Watershed Master Plan Program – Locks Creek and LOMR Update

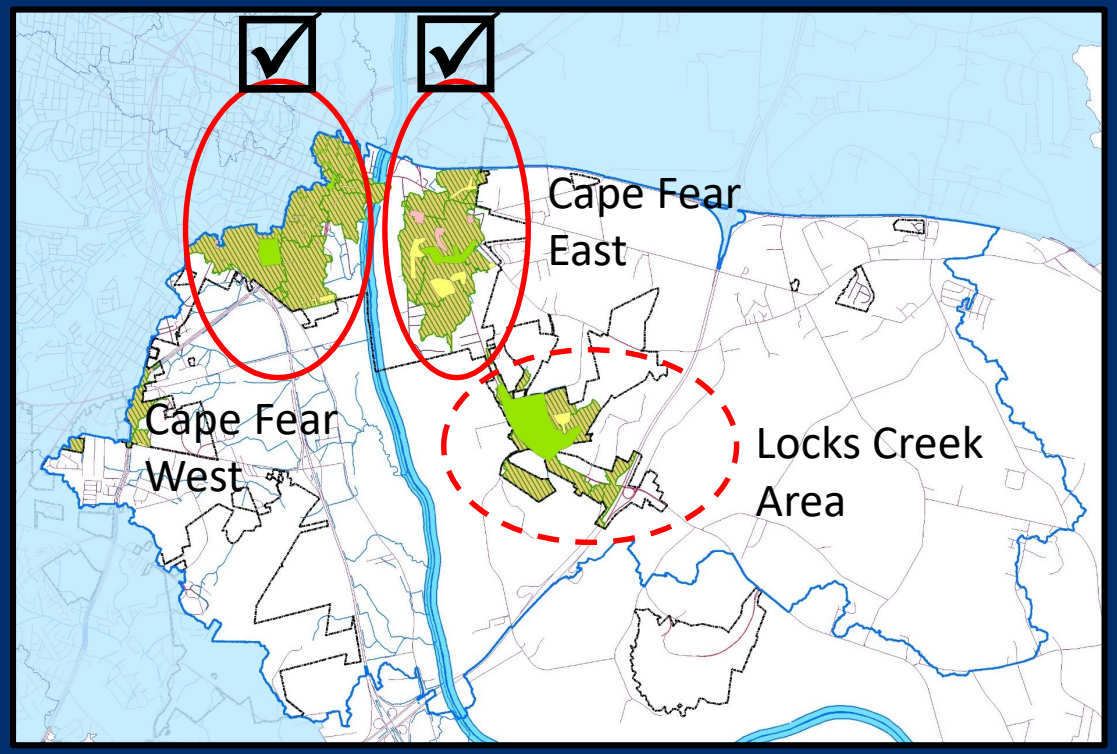
April 4, 2022

FAYETTEVILLE NC

Agenda

1. Background
2. Locks Creek Proposed Solutions
3. Locks Creek LOMR
4. Council Request

Cape Fear 2 Watershed



Work has been Completed by:
Consultant: Gradient
Sub Consultant: Woolpert
PgM: Freese and Nichols

Results Presented by CoF

LOS Watershed Master Plan Standards

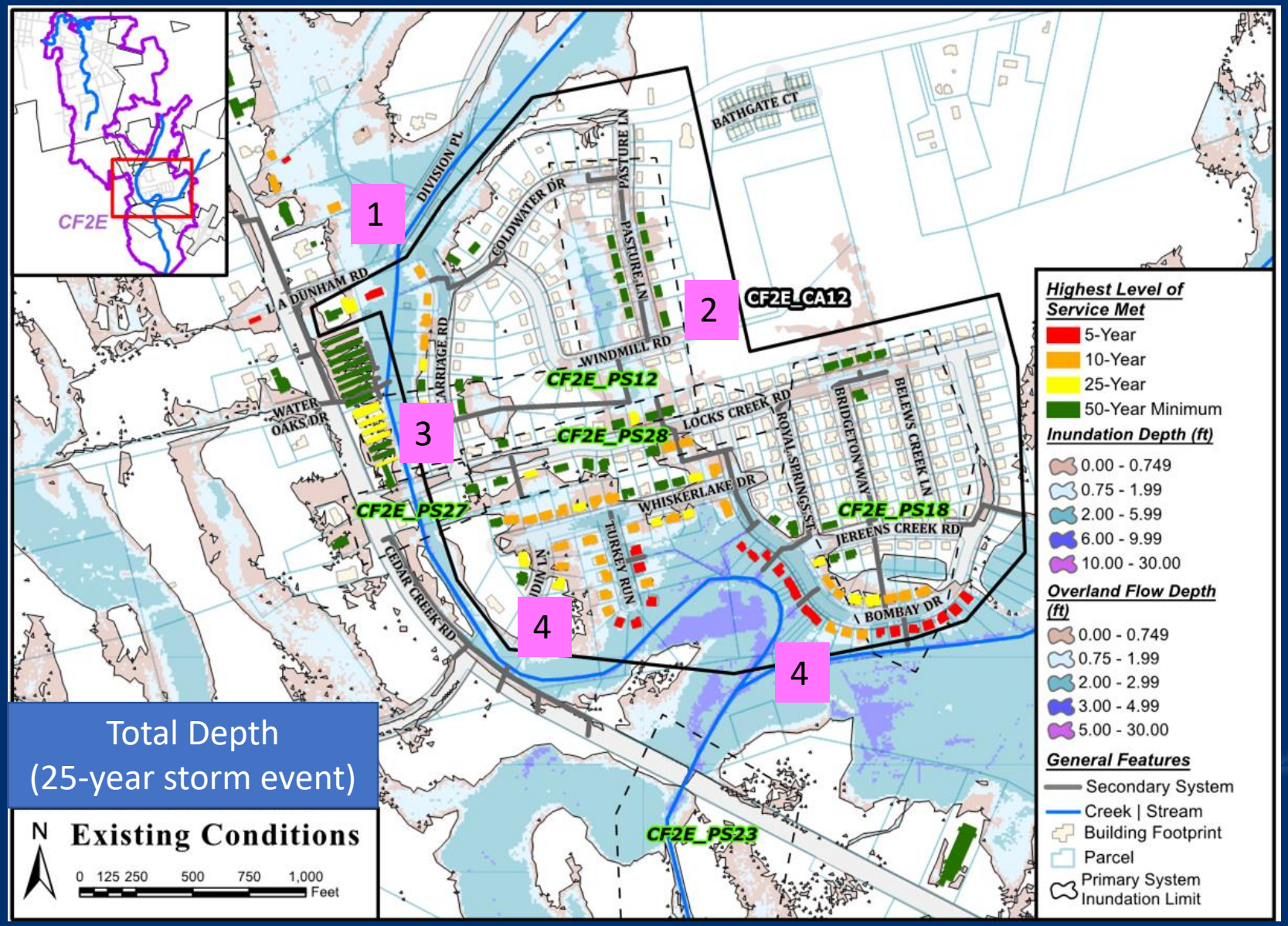
Level of Service for Flooding is defined as the largest storm event that can be safely conveyed by the stormwater system or asset in consideration.

5.51" of rain in 24 hrs. is a 10 year event.
6.68" of rain in 24 hrs. is a 25 year event.
7.63" of rain in 24 hour is 50 year event

LOS Discovery and Design for Capital Projects Focused on RoW Infrastructure and Access

Classification	Level of Service Standard Design			
	10 Year	25 Year	50 Year	100 Year
Secondary System (closed-pipe drainage)				
-Conduits and On-grade Inlets (City/Private/DOT) (10 yr)	■			
-Inlets at Sag Locations- City/Private (25 yr)		■		
-Inlets at Sag Locations- DOT (50 yr)			■	
-Major Trunk Lines (25 yr)		■		
Habitable Structures (10 yr)	■			
Emergency Spillway (Varies)	Varies			
Road Crossings				
-Culverts – City/Private (25 yr)		■		
-Culverts – DOT (50 yr)			■	
-Bridges - City/Private (25 yr)		■		
-Bridges – DOT (50 yr)			■	
Disconnected Structures (Single Access)			■	
Essential Facilities – Tier 1 (100 yr), Tier 2 (50 yr)			■	■

Locks Creek - Issues



Total Depth
(25-year storm event)

1. Street Flooding: LA Dunham, Carriage Rd.
2. Street Flooding: Pasture Lane, WindMill Rd.
3. Street Flooding: Locks Creek Rd.
4. Street Flooding: Whiskey Run, Turkey Run, Bombay Drive

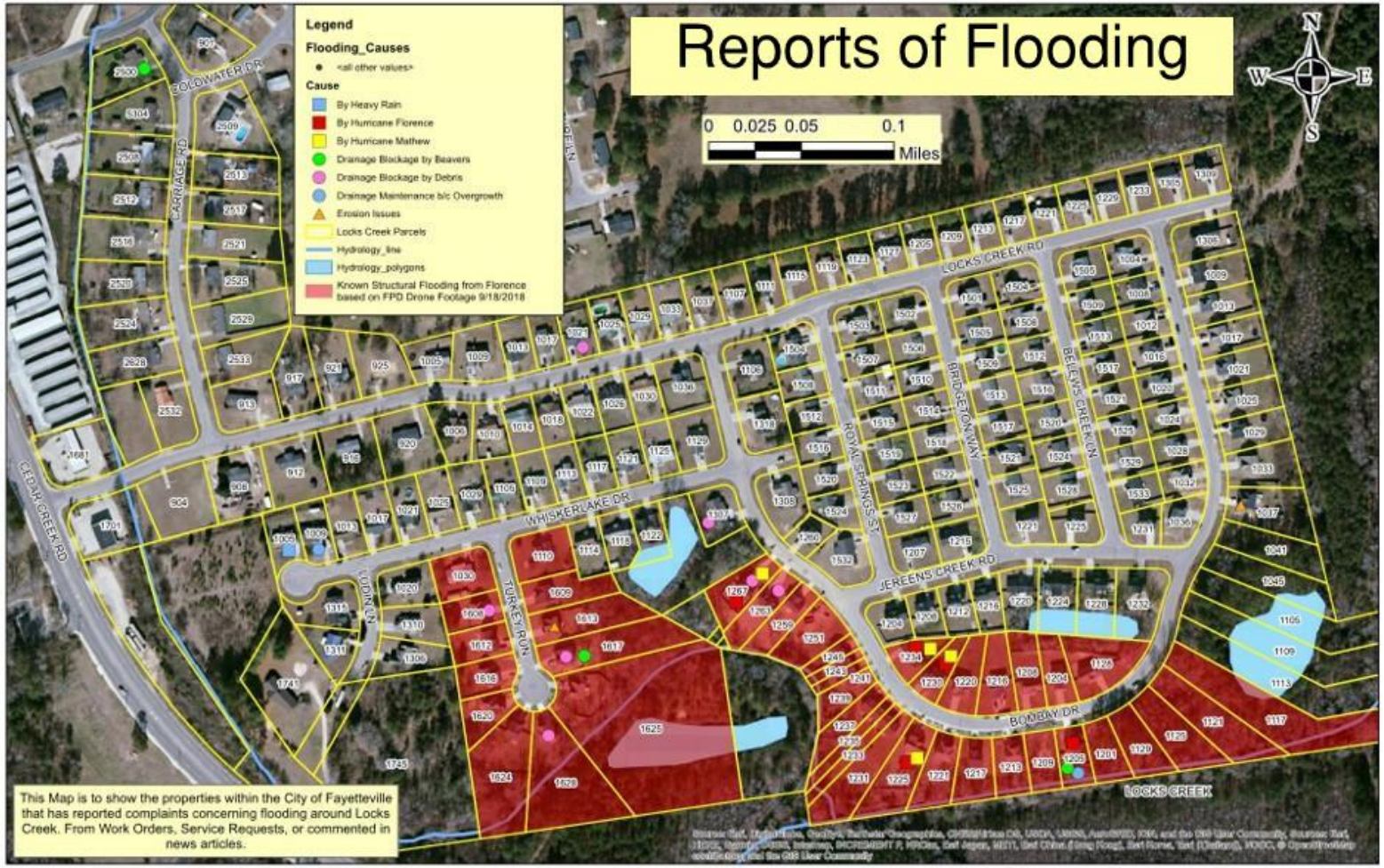
4. Homes on Bombay Drive and Turkey Run < 5 LOS

Locks Creek - Issues

L. A. Dunham Drive

Bombay Drive

Summary of Past Flooding Reports – June 2020



Locks Creek Solutions Investigated

Primary Systems

- Rivers, streams
- Major culverts under roadways

Secondary Systems

- Neighborhood Drainage
- Pipes, Ditches, Swales

Total 7 Solutions Explored

- LOS Discovery and Solution Design for Capital Projects Focused on RoW Infrastructure and Access
    - Driver of the projects are to seek solutions to reduce flooding or improve infrastructure on streets and as available the auxiliary benefit of protecting structures when integral to the Capital Project

Snapshot from Dec '21

Little Cross Creek

Study Area
69 – Total Sub-basins
20 – Priority I Sub-basins
2.13 – Sq. Miles

Study Identified
83 – Concern Areas (CAs)
37 – CAs Selected
41 – Proposed Solutions

Miles of Impacted Lane Length
Identified – 6.6 | Resolved – 3.3

Number of Traverse Road Crossings
Identified – 12 | Resolved – 8

Number of Disconnected Structures
Identified - 38 | Resolved – 24

Number of Impacted Structures

	10-yr	25-yr	50-yr
Identified –	59	103	115
Resolved –	44	72	70

Current Total Cost $57,815,500

Beaver Creek 3

Study Area
31 – Total Sub-basins
10 – Priority I Sub-basins
1.55 – Sq. Miles

Study Identified
39 – Concern Areas (CAs)
23 – CAs Selected
23 – Proposed Solutions

Miles of Impacted Lane Length
Identified – 4.7 | Resolved – 4.1

Number of Traverse Road Crossing
Identified – 33 | Resolved – 23

Number of Disconnected Structures
Identified - 10 | Resolved – 8

Number of Impacted Structures

	10-yr	25-yr	50-yr
Identified –	59	110	165
Resolved –	54	92	128

Current Total Cost $40,014,200

Cape Fear West

Study Area
92 – Total Sub-basins*
10 of 30 – Priority I Sub-basins
1.34 – Sq. Miles

Study Identified
32 – Concern Areas (CAs)
19 – CAs Selected
15 - Proposed Solutions**

Miles of Impacted Lane Length
Identified – 9.1 | Resolved – 6

Number of Traverse Road Crossings
Identified – 34 | Resolved – 12

Number of Disconnected Structures
Identified - 0 | Resolved – 0

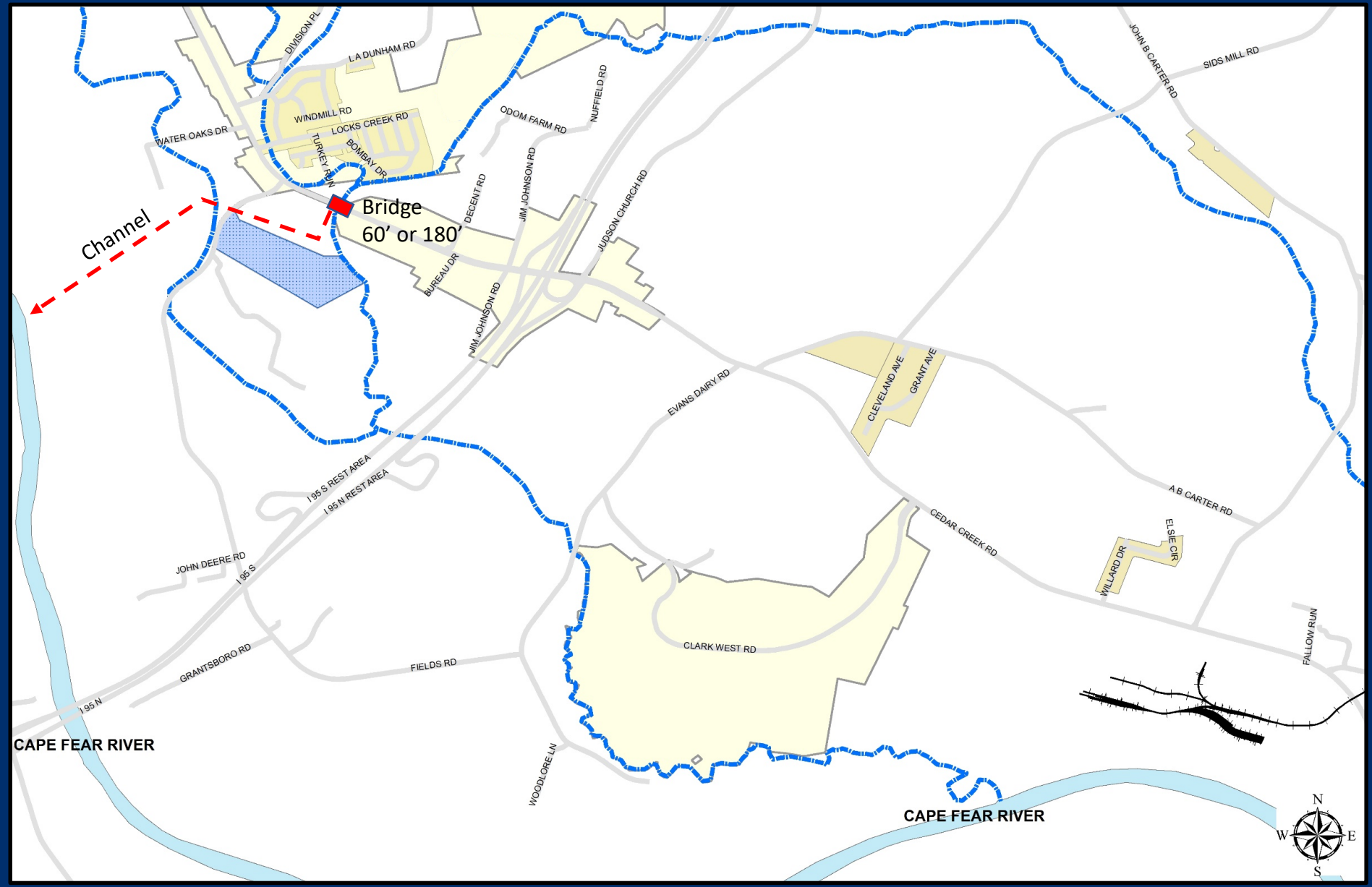
Number of Impacted Structures

	10-yr	25-yr	50-yr
Identified –	12	28	32
Resolved –	10	25	28

Current Total Cost $28,056,900**

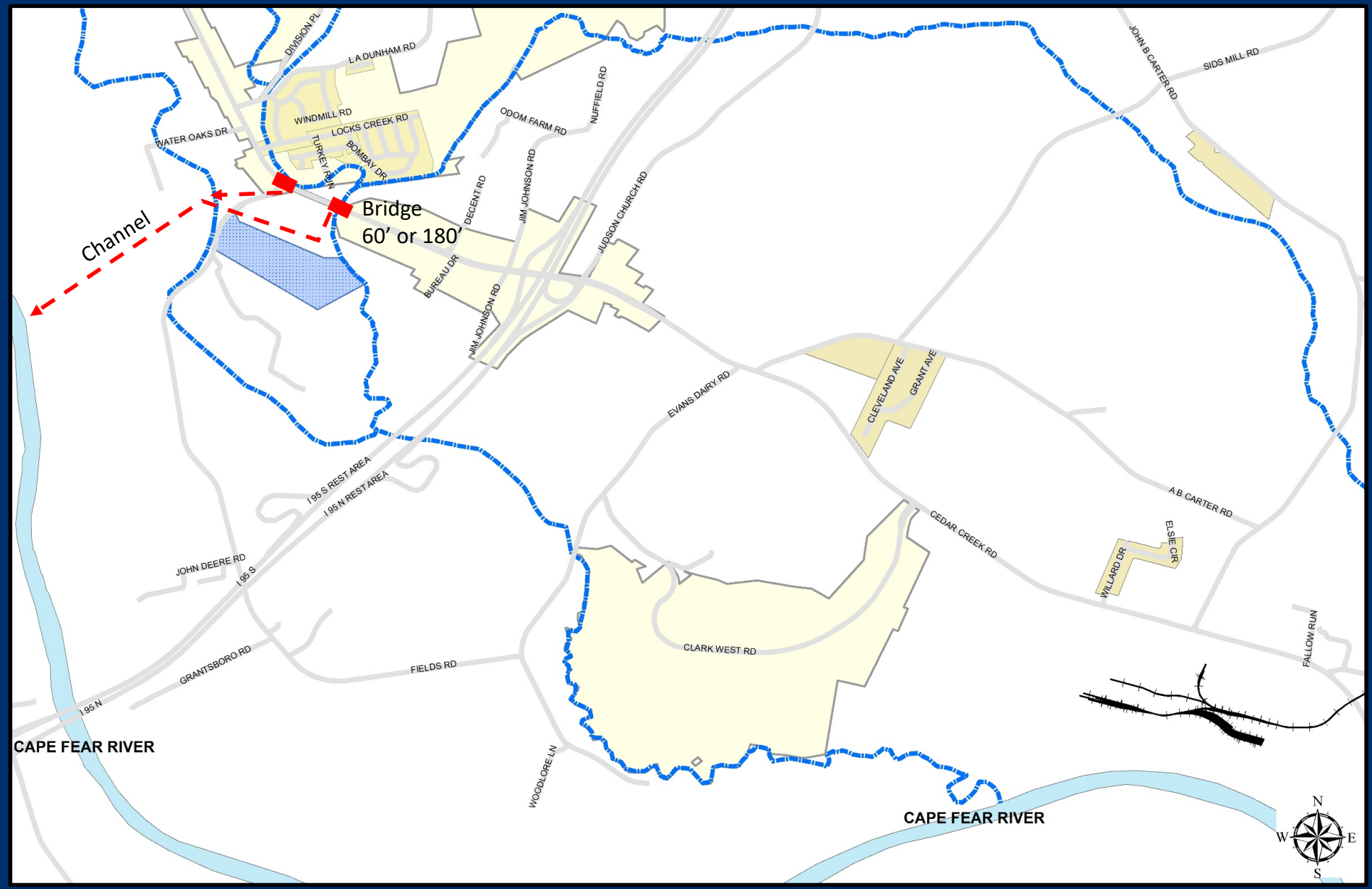
Primary System

1. Convert culvert to 60’ span bridge
2. Or, convert culvert to 180’ span bridge
3. With either bridge option construct a channel westward to divert flow to Cape Fear



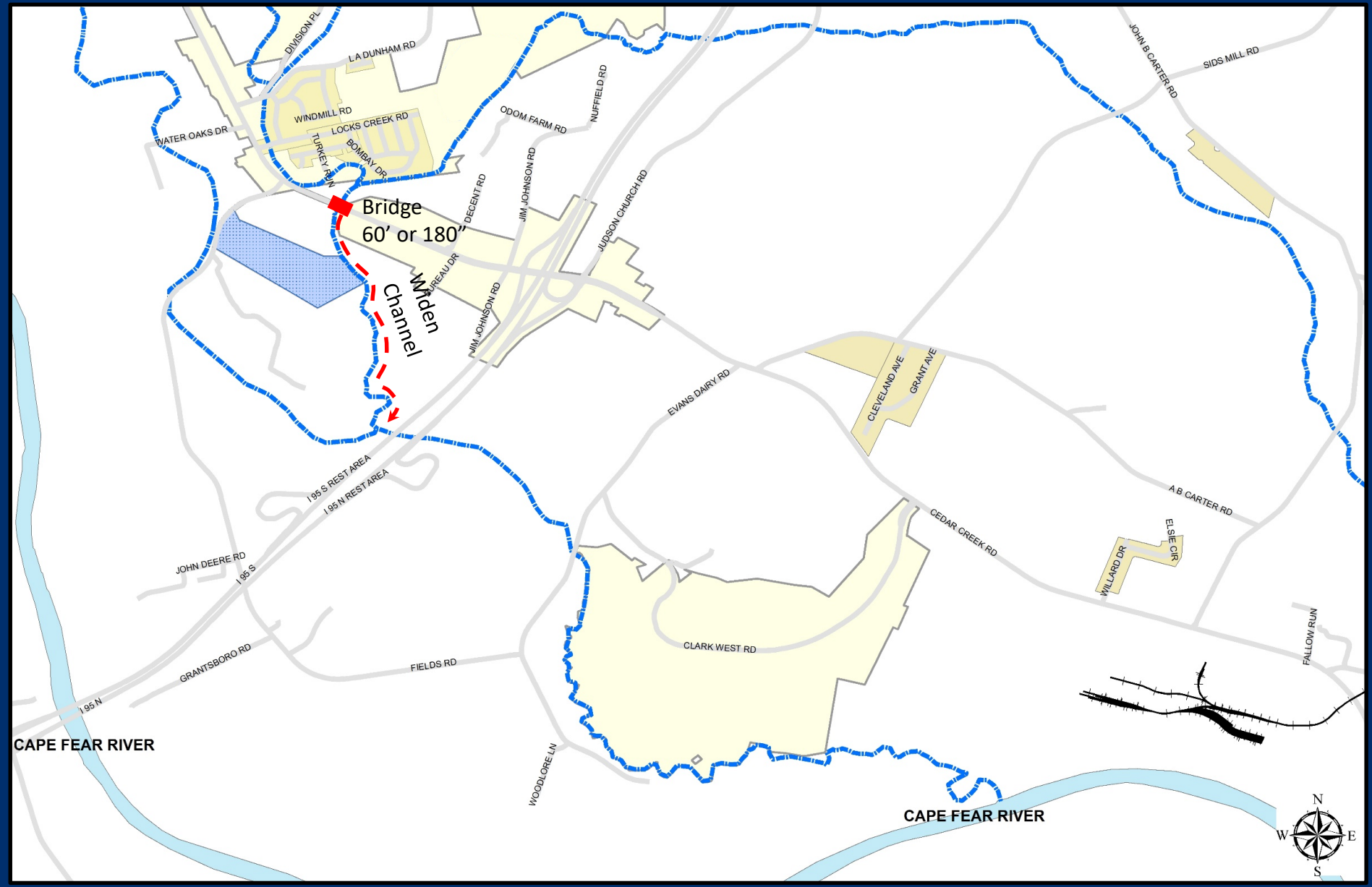
Primary System

1. Convert culvert to 60’ span bridge
2. Or, convert culvert to 180’ span bridge
3. With either bridge option construct a channel westward to divert flow to Cape Fear
4. Intercept flow upstream and divert to Cape Fear



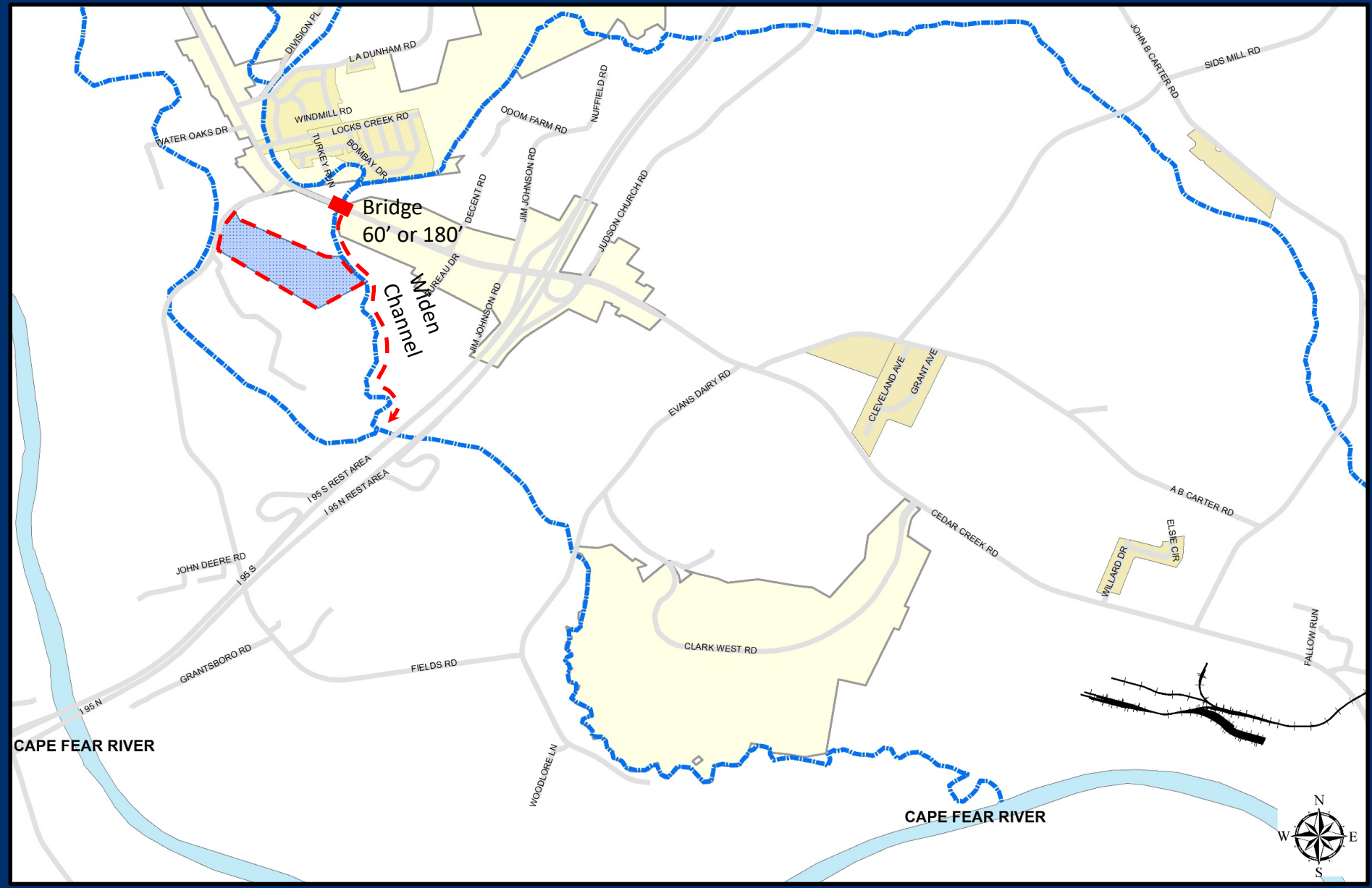
Primary System

1. Convert culvert to 60’ span bridge
2. Or convert culvert to 180’ span bridge
3. With either bridge option widen existing channel southward to tributary to Cape Fear (~1 mile)



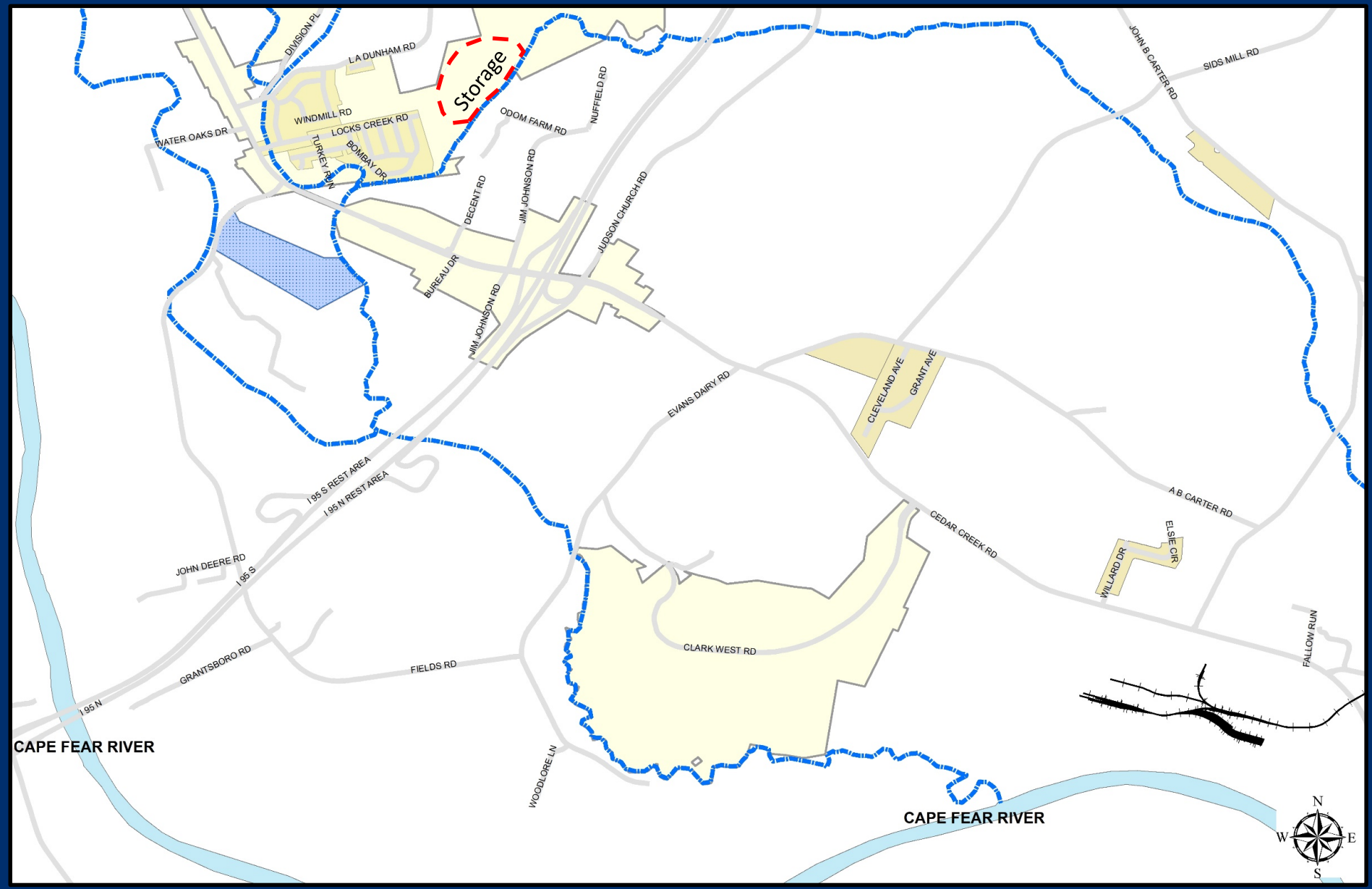
Primary System

1. Convert culvert to 60’ span bridge
2. Or convert culvert to 180’ span bridge
3. With either bridge option widen existing channel southward to tributary to Cape Fear (~1 mile)
4. Use City owned property for offline detention



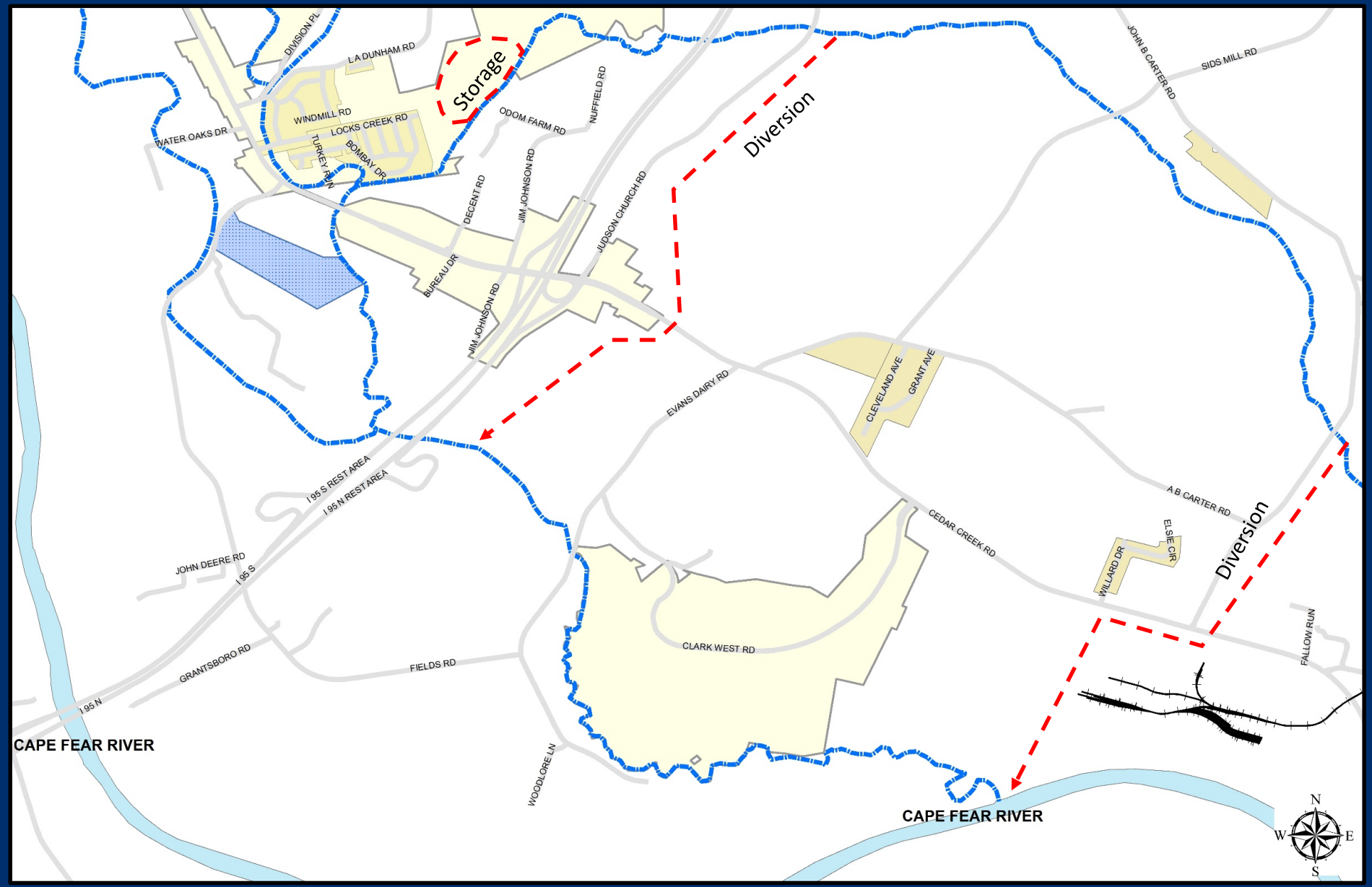
Primary System

1. Off-line Detention



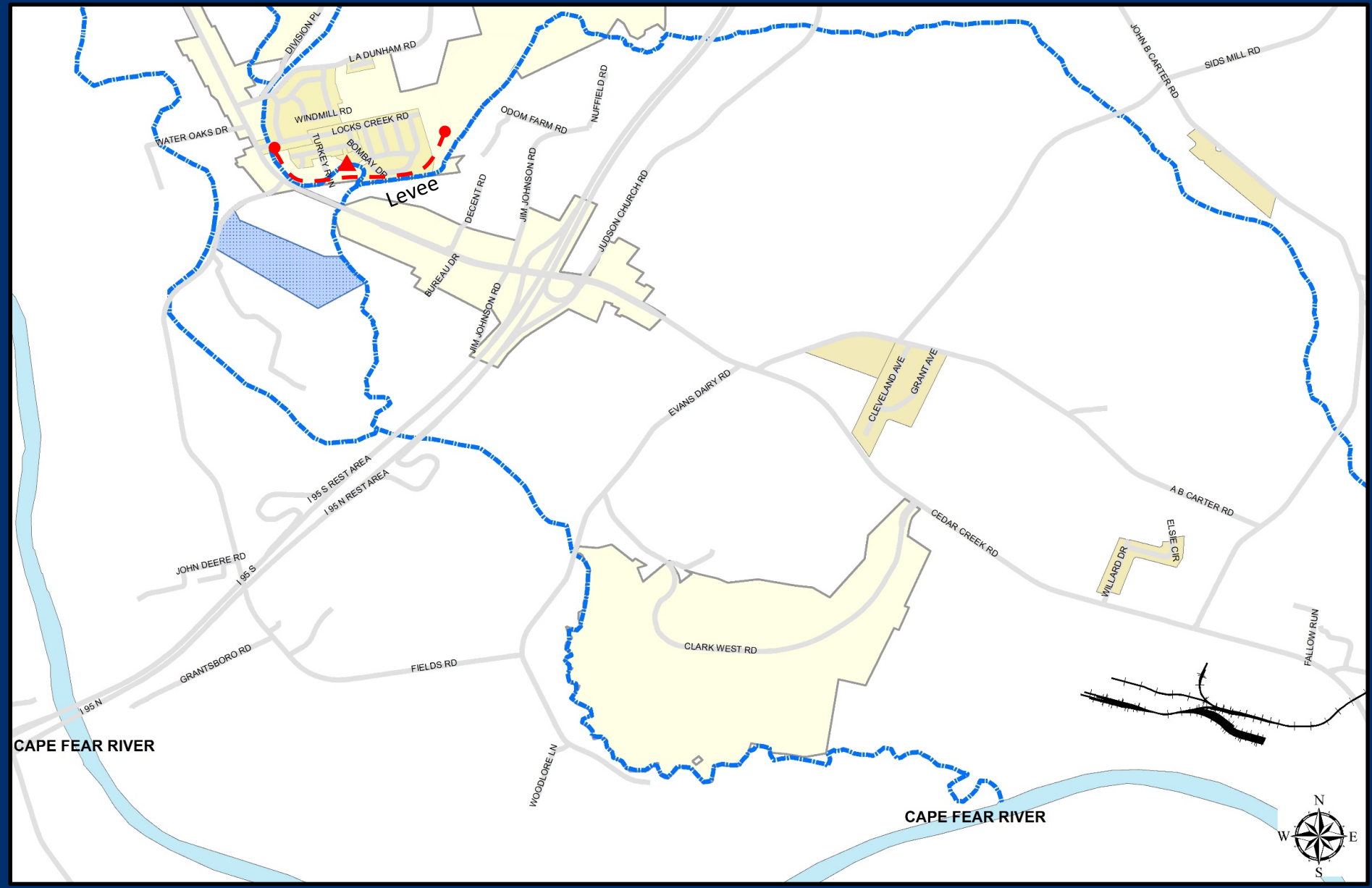
Primary System

1. Off-line Detention
2. Diversion Upstream of Locks Creek



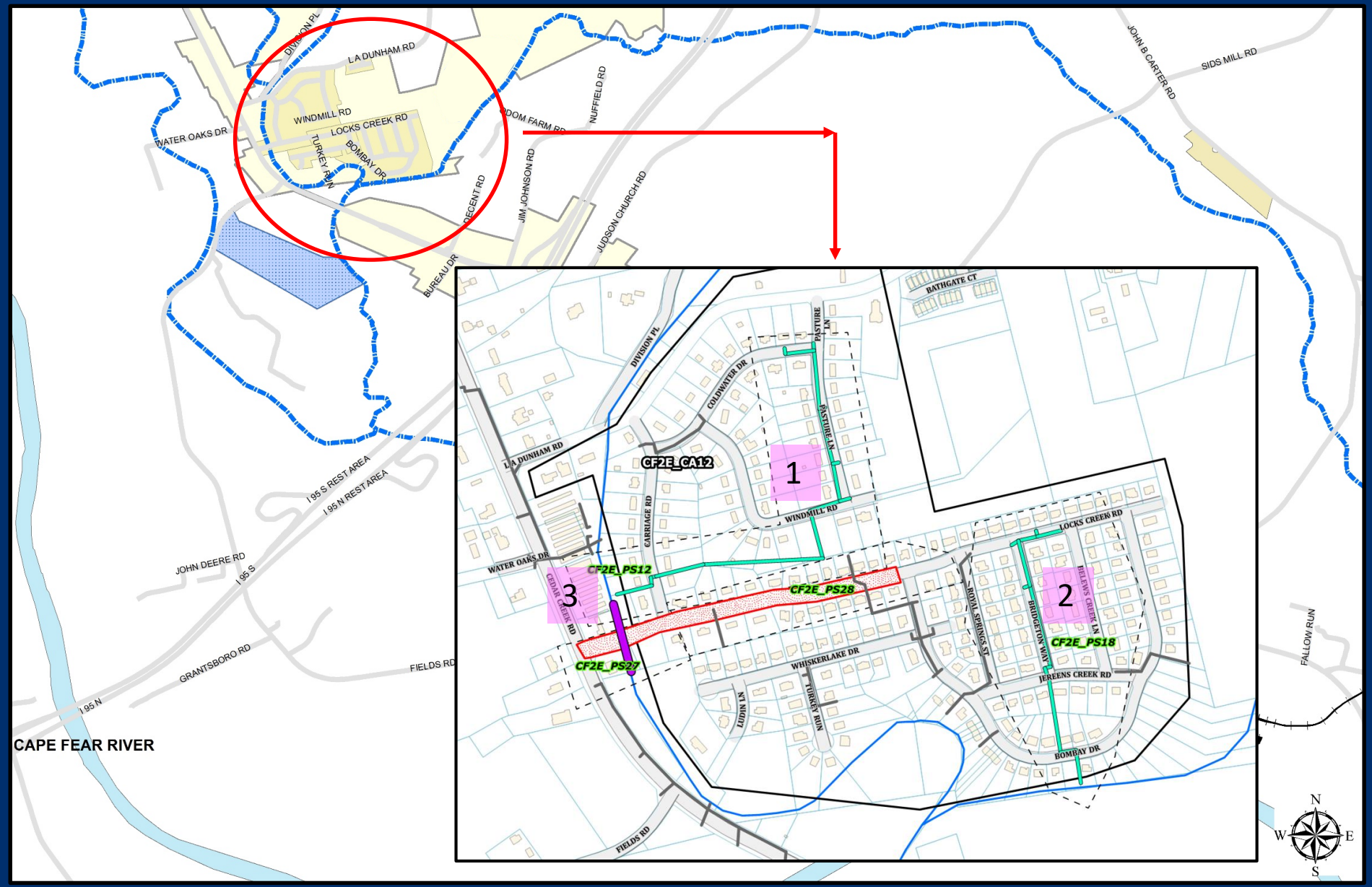
Primary System

1. Levee Wall
2. Pump Station

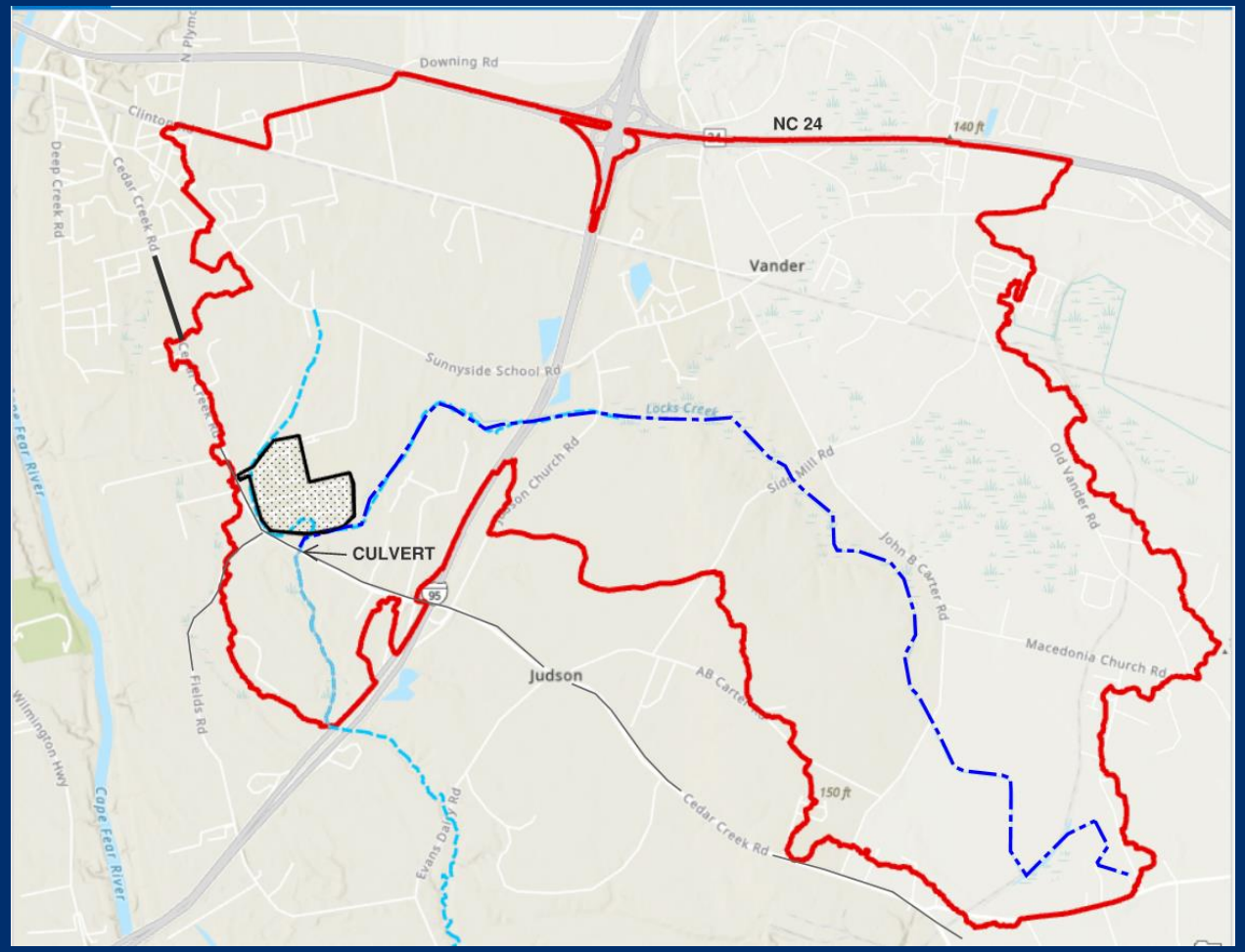


Secondary System

1. Secondary Pipe System on Pasture Lane and Windmill Rd
2. Secondary Pipe System on Locks Creek Rd., and Bridgeton Way
3. Culvert Expansion Under Locks Creek Rd and Increase Road Height on Locks Creek Road



Solution Challenges

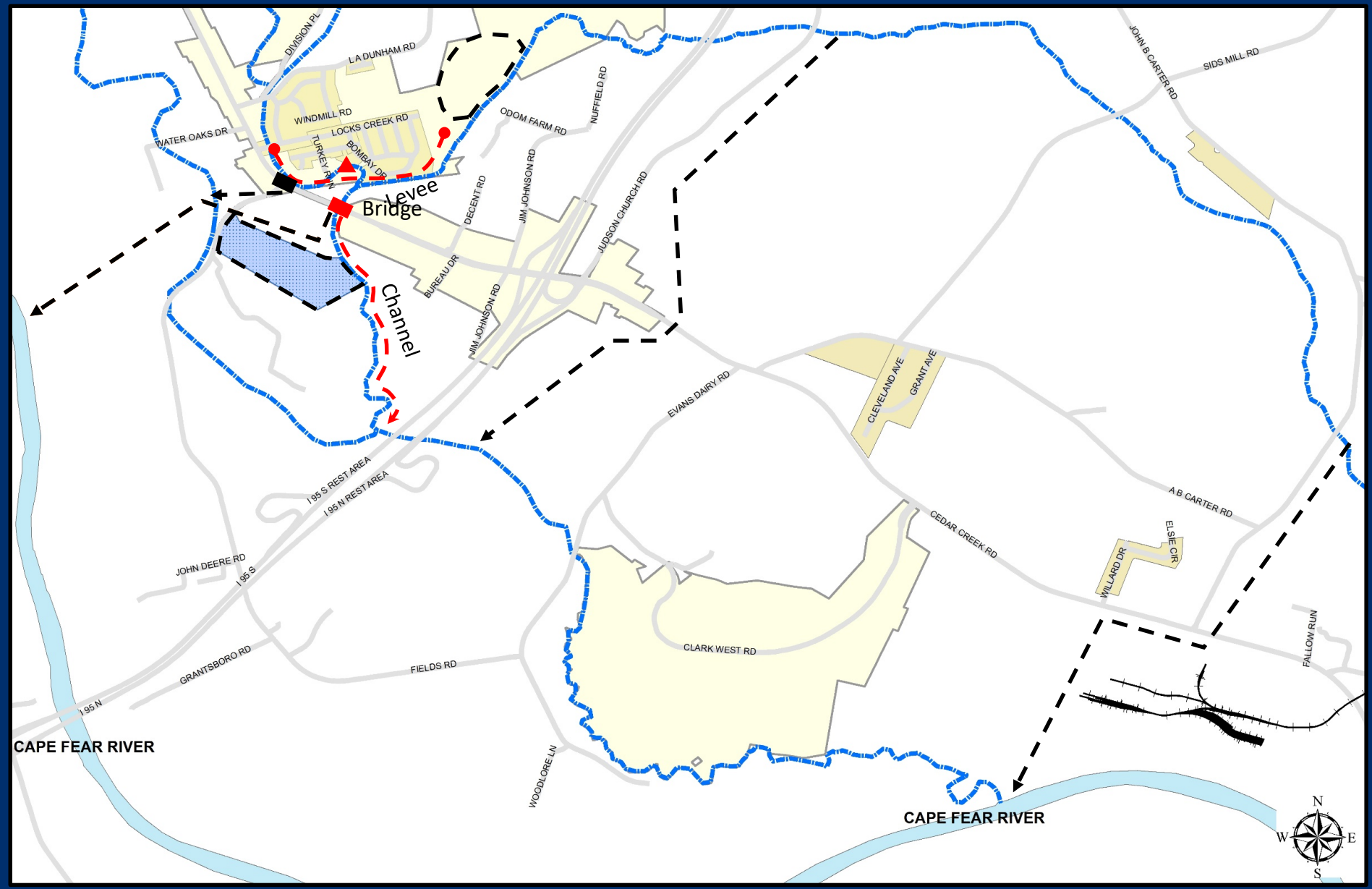


The nature of the Cape Fear 2 (East) watershed is significantly different from the other watersheds.

- 14 Square Miles drains to the culvert at NC 53 (Cedar Creek Rd)
- Length from most remote point in watershed to NC 53 is about 4.5 miles
- The entire area is relatively flat
- Limited ability to quickly remove stormwater runoff during large rain events.

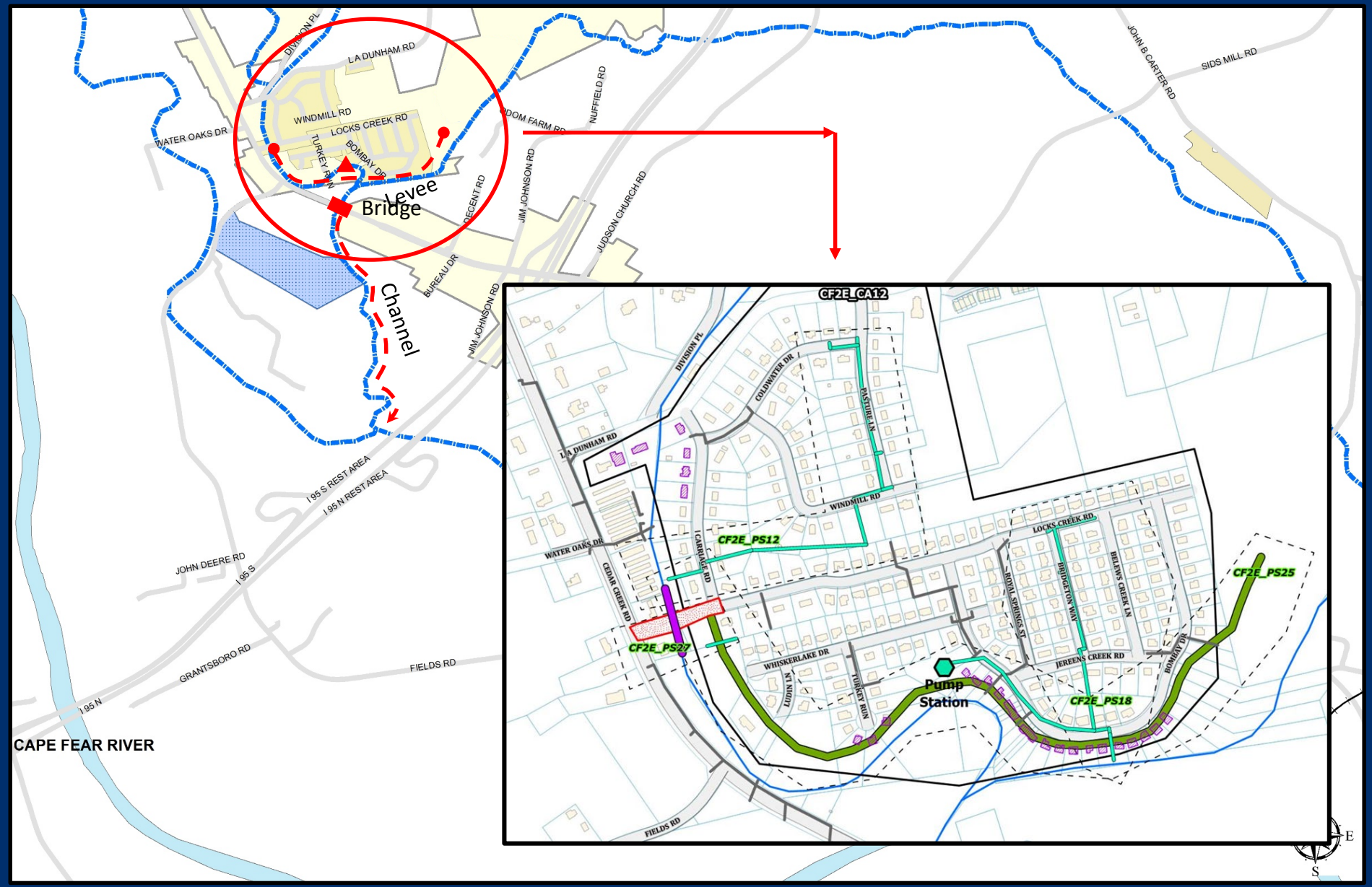
Options Selected for Further Study

1. 180’ Bridge
2. Expanding Channel Southward to I-95
3. Levee and Pump Station



Options Selected for Further Study

1. 180’ Bridge
2. Expanding Channel Southward to I-95
3. Levee and Pump Station
4. Secondary Pipe System on Pasture Lane and Windmill Rd
5. Secondary Pipe System on Locks Creek Rd., and Bridgeton Way
6. Culvert Expansion Under Locks Creek Rd and Increase Road Height on Locks Creek Road



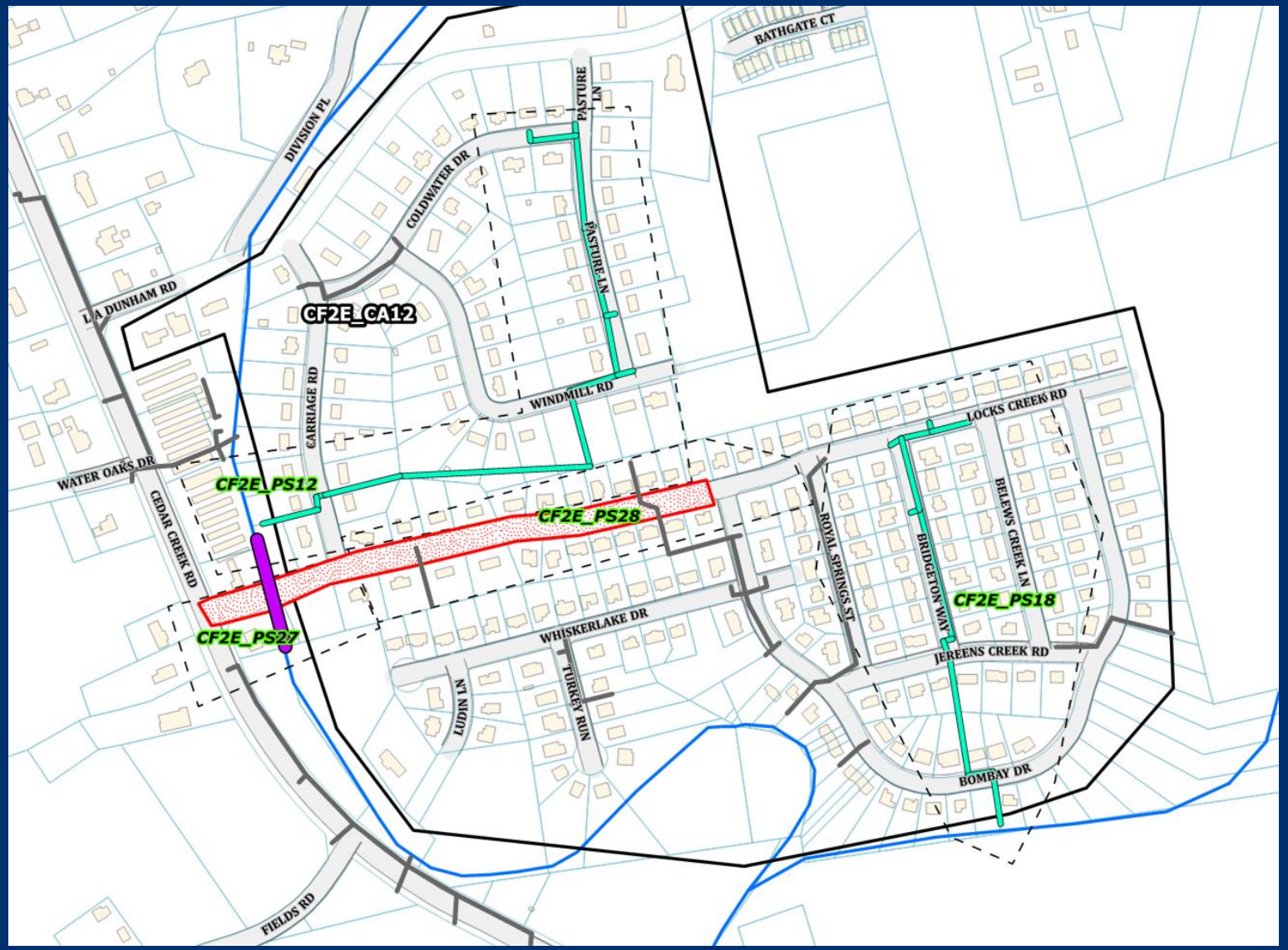
Options for Further Study and Analysis

	Option 1 Phase I	Option 1 Phase II	Option 2
Drainage Improvements on Pasture Ln & Windmill Dr., Locks Creek Rd along Bridgeton Way (Secondary)	☑	☑	☑
Additional culverts on Locks Creek Rd (Secondary)	☑	☑	☑
Increase road height on Locks Creek Rd (Secondary)	☑	☑	☑
Install 180’ long bridge on NC 53 with channel improvements down to I-95 (Primary)		☑	
Construct levee along Locks Creek and tributary and Install stormwater pump station. Includes property acquisition required to construct levee (Primary)			☑

Goals

- 25 Year Level of Service for Roads
- 50 Year Level of Service for Entrance Road to Community
- Explore Co-benefit Options to protect structures

Locks Creek – Option 1 Phase I



Proposed Solutions:

PS12 – Drainage Improvements on Pasture Ln & Windmill Rd

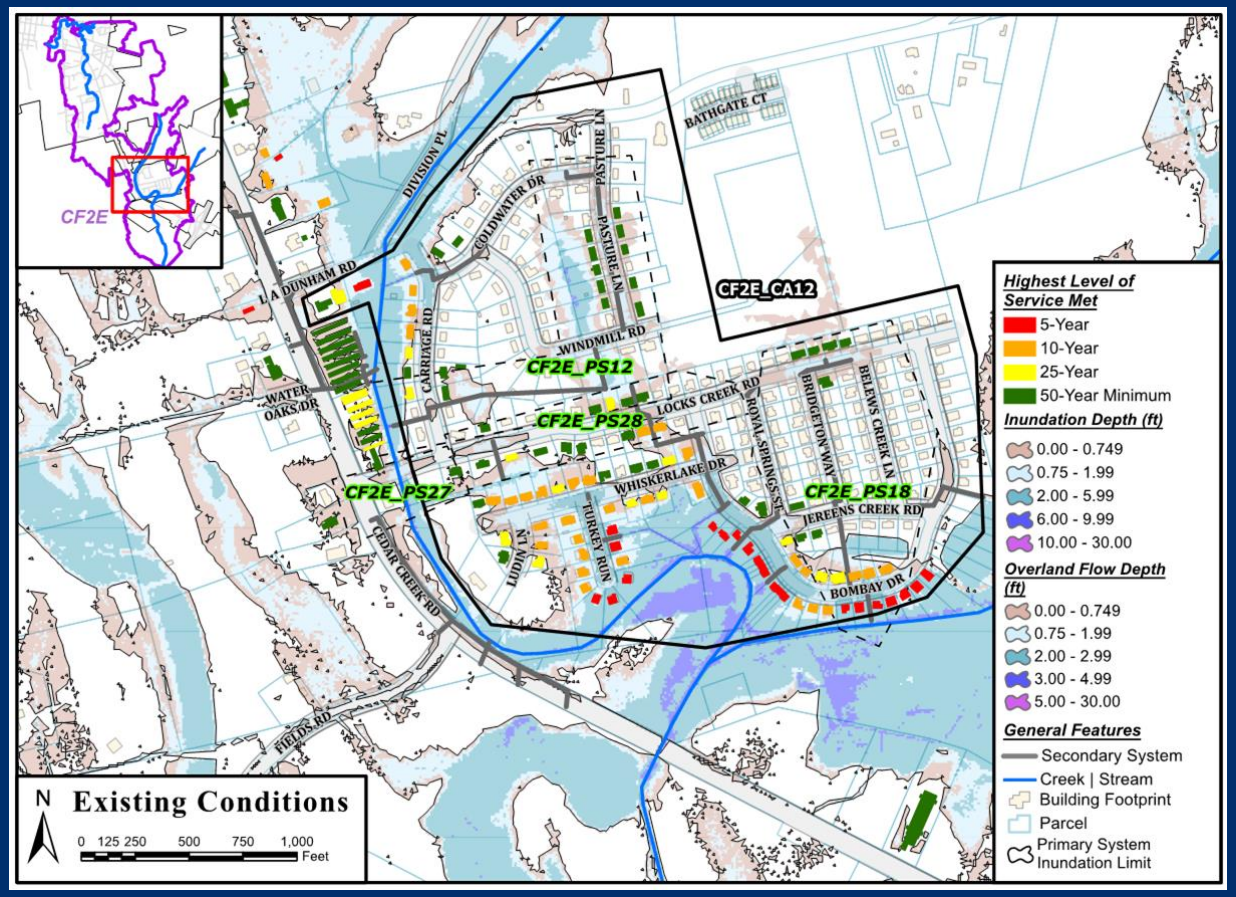
PS18 – Drainage Improvements from Locks Creek Rd along Bridgeton Way

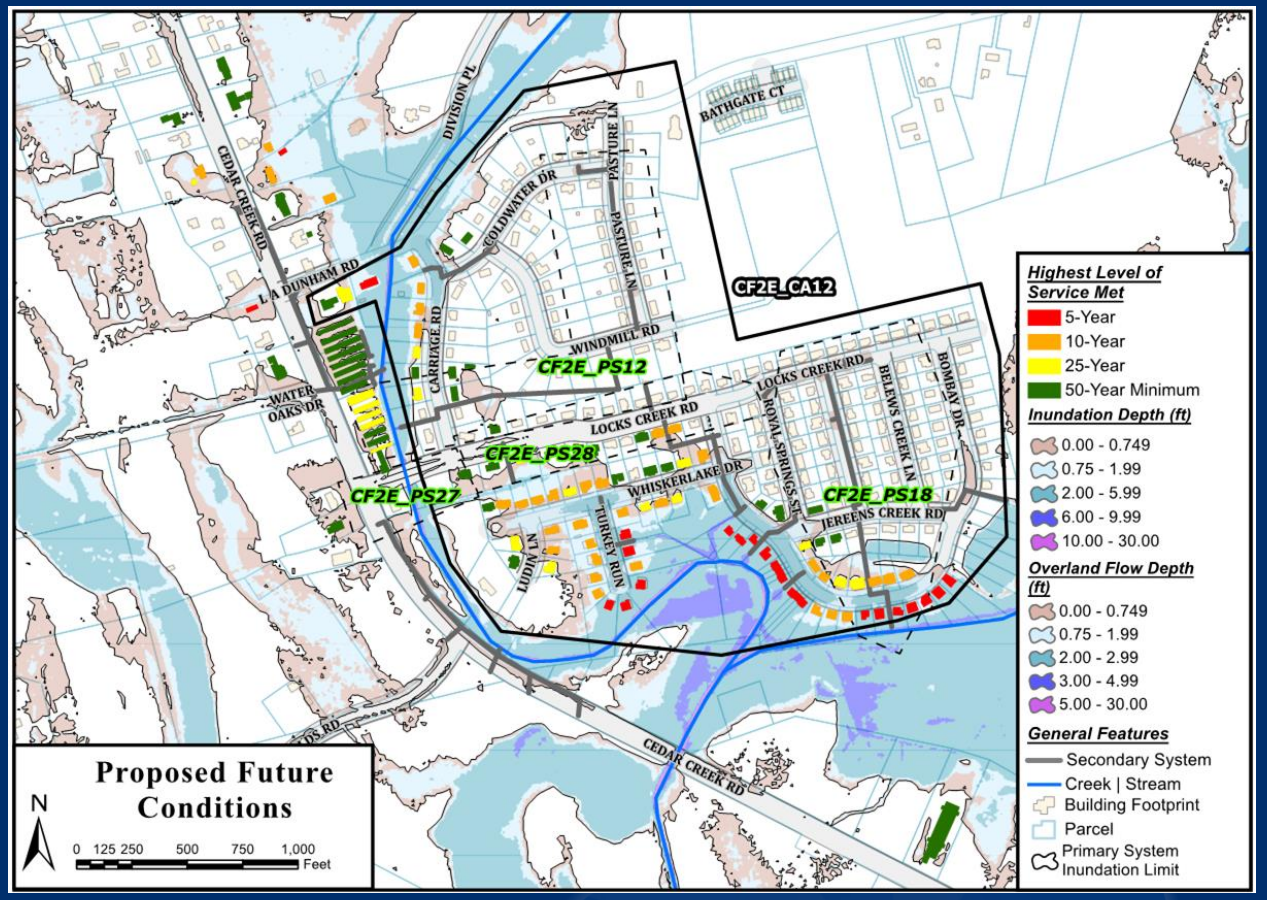
PS27 – Additional culverts on Locks Creek Rd

PS28 – Increase road height on Locks Creek Rd

Cost -- $8.80M

Locks Creek – Option 1 Phase I

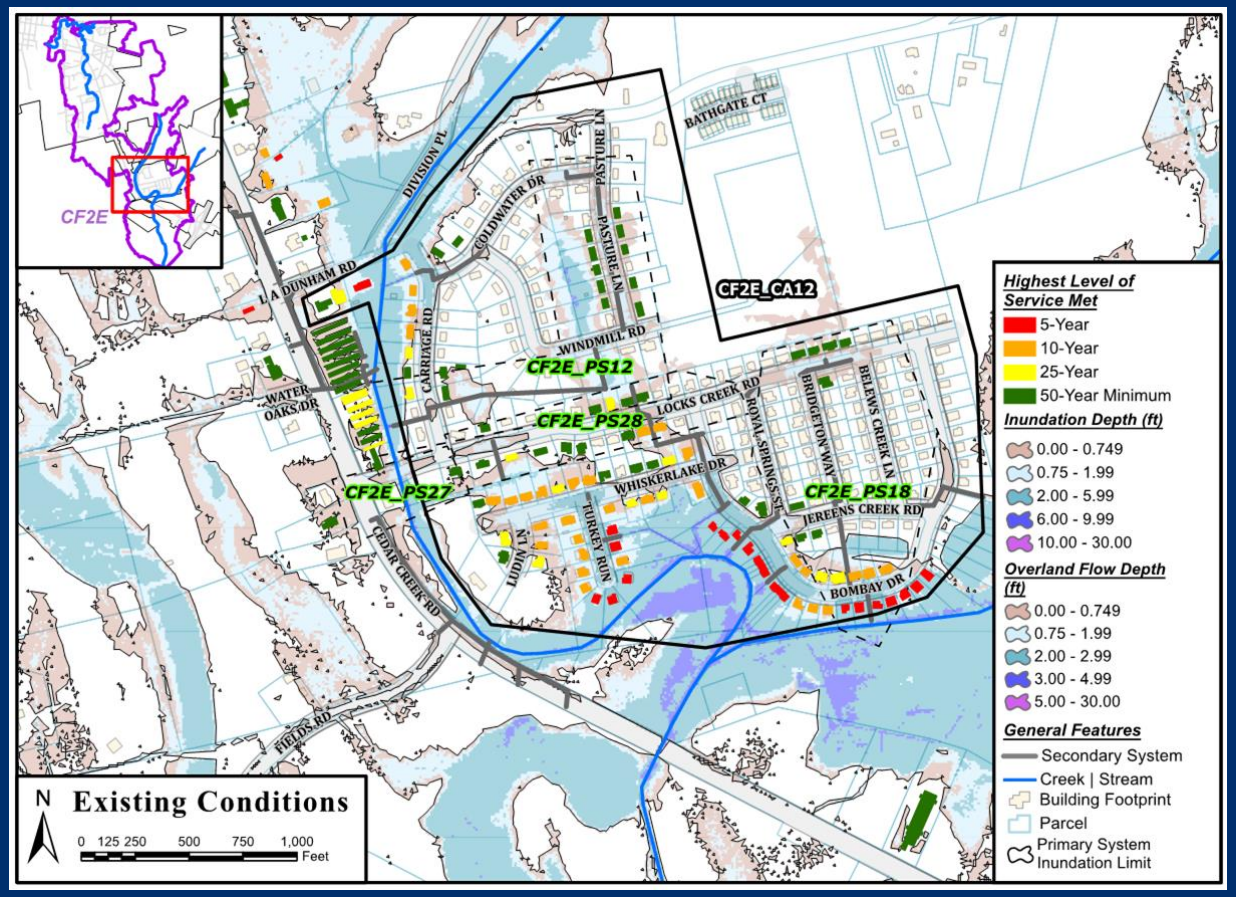


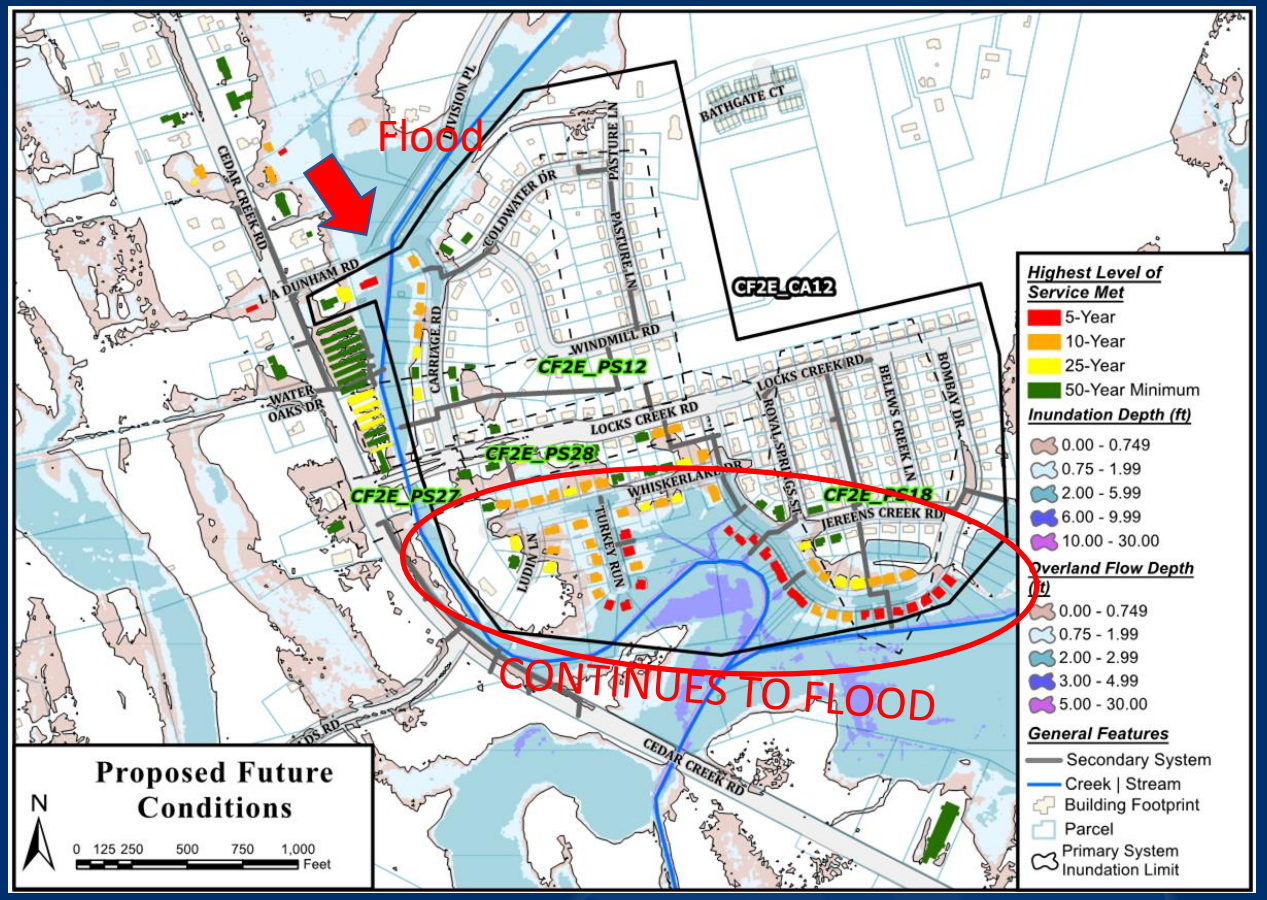


Existing Depth
(25-year storm event)

Proposed Depth (w/ improvements)
(25-year storm event)

Locks Creek – Option 1 Phase I

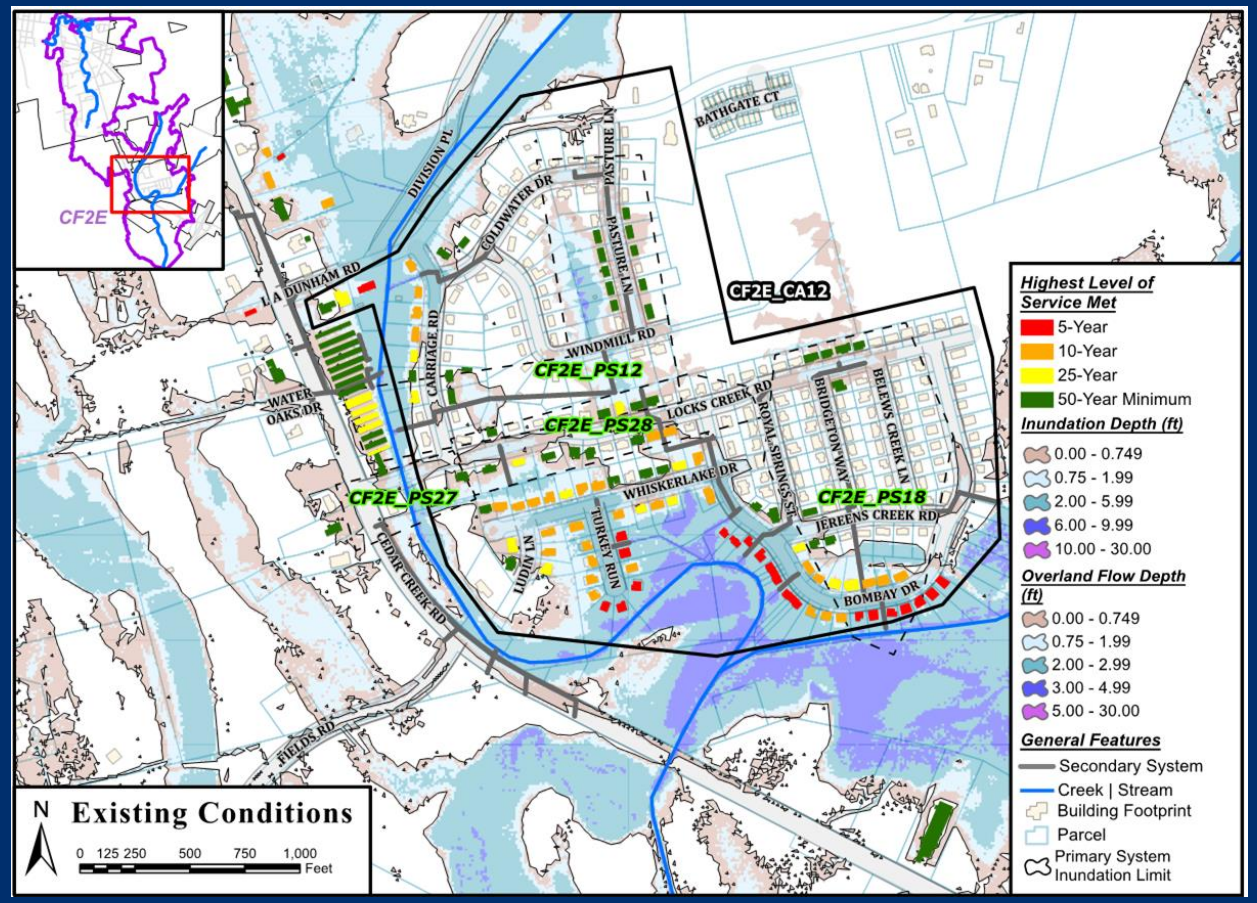


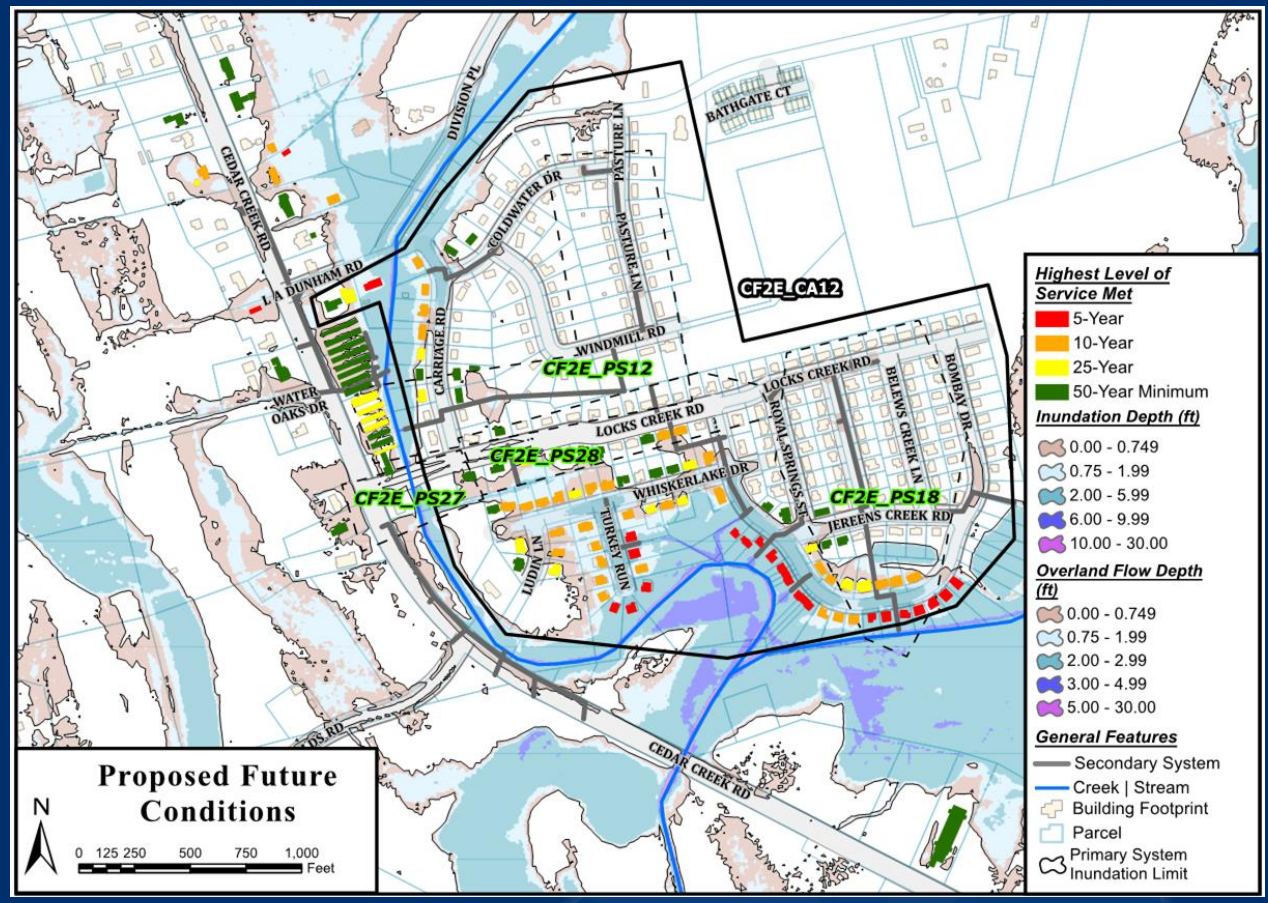


Existing Depth
(25-year storm event)

Proposed Depth (w/ improvements)
(25-year storm event)

Lock's Creek – Option 1, Phase 1



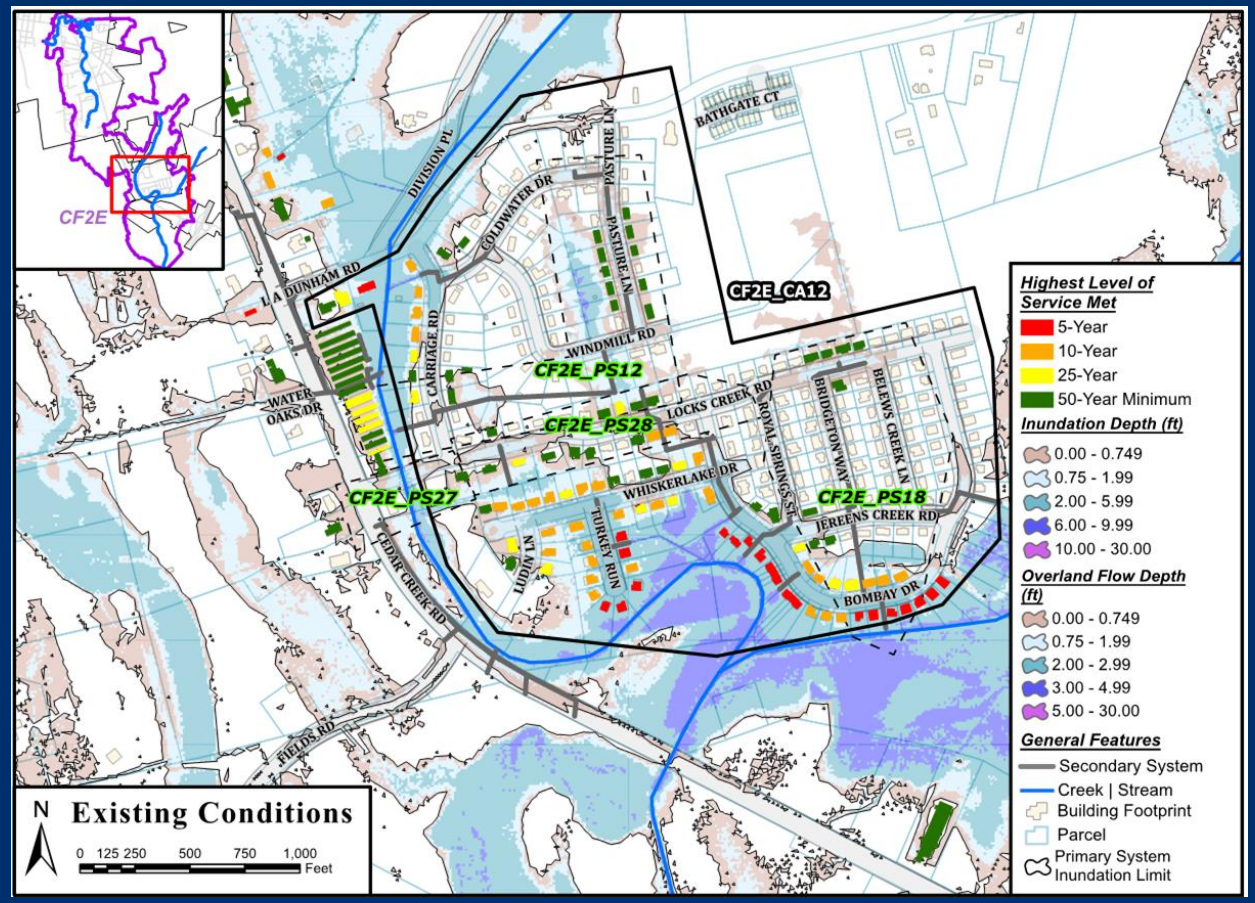


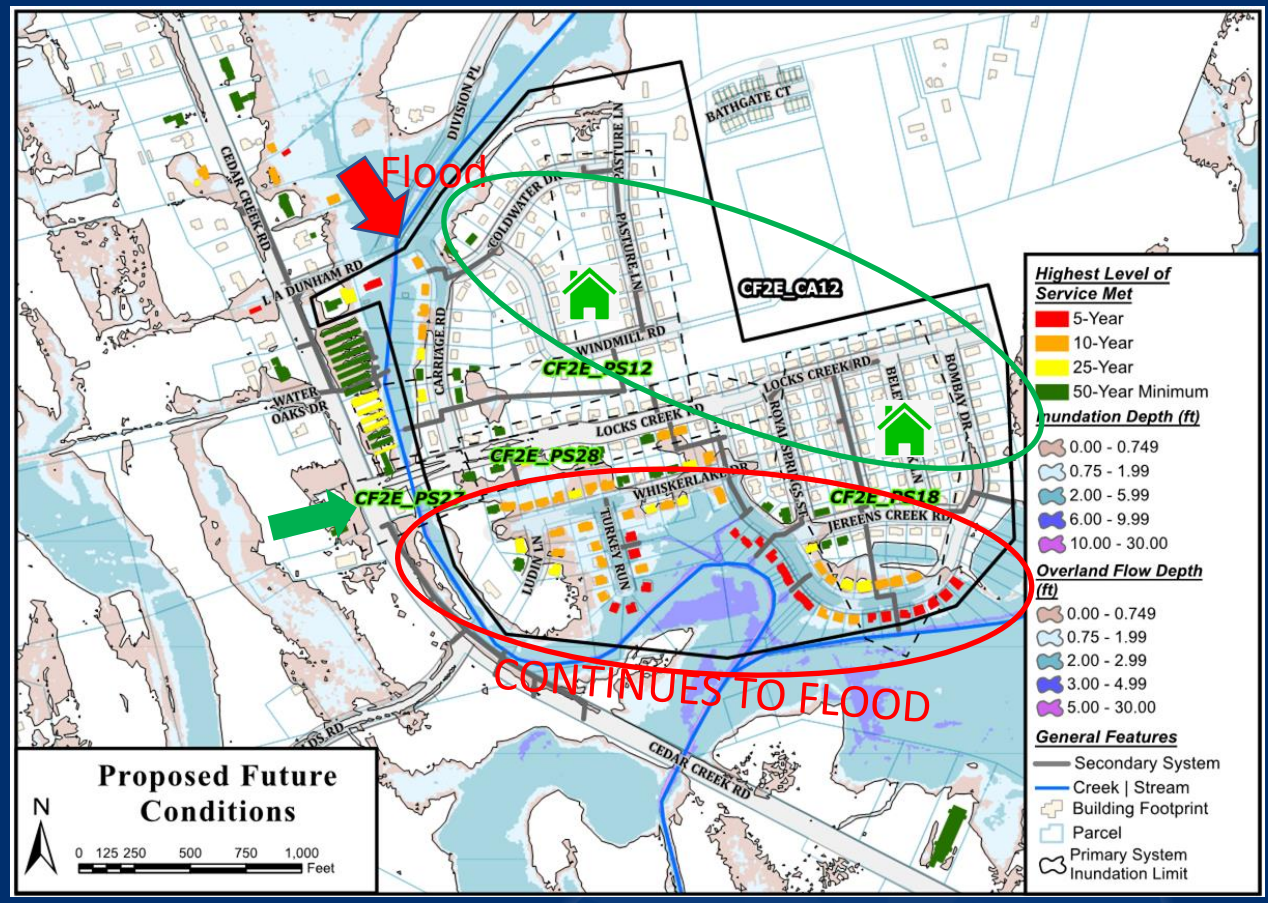
PRIMARY BENEFIT IS ACCESS FOR ~180 HOMES THAT DON'T FLOOD

Existing Depth
(50-year storm event)

Proposed Depth (w/ improvements)
(50-year storm event)

Lock's Creek – Option 1, Phase 1





PRIMARY BENEFIT IS ACCESS FOR ~180 HOMES THAT DON'T FLOOD

Existing Depth
(50-year storm event)

Proposed Depth (w/ improvements)
(50-year storm event)

Locks Creek – Option 1 Phase I

Existing Depth
(50-year storm event)

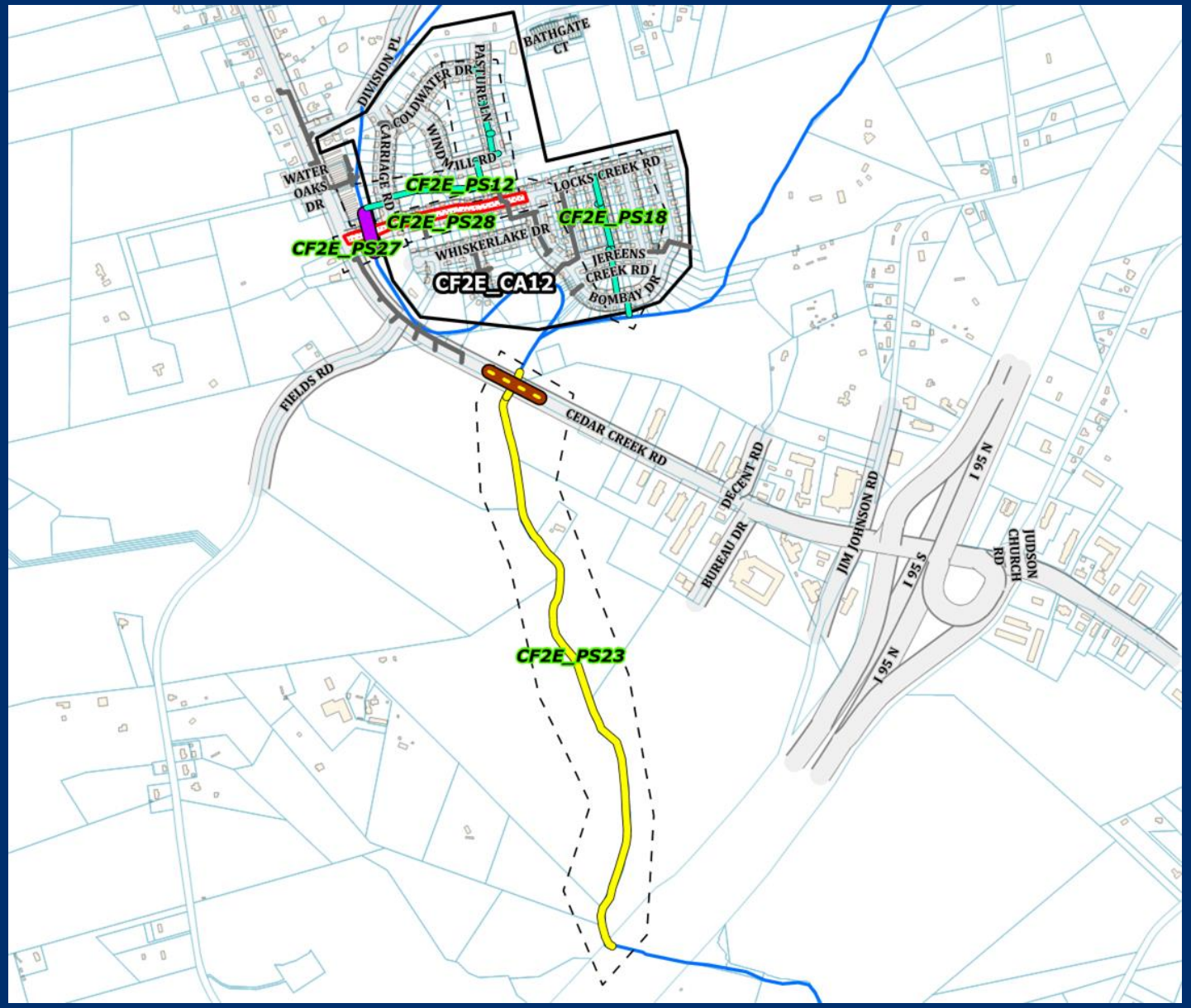
Proposed Depth (w/ improvements)
(50-year storm event)

Summary Data Sheet of Proposed Solutions

Core Information	Impacted Lane Length (feet)			Summary of Impacted Structures (> 400 ft^2)				Number of Impacted Essential Facilities		Number of Disconnected Structures	Traverse Road Crossing Risk Rating (D x V)		Final Score and Efficacy	
Proposed Solution Name	10-yr On-Grade Inlets (All)	25-yr Sag Location (City / Private)	50-yr Sag Location (DOT)	2-yr	10-yr	25-yr	50-yr	100-yr	50-yr	50-yr	25-yr (City)	50-yr (DOT)	Score	Efficacy
Existing Conditions	*11,530*	*2,114*	*0*	*4*	*20*	*52*	*66*	*0*	*0*	*251*	*3.24*	*2.24*	*31*	*0%*
Option 1 Phase I	9,299	1,147	0	3	19	51	64	0	0	79	3.24	2.24	31	

Cost: $8,778,700

Locks Creek – Option 1 Phase II



Proposed Solutions:

<u>Phase I</u>

PS12 – Drainage Improvements on Pasture Ln & Windmill Rd

PS18 – Drainage Improvements from Locks Creek Rd along Bridgeton Way

PS27 – Additional culverts on Locks Creek Rd

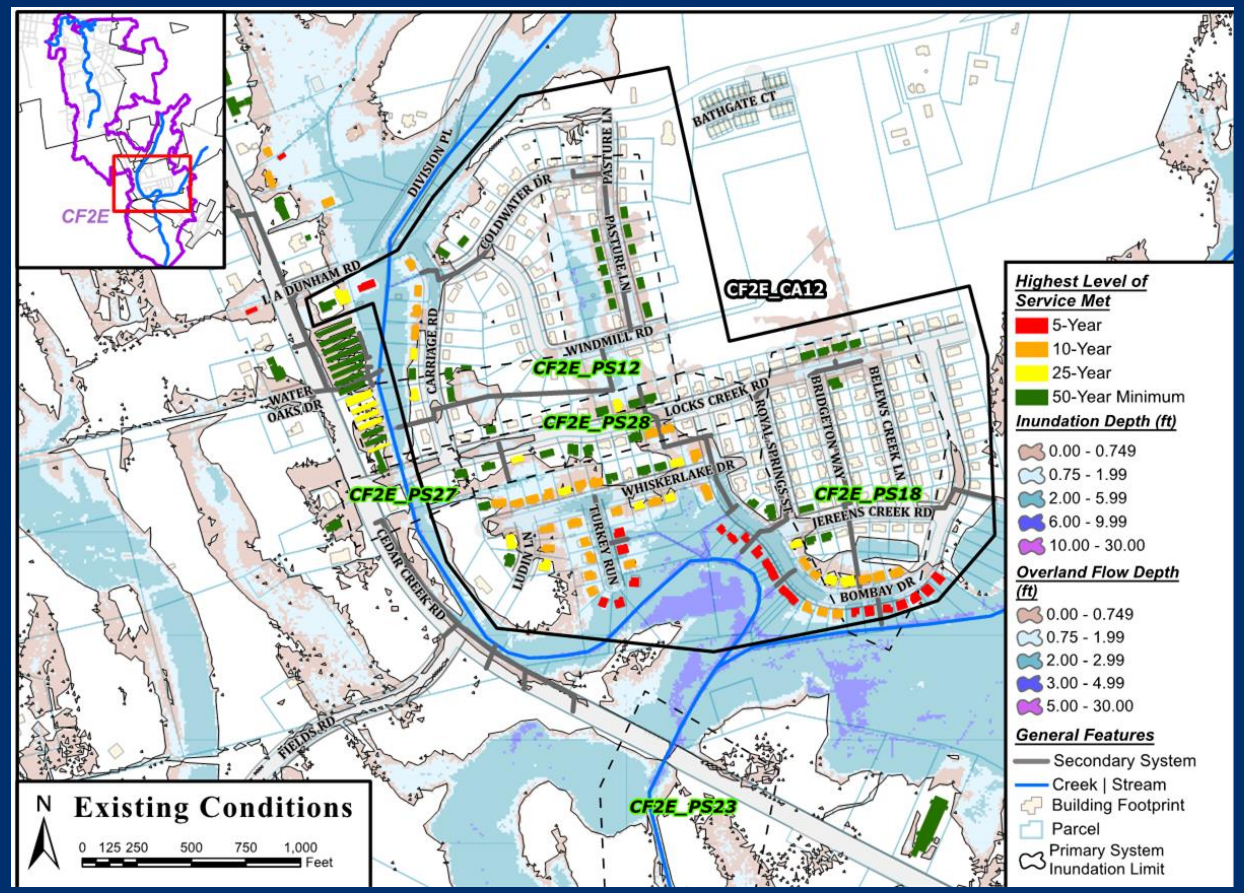
PS28 – Increase road height on Locks Creek Rd

<u>Phase II</u>

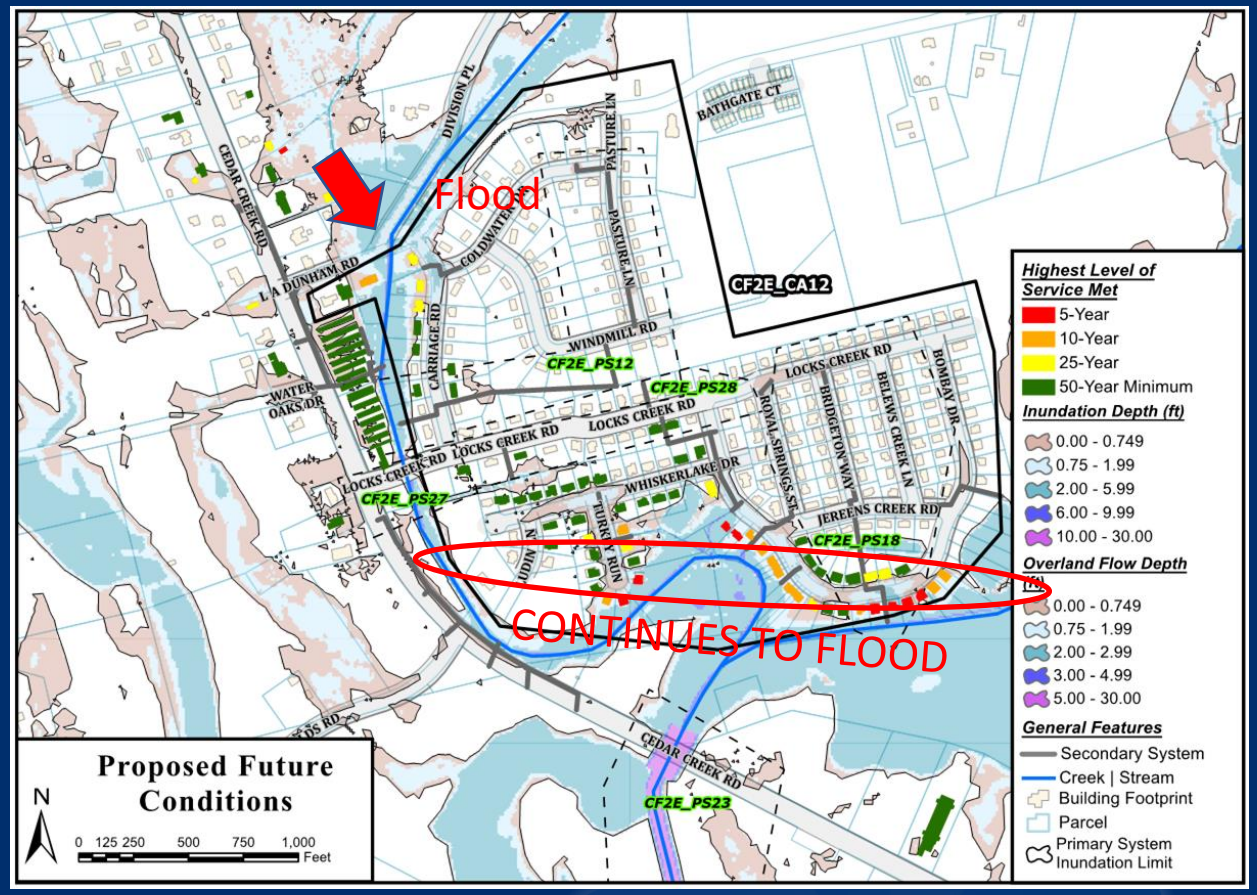
PS23 – 180 foot Bridge on NC 53 and channel improvement to I-95.

$24.5M ($8.80 M + $15.7M)

Locks Creek – Option 1 Phase II

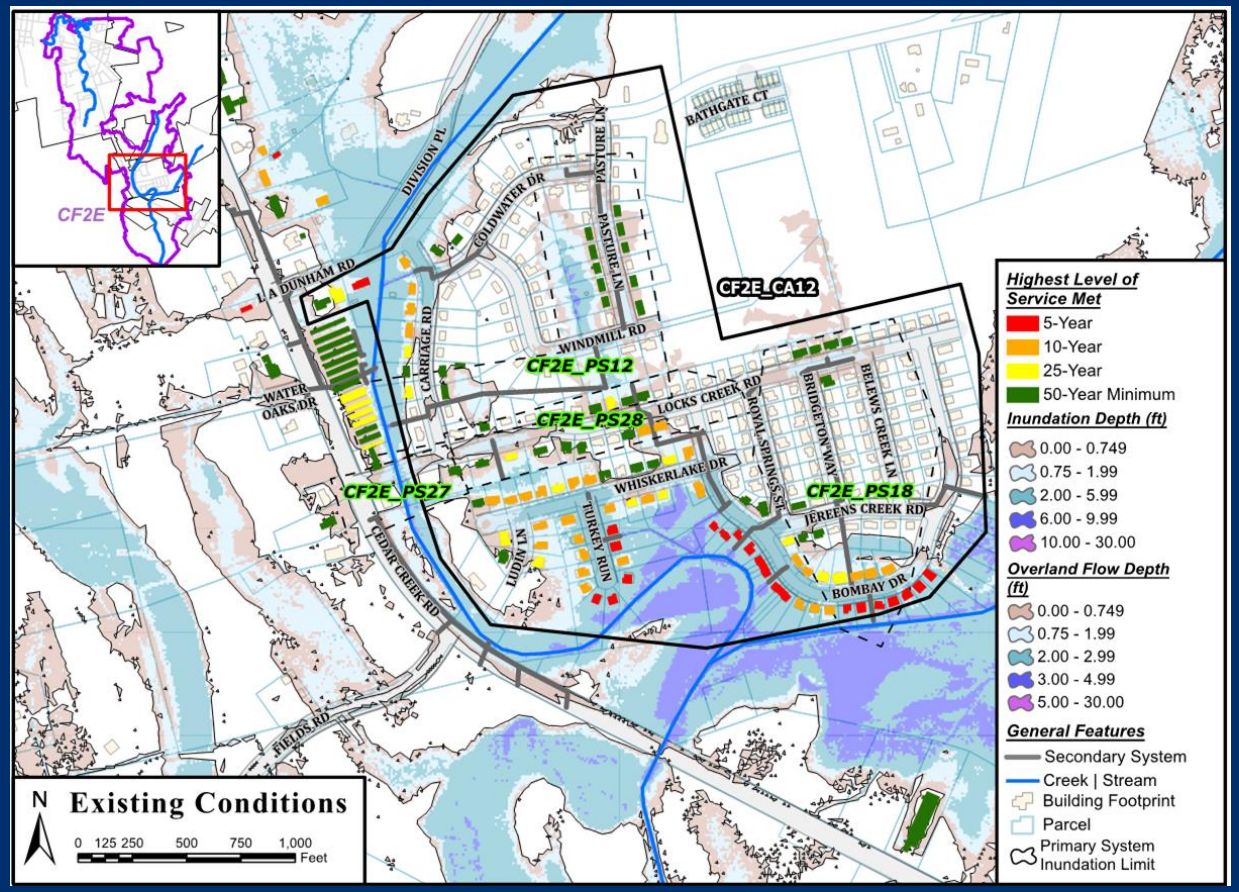


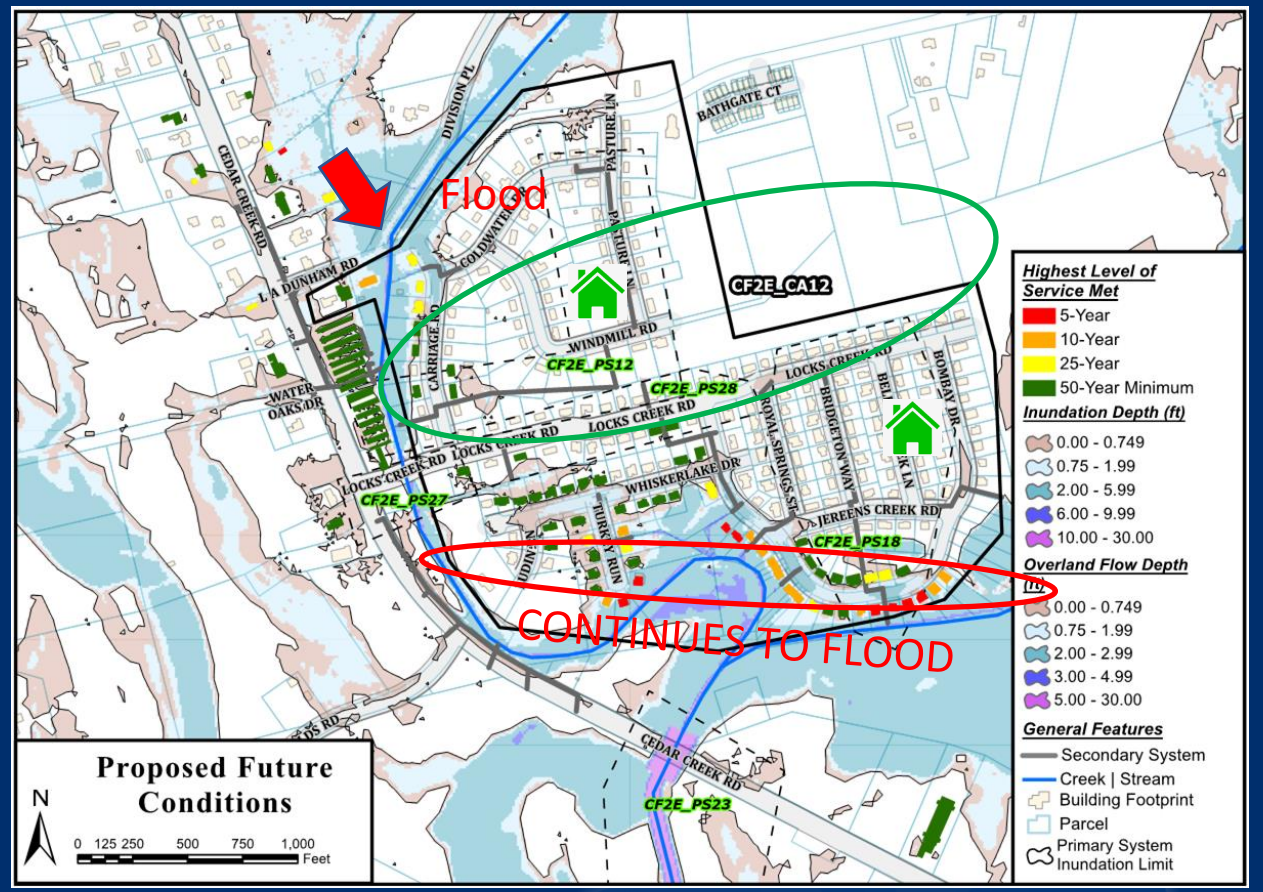
Existing Depth
(25-year storm event)



Proposed Depth (w/ improvements)
(25-year storm event)

Locks Creek – Option 1 Phase II





PRIMARY BENEFIT IS ACCESS FOR ~180 HOMES THAT DON'T FLOOD

Existing Depth
(50-year storm event)

Proposed Depth (w/ improvements)
(50-year storm event)

Summary Data Sheet of Proposed Solutions

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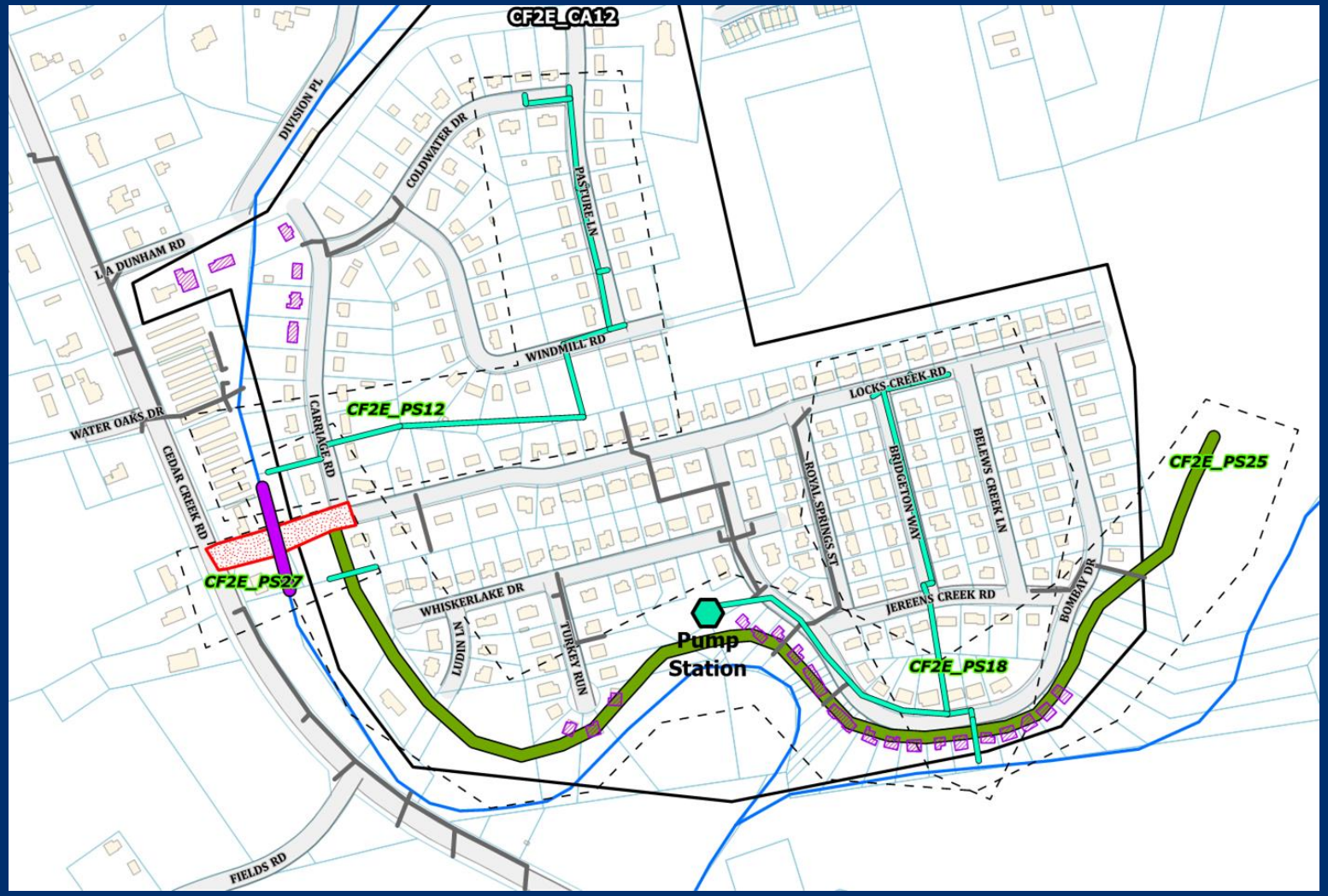
Existing Conditions	*11,530*	*2,114*	*0*	*4*	*20*	*52*	*66*	*0*	*0*	*251*	*3.24*	*2.24*	*31*	*0%*
Option 1 Phase II	6723	985	0	1	8	20	27	0	0	70	1.51	1.86	31	

Cost: $24,495,000

Locks Creek – Option 2



Proposed Solutions:

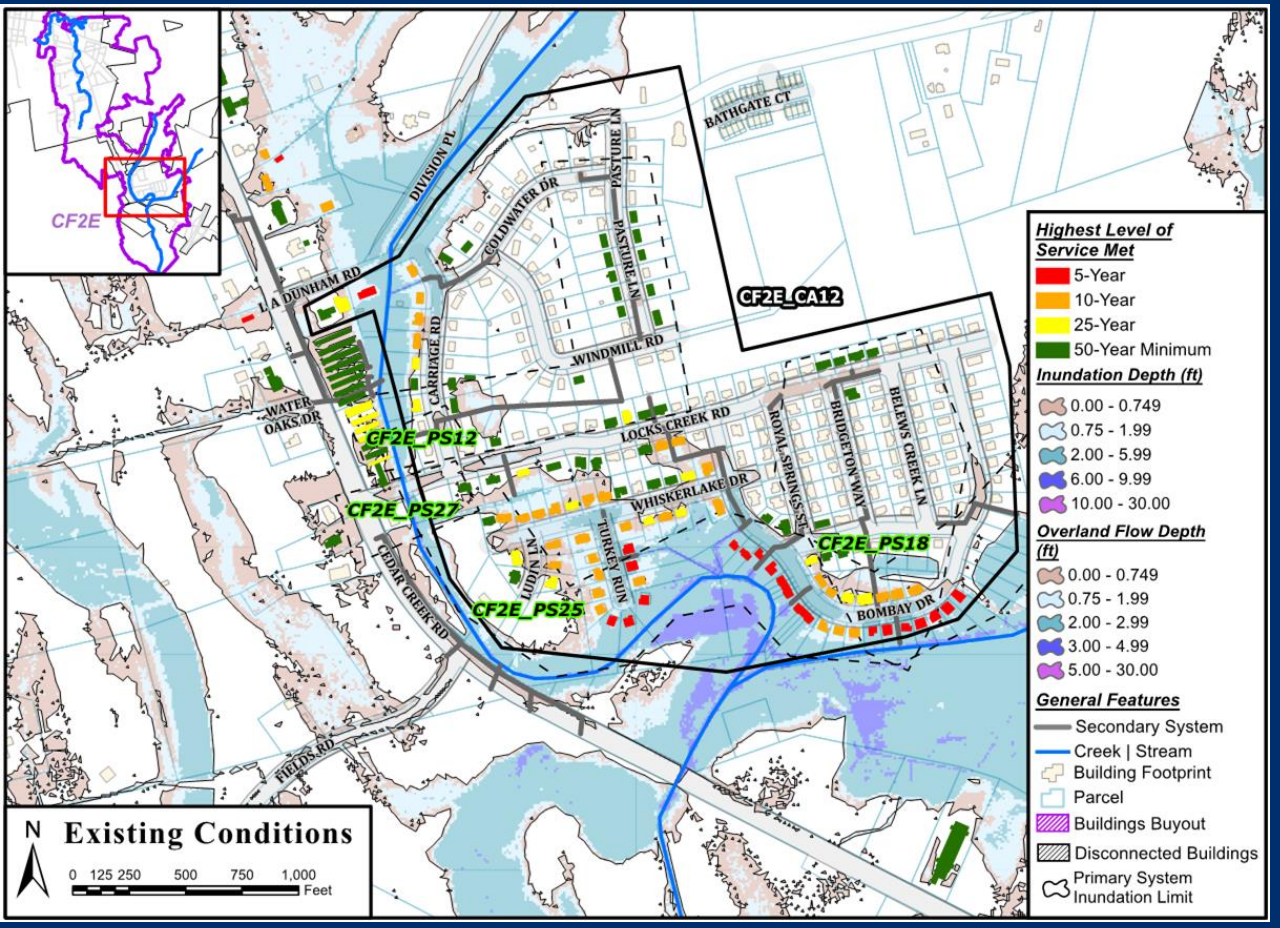
PS12 – Drainage Improvements on Pasture Ln & Windmill Rd

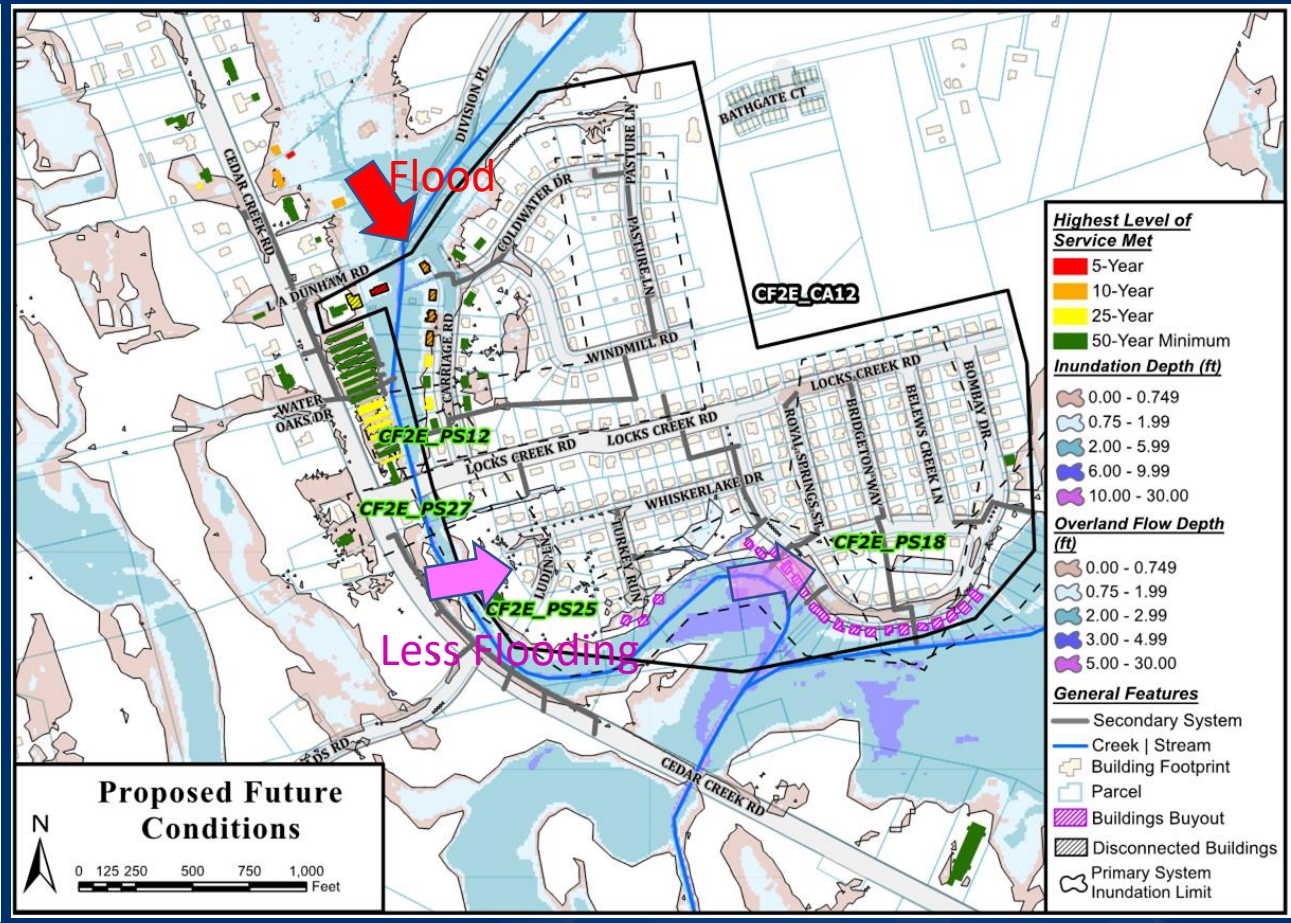
PS18 – Drainage Improvements from Locks Creek Rd along Bridgeton Way

PS27 – Additional culverts on Locks Creek Rd

PS25 – Install levee along creek with pump station (requires property acquisition)

Locks Creek – Option 2





Existing Depth
(25-year storm event)

Proposed Depth (w/ improvements)
(25-year storm event)

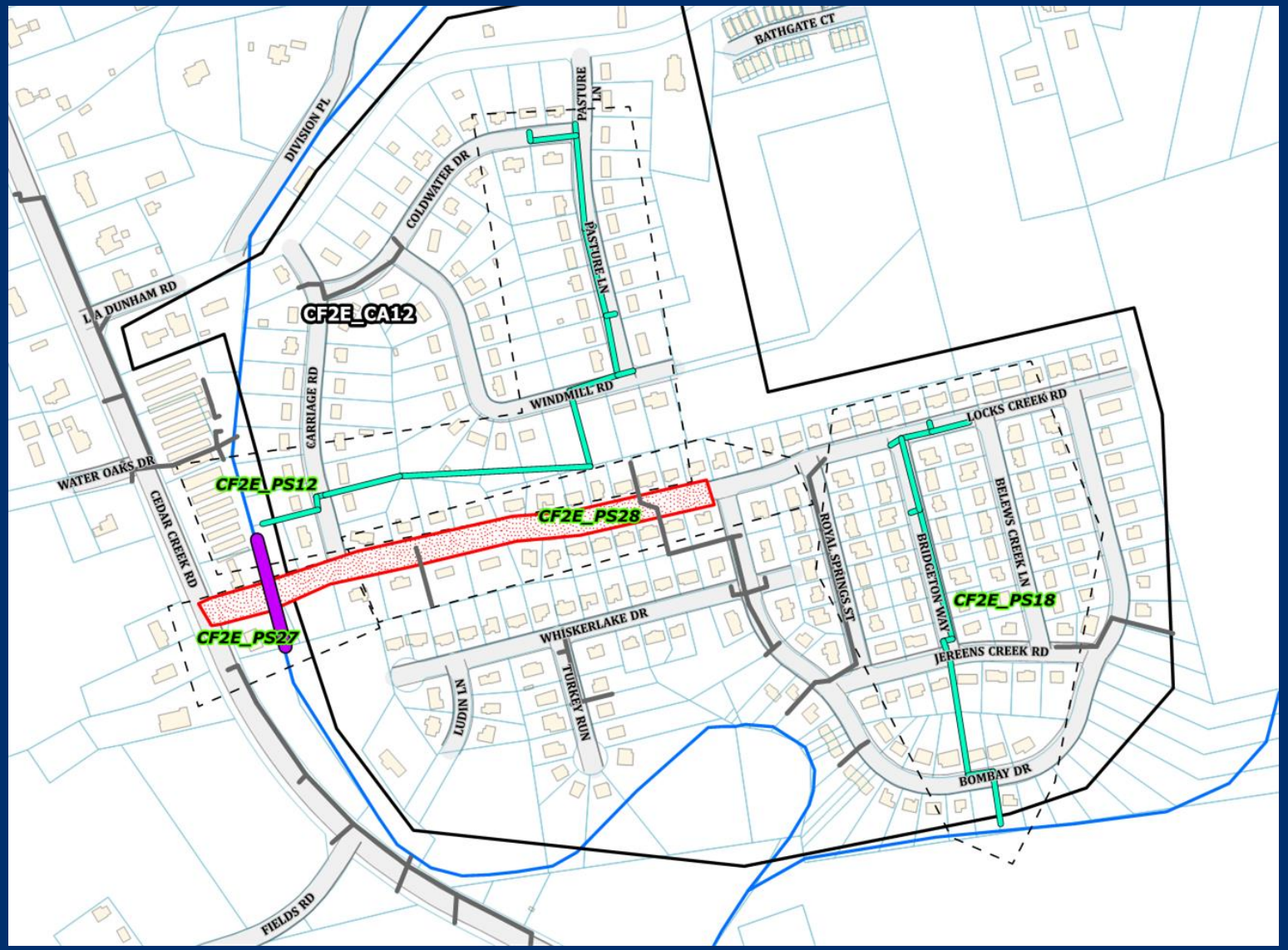
Summary Data Sheet of Proposed Solutions

Core Information	Impacted Lane Length (feet)			Summary of Impacted Structures (> 400 ft^2)				Number of Impacted Essential Facilities		Number of Disconnected Structures	Traverse Road Crossing Risk Rating (D x V)		Final Score and Efficacy	
Proposed Solution Name	10-yr On-Grade Inlets (All)	25-yr Sag Location (City / Private)	50-yr Sag Location (DOT)	2-yr	10-yr	25-yr	50-yr	100-yr	50-yr	50-yr	25-yr (City)	50-yr (DOT)	Score	Efficacy
Existing Conditions	*11,530*	*2,114*	*0*	*4*	*20*	*52*	*66*	*0*	*0*	*251*	*3.24*	*2.24*	*31*	*26%*
Option 1 Phase I	6,804	1,088	0	0	1	5	8	0	0	37	0.39	2.04	23	

Cost: $45,371,200

Levee: $5M
Pump Station: $3.5M

Locks Creek – Option 1 Phase I Staff Recommendation



Proposed Solutions:

PS12 – Drainage Improvements on Pasture Ln & Windmill Rd

PS18 – Drainage Improvements from Locks Creek Rd along Bridgeton Way

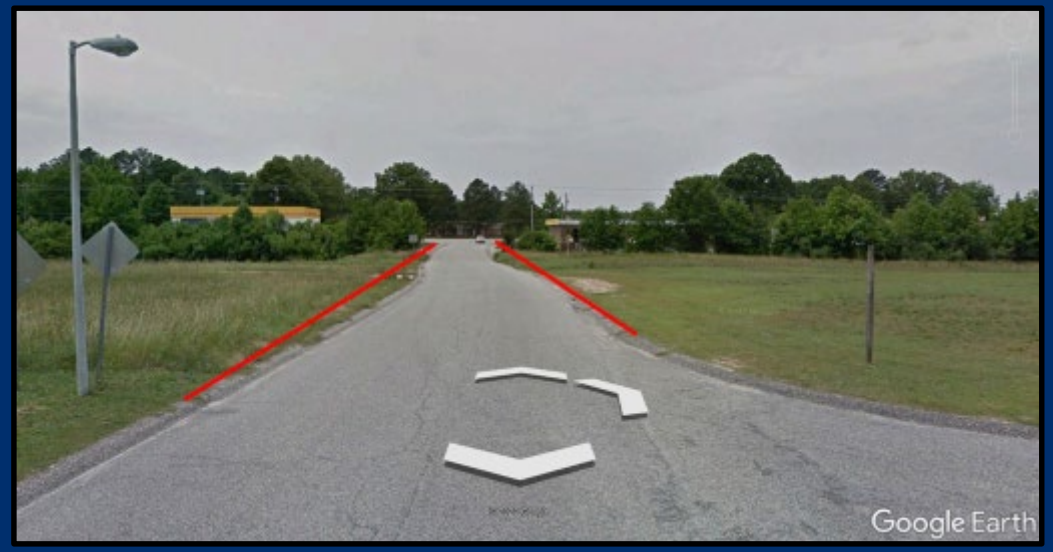
PS27 – Additional culverts on Locks Creek Rd

PS28 – Increase road height on Locks Creek Rd

Cost -- $8.80M

Locks Creek – Option 1 Phase I Staff Recommendation

Raised Road



Limitations/Impacts

- Planning Level – Detailed Survey/Design Needed
- Does not eliminate flooding to roads and impact to structures south of Whisker Lane and on Bombay Drive
- Timeframe: Minimum 18 -24 Months to Complete Design
- Raised Road – Road Reconstruction, Fill
- RoW Acquisition – Build Shoulder
- Does not protect for >50 year storm . Below in blue are areas that will flood for an event such as Florence.

Florence Flooding with Improvements

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Locks Creek Flood Study

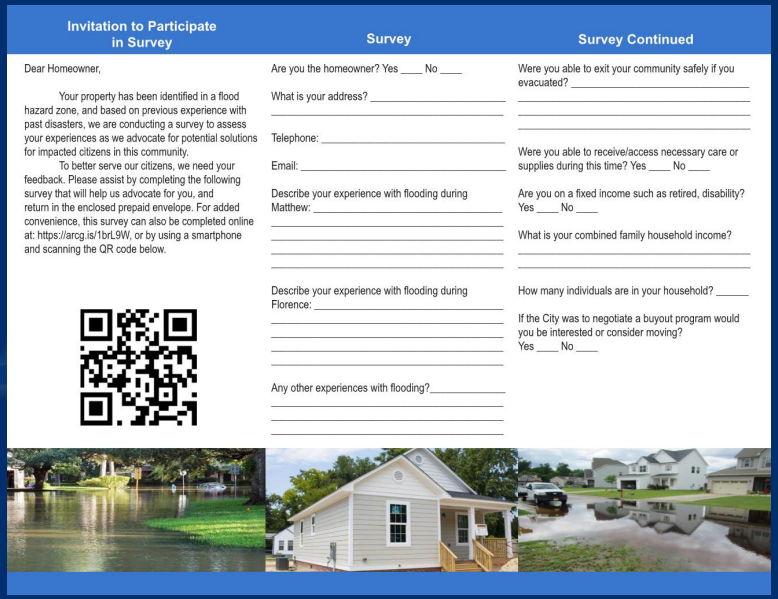
&

LOMR

(Letter Of Map Revision)

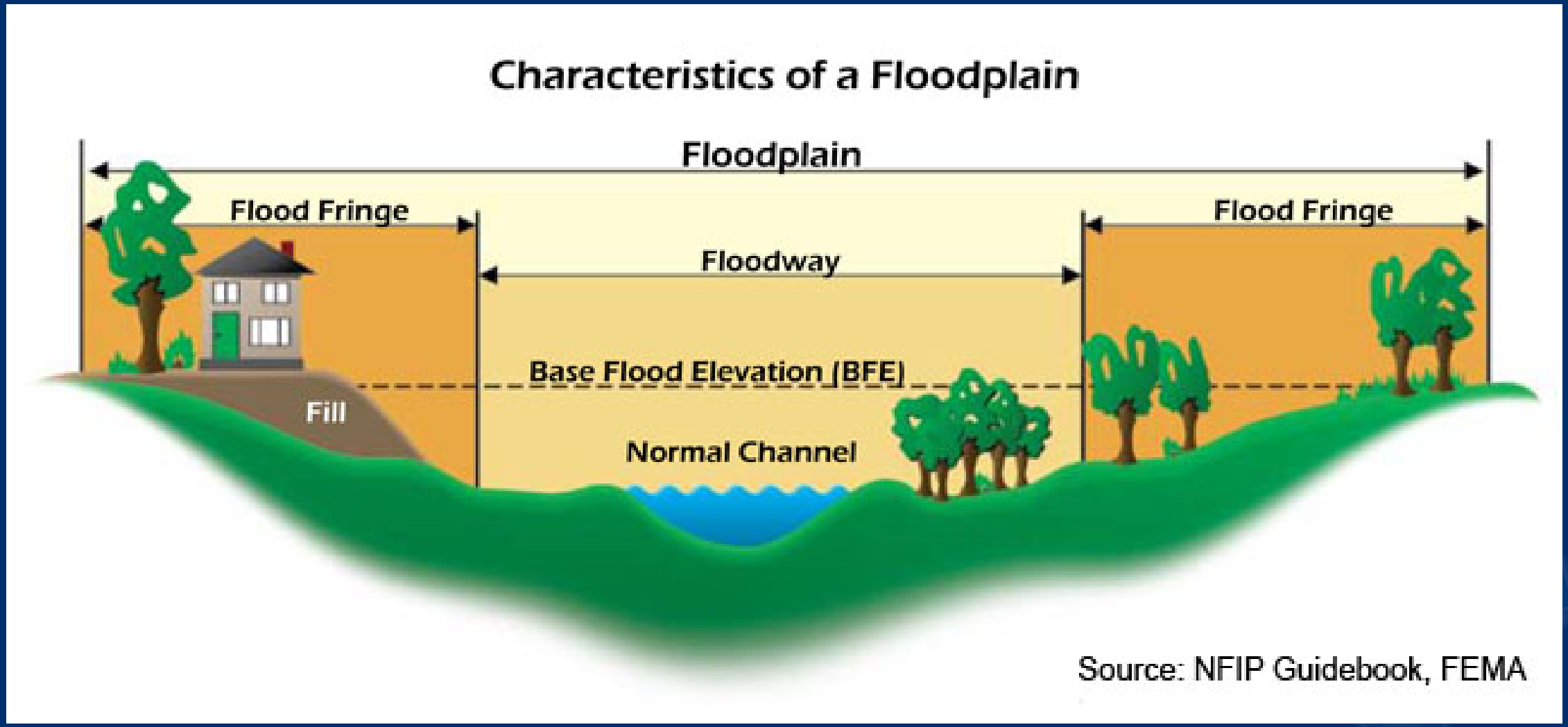
BACKGROUND

- ***Sought CDBG-MIT funding***
  - *Locks Creek Flood Questionnaire* – Fall 2020
  - *Applied for grant through NC Office of Recovery & Resiliency*
  - *Area did not meet the Low to Moderate Income thresholds*



Current FEMA Mapping

DEFINITIONS



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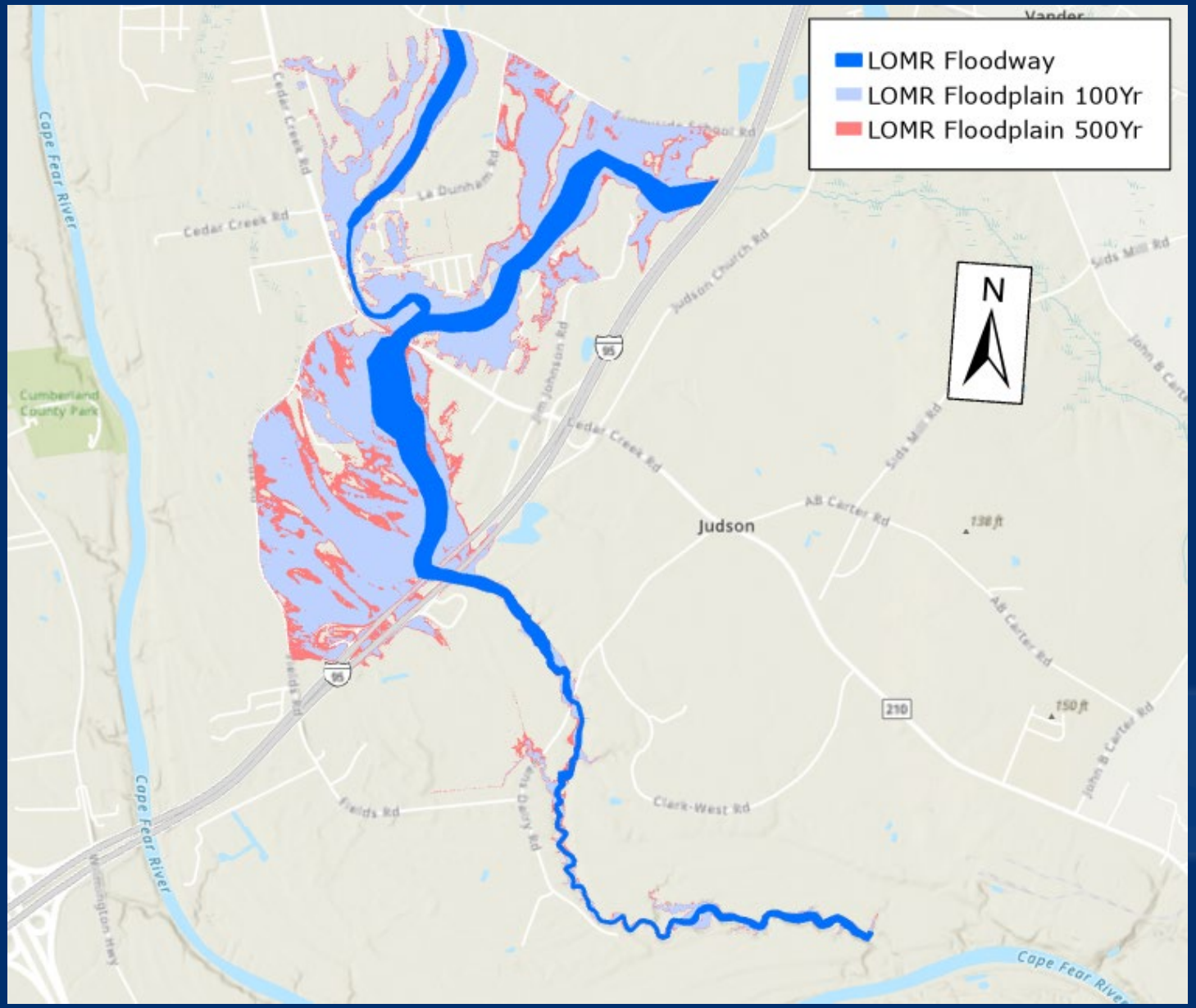
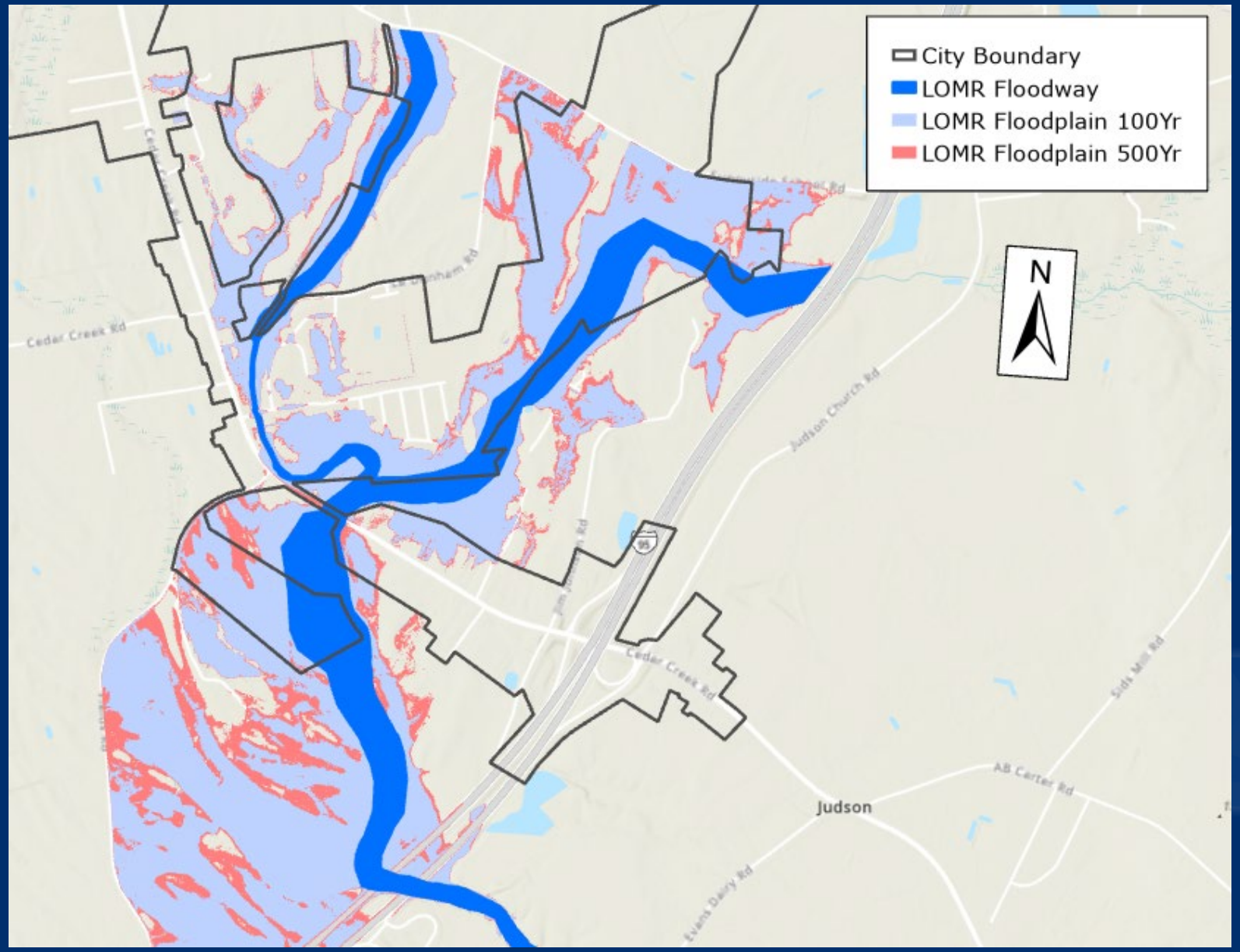
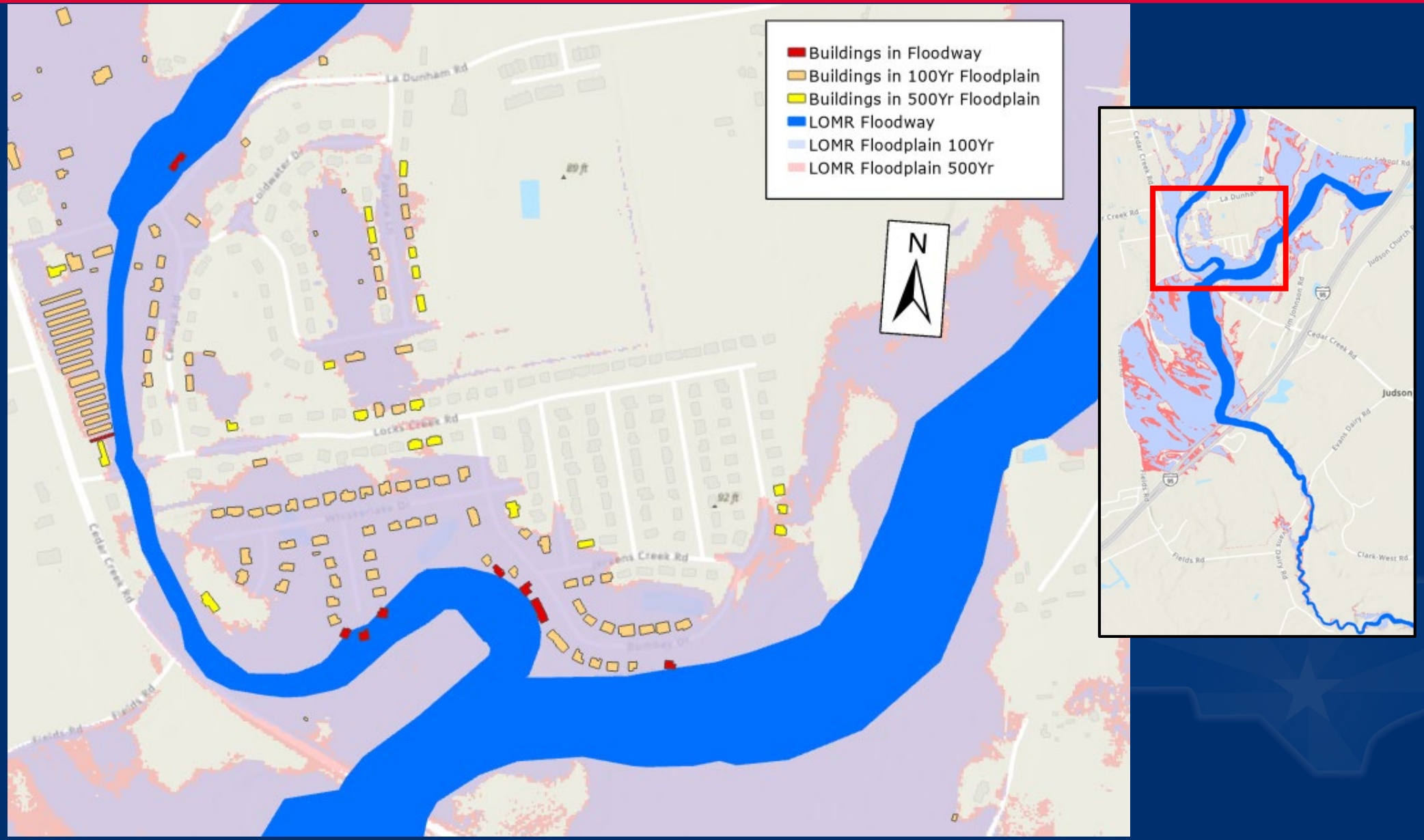
RESULTS: Phase I



RESULTS: Phase I

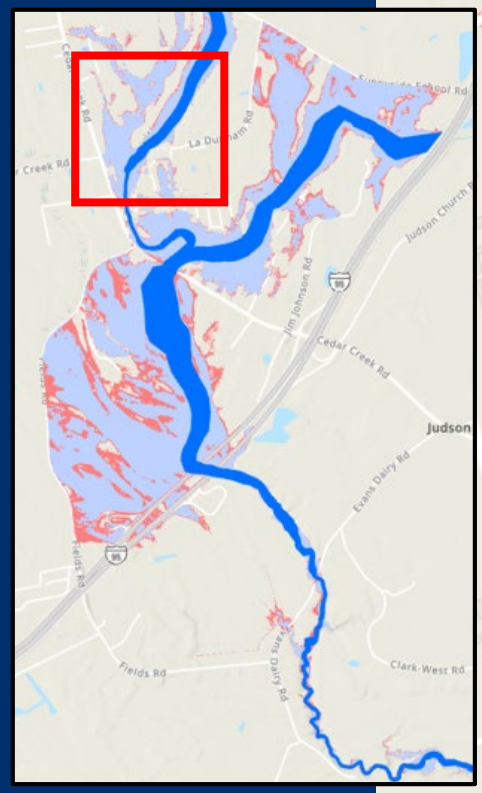


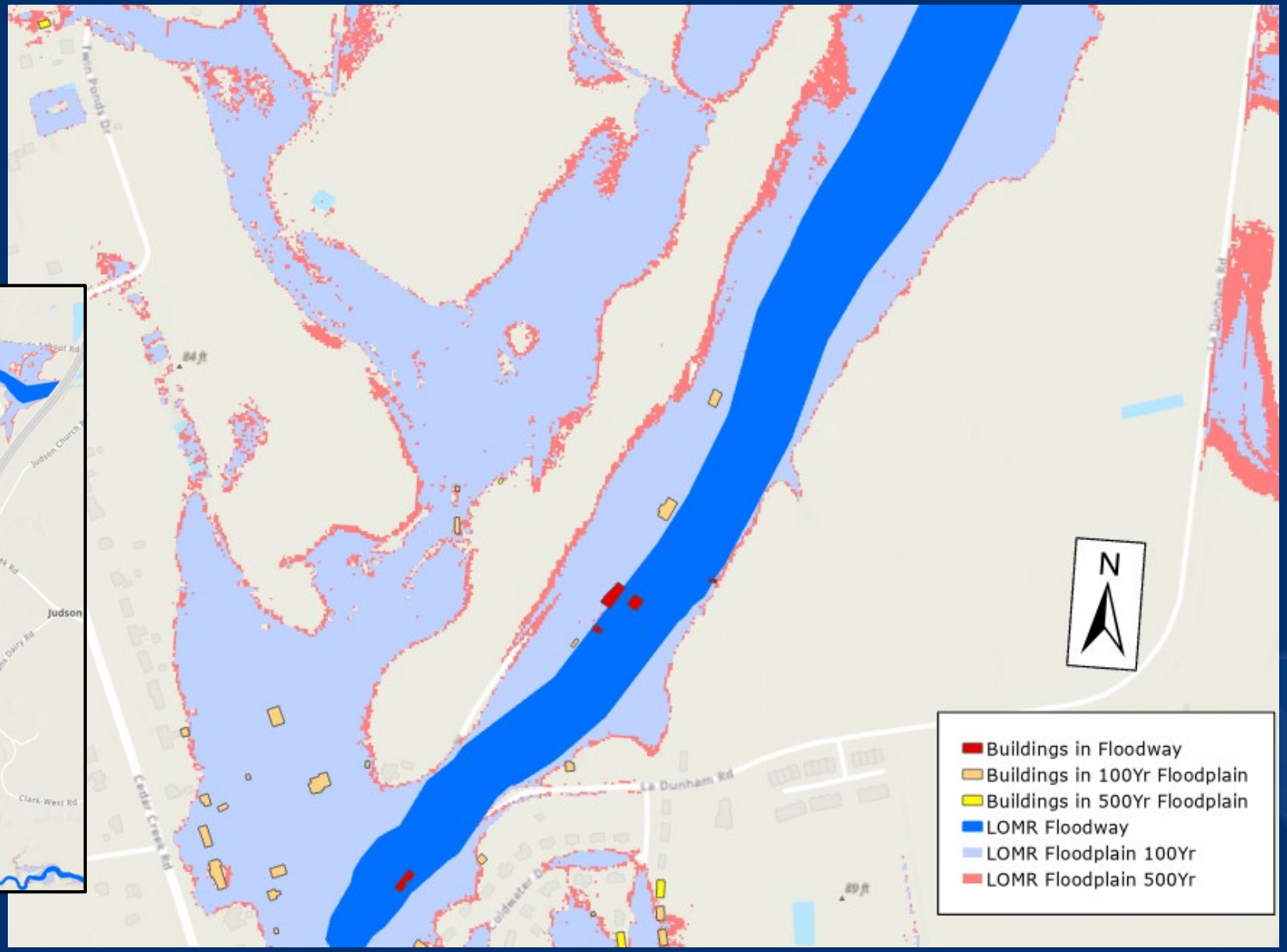
RESULTS: Phase I



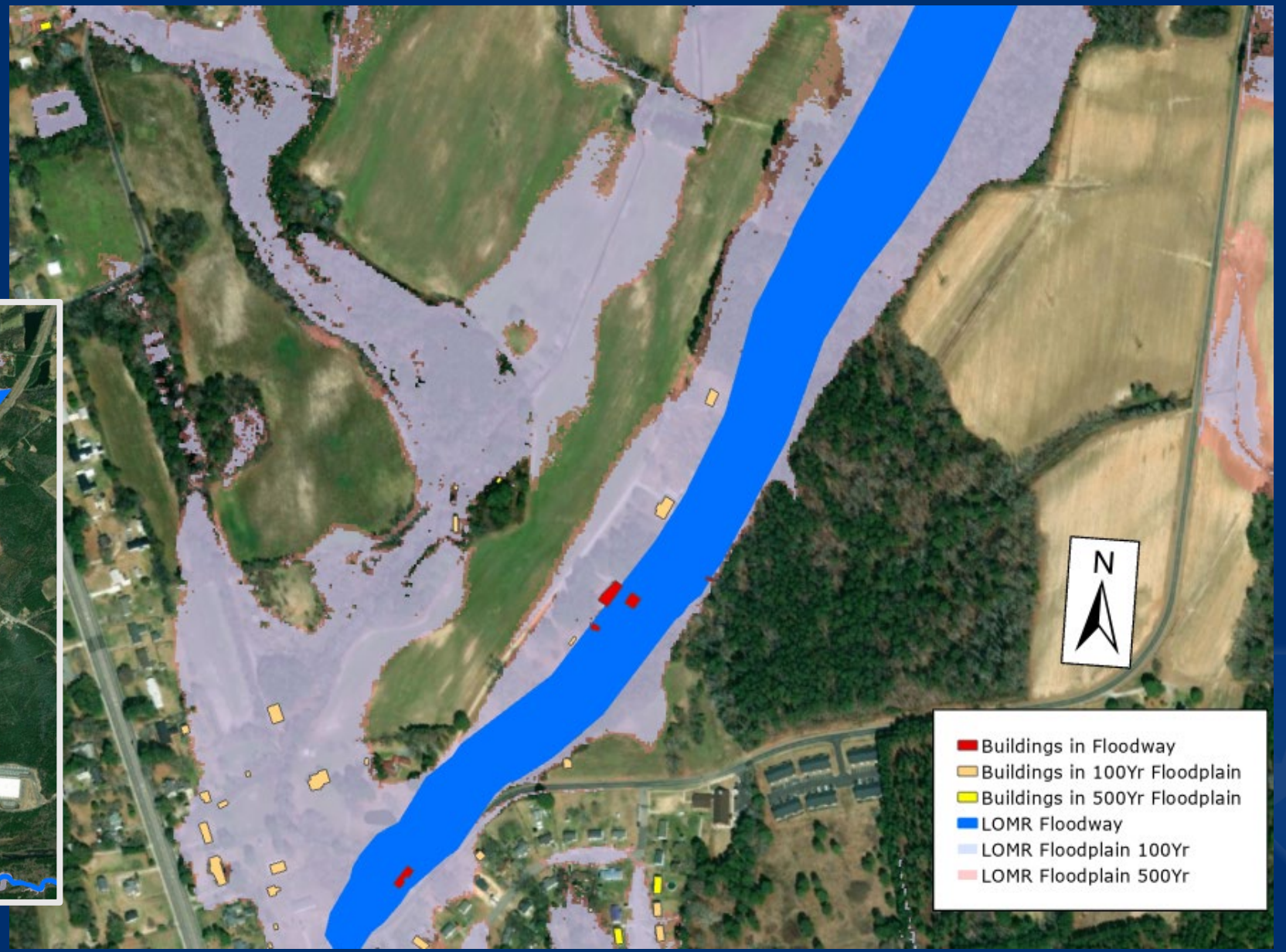
RESULTS: Phase I

RESULTS: Phase I





RESULTS: Phase I



RESULTS

Parcel Impacts

Parcels with Buildings*

	Floodway	100-Year
City	13	96
County	6	45
Total	***19***	***141***

All Parcels

	Floodway	100-Year
City	53	214
County	76	163
Total	***129***	***377***

Building Impacts

	Floodway	100-Year
City	8	119
County	8	58
Total	***16***	***177***

Agenda

1. Background
2. Locks Creek Proposed Solutions
3. Locks Creek LOMR
4. Council Request

Locks Creek – Option 1 Phase I Staff Recommendation

Staff's Recommended Action:

Option 1 Phase I

1. Approve Option 1 Phase I to move forward with project development and design of the estimated $8,778,700 proposed solution and pursue funding options.

Option 1 Phase II

1. Direct staff to pursue funding options for the estimated $15,716,300 proposed solution improvements outlined in Option 1 Phase II.

Questions?

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