

Hazen



City of
Fayetteville
North Carolina

Beaver Creek (2)

Stormwater Master Plan

City Council Update | March 04, 2019

Overview

Definitions



```
graph TD; A[Definitions] --> B[Watershed]; B --> C[Goals/process]; C --> D[Beaver Creek (2)]; D --> E[Prioritization/master plan];
```

Watershed

Goals/process

Beaver Creek (2)

Prioritization/master plan

Definitions

Stormwater

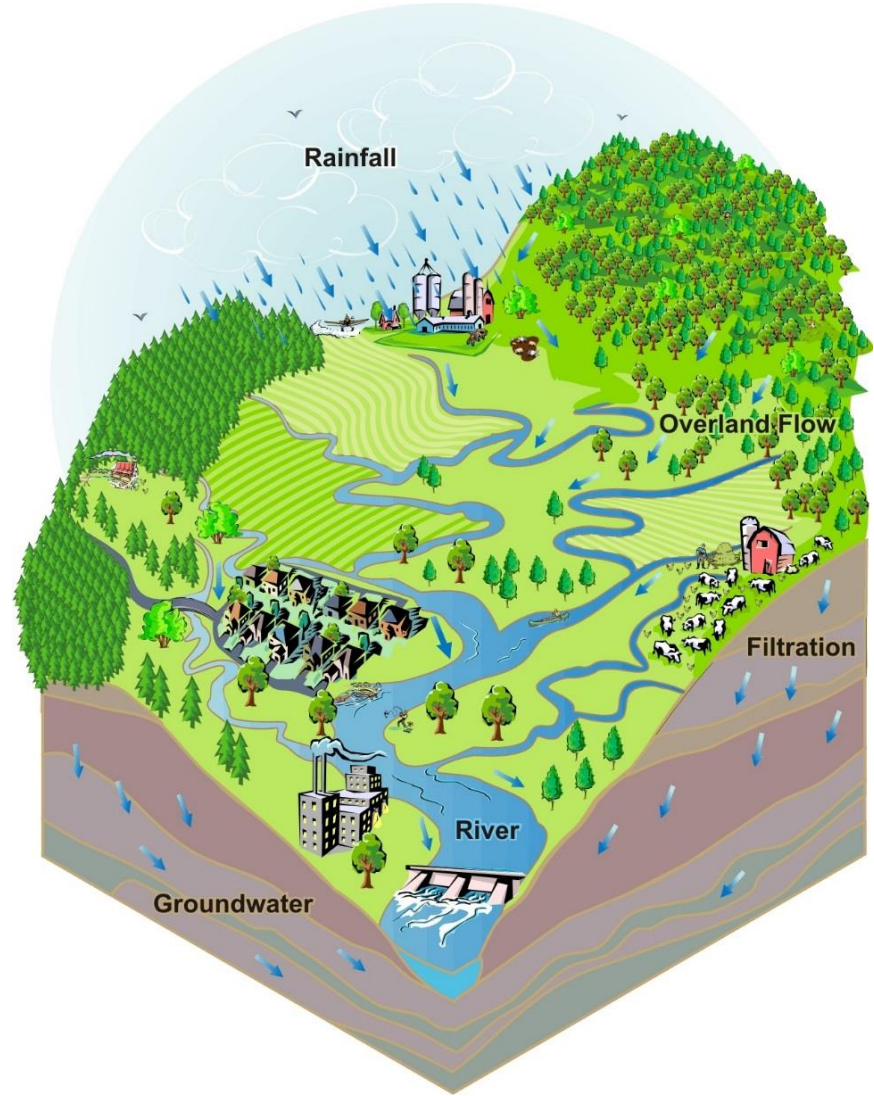
Watershed

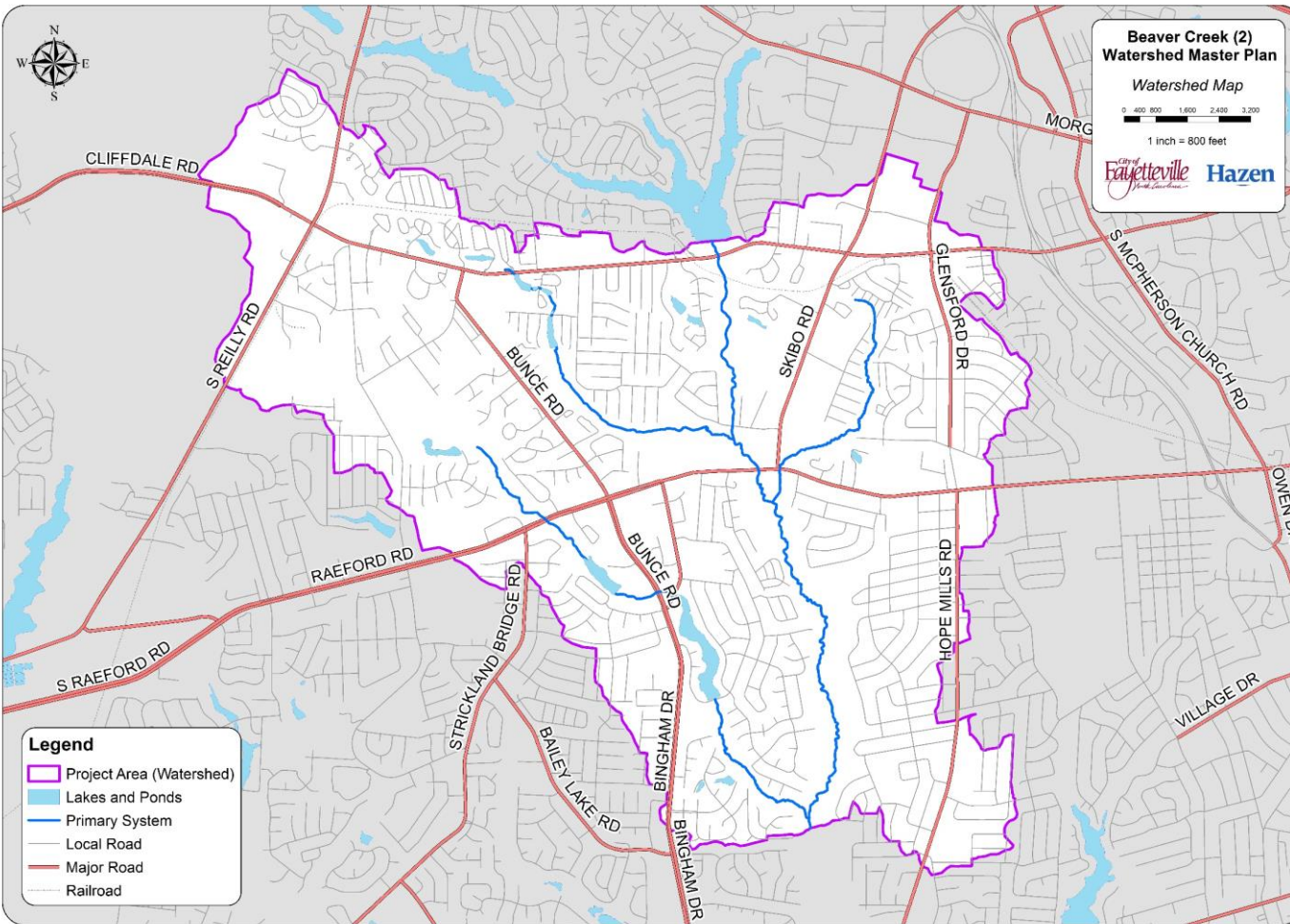
Master Plan

Culvert

Primary System

Secondary System





Watershed Characteristics

Beaver Creek (2) Watershed

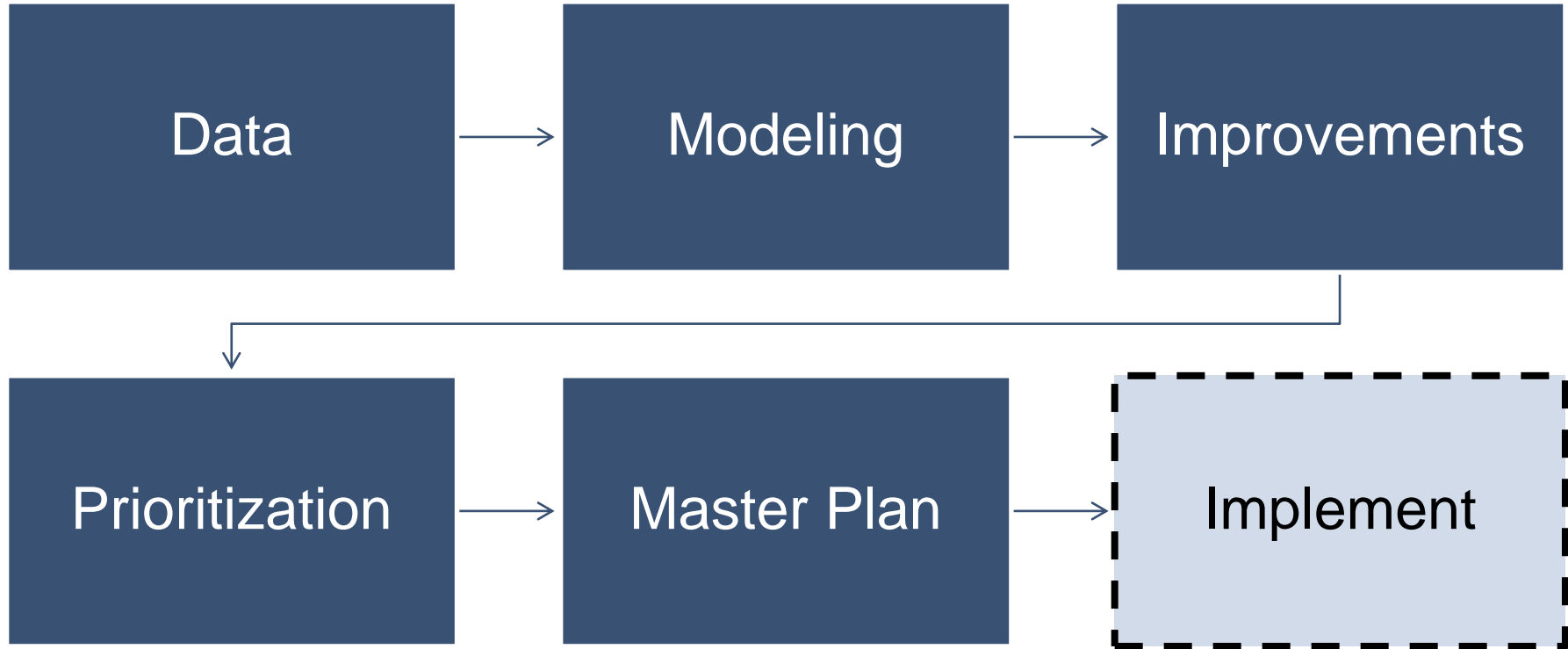
- 8.3 square miles
- 9 miles primary system
- 44 miles closed piping
- 37 miles open channel
- 2,900 drainage structures

Typical Stormwater Master Plan Goals



- *Engage*
- *Receive feedback*
- *Improve existing information*
- *Identify needs*
- *Prioritize projects*
- *Quantify costs*
- *Improve water quality*

Typical Stormwater Master Plan Process



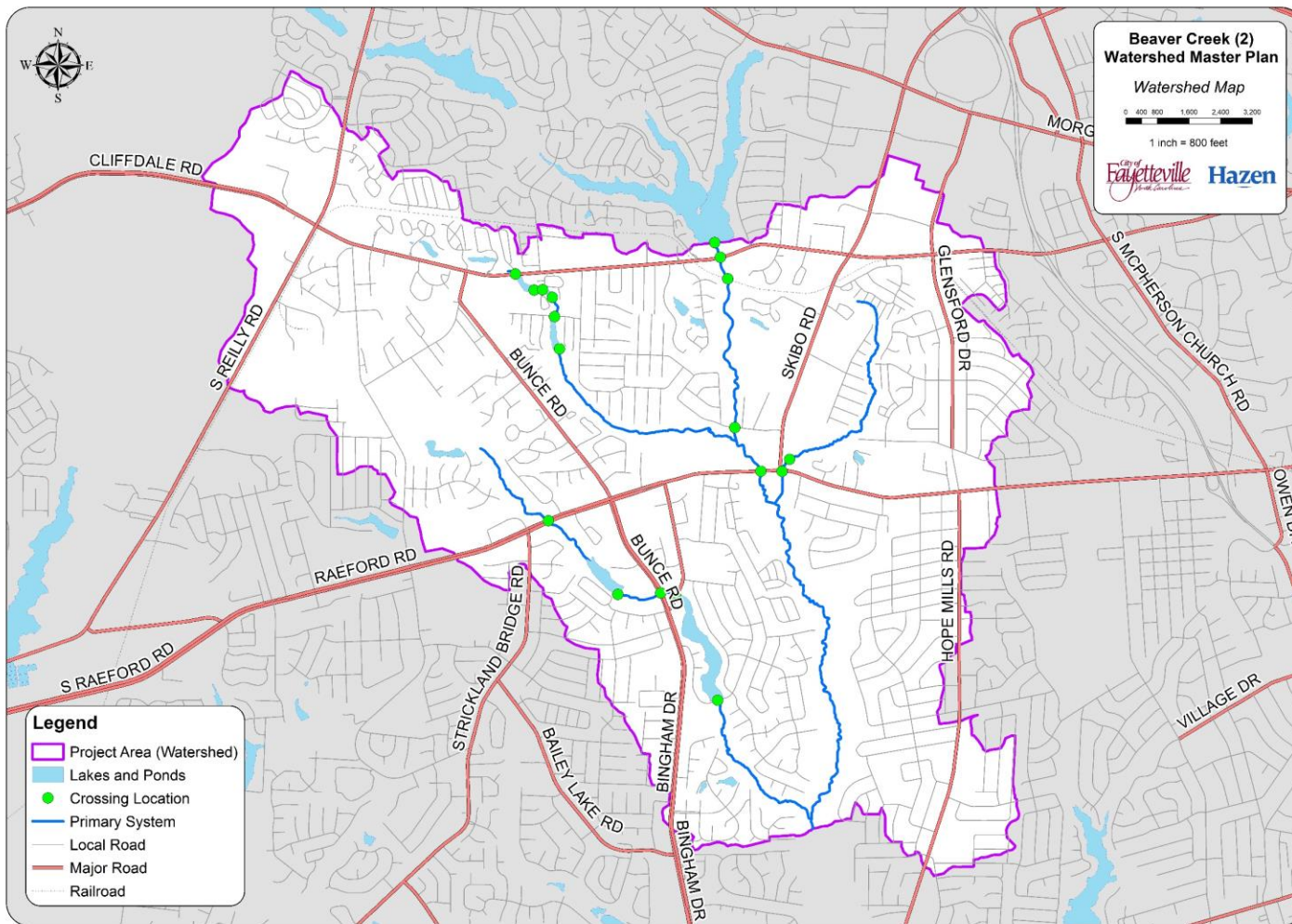


Primary System

Primary System (Beaver Creek (2) at Raeford Road)

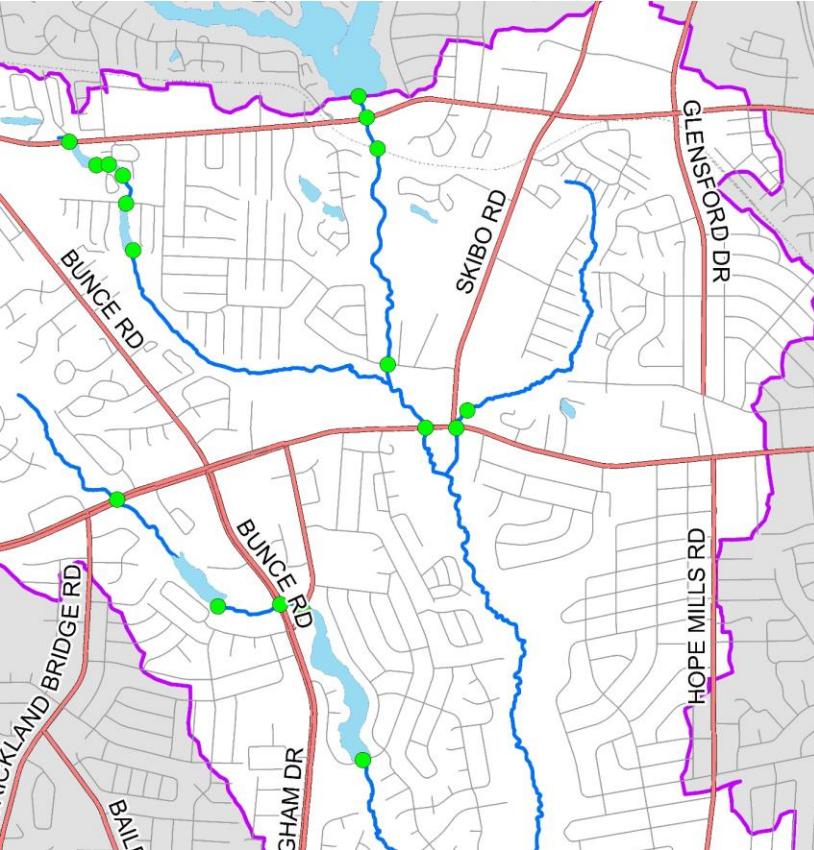
Primary System Selection

Streams selected as Primary System



Primary System Details

Modeling



Beaver Creek (2)
Watershed Master Plan

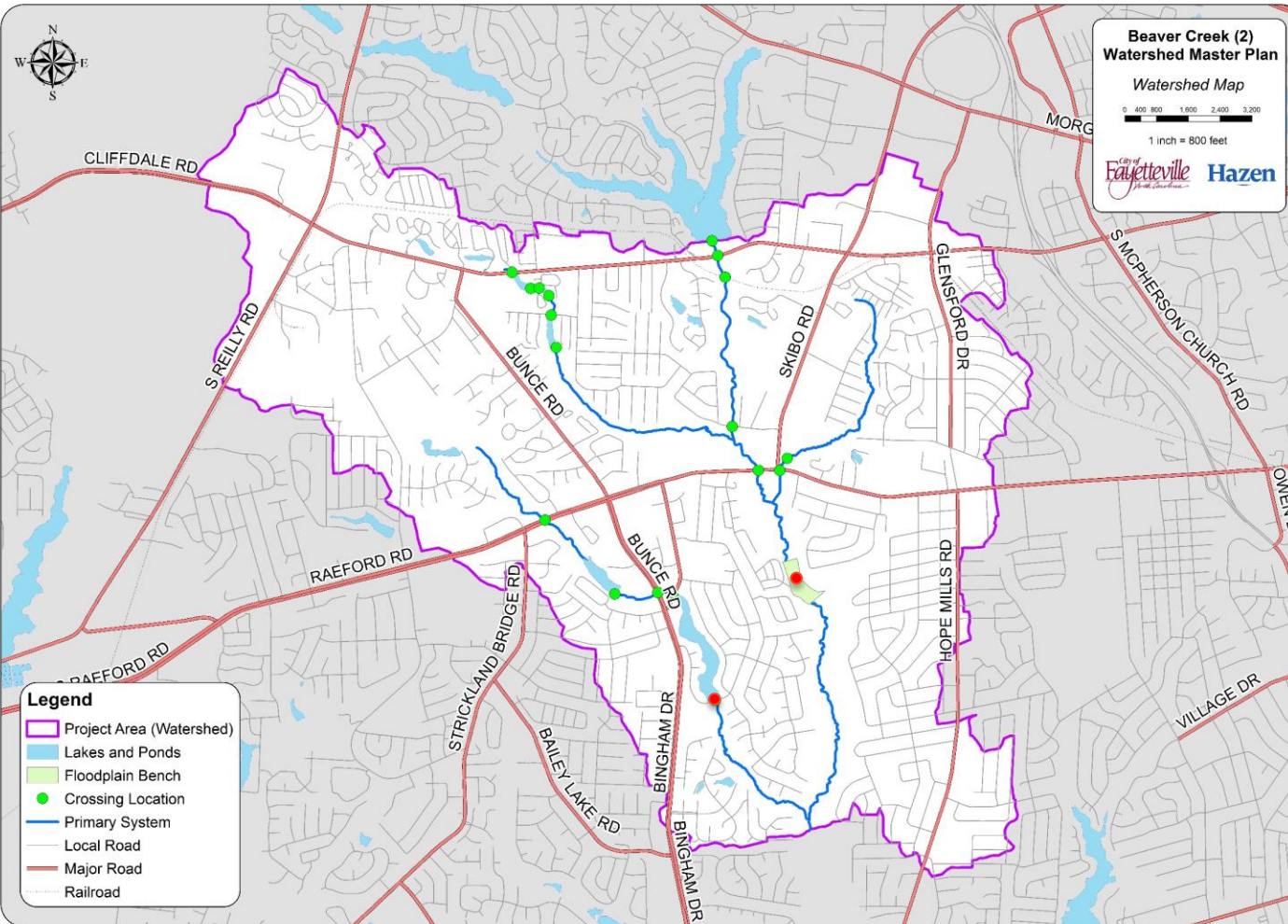
Crossing Structures
Level of Service Summary

Stream	Crossing Name	Crossing Owner	Existing Infrastructure ¹	Desired LOS ²	Overtopping Elevation (ft)	Existing Conditions Predicted Water Surface Elevation (ft)				
						2-Year	10-Year	25-Year	50-Year	100-Year
Beaver Creek (2)	McFadyen Reservoir	Private	Dam	100-Year	167.3	161.7	164.1	165.4	166.3	167.2
	Cliffdale Road	NCDOT	Bridge	50-Year	160.7	150.3	154.4	156.2	157.5	158.7
	Railroad	AR RR	Bridge	100-Year	158.8	149.8	153.6	155.3	156.4	157.5
	Louise Street	City	Bridge	25-Year	147.6	146.0	150.6	152.0	152.7	153.3
	Skibo Road ³	NCDOT	-	50-Year	150.3	144.1	148.4	150.6	151.2	151.7
Beaver Creek Tributary A	Raeform Road	NCDOT	(4) 10' x 10' RCBC	50-Year	149.6	143.9	148.2	150.5	151.2	151.7
	Raeform Road	NCDOT	(2) 66" RCP	50-Year	191.2	181.2	185.6	188.0	189.9	191.7
	Hidden Lake	Private	Dam	100-Year	173.4	173.7	174.3	174.5	174.6	174.7
	Bunce Road	NCDOT	Bridge	50-Year	179.3	162.2	167.7	169.8	170.5	170.8
	Bingham Drive	NCDOT	110" x 78" ECMP	50-Year	167.0	161.5	166.3	168.3	168.9	169.2
Unnamed Tributary	Arran Lake	Private	Dam	100-Year	162.2	160.9	162.8	163.1	163.3	163.4
	Lewis Chapel ⁴	Private	16' x 5' CMPA	50-Year	150.1	152.0	152.7	152.9	153.2	153.3
	Skibo Road ³	NCDOT	-	50-Year	150.3	151.0	152.1	152.5	152.8	153.1
	Raeform Road	NCDOT	(2) 84" CMP	50-Year	151.4	150.8	151.7	152.0	152.3	152.5
Stewart Creek	Cliffdale Road	NCDOT	(2) 48" RCP	50-Year	204.9	205.3	205.8	206.0	206.1	206.2
	Upper Bassman Lake	Private	Dam	100-Year	203.7	203.5	204.4	205.0	205.3	205.5
	Bassman Lane	Private	(2) 48" RCP	25-Year	203.6	199.9	204.3	204.9	205.2	205.5
	Lower Bassman Lake	Private	Dam	100-Year	198.3	198.2	198.8	199.1	199.3	199.5
	Cross Pointe Drive	Private	(3) 60" CMP	25-Year	192.9	191.1	193.3	194.2	194.7	195.0
	Cross Pointe Lake	Private	Dam	100-Year	192.2	190.8	191.8	192.3	192.7	193.0
Legend:						Non-Overtopping	Level of Service		Overtopping	

¹ Existing infrastructure prior to Hurricane Matthew; infrastructure repairs subsequent to the Hurricane have been incorporated into Future Conditions WSM modeling.

Primary System Status

- ✓ *Surveying complete*
- ✓ *Models complete*
- ✓ *Model validation*
- ✓ *Improvements identified*
- *Cost opinion*
- *Prioritization*
- *Master plan document*



Secondary System

*Structures, piping, and
ditches.*



Secondary System Selection

Step 2 – Review and Interpret

Data Overlay

- Known flooding

Comparison

- Flooding vs. drainage

Review

- Past drainage study

Identify

- Systems for analysis

Collaborate

- Provide systems to staff

Staff Selection

- Systems to analyze

Proceed


- Surveying/Analysis

Secondary System Selection

Step 1 – Collect Data via Questionnaire

Questionnaires

- Past work orders (late March)
- Arran Lake Baptist Church (3/5/18)
- Dogwood Festival (4/28/18)
- Hollywood Heights Community Watch (5/10/18)

City of Fayetteville
Beaver Creek 2 Watershed Master Plan Questionnaire

The City of Fayetteville has initiated a watershed study and master plan for a portion of the Beaver Creek watershed. The portion of Beaver Creek under study includes the area between McFayden Lake and Winnabow Drive in Shenandoah Beaver Creek North subdivision. The purpose of the study is to better understand the capacity of the existing streams and piped drainage system and identify needed improvements to the drainage system.

Please take a few moments to provide feedback on any issues you may be experiencing to allow us to obtain information about drainage, flooding, and erosion problems as part of our study. If you own multiple properties, please complete [a separate questionnaire for each property](#). Thank you for your participation!

OK

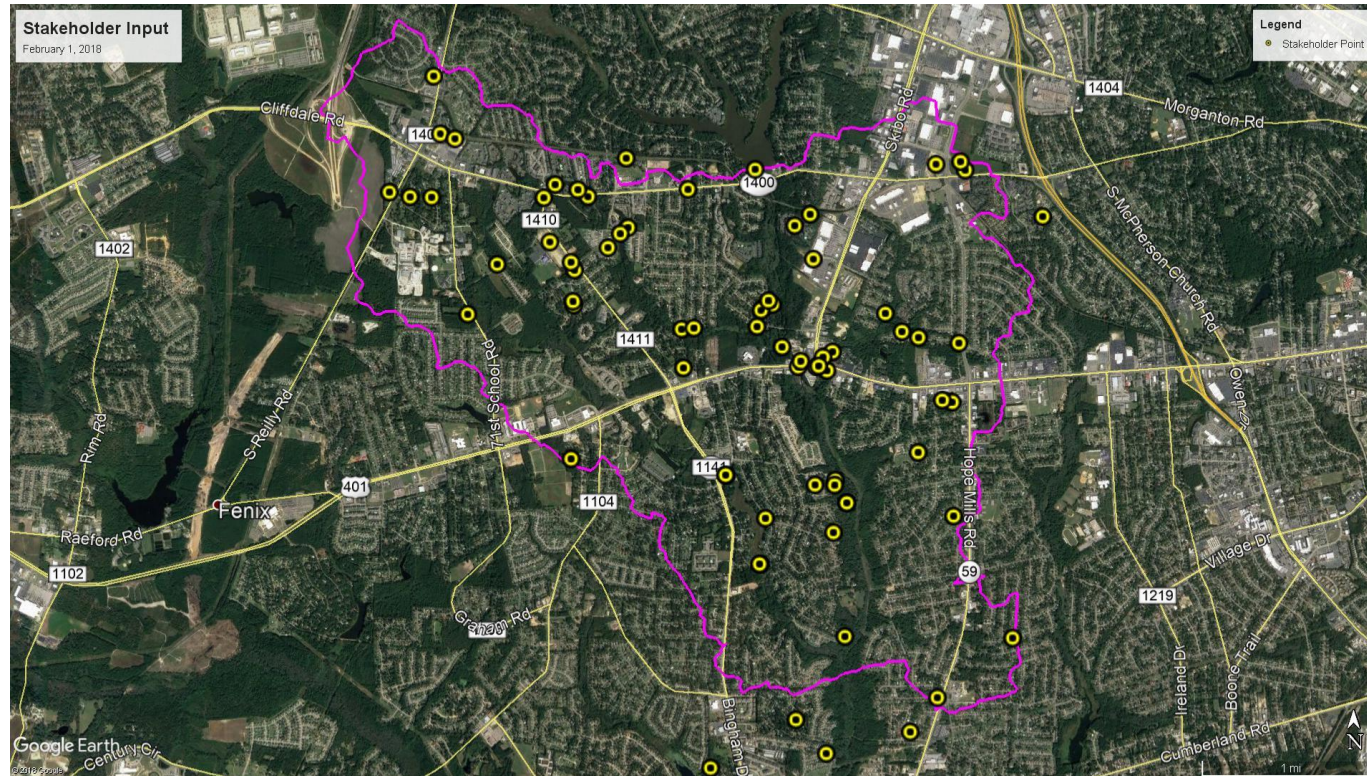
1. Please share your contact and location information.

Name

Property Address

Primary Residence or Business (if different)

Secondary System Selection



City stakeholders (2/1/18)

- *Emergency Services*
- *Engineering*
- *Street Maintenance*
- *Stormwater Inspections*
- *Traffic Construction Management*
- *Zoning and Planning*

Secondary System Selection

Step 1 – Collect Data

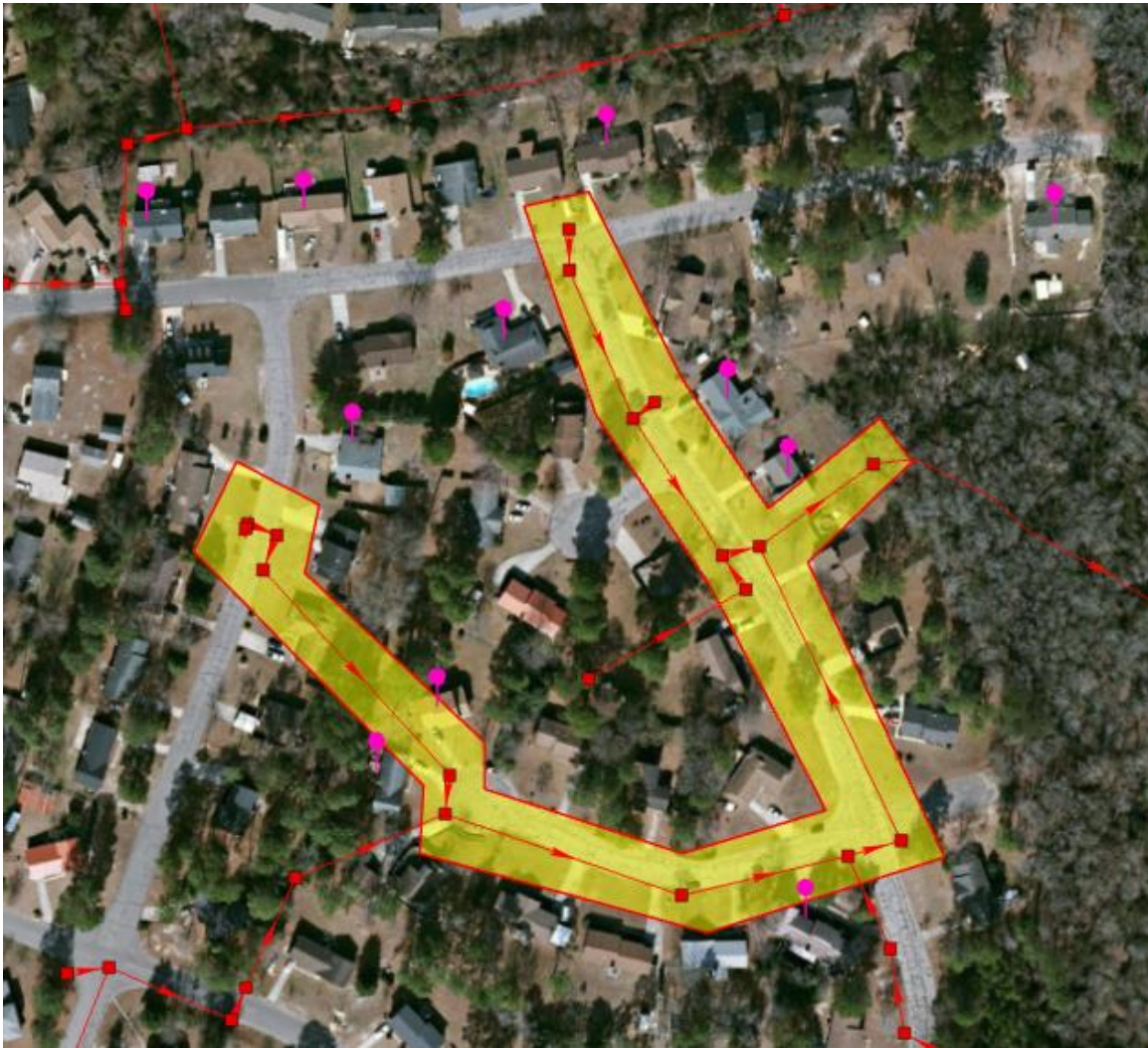
- Work Order data (2/16/18)
- Public meeting (3/13/18)

	A	B	C	D	E	F
1	System	Work Order	Date	Address	Street	Description
2	Main Trac	391384	10/29/2010	1500	Acacia Dr	No infrastructure
3	Main Trac	264634	9/6/2008	5800	Aftonshire Dr	Jet rod storm drain
4	Main Trac	574397	4/1/2014	2044	Amoora Dr	Sink hole behind storm drain
5	Main Trac	250800	7/16/2008	5703	Andes Court	Cave in
6	Main Trac	314123	7/22/2009	5703	Andes Court	Jet rod storm drain
7	Main Trac	229466	4/7/2008	1008	Arberdale Dr	Paving changed drainage pattern
8	Main Trac	395981	12/3/2011	1018	Arran Circle	Ditch maintenance
9	Main Trac	257479	8/8/2008	1149	Arran Circle	Ditch maintenance
10	Main Trac	264620	9/5/2008		Arran Circle	Ditch maintenance
11	Main Trac	14959	7/13/2004	2552	Arrow Ridge Way	Grass growing in roadway
12	Main Trac	3188	3/19/2004	753	Ashbrook Rd	Creek blockage
13	Main Trac	130443	9/13/2006	753	Ashbrook Rd	Creek blockage
14	Main Trac	435109	7/20/2011	756	Ashbrook Rd	Erosion in drainage ditch
15	Main Trac	436316	7/25/2011	756	Ashbrook Rd	Erosion in drainage ditch
16	Main Trac	580215	5/9/2014	756	Ashbrook Rd	Erosion in drainage ditch
17	Main Trac	11286	7/11/2006	1821	Ashton Rd	Drainage backing up flooding property
18	Main Trac	159382	3/16/2007	1821	Ashton Rd	Drainage backing up flooding property
19	Main Trac	248035	7/7/2008	1821	Ashton Rd	Drainage backing up flooding property
20	Main Trac	327135	10/6/2009	1821	Ashton Rd	Cave in



Secondary System Selection

Secondary system data



Secondary System Selection

Secondary system data

4. Hallberry Drive (1,809 feet)

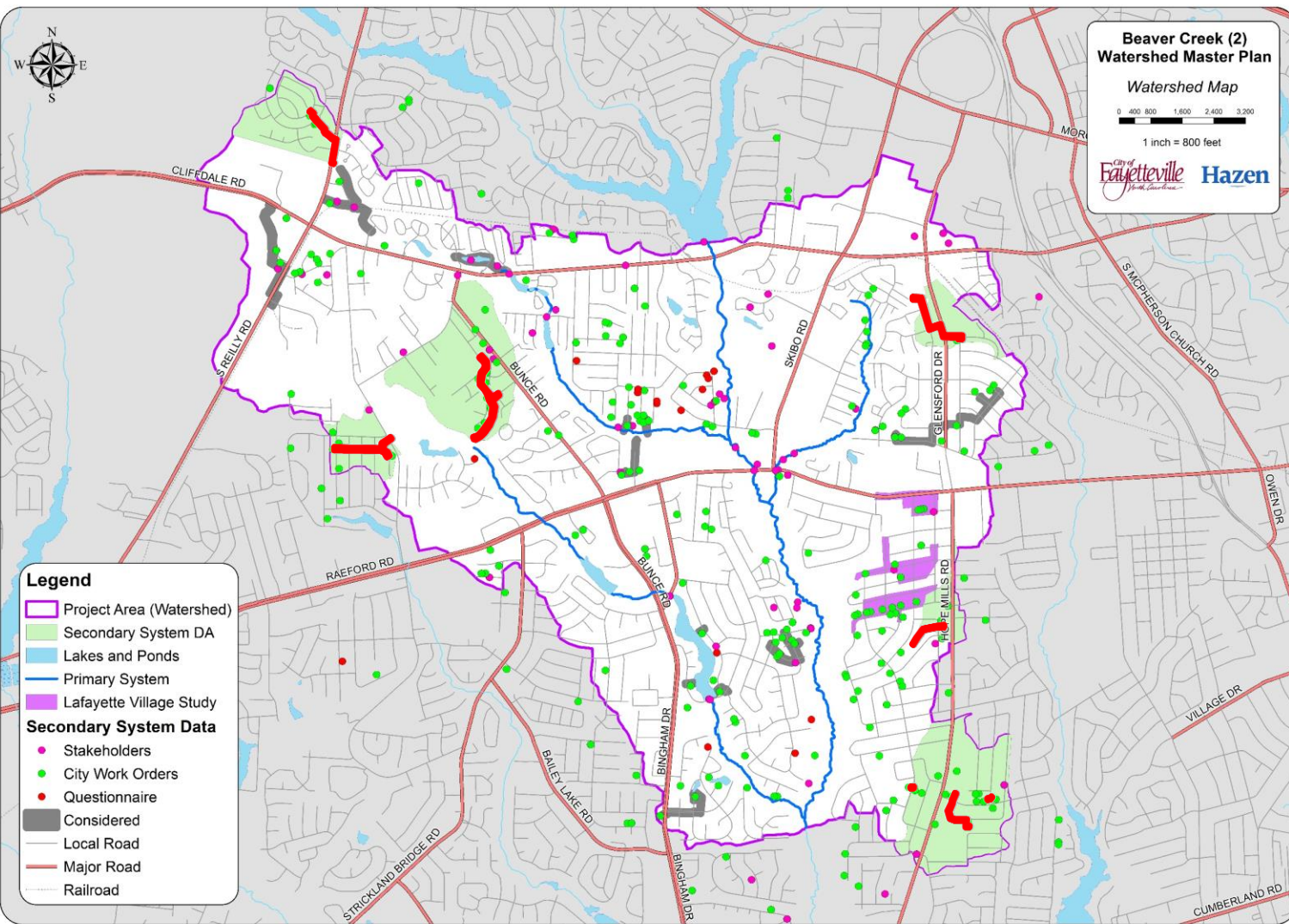
- Two reports of road flooding along Hallberry Dr. (2005/2008)
- One report of runoff from road causing flooding along Barley Hill Ct. (2006)

5. Portsmouth Drive (2,696 feet)

- Four reports of property flooding along Portsmouth Dr. (2006/2010/2013/2014)
- One report of daycare flooding possibly due to undersized culvert beneath Portsmouth (2018). This may be a duplication of the 2010 report listed in first bullet.
- Note: property flooding upstream of culvert was reported in 2010; Stormwater Inspections Group indicated culvert under Portsmouth replaced 8-9 years ago; may have solved issue for Daycare / 6358 Portsmouth.

6. Barton's Landing Place (595 feet)

- Reports from two different City departments about possible road overtopping in the vicinity (2018)

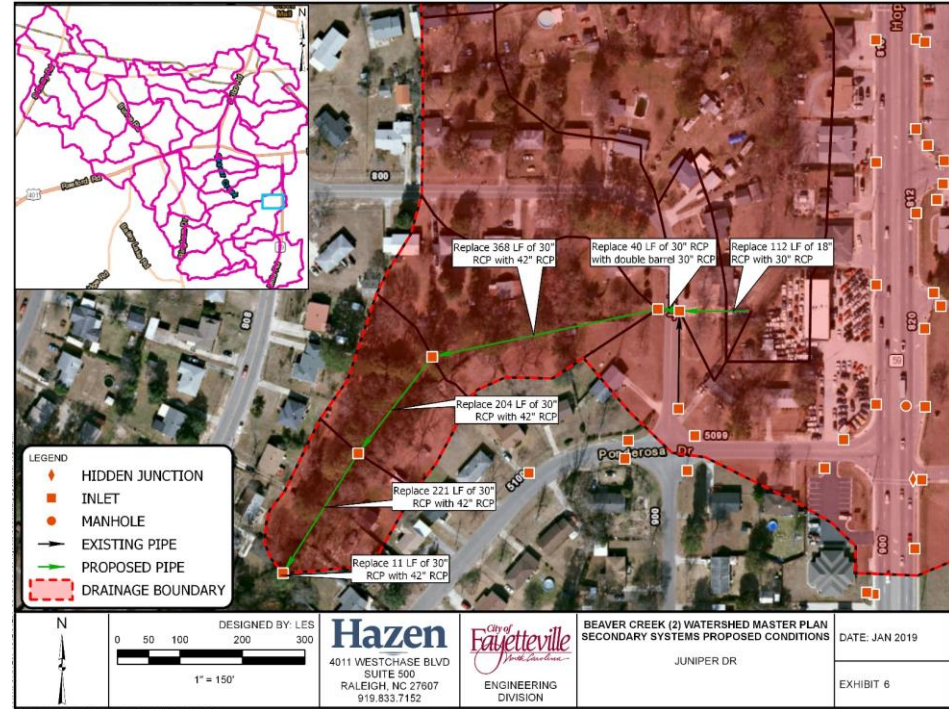


Secondary Systems

Secondary systems considered and chosen

Secondary System Status

- ✓ Surveying complete
- ✓ Models complete
- ✓ Approx. 6,800 linear feet of improvements identified
- Current activity
 - Cost opinion and prioritization
 - Master plan document



Why go through the selection process?

Engineering Fee Data

For similar projects

- Range of costs to model \$5 - \$8 / foot (excludes surveying)
- Average: \$6.90 / foot
- Beaver Creek (2): \$3M (model entire watershed)

Prioritization

- City prioritization scorecard
 - Safety, property damage, degree of flooding, public street impact
- Rank/prioritize all improvements

Stormwater Project Evaluation Form									
Title of Project:									
Location of Project:									
Completed by:									
Remedial: <input checked="" type="checkbox"/>		Capital: <input type="checkbox"/>		Current Scoring		Modified Scoring Criteria		Modified Scoring	
				Scorecard				Design Criteria	
Criteria	Score Range	Score	Points	Score Range	Score	Points			
01	Safety		0	Safety		0			
	Potential for Loss of Life or Limb	0		Potential for Injury / Loss of Life	0				
	No Potential for Loss of Life or Limb	0		No Potential for Loss of Life or Limb	0				
02	Property Damage		0	Property Damage		0			
	Home or Business	0		Livable Space	0				
	Detached Buildings	0		Basement	0				
	Front and/or Rear Yards	0		Crawl space / Mechanicals	0				
	Other	0		Garage / Shed / Driveway	0				
				Landscape damage / Yard flooding	0				
03	Degree of Flooding		0	Degree of Flooding			Not applicable from criteria		
	002 Year Storm	0		002 Year Storm					
	010 Year Storm	0		010 Year Storm					
	025 Year Storm	0		025 Year Storm					
	050 Year Storm	0		050 Year Storm					
	100 Year Storm	0		100 Year Storm					

Stormwater Master Plan

- Documents and presents results
- Quantifies planning cost opinion
- Prioritizes improvements for implementation



Use of the Study

Within the BC2 Watershed

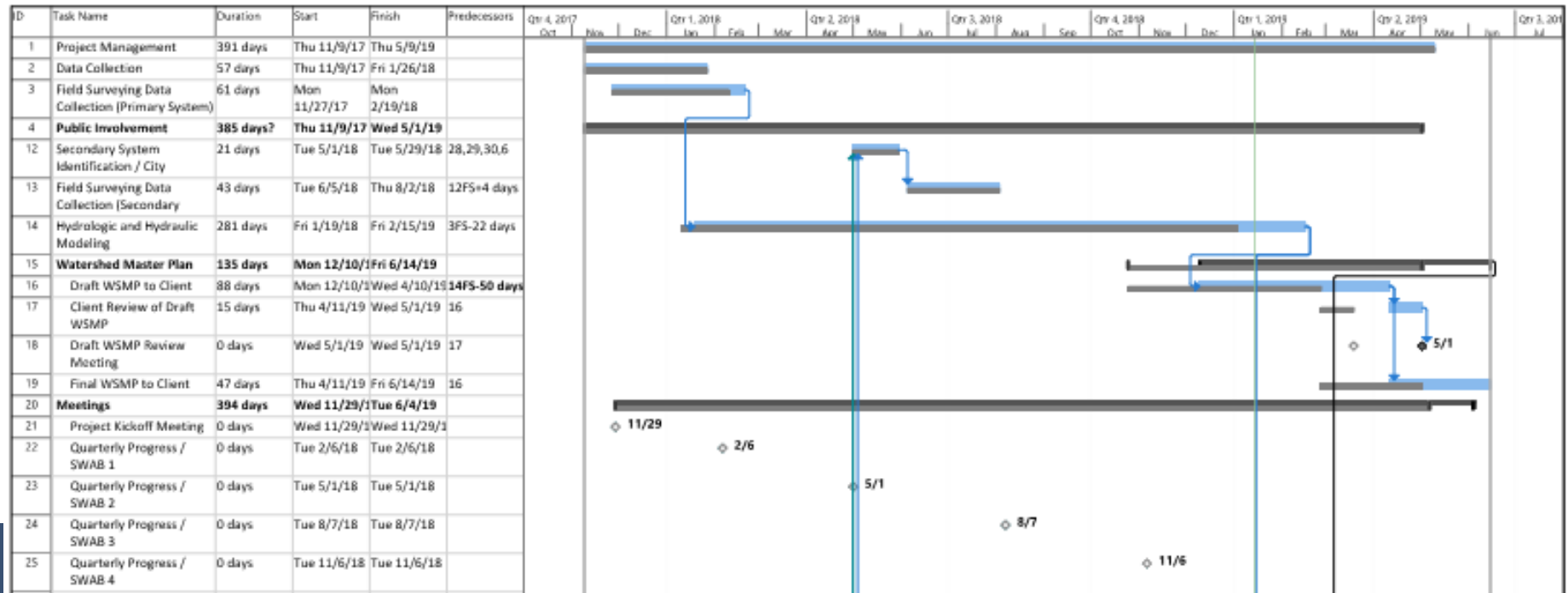
- ✓ Improvements needed
- ✓ Basis of design
- ✓ Financial planning
- ✓ Capital Improvement Program planning
- ✓ Prioritization

- ✗ Detailed design
- ✗ Construction
- ✗ Entirely eliminate flooding
- ✗ New FEMA zones

Looking Ahead

Remaining Schedule

- Mid-April: Draft document completed
- Mid-June: Final document completed



Thank You

Travis Crissman, PE

Hazen and Sawyer

919-863-9262

tcrissman@hazenandsawyer.com

Hazen