

# Best Practices for Road Weather Management

## Version 2.0

### Houston, Texas Environmental Monitoring System

Four agencies in the Greater Houston area have partnered to provide transportation management and emergency management services to the region. The Houston TranStar consortium includes the Texas Department of Transportation (DOT), City of Houston Traffic Operations, Harris County (i.e., Traffic Operations and the Office of Emergency Management (OEM)), and the Metropolitan Transit Authority of Harris County. TranStar partners—who are collocated in a combined management center—utilize an environmental monitoring system to identify and respond to weather threats (e.g., flooding, ice, high winds). Partners also disseminate environmental data to the traveling public.

*System Components:* The monitoring system includes 164 Environmental Sensor Stations (ESS), 314 Closed Circuit Television (CCTV) cameras, as well as communication and central control systems. The Harris County OEM owns 127 ESS that measure rainfall rate, rainfall accumulation, and water levels). The DOT's ESS detect these same conditions as well as wind speed and direction, pavement temperature, air temperature, humidity, ice and/or roadway water depth (i.e., flooding). The CCTV cameras are used to visually monitor environmental and traffic conditions on freeways.

Video from CCTV cameras is sent to the TranStar management center via fiber optic cable. A low-frequency radio communication system transmits ESS data from the field to central systems. Data from DOT and county ESS are stored in a database and posted on the TranStar website ([www.hcoem.org](http://www.hcoem.org)), which can be viewed by maintenance personnel and travelers. Four static warning signs with flashing beacons, 13 Highway Advisory Radio (HAR) transmitters, and 153 Dynamic Message Signs (DMS) may also be used to notify motorists of prevailing conditions.

*System Operations:* Traffic and emergency managers use central computers to monitor CCTV video, ESS data, and information from the National Weather Service and private vendors (e.g., radar, river forecasts). When established threshold criteria are met, the Emergency Operations Center (EOC) in the TranStar facility is activated and computers send alarms to maintenance managers (via email and pager). Managers from each agency coordinate to plan appropriate responses and to warn motorists. The transit authority uses ESS data to manage operations in High Occupancy Vehicle (HOV) lanes, which are prone to icing and flooding. If warranted, maintenance personnel will erect barricades to close flooded roadways.

*Transportation Outcome:* The environmental monitoring system enhances agency productivity by eliminating trips to bridge locations, by providing decision support to managers, by fostering interagency coordination, and by facilitating efficient transportation management in inclement conditions. Roadway safety is improved by controlling access to flooded roads and through the provision of weather-related advisories that allow travelers to make informed decisions.



**Houston, TX Water Level Gauge**



**Houston, TX Static Warning Sign**

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*Implementation Issues:* Researchers with the Texas Transportation Institute evaluated the operation of the monitoring system and designed a survey to determine how motorists access and interpret road weather information. Survey results indicated that 43 percent of respondents utilize the Internet to obtain hazard information.

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*Keyword(s):* rain, precipitation, flooding, ice, wind, environmental monitoring system, freeway management, traffic management, emergency management, decision support, institutional issues, traveler information, weather information, advisory strategy, control strategy, environmental sensor station (ESS), closed circuit television (CCTV), dynamic message sign (DMS), highway advisory radio (HAR), road weather information system (RWIS), internet/web site, safety, productivity