

**Drainage Planning,  
Design, Operation  
and Maintenance  
in Fairview**

# Outline for Meeting

- Drainage Regulation in Fairview
- Drainage Infrastructure in Fairview
- Drainage Planning in Fairview
- Drainage System Operation
- Development Engineering Process
- Development in Fairview
- Regional Issues



# Drainage Regulation in Fairview

- Town incorporated in 1958
- First FEMA flood study and flood hazard ordinance - 1979 (First flood management ordinance – 1991 (updated in 2009))
- Town creates drainage utility – 2003
- Town hires first in-house civil engineer - 2004
- Town adopts first drainage ordinance – 2004
- FEMA approves updated flood hazard mapping - 2019

# 1979 FEMA FLOOD STUDY

## 2.0 AREA STUDIED

### 2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Town of Fairview. The area of study is shown on the Vicinity Map (Figure 1).

The stream studied in detail is Sloan Creek, which flows in a southeasterly direction and drains an area of 9.1 square miles, an unnamed tributary of Sloan Creek, and Wilson Creek. The detailed studies were terminated where the 100-year flood plain width is equal to or less than: (1) 200 feet in urban and developing areas; (2) 400 feet in areas with a low development potential; or (3) where the drainage area of the water course is less than one square mile. The areas studied by approximate methods were the segments of water course with less than one square mile of drainage area.

### 2.2 Community Description

The Town of Fairview is located in south central Collin County, Texas. Fairview is located 30 miles northeast of Dallas. The community is composed primarily of residential housing. Most of the residents commute to work each day in Dallas and Richardson. The town has no businesses except a mobile home park in the westernmost part of the town.

The central to western parts of the town are sparsely populated and are still rural in nature. The central to eastern parts of the town are experiencing the most significant residential growth. The upper end of Sloan Creek is characterized by a very deep and wide channel of Chiliche rock. In the lower end of the watershed the deep channel disappears to the point that Sloan and Wilson Creek share a common flood plain.

The climate of the study area is warm and temperate. Summers are hot, winters are short and mild. Extremes of temperature and rainfall are of relatively short duration. The annual mean rainfall is about 38 inches.

### 2.3 Principal Flood Problems

At present there is no stream gaging station in the Sloan Creek Watershed. Therefore, historical flood information was obtained from information received from local residents. High velocities have been observed in Sloan Creek and residents report seeing water flow over the bridge at Highway 1378. Some residents in the eastern end of the watershed have had the water come into their homes. The areas of the town above station section H should not have any problems with flooding from Sloan Creek. It should be noted that in some cases the relative magnitudes of the experienced floods may vary from one reach of the stream to the other, due primarily to differences in rainfall intensity and volume at different points in the watershed.

## CHAPTER 54: STORMWATER ORDINANCE

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# Drainage Infrastructure in Fairview

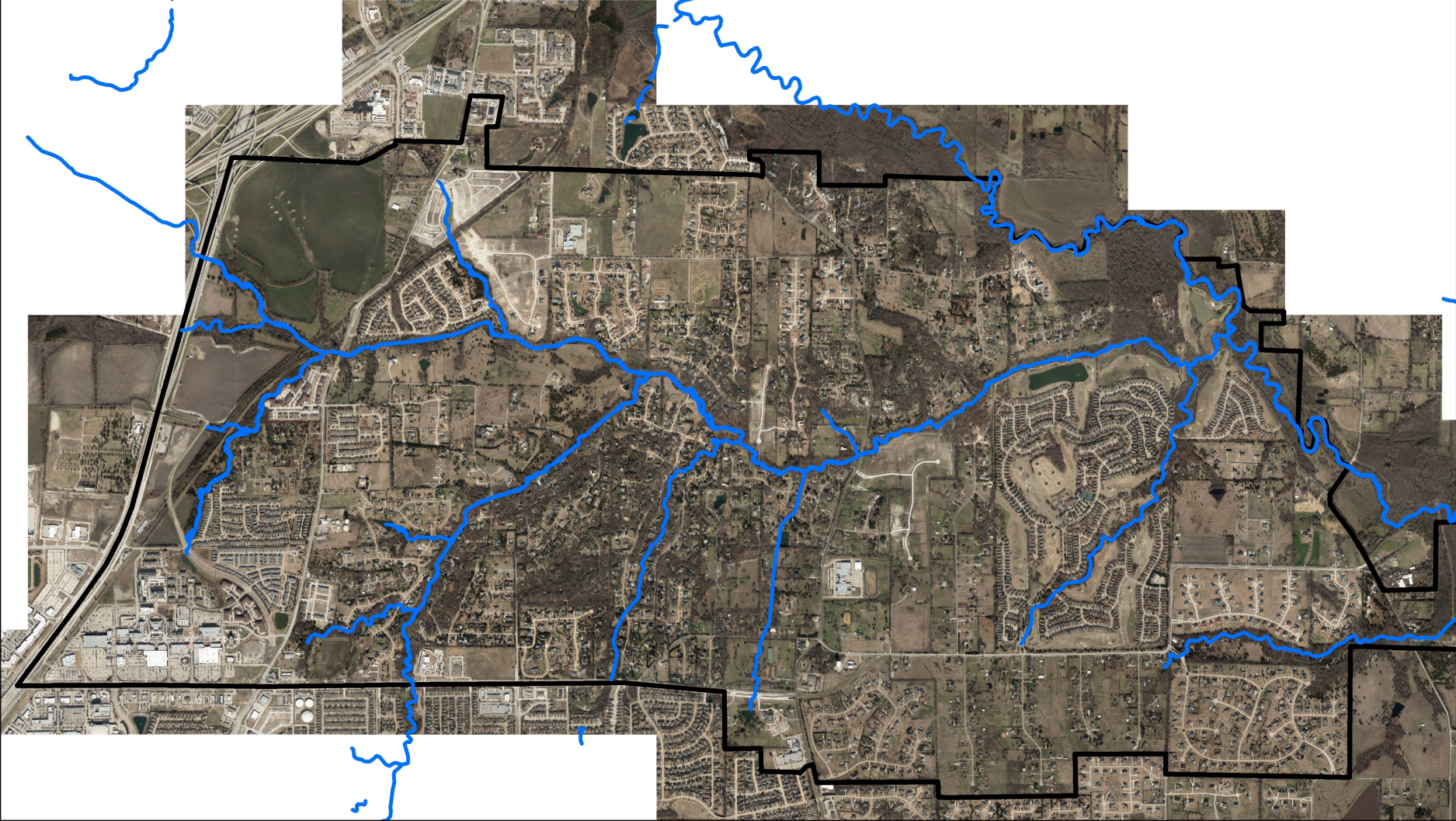
- Drainage methods in Fairview – low density areas of town are primarily open drainage design
  - Established by Town policy with initial development
  - Creeks and streams
  - Natural channels
  - Designed open channels



# Fairview Drainage




— Creeks Streams and Tributaries

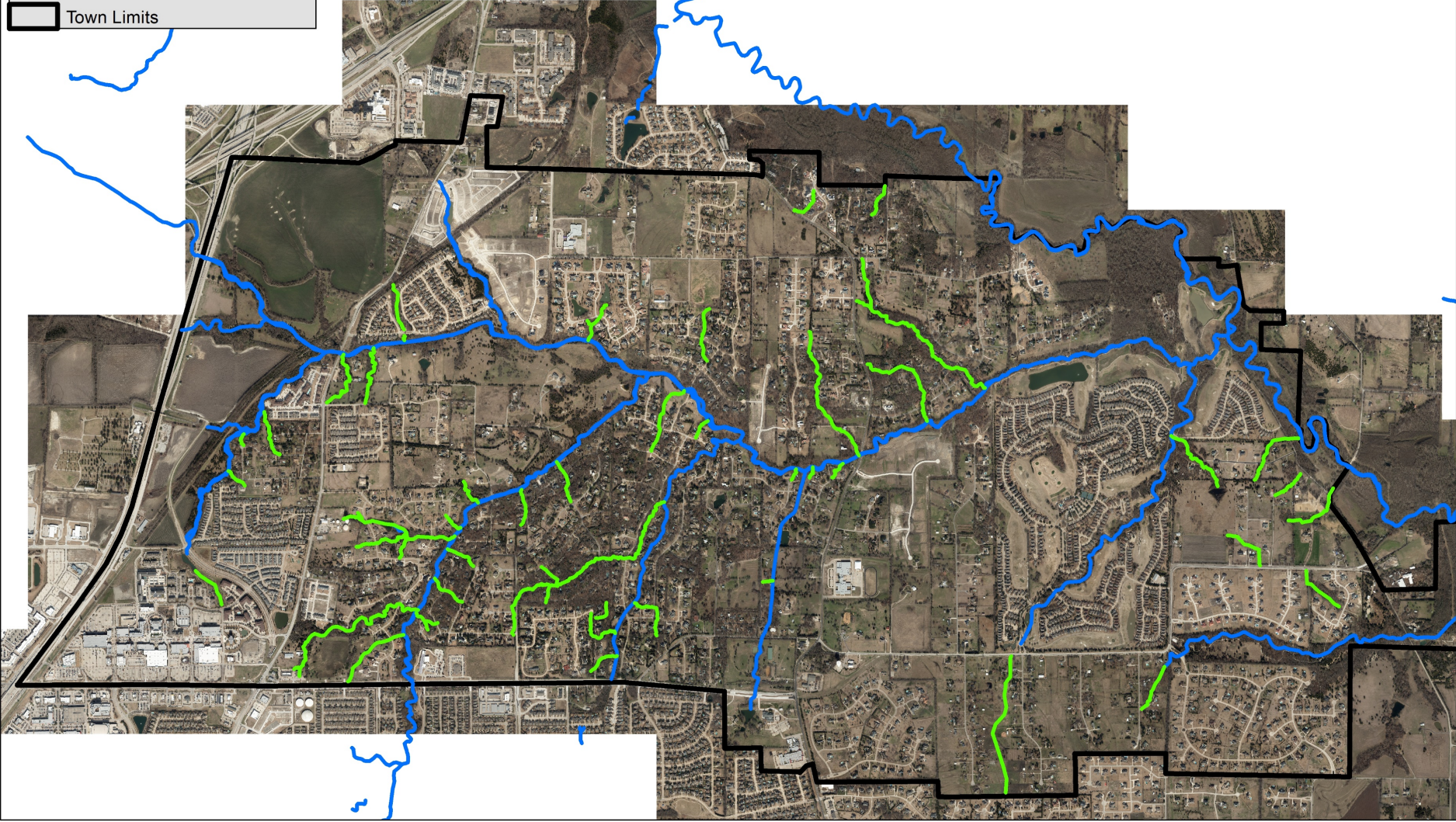
▭ Town Limits





# Fairview Drainage

-  Natural Drainage
-  Creeks Streams and Tributaries
-  Town Limits





Natural Channel





Natural Channel





Natural Channel





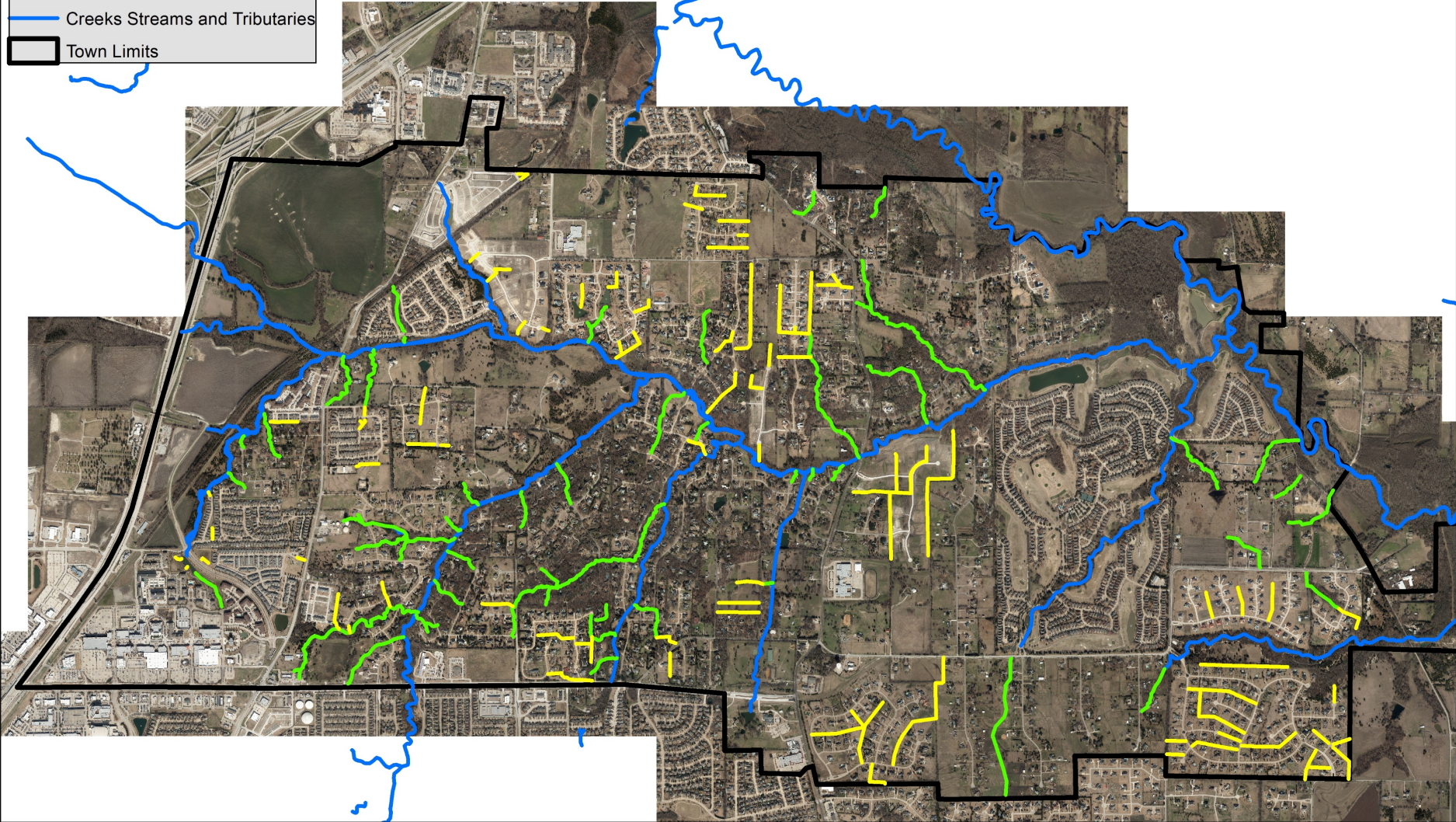
# Natural Channel





# Fairview Drainage

- Open Channel Flow
- Natural Drainage
- Creeks Streams and Tributaries
- Town Limits





Designed Channel





Designed Channel





# Designed Channel





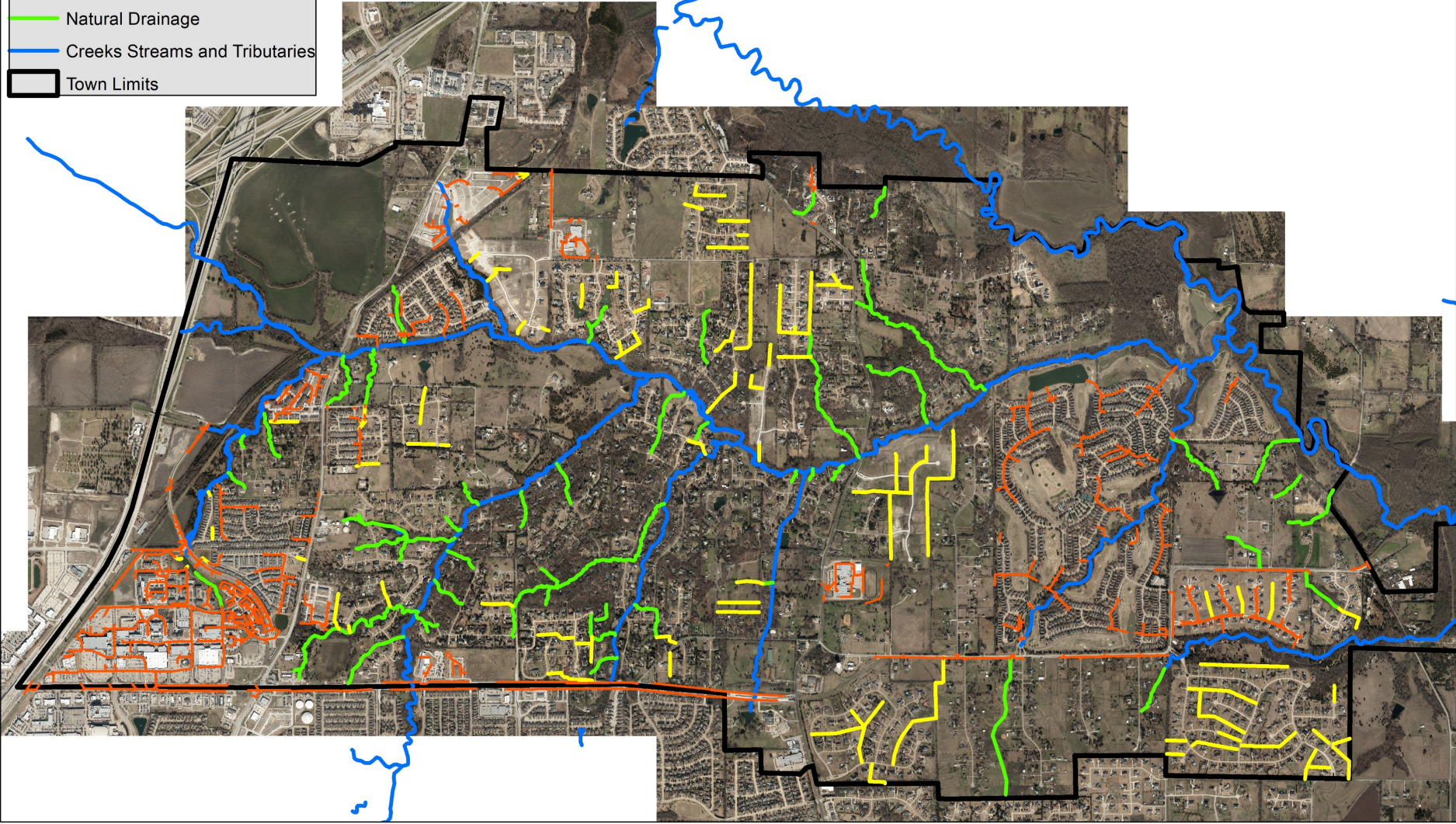
# Drainage Infrastructure in Fairview

- Drainage methods in Fairview – CPDD, Heritage Ranch, public roads designed with curb and gutter
  - Primarily enclosed and engineered drainage improvements
  - Enclosed storm sewer
  - Detention/retention required in CPDD



# Fairview Drainage

- Storm Sewer
- Open Channel Flow
- Natural Drainage
- Creeks Streams and Tributaries
- Town Limits





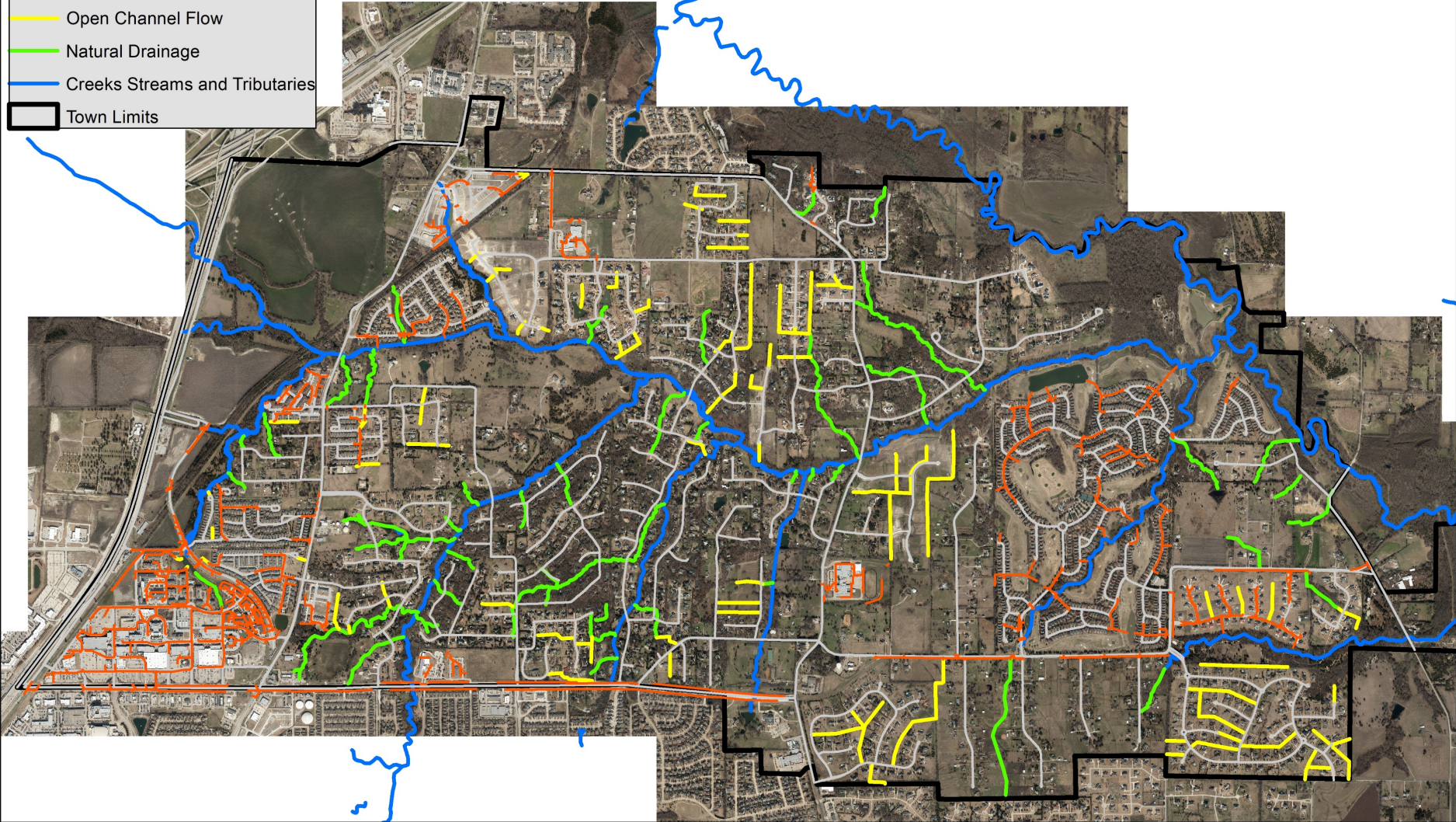






# Fairview Drainage

- Storm Sewer
- Roads
- Open Channel Flow
- Natural Drainage
- Creeks Streams and Tributaries
- Town Limits



# Drainage Infrastructure in Fairview

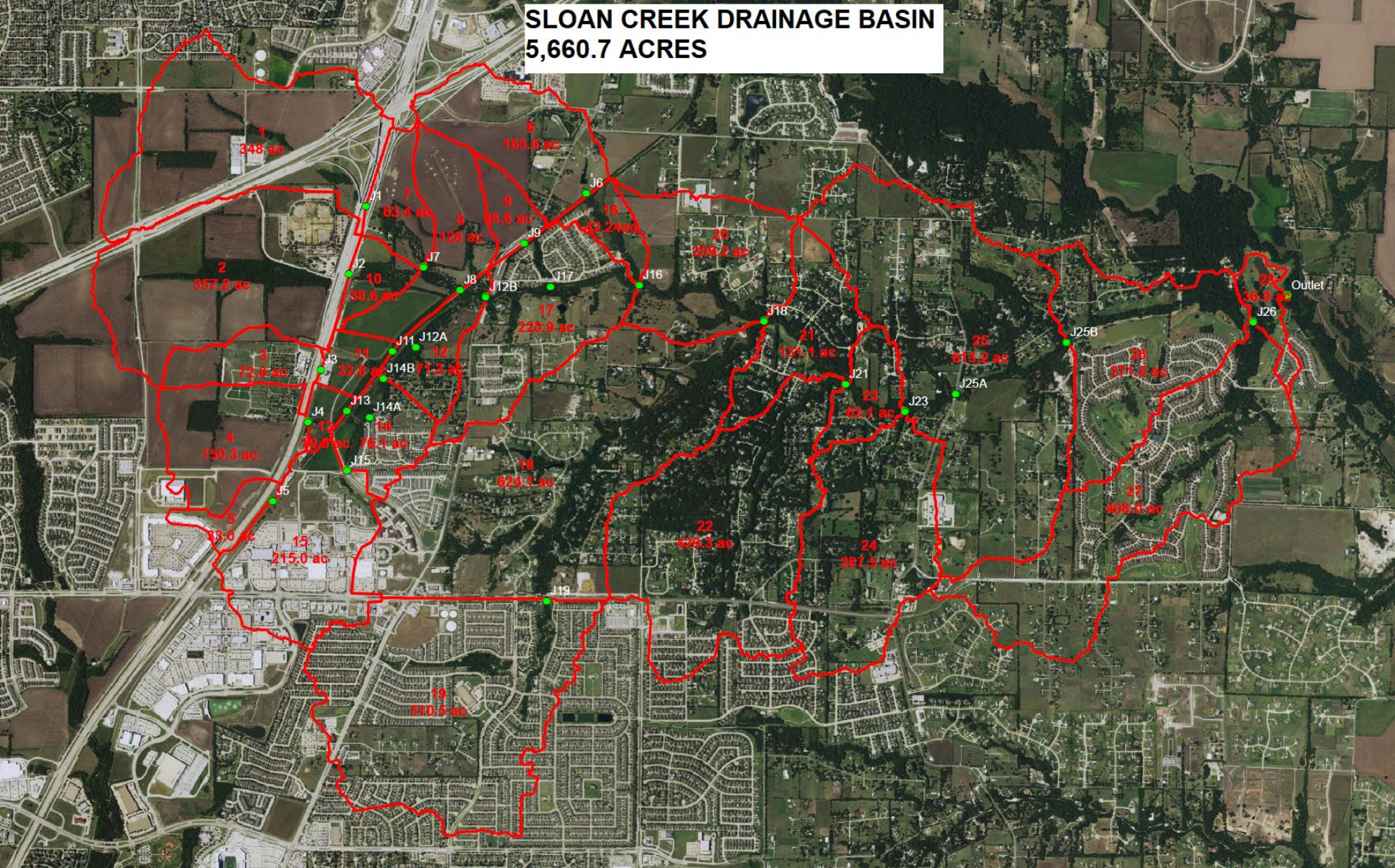
- Where can the town LEGALLY spend drainage fees (taxes) on drainage issues:
  - Street Rights of Way
  - Street Easements
  - Drainage Easements
- It is not legal to spend funds to improve private property
- Many drainage projects are combined Town and homeowner efforts

# Drainage Planning in Fairview

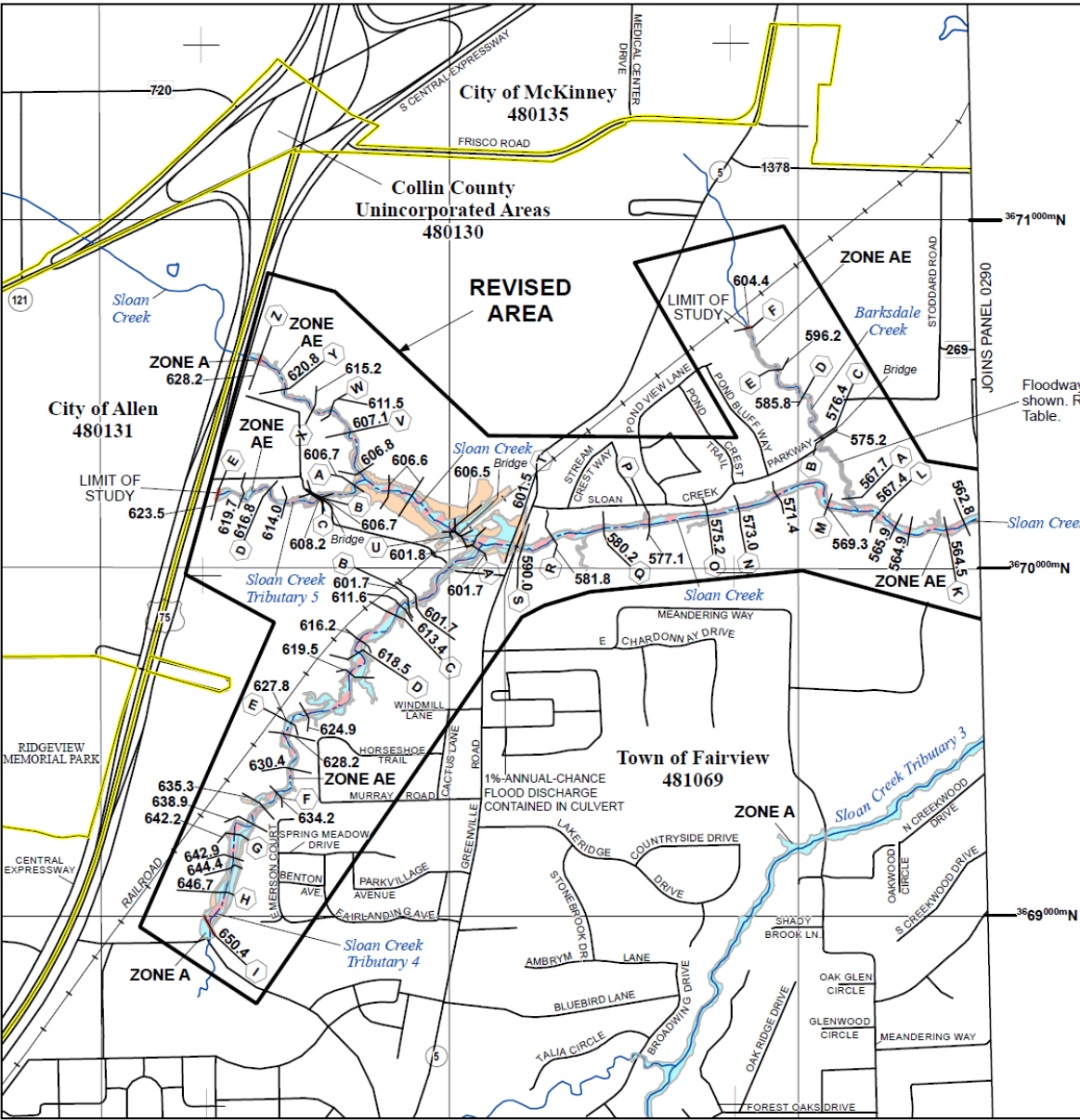
- Town has undertaken two major studies of Sloan Creek to evaluate conditions on the entire creek, and to outline mitigation measures related to impacts of commercial urban development in CPDD
- Both initiated in 2016
- Sloan Creek full length drainage study
  - Purpose – conduct detailed analysis of flood area for Sloan Creek – never been done to this detail
  - Outcome – updated flood maps



# SLOAN CREEK DRAINAGE BASIN 5,660.7 ACRES







**SPECIAL FLOOD HAZARD AREAS**

- Without Base Flood Elevation (BFE) Zone A, AE, AD, AH, VE, AR
- With BFE or Depth Zone AE, AD, AH, VE, AR
- Regulatory Floodway
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
- Future Conditions 1% Annual Chance Flood Hazard Zone X
- Area with Reduced Flood Risk due to Levee See Notes, Zone X

**OTHER AREAS OF FLOOD HAZARD**

**SCALE**

Map Projection: NAD 1983 UTM Zone 14N  
 Western Hemisphere; Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

0 500 1,000 2,000 Feet  
 0 150 300 600 Meters

**NATIONAL FLOOD INSURANCE PROGRAM FLOOD INSURANCE RATE MAP**

**COLLIN COUNTY, TEXAS**  
 and Incorporated Areas  
 PANEL 270 of 600

Panel Contains:

COMMUNITY	NUMBER	PANEL SUFFIX	FEMA
ALLEN, CITY OF	480131	0270	K
COLLIN COUNTY	480130	0270	K
FAIRVIEW, TOWN OF	481069	0270	K
MCKINNEY, CITY OF	480135	0270	K

**REVISED TO REFLECT LOMR EFFECTIVE: July 8, 2019**

VERSION NUMBER 2.1.3.0  
 MAP NUMBER 4805C0270K  
 MAP REVISED JUNE 7, 2017



Collin County  
Unincorporated Areas  
480130

City of McKinney  
480135

Collin County  
Unincorporated Areas  
480130

City of McKinney  
480135

AREA REVISED BY  
LOMR EFFECTIVE  
NOVEMBER 24, 2009

Town of Fairview  
481069

REVISED  
AREA  
AREA REVISED BY  
LOMR EFFECTIVE  
NOVEMBER 23, 2009

Town of Fairview  
481069

**SPECIAL FLOOD HAZARD AREAS**

- Without Base Flood Elevation (BFE)  
Zone A, AE, AH
- With BFE or Depth Zone AE, AO, AH, VE, AR
- Regulatory Floodway

**OTHER AREAS OF FLOOD HAZARD**

- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
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**SCALE**

Map Projection:  
NAD 1983 UTM Zone 14N  
Western Hemisphere, Vertical Datum: NAVD 88

1 inch = 1,000 feet 1:12,000

**FEMA National Flood Insurance Program**

**NATIONAL FLOOD INSURANCE PROGRAM  
FLOOD INSURANCE RATE MAP**

**COLLIN COUNTY, TEXAS  
and Incorporated Areas**

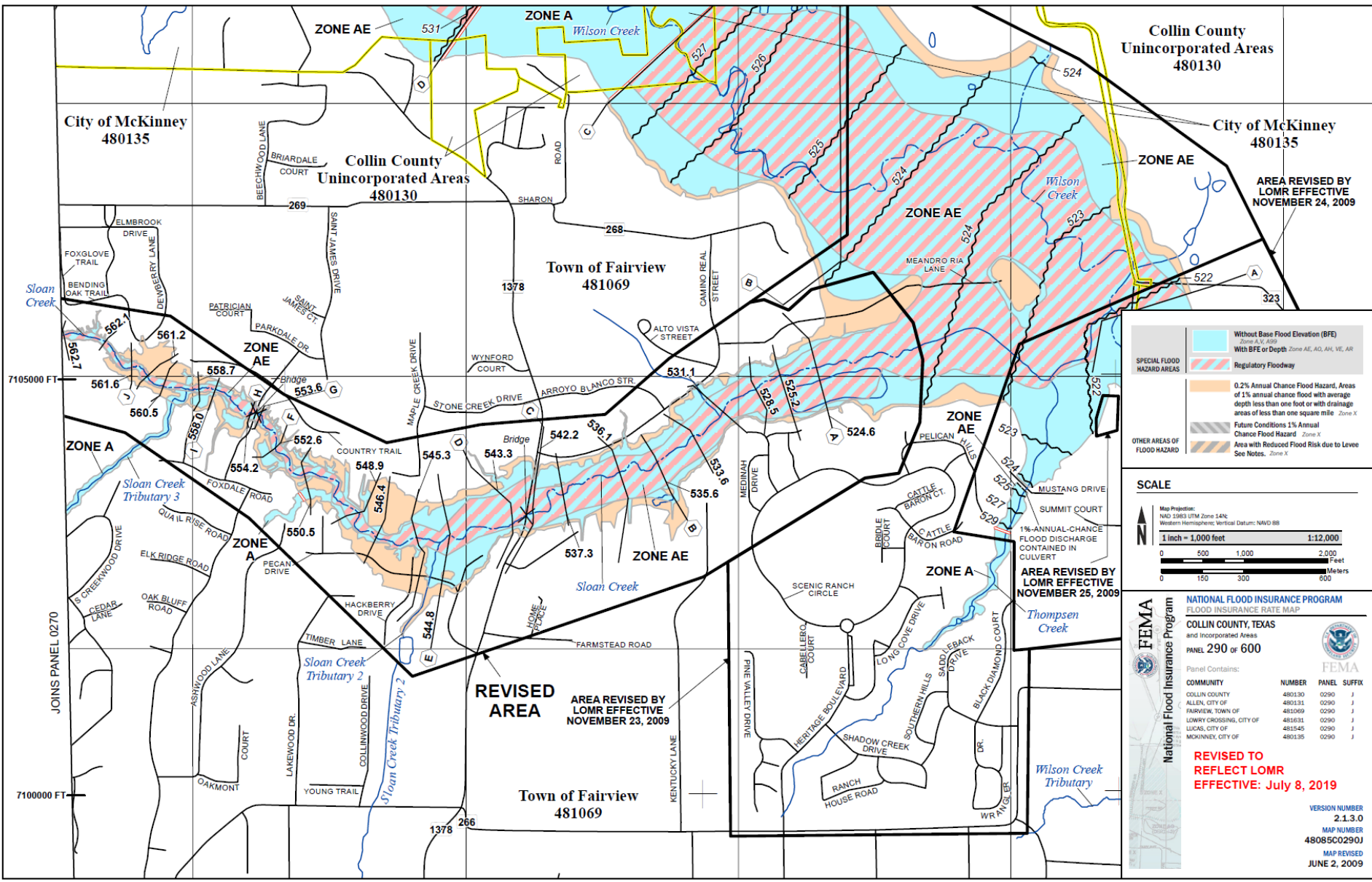
PANEL 290 of 600

Panel Contains:

COMMUNITY	NUMBER	PANEL	SUFFIX
COLLIN COUNTY	480130	0290	J
ALLEN, CITY OF	480131	0290	J
FAIRVIEW TOWN OF	481069	0290	J
LOWRY CROSSING, CITY OF	481031	0290	J
LUCAS, CITY OF	481545	0290	J
MCKINNEY, CITY OF	480135	0290	J

**REVISED TO REFLECT LOMR EFFECTIVE: July 8, 2019**

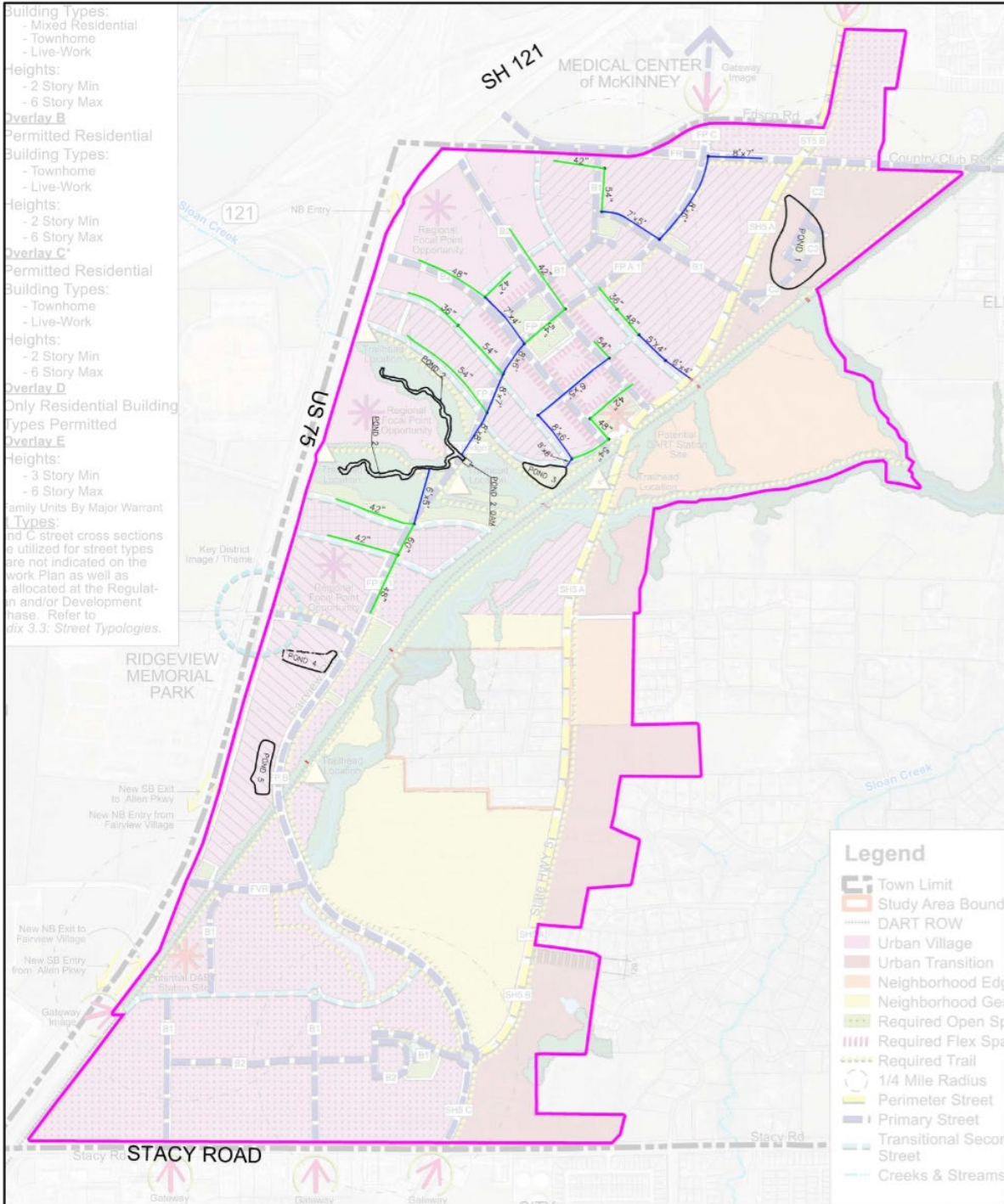
VERSION NUMBER 2.1.3.0  
MAP NUMBER 48085C0290J  
MAP REVISED JUNE 2, 2009



# Drainage Planning in Fairview

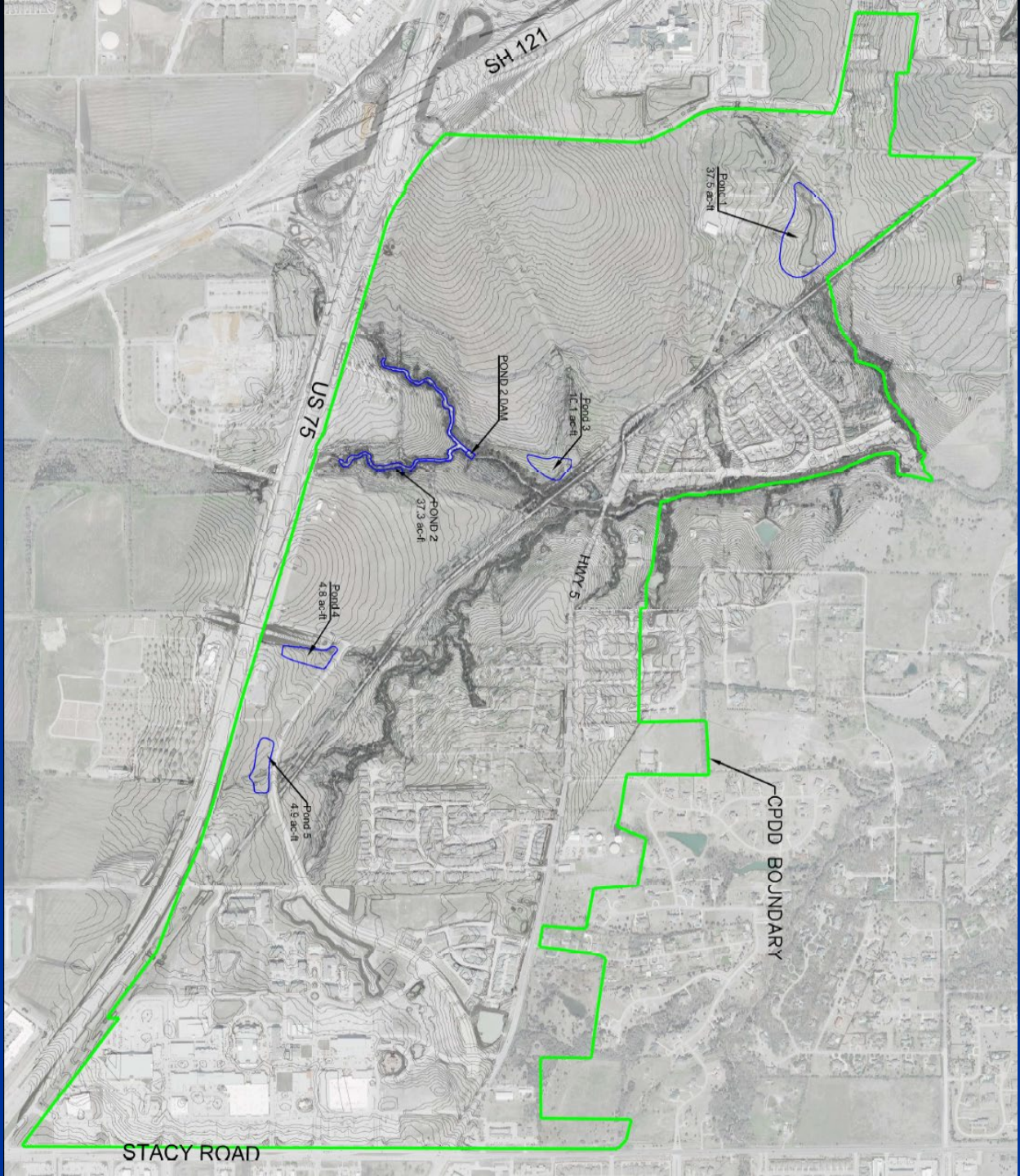
- CPDD master drainage study
  - Purpose – evaluate detailed drainage and detention needs to ensure future downstream impacts are mitigated by future upstream development
  - Outcome – detailed planning and provision for regional detention within the full CPDD
  - Previous drainage design in Center development also incorporated regional detention

- Building Types:
  - Mixed Residential
  - Townhome
  - Live-Work
- Heights:
  - 2 Story Min
  - 6 Story Max
- Overlay B**
- Permitted Residential Building Types:
  - Townhome
  - Live-Work
- Heights:
  - 2 Story Min
  - 6 Story Max
- Overlay C**
- Permitted Residential Building Types:
  - Townhome
  - Live-Work
- Heights:
  - 2 Story Min
  - 6 Story Max
- Overlay D**
- Only Residential Building Types Permitted
- Overlay E**
- Heights:
  - 3 Story Min
  - 6 Story Max
- Family Units By Major Warrant
- Types:
- and C street cross sections are utilized for street types are not indicated on the work Plan as well as allocated at the Regulation and/or Development phase. Refer to Appendix 3.3: Street Typologies.



- Legend**
- Town Limit
  - Study Area Bound
  - DART ROW
  - Urban Village
  - Urban Transition
  - Neighborhood Edge
  - Neighborhood Gen
  - Required Open Sp
  - Required Flex Spa
  - Required Trail
  - 1/4 Mile Radius
  - Perimeter Street
  - Primary Street
  - Transitional Second Street
  - Creeks & Streams





STACY ROAD

SH 121

US 75

HWY 5

Pond 1  
37.9 ac-ft

POND 2  
37.3 ac-ft

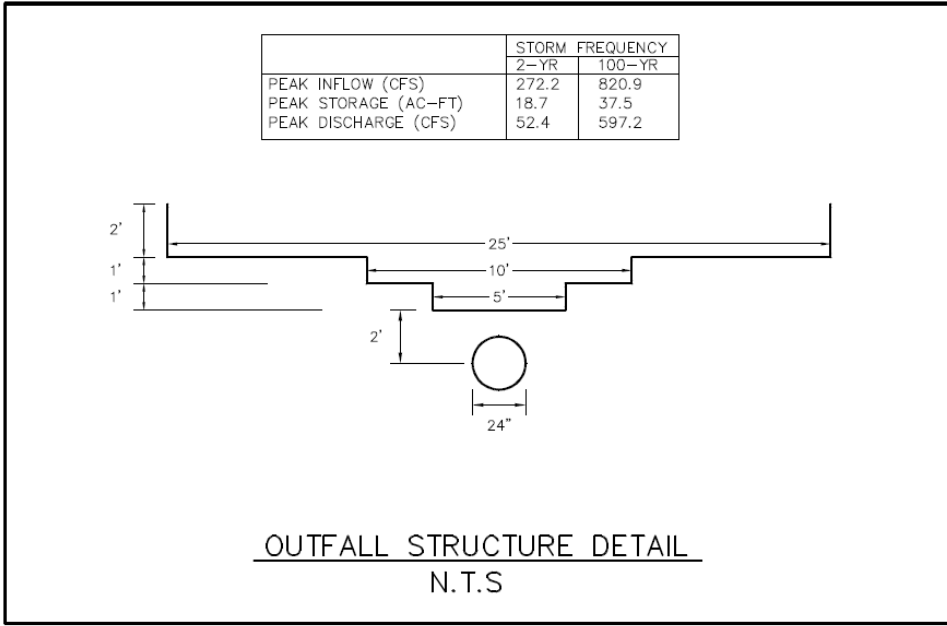
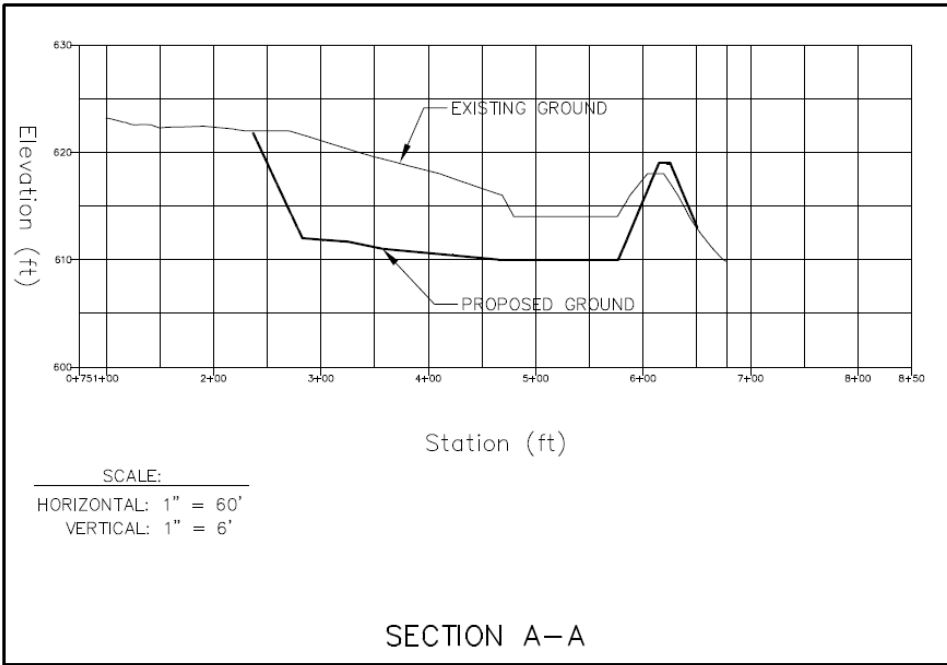
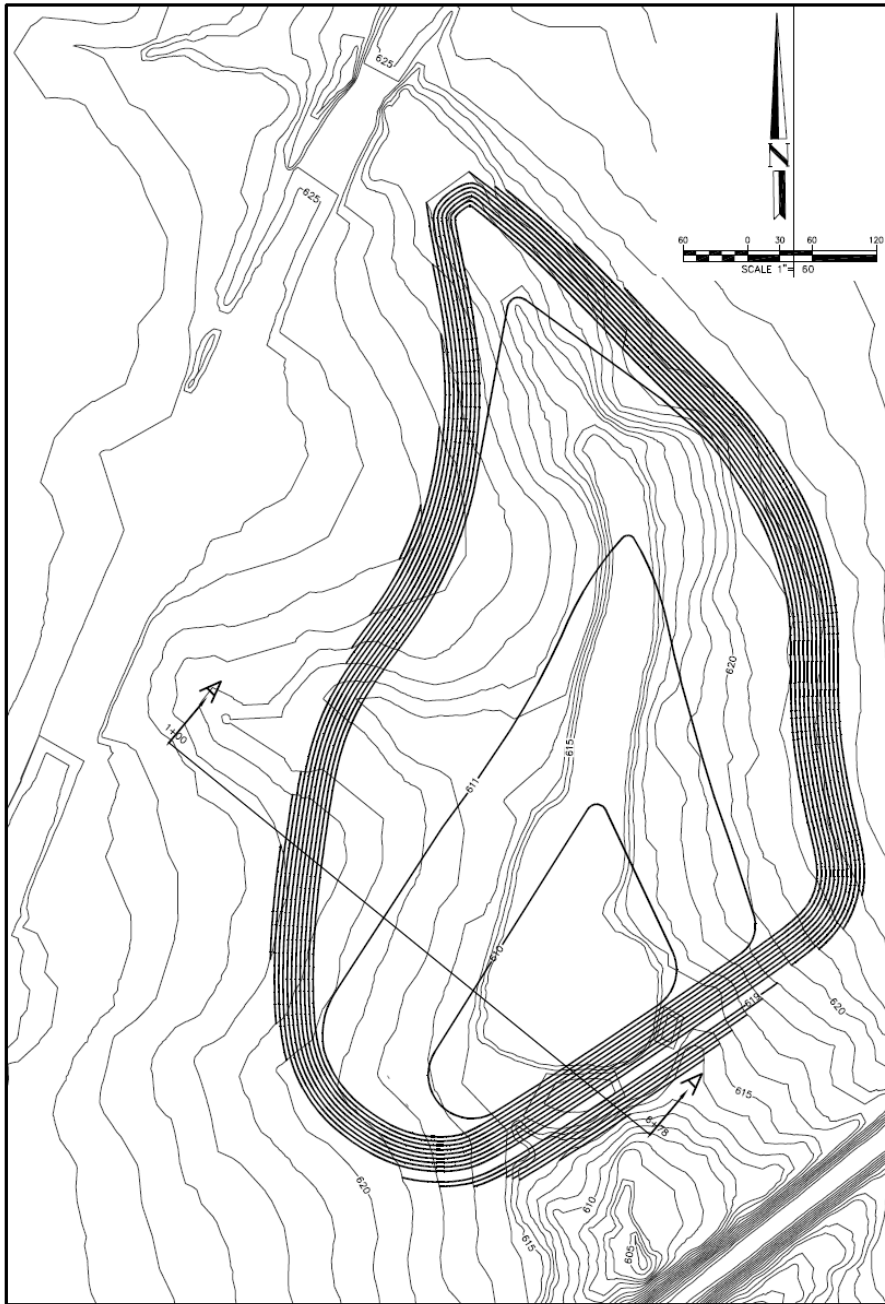
Pond 3  
1.1 ac-ft

Pond 4  
4.8 ac-ft

Pond 5  
4.9 ac-ft

POND 2 DAM

CPDD BOUNDARY



# Drainage System Maintenance and Operation

- Levels of drainage review and actions
  - Local drainage issues -
    - Lot to lot drainage, adjacent construction
    - Clogged culverts, erosion, standing water
    - Neighbor affecting neighbor, berms, flower beds, pools
    - Maintenance issues, mowing, weeds
    - Ground water



# Drainage System Maintenance and Operation

- Levels of drainage review and actions
  - Area issues
    - Older subdivisions and needed improvements in a larger area
    - Channels affecting multiple lots needing maintenance or improvements



Roadside ditch  
designed/excavated  
(original too small for  
flows)













# Drainage System Maintenance and Operation

- Levels of drainage review and actions
  - Prioritizing drainage issues as high, medium and low to make best use of limited funds
  - High (water in a home, septic system not functioning during heavy rains, traffic safety impacted on roadways)
  - Medium (erosion and silt deposits, difficulty maintaining channel on property, culverts partially clogged)
  - Low (standing water, lawn mower vs. weed eater)



















**Resident built rock lined channel**









**Resident built  
berm**













ACTIVE CASE

SILT COMING OUT  
OF FORESTED  
RUNOFF



TOWN TO  
REMOVE SILT  
DEPOSITS IN ROW



TOWN TO REMOVE SILT  
DEPOSITS IN ROW

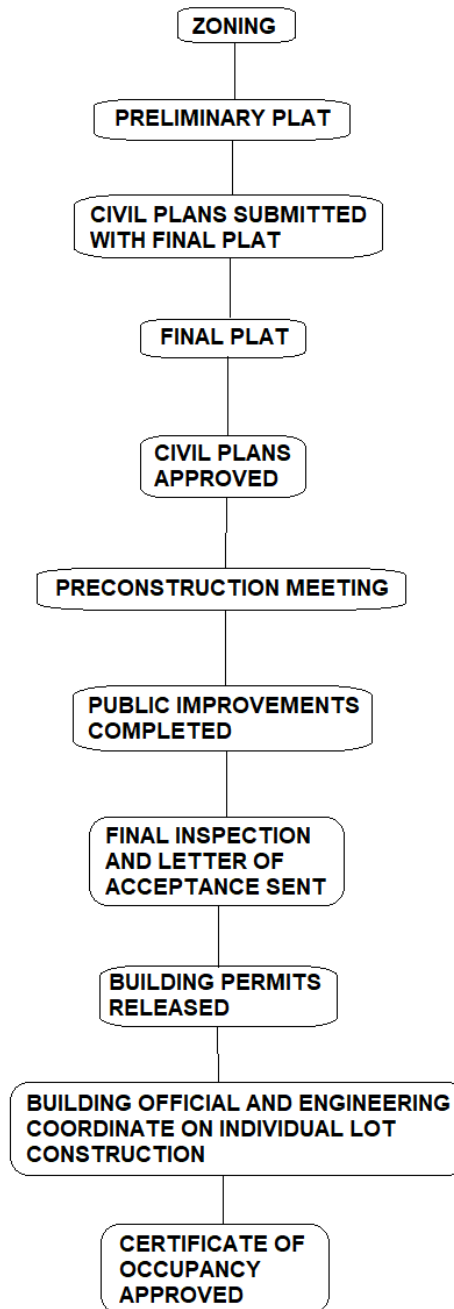




# Development Engineering Review Process



## ENGINEERING DEVELOPMENT REVIEW PROCESS





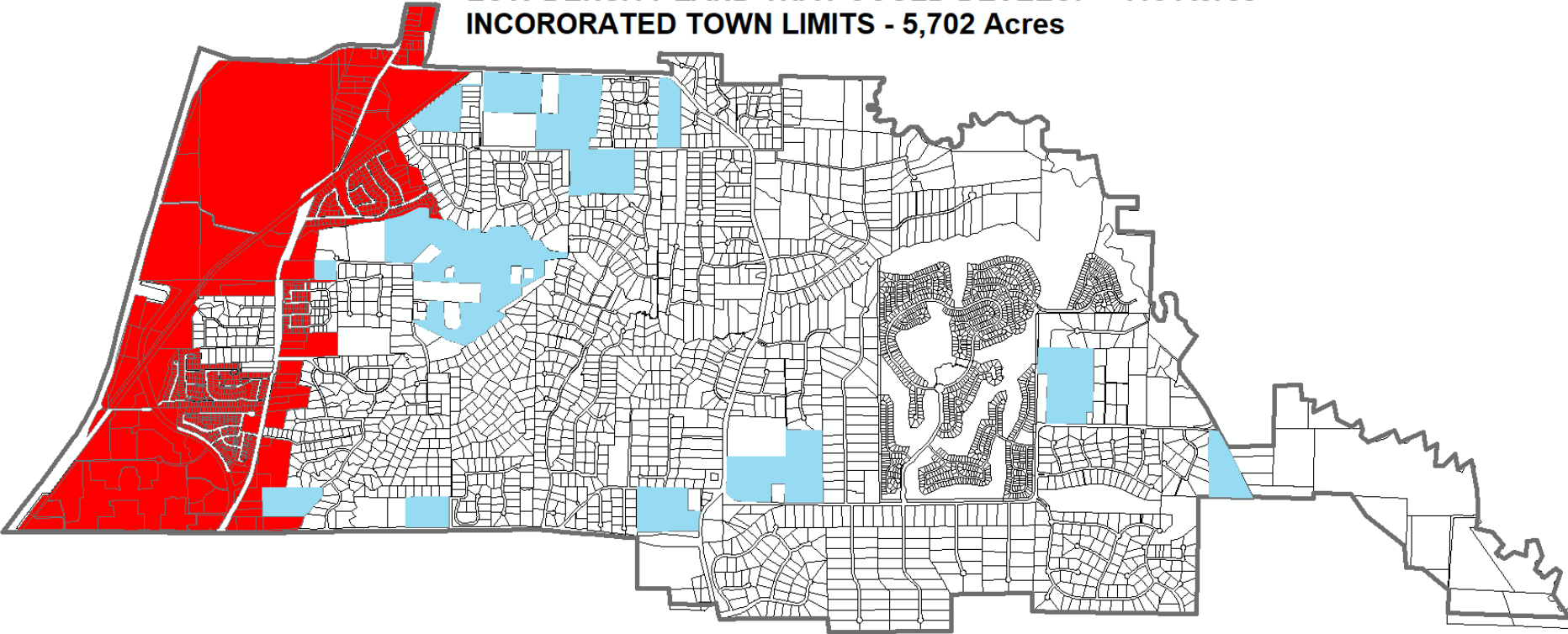
# Development in Fairview

- ➔ ■ Status of development in low density area
- Status of development in CPDD
  - Implementation of drainage plan (show pictures of Apple Crossing pond and pipe)



# Development in Fairview

**LOW DENSITY LAND THAT COULD DEVELOP - 413 Acres**  
**INCORPORATED TOWN LIMITS - 5,702 Acres**



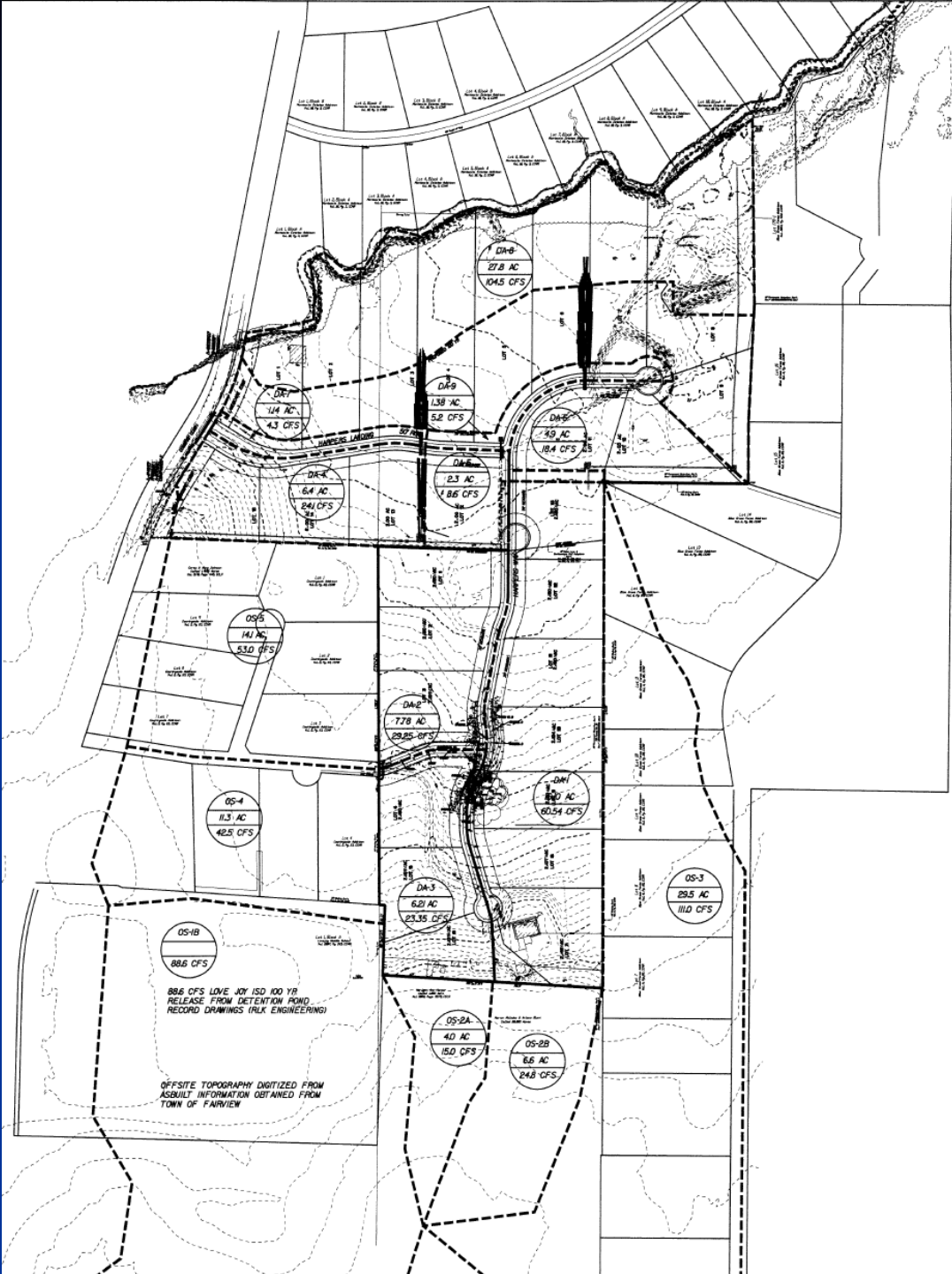


# Development in Fairview

- Status of development in low density area
  - Total acres in Fairview - 5,702
  - Total potential acres for future development in low density area - 413
  - Percentage of possible future development in low density area- 7.2%

---
- Total water volume in Sloan Creek at 100 year storm - 12,979 cfs
- Potential impact of additional low density development to Sloan Creek - 454 cfs
- Percentage of possible future impact of low density development to Sloan Creek - 3.5%









JANA C. ADAMS VOL. 2009-0151254  
 MARILYN HARPER VOL. 93-1436  
 COUNTRYSIDE ADDITION CAB. O. PG. 83 LOT 6  
 COUNTRYSIDE ADDITION CAB. O. PG. 83 LOT 5  
 CAB. O. PG. 83 LOT 7

MARILYN HARPER VOL. 93-1436

MARILYN HARPER VOL. 93-1436

MICHAEL & DAWN PUTA VOL. 5597, PG. 30

VERNON & ELEN FICKER VOL. 2007-017187

**PROPOSED DRAINAGE CRITERIA**

- C = 0.15
- C = 0.51 (Commercial)
- $T_{10} = 0.78$  in/hr
- $t_0 = 20$  min.

- D.A. Designation
- Acres
- $T_{10}$  (in/hr)
- $t_0$  (min)
- Proposed Drainage Divide Line

**COMPOSITE C VALUE**  
 C = 0.25 For Aerial  
 C = 0.75 For Other  
 A = 73.7 acres for D.A.  
 (Composite C) = 0.75  
 26.73 / 35.2 = 0.75  
 Composite C = 0.81

**DRAINAGE AREA CALC**

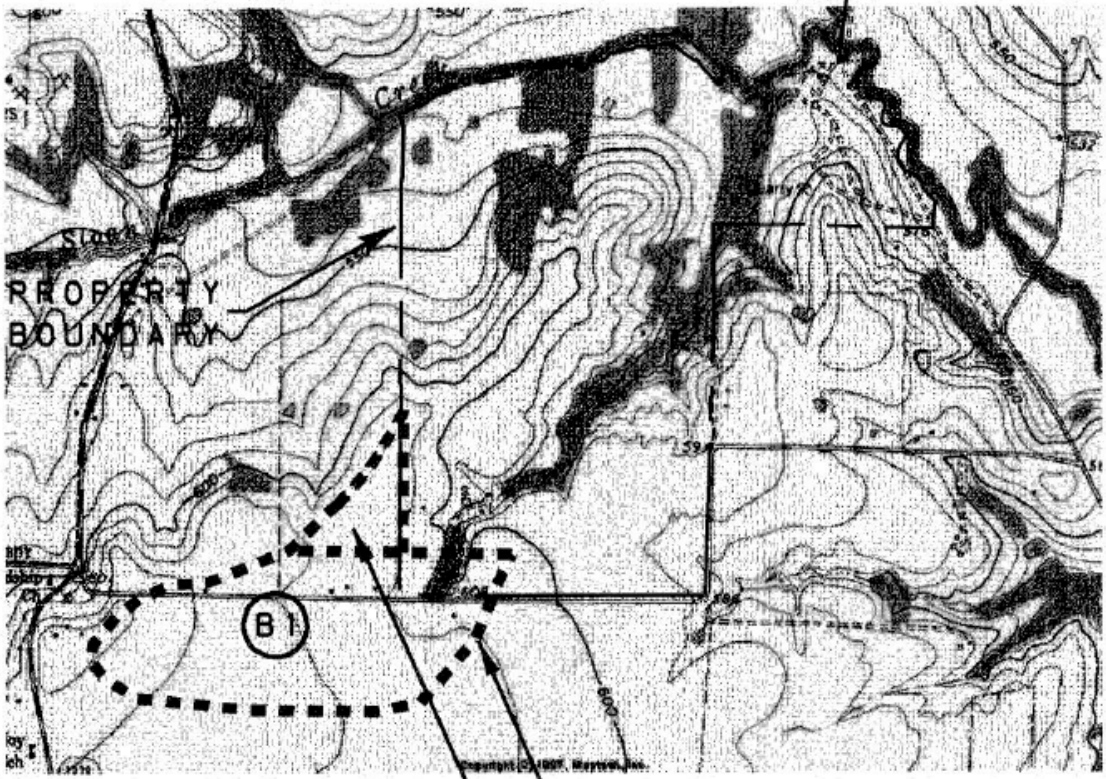
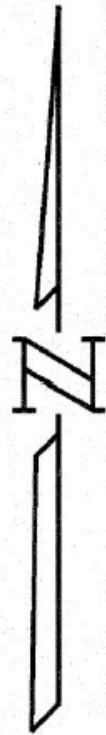
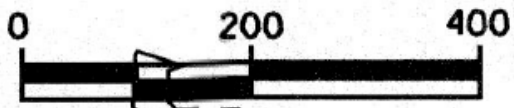
Drainage Area No.	Drainage Area (Acres)	C	$T_{10}$ (in/hr)	$t_0$ (min)	$Q_{10}$ (cfs)
D	0.21	0.5	0.5	20	7.57
E	0.21	0.5	0.5	20	7.57
F	0.21	0.5	0.5	20	7.57
G	1.35	0.5	0.5	20	7.57
H	19.24	0.5	0.5	20	7.57
I	4.89	0.5	0.5	20	7.57
J	2.99	0.5	0.5	20	7.57

**RECORD DRAWING**

REVISED TO CONFORM TO  
 CONSTRUCTION RECORDS  
 11/17

[Signature]  
 [Firm Name]





HYDROLOGIC DATA

SIN 1 (B1)

EA=180 ACRES  
 TIME OF CONCENTRATION=25 MIN  
 0.6 (ASSUME MED. DENSITY)

OFFSITE AREA  
 DRAINING INTO SD-1  
 OFFSITE AREAS KK & LL

OFFSITE INFORMATION FROM  
 APPENDIX 2:  
 HYDROLOGY WORK MAP





# Development in Fairview

- Status of development in low density area

- ➡ ■ Status of development in CPDD

- Implementation of master drainage plan in northern CPDD



# Apples Crossing Regional Detention Pond







100 YEAR  
ELEVATION  
OVERFLOW



NORMAL POOL  
ELEVATION  
OVERFLOW





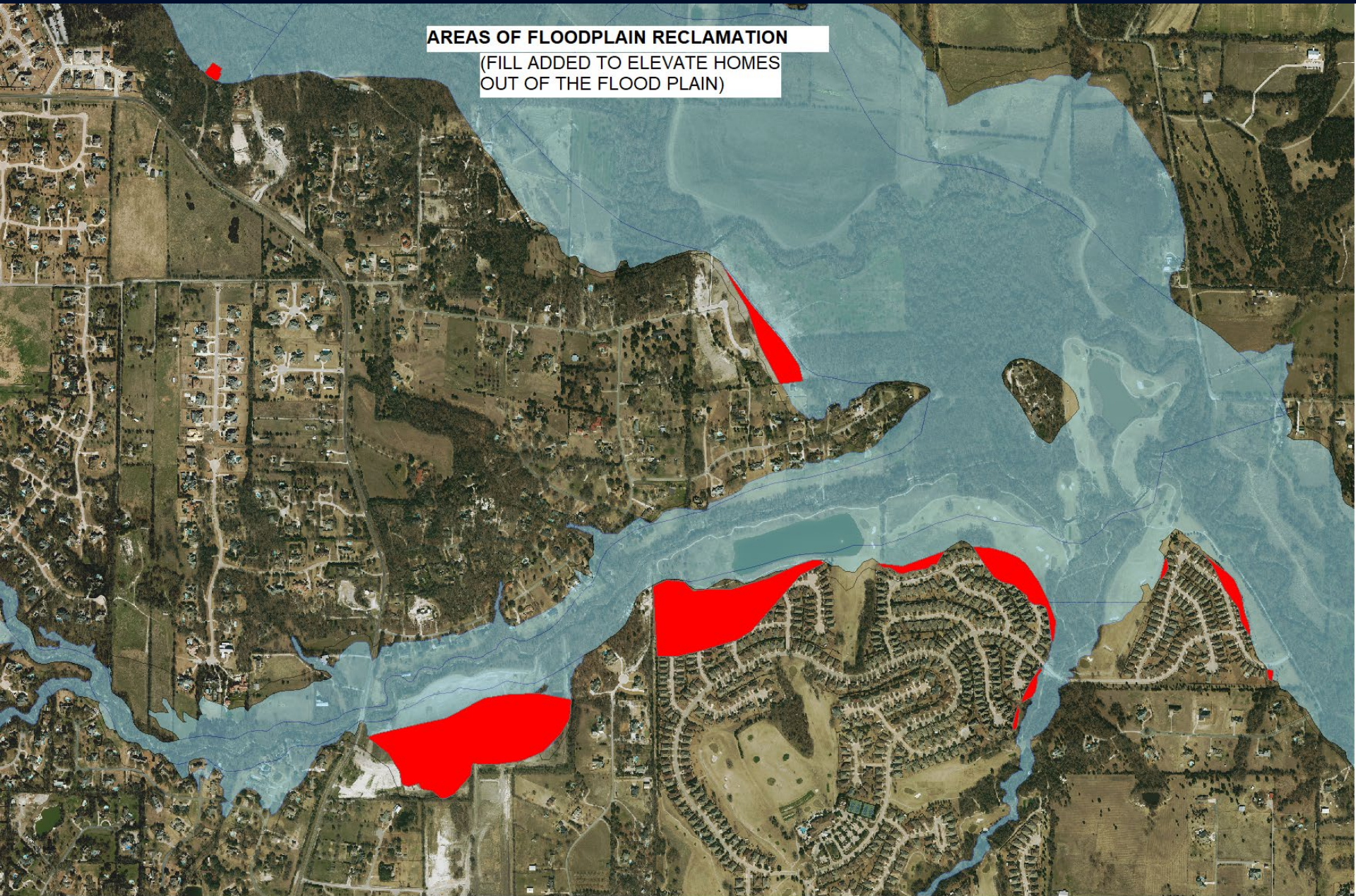
# Development in Fairview

- Flood plain reclamation in Fairview
  - Reclamation permitted under current Town ordinances
  - Town establishes engineering standards for any reclamation
  - Examples of previous reclamation projects
    - Heritage Ranch
    - Harper Landing
    - Others
  - Potential future reclamation areas



**AREAS OF FLOODPLAIN RECLAMATION**

(FILL ADDED TO ELEVATE HOMES  
OUT OF THE FLOOD PLAIN)

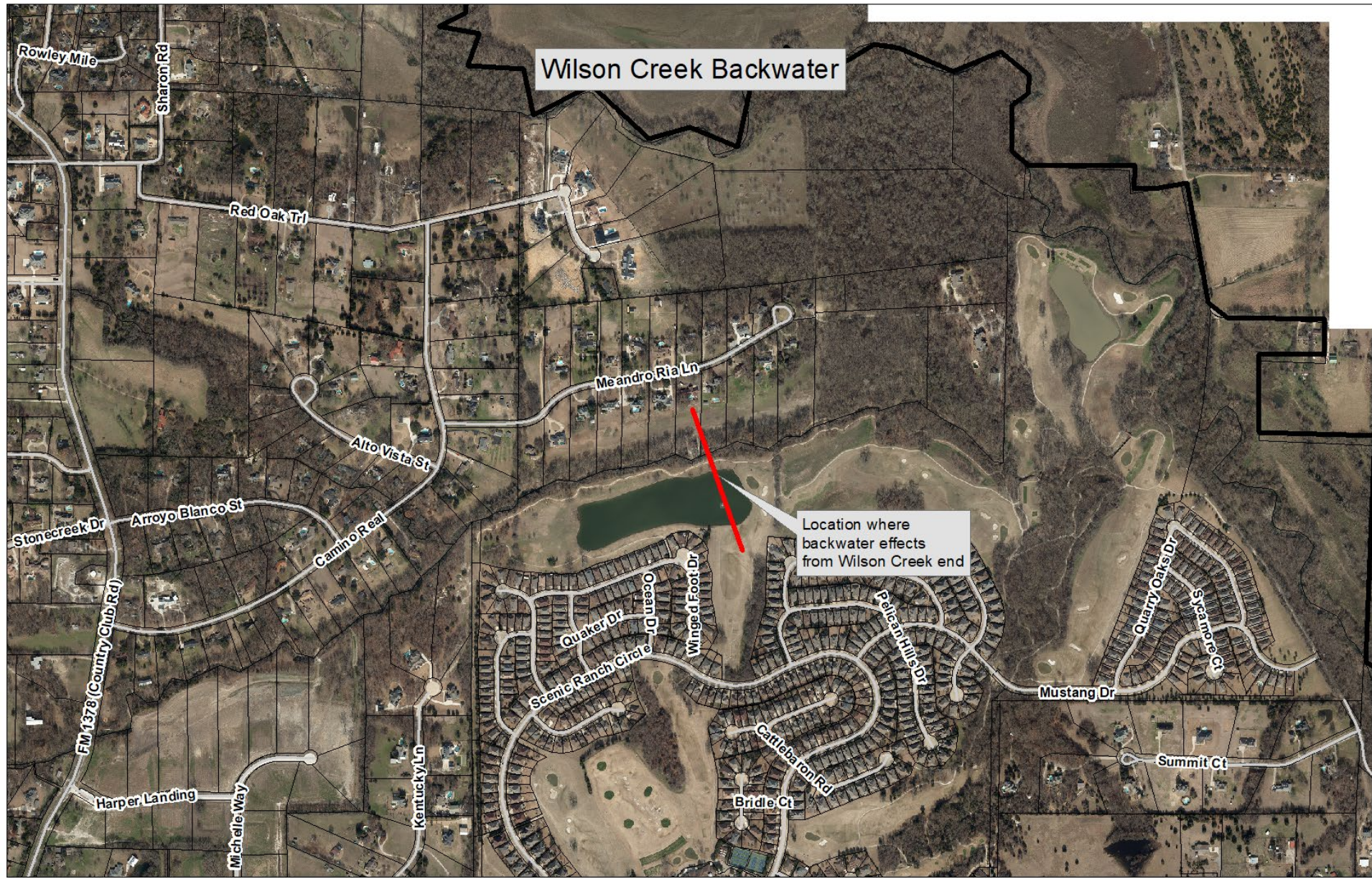




# Regional Issues

- Wilson Creek





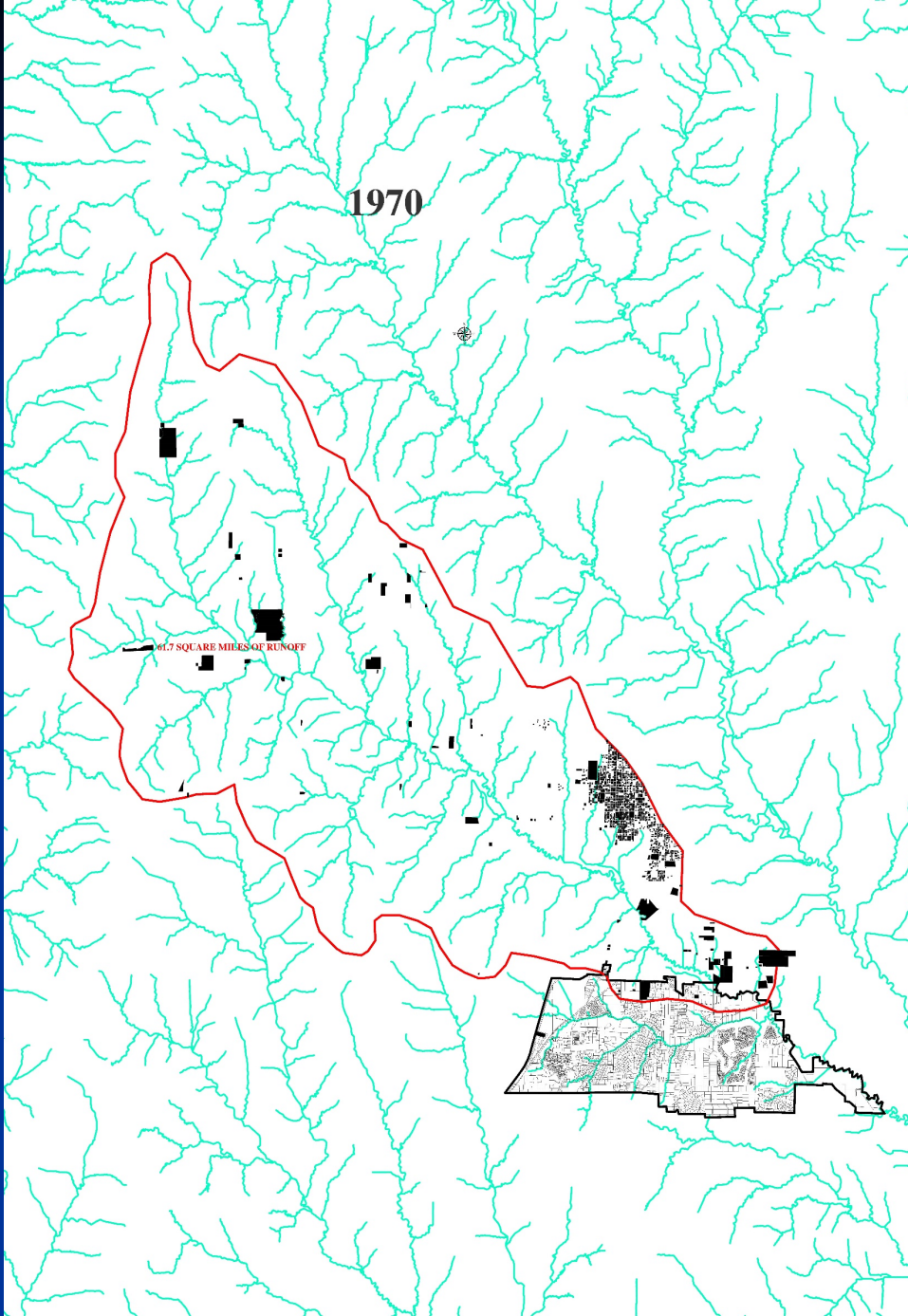
# Wilson Creek Backwater

Location where backwater effects from Wilson Creek end



1970

61.7 SQUARE MILES OF RUNOFF





2015

