

# Hurricane Harvey Experience

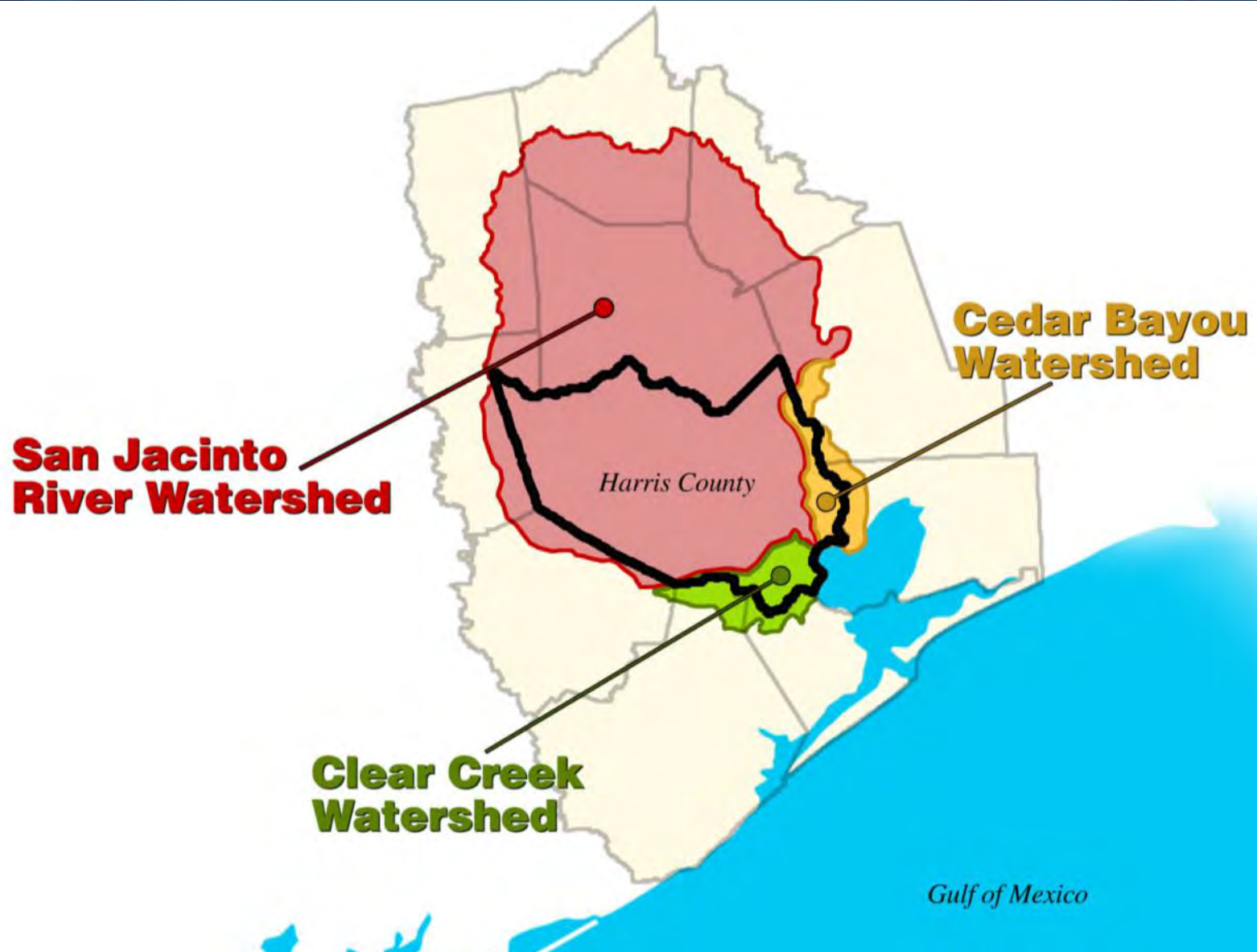
## Harris County, Texas

**USACE, Galveston District**  
**Stakeholder Partnering Forum**  
**February 27, 2018**



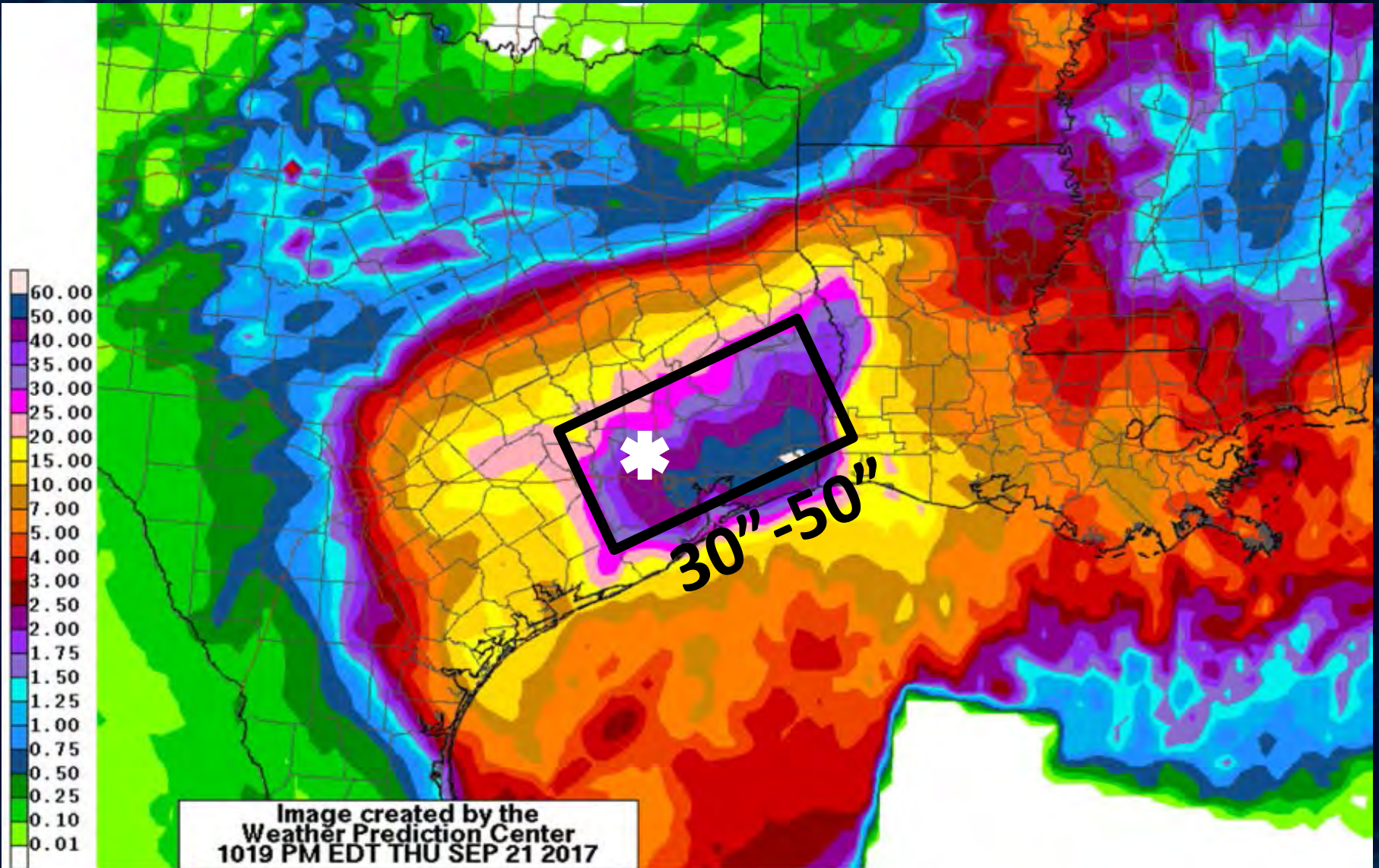
**Russ Poppe, P.E. Executive Director**  
**Steve Fitzgerald, P.E. Chief Engineer**

# Harris County Local Watersheds





# Harvey's Rainfall – 7 Days



Max: 62.07 inches

# Harvey Rainfall and Other Major Floods

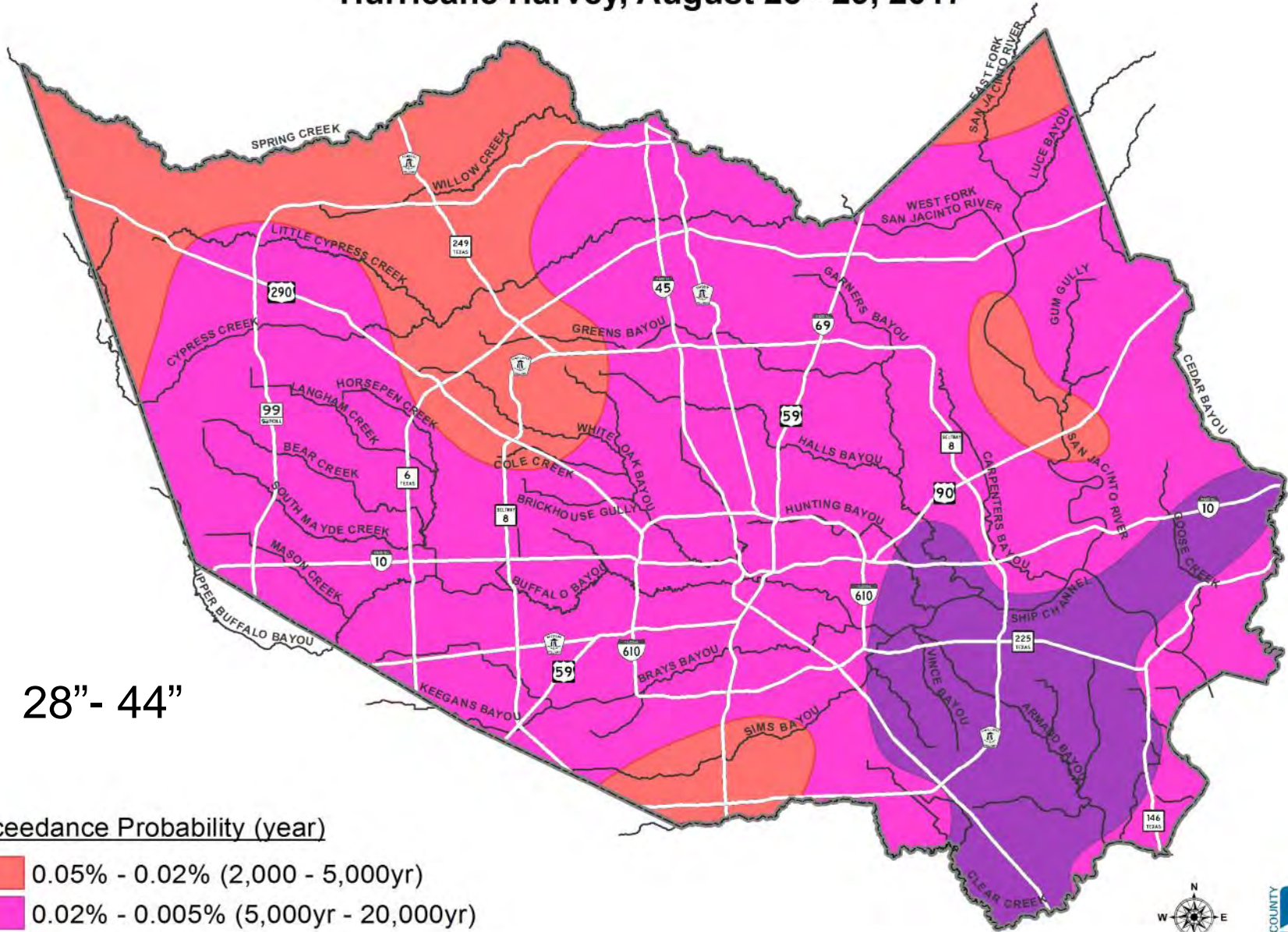
Duration	Harvey August 2017	Allison June 2001	Tax Day April 2016	October 1994
1-hr	<b>6.8</b>	5.7	4.7	3.7
2-hr	<b>11.9</b>	9.9	7.3	4.7
3-hr	<b>14.8</b>	13.5	8.3	5.3
6-hr	18.9	<b>21.2</b>	13.9	7.2
12-hr	20.9	<b>28.3</b>	16.7	12.0
24-hr	25.6	<b>28.4</b>	17.4	20.9
2 days	<b>35.2</b>	28.5	17.5	23.1
4 days	<b>47.7</b>	38.5	N/A	28.9

**33.7" average over 4 days = 69% of Probable Maximum Precipitation**



# Four Day Peak Rainfall Frequency

## Hurricane Harvey, August 25 - 29, 2017



28" - 44"

### Exceedance Probability (year)

- 0.05% - 0.02% (2,000 - 5,000yr)
- 0.02% - 0.005% (5,000yr - 20,000yr)
- .005%+ (20,000yr+)

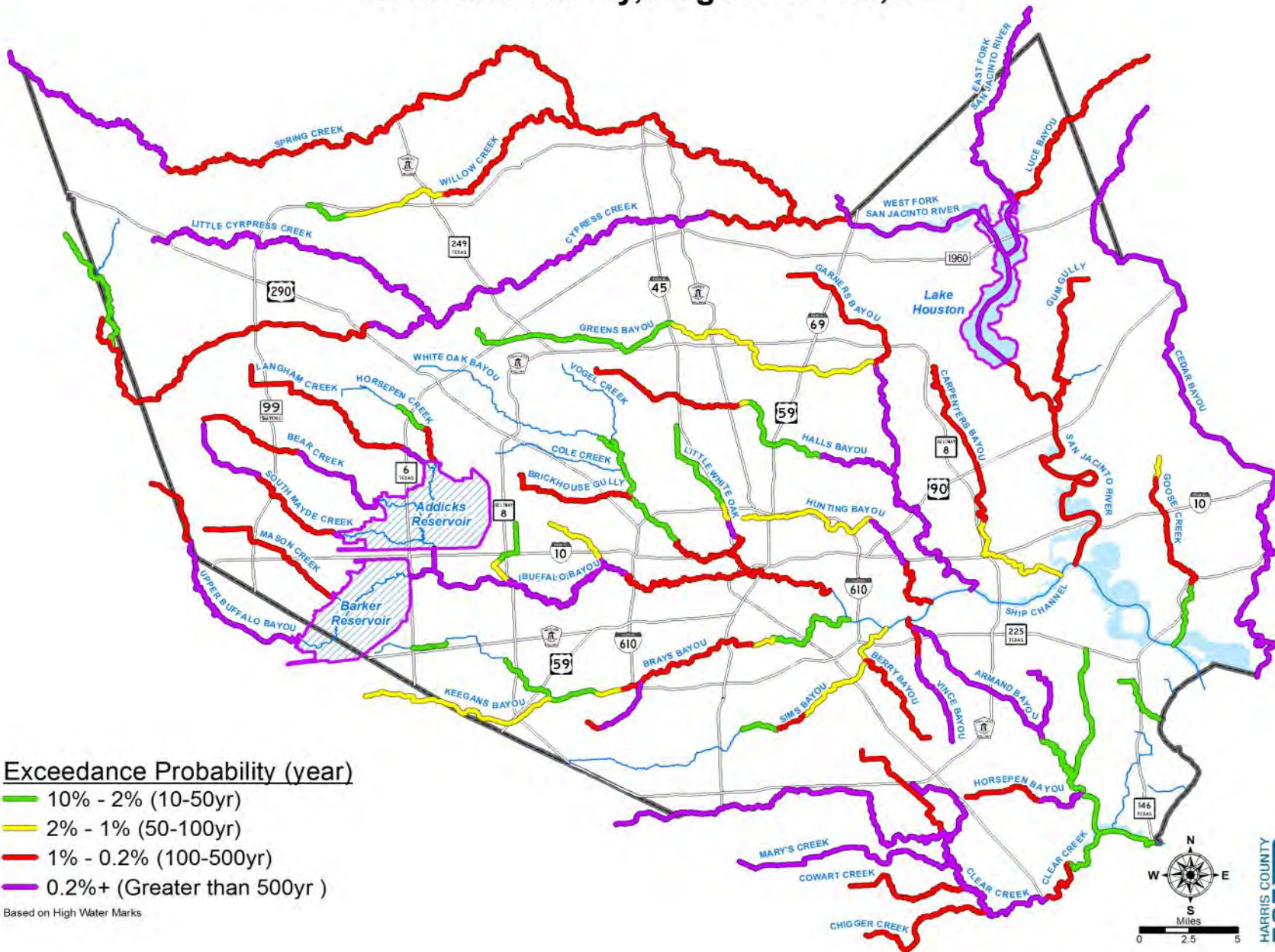
Based on HCPCD Rainfall Gages





# Peak Channel Water Surface Elevation Frequencies

## Hurricane Harvey, August 25 - 29, 2017





# Clear Creek



Event Date	HWM
Harvey	16.6
Allison (01)	10.7
4/18/09	9.5
Ike (08)	11.0
<b>Claudette (79)</b>	<b>16.9</b>





# Cedar Bayou



Event Date	HWM
<b>Harvey</b>	<b>34.4</b>
10/31/15	31.0
Ike (08)	26.8
5/20/00	27.5
10/18/94	32.2





# Cypress Creek



Event Date	HWM
<b>Harvey</b>	<b>97.0</b>
<b>4/18/16</b>	<b>90.6</b>
<b>Allison (01)</b>	<b>92.5</b>
<b>11/14/98</b>	<b>85.6</b>
<b>10/49</b>	<b>95.5</b>





# Inverness Forest Levee



Event Date	HWM
<b>Harvey</b>	<b>92.1</b>
Allison (01)	86.9
4/18/16	86.9
11/14/98	85.4
10/49	89.8



# Addicks Reservoir



## Top 5 Pools

Date	Elevation
<b>Harvey</b>	<b>109.1</b>
Apr 2016	102.65
Mar 1992	97.64
Apr 2009	97.08
Nov 2002	96.63



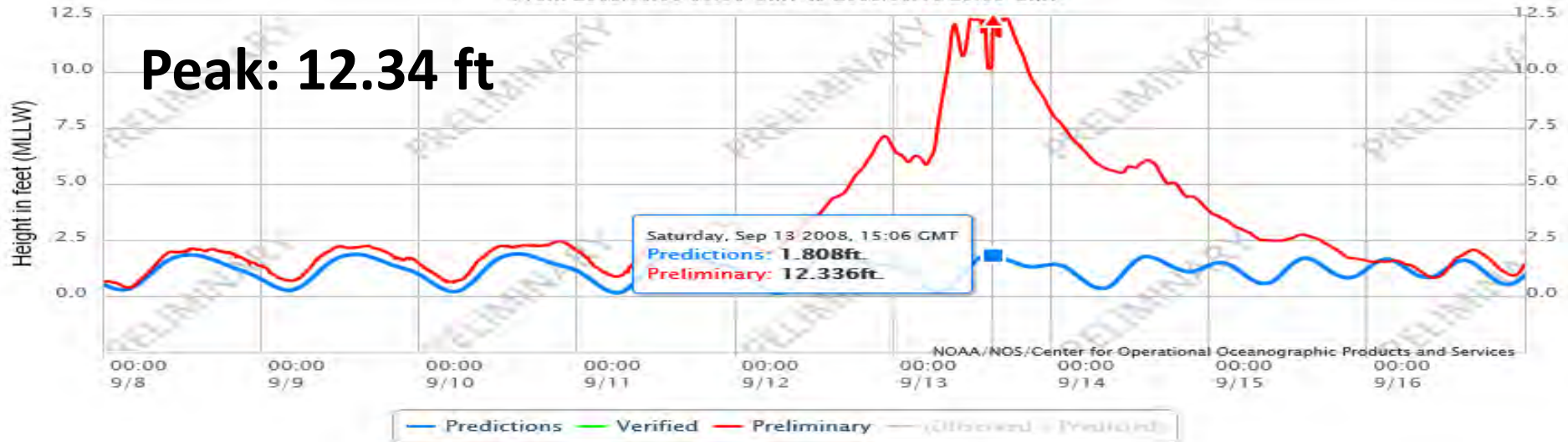


# Houston Ship Channel

## Ike 2008

NOAA/NOS/CO-OPS  
Observed Water Levels at 8770777, Manchester TX  
From 2008/09/08 00:00 GMT to 2008/09/16 23:59 GMT

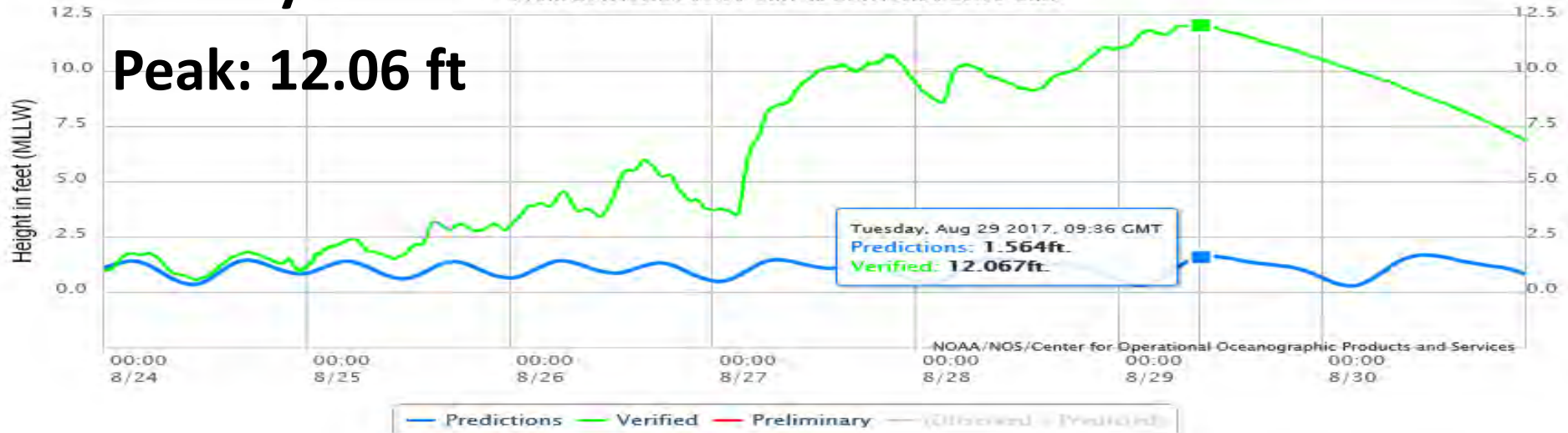
Peak: 12.34 ft



## Harvey 2017

NOAA/NOS/CO-OPS  
Observed Water Levels at 8770777, Manchester TX  
From 2017/08/24 00:00 GMT to 2017/08/30 23:59 GMT

Peak: 12.06 ft





## **Numbers – Harris County**

- **4.7 million people impacted – Everyone!**
- **60,000+ persons rescued**
- **32,000 sheltered**
- **36 fatalities Harris County (5 home or work)**
- **Est. 100,000-140,000 structures flooded (TS Allison 73,000)**
- **300,000 vehicles flooded**
- **46,000 flood insurance claims (\$4.7B paid so far)**
- **450,000 Individual Assistance registrations**
- **Est. damages \$125B (TX), (Katrina \$120B)**

# Blessings

- Not a wind event in Harris County → electricity outages, wind damage, and storm surge minor
- People took warnings seriously – stayed home Saturday night!
- First week → No work, no school – helped friends, family, neighbors, strangers
- Outpouring of support from Texas and Nation
- Cool front a few days later
- Survivor's Resolve

“The Most Important Things in  
Life  
Aren't Things”





# Lessons Learned

- Plans, procedures, and practice
- Public comprehension of forecasted rainfall and potential flooding
- Effective Communication – between departments, agencies, media, and public
- Curve balls, change-ups, and fast balls!
- Be flexible & make improvements



# Partnerships and Relationships Matter!!!

