

**QUARTER 4 2006**

**ANIMAL VEHICLE CRASH MITIGATION USING ADVANCED TECHNOLOGY**

**PHASE II**

SPR 3(076) & Misc. Contract & Agreement No. 17,363

for

Oregon Department of Transportation  
Research Unit  
200 Hawthorne SE, Suite B-240  
Salem OR 97310

and

Federal Highway Administration  
400 Seventh Street SW  
Washington, DC 20590

and

Departments of Transportation of California, Indiana, Iowa, Kansas, Maryland, Montana, Nevada, New Hampshire, New York, North Dakota, Pennsylvania, Wisconsin, and Wyoming

**CONTENTS**

<b>OCTOBER</b>	<b>PAGE 2</b>
<b>NOVEMBER</b>	<b>PAGE 7</b>
<b>DECEMBER</b>	<b>PAGE 8</b>

## ***Monthly report Animal-vehicle pooled fund study***

### **October 2006**

#### General

1. WTI-MSU summarized the known publications as a result of the press release (see attachment A).
2. A meeting date for the TAC was set: 5-6 Dec 2006 in Big Sky. Arrival on 4 Dec, Departure on 6 Dec.

#### **Task 1: Site survey            100%**

1. The results of the site survey and a summary were made available to the TAC.
2. WTI prepared subcontract with Eagle Rock Timber and STS for system modifications.

#### **Task 2: Modifications to system            80%**

1. Eagle Rock Timber and STS representative Doug Simpfenderfer conducted the modifications (Eagle Rock Timber work scope) on 9 and 10 Oct 2006.
2. WTI ordered additional brackets and they were sent on 10 Oct 2006.
3. STS conducted a site visit 11-18 Oct to conduct system modifications (STS workscope).
4. Christie Hendrix (YNP), Lloyd Salsman (STS), and Marcel Huijser (WTI) met on 17 Oct to discuss vegetation maintenance within and outside of the right-of-way.
5. MDT conducted additional vegetation management on 31 Oct 2006. Morning: within right-of-way; afternoon: outside of right-of-way, directed by Marcel Huijser (WTI).

#### **Task 3: Confirmation of system modifications            20%**

STS confirmed that the work conducted by Eagle Rock Timber was done correctly during and after Eagle Rock Timber conducted the work..  
YNP confirmed that pole removals and pole installation was done correctly on 17 Oct.

#### **Task 4: System reliability 0%**

#### **Task 5: System effectiveness 0%**

#### **Task 6: System acceptance 0%**

**Task 7: Information to project partners 31% (month 10 out of 32)**

**Task 8: System removal 0%**

Marcel Huijser

Attachment A.

Known publications as a result of our press release

Interviews:

Billings Gazette (see also link below)

Technology Review (see also link below)

Photonics Spectra magazine

The Engineer & The Engineer Online (UK) (see also link below)

**USA Today** (see also link below)

Wyoming Public Radio

Better Roads Magazine

Philadelphia Inquirer

The Gazette, Cedar Rapids

WIZ-CBS Radio--Boston

See also the following websites:

<http://upi.com/NewsTrack/view.php?StoryID=20060912-043207-3060r>

[http://www.eurekaalert.org/pub\\_releases/2006-09/msu-hem091206.php](http://www.eurekaalert.org/pub_releases/2006-09/msu-hem091206.php)

<http://www.bestfriends.org/blogs/index.cfm?page=news&mode=entry&entry=A2B9344F-BDB9-396E-948E10F4213E0023>

<http://www.ens-newswire.com/ens/sep2006/2006-09-13-09.asp>

<http://www.sciencedaily.com/upi/index.php?feed=Science&article=UPI-1-20060912-16360900-bc-us-animaldetect.xml>

<http://www.physorg.com/news77295974.html>

<http://news.webindia123.com/news/Articles/Science/20060913/449161.html>

<http://www.newsguide.us/education/science/High-tech-equipment-may-help-reduce-wildlife-vehicle-collisions/>

[http://www.newsvantage.com/perl/p/wed/ac/Uus-animaldetect.RRNq\\_GSC.html?day=Tue&yqy&g=tw.top](http://www.newsvantage.com/perl/p/wed/ac/Uus-animaldetect.RRNq_GSC.html?day=Tue&yqy&g=tw.top)

<http://story.indiagazette.com/index.php/ct/9/id/9877908d658dc10e/cid/a9927dde6777aafc/>

<http://sttammany.com/news-detail/article/560/roadway-anim.html>

[http://www.playfuls.com/news\\_002167\\_Roadway\\_Animal\\_Detection\\_System\\_Developed.html](http://www.playfuls.com/news_002167_Roadway_Animal_Detection_System_Developed.html)

[http://science.monstersandcritics.com/news/article\\_1200853.php/Roadway\\_animal\\_detection\\_system\\_developed](http://science.monstersandcritics.com/news/article_1200853.php/Roadway_animal_detection_system_developed)

<http://www.testandmeasurement.com/content/news/article.asp?DocID=%7BE3F30E74-15D2-47F3-8604-31B910D980A0%7D&Bucket=Current+Headlines&VNETCOOKIE=NO>

<http://www.innovations-report.de/html/berichte/studien/bericht-70471.html>

<http://www.ccnmag.com/news.php?id=4467>

<http://www.newswise.com/articles/view/523444/>

<http://www.e4engineering.com/Articles/296066/Putting%20an%20end%20to%20roadkill.htm>

[http://www.helenair.com/articles/2006/09/12/health/c01091206\\_03.txt](http://www.helenair.com/articles/2006/09/12/health/c01091206_03.txt)

<http://www.billingsgazette.net/articles/2006/09/20/news/state/45-warning.txt>

[http://www.magicvalley.com/news\\_other/news\\_idaho/?storyid=/dynamic/stories/M/MT\\_WILDLIFE\\_DETECTION\\_DEVICE\\_IDOL-](http://www.magicvalley.com/news_other/news_idaho/?storyid=/dynamic/stories/M/MT_WILDLIFE_DETECTION_DEVICE_IDOL-)

<http://www.localnews8.com/news/regional/3963281.html>

<http://latestinsciencetechnology.blogspot.com/2006/09/high-tech-equipment-may-help-reduce.html>

<http://www.yellowstone.net/forums/viewtopic.php?p=50701&sid=bfc94e6ba9bc189737420a93c0e406c1>

<http://pressreleasegold.com/09/13/09.htm>

<http://www.newsdaily.com/Science/UPI-1-20060912-16360900-bc-us-animaldetect.xml>

<http://www.jacksonholestartrib.com/articles/2006/09/23/news/regional/a089909022114de6872571ef00694d95.txt>

<http://www.what-is-this.com/blogs/my-media-blog.html>

[http://bigcatrescue.blogspot.com/2006\\_09\\_01\\_bigcatrescue\\_archive.html](http://bigcatrescue.blogspot.com/2006_09_01_bigcatrescue_archive.html)

<http://www.technologynewsdaily.com/node/4423>

<http://www.iee.org/oncomms/sector/transport/SectionNews/Object/CC35B51A-0952-3BA1-606D76FBD2EC60A7>

<http://www.casperstartribune.net/articles/2006/09/23/news/regional/a089909022114de6872571ef00694d95.txt>

<http://waterandwoods.net/news.php?extend.2035>

[http://www.magicvalley.com/news\\_other/news\\_idaho/?storyid=/dynamic/stories/M/MT\\_WILDLIFE\\_DETECTION\\_DEVICE\\_IDOL-](http://www.magicvalley.com/news_other/news_idaho/?storyid=/dynamic/stories/M/MT_WILDLIFE_DETECTION_DEVICE_IDOL-)

[http://www.usatoday.com/news/nation/2006-10-04-drivers-deer\\_x.htm](http://www.usatoday.com/news/nation/2006-10-04-drivers-deer_x.htm)

[http://www.technologyreview.com/read\\_article.aspx?id=17581&ch=infotech&sc=&pg=1](http://www.technologyreview.com/read_article.aspx?id=17581&ch=infotech&sc=&pg=1)

<http://www.billingsnews.com/story?storyid=21250&issue=355>

Other articles/notes appeared in:

Transportation Communications Newsletter  
Wednesday, September 20, 2006 -- ISSN 1529-1057

TRB Transportation Research E-Newsletter - September 5, 2006

“a hunting magazine”

“ an am radio station, probably Billings, MT”

Bozeman Chronicle Tue 26 Sep and earlier that week (according to Pat McGowen and Rob Ament)

## ***Monthly report Animal-vehicle pooled fund study***

### ***November 2006***

#### General

3. WTI organized and prepared for the TAC meeting (5-6 Dec 2006) in Big Sky.

#### **Task 1: Site survey            100%**

3. The results of the site survey and a summary were made available to the TAC.
4. WTI prepared subcontract with Eagle Rock Timber and STS for system modifications.

#### **Task 2: Modifications to system            90%**

6. STS further developed soft- and hardware for remote access through satellite.
7. A draft procedure for remote access was provided to MDT for review.

#### **Task 3: Confirmation of system modifications            20%**

#### **Task 4: System reliability 0%**

#### **Task 5: System effectiveness 0%**

#### **Task 6: System acceptance 0%**

#### **Task 7: Information to project partners            34% (month 11 out of 32)**

#### **Task 8: System removal 0%**

Marcel Huijser

## ***Monthly report Animal-vehicle pooled fund study***

### ***December***

#### ***2006***

##### General

4. The TAC meeting was held on 5-6 Dec 2006 in Big Sky. Meeting notes are in attachment A.

**Task 1: Site survey            100%**

**Task 2: Modifications to system            90%**

1. STS further developed soft- and hardware for remote access through satellite. A demo was shown to the TAC, incl. MDT representatives during the TAC meeting.
2. Solar panels (loosened by elements) were re-attached by MDT between 6-8 Dec.
3. The batteries were serviced/replaced by MDT on 13 Dec.
4. 2 variable message signs were installed (one on each end) by MDT, probably on 13 Dec.
5. The black on yellow warning signs were installed around 19 or 20 Dec (by MDT), making the system fully operational for the drivers.
6. Satellite access is still under development (this is the last component of system modifications).

**Task 3: Confirmation of system modifications            30%**

**Task 4: System reliability 0%**

**Task 5: System effectiveness    0%**

**Task 6: System acceptance       0%**

**Task 7: Information to project partners            38% (month 12 out of 32)**

**Task 8: System removal 0%**

Marcel Huijser

Attachment A  
Meeting notes TAC meeting 5-6 Dec 2006 Big Sky

**Animal Detection System - Highway 191 (Yellowstone) Pooled Fund Study  
TAC Meeting, Big Sky 12/4-12/6/06**

Meeting notes by Angie Kociolek and Rob Ament.

**In attendance:**

James Merriman (WI)  
Greg Placy (NH)  
Pete Hansra (CA)  
Andrew Morrow (KS)  
Troy Jerman (IA)  
June Ross (OR)  
Kevin Powell (WY)  
Kevin Bruski (MT)  
Deb Wambach (MT)  
Bill Branch (MD)  
Kyle Williams (NY)  
Allan Covlin (ND)

Lloyd Salsman (STS)

Marcel Huijser (WTI)  
Rob Ament (WTI)  
Angie Kociolek (WTI)

**Monday 12/4**

Arrival

**Tuesday 12/5**

Introductions for new TAC members

**Powerpoint #1: project history (MH)**

1993 – first Animal Detection System (ADS) in Switzerland; now several locations in US and Europe

Technologies include: area cover (IR, microwave), break the beam (IR, laser, microwave), geophone, radio collar

Highway 191 is a micro-wave break the beam system.

Problems encountered here: (2<sup>nd</sup> generation system changes discussed later)

Reliability sensors

Extreme and dynamic environment

Power - solar panels in shade; need for extra panels, batteries

Posts – obstacle; safety hazard

Hazardous materials – can bury them

Snow on panels and snow spray; use sleeves to keep snow off sensors

Type of warning sign? – verbage “use extra caution...” helped increase correct interpretation by drivers that deer may still be on roadway

Aesthetics – big equipment

<b>Year</b>	<b>YNP</b>	<b>PA</b>
1999	Project started	
2000	Site and STS selected	
2002	System installed	Site selected
2004	System reliable	System installed
2005		System removed

When the receiver stations detect a valid break of the beam, they send a signal to the master station. The three nearest signs light up.

Reliability tests compared data pattern with snow tracking every 24 hours and compared system log with camera images.

Other things besides animals get registered by the sensors – snow plow spray, skiers using trail head (small %), traffic at Black Butte Ranch (BBR), other and unknown.

Can determine detection data patterns:

East-west; west-east; if beam broken on one side then shortly after on other side, that is a clear detection of an object (probably animal) crossing the road.

Warning signals stay on for 3 minutes but 13% of crossing events (one or multiple animals) are not completed within that time frame; animals may linger in right-of-way.

Snow tracking found that some animals approach the road and others walk parallel to the road.

This system is designed to detect elk and it is indeed detecting elk. Wolf and coyote are less than 4 ft tall so are not or, rarely, detected.

There was a fair amount of blind spots (about 12% of total road length) when testing at regular intervals with humans

Cannot test effectiveness here until we put up signs.

In Nugget Canyon, a big portion of traffic was trucks that did not slow down substantially; perhaps because they do not sustain damage themselves.

A small reduction in vehicle speed at high speed does help exponentially reduce the risk of a fatal crash. Therefore, even small reductions in speed can be beneficial.

By being alert, one can decrease the stopping distance substantially; animal detection systems can be effective through increasing alertness, reducing vehicle speed, or a combination of the two.

Cost-benefit analyses show that ADS can have financial merit for  $\geq 5$  deer/mile/year,  $\geq 3$  elk/mile/year and  $\geq 2$  moose/mile/year.

Potential applications of ADS include: on road, with fences, with fences that funnel, or with crossing structure.

Pros of ADS over crossing structures: offers a wider crossing area for wildlife; may be less expensive; portable

Cons: geared to large animals only (lacking in conservation perspective); avoidance not addressed (animals may avoid pavement); human safety hazards (poles and animals that still make it onto the roadway)

## **Powerpoint #2: system modifications (MH)**

Concerns:

MDT – the blind spots were reduced from about 12% to less than 1% of the total road length.

NPS/MDT regarding vegetation management – MDT has the right to manage; there was disagreement regarding width; MDT agreed to do minimal maintenance in a consistent fashion for data collection.

STS – can provide feedback for when mowing is necessary (IN does this).

Because of the impact, cost, crossing patterns, it is a good idea to keep vegetation management to a minimum.

In WI, the cost of reintroduced elk is a consideration when estimating costs of WVCs. Of about 100 individuals, about 8 have been hit.

This system works on mm waves (2 cm system) so small objects are not registered.

15 foot from sensors rule clearing of vegetation; 400 m is the maximum distance between sensors.

Adjusted thresholds for noise so not too sensitive. There is also a time threshold so don't register birds flying through.

The system now automatically deals with parked cars. It shuts down, then starts working again.

This system functions between -40 degrees F to 130 degrees F.

### **Powerpoint #3: system modifications (LS)**

Blind spots:

- determined precise measurements of where spots occurred
- design errors, beam too high
- regular maintenance
- poles/equipment removed

Figured out what the manufacturer was of the bracket for the sensors through emailing TAC; Andrew recognized it.

MDT will be in charge of the system during the data collection/testing. Originally were going to wait for remote access and signs but MDT will not wait for remote access because it's important to start collecting data. Data collection will start soon (February 2007 for about one year).

2-tiered access system online

- 1<sup>st</sup> level – see auto message, beam break record, etc. (everyone involved with the project can have access)
- 2<sup>nd</sup> level – have control of turning system on and off.

Kevin Bruski (MDT) asked for feedback, suggestions and communication from TAC.

Fog has no effect.

Lloyd gave a very detailed summary of issues, fixes, how it works....

Orbcom – where data is archived

Vikon Co. – provides functionality

Go to website

Log in

Red – received command, no reply, not listening

Yellow – pending

Green – working

There is a certain amount of noise required (vegetation moving in breeze, etc.) and the object that breaks the beam must be of a certain threshold in order to be sensed.

To know if system is working, go to Vikon website.

-Actual detections, beam breaks

-All data is on card at master station

-C++ software can be used to analyze reams of data when researching reliability or want to know about a particular day.

#### **Powerpoint #4: Related research (MH/RA)**

Marcel talked about Lewistown project

Rob talked about ROCS

Troy Jerman raised concern about accident data standardization in National Parks because he's worked with a group of states trying to do same thing.

#### **Field trip**

Traffic speed measurements will be taken manually in winter while parked at BBR; in summer maybe tubes. Important thing is to be inconspicuous so as not to influence drivers. Will collect data with sign lights on and off.

Group dinner at restaurant "By Word of Mouth"

#### **Wednesday 12/6**

#### **Powerpoint #5: 2nd generation system (LS)**

When beam intensity drops = intrusion; can tell if it's an animal or a car by its signature.

Wavelength processors are being trained to recognize shapes/signatures (such as resident woman on a horse)

It is important that there is some noise so system is not so sensitive it registers flying birds.

Changes resulting in 2<sup>nd</sup> generation system:

-"on event" radio signal – saves energy; 1% of 1<sup>st</sup> generation

-made many changes to save energy – overall 10% of energy of 1<sup>st</sup> gen

-made smaller foot print

-moving solar panels away from road, hide in vegetation

-put gel cell batteries in a vault underground

MDT will fix solar panel (loosened by wind) and batteries.

WTI will complete checklist (except for remote access for time being) and MDT will take ownership.

When MDT is ready (Friday 12/8 the earliest), they will attach signs and get beacons working.

Research will start soon after (February).

Effectiveness – vehicle speed in a range of weather conditions and with lights on/off. Lloyd says can control lights remotely.

Driver opinions – questionnaire; do people understand its function?

Road kill – ongoing MDT/YNP do this

In August 2007, will discuss research via conference call.

In May 2008, in Big Sky, will discuss research, report for phase II, system removal and end project August 31, 2008.

YNP is adamant must remove by August 31, 2008 but will discuss results first. If positive results, then maybe can persuade to keep in place.

### **Powerpoint #6: patent**

For patents, must check and refute each claim. Claims are the only important section of the patent.

Oh Deer Co. put the concept out there and gets \$1,000 each year from those who use something similar. STS pays but company in Switzerland probably does not.

### **To do list:**

1. Bill Branch would like to see patent issue addressed. Marcel will check with Carol Tan to see what FWHA wants to do about this.

2. Pete Hansra asked June Ross for list of participating states and level of funding.

3. June (ODOT) requested more opportunity to evaluate the approach for studying effectiveness; Marcel will write up and send out

4. Jim (WisDot) wants:

-to know how to prioritize for lane/miles

-criteria for placement, defensible info by which to select sites

-preapproved materials, accepted standard by DOTs (buried boxes, etc.)

Who will do this?

5. Rob suggested local media before putting up signs