Synthesis of Western U.S. Automated Safety Warning Systems

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Overview

• Introduction
• Motivation
• Approach
• States surveyed
• Systems
• Conclusions
Introduction

• ITS evolution has produced site-specific systems
  – Address local safety and/or operational issues
  – Ex. – Ice warning, queue presence, etc.
• Systems often “self-contained”
  – Collect localized data, process it, perform specific task such as post warning message on CMS
• Systems typically roadside-based
  – All equipment and processing completed on-site (no TMC input or activation)
Introduction

• “Self-contained” safety warning systems exist throughout western United States
  – Deployed by wide range of entities
• Lack of documentation, specifically inventory/synthesis of deployments
• Tracking down information on deployments is a challenge
• Absence of information prevents practitioners from learning about other systems prior to pursuing their own
Project Motivation

• Western States Rural Transportation Consortium pursued synthesis of safety warning devices in western U.S. to address information gap
  – http://www.westernstates.org/

• Identify past/present deployments, their function/purpose and other information

• Develop summaries that present practitioners with information on systems

• Information used to learn about benefits systems, provide contact information to learn more about specific sites/systems
Approach

• Interview agency contacts via telephone
• Discussions generally 5-7 minutes per system
• Document active and inactive systems
• Information of interest:
  – Type of system, problem addressed, location, deployment year, status, type of roadway/speed, system components, effectiveness, evaluation results, consideration of use elsewhere, future improvements/changes
States of Interest

- Alaska
- Arizona
- California
- Colorado
- Idaho
- Montana
- New Mexico
- Nevada
- Oregon
- Utah
- Washington
- Wyoming
Summary of Systems

- Ice/Weather warning (9)
- Animal warning (8)
- Curve Speed warning (15)
- Traffic/Queue warning (5)
- Variable Speed Limit (3)
- Wind warning (7)
- Runaway Truck Ramp (2)
- Flood warning (3)
- Visibility warning (2)
- Tunnel warning (2)
- Seismic warning (2)
- “Other” (8) [vehicle overlength detection, travel time, downhill speed]
Ice/Weather Warning

- Eight systems identified
  - CA (3), OR (1), NV (1), WA (1), AZ (1), ID (1)
- Purposes – ice warning (tangents, curves, tunnels), general storm warning
- Components - pavement sensors, RWIS, controller, CMS, CCTV, power, communications
- Experiences – systems work to differing extents (reduce speeds and crashes), sensor placement and accuracy critical to operations
Animal Warning Systems

- Eight systems identified
  - WA (3), NM (1), MT(1), WY (1), AZ (1)
- Purpose – provide animal presence warning
- Components – animal sensors (radio collars, infrared, laser, body heat or microwave sensors, video detection), receivers, controller, static signs with beacons, portable VMS
- Experiences – detection is difficult, varying effectiveness in meeting goals
Curve Warning Systems

• Fifteen systems identified
  – CA (8), OR (3), WA (3), NV (1)
• Purpose – provide curve and/or speed warning
• Components – Speed sensors (radar or microwave vehicle detection systems), controller, signage (CMS, DMS, VMS, static signs with beacons or chevrons w/ flashing LEDs)
• Experiences – Components straightforward, generally effective in addressing speeds/crashes
Traffic/Queue Warning Systems

• Five systems identified
  – CA (3), OR (2)

• Purpose – Provide warning of slowed or stopped traffic

• Components – Loop detectors, controller, CMS, DMS or overhead warning signs with beacons

• Experiences – Generally effective in addressing rear end crashes

Image: Caltrans
Variable Speed Limit Systems

- Three systems identified
  - WA (2), OR (1)
- Purpose – Adjust speed limits based on traffic levels or weather conditions
- Components – Loop detectors, sidefire radar, RWIS, controller, CMS or VMS
- Experiences – Effective in reducing speeds, some reduction in crashes

Wind Warning Systems

• Seven systems identified
  – OR (2), AZ (1), WA (1), NM (1), NV (1), CA (1)
• Purpose – Provide drivers warning of high winds at point and segment locations
• Components – Loop detectors, sidefire radar, RWIS, controller, CMS or VMS
• Experiences – Very effective in alerting drivers to presence of winds

Image: Phillip Graham/Caltrans
Runaway Truck Ramp Systems

- Two systems identified
  - CA (1), AZ (1)
- Purpose – Notify truck drivers that a runaway ramp is occupied
- Components – Loop detectors, presence sensors, CCTV, controller, DMS, static metal signs with beacons
- Experiences – Very effective in providing information on ramp use, reduced truck crashes
Flood Warning Systems

• Three systems identified
  – OR (3)

• Purpose – Notify drivers of water over roadway surface

• Components – Ultrasonic or float sensors, controller, static metal signs with beacons

• Experiences – Generally effective and reliable, straightforward in design

Image: Oregon DOT
Additional Systems of Interest

• Additional systems documented
  – Visibility warning (CA – 1)
  – Tunnel warning (WA – 2)
  – Downhill truck speed warning (OR – 1, CO – 1)
  – Overheight/length detection (OR – 3)
  – Travel time – (WA -1, AZ – 1, CO - 1)
  – Seismic warning (WA – 2)
Conclusions

• Variety of different systems deployed
  – Address many site-specific conditions
• Some states deploy more systems than others
  – Some agencies not comfortable with automation, prefer operator input
• As technologies improve, components have changed
Conclusions

• Some systems operate better than others
  – Animal warning systems less reliable
• Most systems met intended objectives
• Work wrapping up, always interested in new study state contacts
  – Report is a living document, so additions can be made
• For more information:
  – http://www.westernstates.org/
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Questions