

Survey of Montana Vehicle Infrastructure Integration (VII) Related Testbed Activities

	Research/Project Title & Description	Sponsoring Organization/ Researchers	Point of Contact	Key Applications	Communications Media	Time Frame	Status (current/ planned)	VII Arch. & Stds. Compliance	Assessment: Relevance to VII Program
27	<p>NSF/USDOT Partnership for Exploratory Research - ICSST: Timely and Effective Dissemination of Traveler Information in Rural Areas</p> <p>The Department of Electrical and Computer Engineering at Montana State University collaborated with WTI in a project that explored alternative technical and structural approaches to effectively disseminating traveler information in rural areas. Researchers used a systems engineering approach to incorporate technologies and methodologies from diverse disciplines. Peer to-peer, ad hoc communications between vehicles and between vehicles and roadside sensors, using recent advances in wireless technologies such as DSRC and ad hoc networking protocols are being explored to serve as a surrogate for extensive fixed communication and information infrastructure. Human factors and inputs from private and public sector stakeholders are being used to further shape the system design.</p>	National Science Foundation/ USDOT	Richard Wolff Montana State University, College of Electrical and Computer Engineering (406) 994-7172; rwofff@ece.montana.edu	ITS Applications: Traveler Information Day 1 Applications:	Wireless DSRC	N/A	Complete	Yes	Rural Applications Vehicle-infrastructure Simulation

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28	Blackfeet Automated Accident Reporting System The objective of this project was to improve accident reporting through the application of advanced technology to increase the accuracy and completeness of accident reporting. This project will provide a system to improve the current system of accident reporting by addressing several issues; the inaccuracy of data, the incompleteness of the data and the potential errors associated with transcribing and communicating the data. The basis of the improvement is the use of mobile computing systems to collect the data at the accident scene and using Global Positioning System (GPS) units to identify the accident locations with greater precision than can be done manually. The advantages of the improvement will be superior accident report data and improved accuracy in the resulting reports. There are two major pieces to the system: the mobile data collection portion and the fixed data upload and database interface portion.	Robin Kline USDOT/Research and Innovative Technologies Administration, Office of Research, Development, & Technology 400 Seventh St SW Room 2440 Washington DC 20590-0001 202-366-2732 robin.kline@dot.gov	Steve Albert, Director, Western Transportation Institute, College of Engineering - Montana State University; (406) 994-6114	ITS Applications: Emergency Management Day 1 Applications:	GPS, wireless	N/A	Complete	Yes	Rural Data Accuracy advanced technology to increase the accuracy and completeness of accident reporting Global Positioning System (GPS)
29	Roadside Animal Detection System Test bed - The objective is to evaluate different types of animal detection systems with regard to system reliability, and operation and maintenance aspects. Phase 1 of the FHWA is designing and implementing the backbone of the "Roadside Animal Detection Systems" (RADS) test-bed in a controlled access environment, facilitating integration of animal detection systems. Selected animal detection systems will be installed in the test-bed. Design, implement, operate and maintain the RADS test-bed communication system has been implemented by utilizing a systems engineering approach.	Mike Bousliman Montana Department of Transportation, Maintenance Division P.O. Box 201001 Helena, MT 59620-1001 406-444-6159 mbousliman@mt.gov	Marcel Huijser Western Transportation Institute P.O. Box 174250 Bozeman, MT 59717 406-543-2377 mhuijser@coe.montana.edu	ITS Applications: Freeway Management Traveler Information Arterial Management Emergency Management Day 1 Applications:	microwave, break-the-beam and infrared devices	N/A	Complete	Yes	Rural National ITS architecture standards

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30	<p>An Integrated PDA/GPS System to Collect Standardized Road Kill Data The objective of this project is to conduct a pilot study of field-rugged PDA/GPS units that will enable transportation agencies, natural resource management agencies, and other interested parties to easily collect spatially accurate animal road kill data. The researchers at WTI are developing the "Roadkill Observation Collection System" (ROCS), integrating customized software with a field-rugged instrument for the collection, integration, and analysis of standardized, spatially-accurate animal-vehicle collision data. This project demonstrates how a Personal Data Assistant (PDA) in combination with a Global Positioning System (GPS) and customized software is an efficient, cost-effective tool to collect spatially accurate and standardized animal-vehicle collision data.</p>	<p>Kim Vaughn Washington Department of Transportation P.O. Box 12560 Yakima, WA 98909-2560 509-577-1881 VaughnK@wsdot.wa.gov</p>	<p>Douglas Galarus WTI P.O. Box 174250 Bozeman, MT 59717-4250 406-994-5268 dgalarus@coe.montana.edu</p>	<p>ITS Applications: Freeway Management Traveler Information Arterial Management Emergency Management</p> <p>Day 1 Applications:</p>	wireless	Within one year	Current	Yes	Rural Standardized data collection, global positioning systems (GPS)

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31	<p>Cold Regions Laboratory, Lewistown Montana</p> <p>The vision of this laboratory is to improve transportation maintenance, operations and safety with cold-regions research through the collaboration of academia, industry and government. The Lewistown Cold Region Rural Transportation Research Testbed will be constructed along portions of old runways at the Lewistown Airport in central Montana. The site will include a backbone of communications, power, and data networking capabilities, all of which are necessary to collect, store, and disseminate data during research. The multidimensional research capability that the site offers can greatly enhance researchers' understanding of the many interrelated issues associated with the transportation environment. The site offers a safe environment to test innovative products without creating a nuisance or endangering the traveling public. This laboratory will be used on projects to: Conduct multidimensional rural transportation research in a cold environment Test products and their effects on roadway infrastructure, vehicles, and the surrounding environment Evaluate de-icing and anti-icing protocols in the field Demonstrate and test technologies aimed to reduce animal-vehicle crashes Study new and improved materials used to build and maintain infrastructure Study the effects of winter driver training for commercial vehicle operators</p>	<p>Robin Kline USDOT/Research and Innovative Technologies Administration, Office of Research, Development, & Technology 400 Seventh St SW Room 2440 Washington DC 20590-0001 202-366-2732 robin.kline@dot.gov</p>	<p>Eli Cuelho Western Transportation Institute P.O. Box 174250 MSU Bozeman Bozeman, Montana 59717-4250 (406) 994-7886 elic@coe.montana.edu</p>	<p>ITS Applications: Freeway Management Traveler Information Arterial Management Emergency Management</p> <p>Day 1 Applications:</p>	<p>microwave, break-the-beam and infrared devices</p>	<p>Long term</p>	<p>Current</p>	<p>Yes</p>	<p>rural Demonstrate and test technologies multidimensional rural transportation research</p>

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31	<p>Redding Responder The Responder System integrates hardware, software, and communications to provide incident responders, particularly those in remote rural areas, with a structured, easy to use means for collection and digital communication of incident information. The Responder pilot deployment has been developed with an emphasis on ease of use and usability. The WTI Project Team will assist Caltrans in developing a business case to determine whether and how to proceed with full deployment. WTI will evaluate hardware to reduce the size of equipment and to "harden" the system for use in extreme heat and cold. Software will be finalized to accommodate hardware updates and to increase usability and robustness of the system. The system will then be installed in vehicles for testing by several crews over one to two months during a time period in which incidents and usage are most likely to occur. The system will be evaluated under real use situations with criteria including ease of use, usefulness and reliability.</p>	<p>Jeff Kiser Caltrans District 2 1490 George Drive Redding, CA 96003-1460 530-225-3210 Jeff_Kiser@dot.ca.gov</p>	<p>Douglas Galarus WTI P.O. Box 174250 Bozeman, MT 59717-4250 406-994-5268 dgalarus@coe.montana.edu</p>	<p>ITS Applications: Freeway Management Traveler Information Arterial Management Emergency Management</p> <p>Day 1 Applications:</p>	wireless	Within one year	Current	Yes	rural data communication, incident management

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32	<p>Greater Yellowstone Rural VII Demonstration and Test-bed: - <u>Road-Weather Case Study/Demonstration:</u> The first demonstration project will address the ability for the roadside infrastructure (Road-Weather Information Systems) to communicate road-weather information and to pass, or hand-off, that information to other vehicles before those vehicles encounter road-weather problems. - <u>Corridor Animal -Vehicle Collision Warning and Avoidance Demonstration:</u> The second demonstration project will focus on warning motorists of potential animal collisions. - <u>Western States Emergency Medical Services Network VII:</u> Working with our partners, the Critical Illness and Trauma Foundation and the Western States EMS Network, WTI will expand the VII research and demonstration effort to the western United States and a potential fleet of 5000 vehicles.</p>		Steve Albert, Director, Western Transportation Institute, College of Engineering - Montana State University; (406) 994-6114	<p>ITS Applications: Road Weather Management Emergency Management Driver Assistance</p> <p>Day 1 Applications</p>	Wireless communications between road and vehicle, microwave, break-the-beam and infrared devices		Planned	Yes	rural vehicle to Infrastructure

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33	<p>MANETS for Rural Public Safety The overall objective of this project is to enhance or develop a routing protocol for Mobile Ad-hoc Networks and conduct proof-of-concept demonstration of Mobile Ad-hoc Networks, as a method for enhancing wireless communications for law enforcement agencies in remote, rural locations. Mobile ad hoc networks (MANETs) provide the potential for addressing these pressing needs. A MANET is a network of computers that can automatically start communicating when they are close enough to one another to be in wireless range. A team from the Western Transportation Institute and the Departments of Electrical and Computer Engineering and Computer Science at Montana State University, and the Hot Springs County Wyoming Sheriff's Department have initiated a project to develop a routing protocol for Mobile Ad-hoc Networks and field test a MANET, in partnership with the U.S. Department of Homeland Security (DHS).</p>	<p>Luke Klein-Berndt, OIC Program Mgr Department of Homeland Security 245 Murray Lane, SW Washington, DC 20528 Luke.Klein-Berndt@dhs.gov</p>	<p>Douglas Galarus WTI P.O. Box 174250 Bozeman, MT 59717-4250 406-994-5268 dgalarus@coe.montana.edu</p>	<p>ITS Applications: Emergency Management Day 1 Applications</p>	<p>Wireless communication, mobile ad-hoc networks, routing protocols</p>	<p>Within one year</p>	<p>Current</p>	<p>Yes</p>	<p>rural VII data simulation</p>

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34	<p>FHWA Pooled Fund Animal-Vehicle Crash Mitigation using advanced technology demonstrations The objective of this demonstration is to evaluate an animal detection system in a real-world environment with regard to system reliability, and operation and maintenance aspects. For this project WTI, in partnership with Oregon DOT and 15 other states, is evaluating a animal detection system that detects large animals (e.g., deer, elk, moose) along US-191 in Montana/ Yellowstone National Park. When an animal is detected, signs are activated that warn drivers that large animals may be on or near the road at that time.</p>	<p>Felix Martinez Oregon Department of Transportation 200 Hawthorne SE Suite B-240 Salem, OR 97301 503-986-2848 felix.c.martinez@odot.state.or.us</p>	<p>Marcel Huijser Western Transportation Institute P.O. Box 174250 Bozeman, MT 59717 406-543-2377 mhuijser@coe.montana.edu</p>	<p>ITS Applications: Freeway Management Traveler Information Arterial Management</p> <p>Day 1 Applications:</p>	<p>microwave, break-the-beam and infrared devices</p>	<p>N/A</p>	<p>Complete</p>	<p>Yes</p>	<p>rural Vehicle to Infrastructure Animal detection system</p>

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35	<p>Ant Colony Optimization for Transportation Optimization Problems The overall objective of this project is to formalize, test and enhance propagation estimate techniques used to select the optimal placement of communications infrastructure using artificial intelligence. WTI leads numerous research projects to improve transportation in rural areas. A typical challenge in locations is the absence of seamless or reliable communication, due to the difficulty of effectively placing infrastructure in remote areas or rugged terrain. WTI has conducted preliminary research into the use of an optimization technique called "Ant Colony Optimization," to investigate whether it can be applied to select optimal placement of communications infrastructure along a roadside. The initial research has included computational analysis, integration of digital elevation models, and development of a working algorithm. Ant Colony Optimization (ACO) is an artificial intelligence algorithm and is a form of "Swarm Intelligence." Ant Colony Optimization algorithms mimic the behavior of ants searching for food.</p>	<p>Robin Kline USDOT/Research and Innovative Technologies Administration, Office of Research, Development, & Technology 400 Seventh St SW Room 2440 Washington DC 20590-0001 202-366-2732 robin.kline@dot.gov</p>	<p>Douglas Galarus WTI P.O. Box 174250 Bozeman, MT 59717-4250 406-994-5268 dgalarus@coe.montana.edu</p>	<p>ITS Applications: Day 1 Applications:</p>	radio	Within one year	Current	Yes	<p>rural communications networks; communications infrastructure placement</p>

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36	<p>Northern California Rural VII Case Study- The intent of the Rural Fleet Application Case Study was to recommend applications and consider implications of Vehicle-Highway Cooperative Systems in a rural environment. The research developed the plan for applying advanced technology solutions that will assist fleet operations and would ultimately increase safety and improve operations of the transportation system in northern California. The study area for this project consists of Caltrans Districts 1 and 2, which make up the California portion of the California Oregon Advanced Transportation Systems (COATS) project. The research examined principally applications for the two-lane rural highway (non-interstate) system. This project provides a foundation for testing and deployment of Vehicle-Highway Cooperative Systems concepts in northern California. As it is difficult to initiate or influence the deployment of technologies on light duty passengers vehicles, the opportunities for research, development, testing and potential deployment lie in partnering with a fleet owner/operator and in developing infrastructure systems that complement emerging in-vehicle technologies.</p>	<p>Matt Hanson Caltrans New Technology and Research 1227 O Street, P.O. Box 942873 Sacramento, CA 94273-0001 916-654-8171 Matt_Hanson@dot.ca.gov</p>	<p>Michael Kelly, WTI 406-994-7377 mkelly@coe.montana.edu</p>	<p>ITS Applications: Freeway Management Commercial Vehicle Management</p> <p>Day 1 Applications:</p>	DSRC	N/A	Completed	Yes	Rural Intelligent Vehicle Highway Systems, Advanced Rural Transportation Systems