



The Road Weather Bulletin #2

Road Weather Management Publications and Training Materials

Fall 2013, FHWA-JPO-13-070

About this Flyer

This flyer summarizes recent documents and training materials concerning road weather management and surface transportation published since June 2011. It includes reports, flyers, pamphlets, and training courses to show the progress made in the management of surface transportation operations and infrastructure maintenance in response to adverse weather.

Connected Vehicles and Road Weather

Passenger Bus Industry Weather Information Application (PBI WxApp), March 2011

The primary objective of the PBI WxApp was to integrate mobile platform environmental observations with fixed-site (airports and road-weather stations) observations to create a window of meteorological information along a commercial vehicle's intended travel route. This report describes its development, general outcomes, and shows that mobile platform data are reliable and provide a more complete weather window.

<http://goo.gl/SIJX2>

(FHWA-JPO-11-123)

The Vehicle Data Translator (VDT) V3.0 System Description, May 2011

The National Center for Atmospheric Research (NCAR) is developing a VDT system that incorporates vehicle-based measurements of the road and surrounding atmosphere with other weather data sources. This document describes version 3.0 of the VDT, including data ingest, quality check, derivation of road and weather statistics, and the open-source philosophy.

<http://goo.gl/uO4BP>

(FHWA-JPO-11-127)

The Vision for Use of Connected Vehicle Data in Practical Road Weather Applications, April 2012

This document provides an overview of NCAR's VDT software, a description of several applications for key end-users of the VDT, and a description of the data standards required for the mobile weather data to be useful for various road weather applications. Specific examples are provided for everyday drivers, truckers, emergency services, and the road maintenance community. Each example shows how VDT information could alter operations under inclement road conditions.

<http://goo.gl/8har1H>

(FHWA-JPO-12-040)

Realizing the Potential of Vehicle-Based Observations, August 2011

Mobile observations and their potential use by the weather and transportation communities presents the availability of millions of surface observations from passenger vehicles and fleets, representing substantial opportunity for improvement. Thus, the weather community will need a greater understanding of the mobile datasets and the level of participation in the transportation community. Based on that assessment, this study provides a series of recommendations to improve the development and implementation of vehicle-based observations to improve road weather information.

<http://goo.gl/8DNby>

Concept of Operations for Road Weather Connected Vehicle Applications, May 2013

Connected vehicle technologies continue to expand the amount of data available for addressing the impacts of weather on roads, vehicles, and travelers, which fundamentally changes the way we manage and operate the surface transportation system. This document defines the priorities for connected vehicle-enabled road weather applications, highlighting Enhanced Maintenance Decision Support System, Information for Maintenance and Fleet Management Systems, Weather-Responsive Traffic Management, Motorist Advisories and Warnings, Information for Freight Carriers, and Information and Routing Support for Emergency Responders.

<http://goo.gl/iF7UHe>

(FHWA-JPO-13-047)

Results from the Integrated Mobile Observations (IMO) Study, May 2013

The purpose of this document is to provide a summary of the data collection efforts for the ITS IMO study, the results of the analysis of the quality of those observations, and results of the incorporation of the observations into road weather and/or road maintenance specific applications.

<http://goo.gl/VhXA6e>

(FHWA-JPO-13-066)

Flyers about Connected Vehicles and Road Weather

Road Weather and the Connected Vehicle, December 2011

<http://goo.gl/swNNgW>

(FHWA-JPO-11-138)

Clarus and Road Weather Information Systems (RWIS)

Results of the Clarus Demonstrations—Evaluation of Enhanced Road Weather Forecasting Enabled by Clarus (Use Case #1), June 2011

This report examines the use of *Clarus* data to enhance the Local Analysis and Predictions System (LAPS), the Weather Research and Forecast (WRF) atmospheric weather forecast models, the Model of the Environment and Temperature of Roads (METRo), and the Pavement Precipitation Accumulation Estimation System (PPAES) tool.

<http://goo.gl/mNYfb>

(FHWA-JPO-11-116)

Clarus Multi-State Regional Demonstrations—Evaluation of Use Case #2: Seasonal Load Restriction Tool, July 2011

This report presents the results of an evaluation of the demonstration of an experimental seasonal load restriction decision support tool. This system offers state DOTs subsurface condition forecasts (e.g., moisture, temperature, and freeze-thaw trends) to support their decisions to place and remove load restrictions in a timely and effective way. The report identifies the hypotheses tested, the approach to data collection and analysis, results from the evaluation, and lessons learned.

<http://goo.gl/7kicG>

(FHWA-JPO-11-117)

Clarus Multi-State Regional Demonstrations—Evaluation of Use Case #3: Non-Winter Maintenance Decision Support System, May 2011

This evaluation report documents benefits, challenges and the lessons learned from the demonstration of a new tool that offers state DOTs the ability to expand decision support beyond snow and ice control to incorporate *Clarus* data to assist maintenance, operations, and construction-related scheduling decisions. The tool was demonstrated in selected northern tier states as part of the *Clarus* Multi-State Regional Demonstration Program under the auspices of the RWMP.

<http://goo.gl/PBpwm>

(FHWA-JPO-11-118)

Clarus Multi-State Regional Demonstrations—Evaluation of Use Case #4: Multi-State Control Strategy Tool, June 2011

This report provides the results of an independent evaluation of the *Clarus* Use Case #4 Multi-State Control Strategy Tool (MSCST). The study found that while agencies felt the concept of the MSCST was valid, the current tool needs significant expansion of its current utilities and sophistication before widespread acceptance and deployment can be expected.

<http://goo.gl/awBrp>

(FHWA-JPO-11-119)

Clarus Multi-State Regional Demonstrations—Evaluation of Use Case #5: Enhanced Road Weather Content for Traveler Advisories, May 2011

This report presents an assessment of the benefits of a new road condition forecast tool that offers road weather information to travelers. The tool was demonstrated in selected northern tier states as part of the *Clarus* Multi-State Regional Demon-

stration Program under the auspices of the RWMP. The use of this tool was independently evaluated under contract to the RWMP. This report identifies the tested hypotheses, the data collected and analyzed, and the findings from the evaluation.

<http://goo.gl/eg2Tp>

(FHWA-JPO-11-120)

Integrating Clarus Data with the New York 511 Weather Alert System, June 2011

This document describes the process and results of integrating *Clarus* and other weather alert data into the 511 New York Traveler Information System. The goal of this project was to demonstrate the feasibility of collecting, integrating, and disseminating various types of current and forecast location-specific weather alert data for use by traffic managers and motorists to help make better travel decisions, reduce congestion and improve safety.

<http://goo.gl/mm6tB>

(FHWA-JPO-11-112)

Integrating Clarus Weather Station Data and State Crash Data into a Travel Decision Support Tool, September 2011

2009 crash data from the State of Michigan was combined with weather data from four *Clarus* weather stations in the Upper Peninsula of Michigan. From this data, a series of regression models were then created based on critical tipping points of weather data, as well as continuous weather observations. An algorithm consisting of seven risk equations which are used under differing weather conditions was combined with a time based algorithm in order to recommend a route. Using an open source geospatial routing tool and open source road network software, a recommended route is defined.

<http://goo.gl/bTZ4rM>

(FHWA-JPO-11-162)

Western States One-Stop Shop for Rural Traveler Information Research on Clarus System Data, September 2011

For this project a website was developed to display *Clarus* Environmental Sensor Station (ESS) data, along with other information streams such as DOT Intelligent Transportation System (ITS) field elements, closed-circuit television (CCTV), planned and active closures, incidents, weather sensor readings from non-DOT sources, and National Weather Service (NWS) forecast information. The weather information displayed is easily accessed and understood by users, and the site was well received and examined by users. Further improvements are required to enhance route planning.

<http://goo.gl/Hwfd7>

(FHWA-JPO-11-153)

Integrating Clarus Data in Traffic Signal System Operation—A Survivable Real-Time Weather-Responsive System, November 2011

This report presents a prototype of a secure, dependable, real-time weather-responsive traffic signal system that accesses weather information and adapts signal timing in response to inclement weather. This weather-responsive traffic signal system serves as a major milestone in the development of secure and dependable real-time traffic control applications.

<http://goo.gl/Ounom>

(FHWA-JPO-12-016)

The Integration of Multi-State Clarus Data into Data Visualization Tools, December 2011

This project focused on the integration of all *Clarus* Data into the Regional Integrated Transportation Information System (RITIS) for real-time situational awareness and historical safety data analysis. The incorporation of *Clarus* data into the RITIS platform means that there are now thousands of transportation operations specialists, university researchers, and metropolitan planning agencies that have the ability to view real-time road weather data within the broader context of other transportation system information.

<http://goo.gl/xgZnK> (FHWA-JPO-12-008)

Flyers about Clarus and Road Weather Information Systems

Clarus—A Clear Solution for Road Weather Information, 2011

<http://goo.gl/HrMYy> (FHWA-JPO-11-154)

Enhanced Road Weather Forecasting—Clarus Regional Demonstrations, 2011

<http://goo.gl/tfDkT> (FHWA-JPO-11-155)

Seasonal Load Restriction Tool—Clarus Regional Demonstrations, 2011

<http://goo.gl/8Zi8B> (FHWA-JPO-11-156)

Maintenance and Operations Decision Support Tool—Clarus Regional Demonstrations, 2011

<http://goo.gl/t1Jv> (FHWA-JPO-11-157)

Multistate Control Strategy Tool—Clarus Regional Demonstrations, 2011

<http://goo.gl/RCGdO> (FHWA-JPO-11-158)

Enhanced Road Weather Content for Travel Advisories—Clarus Regional Demonstrations, 2011

<http://goo.gl/UOOew> (FHWA-JPO-11-159)

Results of the Clarus Regional Demonstrations—Evaluation of Enhanced Road Weather Forecasting, 2011

<http://goo.gl/VgLao> (FHWA-JPO-12-014)

Results of the Clarus Regional Demonstrations—Evaluation of Four Decision Support Tools, 2011

<http://goo.gl/PvMlb> (FHWA-JPO-12-013)

Using the Clarus System to Improve the Use of Mobile Data, 2012

<http://goo.gl/hsjoa> (FHWA-JPO-12-076)

Demonstrations of Clarus System Data, Clarus Broad Agency Announcement (BAA) Projects, 2012

<http://goo.gl/1m28Nt> (FHWA-JPO-11-160)

Weather Responsive Traffic Management (WRTM)

Guidelines for the Use of Variable Speed Limit (VSL) Systems in Wet Weather, August 2012

This report provides guidance on the use of VSL systems in wet weather at locations where the operating speed exceeds the design speed and the stopping distance exceeds the available sight distance. By using VSLs, agencies can take into account traffic volume, operating speeds, weather information, sight distance, and roadway surface condition when posting speed limits to improve safety and decrease risk. The guidelines cover the design, installation, operation, maintenance, and enforcement of wet weather VSL systems and provide lessons learned from past examples, aiding future implementers to develop practices that increase the likelihood of success.

<http://goo.gl/wwir6> (FHWA-SA-12-022)

Second National Weather Responsive Traffic Management Stakeholder Meeting—Summary Report and Presentations, September 2013

This meeting included participants from 26 State DOTs, private contractors and the federal government discussing the state of the practice and future direction to better manage traffic during adverse weather. The objectives were to provide updates on successful implementations, disseminate research results, available tools, and training opportunities, identify emerging technologies, identify gaps, challenges, and opportunities in implementation, and determine future research, development, and deployment areas.

<http://goo.gl/pJv8Zp>

Guidelines for Disseminating Road Weather Advisory & Control Information, June 2012

This project builds upon the earlier Human Factors Analysis of Road Weather Advisory and Control Information project, resulting in preliminary guidelines. For the current effort, the preliminary guidelines were disseminated to a broad group of transportation and road weather officials for review and use. Evaluation of the guidelines followed through end user surveys, on-site interviews and discussions, and application to assess their suitability and effectiveness for traffic operations. The feedback provided was used to modify the preliminary guidelines and develop the revised guidelines presented here.

<http://goo.gl/nWgG0> (FHWA-JPO-12-046)

Developments in Weather-Responsive Traffic Management Strategies, June 2011

This report investigates existing strategies, the benefits realized, and how to improve, implement, and evaluate them as part of transportation operations. It contains guidance to assist in evaluating the benefits and performance of over 20 WRTM strategies. Specific recommendations that define a roadmap to continue the efforts of the RWMP to promote and enhance the level of WRTM in the country are presented.

<http://goo.gl/cGoQK> (FHWA-JPO-11-086)

Use of Mobile Data for Weather-Responsive Traffic Management Models, October 2012

This report identifies the components within the WRTM framework where mobile data could be incorporated and summarizes the unique properties of mobile data in contrast to traditional traffic data. Different types of mobile data which could be offered from major vendors is also discussed. The report also presents a framework for implementing the integration of mobile data and WRTM models.

<http://goo.gl/XTDwA>

(FHWA-JPO-13-003)

Flyers about WRTM

Weather Responsive Traffic Management—New Approaches to Improve Safety and Mobility, 2011

<http://goo.gl/gqBNh>

(FHWA-JPO-11-093)

Guidelines for Disseminating Road Weather Messages—Improved Road Weather Information for Travelers, 2013

<http://goo.gl/Hj7HPX>

(FHWA-JPO-13-005)

Road Weather Management Best Practices: Version 3.0, 2013

<http://goo.gl/7aQhgn>

(FHWA-JPO-13-036)

Data and Performance Management

Weather Delay Costs to Trucking, November 2012

This report presents an analysis of the use of weather products and the economic impact to the industry for specific sectors of the transportation community, offering an insight into the current and potential value of weather products.

<http://goo.gl/kKlkyF>

(FHWA-JPO-13-023)

Road Weather Management Performance Measures—2012 Update, August, 2013

This document includes a discussion on the background for the development and update of RWMP performance measures, the evolution of the measures since 2007 including the approach and data sources used, a description of each RWMP objective and the quantification of each associated measure, and an overall assessment of the RWMP based on the performance measures tracked.

<http://goo.gl/IKbAPV>

(FHWA-JPO-13-087)

Methods for Estimating the Benefits of Winter Maintenance Operations, September 2012

The work presented in this report sought to establish approaches to estimating the benefits of winter highway maintenance. Using 2001-06 winter season data as a case study, the researchers estimated the quantified benefits of winter highway maintenance per winter season for the Minnesota DOT. This work helps to shed light on data elements needed to enable a reliable cost-benefit analysis for winter maintenance operations by a specific agency or region.

<http://goo.gl/o7s0U>

Photos in banner courtesy of the RWMP

Training & Technology Transfer

Best Practices for Road Weather Management: Version 3.0, June 2012

This report contains 27 case studies of systems in 22 states that improve roadway operations under inclement weather conditions. Each case study includes general system descriptions, system components, operational procedures, resulting transportation outcomes, and implementation issues to capture the practices that build upon agencies' previous success.

<http://goo.gl/uHnKXU>

(FHWA-HOP-12-046)

Road Weather Management Stakeholder Meeting—Presentations, July, 2013

This annual meeting provides a venue for collaboration between the transportation and weather community. It included presentations and facilitated discussions on topics such as the Integrated Mobile Observations project, tire sensor and friction prediction testing research, and in-depth explanations of road weather connected vehicle applications.

<http://goo.gl/WCVavn>

Weather Responsive Traffic Management. This course provides information and guidance to transportation system managers and operators to help effectively manage traffic flow and operations during adverse weather conditions.

www.citeconsortium.org

Principles and Tools of Road Weather Management.

Through this course, participants are exposed to various strategies for addressing road weather problems, including RWIS and the development of crosscutting decision support systems to respond effectively to weather situations.

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Road Weather Information Systems Equipment and Operations. The goal of this course is not only to discuss RWIS initiatives and considerations, but also explore individual state and local deployment challenges through workshops, exercises, and self-assessments, which will leave participants with an action plan tailored for their specific needs.

www.citeconsortium.org



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