Preliminary Plan For
Master Drainage Study
For The
City of Huntsville

Prepared for
City of Huntsville

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*To be delivered electronically.
**Videos to be delivered electronically.

INTRODUCTION

1.1 Purpose

The City of Huntsville is preparing to create a Master Drainage Plan for the City to develop high-level strategies for mitigation of flooding problems and address improved drainage infrastructure required for future development. An initial evaluation of the City's current status is necessary to initiate the scoping of this Master Drainage Plan.

This report summarizes all the current available data for the City of Huntsville and identifies any gaps and information that may need to be acquired to begin the Master Study.

1.2 Site Location and Description

The City of Huntsville is located in Walker County and is bisected by Interstate 45 running north and south. The population is 45,941 per the 2020 Census. The City limits are located within eight watersheds: Crabb Creek-Nelson Creek, McGary Creek, Robinson Creek-West Fork San Jacinto River, McDonald Creek-West Fork San Jacinto River, East Sandy Creek, Gourd Creek-Winters Bayou, Little School Branch-Nelson Creek, and Harmon Creek. **Exhibit 1** shows a map of these watersheds around the City.

1.3 Project Objectives

The objective of this preliminary plan is to:

1. Collect all available data that could be used for the Master Drainage Plan, including drainage concerns from citizens, previous drainage studies, floodplain development permits, topography, land use data, soil data, bridge and hydraulic structure geometries, drainage infrastructure as-builts, and gage data.

2. Interpret and analyze all data collected to identify problems areas within the City due to drainage

3. Evaluate previous drainage studies conducted within the City, including geographic coverage, date of studies, criteria used, and opinion of usefulness.

4. Make recommendations of an implementation plan that includes problem area prioritization and develop order of magnitude costs to prepare studies for each watershed.

5. Review the City Code of Ordinances and Development Criteria and document all recommendations for updates.

1.4 FEMA National Flood Insurance Program

1.4.1. Effective Floodplain

The latest updates to the FEMA Flood Insurance Rate Maps within the City date to August 16, 2011.

There are nine (9) Flood Insurance Rate Map Panels within the City limits:

Panel	Studied Streams in Huntsville	Flood Zones
48471C0225D	None	N/A
48471C0240D	Hadley Creek	AE
48471C0250D	None	N/A
48471C0350D	McGary Creek	AE
48471C0355D	McGary Creek	AE, A
48471C0360D	Town Branch/Horse Branch/ Tributary B/Tanyard Branch/East Fork/ Mathews Lake/Robinson Creek/ Shepherd Creek	AE, A
48471C0365D	McDonald Creek	AE
48471C0370D	Prairie Branch/Elkins Lake/Azalea Lake/ Camelia Lake/Spring Lake	AE, A
48471C0400D	None	N/A

1.4.2. Hydrologic Analyses

The hydrologic and hydraulic analyses were performed by the U.S. Army Corps of Engineers (USACE), Galveston District for the Federal Emergency Management Agency (FEMA), under Contract No. EMW-96-IA- 0294. This work was completed in September 1997.

Peak discharges for the selected exceedance probabilities were computed using published regional regression equations for the State of Texas (Reference: U.S. Department of the Interior, Geological Survey, Water resources Investigations Report 96-4307, Regional Equations for Estimation of Peak-Streamflow Frequency for Natural Basins in Texas, 1997). A second United States Geological Survey (USGS) regression method was used to adjust the computed peak flows for the effects of watershed urbanization (Reference: U.S. Department of the Interior, Geological Survey, Water Supply Paper 2207, Flood Characteristics of Urban Watershed in the United States, 1983). The percentage of urbanization in the watershed for each stream was determined by field visits to the study area. The 0.2-percent (500-year) exceedance probability peak discharges were determined by extrapolation.

1.4.3. Hydraulic Analyses

Water-surface elevations were computed using the USACE HEC-RAS one-dimensional hydraulic computer program (Reference: U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-RAS River System Analysis System Version 2.0, Hydraulic Computer Modeling Software, CPD-68, CPD-69, CPD-70, April 1997).

Digital terrain models used to obtain the channel and valley cross sections, as well as some bridge data. Field spacing of 1,000 feet between cross sections was used in the hydraulic computations.

The only topography referenced was USGS Quadrangle maps from 1960 to 1976 (Reference: U. S. Geological Survey Quadrangle Maps, 7.5-Minute Series Topographic Maps Scale 1:24,000: Baker Lake,1972; Connor, 1962; Crabb's Prairie, 1976, Galilee, 1962; Huntsville 1976; Loma, 1963; Lovelady South, 1962; Maynard, 1976; Moore Grove, 1976; New Waverly, 1960; Oakhurst, 1972; Phelps, 1976; Pine Prairie, 1962; Richards, 1962; Riverside, 1972; San Jacinto, 1976; Staley, 1972; Steep Branch, 1963; Trinity West, 1972; Weldon, 1972; Wyser Bottom, 1972).

2.0 DATA COLLECTION

2.1 Data Collection by Agencies

Coordination with various agencies was required to collect data and complete the plan for the master drainage study. These agencies include the City of Huntsville, TxDOT, USGS, and FEMA. The City of Huntsville provided information on previous drainage studies in the City, floodplain permits requests and their status, service requests, drainage problem areas, and storm sewer system information. Meetings with City staff were also conducted to address and discuss drainage issues. TxDOT provided all bridge and hydraulic structure information within the City through formal data requests. The USGS provided gage and precipitation data for gages surrounding the City. FEMA provided repetitive loss data and claims for structural losses due to flooding.

2.2 Topography

The topography collected for the city is LiDAR raster data from the NAVD88 Datum using NAD 1983 State Plane Texas Central FIPS 4203 in feet. The raster extents include the eight watersheds encompassing the City. Two separate raster files make up these extents. The Upper Coast Lidar taken March 22, 2018, covers the majority and west side of the City limits, and the East Texas Lidar taken April 14, 2017, covers the lower east side of the City limits. The datasets are in the same projection and datum and have a 3 foot by 3 foot cell size. **Figure 1** shows the LiDAR data with the City Huntsville boundary. A large scale map of his data can also be found on **Exhibit 2.**

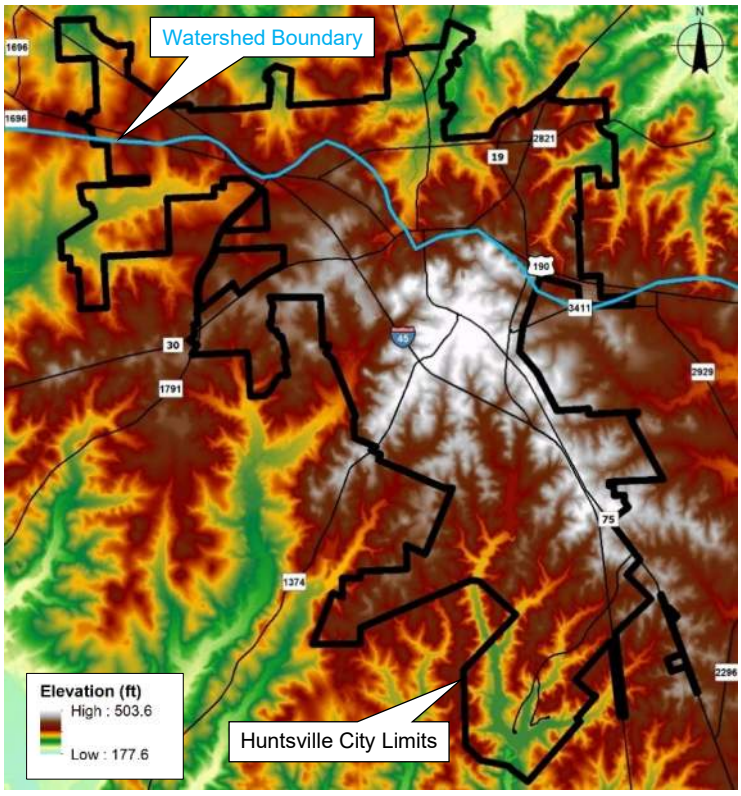


Figure 1: Huntsville LiDAR Map

2.3 Land Use

The Land Use data collected for Huntsville is sourced from the National Land Cover Database (NLCD) released in 2019 and covers the full extents of the City limits. The NLCD data within the City of Huntsville can be seen on **Exhibit 3**. As shown on the exhibit, the northeastern portion of the city is primarily developed land while the northwestern part of the city has large amounts of pastureland. The southern side of the city is primarily covered by forest and vegetation. The Elkins Lake area stands out as the only development on the southern limits.

However, the NLCD data requires updating to reflect present land development conditions not accounted for since the collection of the 2019 NLCD data. For example, several subdivisions have experienced high levels of development and the construction of new homes, including Crown Point in northern Huntsville, Hunter's Creek in northwest Huntsville, Sterling Ridge to the northeast of Huntsville, Elkins Lake and Texas Grand Ranch in southern Huntsville, and Rockbridge in western Huntsville. As seen on **Exhibit 3**, this new development is not shown in the 2019 NLCD.

2.4 Soils

Soil data was collected and examined for the City of Huntsville from the Soil Survey Geographic Database (SSURGO), collected by the National Cooperative Soil Survey. As seen in the soil map on **Exhibit 4**, Group A soils are dominant in the southern part of the city limits. These soils are characterized by their high infiltration rate and a low runoff potential. Group D soils are dominant in the northwest portion of the city limits. These soils are characterized by their very slow infiltration rate and a high runoff potential. A third soil group, Group C/D soils, are located along streams. This mixed soil group acts as Group C with slow infiltration in drained areas and Group D with very slow infiltration in undrained areas. **Table 2-1** summarizes the soils found in the City of Huntsville.

Table 2-1: Soils Summary

Soil Group	Location on City Limits	Characteristics
A	South	High infiltration rate and a low runoff potential
D	Northwest	Slow infiltration rate and a high runoff potential
C/D	Along streams	Slow infiltration in drained areas and very slow infiltration in undrained areas

2.5 Bridge and Hydraulic Structure Geometries

Structure geometries include shapefile data or any spatial files of existing bridges, channels, ponds, or storm sewers. Spatial data for the streams, lakes, ponds, and wetlands are also available; these files show the shape and outline of these features but no other geometry features. Hydraulic structures data is shown on **Exhibit 5.**

Bridge and hydraulic structure data were obtained from the Bryan TxDOT District. A formal request was made for as-built documents for all TxDOT bridges and culverts within Huntsville. Documents containing plan and profile sheets were received from TxDOT.

2.6 Storm Sewer Spatial Data

2.6.1. Open Channels

Open channel data is encompassed by the available LiDAR data. No other types of data will be needed for the open channels.

2.6.2. Storm Sewers

The current storm sewer files that exist for the City are concentrated in the Elkins Lake with some sporadic areas across the rest of the city, and along Veterans Memorial Parkway. As shown on **Exhibit 5**, there are many gaps in the storm sewer data across the City. It is recommended that the City maintains an updated storm sewer system database across the City to fill in these data gaps

2.6.3. Detention Ponds

The City maintains the following four detention areas:

- Intramural fields at Sam Houston State University: maintained since the completion of the Town Creek Grant Project
- Dawson Pond near Fire Station 1 on Veterans Memorial Pkwy: maintained since station construction
- 224 Greenleaf: Property is privately owned by developer, but the City has mowed and done grading of silt since its construction
- Detention area near Fire Station 4 on SH 30: owned and maintained by the City

2.7 Gage Data

Gage data was obtained from the USGS. **Exhibit 6** shows the active USGS streamflow and precipitation gages near Huntsville.

2.7.1. Streamflow

No USGS stream gages are located within Huntsville City limits, but there are several in the surrounding area. Four of these stream gages are within Walker County.

2.7.2. Rainfall

No USGS precipitation gages are located within the City limits, but gages in the surrounding area can be used for calibration to obtain gage-adjusted rainfall. There is one precipitation gage in Walker County, to the northeast of Huntsville in Riverside. There are four additional gages recording precipitation data in the surrounding area by Shiro, Dobbin, Livingston, and Romayor. Precipitation data from these gages is considered provisional by the USGS and is not verified with quality assurance processes. Provisional precipitation data was obtained through a request to USGS for large storm events for the gages shown in **Table 2-2**. These storms include Hurricane Harvey, Tropical Storm Imelda, and storms in March and December 2018.

Table 2-2: Gages Near Huntsville Recording Precipitation Data

Station No.	USGS Station	Data Recorded	Start of Period of Record	Peak Recorded Value	Date of Peak Recorded Value
8111058	Gibbons Ck Res nr Shiro, TX	Lake Elevation	5/2/2017	250 ft	3/29/2022
		Precipitation	Provisional data only	-	-
8067690	Lake Ck nr Dobbin, TX	Discharge	2/1/2018	21,100 cfs	12/8/2018
		Gage height	Provisional data only	-	-
		Precipitation	Provisional data only	-	-
8066000	Trinity Rv at Riverside, TX	Gage height	10/1/2007	149 ft	10/8/2018
		Precipitation	Provisional data only	-	-
8066200	Long King Ck at Livingston, TX	Discharge	10/1/1990	50,900 cfs	10/17/1994
		Gage height	10/12/2007	28 ft	8/28/2017
		Precipitation	Provisional data only	-	-
8066500	Trinity Rv at Romayor, TX	Discharge	10/1/1988	122,000 cfs	10/19/1994
		Gage height	10/1/2007	42 ft	8/30/2017
		Precipitation	Provisional data only	-	-

2.8 Data Inventory

All data collected was reviewed for relevance and usefulness. Exhibits were created to complete a data gap analysis and identify any missing data that might be required in preparation for a Master Drainage Plan.

3.0 CURRENT DRAINAGE STUDIES

3.1 Study Inventory

The City provided LJA with ten previous drainage studies for review. All studies were in PDF format and did not include electronic models or other supporting data. While one study was completed in 2021, the remainder of the studies range from six (6) to thirty-two (32) years old and do not account for development that has taken place in the City since their completion. The studies do not encompass all of Huntsville but include several major areas, with multiple focusing on the Elkins Lake and Spring Lake areas. **Exhibit 7** shows the streams included in the studies provided by the City. **Table 3-1** details these studies and their recommendations.

As summarized on **Table 3-1**, the drainage studies, including the 2015 Master Drainage Plan do not follow consistency in criteria among the previous studies. Within the 2015 Master Drainage Plan, hydrologic and hydraulic methodologies varied per watershed. In addition, aerial photographs and the City permit log show that just in the past two years there has been a rapid rate of development within the City. Since 2020 to present day, there have been over 1,300 permit requests including over 770 permits for new single-family dwellings spread over all watersheds in the City. These changes in development could affect drainage patterns not accounted for in the 2015 Master Drainage Plan. The City of Huntsville has also experienced several storms that created impacts not seen in previous studies, and advances in topographic information and hydraulic modeling including 2D modeling support that an updated study is needed and that the previous studies alone are not alone useful going forward.

Table 3-1: Previous Studies

Study Name	Firm	Date Complete	Study Area	Criteria Used	Hydrologic Methodology	Hydraulic Methodology	Problem Areas	Recommendations
Flood Reduction Study for Azalea Lake	Esmond Engineering	Oct 1990	Azalea Lake, River Oaks Dr	Harris County Design Criteria Manual	• Small Watershed Method • Rational Method/ Manning Equation	FORTRAN	Intersection of River Oaks Dr & Azalea Lake headwaters	• Proposed Spillway at Azalea Dam • Elevate crossing of River Oaks Dr (approx. 300' of street) to 1.5' above existing • 8-8x8 RCB culverts at River Oaks Dr Crossing to be poured in place
McDonald Creek Dredging from Winter Way to Autumn Rd	-	Nov 1991	McDonald Creek				Autumn Rd, Winter Way	• Dredge the creek
Drainage Investigation on McDonald Creek	Rust Lichliter/ Jameson	Nov 1995	McDonald Creek (near Summer/ Autumn Ln)				Autumn Rd, Summer Ln	• Option 1 • Remove sediment deposition from Autumn Ln & Summer Ln
Drainage Investigation on McDonald Creek	Rust Lichliter/ Jameson	Oct 1996	McDonald Creek (near Summer/ Autumn Ln)				Autumn Rd, Summer Ln	• Channel redesign

Drainage Investigation on McDonald Creek	Klotz Associates (uncertain)	Revised Feb 2010	McDonald Creek (near Summer/ Autumn Ln)				Autumn Rd, Summer Ln	• Channel redesign
Horse Branch Watershed Study	Klotz Associates	August 2014	Horse Branch, Town Branch, Tributary B		• HEC-HMS	HEC-RAS		• Culvert replacement • Channel improvements
McDonald Creek Drainage at Spring Lake Memorandum	City of Huntsville Staff	Jun 2015	McDonald Creek				Autumn Rd, Winter Way	• Dredge and clear flowpath between Autumn Rd and Winter Way • Culvert replacement at Autumn Rd and Winter Way • Dredge Spring Lake and modify overflow pipe level • Channelize creek using man-made structures, engineered sediment, & erosion control devices • Use Klotz McDonald Creek Watershed Study (2012) for full watershed

City of Huntsville Watershed Master Drainage Plan Compilation	Klotz Associates	March 2015	McDonald Creek		• HEC-HMS (FEMA Basis) • Junction 4 & 5/ Avg of FEMA Regions 8 & 11	HEC-RAS (FEMA Basis)		• Sub-regional detention • Alternative 1 • Culvert enlargements at Winter Way, Autumn Rd, Talltimbers I-45 Frontage Rd, Sabrina Lane Hayman St, and Windridge Ln
			Robinson Branch		• HEC-HMS (FEMA Basis) • Avg of FEMA Regions 8 & 11	HEC-RAS (FEMA Basis)		• Sub-regional detention • LOS 5 Plan
			Town Creek		• FIS Hydrology Report	HEC-RAS (FEMA Basis)		• Detention pond construction • Culvert replacement • Level of Service 50-Yr Plan
			Tributary A		• FIS Hydrology Report • SCS Hydrology/ Avg of FEMA Regions 8 & 11	XPSWMM		• Sub-regional detention • Alternative 2 • Culvert replacement near SH 30, Bypass pipe installation
			Horse Branch		• HEC-HMS (FEMA Basis) • Avg of FEMA Regions 8 & 11	HEC-RAS (FEMA Basis)		• Channel improvements • Alternative 1 • Culvert replacement: double 9x9 RCB near FM-2821, triple 84" RCP near Huntsville HS, triple 4x4 RCB near SH-30

City of Huntsville Watershed Master Drainage Plan Compilation	Klotz Associates	March 2015	Lower Town Creek		• HEC-HMS (FEMA Basis) • Avg of FEMA Regions 8 & 11	HEC-RAS (FEMA Basis)		• Channel improvements • Alternative 1 • Culvert replacement: triple 10x10 RCB near FM 2821, double 10x8 RCB near Ave Q, Clearspan Bridge near SH 30, double 7x6 RCB near Ave M, double 7x7 RCB near 14th St
			Tanyard Branch		• Rational Method	HEC-RAS		
			McGary Creek		• Rational Method	HEC-RAS		
Culvert Replacement Feasibility Study	TERRA	Jun 2016	River Oaks Dr				River Oaks Dr	• Replace culvert crossing with one of the options (1-5) • Alternative 1
West Green Briar & River Oaks Drainage & Street Improvements	RPS	Nov 2021	W Green Briar/River Oaks Dr/ Prairie Branch Stream	TXDOT NRCS ATLAS 14	• Rational Method/ Malcom's Method	HEC-RAS 2D	West Green Briar Dr, River Oaks Dr	• 4-36" RCPs crossing at W Green Briar near Freemont Ct • Raise 380-ft long section of W Green Briar up to 2.8 ft above existing road • Add a 12-ft bottom width and 3H:1V side slope trapezoidal channel/ Grading V bottom (6-ft top width) ditches along the N and S side of W Green Briar • 4-10x8 RCBs under River Oaks Dr and new 18" RCPs to connect to RCB/Widen existing channel of Prairie Branch to accommodate RCBs • Articulated blocks at downstream side of River Oaks Dr for slope protection

4.0 IDENTIFY FLOODING PROBLEMS

4.1 Data Used to Identify Flooding Problems

Data from numerous sources was collected and reviewed to determine areas prone to flooding during storm events due to insufficient channel capacity, undersized structures, areas of significant erosion where silt is carried by runoff, and insufficient inlet or storm sewer capacity. Sources include FEMA claim data, floodplain development permits, a Public Meeting to obtain citizen feedback and primary concerns, citizen input forms, photographs, videos, service requests submitted to the City, lists developed by the City's Public Works Department, and a phone and desktop application called LUKE created by LJA.

4.1.1. FEMA Repetitive Loss Data

There were thirty-four (34) FEMA loss claims within Huntsville City limits and the City's extraterritorial jurisdiction (ETJ). Six (6) properties experienced repetitive losses. While this number of reported claims is low, it is expected that additional residential structures have experienced flooding in the past but have not submitted claims to FEMA as a result of not having flood insurance. The number of FEMA reported losses can be seen in the statistics tables for each watershed on **Exhibit 8** through **Exhibit 15**. However, the exact locations of the FEMA Repetitive Loss Data are not for public display and have been omitted from this report. The highest concentration of reported losses occurs in the East Sandy Creek watershed with thirteen (13) FEMA claims. The concentration of claims covers the Elkins, Azalea, Camelia Lake areas. The second largest concentration of claims occurs in the McGary Creek watershed with eight (8) FEMA claims. The concentration of claims cover covers the Forest Hills subdivision. The third largest concentration of repetitive losses occurs in the Harmon Creek watershed with seven (7) FEMA claims. The losses in Harmon Creek are spread out throughout the City. **Table 4-1** summarizes the number of FEMA claims per watershed.

Table 4-1: FEMA Claims

Watershed	Number of FEMA Claims
Crabb Creek	0
East Sandy Creek	13
Gourd Creek	1
Harmon Creek	7
Little School Branch	0
McDonald Creek	4
McGary Creek	8
Robinson Creek	1

The location of the reported FEMA claims corresponds to the concentration of residential areas within the City. In other words, the East Sandy Creek, McGary Creek, and Harmon Creek watersheds with the highest concentration of FEMA losses also make up a majority of the City of Huntsville developed extents.

4.1.2. Floodplain Development Permits

As a participant in the National Flood Insurance Program (NFIP), the City requires a Floodplain Development Permit for any work performed within its floodplains. An analysis of the location and categories of floodplain permits within a community can be used to identify potential drainage problems, as they indicate what development has taken place in the floodplain or if rebuilding has occurred after a flood. The City of Huntsville regulates floodplain permits within the City limits and the ETJ. All floodplain permit requests submitted to the City from 2014 to 2022 were obtained and analyzed for the purposes of identifying areas of active development within the City's floodplains. A total of fifty-four (54) floodplain development permits have been approved and issued by the City during this time frame. The highest concentrations of floodplain permits are within the Harmon Creek and East Sandy Creek watersheds, where twenty-one (21) and twenty (20) permits were granted, respectively. Ten (10) permits were granted in the McDonald Creek watershed, and three (3) permits were granted in the Robinson Creek watershed. **Table 4-2** summarizes the four watersheds where floodplain permits were granted and categorizes permits by type. Locations of floodplain development permits for each watershed can be seen on **Exhibit 8** through **Exhibit 15**.

Table 4-2: Floodplain Permits

	East Sandy Creek	Harmon Creek	McDonald Creek	Robinson Creek
New Single-Family Home	11	2	3	1
New Commercial Building	0	3	0	0
New Manufactured Home	0	9	0	0
Additions (pool, deck, storage building, etc.)	8	7	7	2
Miscellaneous	1	0	0	0
Total	20	21	10	3

4.1.3. Citizen Input Forms, Emails and Map Mark-ups

A Public Meeting was held on May 12, 2022, in the William Hodges Education Building at the Sam Houston Visitor Center to reach out to Huntsville citizens and request their assistance in identifying areas of drainage and flooding problems. Data was collected during the meeting and citizens were able to mark problem areas on large scale maps. Citizen Input Forms were also provided for citizens to describe specific drainage problems and their locations. Citizen Input Forms were available to take home to complete and return via mail or e-mail, and an electronic version of the Form was added to the City website as a method to submit problem areas. In addition, some citizens submitted photographs or pre-written problem area descriptions during the Public Meeting. The data collected from Citizen Input Forms, maps, e-mail, and mail was mapped to aid in the prioritization of problem areas.

4.1.4. Maintenance Service Requests

The City of Huntsville keeps a log of all drainage service requests reported by citizens. A copy of this log was provided for requests between January 2021 and February 2022, and unresolved drainage service requests were accounted for to prioritize problem areas. The City's Public Works Department assists with and resolves these issues on an ongoing basis, and many of the service requests have already been addressed by the Public Works Department through activities like culvert cleanings, ditch cleanings, and addition of backfill. A copy of all service requests used can be found in **Appendix J**.

4.1.5. City-Identified Problem Areas

The City's Public Works Department provided an updated log of identified areas of drainage concerns. This list includes the Elkins Lake, Spring Lake, and Town Creek areas, as well as other locations around Huntsville. A copy of the log provided by the Public Works Department can be found in **Appendix J**.

4.1.6. LUKE Application Process

The LUKE application developed by LJA allows users to report issues in their community. Users can describe an issue, tag its location, and attach photographs via the mobile app or website. For this evaluation project, LUKE was used as a method for citizens to submit their drainage concerns. The LUKE application was presented during the initial Public Meeting, and citizens added observed drainage problems during a two (2) month time frame. Reported flooding and drainage problems in Huntsville were retrieved from this site and used to prioritize problem areas. A layout of the problem areas reported in the LUKE application is included in **Appendix J**.

4.2 Identified Problems Areas By Watershed

All sources listed in Section 4.1 were used to identify problem areas and create **Exhibit 8** through **Exhibit 15** for each HUC-12 watershed within Huntsville City limits. These exhibits show information on floodplain development permits, drainage complaints, and FEMA claims.

4.2.1. Crabb Creek-Nelson Creek

Crabb Creek-Nelson Creek is a sub-watershed to the Trinity River basin and flows southwest to northeast. It has an area of 59.6 square miles and covers the northwestern edge of the City of Huntsville. Most of the watershed remains undeveloped and consists of forested areas. A small area of light commercial development is located in the City boundaries. There are small residential land-use areas scattered within the watershed. **Table 4-3** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the Crabb Creek watershed.

Table 4-3: Crabb Creek-Nelson Creek Statistics

Category	Total Number
Floodplain Permits	0
Drainage Complaints	0
FEMA Claims	0

As shown on the table, there are no drainage complaints, FEMA loss claims, or recorded floodplain development permits in the Crabb Creek watershed. **Exhibit 8** shows a map highlighting the watershed boundaries relative to the Huntsville City limits. Due to low overall statistics, this watershed ranks as low priority in terms of drainage issues.

4.2.2 East Sandy Creek

East Sandy Creek is a sub-watershed to the San Jacinto River basin and flows northwest to southeast. It has an area of 24.1 square miles and covers a large portion of southern Huntsville. Communities within this watershed include residential areas around Elkins, Azalea, and Camelia Lakes and the area north of I-45. Historical aerial images show that recent development within the watershed is concentrated in the north, particularly in the Elkins, Azalea, and Camelia Lake areas. **Table 4-4** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the East Sandy Creek watershed.

Table 4-4: East Sandy Creek Statistics

Category	Total Number
Floodplain Permits	20
Drainage Complaints	32
FEMA Claims	13

As shown on the table, the East Sandy Creek watershed has thirty-two (32) drainage complains, a relatively high number compared to other watersheds in the City. Most complaints are located in the residential area around Elkins, Azalea, and Camelia Lakes, with the highest concentration at Azalea Lake. Reported drainage issues include storm sewers clogging and overflowing after reaching capacity, flooding on streets, creek overflow, and flooding of yards after intense rainfall. Residents also voiced concerns that silt and sediment has built up in the storm sewer system and lake, contributing to the flooding issues. In addition, there are a total of twenty (20) floodplain development permits that have been granted, indicating that this watershed's floodplain has an active level of development, particularly at Elkins Lake. A total of thirteen (13) FEMA claims have also been reported. **Exhibit 9** shows a map highlighting the locations of the floodplain permits and drainage complaints reported in the watershed.

4.2.3 Gourd Creek-Winters Bayou

Gourd Creek is a sub-watershed to the San Jacinto River basin and flows northwest to southeast. It has an area of 61.6 square miles. The watershed's upstream boundary overlaps eastern Huntsville and extends towards the town of Phelps to the east. The western boundary is marked by Highway 75 on the west and the Sam Houston National Forest on the east. The land use consists of largely undeveloped land. Ground cover is mostly forested with some cleared undeveloped areas. There are scattered large-lot residential areas on the south of the watershed and along FM 2296. **Table 4-5** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the Gourd Creek watershed.

Table 4-5: Gourd Creek-Winters Bayou Statistics

Category	Total Number
Floodplain Permits	0
Drainage Complaints	0
FEMA Claims	1

As shown on the table, there are no drainage complaints reported or floodplain permits granted by the City. There is a single FEMA claim in the northwestern part of the watershed within the City boundary. **Exhibit 10** shows a map of the watershed. The low levels of development observed and the lack of drainage complaints and FEMA claims suggest that this watershed ranks as low priority in terms of drainage problems.

4.2.4. Harmon Creek

Harmon Creek is a sub-watershed to the Trinity River basin and flows southwest to northeast. It has an area of 56.2 square miles and includes northeast Huntsville. The part of the watershed within the City is highly developed and makes up the most urban part of the City limits, including Sam Houston State University. Outside of the City limits, most of the watershed remains undeveloped with a ground cover of forested areas and cleared fields. **Table 4-6** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the Harmon Creek watershed.

Table 4-6: Harmon Creek Statistics

Category	Total Number
Floodplain Permits	21
Drainage Complaints	29
FEMA Claims	7

As seen on the table, this watershed has a large number of floodplain development permits, the highest of all watersheds evaluated. The greatest numbers of permits were granted for new manufactured homes and additions like porches and accessory buildings.

The twenty-nine (29) drainage complaints in the Harmon Creek watershed are concentrated on the upstream end of the watershed or the southwest side, aligning with the developed areas in the watershed. Drainage complaints in this watershed identify clogged culverts, ditches not draining, properties flooding during heavy rain events, and street flooding. **Exhibit 11** shows a map highlighting the locations of the floodplain permits and drainage complaints reported in the watershed.

4.2.5. Little School Branch-Nelson Creek

Little School Branch-Nelson Creek is a sub-watershed to the Trinity River basin and flows south to north. It has an area of 31.7 square miles and is located to the north of Huntsville. Only 2.4 square miles of this watershed are located within Huntsville City limits and the ETJ.

The area consists largely of undeveloped land. Ground cover is mostly forested with cleared undeveloped fields. Small areas of large-lot residential areas are located on the south side of the watershed. **Table 4-7** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the Little School Branch watershed.

Table 4-7: Little School Branch-Nelson Creek Statistics

Category	Total Number
Floodplain Permits	0
Drainage Complaints	0
FEMA Claims	0

As shown on the table, there are no granted floodplain permits, drainage complaints, or FEMA claims reported in this watershed. **Exhibit 12** shows a map of the watershed. The low levels of development observed and the lack of drainage complaints and FEMA claims make this watershed a low priority in terms of drainage problems.

4.2.6. McDonald Creek-West Fork San Jacinto River

McDonald Creek is a sub-watershed to the San Jacinto River basin and flows northeast to southwest. It has an area of 56.8 square miles and covers the southern part of Huntsville. Development is concentrated in the northern part of the watershed along McDonald Creek and Spring, Club, and Sunset Lakes. New development in the eastern part of the watershed accounts for the recent growth where almost 7.5 square miles is being converted from forested areas to large-lot residential land-use in the Texas Grand Ranch subdivision. However, most of the watershed remains undeveloped with a ground cover of forested areas and cleared fields. **Table 4-8** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the McDonald Creek watershed.

Table 4-8: McDonald Creek-West Fork San Jacinto River Statistics

Category	Total Number
Floodplain Permits	10
Drainage Complaints	50
FEMA Claims	4

McDonald Creek has the third largest number of floodplain development permits granted. Three (3) permits consist of new single-family residential construction, and seven (7) were for additions to existing homes. These floodplain permits are concentrated in Spring Lake residential area.

The McDonald Creek watershed has the greatest number of reported drainage complaints. The majority of these reports originate in the residential areas at Spring Lake. Multiple complaints report street flooding, flooded yards after heavy rain events, sediment in runoff, clogged culverts, and a build-up of silt in the storm sewer system over time as well as silting in Spring Lake.

Residents expressed concern that silting of the drainage system could potentially reduce the capacity in the storm sewer system and prevent efficient drainage during storm events. **Exhibit 13** shows a map highlighting the locations of the floodplain permits and drainage complaints reported in the watershed.

4.2.7. McGary Creek

McGary Creek is a sub-watershed to the San Jacinto River basin and flows northeast to southwest. It has an area of 25.7 square miles and is on the northwestern side of the City. Development within the watershed is concentrated on the upstream end within the Huntsville City limits. There are also large-lot residential areas along the southern boundary of the watershed. However, most of the land cover consists of undeveloped, cleared fields with some scattered forested areas. **Table 4-9** summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the McGary Creek watershed.

Table 4-9: McGary Creek Statistics

Category	Total Number
Floodplain Permits	0
Drainage Complaints	5
FEMA Claims	8

As shown on the table, there are no floodplain permits in the watershed. The five (5) drainage complaints were service requests for problems like property flooding or clogged ditches and inlets, which were resolved by the City's Public Works Department. **Exhibit 14** shows a map highlighting the locations of the drainage complaints reported in the watershed.

4.2.8. Robinson Creek-West Fork San Jacinto River

Robinson Creek is a sub-watershed to the San Jacinto River basin and flows northeast to southwest. It has an area of 46.1 square miles and it drains the west side of Huntsville. The eastern portion of the watershed within the City limits is highly developed, and there are scattered large-lot residential areas to the west. However, most of the watershed remains undeveloped with a ground cover that consists of forested areas and cleared fields.

Table 4-10 summarizes the number of floodplain permits granted by the City, drainage complaints, and FEMA claims within the Robinson Creek watershed.

Table 4-10: Robinson Creek-West Fork San Jacinto River Statistics

Category	Total Number
Floodplain Permits	3
Drainage Complaints	5
FEMA Claims	1

As shown on the table, there are three (3) floodplain development permits, which were granted for the construction of a new home and additions to existing buildings. There are five (5) drainage complaints in this watershed that include clogged culverts and lack of storm sewer capacity that results in overflow to properties. There is a single FEMA claim located within the watershed. **Exhibit 15** shows a map highlighting the locations of the floodplain permits and drainage complaints reported in the watershed.

5.0 ORDINANCE AND CRITERIA REVIEW

5.1 Unified Development Ordinance

The City of Huntsville Unified Development Ordinance was reviewed as part of this evaluation project. Flood Protection is discussed in detail under the Unified Development Ordinance Article 9. Mandates included in the Ordinance pertaining to the scope of this project include Elevation Certificates, Floodway Encroachments, and final plat submittal requirements. The mandates reviewed, including comments and suggestions, are as follows:

5.1.1. Article 9 Flood Protection

9.402.B Certification Required

1. An architect or registered professional engineer must develop and/or review structural design, specifications, and plans for the construction, and must certify that the design and methods of construction are in accordance with accepted standards of practice, as outlined in these regulations. A record of such certification, which includes the specific elevation (in relation to vertical datum used in the Flood Insurance Rate Maps) to which such structures are floodproofed, must be maintained by the City as part of the permanent development permit file.

2. Submittal of the latest edition of the elevation certificate form published by FEMA is also required. This certificate must be duly certified by a registered professional engineer, architect or registered land surveyor.

COMMENT: It is unclear if only one Elevation Certificate (EC) is required after construction is complete or if additional ECs are required.

SUGGESTION: Require three (3) ECs

1. When Permit Documents are submitted
2. When formwork is placed but concrete has not been poured for foundations
3. Completion of Construction

9.800 FLOODWAYS

Floodways are located within areas of special flood hazard established in Sec. 9.200. The floodway is an extremely hazardous area due to the velocity of flood waters that carry debris, potential projectiles and high erosion potential. The following regulations apply in such areas:

1. 9.801 Encroachments are prohibited, including fill, new construction, substantial improvements and other development unless it has been demonstrated through hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachments will not result in any increase in flood levels within the City during the occurrence of the base flood discharge.

2. 9.802 Where Sec. 9.801 is satisfied, all new construction and substantial improvements must comply with all applicable flood hazard reduction provisions of Sec. 9.300 and Sec. 9.400.

COMMENT: FEMA has recently been requiring that "No-Rise" Certifications (hydrologic and hydraulic analyses performed in accordance with standard engineering practice that the proposed encroachments will not result in any increase in flood levels within the City during the occurrence of the base flood discharge) include a Floodway run. This requires that the developer/engineer obtain the FEMA Floodway model and update it with the Floodway Encroachment. This may be onerous and expensive for the developer when a simplified method should be acceptable. In addition, this language is more practical to be included in the Engineering Criteria rather than in the Unified Development Ordinance.

SUGGESTION: Contact FEMA Region VI and the Texas Water Development Board for technical assistance. Update the Unified Development Ordinance to reference to the Engineering Criteria regarding floodways and add this language to the Engineering Criteria.

5.1.2. Appendix 2

Appendix 2: Final Plat Submittal Requirements

17. The plat shall be accompanied by the construction documents and reports as prescribed below and bearing the seal and signature of a registered professional engineer, including the following:

e. Storm drainage system plan with contours, street lines, inlets, storm sewer and drainage channels with profiles and sections. Detail drainage structure design and channel lining design if used, with specifications, drainage report, and detailed cost estimate; Street lighting plan showing location of lights, design, and with specifications and detailed cost estimates.

COMMENT: Street lighting should be in a different section. Off-Site Runoff should be identified in the Storm Drainage Plan as well as minimum Finished Floor Elevations determined by Article 9 Flood Protection or Subdivision Requirements. In addition, this language is more practical to be included in the Engineering Criteria rather than in the Unified Development Ordinance.

SUGGESTION: Add a new section for Street Lighting. Add requirements for Off-Site Runoff and Finished Floor Elevations. Update the Unified Development Ordinance to reference to the Engineering Criteria regarding Final Plat Submittal Requirements and add this language to the Engineering Criteria.

5.2 Code of Ordinances

The City of Huntsville Code of Ordinances was reviewed as part of this evaluation project. Management of soil deposits pertaining to the scope of this project are discussed in detail under Section 40-22 – Article II of the Code. Subsections reviewed are as follows:

5.2.1. Article II

ARTICLE II. - SOIL DEPOSITS

Sec. 40-22. - Nuisance declared.

Soil which washes from the abutting real estate and is deposited into and upon a paved street in the city, from the result of rain or other means, is detrimental to the safety and welfare of the

general public, is a traffic hazard, impairs the operation of and damages the storm sewers of the city creating a health hazard, and such soil is therefore declared to be a public nuisance.

Sec. 40-24. - Failure to remove soil; notice and hearing.

Should any person fail to comply with section 32-12, then the city may order said soil to be removed and abated under the following conditions, regulations, and procedure:

1. When it shall come to the notice of the city engineer that there is soil that has washed into and been deposited upon a paved street in the city as the result of rain or other means which has not been removed as provided in section 40-23, the city engineer shall give notice to the owner of the premises from whose premises the soil has washed, to appear before the municipal court and show cause why such soil should not be declared a public nuisance and why the owner should not be ordered to remove same from the paved street. The date of such hearing shall not be less than three days after such notice has been made.

2. Such notice shall be sent by certified or registered mail with a three-day return requested, to the owner or occupant of the premises from which the soil washed. If the notice is returned undelivered by the United States Postal Service, the hearing shall be continued to a date not less than seven days from the date of such return.

3. On the day set in such notice for hearing, hearing shall be had and on the basis of such hearing the court shall determine whether or not such soil is a nuisance, and if so found to be a nuisance, the judge of the municipal court shall issue such orders as shall appear reasonably necessary for the removal and abatement of such soil.

(Code 1961, § 25.01.13; Ord. of 7-10-1973)

Sec. 40-25. - Order for soil removal.

If, upon the hearing provided for herein, there is an order to remove such soil, the removal shall be accomplished by the owner of said premises.

Sec. 40-26. - Removal of soil by city.

If an owner of real property from whose premises the soil washed into and deposited upon the paved street in the city fails to remove said soil within 24 hours after being ordered to do so, the city shall remove said soil, and the costs of removing same shall be assessed on said real estate, or lots from which such soil was washed.

Sec. 40-27. - Statement of expenses incurred for removal of soil to be filed; lien upon realty; priority of lien and interest; foreclosure of lien.

The mayor or superintendent of street maintenance shall file a statement of such expenses incurred under section 40-26, giving the amount of such expenses, the nature of the work done, and the date on which said work was done, with the county clerk, and the city shall have a privileged lien on such lot or real estate from which the soil was washed into and deposited upon the public street, which said lien shall be second only to tax liens and liens for street improvements; and said amount shall have ten percent interest from the date said statement was filed. It is further provided that for any such expenditures and interest, as aforesaid, suit

may be instituted and recovery and foreclosure of said lien may be had in the name of the city; and the statement of expenses so made, as aforesaid, or a certified copy thereof, shall be prima facie proof of the amount expended for such work or improvements.

Sec. 40-28. - Temporary sediment and erosion control.

Prior to development of property, removal of vegetation, logging, or any disturbance of natural or paved ground which may cause sedimentation or erosion from or on that property, erosion control measures must be installed. Temporary sediment control fencing sandbags, hay or an approved engineered erosion control system must be used. Fencing, sandbag, and hay methods must be installed in accordance with city specifications as provided by the city engineer.

Sec. 40-29. - Penalties.

Any person who shall violate any of the provisions of sections 40-22 through 40-28, or who shall fail to comply with same shall be guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine. Each and every day or fraction thereof which said sections or any part thereof shall be violated shall be deemed a separate offense.

COMMENT: There were several complaints from the residents of Spring Lake and Elkins Lake related to the sediment buildup in their streets, ditches, roads, culverts, and lakes from recent and current projects. The City shall remove the soil within 24 hours and assess the property owner with the expenses for the removal and prosecute them for violating the ordinance. Sec. 40-24 erroneously references Sec. 32-12, an inactive section.

SUGGESTION: The City should develop an education program and provide requirements upfront to a developer at the initiation of any project requiring the movement of soil. The City should review their ordinance to determine how enforcement can be improved. The City should consider updating the recommended sandbags to bagel gravel barriers. Correct Sec. 40-24 to reference Sec. 40-23 rather than Sec. 32-12, as intended.

5.3 Engineering Design Criteria

The City of Huntsville Engineering Design Criteria updated in August 2016 was reviewed as part of this evaluation project. Recommended revisions to Chapter 1, Chapter 3, and Chapter 6 of the Criteria are described below.

5.3.1. Chapter 1 – General

100.1 Development plans or plats

The site plan shall provide:

(5) the centerline of existing water courses, drainage features and location and size of existing and proposed streets and alleys, and the 25-year and 100-year floodplain as outlined in Chapter 6

COMMENT: Chapter references the 25-year floodplain, but this is no published information.

SUGGESTION: Remove this requirement.

101.3 Permit procedures for flood hazard zone areas

(1) The developer shall apply to the City Engineer for a development permit on forms furnished by the City Engineer. The form may include, but not be limited to, a site plan showing the location, dimensions, and elevation of proposed landscape alterations, existing and proposed structures, including the placement of manufactured homes, and the location of the foregoing in relation to areas of special flood hazard. Additionally, the developer shall show following information:

(a) elevation (in relation to mean sea level), of the lowest floor (including basement) of all new and substantially improved structures

COMMENT: Datums are updated the National Geodetic Survey and adopted by FEMA. These may change when the City receives a new Flood Insurance Study.

SUGGESTION: Change "elevation (in relation to mean sea level)" to the current datum published in the Effective Flood Insurance Study.

101.5 Construction plans

(3) Storm drainage construction plans

The developer shall submit separate storm drainage plans showing the information specified below.

(c) Calculations showing the anticipated storm water flow including watershed area, runoff coefficient, time of concentrations, and basis for design of all improvements.

COMMENT: Only showing the post-development contours and grades does not indicate areas of cut and fill that may alter drainage patterns internally and from offsite runoff.

SUGGESTION: Add pre-development contours and elevations.

5.3.2. Chapter 3 – Public Easement

302. Drainage/Floodway Easements

If these criteria or other law requires a drainage easement, the developer shall provide a public or private drainage easements along all natural and manmade drainage channels and floodways that drain two or more lots or tracts of land according to the following criteria:

(1) Natural drainage channels

The developer shall provide public or private storm drainage easements along existing or proposed open drainage channels with sufficient width for the water course to handle the flow from the frequency storm required by Section 602.3 plus a minimum of twenty (20) feet on each side, for ingress and egress of maintenance equipment, for clearance from fences, for maintenance of the channel bank, and for adequate slopes along the bank.

(2) Enclosed drainage systems

Where a developer provides an enclosed drainage system that is not within or next to a public street, the developer shall provide public or private storm drainage easements of twenty (20) foot or wider and centered on the system. The developer shall provide easements wide enough

to encompass the system and provide ingress and egress for future maintenance operations. See also Chapter 6, Storm Drainage Facilities.

COMMENT: Based on a review of mapping available on the Walker County Appraisal District (Interactive Map – Walker CAD – Official Site), the City only owns right-of-way along the streets in the Elkins Lake and Spring Lake areas. Any drainage improvements outside of the street right-of-way will require the acquisition of additional right-of-way or drainage easements allowing the City to own, operate, and maintain these areas.

SUGGESTION: Identify easement and right-of-way requirements as drainage improvement projects are identified in future Drainage Master Plans for these areas. Engage the residents early during the study phase of these projects.

5.3.3. Chapter 6 – Storm Drainage Facilities

601.1 Upstream conditions

The developer shall design all drainage facilities based on potential and fully developed upstream conditions. A developer shall use a minimum runoff coefficient of 0.75 for all undeveloped upstream property.

COMMENT: This seems excessive. The downstream developer should only be required to accept and manage existing off-site runoff as described in Section 11.086 of the Texas Water Code.

SUGGESTION: Update to require the developer to manage existing off-site runoff, accepting existing water coming toward the development.

601.3 Protection of downstream properties

The developer shall design and construct downstream drainage improvements or a detention / retention system to protect downstream properties from any change in storm water runoff.

COMMENT: "…any change in storm water runoff" is not definitive enough. It could include a 1,000-year storm.

SUGGESTION: Change "any" to "up to and including the 100-year event." Using only a 100-year criteria can result in an outfall structure that may increase discharges for more frequent (less extreme) events such as a 10-year event.

602. DESIGN CRITERIA

The Rational Formula

COMMENT: The e, b, and d coefficients to determine the average rainfall intensity (I) are not based on the "best available data" as published in NOAA ATLAS 14 POINT PRECIPITATION FREQUENCY ESTIMATES: TX (PF Map: Contiguous US (noaa.gov).

SUGGESTION: Update rainfall design values to NOAA Atlas 14.

TABLE 6-5

COEFFICIENT OF ROUGHNESS

Open Channels	Maximum Permissible Velocity in Feet/Second	Coefficient "n"
Paved Concrete	8	0.011 to 0.020

COMMENT: The Manning's n value for Paved Concrete is low.

SUGGESTION: Increase to a minimum of 0.013.

604. INDIVIDUAL LOT GRADING AND DRAINAGE PLAN

When a new building is constructed, an addition proposed, or a lot or tract of land is excavated, it is essential that grading be handled properly to ensure that surface drainage is directed away from the building and that it does not alter drainage patterns or damage adjacent properties.

604.1 Drainage Plan Required

Approval of a Development Permit as required elsewhere in these criteria will require the submittal of a Drainage Plan for the lot or lots being permitted.

(1) Non-residential or Multi-family Lot Grading and Drainage Plan Contents

(a) Address and legal description of the lot or tract, and adjacent property
(b) Boundary of the lot or tract, and adjacent property
(c) Grading Plan as defined in Chapter 1.
(d) Drainage Improvements Plan as defined in Chapter 1.

COMMENT: Off-site runoff is not mentioned.

SUGGESTION: Add an additional item (e) to include "Offsite runoff management for events up to and including the 100-year event."

6.0 IMPLEMENTATION PLAN

6.1 Assumptions

The recommended prioritization of drainage problems is based on the flooding data collected from Huntsville citizens, the City's inventory of drainage complaints and service requests, and flooding problems identified in previous drainage studies. Maps were created that recorded and quantified all drainage problems within each watershed. Statistics for each watershed were prepared to facilitate the prioritization of problem areas within the City. Problem areas were ranked as high, medium, and low priority depending on the watershed statistics. Three (3) watersheds with the highest concentration of drainage problems are recommended as having high priority.

6.2 Data

As mentioned in previous sections, sources collected and analyzed to identify drainage problem areas include direct citizen input during a Public Meeting, FEMA claim data, floodplain development permits, citizen input forms collected by mail and email, photographs, videos, service requests submitted to the City, catalogs developed by the City's Public Works Department, review of previous drainage studies within the City, and a phone and desktop application called LUKE used to report drainage problems.

Among all data considered, drainage problems directly reported by citizens, both at Public Meetings and to the City, were weighted heaviest when ranking problem areas. These direct complaints typically reflect existing issues that affect residential structures and are considered a primary concern.

Reported FEMA claims are an effective indicator of problem areas within a watershed. With the City of Huntsville, there are only thirty-four (34) FEMA claims. Therefore, the loss data was not a classifying metric to identify problem areas. Nonetheless, concentrations of FEMA claims were taken into account to prioritize problem areas.

A third influential metric to prioritize problem areas was the number of floodplain development permits in a watershed. In addition to reflecting activity within a stream's floodplain, citizens voiced concerns of siltation from new development into the local drainage systems and eventually decreasing the capacity at storm sewer trunklines, roadside ditches, and cross culverts. For these reasons, floodplain development permits were a factor when prioritizing problem areas.

6.3 Methods

Numerous methods were used to collect the data for problem area identifications. These include close coordination with City personnel; a Public Meeting to request citizen input; coordination with multiple agencies including FEMA, TxDOT, and USGS; and a second Public Meeting to present the implementation plan. Invitation flyers were created to inform citizens of the Public Meetings and shared on City social media accounts and on the City's website.

6.4 Recommendations

The following prioritization rankings are recommendations of the order in which the drainage problem areas should be addressed and intend to provide focus to those areas that should have

priority based on input from Huntsville citizens, number of FEMA claims, and level of activity within the floodplain. Any drainage service requests that were already addressed by the City's Public Works Department, although shown in the overall watershed maps on **Exhibit 8** through **Exhibit 15**, were not considered in problem prioritization rankings because they have already been resolved by the City. The intention is to provide focus to a future Master Drainage Plan for the City of Huntsville, to guide the efforts spent studying each watershed or area, and to better use City resources and address existing drainage problems in an effective manner.

6.4.1. High Priority

There are three (3) watersheds or areas in the City that are ranked as high priority. These are as follows:

- Spring Lake area in the McDonald Creek watershed
- Elkins Lake area in the East Sandy Creek watershed
- Central Huntsville area in the Harmon Creek watershed

Spring Lake

Located in the McDonald Creek watershed, the Spring Lake area ranks as high priority due to the high number of overall drainage complaints. There are a total of forty-six (46) unresolved drainage complaints and four (4) FEMA claims in this area. There is also one (1) additional drainage complaint for a clogged culvert that has already been resolved with a culvert cleaning by the City's Public Works Department. **Exhibit 16** shows the location of complaints in the Spring Lake area along with details of the unresolved complaints.

Elkins Lake

Located in the East Sandy Creek watershed, the Elkins Lake area ranks as high priority in drainage problem areas due to the high number of drainage complaints and FEMA claims. There are a total of twenty-six (26) unresolved drainage complaints and nine (9) FEMA claims in this area. There are an additional five (5) drainage complaints that have already been resolved by the City; these include debris in storm drains and a sinkhole, which the Public Works Department addressed with drain cleanings and backfill. **Exhibit 17** shows the location of all complaints for the Elkins Lake area along with details of each unresolved complaint.

Central Huntsville Area

Located in the Harmon Creek watershed, the area along TX-75 ranks as high priority due to the number of drainage complaints. There are a total of twelve (12) unresolved drainage complaints and seven (7) FEMA claims in this area. There are also seventeen (17) drainage complaints that have already been resolved by the City. The resolved complaints include clogged ditches, clogged culverts, and yard drainage issues, which were remediated by the Public Works Department through cleanings and the addition of backfill. **Exhibit 18** shows the location of complaints in the Harmon Creek watershed. The unresolved problem areas can be grouped by location and local drainage systems.

6.4.2. Medium Priority

Robinson Creek-West Fork San Jacinto River

The Robinson Creek watershed ranks as a medium priority due to the number of drainage problems. There are a total of three (3) unresolved drainage complaints and one (1) FEMA

claim in this area. There are also two (2) drainage complaints that have already been resolved by the City; these include a clogged culvert and poor drainage requiring backfill. **Exhibit 19** shows the location of the complaints for the Robinson Creek watershed along with details of each unresolved complaint.

McGary Creek

The McGary Creek watershed ranks as medium priority due to the number of FEMA claims and previously resolved drainage complaints. A total of eight (8) FEMA claims are in this watershed. These FEMA claims are located away from the stream and in older subdivisions. The claims appear to be a result of local drainage systems built to older engineering criteria that did not consider overflows for large rainfall events. There are no unresolved drainage complaints in this watershed, but there is a history of complaints that the City has resolved. An additional five (5) complaints for yard flooding, clogged ditches, and clogged inlets have already been resolved by the Public Works Department through cleanings and the addition of backfill. **Exhibit 20** shows the problem prioritization map for McGary Creek.

6.4.3. Low Priority

Crabb Creek-Nelson Creek

Crabb Creek-Nelson Creek ranks as low in problem area prioritization due to the lack of drainage complaints and FEMA claims.

Gourd Creek

Gourd Creek watershed ranks as low in problem area prioritization due to the lack of drainage complaints and single FEMA claim.

Little School Branch-Nelson Creek

Little School Branch-Nelson Creek ranks low in the problem area prioritization due to the lack of drainage complaints and FEMA claims.

6.5 Cost Analysis

Because the funding cycles of FEMA, the Texas Water Development Board, the General Land Office, and the Texas Commission on Environmental Quality vary from year to year, the City should maintain a relationship with the Houston Galveston Area Council to help keep informed of the grant opportunities and procedures in applying for these grants. Additionally, maintaining a relationship with the Trinity River Authority and the San Jacinto River Authority would be desirable as they may become primary or co-sponsors for future studies.

The collection of previous studies, topographic information, land use, bridge and structure geometries, storm sewers, open channels, detention ponds, rainfall and streamflow gage data, performed as part of this effort will aid the data collection effort for any future watershed study allowing for a reduced effort and potential lesser fee. However, the level of detail and study area will be the primary influences on the cost to prepare a master drainage plan. Surveyed versus LiDAR derived cross sections; the number of surveyed bridges and culverts in lieu of field estimates; the number of structures and how their finished floors are determined; and inclusion of storm sewers in the modeling will increase the accuracy, study duration, and costs to prepare a master drainage plan. Combining several watersheds could provide a benefit of scale with a per square mile reduction in costs as the study area increases.

The following estimates to prepare a master drainage plan should be considered as an order of magnitude estimate. These fees include the development of hydrologic and hydraulic models, alternative analyses for proposed improvements, and cost estimates.

Table 6-1: Cost Estimates

Stream	Drainage Area (square miles)	Comments	Estimated Study Fee
Crabb Creek-Nelson Creek	59.6	No FEMA permits, drainage complaints, or FEMA claims	$300,000
East Sandy Creek	24.1	Developing watershed, 20 floodplain permits, 32 drainage complaints, 13 FEMA claims	$400,000
Gourd Creek-Winters Bayou	61.6	Little development, 1 FEMA claim	$300,000
Harmon Creek	56.2	High development within city limits, 21 floodplain permits, 29 drainage complaints, 7 FEMA claims	$500,000
Little School Branch-Nelson Creek	31.7	No FEMA permits, drainage complaints, or FEMA claims	$250,000
McDonald Creek-West Fork San Jacinto River	56.8	Developing watershed, 10 floodplain permits, 50 drainage complaints, 4 FEMA claims	$500,000
McGary Creek	25.7	Future developing watershed, no floodplain permits, 5 drainage complaints, 8 FEMA claims	$350,000
Robinson Creek-West Fork San Jacinto River	46.1	3 floodplain permits, 5 drainage complaints, 1 FEMA claims	$400,000

EXHIBITS

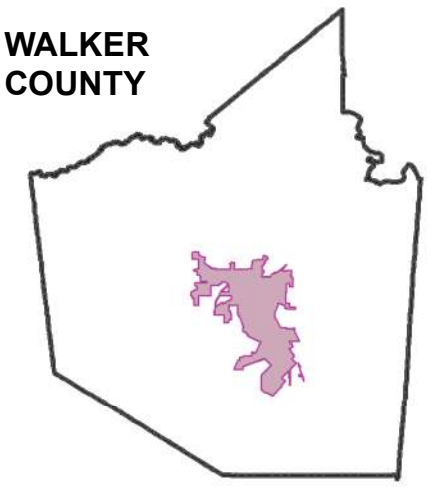
Exhibit 1: Watersheds Map
Exhibit 2: Lidar
Exhibit 3: Land Cover
Exhibit 4: Soils Map
Exhibit 5: Structures
Exhibit 6: Gages
Exhibit 7: Studied Areas
Exhibit 8: Crabb Creek Watershed
Exhibit 9: East Sandy Creek Watershed
Exhibit 10: Gourd Creek Watershed
Exhibit 11: Harmon Creek Watershed
Exhibit 12: Little School Branch Watershed
Exhibit 13: McDonald Creek Watershed
Exhibit 14: McGary Creek Watershed
Exhibit 15: Robinson Creek Watershed
Exhibit 16: McDonald Creek Problem Prioritization
Exhibit 17: East Sandy Creek Problem Prioritization
Exhibit 18: Harmon Creek Problem Prioritization
Exhibit 19: Robinson Creek Problem Prioritization
Exhibit 20: McGary Creek Problem Prioritization

CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

13,000 6,500 0 13,000 Feet

1 inch = 13,000 feet



LEGEND

- WATERSHED BOUNDARY
- HUNTSVILLE CITY LIMITS
- WALKER COUNTY
- TRINITY & SAN JACINTO RIVER BASINS BOUNDARY
- LAKE
- STREAM

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 1

WATERSHEDS MAP

LITTLE SCHOOL BRANCH-NELSON CREEK

CRABB CREEK-NELSON CREEK

HARMON CREEK

MCGARY CREEK

ROBINSON CREEK-WEST FORK SAN JANCINTO RIVER

GOURD CREEK-WINTERS BAYOU

EAST SANDY CREEK

MCDONALD CREEK-WEST FORK SAN JACINTO RIVER

NELSON CREEK
HADLEY CREEK
BALDWIN CREEK
PINE CREEK
CRABB CREEK
PARKER CREEK
MCGARY CREEK TRIBUTARY 6
TOWN BRANCH
TANYARD BRANCH
HARMON CREEK
ROBINSON CREEK
SHEPHERD CREEK
PRAIRIE BRANCH
MCDONALD CREEK
EAST SANDY CREEK
GOURD CREEK
WINTERS BAYOU

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

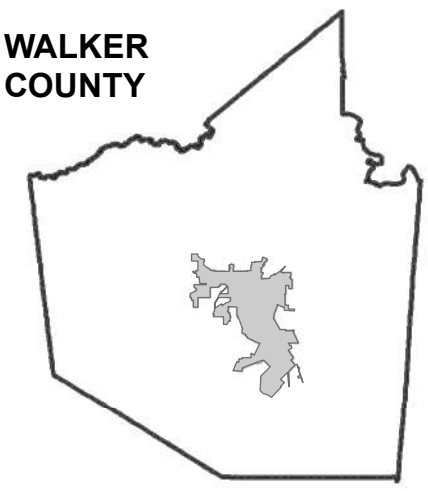
5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

980
247
2821
19
190
3411
2929
30
1791
45
75

Trinity R. Basin
San Jacinto R. Basin

WALKER COUNTY



LEGEND

- Huntsville City Limits
- River Basin Boundary
- Streets (TxDOT)

Elevation (ft)

High : 503.6

Low : 177.6

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EXHIBIT 2

LIDAR

Data Source: Mapping Program (StratMap). Upper Coast Lidar (2018) and East Texas Lidar (2017).

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

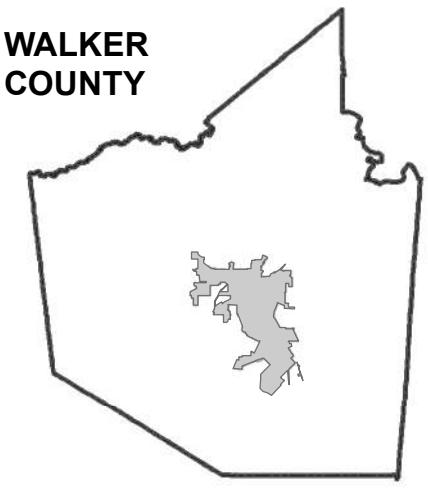
N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

980
247
2821
19
190
3411
2929
30
1791
45
75

WALKER COUNTY



LEGEND

- Huntsville City Limits
- Streets (TxDOT)

NLCD Land Cover Class (2019)

- Woody Wetlands
- Shrub/Scrub
- Open Water
- Mixed Forest
- Herbaceous
- Hay/Pasture
- Evergreen Forest
- Emergent Herbaceous Wetlands
- Developed, Open Space
- Developed, Medium Intensity
- Developed, Low Intensity
- Developed, High Intensity
- Deciduous Forest
- Barren Land

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 3

LAND COVER

Data Source: National Land Cover Database (NLCD) 2019

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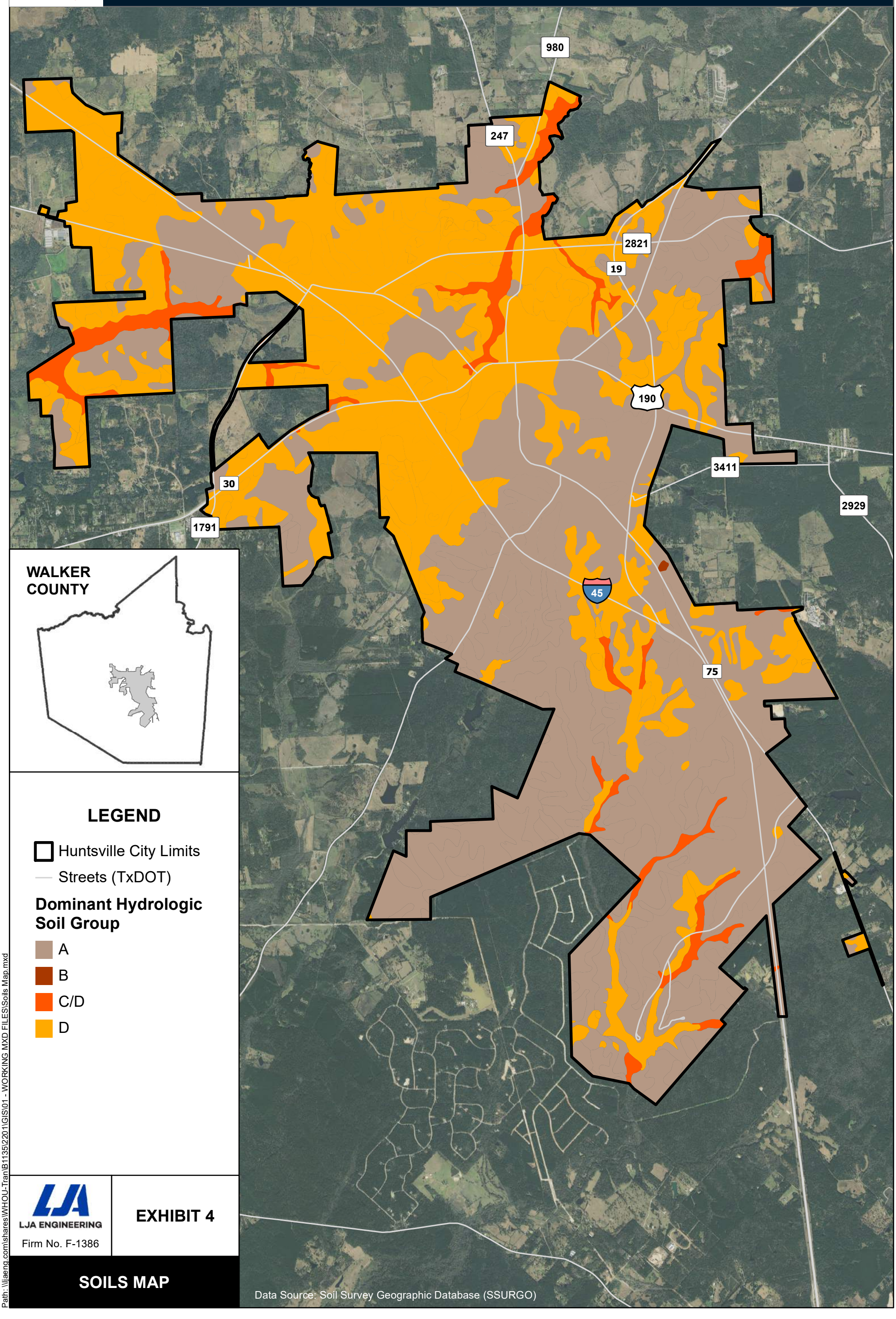
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet



WALKER COUNTY

LEGEND

- Huntsville City Limits
- Streets (TxDOT)

Dominant Hydrologic Soil Group

- A
- B
- C/D
- D

Data Source: Soil Survey Geographic Database (SSURGO)

LJA ENGINEERING

Firm No. F-1386

EXHIBIT 4

SOILS MAP

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

980

247

2821

19

1619 Hwy 30 Fire Station Detention

190

Intramural Fields Detention

224 Greenleaf Detention

3411

2929

30

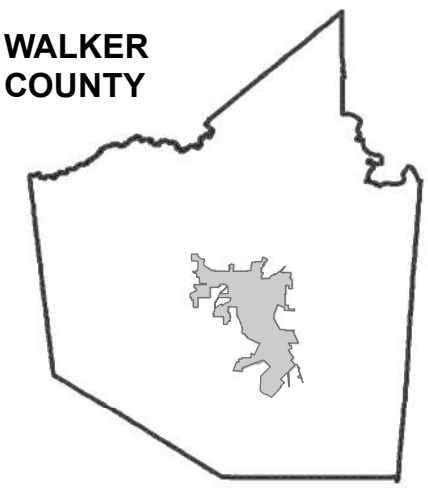
1791

Dawson Pond

45

75

WALKER COUNTY



LEGEND

- Huntsville City Limits
- Street
- Street with As Built/ Structural TxDOT Data Available
- Detention Pond

TxDOT Structures

- Bridge
- Culvert

City of Huntsville Storm Sewer

- Storm Sewer Pipe

LJA ENGINEERING

Firm No. F-1386

EXHIBIT 5

STRUCTURES

Path: \\ljaeng.com\shares\WHOU-Tran\B1135\2201\GIS\01 - WORKING MXD FILES\Structures.mxd

CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

30,000 15,000 0 30,000 Feet

1 inch = 30,000 feet

Tantabogue Ck at FM 230 nr Lovelady, TX

Larrison Ck at FM 1428 nr Midway, TX

Caney Ck nr Madisonville, TX

Bedias Ck nr Madisonville, TX

Nelson Ck at FM 247 nr Huntsville, TX

Trinity Rv at Riverside, TX

Kickapoo Ck at Onalaska, TX

W Fk San Jacinto Rv nr Huntsville, TX

Gibbons Ck Res nr Shiro, TX

Caney Ck at FM 1097 nr Willis, TX

E Fk San Jacinto Rv at SH 150 nr Coldspring, TX

Big Ck at TX 150 nr Shepherd, TX

Long King Ck at Livingston, TX

Trinity Rv nr Goodrich, TX

Menard Ck nr Rye, TX

Trinity Rv at Romayor, TX

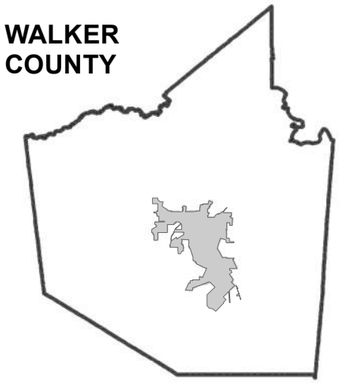
Navasota Rv at SH 6 nr Navasota, TX

Lake Ck nr Dobbin, TX

E Fk San Jacinto Rv nr Cleveland, TX

Normangee
Midway
North Zulch
Trinity
Groveton
Riverside
Onalaska
Leggett
Bedias
Huntsville
Oakhurst
Point Blank
Lake Livingston
West Livingston
Livingston
Richards
New Waverly
Sam Houston National Forest
Anderson
Willis
Panorama Village
Montgomery
Lake Conroe
Navasota
Votaw
Trinity River Nat'l Wildlife Refuge

WALKER COUNTY



LEGEND

- Huntsville City Limits
- Walker County
- River Basin Boundary

USGS GAGE

Gage Type

- Stream
- Precipitation & Lake Elevation
- Precipitation & Stream

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 6

GAGES

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

PARKER CREEK

HARMON CREEK

980

247

2821

2014, 2015

2015

MCGARY CREEK

2014, 2015

MATHEWS LAKE

TRIBUTARY A

TOWN BRANCH

HORSE BRANCH

TRIBUTARY B

2015

2014

190

2015

TANYARD BRANCH

MALLERY LAKE

3411

2929

30

ROBINSON CREEK

2015

1791

MCDONALD CREEK

BALDWIN LAKE

45

75

SPRING LAKE

1991, 1995, 1996, 2010, 2015

CLUB LAKE

ELKINS LAKE

HUNTSVILLE

AZALEA LAKE

1990, 2016, 2021

MITCHAM LAKE

CAMELIA LAKE

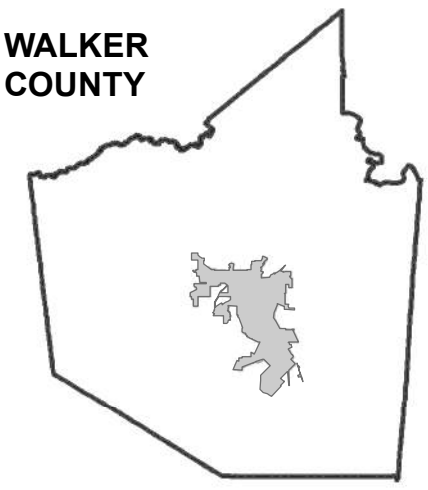
SUNSET LAKE

PRAIRIE BRANCH

LAKE RAVEN

PLUM LAKE

WALKER COUNTY



LEGEND

- STUDIED STREAM
- STREAM
- STREET (TxDOT)
- HUNTSVILLE CITY LIMITS
- STUDY DATE

LJA ENGINEERING

Firm No. F-1386

EXHIBIT 7

STUDIED AREAS

Path: \\ljaeng.com\shares\WHOU-Tran\B11135\2201\GIS\01 - WORKING MXD FILES\Studied Areas.mxd

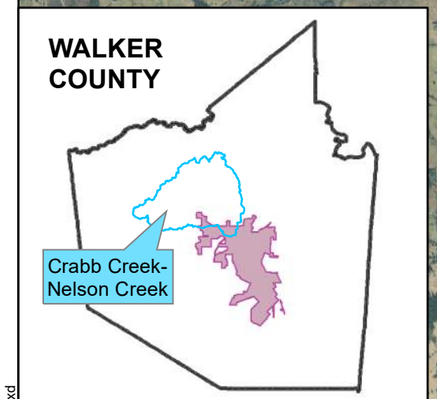
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

CRABB CREEK STATISTICS	
FLOODPLAIN PERMITS	0
DRAINAGE COMPLAINTS	0
FEMA CLAIMS	0



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

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Firm No. F-1386

EXHIBIT 8

CRABB CREEK WATERSHED

NELSON CREEK
CRABB CREEK-NELSON CREEK
CRABB CREEK
PINE CREEK
HADLEY CREEK
45
75
247
2628
1696
980
1696
2550
2821
1791

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

3,000 1,500 0 3,000 Feet

1 inch = 3,000 feet

HUNTSVILLE

1374

19

BALDWIN LAKE

ELKINS LAKE

AZALEA LAKE

CAMELIA LAKE

PRAIRIE BRANCH

45

75

EAST SANDY CREEK

LAKE RAVEN

2296

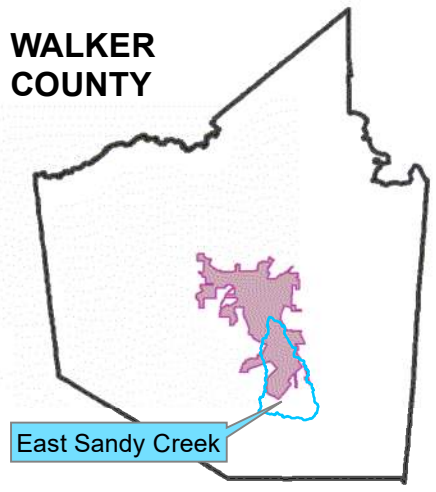
1374

2793

EAST SANDY CREEK

PLUM LAKE

WALKER COUNTY



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- LAKE
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 9

EAST SANDY CREEK WATERSHED

EAST SANDY CREEK STATISTICS	
FLOODPLAIN PERMITS	20
DRAINAGE COMPLAINTS	32
FEMA CLAIMS	13

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

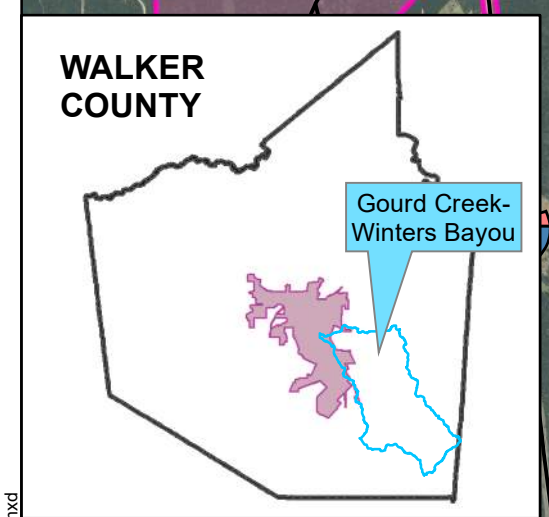
N

7,000 3,500 0 7,000 Feet

1 inch = 7,000 feet

980
405
19
247
2821
30
HUNTSVILLE
190
3411
1374
SHEPHERD CREEK
2929
2296
GOURD CREEK-WINTERS BAYOU
WINTERS BAYOU
75
GOURD CREEK
1375
2793
2693
NEW WAVERLY
150
1097

GOURD CREEK STATISTICS	
FLOODPLAIN PERMITS	0
DRAINAGE COMPLAINTS	0
FEMA CLAIMS	1



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- COUNTY LINE
- STREET (TxDOT)
- STREAM
- LAKE
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 10

GOURD CREEK WATERSHED

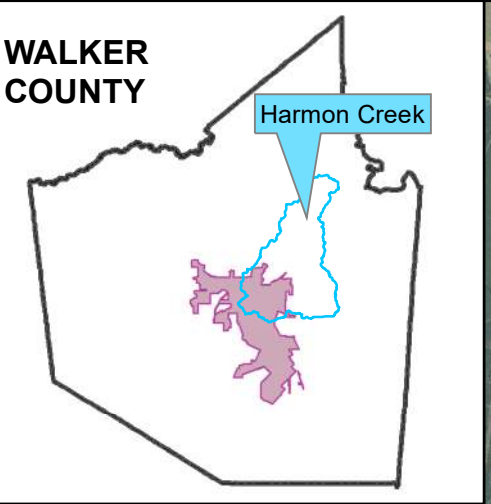
Path: \\ljaeng.com\shares\WHOU-Tran\B1135\2201\GIS\01 - WORKING MXD FILES\Gourd Creek Watershed.mxd

CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREET
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 11

HARMON CREEK WATERSHED

HARMON CREEK STATISTICS	
FLOODPLAIN PERMITS	21
DRAINAGE COMPLAINTS	29
FEMA CLAIMS	7

3478
980
247
19
2821
30
45
75
1374
3411
190
2929
2296

HARMON CREEK
HARMON CREEK
HARMON CREEK
PARKER CREEK
TOWN BRANCH
TANYARD BRANCH
HUNTSVILLE

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

4,000 2,000 0 4,000 Feet

1 inch = 4,000 feet

LITTLE SCHOOL BRANCH STATISTICS	
FLOODPLAIN PERMITS	0
DRAINAGE COMPLAINTS	0
FEMA CLAIMS	0

NELSON CREEK

3478

LITTLE SCHOOL BRANCH-NELSON CREEK

NELSON CREEK

LITTLE SCHOOL BRANCH

980

2628

247

BALDWIN CREEK

WALKER COUNTY

Little School Branch-Nelson Creek

LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 12

LITTLE SCHOOL BRANCH WATERSHED

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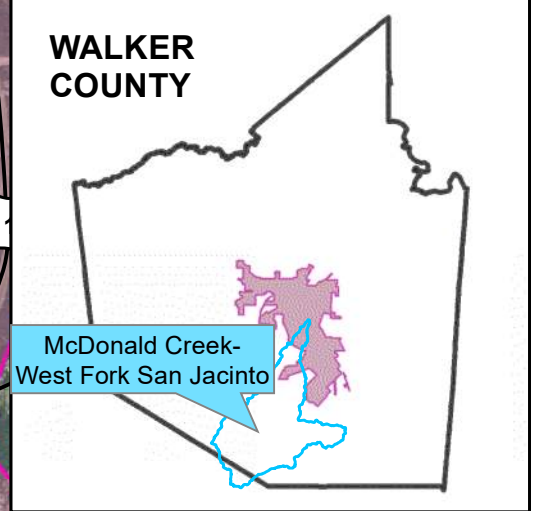
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

6,000 3,000 0 6,000 Feet

1 inch = 6,000 feet



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- COUNTY LINE
- STREET (TxDOT)
- STREAM
- LAKE
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

MCDONALD CREEK STATISTICS	
FLOODPLAIN PERMITS	10
DRAINAGE COMPLAINTS	50
FEMA CLAIMS	4

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 13

MCDONALD CREEK WATERSHED

247
HUNTSVILLE
19
30
1791
SPRING LAKE
CLUB LAKE
SUNSET LAKE
MCDONALD CREEK
WEST FORK SAN JACINTO RIVER
1374
MCDONALD CREEK-WEST FORK SAN JACINTO RIVER
LAKE PAULA
1375
150

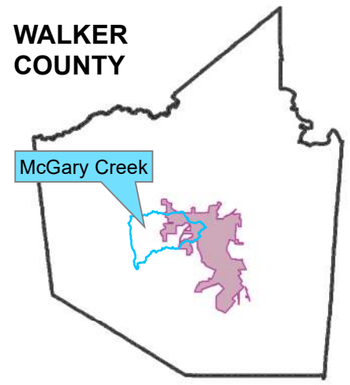
Path: \\ljaeng.com\shares\WHOU-Tran\B1135\2201\GIS\01 - WORKING MXD FILES\McDonald Creek Watershed.mxd

CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

4,000 2,000 0 4,000 Feet

1 inch = 4,000 feet



MCGARY CREEK

TRIBUTARY 5

MCGARY CREEK

1696
75
980
247
2821
45
2550
30
1791
1374

LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

MCGARY CREEK STATISTICS	
FLOODPLAIN PERMITS	0
DRAINAGE COMPLAINTS	5
FEMA CLAIMS	8

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 14

MCGARY CREEK WATERSHED

Path: \\ljaeng.com\shares\WHOU-Tran\B113\12201\GIS\01 - WORKING MXD FILES\McGary Creek Watershed.mxd

CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

5,000 2,500 0 5,000 Feet

1 inch = 5,000 feet

ROBINSON CREEK STATISTICS	
FLOODPLAIN PERMITS	3
DRAINAGE COMPLAINTS	5
FEMA CLAIMS	1

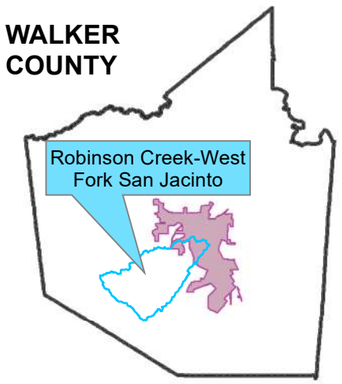
WEST FORK SAN JACINTO RIVER

ROBINSON CREEK

ROBINSON CREEK-WEST FORK SAN JANCINTO RIVER

2550 30 247 1791 3179 1374

WALKER COUNTY



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- FLOODPLAIN PERMITS
- DRAINAGE COMPLAINTS

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 15

ROBINSON CREEK WATERSHED

Path: \\ljaeng.com\shares\WHOU-Tran\B113S\2201\GIS\01 - WORKING MXD FILES\Robinson Creek Watershed.mxd

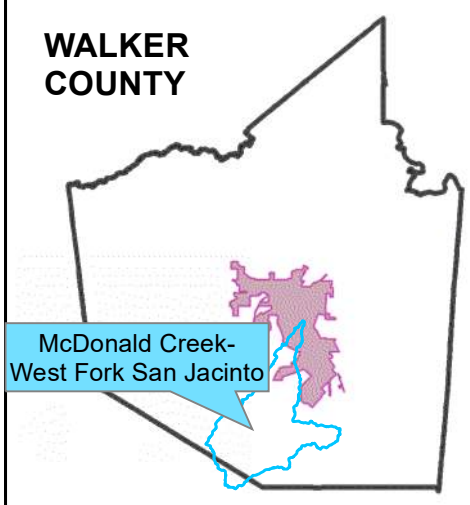
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

350 175 0 350 Feet

1 inch = 350 feet

WALKER COUNTY



LEGEND

- HUNTSVILLE CITY LIMITS
- STREET
- STREAM
- LAKE
- LUKE APP
- PUBLIC MEETING FEEDBACK
- CITIZEN INPUT FORM
- CITY-IDENTIFIED PROBLEM
- MAINTENANCE REQUEST (RESOLVED)

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 16

MCDONALD CREEK PROBLEM PRIORITIZATION

MCDONALD CREEK PROBLEM PRIORITIZATION STATISTICS	
UNRESOLVED DRAINAGE COMPLAINTS	46
RESOLVED DRAINAGE COMPLAINTS	1
FEMA CLAIMS	4

UNRESOLVED DRAINAGE COMPLAINTS	
Number	Complaint
1	Dawson Lake drains to Spring Lake, potential issues with dam
2	Flooding during heavy rains, street flooding
3	Fill detention
4	Flooding and murky water
5	Silt from Stylecraft construction site flows into yard
6	Development pond
7	Yard flooding, flood damage to creek retaining wall
8	Silt buildup and impeded inflow into Spring Lake
9	Culvert clogged with dirt/debris
10	Culvert alignment, siltation cleaning
11	Water plant and Autumn Rd flood occasionally
12	Floodwater covering entire backyard, flooded shed
13	Dirt outside of silt barrier
14	Winter Way floods, water overtops
15	Water overtopping road, outflow blocked by vegetation
16	Construction reduced trees and increased pavement
17	Blocked inlet
18	Lake inflow canal filled with silt from Stylecraft detention
19	Stylecraft home builder/HOA old deteriorated dry detention pond, silt runoff
20	Compromised soil retention at street of new homes
21	Retention pond floods yard with silt
22	Flooding in yards, water flowpath not large enough
23	Flooding in yard, exposed riprap in dry detention pond
24	Sand in lake making it shallower
25	Flooding in yard
26	Spring Lake inflow canal filled with silt from Stylecraft detention pond
27	Spring Lake inflow canal filled in with silt from Stylecraft detention pond
28	Culverts clogged from silt, water overtops road
29	Water overtops road, silt buildup at pond inlet/outlet
30	Water tops Winter Way in heavy rains. Silt from creek is an issue
31	Road block placed due to flooding
32	Winter Way impassable due to flooding
33	Creek flooding and silt from Stylecraft pond in canal
34	Flooding in yard
35	Drainage and flooding issues at McDonald Creek
36	Silt buildup and blocked McDonald Creek
37	Spring Lake blocked by silt from creek
38	Street flooding, sand in lake from development runoff
39	Roadway flooding, flooding in yards, and indundated storm sewer around Spring Lake
40	Water overtops road
41	Sand removal from creek and lake needed
42	Sand blocking ravine causing erosion in land above
43	Soil erosion on streets, soil and water pass under barriers
44	Lake flooding
45	Backyard flooding
46	Street flooding

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CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

1,000 500 0 1,000 Feet

1 inch = 1,000 feet

UNRESOLVED DRAINAGE COMPLAINTS	
Number	**Complaint**
1	Drainage issues at electric station
2	Storm sewer drains slowly due to root infiltration
3	Creek overflows and floods intersection
4	Storm drain goes under house slab
5	Runoff around house, street flooding. Goes down quickly
6	Creek overflows and floods street
7	Creek overflows and floods street
8	Storm sewer overflows onto property
9	Runoff eroding ditch behind property
10	GLO project
11	GLO project
12	Stormwater runs past inlet, crosses street, and enters property from driveway
13	Stormwater runs past inlet, crosses street, and enters property from driveway
14	Stormwater runs past inlet, crosses street, and enters property from driveway
15	Stormwater flows out of yard across the street, crosses street, and enters driveway
16	Flooding in yard
17	Street flooding
18	Street flooding after storm sewer exceeds capacity, then water flows to drain on side of home
19	Storm sewer overflows into yard during heavy rains
20	Water floods front of house, flows around, and erodes backyard
21	Storm sewer overflows into yard during heavy rains
22	Street flooding due to silted sewer/lake level
23	Street flooding due to silted sewer/lake level
24	Storm sewer overflows onto property
25	Storm sewer functions to capacity then overflows onto property
26	Floodwater in home, surging storm drain, street flooding, water from Bershire Dr and Wheatstone St flooding property

EAST SANDY CREEK PROBLEM PRIORITIZATION STATISTICS	
UNRESOLVED DRAINAGE COMPLAINTS	26
RESOLVED DRAINAGE COMPLAINTS	5
FEMA CLAIMS	9

WALKER COUNTY

East Sandy Creek

LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM
- LAKE

DRAINAGE COMPLAINTS

- LUKE
- PUBLIC MEETING FEEDBACK
- MAINTENANCE REQUEST
- CITY-IDENTIFIED PROBLEM
- CITIZEN INPUT FORM
- MAINTENANCE REQUEST (RESOLVED)

LJA ENGINEERING

Firm No. F-1386

EXHIBIT 17

EAST SANDY CREEK PROBLEM PRIORITIZATION

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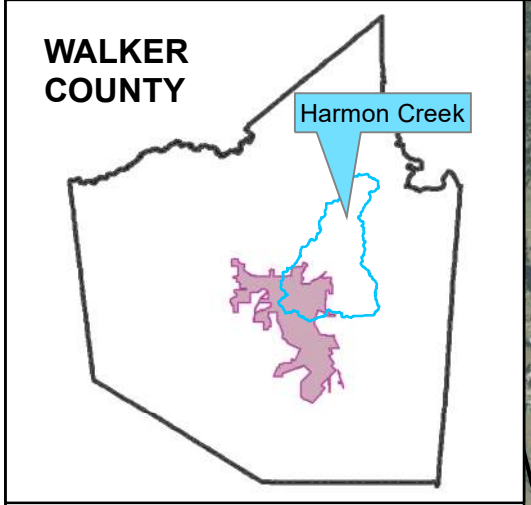
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

2,000 1,000 0 2,000 Feet

1 inch = 2,000 feet



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM

DRAINAGE COMPLAINTS

- MAINTENANCE REQUEST
- CITY-IDENTIFIED PROBLEM
- MAINTENANCE REQUEST (RESOLVED)

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 18

HARMON CREEK PROBLEM PRIORITIZATION

HARMON CREEK PROBLEM PRIORITIZATION STATISTICS	
UNRESOLVED DRAINAGE COMPLAINTS	12
RESOLVED DRAINAGE COMPLAINTS	17
FEMA CLAIMS	7

980 247 2821 30 19 75 190 45 1374 6

PARKER CREEK TOWN BRANCH TANYARD BRANCH

HUNTSVILLE

UNRESOLVED DRAINAGE COMPLAINTS	
Number	Complaint
1	Flooding every time it rains at Iron Works yards
2	Street flooding due to new development
3	Lack of proper grade change causing standing water on property
4	Property flooding during heavy rains
5	Property flooding
6	Runoff on street, usually due to clogged culvert
7	Flooding every time it rains behind Pericos Restaurant
8	Flooding every time it rains at HEB
9	Channel erosion issues, collapsed storm sewer
10	Street flooding, dilapidated storm sewer
11	Intersection flooding
12	Development behind property causing runoff to enter property

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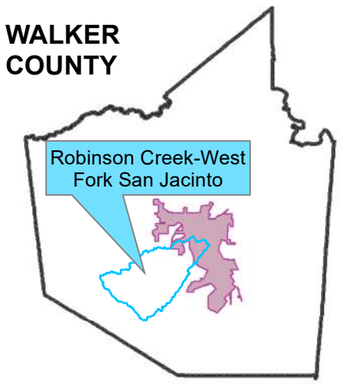
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

1,500 750 0 1,500 Feet

1 inch = 1,500 feet



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM

DRAINAGE COMPLAINTS

- CITY-IDENTIFIED PROBLEM
- MAINTENANCE REQUEST
- MAINTENANCE REQUEST (RESOLVED)

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 19

ROBINSON CREEK PROBLEM PRIORITIZATION

ROBINSON CREEK PROBLEM PRIORITIZATION STATISTICS	
UNRESOLVED DRAINAGE COMPLAINTS	3
RESOLVED DRAINAGE COMPLAINTS	2
FEMA CLAIMS	1

UNRESOLVED DRAINAGE COMPLAINTS

Number	Complaint
1	Runoff from park floods property, storm sewer overflows after reaching capacity
2	Flooding in yard and home after street was redone
3	Storm sewer overflows after reaching capacity onto property

ROBINSON CREEK-WEST FORK SAN JANCINTO RIVER

ROBINSON CREEK

30 75 45 1374

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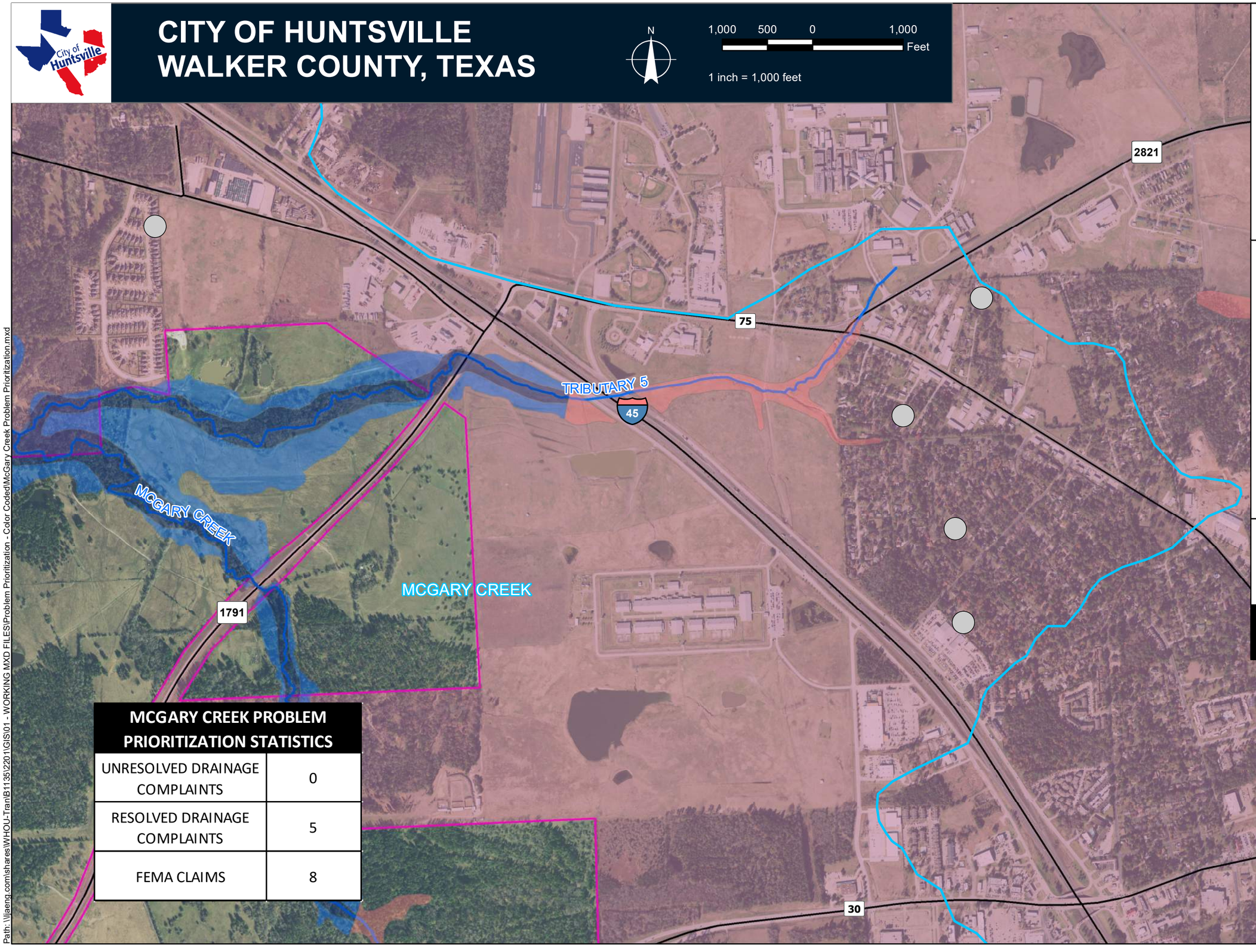
CITY OF HUNTSVILLE
WALKER COUNTY, TEXAS

N

1,000 500 0 1,000 Feet

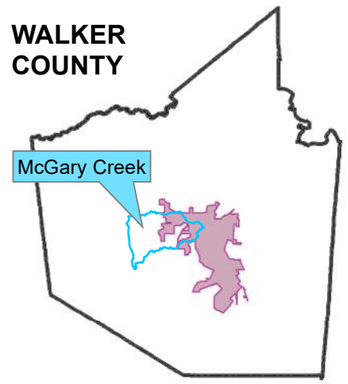
1 inch = 1,000 feet



MCGARY CREEK PROBLEM PRIORITIZATION STATISTICS

UNRESOLVED DRAINAGE COMPLAINTS	0
RESOLVED DRAINAGE COMPLAINTS	5
FEMA CLAIMS	8

WALKER COUNTY



LEGEND

- HUNTSVILLE CITY LIMITS
- WATERSHED BOUNDARY
- STREET (TxDOT)
- STREAM

DRAINAGE COMPLAINTS

- MAINTENANCE REQUEST (RESOLVED)

LJA ENGINEERING
Firm No. F-1386

EXHIBIT 20

MCGARY CREEK PROBLEM PRIORITIZATION

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APPENDIX A

FEMA Flood Insurance Rate Maps

NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information on this FIRM was provided by the TNRIS 2006. Benchmarks provided by the City of Huntsville (ID shown as CP9999) and the Nation Geodetic Survey (ID shown as BL9999). For City of Huntsville benchmarks, visit www.huntsvilletx.gov or call City Surveyor. For NGS Benchmarks, visit www.ngs.noaa.gov.
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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

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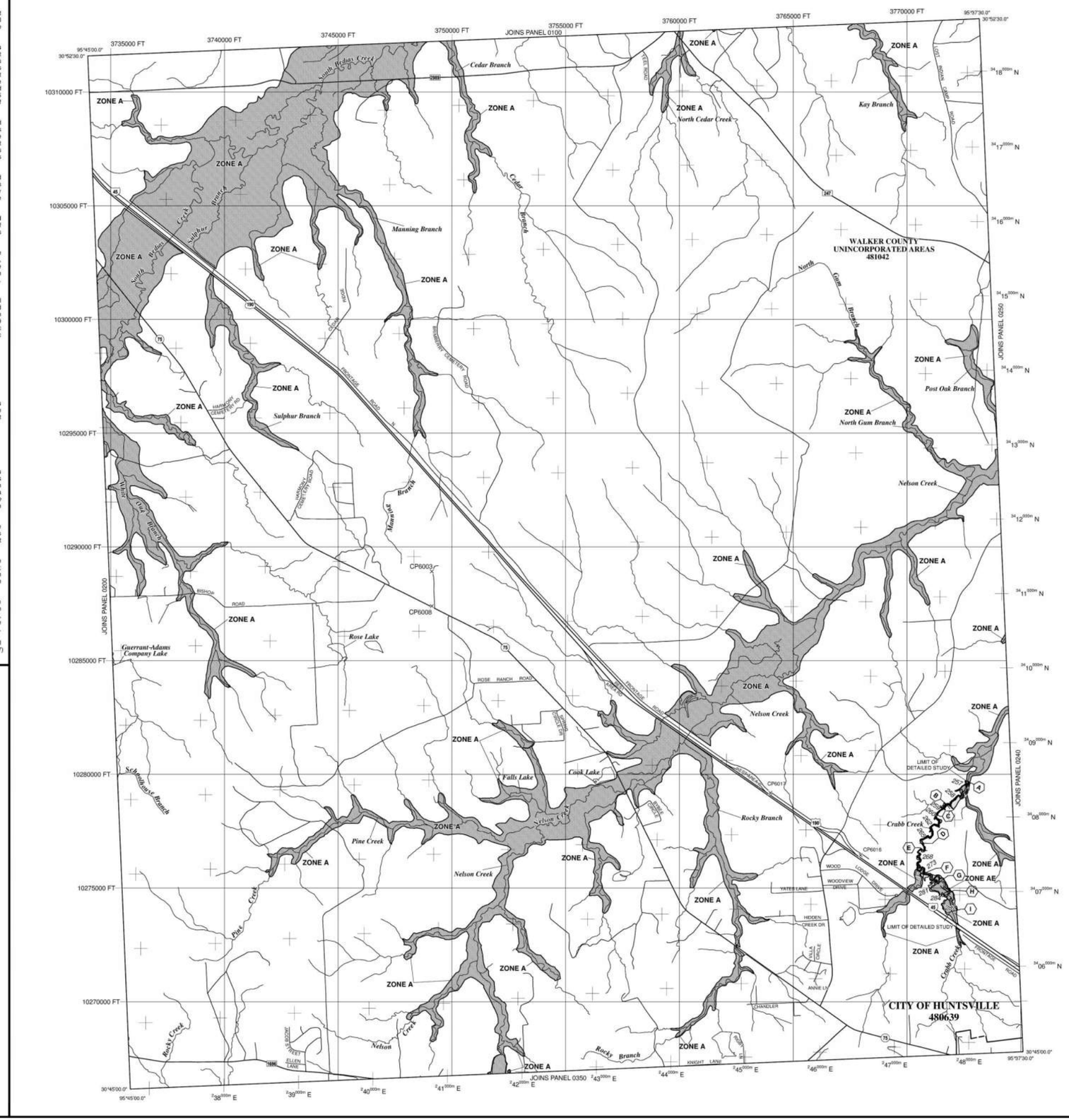

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A	Cross section line
23 — 23	Transect line
97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN	1000-meter Universal Transverse Mercator grid ticks, zone 15
6000000 FT	5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0225D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 225 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0225	D
HUNTSVILLE, CITY OF	480639	0225	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0225D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

NOTES TO USERS

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NOAA, N/NGS12
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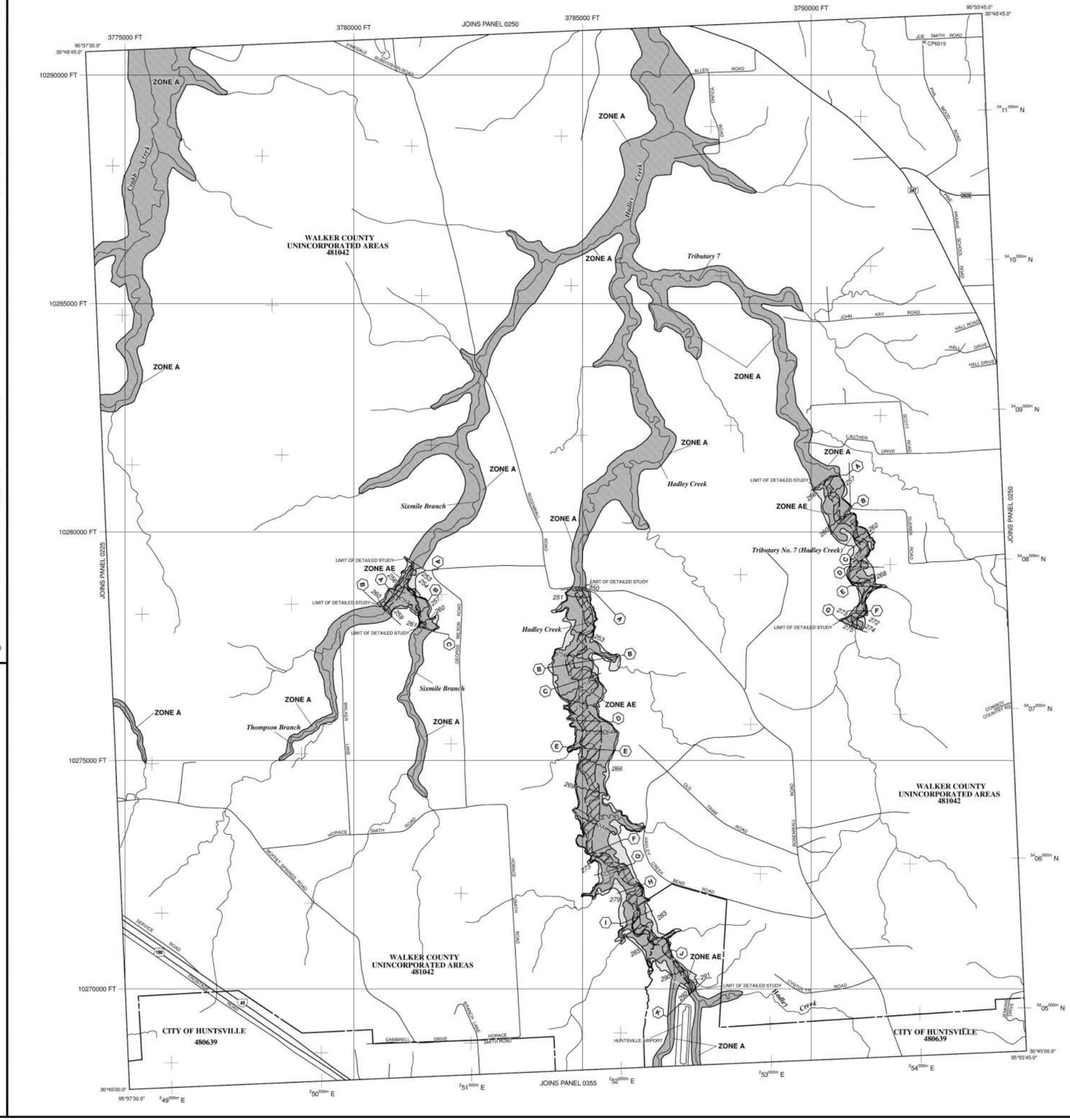

LEGEND

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ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

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OTHERWISE PROTECTED AREAS (OPAs)

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Floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 — Base Flood Elevation line and value; elevation in feet*
(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*
* Referenced to the North American Vertical Datum of 1988 (NAVD 88)
A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4275000mN 1000-meter Universal Transverse Mercator grid ticks, zone 15
6000000 FT 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
DX5510 × Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0240D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 240 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0240	D
HUNTSVILLE, CITY OF	480639	0240	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0240D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

NOTES TO USERS

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To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

Base map information on this FIRM was provided by the TNRIS 2006. Benchmarks provided by the City of Huntsville (ID shown as CP9999) and the Nation Geodetic Survey (ID shown as BL9999). For City of Huntsville benchmarks, visit www.huntsvilletx.gov or call City Surveyor. For NGS Benchmarks, visit www.ngs.noaa.gov.
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

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Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

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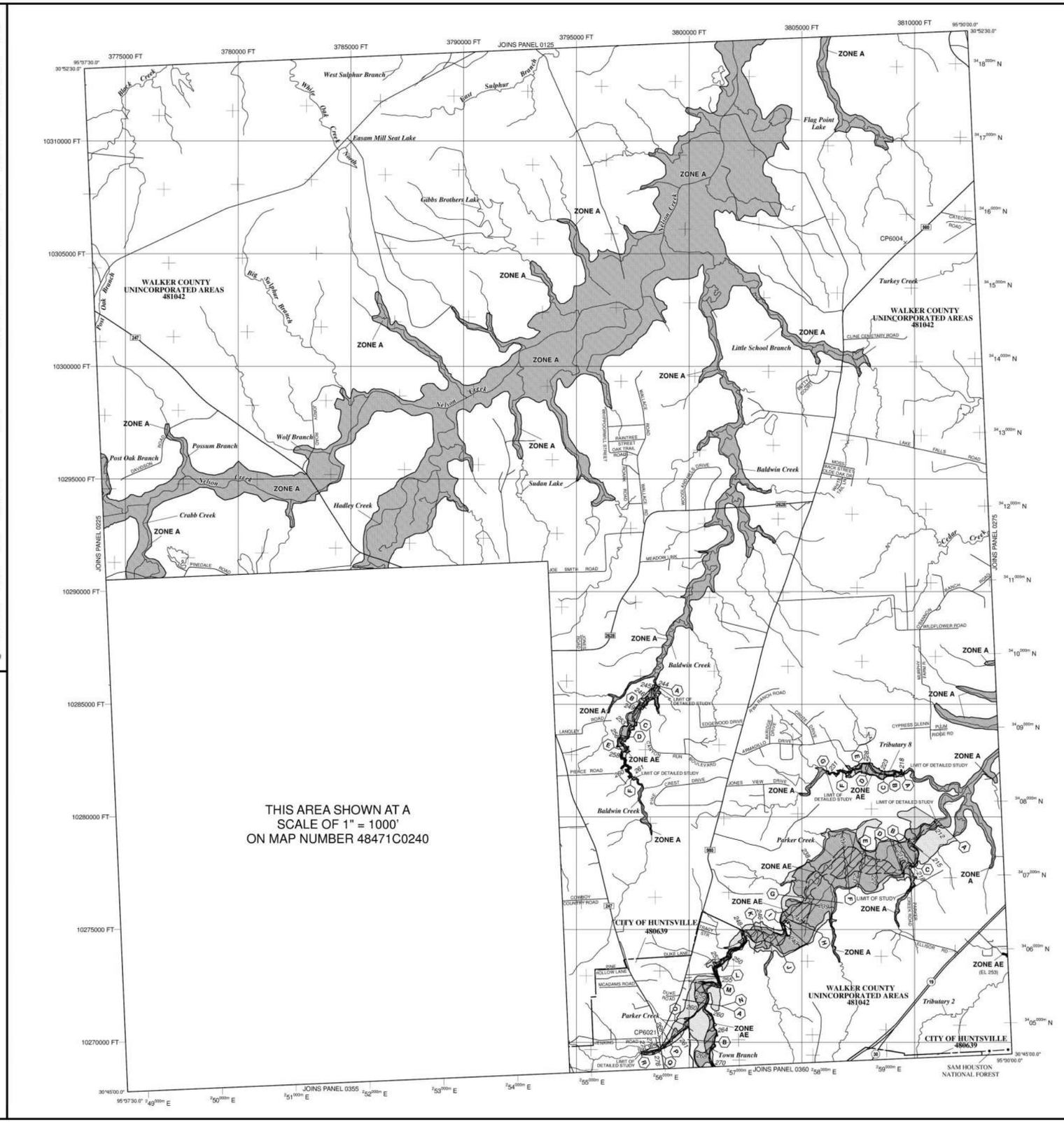

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

- **ZONE A** No Base Flood Elevations determined.
- **ZONE AE** Base Flood Elevations determined.
- **ZONE AH** Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
- **ZONE AO** Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
- **ZONE AR** Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
- **ZONE A99** Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
- **ZONE V** Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
- **ZONE VE** Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

- **ZONE X** Areas determined to be outside the 0.2% annual chance floodplain.
- **ZONE D** Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 (EL 987) Base Flood Elevation line and value; elevation in feet*
- Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A Cross section line
- 23 — 23 Transect line
- 97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
- 4275000mN 1000-meter Universal Transverse Mercator grid ticks, zone 15
- 6000000 FT 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
- DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
500 0 500 1000 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0250D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 250 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0250	D
HUNTSVILLE, CITY OF	480639	0250	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0250D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

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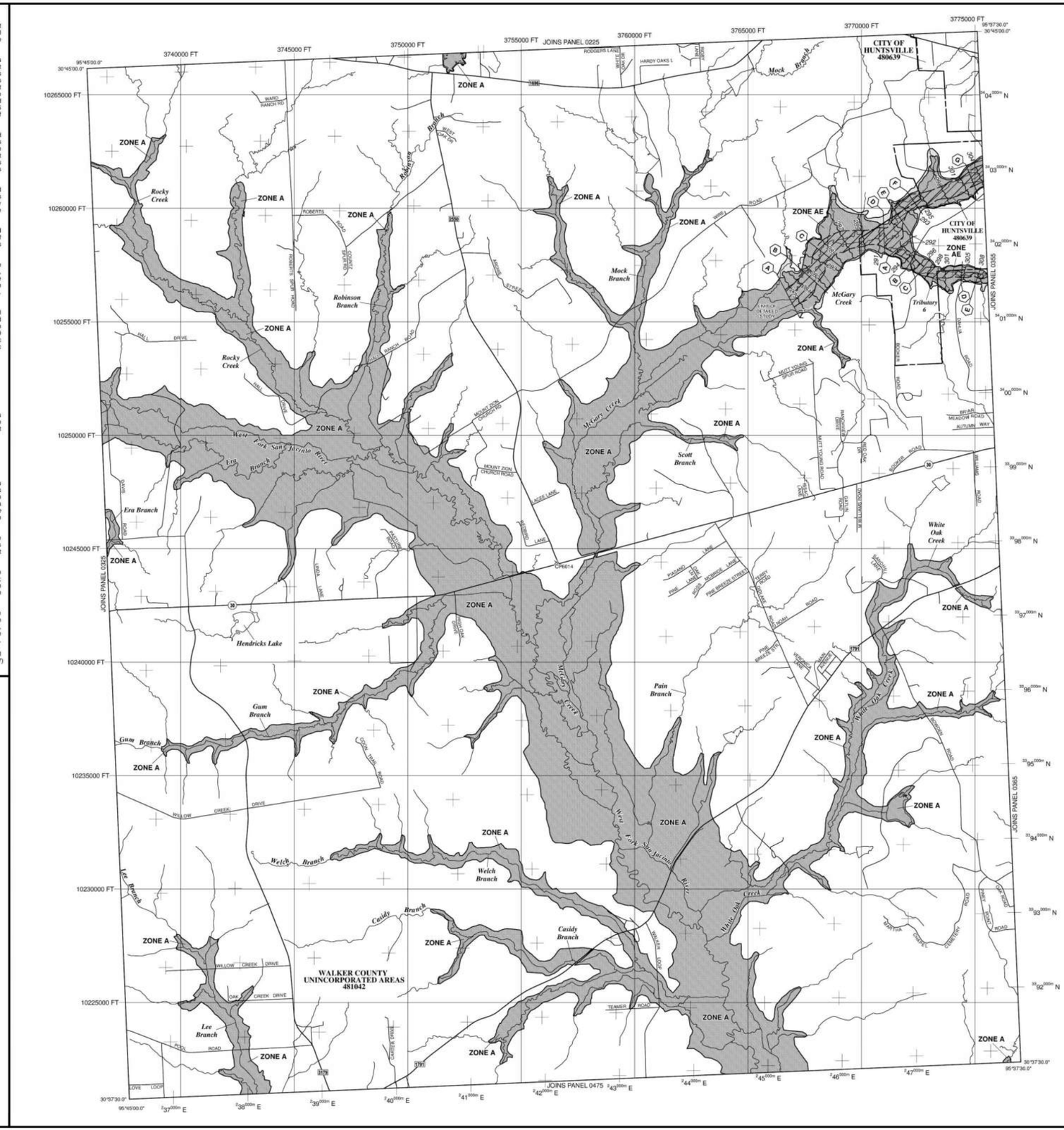

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

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- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
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- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
- 23 — 23 — Transect line
- 97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
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- 6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
- DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)
- M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
500 0 500 1000 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0350D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 350 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0350	D
HUNTSVILLE, CITY OF	480639	0350	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0350D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

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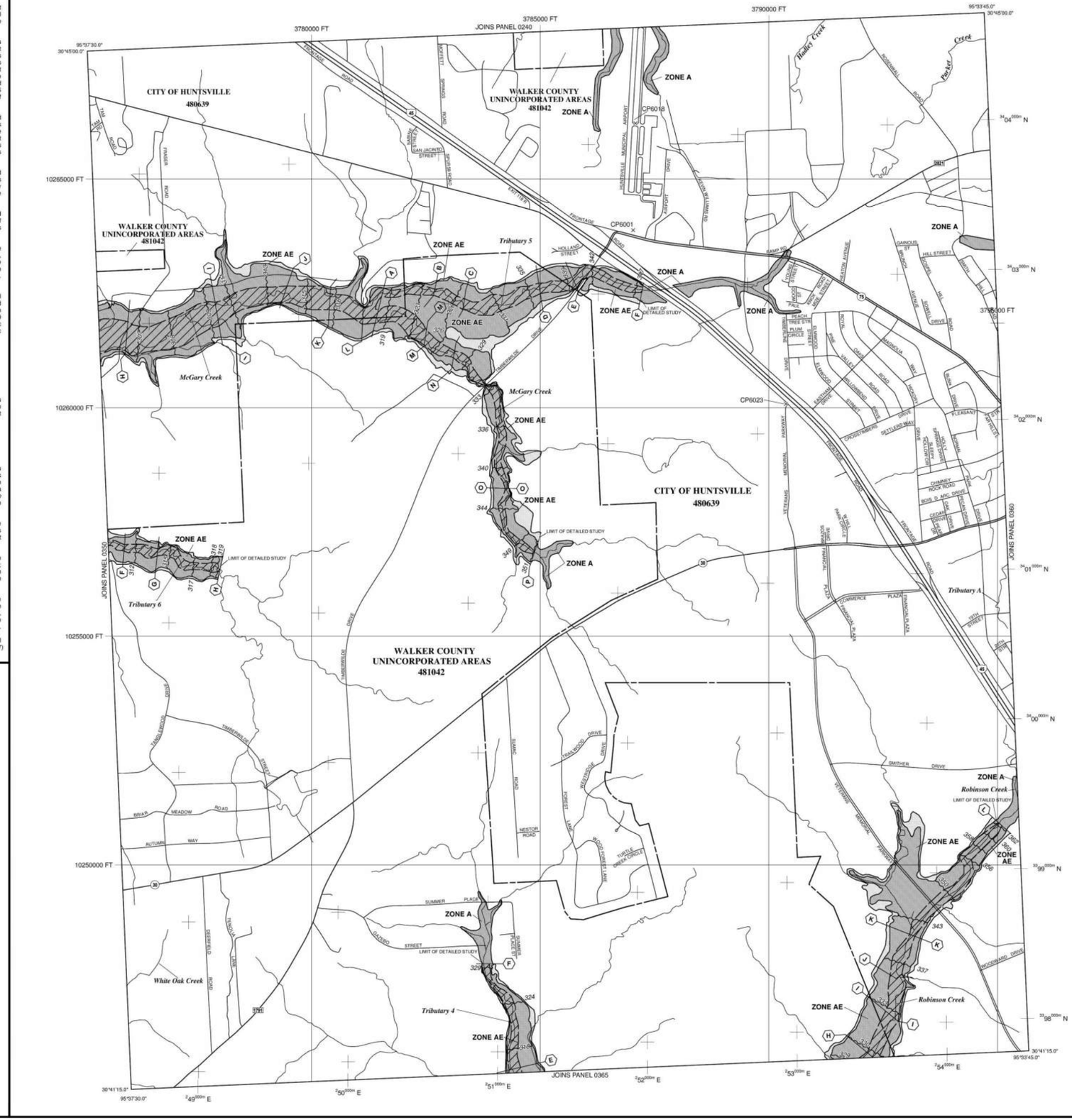

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

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ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	Floodplain boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
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(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

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97°07'30", 32°22'30"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
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6000000 FT	5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE
FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0355D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 355 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0355	D
HUNTSVILLE, CITY OF	480639	0355	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0355D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

NOTES TO USERS

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Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

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NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

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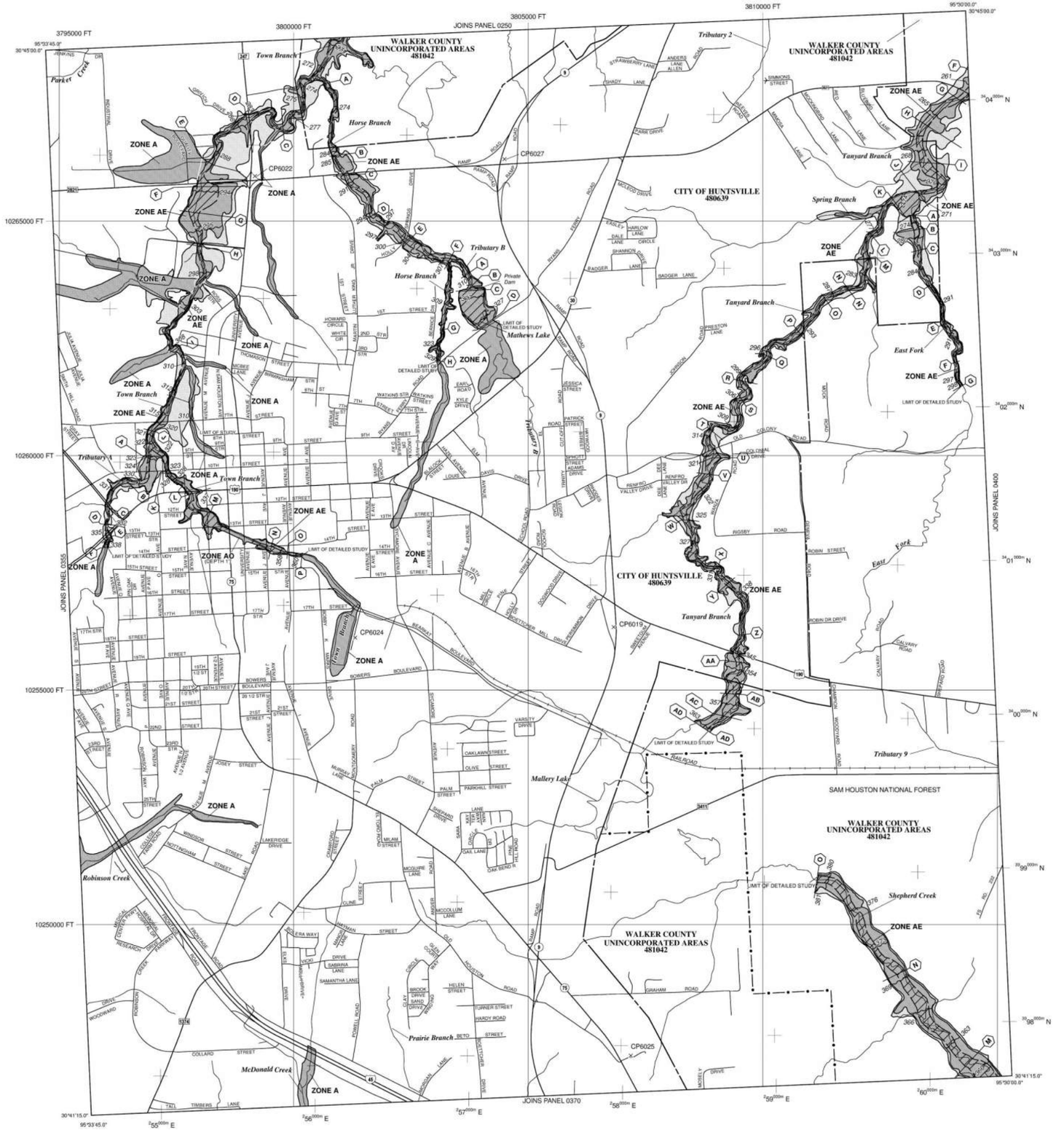

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.
ZONE AE Base Flood Elevations determined.
ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary
Floodway boundary
Zone D boundary
CBRS and OPA boundary
Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
513 (EL 987) Base Flood Elevation line and value; elevation in feet*
Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A Cross section line
23 — 23 Transect line
97°07'30", 32°22'30" Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)
4278000mN 1000-meter Universal Transverse Mercator grid ticks, zone 15
6000000 FT 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic
DX5510 Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5 River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

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MAP SCALE 1" = 1000'
500 0 1000 2000 FEET
300 0 300 600 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0360D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 360 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0360	D
HUNTSVILLE, CITY OF	480639	0360	D

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MAP NUMBER
48471C0360D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

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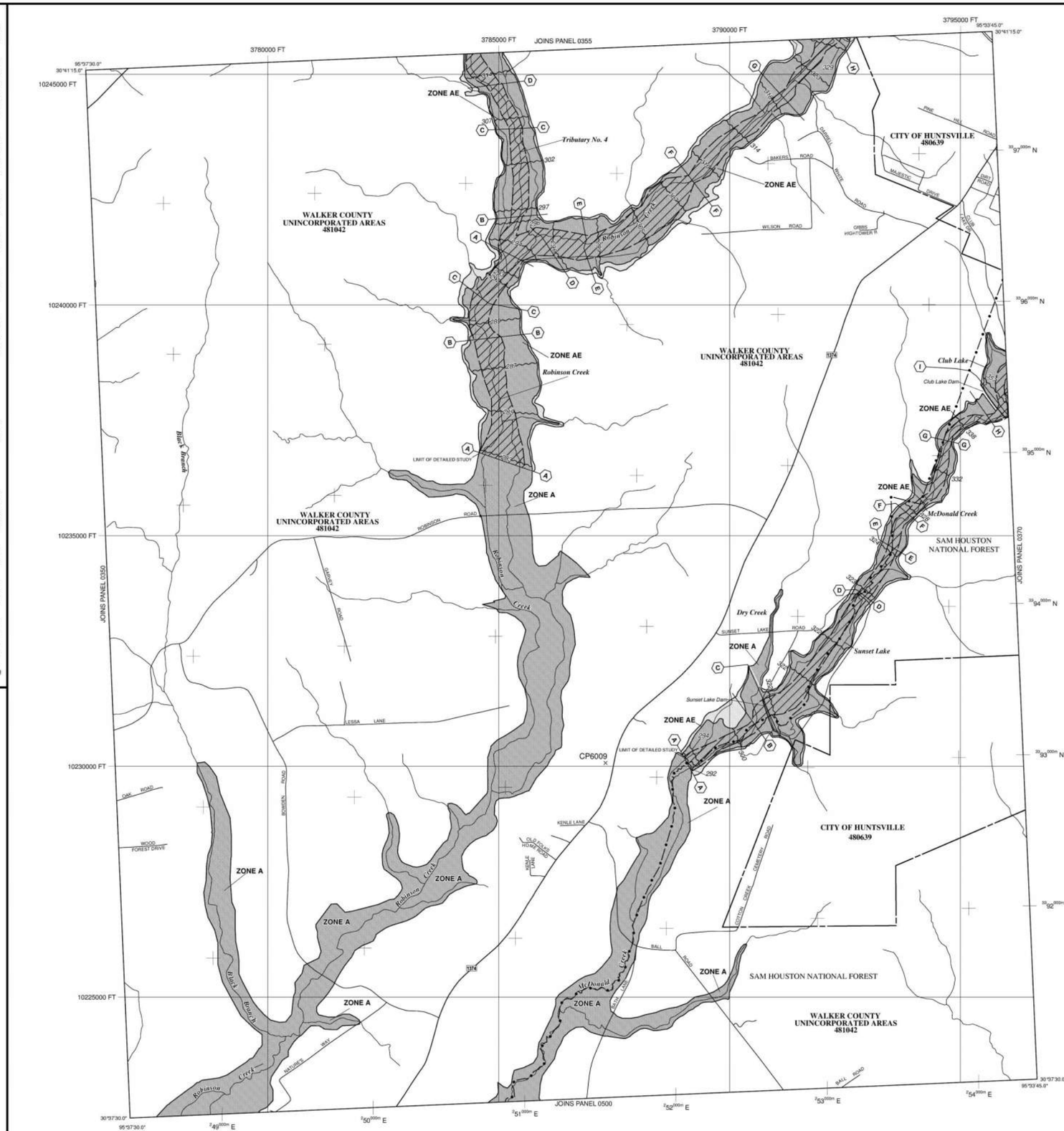

LEGEND

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FLOODWAY AREAS IN ZONE AE

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OTHER FLOOD AREAS

- **ZONE X** Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

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- Floodplain boundary
- Floodway boundary
- Zone D boundary
- CBRS and OPA boundary
- Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.
- 513 — Base Flood Elevation line and value; elevation in feet*
- (EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

- A — A — Cross section line
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MAP REPOSITORIES
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EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0365D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 365 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
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HUNTSVILLE, CITY OF	480639	0365	D

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Federal Emergency Management Agency

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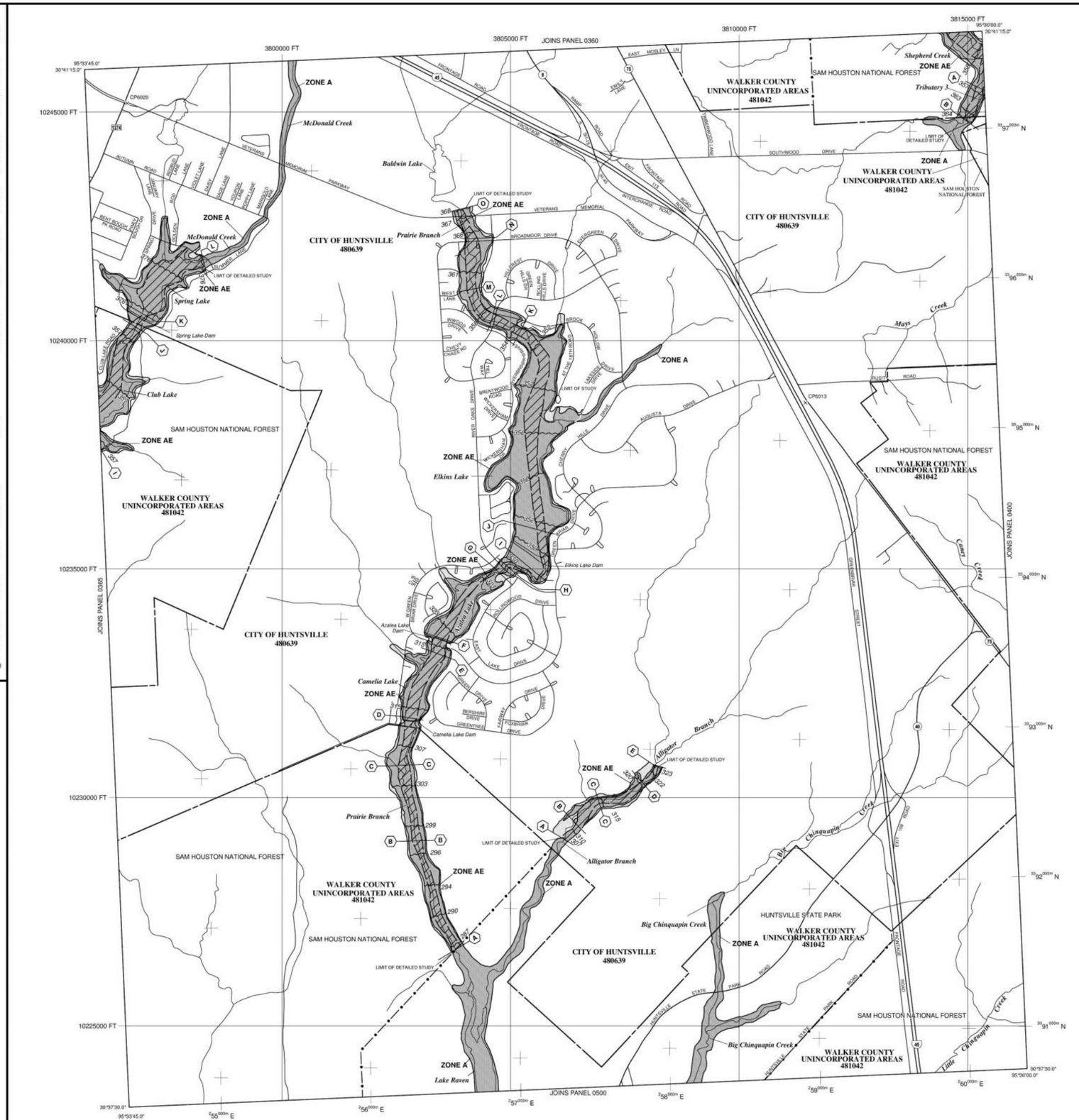

LEGEND

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OTHER FLOOD AREAS

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August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

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NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0370D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 370 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
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HUNTSVILLE, CITY OF	480639	0370	D

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This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures.** Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Texas State Plane central zone (FIPSZONE 4203). The **horizontal datum** was NAD83, GRS1980 spheroid. Differences in datum, spheroid, projection or State Plane zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of the FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum.** For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov/ or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, MD 20910-3282

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713-3242,** or visit its website at http://www.ngs.noaa.gov/.

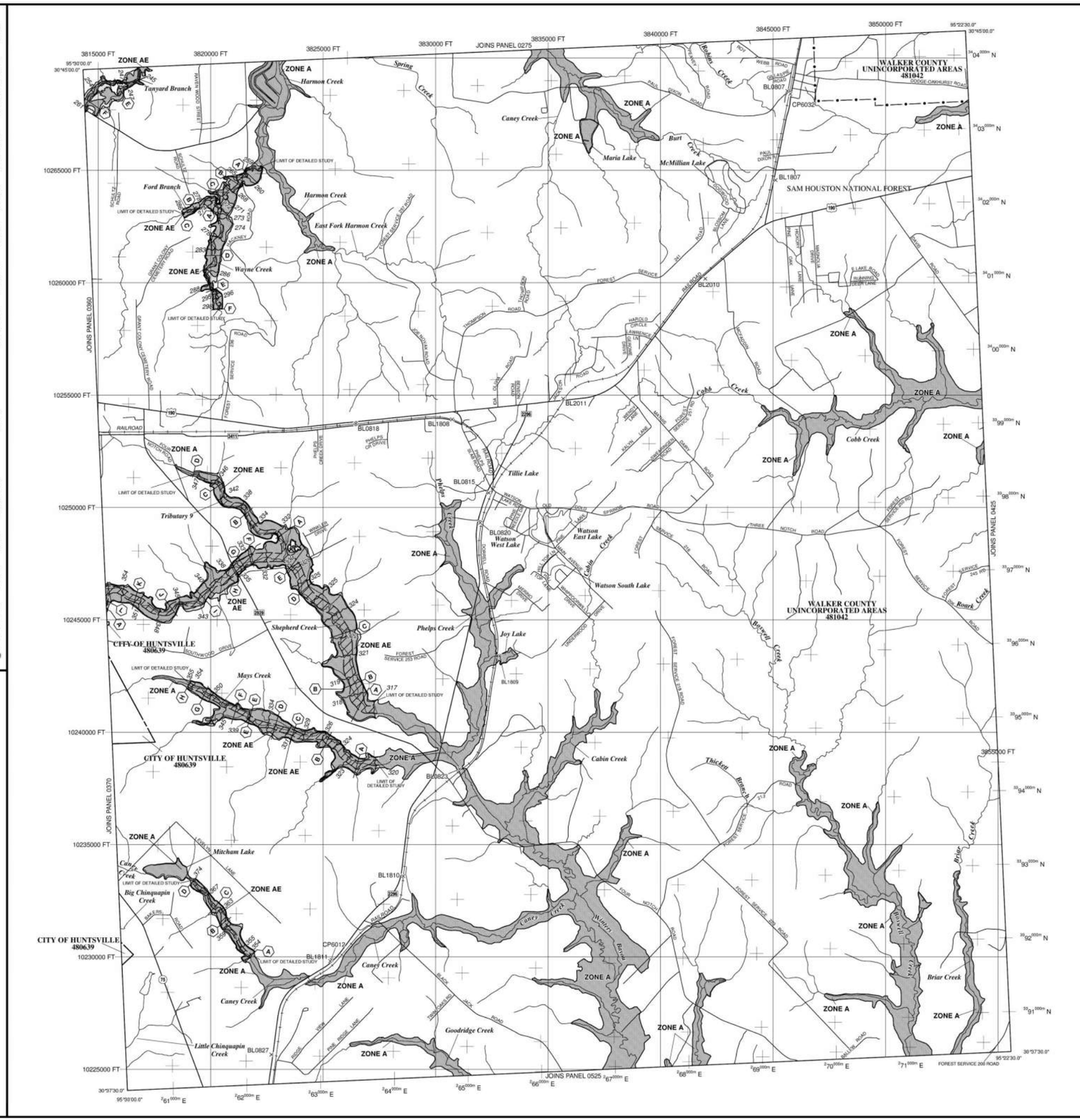
Base map information on this FIRM was provided by the TNRIS 2006. Benchmarks provided by the City of Huntsville (ID shown as CP9999) and the Nation Geodetic Survey (ID shown as BL9999). For City of Huntsville benchmarks, visit www.huntsvilletx.gov or call City Surveyor. For NGS Benchmarks, visit www.ngs.noaa.gov.
This map reflects more detailed and up-to-date **stream channel configurations** than those shown on the previous FIRM for this jurisdiction. The floodplains and floodways that were transferred from the previous FIRM may have been adjusted to conform to these new stream channel configurations. As a result, the Flood Profiles and Floodway Data tables *in the Flood Insurance Study report (which contains authoritative hydraulic data)* may reflect stream channel distances that differ from what is shown on this map.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

Contact the **FEMA Map Service Center** at 1-800-358-9616 for information on available products associated with this FIRM. Available products may include previously issued Letters of Map Change, *a Flood Insurance Study report,* and/or digital versions of this map. The FEMA Map Service Center may also be reached by Fax at 1-800-358-9620 and its website at http://www.msc.fema.gov/.

If you have **questions about this map** or questions concerning the National Flood Insurance Program in general, please call **1-877-FEMA MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A No Base Flood Elevations determined.

ZONE AE Base Flood Elevations determined.

ZONE AH Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.

ZONE AO Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.

ZONE AR Special Flood Hazard Area formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.

ZONE A99 Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.

ZONE V Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.

ZONE VE Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X Areas determined to be outside the 0.2% annual chance floodplain.

ZONE D Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

Floodplain boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

* Referenced to the North American Vertical Datum of 1988 (NAVD 88)

A — A — Cross section line

23 — 23 — Transect line

97°07'30", 32°22'30" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83)

4275000mN — 1000-meter Universal Transverse Mercator grid ticks, zone 15

6000000 FT — 5000-foot grid values: Texas State Plane coordinate system, central zone (FIPSZONE 4203), Lambert Conformal Conic

DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
August 16, 2011
EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 2000'
1000 0 2000 4000 FEET
600 0 600 1200 METERS

NFIP
NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0400D

FIRM
FLOOD INSURANCE RATE MAP
WALKER COUNTY, TEXAS
AND INCORPORATED AREAS

PANEL 400 OF 550
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)
CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
WALKER COUNTY	481042	0400	D
HUNTSVILLE, CITY OF	480639	0400	D

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
48471C0400D
EFFECTIVE DATE
AUGUST 16, 2011

Federal Emergency Management Agency

APPENDIX B

LiDAR*

*File to be delivered electronically

APPENDIX C

Land Use*

*File to be delivered electronically

APPENDIX D

Soil Types*

*File to be delivered electronically

APPENDIX E

Hydraulic Structures*

*File to be delivered electronically

APPENDIX F

Storm Sewers*

*File to be delivered electronically

APPENDIX G

Gage Data*

*File to be delivered electronically

APPENDIX H

Previous Studies*

*File to be delivered electronically

APPENDIX I

Floodplain Permits*

*File to be delivered electronically

APPENDIX J

Drainage Issues*

*Videos to be delivered electronically

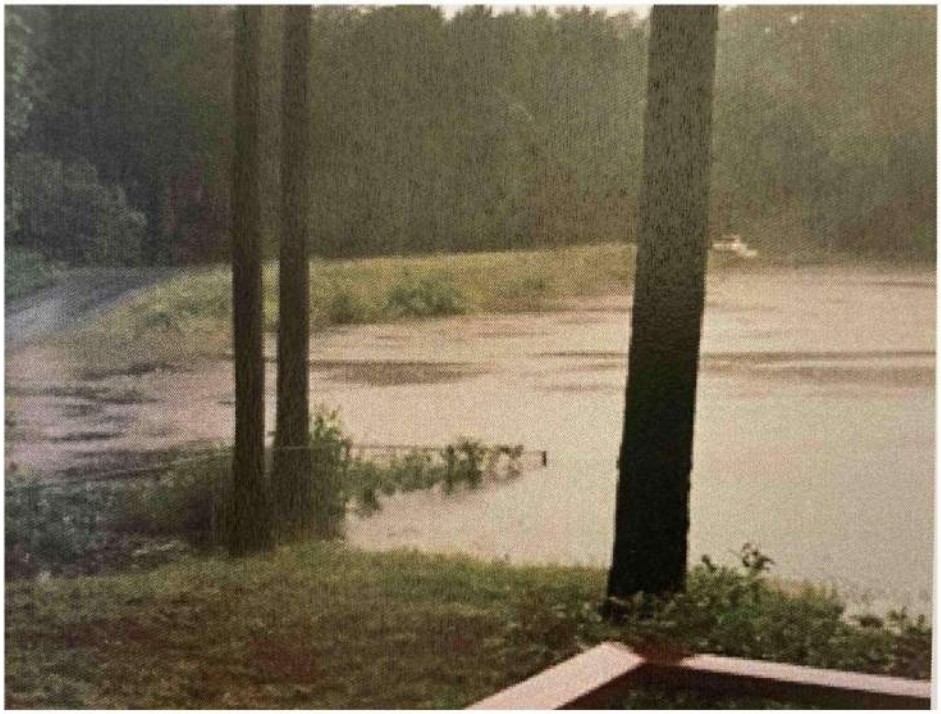
Citizen Photos

May 2015 - Spring Lake Subdivision

May 2015 - 3704 Summer Ln

May 2015 – 3704 Summer Ln

2015 Spring Lake Flooding



Left side shows flow over spillway. Right side below trunk shows top of overflow valve handle. Water height about 4'.

Just to the right of tree trunk, close to fence under water is a sanitation sewer manhole.

2015 flood at 3832 Summer Lane, Spring Lake Estates. Crossing Dam.

Spring Lake Subdivision - May 27, 2016

Spring Lake Subdivision - May 27, 2016

Spring Lake Subdivision - Dec. 3, 2016

Spring Lake Subdivision - Dec. 3, 2016

Spring Lake Subdivision - Dec. 3, 2016

Spring Lake Subdivision - Dec. 3, 2016

Spring Lake - Aug. 27, 2017

Spring Lake - Aug. 27, 2017

Spring Lake - Aug. 27, 2017

Spring Lake - Aug. 27, 2017

Spring Lake Subdivision - Aug. 27 & 28, 2017

Spring Lake Subdivision - Aug. 27 & 28, 2017

Spring Lake Subdivision - Aug. 27 & 28, 2017

Winter Way - Dawson Creek

Winter Way - Dawson Creek

Spring Lake Subdivision - Aug. 27 & 28, 2017

Winter Way - Detention pond

Winter Way - Detention pond

Spring Lake Subdivision - Aug. 27 & 28, 2017

Winter Way - McDonald Creek

Storm sewer inundation near Winter Way

Spring Lake Subdivision - Aug. 27 & 28, 2017

Autumn Rd - McDonald Creek

9/2017

Spring Lake Subdivision

9/2017

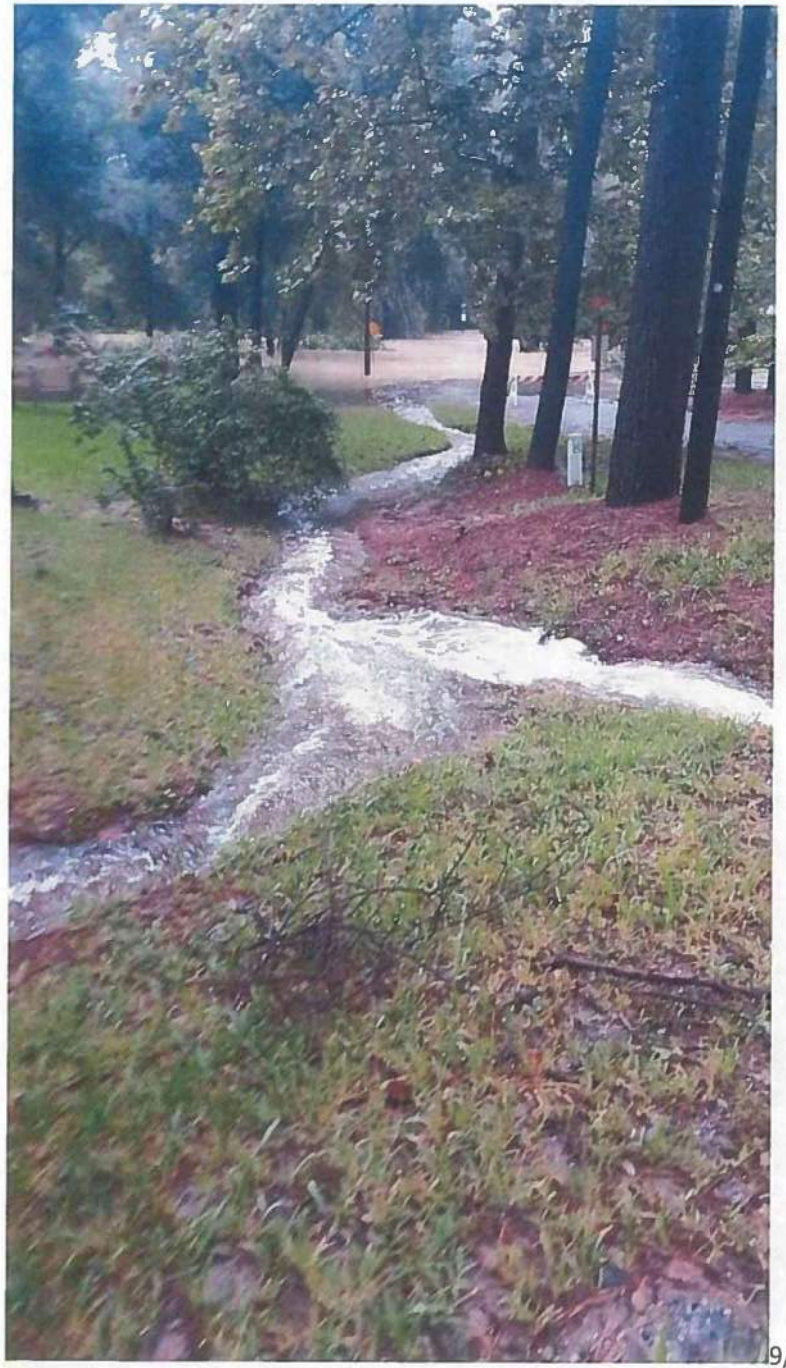
Spring Lake Subdivision

9/2017

McDonald Creek at Winter Way

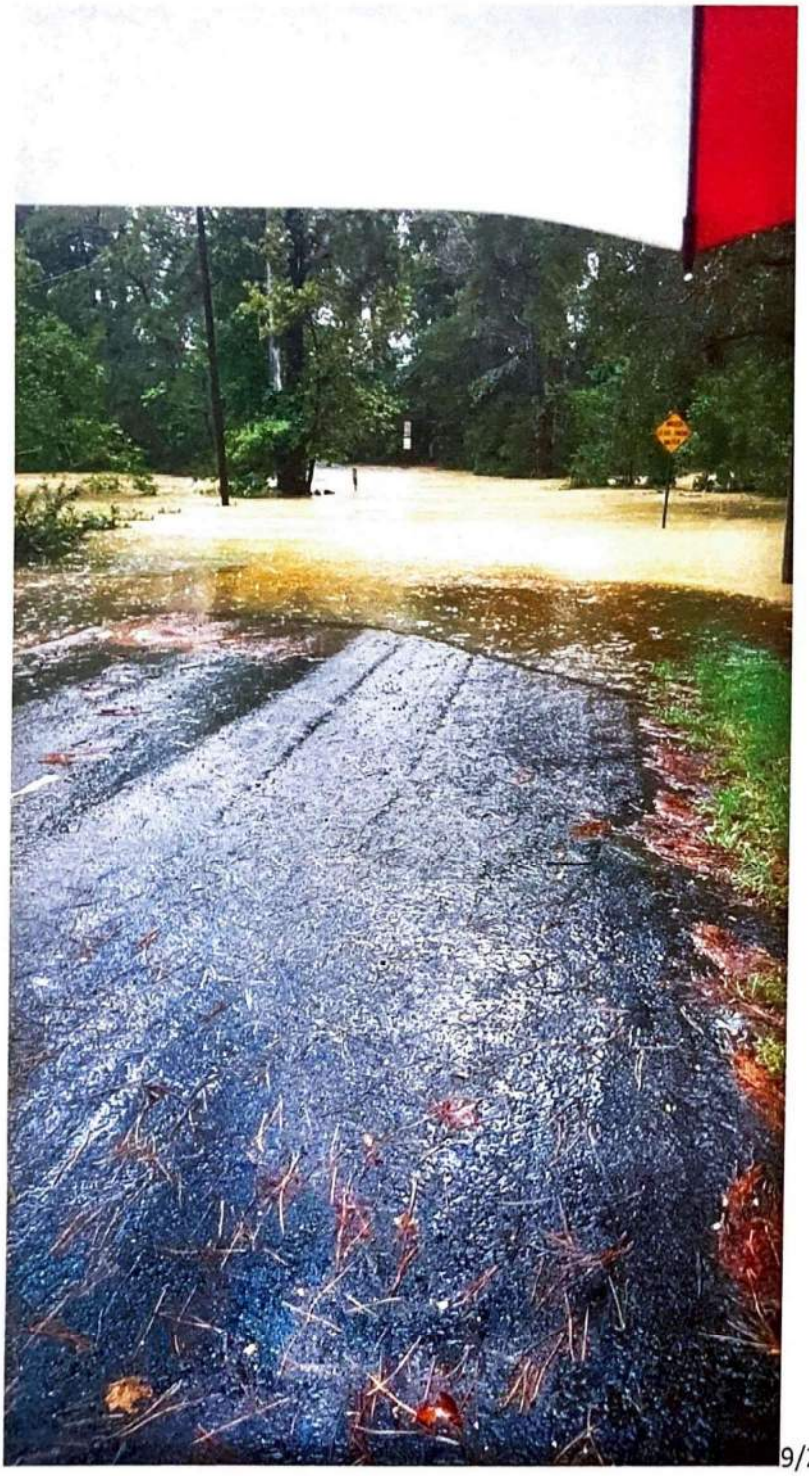
9/2017

McDonald Creek at Winter Way



Spring Lake Subdivision

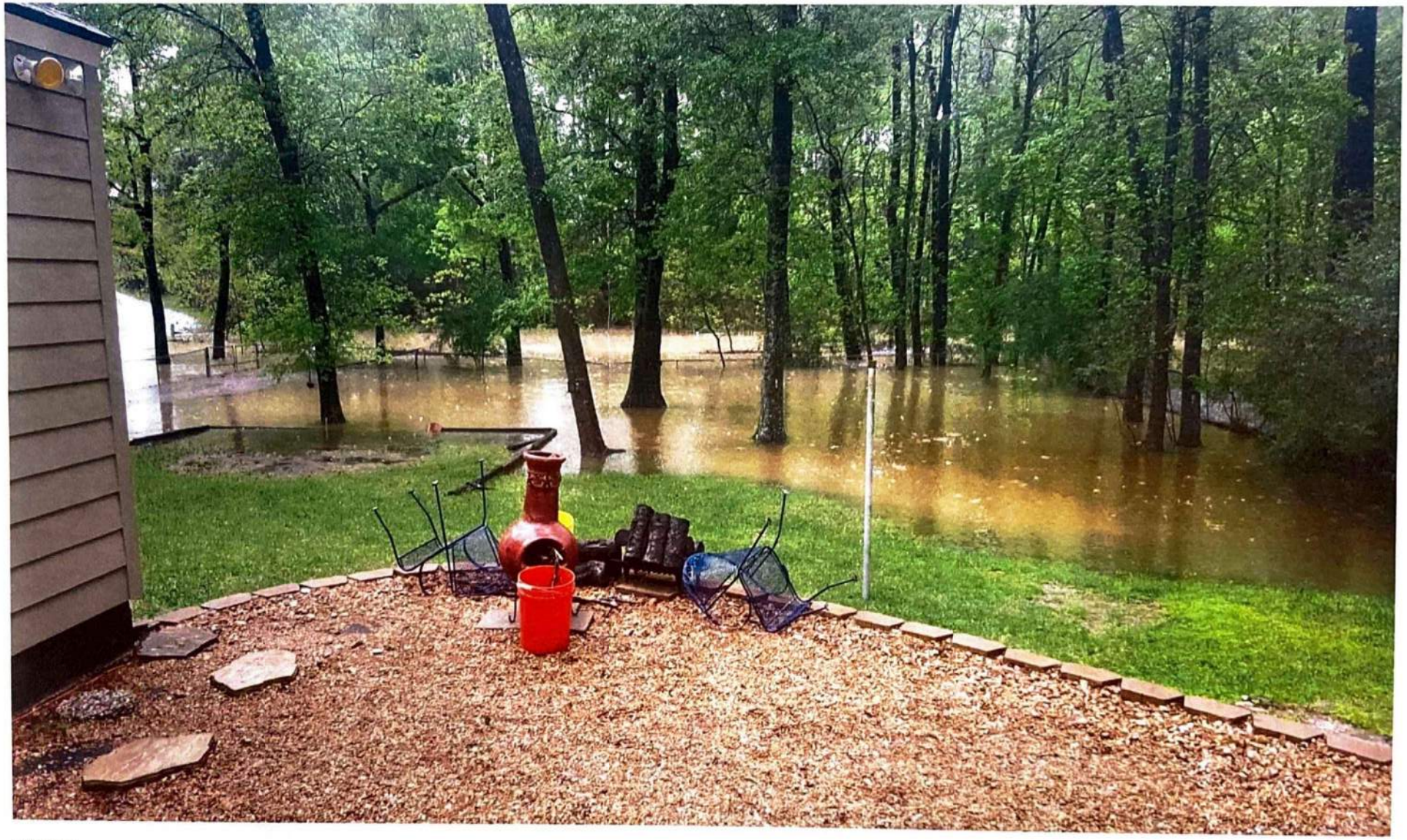
9/2017 BARRICADES, this hasn't been done the last few floods



9/2017

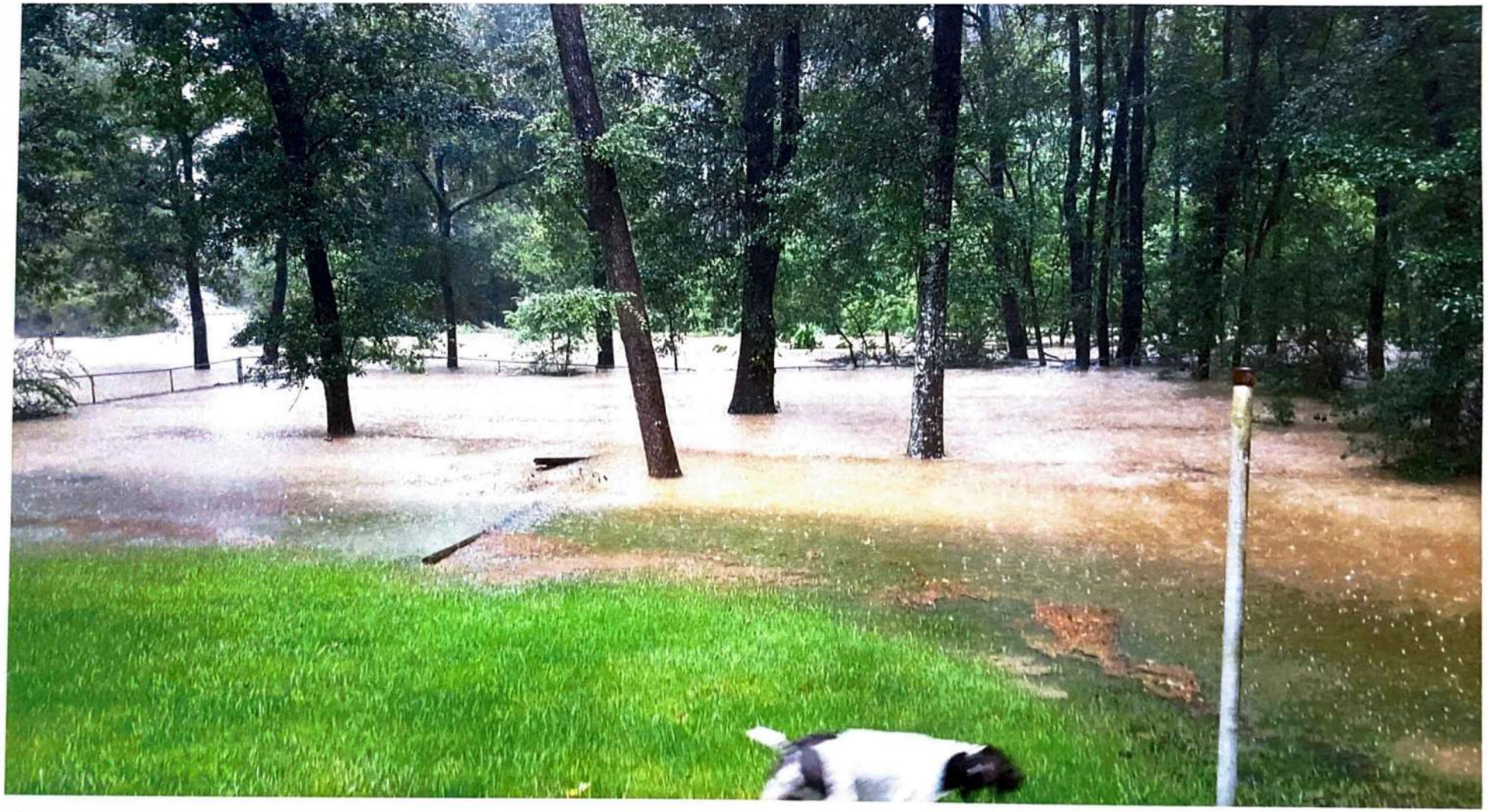
McDonald Creek at Winter Way

Ditches need to be redug 9/2017 - In front of 3744 Summer Ln



9/2017

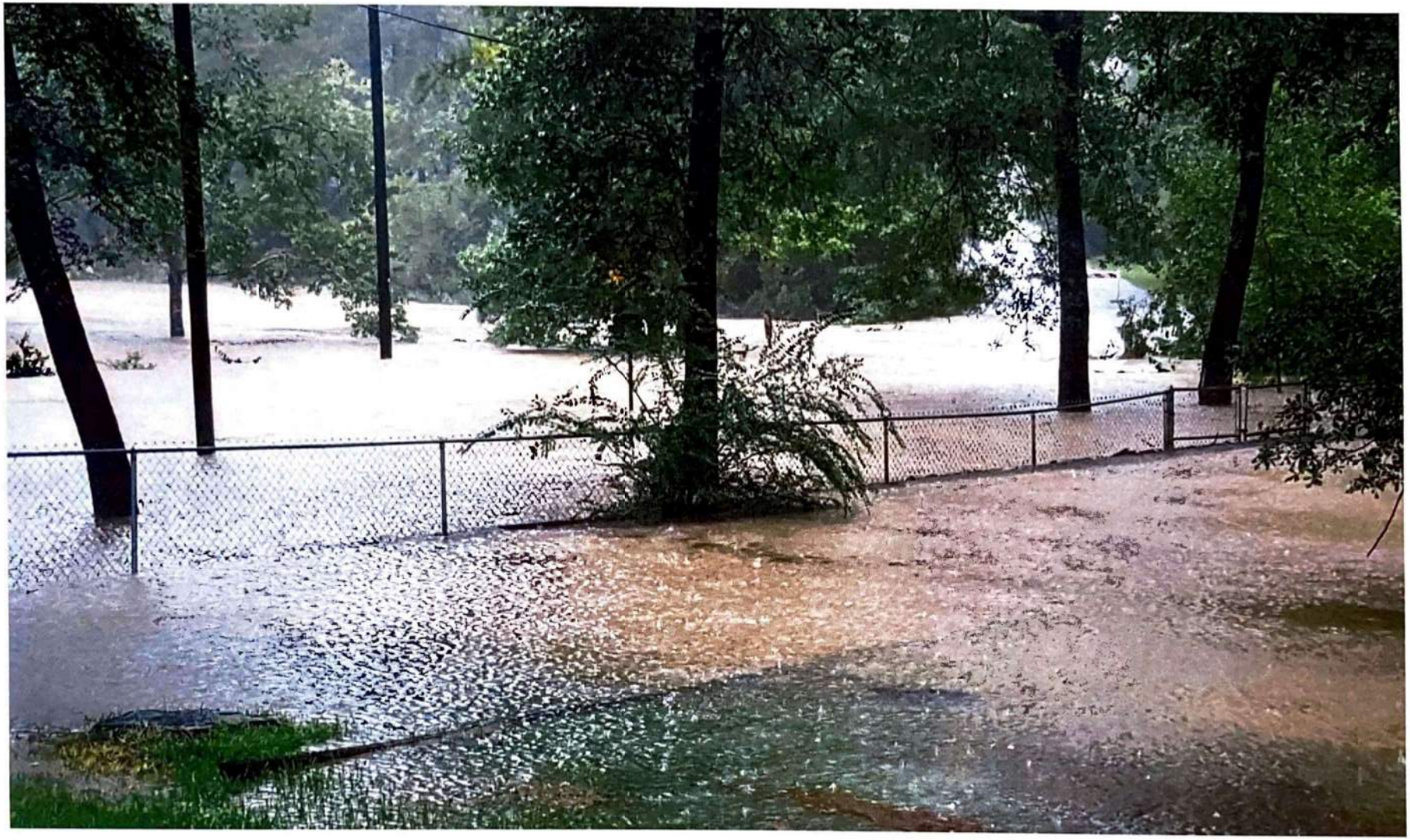
3744 Summer Ln



9/2017

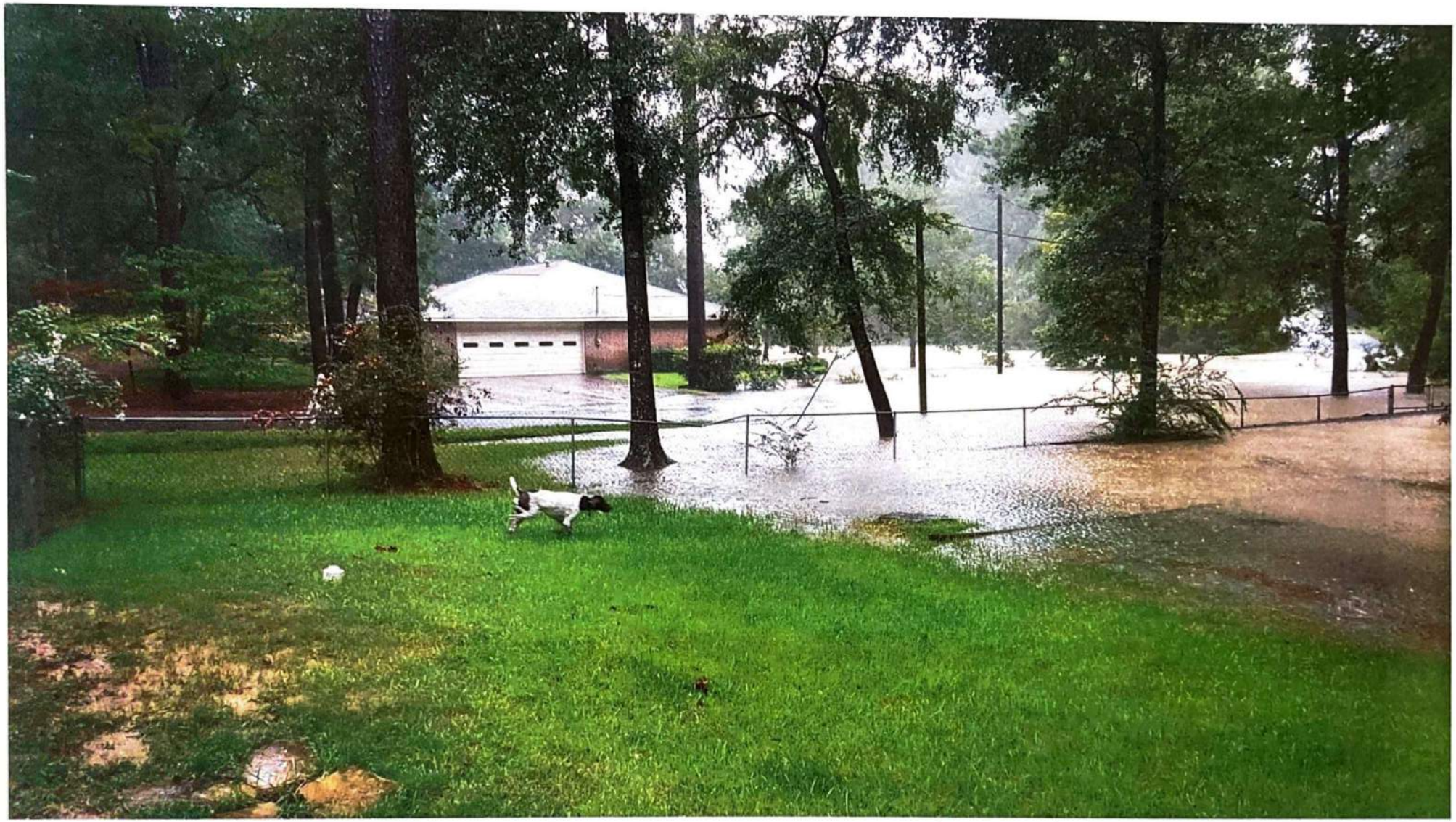
3744 Summer Ln

9/2017



9/2017

3744 Summer Ln



9/2017

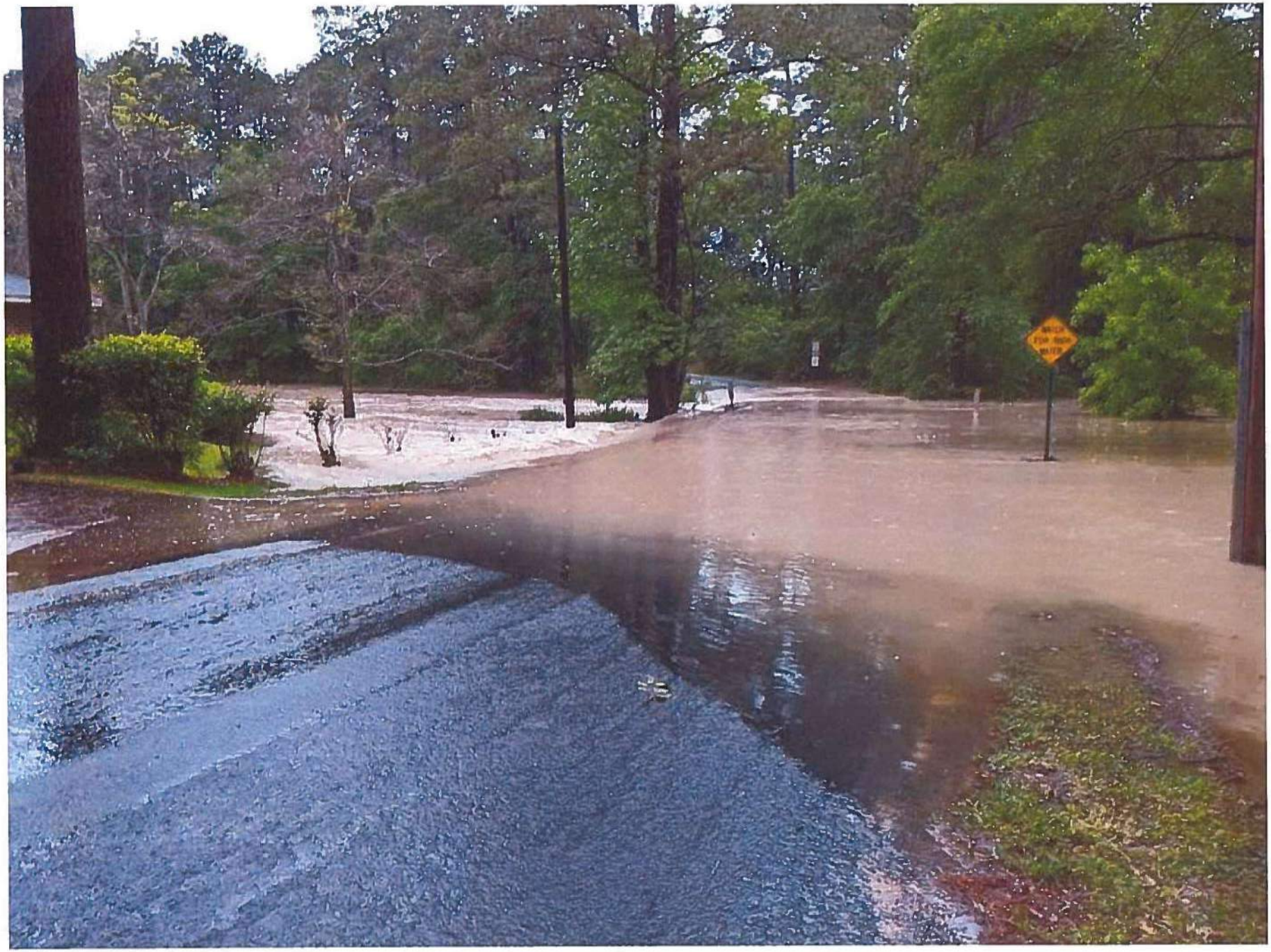
3744 Summer Ln

2018 Reference for previous creek WIDTH

3744 Summer Ln

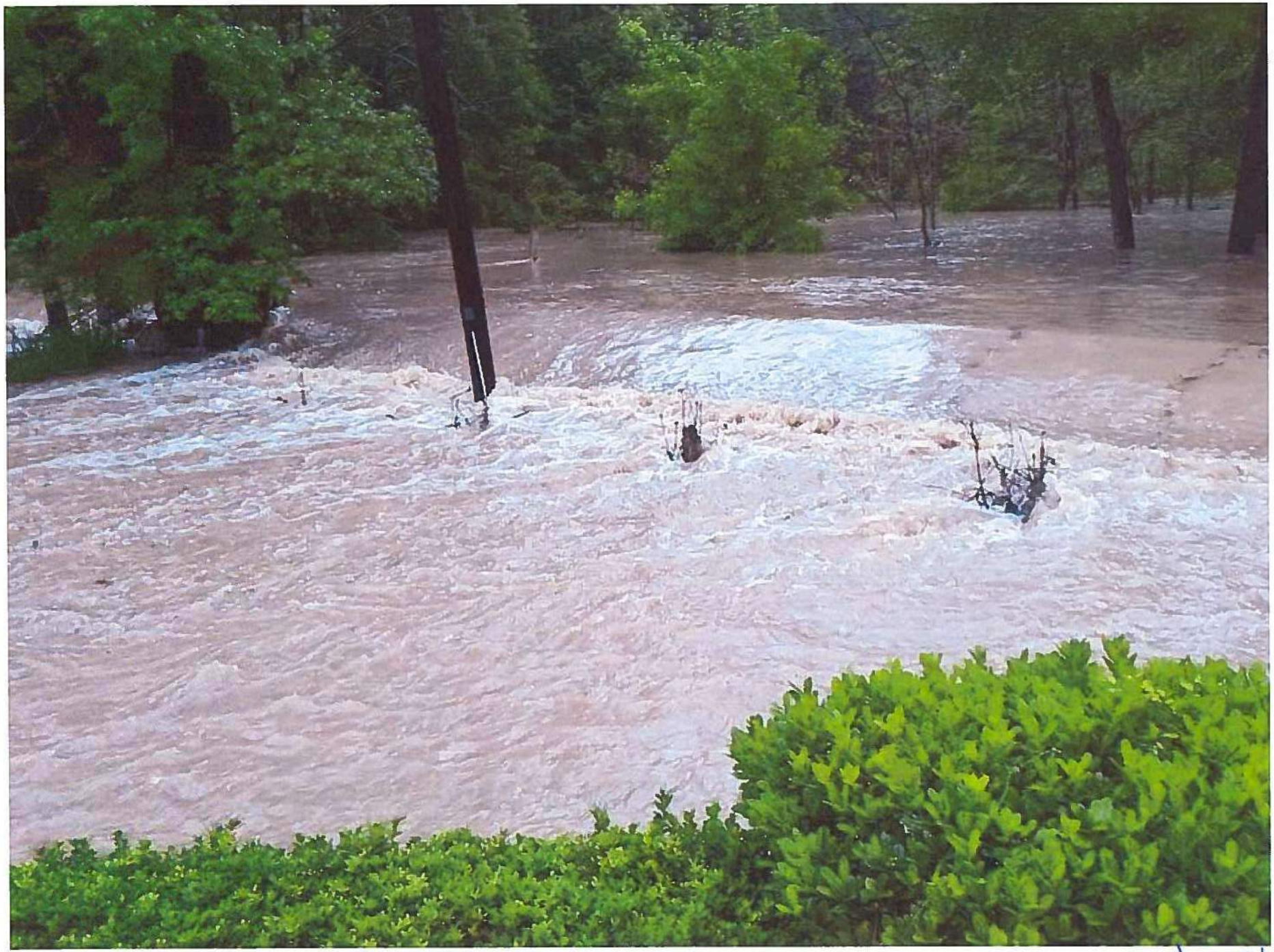
2020

Spring Lake



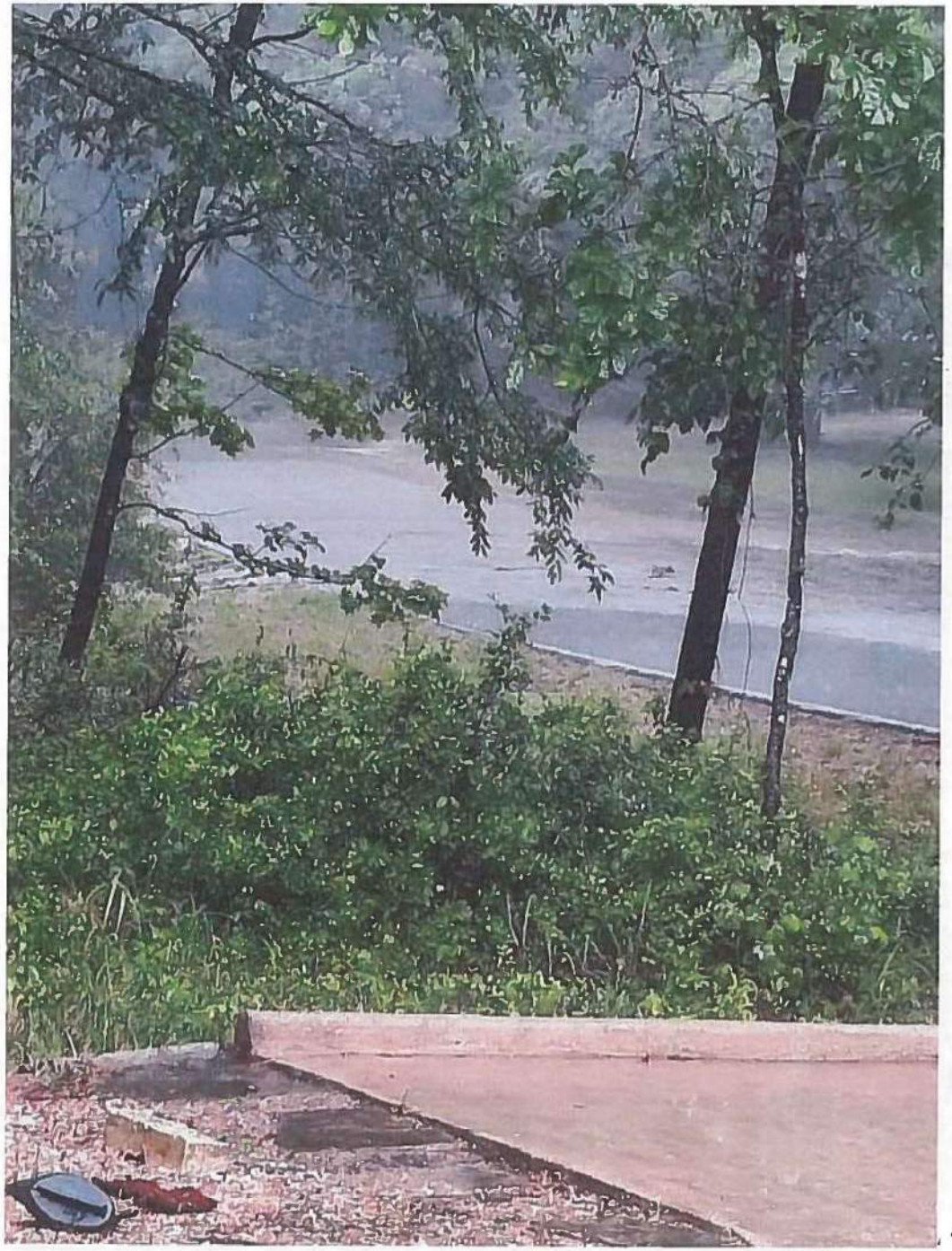
2021 McDonald Creek at Winter Way

Turn around ...



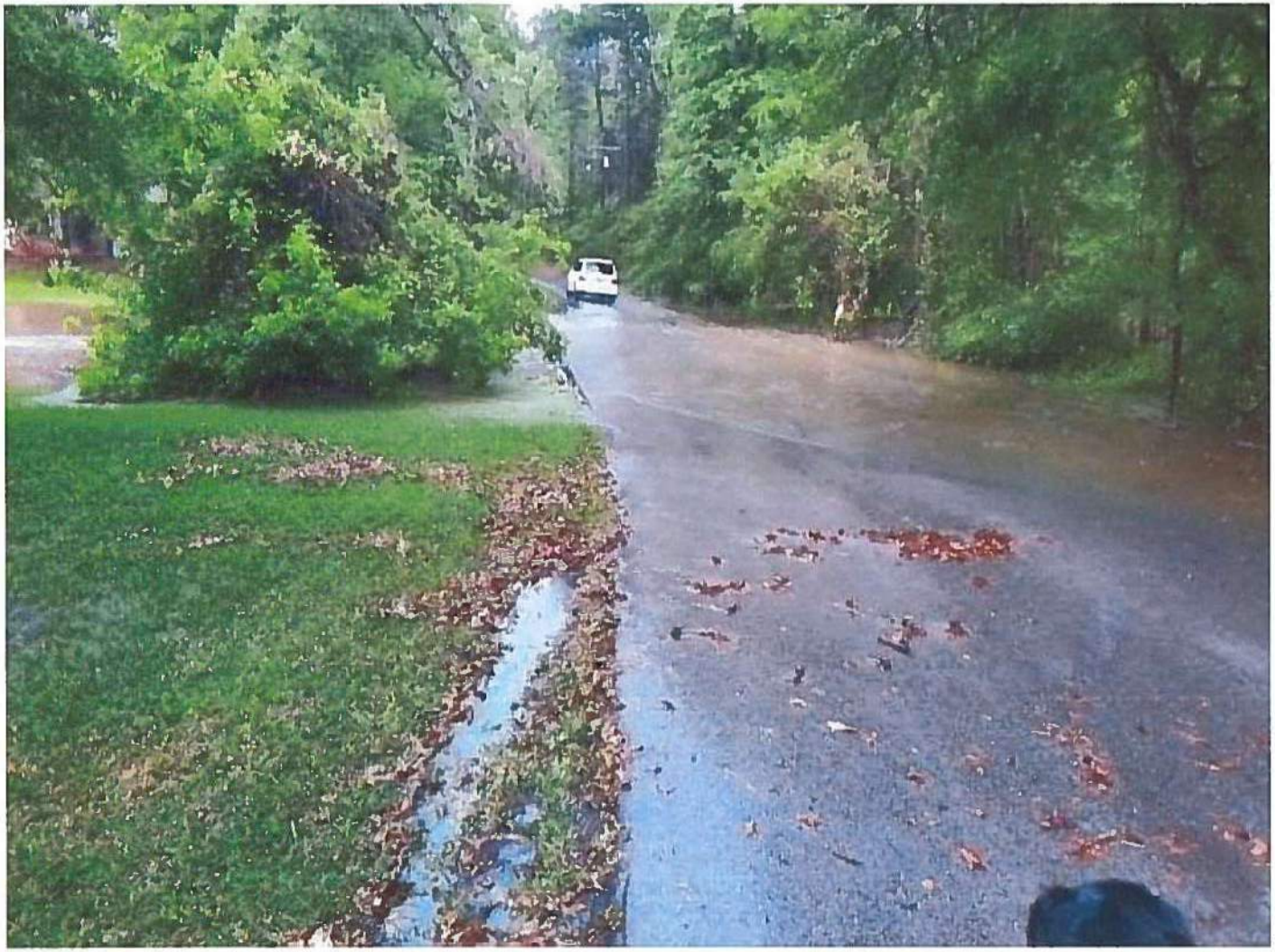
2021 McDonald Creek at Winter Way - behind 3744 Summer Ln

Winter Way



4/2021 Spring Dr

4/2021 Spring Dr



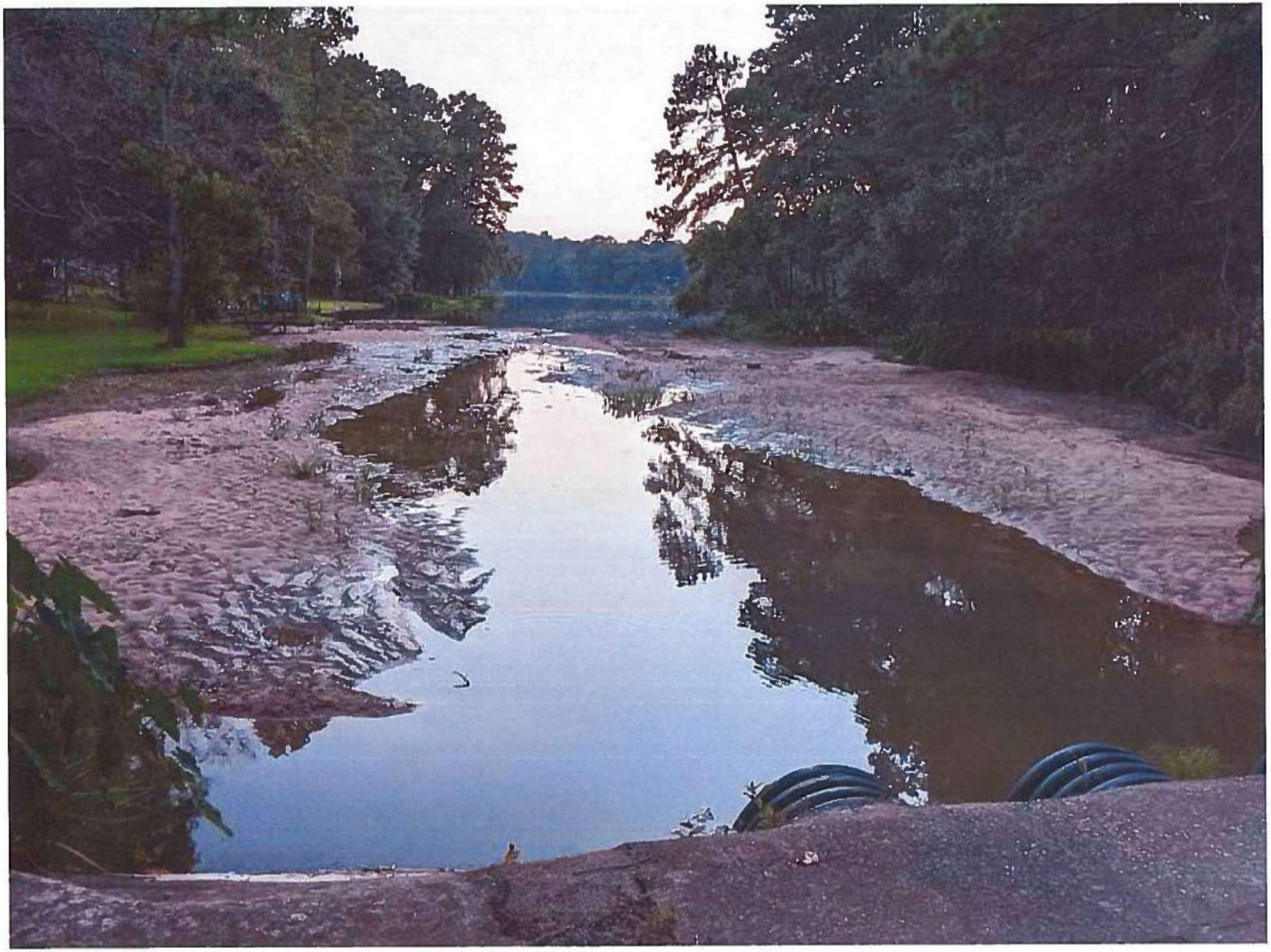
4/2021 Far end inlet spring dr

Far side of neighborhood inlet blocked 2021

Spring Lake

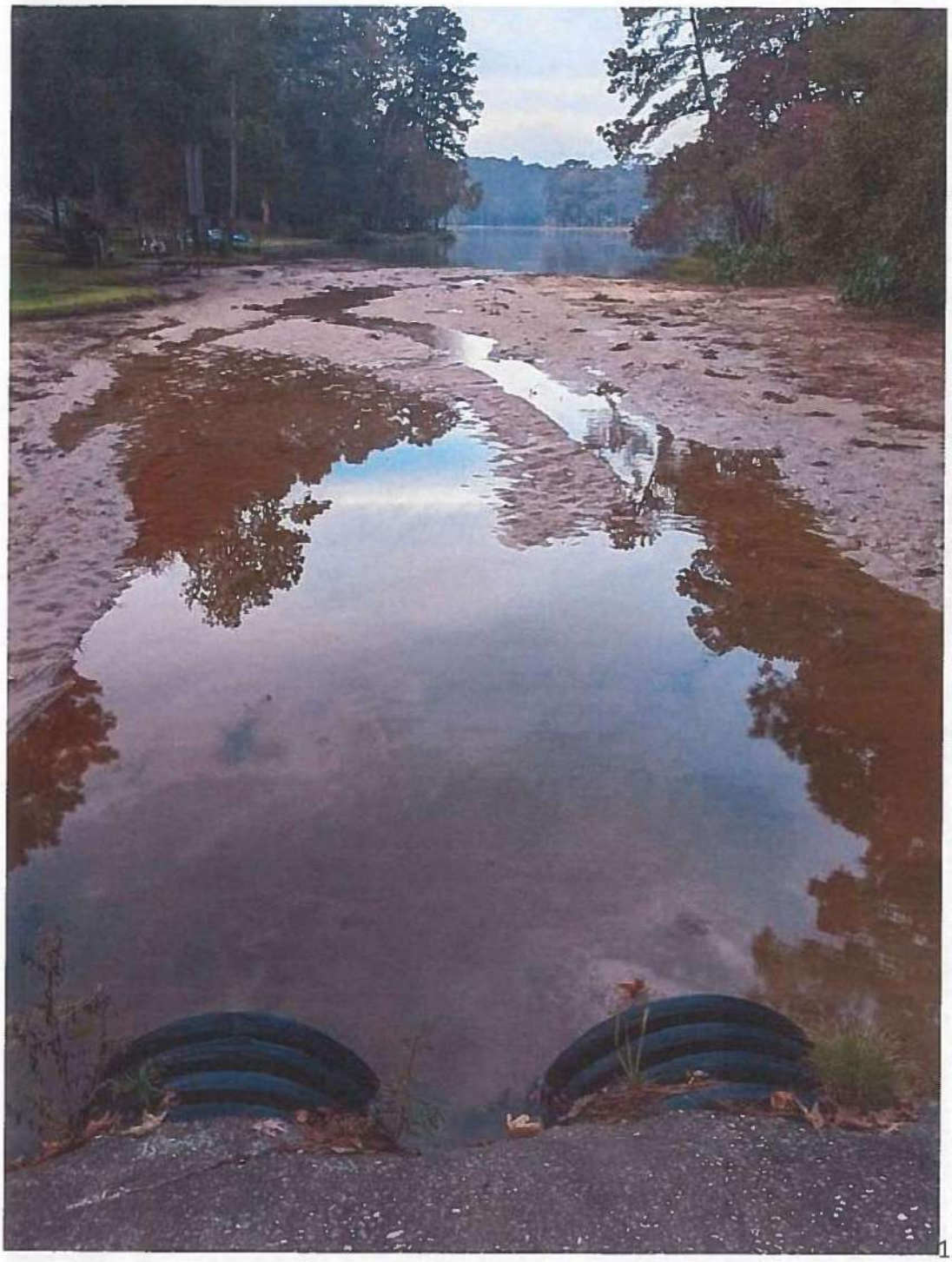
7/28/21

Blockage McDonald Creek at Winter Way - inlet



Silt build up 7/28/21 McDonald Creek at Winter Way - outflow into Spring Lake

winter way

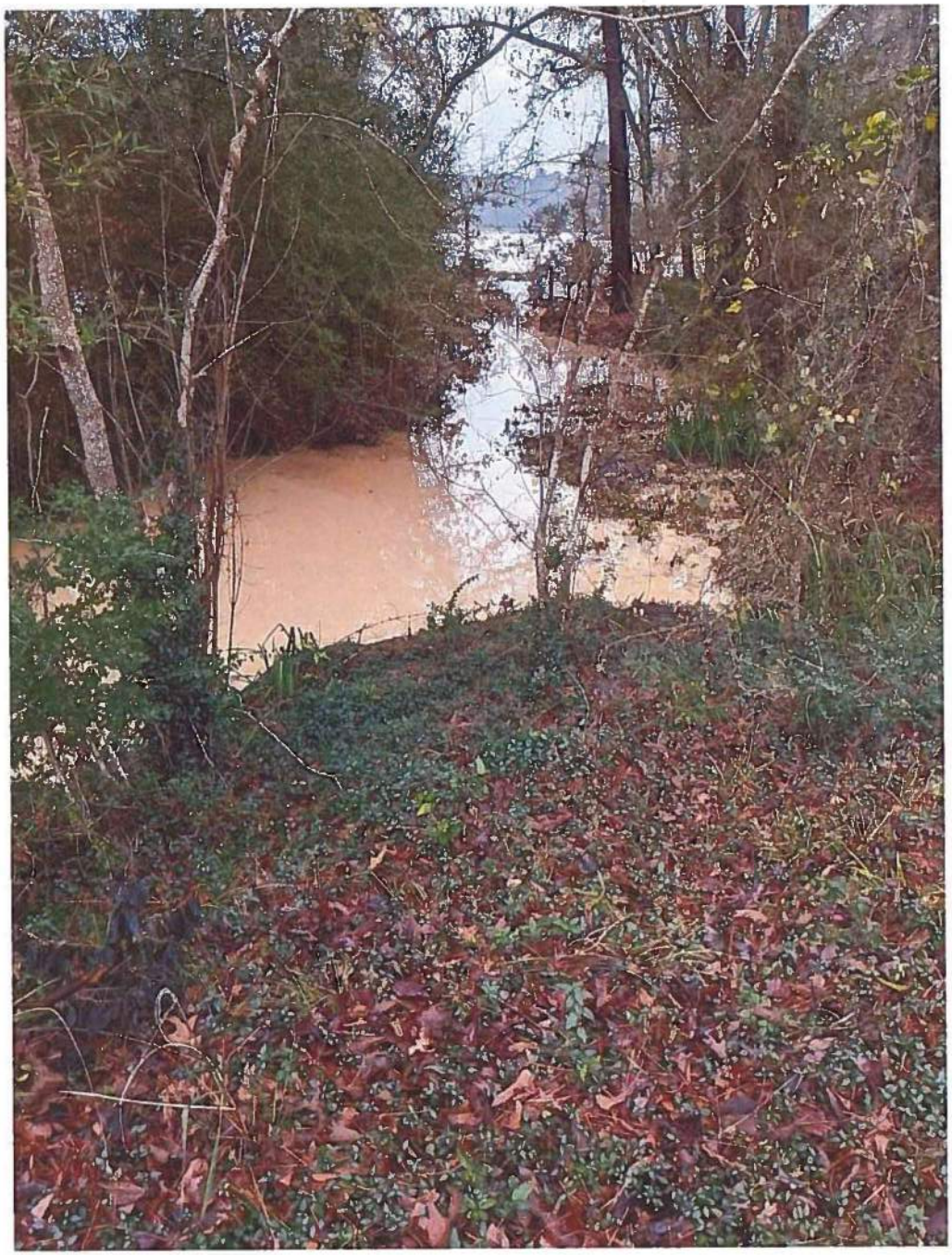


11/9/21

McDonald Creek at Winter Way - outflow into Spring Lake

Culverts will OFTEN be completely blocked 11/9/2021

McDonald Creek at Winter Way - outflow into Spring Lake



1/8/22 Inlet across from StyleCraft Reservoir

Often Debris on the roadways 1/9/22

Spring Lake Subdivision

1/9/22

Spring Lake Subdivision

First inlet on Winter Way 1/9/22

1/9/22 McDonald Creek at Winter Way - outflow into Spring Lake

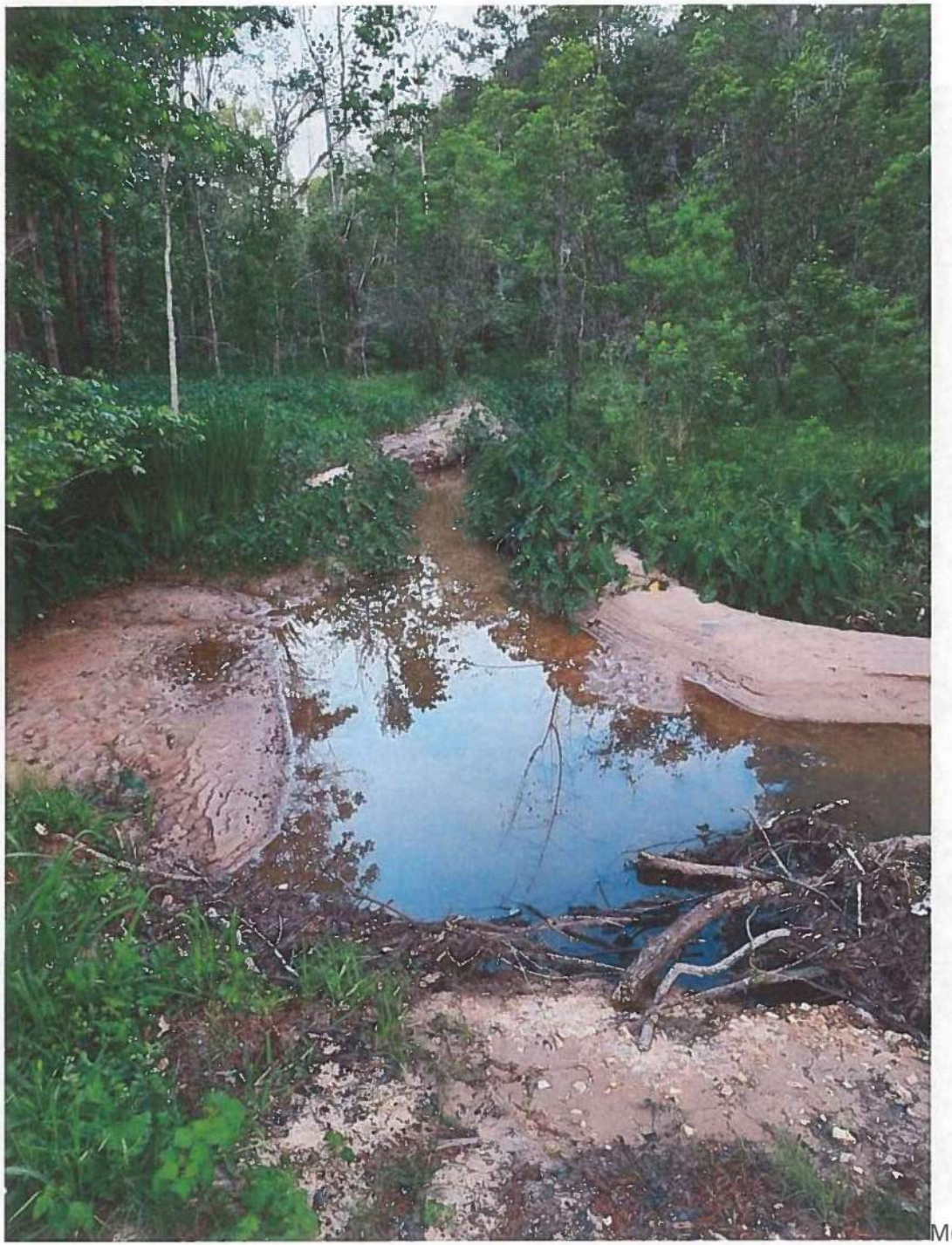
Retention pond outflow is MURKY 3/22/22

Spring Lake Subdivision

McDonald Creek at Autumn Ln

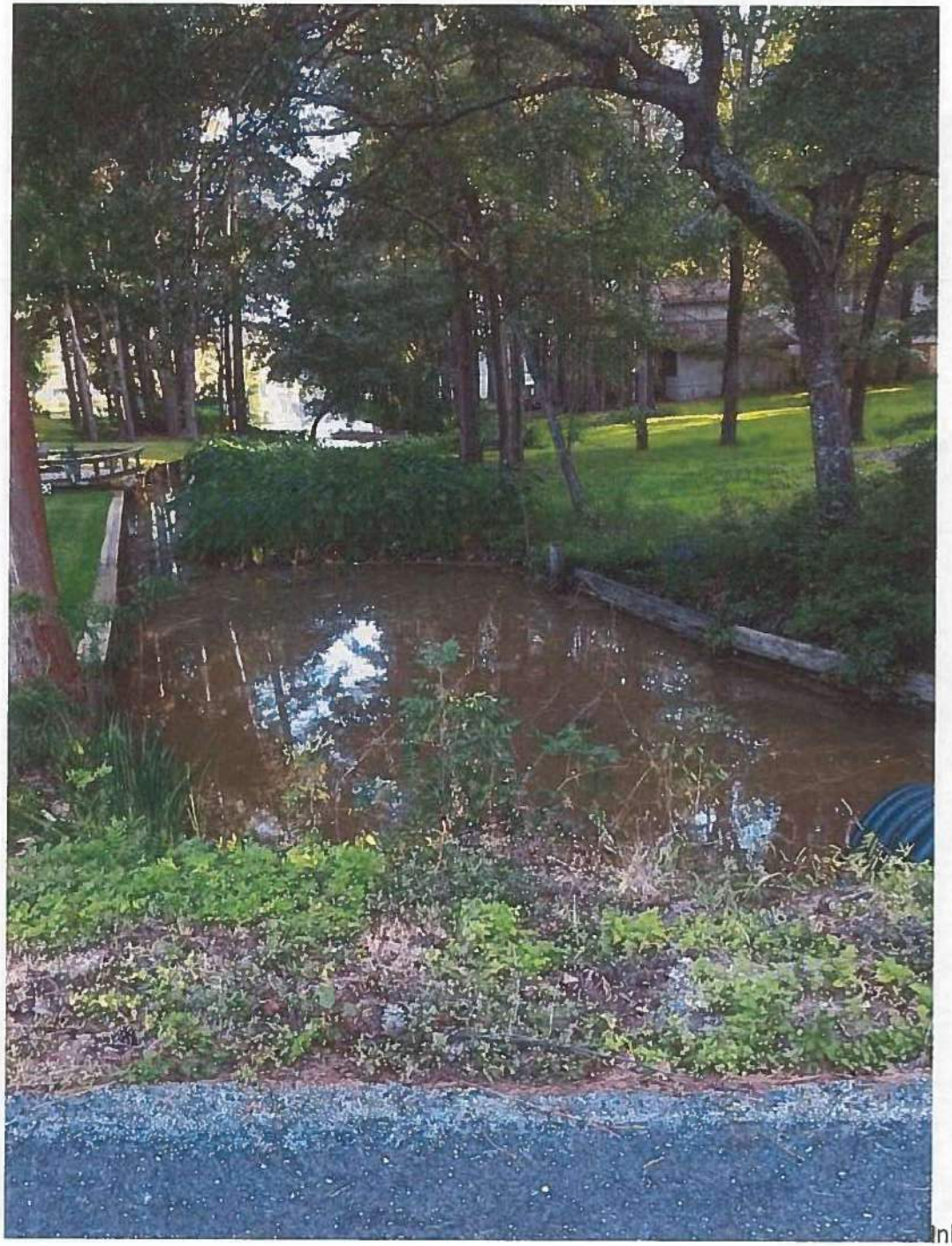
Spring Lake Subdivision

4/2022



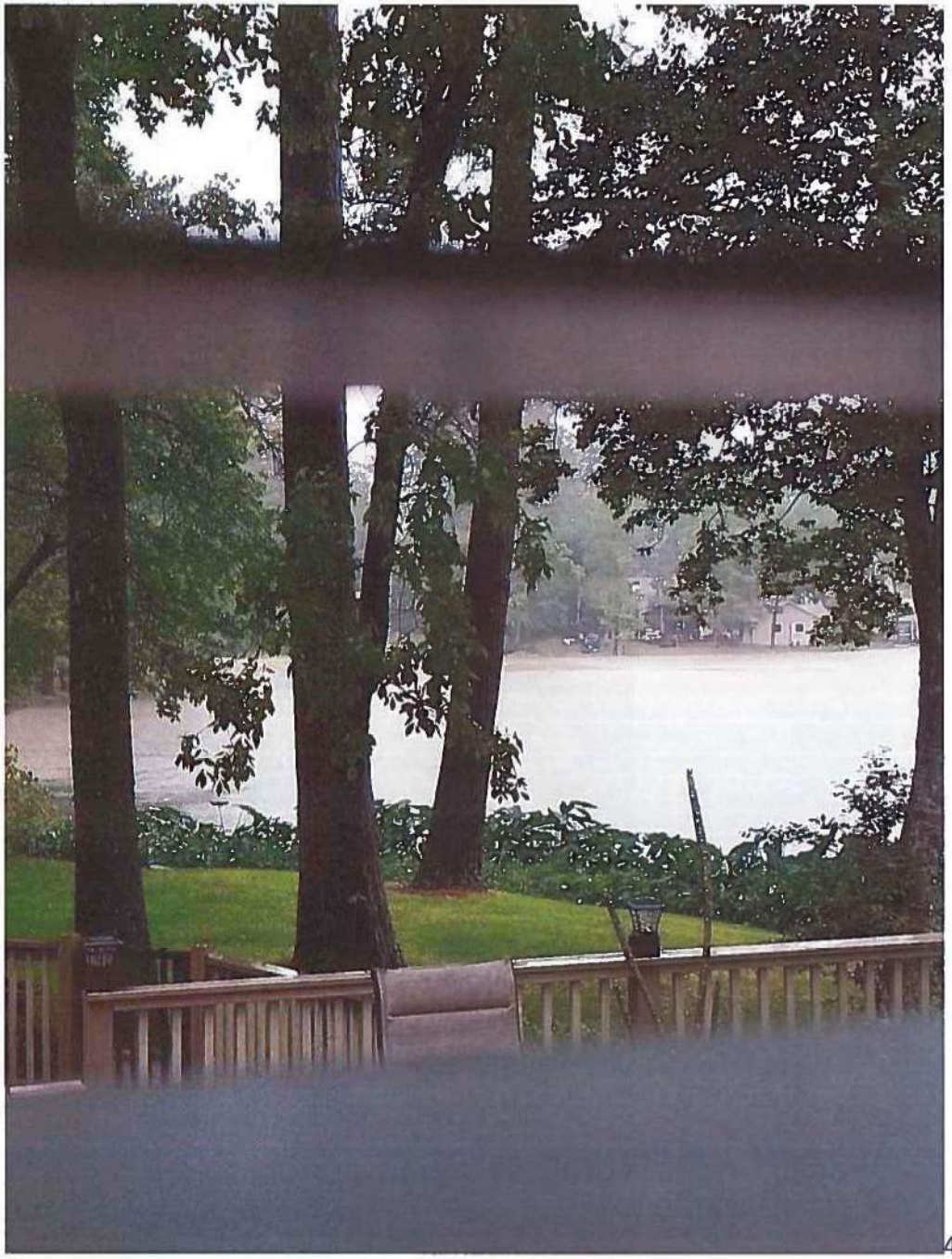
McDonald "Creek" 4/27/22

4/27/22 McDonald Creek at Winter Way - inlet



Dawson Creek at Winter Way - facing south

nlet off Winter Way blocked

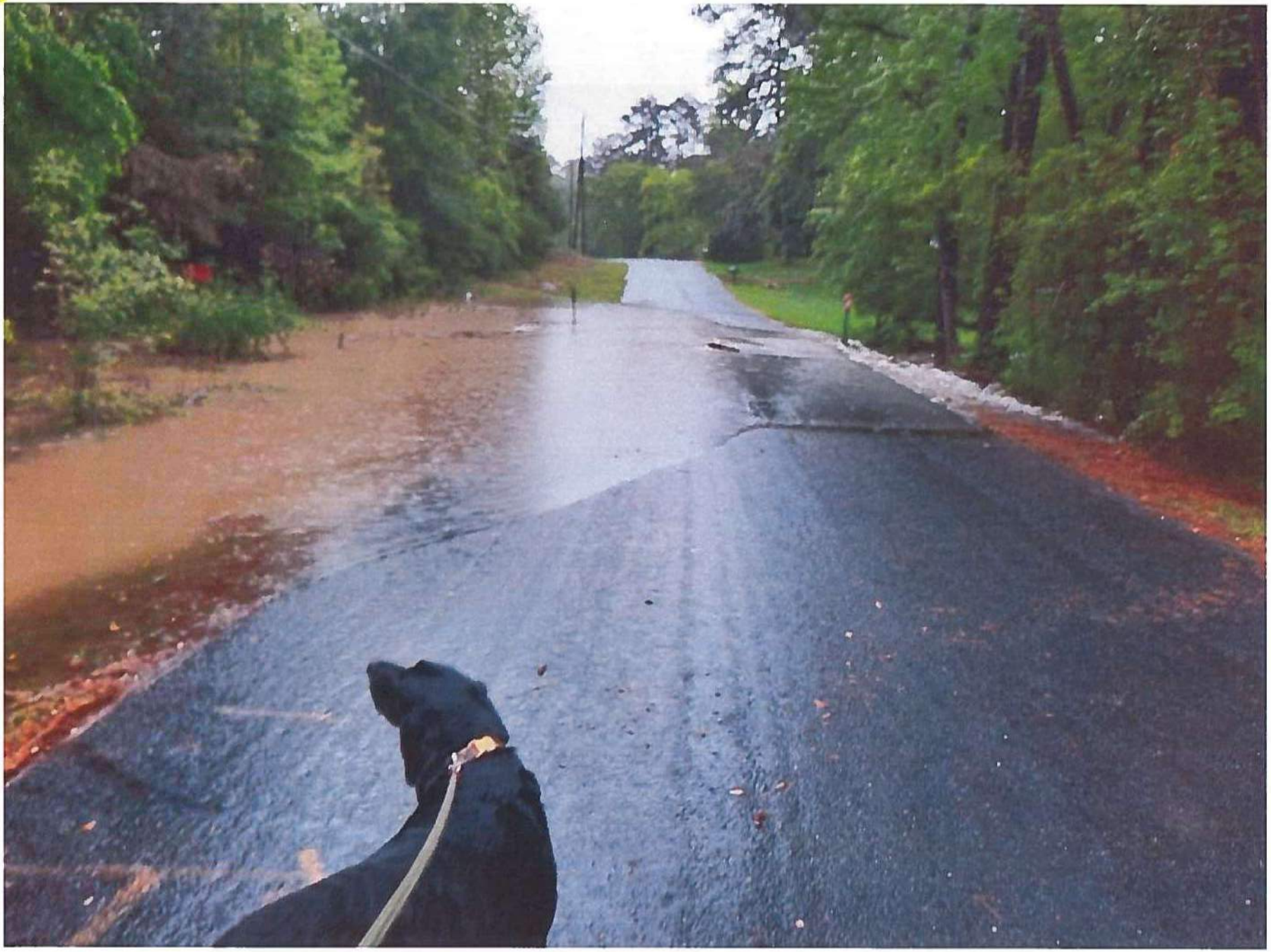


4/22 sand silt spreading through lake

Spring Lake

silt/sand spreading through lake 4/22

Spring Lake



Inlet #1 on winter way 4/22

Dawson Creek

McDonald Creek at Winter Way

4/2022

Inlet across from StyleCraft Reservoir into lake - Near 3348 Winter Way

3721 Golden Rod May 2022

4/2022

McDonald Creek at Winter Way

McDonald Creek at Winter Way

McDonald Creek by water plant (Autumn Ln)

Drain near Golden Rod May 2022

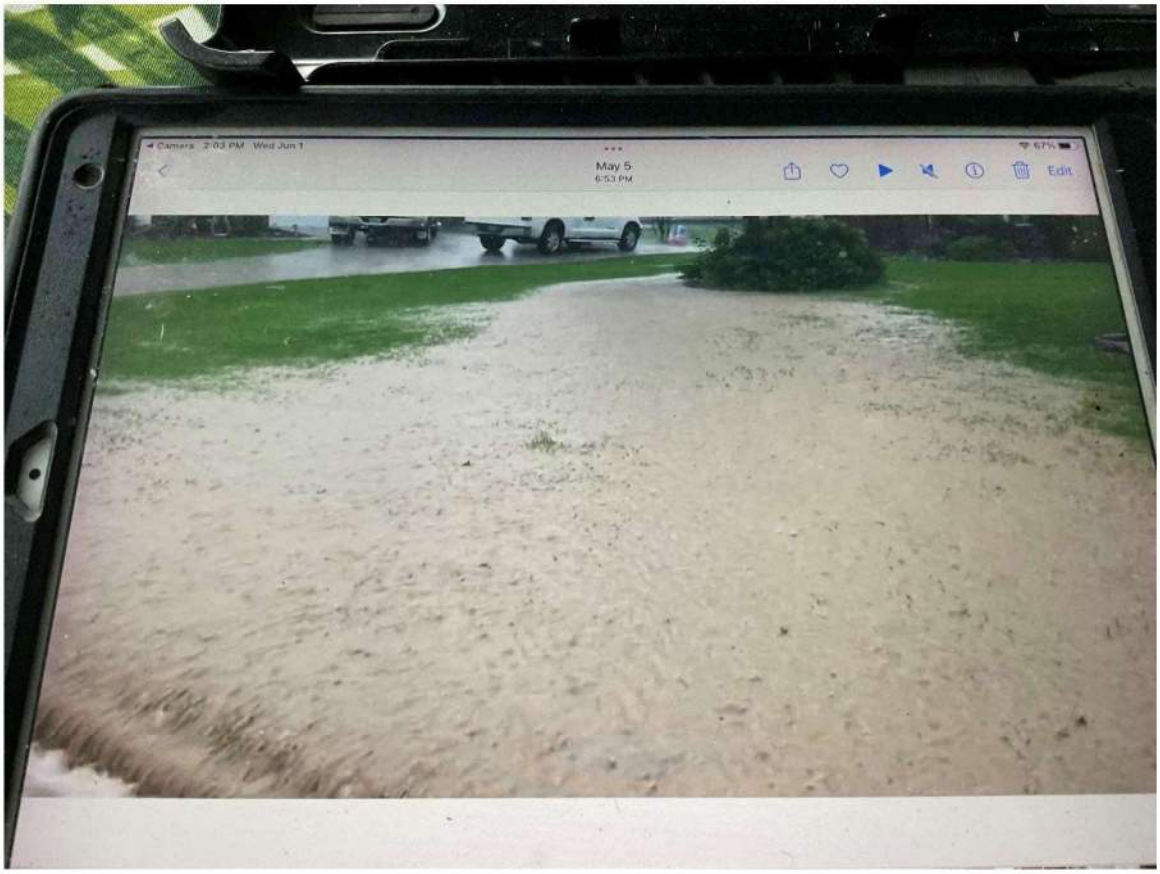
May 5, 2022

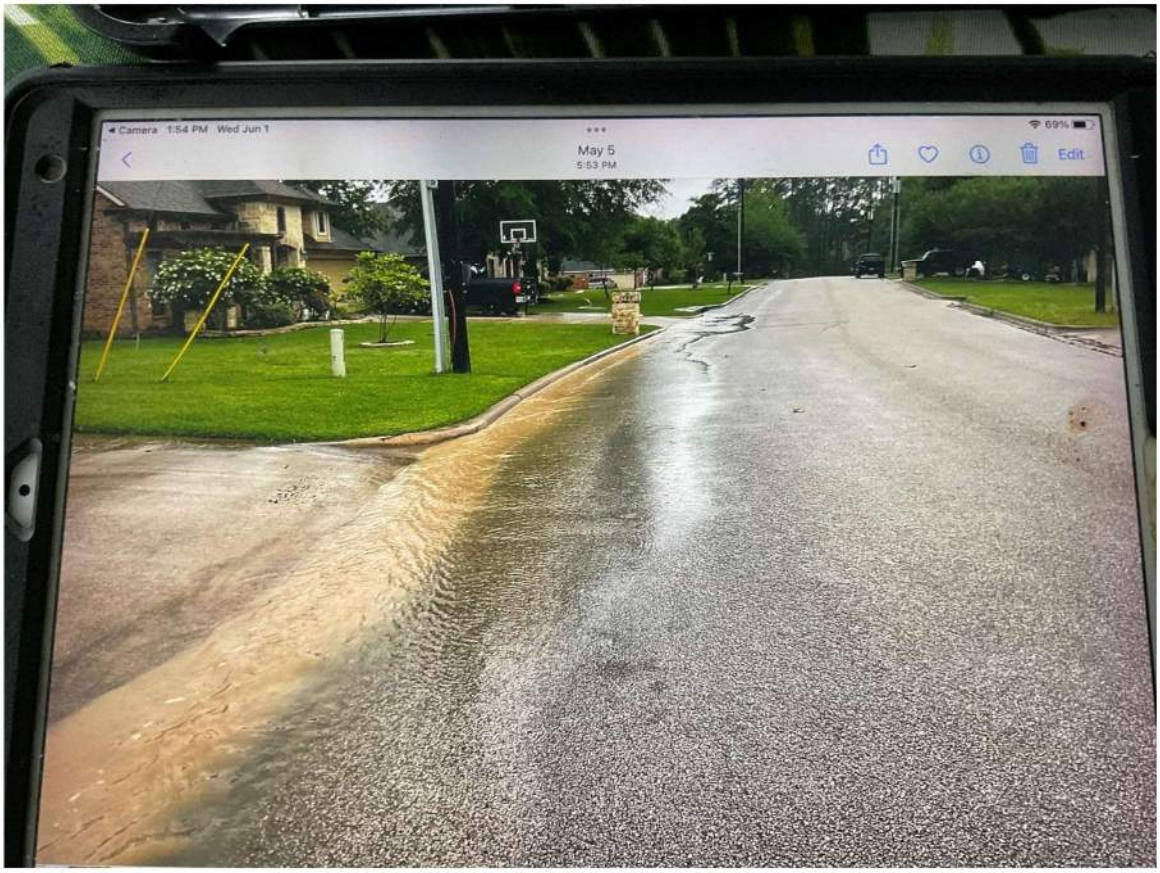
Our home 3344 Winter Way. This "retention" pond just floods our yard with silt and the lake as well. Since the Stylecraft company has started new builds it has gotten EXTREMELY bad. This will cause our house to be flooded if they do not stop stopping up this waterway.

Futher down Winter Way near Autumn Road: the McDonald Creek has already completely clogged the culverts from the silt, and it runs over the road now. This is out of control clearly

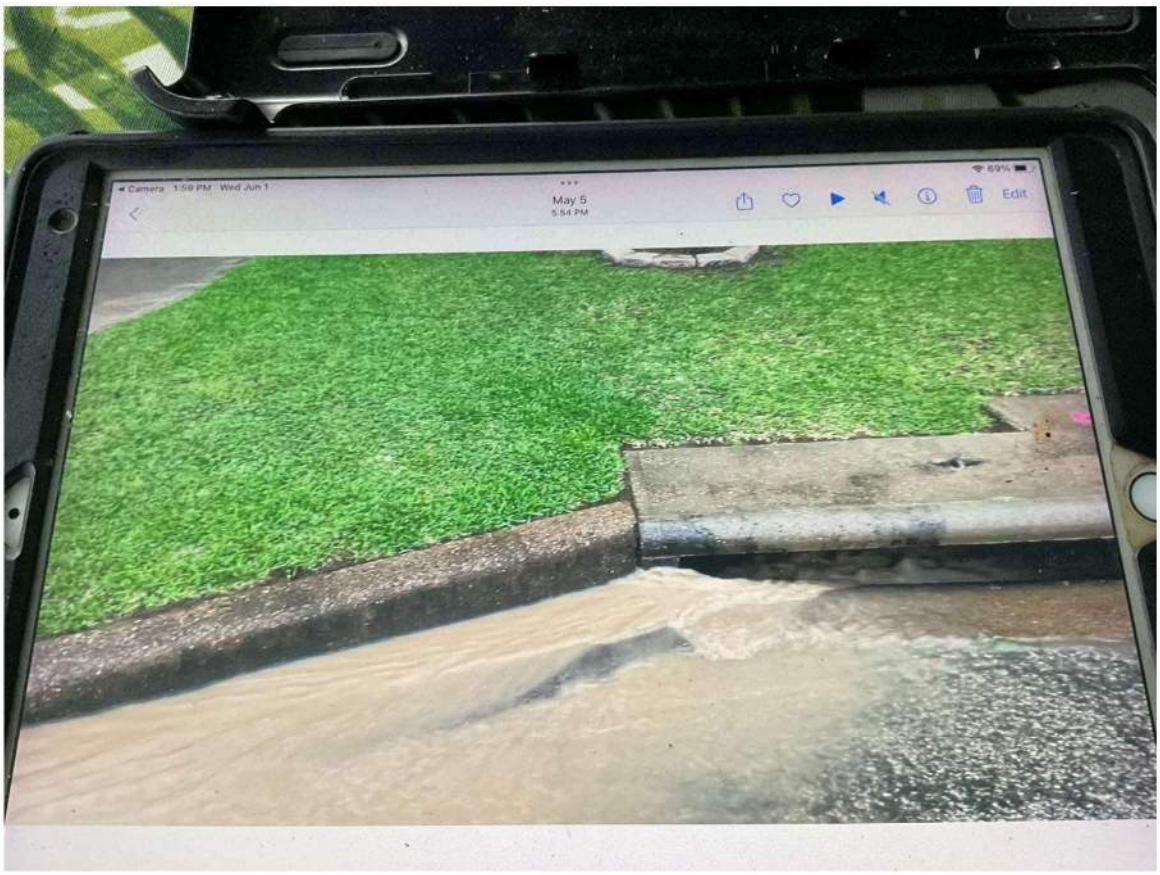
May 5, 2022 – The “retention” pond does not allow the silt to settle – just comes straight to the Spring Lake

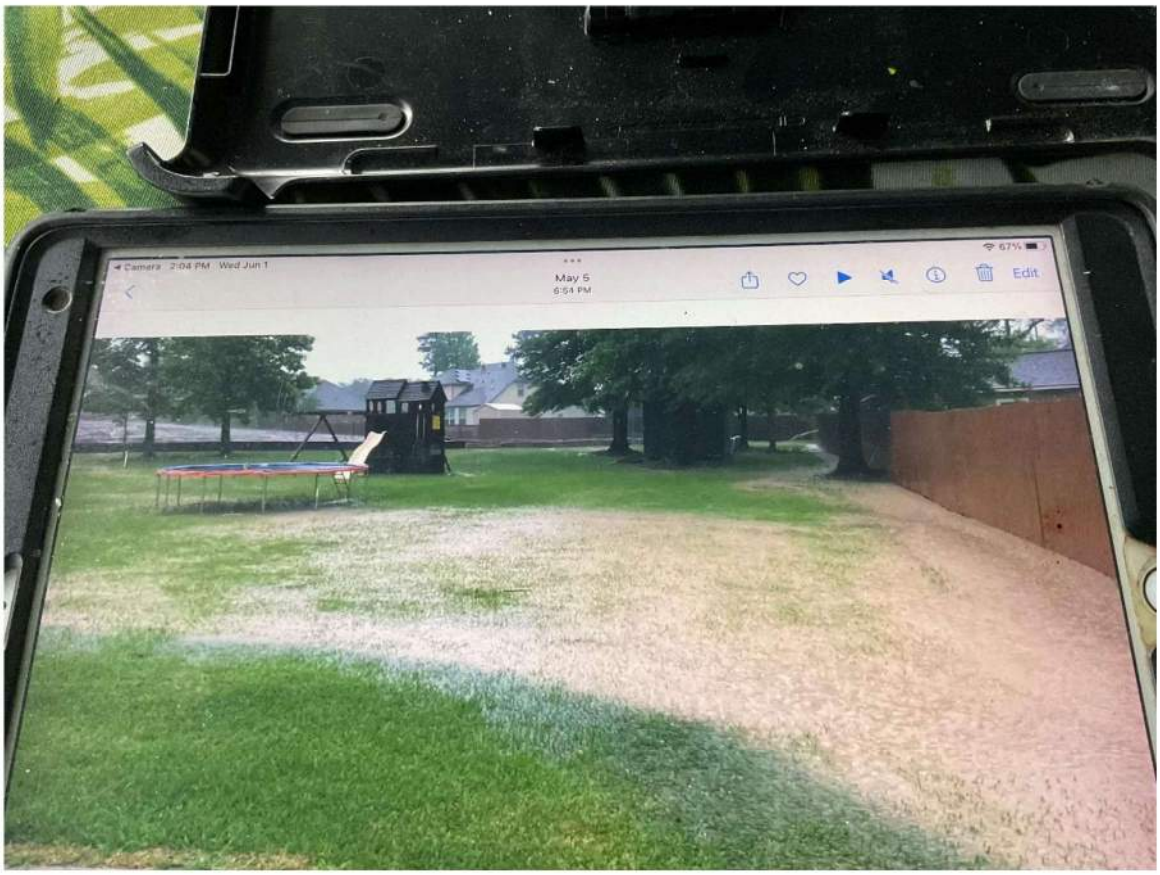
Spring Lake Subdivision - May 5, 2022



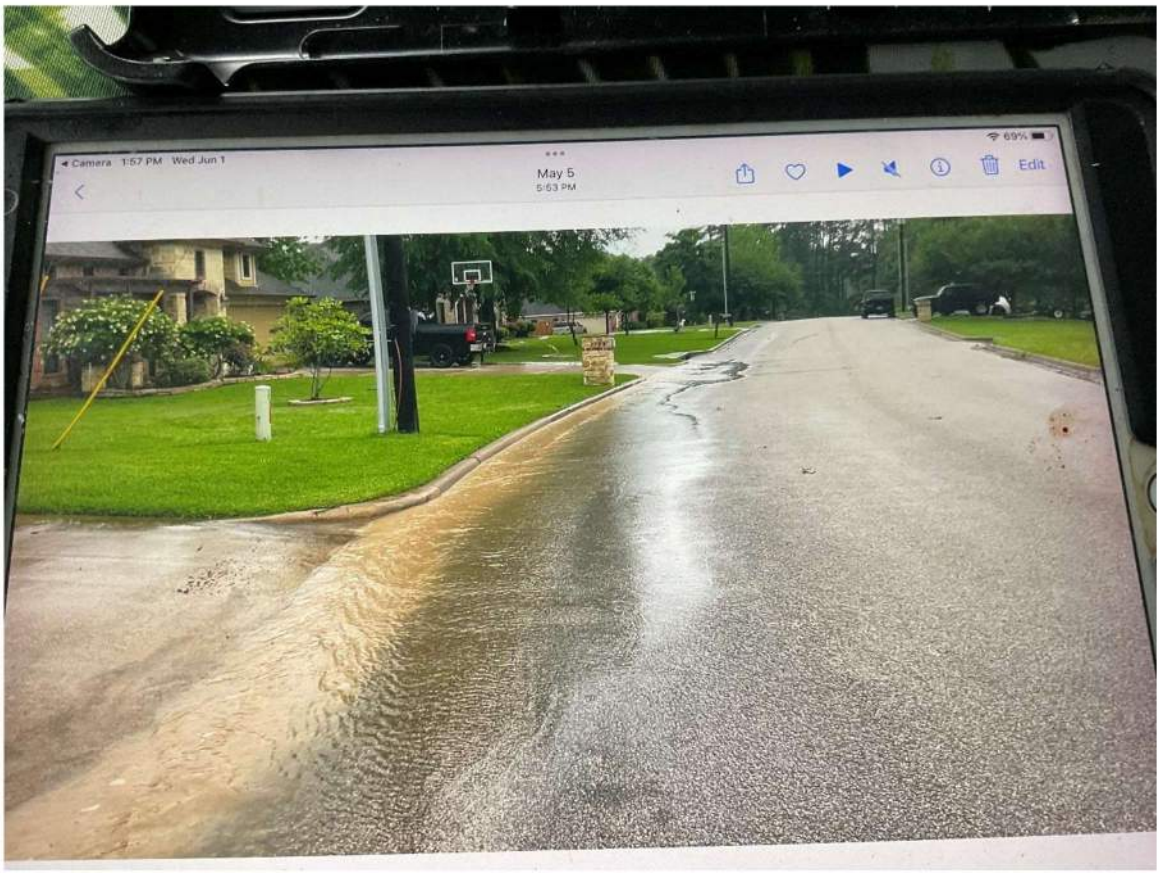


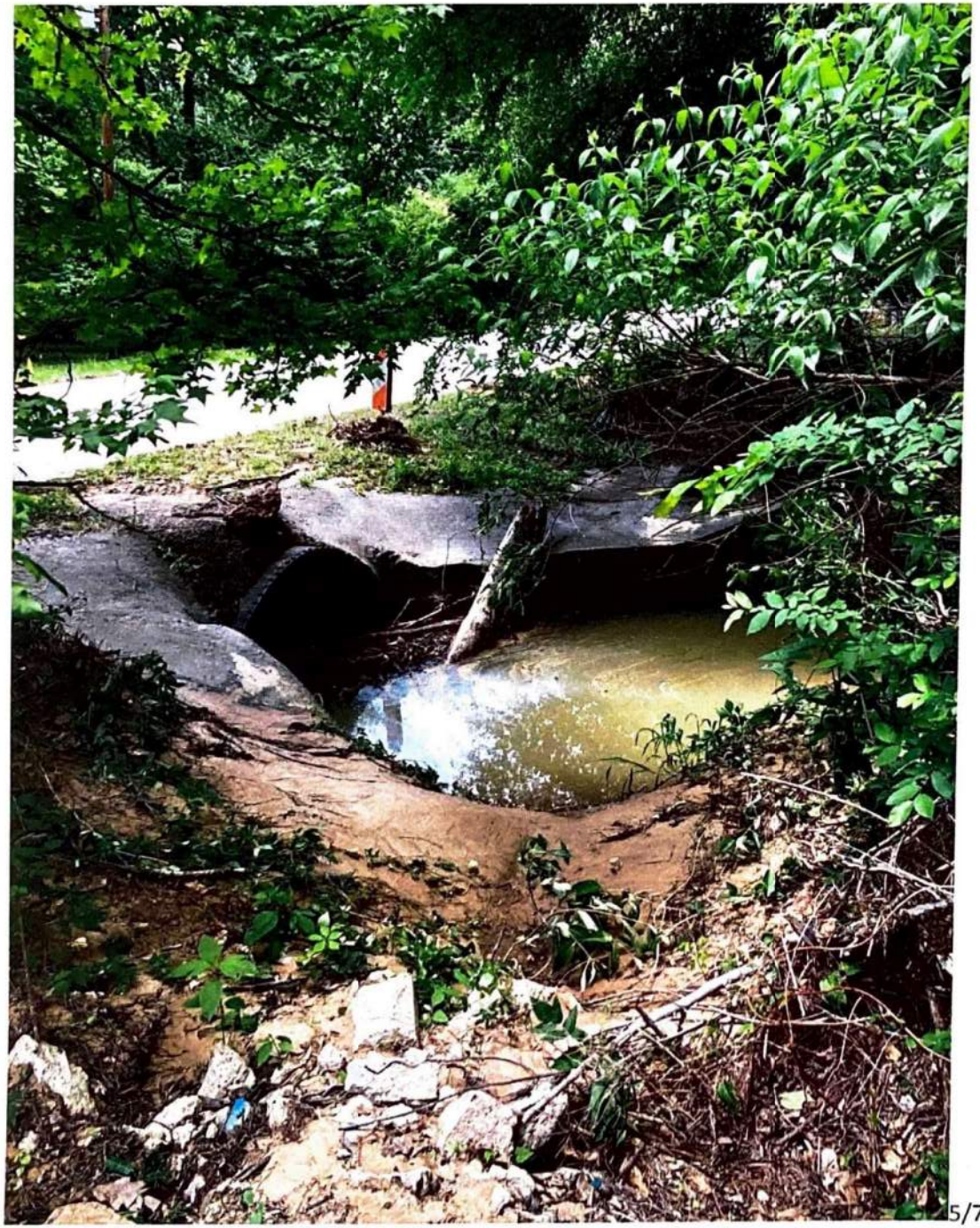
Spring Lake Subdivision - May 5, 2022





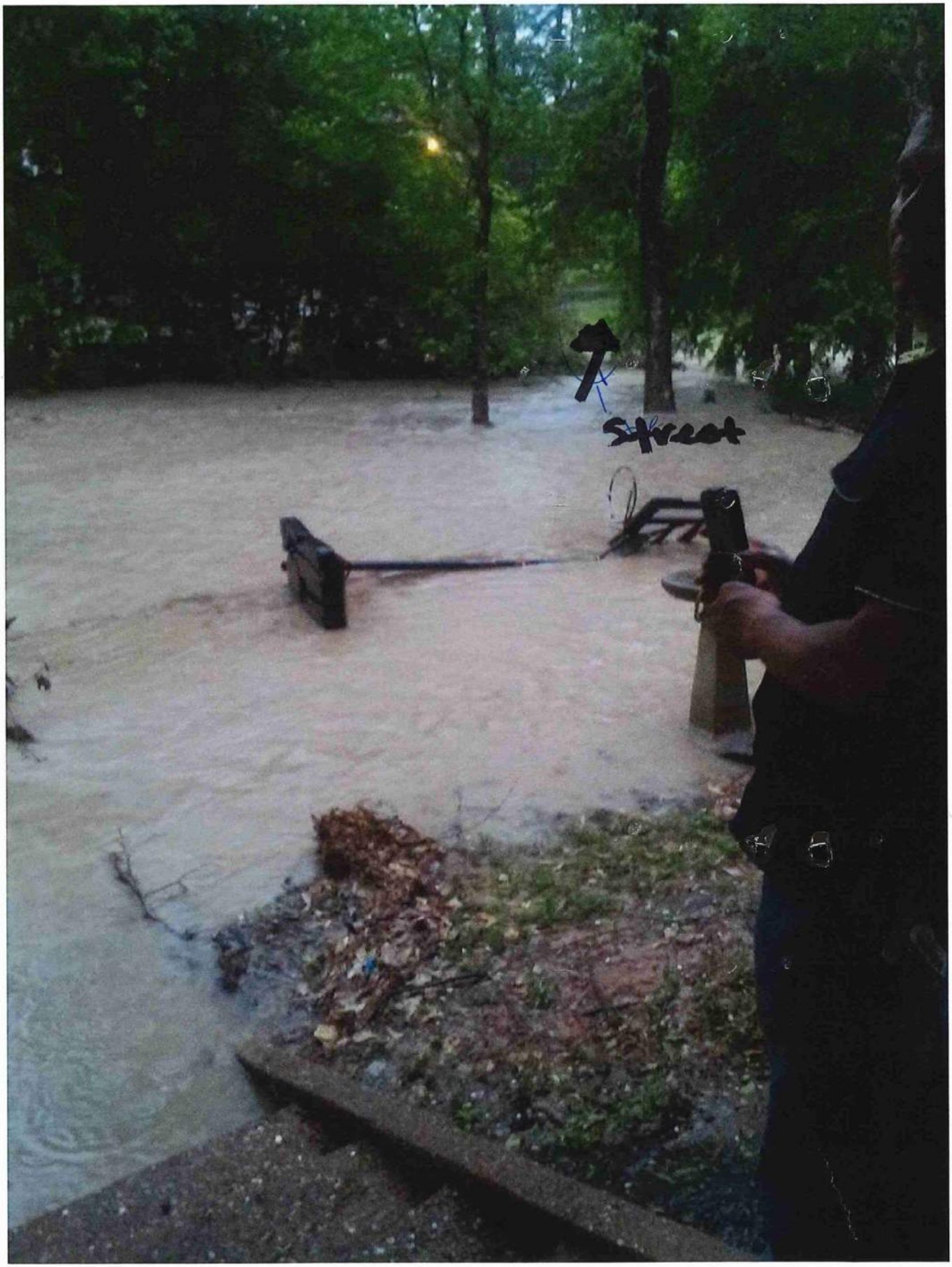
Spring Lake Subdivision - May 5, 2022



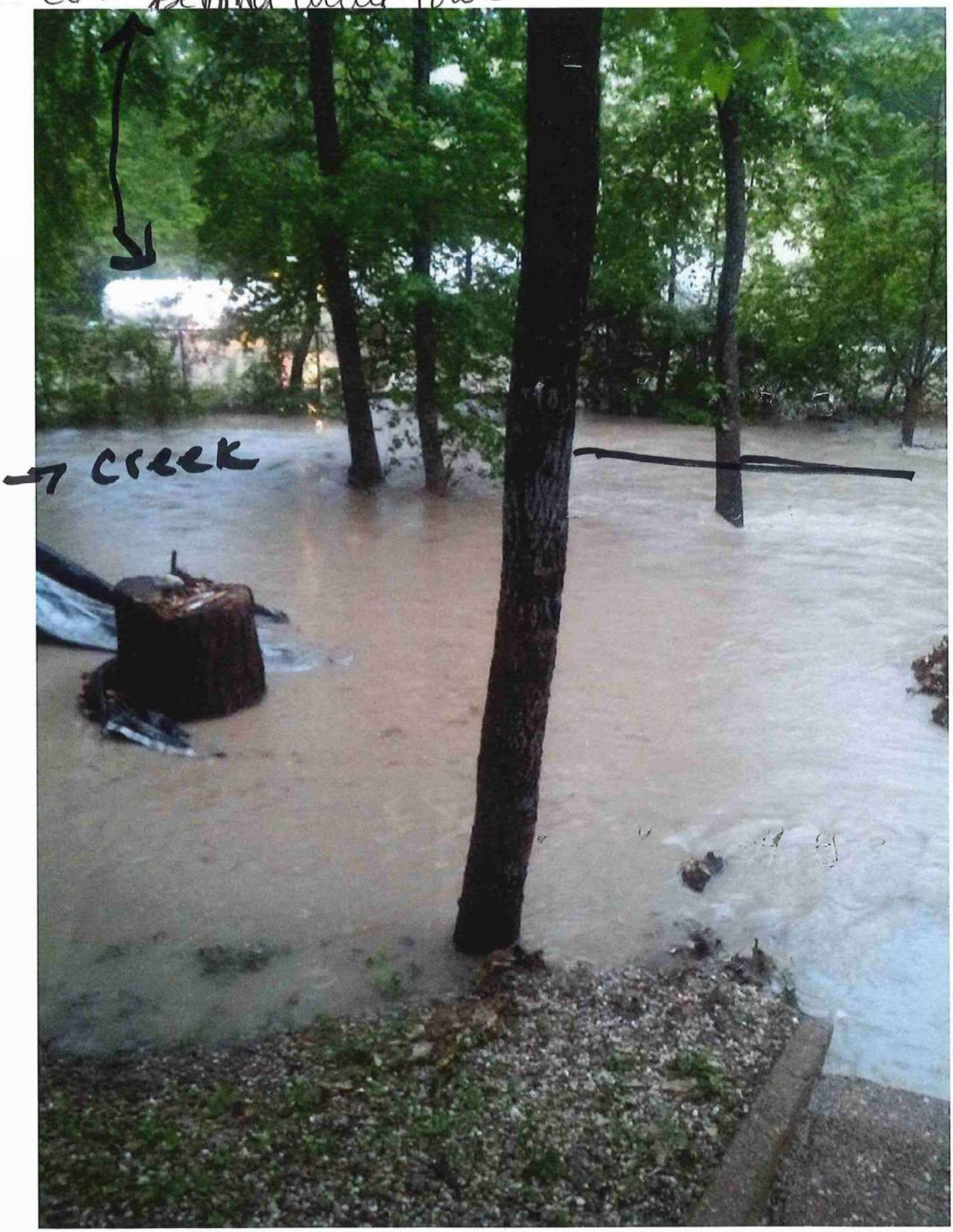


Autumn Rd

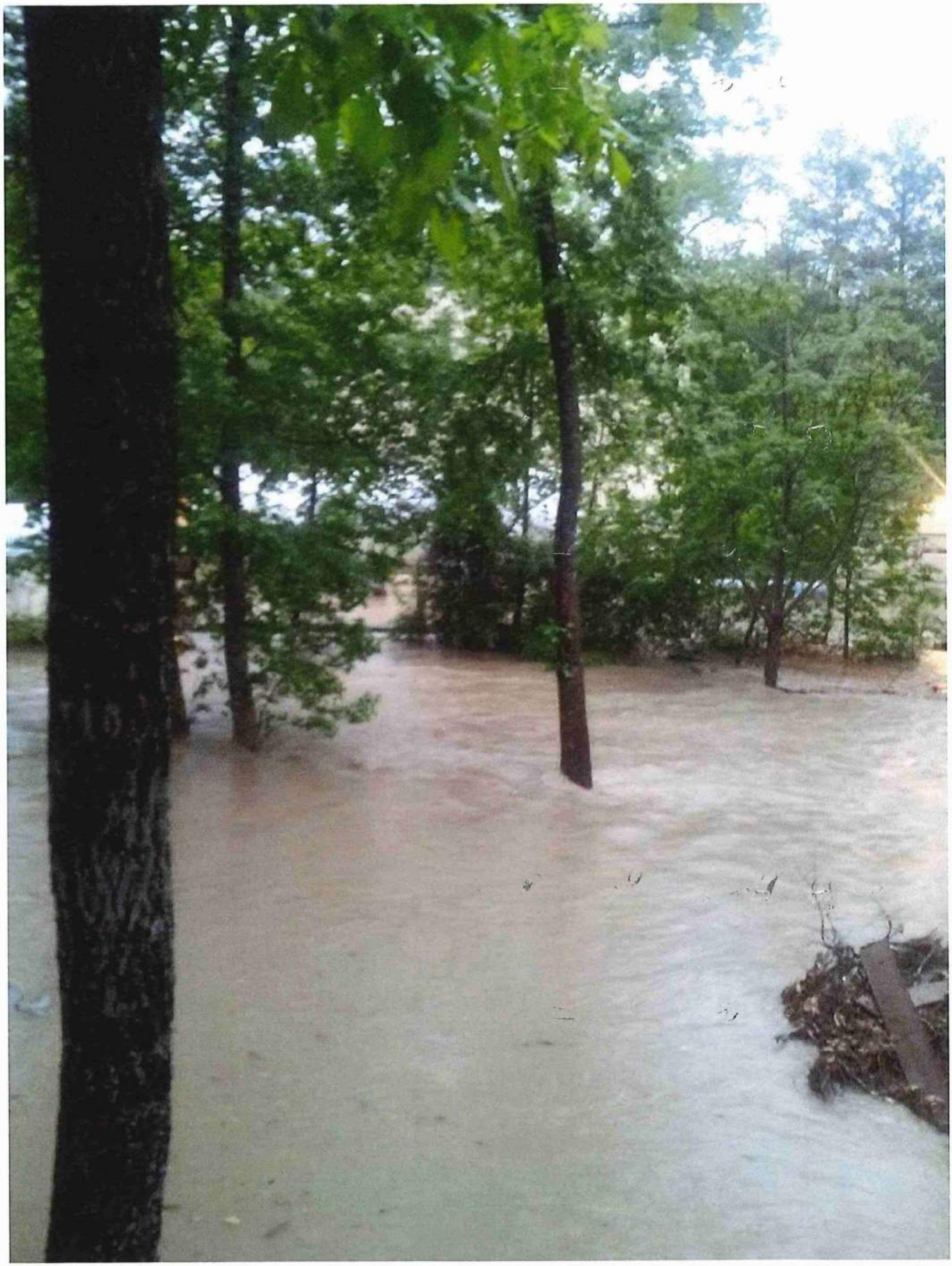
5/7/22 McDonald Creek by water plant



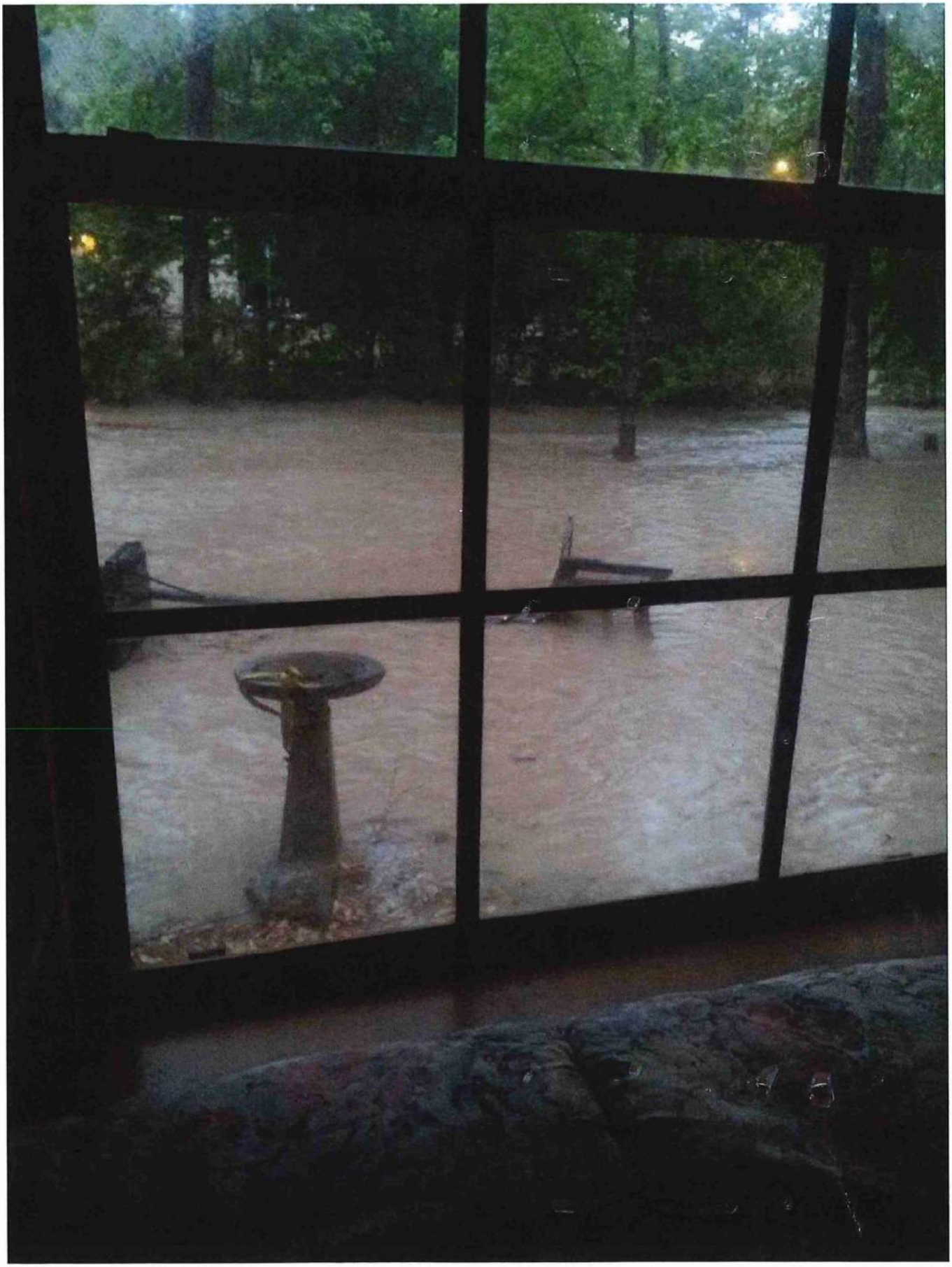
3661 Marigold Ln



3661 Marigold Ln



3661 Marigold Ln



3661 Marigold Ln

Backyard of 3832 Summer Ln

Tree to the right is about 20' from shoreline.

This house is next to 3832 Summer Lane. Adirondack chairs floated away and are in middle of lake.

Spring Lake Subdivision - Autumn Rd

Spring Lake Subdivision - Autumn Rd

Spring Lake Subdivision - Autumn Rd

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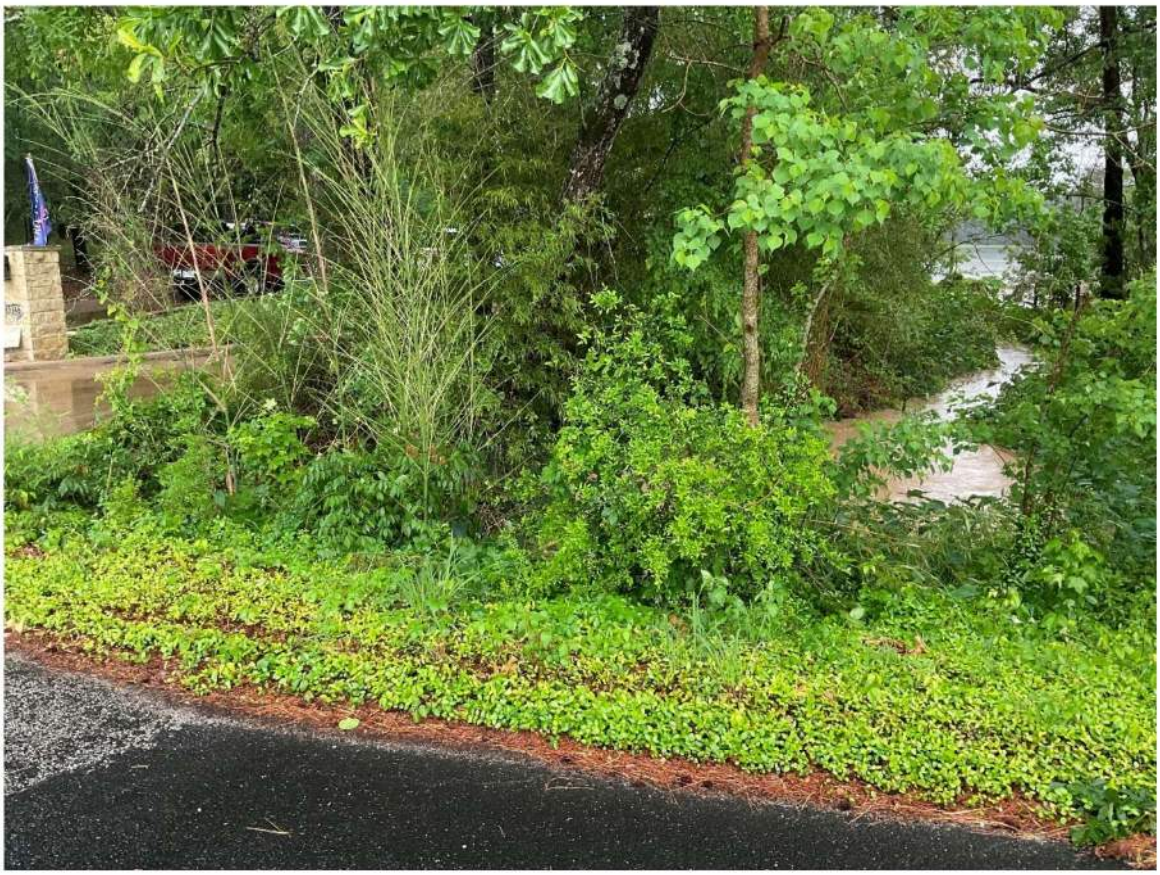
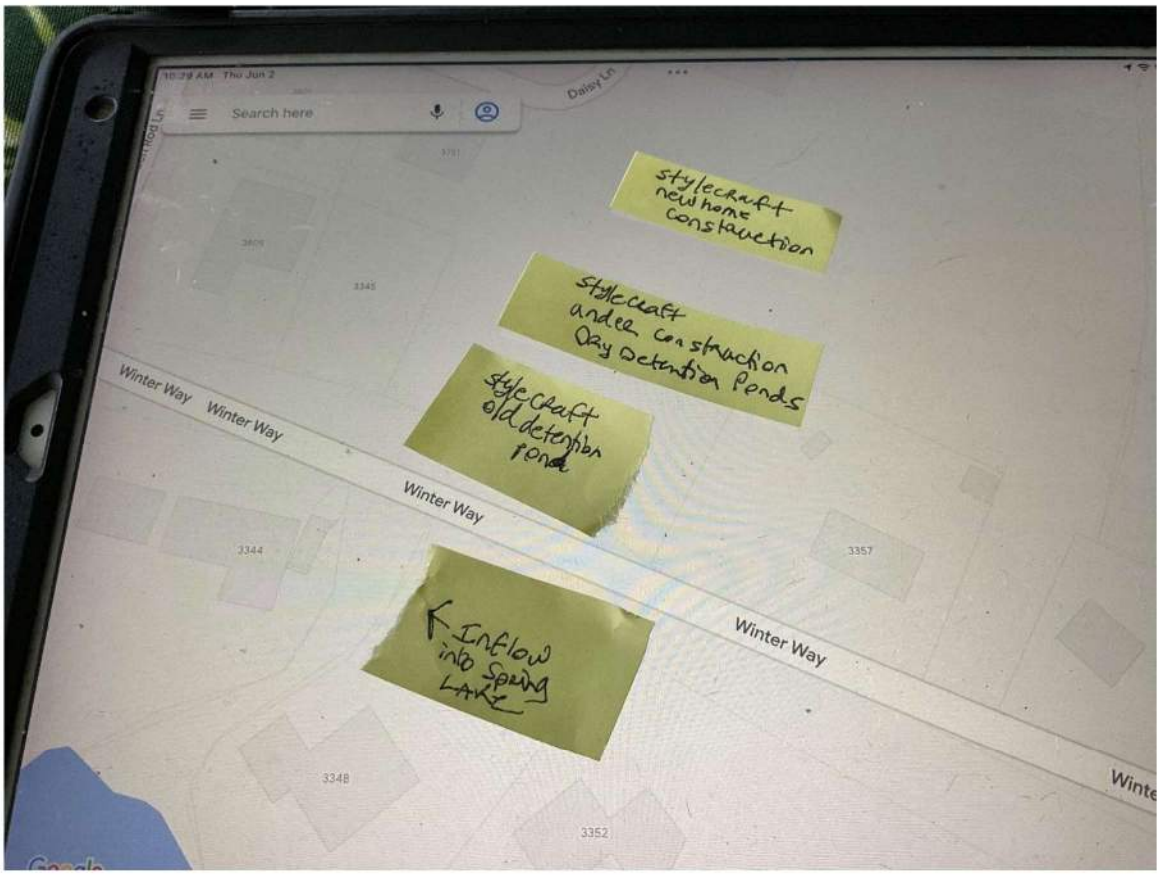
Spring Lake Subdivision - Autumn Rd

Spring Lake Subdivision - Autumn Rd

Spring Lake Subdivision - Stylecraft Construction Site



Spring Lake Subdivision - Stylecraft Construction Site



Spring Lake Subdivision - Stylecraft Construction Site

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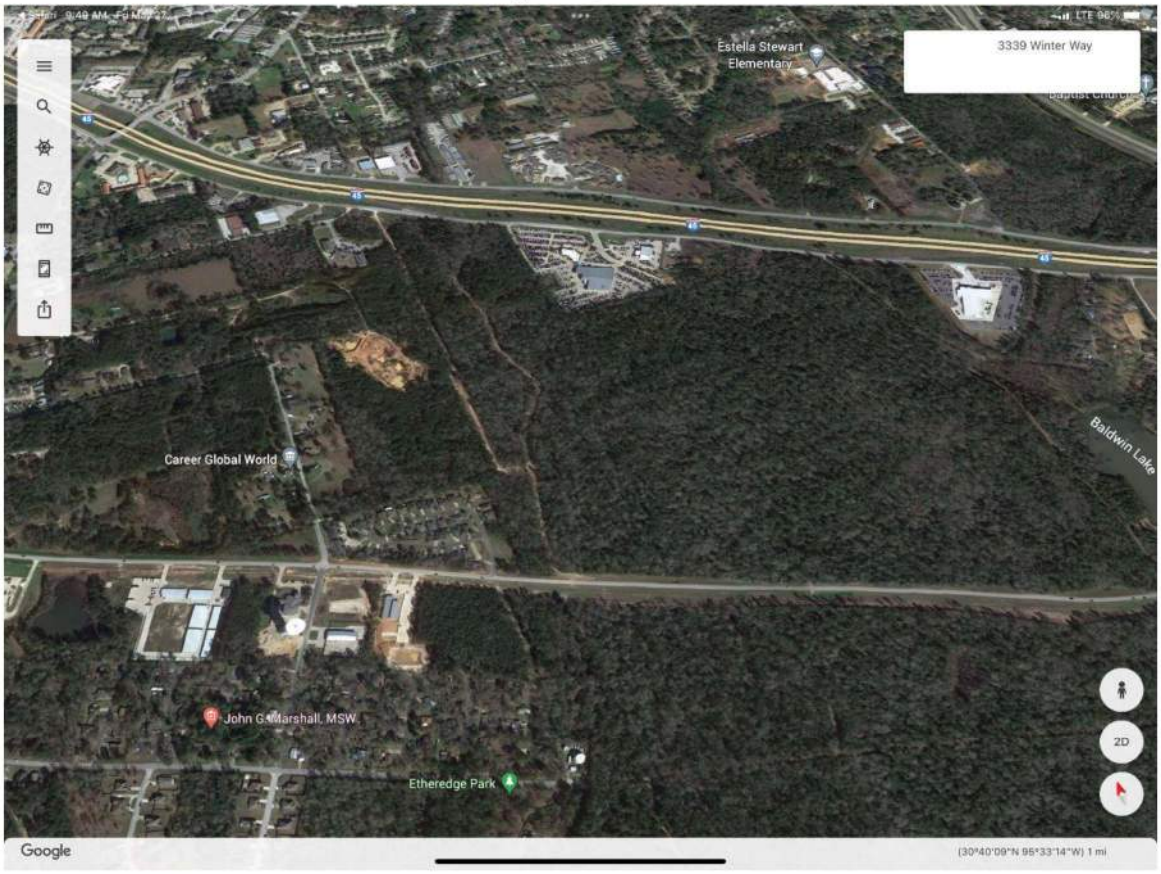
Spring Lake Subdivision - Stylecraft Construction Site

Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022



Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022

Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022

Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2016

Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022

Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022

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Silt from Construction Site at upstream McDonald Creek near I-45 S
May 27, 2022

2157 Greentree Dr

Front yard flooding

Front yard flooding

Debris

2157 Greentree Dr

Old Faithful storm drain

Surging storm drain

2157 Greentree Dr