Testing and Evaluation of Guidelines for Disseminating Road Weather Information

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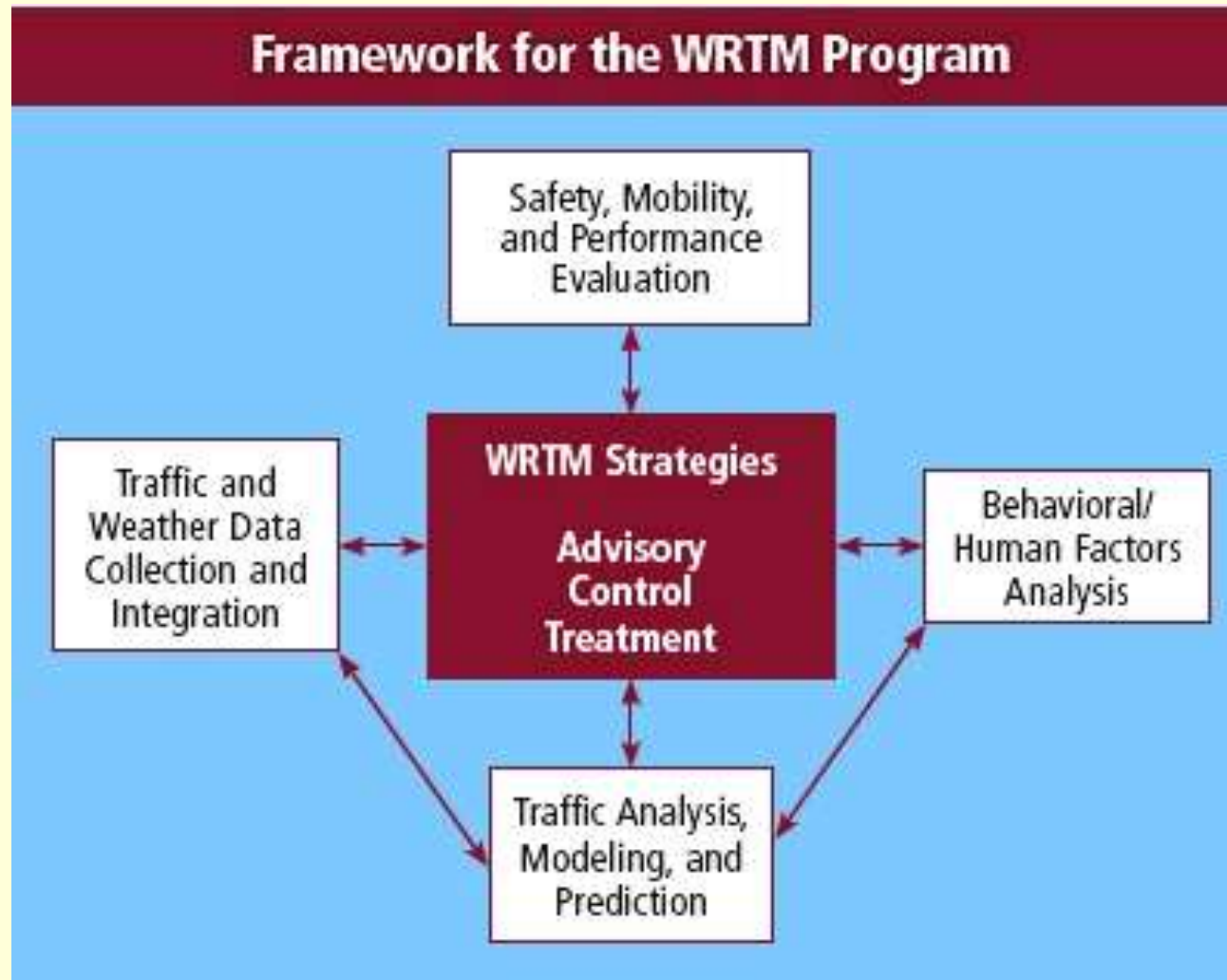roemer.alfelor@dot.gov

Road Weather Management Stakeholder Meeting
September 8, 2011 – Albuquerque, NM

U.S. Department of Transportation
Federal Highway Administration

WRTM Program

Framework for the WRTM Program

Safety, Mobility, and Performance Evaluation

Traffic and Weather Data Collection and Integration

WRTM Strategies

Advisory Control Treatment

Behavioral/ Human Factors Analysis

Traffic Analysis, Modeling, and Prediction

Human Factors Analysis for Road Weather Information

- Identify traveler requirements for Road Wx information

- Review and evaluate existing Road Wx messages and dissemination methods

- Recommend strategies for improving Road Wx information content and dissemination

Phase 1 Accomplishments

1. Identified and Evaluated Existing Messages and Dissemination Strategies

2. Incorporated Information into a Road Wx Message database

3. Developed Preliminary Guidelines for Disseminating Road Wx Information

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Existing Messages and Dissemination Strategies

- *Weather Messages*: Weather advisory and control messages on precipitation, visibility, wind and extreme weather events such as thunderstorms, hurricanes, tornadoes, floods, etc.

- *Dissemination Strategies*:
  - Kiosks
  - Variable/Dynamic Message Signs
  - 511/Highway Advisory Radio
  - Websites
  - Cellular Phones
  - In-Vehicle Navigation Systems
  - Other information portals

Road Weather Message Database

Source

Balke, K.N., Songchitruksa, P., Liu, H., Brydia, R.E., Jasek D.L., Benz, R.J. (2007). Concepts for Managing Freeway Operations During Weather Events. Research Resport 0-5278-1. College Station. Texas Transportation Institute. Retrieved September 19, 2008 from http://tti.tamu.edu/documents/0-5278-1.pdf

Weather Event Messages

Winter Conditions
- ☐ Blizzard conditions
- ☐ Sleet or freezing rain
- ☐ Freezing drizzle
- ☐ Flurries or light snow
- ☑ Blowing snow
- ☐ Moderate to heavy snow
- ☐ Extreme cold
- ☑ Bridge or road frost
- ☑ Low roadway traction

Rain
- ☑ Flooding
- ☑ Moderate to heavy rain
- ☐ Dizzle or light rain

Convective Weather
- ☑ Severe thunderstorms
- ☑ High winds
- ☐ Hail
- ☐ Hurricanes
- ☑ Tornadoes

Other
- ☐ Extreme heat
- ☑ Blowing sand or dust
- ☑ Smoke, mist, fog, or haze
- ☐ Other

Dissemination Method
- ☐ TV
- ☐ Local AM/FM radio
- ☐ Satellite radio
- ☐ HAR
- ☐ 511
- ☐ Portable electronic device
- ☐ Cell phone text message
- ☐ GPS navigation device
- ☑ Dynamic message sign
- ☐ Kiosks
- ☐ Website
- ☐ Other

Message Modality
- ☐ Visual Component
- ☐ Auditory Component

Message Type
- ☑ Advisory
- ☑ Control

Extra Information
- ☐ Driver Information Needs
- ☐ Geo-Specific/Regional Information
- ☐ Design Recommendations
- ☐ Contains Methodological Information

Comments
Suggested messages to be used on DMS signs. Not tested in laboratory or field studies

Content

Suggested DMS Messages for:

LIMITED VISIBILITY CONDITIONS

Warning Messages

Roadway Name	Roadway Name	Roadway Name
Dense Fog	Dense Fog	Blowing Sand
Use Caution	Reduce Speed	Reduce Speed

Speed Advisroy Messages

Roadway Name	Roadway Name	Roadway Name
Dense Fog	Dense Smoke	Blowing Sand
Advise XX MPH	Advise XX MPH	Advise XX MPH

End of Queue Warning (Two Panel Message)

Panel 1	Panel 2	Panel 1	Panel 2
Roadway Name	Watch For	Roadway Name	Watch For
Dense Fog	Stopped	Dense Fog	Stopped
Ahead	Vehicles	Next X Miles	Vehicles

Truck Lane Restriction (Two Panel Message)

Panel 1	Panel 2
Roadway Name	Trucks
Dense Fog	Right Lane
Ahead	Only

Roadway Closed

Roadway Name
Closed
Exit at Voss

Diversion Message (Two Panel Message)

Panel 1	Panel 2
Roadway Name	Use
Closed	Other
Dense Fog	Routes

PONDING OR FLASH FLOODING CONDITIONS

Main Lanes Passable

| Water on Road | Water on Road | Water on Road | Water on Road |

Preliminary Design Guidelines

| Weather Events | → | Traveler Decisions | → | Dissemination Methods | → | Guidelines |
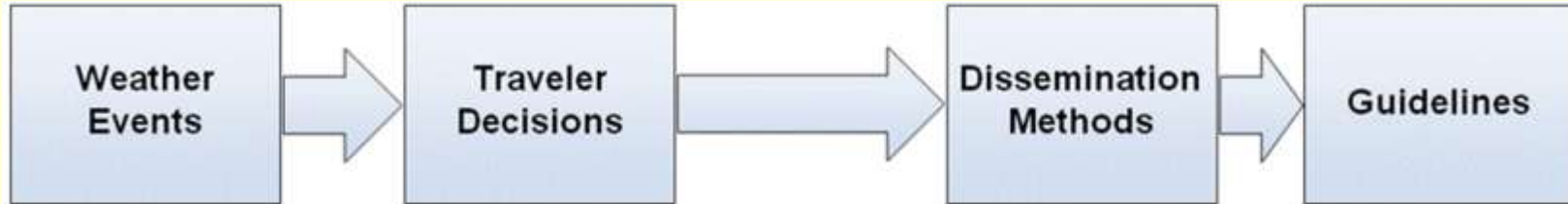
What are the Key Mobility impacts?

For Example:
reduced traction
congestion
poor visibility
road closures

What are the Traveler Decisions to be made?

For Example:
expect & plan for delays
use alternative route
change travel modes
drive with greater caution
change their driving behavior
make safety-related preparations
cancel their trip

What are the appropriate Dissemination Methods?

For Example:
DMS
HAR
511
In-vehicle devices
Cell phones
Kiosks
Websites

Preliminary Design Guidelines

- **30 guidelines and 4 tutorials for road weather advisory and control information for:**
  - Message content, length, and structure
  - Design of fonts, colors, icons, and alerts
  - Display of map, weather, and traffic information
  - How to communicate timeframe, urgency, likelihood
- **Specific guidelines are provided for the range of dissemination methods (DMS, HAR, 511, etc.) associated with road weather information.**

- **The guidelines are organized around traveler information needs and driving decisions.**

Preliminary Design Guidelines

Section Title:
General topic area that is addressed by the guideline

Introduction:
Brief definition of the scope of the guideline

Figure, Table, or Graphic:
Visual representation or example of the information presented in the guideline

Key References:
List of references used to write the design guideline

Guideline Title:
Contains the guideline number, specific topic addressed by the guideline, and the applicable Dissemination Method types

Design Guideline:
Message design guidance, always presented in a blue box

Discussion:
Further explanation and rationale for the design guideline

Page Number

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Phase 2 – Testing and Evaluation of Design Guidelines

1. Develop and implement a plan to test and evaluate the design guidelines.

   - On-line survey/questionnaire
     http://www.surveymonkey.com/s/X72ZSZ5
   - On-site testing/evaluation

2. Revise the guidelines based on the survey/test results and recommendations from operators and travelers.

3. Implement a set of outreach activities in order to attract, engage, and involve the user community.

Criteria for On-Site Testing/Evaluation

1. Geographical/weather variation
2. Transportation network coverage
3. Dissemination methods
4. Types of messages
5. Willingness to evaluate or improve existing dissemination methods
6. Agency responsible for posting messages

Testing/Evaluation Sites

Agency	Operational Network Coverage	Weather Events	Dissemination Methods for Weather	Road Wx Messages	Responsible for Posting Messages	Approach to Messages
Kansas City Scout, MO	Urban freeway; bi-state	Snow, ice, flooding, wind	DMS, 511, website		TMC operators	Approved message sets
Wyoming Statewide TMC	Rural freeway and arterials	Snow, ice, wind	DMS, VSL, 511, website, HAR, "511 notify" that pushes weather messages to subscribers	Closures; variable speed limit control		
Colorado Springs, CO TMC	Urban arterials	Snow, ice		Traffic signal control		
CDOT, Colorado	Freeways	Snow, ice, other	VMS, VSL		Op Program Mgr; Supervisor	Both preset and ad hoc messaging
WA State DOT and NW Regional TMC	Urban freeways and arterials	Snow, ice, heavy rain, flooding, wind, fog	DMS/VMS, website, 511, HAR		TMC supervisors, operations staff, regional and state-wide	

Testing/Evaluation Sites (cont)

Agency	Operational Network Coverage	Weather Events	Dissemination Methods for Weather	Road Wx Messages	Responsible for Posting Messages	Approach to Messages
Maryland CHART	Urban freeways and arterials	Snow, ice, heavy rain,	DMS, HAR, 511 recently activated	Closures, advisories, icy conditions, anti-icing	Operations staff	Standardized set. SOP already for winter events
Indiana DOT	Urban freeways on IN side of Chicago area	Focus on road conditions, winter weather effects	DMS; a CARS state, just getting into 511	Advanced warning of lake snow effects	Dispatchers; "super users" can create custom messages	Both fixed message sets and ad hoc messaging
Meridian	Manages statewide 511 systems (for GA, KS, NE, SD, ND, MT, WY, and NV.	Full range (emphasis on winter weather conditions)	511 phone and websites	Wide range	Varies by states	Varies by state
Castle Rock, Inc.	CARS system	Covers 12 states and several other entities	Focus on 511	Wide range	Varies by state; CRC guidance	Varies by state

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Traveler Evaluation Methods

1. Focus Groups
2. Comment Forms
3. Intercept Surveys
4. Social Media