MEMORANDUM

HARRIS COUNTY FLOOD CONTROL DISTRICT
9900 Northwest Freeway
Houston, TX 77092
713-684-4000

DATE: September 27, 2019

TO: HCFCD Flood Watch/Partners

FROM: Jeff Lindner
Meteorologist / Hydrologic Operations Director

RE: Immediate Flood Report – #1
September 19, 2019 – Rainfall and Flood Information

This is the first report summarizing the heavy rainfall and flooding associated with the landfall and slow movement of Tropical Storm Imelda along the upper Texas coast from September 17th to September 19th.

GENERAL FLOODING STATEMENT

Tropical Storm Imelda formed quickly just off the Brazoria County coast 15 miles south southwest of Freeport, TX around noon on Tuesday, September 17th and moved inland near Freeport, TX shortly after becoming a tropical storm. The center of Imelda moved north-northwest into southern Harris County during the early evening hours of the 17th with moderate to at times heavy rain bands affecting the southeastern and southern portions of the county through the evening and overnight hours of the 17th into the 18th. The center moved north-northeast into southern Montgomery County during the morning hours of the 18th with heavy rains focusing through noon across northeast Harris and southeast Montgomery Counties. As the center moved northeast slowly toward Lake Livingston into the overnight hours of the 18th into the morning of the 19th a large feeder band of intense rainfall developed from Jefferson County west-northwestward into Chambers and Liberty Counties. This band of excessive rainfall then built northwest into central Montgomery County while training over portions of Liberty, Chambers, and Jefferson Counties for several hours resulting in tremendous rainfall amounts of 15-35 inches and catastrophic flooding. After sunrise on the 19th, this band of extremely heavy rainfall began to slowly progress southwest into northeast Harris County and eventually moved southward across the eastern half of the county throughout the 19th. Extremely heavy rainfall rates accompanied this band and resulted in rapid flash flooding across the northeast, north-central, and central portions of Harris County from mid morning to early evening on the 19th. A flash flood emergency was issued for northeast Harris County at 8:50 a.m. and was extended southwest to include the Spring, Aldine, Sheldon, and Downtown areas by late morning.

Dry grounds initially during the landfall of Imelda helped prevent significant flooding impacts associated with the rainfall on the 17th and 18th however increasingly saturated soil conditions and intense short duration rainfall rates on the 19th produce extensive urban flash flooding and channel flooding.

The Harris County Sherriff's Office responded to 425 high water rescue calls and 365 stranded vehicles. The Houston Fire Department responded to 918 water rescues and the Houston Police Department to 1,081water rescues. There has been one confirmed fatality related to Imelda in Harris County where an individual drove into a flooded underpass at US 59 and Will Clayton Parkway.

SEPTEMBER 17-19 RAINFALL

Duration – While rainfall associated with Imelda fell over a 48-hr period, the majority of the rainfall and most intense rainfall occurred in a 3-hr to 12-hr period on the 19th.

Imelda demonstrated the susceptibility of the area to intense short duration rainfall rates. During the initial landfall and subsequent passage of the center of Imelda across Harris County hourly rainfall rates generally average less than 1.5 inches and many areas experienced less than .50 of an inch rates. The result was modest amounts of run-off, sporadic street flooding, and little to no flooding of area creeks and bayous. In stark contrast, the hourly rainfall rates on the 19th were in excess of 4.0-6.0 inches across much of north-central, northeast, and eastern Harris County which resulted in rapid and deep urban flash flooding and sheetflow, deeply flooded underpasses and streets, and several bayous and creeks exceeding their banks. How rainfall impacts Harris County is strongly tied to how fast the rain falls (rainfall rate) and this was clearly evident throughout the various rainfall events during Imelda and the widely varying short term rainfall rates.

Total Amounts – Total 48-hr rainfall amounts averaged 10.0-15.0 inches from the Spring Branch area to Lake Houston and 20.0-30.0 inches from Crosby to Huffman. 12-hr storm totals averaged 6.0-10.0 inches from the Spring Branch area to Lake Houston and 13.0-18.0 inches from Crosby to Huffman. 3-hr storm totals averaged 6.0-10.0 inches from northwest Houston to Huffman. 1-hr storm totals averaged 4.0-6.0 inches from Humble to northwest Houston including a maximum 1-hr total of 6.4 inches at Greens Bayou and US 59 and a 2-hr total of 9.2 inches.

While just outside of Harris County, a 48-hr rainfall of 30.4 inches was recorded on the East Fork of the San Jacinto River at FM 2090 in the Plum Grove area.
.

The table below indicates maximum rainfall for Harris County gage locations

Duration	Max Rainfall (in)	Duration	Max Rainfall (in)
5-min	1.2	3-hr	10.9
15-min	2.1	6-hr	14.3
30-min	3.8	12-hr	17.9
1-hr	6.4	24-hr	21.1
2-hr	9.2	48-hr	29.1

Exceedance Probability –

Note: All rainfall exceedance probabilities are based off the newly adopted NOAA ATLAS 14 rainfall study for Texas.

Rainfall for the 48-hr time period:

- Cedar Bayou: between the 10% (10-yr) and 2% (50-yr)
- West Fork of the San Jacinto River: 4% (25-yr)
- East Fork of the San Jacinto River: 1% (100-yr)
- San Jacinto River below Lake Houston: 20% (5-yr)
- Luce Bayou: between the 2% (50-yr) and 1% (100-yr)
- Greens Bayou: between the 50% (2-yr) and 4% (25-yr)
- Halls Bayou: 10% (10-yr)
- Hunting Bayou: between the 20% (5-yr) and 10% (10-yr)
- Brays Bayou: between the 50% (2-yr) and 10% (10-yr)
- White Oak Bayou: between the 20% (5-yr) and 10% (10-yr)
- Buffalo Bayou: between the 20% (5-yr) and 10% (10-yr)

Rainfall for the 3-hr time period:

- Cedar Bayou: between the 50% (2-yr) and 2% (50-yr)
- West Fork of the San Jacinto River: between the 4% (25-yr) and 2% (50-yr)
- East Fork of the San Jacinto River: between the 2% (50-yr) and 1% (100-yr)
- San Jacinto River below Lake Houston: 20% (5-yr)
- Luce Bayou: between the 4% (25-yr) and 2% (50-yr)
- Greens Bayou: between the 50% (2-yr) and 1% (100-yr)
- Halls Bayou: between the 4% (25-yr) and 2% (50-yr)
- Hunting Bayou: between the 50% (2-yr) and 10% (10-yr)
- Brays Bayou: between the 50% (2-yr) and 10% (10-yr)
- White Oak Bayou: between the 20% (5-yr) and 2% (50-yr)

RAINFALL COMPARISON OF IMELDA, HARVEY, AND ALLISON

A comparison of the spatial coverage of Harvey and Imelda shows that the 10 inch rainfall area was about five times smaller for Imelda over southern Texas. Additionally the maximum rainfall total for Harvey was 60.58 inches at Nederland, TX and the maximum rainfall for Imelda was 43.39 inches at Fannett, TX near the Jefferson/Chambers County line. However many of the same areas that were heavily impacted by Harvey were also greatly impacted by Imelda. One significant factor with Imelda that did differ from Harvey was the extreme short duration rainfall rates. Much of the rainfall with Imelda fell in less than 48 hours compared to 4 days with Harvey. Due to this extreme amount of rainfall in a short period of time, flooding at some locations was worse and deeper than Harvey in Liberty, Chambers, and Jefferson Counties. In

eastern Harris County, upper Cedar Bayou from the headwaters to north of US HWY 90 had water levels similar to Harvey.

The following chart compares the maximum rainfall amounts recorded in Harris County from Tropical Storm Imelda, Hurricane Harvey, and Tropical Storm Allison for various time periods.

	Imelda	Harvey	Allison
5-min	**1.2**	.90	1.1
15-min	**2.1**	2.0	2.2
30-min	**3.8**	3.6	4.2
1-hr	**6.4**	6.8	5.7
2-hr	**9.2**	11.9	9.9
3-hr	**10.9**	14.8	13.5
6-hr	**14.3**	18.9	21.2
12-hr	**17.9**	20.9	28.3
24-hr	**21.1**	28.6	28.4
2-day	**29.1**	35.2	28.5
4 day	**29.7**	47.4	38.5

Imelda produced incredible short duration rainfall rates that exceeded Harvey in the 5, 15, and 30 minute time periods. Harvey and Allison exceed Imelda in nearly each time period after 1-hr. Harvey exceeds Imelda's 4 day storm total by 18.0 inches and Allison exceeds Imelda's 4 days storm total by 8.8 inches.

A COMPARISON OF RECENT RAINFALLS IN HARRIS COUNTY

Since 2015 Harris County has suffered multiple significant rainfall events that have resulted in some of the most devastating flooding in modern times across the county. A review of rainfall data for each one of these events for the 24-hr durations yields a total of six storms that have produced a total of at least ten inches of rainfall in some portion of Harris County. Of these six storm events, two (Harvey and Imelda) produced over 20 inches of rainfall in some portion of Harris County. Of the six storm events two were tropical systems, Harvey and Imelda and the other four were a result of mid latitude weather systems (fronts) with no tropical weather influences.

Using the 24-hr rainfall data for each of these storm events against the NOAA ATLAS 14 rainfall study yields the following results:

Storm Event	**Max Point Rainfall (in)**	**Exceedance Probability**
5-26-15 (Memorial Day)	11.0	10-yr
10-31-15 (Halloween)	11.9	10-yr
4-18-16 (Tax Day)	17.6	100-yr
5-27-16 (Memorial Weekend)	13.4	50-yr
8-27-17 (Harvey)	28.6	500-yr
9-19-19 (Imelda)	21.1	100-yr

Based on the data in the table, some portion of Harris County has recorded two 1% (100-yr) rainfall events (Tax Day and Imelda) and one .2% (500-yr) rainfall event (Harvey) in the last 5 years based on the NOAA ATLAS 14 rainfall study. A more robust review of gage data over the last 5 years indicates that only four gage locations in Harris County have recorded more than one 1% (100-yr) rainfall event. These four locations are located along the western portion of Cypress Creek and in Addicks Reservoir and result from the Tax Day Flood and Harvey. The peak rainfall recorded during Tropical Storm Allison for the 24-hr period was 28.4 inches which exceeds the .2% (500-yr) NOAA ATLAS 14 exceedance probability. When the length of record is expanded to the last 20 years, some portions of Harris County have experienced two .2% (500-yr) rainfall events (Allison and Harvey).

The 24-hr period is only one time period out of many to examine a rainfall event, the table below summarizes the peak rainfall amounts for the major rainfall events in the last 5 years and also includes Tropical Storm Allison and is color coded based on NOAA ATLAS 14 exceedance probabilities for the various time periods.

Storm Event	15-min	30-min	1-hr	2-hr	3-hr	6-hr	12-hr	24-hr	2-day	4-day
Allison	2.3	4.1	6.5	9.9	13.6	21.2	28.3	28.5	28.7	38.5
5-26-15	2.2	3.4	4.8	6.9	8.4	10.1	11.0	11.0	11.7	12.4
10-31-15	1.5	2.4	4.2	6.4	7.4	8.5	11.8	11.9	13.1	13.1
4-18-16	2.2	3.4	4.7	7.3	7.9	13.5	16.6	17.4	17.6	19.2
5-27-16	1.5	2.4	3.6	5.2	6.2	7.4	8.1	13.4	13.4	13.4
Harvey	2.0	3.6	6.8	11.8	14.8	18.9	20.9	28.6	35.2	47.4
Imelda	2.1	3.8	6.4	9.2	10.0	13.1	17.6	21.1	29.1	29.7

Exceedance Probability	2-yr	5-yr	10-yr	25-yr	50-yr	100-yr	500-yr

Tropical Storm Allison, the Tax Day Flood, Harvey, and Tropical Storm Imelda all produced 1% (100-yr) and .2% (500-yr) rainfall amounts for various time periods.

CHANNEL FLOODING

Major overbank and structural flooding occurred along the following channels

- Halls Bayou
- Greens Bayou and lateral tributary P138-00-00
- Luce Bayou
- East Fork of the San Jacinto River
- West Fork of the San Jacinto River
- San Jacinto River below Lake Houston
- Cedar Bayou
- Brickhouse Gully
- Little White Oak Bayou

Overbank channel flooding occurred along the lower portion of Cypress Creek east of Aldine Westfield and lower White Oak Bayou from the confluence with Buffalo Bayou to west of Heights Blvd. The overflow of lower White Oak Bayou and lower Little White Oak Bayou inundated the mainlanes of I-10 and I-45 north of Downtown Houston stranding hundreds of vehicles and motorists on both freeways for hours. Overbank conditions occurred along the lower portions of Gum Gully as a result of backwater from the high levels in the San Jacinto River below Lake Houston.

Luce Bayou:
Significant flooding occurred along Luce Bayou from the headwaters in Liberty County to the confluence with Lake Houston. High water marks indicate the water surface elevation was between the 2% (50-yr) and 1% (100-yr) along the entire bayou. Structure flooding occurred upstream of FM 2100 due to the high levels of Luce Bayou. Imelda is the 3rd highest flood along Luce Bayou behind Harvey and the October 1994 flood. Imelda was 5.0 ft lower than water levels experienced during Harvey and 3.0 ft lower than the October 1994 flood. Harvey remains the flood of record along Luce Bayou.

Cedar Bayou:
Widespread and significant flooding occurred along Cedar Bayou from the headwaters in Liberty County to I-10. The bayou exceeded the .20% (500-yr) water surface elevation from the headwaters to US HWY 90 and was between the 1% (100-yr) and .20% (500-yr) from US HWY 90 to I-10. Water elevations south of I-10 through the City of Baytown averaged generally below the 10% (10-yr) levels. High water marks were generally within 1.0 ft of Harvey from the headwaters of Cedar Bayou to above (north) of US HWY 90. Below (south) of HWY 90 high water marks were nearly identical to the Halloween Flood of 2015 and significantly lower than Harvey. In fact at HWY 146 in Baytown the water surface elevation for Imelda was 12.0 ft lower than Harvey. Cedar Bayou experienced an extended period of inundation from the rainfall of Imelda and multiple gradual rises well beyond the end of the rainfall. It is not clear as to the cause of these rises as this response has not been noted before in the behavior of this watershed. Harvey remains the flood of record along Cedar Bayou, although Imelda's high water marks were very close to Harvey's at FM 1960 in the headwaters of the watershed.

East Fork of the San Jacinto River:
Significant flooding occurred along the East Fork of the San Jacinto River from southeast Montgomery County to the confluence with Lake Houston. Water surface elevations averaged between the 1% (100-yr) and .20% (500-yr) levels. At FM 1485 Imelda was the 3rd highest known water surface elevation, behind Harvey and the October 1994 flood. The flooding along the East Fork of the San Jacinto River was shorter in duration than usual and this is likely a function of the rainfall falling directly on and just upstream of northeast Harris County versus other rainfall events where the heavy rainfall axis was near and north of Cleveland resulting in a much longer flood along the lower portions of the river in northeast Harris County. Harvey remains the flood of record along the East Fork of the San Jacinto River.

West Fork of the San Jacinto River:

Flooding occurred along the West Fork of the San Jacinto River with water surface elevations averaging between a 10% (10-yr) and 2% (50-yr) level. Flooding along the river was well below that experienced during Harvey and the October 1994 Flood by several feet and was most similar to flooding experienced in April 2016 during the "Tax Day" Flood. Much of the structure flooding that occurred in the Kingwood area was not a result of flooding from the river, but instead flooding of local drainage systems that were overwhelmed from the intense short duration rainfall rates. Harvey remains the flood of record along the West Fork of the San Jacinto River.

Lake Houston:
Water surface elevations at the Lake Houston Spillway rose to 48.20 ft which is the 4th highest known flood since 1979. Water surface elevations were 4.0-5.0 feet lower than the October 1994 Flood and Harvey. High water marks were obtained both on the upstream (north) and downstream (south) sides of the FM 1960 bridge over Lake Houston. The upstream mark was 48.90 ft and the downstream mark was 48.44 ft. These marks indicate a difference across the FM 1960 bridge of .46 of a foot between the upstream and downstream sides of FM 1960. The water surface elevations averaged between a 10% (10-yr) and 2% (50-yr) at the Lake Houston spillway and near the 2% (50-yr) at the FM 1960 bridge. A few of the lowest structures near the lake were flooded as well as numerous docks and piers. An estimated 155,000 cfs passed over the Lake Houston spillway at the peak of the flooding on the morning of September 20th. Harvey remains the flood of record for Lake Houston.

San Jacinto River Below Lake Houston:
Water surface elevations below (south) of the Lake Houston Spillway averaged between a 10% (10-yr) and 2% (50-yr) level. Flooding occurred along much of the river to the confluence with Galveston Bay including Rio Villa which was completely cut-off and portions of Highlands and Sheldon near the river. Water surface elevations were similar to the May 2016 flood and were 6-10 feet below Harvey elevations. Strong currents in the river resulted in multiple barges breaking mooring upstream of I-10 early on the morning of the 20th. Several of the barges struck the I-10 westbound lanes and resulted in significant damage to the bridge pillars and a total closure of I-10 from the 20th until the 24th. TXDOT reconfigured traffic lanes to allow both west and east bound traffic on the east bound bridge until repairs can be made to the damaged westbound pillars.

Halls Bayou:
Flooding occurred along Halls Bayou between I-45 and US 59. Water surface elevations were between the 10% (10-yr) and 2% (50-yr) from the confluence with Greens Bayou upstream to Homestead Road. The high water mark at Mesa Rd. just upstream of the confluence with Greens bayou indicated a 1% (100-yr) elevation. Between Homestead Rd and Aldine Westfield, water surface elevations were below the 10% (10-yr) level and generally between the 10% (10-yr) and below the 2% (50-yr) from Aldine Westfield to near I-45. Significant flooding occurred in the portion of the bayou between I-45 and the Hard Toll Rd. Water surface elevations along Halls Bayou averaged 2.0-3.0 feet below Harvey and Tropical Storm Allison levels. Tropical Storm Allison remains the flood of record along most of Halls Bayou.

Greens Bayou:
Flooding occurred along Greens Bayou downstream of Beltway 8 with the most significant flooding occurring at and downstream of East Mt. Houston. Water surface elevations averaged generally less than a 10% (10-yr) level along much of Greens Bayou, except for the reach between US HWY 90 and East Mt. Houston Rd where levels were between the 10% (10-yr) and 2% (50-yr). East Mt. Houston Rd recorded a 1% (100-yr) water surface elevation. It is hypothesized that the significantly higher water surfaces at East Mt. Houston, Tidwell, and Ley Rd is a result of the intense short duration rainfall that was recorded at US 59 likely resulting in a rapid and strong contribution of storm run-off into the bayou downstream. Additionally, the inflow from Garners Bayou just upstream of East Mt. Houston contributed additional flows. Harvey remains the flood of record along Greens Bayou downstream of East Mt. Houston and Tropical Storm remains the flood of record upstream of East Mt. Houston.

Garners Bayou:
Overbank flooding occurred along much of Garners Bayou from the eastern portions of BUSH IAH to the confluence with Greens Bayou. Water surface elevations were at the 1% (100-yr) elevation at Beltway 8 and deep flooding was noted along portions of the Beltway 8 feeder roads and in subdivision streets near the bayou, but no structures were impacted. Water surface elevations averaged near the 10% (10-yr) from Rankin Road into BUSH IAH. Water surface elevations along Garners Bayou were very similar to those experienced in the October 2002 Flood and were generally 2.0 ft below Harvey and 1.0 ft below Tropical Storm Allison levels. Harvey remains the flood of record along Garners Bayou.

Hunting Bayou:
Water surface elevations along Hunting Bayou averaged less than the 10% (10-yr) level from the headwaters downstream to the 610 East Loop. Between the 610 East Loop and Market St. water surface elevations averaged between the 10% (10-yr) and 2% (50-yr). Water surface elevations for Imelda were generally 3.0-5.0 feet lower than Harvey and Tropical Storm Allison and were similar to the Halloween Flood of 2015 and Tropical Storm Erin (2007). Tropical Storm Allison remains the flood of record along Hunting Bayou.

Little White Oak Bayou:
Flooding occurred along Little White Oak Bayou mainly upstream (north) of the 610 north Loop. Water surface elevations averaged between the 2% (50-yr) and 1% (100-yr) from North Main to Cottage and between the 1% (100-yr) and .20% (500-yr) at Patton and Cavalcade. Upstream of Cavalcade water surface elevations were between the 10% (10-yr) and 2% (50-yr). Water surface elevations were similar to Harvey from Patton upstream to the headwaters and 2.0-3.0 feet below Harvey downstream of Patton. Tropical Storm Allison exceeded both Imelda and Harvey by 4.0 ft at Tidwell. Tropical Storm Allison remains the flood of record along Little White Oak Bayou.

Brickhouse Gully:
Intense short duration rainfall rates yielded an extremely rapid response along Brickhouse Gully with flooding occurring along much of the channel. Water surface elevations varied from between the 10% (10-yr) to 2% (50-yr) near and downstream of Costa Rica to between the 2% (50-yr) and 1% (100-yr) upstream of Antoine. Water surface elevations were similar to the May 2015 "Memorial Day" Flood and several feet below Tropical Storm Allison and 2.0 feet below Harvey. Tropical Storm Allison remains the flood of record along Brickhouse Gully.

HOUSE FLOODING ESTIMATES

House flooding occurred from bayous, creeks, rivers, and tributaries exceeding their banks as well as internal drainage systems being overwhelmed by the intense short duration rainfall rates. Early reports from damage assessment teams indicate between 1000-1500 homes were flooded in unincorporated Harris County and the City of Houston. Various damage assessment teams are actively surveying known and suspected flood areas to determine the extent of the structure flooding. Areas of known structure flooding from creeks and bayous include:

- Halls Bayou
- Greens Bayou
- Luce Bayou
- Cedar Bayou
- Brickhouse Gully
- Little White Oak Bayou

There has also been reported structure flooding from internal drainage systems being overwhelmed in the Kingwood, Aldine, Greenspoint, Spring, Spring Branch, Huffman, and Crosby areas.

HIGH WATER MARKS

HCFCD crews collected a total of 189 high water marks within the following watersheds: Cedar Bayou, San Jacinto River, Luce Bayou, Hunting Bayou, Greens Bayou, Halls Bayou, Little White Oak Bayou, Brickhouse Gully, and Brays Bayou. Marks were obtained in detention basins along Greens, Halls, Hunting, and Brays Bayous.

HARRIS COUNTY FLOOD CONTROL DISTRICT ACTIONS

- The HCFCD Flood Watch team was activated from 6:00 p.m. September 17th until 3:00 p.m. September 20th.
- HCFCD had 3-5 staff deployed in the Harris County Emergency Operations Center and Joint Information Center throughout the duration of the event.

- HCFCD conducted approximately 60 media interviews
- The Clear Creek Second Outlet Gates were opened on Tuesday, September 20th at 10:30 a.m. and closed on Monday, September 23rd at 10:15 am
- Flood Warning System:
    - 137 gage locations recorded 1 inch of rainfall in 15 minutes
    - 32 gage locations recorded 4 inches of rainfall in 1 hour
    - 73 gage locations recorded channel elevations within 3.0 ft of bankfull
    - 43 gage locations recorded channel elevations at or above bankfull
    - 27 discharge measurements were conducted
    - 3 out of 177 HCFCD Flood Warning System gages failed during the event
        - Brays Bayou at Stella Link – water level sensor damaged during flood, rainfall continued to functioned
        - Lake Houston at FM 1960 – low rainfall, water level functioned
        - San Jacinto River at Rio Villa – low rainfall, water level functioned

HARRIS COUNTY FLOOD CONTROL DISTRICT FACILITIES CONDITIONS

The HCFCD channels and detention basins functioned as designed and helped to reduce flood levels. 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 observed. HCFCD mowing contractors had completed the 2nd of 3 mowing cycles on September 6th. At the onset of rainfall associated with Tropical Storm Imelda, there were no outstanding service requests related to debris of channel blockages.

HCFCD staff is currently checking channels and detention basins for any blockages, erosion, bank failures, and other storm related problems. To date, HCFCD is estimating a total of 10,000 cubic yards of debris in channels and detention basins that will require a removal cost of $730,000 dollars.

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	0.3	0.7	0.8	1.3	1.6	1.8	2.6	3.0	4.6	7.4	9.7	A100 Clear Lake 2nd Outlet @ SH 146
105	0.2	0.6	0.9	1.4	2.0	2.8	4.5	6.0	8.0	9.5	12.2	Mary's Creek @ Winding Road
110	0.2	0.4	0.7	1.1	1.4	1.8	2.1	3.2	5.6	7.1	9.2	A100 Clear Creek @ I-45
115	0.2	0.5	0.8	1.0	1.6	2.2	3.6	4.9	6.3	7.8	10.0	Cowart Creek @ Baker Road
120	0.2	0.5	0.8	1.2	1.8	2.4	4.0	5.7	7.5	9.3	11.4	A100 Clear Creek @ FM 528
125	0.3	0.6	1.0	1.6	2.4	3.1	5.0	6.2	7.5	8.8	10.6	Chigger Creek @ Windsong Lane
130	0.2	0.4	0.6	1.0	1.5	1.8	2.8	3.8	5.7	7.0	8.6	A100 Clear Creek @ Bay Area Boulevard
135	0.3	0.6	0.8	1.2	1.6	2.2	4.2	6.2	8.4	9.8	11.9	A100 Clear Creek @ FM 2351
140	0.3	0.8	1.2	1.7	1.8	2.0	3.4	6.2	9.2	10.7	13.2	A119 Turkey Creek @ FM 1959
150	0.4	0.9	1.2	1.5	1.8	2.1	2.8	4.3	5.8	7.6	9.8	A100 Clear Creek @ Country Club Drive
160	0.3	0.8	1.2	1.5	1.6	1.9	3.4	5.8	8.1	9.4	11.5	A120 Beamer Ditch @ Hughes Road
170	0.1	0.3	0.6	1.1	1.6	1.8	2.6	3.6	6.0	7.9	10.2	A100 Clear Creek @ Nassau Bay
175	0.3	0.6	1.0	1.3	1.4	1.5	2.8	4.2	5.9	7.0	8.9	A100 Clear Creek @ Pearland Pkwy
180	0.3	0.6	0.9	1.5	1.9	2.1	2.6	4.2	5.7	7.5	9.4	A100 Clear Creek @ Mykawa Road
190	0.4	0.9	1.4	2.2	2.6	2.9	3.4	4.2	5.0	8.0	9.1	A100 Clear Creek @ SH 288
200	0.4	0.8	0.9	1.3	1.6	1.7	2.9	3.2	5.2	7.4	10.0	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	0.8	1.2	1.5	1.8	2.5	3.0	5.2	7.2	9.8	B100 Armand Bayou @ Pasadena Lake (Nasa Road 1)
220	0.4	0.8	1.0	1.1	1.4	1.8	2.6	3.4	6.0	7.5	9.6	B100 Armand Bayou @ Genoa-Red Bluff Road
230	0.3	0.7	1.0	1.4	1.8	2.0	2.6	2.9	5.0	7.2	10.0	B106 Big Island Slough @ Fairmont Parkway
250	0.3	0.7	0.8	1.1	1.5	1.6	2.7	3.2	6.2	7.6	10.0	B104 Horsepen Creek @ Bay Area Boulevard
270	0.3	0.6	1.0	1.2	1.7	1.9	2.7	3.3	6.4	8.1	10.8	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	0.7	0.9	1.1	1.3	1.6	2.4	3.1	5.4	7.4	9.8	C106 Berry Bayou @ Nevada Avenue
320	0.3	0.6	0.9	1.2	1.6	1.8	3.2	3.8	5.5	8.3	10.4	C106 Berry Bayou @ Forest Oaks Boulevard
340	0.2	0.6	1.0	1.6	2.5	2.9	3.3	3.4	5.2	8.7	10.7	C100 Sims Bayou @ Telephone Road
360	0.4	0.8	1.3	2.3	3.0	3.4	3.8	5.5	6.7	11.1	12.5	C100 Sims Bayou @ Martin Luther King Road
370	0.5	1.2	1.9	2.6	3.2	3.6	3.8	4.5	5.3	10.1	11.1	C100 Sims Bayou @ SH 288
380	0.4	0.8	1.3	2.2	2.8	3.2	3.5	3.6	4.7	8.5	9.3	C100 Sims Bayou @ Hiram-Clarke Road

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	0.9	1.6	2.4	3.0	3.6	3.9	3.9	5.5	9.4	10.3	NRG Park
400	0.4	0.8	1.2	2.0	2.7	3.7	4.0	4.0	5.4	9.5	10.9	D109 Harris Gully @ South McGregor Way
405	0.4	0.8	1.4	2.4	3.8	4.5	4.8	4.9	6.4	10.3	11.6	D100 Brays Bayou @ Martin Luther King Blvd
410	0.3	0.8	1.5	2.7	4.1	5.1	5.4	5.5	7.0	10.8	12.0	D100 Brays Bayou @ Lawndale Street
420	0.4	0.9	1.5	2.2	3.0	3.6	3.9	3.9	5.1	8.1	8.8	D100 Brays Bayou @ South Main Street
430	0.4	1.0	1.8	2.7	3.5	4.0	4.2	4.2	6.1	9.0	9.7	D100 Brays Bayou @ Stella Link Road
435	0.4	1.2	2.3	3.4	3.7	4.2	4.6	4.6	8.2	12.0	12.6	D112 Willow Water Hole @ Willowbend Boulevard
440	0.5	1.2	2.2	3.6	3.8	3.9	4.2	4.2	8.1	11.3	11.9	D100 Brays Bayou @ Rice Avenue
445	0.4	0.9	1.7	2.2	2.8	3.2	3.6	3.6	5.8	8.7	9.2	D112 Willow Water Hole @ Landsdowne Drive
460	0.5	1.1	1.9	2.6	3.6	4.2	4.6	4.6	7.3	10.4	10.8	D100 Brays Bayou @ Gessner Road
465	0.5	1.4	2.2	3.0	5.0	5.5	5.9	5.9	7.5	9.8	10.2	D100 Brays Bayou @ Beltway 8
470	0.5	1.0	2.0	3.2	4.6	5.0	5.4	5.4	6.5	8.4	8.8	D100 Brays Bayou @ Belle Park Drive
475	0.5	1.3	2.0	2.9	4.9	5.2	5.6	5.6	6.8	9.1	9.4	D100 Brays Bayou @ Bellaire Boulevard
480	0.4	1.1	1.9	2.8	3.6	4.3	4.8	4.8	5.8	8.6	9.0	D118 Keegans Bayou @ Roark Road
485	0.6	1.5	2.1	3.9	4.8	5.1	5.3	5.3	6.0	7.6	7.8	D100 Brays Bayou @ SH 6
490	0.5	1.6	2.5	3.1	3.8	4.3	4.8	4.8	5.4	7.0	7.4	D118 Keegans Bayou @ Keegan Road
495	0.6	1.5	2.5	4.1	4.5	4.9	5.2	5.2	5.6	7.0	7.3	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	0.5	1.5	2.6	4.1	5.6	6.7	7.0	7.0	7.7	10.3	10.6	Harris County Flood Control @ Brookhollow
520	0.4	1.1	1.8	2.9	3.7	5.0	5.3	5.3	5.9	8.5	9.2	E100 White Oak Bayou @ Heights Boulevard
530	0.6	1.4	2.4	4.2	5.6	6.8	7.1	7.2	8.0	9.8	10.1	E100 White Oak Bayou @ Ella Boulevard
535	0.8	1.8	3.2	4.7	5.6	6.4	7.2	7.2	9.0	11.4	11.9	E100 White Oak Bayou @ Pinemont Drive
540	0.6	1.4	2.7	3.8	5.1	5.7	6.7	6.7	7.1	9.3	9.6	E100 White Oak Bayou @ Alabonson Road
545	0.4	1.0	1.6	1.8	2.3	2.6	3.4	3.4	3.6	5.6	5.8	E100 White Oak Bayou @ Fairbanks North Houston Road
550	0.3	0.8	1.0	1.1	1.4	1.5	2.5	2.5	2.6	4.3	4.4	E100 White Oak Bayou @ Lakeview Drive
555	0.2	0.5	0.7	0.9	1.1	1.4	2.2	2.2	2.4	3.2	3.3	E100 White Oak Bayou @ Jones Road
560	0.3	0.9	1.8	2.8	3.8	4.6	5.1	5.2	6.5	9.2	10.0	E101 Little White Oak Bayou @ Trimble Street
570	0.7	1.9	3.2	5.7	7.3	8.0	8.8	8.9	10.9	13.1	13.6	E101 Little White Oak Bayou @ Tidwell Road
575	0.6	1.6	3.0	4.5	5.4	6.2	7.0	7.0	8.6	11.0	11.3	E100 White Oak Bayou @ Tidwell Road
580	0.6	1.6	2.9	4.0	5.1	6.0	6.6	6.6	8.2	10.4	10.7	E115 Brickhouse Gully @ Costa Rica Road
582	0.5	1.4	2.3	4.4	6.6	7.2	7.9	7.9	8.8	11.4	11.7	E115 Brickhouse Gully @ Hollister
585	0.6	1.6	3.0	4.3	5.8	6.4	7.4	7.4	7.9	10.4	10.7	E121 Vogel Creek @ Victory Drive
590	0.6	1.6	3.0	4.4	5.4	6.0	6.8	6.8	7.8	10.2	10.4	E117 Cole Creek @ Deihl Road
595	0.5	1.3	2.4	3.2	4.2	4.8	5.6	5.7	6.0	8.0	8.3	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	0.3	0.6	0.7	0.9	1.6	2.1	2.7	3.2	5.0	6.6	9.1	A104 Taylor's Bayou @ Shoreacres Boulevard
620	0.4	0.9	1.3	1.6	1.8	2.2	2.7	2.8	3.8	6.6	9.2	F216 Little Cedar Bayou @ 8th Street
640	0.4	1.1	2.0	2.8	3.1	3.4	3.9	4.0	5.9	9.3	11.3	F101 Lateral @ Sens Road

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	0.1	0.2	0.4	0.7	1.2	1.5	2.2	3.2	4.2	7.6	9.6	G103 San Jacinto River @ Rio Villa
720	0.4	0.8	1.4	2.4	4.2	5.5	5.9	6.0	7.1	9.6	10.4	G103 San Jacinto River @ US 90
750	0.6	1.4	2.5	4.6	7.4	9.4	10.4	10.8	11.8	18.1	19.0	G103 Lake Houston Dam Spillway
755	0.5	1.1	2.2	3.8	6.3	8.0	9.8	10.8	11.8	17.2	17.7	G103 San Jacinto River @ Kingwood Country Club
760	0.6	1.6	2.9	5.4	7.4	9.0	11.0	11.6	11.8	15.9	16.3	G103 San Jacinto River @ US 59
765	0.5	1.3	2.3	3.2	6.4	7.5	9.6	11.9	12.9	16.4	16.6	G103 San Jacinto @ SH 99
770	0.6	1.5	1.9	2.6	4.4	6.4	7.3	8.3	9.9	13.2	13.2	G103 San Jacinto @ SH 242
780	1.2	1.5	2.7	4.8	8.6	10.9	14.3	16.0	18.2	25.0	25.2	Caney Creek @ FM 2090
785	0.6	1.5	2.5	3.8	5.6	8.2	12.8	17.9	20.2	26.8	27.3	Peach Creek @ FM 2090
790	0.6	1.6	2.8	4.5	7.4	10.0	13.2	17.6	21.1	29.1	29.7	G103 East Fork San Jacinto @ FM 1485
795	0.6	1.3	2.5	4.2	5.5	7.9	12.2	18.9	21.3	30.4	31.0	G103 East Fork San Jacinto @ FM 2090

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	0.3	0.8	1.0	1.5	2.6	3.2	3.6	3.8	5.6	8.7	10.1	H100 Hunting Bayou @ I-10
830	0.4	1.0	1.6	2.6	4.8	5.6	6.2	6.3	8.3	12.9	14.0	H100 Hunting Bayou @ Loop 610 East
840	0.4	0.9	1.6	3.0	4.8	5.2	5.9	6.0	8.1	12.1	13.0	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	0.3	0.7	1.0	1.1	1.6	1.7	2.6	3.6	5.4	8.6	10.4	I100 Vince Bayou @ West Ellaine Down Stream
940	0.3	0.7	1.0	1.3	1.9	1.9	2.4	3.1	5.6	8.4	10.1	I101 Little Vince Bayou @ Jackson Avenue
240	0.2	0.5	0.8	1.0	1.4	1.9	2.8	3.8	5.4	8.0	10.4	I101 Little Vince Bayou @ Burke Road

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
1050	0.4	1.2	1.9	3.0	4.5	4.8	5.0	5.4	5.8	8.0	8.0	J100 Spring Creek @ I-45
1052	0.2	0.3	0.4	0.6	0.8	0.9	0.9	0.9	1.0	1.4	1.4	Mill Creek @ FM 149
1054	0.1	0.2	0.2	0.4	0.4	0.5	0.6	0.6	0.7	1.0	1.0	Mill Creek @ FM 1486
1055	0.3	0.6	1.2	1.6	2.3	2.6	2.6	2.8	2.9	4.1	4.2	Bear Branch @ Kuykendahl
1056	0.2	0.3	0.4	0.4	0.5	0.6	1.0	1.0	1.0	1.2	1.3	Mill Creek @ FM 1774
1060	0.4	0.8	1.3	1.9	2.6	2.7	2.8	3.2	3.3	4.2	4.2	J100 Spring Creek @ Kuykendahl Road
1070	0.2	0.5	0.7	0.8	0.9	0.9	0.9	1.0	1.3	1.8	1.8	J100 Spring Creek @ SH 249
1072	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.9	1.1	1.6	1.6	Walnut Creek @ Nichols Sawmill
1074	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.6	1.0	1.0	Walnut Creek @ Joseph Road
1075	0.2	0.2	0.2	0.4	0.4	0.4	0.5	0.7	0.8	1.3	1.5	Tomball Repeater
1076	0.1	0.2	0.2	0.3	0.4	0.4	0.6	0.6	0.8	1.1	1.1	Birch Creek @ Riley Road
1080	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.5	0.6	0.9	1.1	J100 Spring Creek @ Cypress Rosehill
1084	0.2	0.3	0.4	0.5	0.6	0.6	0.6	0.6	0.6	0.9	0.9	Threemile Creek @ Joseph Road
1086	0.1	0.2	0.2	0.2	0.3	0.3	0.4	0.4	0.4	0.6	0.6	Threemile Creek @ FM 362
1090	0.0	0.1	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.6	0.6	J100 Spring Creek @ Hegar Road

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	0.6	1.6	2.7	5.2	7.2	8.1	9.6	10.1	10.2	14.0	14.1	K100 Cypress Creek @ Cypresswood Drive
1115	0.4	1.2	2.0	3.5	5.2	6.4	7.5	7.7	7.7	10.8	10.9	K600 Cypress Creek @ Inverness Forest
1120	0.4	1.1	1.6	3.1	5.0	6.4	7.5	7.6	7.7	10.6	10.8	K100 Cypress Creek @ I-45
1130	0.3	0.9	1.2	1.7	3.2	3.9	5.0	5.0	5.0	7.2	7.3	K100 Cypress Creek @ Kuykendahl Road
1140	0.3	0.7	0.9	1.3	2.1	2.6	4.3	4.3	4.3	6.2	6.4	K100 Cypress Creek @ Stuebner-Airline Road
1150	0.3	0.6	0.6	1.1	1.4	2.2	2.9	3.0	3.0	5.2	5.4	K100 Cypress Creek @ SH 249
1160	0.2	0.5	0.8	1.2	1.9	2.2	2.9	3.1	3.1	4.5	4.7	K100 Cypress Creek @ Grant Road
1165	0.2	0.6	0.9	1.4	2.1	2.5	3.2	3.6	3.6	4.5	4.7	K100 Cypress Creek @ Eldridge Parkway N.
1170	0.2	0.5	0.7	1.1	1.8	2.4	2.8	3.2	3.2	3.9	4.1	K100 Cypress Creek @ Huffmeister Road
1175	0.2	0.5	0.9	1.2	1.5	1.6	2.0	2.0	2.0	2.6	2.7	K100 Cypress Creek @ US 290
1180	0.1	0.2	0.3	0.3	0.4	0.4	0.6	0.6	0.6	0.9	0.9	K100 Cypress Creek @ Katy-Hockley Road
1185	0.2	0.4	0.6	0.6	0.8	0.8	0.9	0.9	0.9	1.2	1.2	K100 Cypress creek @ Sharp Road
1186	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.6	0.6	Live Oak Creek @ Penick Road
1190	0.1	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.6	0.6	K166 Little Mound Creek @ Mathis Road
1195	0.1	0.3	0.3	0.5	0.5	0.5	0.6	0.6	0.6	0.8	0.8	Mound Creek @ FM 362
1210	0.2	0.5	0.8	1.1	1.6	2.0	2.3	2.6	2.6	3.4	3.5	L100 Little Cypress Creek @ Kluge Road
1220	0.1	0.3	0.4	0.6	0.7	0.7	1.1	1.2	1.2	1.6	1.6	L100 Little Cypress Creek @ Cypress Rosehill Road
1230	0.2	0.3	0.4	0.4	0.4	0.4	0.7	0.8	0.8	1.0	1.0	L100 Little Cypress Creek @ Becker Road

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	0.3	0.7	1.1	1.4	1.5	1.6	1.6	2.0	3.0	4.0	4.0	M100 Willow Creek @ Kuykendahl Road
1340	0.2	0.4	0.6	0.7	0.8	0.8	0.8	1.0	1.4	1.9	2.0	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	0.4	1.1	1.6	1.8	2.2	2.6	3.2	3.4	5.8	9.7	10.9	N100 Carpenters Bayou @ I-10
1440	0.4	1.1	2.0	3.3	3.9	4.2	5.2	5.3	6.6	10.1	11.3	N100 Carpenters Bayou @ Wallisville Road
1460	0.5	1.4	2.4	3.4	4.4	5.3	6.4	6.4	8.1	11.8	12.8	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	1.2	1.7	3.1	3.7	3.8	3.9	4.6	7.9	10.5	12.8	O100 Goose Creek @ SH 146
1540	0.4	1.1	1.9	2.7	3.6	4.9	5.4	5.5	6.7	10.1	11.4	O100 Goose Creek @ Baker Road

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	1.4	2.4	4.2	6.5	7.2	8.5	8.9	10.0	14.8	15.2	P100 Greens Bayou @ Mount Houston Parkway
1610	0.4	1.0	1.5	2.1	2.6	3.3	3.7	4.0	6.1	9.7	11.2	P100 Greens Bayou @ Normandy Street
1620	0.5	1.3	2.4	4.2	5.4	6.7	7.6	7.8	10.0	15.6	16.5	P100 Greens Bayou @ Ley Road
1630	0.6	1.6	3.0	5.4	7.7	8.5	9.6	10.4	11.2	15.7	16.2	P130 Garners Bayou @ Beltway 8
1640	0.8	2.0	3.4	6.4	9.2	9.9	11.3	11.6	11.7	15.2	15.9	P100 Greens Bayou @ US 59
1645	0.7	2.1	3.8	5.8	7.0	7.8	9.2	9.6	9.7	12.1	12.8	P100 Greens Bayou @ Beltway 8
1650	0.6	1.9	3.3	4.9	7.2	7.8	9.2	9.7	10.3	14.2	14.9	P130 Garners Bayou @ Rankin Road
1655	0.5	1.3	2.0	2.7	3.4	3.8	5.8	6.0	6.0	7.7	8.1	P145 North Fork Greens Bayou @ Ella
1660	0.5	1.4	2.4	3.0	3.7	4.0	5.9	6.2	6.2	8.2	8.6	P100 Greens Bayou @ Knobcrest Drive
1665	0.4	1.0	1.2	1.4	2.1	2.6	4.2	4.6	4.7	6.5	6.7	P100 Greens Bayou @ Bammel N Houston Road
1670	0.4	0.9	1.2	1.7	2.3	2.8	4.3	4.6	4.6	6.9	7.1	P100 Greens Bayou @ Cutten Road
1685	0.5	1.4	2.6	4.2	5.4	6.5	7.7	8.0	9.2	15.5	16.4	P100 Greens Bayou @ Tidwell Road
1695	0.8	2.0	3.7	6.0	7.2	8.1	9.4	9.7	9.8	12.2	13.0	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	1.3	2.2	4.2	5.5	6.5	7.2	7.4	8.5	12.8	13.6	P118 Halls Bayou @ Tidwell Road
1680	0.8	2.0	3.4	5.2	6.9	7.4	8.0	8.2	9.5	13.0	13.4	P118 Halls Bayou @ Jensen Drive
1690	0.6	1.7	3.1	5.8	6.7	7.6	8.4	8.6	8.9	11.2	11.7	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	0.4	0.9	1.4	1.5	2.0	2.9	3.6	3.6	5.8	9.8	11.2	Q100 Cedar Bayou @ SH 146
1725	0.4	0.7	1.2	2.2	3.7	4.4	5.5	5.6	7.2	10.6	11.9	Smith Gully @ SH 146
1730	0.3	0.9	1.7	2.4	4.0	6.3	7.0	7.2	8.9	12.7	13.8	Q100 Cedar Bayou @ FM 1942
1740	0.6	1.5	2.5	4.8	7.9	9.2	10.4	11.6	14.0	19.3	20.7	Q100 Cedar Bayou @ US 90

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	0.4	1.1	1.9	3.0	5.4	7.2	8.0	8.4	10.0	15.1	16.3	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
1930	0.4	1.0	1.8	3.4	5.6	7.0	9.2	10.3	12.1	18.4	19.5	Huffman Repeater
1940	0.5	1.3	2.2	3.4	6.3	8.3	11.4	12.9	15.3	22.0	22.6	S100 Luce Bayou @ FM 2100

Rainfall Intensity Report

1AM 9-16-19 thru 1AM 9-20-19

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	0.4	1.0	1.6	2.2	3.4	3.9	4.4	4.4	5.0	6.1	6.2	Barker Dam
2015	0.5	1.1	1.7	2.5	3.2	3.5	3.6	3.6	3.9	4.8	4.9	Clodine Ditch @ Grand Mission
2020	0.6	1.4	2.4	3.8	5.3	5.5	5.6	5.6	5.9	6.6	6.6	T101 Mason Creek @ Prince Creek Drive
2025	0.4	1.0	2.0	3.6	4.7	4.9	4.9	5.0	5.4	6.2	6.2	T100 Buffalo Bayou @ Peek Road
2030	0.4	1.2	2.4	3.9	4.9	4.9	5.0	5.0	5.8	6.3	6.3	T100 Buffalo Bayou @ Greenbusch Road
2040	0.2	0.5	0.6	0.8	1.2	1.3	1.4	1.4	1.5	1.8	1.8	T100 Buffalo Bayou @ US 90
2050	0.2	0.6	1.0	1.3	1.9	2.1	2.4	2.4	2.8	3.0	3.1	Cane Island Branch @ Clay Road
2060	0.2	0.6	0.7	1.0	1.2	1.2	1.2	1.3	1.4	1.7	1.7	Willow Fork Creek @ Pederson Road
2090	0.2	0.4	0.4	0.5	0.8	1.2	1.7	1.7	1.9	2.1	2.1	Brookshire Katy Drainage District @ Morrison Road

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	0.4	1.0	1.8	2.4	4.3	5.3	5.9	5.9	6.2	7.6	7.6	Addicks Dam
2115	0.3	0.7	0.9	1.2	1.9	2.6	3.4	3.4	4.6	5.5	5.5	U100 Langham Creek @ Clay Rd
2120	0.2	0.4	0.6	0.9	1.3	1.8	2.6	2.6	2.9	3.4	3.4	U100 Langham Creek @ West Little York Road
2130	0.3	0.7	1.0	1.3	1.8	2.4	3.4	3.4	3.7	4.2	4.3	U106 Horsepen @ Trailside Drive
2140	0.4	0.9	1.3	1.6	1.8	2.2	2.8	2.8	3.2	3.6	3.6	U100 Langham Creek @ Longenbaugh Road
2150	0.4	1.1	2.1	2.6	3.7	4.1	4.4	4.4	4.6	5.2	5.2	U101 South Mayde @ Greenhouse Road
2160	0.2	0.6	1.0	1.2	1.8	2.2	2.7	2.8	3.8	4.2	4.2	U102 Bear Creek @ Clay Road
2170	0.3	0.6	1.0	1.4	2.2	2.5	2.7	2.7	3.1	3.3	3.3	U101 South Mayde @ Morton Road
2180	0.2	0.4	0.6	0.9	1.6	1.8	2.4	2.4	2.8	3.2	3.2	U102 Bear Creek @ FM 529
2185	0.3	0.4	0.7	0.8	1.0	1.4	1.6	1.6	1.8	2.2	2.2	John Paul Landing
2190	0.3	0.6	0.9	1.4	2.3	2.8	3.1	3.1	3.7	4.1	4.1	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	0.5	1.2	2.1	3.7	5.6	6.9	7.3	7.3	8.0	10.8	11.4	Houston Transtar
2210	0.4	1.0	1.8	3.1	4.1	4.8	5.4	5.5	6.6	10.5	11.3	W100 Buffalo Bayou @ Turning Basin
2220	0.3	0.7	1.1	1.7	2.3	3.6	4.0	4.1	4.9	8.5	9.3	W100 Buffalo Bayou @ Milam Street
2240	0.4	1.0	1.6	2.4	3.2	5.0	5.3	5.4	5.9	8.8	9.6	W100 Buffalo Bayou @ Shepherd Drive
2250	0.5	1.3	2.2	3.7	6.0	6.7	7.1	7.1	7.9	10.6	10.8	W140 Spring Branch @ Bingle Road
2253	0.6	1.8	3.0	4.9	7.6	8.3	8.8	8.8	9.9	12.8	13.0	W140-06 Buttermilk Creek @ Moorberry Lane
2255	0.5	1.2	2.1	3.4	5.8	6.4	6.7	6.8	7.4	10.1	10.3	W140-01 Briar Branch @ Campbell Road
2260	0.7	1.6	2.7	3.9	5.9	7.0	7.3	7.3	8.6	12.0	12.5	W100 Buffalo Bayou @ San Felipe Drive
2265	0.7	1.7	2.7	3.4	5.4	6.4	6.8	6.8	8.4	11.6	12.2	W100 Buffalo Bayou @ Piney Point Rd
2270	0.5	1.3	2.2	2.6	4.3	5.6	6.0	6.0	7.4	9.7	10.0	W100 Buffalo Bayou @ West Beltway 8
2280	0.4	1.0	1.5	2.1	3.8	5.0	5.4	5.4	6.2	8.4	8.5	W156 Rummel Creek @ Brittmoore Road
2290	0.4	1.1	1.5	2.0	3.7	4.4	4.8	4.9	5.5	7.5	7.7	W100 Buffalo Bayou @ Dairy Ashford Road

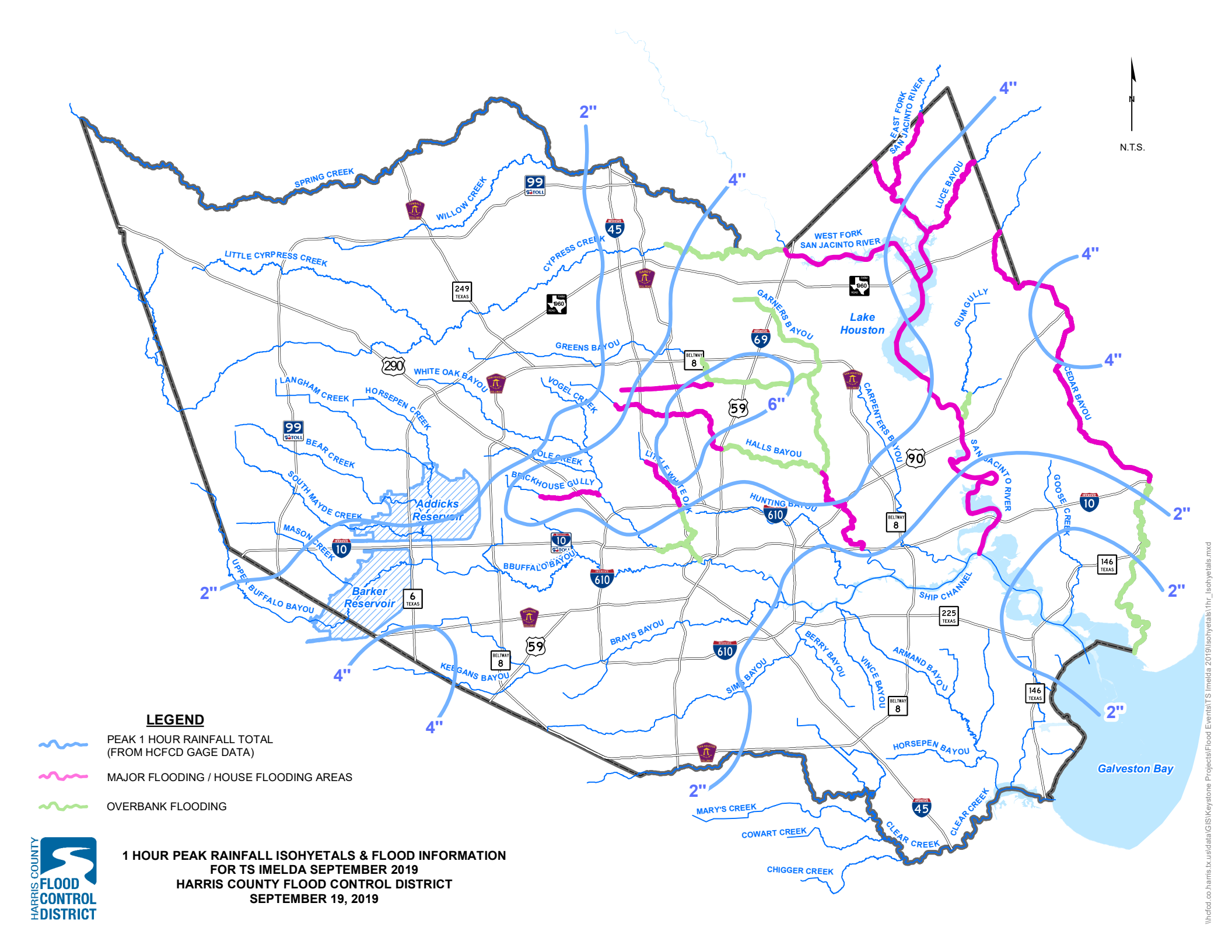
Rainfall Intensity Report

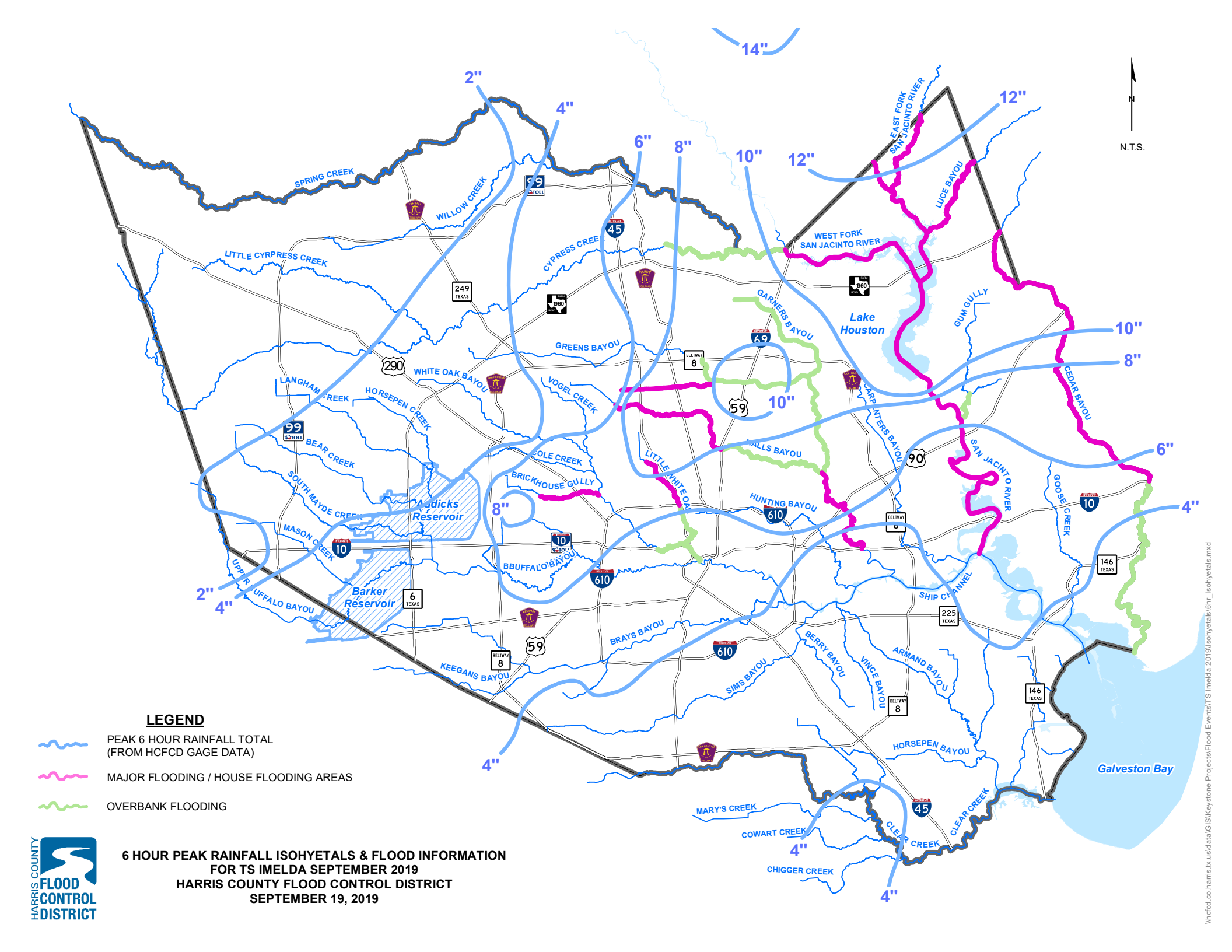
1AM 9-16-19 thru 1AM 9-20-19

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	0.6	1.1	1.6	2.2	2.7	3.0	3.6	4.2	4.8	5.6	6.5
5-year	0.7	1.4	2.0	2.7	3.4	3.9	4.7	5.6	6.5	7.6	8.7
10-year	0.8	1.6	2.3	3.1	4.0	4.7	5.8	7.0	8.2	9.7	11.1
25-year	1.0	1.9	2.7	3.6	4.9	5.9	7.5	9.1	10.9	13.0	14.7
50-year	1.1	2.1	3.0	4.1	5.7	6.8	8.9	11.1	13.4	16.1	18.0
100-year	1.2	2.4	3.3	4.5	6.5	8.0	10.7	13.4	16.3	19.5	21.7
500-year	1.5	3.0	4.2	5.9	9.0	11.5	15.9	20.1	24.2	27.7	30.0

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	0.6	1.2	1.7	2.2	2.8	3.1	3.8	4.4	5.1	5.9	6.8
5-year	0.7	1.5	2.1	2.8	3.6	4.1	5.0	5.9	6.9	8.1	9.3
10-year	0.9	1.7	2.4	3.2	4.3	4.9	6.2	7.4	8.7	10.2	11.7
25-year	1.0	2.0	2.8	3.8	5.2	6.2	7.9	9.7	11.5	13.7	15.6
50-year	1.1	2.3	3.2	4.3	6.0	7.3	9.5	11.7	14.0	16.8	19.1
100-year	1.3	2.5	3.5	4.8	6.9	8.5	11.3	14.0	16.9	20.4	22.9
500-year	1.6	3.1	4.4	6.2	9.6	12.2	16.7	20.9	25.0	29.2	32.1

Region 3--Armand, Carpenters, Cedar, 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	0.6	1.2	1.7	2.3	2.9	3.2	3.9	4.6	5.3	6.1	7.0
5-year	0.8	1.5	2.1	2.9	3.7	4.3	5.2	6.2	7.3	8.5	9.7
10-year	0.9	1.8	2.5	3.4	4.5	5.2	6.6	7.9	9.3	10.9	12.4
25-year	1.1	2.1	3.0	4.1	5.6	6.7	8.6	10.4	12.3	14.5	16.6
50-year	1.2	2.4	3.4	4.7	6.6	8.0	10.4	12.6	15.0	17.7	20.3
100-year	1.4	2.7	3.8	5.3	7.6	9.4	12.5	15.2	18.0	21.3	24.5
500-year	1.8	3.5	5.0	7.0	10.6	13.4	18.2	22.8	27.2	31.5	35.3


N
N.T.S.
2"
4"
6"
SPRING CREEK
WILLOW CREEK
CYPRESS CREEK
LITTLE CYPRESS CREEK
EAST FORK SAN JACINTO RIVER
LUCE BAYOU
WEST FORK SAN JACINTO RIVER
Lake Houston
GARNERS BAYOU
GUM GULLY
CEDAR BAYOU
GREENS BAYOU
WHITE OAK BAYOU
LANGHAM CREEK
HORSEPEN CREEK
VOGEL CREEK
CARPENTERS BAYOU
HALLS BAYOU
BEAR CREEK
SOUTH MAYDE CREEK
COLE CREEK
BRICKHOUSE GULLY
LITTLE WHITE OAK
SAN JACINTO RIVER
GOOSE CREEK
Addicks Reservoir
MASON CREEK
HUNTING BAYOU
UPPER BUFFALO BAYOU
BBUFFALO BAYOU
Barker Reservoir
SHIP CHANNEL
BRAYS BAYOU
BERRY BAYOU
VINCE BAYOU
ARMAND BAYOU
SIMS BAYOU
KEEGANS BAYOU
HORSEPEN BAYOU
Galveston Bay
MARY'S CREEK
COWART CREEK
CLEAR CREEK
CHIGGER CREEK
99 TOLL
45
249 TEXAS
290
8
69
59
90
10
610
6 TEXAS
225 TEXAS
146 TEXAS
LEGEND
PEAK 1 HOUR RAINFALL TOTAL
(FROM HCFCD GAGE DATA)
MAJOR FLOODING / HOUSE FLOODING AREAS
OVERBANK FLOODING
HARRIS COUNTY FLOOD CONTROL DISTRICT
1 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION
FOR TS IMELDA SEPTEMBER 2019
HARRIS COUNTY FLOOD CONTROL DISTRICT
SEPTEMBER 19, 2019
\\hcfcd.co.harris.tx.us\data\GIS\Keystone Projects\Flood Events\TS Imelda 2019\Isohyetals\1hr_Isohyetals.mxd



LEGEND

PEAK 6 HOUR RAINFALL TOTAL
(FROM HCFCD GAGE DATA)

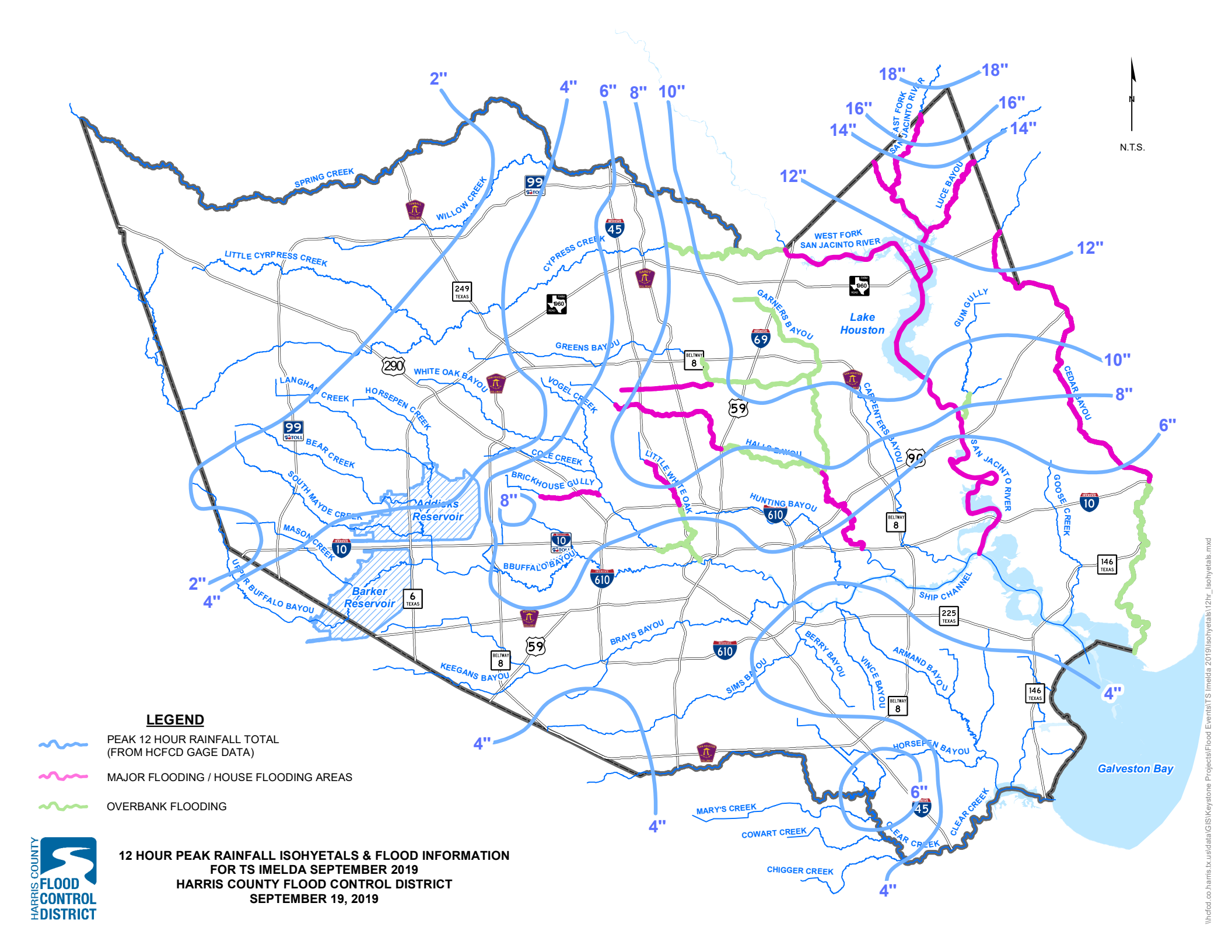
MAJOR FLOODING / HOUSE FLOODING AREAS

OVERBANK FLOODING

HARRIS COUNTY FLOOD CONTROL DISTRICT

6 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION
FOR TS IMELDA SEPTEMBER 2019
HARRIS COUNTY FLOOD CONTROL DISTRICT
SEPTEMBER 19, 2019

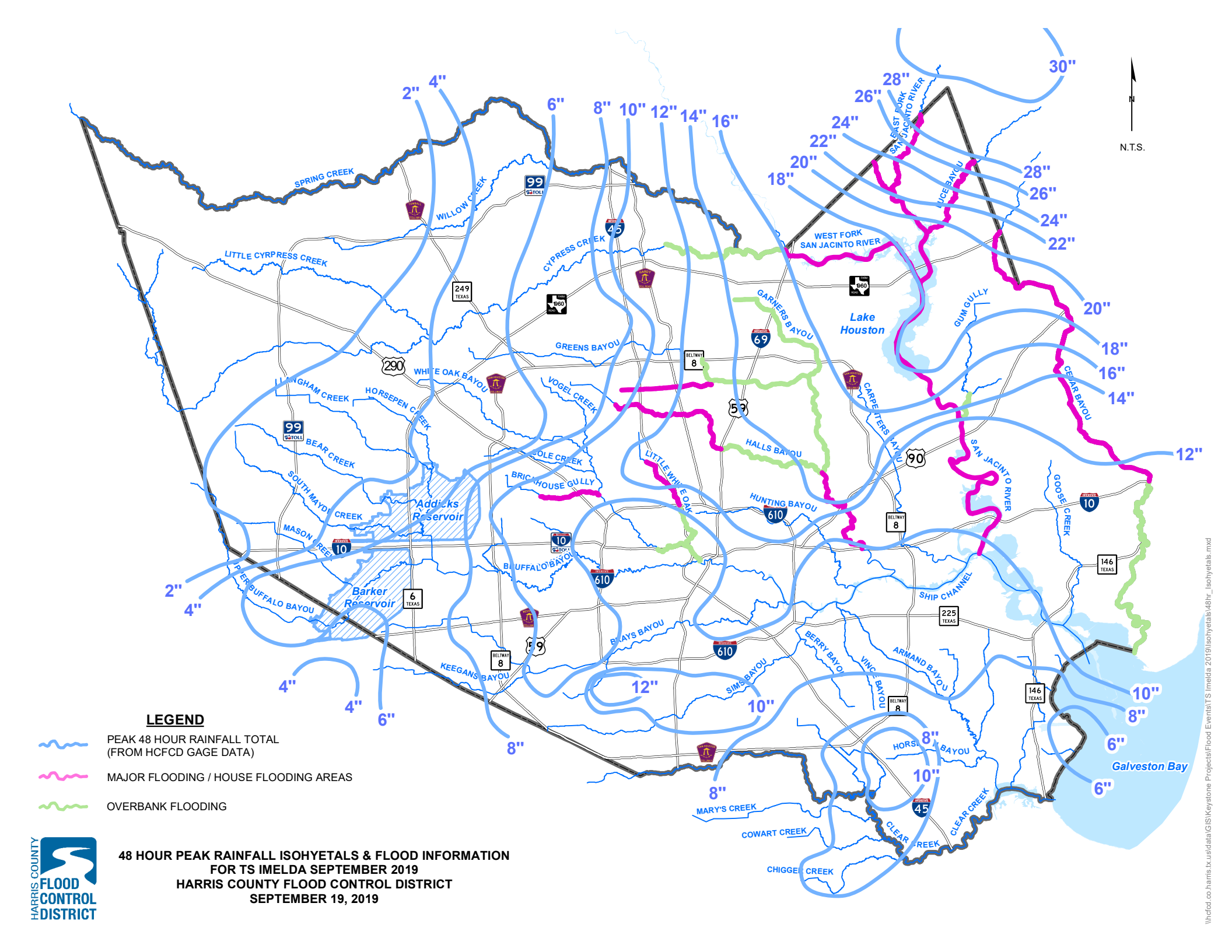
\\hcfcd.co.harris.tx.us\data\GIS\Keystone Projects\Flood Events\TS Imelda 2019\Isohyetals\6hr_Isohyetals.mxd



HARRIS COUNTY FLOOD CONTROL DISTRICT

12 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION
FOR TS IMELDA SEPTEMBER 2019
HARRIS COUNTY FLOOD CONTROL DISTRICT
SEPTEMBER 19, 2019

\\hcfcd.co.harris.tx.us\data\GIS\Keystone Projects\Flood Events\TS Imelda 2019\Isohyetals\12hr_Isohyetals.mxd



48 HOUR PEAK RAINFALL ISOHYETALS & FLOOD INFORMATION
FOR TS IMELDA SEPTEMBER 2019
HARRIS COUNTY FLOOD CONTROL DISTRICT
SEPTEMBER 19, 2019

\\hcfcd.co.harris.tx.us\data\GIS\Keystone Projects\Flood Events\TS Imelda 2019\Isohyetals\48hr_Isohyetals.mxd

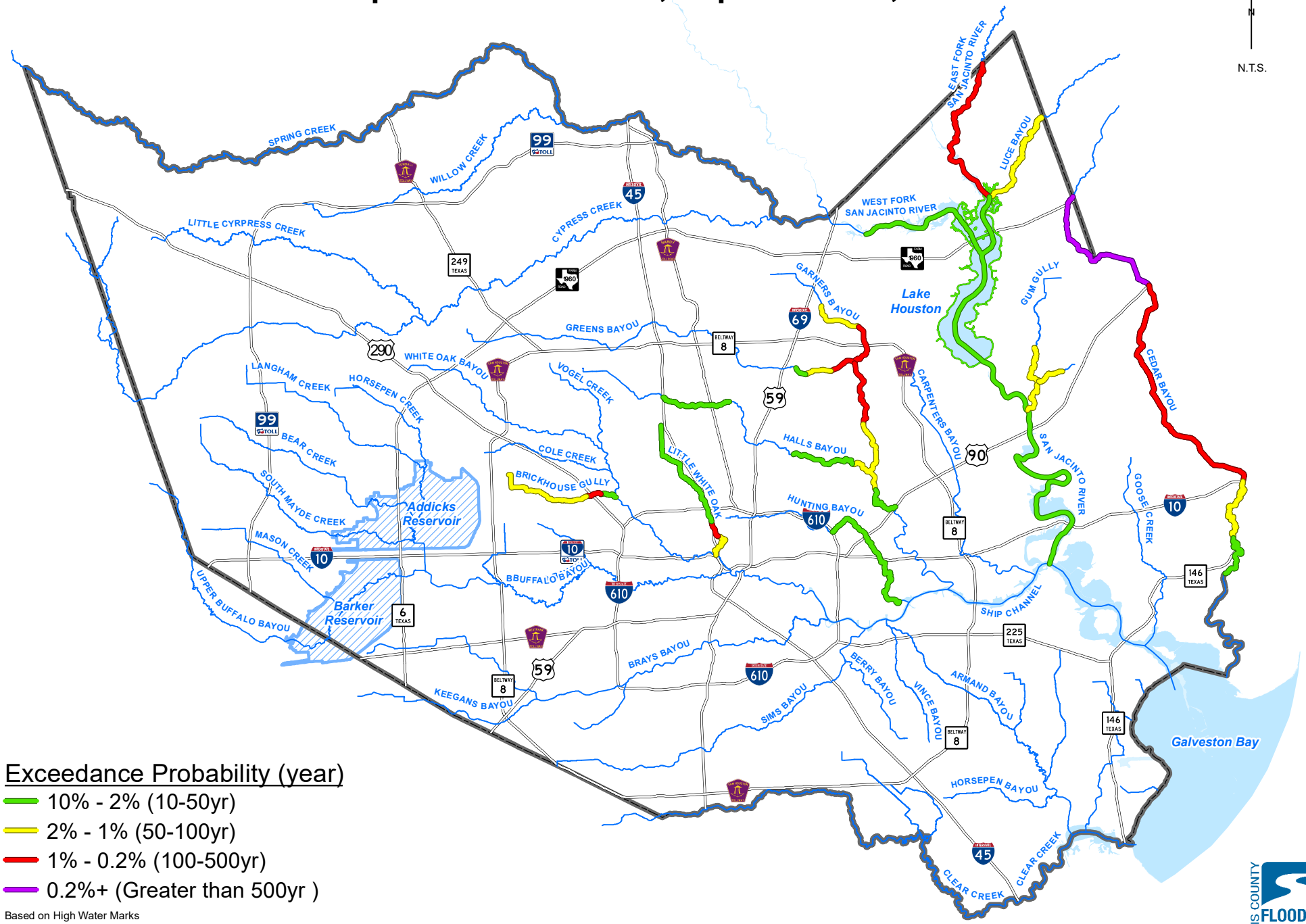
Peak Channel Water Surface Elevation Frequencies

Tropical Storm Imelda, September 19, 2019

DRAFT

N

N.T.S.



Exceedance Probability (year)

- 10% - 2% (10-50yr)
- 2% - 1% (50-100yr)
- 1% - 0.2% (100-500yr)
- 0.2%+ (Greater than 500yr)

Based on High Water Marks

HARRIS COUNTY FLOOD CONTROL DISTRICT

\\hcfcd.co.harris.tx.us\data\GIS\Keystone Projects\Flood Events\TS Imelda 2019\Peak Channel Elevation\Peak Channel Elevation.mxd

SUMMARY SHEET - HCFCD HIGH WATER MARKS

9/27/2019

SAN JACINTO RIVER (G103-00-00), CANEY CREEK, PEACH CREEK

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS 4/23/79	5/20/83	ALICIA 8/18/83	5/18/89	6/27/89	3/4/92	10/18/94	10/18/98	11/14/98	IKE 9/13/08	3/12/16	4/18/16	5/27/16	HARVEY 8/27/17	IMELDA 9/19/19
IH-10 EAST		28.04	-0.1	6.1*	11.3*	12.9*	18.1*	5.4						(3)	4.6	6.1	12.6		4.5	8.6	16.0	8.2
RIO VILLA SUBDIVISON	710	N/A	-0.4								14.5	9.6	8.3	(3)	(3)	(3)			9.3	12.2	20.9	13
US 90	720	39.01	-0.2	14.8	20.6	23.7	28.9	19.3	16.2	12.7	18.8	14.7	11.0	24.6	14.1	17.9	16.5		14.9	18.1	26.7	19.32
OLD US 90		31.53	-0.1	16.3	22.7	26.1	32.0							28.1	15.2	19.6	14.6		15.6	19.4	29.3	19.5
LAKE HOUSTON SPILLWAY	750	63.48	-0.5	45.4	48.8	49.9	52.0		48.0	47.1	49.1	47.4	47.0	52.3			44.5		46.2	47.8	53.1	48.2
FM 1960	740	63.03		45.6	48.3	49.5	53.0															48.9
W LAKE HOUSTON PARKWAY		57.86	-0.7	46.8	50.3	51.7	56.2							53.7	39.9	49.9	49.0		47.9	51.1		49.6
US 59	760	70.40	-0.6	56.5	63.0	64.8	69.1	51.0	52.1		53.9	51.7	49.8	66.7			53.0		57.5	61.9	69.6	55.3
HAMBLEN @ Loop 494		58.19	-2.5	56.5	63.0	64.8	69.1								54.4		51.6		55.7	61.5	65.5	NA
W. FORK SAN JAC. @ SH 99	765	97.58		82.4	88.2	90.4	94.9														94.9	79.8
CANEY CREEK @ FM 2090	780	141.27		138.9	142.5	143.6	146.4							144.1							144.3	139.7
PEACH CREEK @ FM 2090	785	107.47		99.3	104.0	105.9	108.8												101.6	102.2	106.3	106.9
E. FORK SAN JAC. @ FM 1485	790	78.07	-0.1	63.3	68.5	70.6	75.9							76.2	63.5	71.6 [4]	56.9	67.0	63.7	69.7	81.2	72.82
E. FORK SAN JAC. @ FM 2090	795	94.23		89.9	94.4	96.3	100.2														104.0	93.3

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

[1] = Suspect elevation, low confidence in field

(2) SAN JACINTO RIVER SPILLWAY ELEV OF 44.5' IS BASED ON '63/'64 ADJ, '78 ADJ IS 42.0', 01' ADJ IS 41.5'

(3) INACCESSIBLE

[4] = based on ALERT gage data

* = Combined Probability (includes storm surge and rainfall)

NOTE: G103-07-05 (Banana Bend) location was severely damaged in the October 1994 Flood, Gage 710 moved from Bannana Bend to Rio Villa on 10-29-2013

FM 1960 was added on 6/14/18
W. Fork San Jac. @ SH 99 added on 5/15/18
E. Fork San Jac. @ FM 2090 added on 5/17/18

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.

CEDAR BAYOU Q100-00-00

SUMMARY SHEET - HCFCD HIGH WATER MARKS

9/27/2019

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS															
								10/18/94	5/20/00	IKE 9/13/08	10/31/15	5/27/16	6/4/16	HARVEY 8/27/17	IMELDA 9/19/19								
S.H. 146	1720	24.88	0.1	9.6*	12.2*	13.9*	17.0*	11.9	3.5	12.9	5.7	5.0	6.6	18.0	5.9								
IH 10		24.37	0.0	17.7	20.5	21.5	24.3	27.4	17.9	17.8	22.8	16.7	18.6	30.5	23.3								
FM 1942	1730	32.49	0.0	27.2	29.3	30.0	31.6	32.2	27.5	26.8	31.0	25.9	28.3	34.4	31.1								
U.S. 90	1740	64.91	-0.1	52.6	54.3	54.9	56.8	56.1	50.1	53.7	55.1	54.1	50.4	59.0	57.0								
CROSBY-EASTGATE		62.18	-0.1	60.0	61.3	61.7	62.7		58.6	61.0	61.3	60.2		63.6	63.1								
OLD RAMSEY RD		65.38	-0.1								64.3	64.1		66.6	65.7								
FM 1960		74.44	-0.1	66.6	68.8	70.1	71.4		69.0	69.6	68.8	69.0		71.6	71.5								
SMITH GULLY @ HWY 146	1725	28.76	-0.1	22.9	23.6	24.0	25.2							31.1	24.4								

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

9/27/2019

MISCELLANEOUS GAGE LOCATIONS

UNIT @ ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS																
								10/18/94	ERIN 8/16/07	IKE 9/13/08	4/18/09	10/31/15	4/18/16	5/27/16	HARVEY 8/27/17	IMELDA 9/19/19								
R102 @ DIAMOND HEAD	1840	35.00	-0.2	23.7	25.1	28.8	35.5	29.9		N/A		25.5	16.9	22.3	34.0	27.1								
S100 @ FM 2100	1940	63.72	-0.3	50.3	56.7	58.8	64.8	56.8		46.4		N/A	48.7	50.9	60.0	57.5								
S100 @ DOVERBROOK										49.0		N/A		53.0	62.4	61.0								
F216 @ 8TH STREET	620	13.80	-0.6	10.6*	12.6*	13.6*	16.6*		13.7	12.3	11.8	N/A			11.6									
F101 @ SENS	640	20.73	-0.4						13.2	13.3	11.9	N/A			16.5									

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ
* = Combined Probability (includes storm surge and rainfall)

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.

GREENS BAYOU P100-00-00 (PAGE 2 of 2)

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 to '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS 10/31/15	4/18/16	HARVEY 8/27/17	IMELDA 9/19/19									
MARKET STREET		30.08	-0.1	12.0*	15.6*	17.0*	20.4*	6.9	5.7	18.5	7.0									
NORMANDY	1610	27.50	0.0	15.7	18.9	20.4	23.3	12.1	8.2	22.7	12.6									
WALLISVILLE ROAD		27.30	-0.6	22.4	25.8	27..40	30.8	20.1	11.9	33.1	22.1									
S. LAKE HOUSTON PKWY		36.78	-0.6	23.8	27.2	28.9	32.6	21.2	N/A	32.8	23.3									
U.S. HIGHWAY 90		31.08	-0.6	28.7	31.8	33.1	36.7	28.1	26.0	36.8	27.8									
GREENRIVER (LEY) RD	1620	35.71	-0.4	30.5	34.0	35.5	38.8	31.1	29.0	42.3	33.9									
TIDWELL	1685	34.23	-0.4	34.3	37.6	39.3	42.9	32.0	31.9	43.4	35.9									
E. MT. HOUSTON	1600	50.99	-0.9	44.8	47.3	48.3	50.8	44.2	44.4	51.5	48.3									
HOMESTEAD		60.94	-1.7	59.4	61.7	62.6	63.5	54.8	56.7	61.6	57.5									
U.S.59	1640	65.63	-1.8	60.6	62.3	63.1	64.1	56.6	59.8	62.7	59.4									
ALDINE BENDER (FM 525)		74.32	-0.9	66.9	68.4	69.6	71.0	62.8	67.4	68.2	65.4									
BELTWAY 8	1645	72.73	-1.5	69.5	71.3	72.4	73.1	64.7	69.7	71.7	67.9									
ALDINE WESTFIELD		73.04	-2.0	71.8	73.6	74.3	75.3	68.1	71.6	73.6	69.5									
HARDY ROAD		79.38	-2.4	76.9	78.1	78.7	79.6	75.3	75.7	78.5	74.6									
KNOBCREST	1660	88.02	-2.4	85.4	87.1	87.7	88.6	79.6	84.9	85.8	81.0									
I.H. 45		91.61	-2.4	86.7	88.4	88.9	89.7	81.1	86.0	87.0	80.9									
NORTHBOUROUGH		91.84		88.6	90.5	91.7	93.8				83.2									
GREENS PARKWAY		97.31		93.3	94.8	95.4	96.5				88.0									
VETERANS MEMORIAL		102.73	-2.9	98.7	99.9	100.4	101.6	93.9	99.7	98.8	92.2									
ANTOINE		109.61		103.9	105.1	105.3	105.9				94.7									
BAMMEL-N. HOUSTON	1665	111.27	-3.0	106.3	107.6	108.0	108.8	100.6	106.6	106.1	97.7									
CUTTEN ROAD	1670	117.51	-3.7	112.3	113.4	113.7	114.7	107.3	112.4	111.8	108.1									
F.M.249		116.41	-3.8	114.9	116.2	116.7	118.1	108.7	114.5	115.7	109.8									

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

[1] = Suspect elevation, low confidence in field

(?) = Survey Dept research needed to confirm elevation

* = Combined Probability (includes storm surge and rainfall)

Northbourough, Greens Parkway, & Antoine added on 12/4/18

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.

HALLS BAYOU P118-00-00 (PAGE 2 of 2)
GARNERS BAYOU P130-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS IKE 9/13/08	10/31/15	4/18/16	8/8/17	HARVEY 8/27/17	IMELDA 9/19/19					
HALLS BAYOU																		
MESA		39.96	-1.1	31.1	33.8	34.9	37.6	36.1	33.9	28.4	24.2	37.4	36.9					
TIDWELL	1675	47.38	-0.9	39.2	41.6	42.3	44.4	39.9	37.5	32.9	30.4	45.4	41.1					
WAYSIDE		46.85	-0.9	39.4	41.9	42.7	44.8	40.3	36.4	32.3	31.0	45.2	41.5					
HOMESTEAD RD		47.11	-1.2	44.5	47.0	47.5	49.7	44.0	41.7	36.7	34.4	46.3	44.8					
PARKER RD		48.86	-1.1	47.1	49.5	50.0	52.1	45.9	46.3	38.2	37.7	50.0	46.8					
HIRSH RD		56.82	-1.3	52.6	54.2	54.7	56.1	51.4	52.5	43.9	43.4	53.2	51.7					
US 59		60.79	-1.6	56.3	57.2	57.6	59.2	56.1	52.3	49.8	48.2	57.2	54.4					
JENSEN DR	1680	57.47	-1.6	56.9	57.9	58.3	59.7	55.5	53.3	51.1	49.2	57.5	55.4					
LITTLE YORK		61.24	-1.3	58.3	59.2	59.5	60.6	57.8	54.0	53.7	51.5	58.8	57.1					
HOPPER RD		60.00	-1.6	59.8	60.4	60.8	61.6	58.9	55.4	55.5	54.2	60.2	60.0					
BERTRAND RD		63.09	-1.7	61.3	62.3	62.8	63.6	60.3	57.1	56.4	56.0	62.3	61.1					
ALDINE WEST FIELD		68.14	-1.4	65.5	66.8	67.2	68.3	64.4	60.9	61.0	60.5	66.9	64.0					
HARDY TOLL RD		77.39	-1.0	69.4	70.3	70.7	71.5	69.5	67.7	68.1	65.8	71.0	69.4					
AIRLINE DR	1690	77.73	-1.4	75.2	76.1	76.5	77.4	76.0	72.0	75.3	74.5	77.0	75.7					
SWEETWATER		77.11	-2.7	78.0	78.7	79.0	79.5	77.1	75.9	76.5	77.2	79.3	77.7					
W. MOUNT HOUSTON		77.13	-2.8	78.3	78.9	79.2	79.8	78.5	75.9	76.8	77.5	79.9	78.3					
IH 45		80.16	-2.8	78.7	79.3	79.7	80.3	78.4	76.6	77.1	78.3	80.3	78.5					
TURNEY		78.93	-2.8	79.1	80.0	80.3	81.1	78.4	76.7	77.5	77.8	80.4	78.6					
SUNNYWOOD		79.45	-3.0	80.2	80.7	81.0	81.6	79.6	80.2	78.4	78.9	81.0	78.8					
DEER TRAIL		81.91	-2.8	81.5	81.9	82.1	82.6	81.3	78.7	79.1	80.6	82.3	81.0					
VETERANS MEMORIAL		89.85	-1.8	83.0	83.8	84.0	84.6	82.2	79.8	79.2	81.3	83.4	81.8					
GARNERS P130-00-00																		
BELTWAY 8	1630	56.91	-1.2	54.9	55.8	56.5	57.7	53.9	51.8	51.8		58.0	56.5					
RANKIN	1650	69.07	-0.9	66.6	68.1	68.5	69.8	63.3	63.0	64.0		68.7	66.4					
US 59		79.02	-0.7	74.1	75.9	76.5	78.1	73.4	71.6	72.4		77.8	75.5					

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

9/27/2019

HUNTING BAYOU H100-00-00

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS 3/20/72	3/4/92	FRANCES 9/11/98	ALLISON 6/5/01	ALLISON 6/9/01	6/19/06	10/16/06	ERIN 8/16/07	IKE 9/13/08	5/26/15	10/25/15	10/31/15	1/18/17	HARVEY 8/27/17	IMELDA 9/19/19
FEDERAL RD		13.41	0.0	7.0	10.6	12.0	15.1		4.1	7.5	6.6	9.4	5.8	5.9	5.2	13.3	4.8	4.3	6.3	N/A	12.0	4.4
MARKET ST		22.36	0.0	18.1	20.6	22.0	25.3		19.8		21.4	25.7	19.7	17.4	19.1	21.4	10.4	9.3	20.4	10.3	24.7	19.7
IH 10	820	27.21	-0.2	20.5	22.3	24.3	26.7		20.5	21.0	23.0	28.3	21.4	16.2	21.5	23.5	20.1	20.7	24.3	19.4	27.0	22.2
WALLISVILLE		31.50	-0.6	28.9	30.9	31.6	33.0	29.4	29.6	30.1	30.3	31.3	27.2	28.5	31.2	31.0	27.3	31.5	30.0	28.2	33.6	30.6
LOOP 610	830	38.72	-0.9	34.4	36.4	37.2	38.6		34.2	34.6	34.1	37.4	33.8	32.2	34.3	35.5		30.3	34.2	31.7	37.0	34.1
McCARTY RD		39.79	-0.9	36.0	37.7	38.5	40.5	33.8		34.8	36.5	38.0	34.0	32.3	34.9	35.2		31.6	34.6		37.5	34.5
WAYSIDE		40.64	-1.1	39.1	41.0	41.8	43.4				38.4	41.1	37.3	34.5	36.7	37.9	35.9	34.9	37.6	36.0	40.9	38.3
LIBERTY RD		45.03	-1.1	40.0	42.1	42.9	45.3			39.7			37.9	40.4	36.7	39.1	37.3	36.0	36.8	37.2	43.0	39.2
HOMESTEAD RD		48.23	-1.1	41.4	43.5	44.4	46.3	39.7	43.1		41.2	44.4	39.2	40.5	40.6	41.4	37.1	38.3	40.2	39.6	43.7	39.2
PEDESTRIAN BR IN PARK	840	41.44	-1.1	41.9	44.1	45.0	46.8					42.0	40.4	40.5	42.0	42.1	40.7	38.0	41.4	40.6	44.4	41.4
LOCKWOOD RD		41.44	-1.1	42.2	44.4	45.2	47.0	40.7	41.5	41.4	42.2		41.0	41.3	41.8	42.6	39.0		41.5	41.1	44.3	41.7
WIPPRECHT		43.06	-1.1	42.3	44.5	45.3	47.0			41.9	42.6	44.8	40.6	40.7	42.4	42.5	41.0	38.0	42.0	N/A	44.4	42.1
HIRSCH RD		45.13	-1.0	42.5	44.6	45.4	47.1	40.4	42.0	43.8	42.6	44.4	41.8	42.4	42.7	42.8	42.1	39.5	42.5	42.2	45.0	42.5
US 59		44.00	-1.0	43.0	44.8	45.6	47.3	41.5	43.1	42.7	43.5	45.6	42.5	42.7	43.1	42.9	43.1	41.9	43.1	42.8	44.8	42.8

NOTE: BRIDGE AND HIGH WATER ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ
(?) = Survey Dept research needed to confirm elevation

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.

WHITE OAK BAYOU Tributaries E100-00-00 Page 3 of 3

ROAD NAME	STAGE GAGE	BRIDGE BM ELEV	78 TO '01 ADJUST	10.0%	2.0%	1.0%	0.2%	STORM EVENTS ALLISON 6/9/01	10/29/02	11/17/03	12/14/05	6/19/06	10/16/06	5/10/07	IKE 9/13/08	4/28/09	5/26/15	10/25/15	4/18/16	8/8/17	HARVEY 8/27/17	IMELDA 9/19/19
E101: LT WHITE OAK																						
E101 @ N MAIN		33.73		35.4	38.4	39.1	41.6										39.4		NA		40.0	38.7
E101 @ COTTAGE	560	48.22	-1.3	38.0	40.7	41.4	44.0		29.3	35.8		32.1 [1]			41.3		42.9		38.5		44.1	42.5
E101 @ PATTON		N/A		39.8	42.4	43.2	46.0										43.8		NA		45.6	45.9
E101 @ CAVALCADE		47.24		44.5	47.5	48.3	50.0										48.8		NA		53.7	48.6
E101 @ CROSSTIMBERS		N/A		56.2	58.2	58.8	60.2										54.8		NA		56.1	56.7
E101 @ WERNER		63.42		63.7	64.0	64.3	64.9										63.5		NA		63.7	63.6
E101 @ TIDWELL	570	64.38	-1.9	65.2	65.9	66.1	67.0	70.1	64.2	62.5					67.1		65.6		61.6		65.4	66.1
E115 BRICKHOUSE																						
E115 @ WATONGA		62.15		62.7	64.9	65.8	68.8															56.0
E115 @ MANGUM		N/A	N/A	61.1	62.5	63.2	65.6							60.2	59.8	N/A	60.2		60.5	58.2	64.3	61.2
E115 @ COSTA RICA	580	64.38		63.9	65.5	66.4	70.4	68.9	63.7	56.3		58.2	57.3	64.7	64.6	63.3	65.5		63.8	63.2	66.7	64.5
E115 @ ANTOINE		65.72	-2.8	65.4	66.0	66.5	71.1							65.7	65.6	65.3	66.2		65.7	65.5	67.9	66.6
E115 @ US 290		N/A	N/A	67.4	67.9	68.2	71.5							68.3	66.8	67.2	68.0			68.3	68.2	68.4
E115 @ BOLIN		70.26	-2.8	69.4	71.3	71.8	73.6							69.7	66.4	69.4	70.2		70.0	69.4	70.4	70.1
E115 @ LANG		74.25	-3.0	70.5	71.9	72.2	73.5							70.4	69.1	70.2	71.8		71.1	70.3	72.5	71.7
E115 @ BINGLE		74.22														74.3	74.2		NA	73.5	74.6	75.8
E115 @ HOLLISTER		80.85														77.0	77.6		NA	75.8	76.4	76.7
E117 COLE CREEK																						
E117 @ DEIHL	590	80.94	-3.0	75.8	79.0	80.2	81.4		73.8	73.2	73.4	71.6			74.0				74.7		74.6	
E121 VOGEL CREEK																						
VICTORY	585	75.11	-1.6	74.7	75.2	75.6	76.0		77.1	73.7	72.6	73.3			69.1			67.3	73.1		75.0	
MAPLE TREE		78.79		77.6	78.2	78.5	78.9					77.1						67.9	73.6		74.9	
GULF BANK	595	78.97	-3.4	79.7	80.4	80.7	81.3		81.0	80.4	77.6	78.0			74.2			72.6	77.3		77.8	
RAMONA		98.39		98.7	99.3	99.5	99.9					99.1			98.4			95.0	97.6		98.6	

NOTE: ELEVATIONS ARE ON 1988 NAVD; 2001 ADJ

[1] = Suspect elevation, low confidence in field

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.