

Tax Day Flood

April 17-18, 2016

Harris County, Texas

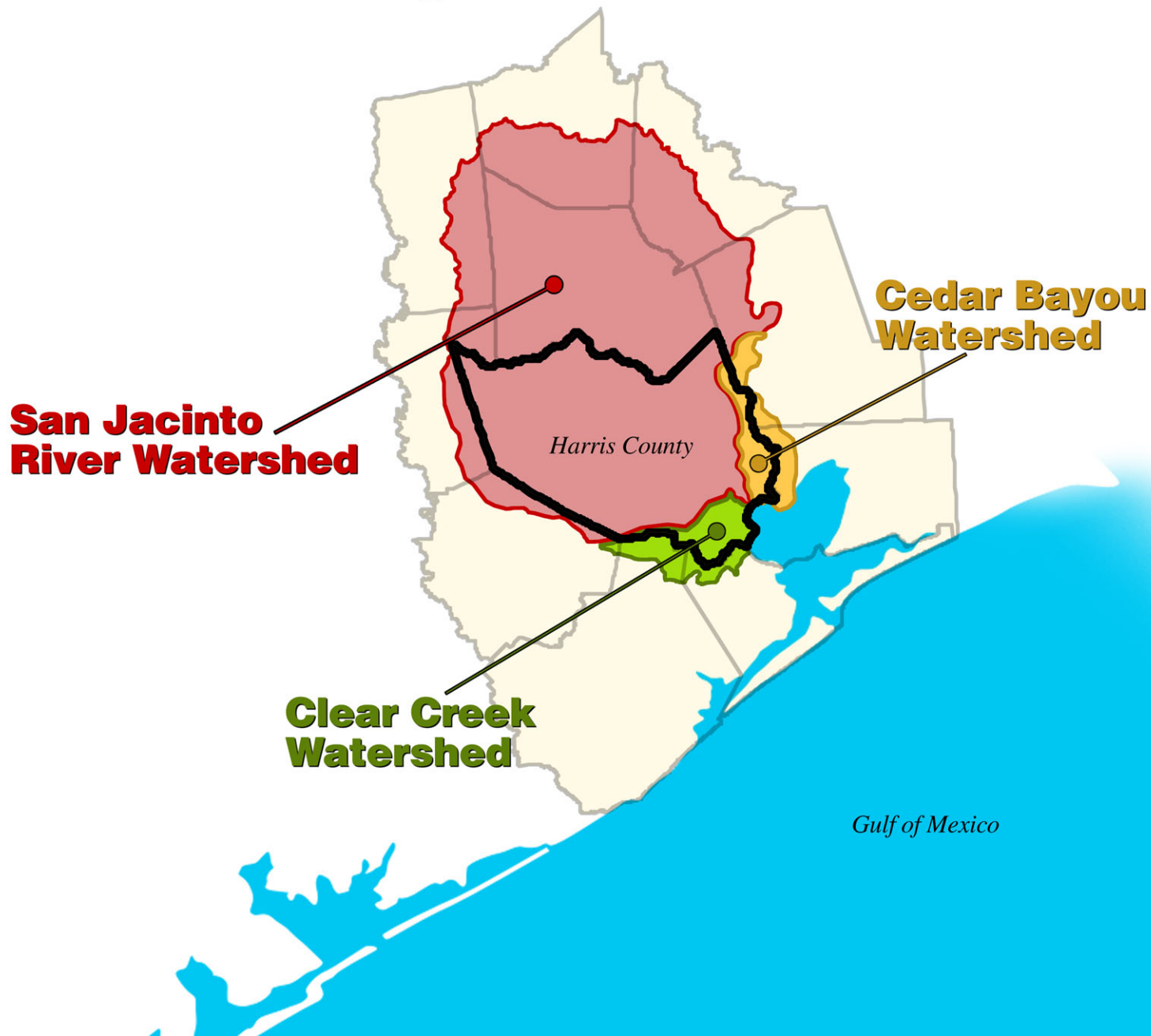
Jeff Lindner

Meteorologist/Director Hydrologic Operations Division

Harris County Flood Control District

December 14, 2016

Harris County Local Watersheds



Harris County Watersheds



Recent Major Flooding Events

- May 1989
- June 1989 (TS Allison # 1)
- March 1992
- October 1994
- September 1998 (TS Frances)
- October 1998
- November 1998
- June 2001 (TS Allison # 2)
- October 2002
- November 2003
- June 2006
- October 2006 (2)
- August 2007 (TS Erin)
- September 2008 (Hurricane Ike)
- April 2009 (2)
- January 2010
- July 2012
- May 2015 (2)
- October 2015
- April 2016
- May 2016



5 of 24 (21%) Tropical Cyclone
10 of 24 (42%) (Sept, Oct, Nov)
10 of 24 (42%) (Apr, May, June)

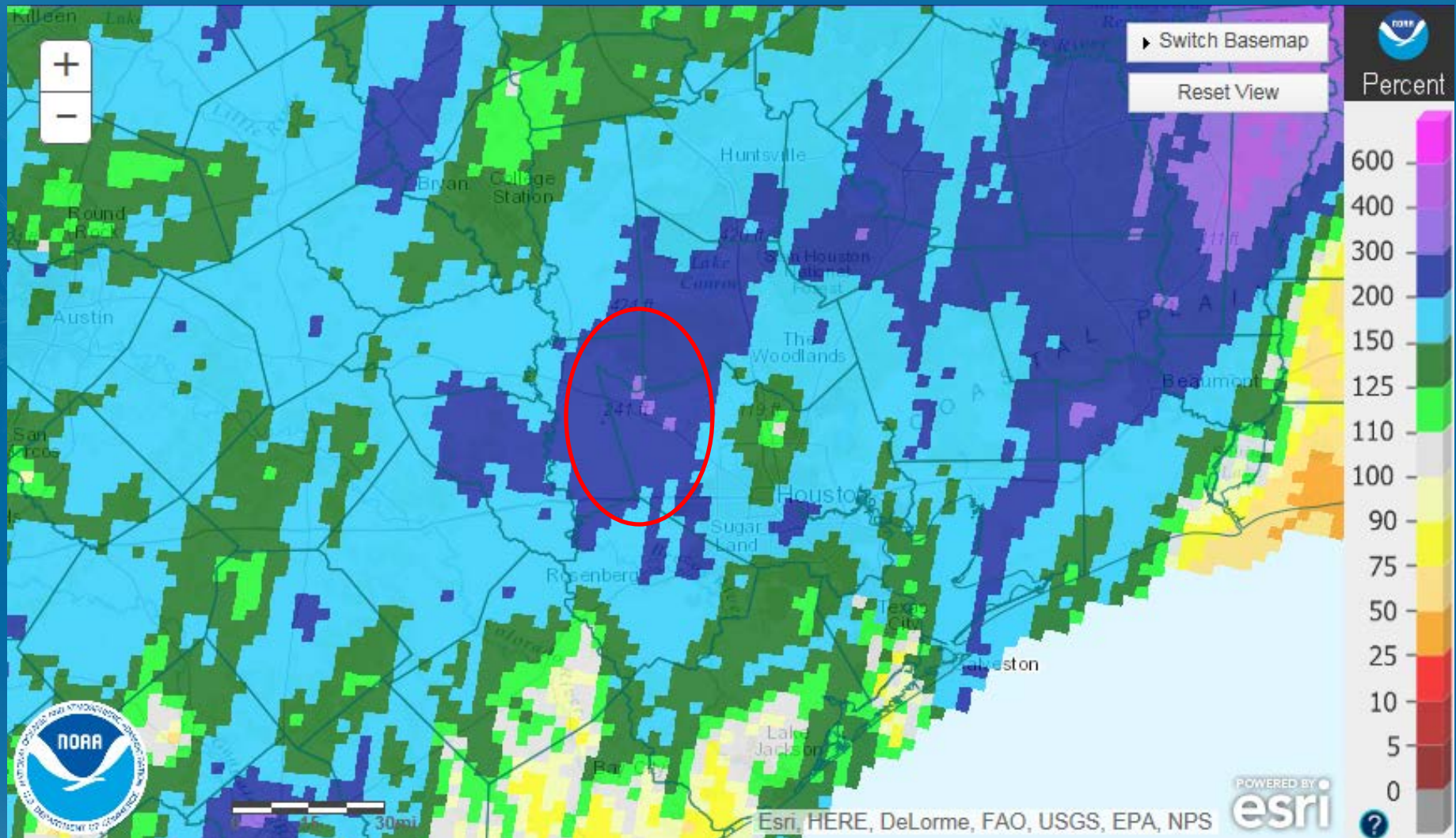
2015-16 Floods Summary

Date (Major Flood)	Max 12-hr Rain (in)	Max Flood Freq. (yr)	Homes/Deaths
4/17/15	5.1	2-5	~50/0
5/13/15	8.2	5	~50/1
5/26/15 (Memorial Day)	11.0	100-500	~6,500/7
10/25/15	8.4	10	0/0
10/31/15 (Halloween)	11.8	50-100	~400/2
3/11/16	6.8	2-5	0/0
4/18/16 (Tax Day)	16.7	+500	~9,800/9
5/27/16 (Memorial Wkd)	8.1	10-50	~460/0

Deaths: 19

House Flooding: 17,300

Antecedent Conditions – March 2016

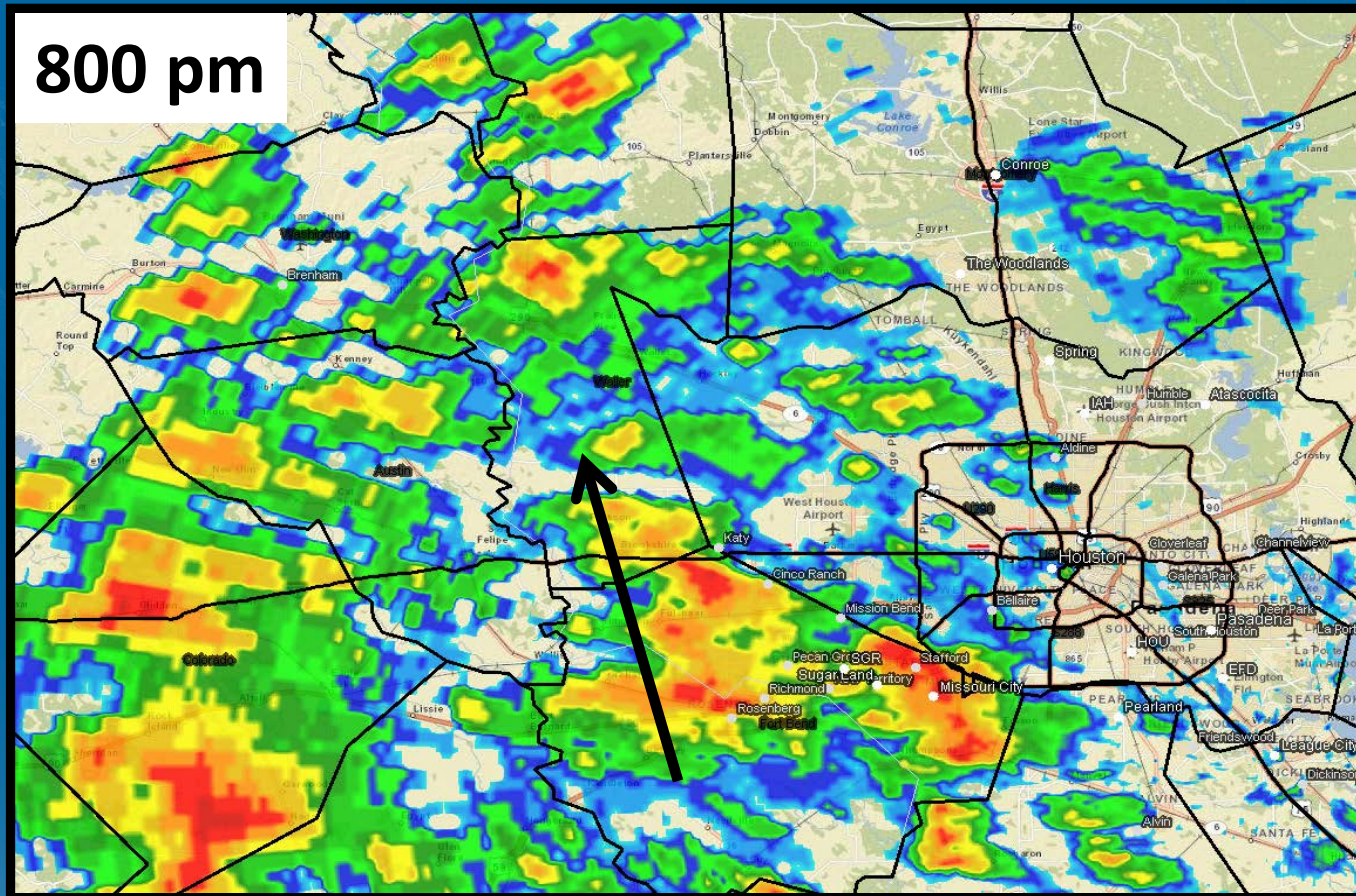


March 2016 Rainfall 200% to 400% of normal for Harris County

Activation Timeline

3:24 pm: Flash Flood Watch issued

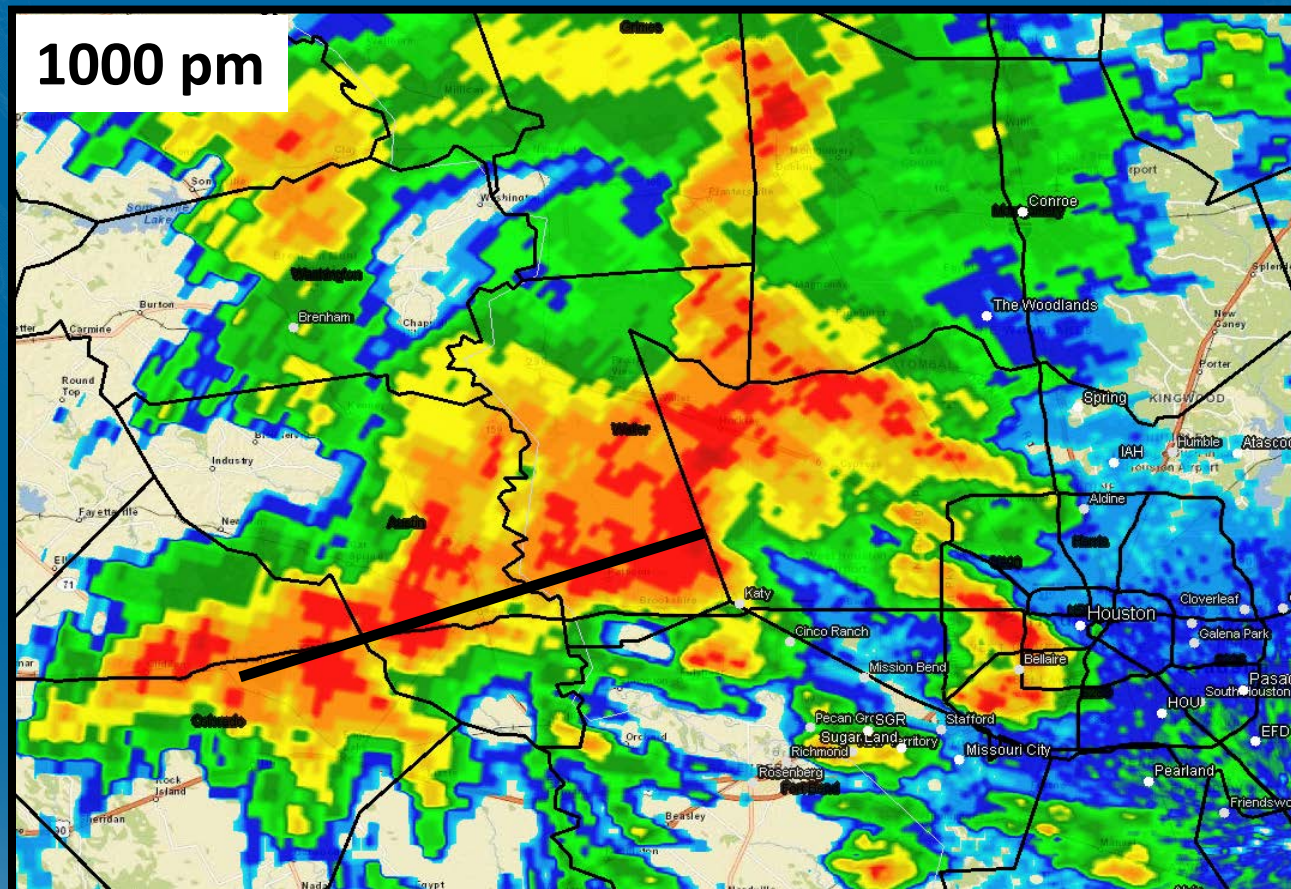
7:30 pm: Con call (HCFCFCD, HCOEM, NWS)



Activation Timeline

9:38 pm: Flash Flood Warning issued for NW Harris/Waller Counties

11:30 pm: EOC at Level 3 activation

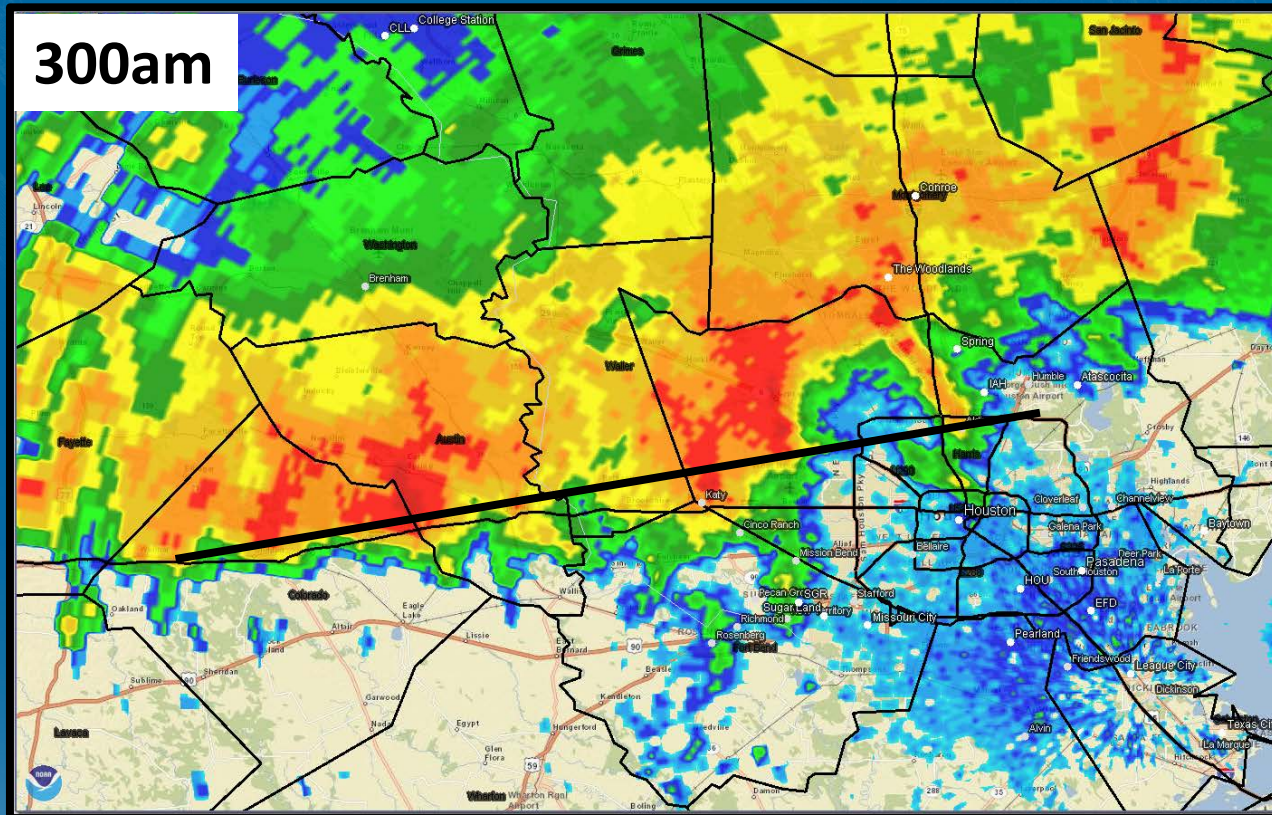


Activation Timeline

11:55 pm: HCFCF employees arrive at HCOEM

12:59 am: EOC at Level 2 activation

1:45 am: Flash Flood Emergency for NW Harris County



Flash Flood Emergency

BULLETIN - EAS ACTIVATION REQUESTED: FLASH FLOOD WARNING
NATIONAL WEATHER SERVICE HOUSTON/GALVESTON TX
144 AM CDT MON APR 18 2016...

FLASH FLOOD EMERGENCY...

THE NATIONAL WEATHER SERVICE IN LEAGUE CITY HAS ISSUED A* FLASH FLOOD WARNING FOR...WALLER COUNTY... SOUTHEASTERN GRIMES COUNTY... NORTHWESTERN HARRIS COUNTY...* UNTIL 445 AM*

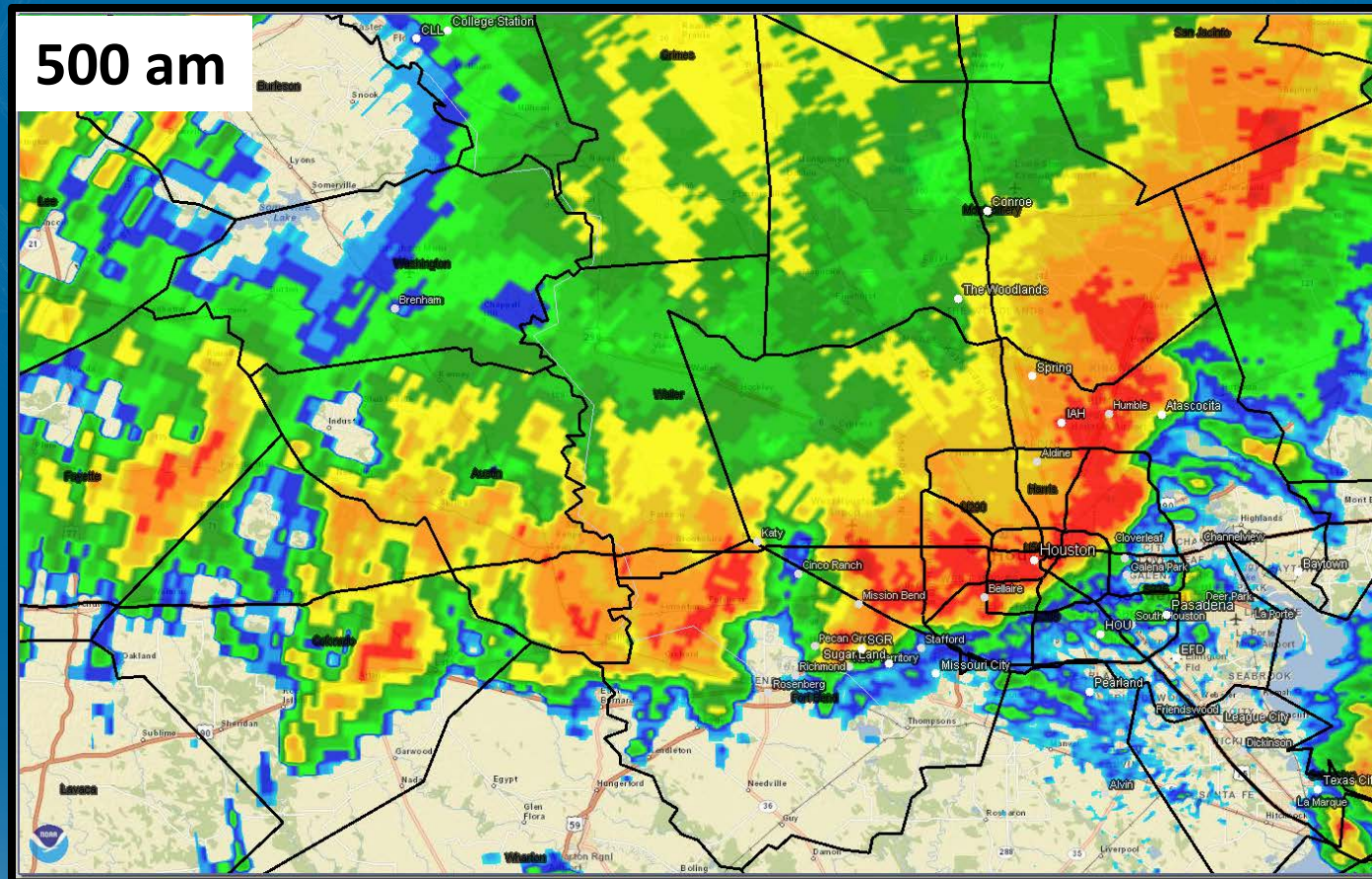
AT 141 AM CDT...DOPPLER RADAR INDICATED THUNDERSTORMS PRODUCING HEAVY RAIN ACROSS THE WARNED AREA. FLASH FLOODING IS OCCURRING. THIS IS A FLASH FLOOD EMERGENCY. **THIS IS A PARTICULARLY DANGEROUS SITUATION. NUMEROUS HIGH WATER RESCUES ARE OCCURRING DUE TO 5 TO 10 INCHES OF RAINFALL WITH ADDITIONAL HEAVY RAINFALL EXPECTED. ***

ACTIONS...THIS IS AN EXTREMELY DANGEROUS AND LIFE-THREATENING SITUATION. DO NOT ATTEMPT TO TRAVEL .

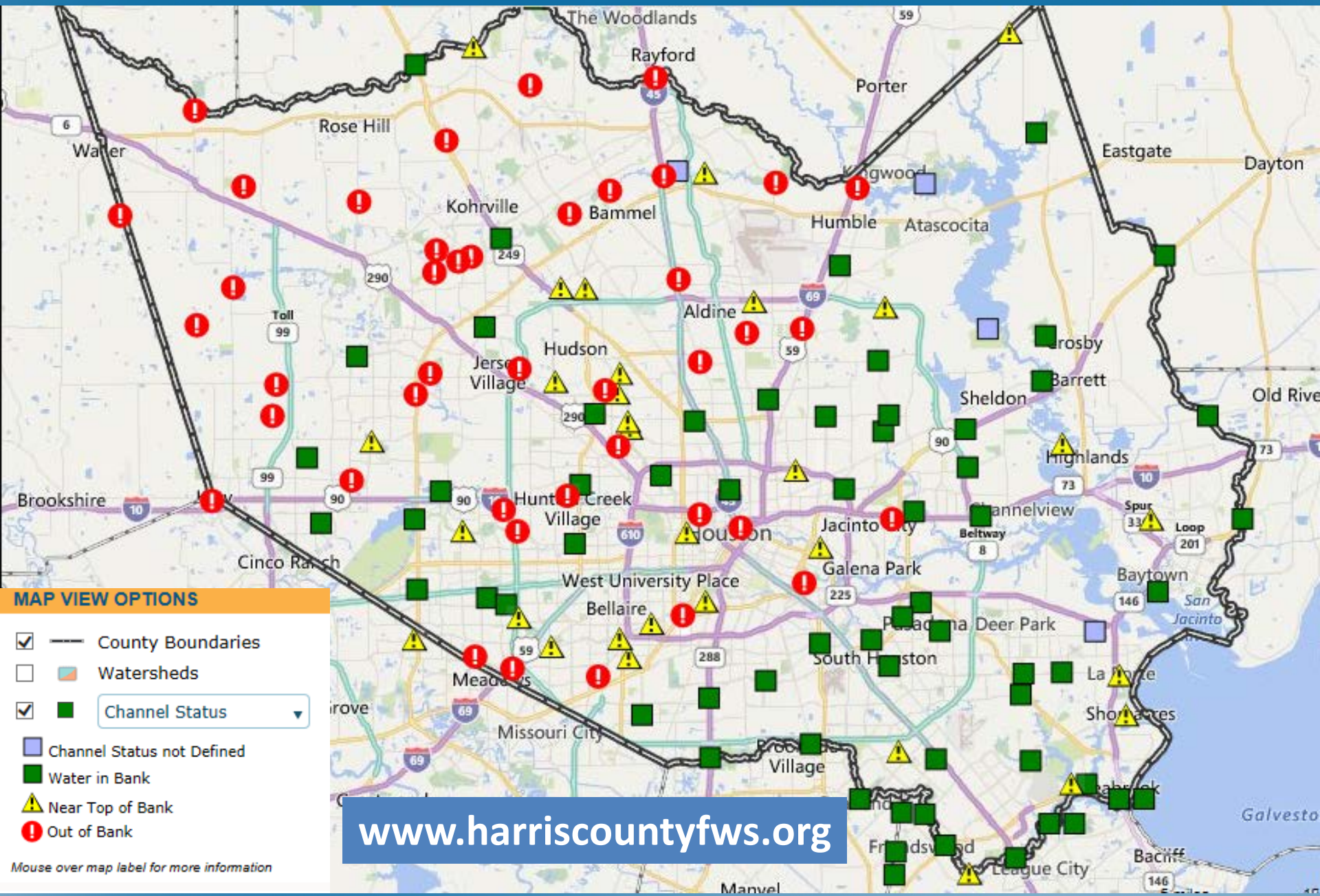
Activation Timeline

3:30 am: EOC at Level 1 activation

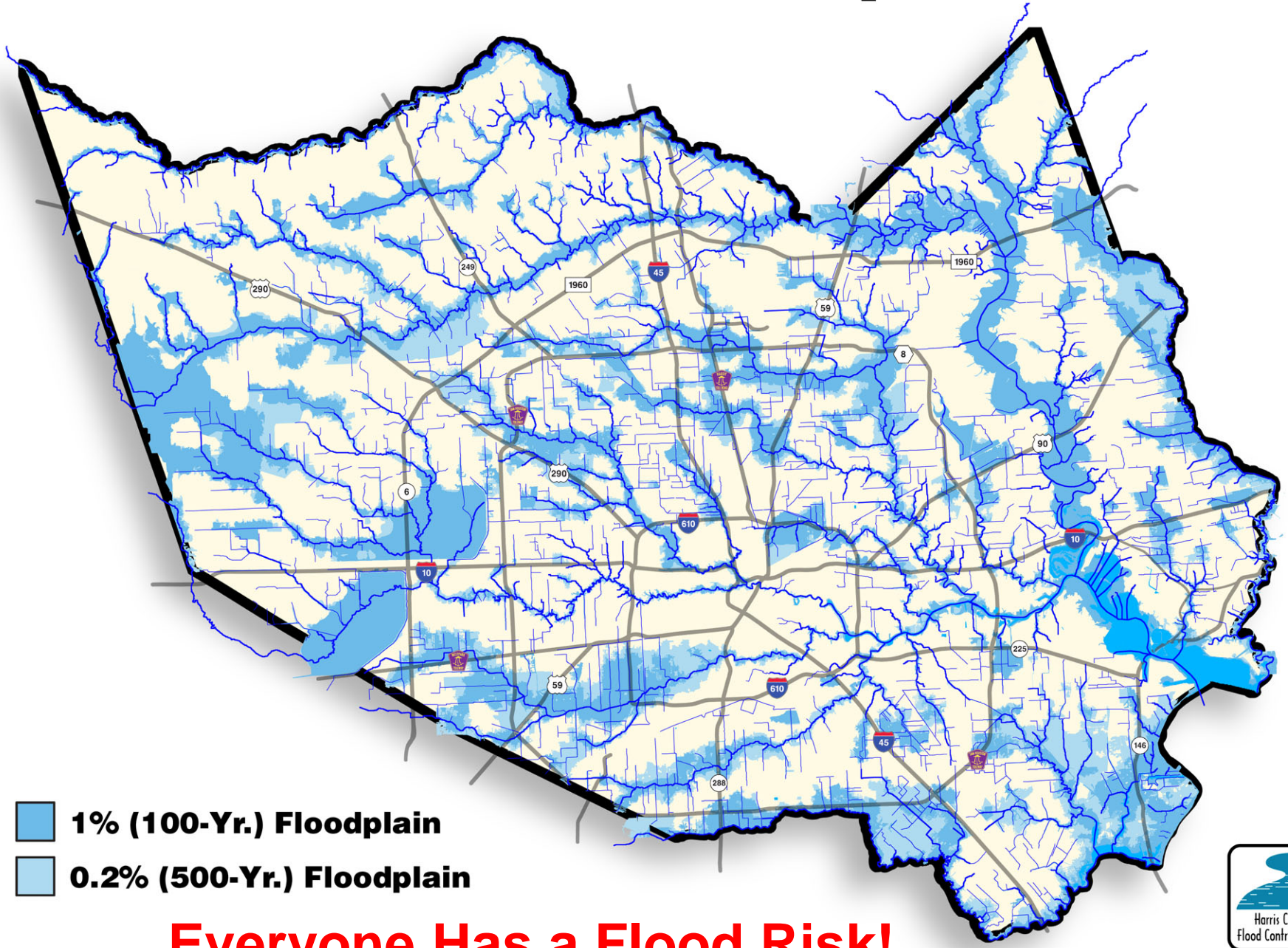
5:00 am: 11 out of 22 watersheds overbanks



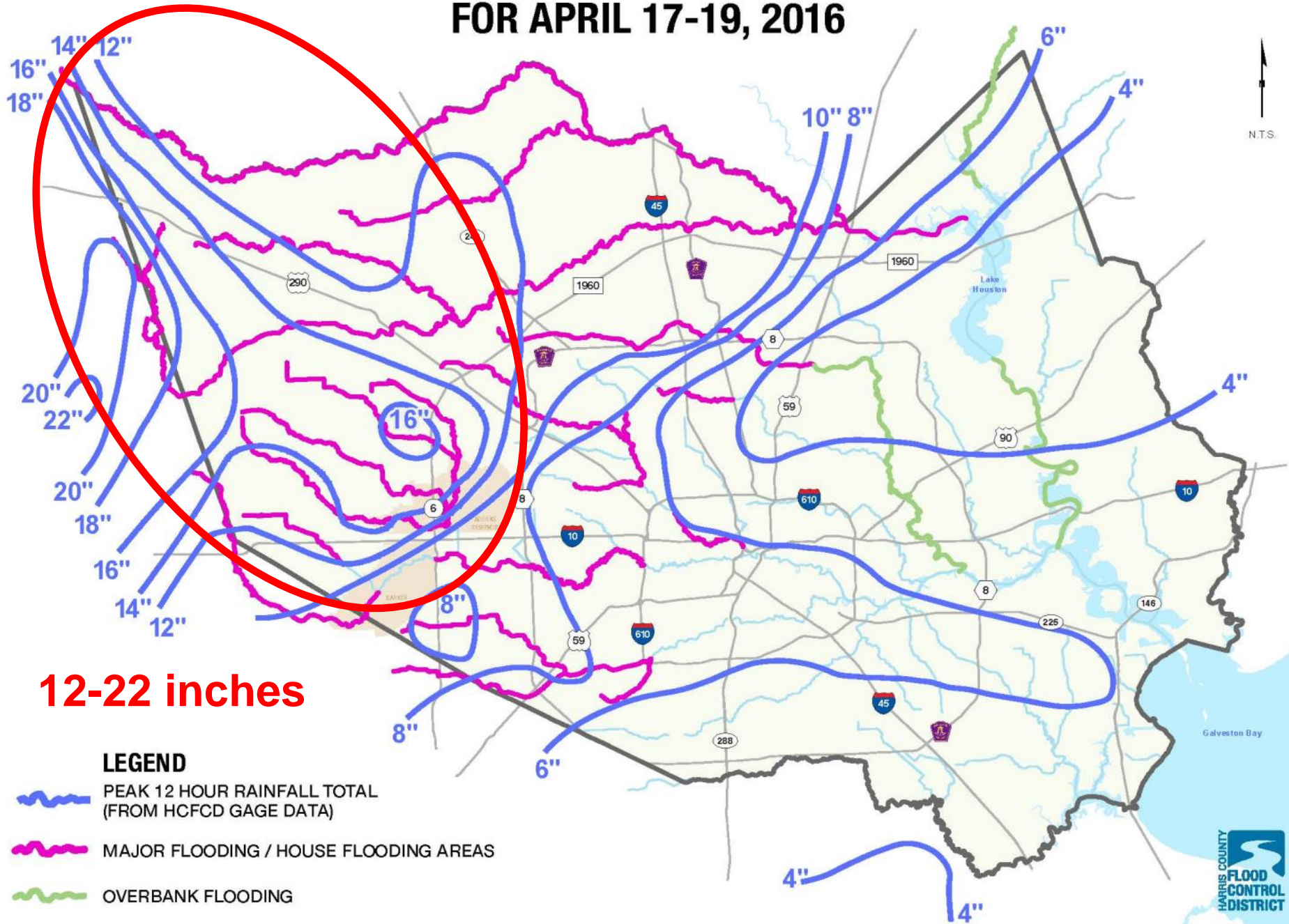
Channel Status – Tax Day 2016 – 800 am



2007 FEMA Floodplains



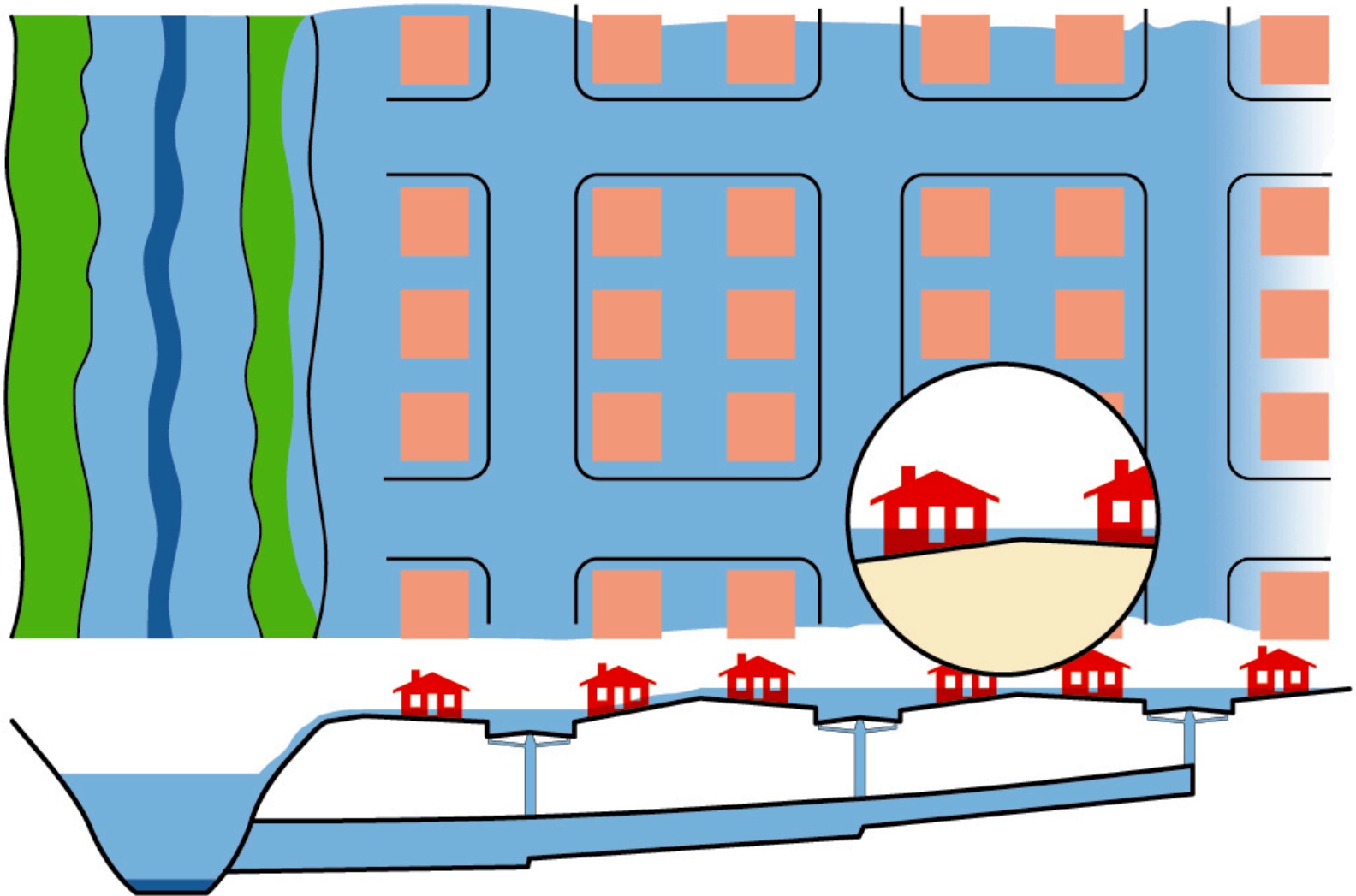
12 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION FOR APRIL 17-19, 2016



12-22 inches

Ponding & Sheet Flow Flooding

STREET SEWERS



FLOODING FROM INTENSE LOCAL RAINFALL
(Longer Duration)

2016 Tax Day Flood - Rainfall

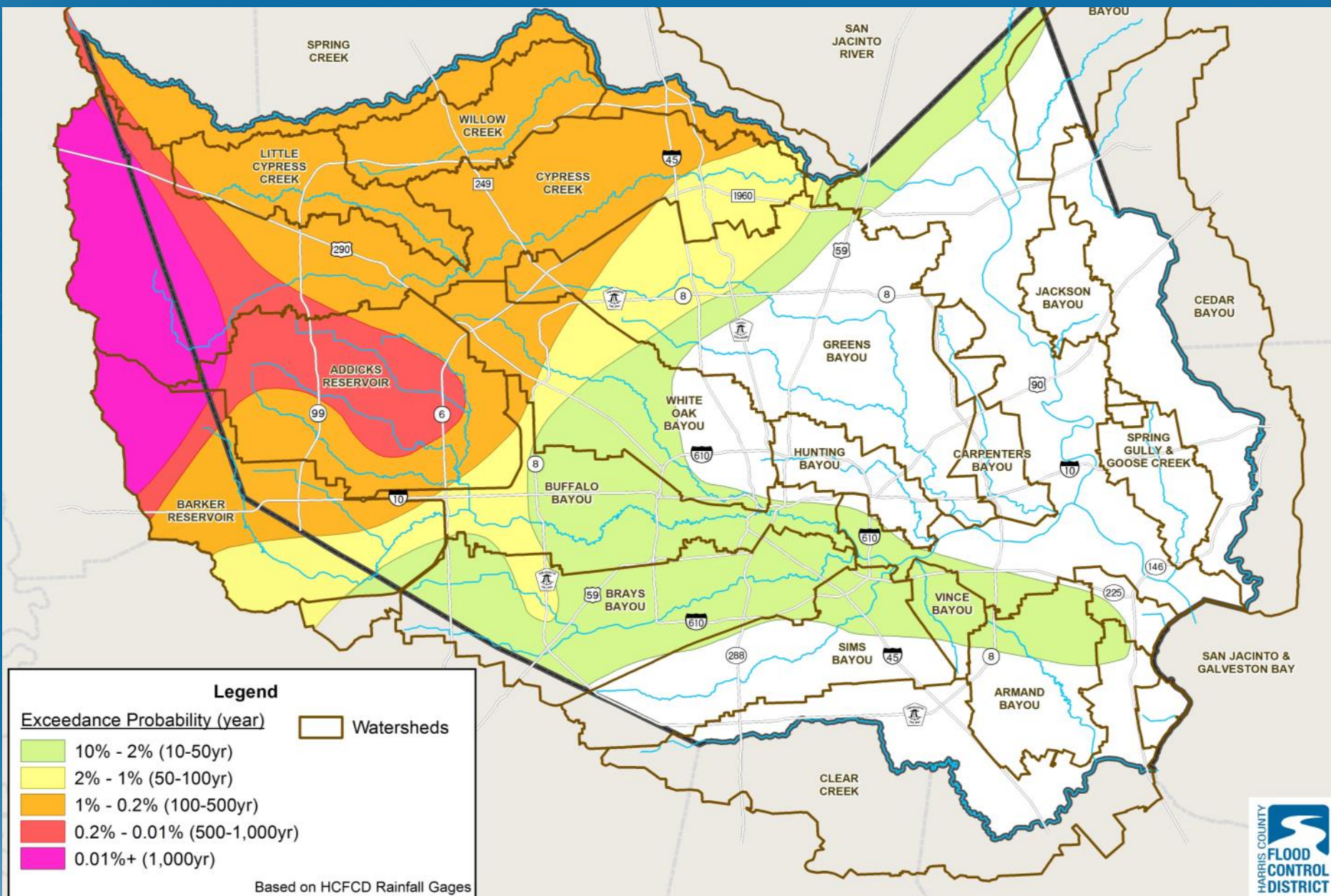
Duration	Max Rainfall	Duration	Max Rainfall
5-min	1.0	3-hr	8.3
15-min	2.2	6-hr	13.9
30-min	3.4	12-hr	16.7
1-hr	4.7	24-hr	17.4
2-hr	7.3	48-hr	17.5

Location	Rainfall	Duration
Pattison	23.50	14.5 hrs
Pattison	21.93	24 hrs
Waller	20.00	unknown
Monaville	19.30	10 hrs
Waller	18.76	unknown

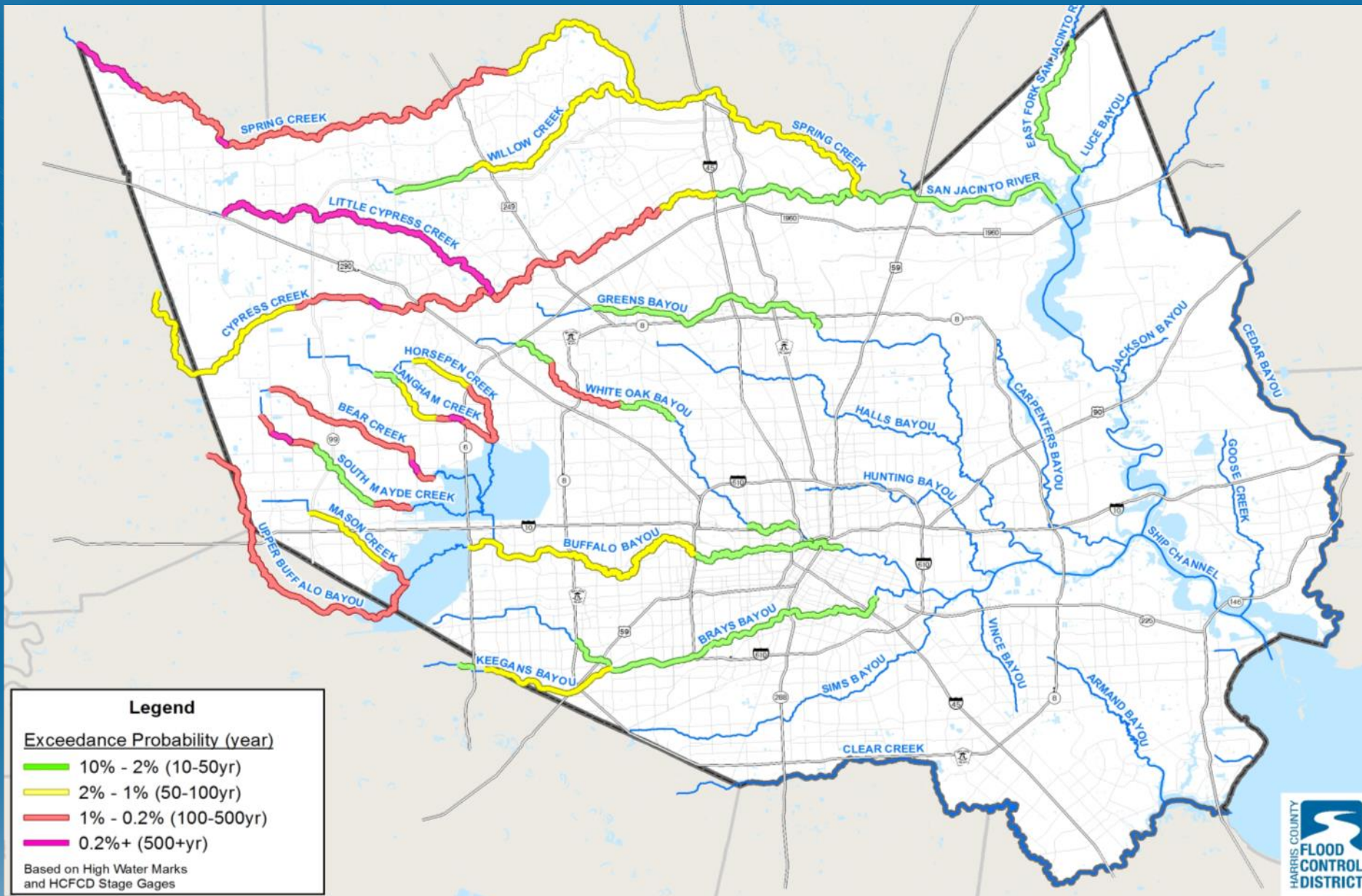
Tax Day Rainfall vs. Historic Events

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
5/26/15	4.8	8.0	10.1	11.0	11.0
4/18/16	4.7	8.3	13.9	16.7	17.4

12 Hour Peak Rainfall Frequency



Peak Flood Level Frequencies



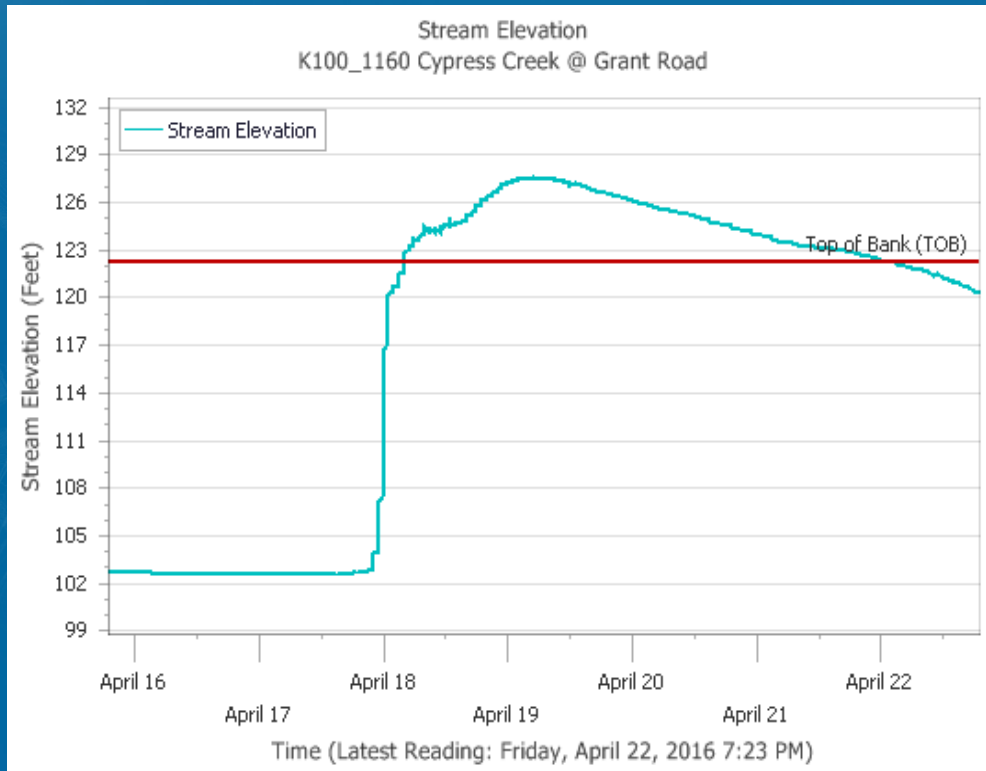
Cypress Creek

Record flood levels set at 13 bridges.

11 bridges closed; 3 open between I-45 & US 290

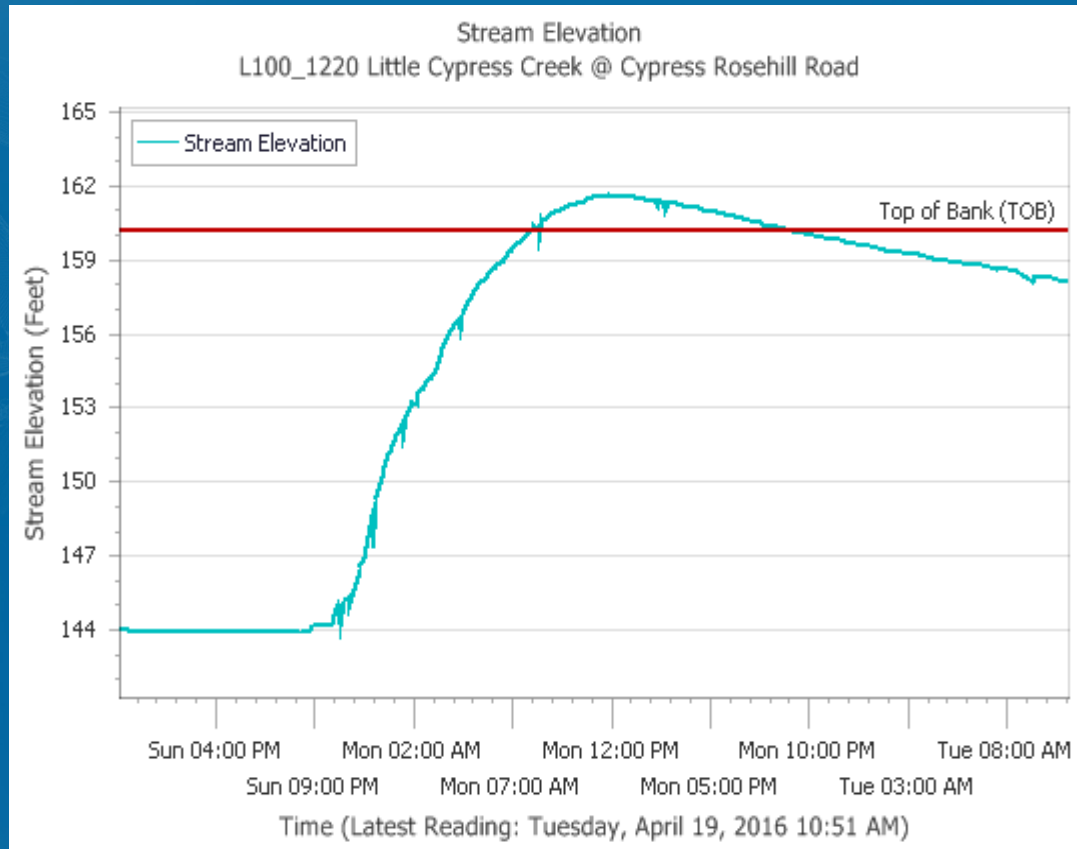


Cypress Creek – Grant Rd



Event Date	HWM
10-18-94	125.4
10-19-98	124.3
Allison (01)	123.8
7-12-12	124.6
4-16-18	127.4

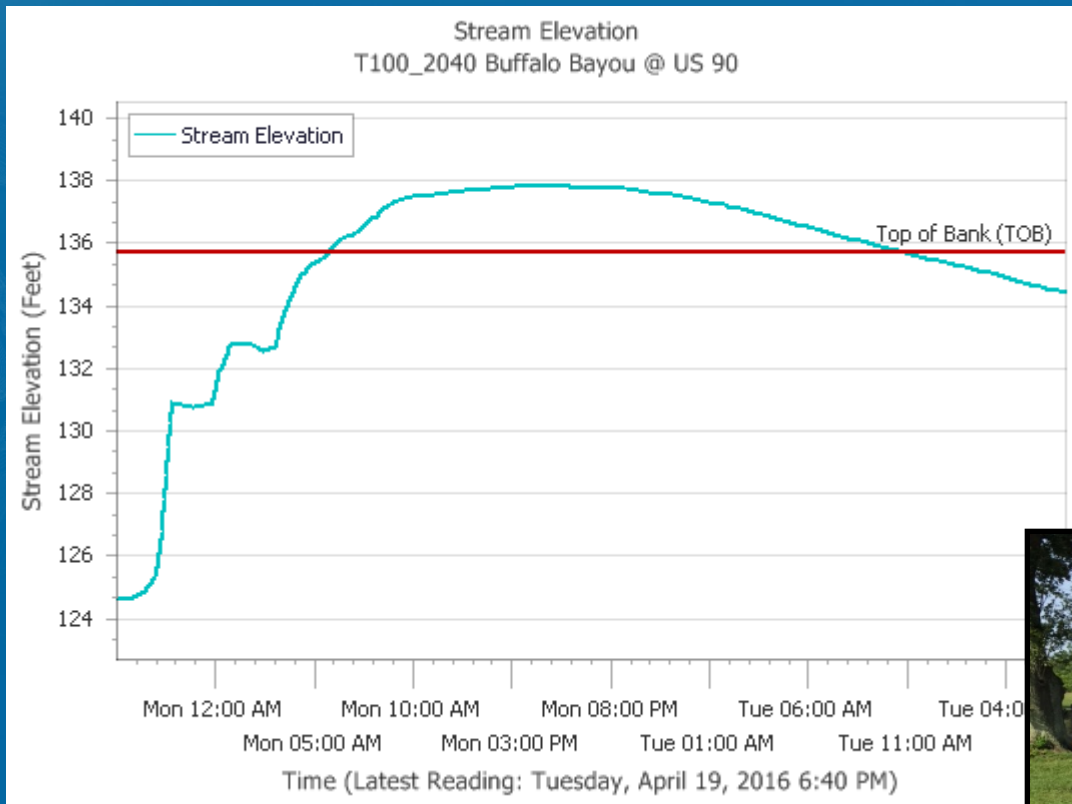
Lt. Cypress Creek at Cypress Rosehill



Event Date	HWM
10-19-94	159.1
10-19-98	160.2
4-28-09	158.1
7-12-12	160.4
4-18-16	162.1

Record flood levels set at all 8 bridges on Little Cypress Creek and all above 0.2% (500-yr)

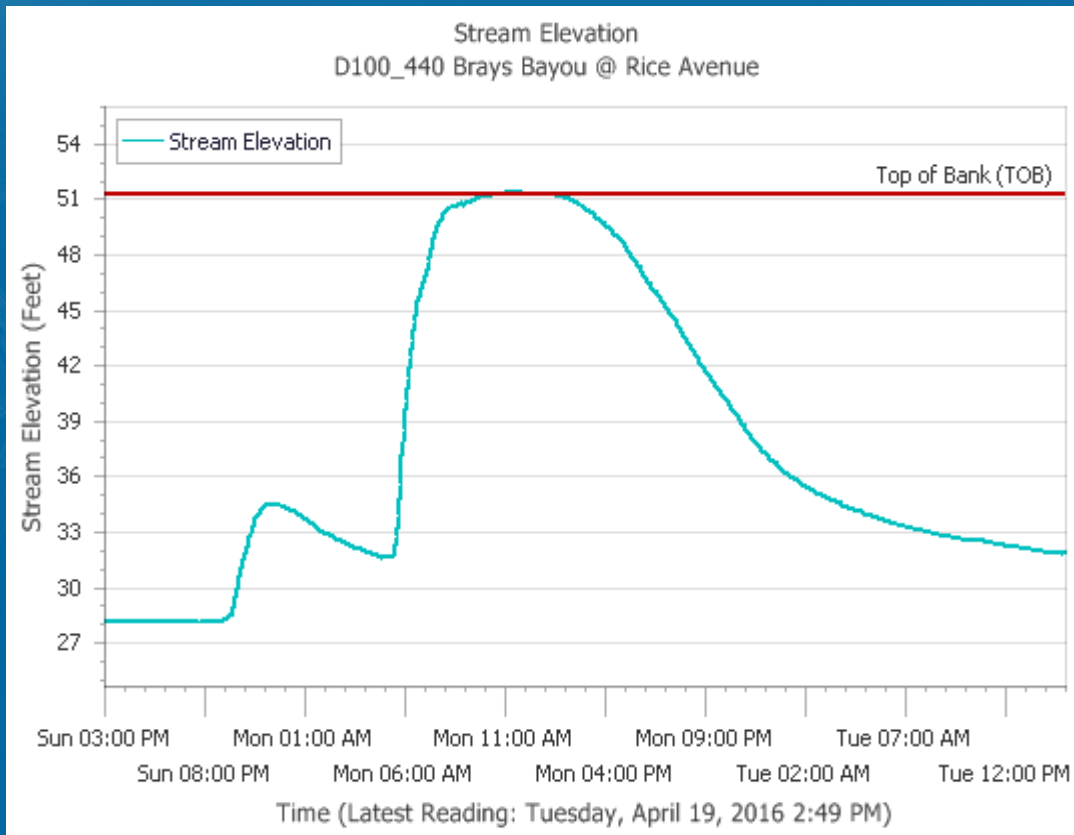
Cane Island/Upper Buffalo Bayou



Event Date	HWM
4-28-09	134.3
4-18-16	137.9

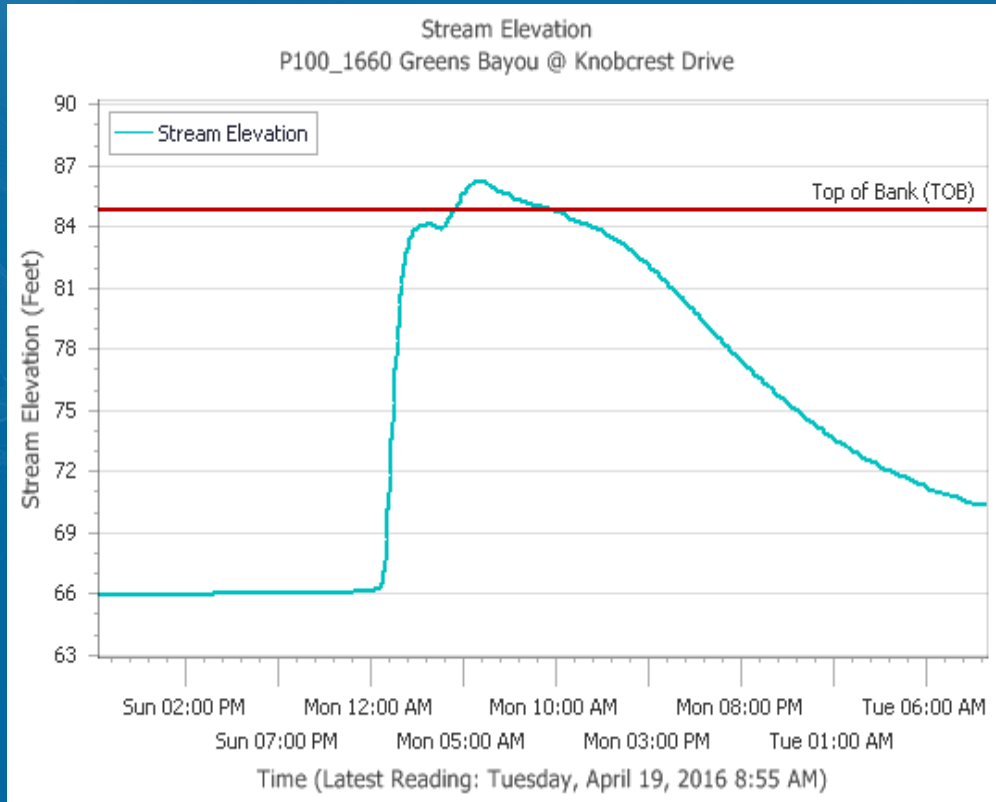


Brays Bayou



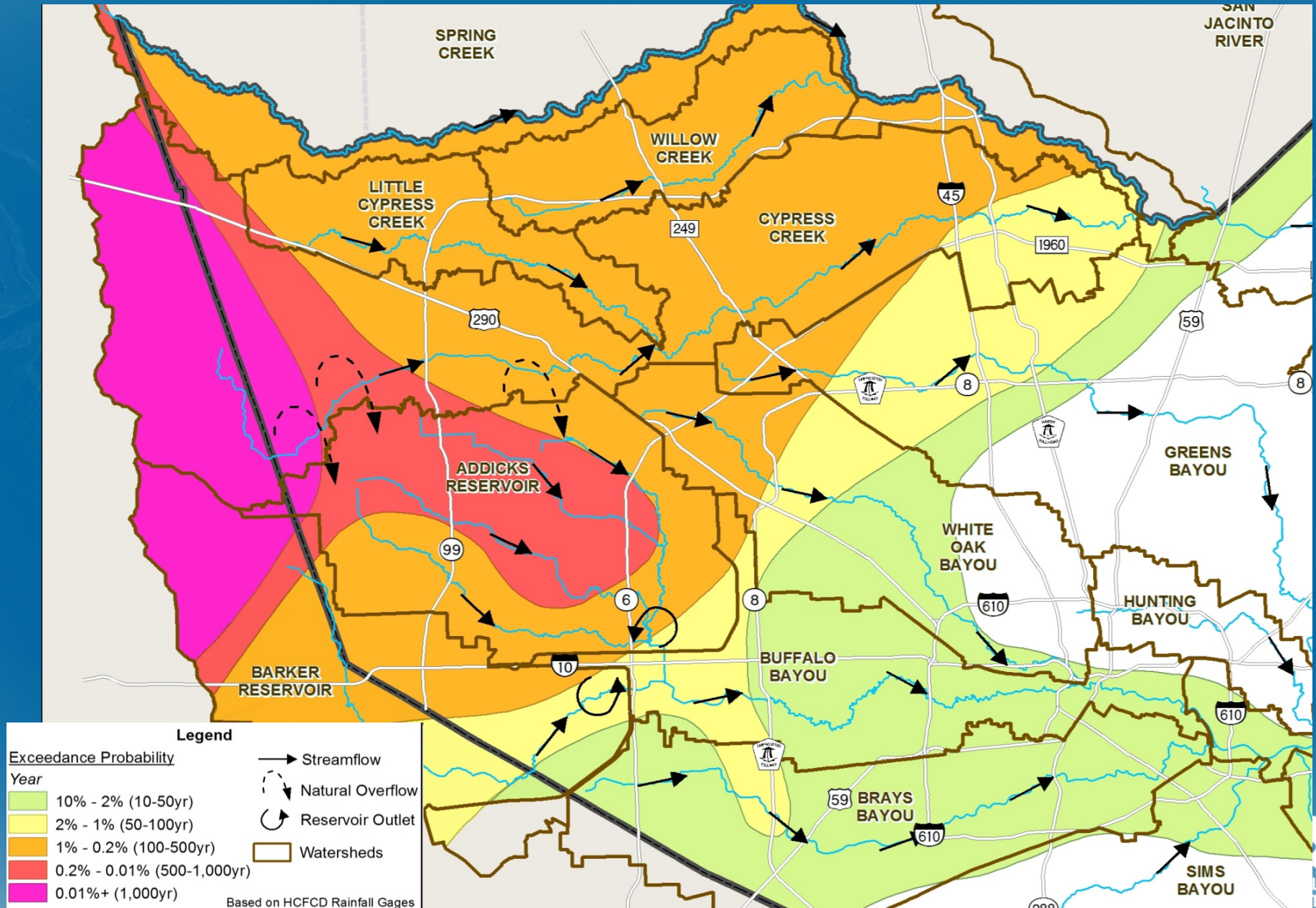
Event Date	HWM
9-19-83	52.5
10-18-94	51.4
Allison (01)	50.4
11-17-03	51.0
5-26-15	52.9
4-18-16	51.7

Greens Bayou



Event Date	HWM
Allison (01)	86.7
Oct 2002	86.6
Ike (08)	82.8
4/18/16	84.9

Natural Cypress Creek Overflow

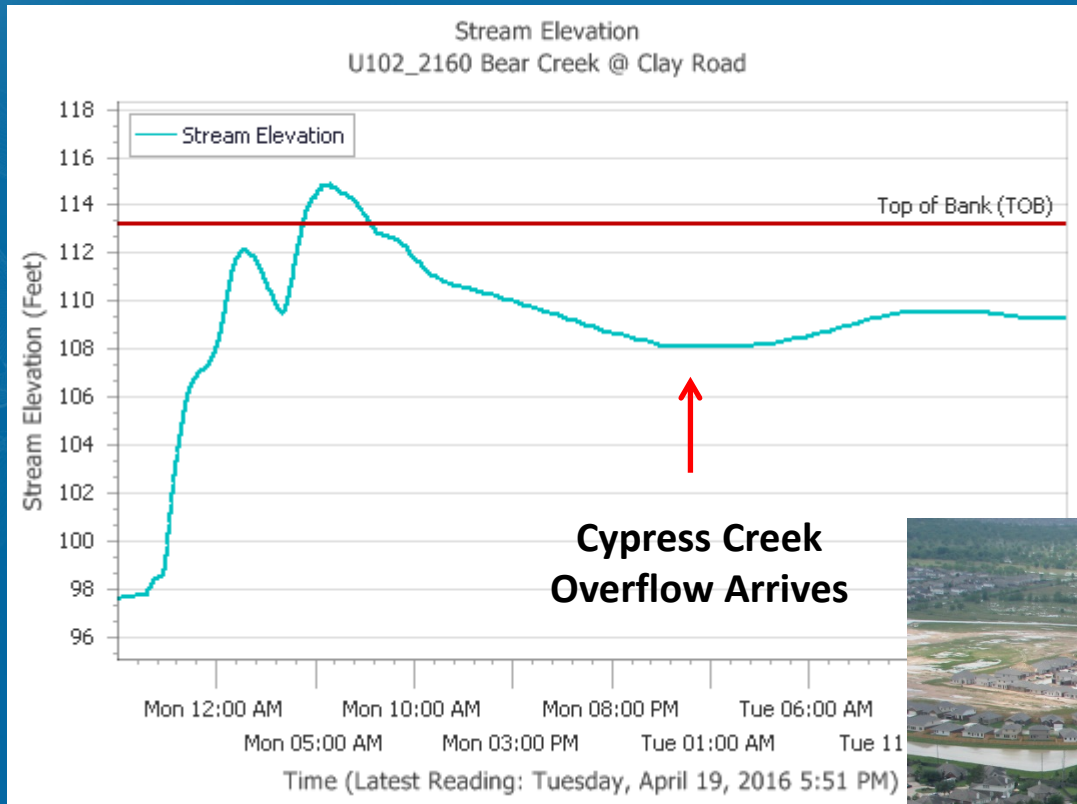


Cypress Creek Overflow

Location	April 2016	April 2009	Oct 1998	Oct 1994
Katy Hockley Cut-off @ U102	160.8	158.7	158.6	159.1
Katy Hockley at Sharp Rd	166.8	166.7	157.9	N/A
U102-14 @ Katy Hockley	166.9	159.0	N/A	160.7



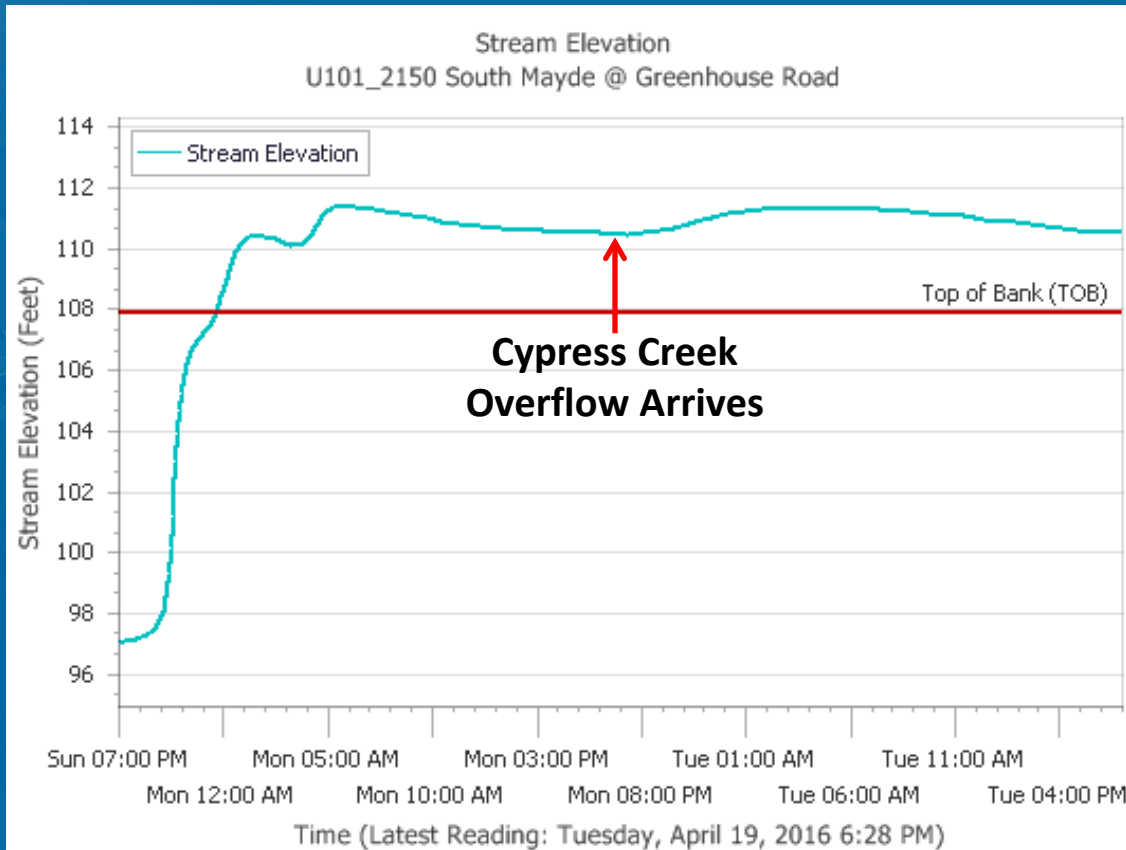
Bear Creek at Clay Rd



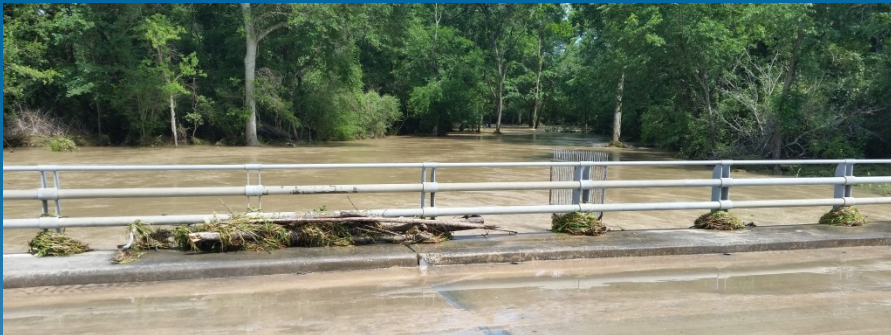
Event Date	HWM
Ike (08)	111.3
4-29-09	114.4
7-12-12	108.7
4-18-16	114.9



South Mayde Creek at Greenhouse Rd.



Event Date	HWM
10/19/98	109.2
Ike (08)	110.4
4/28/09	111.5
7/12/12	108.5
4/18/16	111.4



Addicks/Barker Reservoir Flood Warning

FLOOD WARNING

NATIONAL WEATHER SERVICE HOUSTON/GALVESTON TX

610 PM CDT WED APR 20 2016

*** FLOOD WARNING FOR...**

WEST CENTRAL HARRIS COUNTY.... NORTHERN FORT BEND COUNTY

*** UNTIL 615 PM CDT SATURDAY**

AN AREAL FLOOD WARNING IS IN EFFECT THROUGH SATURDAY AFTERNOON APR 23RD FOR AREAS SURROUNDING ADDICKS AND BARKER RESERVOIRS AND NEIGHBORHOODS ADJACENT TO THE RESERVOIR.

FLOODING WILL LIKELY HAMPER TRAFFIC AROUND THE RESERVOIRS. SEVERAL ROADWAYS ARE CLOSED INCLUDING PARTS OF HIGHWAY 6, CLAY RD, ELDRIDGE PARKWAY AND WESTHEIMER PARKWAY.

FLOOD WATERS COULD ALSO IMPACT STREETS IN SECTIONS OF BEAR CREEK VILLAGE, AND LAKEFOREST OF KELLIWOOD, AND CINCO RANCH WHICH BORDER THE RESERVOIR.

Addicks Reservoir



Top 5 Pool Elev.

Date	Elevation
Apr 2016	102.65
Mar 1992	97.64
Apr 2009	97.08
Nov 2002	96.63
Nov 1998	95.88



Barker Reservoir



Top 5 Pool Elev.

Date	Elevation
Apr 2016	95.22
Mar 1992	93.60
Nov 2002	93.24
Nov 1998	92.31
Jul 2007	91.85



Structure Flooding Estimates

Watershed	Structure Count		Watershed	Structure Count
White Oak Bayou	2,080		Willow Creek	240
Cypress Creek	1,680		S Mayde Creek	220
Brays Bayou	1,380		Bear Creek	130
Buffalo Bayou	950		Cane Island Branch	120
Langham Creek	810		Barker Reservoir	90
Greens Bayou	600		San Jacinto Bayou	90
Horsepen Creek	510		Sims Bayou	50
Little Cypress	430		Spring Creek	40
Halls Bayou	370		Other	50
			TOTAL	9,840*

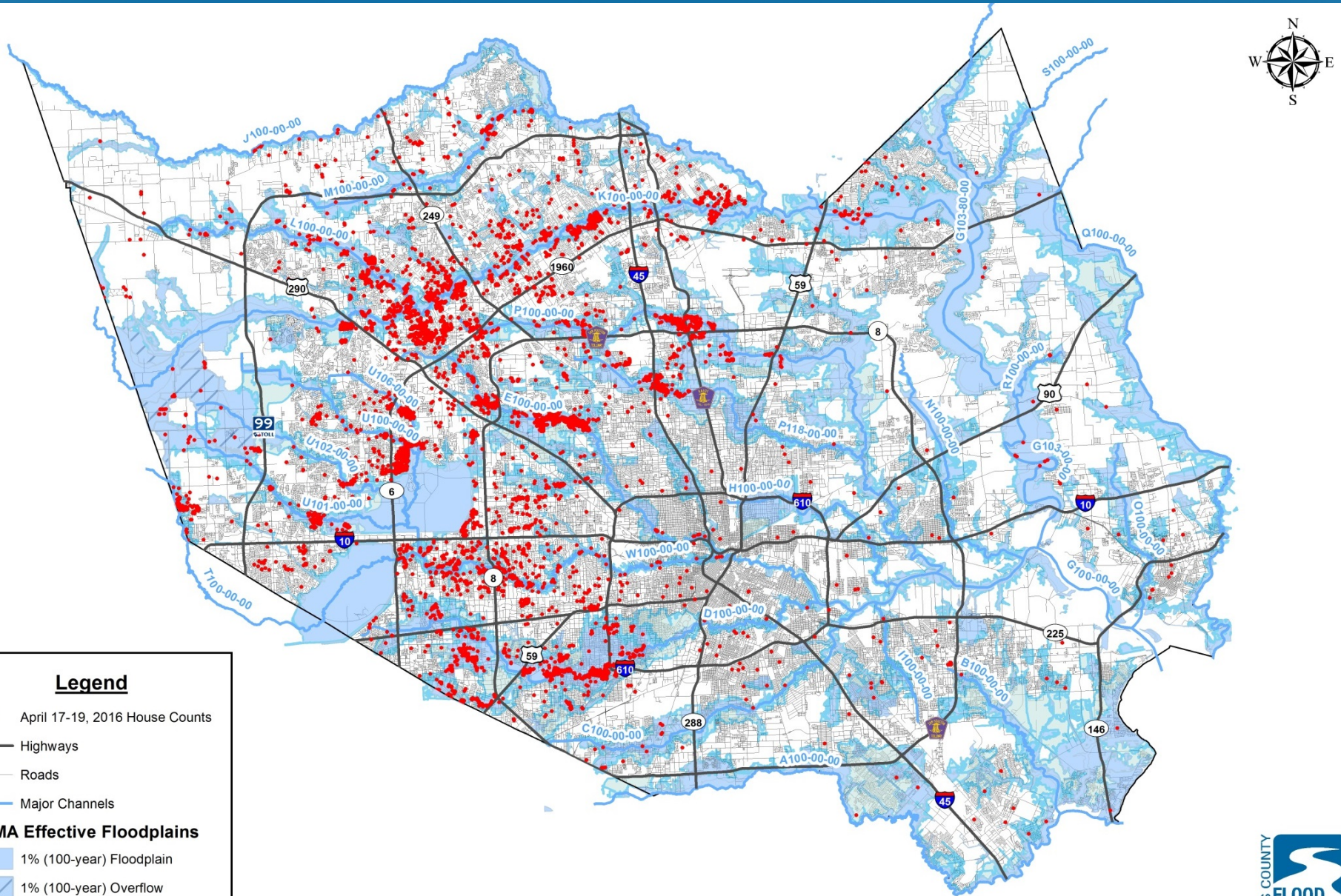
****FEMA flood insurance claims account for 4,030***

Harris County: Addtional 2700 apartment units + 50 commercial properties

Waller County: 430 homes + 27 commercial properties

Montgomery County: 55 homes along Spring Creek

Preliminary House Flooding Areas



DRAFT

Flood Facts

Due to extremely intense rainfall rates,
40,000 + cars/trucks flooded
Significant overland flooding

Nine fatalities related to the flooding
(No one died in their home or work place)

Federal disaster declaration April 25 for
individuals; public assistance added June 3

As of 5-19-16, 17,000 people signed up
requesting Individual Assistance.

Questions

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