

MEMORANDUM



DATE: June 22, 2009

TO: Distribution

FROM: Jeff Lindner
Meteorologist / Flood Watch Coordinator

RE: Immediate Report – Final
April 28, 2009 Storm and Flood Information

This is the fourth and final report summarizing the flooding that occurred from excessive rainfall over the western and central part of Harris County on April 27-28.

GENERAL FLOODING STATEMENT

A large thunderstorm complex that originated in northwest Texas moved into Harris County late in the afternoon on Monday, April 27th producing very heavy rainfall and significant street flooding. The complex pushed offshore before midnight and weakened while the old outflow boundary on the western end retreated northward from Matagorda and Brazoria Counties. As this boundary entered into western Harris County a cluster of thunderstorms developed between Tomball and Katy and remained nearly stationary. Hourly rainfall rates of 3.0-4.0 inches per hour on top of 4.0-5.0 inches of rainfall in the late afternoon of the 27th produced major flooding across the western half of Harris County. The cluster began to drift east-southeast across the upper portions of Brays, Buffalo, and White Oak Bayous around 5:30 a.m. and then weakened as it tracked into the central part of the county. Rainfall resulted in rapid rises along upper Brays, Buffalo, and upper White Oak Bayous and major flooding of creeks in the western and northern portions of the county. Extensive street flooding closed portions of I-10 W feeder roads, part of US 59 at the 610 Loop, mainlanes of I-45 at Spring Stuebner, and parts of the west Sam Houston Tollway.

The event was the third in a series of excessive rainfall events across Harris County which began on April 18th. Grounds were wet going into the rainfall on the afternoon of the 27th and completely saturated prior to the onset of the excessive rains during the morning hours of the 28th. The saturated grounds and intense rainfall rates led to the rapid and in places near record flood levels. In fact, the flows recorded by the USGS gage at Piney Point on Buffalo Bayou exceeded the flood of record in March 1992. Tremendous inflow into Addicks Reservoir resulted in the flooding of HWY 6 and Eldridge Pkwy for the first time since October 2002, and for several hours during the morning of Tuesday, April 28th, water from overflowing Bear Creek was flowing across HWY 6. High water marks obtained by HCFCD crews indicate the highest levels ever recorded along portions of Bear Creek, Langham Creek, and South Mayde Creek.

RAINFALL

Duration – Heavy rains fell between 4:00 p.m. and 10:00 p.m. on the 27th with a brief break before the development and onset of excessive rainfall just after midnight on the 28th and continuing through 8:00 a.m. The most extreme rainfall fell between 1:00 a.m. and 4:00 a.m. over much of Addicks Reservoir and upper Buffalo Bayou.

Total Amounts – 24-hr storm totals averaged 6.0-8.0 inches from just west of The Woodlands to northeast of Katy with totals of 9.0-11.5 inches across the upper portions of Bear Creek within Addicks Reservoir. Along and west of US 59 from Kingwood to Sugar Land rainfall totals averaged 4.0-6.0 inches with totals generally less than 2.0 inches east of US 59. Another rainfall maximum of 7.0-9.0 inches fell in a small band from near Hunter Creek Village to just north of The Meadows.

Exceedance Probability – The highest short term rainfalls occurred over Addicks Reservoir and Buffalo Bayou. The maximum 30-min rainfall recorded was 2.9 inches at Addicks Dam which is near the 1% (100-yr) frequency. 1-hr rainfall totals of 4.2 to 4.8 inches were recorded over Addicks, upper Brays Bayou, and upper Buffalo Bayou which equates to over a 1% (100-yr) frequency. For the 6-hr to 24-hr time periods the rainfall totals over Addicks, upper Brays, middle and upper Buffalo, Cypress Creek, Spring Creek, and upper White Oak Bayou ranged from a 10% (10-yr) to 2% (50-yr) event. See attached rainfall analysis table for detailed rainfall and frequency exceedance at each ALERT gage station.

The magnitude of rainfall over the central part of Addicks Reservoir especially upper Bear Creek, for a 24-hr time period has not been experienced in this part of the county since detailed rainfall analysis collection began in the early 1980's. The last time similar rainfall occurred on upper Buffalo Bayou was in March 1992 and this event averaged 1.0-2.0 inches higher than the 1992 rainfall. The areas heavily impacted in this event have largely escaped excessive rainfall events in the recent past including the floods of Tropical Storm Allison and Hurricane Ike.

OVERBANK FLOODING

Overbanks conditions occurred on the following channels:

Bear Creek
South Mayde Creek
Langham Creek (spotty above W Little York and widespread below W Little York)
Cypress Creek
Little Cypress Creek
Willow Creek
Spring Creek below SH 249
Buffalo Bayou (and several tributaries)
Brickhouse Gully
West Fork of the San Jacinto River

Bankfull conditions were noted on the following channels:

White Oak Bayou (FM 1960 to Beltway 8 and below Heights to downtown Houston)
Brays Bayou (SH 6 to above Bellaire)
Lemm Gully (K120)
Faulkey Gully (K142) below Louetta.

CHANNEL WATER SURFACE ELEVATIONS

Several channels recorded near record or record levels especially across Addicks Reservoir and Buffalo Bayou. The following is a comparison by channel of high water marks to previous floods and flood frequency levels.

Brickhouse Gully: Levels along the middle portion of Brickhouse were similar to those recorded in May 2007 and were equal to around a 10% (10-yr) water surface level.

Cypress Creek: Levels along Cypress Creek were similar to those of Hurricane Ike below I-45 and higher than Hurricane Ike above I-45 to below SH 249. Above SH 249 levels were similar to the floods of October and November 1998. The high water marks along Cypress generally equate to around or just below a 10% (10-yr) water surface level.

Mason Creek: Levels along Mason Creek are the highest ever recorded at every bridge location where marks were obtained. The previous flood of record was Hurricane Alicia in 1983 and this event surpassed Alicia by 5.0-6.0 feet. The high water marks equate to around a 1% (100-yr) water surface level around Prince Creek Drive and around the 2% (50-yr) water surface level above I-10.

Langham Creek: Levels along Langham Creek were the highest ever recorded. From Addicks Satsuma upstream to FM 529 water surface levels averaged above the 2% (50-yr) levels at each location and were above the 1% (100-yr) level by 1.5-2.0 feet below Addicks Satuma and West Little York.

South Mayde Creek: Levels along South Mayde Creek were the highest ever recorded below Fry Rd. All locations experienced water surface levels at or just below the 2% (50-yr) level. Along the upper portion of the watershed, high water marks were similar to the October 1994 flood event.

Bear Creek: Levels along Bear Creek were the highest ever recorded below Fry Rd. Elevations at Fry Rd were just below the 1% (100-yr) level and at Clay Rd exceeded the .2% (500-yr) level. The upstream portion of the watershed experienced levels similar to levels in October 1994 and October 1998.

Buffalo Bayou: Levels in the middle and upper portions of Buffalo Bayou were higher than the record levels set in March 1992 from the West Belt downstream to around Voss. Above the West Belt levels were slightly lower than those of March 1992. A record flow of 7,990 cfs occurred at the Piney Point USGS gage with the USGS gage at Beltway 8 recording similar flows to March 1992. Water surface levels along Buffalo

Bayou from the 610 Loop to HWY 6 averaged between the 2% (50-yr) and 1% (100-yr) levels at each bridge location.

HOUSE FLOODING ESTIMATES

Extensive house flooding occurred throughout western and portions of central Harris County from channels overflowing their banks and internal drainage systems being overwhelmed by the high intensity rainfall rates. The largest concentration of flooded homes occurred across the lower portions of the creeks feeding in Addicks Reservoir, along Buffalo Bayou and its tributaries, Brickhouse Gully, and the tributaries feeding into upper Brays Bayou. The majority of the houses flooded were outside the mapped 1% (100-yr) floodplains. Based on HCFCD records, the April 28th event resulted in the 4th largest number of flooded homes.

June 2001 (TS Allison)	73,000
June 19, 2006	3,370
October 1994	3,248
April 28, 2009	2,305
October 2002	1,999

Between 335-345 homes were flooded along the lower end of Langham Creek downstream of HWY 6 and just north of Clay Rd west of the channel. An additional 295-305 homes flooded along the lower part of Bear Creek with 70-80 homes flooded along South Mayde Creek. This was the first time for many of the homes in these locations to experience house flooding as previous heavy rainfall events had not greatly impacted this part of the county.

Over 900 homes flooded within the Buffalo Bayou watershed from above the 610 West Loop to below Addicks. The majority of the house flooding resulted from tributaries and internal drainage systems being overwhelmed along with significant flows in Buffalo Bayou. The worst flooding was in the far upper reaches of the watershed where 7.0-9.0 inches of rain fell in a little over 3 hours resulting in widespread inundation of the area just below Addicks Reservoir. Record levels on the portion of Langham Creek below Addicks Dam flooded nearly 150 homes. This flood event was by far the worst house flooding ever recorded along the middle and upper portion of the Buffalo Bayou watershed and its tributaries.

Between 270-280 homes flooded along the upper portion of Brays Bayou due to HCFCD lateral channels D120, D122, D129, and D124 approaching bankfull conditions and internal drainage systems being overwhelmed. Additional house flooding was reported along portions of Keegans Bayou.

Significant house flooding occurred along the middle reach of Brickhouse Gully where the channel exceeded its banks. This is the largest number of flooded houses ever recorded on Brickhouse Gully.

Along Cypress Creek overbank flooding threatened homes from downstream of US 290 to just above SH 249. House flooding occurred in the area upstream and downstream of US 290. Portions of the HP facilities just west of SH 249 were inundated for 3 to 4 days. House flooding also occurred along a few Cypress Creek tributaries including Lemm Gully (K120).

Scattered house flooding occurred along the lower portions of Little Cypress Creek around Kluge Rd and along Willow Creek east of SH 249 and along Dowdell Rd.

Between 10-20 houses along the west fork of the San Jacinto River experienced flooding with many other elevated structures surrounded by water and cut-off on both the south and north sides of the river downstream of the US 59 bridge.

Thanks are extended to the following jurisdictions for house count information and damage assessment: City of Houston, Harris County Permits, City of Katy, City of Tomball, City of Jersey Village, and The Villages along Buffalo Bayou.

PROJECTS THAT HELPED REDUCE HOUSE FLOODING

White Oak Bayou:

The rain that fell over the White Oak Bayou watershed during the April 27-28 flood can be compared to the rain that fell over the watershed during Tropical Storm Frances in September 1998 – not in terms of rainfall totals but in terms of intensity within a 12-hour period. During Frances, 12-hour peak rainfall totals ranged from 7.5 inches in the upper portion of the watershed to 4.5 inches in the lower portion of the watershed. During this event, 12-hour peak rainfall totals ranged from 6.5 inches in the upper part of the watershed to 3.5 inches in the lower portion of the watershed. Because the ground was saturated prior to this event, we can factor in an additional $\frac{3}{4}$ inch of rain to account for additional stormwater runoff.

During Frances, approximately 1,100 homes flooded from White Oak Bayou leaving its banks. The Flood Control District estimates that 1,100 homes were spared from flooding during this recent event. It is estimated that 200 homes were spared from flooding from a project to widen and deepen the channel from Cole Creek (near Tidwell Road) to Beltway 8 and from 10 detention basins that flank the channel with a combined storage capacity of 1.2 billion gallons of stormwater. It is estimated that another 900 homes were spared from flooding from voluntary home buyouts along White Oak Bayou and Vogel Creek. Buyout neighborhoods include Creekside Estates, Woodland Trails, Woodland Oaks, Inwood Forest, Arbor Oaks and Oak Forest.

Brays Bayou:

The upper portion of the Brays Bayou watershed (above Beltway 8) received 7.0 to 8.0 inch rainfall totals, and the lower portion of the watershed received 2.0 to 4.0 inch rainfall totals. Had the upper portions of the bayou not been widened, deepened, and flanked by detention basins, Brays Bayou would have likely overflowed its banks in

many areas. Three detention basins, located near Eldridge Road, Old Westheimer Road and Beltway 8, safely stored 2.6 billion gallons of stormwater (or 5 Reliant Astrodomes of stormwater) and prevented Brays Bayou from flooding the following neighborhoods: West Bend (near Highway 6), parts of Alief, parts of Sharpstown, areas near Beltway 8, Bellaire Boulevard, and parts of Meyerland.

Buffalo Bayou:

The western portion of the Buffalo Bayou watershed was one of the hardest hit in terms of rainfall during this event. Areas near Beltway 8 and Dairy Ashford received 1% (100-yr) rainfall during this event. A series of linear detention basins along Buffalo Bayou helped reduce water surface elevations in the channel by an average of 1 foot from Wilcrest to Dairy Ashford.

Cypress Creek:

We estimate that 330 homes were spared from flooding on Cypress Creek because of voluntary home buyout programs in the neighborhoods of: Ponderosa Forest, Norchester, Lake Cypress Estates, Grantwood, Enchanted Oaks and other areas.

San Jacinto River:

More than 400 homes in the San Jacinto River watershed have been purchased. HCFCD estimated that about 300 of those would have flooded during this event as well.

BUYOUT

Some homes that flooded previously from similar rainfall events have been purchased by HCFCD and other cities in partnership with FEMA. Locations that received heavy rainfall and approximate number of homes that have been removed are listed below:

- Cypress and Little Cypress Creeks Watershed
330 homes have been removed that would have likely flooded
- White Oak Bayou Watershed
906 homes have been removed that may have flooded
- San Jacinto River Watershed
403 homes have been removed that would have likely flooded

In the significantly impacted watersheds from this rainfall event a total of almost 1,600 homes have been bought out and removed. HCFCD estimates that of the 1,600 bought out at least 1,100 of those would have likely flooded during this event.

ADDICKS RESERVOIR

Widespread rainfall of 7.0-9.0 inches fell across the creeks that feed into the reservoir with an area of 9.0-11.5 inches over the middle and upper portions of Bear Creek, South Mayde Creek, Langham Creek, Dinner Creek, and Horsepen Creek. Tremendous inflow from these creeks resulted in a significant rise in Addicks to levels not experienced since October 2002. Large amounts of inflow overtopped portions of HWY

6 from Bear Creek and Clay Rd from Langham Creek for many hours on Tuesday, April 28th. The pool elevation of Addicks Reservoir crested just over 100.0 ft early on Friday, May 1st. This level fell just short of the record pool elevation set in March 1992 of 100.58 ft. SH 6 was closed for 4-5 days as water from the reservoir overtopped sections of the roadway along with portions of Eldridge Pkwy. Both Addicks and Barker Reservoirs were on the Corps of Engineers "Extended Watch" for a total of 35 days and fell below the set criteria on June 1, 2009.

AERIAL RECONNAISSANCE

HCFCFCD personnel conducted an aerial tour of White Oak Bayou and Addicks Reservoir on the afternoon of Tuesday, April 28th and a second tour to Addicks, the Cypress Creek overflow zone, Cypress Creek, Little Cypress Creek, Willow Creek, Spring Creek, and the west fork of the San Jacinto River on Wednesday, April 30th. These missions were flown to determine how HCFCFCD channels and stormwater detention basins preformed, help with locating house flooding areas, and determine the extent and magnitude of Cypress Creek overflow into upper Addicks Reservoir.

CYPRESS CREEK OVERFLOW

Aerial survey of the overflow zone along with HCFCFCD ground crew reports indicate that water levels in the upper reaches of Cypress Creek did overflow into the northwestern portions of Addicks Reservoir. Shallow overland flow flooding was noted along and west of Katy Hockley Rd to Sharp Rd. The highest water level recorded at the Katy Hockley ALERT station was 159.50 feet or between a 1% (100-yr) and .2% (500-yr) level. This level is 1.0-3.0 feet below the levels experienced on the upper part of Cypress during the floods in the Fall of 1998 and the October 1994 flood (current record stage).

HIGH WATER MARKING

Five HCFCFCD crews marked and surveyed high water marks on Wednesday, April 29th and Thursday, April 30th along the following channels: Cypress Creek, Little Cypress Creek, Willow Creek, Spring Creek, Brays Bayou, Keegans Bayou, Langham Creek, Bear Creek, South Mayde Creek, Mason Creek, Buffalo Bayou, White Oak Bayou (between FM 1960 and North Houston Rosslyn), Brickhouse Gully, and two tributaries along Cypress Creek (Turkey Creek and Faulkey Gully).

HARRIS COUNTY FLOOD CONTROL DISTRICT FACILITIES CONDITIONS

All HCFCFCD channels and detention basins were in good condition prior to the onset of the rainfall. Debris blockages along Cypress Creek at Cypresswood and The Hardy Toll Rd bridges were removed prior to the flooding. Additional debris along several watersheds in the southern part of the county due to recent flooding in the past 10 days had been removed before the rainfall on the 27th and 28th. The regular seasonal mowing contracts began on May 15, 2009

A portion of a subdivision stormwater detention basin (U506-05) along the upper portion of U106 (Horsepen Creek) was overtopped by flow in the creek, heavily eroded, and

then breached into the detention basin. HCFCD crews are currently assessing the situation. Heavy erosion and slope failures were also noted at several locations along upper Langham Creek.

Distribution:

Wayne Crull
Fred Garcia
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April 28 Rainfall Maximums by Watershed

Monday 4/27 10AM to Tuesday 4/28 at 10AM

CLEAR CREEK, A100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
100	0.2	0.4	0.7	1.1	1.2	1.2	1.2	1.2	2nd Outlet
105	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	Melodywood @ Mary's
110	0.2	0.5	1.0	1.5	1.7	1.7	1.7	1.7	I-45
115	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Baker @ Chigger
120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	FM 528
125	0.4	0.9	1.5	2.0	2.2	2.2	2.2	2.2	Windsong @ Chigger
130	0.3	0.7	1.2	1.6	1.8	1.8	1.8	1.8	Bay Area Blvd
135	0.5	1.1	1.5	2.5	2.6	2.6	2.7	2.7	FM 2351
140	0.6	0.9	1.1	1.4	1.4	1.6	2.5	2.6	FM 1959 @ A119
150	0.4	1.0	1.5	2.4	2.5	2.6	2.6	2.6	Country Club
160	0.6	1.0	1.5	2.4	2.7	2.8	2.8	2.9	Hughes @ A120
170	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Nassau Bay
180	0.3	0.7	1.1	1.4	1.6	1.7	1.7	1.8	Telephone
185	0.3	0.7	1.0	1.2	1.4	1.6	1.7	1.7	Mykawa
190	0.4	1.0	1.5	2.1	2.3	2.4	2.5	2.5	SH 288
200	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Nasa Rd 1 @ A104

ARMAND BAYOU, B100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
210	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	Nasa Rd 1
220	0.2	0.5	0.7	1.2	1.6	1.6	1.6	1.6	Genoa-Red Bluff
230	0.2	0.4	0.7	1.2	1.7	1.9	2.0	2.0	Fairmont @ B106
240	0.2	0.4	0.8	1.1	1.2	1.2	1.2	1.2	Beltway 8
250	0.3	0.7	1.0	1.7	2.0	2.0	2.0	2.0	Bay Area Blvd @ B104
270	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	B112 @ Fairmont

SIMS BAYOU, C100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
310	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Nevada @ C106
320	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Forest Oaks @ C106
340	0.4	0.6	0.8	1.1	1.5	1.7	1.7	1.9	Telephone
360	0.3	0.8	1.4	1.8	2.1	2.3	2.3	2.3	MLK
370	0.6	1.5	2.4	2.8	3.0	3.0	3.0	3.1	SH 288
380	0.2	0.6	0.9	1.3	1.4	1.5	1.6	1.6	Hiram Clarke

Return Period: 10year 25year 50year 100year 500year

April 28 Rainfall Maximums by Watershed

Monday 4/27 10AM to Tuesday 4/28 at 10AM

BRAYS BAYOU, D100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
400	0.3	0.7	1.2	1.8	1.9	1.9	2.5	2.7
410	0.2	0.6	1.0	1.4	1.7	1.8	1.8	2.0
415	0.3	0.5	0.5	0.5	0.5	0.5	0.8	0.8
420	0.4	0.8	1.2	1.4	1.7	1.8	2.5	2.7
430	0.4	0.9	1.2	1.6	1.9	1.9	3.5	3.6
435	0.4	0.9	1.3	1.5	1.6	1.7	2.9	3.0
440	0.5	1.0	1.4	2.1	2.4	2.4	4.2	4.3
460	0.3	0.8	1.4	1.8	2.2	2.2	4.0	4.1
465	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
470	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
475	0.6	1.5	2.5	3.8	5.5	5.5	7.0	7.5
480	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
485	0.6	1.8	2.8	4.3	5.4	5.5	7.8	8.2
490	0.4	1.1	2.0	3.2	3.5	3.5	5.0	5.2

LOCATION

S. MacGregor @ D109
Lawndale
MLK
S Main
Stella Link
Willowbend @ D112
Rice
Gessner
Beltway 8
Belle Park
Bellaire Blvd
Roark @ D118
SH 6
Keegans @ D118

WHITE OAK BAYOU, E100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
520	0.4	0.4	0.6	1.0	1.6	1.6	2.5	3.0
530	0.3	0.7	1.0	1.8	2.6	2.6	4.0	4.8
535	0.5	1.0	1.4	1.7	1.9	2.0	3.0	3.6
540	0.4	0.8	1.2	1.9	2.8	3.0	4.4	4.9
545	0.4	0.8	1.2	1.8	3.0	3.2	4.8	5.5
550	0.3	0.9	1.4	2.3	3.4	3.7	5.3	5.7
555	0.4	1.0	1.9	3.4	4.9	5.1	7.3	7.6
560	0.2	0.4	0.6	1.0	1.7	1.7	2.3	3.0
570	0.4	0.4	0.7	1.0	1.7	1.8	2.6	3.1
575	0.7	1.2	1.6	2.0	2.4	2.4	3.9	4.7
580	0.5	1.0	1.6	2.1	2.9	2.9	4.7	5.4
585	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
590	0.4	0.9	1.4	2.0	2.8	3.0	4.7	5.2
595	0.4	0.8	1.1	1.4	2.1	2.4	3.7	4.2

LOCATION

Heights
Ella
Pinemont
Alabonson
Fairbanks-N. Houston
Lakeview
Jones
Trimble @ E101
Tidwell @ E101
Tidwell
Costa Rica @ E115
Victory @ E121
Deihl @ E117
Gulf Bank @ E121

LITTLE CEDAR BAYOU, F216

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
610	0.3	0.4	0.6	1.0	1.2	1.3	1.3	1.4
620	0.2	0.3	0.5	0.7	1.3	1.4	1.5	1.5
640	0.3	0.4	0.5	0.8	1.2	1.4	1.5	1.5

LOCATION

F216 @ 8th St
F101 @ 26th

SAN JACINTO RIVER, G103

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
710	0.3	0.7	1.1	1.2	1.6	1.8	1.8	1.9
720	0.1	0.3	0.5	0.6	0.8	1.0	1.1	1.2
750	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
755	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
760	0.2	0.5	0.8	1.2	1.8	1.9	3.3	3.4
790	0.3	0.5	0.7	1.2	1.6	1.8	2.1	2.3

LOCATION

G103-07-05
US 90
Lake Houston Dam
West Fork @ G103-36
US 59
FM 1485 @ East Fork

Return Period: 10year 25year 50year 100year 500year

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HUNTING BAYOU, H100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
820	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	I-10
830	0.2	0.2	0.4	0.6	1.1	1.1	1.3	1.4	Loop 610
840	0.4	0.5	0.6	0.9	1.5	1.6	1.8	2.0	Lockwood

VINCE BAYOU, I100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
920	0.3	0.7	1.0	1.4	1.7	1.8	1.8	1.8	W. Ellaine
940	0.2	0.4	0.7	0.9	1.2	1.2	1.2	1.2	Jackson

SPRING CREEK, J100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1020	0.4	0.9	1.4	2.2	2.4	2.5	3.0	3.2	FM 2979
1040	0.3	0.7	1.2	2.0	3.0	3.3	4.3	5.2	I-45
1050	0.2	0.6	0.6	0.6	0.6	0.8	0.8	0.8	Kuykendahl
1060	0.3	0.7	1.0	1.7	2.4	2.7	3.8	4.6	SH 249
1070	0.7	1.3	2.5	3.2	4.0	4.4	7.2	8.1	Hegar
1090	0.5	0.9	1.2	1.3	1.7	1.9	3.2	3.4	

CYPRESS CREEK, K100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1110	0.4	1.0	1.5	2.0	2.6	2.6	4.0	4.1	Cypresswood
1115	0.3	0.6	1.0	1.4	2.4	2.8	4.5	4.5	Inverness Forest
1120	0.3	0.9	0.9	1.4	2.6	3.1	4.7	4.7	I-45
1130	0.6	1.3	1.8	1.8	2.8	3.3	5.6	5.6	Kuykendahl
1140	0.5	1.3	1.7	2.0	2.4	2.4	4.4	4.8	Stuebner-Airline
1150	0.5	1.1	1.4	1.6	2.4	2.7	4.9	5.2	249
1160	0.3	0.8	1.2	1.4	2.9	3.2	5.2	5.5	Grant
1170	0.5	1.3	1.9	2.4	4.5	4.9	8.0	8.2	Huffmeister
1175	0.5	1.3	2.2	2.8	3.8	4.2	7.8	8.3	290
1180	0.3	0.7	1.2	2.0	4.1	4.9	7.0	7.6	Katy-Hockley
1190	0.2	0.5	0.8	1.0	2.0	2.2	3.1	3.4	Mathis @ K166 in Waller
1210	0.5	1.3	2.2	2.6	3.6	3.9	7.2	7.6	Kludge @ L100
1220	0.4	0.9	1.5	2.5	4.1	4.4	7.2	7.6	Cypress-Rosehill@L100

WILLOW CREEK, M100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1320	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Kuykendahl
1340	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	SH 249

CARPENTERS BAYOU, N100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1420	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	I-100
1440	0.3	0.7	0.9	1.1	1.4	1.4	1.4	1.4	Wallisville
1460	0.3	0.6	1.2	1.6	1.8	1.9	2.0	2.1	US 90

Return Period: 10year 25year 50year 100year 500year

April 28 Rainfall Maximums by Watershed

Monday 4/27 10AM to Tuesday 4/28 at 10AM

GOOSE CREEK, O100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1520	0.3	0.4	0.6	1.3	1.6	1.8	1.8	1.8	SH 146
1540	0.7	1.3	1.6	0.8	1.1	1.1	1.1	1.1	Baker Rd

GREENS BAYOU, P100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1600	0.3	0.8	1.0	1.4	1.7	1.8	2.3	2.4	Mt. Houston Pkwy
1610	0.1	0.2	0.2	0.3	0.4	0.4	0.4	0.4	Normandy
1620	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Ley Rd
1630	0.4	0.7	0.8	1.1	1.5	1.8	2.3	2.4	Beltway 8 @ P130
1640	0.2	0.4	0.6	0.8	0.9	1.0	1.4	1.6	US 59
1645	0.4	0.8	1.2	1.6	1.8	1.9	3.4	3.5	Beltway 8
1650	0.3	0.8	1.2	1.5	1.8	2.0	2.9	3.0	Rankin @ P130
1660	0.3	0.4	0.6	1.1	1.4	1.7	3.0	3.0	Knobcrest
1665	0.7	1.3	1.6	1.9	2.4	2.5	4.5	4.7	Bammel-N Houston
1670	1.0	1.1	1.1	1.4	2.7	2.8	4.4	4.5	Cutten
1685	0.2	0.4	0.7	0.9	1.3	1.5	2.0	2.2	Tidwell

HALLS BAYOU, P118

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1675	0.2	0.4	0.7	0.9	1.3	1.4	1.8	1.9	Tidwell
1680	0.2	0.5	0.5	0.9	1.2	1.4	1.7	1.8	Jensen
1690	0.2	0.4	0.6	1.4	1.9	2.1	3.1	3.1	Airline
1695	0.4	0.7	1.0	0.2	0.4	0.5	0.8	0.8	

CEDAR BAYOU, Q100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1720	0.2	0.4	0.5	0.8	1.1	1.2	1.2	1.3	SH 246
1740	0.3	0.6	0.9	1.0	1.2	1.3	1.5	1.5	US 90

JACKSON BAYOU, R100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1840	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	Diamond Head

LUCE BAYOU, S100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	LOCATION
1940	0.0	0.0	0.0	2.0	2.2	2.5	2.7	2.9	FM 2100

Return Period: 10year 25year 50year 100year 500year

April 28 Rainfall Maximums by Watershed

Monday 4/27 10AM to Tuesday 4/28 at 10AM

BARKER RESERVOIR, T100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
2010	0.2	0.3	0.4	0.4	0.6	0.6	0.6	0.6
2020	0.6	1.6	2.4	3.5	5.1	5.4	6.2	7.6
2040	0.3	0.9	1.6	1.9	3.6	3.9	4.7	6.0

LOCATION

Barker Dam
Prince Creek @ T101
US 90 @ T100

ADDICKS RESERVOIR, U100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
2110	0.6	1.7	2.9	4.2	5.5	5.6	7.6	8.3
2120	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2150	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2160	0.4	1.2	2.2	3.7	6.2	6.8	7.4	8.4
2180	0.6	1.5	2.6	3.8	5.2	5.9	10.4	11.3

LOCATION

Addicks Dam
W Little York @ U100
Greenhouse @ U101
Clay @ U102
FM 529 @ U102

BUFFALO BAYOU, W100

GAGE ID	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour
2210	0.2	0.6	1.0	1.4	2.0	2.1	2.1	2.2
2220	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2230	0.1	0.2	0.4	0.6	0.9	1.0	1.0	1.0
2240	0.3	0.4	0.8	1.1	1.9	2.0	3.0	3.4
2250	0.7	1.7	2.5	3.6	5.0	5.0	7.7	8.1
2260	0.6	1.7	2.8	3.6	5.2	5.2	7.4	7.7
2270	0.6	1.7	2.8	4.8	7.0	7.1	8.9	9.4
2280	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2290	0.5	1.5	2.8	4.7	6.8	7.1	8.8	9.6
3990	0.3	0.7	1.0	1.5	1.7	1.7	2.4	2.6

LOCATION

Turning Basin
Main St.

Sheperd
Bingle
San Felipe
Beltway 8
I-10 @ W156
Dairy Ashford
Metro

Return Period: 10year 25year 50year 100year 500year

POINT RAINFALL - ANNUAL EXCEEDANCE PROBABILITIES FOR HARRIS COUNTY

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

Exceedance

Probability	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	2-day
50% (2-yr)	0.7	1.1	1.4	1.9	2.5	2.9	3.4	4.1	4.7
20% (5-yr)	0.9	1.4	1.8	2.5	3.3	4.0	4.8	5.8	6.6
10% (10-yr)	1.0	1.5	2.1	2.8	3.9	4.9	5.9	7.1	8.1
4% (25yr)	1.1	1.8	2.4	3.4	4.8	6.1	7.4	9.0	10.1
2% (50-yr)	1.2	2.0	2.7	3.8	5.6	7.2	8.7	10.6	11.8
1% (100-yr)	1.3	2.2	3.0	4.2	6.5	8.5	10.2	12.4	13.6
0.2% (500-yr)	1.5	2.7	3.9	5.5	9.0	12.2	14.7	17.7	18.7

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

Exceedance

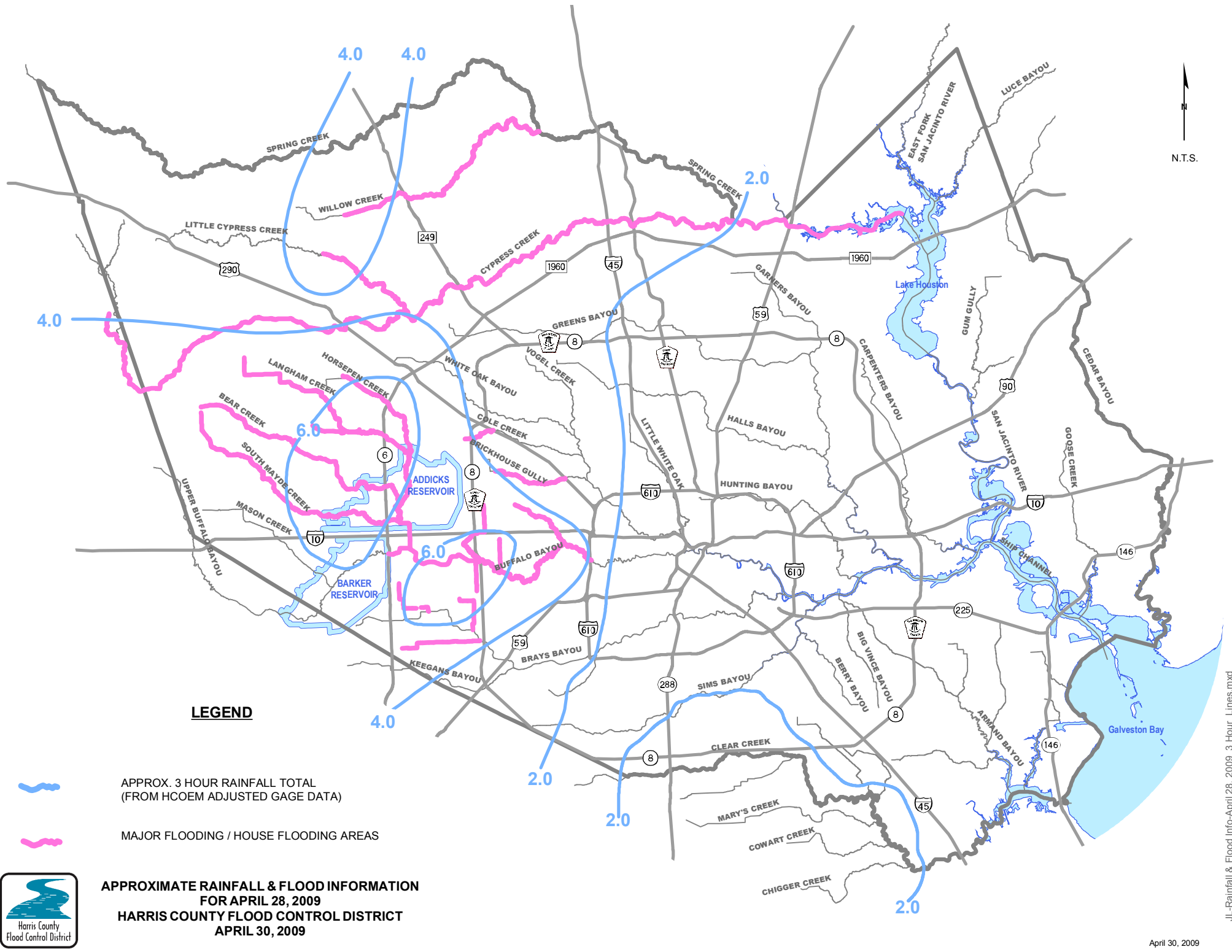
Probability	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	2-day
50% (2-yr)	0.7	1.1	1.5	2.0	2.6	3.1	3.7	4.4	5.0
20% (5-yr)	0.8	1.4	1.8	2.5	3.5	4.3	5.1	6.2	7.1
10% (10-yr)	0.9	1.5	2.1	2.9	4.1	5.1	6.2	7.6	8.6
4% (25yr)	1.0	1.7	2.4	3.4	5.0	6.4	7.8	9.6	10.8
2% (50-yr)	1.1	1.9	2.7	3.8	5.8	7.6	9.2	11.3	12.5
1% (100-yr)	1.2	2.1	3.0	4.3	6.7	8.9	10.8	13.2	14.5
0.2% (500-yr)	1.4	2.6	3.8	5.5	9.2	12.8	15.5	18.9	20.0

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

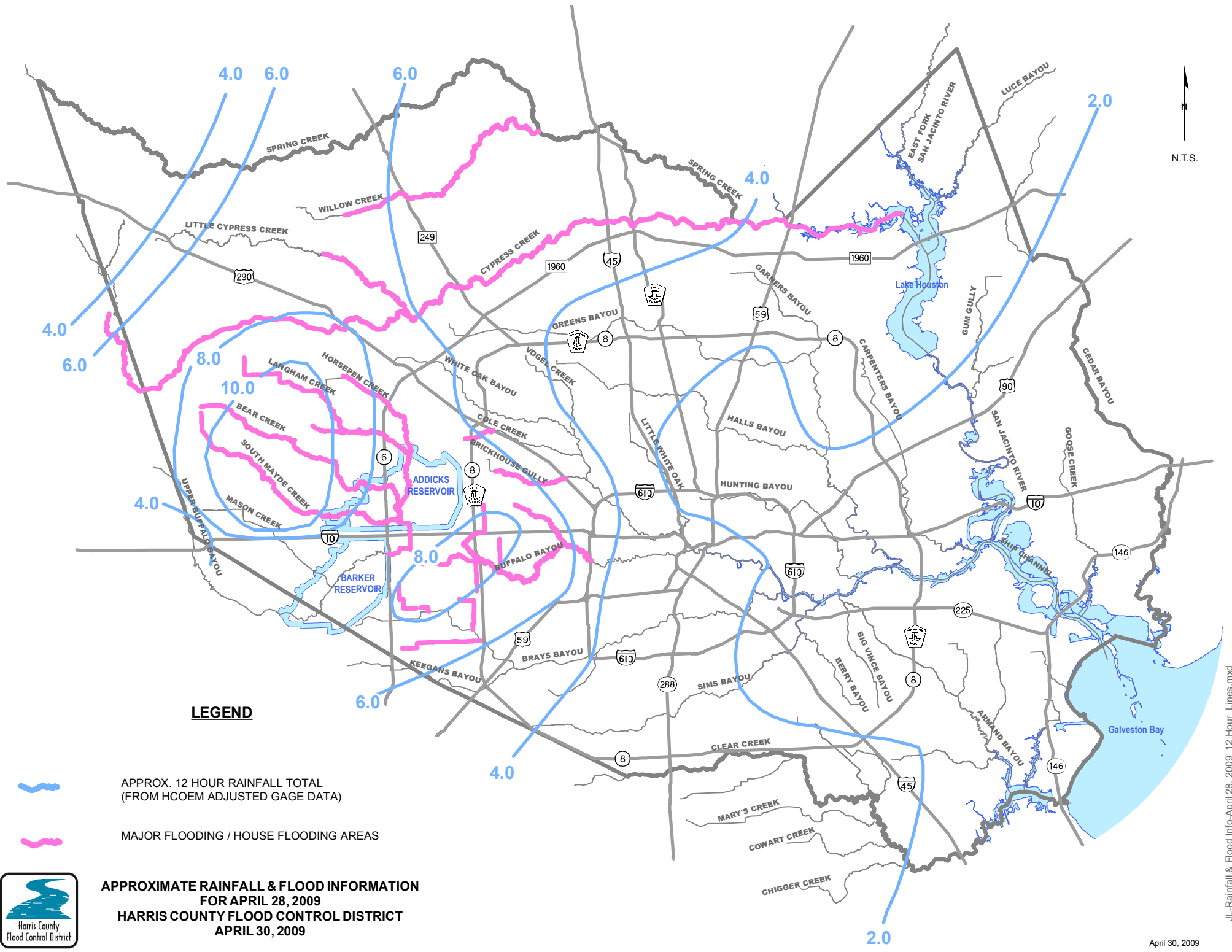
Exceedance

Probability	5-min	15-min	30-min	1-hour	3-hour	6-hour	12-hour	24-hour	2-day
50% (2-yr)	0.7	1.1	1.5	2.0	2.7	3.2	3.8	4.5	5.3
20% (5-yr)	0.8	1.4	1.9	2.5	3.5	4.4	5.3	6.4	7.5
10% (10-yr)	0.9	1.5	2.1	2.9	4.2	5.3	6.4	7.8	9.0
4% (25yr)	1.0	1.7	2.4	3.4	5.1	6.6	8.0	9.8	11.2
2% (50-yr)	1.1	1.9	2.7	3.8	5.9	7.7	9.5	11.6	13.1
1% (100-yr)	1.2	2.1	3.0	4.3	6.8	9.1	11.1	13.5	15.1
0.2% (500-yr)	1.4	2.5	3.7	5.5	9.4	13.1	15.9	19.3	20.7

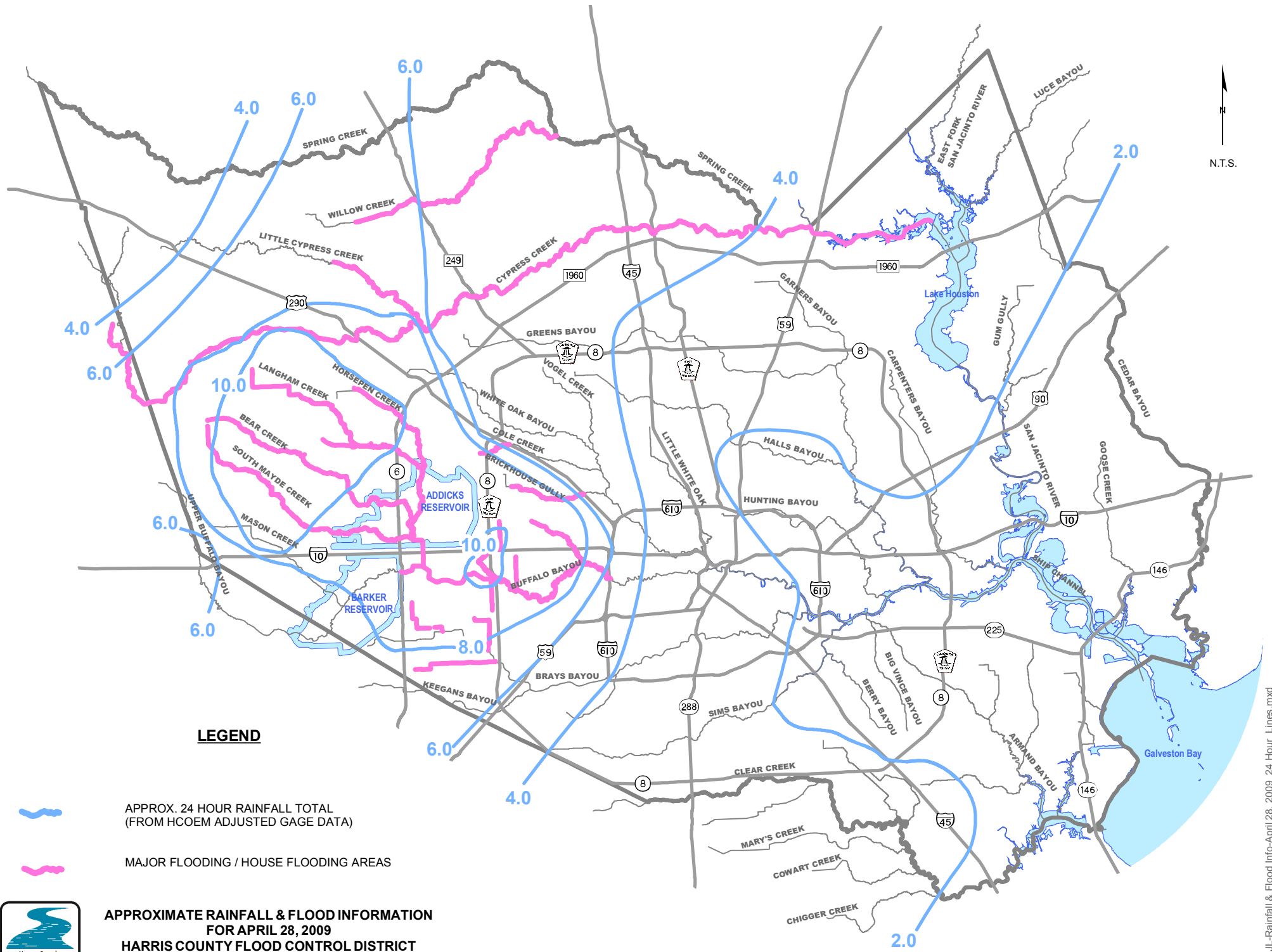
Source: TSARP White Paper for rainfall from USGS



JL-Rainfall & Flood Info-April 28, 2009_3 Hour_Lines.mxd



JL-Rainfall & Flood Info-April 28, 2009_12 Hour_Lines.mxd



House Flooding Estimates for 4-28-09 Flood Event
Compiled by Harris County Flood Control District
As of June 16, 2009 - Final

Watershed	HCFCU Unit	Estimated Number	Subdivision	KM	Reported By	Jurisdiction	County	Estimate Based On
Langham Creek								
	U100/U120	6	Autumn Run	407 N	HC Permits	unicorp. County	Harris	2
	U100-00-00	6	Bear Creek Northwest	408 W	HC Permits	unicorp. County	Harris	2
	U106-00-00	4	Bradford Colony	408 U	HC Permits	unicorp. County	Harris	2
	U106-00-00	37	Fairway West	408 J	HC Permits	unicorp. County	Harris	2
	U100-00-00	21	Georgetown Colony	408 X	HC Permits	unicorp. County	Harris	2
	U106-00-00	128	Hearthstone	408 K	HC Permits	unicorp. County	Harris	2
	U100-00-00	65	Savannah Estates	408 X	HC Permits	unicorp. County	Harris	2
	U100-00-00	11	South Copperfield Village	408 J	HC Permits	unicorp. County	Harris	2
	U100-00-00	8	Villages of Langham Creek	407 V	HC Permits	unicorp. County	Harris	2
	U100-00-00	55	Yorktown Villas	408 S	HC Permits	unicorp. County	Harris	2
	TOTAL	341						
Bear Creek								
	U102-00-00	9	Bear Creek Trails	406 X	HC Permits	unicorp. County	Harris	2
	U102/U107	250	Bear Creek Village	448 E, A	HC Permits	unicorp. County	Harris	2
		8	Bear Creek West	447D/448A	HC Permits	unicorp. County	Harris	2
	U102-20	2	Glencarin	447 H	HC Permits	unicorp. County	Harris	2
	U102-00-00	10	Ricewood Village	446 B	HC Permits	unicorp. County	Harris	2
	U100-00-00	6	Villages of Bear Creek	406 Y	HC Permits	unicorp. County	Harris	2
	U102-00-00	15	Woodfern	447 J	HC Permits	unicorp. County	Harris	2
	TOTAL	300						
South Mayde Creek								
	U101-00-00	1	Creekbend Estates	446 Q	HC Permits	unicorp. County	Harris	2
	U101-00-00	2	Saums Rd	446 V	HC Permits	unicorp. County	Harris	2
	U101-00-00	1	Villages of Sundown Glen	446 P	HC Permits	unicorp. County	Harris	2
	U101-19-00	10	Westgreen	446 X	HC Permits	unicorp. County	Harris	2
	U101-00-00	43	Westlake	446 V	HC Permits	unicorp. County	Harris	2
	U101-00-00	4	Westlake Forest	446 U	HC Permits	unicorp. County	Harris	2
	U101-00-00	16	Westlake Place	446 Q	HC Permits	unicorp. County	Harris	2
	TOTAL	77						

Based On Legend:
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Watershed	HCFCU Unit	Estimated Number	Subdivision	KM	Reported By	Jurisdiction	County	Estimate Based On
Mason Creek								
	T103-00-00	11	Memorial Parkway	486 J	HC Permits	unicorp. County	Harris	2
	T101-00-00	10	Williamsburg Settlement	445 Z	HC Permits	unicorp. County	Harris	2
	TOTAL	21						
White Oak Bayou								
	E133-00-00	4	Barwood	368 Q	HC Permits	unicorp. County	Harris	2
	E115-00-00	19	Binglewood	450 M	City of Houston	City of Houston	Harris	1
	E100-00-00	4	Burnett Park Area	493 H	City of Houston	City of Houston	Harris	1
	E101-12-00	5	Clark Park Area	453 B	City of Houston	City of Houston	Harris	1
	E117-00-00	6	Jersey Acres	409 U	HC Permits	unicorp. County	Harris	2
	E100-00-00	2	Jersey Village	409 M	Jersey Village	Jersey Village	Harris	1
	E115-00-00	103	Langwood	450M/451J	City of Houston	City of Houston	Harris	1
	E100/E107-00	51	Shepherd Park Plaza	452 K	City of Houston	HCFCU	Harris	1
	TOTAL	194						
Cypress Creek								
	K124-00-00	4	Bridgestone	291 T	HC Permits	unicorp.County	Harris	2
	K100-00-00	4	Cypress Bend	367 G,L	HC Permits	unicorp.County	Harris	2
	K100-00-00	3	Enchanted Valley	368 E	HC Permits	unicorp.County	Harris	2
	K100-00-00	1	House Hahl Rd Area	366 L	HC Permits	unicorp.County	Harris	2
	K100-00-00	6	Houston Hot Wells	367 K	HC Permits	unicorp.County	Harris	2
	K100-00-00	1	Katy Hockley Rd Area	364 M/R	HC Permits	unicorp.County	Harris	2
	K120-00-00	4	North Hill Estates	332 C	HC Permits	unicorp.County	Harris	2
	K100-00-00	3	Pecan Forest	331 L,Q	HC Permits	unicorp.County	Harris	2
	K100-00-00	1	Ravensway	368 F	HC Permits	unicorp.County	Harris	2
	K163-00-00	7	Timber Lake Estates	368 L	HC Permits	unicorp.County	Harris	2
	K145-00-00	2	Western Trails	368 B	HC Permits	unicorp.County	Harris	2
	TOTAL	32						
Spring Creek								
	J120-00-00	10	Mossy Oaks (street name)	291 L	HC Permits	unicorp. County	Harris	2
	J121-00-00	3	Spring Stuebner Estates	291 J	HC Permits	unicorp. County	Harris	2
	J121-02-00	7	Sumac Ln (street name)	291 L	HC Permits	unicorp. County	Harris	2
	TOTAL	20						

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House Flooding Estimates for 4-28-09 Flood Event
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As of June 16, 2009 - Final

Watershed	HCFCF Unit	Estimated Number	Subdivision	KM	Reported By	Jurisdiction	County	Estimate Based On
San Jacinto River								
	G103-00-00	13	Belleau Woods East	336 Z	HC Permits	unicorp. County	Harris	2
	G103-00-00	6	Northshore	336 L	HCFCF	City of Houston	Harris	1
	TOTAL	19						
Brays Bayou								
	D122-00-00	40	Bellaire West	529 K	City of Houston	City of Houston	Harris	1
	D100-00-00	36	Brays Village	529 B/F	City of Houston	City of Houston	Harris	1
	D124-00-00	27	Brays Village East	529 G	City of Houston	City of Houston	Harris	1
	D129-00-00	77	Briar Village	488 T/S	City of Houston	City of Houston	Harris	1
	D122-00-00	37	Catalina Square	529 J	City of Houston	City of Houston	Harris	1
	D120-00-00	10	Chessington	529 P	City of Houston	City of Houston	Harris	1
	D100-00-00	13	Clayton	527 H	HC Permits	unicorp. County	Harris	2
	D118-00-00	2	Huntington Village	528 V	City of Houston	City of Houston	Harris	1
	D118/D118-09	6	Keegans Glen	529 W/S	City of Houston	City of Houston	Harris	1
	D129-03	8	Park Hollow Place	488 Y	City of Houston	City of Houston	Harris	1
	D133-00-00	3	Sharpstown Country Club	530 B	City of Houston	City of Houston	Harris	1
	D120-00-00	19	Wellington Park	528 R	City of Houston	City of Houston	Harris	1
	TOTAL	278						
Sims Bayou								
	C143-00-00	16	Cielo	572 T	City of Houston	City of Houston	Harris	1
	C106-01-00	15	Freeway Manor	576 A	City of Houston	City of Houston	Harris	1
	C139-00-00	4	N/A	572 U	City of Houston	City of Houston	Harris	1
	TOTAL	35						
Buffalo Bayou								
	W100-00-00	71	Ashford Forest	488 M	City of Houston	City of Houston	Harris	1
	W165-00-00	16	Ashford Hollow	488 V/R	City of Houston	City of Houston	Harris	1
	W156-00-00	8	Ashford Village	489 N	City of Houston	City of Houston	Harris	1
	W170-00-00	48	Barkers Landing	488 A	City of Houston	City of Houston	Harris	3
	W157-00-00	5	Briar Court	489 V	City of Houston	City of Houston	Harris	1
	W150-00-00	4	Briar Grove Park	489 R/M	City of Houston	City of Houston	Harris	1
	W167-04-00	42	Brittmore Village	449 X/T	City of Houston	City of Houston	Harris	1
	W151/W146	37	Bunker Hill	490 F	City of Houston	City of Houston	Harris	1
	W100-00-00	26	Fleetwood	488 E	City of Houston	City of Houston	Harris	1

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Watershed	HCFCU Unit	Estimated Number	Subdivision	KM	Reported By	Jurisdiction	County	Estimate Based On
	W100/W156	8	Gaywood	489 G	City of Houston	City of Houston	Harris	1
	W141-00-00	42	Hedwig Village	490 B	Hedwig Village	Hedwig Village	Harris	1
	W140-02-00	1	Hillshire Village	491 B	Hillshire Village	Hillshire Village	Harris	1
	W140-11-00	27	Long Point Acres	450 T	City of Houston	City of Houston	Harris	1
	W153/W156	57	Memorial Bend	489 H	City of Houston	City of Houston	Harris	1
	W151-00-00	7	Memorial First	490 E	City of Houston	City of Houston	Harris	1
	W156-00-00	7	Memorial Plaza	489 C	City of Houston	City of Houston	Harris	1
	W100/U100	147	Memorial Thicket	488 B	City of Houston	City of Houston	Harris	1
	W100/W163	20	Nottingham Forest	489 E	City of Houston	City of Houston	Harris	1
	W100/W147	12	Piney Point Village	490 Q	Piney Point Vill	Piney Point Vill	Harris	1
	W140-01-00	60	Rollingwood	450 X	City of Houston	City of Houston	Harris	1
	W140-00-00	20	Spring Branch	450 Q	City of Houston	City of Houston	Harris	1
	W140-06-00	64	Spring Shadows	450 P	City of Houston	City of Houston	Harris	1
	W140-00-00	17	Spring Valley	491 A	Spring Valley	Spring Valley	Harris	1
	W147-00-00	26	Tanglewilde	490 X	City of Houston	City of Houston	Harris	1
	W151-00-00	15	Tealwood	490 J	City of Houston	City of Houston	Harris	1
	W157-00-00	25	Walnut Bend	489 Q/L	City of Houston	City of Houston	Harris	1
	W100-00-00	8	West Briar	488 F	City of Houston	City of Houston	Harris	1
	W100-00-00	21	Westchester	488 L	City of Houston	City of Houston	Harris	1
	W100/W147	36	Woodlake Area	490 T	City of Houston	City of Houston	Harris	1
	W100-00-00	32	Yorkchester	489 F	City of Houston	City of Houston	Harris	1
	TOTAL	909						
Misc Locations								
	N/A	4	Briar Hills	488 J	City of Houston	City of Houston	Harris	1
	M100-00-00	2	Dowdell Rd	Various	HC Permits	unicorp. County	Harris	2
	N/A	21	Forest Park West	488 U	City of Houston	City of Houston	Harris	1
		1	Katy	Various	Katy	Katy	Harris	1
		36	Misc County Locations	Various	HC Permits	unicorp. County	Harris	1
	M100-00-00	1	Tomball	Various	Tomball	Tomball	Harris	1
	W100-00-00	11	Various	Various	City of Houston	City of Houston	Harris	1
		3		572 Y/Z	City of Houston	City of Houston	Harris	1
	TOTAL	79						

GRAND TOTAL 2305

Based On Legend:
1= Final Field Count
2= Initial Field Count
3= Citizen Report