



Weather-Responsive Traffic Management

Real Solutions for Serious Traffic Problems

A safe and efficient journey for the traveling public is a goal of transportation agencies throughout the U.S. Even the best laid systems, however, can go awry, and one of the causes is weather.

Weather is the second largest cause of nonrecurring congestion, the unexpected congestion that frustrates even the calmest driver. Weather, which accounts for 25 percent of all delays, is also costly. Close to 1 billion hours are lost each year due to weather-related delays.

Minimizing Delay and Risk

The U.S. Department of Transportation's Road Weather Management Program (RWMP) and its partners in the transportation and weather communities are researching, developing, and implementing weather-responsive traffic management (WRTM) strategies that effectively manage the flow of traffic during inclement weather conditions. The goal is to minimize the delay and risk experienced by motorists while driving in bad weather.



Photo courtesy of U.S. DOT Road Weather Management Program

Inclement weather is a factor in approximately 1.57 million crashes that result in more than 7,000 fatalities and 800,000 injuries.

Weather is more than aggravating, it is dangerous. Between 2005 and 2008, inclement weather was a factor in an average of 1.3 million crashes that resulted in an average of 6,000 fatalities and an average of 400,000 injuries.

While no one can change the weather, a Weather Responsive Traffic Management System can mitigate its impacts.



Photo courtesy of the California Department of Transportation

Three types of WRTM strategies can prevent or mitigate the effects of weather:

- Advisory strategies provide warning and other information to travelers;
- Control strategies to regulate or optimize traffic flow; and
- Treatment strategies to ensure the roads are clear of obstructions.

The result is better and more informed decision-making by agencies and the traveling public based on real-time weather and traffic information, and improved mobility, safety, and reliability of the transportation system.

WRTM directly targets RWMP's key areas – improvements in traffic operations and reductions in congestion. A successful program is one that accomplishes the following:

- Transportation agencies use both current and predicted weather and traffic information to make traffic management decisions and plans;
- Weather impacts are incorporated in traffic analysis and engineering models, and in strategies used to mitigate or manage the impacts of weather; and
- Motorists receive timely, accurate, and relevant weather and traffic information so they can respond more appropriately to the prevailing and predicted weather and traffic conditions.

“Anytime, Anywhere Road Weather Information”

WRTM Program Tracks

WRTM involves several program tracks including the following:

Data Collection and Integration

Timely, accurate, and relevant weather and traffic information depends on the right data collection and integration strategies. WRTM obtains weather and traffic data from the Road Weather Information Systems (RWIS), Traffic Management/Operations Centers (TMC/TOC), and other sources and then integrates the data to support effective transportation decision-making.

Timely, accurate, and relevant weather and traffic information depends on the right data collection and integration strategies.

A recently completed study by FHWA on weather and traffic data used by TMCs, *Integrating Weather in TMC Operations*, (http://www.itsdocs.fhwa.dot.gov/JPODOC/S/REPTS_TE/14438.htm) revealed assistance is needed on identifying and integrating this data. The RWMP developed a self-evaluation and planning guide (http://www.itsdocs.fhwa.dot.gov/JPODOC/S/REPTS_TE/14437.htm) to help TMCs evaluate their weather integration needs and develop appropriate implementation strategies.

The RWMP also completed a baseline assessment of the current types, quality, and uses of road weather data for implementation of advisory, control, and treatment strategies and for future road weather data collection and processing products and services, including the *Clarus* system.

Weather Impacts on Traffic Flow

Existing traffic engineering models do not take into account how weather impacts traffic flow parameters such as speed, volume, and density. The RWMP is conducting research on how weather events



Photo courtesy of U.S. DOT Road Weather Management Program

affect traffic flow, and developing weather-sensitive traffic engineering models that can feed directly into WRTM strategies and next generation simulation models. Some of the activities include the following:

- The development of statistical models and adjustment factors to account for weather impacts on traffic speed, capacity, and density using data from major cities;
- A study to develop microscopic traffic models on how weather affects car-following, lane changing, and gap acceptance behavior;
- A research study to incorporate weather impacts in traffic estimation and prediction systems (TrEPS) for use in dynamic traffic assignment models (DynaSMART and DynaMIT); and
- An analysis of existing road weather messages and dissemination methods, including an evaluation of their effectiveness in conveying information to travelers.

Weather-Responsive Traffic Management Strategies

The RWMP helps develop, evaluate, and deploy advisory, control, and treatment strategies to effectively manage traffic during inclement weather including the following:

- The use of weather/traffic information to control traffic signals and ramp meters;

- Posting advisory and control messages on arterial roads and freeways through 511, Dynamic Message Signs, Highway Advisory Radio, and other communications devices; and
- The use of models to improve network optimization and real-time traffic prediction.

The RWMP is also expanding the capabilities of winter maintenance decision support systems to traffic management and non-winter maintenance operations. A concept of operations was developed that combines traffic management practices with road weather information to develop weather-responsive traffic management strategies, some of which have been included in the *Clarus* regional demonstration project.

WRTM research reports and other materials that provide effective solutions to weather-related problems are on the RWMP web site at <http://ops.fhwa.dot.gov/Weather/>.



**U.S. Department of Transportation
Road Weather Management**
1200 New Jersey Avenue, E86-205
Washington, DC 20590

Roemer M. Alfelor
202-366-9242

E-mail: roemer.alfelor@dot.gov
<http://ops.fhwa.dot.gov/Weather/index.aspx>



Federal Highway Administration
Research & Innovative Technology Administration

Publication #: FHWA-JPO-09-035
EDL #14471

Weather-Responsive Traffic Management

Real Solutions for Serious Traffic Problems