Weather-Responsive Traffic Management

2012 Stakeholder Meeting Update

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Weather-Responsive Traffic Management (WRTM)

Implementation of traffic advisory, control and treatment strategies in direct response to, or in anticipation of developing roadway and visibility issues that result from deteriorating or forecasted weather conditions.

Picture Source: Oregon Department of Transportation
WRTM Success Measures

- Transportation agencies use current and forecast weather and traffic conditions to manage traffic flow and highway operations.

- Motorists receive and respond to road weather and traffic information in the short-term and in the long-term.

- Weather impacts incorporated in traffic analysis and engineering models to calibrate and optimize advisory, control and treatment strategies.
WRTM Framework

Safety, Mobility and Performance Evaluation

WRMT Strategies

- Advisory Control Treatment
- Behavioral/Human Factors Analysis
- Traffic Analysis and Modeling Tools
- Traffic and Weather Data Collection and Integration
Recently Completed/Ongoing Activities

- **Research and Guidance**
  - Human Factors Guidelines for Messaging
  - TrEPs
  - WRTM Strategies Development

- **Stakeholder Outreach**
  - 1ST National Workshop on WRTM, Portland, OR

- **Training/Technical Assistance**
  - Webinar Series on WRTM (Use of Social Media, Active Traffic Management and Weather, Traffic Signal Timing)
  - CITE Online Training
Human Factors Analysis of Road Weather Advisory and Control Information

- Project Purpose: Identify ways to disseminate road weather advisory and control information to travelers in a manner that is understandable, useful, and effective
Project Overview: General Approach

Phase I
(2008 - 2010)
Develop Preliminary Road Weather Messaging Guidelines

Literature Review of Traveler Information Needs & Relevant Human Factors Research
Survey of Travelers in Washington State
Review of DOT Messaging Practices

30 Preliminary Guidelines, Organized by Message Type

On-line Questionnaire Sent to over 200 Potential End-users
Site Visits and In-depth Evaluations with State-level DOT & TMC Staff
(6 States + 2 Private Organizations)

Simpler, More Streamlined Guidelines Organized by Dissemination Method
(DMS, 511/HAR, Web-based)

Phase II
(2010 – 2012)
Evaluate and Revise the Guidelines
Evaluate and Revise the Guidelines: Key Recommendations for Revisions

- Organize the guidelines by major dissemination methods (Dynamic Message Signs (DMS), Auditory Messages (511/HAR), and Web-based Messages).
- Increase focus on weather and road weather in the guidelines.
- Identify how to communicate road weather information such as roadway surface conditions more clearly in the guidelines.
- Consolidate guidelines and reduce verbosity as much as possible.
Updated Guidelines

Chapter 2 Dynamic Message Signs

Guideline 2-2. Determining DMS Message Length Limits

Introduction

This guideline provides a method for determining the appropriate length of a DMS message by considering information units, which are a measurement of the amount of information in a message. Information units are often defined as the answers to basic questions (e.g., what, where, who).

Design Guidelines

- Keep messages as short and concise as possible.
- Use no more than
  - 2 information units per line
  - 3 information units per phase
  - 4 information units per message read at speeds of 35 m/h or more (Figure A)
  - 5 information units per message read at speeds less than 35 m/h (Figure B)
- Messages may reference other sources containing additional information (e.g., 511, NAR).

Examples

An information unit can be defined as the answer to a basic question about the subject of the message. For example, in the table below, each answer to the question “what is the problem?” is a single information unit.

Sample information units in DMS messages.

<table>
<thead>
<tr>
<th>Question</th>
<th>Answer (One information unit each)</th>
</tr>
</thead>
<tbody>
<tr>
<td>What is the problem?</td>
<td>FLOODING, SLICK IN SPOTS, BLOWING SNOW</td>
</tr>
<tr>
<td>Where is the problem?</td>
<td>AT US-23, PAINT-1.5, METRO AREA</td>
</tr>
<tr>
<td>Who is affected?</td>
<td>NEW YORK, ALL TRAFFIC, WEST BOUND TRAFFIC</td>
</tr>
<tr>
<td>What should they do?</td>
<td>USE-I-280 EAST, REDUCE SPEED, TRAVEL NOT ADVISED</td>
</tr>
</tbody>
</table>

Figure A. Example message with 4 information units.

Figure B. Example message with 5 information units.

References


NOTE: The use of Portable Electronic Devices, such as cell phones, while driving is a distraction. Consult the current editions of the manuals for more information.
Weather-Responsive Traffic Estimation and Prediction System (TrEPS)

- Project Purpose: Capture Weather Effects in a Dynamic Traffic Assignment Model to:
  - Assess the impacts of adverse weather on transportation networks.
  - Evaluate effectiveness of weather-responsive traffic management (WRTM) strategies in alleviating traffic congestion due to adverse weather conditions.
Phase I - Model impacts of adverse weather on transportation networks (2009)

Supply-side Parameter Calibration

- Free-flow speed,
- Saturation flow rate,
- Section capacity,
- etc.

Weather Scenario Specification

- Rain intensity ($r$)
- Snow intensity ($s$)
- Visibility ($v$)

Simulate Traffic Flow under Adverse Weather

TrEPS

DYNASMAR

T
Phase II - Implement and Evaluate WRTM Strategies using TrEPS Models
Study Networks

- Three study networks calibrated and set-up for implementation
  - Salt Lake City
  - Long Island
  - Chicago
Latest Status/Results

- TrEPs demonstrated and evaluated in the three cities using number of WRTM strategies:
  - Variable Speed Limits
  - With or Without Diversion using DMS signs
  - Without WRTM
- Report forthcoming
Developments in Weather Responsive Traffic Management Strategies

- Project Purpose: Investigate what strategies exist, where they have been used, the benefits realized, and how to improve, implement, and evaluate them as part of transportation operations.
Developments in Weather Responsive Traffic Management Strategies

- Battelle Institute, TTI, and McFarland Management
- Contains:
  - Review of WRTM Strategies
  - Improvements to WRTM Strategies
  - FiveWRTM ConOps
  - Evaluation Approaches and Procedures
- Available at:
Stakeholder Coordination: WRTM Workshop

- October 6-7, 2011, Portland OR
- Jointly with the TMC Pooled Fund Program
- 26 State DOT’s, 2 cities, 1 turnpike authority
- Objectives: Discuss existing practices, identify needs, and create a stakeholder group
Workshop Recommendations

- Refine/Implement Concepts of Operations for WRTM Strategies
- Conduct a series of webinars and tech transfer activities
- Provide guidance on the 1201 Rule
- Include private sector and academia in stakeholder group
- Create a peer exchange group
- Coordinate research activities with relevant pooled fund efforts and coalitions
- Continue to develop and deploy guidelines for consistent Road Weather Messages
- Coordinate with other Operations programs such as ICM, ATDM, Freight, etc.
- Apply performance/effectiveness measures, monitor and compile evaluation results
Training/Outreach

• NTOC Webinars
  - Active Traffic Management and Weather (*March 20, 2012*)
  - Using Social Media During Weather Events (*April 19 2012*)
  - Weather Responsive Traffic Signal Management  (*May 31 2012*)
  - Webinar transcripts available through NTOC

• CITE Training
  - Weather Responsive Traffic Management (WRTM)
  - Offered October to December 2012
Road Weather Management
Anytime, Anywhere Road Weather Information

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