# Maintenance Decision Support Systems

A Proven, Cost-Effective Tool for State and Local DOTs

When state or local departments of transportation (DOT) prepare for a snow or ice storm, they do more than operate snow plows. Timely decisions must be made on when to call in crews, whether overtime will be required, what kinds and how much material to load on trucks, whether and when to pre-treat the roads, and how to optimize equipment assignments.

During a storm event, supervisors also make ongoing tactical decisions based on a storm's progress and the effectiveness of maintenance activities, all of which has immediate and vital consequences for the agency, the traveling public, and the environment.

A proven, cost-effective tool called the Maintenance Decision Support System (MDSS) is increasingly being used by state and local maintenance departments for reliable and accurate decision-making under stressful weather and adverse roadway conditions.
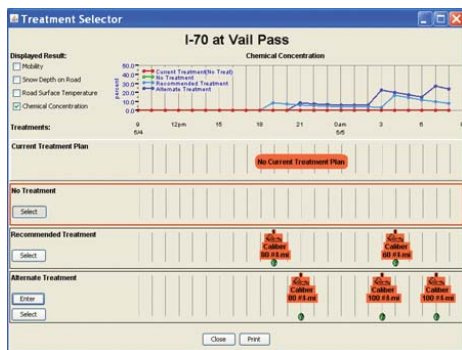
MDSS Treatment Selector Screen Shot
Courtesy of the National Center for Atmospheric Research.

> **"Statewide reducing one extra trip per truck for a winter storm event saves over $600,000 in material costs."**
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> *Tony McClellan, Indiana DOT*
> *MDSS Stakeholder Meeting, Charlotte, NC, 2009*

What is MDSS?

MDSS provides clear, actionable information about weather and roadway conditions so DOTs can make confident and effective decisions on deployment, materials, and tactics when responding to weather events. The MDSS software integrates current and forecast atmospheric weather and pavement condition data with agency snow and ice policies for a comprehensive maintenance strategy.

MDSS has grown from a Federal research program into an operational tool for winter maintenance with several private sector vendors providing custom versions of the MDSS to states and cities. MDSS usage has grown rapidly since 2004. Forty-one states participate in some way, and 16 have pooled resources to utilize the technology.

Some DOTs are finding MDSS technology can be adapted to schedule maintenance activities during nonwinter weather events, and the Road Weather Management Program (RWMP) is currently demonstrating a modified tool for these applications.

Why Invest In MDSS?

Agency budgets and staffing are increasingly constrained, and the pressure to maintain a safe level of service for the traveling public is a challenge. MDSS helps agencies make better decisions that result in improved agency productivity and efficiency while maintaining or enhancing traveler safety and mobility. Following are the reasons agencies should invest in MDSS:

- **Reduce winter maintenance labor cost.** Overtime and regular labor costs are a major and unavoidable portion of agency maintenance budgets.

  On a statewide basis, the Indiana DOT reported a dramatic savings in labor costs, comparing the FY 08 and FY 09 winter maintenance seasons, of 41,967 overtime hours valued at $979,136.

  At the local level, the City and County of Denver experienced savings over the 2007-2009 winter periods valued at $92,200 per winter. After deducting MDSS costs, Denver experienced a net savings of about 10 percent in their overtime budget.

- **Use less material in event response.** The impacts of chemicals on transportation infrastructure, vehicle wear and tear, and the environment can be substantial.

"Anytime, Anywhere Road Weather Information"

The Indiana DOT experienced a significant reduction in their salt usage, based in part on MDSS treatment recommendations during the 2008-2009 winter season, of nearly $9.979 million or 188,274 tons. The South Dakota DOT also found the MDSS enabled them to reduce material use.

- **Improve situational awareness of weather conditions.** MDSS allows an agency to focus on their weather conditions because forecasts are targeted to specific geographic areas rather than being on a national or regional basis.

  The City and County of Denver found MDSS forecasts were more "actionable" than other forecasts and consistently more accurate. Maine DOT reported MDSS offered more precise location-specific weather and pavement forecasts.

- **Increase confidence in winter maintenance decision-making.** Decisions during snow events have far-reaching consequences, and MDSS provides a rational and consistent basis for making the right call.

  Maine DOT found MDSS precipitation forecasts were more accurate than traditional weather services. Denver worked closely with their vendor who provided frequent updates and detailed interpretations of complex forecast content which raised their confidence level.

- **Continue maintenance improvements.** MDSS helps agencies improve maintenance operations through a more data-driven and performance-oriented approach.

"**Making the correct decision on snow response is critical. The focused weather and pavement forecasts from the MDSS improve our ability to provide the proper service delivery for our citizens. We are now more efficient, cost-effective, and confident in our decisions.**"

William Kennedy
City of Denver Public Works

MDSS effectively integrates with capabilities such as Automatic Vehicle Location (AVL) and Mobile Data Computers (MDCs) in trucks.

The use of MDSS for early snow planning meetings allows agencies to be proactive, and use of archived MDSS data during postevent debriefings makes MDSS a powerful tool for monitoring and improving performance.

Evaluations from states that use MDSS and evaluations from New Hampshire, Colorado, and Minnesota indicate MDSS benefits far outweigh costs. While the system is effective, however, it is not intended to replace the years of acquired expertise, skills, and judgment that reside in maintenance operations across the country.

MDSS is a new tool in the maintenance toolbox that can be adjusted to fit the conditions and special needs of each agency user. It is also designed to be used by both experienced and new employees. Maine DOT management reported MDSS provided maintenance crews with valuable training in the use of this new computerized technology, and expanded the outlook on what was possible.

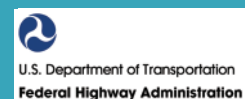Technical documentation on the Federal MDSS program can be found at the Research Applications Lab web site at the National Center for Atmospheric Research (NCAR): http://www.rap.ucar.edu/projects/rdwx_mdss/documents/. An MDSS deployment guide is also available through the FHWA RWMP web site: http://www.itsdocs.fhwa.dot.gov/JPODOCS/REPTS_TE/14439.htm. Additional information on the benefits of MDSS are available in the final report from the Indiana Department of Transportation, which can be viewed at http://www.in.gov/indot/files/MDSSReportWinter08-09.pdf.

All photos courtesy of
Road Weather Management Program

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