

MEMORANDUM



9900 Northwest Freeway
Houston, TX 77092
713-684-4000

DATE: June 27, 2016

TO: HCFCF Flood Watch/Partners

FROM: Jeff Lindner
Meteorologist / Flood Watch Manager

Steve Fitzgerald
Flood Watch Leader

RE: Immediate Report – Final
April 17-18, 2016 (Tax Day) Storm and Flood Information

This is the third update and final report summarizing the historic and devastating flooding from rainfall that occurred across Harris County late on the evening of the 17th into the 18th of April 2016.

GENERAL EVENT STATEMENT

A slow moving and powerful upper level storm system over the southwest US combined with near record moisture levels for mid-April produced a devastating flood event over the northern and western portions of Harris County from the evening hours of April 17th into the day of April 18th. Rainfall began during the early evening hours in southeast to northwest bands across extreme southwest and western Harris County westward into Fort Bend and Waller Counties. Between 8:00 p.m. and 9:00 p.m. thunderstorms began to greatly intensify and slow their northward movement over Waller County and by late evening had stalled and began to shift eastward into western Harris County. Excessive rainfall spread across northwest Harris County during the late evening hours of the 17th into the early morning hours of the 18th. Significant cell training and slow movement of the thunderstorms resulted in a large portion of northwest Harris County receiving between 10-15 inches of rainfall during the morning hours of the 18th. Torrential rainfall slowly shifted into central and southwestern Harris County between 3:00 a.m. and 6:00 a.m.

A Flash Flood Emergency was issued at 1:45 a.m. for northwest Harris County and was later expanded to include portions of western and north-central Harris County.

The flooding resulted in seven fatalities in Harris County with an additional one in Waller County and one in Austin County all of which were vehicle related. Approximately 40,000 cars and trucks flooded with the majority at homes and apartments. Several public school districts in north and west Harris County were closed all week.

APRIL 17-18 RAINFALL

Duration – The heaviest rainfall occurred in northwest Harris County along and northwest of a line from The Woodlands to Jersey Village to Katy. The majority of the rainfall occurred in a 12-hr period and averaged 12.0-16.0 inches from Tomball to Addicks westward to Waller County.

Short duration rainfall rates from less than 1-hr to 3-hr were extreme over this area including a 2-hr total of 7.3 inches in Addicks. Rainfall averaged 10.0-12.0 inches over the headwaters and upper portions of Greens and White Oak Bayous for the 6-hr and 12-hr time period. Rainfall over upper Brays Bayou averaged 7.5-9.5 inches in 12-hr and 6.0-6.5 inches in 2-hr. Along middle and upper Buffalo Bayou west of the 610 Loop rainfall averaged 6.5-7.0 inches in 6-hr and 7.0-7.5 inches in 12-hr.

The maximum rainfall amounts measured in Harris County for various durations are shown below.

Duration	Max Rainfall (in)	Duration	Max Rainfall (in)
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

Total Amounts – Total rainfall amounts averaged 12.0-16.0 inches over northwest Harris County from Katy to Addicks to Waller and over 10.0 inches west of a line from Spring to Greenspoint to Stafford. Rainfall totals east of US 59 averaged generally less than 4.0-6.0 inches.

An average of 7.75 inches of rainfall occurred across Harris County equating to over 240 billion gallons of water compared to an average of 5.3 inches and 162 billion gallons of water from the Memorial Day flood of 2015. Eighty (80) billion more gallons of water fell across Harris County with the April 2016 event compared to Memorial Day 2015.

Additional rainfall data was obtained from residents in Waller County both within and outside the upper Cypress Creek watershed who collected rainfall with personal weather stations. The following totals were reported:

- Monaville: 19.30 inches in 10 hours
- Waller: 20.0 inches (duration unknown; upper Cypress Creek)
- Waller: 18.76 inches (duration unknown; upper Cypress Creek)
- Pattison: 21.93 inches in 24 hours
- Pattison: 23.50 inches in 14.5 hours

Rainfall Exceedance Probability (12-hr time period) - Rainfall exceedance probability is a function of both the rainfall intensity and the duration, and the relationship for Harris County includes three different regions. The “percentage” number (e.g. 1% or 0.2%) refers to the chance that event will be equaled or exceeded in any given year. The last page of the attached Rainfall Intensity Report table shows the intensity-duration-frequency information for the three regions. Values below are summarized for the maximum rainfall during a 12-hr period. Intensity-duration-frequency information for specific gages is found in the attached Rainfall Intensity Report table. Also attached are the following: isohyetal map that shows the rainfall distribution in Harris County and part of Waller County for the maximum 12-hour duration, rainfall frequency map that shows the rainfall exceedance probability across Harris County and parts of Waller and Ft. Bend counties for the same maximum 12-hour duration, and three separate rainfall-duration-frequency plots from select HCFCF gages in different watersheds.

- **Cypress Creek:** above the 0.2% (500-yr) in the headwaters; at or above 1% (100-yr) entire channel
- **Little Cypress Creek:** above the .2% (500-yr) along entire channel
- **Langham Creek:** above the 0.2% (500-yr) along the entire channel
- **Horsepen Creek:** above the 0.2% (500-yr) along the entire channel
- **Bear Creek:** above the 1% (100-yr) along the entire channel
- **South Mayde Creek:** above the 1% (100-yr) along the entire channel
- **Mason Creek:** above the 1% (100-yr) along the entire channel
- **Cane Island:** above the 1% (100-yr) along the entire channel
- **Spring Creek:** between the 2% (50-yr) and 1% (100-yr) along the entire channel
- **Willow Creek:** at or above the 1% (100-yr) along the entire channel
- **Greens Bayou:** above the 1% (100-yr) west of I-45; between the 50% (2-yr) and 10% (10-yr) east of I-45
- **Halls Bayou:** between the 20% (5-yr) and 4% (25-yr) west of Airline; less than the 50% (2-yr) east of Airline
- **White Oak Bayou:** above the 1% (100-yr) west of Beltway 8; between the 20% (5-yr) and 4% (25-yr) east of Beltway 8
- **Brays Bayou:** 4% (25-yr) to 2% (50-yr) west of Gessner; less than 10% (10-yr) east of Gessner
- **Keegans Bayou:** 4% (25-yr) along the entire channel
- **Buffalo Bayou:** 4% (25-yr) west of Beltway 8; 10% (10-yr) east of Beltway 8
- **West Fork of San Jacinto River:** 10% (10-yr) along the entire channel

Rainfall totals over the headwaters of Cypress Creek in Waller County and extreme western Harris County far exceeded the 0.2% (500-yr) rainfall frequency for the 6-hr and 12-hr time periods. These rainfall amounts were simply “off the charts” and there is a good deal of extrapolation in attempting to place a return frequency on such large rainfall in such a short period of time. The following table provides the best estimates to quantify the incredible rainfall amounts.

Location	Rainfall	Duration	Extrapolated Return Frequency
Pattison (Waller County)	23.50 in	14.5-hr	~ 10,000 yr (0.01%)
Pattison (Waller County)	21.93 in	24-hr	~ 2,000 yr (0.05%)
Monaville (Waller County)	19.30 in	10-hr	~ 2,500 yr (0.04%)
Mound Creek at Mathis	16.70 in	12-hr	~ 1,000 yr (0.1%)
Langham Creek at W Little York	16.60 in	12-hr	~ 900-yr (0.11%)
Cypress Creek at Sharp Rd	16.10 in	12-hr	~ 900-yr (0.11%)
Langham Creek at Longenbaugh	15.70 in	12-hr	~ 700-yr (0.14%)
Cypress Creek at Katy Hockley	15.10 in	12-hr	~ 600-yr (0.17%)

For comparison, the maximum rainfall recorded during Tropical Storm (TS) Allison was 28.5 inches in 12-hrs on Greens Bayou and the maximum rainfall recorded during the 2016 Tax Day event was 16.70 inches or 60% of the TS Allison maximum recorded rainfall. Another way to examine the rainfall is to compare against the Probable Maximum Precipitation (PMP), or the theoretical maximum amount of rainfall that can fall in a specified time period, for this region. The PMP for this region for 12-hr: 38.7 inches and 24-hr: 47.1 inches. The 16.70 inches recorded in 12-hrs for this event was 43% of the 12-hr PMP. The 23.50 inches in just over 12-

hrs in Waller County is 61% of the 12-hr PMP whereas the maximum 12-hr during TS Allison was 74% of the PMP.

RAINFALL COMPARISON TO OCTOBER 1994/1998 and APRIL 2009 FLOODS

Note: The records for many stream and rainfall gages are relatively recent, covering only the past 30 years. When a statement is made regarding a “record” rainfall or flood level, it is in reference to the period of record only – other more extreme events may exist.

Until April 17-18, 2016, the storms of record for much of the Cypress and Little Cypress Creek watersheds was the October 1994 and October 1998 events, while for Addicks it was the April 2009 event. The 2016 Tax Day event exceeded all the previous rainfall events for this portion of the county by several inches. For example the 16.7 inches in 12 hours at Mound Creek and Mathis Rd surpassed the October 1994 rainfall by 7.4 inches. The April 17-18 event is by far one of the most significant rainfall events over the northwest and western portion of Harris County in modern times.

The following rainfall comparison is for the maximum amount during a 12-hr time period in inches.

Location	April 2016	April 2009	October 1998	October 1994
Mound Creek at Mathis	16.7	3.1	8.6	9.3
Langham Creek at W Little York	16.6	7.5	3.2	3.4
Cypress Creek at Katy Hockley	15.1	7.0	7.9	3.0
Spring Creek at Hegar	10.8	3.2	3.9	N/A
Willow Creek at SH 249	12.2	N/A	7.6	3.8
Bear Creek at FM 529	14.4	10.4	4.3	N/A
South Mayde Creek at Greenhouse	12.4	7.6	3.1	2.5

CHANNEL FLOODING

Note: Channel (or “riverine”) flood frequency is often different than the rainfall frequency determination due to variations in the rainfall pattern, areal extent of the rainfall, antecedent moisture levels and other variables. The records for many high water marks are relatively recent, covering the past 40 years. When a statement is made regarding a “record” flood level, it is in reference to the period of record only – other more extreme events may have occurred. Also, as flood damage reduction projects are constructed, the channel system response is improved and comparisons to flood levels pre- and post-project are affected. In a few cases noted below, the official FEMA Flood Insurance Study and Flood Insurance Rate Maps information does not yet reflect the benefits of recently completed projects. The “percentage” number (e.g. 1% or 0.2%) refers to the chance that that event will be equaled or exceeded in any given year.

Major overbank and structural flooding occurred along the following channels (the attached map shows the general reaches of primary channels affected):

- Cypress Creek and major tributaries
- Little Cypress Creek
- Willow Creek

- Spring Creek
- Addicks Reservoir (Bear Creek, South Mayde Creek, Langham Creek, Horsepen Creek)
- Barker Reservoir (Upper Buffalo Bayou/Cane Island Branch)
- Greens Bayou (upstream of US 59)
- Halls Bayou
- White Oak Bayou (upstream of 610 N Loop)
- Brays Bayou (US 59 to 610 W Loop)
- Keegans Bayou
- Willow Waterhole
- San Jacinto River (West Fork, East Fork, Mainstem)

The following selected locations recorded new record flood levels based on historical high water marks compared to best available data from the April 2016 flood. All elevations are in feet and reflect 1988 NAVD, 2001 subsidence adjustment.

Flood frequencies referenced in the table and discussions below refer to current effective FEMA Flood Insurance Study and Flood Insurance Rate Maps, unless otherwise noted.

Watershed	Bridge	April 2016 Elevation	Flood Frequency	Previous Record	Previous Record Date
Cypress Creek	Huffmeister	132.90	~0.2%(500-yr)	131.63	Oct. 1998
Cypress Creek	Eldridge	128.71	~0.2%(500-yr)	126.10	Oct. 1994
Cypress Creek	Grant	127.40	~0.2%(500-yr)	125.40	Oct. 1994
Cypress Creek	SH 249	120.51	~1%(100-yr)	120.50	June 2001
Cypress Creek	Stuebner-Airline	110.30	~1%(100-yr)	109.70	June 2001
Cypress Creek	Kuykendahl	101.35	~2%(50-yr)	101.30	May 1989
Lt. Cypress Creek	Becker	197.80	~1%(100-yr)	197.20	July 2012
Lt. Cypress Creek	Cypress Rosehill	162.10	~0.2%(500-yr)	160.40	July 2012
Lt. Cypress Creek	Kluge	136.40	~0.2%(500-yr)	136.30	Oct. 1994
Langham Creek	W. Little York	112.84	~0.2%(500-yr)	110.70	April 2009
Bear Creek	Clay	114.86	~0.2%(500-yr)	114.40	April 2009
Horsepen Creek	Trailside	118.90	~1%(100-yr)	112.80	Oct. 2009
Cane Island	Hwy 90	137.88	~1%(100-yr)	134.30	April 2009
Mason Creek	Prince Creek	106.30	~1%(100-yr)	106.10	April 2009

A county-wide channel flood frequency map is attached.

Cypress Creek

Water levels along Cypress Creek were at or above the 1% (100-yr) elevation from Kuykendahl upstream to near Katy Hockley Rd. Water levels between Grant Rd and Barker Cypress exceeded the previous flood of record in October 1994 by 1.0-2.0 ft. East of I-45 water levels averaged between the 10% (10-yr) and 2% (50-yr) elevations and compared closest with the May 1989 flood. On the middle and lower portion of Cypress Creek, TS Allison water levels were generally met or exceeded at most locations. In the reach from US 290 downstream to Kuykendahl Rd, the April 2016 flood was one of the most significant flood events since records

have been kept. Record levels occurred at the 14 bridges between I-45 and US 290 and only 3 were passable for several days. Natural overflow occurred from upper Cypress Creek to the Addicks and Barker reservoirs watersheds and is discussed later.

Little Cypress Creek

Record flooding occurred along nearly the entire length of the watershed with water levels at or above the 0.2% (500-yr) elevation at most bridges. Previous high water records established in October 1994, October 1998, and July 2012 were exceeded at all locations east of Bauer-Hockley Rd. At Cypress Rosehill Rd, the previous record of 160.4 ft in July 2012 was exceeded by 1.7 ft. Water levels on the headwaters (L120-00-00) were generally equal to or lower than the October 1994 and October 1998 floods.

Willow Creek

Water levels averaged between the 2% (50-yr) and 1% (100-yr) from the confluence of Spring Creek west to SH 249 and between the 10% (10-yr) and 2% (50-yr) west of SH 249. Water levels were similar to Hurricane Ike (2008) and higher than October 1994, October 1998, and TS Allison.

Spring Creek

Water levels averaged between the 2% (50-yr) and 1% (100-yr) from the confluence with the West Fork of the San Jacinto River west to SH 249. West of SH 249 water levels were between the 1% (100-yr) and .2% (500-yr) and along the headwaters exceeded the 500-yr. Water levels exceeded the October 1998 flood, but were lower than the October 1994 flood. This was the most significant flood along Spring Creek since October 1994.

Langham Creek

Water levels along Langham Creek were at or above record levels from Addicks Reservoir upstream to Barker Cypress Rd and averaged between the 1% (100-yr) and .2% (500-yr). From upstream of Barker Cypress to Longenbaugh water levels averaged between the 10% (10-yr) and 2% (50-yr). Water levels were generally near or above the previous flood of record in April 2009 along the entire channel.

Horsepen Creek

Water levels along Horsepen Creek averaged between the 1% (100-yr) and .2% (500-yr) from the confluence with Langham Creek upstream to near Hwy 6. Water levels upstream of Hwy 6 averaged between the 2% (50-yr) and 1% (100-yr). The period of record for high water marks along Horsepen Creek only dates back to October 2009, but significant flooding did occur in April 2009 along portions of this channel.

South Mayde Creek

Water levels along South Mayde Creek averaged between the 1% (100-yr) and .2% (500-yr) from Barker Cypress upstream to Greenhouse and between the 10% (10-yr) to 2% (50-yr) from upstream of Greenhouse to Lakes of Bridgewater. West of Lake of Bridgewater the water surface elevation was at or above the 1% (100-yr) elevation. From the headwaters east to Fry Rd water levels were at or above previous records and higher than both the April 2009 and October 1998 floods. East of Fry Rd to Addicks Reservoir water levels were similar to the April 2009 flood.

Bear Creek

Water levels along Bear Creek averaged between a 1% (100-yr) and .2% (500-yr) elevation along the entire channel. The water surface was at or above previous records from Fry Rd eastward to Clay Rd and was generally 1.0-2.0 ft higher than the April 2009 flood. Water levels across the headwaters and upper portion of Bear Creek were some of the highest ever

observed which matches well with the widespread and record amounts of overflow which occurred from the upper portions of Cypress Creek.

Cane Island Branch

Significant and record flooding occurred along the entire channel from Waller County into extreme western Harris County and the City of Katy. Water levels were at or above the 1% (100-yr) level along the entire watershed north of I-10. At Franz Rd the April 2016 flood was over 2.0 ft higher than the previous record set in October 1994.

Mason Creek

Water levels were between the 2% (50-yr) and 1% (100-yr) along the entire channel and compared very close to the April 2009 flood. At locations north of I-10 water levels exceeded the April 2009 flood establishing new records.

Brays Bayou

Water levels east of SH 288 were below the 10% (10-yr) and between the 10% (10-yr) and 2% (50-yr) west of SH 288 to east of Gessner. West of Gessner to the headwaters water levels were below the 10% (10-yr). In the reach of the channel from east of US 59 to near the 610 West Loop water levels averaged generally 1.0 ft below the Memorial Day 2015 flood and match closely with the October 1994 flood.

Note: Flood frequencies referenced for Brays Bayou refer to an interpolation based on judgment between the current FEMA effective flood levels and approximate future flood levels when the Federal project is fully complete Conditional Letter of Map Revision (CLOMR). This interpolation is necessary to reflect the benefits of recently completed flood damage reduction projects (Project Brays) that are not yet included in the FEMA Flood Insurance Study and Flood Insurance Rate Maps.

Keegans Bayou

Water levels along the entire channel east of Dairy Ashford Rd were between the 2% (50-yr) and 1% (100-yr) elevations. Water levels were generally 1.0-2.0 ft lower than the record flooding on Memorial Day 2015 and were similar to the November 2003 flood.

White Oak Bayou

Water levels from the confluence of Buffalo Bayou west to W 11th St. averaged between the 10% (10-yr) and 2% (50-yr) and below the 10% (10-yr) from west of W 11th St. to W. Little York. Upstream of W. Little York to Fairbanks North Houston Rd the water elevations averaged between the 10% (10-yr) and 2% (50-yr). From Fairbanks North Houston Rd to West Rd, including the Jersey Village area, the water elevations averaged between the 2% (50-yr) and 1% (100-yr). Water levels from the headwaters to Jersey Village were the highest ever recorded surpassing those of TS Allison. From Jersey Village eastward to downtown Houston, water levels were similar or slightly lower than TS Frances (1998).

Note: Flood frequencies referenced for White Oak Bayou refer to draft computer models that include flood damage reduction projects that have been completed. This adjustment is necessary to reflect the benefits of recently completed flood damage reduction projects that are not yet included in the FEMA Flood Insurance Study and Flood Insurance Rate Maps.

Greens Bayou

Water levels averaged below the 10% (10-yr) from the Houston Ship Channel to FM 525 and between the 10% (10-yr) and 2% (50-yr) west of FM 525 to SH 249 including the Greenspoint area. Water levels were similar to previous floods in October 2002 and November 2003, but lower than TS Allison levels.

Buffalo Bayou

Water levels averaged between the 10% (10-yr) and 2% (50-yr) from Downtown Houston west to the 610 Loop and between the 2% (50-yr) and 1% (100-yr) west of the 610 Loop. Water levels east of San Felipe were generally lower than both Memorial Day 2015 and TS Allison and west of San Felipe were similar to the April 2009 and March 1992 floods.

San Jacinto River Basin

Water levels on the West Fork of the San Jacinto River averaged between the 10% (10-yr) and 2% (50-yr) elevations and were similar or slightly higher than the October 1998 and November 1998 floods. Water levels along the East Fork of the San Jacinto River averaged between the 10% (10-yr) and 2% (50-yr) elevations and were similar to the October 1998 flood, but over 3.0 ft lower than levels recorded in March of 2016. Elevations below Lake Houston averaged below the 10% (10-yr) and were similar to the October 1998 flood.

A peak flow of 72,100 cfs passed through the West Fork of the San Jacinto River at US 59. 47,400 cfs or 66% of this flow was from Spring and Cypress Creeks alone. The maximum peak release from Lake Conroe of 6,978 cfs was only 9.6% of the total flow down the West Fork of the San Jacinto River. Flooding along the West Fork of the San Jacinto River was not a result of Lake Conroe releases, but instead large inflows from Spring and Cypress Creeks and other watersheds below Lake Conroe. In fact, even though the peak inflow into Lake Conroe was 30,000 cfs, the maximum outflow from the dam was only 6,978 cfs indicating the lake held back a significant amount of water that would have otherwise moved downstream and worsened the flooding along the West Fork of the San Jacinto River.

Cypress Creek Overflow

Naturally occurring watershed overflow can occur from Cypress Creek upstream of US 290 to the Addicks and Barker reservoir watersheds. Overflows generally begin at Cypress Creek flood levels approaching the 20% (5-yr) to 10% (10-yr) event). The incredible rainfall amounts across much of Waller County into western Harris County resulted in widespread and massive overland flows across a large part of western Harris County extending from near US 290 and Cypress Creek westward well into a large portion of Waller County. Large amounts of water flowed southeastward across the Cypress Creek basin divide into Bear, South Mayde, Langham, and Horsepen Creeks. At some locations along Sharp Rd and Katy Hockley Rd water was at least 3 feet deep flowing across the land. This large overflow event started early Monday morning around Sharp Rd and downstream during the day Tuesday just west of US 290 and Barker Cypress. This flow continued into Wednesday before ending on Friday as water levels in Cypress Creek receded enough to stop the flow of water out of the Cypress basin into the Addicks Reservoir and Barker Reservoir watersheds. High water marks obtained across the overflow zone indicate the April 2016 event is the highest known overflow surpassing previous significant floods in October 1994, October 1998, and April 2009. The table below compares the 2016 high water marks with previous significant events.

Location	April 2016	April 2009	October 1998	October 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

ADDICKS AND BARKER RESERVOIRS

Historic rainfall across the Addicks and Barker Reservoir watersheds, combined with the naturally occurring Cypress Creek overflow, resulted in tremendous inflows into the reservoirs. Peak inflows into Addicks Reservoir between 5:30 a.m. and 6:00 a.m. on the 18th were on the order of 49,150 cfs. In comparison, the peak inflows into Addicks Reservoir in April 2009 were on the order of 40,900 cfs or 8,250 cfs lower than April 2016. The peak inflow into Barker Reservoir of 5,360 cfs occurred around 10:00 a.m. on the 18th and surpassed the April 2009 peak inflow of 2,910 cfs by 2,450 cfs at the USGS station on Upper Buffalo Bayou. Three of the creeks feeding inflow into Addicks Reservoir appear to have set new inflow records. House flooding occurred on all the tributaries adjacent to the reservoir due to these high flows and overwhelmed internal drainage systems prior to the reservoir levels rising.

The following table summarizes the inflows into Addicks and Barker Reservoirs for the April 2009 and April 2016 events in cfs.

Location	April 2016	April 2009	Record Flow (year)
Bear Creek at Clay Rd	25,500	24,110	25,500 (2016)
Langham Creek at W Lt York	19,100	12,800	19,100 (2016)
South Mayde Creek at Groeschke	4,550	~ 4,000	4,550 (2016)
Upper Buffalo Bayou (Barker)	5,360	2,910	11,200 (1945)

Note: Flows are not available from Horsepen Creek (Addicks) or Mason Creek (Barker)

The Corps of Engineers operates the stormwater detention reservoirs to maximize downstream flood protection on Buffalo Bayou. When rain is forecast, the gates are closed. Reservoir releases begin when flood flows at the Piney Point Road USGS gage are less than 2,000 cfs and additional rain is not forecasted. Under normal operations, reservoir gate releases are controlled to achieve a total discharge of 2,000 cfs at the Piney Point gage. The Tax Day flood event produced a peak flow at Piney Point of about 7,190 cfs.

Because of the severity of the rainfall in the upstream watersheds, overflow from Cypress Creek, forecasted reservoir water levels, the Corps made the decision to increase the combined releases to 4,000 cfs at the Piney Point gage to reduce the pressure on the dams, protect downstream property owners, and more quickly restore the flood holding capacity of the reservoirs. This is the highest release rate the Corps has decided to use since the outlets were gated. After water levels dropped several feet, they returned to the 3,000 cfs limit. Due to subsequent rainfall events that added water to the reservoirs, combined with having to close the gates when rain was forecasted, the reservoirs are still not empty.

Addicks Reservoir

Addicks Reservoir reached a peak pool elevation of 102.65 ft at 6:30 a.m. on April 23, 2016 impounding 122,900 acre-ft of water. The previous record pool elevation of 97.46 ft was surpassed by 5.19 ft. At its peak pool elevation, the stormwater storage occupied 93% of the government owned land and 60% of the total reservoir capacity. Hwy 6 went under water on April 18th around 11:45 a.m. and was impassible for four weeks (and an additional four days in early June). Addicks surpassed its previous historical pool level of 97.46 ft from March 1992 at 5:30 p.m. on April 18th and surpassed the 100-yr pool level of 101.16 ft by 1.49 ft. The historical pool levels in Addicks Reservoir resulted in the flooding of some streets in one subdivision adjacent to the reservoir lands as well as the complete closure of Hwy 6, N. Eldridge Pkwy, and Clay Rd.

Barker Reservoir

Barker Reservoir reached a peak pool elevation of 95.22 ft at 7:15 a.m. on April 23, 2016 impounding 86,080 acre-ft of water. The previous record pool elevation of 93.60 ft was surpassed by 1.62 ft. At its peak Barker Reservoir occupied 102.5% of its government owned land and 40.5% of its total storage capacity. Westheimer Pkwy went under water around 8:00 p.m. on April 19. Barker Reservoir surpassed its historical pool level of 93.60 ft at 4:15 a.m. on April 20th and peaked just under its 100-yr pool elevation of 95.50 ft by .28 of a foot. Water levels were close to the top of some storm sewer inlets in a few adjacent subdivisions, but there were no flooded streets.

The Corps of Engineers estimate that \$5,100,000,000 dollars of flood damages were prevented along Buffalo Bayou as a result of Addicks and Barker Reservoirs during the Tax Day Flood of 2016. In the last two years, Addicks and Barker Reservoirs have prevented around \$7,659,078,000 dollars in damages along the Buffalo Bayou corridor and within the city of Houston.

HOUSE FLOODING ESTIMATES

House flooding occurred at many locations across north and western unincorporated Harris County as well as the City of Houston and several other cities from both creeks and bayous and overwhelmed internal drainage systems from the intense rainfall rates.

Based on preliminary damage assessment a total of 9,840 homes were flooded. An additional 2,700 apartment units and around 50 commercial properties were flooded. These numbers are based on damage assessment reports, FEMA flood insurance claims, HCFCD phone bank calls, and self-reports via readyharris.org, with duplicates being removed. Additionally, 430 homes and 27 commercial properties were flooded in Waller County, some of which fall in the upper portions of the Cypress Creek, Addicks, and Barker watersheds. The Waller County numbers are not listed in the counts by watershed below. Thanks are extended to the various damage assessment teams across Harris County for their hard work locating and completing assessment of the thousands of flooded structures.

Watershed	House Flooding	Watershed	House Flooding
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	120
Langham Creek	810	Barker Reservoir	90
Greens Bayou	600	San Jacinto River	90
Horsepen Creek	510	Sims Bayou	50
Little Cypress Creek	430	Spring Creek	40
Halls Bayou	370	Other Watersheds	50

Total ***9,840***

Jurisdiction	House Flooding Estimates
Unincorporated Harris County	5,690
Houston	3,490
Jersey Village	190
Tomball	180
Katy	120
Bellaire	50
Other Jurisdictions	120

Total 9,840

FEMA flood insurance claim data accounts for approximately 4,030 homes in the totals listed above. A county-wide map showing the locations of the estimated house flooding locations is attached.

There is no way to know how many other homes may have flooded that did not have flood insurance if the damages were not noticed by the jurisdictions and the owners did not report damage.

Based on historical house flooding information that was gathered by the various jurisdictions and FEMA flood insurance claims as noted in the table below, the Tax Day flooding resulted in the 2nd highest number of flooded homes.

Flood Event	Total House Flooding Estimates	FEMA Flood Insurance Claims
June 2001 (TS Allison)	73,000	Count from FEMA
April 17-18, 2016	9,840	Included
May 25, 2015	6,335	Included
June 19, 2006	3,370	Not included
October 1994	3,248	Not included
April 28, 2009	2,305	Not included

HIGH WATER MARKS

HCFCDD collected high water marks along the following channels: Cypress Creek and tributaries, Little Cypress Creek, Willow Creek, Spring Creek, Bear Creek, Langham Creek, Horsepen Creek, South Mayde Creek, Mason Creek, Upper Buffalo Bayou/Cane Island Branch, Buffalo Bayou, Brays Bayou, Keegans Bayou, Willow Waterhole, Greens Bayou, Halls Bayou, White Oak Bayou and tributaries, and the San Jacinto River.

High water marks were also collected at detention basins along the following six watersheds: Brays Bayou, White Oak Bayou, Greens Bayou, Cypress Creek, Little Cypress Creek, and the Addicks Tributaries

A total of 396 marks were obtained including 270 along District channels and tributaries, 26 in the Addicks overflow area, and 100 at detention basins and in subdivisions. High water mark tables for the select watersheds with the highest flood levels are attached. This is the second largest high water mark effort completed by HCFCD only surpassed by Hurricane Ike's 476 marks along channels and across the storm surge inundation area in 2008.

HARRIS COUNTY FLOOD CONTROL DISTRICT ACTIONS

- The HCFCD Flood Watch team was activated from 10:45 p.m. April 17th to 8:00 a.m. May 2nd.
- Clear Creek Second Outlet Gates were opened on April 17th at 11:30 p.m. and closed on April 20th at 4:30 p.m.
- HCFCD conducted approximately 70 media interviews.
- HCFCD phone bank has received about 900 calls and recorded 628 house flooding or post-flood response reports.
- 107 rainfall alarms (1 inch rainfall in 15-min) and 99 water level alarms (3 ft below bankfull) were reported from April 17th to April 20th. 75% of the HCFCD FWS gages experienced excessive rainfall of at or above 1 inch in 15 min during the event.
- 3 HCFCD Flood Warning System gages were inundated by the extreme flows and destroyed during the flooding.
 - Spring Creek at Hegar Rd.
 - Cypress Creek at Sharp Rd
 - West Fork San Jacinto at Kingwood Country Club
 - White Oak Bayou at Jones Rd (water inundated the PT tube)

PROJECTS THAT HELPED REDUCE HOUSE FLOODING

Capital projects and maintenance of the channels throughout the county helped reduce the risk of flooding and ensure the systems operated as designed. Major capital project efforts in the highest rainfall areas are discussed below.

Brays Bayou:

Project Brays (a partnership project with the Corps of Engineers) construction completed to date prevented the flooding of about 1,500 homes and businesses that would have otherwise flooded without the project work. For example, the 8.9 miles of channel conveyance improvements and 10 bridge replacements/modifications downstream of Fannin Street helped lower flood levels and excavation in the Eldridge, Old Westheimer, Arthur Storey Park, and Willow Waterhole regional detention basins temporarily held back 2.1 billion gallons of stormwater that otherwise would have flowed downstream (3.5 billion gallons at 1% design).

White Oak Bayou:

The HCFCD Regional Project and Federal Project (a partnership project with the Corps of Engineers) construction completed to date prevented the flooding of about 1,800 homes and businesses that would have otherwise flooded without the project. For example, the 9.5 miles of channel conveyance improvements (including Championship Park at the mouth) and multiple bridge replacements/modifications helped lower flood levels and excavation of ten regional and federal detention basins temporarily held back 1.3 billion gallons of stormwater that otherwise would have flowed downstream.

Greens Bayou:

The HCFCD Regional Project and Federal Project (a partnership project with the Corps of Engineers) construction completed to date reduced water levels along Greens Bayou. Partial excavation of six regional and one federal detention basin held back a large volume of stormwater that otherwise would have flowed downstream.

Other HCFCD Projects:

Projects in other watersheds that helped reduce flood levels for this event include:

- Vogel Creek Channel Conveyance Improvement from the mouth to Gulf Bank Rd.
- Two regional detention basins built in conjunction with the City of Houston on Halls Bayou, Keith-Wiess Park and the Bretshire Park
- Channel conveyance improvement and regional detention project on HCFCD Unit M125-00-00 and Willow Creek
- Regional detention basins in Mason Creek, Langham Creek, Horsepen Creek, Cypress Creek, and Greens Bayou.

Addicks and Barker Reservoirs:

The U.S. Army Corps of Engineers' Addicks and Barker Reservoirs in western Harris County held back the Tax Day Flood runoff from the upstream watersheds and overflow from Cypress Creek. The reservoirs' storage helped keep the water levels along Buffalo Bayou and downtown from reaching major damaging flood levels.

Home Buyouts

Past voluntary home buyouts throughout the county of homes hopelessly deep in the floodplain were very effective for this storm event. Through a partnership with FEMA, more than 2,000 homes were acquired, the residents moved to higher ground, and the homes demolished. The sites are kept undeveloped and are useful as open space and natural floodplain functions. In addition, the HCFCD has acquired about 1,000 additional homes. In the watersheds listed below, approximately 1,500 homes would have flooded had the HCFCD and FEMA not purchased and removed them.

Watershed	# of Homes
Greens Bayou	505
White Oak Bayou	400
Cypress Creek	220
San Jacinto River	180
Halls Bayou	150
Brays Bayou	35
Other Watersheds	10
Total	1,500

HARRIS COUNTY FLOOD CONTROL DISTRICT FACILITIES CONDITIONS

The HCFCD channels and detention basins functioned as designed and helped to reduce flood levels. Where rainfall amounts were extreme in the county's northern, northwestern, and western areas, the HCFCD channels and basins were overwhelmed especially where rainfall amounts were in the 1% (100-year) and 0.2% (500-yr) or above frequency range.

All channels and detention basins were in good condition prior to the start of the rainfall and flooding, and no major blockages had been reported or were observed. The first HCFCD mowing cycle of 2016 began on May 9th. Vegetation growth along the channels did not impede storm water flows.

HCFCD staff checked channels and detention basins for blockages, erosion, bank failures, and other storm-related problems. To date, over \$12.5 million of channel and detention basin repairs and debris removal have been identified primarily in the Addicks and Baker Reservoir watershed tributaries, Cypress Creek and Little Cypress Creek watersheds, and Buffalo Bayou. Damages include slope failures, bank erosion, outfall pipe damage, and fallen trees. For the first time since Hurricane Ike in 2008, the emergency debris removal contract was activated.

Rainfall Intensity Report
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Clear Creek, A100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
100	0.2	0.6	0.9	1.4	2.6	3.4	4.1	4.1	4.2	4.2	5.3	A100 Clear Lake 2nd Outlet @ SH 146
105	0.4	1.0	1.6	2.6	3.6	4.3	4.5	4.6	4.6	4.6	5.2	Mary's Creek @ Melodywood Drive
110	0.4	0.9	1.6	2.4	3.5	4.4	4.6	4.6	4.6	4.7	6.0	A100 Clear Creek @ I-45
115	0.3	0.8	1.3	2.0	3.0	3.5	3.7	3.8	3.9	3.9	4.7	Cowart Creek @ Baker Road
120	0.3	0.8	1.6	2.6	4.0	4.6	4.8	4.9	5.0	5.0	5.6	A100 Clear Creek @ FM 528
125	0.4	0.8	1.3	2.0	2.9	3.6	3.8	3.8	4.0	4.0	5.2	Chigger Creek @ Windsong Lane
130	0.4	0.9	1.8	2.9	4.1	4.8	5.0	5.0	5.2	5.2	6.3	A100 Clear Creek @ Bay Area Boulevard
135	0.3	0.8	1.4	2.3	3.4	4.1	4.4	4.4	4.6	4.6	5.2	A100 Clear Creek @ FM 2351
140	0.4	1.0	1.6	2.6	3.6	4.5	4.8	4.9	5.0	5.0	5.5	A119 Turkey Creek @ FM 1959
150	0.3	0.9	1.4	2.3	3.1	3.9	4.2	4.4	4.4	4.4	5.0	A100 Clear Creek @ Country Club Drive
160	0.3	0.8	1.2	1.9	2.7	3.3	3.7	3.8	3.9	3.9	4.5	A120 Beamer Ditch @ Hughes Road
170	0.4	1.0	1.8	2.5	3.4	4.4	4.9	5.0	5.0	5.0	6.4	A100 Clear Creek @ Nassau Bay
180	0.4	0.8	1.4	2.3	3.5	4.2	4.6	4.8	4.9	5.1	5.7	A100 Clear Creek @ Mykawa Road
190	0.4	0.7	1.4	2.1	2.8	3.6	4.0	4.1	4.4	4.5	5.8	A100 Clear Creek @ SH 288
200	0.3	0.6	1.0	1.7	2.6	3.5	4.4	4.5	4.5	4.5	5.8	A104 Taylor Lake @ Nasa Road 1

Armand Bayou, B100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
210	0.3	0.7	1.3	2.0	2.8	3.6	4.5	4.5	4.6	4.6	5.8	B100 Armand Bayou @ Pasadena Lake (Nasa Road 1)
220	0.2	0.7	1.0	1.4	2.5	3.3	4.2	4.4	4.5	4.5	5.3	B100 Armand Bayou @ Genoa-Red Bluff Road
230	0.3	0.7	1.1	1.6	2.8	3.8	4.6	4.8	4.9	5.0	6.0	B106 Big Island Slough @ Fairmont Parkway
240	0.2	0.6	1.1	1.7	3.2	4.2	5.1	5.3	5.4	5.4	6.4	B100 Armand Bayou @ Beltway 8
250	0.5	1.1	1.5	2.0	3.0	3.8	4.4	4.5	4.6	4.6	5.3	B104 Horsepen Creek @ Bay Area Boulevard
270	0.2	0.5	0.7	1.1	2.0	2.8	3.7	4.0	4.0	4.0	4.7	B112 Willow Spring Bayou @ Fairmont Parkway

Sims Bayou, C100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
310	0.3	0.8	1.3	2.0	3.7	4.4	5.3	5.5	5.6	5.6	6.8	C106 Berry Bayou @ Nevada Avenue
320	0.4	0.8	1.3	2.2	3.8	5.3	6.2	6.4	6.5	6.6	8.2	C106 Berry Bayou @ Forest Oaks Boulevard
340	0.3	0.6	1.1	1.9	3.6	5.0	5.9	6.1	6.2	6.6	7.3	C100 Sims Bayou @ Telephone Road
360	0.3	0.6	0.9	1.5	2.9	3.4	4.2	4.6	4.6	4.7	5.2	C100 Sims Bayou @ Martin Luther King Road
370	0.3	0.6	1.1	1.8	2.6	3.3	4.1	4.3	4.7	5.2	6.1	C100 Sims Bayou @ SH 288
380	0.4	1.0	1.4	2.1	3.0	4.0	4.9	5.2	5.6	5.9	6.9	C100 Sims Bayou @ Hiram-Clarke Road

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Brays Bayou, D100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1020	0.4	0.7	1.3	2.5	4.1	5.4	6.5	6.9	7.5	7.9	9.4	NRG Park
400	0.4	1.0	1.6	3.0	4.6	5.6	6.6	7.0	7.4	7.8	9.5	D109 Harris Gully @ South McGregor Way
410	0.4	1.1	1.6	2.5	4.2	4.9	5.6	6.0	6.0	8.3	9.0	D100 Brays Bayou @ Lawndale Street
420	0.3	0.8	1.4	2.5	4.0	5.0	6.0	6.4	6.8	7.3	8.7	D100 Brays Bayou @ South Main Street
430	0.3	0.9	1.5	2.8	4.6	5.8	6.9	7.4	7.7	8.3	9.0	D100 Brays Bayou @ Stella Link Road
435	0.4	0.8	1.3	2.3	4.0	4.8	6.1	6.5	7.2	7.5	8.6	D112 Willow Water Hole @ Willowbend Boulevard
440	0.4	0.8	1.4	2.8	4.2	5.4	6.5	6.8	7.6	8.5	9.2	D100 Brays Bayou @ Rice Avenue
445	0.3	0.7	1.2	1.9	3.7	4.3	5.6	5.9	6.8	7.2	7.6	D112 Willow Water Hole @ Landsdowne Drive
460	0.6	1.5	2.2	3.7	5.3	6.6	7.7	8.1	9.1	9.3	10.6	D100 Brays Bayou @ Gessner Road
465	0.8	1.7	2.9	4.4	6.4	7.9	8.9	9.3	10.4	10.5	11.9	D100 Brays Bayou @ Beltway 8
470	0.6	1.5	2.4	4.2	6.3	7.6	8.4	9.0	10.3	10.4	11.3	D100 Brays Bayou @ Belle Park Drive
475	0.8	1.7	3.0	4.5	6.6	7.8	8.7	9.0	9.9	10.1	11.2	D100 Brays Bayou @ Bellaire Boulevard
480	0.4	0.9	1.8	2.9	5.0	6.1	7.4	7.8	9.6	9.6	10.6	D118 Keegans Bayou @ Roark Road
485	0.5	1.0	1.9	2.7	4.2	5.3	6.0	7.1	8.3	8.5	9.1	D100 Brays Bayou @ SH 6
490	0.4	1.0	1.8	3.4	5.0	6.3	7.3	7.8	9.2	9.3	10.3	D118 Keegans Bayou @ Keegan Road
495	0.6	1.6	2.7	3.5	5.8	6.9	7.6	8.7	10.0	10.0	11.6	D118 Keegans Bayou @ Rocky Valley

White Oak Bayou, E100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
510	0.6	1.2	2.0	3.0	4.4	5.2	6.0	6.6	7.1	7.2	7.6	Harris County Flood Control @ Brookhollow
520	0.6	1.2	2.0	3.1	4.5	5.0	5.8	6.3	6.6	6.6	7.1	E100 White Oak Bayou @ Heights Boulevard
530	0.5	1.2	1.9	2.8	3.9	4.5	5.4	6.0	6.1	6.2	6.6	E100 White Oak Bayou @ Ella Boulevard
535	0.4	1.3	2.0	2.8	3.9	4.4	5.3	6.3	6.8	6.8	7.6	E100 White Oak Bayou @ Pinemont Drive
540	0.4	1.1	1.9	2.7	3.8	4.4	6.2	7.8	8.5	8.5	9.5	E100 White Oak Bayou @ Alabonson Road
545	0.4	0.9	1.7	2.8	3.6	4.2	7.0	9.1	9.9	10.0	10.5	E100 White Oak Bayou @ Fairbanks North Houston Road
550	0.5	1.3	2.4	3.9	4.8	5.4	9.4	11.5	12.3	12.3	13.0	E100 White Oak Bayou @ Lakeview Drive
555	0.6	1.6	2.8	4.5	6.1	6.5	10.7	12.1	12.8	12.8	13.9	E100 White Oak Bayou @ Jones Road
560	0.4	1.1	1.8	2.6	3.6	3.9	4.6	5.0	5.3	5.4	6.1	E101 Little White Oak Bayou @ Trimble Street
570	0.7	1.8	2.2	2.7	3.4	3.8	4.5	5.3	5.7	5.7	6.8	E101 Little White Oak Bayou @ Tidwell Road
575	0.4	1.0	1.5	2.2	3.2	3.8	4.6	5.8	6.4	6.4	6.9	E100 White Oak Bayou @ Tidwell Road
580	0.5	1.2	1.8	2.7	4.0	4.5	5.3	6.1	6.6	6.8	7.7	E115 Brickhouse Gully @ Costa Rica Road
585	0.5	1.2	1.9	2.6	3.7	4.2	5.9	7.4	8.0	8.0	9.0	E121 Vogel Creek @ Victory Drive
590	0.5	1.2	2.1	3.0	3.8	4.4	5.4	6.9	7.6	7.7	8.7	E117 Cole Creek @ Deihl Road
595	0.4	1.3	2.1	2.8	4.0	4.4	6.8	8.0	8.6	8.7	9.5	E121 Vogel Creek @ Gulf Bank Road

Little Cedar Bayou, F216												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
610	0.4	0.8	1.2	1.7	3.0	3.8	4.8	5.0	5.0	5.1	7.2	A104 Taylor's Bayou @ Shoreacres Boulevard
620	0.3	0.6	1.2	1.9	3.4	4.5	5.5	5.7	5.8	5.8	6.8	F216 Little Cedar Bayou @ 8th Street
640	0.4	1.1	1.6	2.4	4.1	5.0	5.7	5.9	6.0	6.0	7.0	F101 Lateral @ Sens Road

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San Jacinto River, G103												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
710	0.6	1.6	2.1	2.8	3.2	3.5	4.1	4.4	4.6	4.6	5.2	G103 San Jacinto River @ Banana Bend Street
720	0.5	1.3	1.8	2.2	2.4	2.5	3.0	3.4	3.5	3.5	3.8	G103 San Jacinto River @ US 90
750	0.4	0.8	1.0	1.4	1.4	1.6	2.0	2.5	2.7	2.7	3.5	G103 Lake Houston Dam Spillway
755	0.6	1.5	2.6	3.5	3.6	3.7	4.3	5.2	7.3	7.4	7.4	G103 San Jacinto River @ Kingwood Country Club
760	0.6	1.4	2.4	3.3	3.4	3.4	5.8	6.6	6.7	6.7	7.4	G103 San Jacinto River @ US 59
790	0.6	1.6	2.3	2.6	2.7	2.8	5.4	6.4	6.5	6.5	7.5	G103 East Fork San Jacinto @ FM 1485

Hunting Bayou, H100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
820	0.6	1.4	2.4	3.2	4.2	4.9	5.6	5.8	5.9	6.0	6.6	H100 Hunting Bayou @ I-10
830	0.6	1.3	1.8	2.6	3.7	4.3	5.0	5.3	5.4	5.5	6.5	H100 Hunting Bayou @ Loop 610 East
840	0.4	1.1	1.8	2.8	3.6	3.9	4.5	4.9	5.0	5.0	5.8	H100 Hunting Bayou @ Lockwood Drive

Vince Bayou, I100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
920	0.4	1.2	1.9	2.6	4.6	5.7	6.6	6.8	6.8	6.8	8.0	I100 Vince Bayou @ West Elaine Down Stream
940	0.5	1.2	2.1	2.8	4.7	5.7	6.7	6.9	7.0	7.0	8.1	I101 Little Vince Bayou @ Jackson Avenue

Spring Creek, J100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1040	0.6	1.6	2.9	3.9	4.6	5.6	9.5	10.6	11.0	11.0	12.1	J100 Spring Creek @ FM 2978
1050	0.7	1.7	2.4	3.2	4.4	5.3	8.3	9.2	9.4	9.4	11.0	J100 Spring Creek @ I-45
1060	0.5	1.2	2.1	3.1	4.7	5.5	9.1	10.2	10.5	10.5	11.4	J100 Spring Creek @ Kuykendahl Road
1070	0.4	1.1	1.7	2.8	3.9	4.7	8.4	9.7	10.1	10.1	11.7	J100 Spring Creek @ SH 249
1090	0.6	1.7	2.7	3.4	5.4	7.1	10.5	10.8	10.8	10.8	11.8	J100 Spring Creek @ Hegar Road

Cypress Creek, K100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1110	0.7	2.0	3.4	4.7	4.9	5.0	9.8	10.6	10.8	10.8	12.6	K100 Cypress Creek @ Cypresswood Drive
1115	0.6	1.8	2.8	4.5	5.2	5.6	9.1	10.0	10.2	10.4	12.5	K600 Cypress Creek @ Inverness Forest
1120	0.7	1.8	2.6	4.3	5.3	5.7	9.2	10.2	10.3	10.3	13.3	K100 Cypress Creek @ I-45
1130	0.6	1.6	2.7	3.5	4.8	5.1	7.6	8.7	8.9	9.0	11.0	K100 Cypress Creek @ Kuykendahl Road
1140	0.8	2.0	3.1	4.0	5.1	5.4	8.2	9.2	9.7	9.8	11.8	K100 Cypress Creek @ Stuebner-Airline Road
1160	0.6	1.6	3.1	4.2	5.6	6.2	10.2	12.0	12.6	12.7	14.0	K100 Cypress Creek @ Grant Road
1165	0.7	1.7	3.0	4.1	5.6	6.3	11.3	12.7	13.4	13.6	15.1	K100 Cypress Creek @ Eldridge Parkway N.
1170	0.6	1.6	2.8	4.2	5.8	7.1	11.8	13.6	14.1	14.5	16.3	K100 Cypress Creek @ Huffmeister Road
1180	0.7	1.7	2.8	3.8	6.9	7.2	11.7	15.1	15.7	15.7	17.0	K100 Cypress Creek @ Katy-Hockley Road
1185	0.7	1.7	3.0	4.4	6.7	6.9	12.1	16.1	16.5	16.5	16.5	K100 Cypress creek @ Sharp Road
1190	0.9	1.8	2.7	4.2	7.1	8.3	13.9	16.7	17.6	17.6	19.0	K166 Little Mound Creek @ Mathis Road
1210	0.8	1.8	3.0	4.4	5.8	6.8	10.5	12.2	12.8	13.0	14.7	L100 Little Cypress Creek @ Kluge Road
1220	0.6	1.5	2.2	3.2	4.3	4.7	8.0	10.7	11.2	11.2	12.6	L100 Little Cypress Creek @ Cypress Rosehill Road
1230	0.6	1.5	2.2	3.2	4.5	5.4	9.1	12.2	12.7	12.7	14.7	L100 Little Cypress Creek @ Becker Road

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Willow Creek, M100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1320	0.6	1.6	2.7	3.5	4.3	5.1	8.6	10.0	10.3	10.4	11.4	M100 Willow Creek @ Kuykendahl Road
1340	0.7	1.8	2.9	3.7	4.8	5.6	10.7	12.2	12.6	12.6	14.2	M100 Willow Creek @ SH 249

Carpenters Bayou, N100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1420	0.6	1.4	2.2	3.4	4.1	4.6	5.3	5.6	5.6	6.0	6.9	N100 Carpenters Bayou @ I-10
1440	0.4	1.1	1.8	2.6	3.0	3.4	4.0	4.2	4.3	4.3	5.6	N100 Carpenters Bayou @ Wallisville Road
1460	0.6	1.5	2.1	2.8	3.1	3.4	3.9	4.3	4.3	4.3	5.6	N100 Carpenters Bayou @ US 90

Goose Creek, O100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1520	0.6	1.5	2.4	3.0	4.1	5.0	5.6	5.8	5.9	5.9	6.6	O100 Goose Creek @ SH 146
1540	0.6	1.4	2.6	3.5	4.4	5.1	5.6	5.8	5.9	5.9	6.6	O100 Goose Creek @ Baker Road

Greens Bayou, P100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1600	0.6	1.1	1.3	1.6	1.8	2.1	2.6	3.0	3.0	3.0	3.5	P100 Greens Bayou @ Mount Houston Parkway
1610	0.6	1.4	2.2	3.1	4.1	4.6	5.3	5.6	5.6	5.7	6.2	P100 Greens Bayou @ Normandy Street
1620	0.6	1.5	2.0	2.8	3.3	3.7	4.3	4.6	4.7	4.7	5.3	P100 Greens Bayou @ Ley Road
1630	0.6	1.4	1.6	1.8	2.0	2.1	2.6	3.0	3.0	3.0	3.4	P130 Garners Bayou @ Beltway 8
1640	0.5	1.0	1.2	1.4	1.7	1.8	2.5	3.4	3.5	3.5	4.4	P100 Greens Bayou @ US 59
1645	0.8	2.1	2.7	3.0	3.2	3.3	5.2	6.2	6.4	6.4	7.5	P100 Greens Bayou @ Beltway 8
1650	0.8	2.0	2.5	2.7	2.8	2.9	3.4	4.3	4.4	4.4	5.3	P130 Garners Bayou @ Rankin Road
1660	0.6	1.8	3.3	4.7	5.0	5.2	10.1	11.1	11.2	11.3	12.2	P100 Greens Bayou @ Knobcrest Drive
1665	0.8	1.9	3.1	4.5	5.3	5.3	10.3	11.6	12.0	12.0	12.9	P100 Greens Bayou @ Bammel N Houston Road
1670	0.6	1.6	3.0	4.4	5.4	5.5	9.5	11.0	11.6	11.6	12.4	P100 Greens Bayou @ Cutten Road
1685	0.6	1.6	2.1	2.8	3.2	3.5	4.1	4.4	4.5	4.5	5.4	P100 Greens Bayou @ Tidwell Road
1695	0.6	1.5	2.0	2.2	2.5	2.6	4.1	5.2	5.4	5.4	6.1	P138 @ Aldine Westfield Road

Halls Bayou, P118												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1675	0.5	1.2	1.7	2.3	2.8	3.2	3.7	4.2	4.2	4.2	5.2	P118 Halls Bayou @ Tidwell Road
1680	0.4	0.8	1.2	1.8	2.3	2.5	3.1	3.6	3.8	3.8	4.6	P118 Halls Bayou @ Jensen Drive
1690	0.4	1.2	1.8	2.2	2.6	2.9	4.0	5.4	5.8	5.9	6.8	P118 Halls Bayou @ Airline Drive

Cedar Bayou, Q100												
Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1720	0.5	1.0	1.6	2.6	3.3	3.8	4.4	4.6	4.6	4.8	6.4	Q100 Cedar Bayou @ SH 146
1730	0.7	1.5	2.1	2.8	3.3	3.5	4.0	4.2	4.2	4.2	5.3	Q100 Cedar Bayou @ FM 1942
1740	0.6	1.0	1.4	1.8	2.0	2.0	2.6	3.3	3.4	3.4	4.8	Q100 Cedar Bayou @ US 90

Rainfall Intensity Report

4-17-16 2:30 PM through 4-21-16 2:30 PM

Jackson Bayou, R100

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1840	0.6	1.1	1.4	1.7	1.9	2.0	2.5	3.0	3.1	3.1	3.5	R102 Gum Gully @ Diamond Head Boulevard

Luce Bayou, S100

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1940	0.5	1.4	2.2	2.6	2.7	2.8	3.3	4.1	4.2	4.2	5.2	S100 Luce Bayou @ FM 2100

Barker Reservoir, T100

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
2010	0.6	1.4	2.6	4.3	5.4	6.2	7.0	9.4	10.6	10.7	11.2	Barker Dam
2020	0.4	1.2	2.2	3.3	4.4	5.2	7.0	11.8	12.7	12.8	13.3	T101 Mason Creek @ Prince Creek Drive
2040	0.4	0.8	1.4	2.2	3.5	5.0	7.0	10.4	11.3	11.4	12.0	T100 Buffalo Bayou @ US 90

Addicks Reservoir, U100

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
2110	0.6	1.6	2.5	4.2	5.2	5.9	6.9	8.8	10.0	10.1	10.4	Addicks Dam
2120	0.7	1.6	2.5	4.2	7.1	7.5	13.6	16.6	17.4	17.5	19.1	U100 Langham Creek @ West Little York Road
2130	0.6	1.4	2.3	3.9	6.2	7.3	12.5	14.9	15.7	15.8	16.9	U106 Horsepen @ Trailside Drive
2140	0.6	1.6	2.8	4.4	7.3	7.7	12.4	15.7	16.3	16.4	17.2	U100 Langham Creek @ Longenbaugh Road
2150	0.6	1.5	2.8	4.1	5.1	5.8	9.9	14.1	15.1	15.3	15.9	U101 South Mayde @ Greenhouse Road
2160	0.5	1.3	2.5	3.9	6.0	6.4	10.9	14.3	15.2	15.2	16.0	U102 Bear Creek @ Clay Road
2170	0.6	1.7	2.6	4.5	6.2	6.8	9.8	13.8	14.6	14.7	15.4	U101 South Mayde @ Morton Road
2180	0.5	1.3	2.4	3.7	7.1	7.5	10.4	14.4	15.0	15.0	15.7	U102 Bear Creek @ FM 529
2190	0.5	1.1	2.0	3.4	6.4	7.0	9.2	13.7	14.4	14.5	14.9	U101 South Mayde Creek @ Peek Road

Buffalo Bayou, W100

Sensor ID	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day	Site
1000	0.4	1.0	1.9	2.8	4.4	5.2	6.1	6.6	7.0	7.1	7.5	Houston Transtar
2210	0.5	1.2	1.9	2.7	4.3	5.4	6.1	6.4	6.5	8.3	9.2	W100 Buffalo Bayou @ Turning Basin
2220	0.5	1.4	2.3	3.2	4.6	5.1	5.6	6.1	6.3	6.4	8.6	W100 Buffalo Bayou @ Milam Street
2240	0.4	0.8	1.6	2.9	4.5	5.2	6.0	6.5	6.8	6.8	7.6	W100 Buffalo Bayou @ Shepherd Drive
2250	0.7	1.4	2.8	4.0	5.4	6.0	6.8	7.5	8.3	8.4	9.0	W140 Spring Branch @ Bingle Road
2255	0.7	1.5	2.8	4.1	5.4	6.2	6.9	7.5	8.3	8.4	9.1	W140-01 Briar Branch @ Campbell Road
2260	0.5	1.3	1.9	3.0	4.8	5.7	6.4	6.9	7.8	7.8	8.6	W100 Buffalo Bayou @ San Felipe Drive
2270	0.8	1.7	2.9	4.4	6.5	7.6	8.3	8.8	9.8	10.0	10.5	W100 Buffalo Bayou @ West Beltway 8
2290	0.6	1.5	2.5	4.0	5.6	6.3	7.2	8.3	9.6	9.7	10.2	W100 Buffalo Bayou @ Dairy Ashford Road

Rainfall Intensity Report

4-17-16 2:30 PM through 4-21-16 2:30 PM

Region 1--Addicks, Barker, Cypress, Spring, and Willow

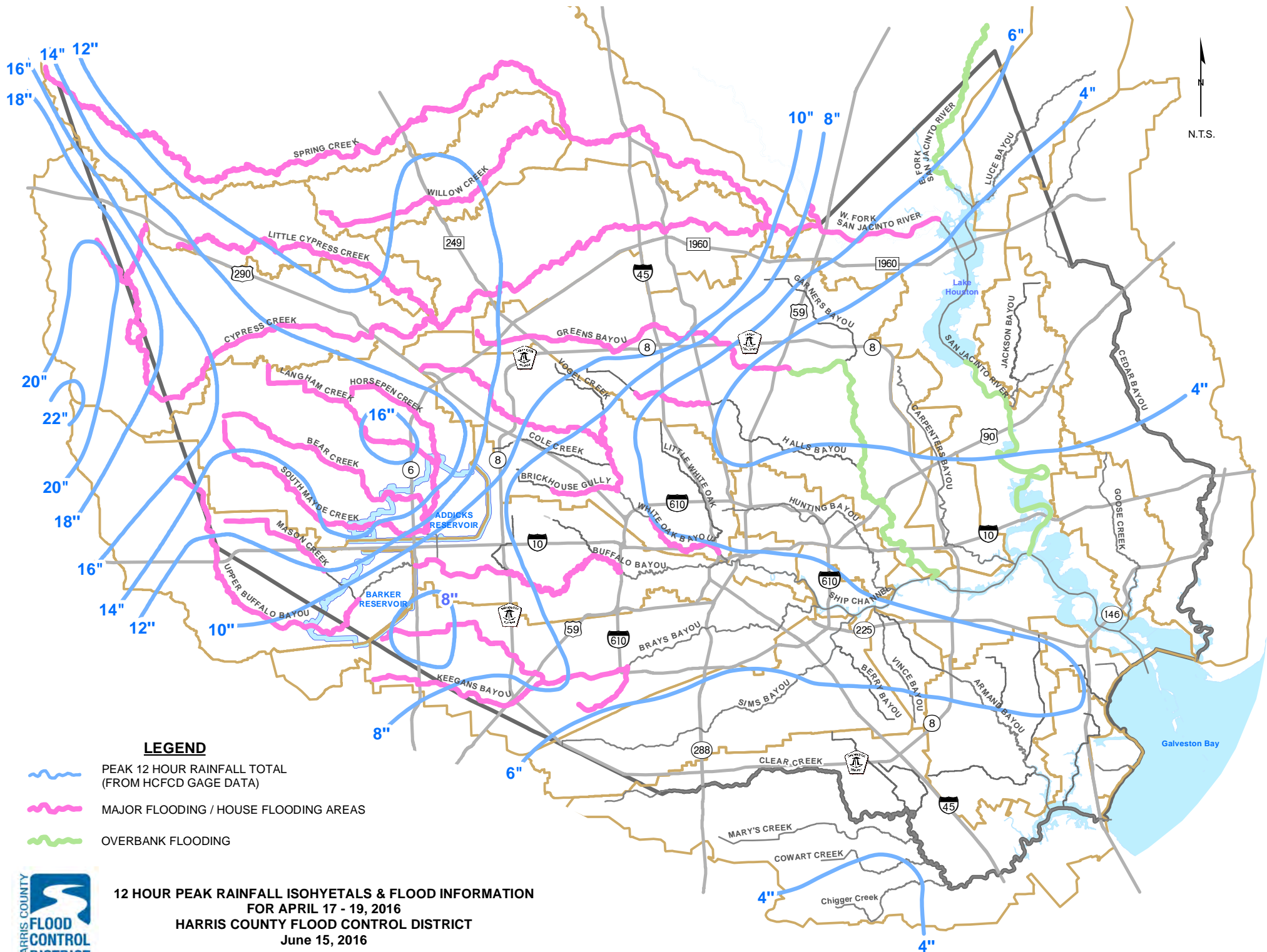
Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day
2-year	0.7	1.1	1.4	1.9	2.2	2.5	2.9	3.4	4.1	4.7	5.4
5-year	0.9	1.4	1.8	2.5	3	3.3	4	4.8	5.8	6.6	7.6
10-year	1	1.5	2.1	2.8	3.5	3.9	4.9	5.9	7.1	8.1	9.2
25-year	1.1	1.8	2.4	3.4	4.2	4.8	6.1	7.4	9	10.1	11.3
50-year	1.2	2	2.7	3.8	4.9	5.6	7.2	8.7	10.6	11.8	13.1
100-year	1.3	2.2	3	4.2	5.5	6.5	8.5	10.2	12.4	13.6	14.9
500-year	1.5	2.7	3.9	5.5	7.5	9	12.2	14.7	17.7	18.7	19.8

Region 2--Brays, Buffalo, Greens, Hunting, Luce, West Fork San Jacinto, and White Oak

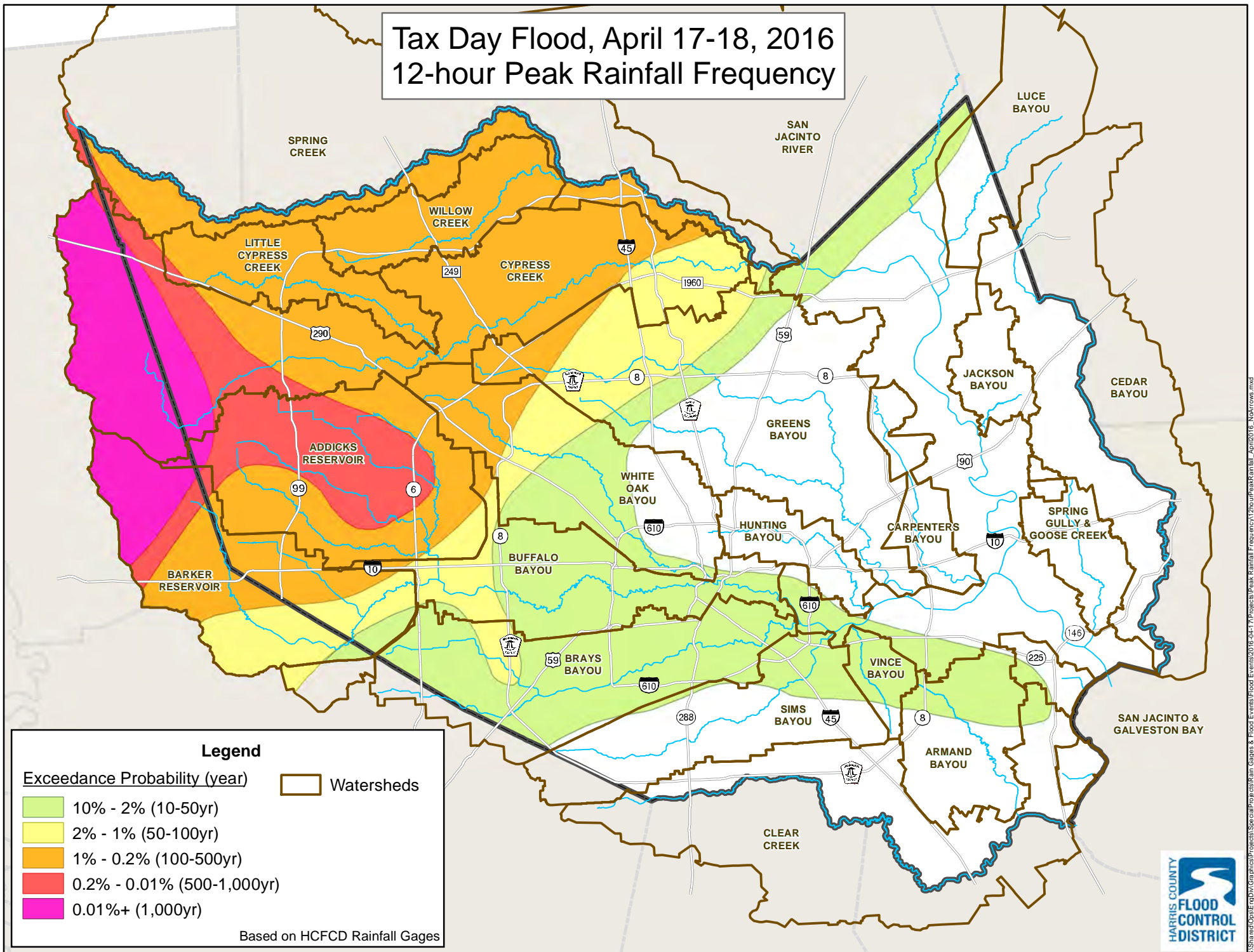
Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day
2-year	0.7	1.1	1.5	2.0	2.3	2.6	3.1	3.7	4.4	5.0	5.8
5-year	0.8	1.4	1.8	2.5	3.1	3.5	4.3	5.1	6.2	7.1	8.1
10-year	0.9	1.5	2.1	2.9	3.6	4.1	5.1	6.2	7.6	8.6	9.8
25-year	1.0	1.7	2.4	3.4	4.3	5.0	6.4	7.8	9.6	10.8	12.1
50-year	1.1	1.9	2.7	3.8	5.0	5.8	7.6	9.2	11.3	12.5	14.0
100-year	1.2	2.1	3.0	4.3	5.7	6.7	8.9	10.8	13.2	14.5	15.9
500-year	1.4	2.6	3.8	5.5	7.6	9.2	12.8	15.5	18.9	20.0	21.1

Region 3--Armand, Carpenters, Ceder, Clear, Galveston Bay, Goose, Jackson, Lower San Jacinto River, Sims, Ship Channel and Vince

Period	5-min	15-min	30-min	1-hour	2-hour	3-hour	6-hour	12-hour	1-day	2-day	4-day
2-year	0.7	1.1	1.5	2.0	2.4	2.7	3.2	3.8	4.5	5.3	6.2
5-year	0.8	1.4	1.9	2.5	3.1	3.5	4.4	5.3	6.4	7.5	8.7
10-year	0.9	1.5	2.1	2.9	3.7	4.2	5.3	6.4	7.8	9.0	10.5
25-year	1.0	1.7	2.4	3.4	4.4	5.1	6.6	8.0	9.8	11.2	12.9
50-year	1.1	1.9	2.7	3.8	5.0	5.9	7.7	9.5	11.6	13.1	14.8
100-year	1.2	2.1	3.0	4.3	5.7	6.8	9.1	11.1	13.5	15.1	16.9
500-year	1.4	2.5	3.7	5.5	7.7	9.4	13.1	15.9	19.3	20.7	22.3

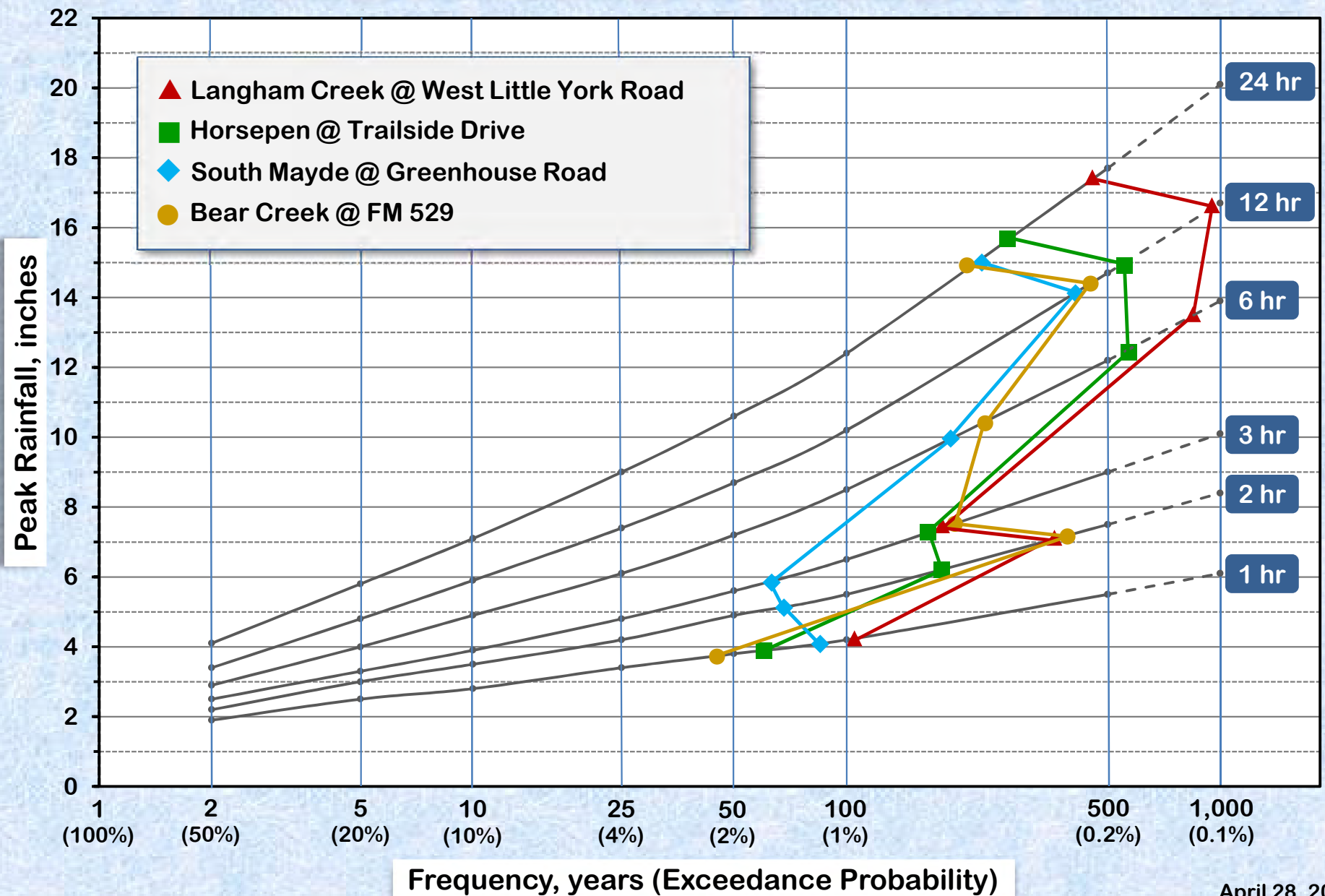


Tax Day Flood, April 17-18, 2016 12-hour Peak Rainfall Frequency



Rainfall - Duration - Frequency ▶ April 17 to 18, 2016

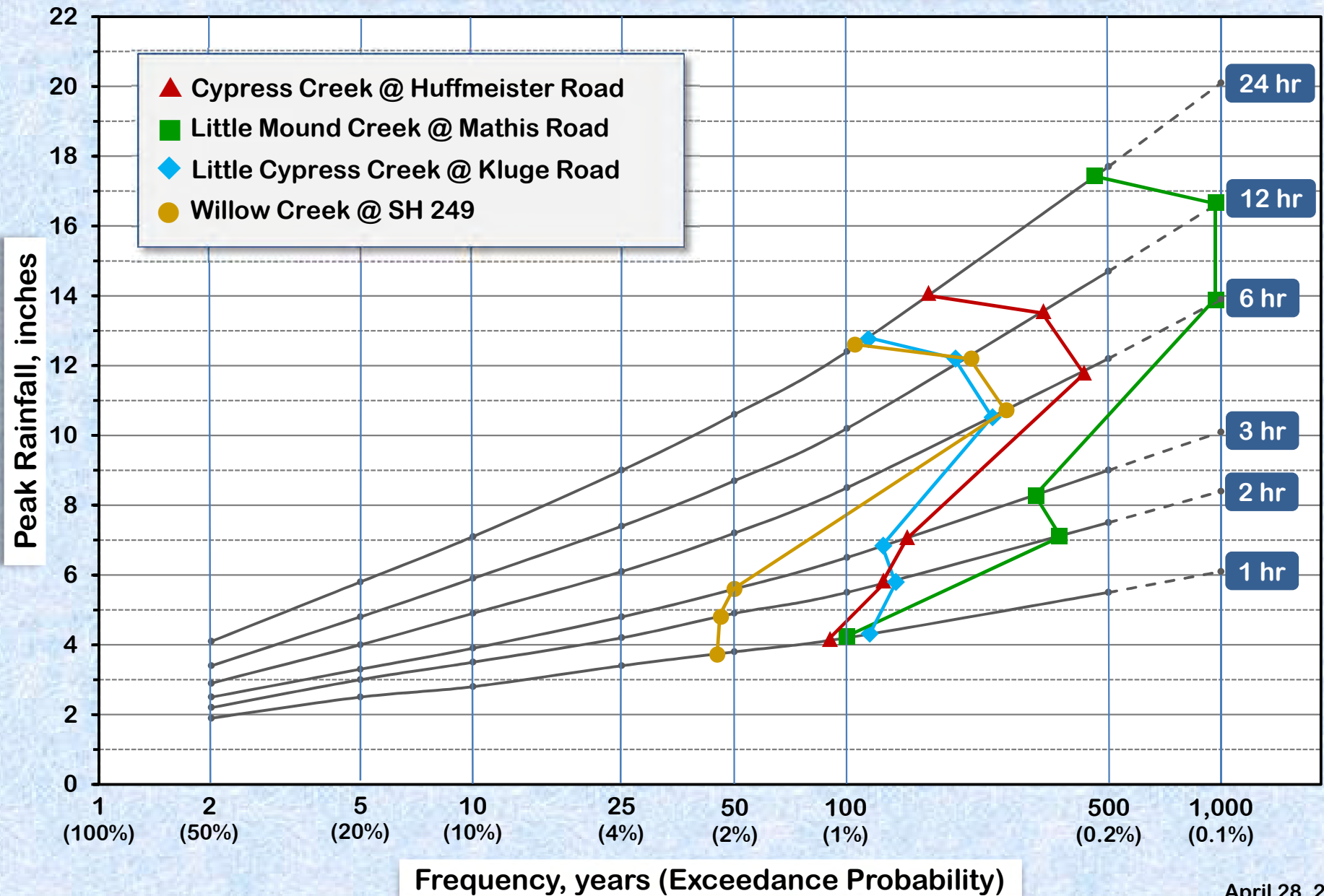
Region 1 ▶ Addicks Reservoir Tributaries



April 28, 2016

Rainfall - Duration - Frequency ▶ April 17 to 18, 2016

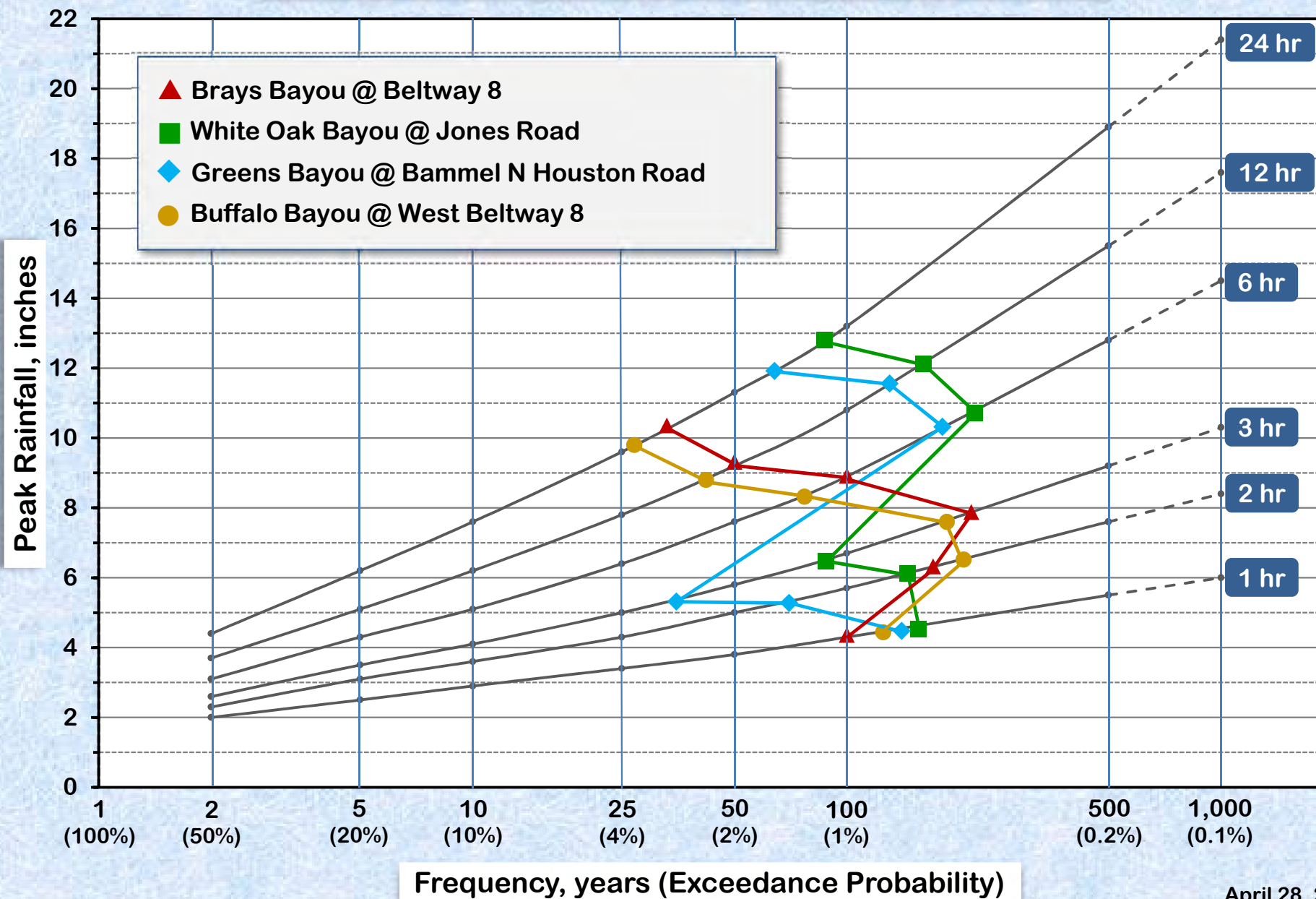
Region 1 ▶ Cypress, Willow



April 28, 2016

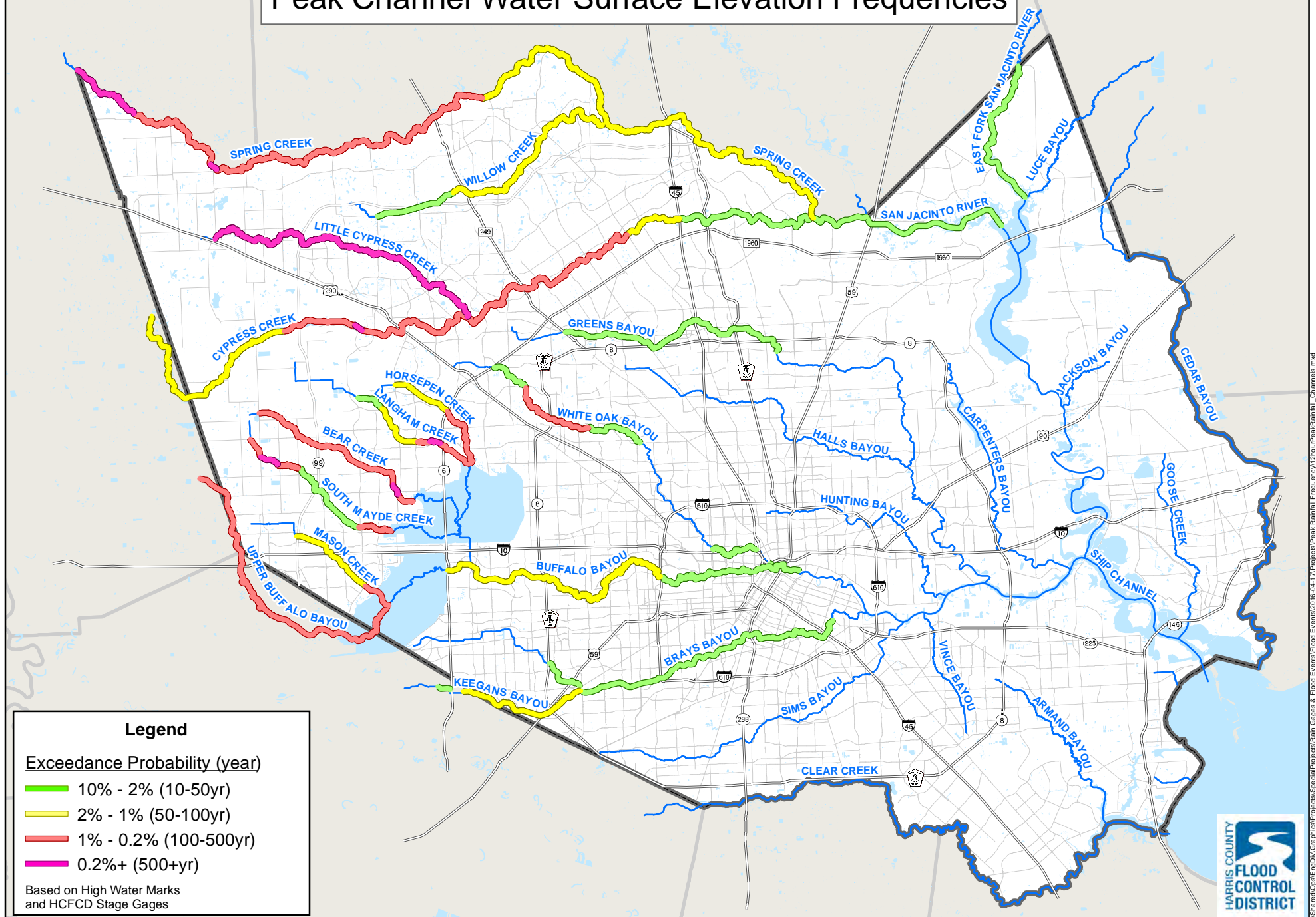
Rainfall - Duration - Frequency ▶ April 17 to 18, 2016

Region 2 ▶ Brays, White Oak, Greens, Buffalo

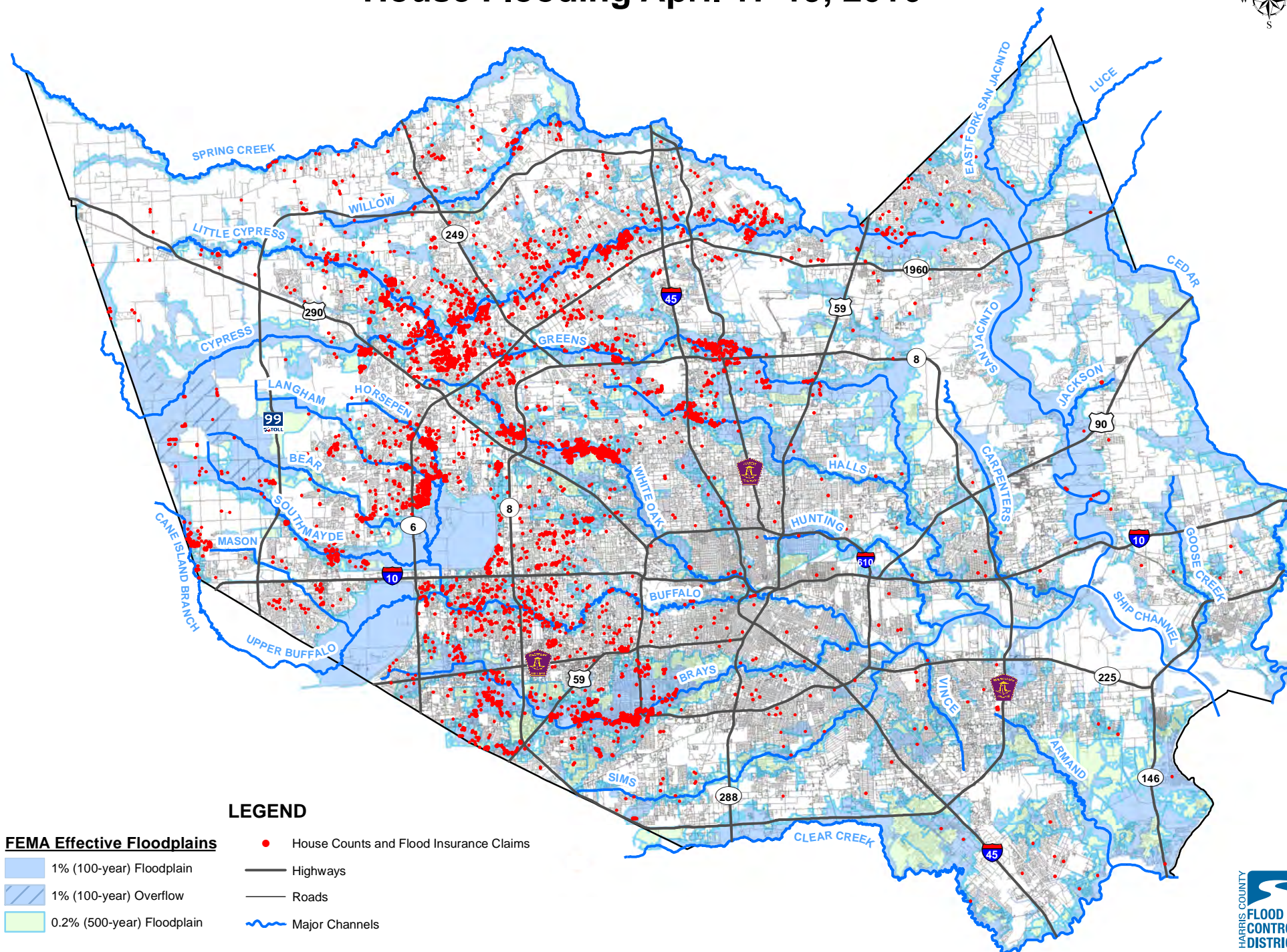


Tax Day Flood, April 17-18, 2016

Peak Channel Water Surface Elevation Frequencies



House Flooding April 17-19, 2016



ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS																
								10/49	CARLA 9/61	1/19/79	9/19/79	8/31/81	5/21/83	5/19/89	6/26/89	10/18/94	10/19/98	11/14/98	ALLISON 6/9/01	12/14/05	IKE 9/13/08	4/28/09	7/12/12	4/18/16
CYPRESSWOOD DR	1110	79.65	-0.5	68.2	75.0	77.8	85.4									79.2	65.5	70.7	72.5	63.2	68.9	66.0	64.5	71.4
TRESCHWIG		85.39	-1.4	76.4	79.2	80.2	85.4							78.0		78.4	75.3	73.7	78.5	70.8	76.6	74.8	71.8	78.3
ALDINE WESTFIELD		89.06	-1.4	79.7	83.0	84.2	86.3	85.3				78.9	76.6	83.2	81.5	80.8	78.4	77.9	82.4	73.5	80.5	79.2	74.2	81.7
HARDY ROAD		94.85	-2.0	84.9	88.1	89.5	91.5	89.8	80.9		81.8		81.6			83.7*	85.4	81.7	86.9	81.6	84.4	84.7	79.5	86.9
I.H. 45	1120	101.82	-2.1	91.2	93.0	94.4	97.3	95.5	87.5	84.3	87.3	88.6	83.8	92.1	90.7	88.0	89.1	86.8	92.5	84.9	89.3	87.9	83.6	90.6
KUYKENDAHL	1130	109.01	-1.9	97.1	100.6	102.2	107.0	103.6	95.0	96.5	97.6	97.5	96.4	101.3	99.1	99.4	98.2	97.1	100.9	92.7	97.2	96.8	96.5	101.4
TC JESTER		NA																						105.4
STUEBNER-AIRLINE RD	1140	115.95	-1.7	104.9	108.5	109.6	112.3	110.7		105.6	104.0		102.4	108.0	105.3	107.9	106.8	104.9	109.7	101.8	104.3	104.6	103.7	110.3
CHAMPION FOREST DR		110.31	-1.5	108.7	112.0	113.0	115.5						105.2	108.5		110.3	109.5	107.3	109.5	102.2	106.9	107.4	108.9	112.4
CYPRESSWOOD DR		120.21	-2.2	112.2	114.8	115.8	118.1										112.7	110.8	114.8	111.5	110.6	111.2	111.7	115.5
CUTTEN		121.47	-2.1	113.8	116.3	117.4	119.9									114.6	117.6	112.2	114.6	107.7	111.4	112.7	114.6	117.4
SH 249	1150	128.69	-1.4	115.7	118.9	120.1	122.5	123.7		119.3	118.5		116.8	114.2	113.7	119.4	120.1	116.3	120.5	N/A	N/A	116.5	119.2	120.3
JONES		126.98	-1.2	118.3	121.1	122.3	125.1									121.0	122.1	119.8	121.2	109.2	116.3	119.0	121.5	122.5
CYPRESSWOOD 369B		128.42	-1.1	119.5	122.2	123.4	126.2										123.5	121.1	122.9	109.5	117.4	120.3	122.8	125.3
GRANT ROAD	1160	127.25	-2.2	122.3	124.3	125.2	127.6	123.4		122.6	122.7	120.4	120.6		115.3	125.4	124.3	122.9	123.8	112.6	119.0	123.1	124.6	127.4
N. ELDRIDGE PARKWAY	1165	134.31	-2.4	124.3	126.3	127.3	129.7									126.1	125.4	123.5	125.9	113.8		124.5	125.0	128.6
HUFFMEISTER ROAD	1170	134.24	-1.6	128.4	130.4	131.4	133.7			123.5	128.1		127.4			130.0	131.6	129.6	129.8			129.6	130.7	132.9
TELGE ROAD		139.71	-1.6	132.1	134.2	135.2	137.5		131.9	132.4			131.8			134.5	135.4	134.4	N/A			132.7	133.2	136.9
BARKER CYPRESS		144.00	-2.4	136.1	138.2	139.1	141.2										138.8	137.2	137.5			135.8	137.4	138.9
U.S. 290	1175	147.52	-1.0	137.0	139.3	140.2	142.4	137.7	131.0		136.8	135.0	136.2			143.5	138.7	137.4	138.2			137.3	138.9	141.7
HOUSE HAHN ROAD		149.00	-1.0	144.7	145.8	146.4	148.0						144.8			145.7	147.0	142.0	145.1			145.0	145.1	148.4
KATY HOCKLEY ROAD	1180	162.20	-0.4	161.5	162.5	162.9	164.0			160.5			160.8			163.0	162.9	161.3	160.6			159.9	159.8	162.3
SHARP ROAD		164.42	-0.1	167.6	169.2	169.9	171.7			166.5						168.9*	166.8	163.5	164.9			165.8	166.7	168.9
K166 @ MATHIS	1190	206.86	-0.6	208.8	209.7	210.1	211.1																207.9	209.3
K111 @ FM 1960		81.53	-1.4	71.9	75.0	77.8	85.3									74.6		71.4			73.3	69.0	67.7	76.1
K133 @ CYPRESSWOOD		108.36	-1.5	108.5	111.3	112.4	115.1									109.9	108.8	107.3			106.5	106.5	N/A	110.8
K142 @ JONES RD		121.74	-2.3	117.2	120.2	121.5	124.2												121.4		116.9	119.1	120.1	123.7

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

(?) = Survey Dept research needed to confirm elevation

All K100 exceedance probability elevations based on PMR issued 3/22/2010

K111, K133, K142 exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.
High water marks are approximate. HCFCD assumes no responsibility for their accuracy.

SUMMARY SHEET - HCFCD HIGH WATER MARKS

6/21/2016

LITTLE CYPRESS CREEK L100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS													
								10/18/94	10/19/98	11/14/98	ALLISON 06/09/01	IKE 09/13/08	4/28/09	7/12/12	3/10/16	4/18/16					
KLUGE	1210	137.03	-1.7	132.5	134.5	135.1	136.1	136.3		133.9	135.3	128.7	133.4	135.4	131.3	136.4					
SPRING CYPRESS		144.56	-1.4	140.8	142.9	143.8	145.7	145.3*	144.6	141.8	144.0	139.0	139.4	143.9	141.0	145.2					
CYPRESS ROSEHILL	1220	164.10	-0.8	158.0	159.1	159.5	160.7	159.1	160.2	159.2	159.5	156.0	158.6	160.4	159.0	162.1					
MUESCHKE		166.73	-1.1	166.3	167.3	167.8	169.1	166.8	167.1	167.1	168.5	164.4	166.6	168.3	167.3	172.2					
BAUER		190.03	-0.4	186.6	187.4	187.8	188.7	188.7	188.7	187.5	187.7	186.0	186.5	188.9	187.1	189.7					
BECKER	1230	200.12	-0.6	195.2	196.0	196.2	196.9	197.1	197.0	195.8	196.4	193.5	195.4	197.2	195.1	197.8					
ROBERTS		204.10	-0.4	202.2	203.2	203.6	204.5	204.4*	205.0	202.8	203.1	200.8	202.2	204.6	202.6	205.6					
BAUER-HOCKLEY		212.93	-0.4	207.2	207.7	207.9	208.5	210.1*	209.5	208.9		206.4	207.3	210.9	207.5	211.8					
HEGAR @ L120		220.01	-0.9					216.9	219.1			216.6	217.8	220.0	218.08	219.5					
KERMIER @ L120		231.55	-0.5					216.7	227.0				224.4	226.2	225.6	228.1					
KICKAPOO @ L120		235.71	-0.9					238.8	242.4				234.7	237.6	234.9	238.3					

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.
High water marks are approximate. HCFCD assumes no responsibility for their accuracy.

SUMMARY SHEET - HCFCD HIGH WATER MARKS

6/21/2016

MASON CREEK T101-00-00
 BUFFALO BAYOU T100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS															
								ALICIA 8/18/83	10/18/94	4/28/09	4/18/16												
T101																							
PRINCE CREEK	2020	110.63	-1.1	102.7	105.0	106.1	108.7	100.8	98.8	106.0	106.0												
PARK PINE		113.54	-1.2	104.4	107.0	108.2	111.0	103.8		108.0	107.1												
IH 10		126.52	-1.0	116.0	118.6	119.7	122.3	121.9		115.2	115.1												
MASON RD		130.5	-1.0	120.5	123.0	124.1	126.1	119.3		121.5	122.8												
COLONIAL PARKWAY		131.24	-1.1	123.4	125.9	126.9	128.9	123.7		125.0	125.8												
T100																							
US 90	2040	140.25	-0.5	134.0	136.2	137.0	138.5			134.3	137.9												
10TH ST			-0.5	137.4	140.4	141.3	142.9				142.3												
FRANZ RD		145.36	-0.5	139.3	141.9	142.8	144.2	128.6	140.9	138.6	143.0												
MORTON RD			-0.5	148.7	150.4	151.0	151.8				150.3												
CLAY RD			-0.5	155.2	156.3	156.7	157.6				156.9												
PITTS RD			-0.5	157.1	158.0	158.3	159.0				159.5												
BARKER DAM	2010	111.55	-0.5							91.2	95.2												

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

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SUMMARY SHEET - HCFCD HIGH WATER MARKS

6/21/2016

LANGHAM CREEK U100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS									
								10/18/94	7/26/06	IKE 9/13/08	4/28/09	10/29/09	7/12/12	4/18/16			
MEMORIAL DR		79.42	-1.9						62.7	65.5	73.8	N/A	N/A	N/A			
ADDICKS DAM	2110	117.02	-1.1						90.8	N/A	100.0	N/A	94.1	102.5			
ADDICKS SATSUMA RD		107.81	-4.2	103.6	105.2	105.9	107.6		104.0	106.4	107.2	102.9	101.2	107.2			
W. LITTLE YORK	2120	112.4	-3.7	106.2	108.6	109.5	112.4	96.7	102.7	107.7	110.7	105.6	106.3	112.8			
BARKER CYPRESS RD		123.73	-3.1	116.2	118.8	120.1	122.8			117.0	119.7	114.9	110.9	119.5			
AUTUMN HILLS DR		125.29	-2.8	119.0	121.5	122.6	125.1		117.6	118.3	121.1	116.1	116.8	120.7			
FM 529		131.26	-2.7	123.0	125.0	126.1	128.3		117.0	121.4	123.4	120.6	121.5	124.4			
LONGENBAUGH	2140	136.28		131.4	134.5	136.2	137.7							131.1			
FRY RD														141.4			

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

LONGENBAUGH AND FRY ADDED AS HWM LOCATIONS IN JULY 2014

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.
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SUMMARY SHEET - HCFCD HIGH WATER MARKS

6/21/2016

SOUTH MAYDE CREEK U101-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS															
								ALICIA 8/18/83	10/18/94	10/19/98	7/26/06	IKE 9/13/08	4/28/09	7/12/12	4/18/16								
HWY 6		97.64	-2.0					93.3		83.2	90.7	92.6	96.8	94.2	102.5								
BARKER CYPRESS RD		107.69	-2.0	106.1	107.3	107.7	108.8	103.2	103.7	103.1		105.4	107.1	103.3	107.2								
GROESCHKE RD		106.75	-2.5	107.3	108.3	109.3	110.2	103.7		104.5	105.2	105.4	107.8	103.5	107.4								
GREENHOUSE RD	2150	109.95	-2.0	109.6	110.5	110.9	111.8		103.7	109.2	110.2	110.4	111.5	108.5	111.4								
FRY RD		114.19	-1.5	114.2	116.4	117.2	118.9	110.7	110.4	111.6	110.3	113.7	113.3	110.3	113.4								
RAINTREE VILLAGE		124.84	-1.6	118.7	120.6	121.2	122.5			115.2	112.3	117.8	117.9	112.6	119.0								
MORTON RD	2170			120.6	123.4	124.4	125.9			117.8	114.0	118.6	118.4	113.4	123.4								
LAKES OF BRIDGEWATER		129.01	-1.5	122.5	125.3	126.3	128.0			119.7	115.9	120.5	120.3	115.3	124.0								
CLAY RD		133.45	-1.3	125.9	128.2	129.2	131.5			125.3	119.6	129.3	124.8	119.0	129.2								
STOCKDICK RD		139.57	-1.2	139.4	140.2	140.6	141.3		140.0	139.1	131.0	137.8	140.1	137.4	140.8								
PEEK RD	2190	142.42	-1.2	142.4	143.0	143.2	143.7			142.9	135.1	138.7	142.0	139.8	141.4								
KATY HOCKLEY CUT OFF		156.62	-1.1	153.0	153.4	153.6	154.1		152.9	154.0		150.0	153.2	152.4	154.3								
FM 529		157.41	-0.7	157.2	157.5	157.6	157.9			159.6	153.7		157.6	157.4	157.4								

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

MORTON RD ADDED AS A HWM LOCATION IN JULY 2014, HWM'S TRANSLATED FROM LAKES OF BRIDGEWATER USING PROFILES FOR FWS PRIOR 2012

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.
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SUMMARY SHEET - HCFCD HIGH WATER MARKS

6/21/2016

BEAR CREEK U102-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS													
								10/18/94	10/19/98	7/26/06	IKE 9/13/08	4/28/09	7/12/12	4/18/16							
CLAY RD	2160	116.55	-2.6	108.8	111.3	112.4	114.1			108.0	111.3	114.4	108.7	114.9							
FRY ROAD		133.09	-2.4	124.7	126.8	127.5	129.9	122.4	121.7	118.8	124.9	127.0	123.6	127.9							
STOCKDICK SCHOOL RD		148.90	-1.2	144.4	145.0	145.2	146.6	144.0		136.5	139.9	144.4	142.5	145.0							
FM 529	2180	148.37	-1.1	148.4	149.1	149.5	151.1	147.7	150.3	145.8	143.7	148.6	147.0	150.5							
LOGENBAUGH		158.98	-0.9	156.3	157.6	158.2	159.1		157.6	150.8	152.1	156.2	154.8	158.3							
KATY-HOCKLEY CUT OFF		158.11	-0.9					159.1	158.6		155.7	158.7	158.0	160.8							
KATY-HOCKLEY @ SHARP		166.24	-0.9						157.9		164.4	166.7		166.8							
U102-14 @ KATY-HOCKLEY		158.22	-0.9					160.7			157.3	159.0		166.9							

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

Exceedance probability elevations are from the June 9th, 2006 TSARP Flood Insurance Study.
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HORSEPEN CREEK U106-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS								
								10/29/09	7/12/12	4/18/16						
W LITTLE YORK		108.87		103.6	106.2	107.5	110.3	104.4	104.5	108.3						
HUFFMEISTER		114.23		109.7	113.0	114.6	117.6	111.6	109.7	116.6						
TRIALSIDE	2130	115.16		112.0	115.5	116.8	119.0	112.8	111.2	118.9						
GOLF BRIDGE		N/A		113.2	116.8	118.1	120.1	113.6	N/A	N/A						
HWY 6		122.07		115.6	118.6	119.9	122.5	115.2	114.2	119.6						
PINE FALLS		123.45		117.6	120.5	121.8	124.2	115.8	116.5	121.2						
SUNNY RIDGE		127.31		121.0	123.0	124.1	126.3	116.7	122.5	122.2						

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ