

# ROADWAY FLOOD WARNING SYSTEM

By: Houston TranStar

## IN THIS CASE STUDY YOU WILL LEARN:

1. How TranStar's Roadway Flood Warning System helped transform the relaying of vital emergency flooding information.
2. Bus controllers can use the system to reroute busses before, during, and after flooding events.
3. The Roadway Flood Warning System project enhances traveler safety, educates people about flood risks, and helps displaced individuals by giving motorists information to avoid areas.

## BACKGROUND

In Southeast Texas, frequent and heavy rainfall makes roadway flooding a concern for travelers throughout the region. In the Greater Houston area, rainfall totals of more than one inch every 15 minutes are enough to cause roadway flooding. Unfortunately, during Hurricane Harvey, first responders and the public had no definitive information about flooding



conditions on local streets and emergency crews did not know whether they could send ambulances, firetrucks, and other vehicles into area neighborhoods. While Houston TranStar's Real-Time Traffic Map ([www.houstontranstar.org](http://www.houstontranstar.org)) provided information gleaned from closed circuit television cameras along freeways to alert motorists to flooded locations, no such flood reporting existed on non-freeway facilities.

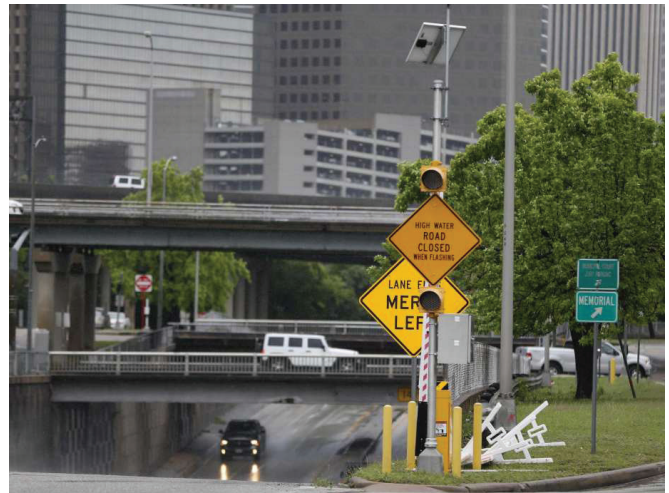
After Harvey, several agencies in the region collaborated to find a solution. A first meeting was held in November 2017 with the following participating entities: Houston TranStar, the Texas Department of Transportation-Houston District, the Texas A&M Transportation Institute, the Harris County Flood Control District (HCFCD) and Harris County. The need for an accurate, local Roadway Flood Warning System was evident, and thanks to the combined efforts of multiple agencies

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sharing information that enhances the safety of first responders and the traveling public during flooding events, motorists were provided potentially life-saving information with the development of this tool.

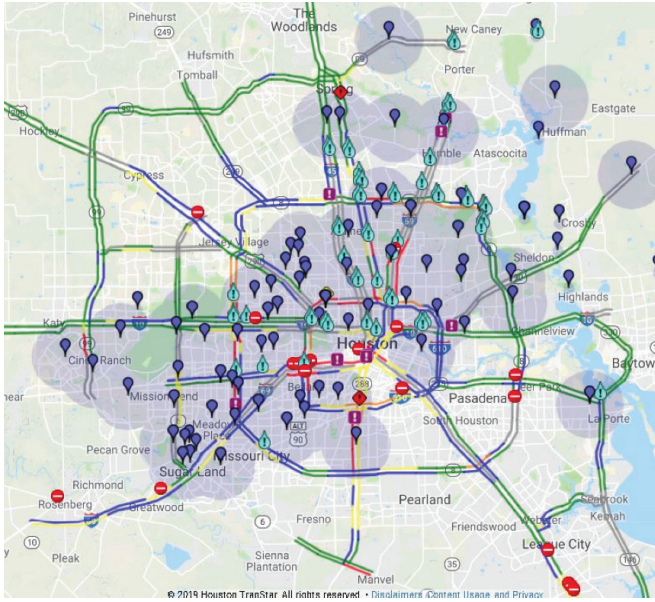
## TSMO PLANNING, STRATEGIES, AND DEPLOYMENT

The project concept was to capture rainfall rates from an existing network of flood gauges and use this information to identify areas where roadways are highly-likely to become flooded during heavy rain events. Over the course of several months, partner agencies worked to share and integrate data from HCFCD's 170+ regional rainfall/stream elevation gauges onto the Houston TranStar website and mobile application; tools that provide motorists with real-time travel and traffic information.



Because existing sensors and datasets were accessed, implementation costs were minimal, yet the Roadway Flood Warning System provides significant benefit to the safety and mobility of regional travelers. To keep the technology active and accurate, rainfall sensors – strategically located along the banks of 24 watersheds in Harris County and surrounding areas – must be consistently maintained. For HCFCD, this is a routine responsibility and as additional rainfall sensors are added to the system, they automatically become part of the Roadway Flood Warning System, which enhances resolution and accuracy. Active promotion of the Roadway Flood Warning System is ongoing, as participating agencies work to familiarize residents, travelers, first

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After the system was tested in-house during a number of small rain events, a media conference was held on July 25, 2018. Local news outlets covered the event extensively, and information was shared on the Houston TranStar website and social media platforms. Our facility tour script was also updated to include information about the new technology. On average, TranStar provides facility tours to approximately 2,700 visitors annually.

## OUTCOMES, BENEFITS AND LEARNINGS

Houston TranStar believes no other entity in the nation synthesizes rainfall/stream elevation data with traffic information in real-time to identify where roadway flooding is likely to occur, and displays that data on a website map and mobile application. This project enhances traveler safety by giving motorists information to avoid potential roadway flooding conditions, educates people about flood risks by reducing travel on dangerous roadways, and helps displaced individuals return to their communities following major storms by displaying real-time, highly accurate maps that notify the public and the media of roadway conditions.

In addition to individual traveler use of the information, bus controllers for the Metropolitan Transit Authority of Harris County can reroute their vehicles based on information provided on TranStar's website, and because the information is publicly provided, commercial trucks and other business vehicles can also manage their deliveries and routes more securely. Finally, but not least, emergency responders now have a reliable tool to use in determining the best routes to serve the community during heavy rain events. The Houston TranStar website reached more than three million unique visitors during Hurricane Harvey. Information displayed on the site influences travel patterns of a large portion of the driving population, and thanks to the unique partnership of agencies on this project, the Roadway Flood Warning System will be available to travelers when the next hurricane strikes.

The Roadway Flood Warning System may be accessed at <https://traffic.houstontranstar.org/layers/> and the Harris County Flood Warning System may be accessed at <https://www.harriscountyfws.org/>.

responders, and members of the media with this advanced technology. Conceiving the idea of using rainfall rates to establish a geographic area of flood concern was this project's first step. Strategically convening appropriate resources was the next crucial stage, and extensive testing, sharing of data and inter-agency communication followed to ensure the accuracy and reliability of our final product.

## COMMUNICATIONS PLANNING AND EXECUTION

In 1993, Houston TranStar was the first center in the nation to combine transportation management and emergency management technologies, and during the years 2017-2018, our Roadway Flood Warning System project proved once more that several heads are better than one, and that teamwork denotes strength. Lessons learned, or rather re-learned for TranStar throughout this project, demonstrate the power of innovative thinking, uniting multiple entities, and mobilizing multi-agency resources to improve public safety.

While an initial challenge for Houston TranStar was getting project buy-in and participation from the appropriate agencies, the key to success was maintaining open lines of communication, exercising patience with one another and cultivating trust between various organizations.

A second challenge we faced was a technological one. Obtaining datasets and information from one organization or site, sharing that data with another site, and calibrating it successfully to ensure that the information shared is technologically accurate is no small feat. Testing, data sharing, and cross-communication between TranStar, HCFCD staff, and information technology personnel at various government agencies was essential to ensuring a reliable and accurate final product.

## FURTHER INFORMATION

NOCoE Knowledge Center: <https://transportationops.org/knowledge-center>

Harris County Flood Warning System Website:  
<https://www.harriscountyfws.org/>