

Pin2Flood App – Real-Time Flood Inundation Mapping for First Responders

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Breakout Session





Real-Time Flood Mapping for First Responders

**Presented by Harry Evans & Christine Thies
Center for Water and Environment
University of Texas at Austin**

Presentation for ESRI User Conference – July 2019

Acknowledgements: National Weather Service, Texas Division of Emergency Management, Austin Fire Department, Kisters, ESRI, David Maidment, Harry Evans, Xing Zheng, David Arctur, and Christine Thies.



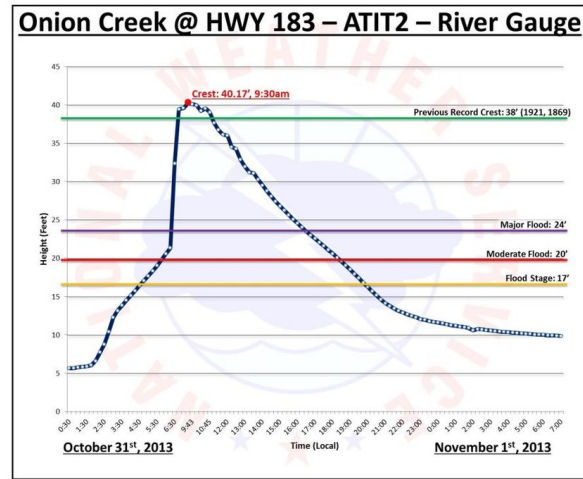
esri

Historical Approach to Flood Mapping

Flood Emergency Response

2013

Problem



- Difficult for Fire Chiefs and EMs to interpret which homes/roads were impacted by flood
- Fire Chiefs and EMs needed a 'common language' to communicate situation and impact

Flood Emergency Response

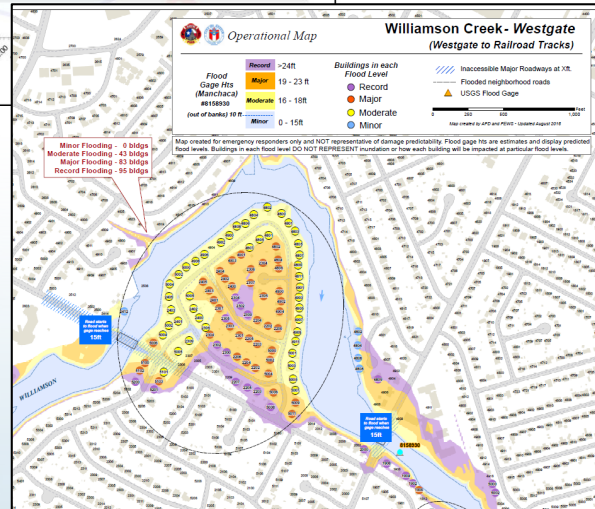
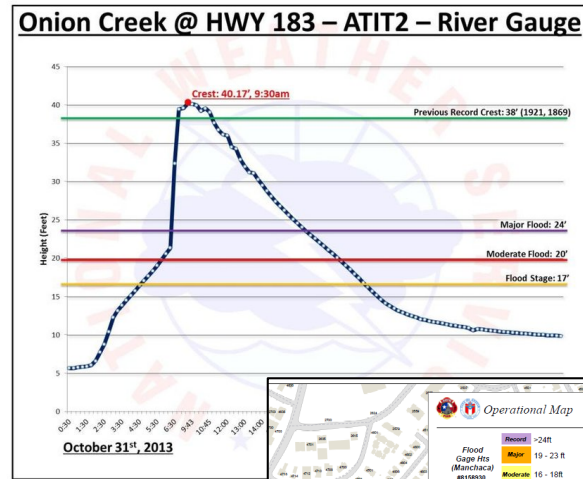
2013

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2015

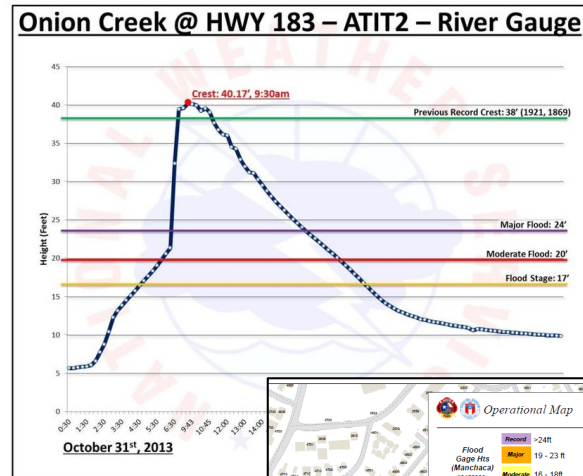
- Maps were produced to be the 'common language'
- Helped significantly, but lacked the ability to communicate current & future inundation without discussion
- Not interactive

Initial Solution



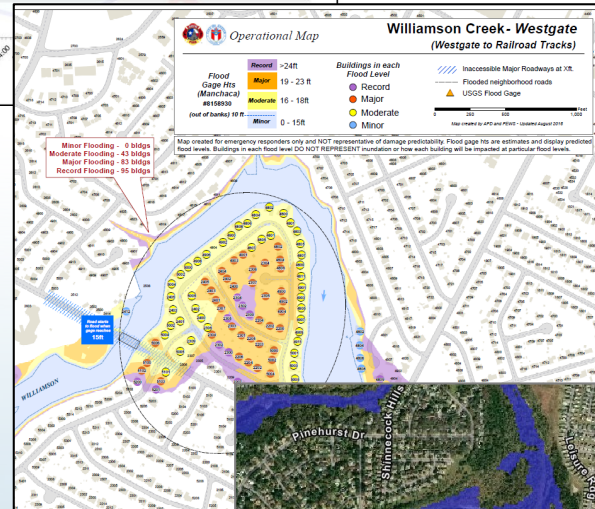
Flood Emergency Response

2013



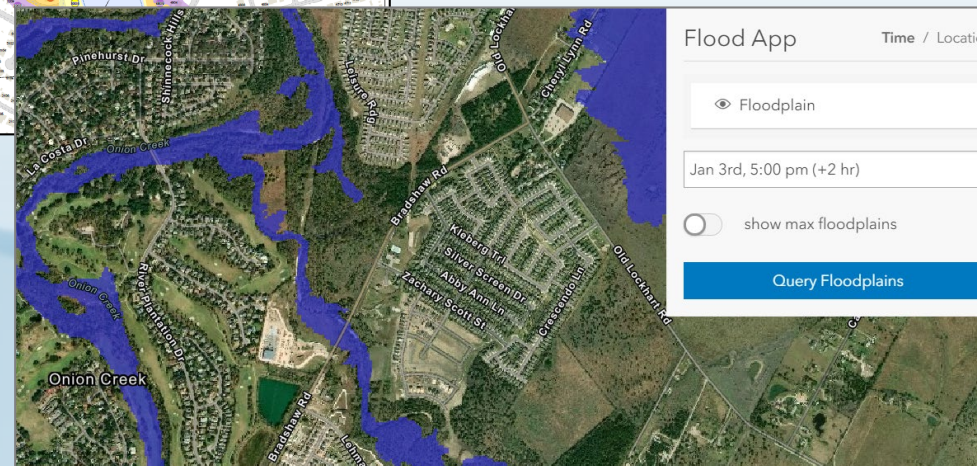
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2019



- Interactive – web based
- Able to communicate/log what the field personnel are 'seeing' during the event
- Able to identify impacted infrastructure (homes, roads)
- **Future goal** - communicate predicted inundation from NWS

Next Generation Solution

Flood Forecast

What a forecast map can do for us

Pre-Event – Getting Ready for the Flood



General Notification:

Weather Service is predicting significant rain, with localized major flooding

City X and Counties X, Y, Z are under a flood watch

Could potentially impact Creek A, Creek B, and River C

Be prepared!

Flood Impacts & Photos		Collapse
If you notice any errors in the below information, please contact our Webmaster		
61	Major lowland flooding continues as homes on Sequoia Bend Drive begin flooding with widespread flooding of homes on McDermott Drive.	
60	Major lowland flooding continues as homes on McDermott Drive begin flooding.	
59.5	Major lowland flooding begins as home in Sequoia Estates subdivision begin flooding. Homestead Road south of the channel is inundated with one to two feet of water and water is several feet deep on the south bound feeder of U.S. Highway 59.	
56.5	Moderate lowland flooding begins as streets in the Sequoia Estates subdivision and west of JFK Boulevard become inundated. The south bound feeder road of U.S Highway 59 is under close to one foot of water.	
55	Minor lowland flooding begins as water escapes the north side of the upstream bank at U.S. Highway 59. Water is close to inundating the south bound feeder road south of the channel.	

Pre-Event – Getting Ready for the Flood

When will the rain hit? What **neighborhoods** will flood?

Do we **evacuate or protect in place**? **How much** flooding will occur?

Where do I **pre-stage response crews**?

How much do we “**over-staff**” and when?

How many **homes/people** do we have to **evacuate**?

Do we have enough **reaction time** to evacuate?

If we evacuate, **where do the evacuees go**? What is the **evacuation route**?

Who cannot evacuate and needs **special transport**?

When and how do we **alert the public**? Where are the **shelter locations**?

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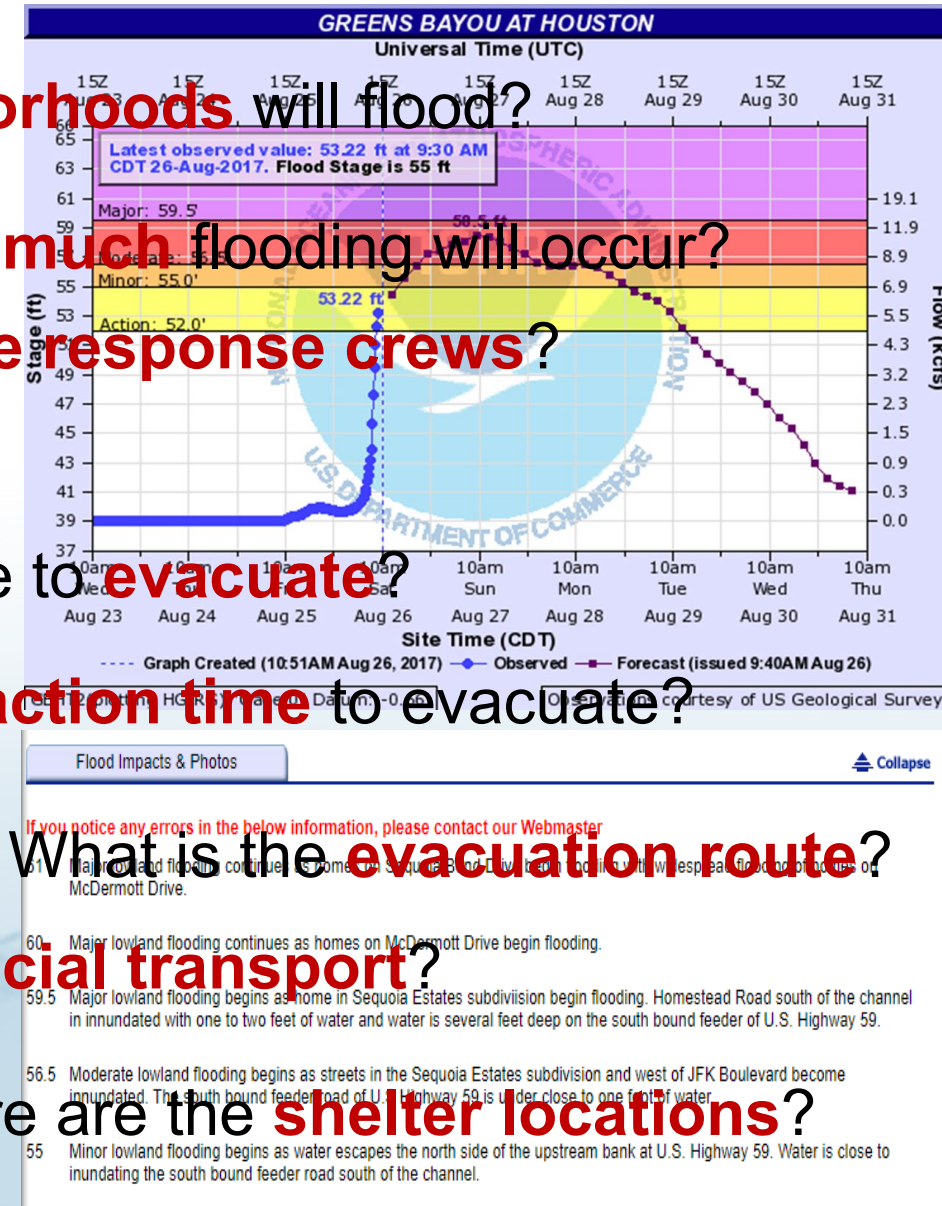
Who cannot evacuate and needs special transport?

Where are the shelter locations?

What neighborhoods will flood?

How much flooding will occur?

Where do I pre-stage response crews?



Pre-Event – Getting Ready for the Flood

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How much flooding will occur?

~~How much do we “over-staff” and when?~~

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~~When and how do we alert the public?~~

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~~Do we evacuate or protect in place?~~

~~How many homes/people do we have to evacuate?~~

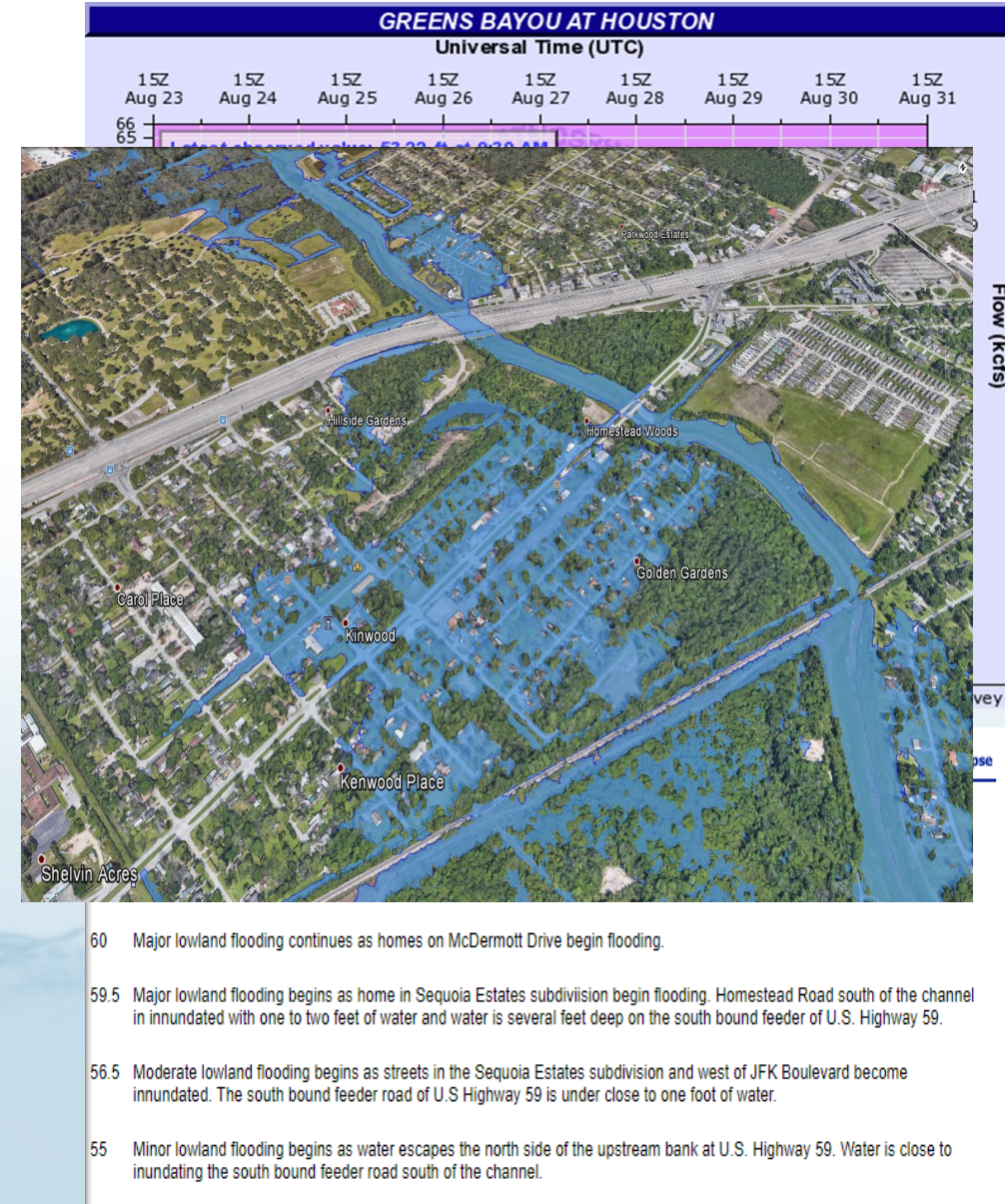
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Where are the **shelter locations**?



Source: Derek Giardino, WGRFC

Why Water Depth Matters

“How many helicopters, boats, and high profile vehicles and where to send them”
– Texas State Operations Center



~1 Foot

Response focused on those who need additional assistance



~3 Feet

Near the limit to use High Profile Vehicles to perform high water rescues



~6 Feet

Boats and helicopters now required to perform high water rescues



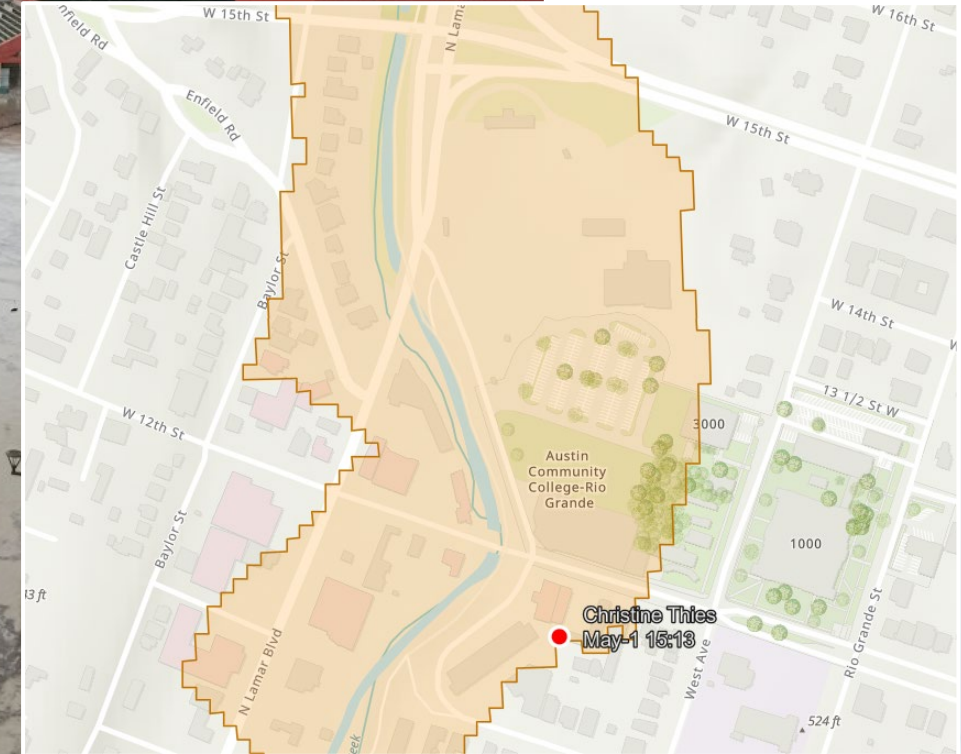
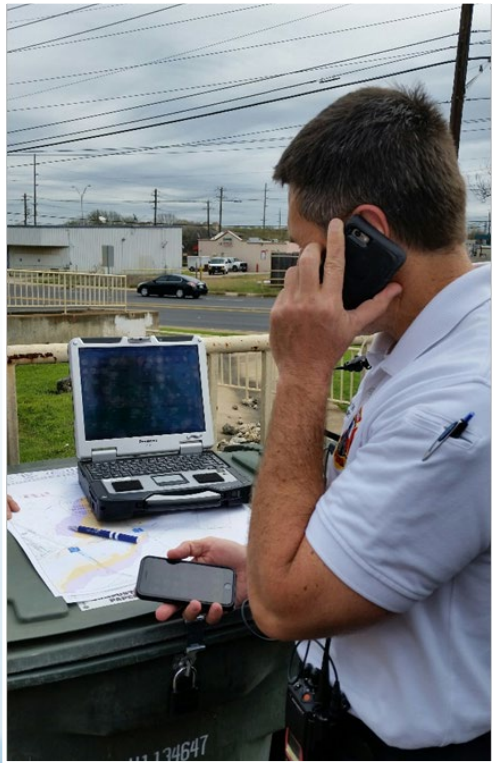
~9 Feet

1st Floors completely inundated

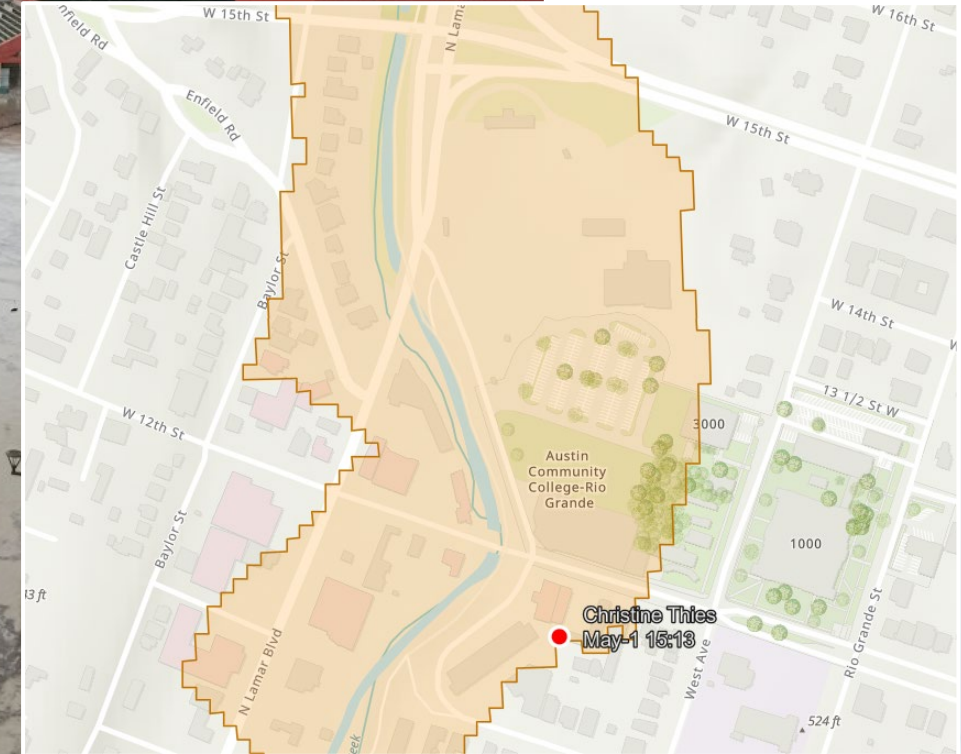
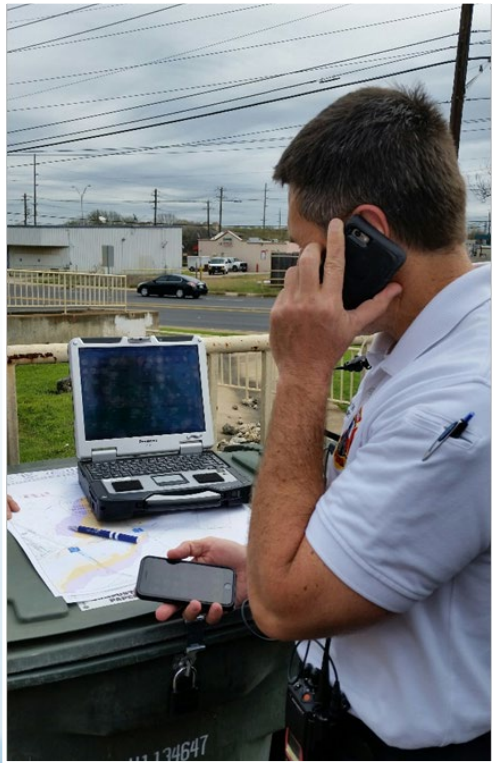
Flood Response

What Pin2Flood can do for us

During Flood – Common Operating Picture



During Flood – Common Operating Picture



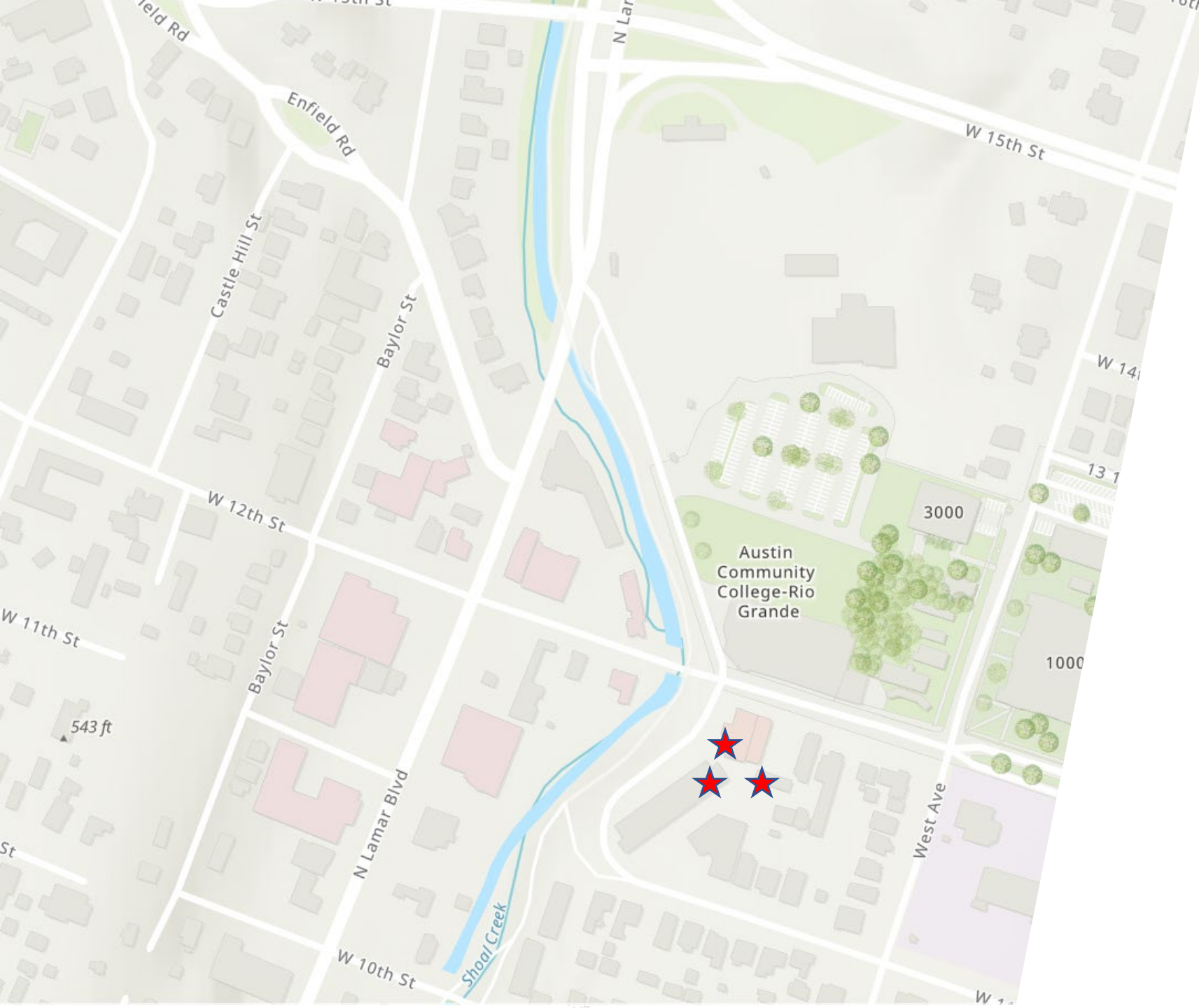


Pin2Flood Vision

Arrival of On-Scene Units

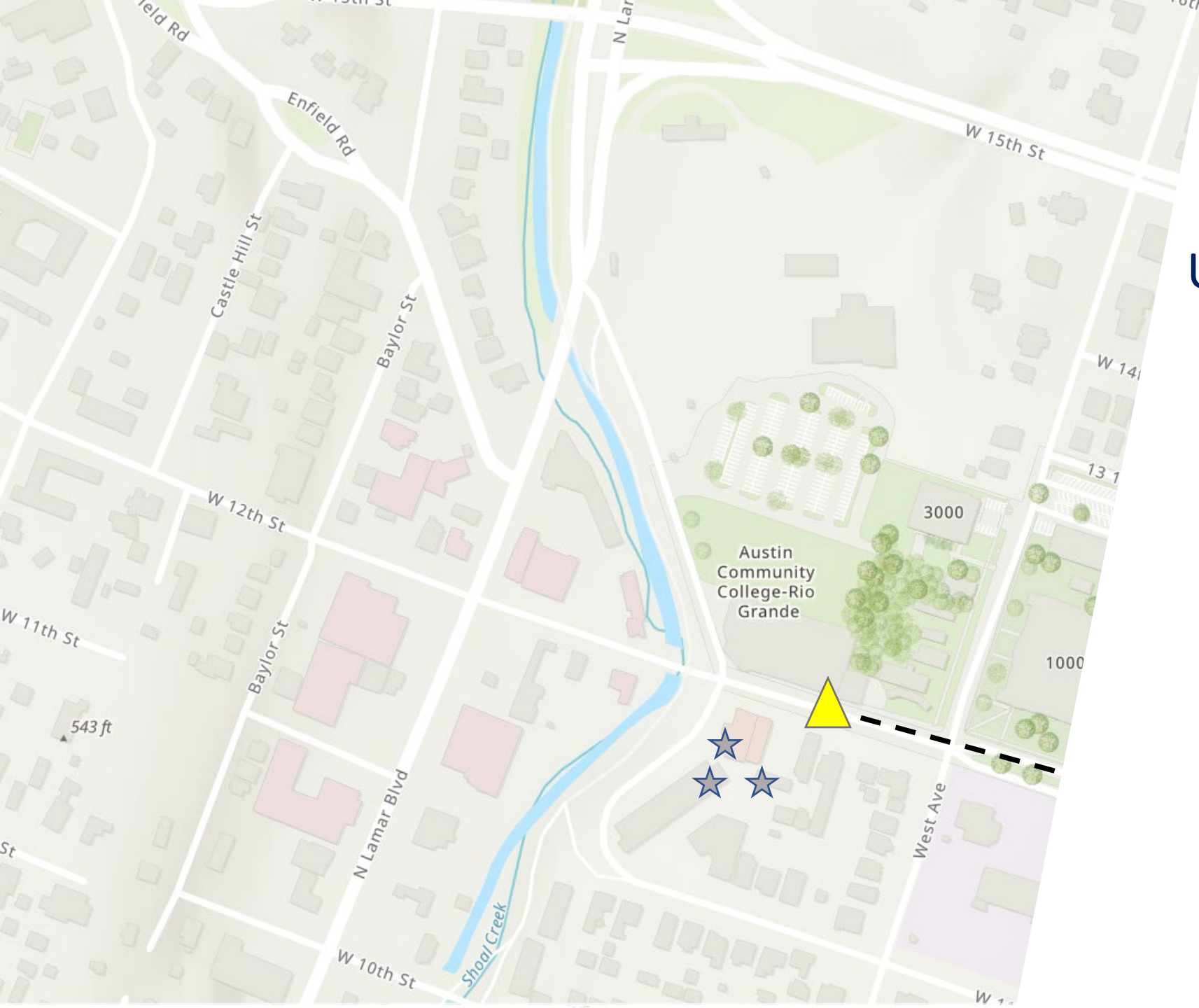
02:00

Flood calls start coming in..



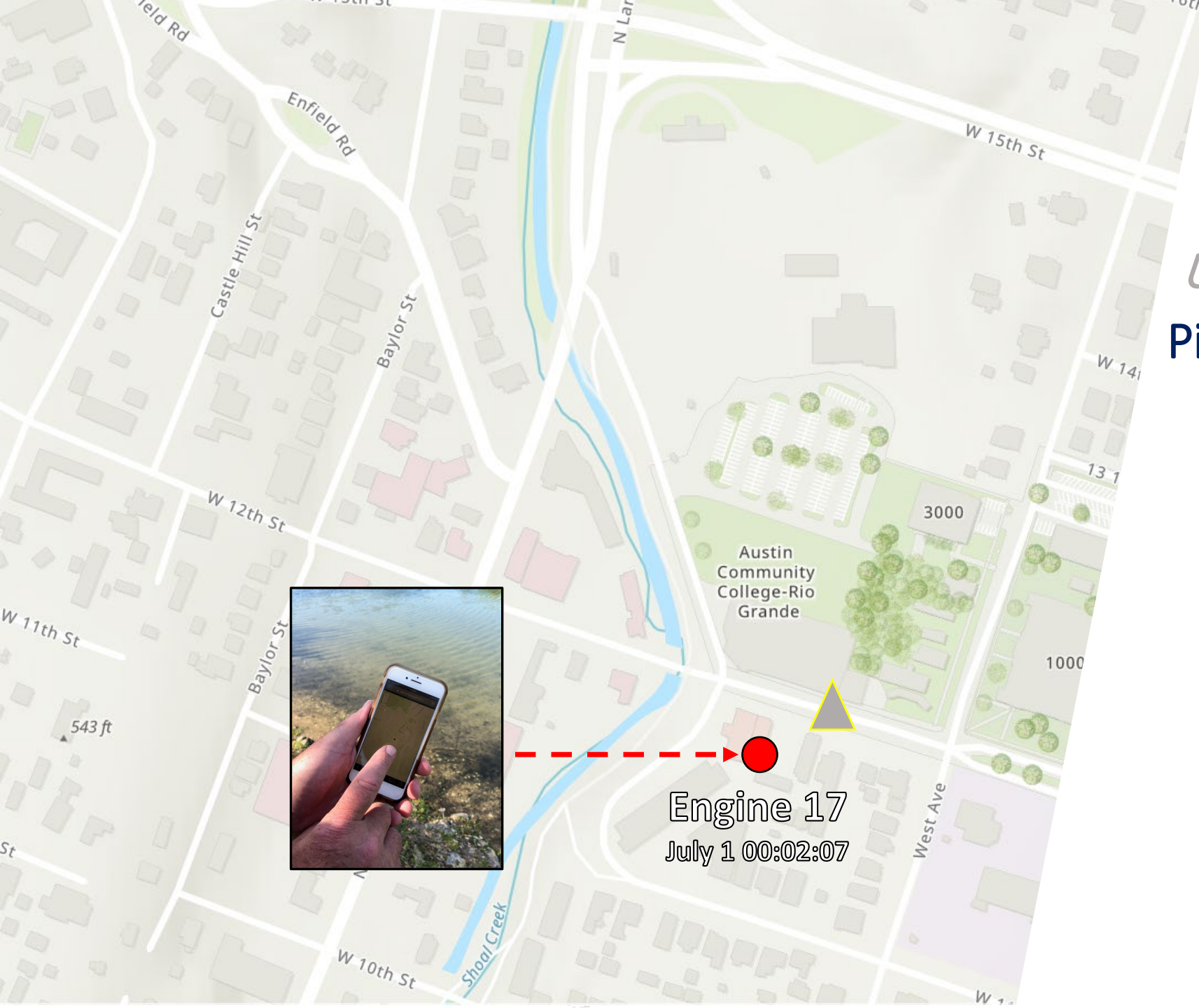
02:05

Flood calls start coming in..
Units Arrive on-scene



02:07

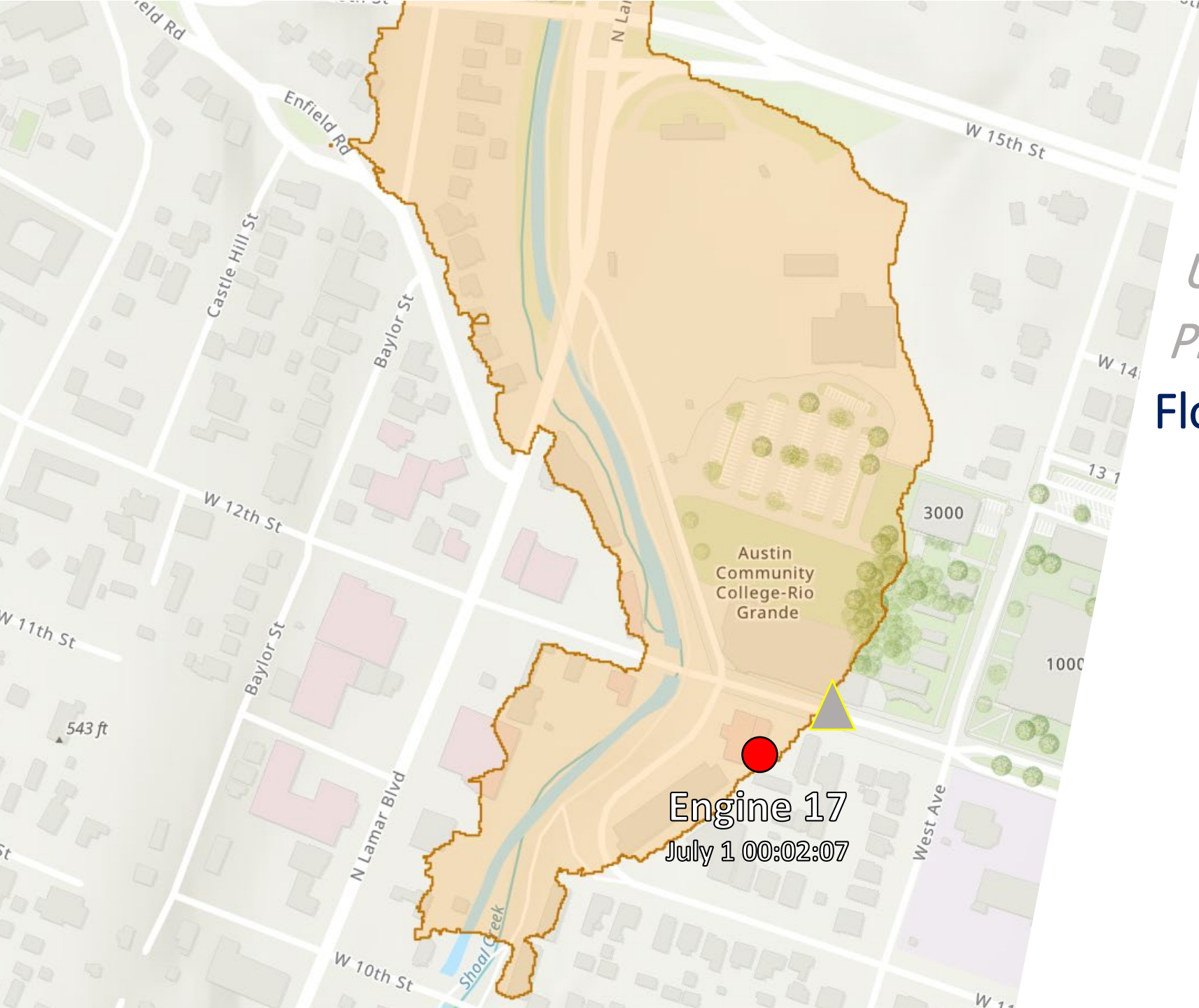
Flood calls start coming in..
Units Arrive on-scene
Pin dropped at water's edge



Engine 17
July 1 00:02:07

02:09

Flood calls start coming in..
Units Arrive on-scene
Pin dropped at water's edge
Flood inundation calculated



02:09

Flood calls start coming in..

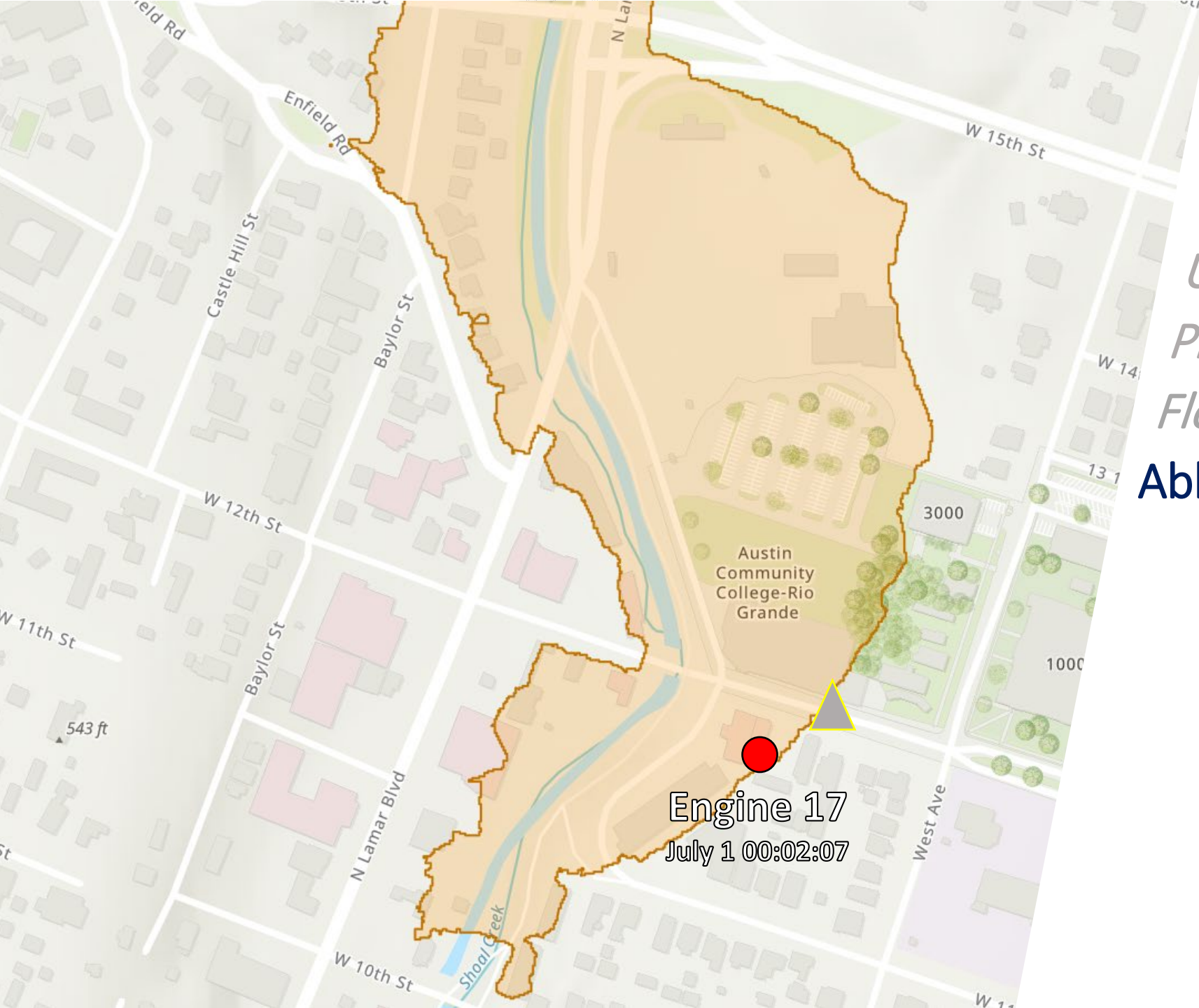
Units Arrive on-scene

Pin dropped at water's edge

Flood inundation calculated

Able to identify....

- Homes Impacted**



02:09

Flood calls start coming in..

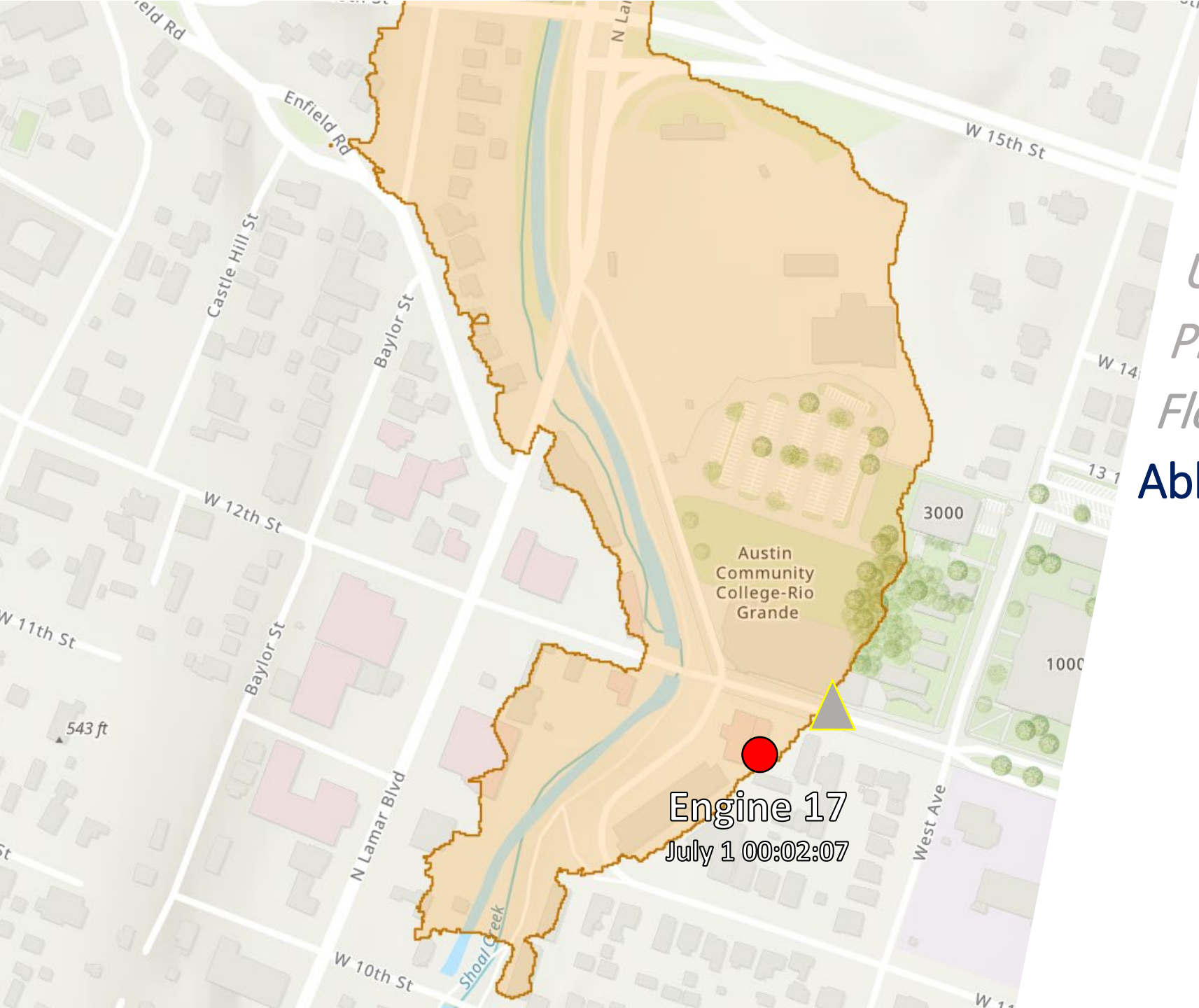
Units Arrive on-scene

Pin dropped at water's edge

Flood inundation calculated

Able to identify....

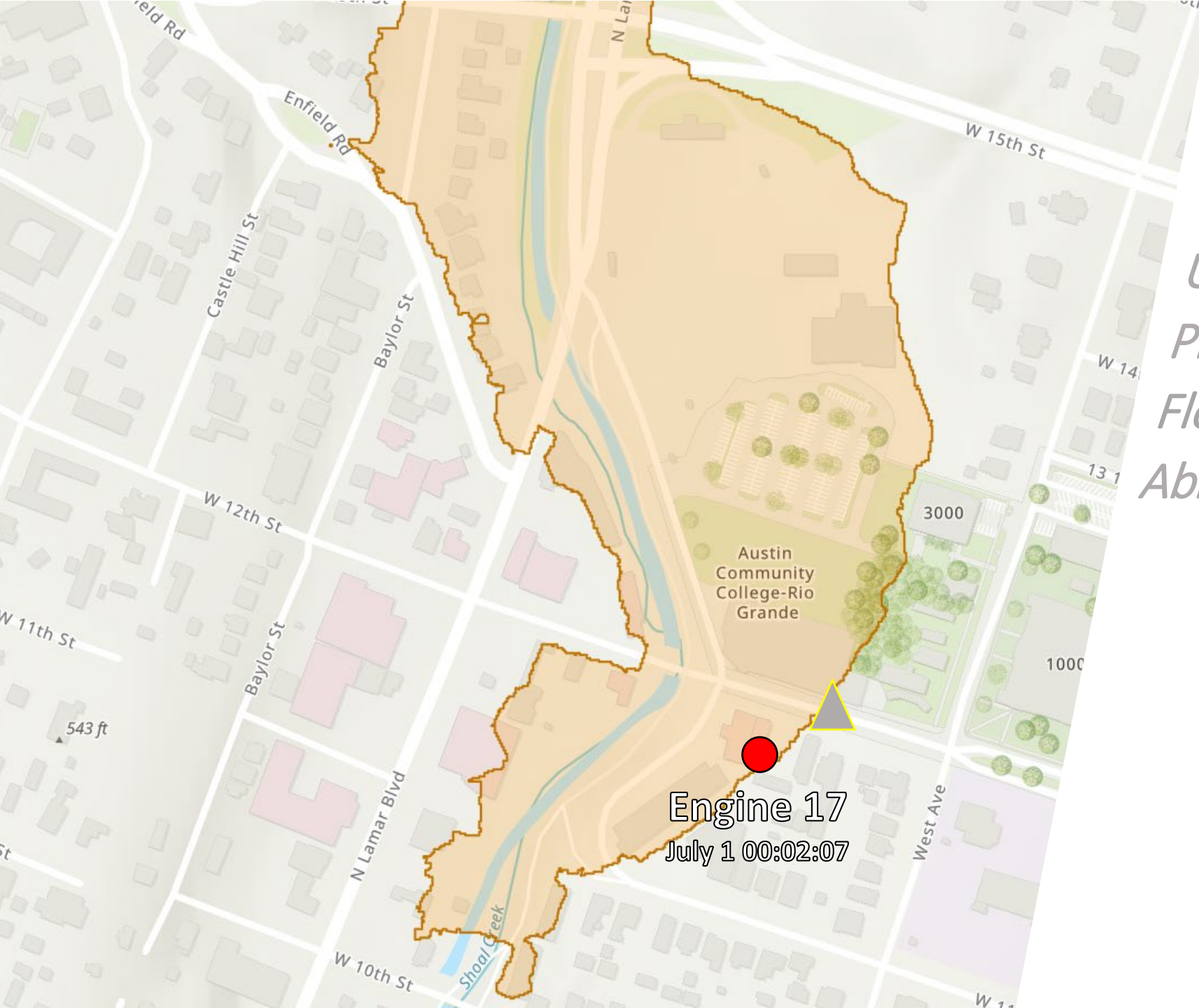
- *Homes Impacted*
- **Population**



02:09

*Flood calls start coming in..
Units Arrive on-scene
Pin dropped at water's edge
Flood inundation calculated
Able to identify....*

- *Homes Impacted*
- *Population*
- **Flooded Roads**



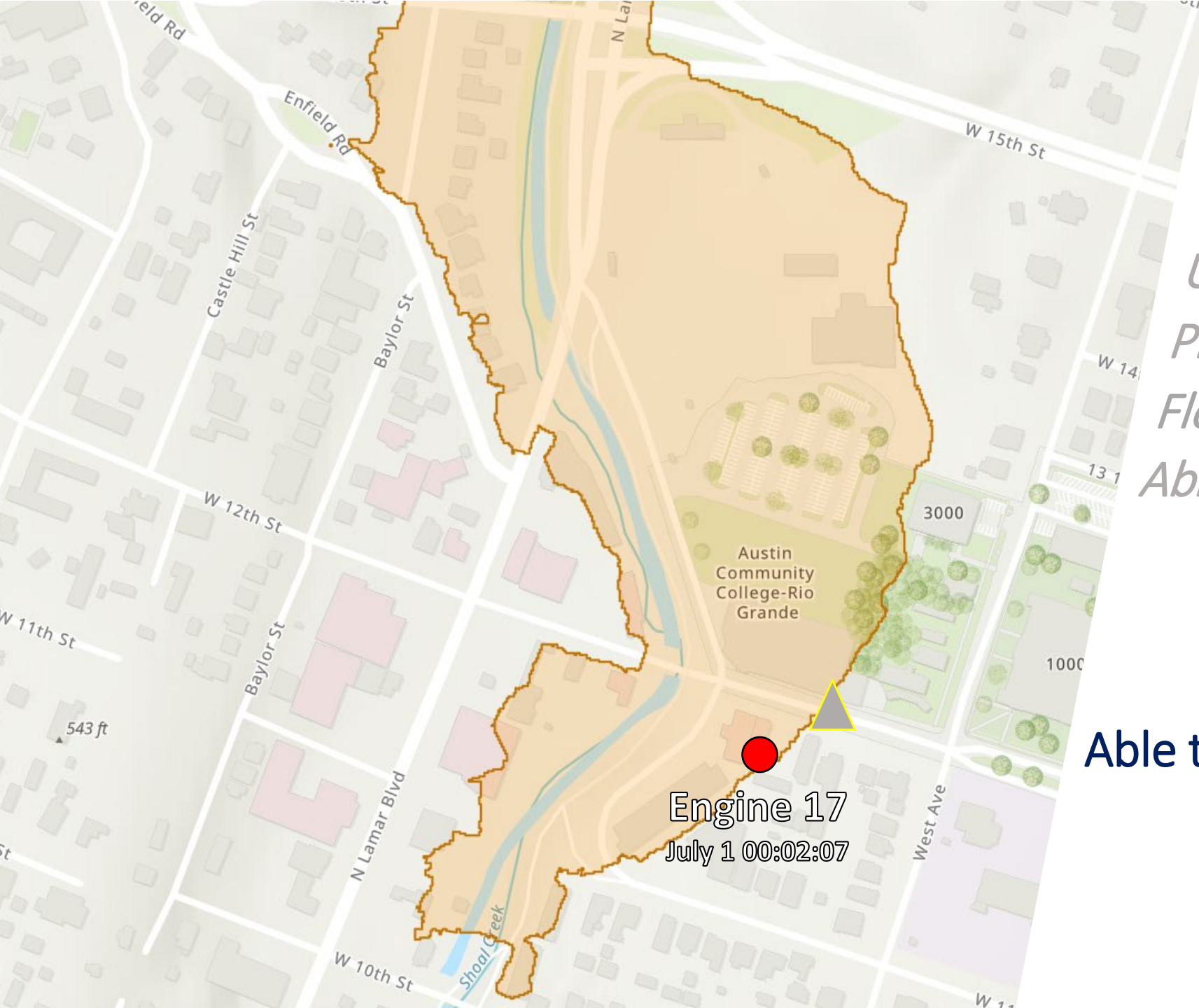
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Flood inundation calculated
Able to identify....*

- *Homes Impacted*
- *Population*
- *Flooded Roads*

Able to access map and data....

- **In Field**
- **At EOC**



Pin2Flood

Where do we go from here?

Testing

- ✓ Homeland Security Exercise and Evaluation Program (HSEEP) Functional Exercise with Travis County and City of Austin Fire Department
- Testing outside Travis County
- Testing with larger/smaller departments
- Testing with Emergency Operation Centers

Data

- ✓ Automation of data processing for Texas
- Automation of data processing outside Texas
- Work closely with Federal Agencies (NOAA, National Water Center) on incorporating predictions
- Work with FEMA nationally to implement Pin2Flood in other regions of the country

Implementation

- Work with State & Federal groups to identify implementation process
- Work to identify management and maintenance ownership

Stakeholders *'Testing Team'*



Texas Division of Emergency Management (TDEM)



**Univ of Texas
Center for Water & the
Environment**



**National Weather Service
West Gulf River
Forecast Center**

**National Weather Service
New Braunfels WFO**



**City of Austin
Homeland Security
Emergency Management
(HSEM)**



**City of Austin
Fire Department (AFD)**



**Travis County
Emergency Management**

**Travis County
Emergency Service
Districts**



Conclusion

Map Based Approach

- ✓ Pin2Flood can move a field observation from a single person, all the way up to FEMA.
- ✓ Pin2Flood can inform action on flooding in real-time.
- ✓ Pin2Flood can show the vision of how a national, multi-jurisdictional infrastructure works in a real world scenario.



Questions?