



“Wireless” Traffic Control Solutions

APPLICATION: Wildlife Crossing System

LOCATION: State Route 260 east of Payson, Arizona U.S.A.

Description

The goal of the project is to alert motorists to the presence of elk, get drivers to slow down, and avoid collisions between motorists and elk. The system employs thermal imaging for detection; electric fencing for channeling of game; radio networking and solar-powered controls. This is a cooperative effort between Arizona Department of Transportation (ADOT); Arizona Game & Fish Department (AZGFD); the Federal Highway Administration, and the USDA Forest Service.

Traffic patterns at the site

The primary conduit for traffic to the Arizona Rim country and the White Mountains has been SR260 from Payson to Show Low: a two-lane highway with occasional passing lanes and a speed limit of 55mph. ADOT has been engaged in a long term build-out to expand a 17-mile stretch of SR260 to a four-lane highway with a median. Expansion work on the first three of five planned sections is complete, prioritized on the incidence of wildlife-vehicle collisions. The posted speed on the upgraded highway remains 55mph but may be raised depending on conditions.

Game crossing issues

Northern Arizona has a large elk population in its higher elevations. Along this upgraded 17-mile stretch, over 100 wildlife-vehicle collisions were documented in 2001; 73 involving 600-pound-plus elk which can cause substantial vehicle damage and serious human injury.

Seven of 11 wildlife underpasses have been installed as part of the roadway improvement project, along with six completed bridges. The underpasses were designed large enough to allow elk to pass without issue. These underpasses were supplemented with 8-foot high game fences to funnel the wildlife to and through the underpasses. AZGFD has recorded over 9,000 animals by video surveillance at six of the underpasses; more than half have passed under SR260 without endangering motorists. On one upgraded section completed in 2004, 50 percent of the length was strategically fenced based on elk crossing patterns determined from Global Positioning System (GPS) telemetry.

In the year after the section was opened to traffic, before fencing was erected, 52 elk-vehicle collisions were recorded. In the two years since fencing, only 11 collisions with elk occurred each year, a nearly 80 percent reduction. The fencing actually improved the elk's ability to cross the highway. The elk passage rate increased 60 percent with fencing which serves to funnel elk to the underpasses where they can cross unimpeded below grade.



Advanced solar-powered flasher for wildlife crossings.



“Caution Elk Detected”



System/site configuration

The basic traffic control equipment consists of two video processor/detection locations, two solar-powered flasher assemblies and two variable message sign units (VMS). The towers with the cameras are approximately 100 feet from the actual detection zone. The solar flashers about 50 feet in advance of the actual crossing and the VMS units are about 500 feet in advance of the crossing. It should be noted that the VMS units are trailer mounted so they can be moved during the two-year testing period if their present location proves unacceptable. There are two automatic exit gate points in the system which allow animals a means to exit the roadway area if they become trapped. The exit gates are equipped with sensors and solar-powered gate opening units which open when an animal is detected on the roadway side of the fence.

Electrobraided fencing

Since there is no way to funnel animals either over or under the road at the west end of the project zone, an active, pedestrian crosswalk system was installed. However, the challenge to the system design was to get the animals to cross at a specific point on the highway. Electrobraided game fencing was installed from the natural underpass at the Preacher Canyon Bridge to the roadway crossing point. The 8-foot high fence is designed to channel any large game animals to the highway crossing: the only entry-exit point in the system.

Detection

Detection of elk or other large game animals is done using thermal imaging techniques. Each side of the road is equipped with a 30-foot tower set back from the crossing zone approximately 100 feet. Each tower is equipped with IR lamp arrays and IR sensitive cameras. Each side contains its own industrial computer unit which includes an image processing card and an Ethernet bridge between the two processors. When a target fitting the software algorithm is seen in the image field the system activates the warning devices, solar flashers and VMS units, via a radio link.

Solar flashers

To warn motorists that elk have been detected at the crossing, dual 8-inch solar flashers, one unit for each approach, were placed approximately 30-feet in advance of the crossing zone. The flasher unit is assembled on a 15-foot ADOT Type A-2 pole with a breakaway base. It includes a 36-inch W11-3A diamond grade sign with an elk symbol on it as well as a W-7 "When Flashing" sign beneath it.

Each pole was outfitted with two Precision Solar Controls Model 1384, 8-inch LED lamps. The controls for the equipment consist of a modified STC Solar Ped-X control. It includes a spread spectrum radio transceiver, programmable logic module and a DPC-2000 integrated charge/flasher control. Since this is a pilot project, a 2.5-inch LED lamp cluster was placed on the rear of each flasher unit to act as a confirmation lamp and is positioned to be visible to the IR camera.

VMS units

In order to provide motorists with as much warning as possible, VMS units have been placed in advance of the crossing. Both units were outfitted with a modified STC Solar Ped-X control package to allow them to function in an identical fashion to the flasher units. Using the Priority Encoded Sensor feature on each trailer allows the Solar Ped-X controls to interface with VMS controls so if the operating-time register value in the logic has a value, the sign will display "Caution Elk Detected." When the operating-time register reaches zero the sign goes blank and remains so until activated again.

Data to be collected

Currently the project employs two Numetrics Groundhog embedded roadway data collection units to monitor speeds at the crossing. For more information, go to www.solar-traffic-controls.com Articles /References; "The Nation's Most Advanced Game Crossing System" IMSA Journal, March /April 2007

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