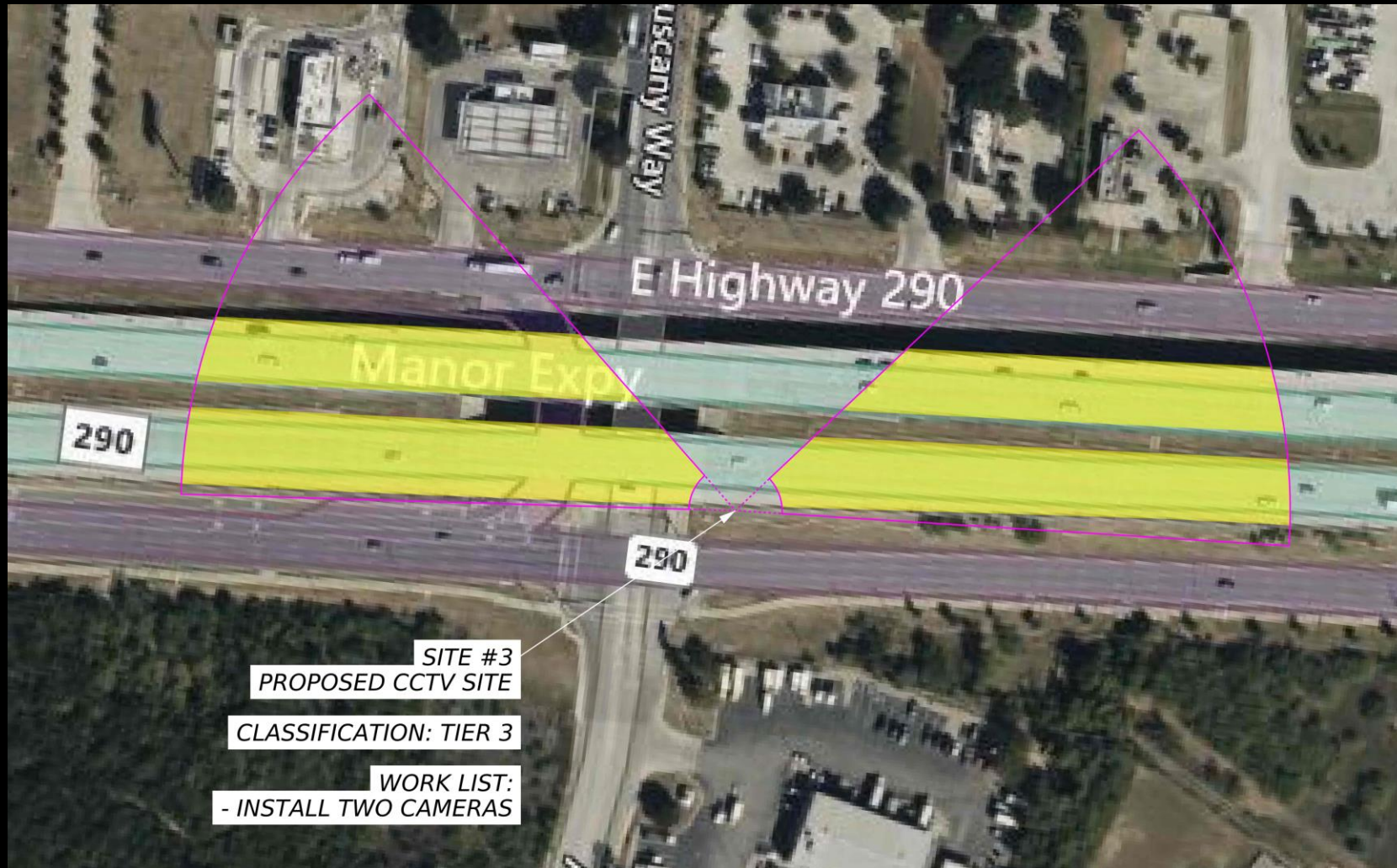


5 HANWHA
XVN-9083RZ

Roll Plot (cont'd)



Roll Plot (cont'd)



Detection Modeling Verification

In April 2025, the selected camera was installed along MoPac near the 183 & MoPac interchange.

Goal 1: Confirm camera performance

- Detection occurring as far as 850 feet, an additional 255 feet, a 30% increase
 - AtkinsRéalis delivered exceptional results
- Significant improvement in commissioning process due to remote PTRZ features

Goal 2: Confirm video quality

- Sample video is 800x600 @ 10 frames per second
- Captured at 4K and the camera down samples video to 240x320 for TrafficVision analysis



Conclusions

01

AtkinsRéalis' technical expertise and detailed product evaluation increased the value of CTRMA's existing video analytics platform.

02

Due to the success of the video analytics program, CTRMA is advancing with a comprehensive deployment on two of its roadways.

03

CTRMA's deployment of video analytics will improve their incident response and assist in preventing secondary incidents.

thank you



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