

Wildlife Detection System

Colorado Dept. of Transportation

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PEW
ENGINEERING

Background



- **Transportation agencies across North America challenged by vehicle collisions with large animals**
 - Alberta: wildlife/vehicle collisions second leading cause of damage claims to cars and trucks
 - Accounts for half of all crashes on rural highways
 - \$280 million a year
 - Average claim tops \$8,000
- **PBX involved with implementation of leading-edge Wildlife Detection Systems to reduce collisions**
 - Hwy 3 Corridors, SW British Columbia, Saskatchewan, Colorado

Project Goals



- **Reduce risk, improve overall safety**
 - Reduce high severity incident rate
 - Reduce traffic violations in corridor
 - Improve user awareness of safe behaviours and risks
 - Improve comfort (drivability) of those using the corridor
- **Focus on proactive prevention and accident mitigation**

Design Approach



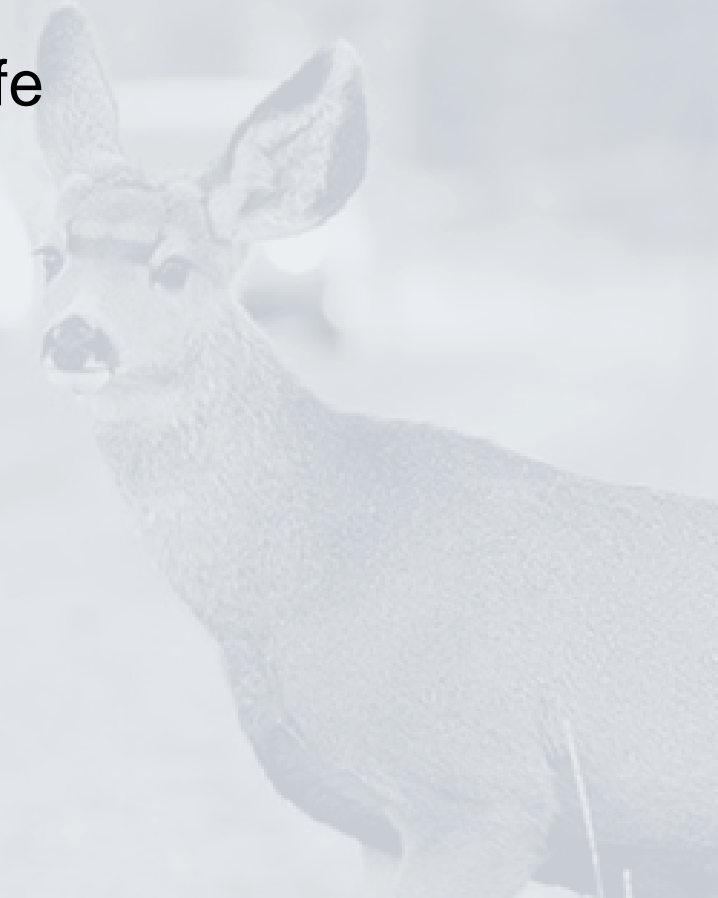
- Based on highly successful system designed and implemented for the BC MoTI

System Design Methodology

- Functional requirements
- Past project analysis (North America wide)
- Technology research and evaluation
- Extensive field investigation
- Preliminary design report
- Detailed design
- Thorough software and system specifications
- Construction/implementation oversight
- Extensive testing and data validation

Concept of Operations

- WDS activates advisory signs upon detection of wildlife
- Signs stay active for the duration that wildlife is within the detection zone
- WDS deactivates advisory signs when wildlife clears
- Detection zone coverage area:
 - Within 4m of paint line on each shoulder, along entire corridor



Technology – Systems Overview

■ Detection

- Radar
- Blind-Spot Mitigation Camera

■ Communication & Control System

- Wireless Bridge
- Communication Equipment
- Control Cabinet



■ Notification

- Gateway Signs
- Warning Signs

■ Validation

- PTZ Camera
- Thermal Cameras
- Inductive Vehicle Loops

System Overview

- System designed to detect the presence of large animals: deer, elk, moose, and sheep
- WDS consists of a dense deployment of COTS ITS field components
 - Detectors
 - Cameras
 - DMS (NTCIP) and static signing
 - Field server
 - Software



Detection Technology



Radars

- Ground based surveillance radars
- Designed for perimeter intrusion detection applications
- Cover large area (1400m/2800m radius)
- Work exceptionally well – highly accurate



Signing Strategy



Gateway Signs

- Shoulder mounted signs at the extent of the detection zone
- Notify motorists when they are exiting or entering a detection zone

Warning Signs

- Static advisory signs constructed with two RRFB affixed above and below static signs
- Function as follows:
 - Upon detection of animal(s), the WDS will activate the Rectangular Rapid Flashing Beacon (RRFB) located on the warning signs
 - Stays active for the duration that the animal is within the detection zone
 - Warning signs deactivated when animal(s) clears detection zone



System Validation

System augmented with cameras for data validation, calibration, and troubleshooting

- Color PTZ
- Fixed thermal

Video recording system integrated into ATMS



Technology Validation

COLOR PTZ

- **Pan-Tilt-Zoom Camera capable of 360° viewing angles**
- **Critical for site security, troubleshooting**
 - Realtime awareness, and validation of the system

FIXED THERMAL CAMERAS

- **Thermal cameras provide ability to view objects in all weather conditions. Video is recorded to support system performance analysis in the following ways:**
 - Prove accurate system performance
 - Help apply rigorous and systematic testing
 - Testing, calibration, data validation
 - Identify issues
 - Adjust sensor configurations
 - Accurately validate the detection capability

INDUCTIVE VEHICLE LOOPS

- **Inductive loops typically provide vehicle data in the form of counts, vehicle speed, occupancy, classification or presence**
- **Data can be used to observe driver behaviour in response to activation of warning signs**

Thermal Camera Validation



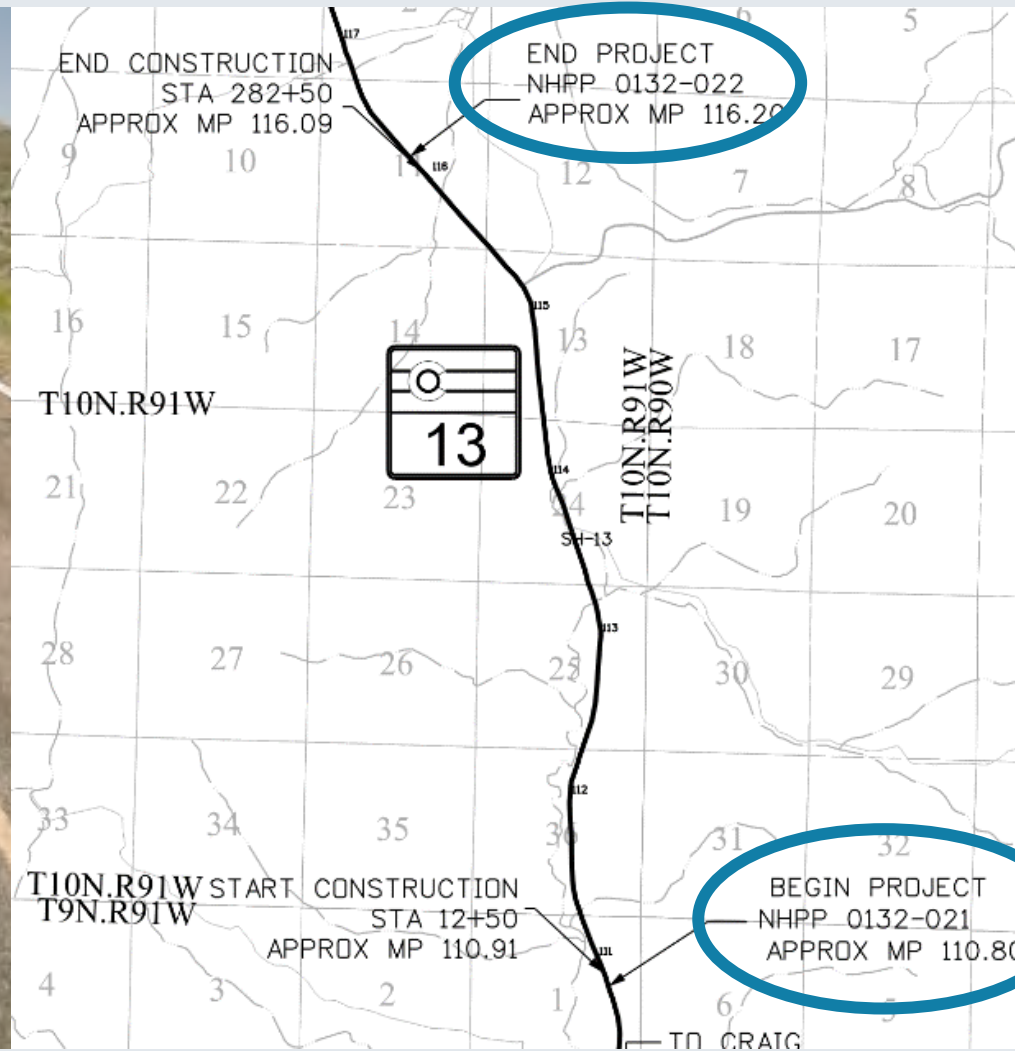
Control System (ATMS)



- System operates autonomously
- Integrates all devices into common platform
 - Control
 - Detection algorithms
 - Reporting
 - Maintenance alerts
- Auto-tracking of detected objects with PTZ slaved to radar
- Detection events are synchronized with video recording
- All major parameters/thresholds are configurable

SH 13 Design Layout

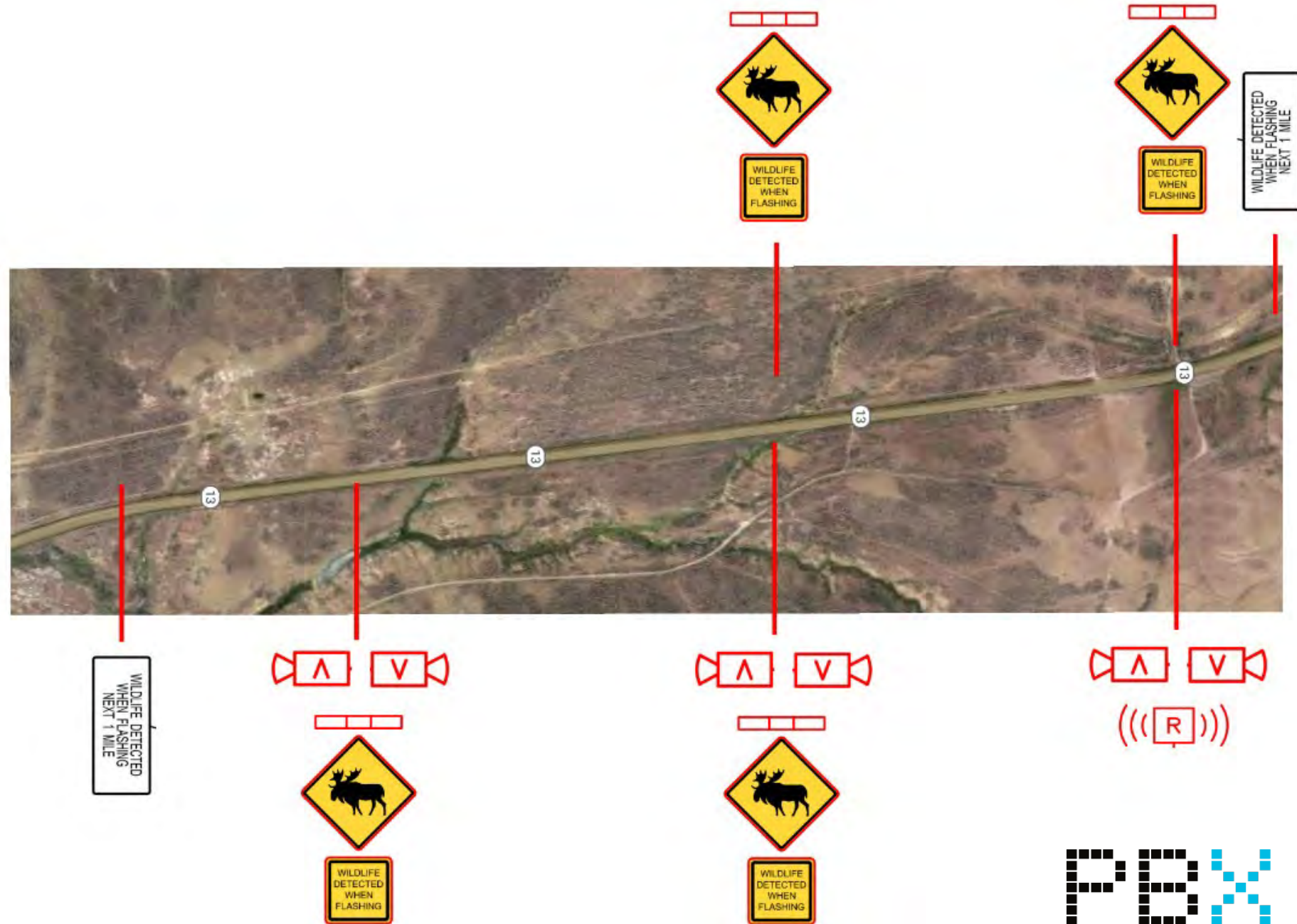
- Site is conducive to use of radar
- Excellent sight lines
- Flat topography
- Wide shoulders



SH 13 Design Layout

Monitoring/detection zone considerations:

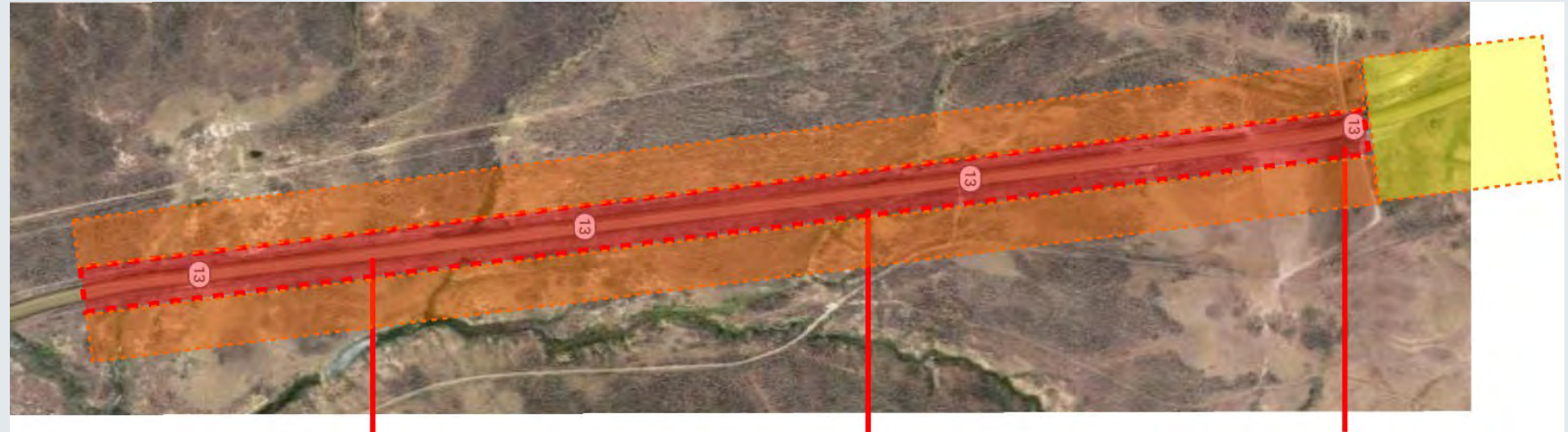
- Can select different areas and apply specific rules



Monitoring / Detection Zones

Considerations:

- Zoning of sign activation
- Activate sign that are geo-relevant to the driver
- i.e. don't activate signs that relate to detections behind the driver



Design Considerations

Site Specific

- Multiple animals on roadside
- Cars, trucks, motorcycles, cyclists, and pedestrians
- Inclement weather
- Obstructions
- Extensive filtering scripts applied over multiple layers of detection zones
- Unknown animal behavior
- Remoteness of sites
- WDS solution (Mobile, Hybrid, or Permanent)
- Signage (Symbol and text)

Gateway Signs

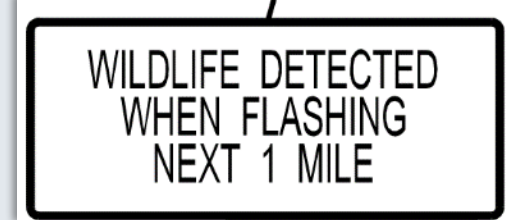
- Overhead vs shoulder mounted structure
- Quantity

Warning Signs

- RRFB vs LED signal heads
- Wording
- Static vs Dynamic
- Location
- Quantity

Design Considerations

Gateway and Warning Sign format



Testing and Data Validation



- Critical to demonstrate and prove accurate performance of the system
- Rigorous and systematic testing methodology developed and applied
- Multiple layers of FT/SAT/UAT testing

Testing and Data Validation



- Realistic test subjects equipped with GPS and radios



Detection Examples



Performance



- System GO-Live: November 2022
- Extensive testing performed to confirm accurate operation of detection and notification sub-systems
- CDoT plans to conduct long term research into overall effectiveness



Thank you.

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QUESTIONS?

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