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*Advance  
Flood  
Warning  
Systems Can  
Save Lives  
and Property*

# Flood Fatality Averages

- Flash flooding is the leading cause of severe weather related deaths in the U.S., with 75-200 deaths per year.
- Approximately 50% of flood-related drownings are vehicle-related.



Webster County Flooding

Source: [www.floodsafety.com](http://www.floodsafety.com)

# Best Flood Safety Management Practices

*The Texas Flash Flood Coalition web sites shows six municipalities, counties, or organizations that have some type of Flood Warning Systems. There are many others in the State of Texas, as ALERT users we must strive to let the public know what is available to them.*



# Vehicles in Moving Water

- One foot of water will displace 1,500 pounds of vehicle weight.
- Water's momentum is transferred to the car. For each foot of water moving at 6 mph, approximately 500 lb. of lateral force is applied to the car.
- The vehicle can be swept away and its occupants placed in extreme danger of drowning.
- Cars will float and be swept away in 12-24 inches of moving water (18-30 inches for Trucks and SUVs).
  - Many drivers rescued from flood waters were in a hurry to get home -- to safety!
  - Despite what car commercials depict, driving into flood waters may be the most dangerous things one might ever try.



# Advanced Flooded Roadway Warning System

- Road Weather Information System (RWIS)
- Stream level continuously monitored.
- Flashing Beacons warn motorists of flooded roadway.
- Red Flashing beacons with gates.



# Advanced Flooded Roadway Warning System Benefits

- Immediate response to developing flood emergency
- Relieves manpower requirements during flood for other emergency response activities
- Emergency Management personnel are notified as actions are taken by the system
- Optional Video monitoring provides visual confirmation of conditions
- Audit trail of system data and controller actions



# System Components

- Master Gauging Station
  - Stream monitoring
- Advance Warning Stations
  - Flashing Beacons
- Base Station
  - Communications
  - Supervisory & Control Software
- Optional Equipment
  - Video Monitoring
  - Automatic Barrier Gates
  - Sirens



# Master Gauging Station



- Standpipe or cabinet mount
- Pressure Transducer (PT) provides water level data for trends & analysis
  - Accurate & Reliable industry standard sensor
  - Float Sensors
- Sensor can be several hundred feet from the station
  - Station set away from flood area
  - FHWA ESS Siting Guidelines
- Triggers activation of up to 8 Advance Warning (flashing beacon) Sites
- Communicates with base station
- Additional sensor input for redundancy or other for monitoring another weather parameter

# Advance Warning Site

- Receives commands from Master Station
- Outputs energize Beacons, DMS or Barrier Gate Operator
- Sends confirmation to Master
- Additional sensor may be equipped (precipitation, wind, etc.)
- 12" or 8" LED Beacons
- Automatic night dimming
- 12-hour status report



# Communications

- Hydrological VHF Radio Frequencies
  - Licensed band
  - Stream level and Precip shared with NWS
- 900 MHz Spread Spectrum Radio
  - Line of Sight required
  - Rain fade considerations
- Cellular Modem
  - Outage considerations
  - Subscription charges
- Dial-Up
  - Outage considerations
- Ethernet
  - Outage considerations
- Microwave
- Satellite
  - Rain fade considerations
- Fiber Optic
- WiMax



# Power Systems

- Low Power Requirements
- Battery Operated
  - 72 hours Autonomy
  - Night Dimming
- Solar Powered
- AC Powered
  - Utility Installation Costs
- Remote Power Activation
  - Video Cameras
  - Barrier Gate Operators
  - Sirens
- UPS at Base Station



- *Underpass Pump Station Site at Houston RR crossing*
- *Pumps were overwhelmed in Nov. 2006, resulting in the death of a mother and young child.*

# Base Station Supervisory Alarm & Control Software

- Receives, displays & acts upon system sensor & status information
- Communicates via radio transceiver or IP connection
- Initiate override commands or status requests
- Communicate with Masters and Remotes using Mobile App available with DataWise Version 10 Software
- Notifications sent via text message, email or pager
  - Combinations of alarms can be set to alert selected personnel
- Hydrological Forecasting and analysis tools
- Import existing USGS Stream Gauge data automatically
- Easily interfaces with other databases
- Serves WebPages
- Full NTCIP 1204 ESS Database
- Archives data

## DW Mobile

6133 Fish Ck @ Carrier (481.83)  
492 ft  
October 27th at 08:22:54 PM

- Current Data** 407
- Alarms** 0
- Tabular**
- Chart**
- Map**
- Settings**



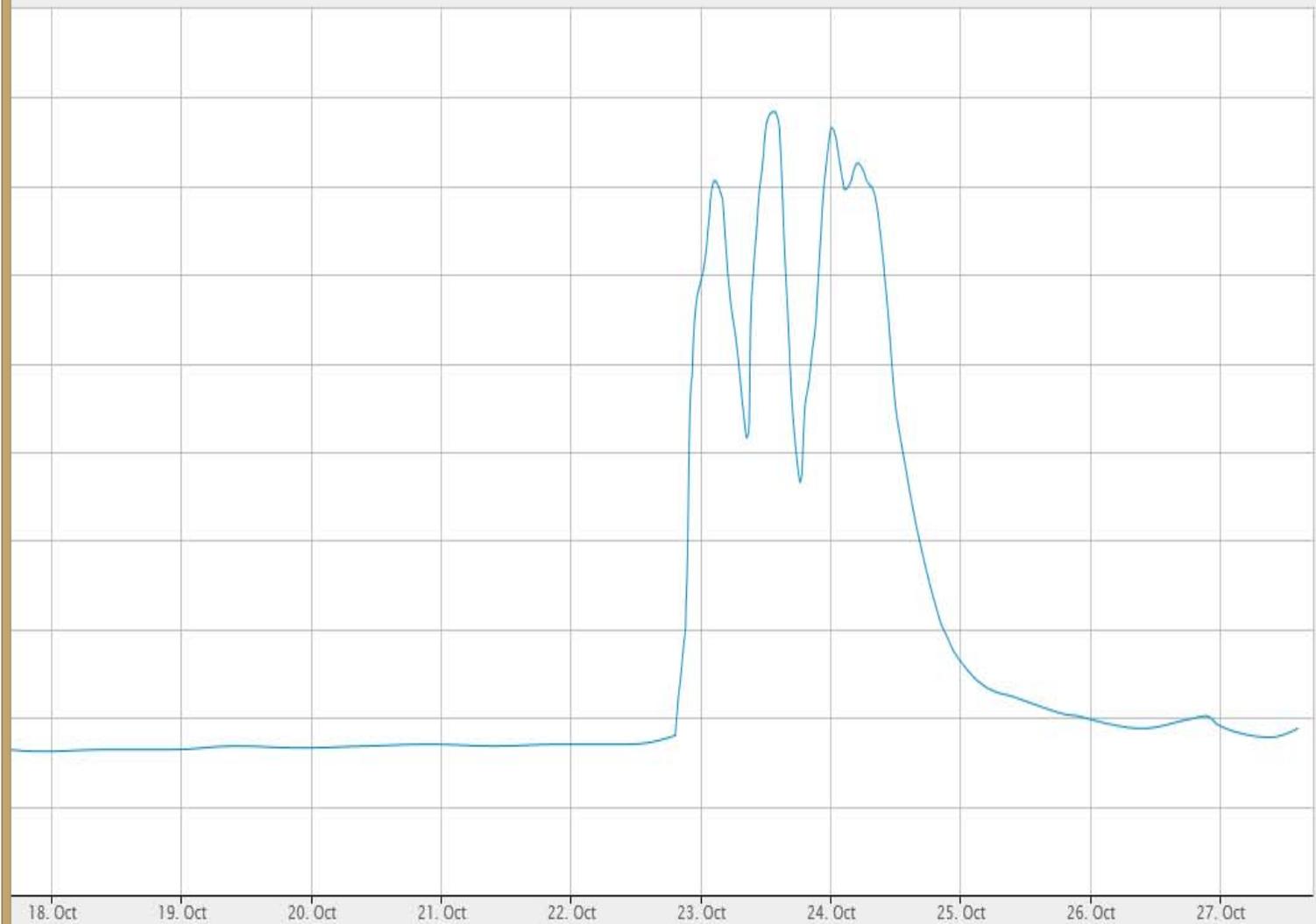
### Last 15 Days

### Chart Settings

Display data for the last:

15

Minutes  Hours  Days



— 6103 Cottonwood Ck @ Beltline(469.0)

# Traffic Safety - Old Process

- Hourly drive by checks during rain events
- Public Works manually place barricades
- Inspect roadway after flooding subsides
- Clear and store barricades



- Labor intensive
- Delay in response exposes County to liability
- Crews unavailable to respond elsewhere

# Traffic Safety - New Process

- Rising water triggers flashing beacons
- 20 seconds later Barrier Gate Arms deploy
- Mobile App allows view of data in field
- Text message and email sent to Public Works
  - Any exceptions sent via text message
- Road Crew checks roads after flooding event
- Raise arms via RF remote from inside
- Reset system from base station
  - Road Maintenance chooses how to respond
  - Available to respond elsewhere
  - Check status from home
  - Historical records



# Bell Road Low Water Crossing



# Summary

- Motorists lose lives every year due to driving through flooded low-water crossings.
- People underestimate the power and force of water.
- Manually placed barriers have little credibility to some motorists.
- No studies available to quantify lives saved
  - but... Anecdotal evidence and system operators suggests incidents are drastically reduced.
- Automated systems recommended for low-water crossings with a history of repeated flooding.
- With careful planning, an effective traffic safety improvement can be attained.







# Advance Flood Warning Systems Can Save Lives and Property

