City of Fort Worth
Flood Warning System

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Acknowledgment

Recent improvements were made possible by grant from:

Texas Water Development Board
• 3 fatalities in 2000 and 2002 led to 2003 pilot installation of High-Water Warning System (HWWS) at 3 test locations

• $500,000 for 15 flashers in 2004 bond election

• 5 deaths in 6 weeks during 2004 made it a top priority

• 285 road crossings scored

• 38 additional sites 2010-2014 with TxDOT/FHWA funding
Automated Local Evaluation in Real-Time (ALERT) messaging
• 1970s technology to transmit rainfall data from remote sites
• All sites report whenever data is collected; collisions between transmissions very likely
• No error correction in protocol
• Data transmissions extremely high during storm events
• As network expands > 50% data loss
• Outdated by new technology
Flood Warning System
"City-Wide" RADAR and Rainfall

Incident vertical polarization

Reflected vertical polarization

Incident horizontal polarization

Reflected horizontal polarization

> 4,000 feet

City limit
CASA Radar System
Rain Gauges
ALERT2

• High data transmission rate (16 X ALERT)
• Uses GPS technology to provide time slots, and data collisions are eliminated
• Has “forward error correction” in communication protocol
• Variable length and multiple messaging for more data variety and accuracy
• ALERT2 performed very well during Hurricane Harvey
Time Division Multiple Access (TDMA)

Source Address (SA) assigned at each slot
AL/2 Weather Station
Installations
Spring-Summer, 2018
Contrail Software
Decoded ALERT/1 ➔

Decoded ALERT/2 ➔
Arlington Heights

7 Day Stage

- Bryce and Hulen (43710) Stage (7)

7 Day Rain

- Bryce and Hulen (43710) Rain Increment (0)

Current Stage

- Bryce and Hulen (43710) Stage (7)

- 0.01 ft

24 Hour Rain Total

- Bryce and Hulen (43710) Rain Increment (0)

- 0.000 in

in Last 24 Hour
# Data Driven Maintenance

<table>
<thead>
<tr>
<th>Location</th>
<th>Code</th>
<th>Type</th>
<th>ID</th>
<th>Voltage</th>
<th>Current</th>
<th>Temperature</th>
<th>Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Springtown HS</td>
<td>43730</td>
<td>Battery</td>
<td>8</td>
<td>14.1</td>
<td>12.4</td>
<td>78</td>
<td>100.0</td>
</tr>
<tr>
<td>Godley</td>
<td>43718</td>
<td>Battery</td>
<td>8</td>
<td>14.2</td>
<td>12.7</td>
<td>78</td>
<td>100.0</td>
</tr>
<tr>
<td>3725 Confidence</td>
<td>3660</td>
<td>Battery</td>
<td>3664</td>
<td>13.259</td>
<td>4.063</td>
<td>29</td>
<td>98.0</td>
</tr>
<tr>
<td>Decatur Ave @ NE 28th</td>
<td>1100</td>
<td>Battery</td>
<td>1104</td>
<td>12.549</td>
<td>7.063</td>
<td>28</td>
<td>100.0</td>
</tr>
<tr>
<td>1200 NE 28th St. Sign 1</td>
<td>1110</td>
<td>Battery</td>
<td>1114</td>
<td>14.199</td>
<td>2.535</td>
<td>28</td>
<td>88.0</td>
</tr>
<tr>
<td>2702 Decatur Ave Sign 2</td>
<td>1120</td>
<td>Battery</td>
<td>1124</td>
<td>12.346</td>
<td>2.57</td>
<td>52</td>
<td>100.0</td>
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<tr>
<td>1401 NE 28th St. Sign 3</td>
<td>1130</td>
<td>Battery</td>
<td>1134</td>
<td>13.497</td>
<td>12.432</td>
<td>51</td>
<td>100.0</td>
</tr>
<tr>
<td>5200 Wagley Robertson Rd. Sign 2</td>
<td>2370</td>
<td>Battery</td>
<td>2374</td>
<td>18.97</td>
<td>12.377</td>
<td>90</td>
<td>100.0</td>
</tr>
</tbody>
</table>
Public Website

This website contains real-time flood warning information at monitored low-water road crossings. The Flood Threat link shows whether the road crossing is experiencing no known threat (NONE), potential conditions for flooding (CAUTION), or has overtopped (AVOID).
30-Day Rainfall Total, inches  Barometric Pressure, mBar
### Alarms

#### RISING WL at 0 ft (723)

<table>
<thead>
<tr>
<th>Rule</th>
<th>723</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site</td>
<td>5300 Prickly Pear Rd (130)</td>
</tr>
<tr>
<td>Level</td>
<td>Warning</td>
</tr>
<tr>
<td>Sensor</td>
<td>Stage (132)</td>
</tr>
<tr>
<td>Active</td>
<td>Off</td>
</tr>
<tr>
<td>Acknowledged</td>
<td>Off</td>
</tr>
<tr>
<td>Publisher</td>
<td>Karan S. Muttan PR/05/16/2016</td>
</tr>
</tbody>
</table>
| Equation | \[
\text{if} \ (\text{last_value}_1 < 0.4 \text{ ft} \ \text{and} \ \text{last_value}_2 \geq 0.4 \text{ ft}) \ \text{then} \ \text{RISE} (0.4 \text{ ft} \ \text{change} \times 5.0) \\
\text{ ELSE } \ \text{RISE} (0 \text{ ft} \ \text{change} \times 5.0) \\
\text{ ENDIF} 
\] |
| Hicut | \text{time \_ \_ \_ \_ \_ \_ \_ \_ \_} / 7.0 |

#### Deliveries

- **SITE NAME**: RISING WL at 0 ft
- **To**: Site name for City Code (KARE_BK_Deliveries)
- **From**: notification@xanadu.com
- **Rule**: RISING WL 0 ft, at <site_name>
- **Water Level**: data_value ft, at <data_time>
- **Link Data**

**Disclaimer**: This sensor alarm is based on actual raw readings that have not been verified. This data is intended for information purposes only. The City of Fort Worth strives to provide accurate information. However, information provided might sometimes be inaccurate due to a variety of environmental, equipment, or other reasons.

[Fort Worth logo]

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Flood Emergency Operation

- Storm assessment from OEM
- Field Operations mobilized
- Rainfall alarms (>= 0.3 inches/30 minutes)
- Water level alarms (rising/falling at -2', -1', -0.5', 0)
- Crews deploy by alarms
- Roads barricaded
- Roadside flashers turn on at overtop
- Flashers turn off after flood waters recede
- Crews remove barricades
On-Going Improvements
Transition from ALERT to ALERT2

• Move all dedicated weather stations to ALERT2
• After eventual ALERT de-commissioning:
  - All 3 frequencies on ALERT2
  - HWWS Master sites only to communicate to receive site
  - HWWS Local sensors and flashers to communicate with master controller site
Lead Times for Alarms
IBM Design-Think Flood Warning Workshop
CASA Apps
Flood Warning System

Purpose and Objectives

The current flood warning system in Fort Worth, known as the High Water Warning System (HWWS), relies on water level measurements made at 32 low-water crossings throughout the city. Roadside flashers are installed at those 32 locations, to immediately warn drivers of a flood hazard. At the same time, text and email alerts to first responders are issued when the water level sensors of each flasher system are triggered from rising water.

Weather data (mainly rainfall) is collected at 39 low-water crossings and seven other weather stations. The gaged data is communicated through two dedicated radio frequencies in real-time, to a receiver station at the Burnett Plaza building.

The Flood Warning System (FWS) will use the existing HWWS communication backbone as much as possible, while making improvements to weather data collection, and will disseminate the real-time data to the public and other stakeholders.

A grant through the Texas Water Development Board (TWDB) is providing development support for this system. The grant project has the following overall goals:

- Improve system reliability
- Expand the gaging network with additional rain gaging sites
- Upgrade data collection and data dissemination (communication tool) software
- Develop a Flood Response Plan

Calendar

There will be three public meetings related to the TWDB grant.

Upcoming Meeting

Public Meeting 3:
Stormwater Management Public Meeting
Early Flood Warning System Grant
Hazel Harvey Peace Center for Neighborhoods,
Room 105 828 Missouri Ave.
Dec. 12, 6-8 p.m.

Past Meetings

Public Meeting 1: March 23, 2017
Public Meeting 2: Nov. 1, 2017

OneAddress

Find data about your address, including
if your property falls within a regulatory
floodplain or is in an area that is
potentially flood prone.

Contact

Rajin S. Mottah
Senior Professional Engineer
Transportation & Public Works
Department
817-392-7659
Factory mishap paves street with chocolate in Germany

By THE ASSOCIATED PRESS  BERLIN — Dec 11, 2018, 1:51 PM ET

A street in a western German town got a repaving worthy of fictional candy maker Willy Wonka when a ton of chocolate flowed out of a factory and solidified.

The German newspaper Soester Anzeiger reported Tuesday that a "small technical defect" involving a storage tank caused the sweet and sticky spill from the DreiMeister chocolate factory in Westoennen.

After hitting the chilly pavement, the milk chocolate quickly hardened. About 25 firefighters got the job of prying the coating off with shovels and using hot water and torches to remove remaining bits from cracks and holes.

Company boss Markus Luckey told the Anzeiger the factory would be back in action on Wednesday. Luckey said if the spill had happened closer to Christmas, "that would have been a catastrophe."
Thank you