



NGWOS Urban Hydrology: Building Future Resilience

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Source: <https://www.cnn.com/2023/01/10/weather/gallery/california-weather-flooding/index.html>

'We weren't prepared': Redwood City grapples with the aftermath of devastating winter storms

Residents and officials said more needs to be done to prepare for weather events made increasingly severe by climate change



[Leah Worthington](#)
Jan 12, 2023 10:19 AM



Source: RWCPulse.com

Community First

Olympics Medal Count SkyWarn 13 Weather SportScene 13 Community First Hello Wisconsin

Winter Weather Advisory Is In Effect

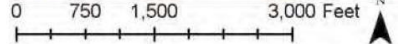
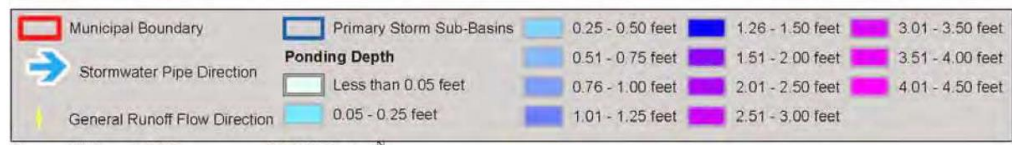
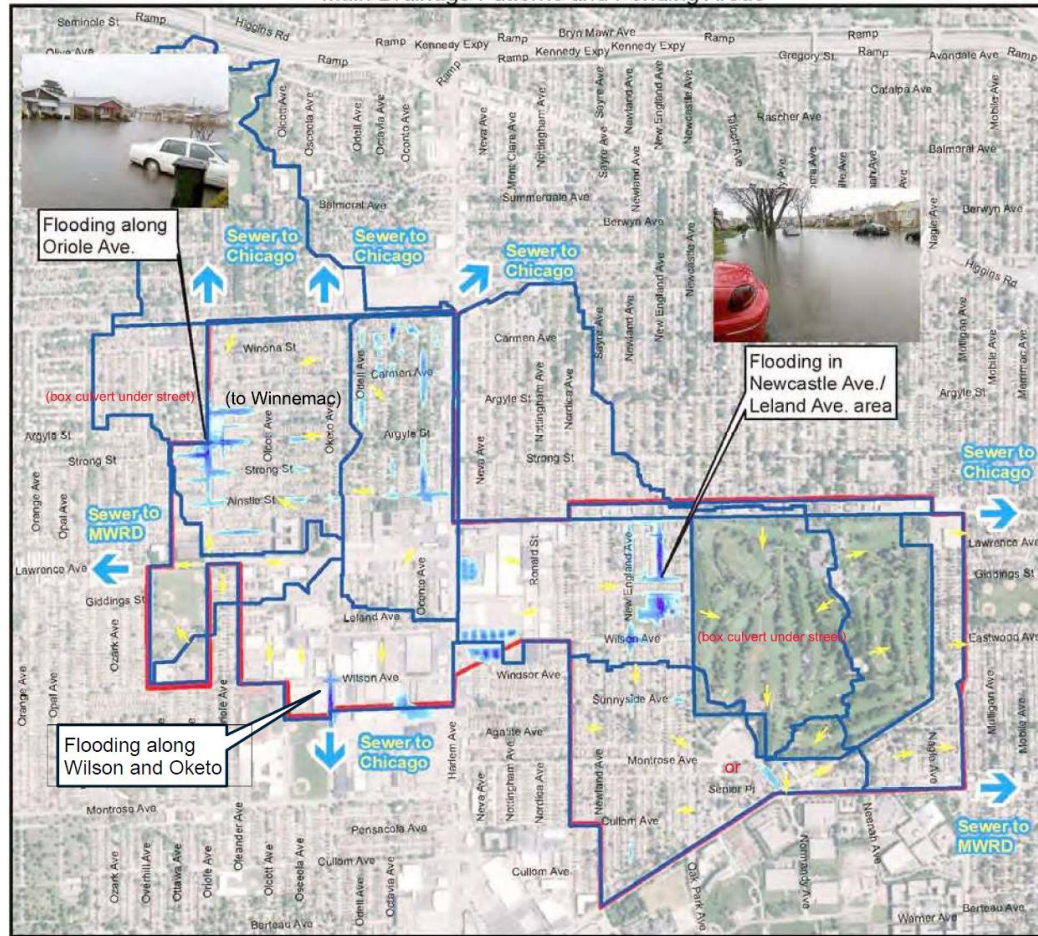
Authorities identify man killed in Madison flood

Source: WEAU news

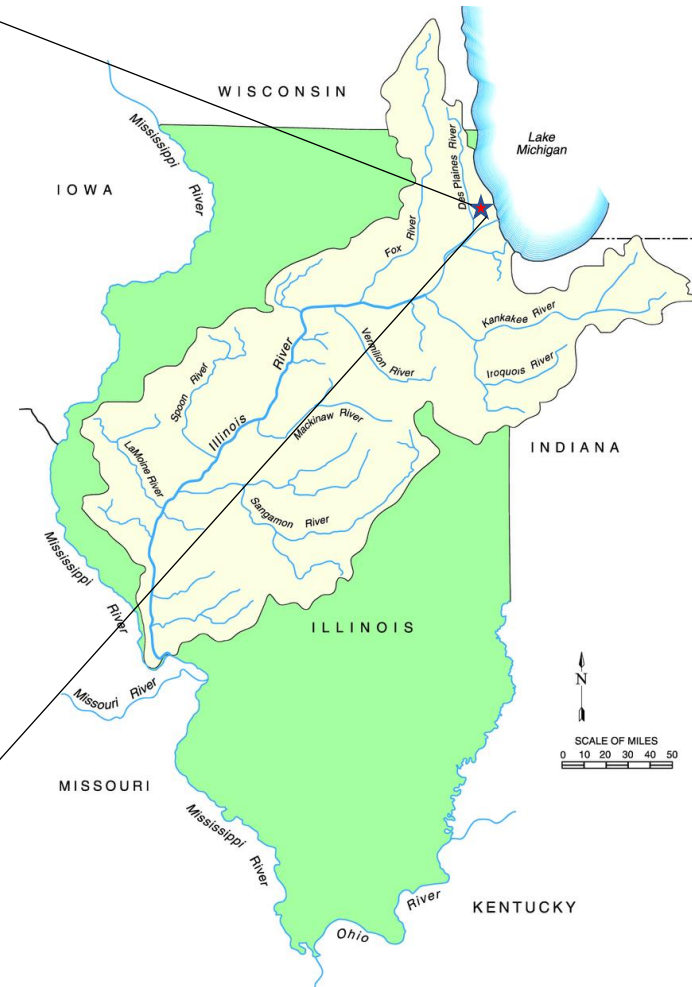


Source: Ryan Soderlin/Omaha World-Herald via AP

Stormwater Management Master Plan For The Village of Harwood Heights Main Drainage Patterns and Ponding Areas



Modified by: Melissa Bernard on 4/8/2016, Document Path: R:\Projects\141\403143039100_MWRD\G_C_Harwood Heights\GIS\Map\Drainage_Patterns_20160407.mxd
 Sources: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerpoint, IGN, iGP, swisstopo, and the GIS User Community
 Disclaimer: This map and all data contained within are supplied as is with no warranty. Canpro, Inc. expressly disclaims responsibility for damages or liability from any claims that may arise out of the use or misuse of this map. It is the sole responsibility of the user to determine if the data on this map meets the user's needs. This map was not created as survey data, nor should it be used as such. It is the user's responsibility to obtain proper survey data, prepared by a licensed surveyor, where required by law.



Harwood Heights, IL

(population = ~8,500)

Concept

- Pilot ***low-cost, low-power***, autonomous sensor network in urban areas prone to flooding
- Provide real-time data dashboard for end users
- Automatically send alerts to critical response teams when thresholds breached





All photos: USGS

LoRaWAN

- Low-cost, long-range wide area network
- Many-to-one

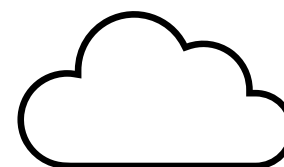
NB-IoT

- Narrow band Internet of Things (LTE-M, CAT-M1)
- One-to-one

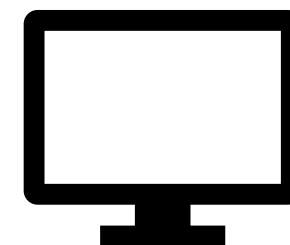
LoRa nodes



LoRaWAN Gateway



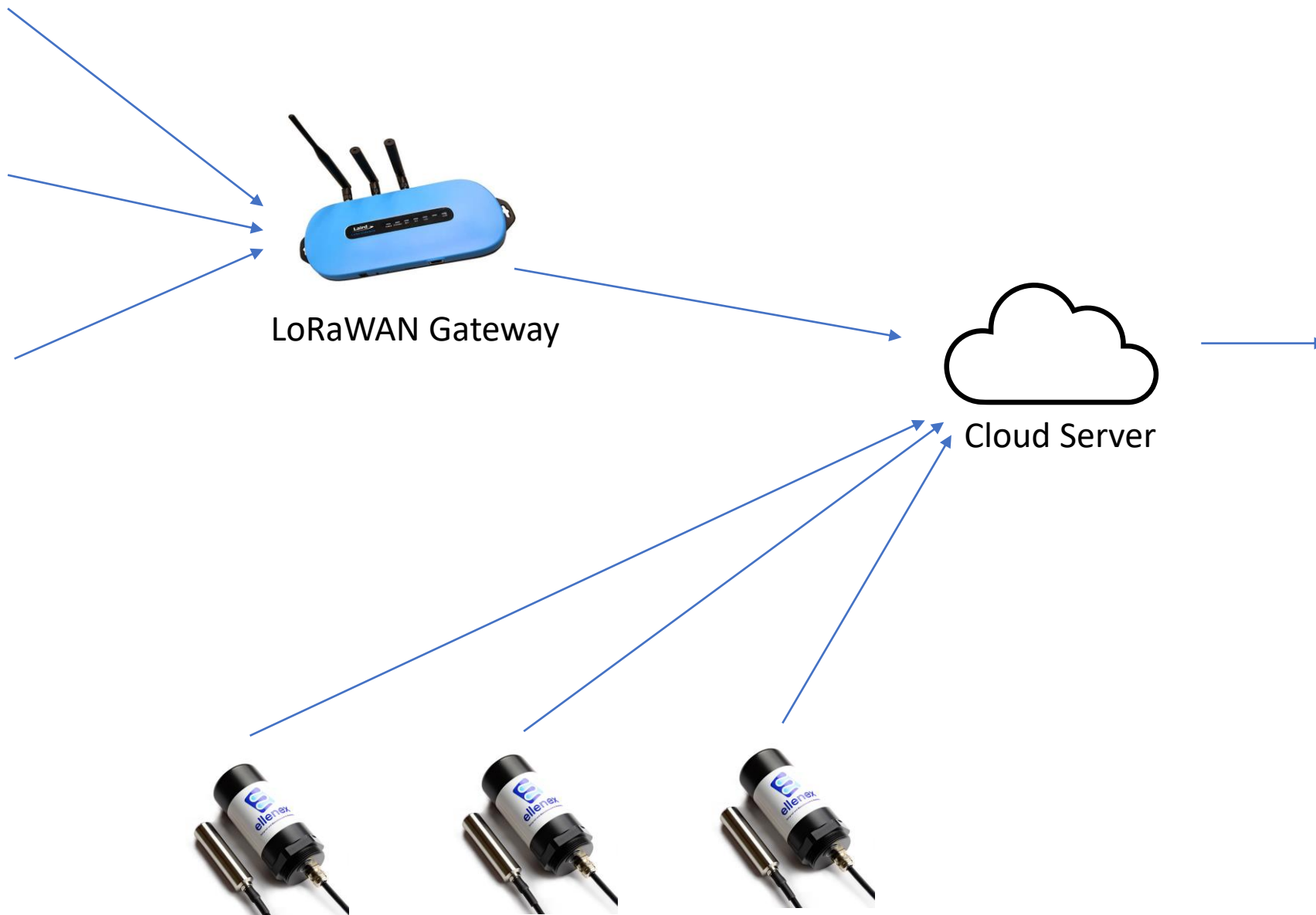
Cloud Server



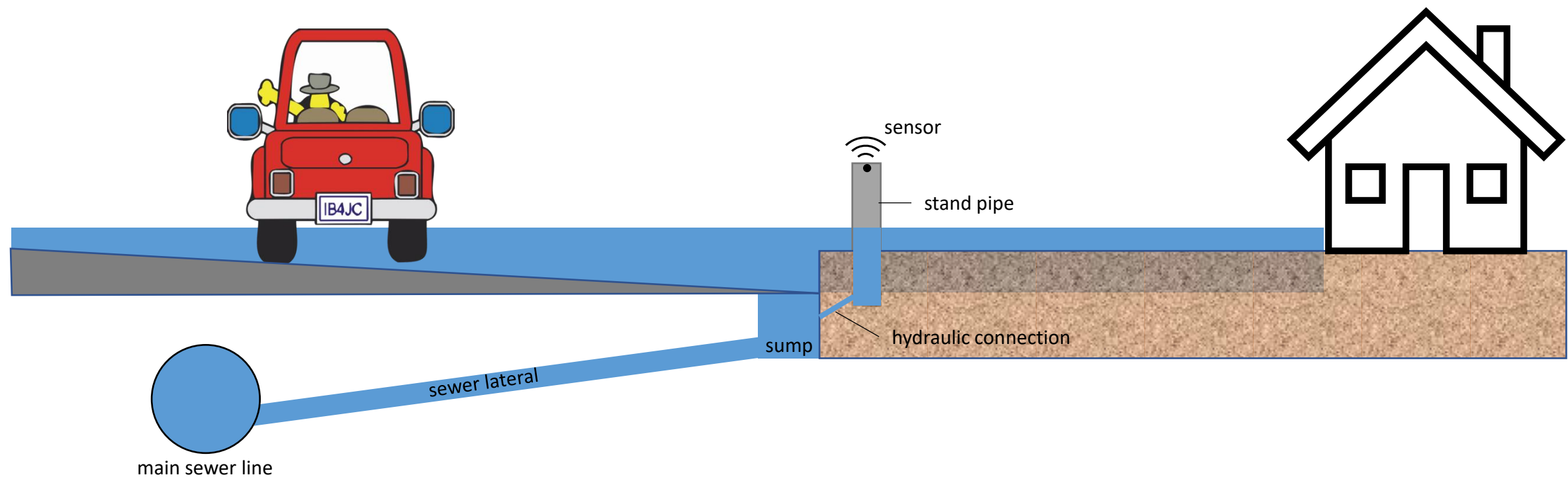
Dashboard

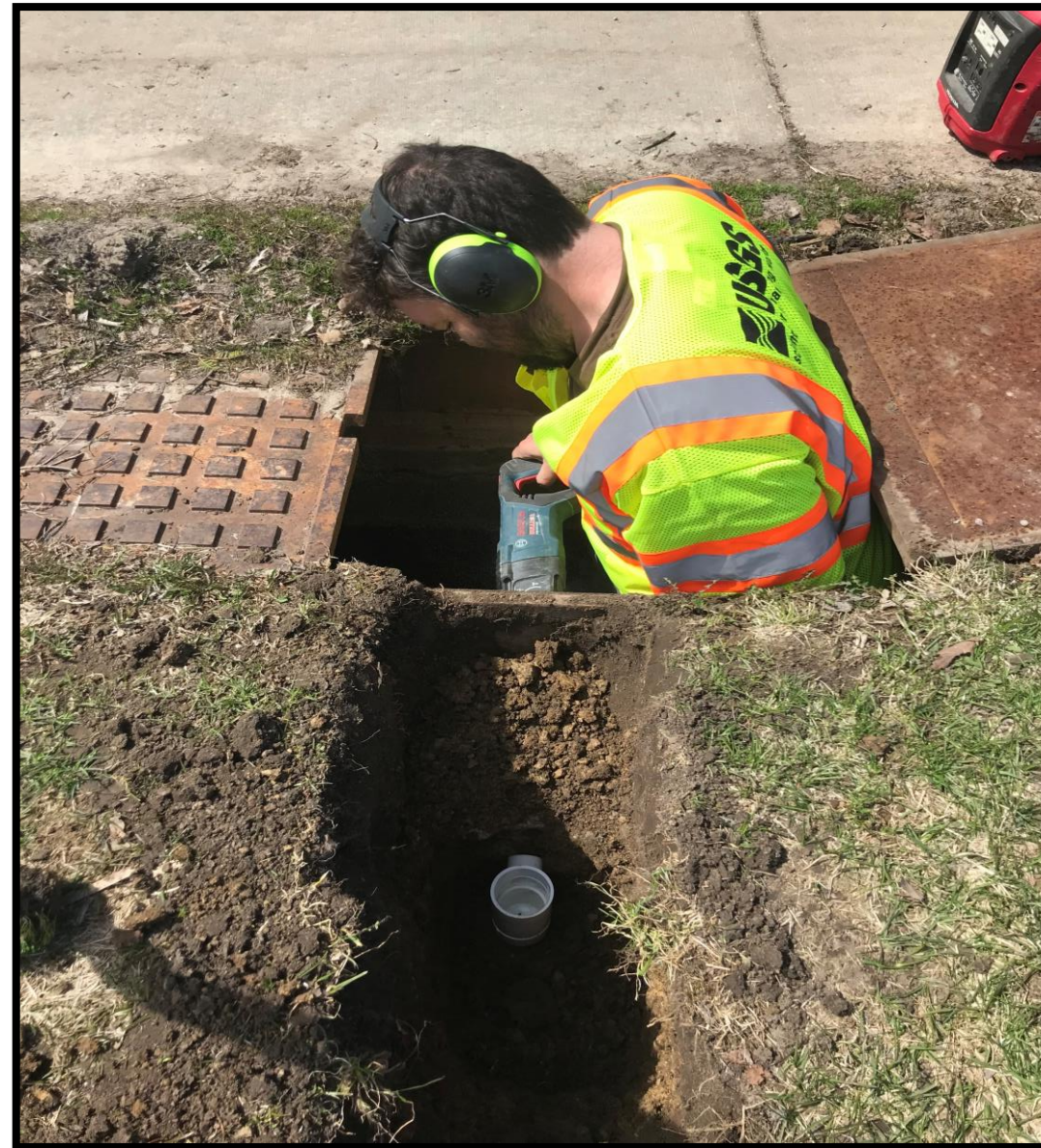


NB-IoT nodes



Conceptual Diagram









Ultrasonic
\$70



Mechanical float
\$125



Submersible pressure transducer
\$ 500

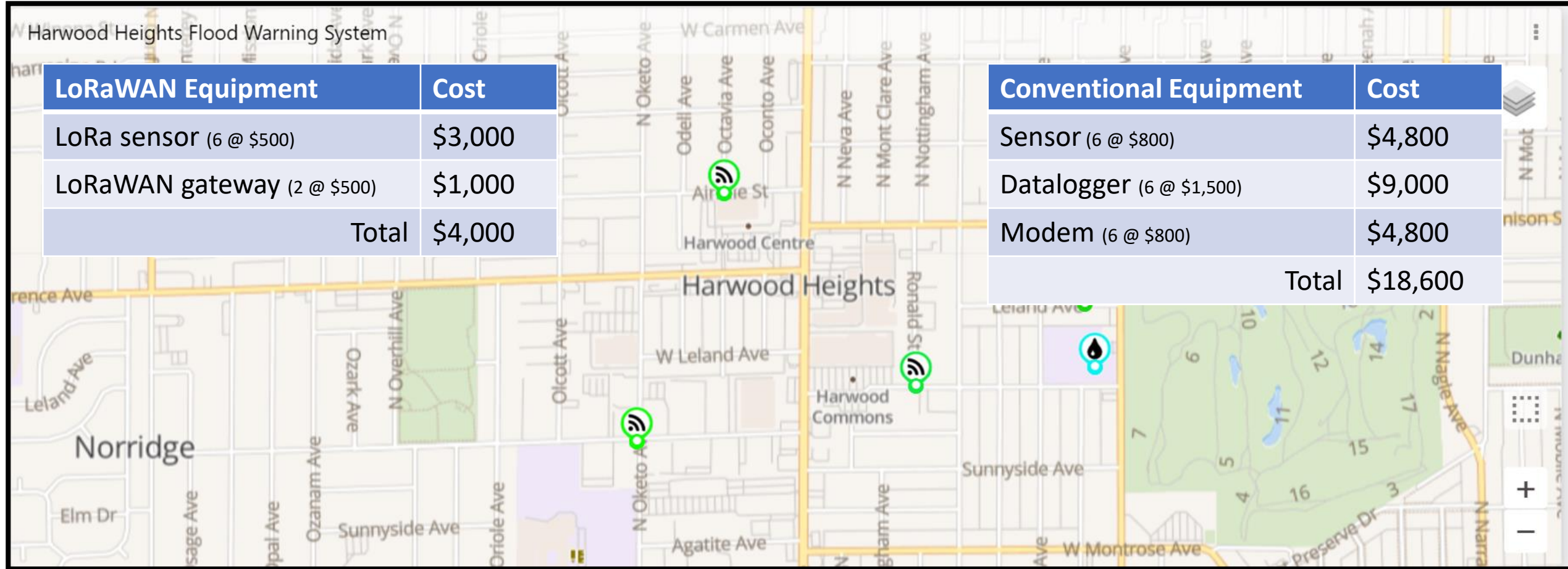


Equipment cost to monitor 6 different locations

Harwood Heights Flood Warning System

LoRaWAN Equipment	Cost
LoRa sensor (6 @ \$500)	\$3,000
LoRaWAN gateway (2 @ \$500)	\$1,000
Total	\$4,000

Conventional Equipment	Cost
Sensor (6 @ \$800)	\$4,800
Datalogger (6 @ \$1,500)	\$9,000
Modem (6 @ \$800)	\$4,800
Total	\$18,600



Real-time Dashboard and Alert System



Rapid identification of hazardous areas

- Graphical tools for quick visual assessment
- Data updated every 5 minutes (user defined)



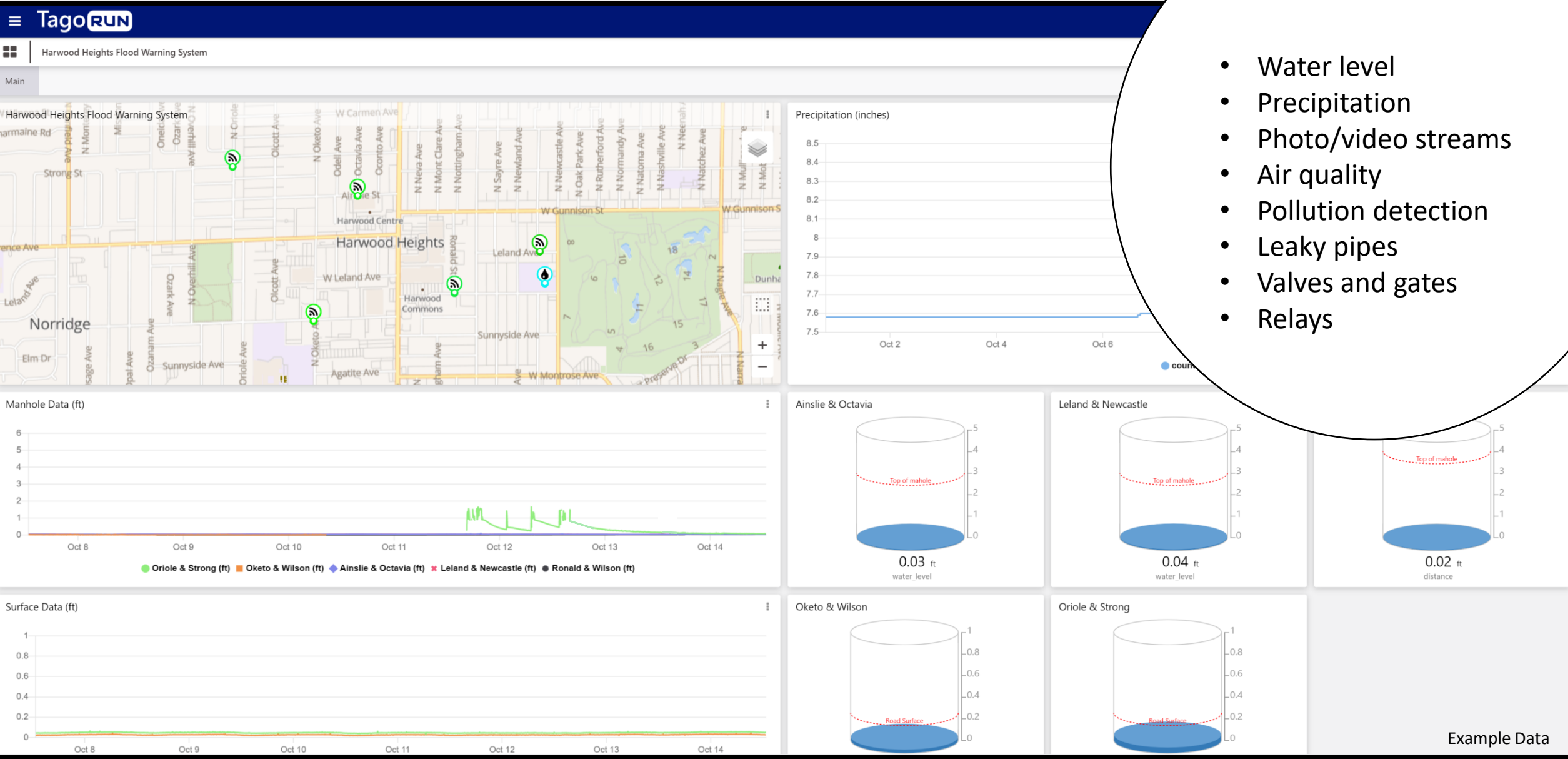
Automated alerts

- Sent to specific people or teams (e.g. fire, police)
- Trigger other actions/analyses based on sensor data (e.g. signs)



Data logging capabilities

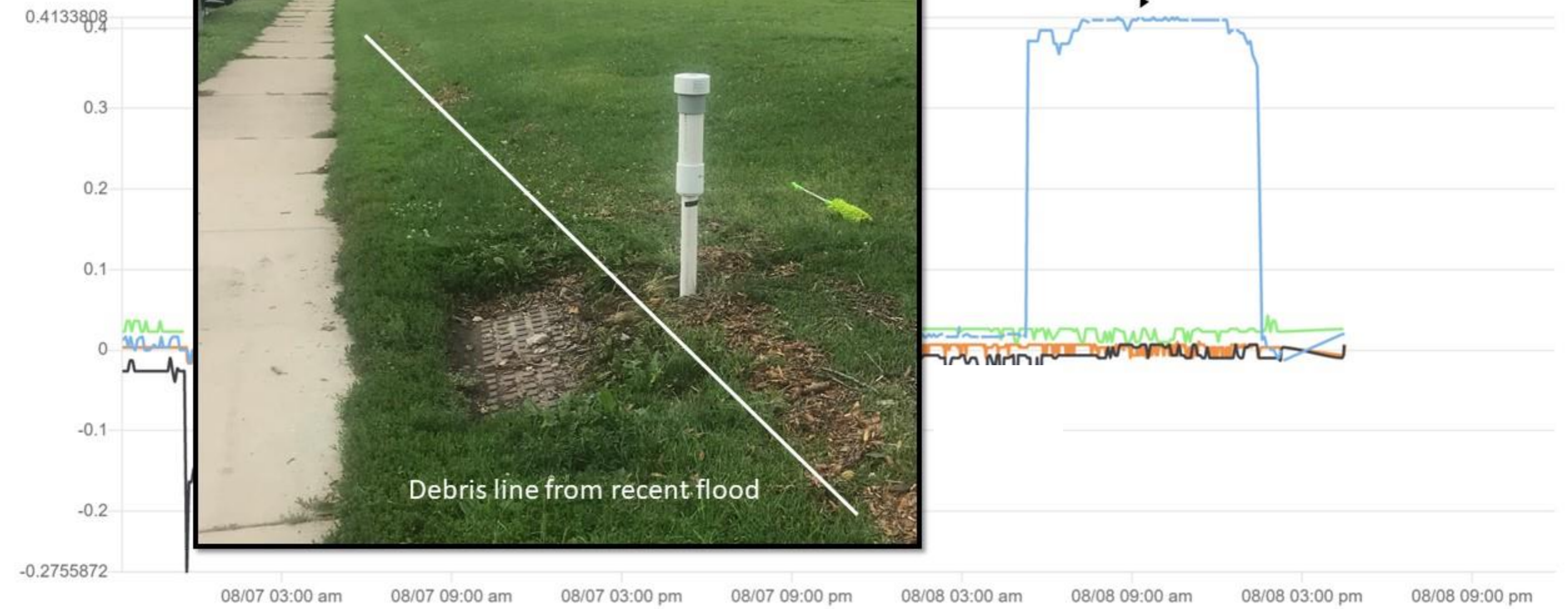
- Export data to files
- Integrate with external websites/databases



- Water level
- Precipitation
- Photo/video streams
- Air quality
- Pollution detection
- Leaky pipes
- Valves and gates
- Relays

Dashboard visually presents real-time data in various graphical displays

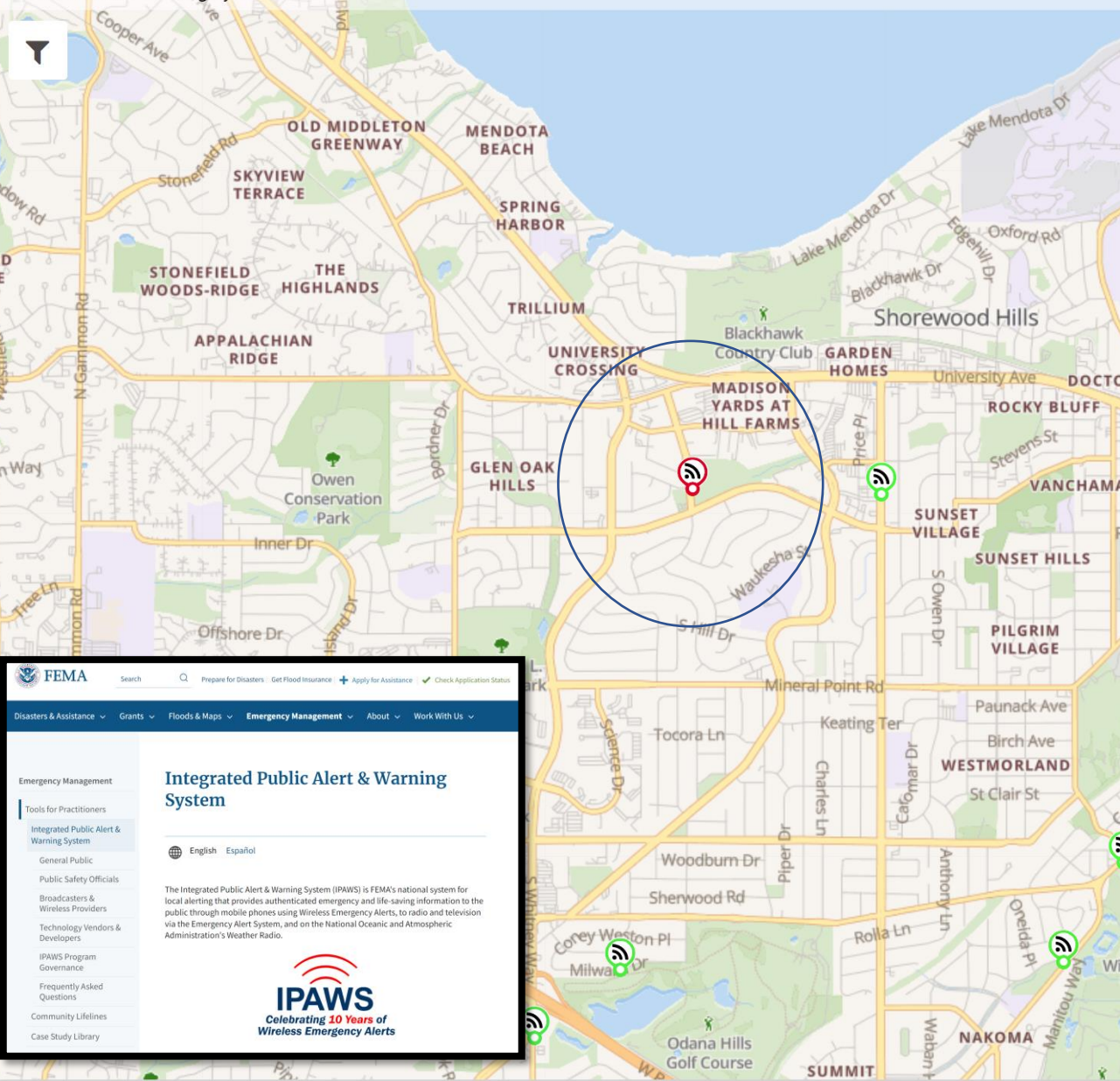
Historical Data



● Eau Claire & Buffalo ■ Rose Pl. ◆ Shorewood Blvd ✖ Midvale & Vernon



Madison Flood Warning System





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Emergency Management

Tools for Practitioners

Integrated Public Alert & Warning System

General Public

Public Safety Officials

Broadcasters & Wireless Providers

Technology Vendors & Developers

IPAWS Program Governance

Frequently Asked Questions

Community Lifelines

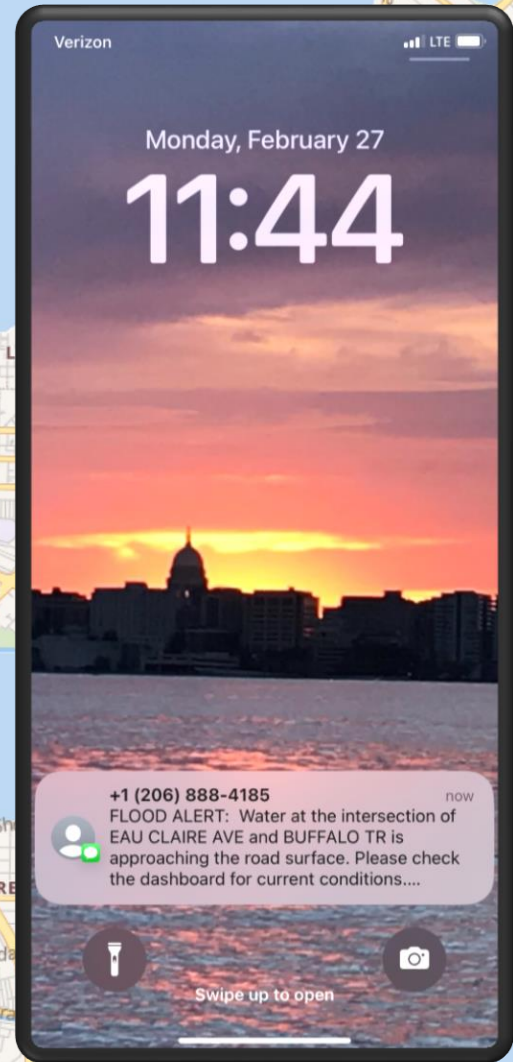
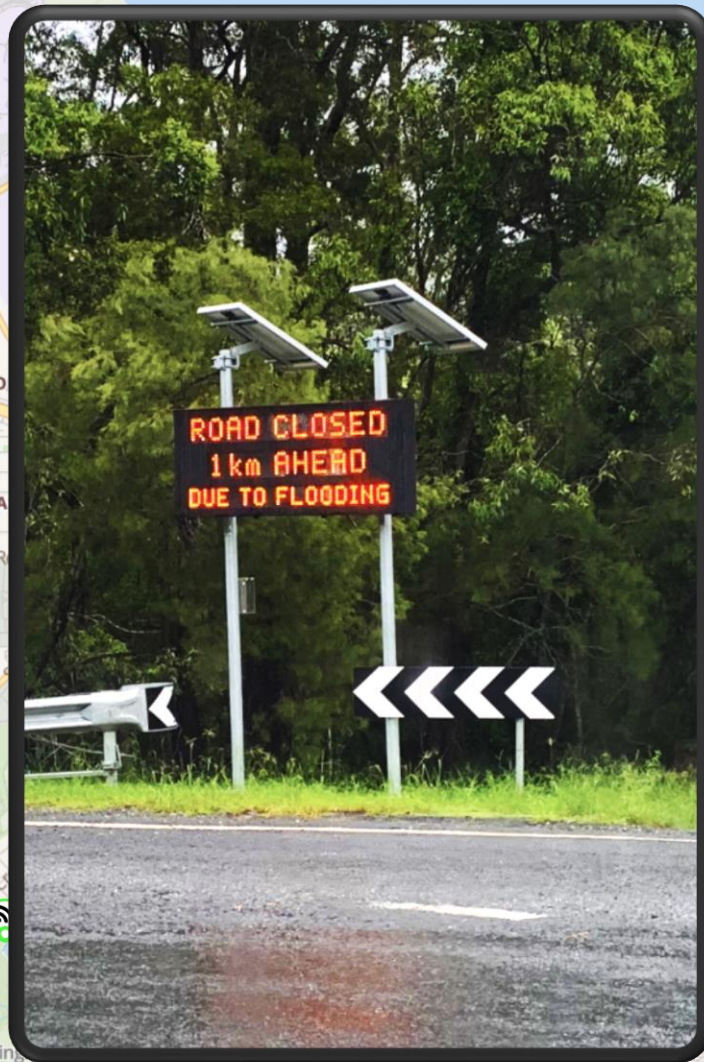
Case Study Library

Integrated Public Alert & Warning System

English Español

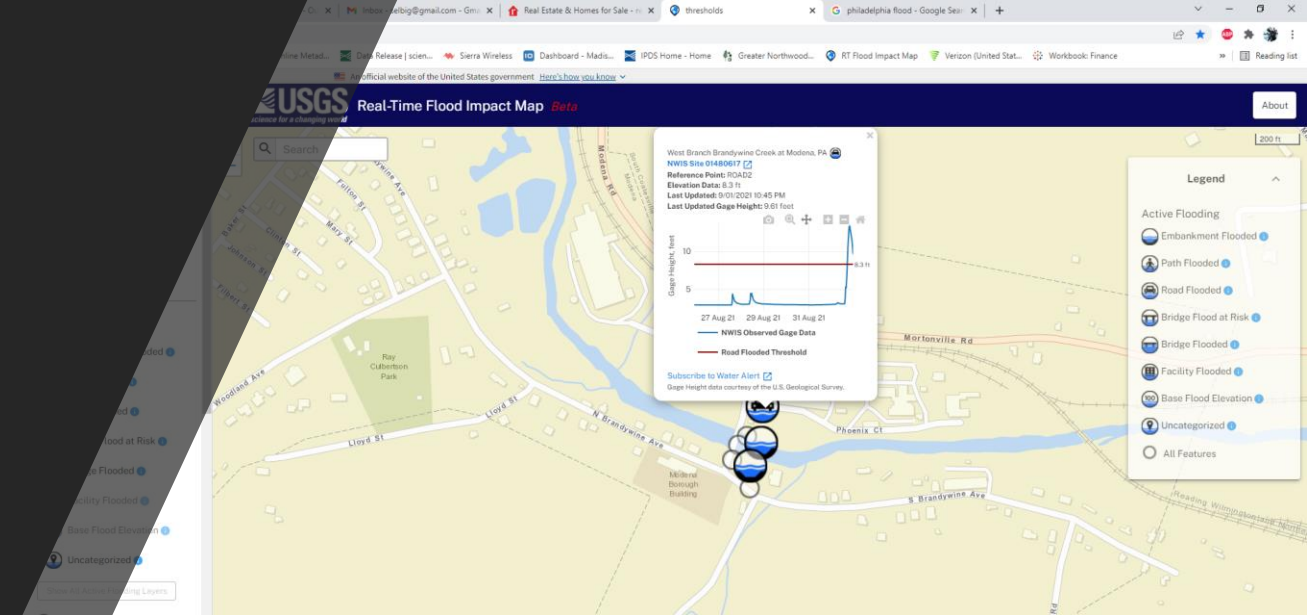
The Integrated Public Alert & Warning System (IPAWS) is FEMA's national system for local alerting that provides authenticated emergency and life-saving information to the public through mobile phones using Wireless Emergency Alerts, to radio and television via the Emergency Alert System, and on the National Oceanic and Atmospheric Administration's Weather Radio.

**IPAWS**
Celebrating 10 Years of Wireless Emergency Alerts



Future Smart City Integration

- Integrate cameras for visual confirmation
- Integrate with other USGS web mapping services
- Incorporate edge analytics for autonomous flood prevention (gates, valves, etc.)
- Public alerts – warn vehicles based on proximity to flooded area





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NGWOS



City of Madison

Collaborative Partners



U.S. Army Corps of Engineers



National Weather Service



Metropolitan Water Reclamation District



Illinois Department of Natural Resources



Village of Harwood Heights