



**working to advance road weather
information systems technology**

RESEARCH PROJECT TITLE

Mobile Weather and Road
Condition Reporting –
Aurora Project 2005-03

COMPLETION DATE

May 2009

PROJECT TEAM

Purdue University and Indiana
Department of Transportation

KEY WORDS

AVL, MDSS, mobile weather
reporting, road condition reporting,
RWIS

MORE INFORMATION

Chris Albrecht
Iowa State University – InTrans
2711 S. Loop Drive, Suite 4700
Ames, IA 50010-8664
Phone: 515-294-7684
Fax: 515-294-0467
Email: calbrech@iastate.edu

ABOUT AURORA

Aurora is an international partnership of
public agencies performing joint research,
evaluation, and deployment initiatives
related to road weather information systems
(RWIS).

The opinions, findings, and conclusions
expressed in this publication are those of
the authors and not necessarily those of the
project partners.

www.aurora-program.org

Mobile Weather and Road Condition Reporting

project summary

Objective

This project demonstrated an automatic vehicle location (AVL) system with added data fields from either sensors or driver input to create a mobile reporting system for winter operations.

Description

The project developed many solutions: a complete working AVL system that includes hardware, software to transfer data through the state police wireless network, and map-based reports of the data; an automatic data transfer into a Maintenance Decision Support System; a hotspot data transfer solution; and another hardware option using a smart phone device to collect and send data. The project also used sensors to determine field, weather, location, and chemical distribution amounts. These systems provide answers to an agency's desire to collect real-time data in maintenance operations.

Sensors were evaluated for friction and were deemed uneconomical for this project funding. Since the completion of the project, the Indiana Department of Transportation (INDOT) has purchased and is testing a Halliday Technologies RT3 friction device (about \$25,000 at the time of purchase). This device produces friction values that are added to the data string for a maintenance decision support system (MDSS). Currently, the INDOT MDSS does not have the capability to display friction values.

Various sensors can be used in maintenance vehicles that are fairly economical to use. This project demonstrated that, by adding a few sensors and using driver judgment, road and weather conditions and



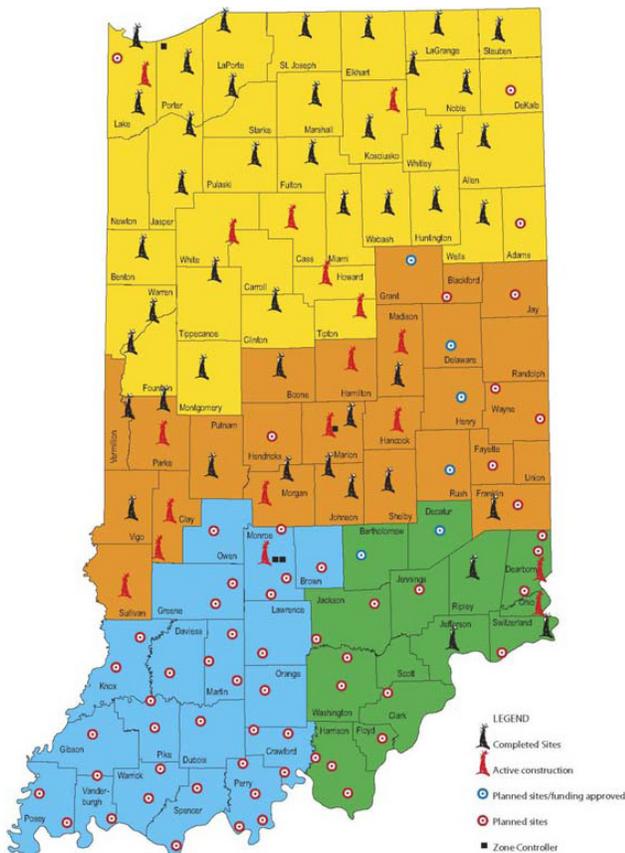
Laptop mounting

Continued on next page

maintenance activities can be reported in either real time or at various times through hot spots. Sensors that were added and tested through this project were a plow position sensor and infrared temperature sensors. The plow position sensor was placed in a hydraulic line and used backflow pressure to detect plow position. These are economical sensors (less than \$1000) that provide important information during winter operations and for post storm evaluations and archival reasons.

Data came from various sources: sensors, a Muncie chemical controller, and driver input. Driver-required input was held to a minimum for safety reasons. The driver was required to input road and weather conditions through either an on-board laptop, tablet, or mobile computer. The sensor data was fed into the Muncie controller and combined with driver input. This data string from the various sources was then transferred to a server through the wireless network, where it was parsed and displayed on state geographic information system (GIS) maps.

The data was available to the MDSS through a file transfer protocol (FTP) connection. Meridian Environmental Technologies would poll or collect the data at a set interval and display it to the MDSS. This MDSS connection is not difficult, but it requires cooperation and coordination between state information technology (IT) and Meridian.



Indiana SAFE-T wireless network implementation map

The control unit, in this case Muncie, is the device where all data is collected. Any sensor has a limited number of ports for receiving data from remote sensors, so this is a limiting factor. In our case, there was one external port. One possible work-around is to work with the controller supplier to include sensors in their data string and be included with their controller.

Conclusions

- A statewide wireless network like the Indiana State Police is very unreliable and suffers from poor coverage areas and archaic data transfer technologies. State DOT agencies should perform a traffic and coverage analysis and explore security (firewall) issues before embarking on this option.
- Some remote sensors are very expensive and therefore not feasible to place on all winter vehicles. For example, the friction device could be placed on a patrol vehicle.
- Data transmission costs are a big component of any AVL system.
- The commercial AVL system mapping feature is typically poor quality and cannot utilize agency GIS maps.
- Collecting and transferring data through a PC/Smart Phone device may be an economical option.
- Hot spot data transfer is a secure reliable option but does not provide “real time” data.
- Investigate using the system for summer activities to make it more cost effective and provide a better return on the investment.
- The information can be used in the Condition Acquisition and Reporting System (CARS). An interface like that used in the MDSS will automate transferring the appropriate information.



Mini PC screen mounting