

Memorial Day Flood

May 25-26, 2015

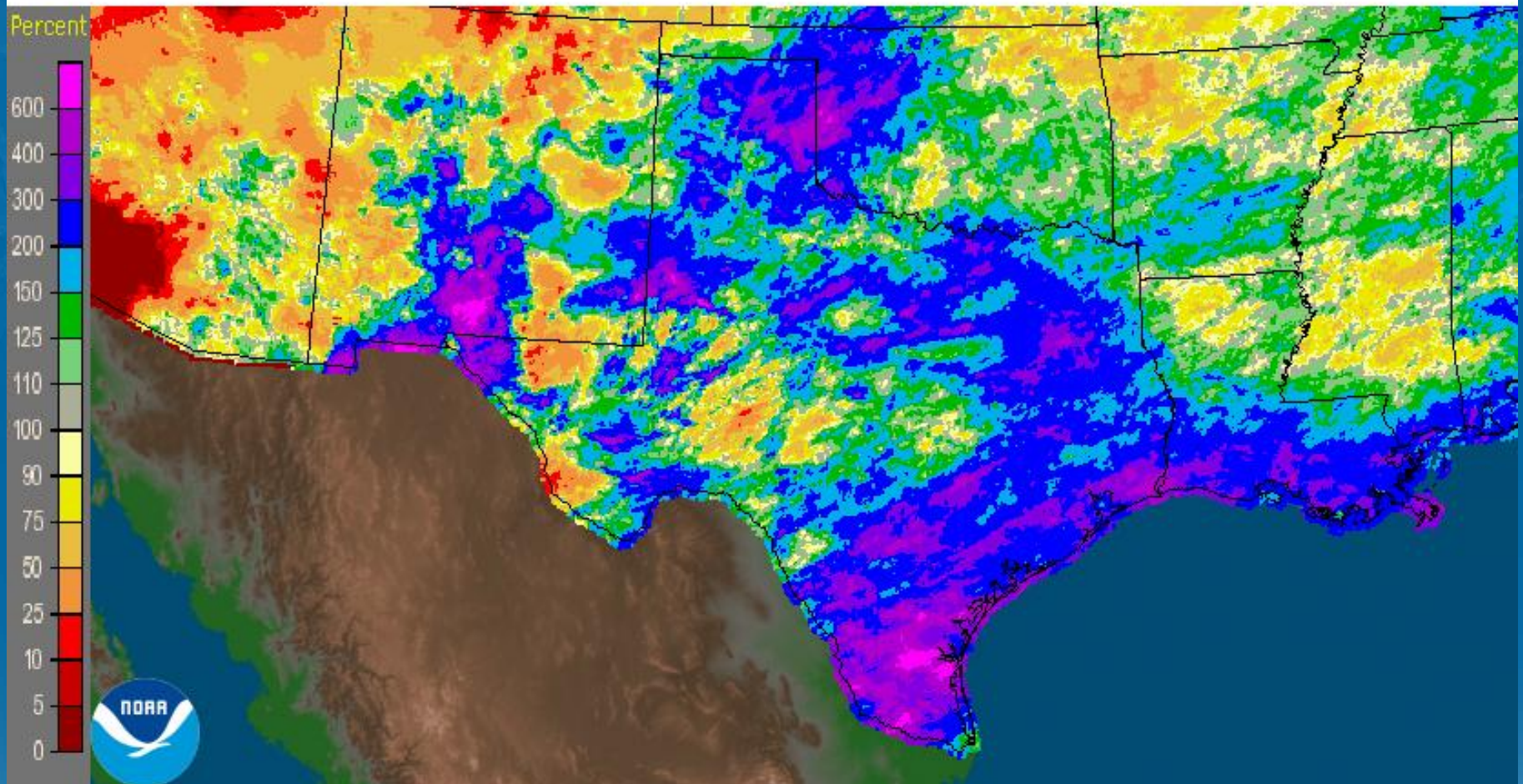
Harris County, Texas

National Hydrologic Warning Council
October 28, 2015

Jeff Lindner, Flood Operations Manager/Meteorologist

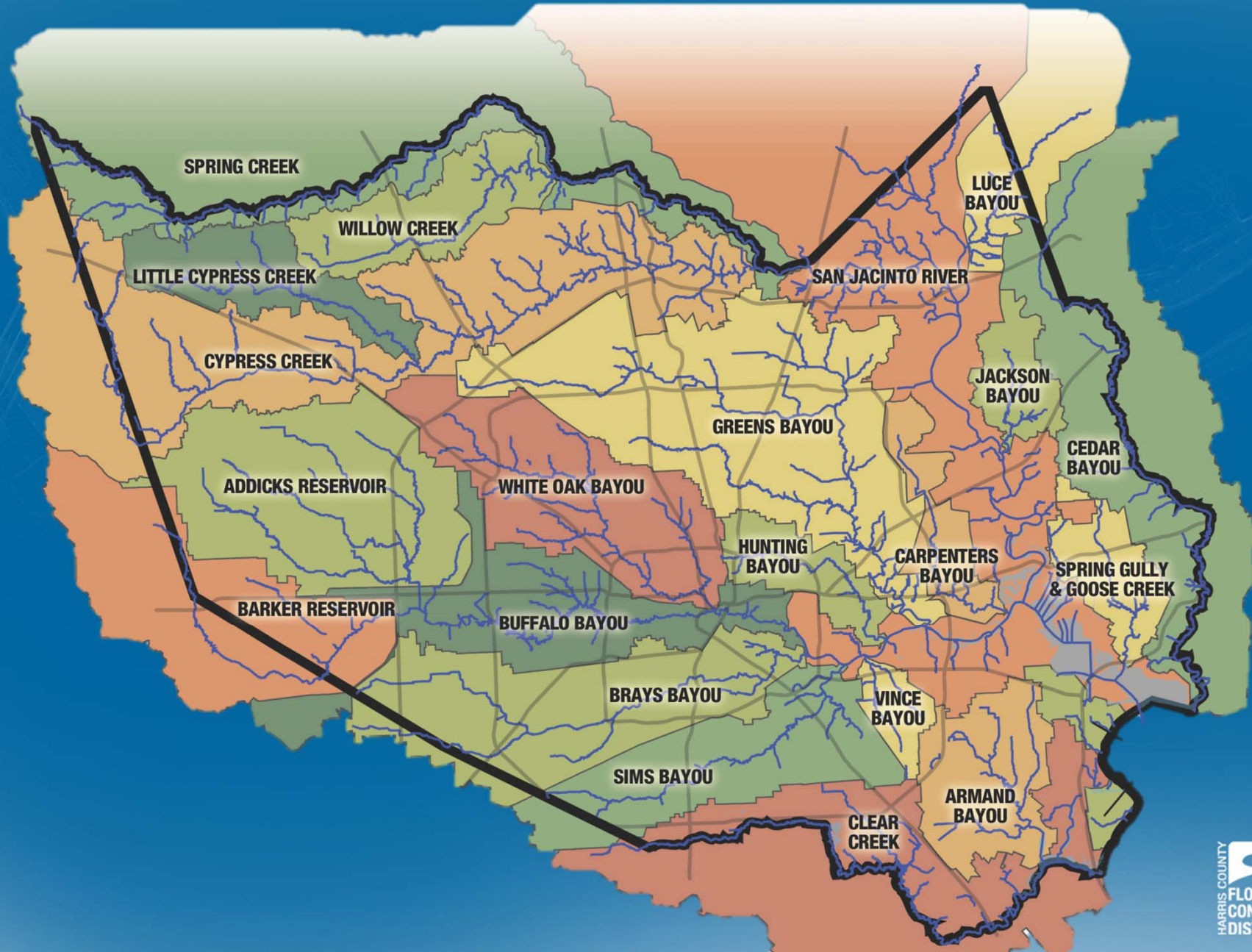
Antecedent Conditions - April 2015

Texas: April, 2015 Monthly Percent of Normal Precipitation
Valid at 5/1/2015 1200 UTC- Created 5/14/15 10:54 UTC



April 2015 Rainfall 150% to 500% of normal for Harris County

Harris County Watersheds



Prior Harris County Events

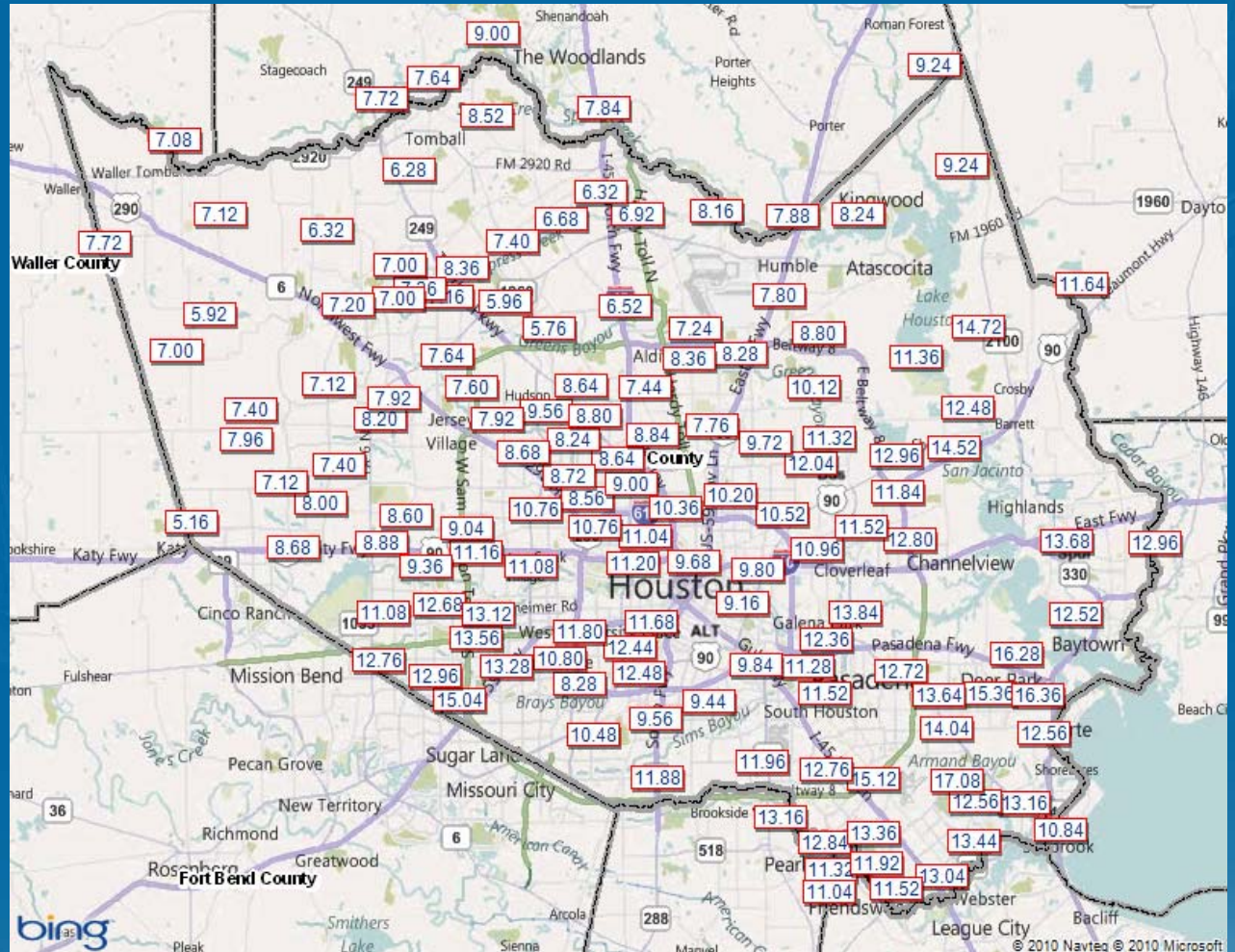
April 16-17

2-3" widespread
4-6" max
street flooding
40 homes flooded

May 12-13

1-3" widespread
8-10" max
Sig. street flooding
300 Apts. flooded
1 death

30-Day Rainfall Prior to Memorial Day



Average Rainfall: 7.0-17.0 inches

Memorial Day Activation Timeline

**645 pm: Activate HC EOC at 800pm – Level 3...
increased readiness**

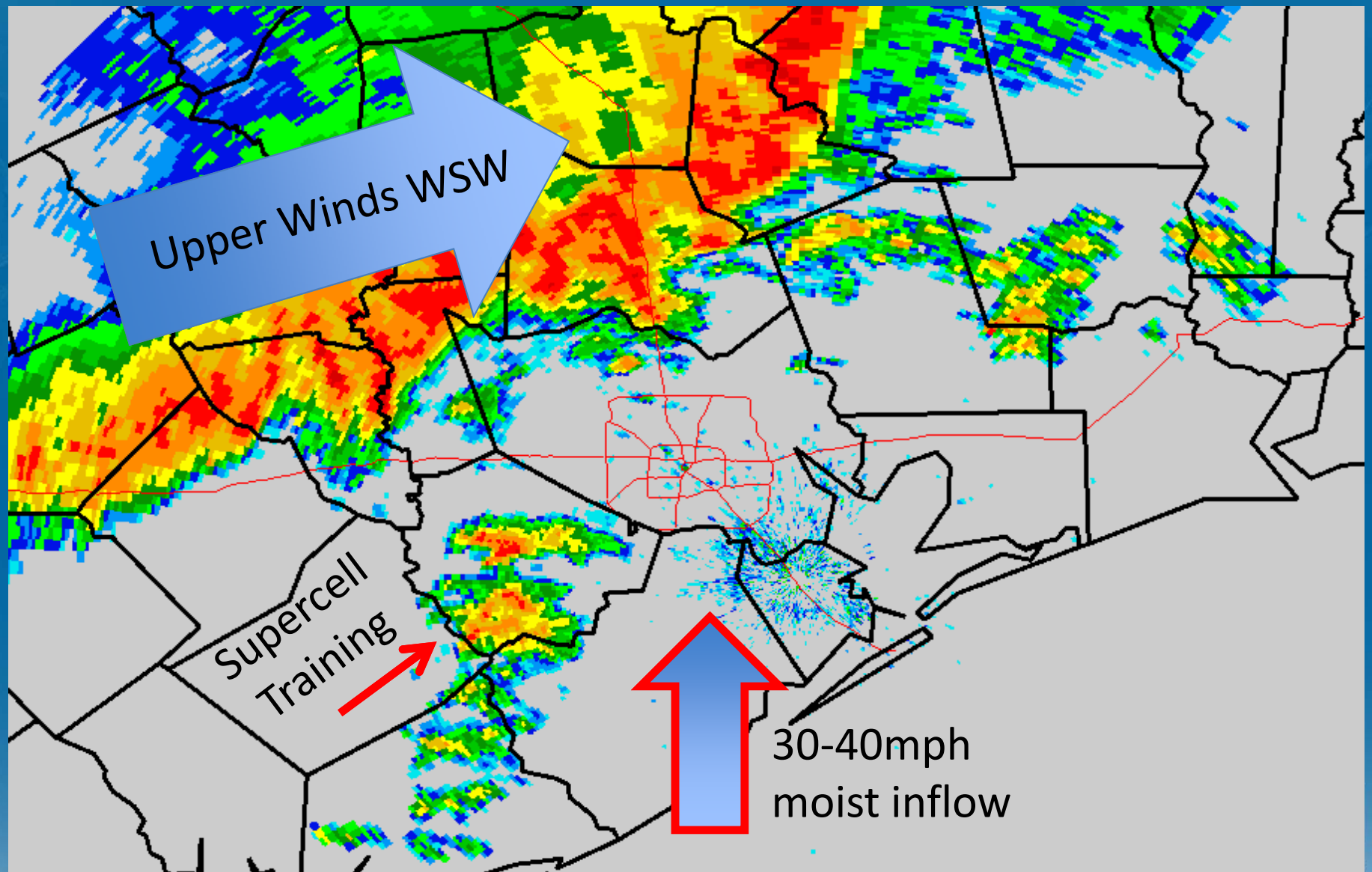
740 pm: Some staff in place at EOC

8:00 pm: Initial staff briefing (S.O., HCFCD, HCFMO, HCOEM)

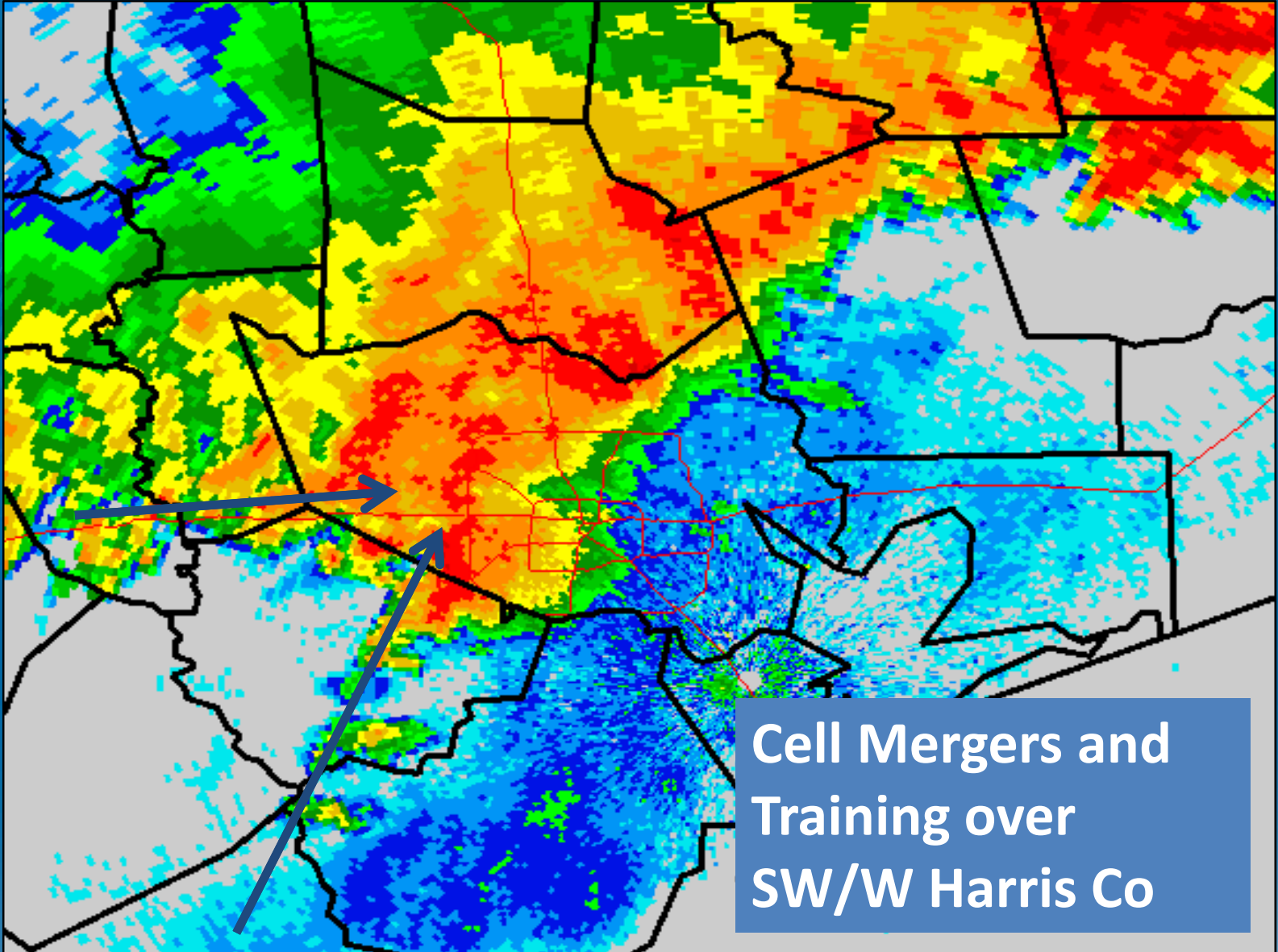
8:17: Move HCFCD staff to Monitor mode

**8:33: Flash Flood Warning issued for Harris County
(53 min)**

May 25 Radar – 800 pm



May 25 Radar – 900 pm



Cell Mergers and
Training over
SW/W Harris Co

Memorial Day Activation Timeline

9:57 pm: HCFCDD staff to flood mode (1hr 40 min)

10:00 pm: EOC Level 2...high readiness

10:04 pm: Flood Warning Rummel Creek (W156)
(2hr 24min)

10:52 pm: Flash Flood Emergency (NWS)

11:00 pm: EOC Level 1...maximum readiness
(1st time since Ike)

NWS Chat Log – May 25

02:01 <media-brooks.garner> Jeff, please let us know especially if there's anything more than the typical low-land stuff. Thanks!

02:02 <HCFCD-Jeff Lindner> 2.04 inches in 1 hr Spring Creek

02:02 <HCFCD-Jeff Lindner> Brooks: really worried about the SW/W side with cell mergers.

03:31 <HCFCD-Jeff Lindner> HGX: any consideration for FF emergency wording.

Have several watersheds nearing bankfull

03:32 <nws-joshua.lichter> Jeff- Yes. We have been discussing.

03:34 <HoustonOEM Michael Walter> Talked with safety folks at Toyota Center - They're holding people in their seats until the storms clear.

03:43 <nws-joshua.lichter> Looking at FFW emergency for southwest Harris into northern Fort Bend. This area has taken the brunt of it and still more rain coming.

03:47 <nwshgx-melissa.huffman> Flash Flood Emergency coming shortly for SW Harris, Northern Ft. Bend

03:48 <nwshgx-melissa.huffman> This will include Spring Branch, Sugar Land, Stafford, Mission Bend

03:50 <HCFCD-Jeff Lindner> Nearing 7 inches on Buffalo

03:56 <HCFCD-Jeff Lindner> HCFCD is advising all residents to remain at their current location. Avoid all travel.

03:57 <HCFCD-Jeff Lindner> Overbanks on Brickhouse...homes are flooding

BULLETIN - EAS ACTIVATION REQUESTED

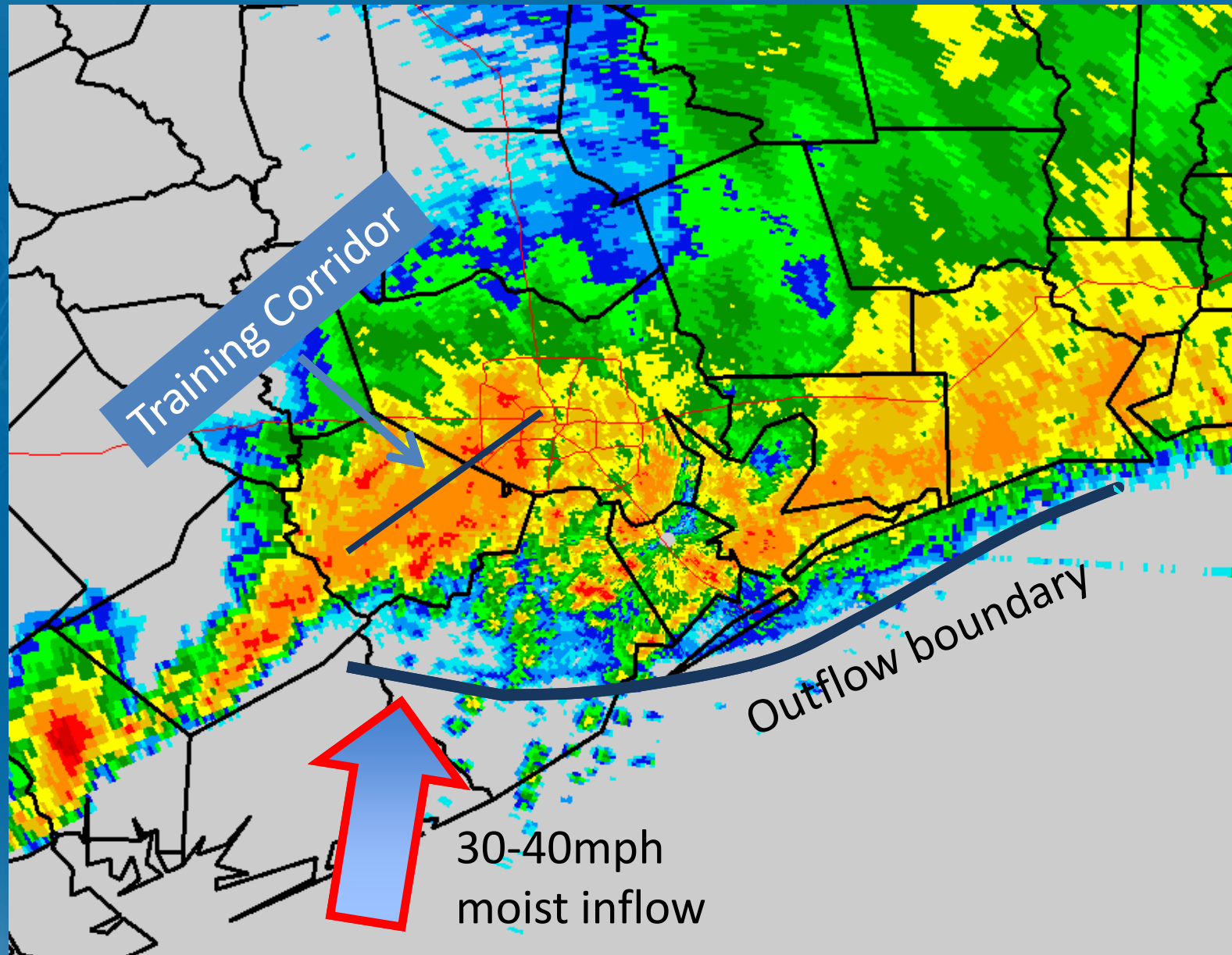
FLASH FLOOD WARNING NATIONAL WEATHER SERVICE HOUSTON/GALVESTON TX

1052 PM CDT MON MAY 25 2015 ...

FLASH FLOOD EMERGENCY FOR SOUTHWEST HARRIS COUNTY...

- UNTIL 1245 AM CDT *
- AT 1047 PM CDT...DOPPLER RADAR INDICATED A THUNDERSTORM PRODUCING HEAVY RAIN ACROSS THE WARNED AREA. 5 TO 7 INCHES OF RAIN HAVE FALLEN.
- **THIS IS A FLASH FLOOD EMERGENCY FOR AREAS FROM SUGAR LAND...MEADOWS PLACE...SPRING BRANCH...BUNKER HILL VILLAGE TO MEMORIAL.**
- ADDITIONAL RAINFALL AMOUNTS OF 2 TO 4 INCHES ARE POSSIBLE IN THE WARNED AREA.
- PRECAUTIONARY/PREPAREDNESS ACTIONS... **THIS IS AN EXTREMELY DANGEROUS AND LIFE THREATENING SITUATION.** DO NOT ATTEMPT TO TRAVEL. BE ESPECIALLY CAUTIOUS AT NIGHT WHEN IT IS HARDER TO RECOGNIZE THE DANGERS OF FLOODING. TURN AROUND...DONT DROWN WHEN ENCOUNTERING FLOODED ROADS. MOST FLOOD DEATHS OCCUR IN VEHICLES.

May 25 Radar – 1100 pm

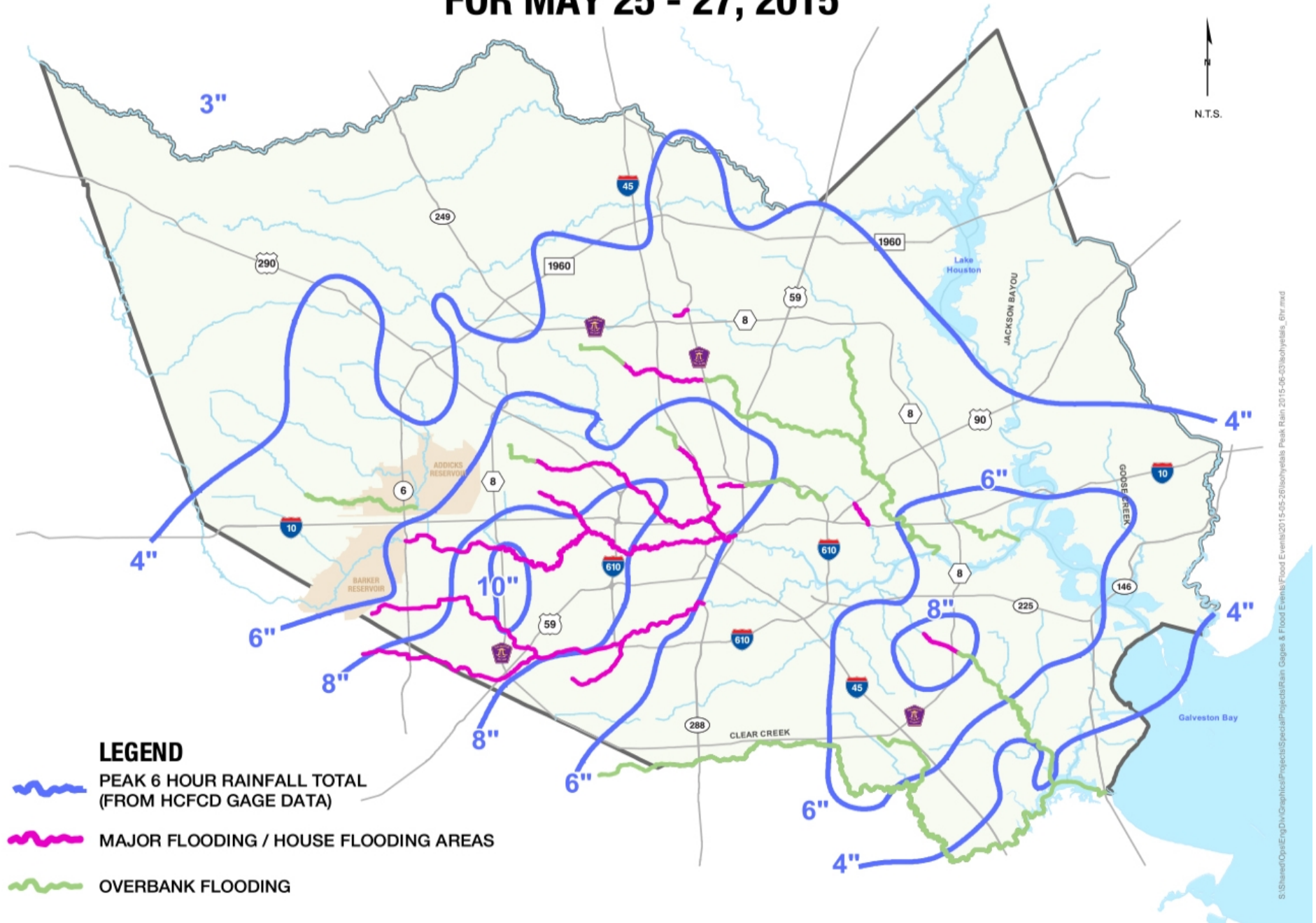


Highest Rainfall Amounts

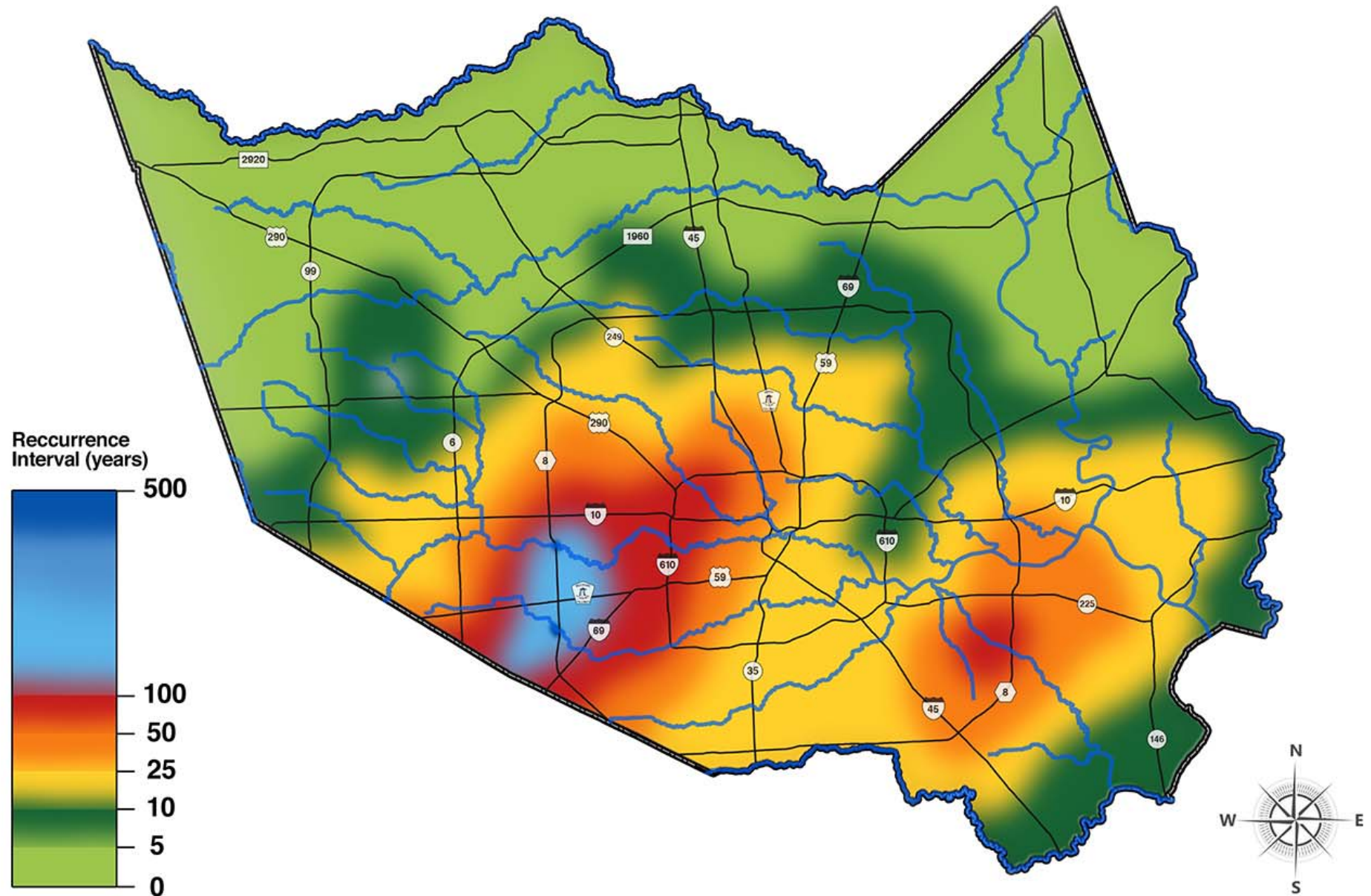
15 min	2.1"	Little White Oak at Tidwell
30 min	3.3"	Little White Oak at Tidwell
1 hour	4.8"	Little White Oak at Tidwell
3 hour	8.0"	Brays at West Belt
6 hour	10.1"	Buffalo at West Belt
12 hour	11.0"	Brays at West Belt

Harris County average for 12 hours:
5.3 inches = 162 billions gallons


6 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION FOR MAY 25 - 27, 2015



SIX HOUR PEAK RAINFALL RECURRENCE INTERVALS for the May 25-27, 2015 Flood Event

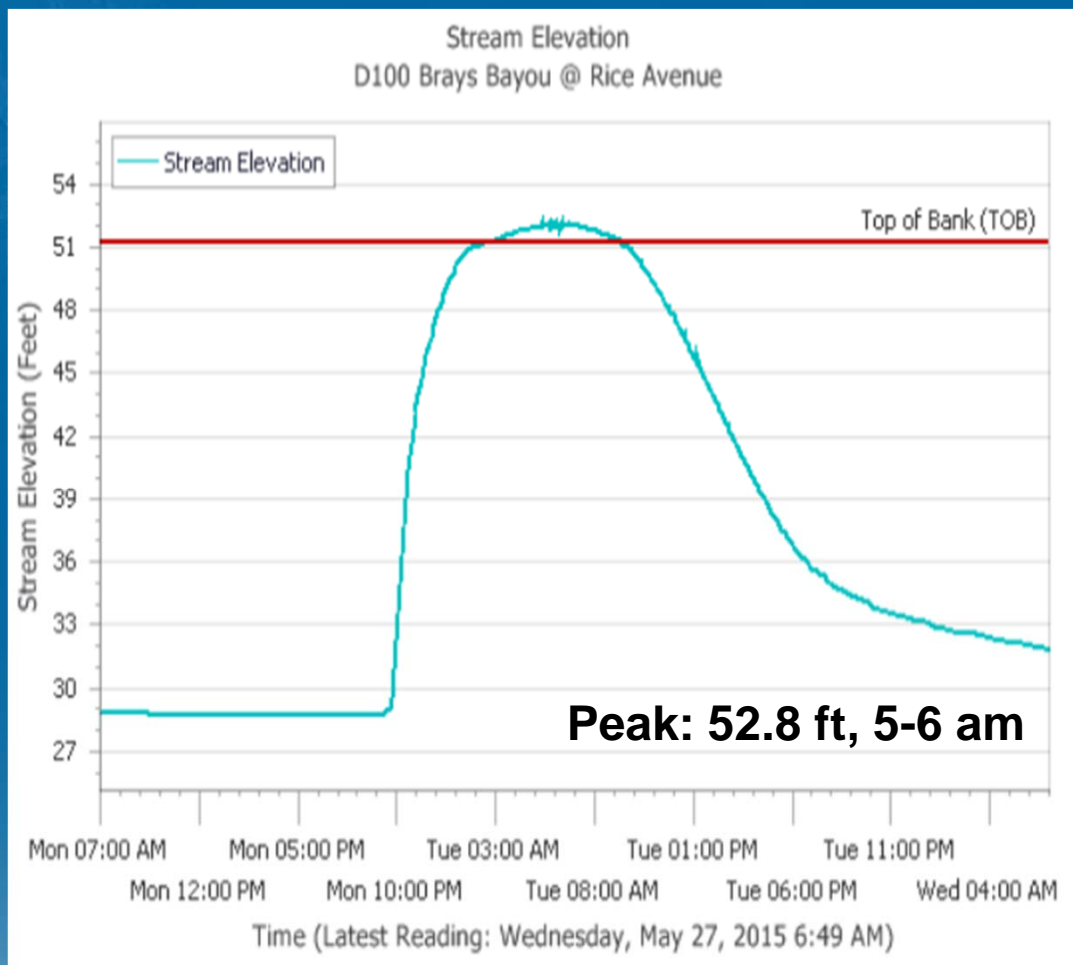


Flood Event Rainfall Comparison

Date	1-hr	3-hr	6-hr	12-hr	24-hr
6/8/01 (Allison)	6.3	13.5	21.2	28.3	28.5
6/26/07 (Marble Falls, TX)	6.8	13.4	17.8	17.8	17.8
4/18/09	6.9	9.2			11.0
5/26/15	4.8	8.0			11.0

Brays Bayou

- Ship Channel to US 59: 10% (10-yr) and 2% (50-yr)
- Upstream US 59: below 10% (10-yr)



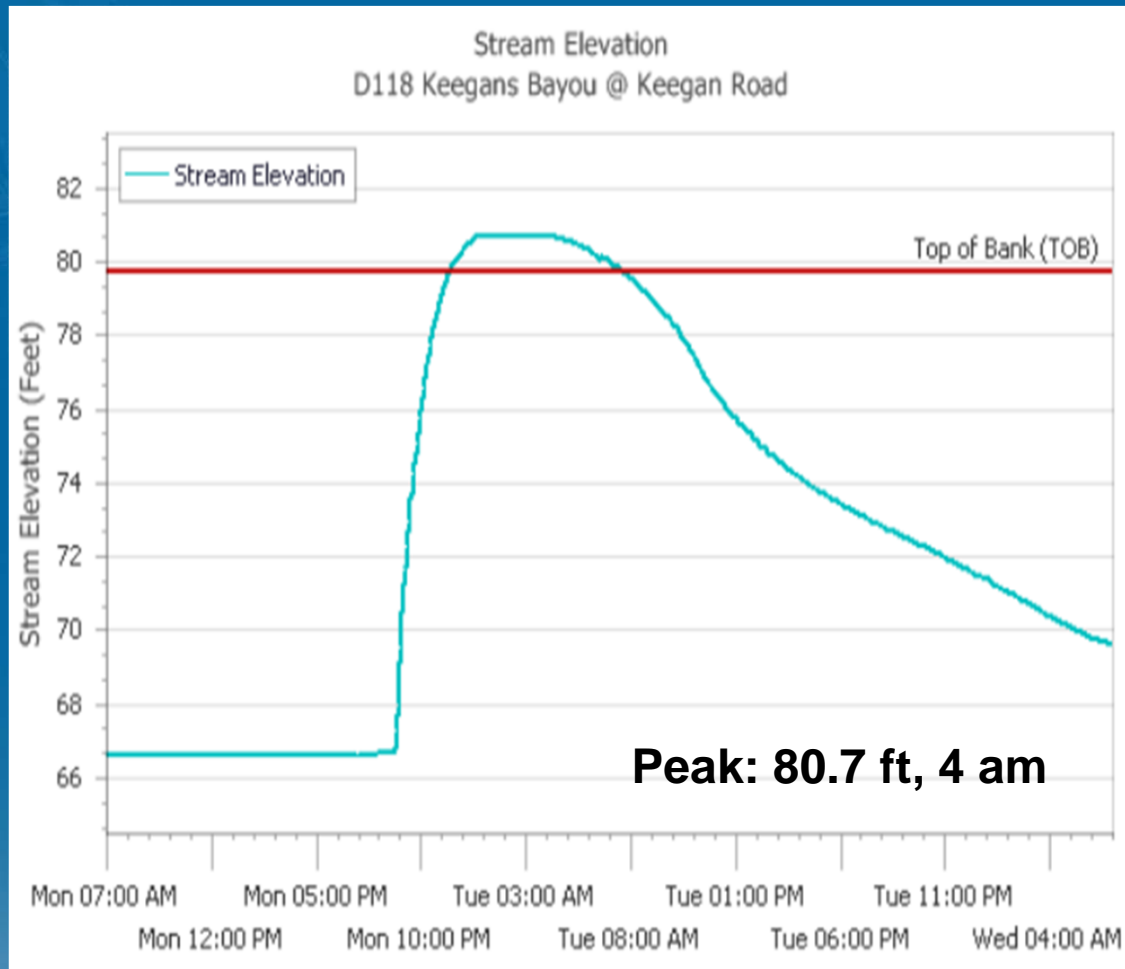
Event Date	HWM
5/26/15	52.9
9/19/83	52.5
10/18/94	51.5
11/17/03	51.0
Allison (01)	50.4
1/9/12	50.3

Brays Bayou Channel – May 26 am



Keegans Bayou

- Entire channel: at or above 1% (100-yr)
- Keegans to Dairy Ashford: near .2% (500-yr)



Event Date	HWM
5/26/15	80.8
1/9/12	78.9
5/12/12	77.8
4/28/09	75.9
Ike	75.6

Keegans Bayou – May 26 am



Huntington Park Sub



Huntington Park Sub



Keegans Rd

House Count Estimate

1,185	Brays Bayou
245	Keegans Bayou
295	Willow Waterhole
270	Buffalo Bayou
335	Spring Branch
485	White Oak Bayou & Tributaries
495	Other Watersheds
<hr/>	
3,015	(3,540 multi-family + 92 businesses)

FEMA Flood Insurance Claims

4,630 total

3,320 not in house count above

Total flooded homes likely between 3000 and 6000

House Count Comparison

Jurisdiction	House Flooding Estimate
City of Houston	2,660
City of Bellaire	160
Unicorp. Harris County	110
The Villages	65
City of Pasadena	20
Total	3,015

May 25, 2015 Flood
currently ranks as 4th
 most number of
 homes flooded

Flood Event	House Flooding
TS Allison	73,000
6-19-06	3,370
10-18- 94	3,248
5-25-15	3,015 w/o FEMA 6,335 w/ FEMA
4-28-09	2,305

90% flooded homes in City of Houston

House Damage



HCFCF Actions

- 115 high water marks identified and surveyed at bridges on seven channels
- High water marks taken in houses along Brays Bayou and HCFCF detention basins

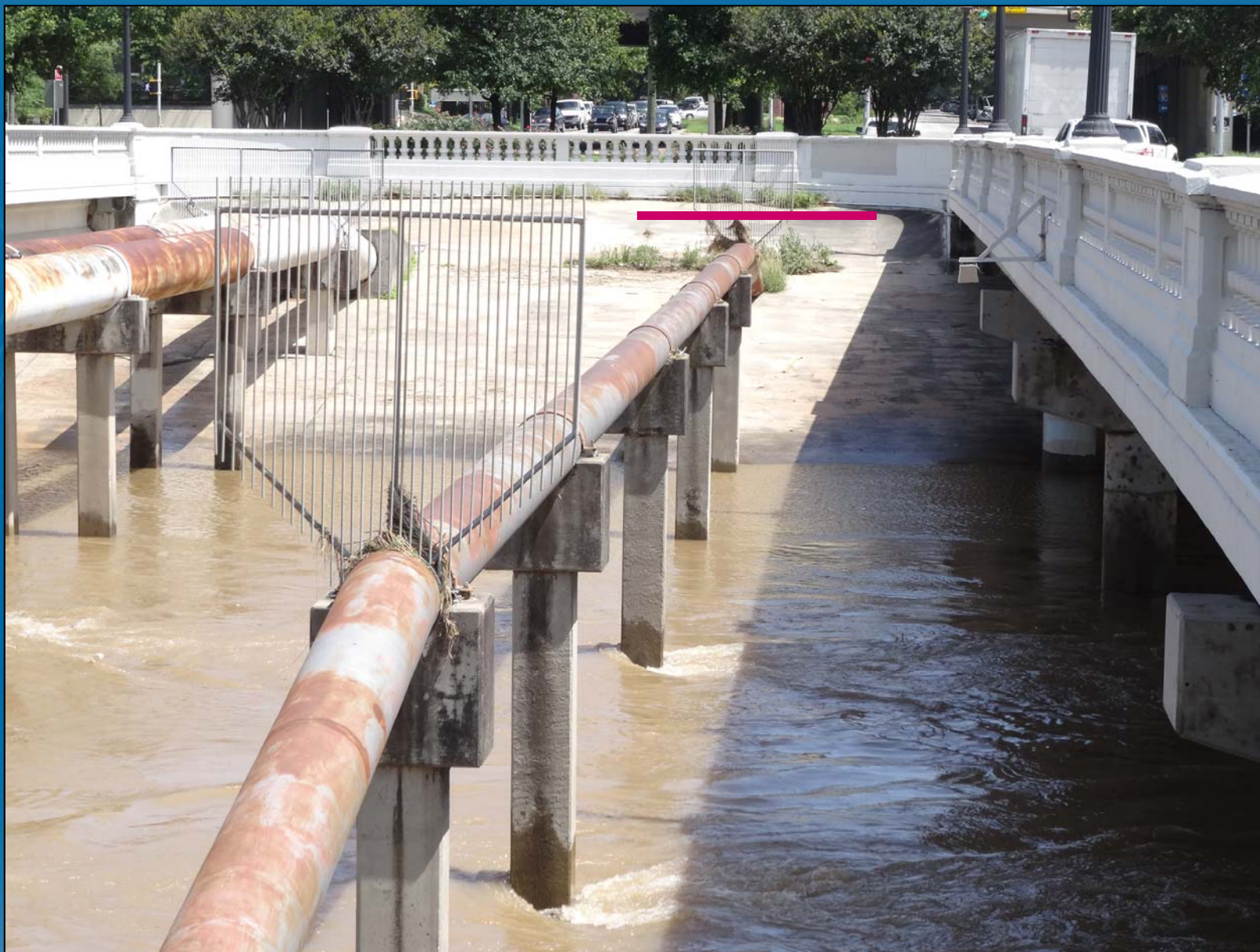


Flood Warning System

- 89 rainfall alarms (1" in 15 minutes)
- 69 water level alarms (3 ft from bankfull)

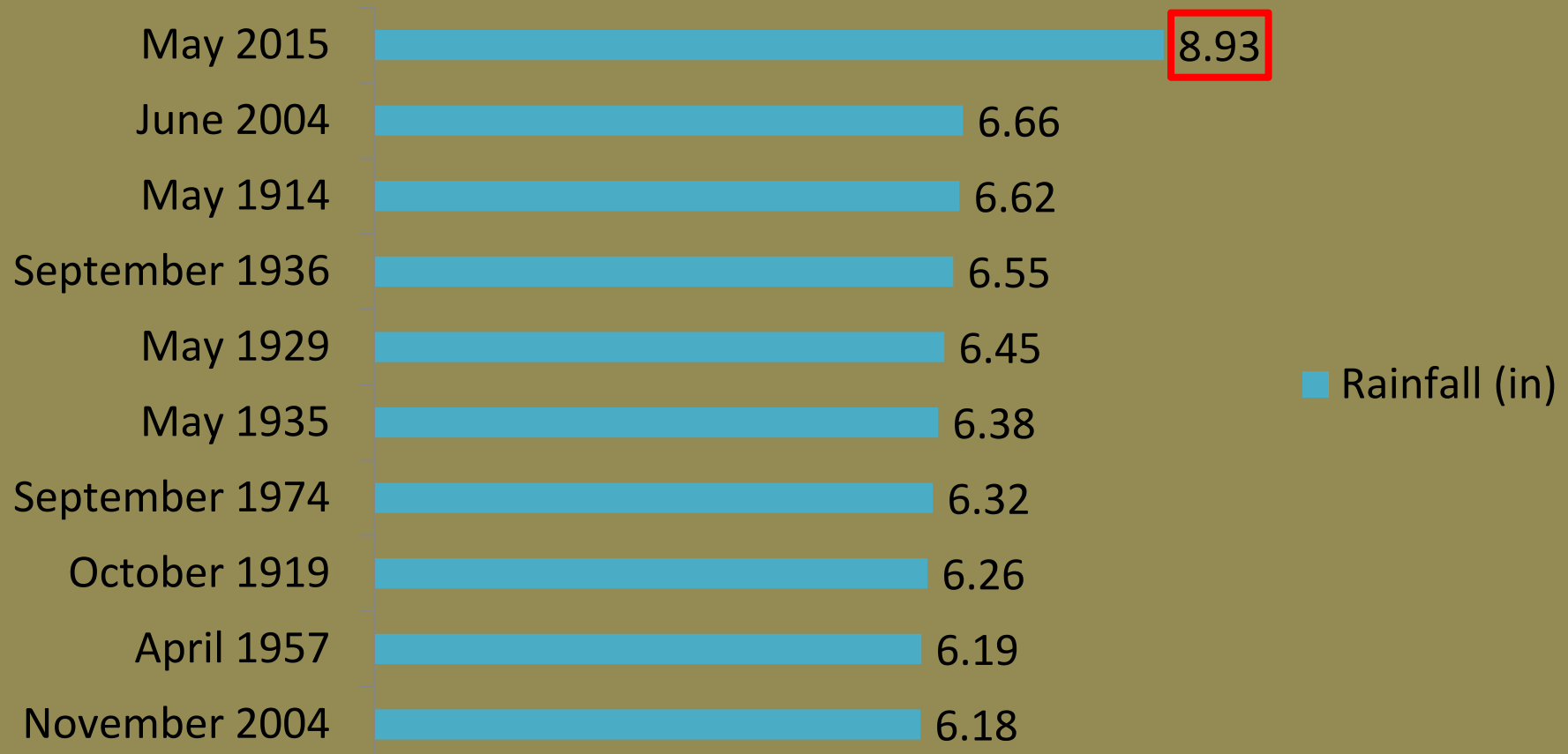


Things That Make You Go – Hmmm!



May 2015 Rainfall

Ten Wettest Months in Texas History (1895-Present)



May 2015 wettest month ever since 1895.

Surpassed previous record by 2.27 inches!

May 2015 rainfall = 35 trillion gallons across TX!

Questions?

Jeff Lindner
Harris County Flood Control District
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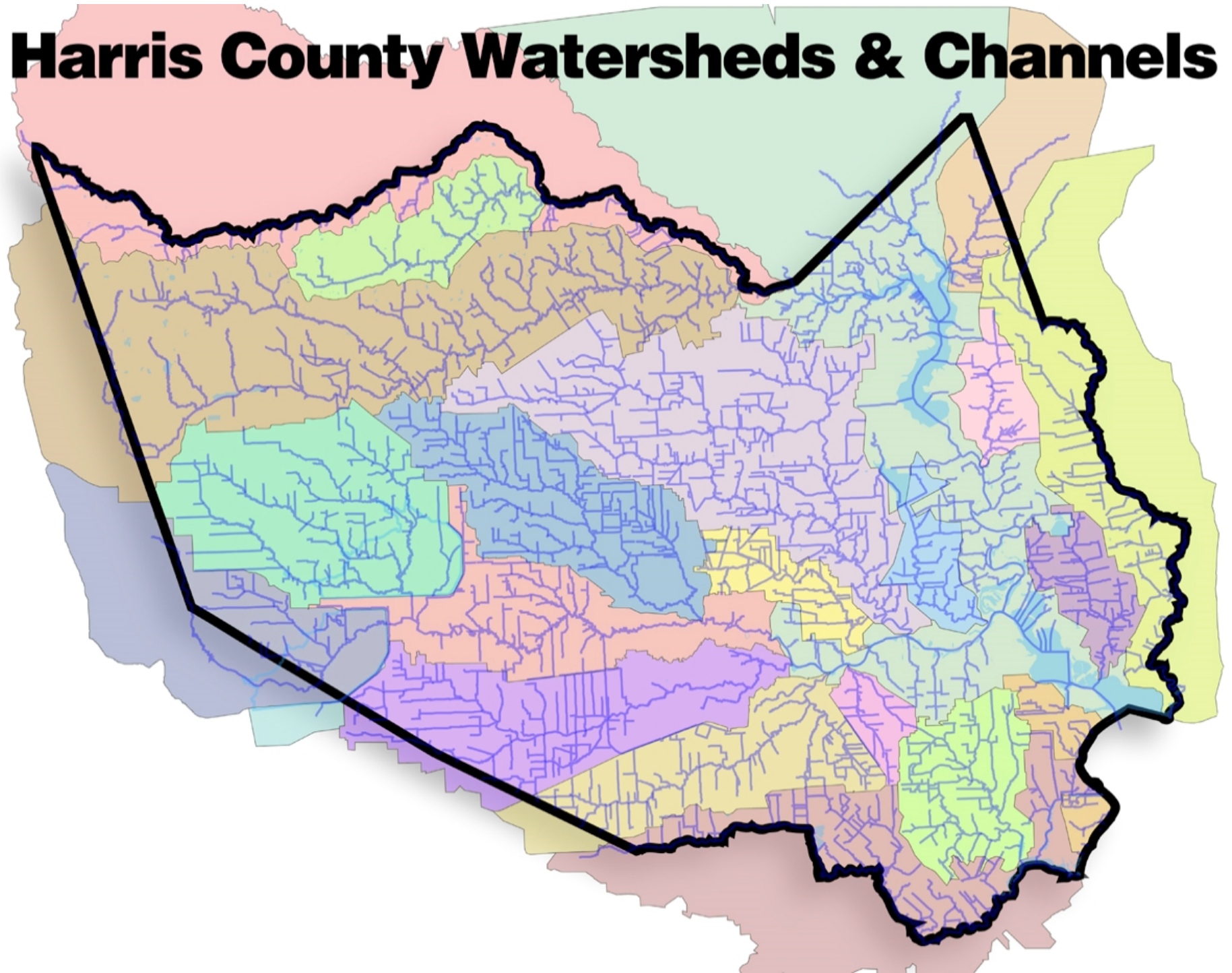
Harris County Flood Warning System Performance

- 89 rainfall alarms (1' in 15 minutes)
69 water level alarms (3 ft from bankfull)
- No obvious loss of data due to contention during peak of event
- Rainfall & stage data real-time & accurate
- Record # of hits on public FWS website (no overloading problems)
- One radar sensor destroyed by flood flow

Lessons Learned

- When to activate and staff onsite at HCOEM and Flood Operations Center?
- Working flood from multiple locations hinders communications and coordination
- Working floods after many years of little to no flood activity a challenge – new people, new tools, new versions.
- Need to improve flood forecasting

Harris County Watersheds & Channels



Total Drainage Network

