Big Creek Flood Mitigation

A PATH TOWARD FLOOD RESILIENCE

BARGE
DESIGN SOLUTIONS

About Barge

Adrian Ward, PE, CFM, CPESC

Vice President, Sr. Engineering Manager

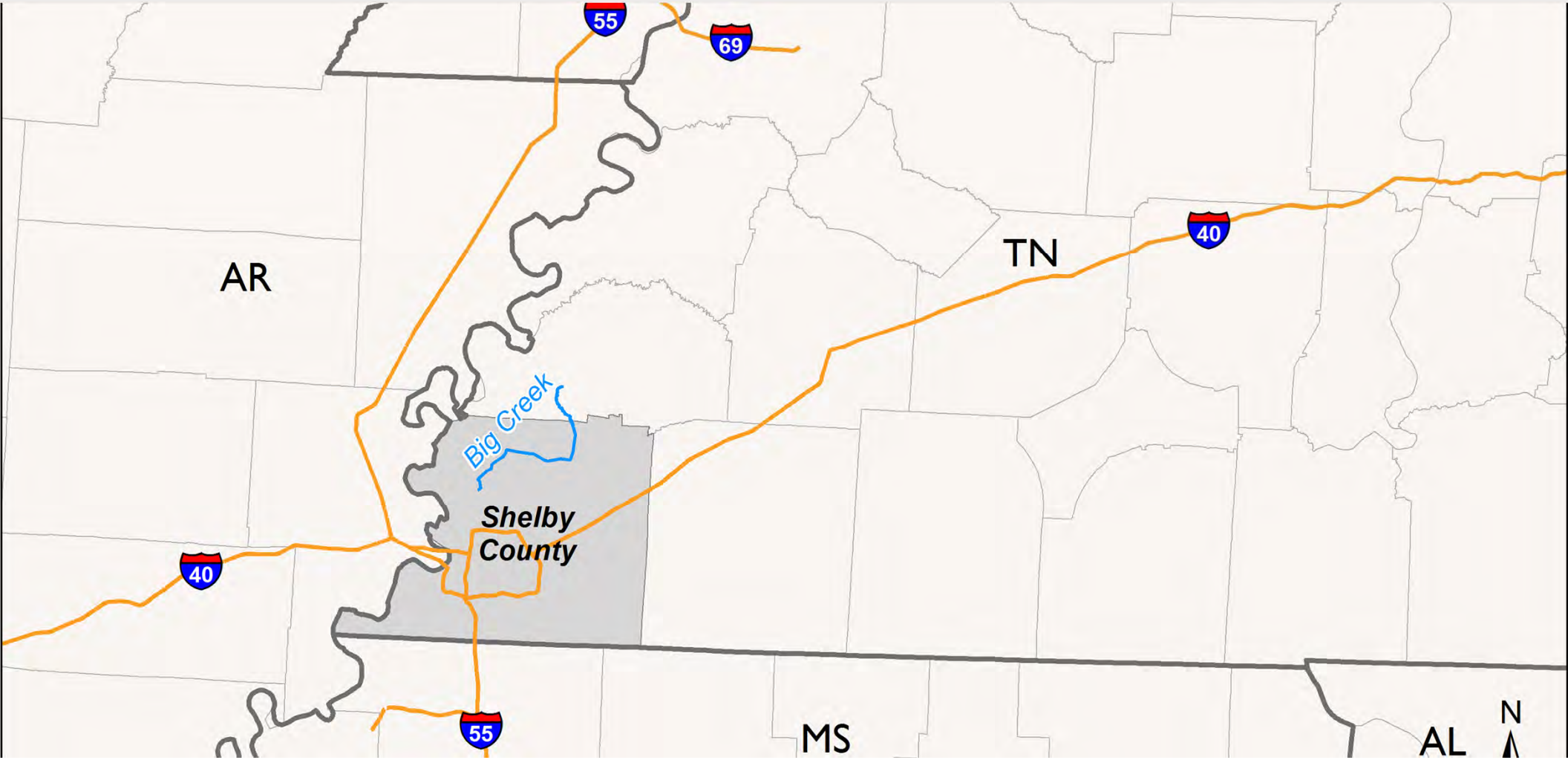
We are an **engineering** and **architecture** firm with diverse in-house multidisciplinary **practice areas**. Our **employee-owned** company is 400+ people strong, and we serve our clients **nationwide** from multiple U.S. locations.

BARGE DESIGN SOLUTIONS

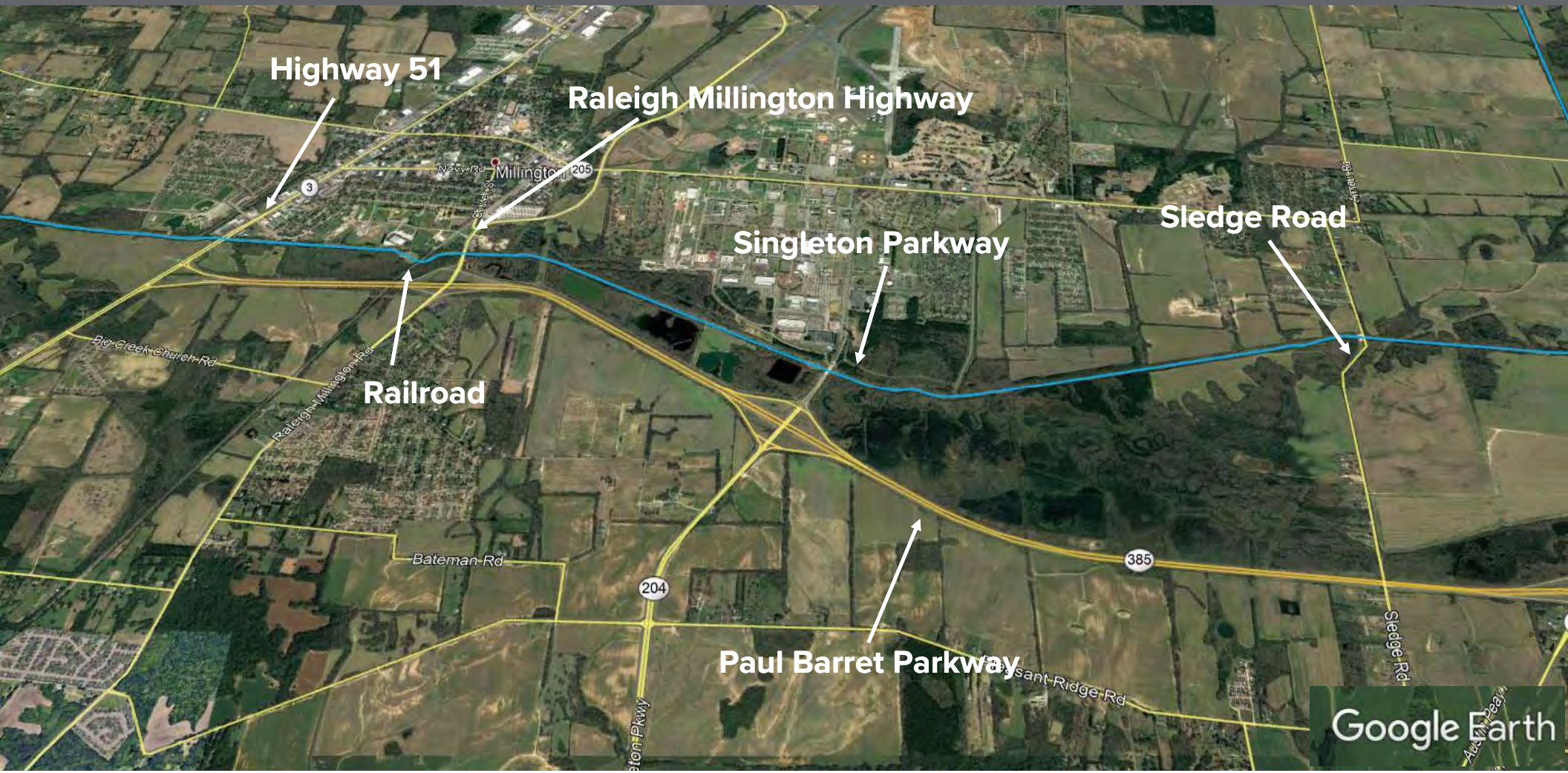
Overview

- Watershed Background
- Flooding History
- Watershed Study
- NDRC Grant Opportunity
- Implementation

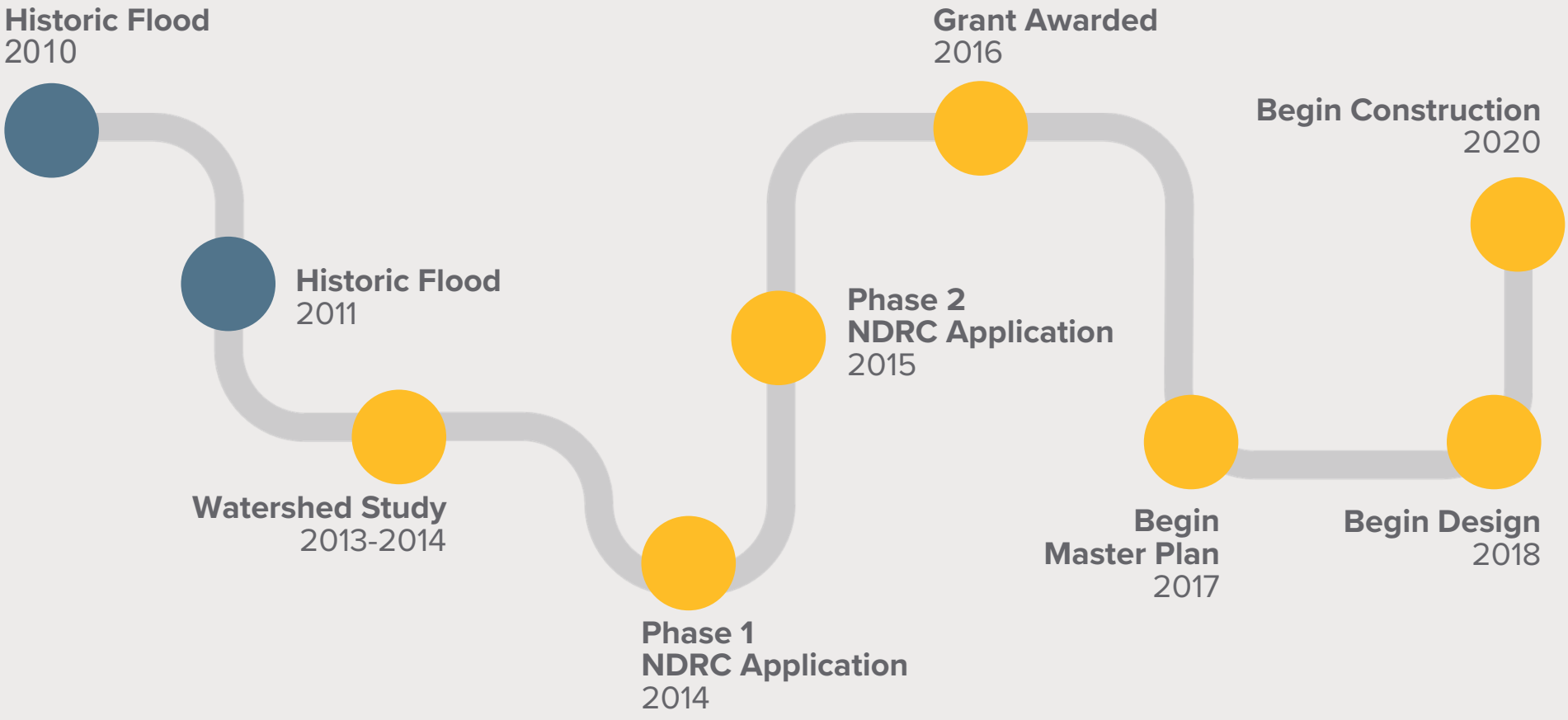
Watershed Background



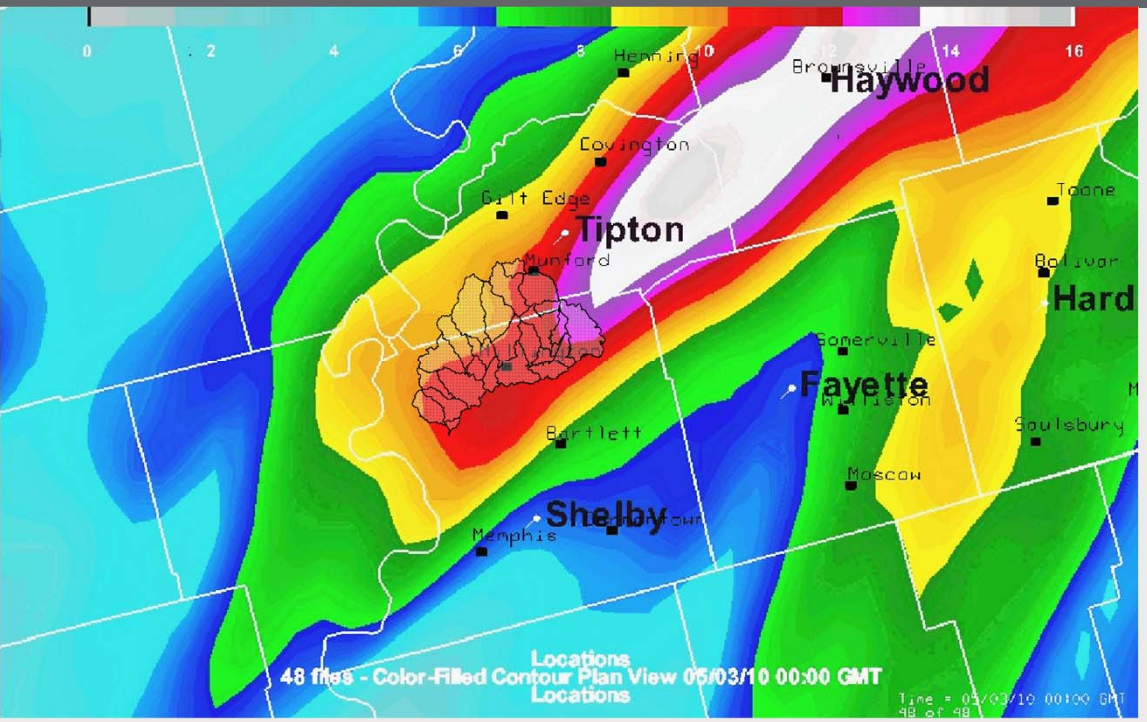
Watershed Background



Project Path



Historic Flood Event



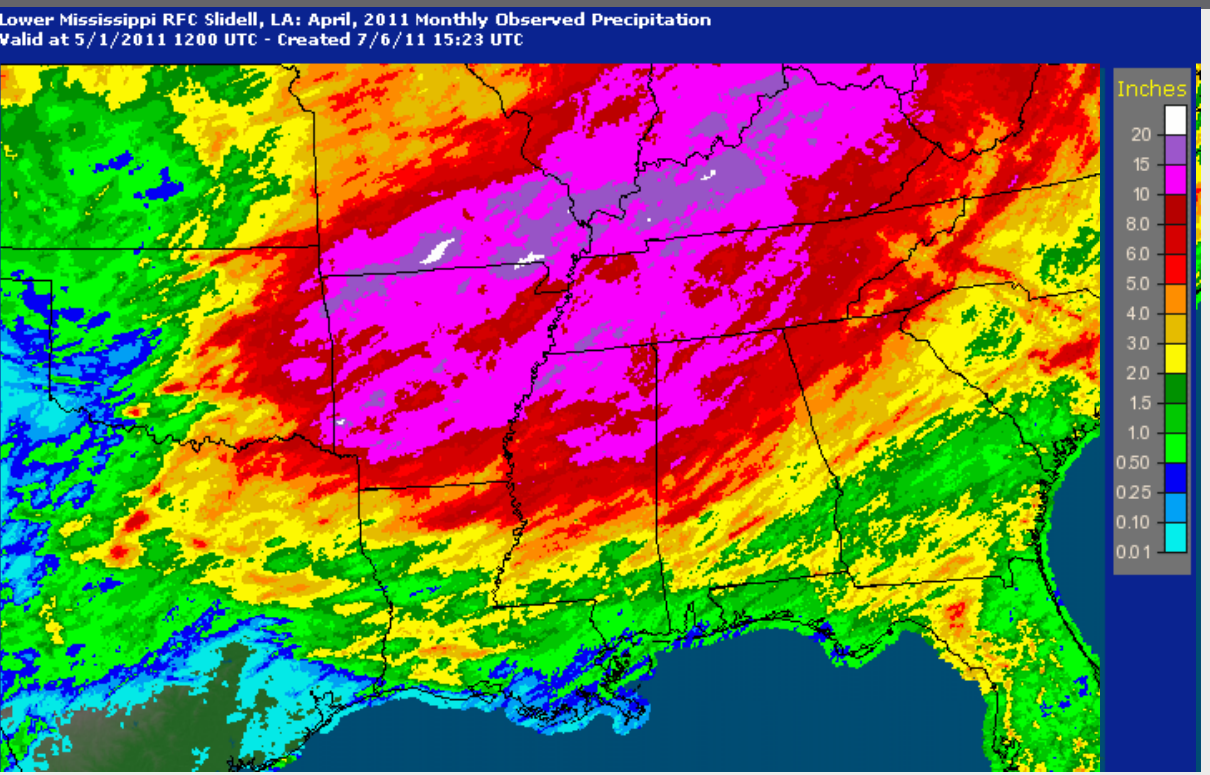
City of Millington Flooding

Over 13 inches of rain in two days

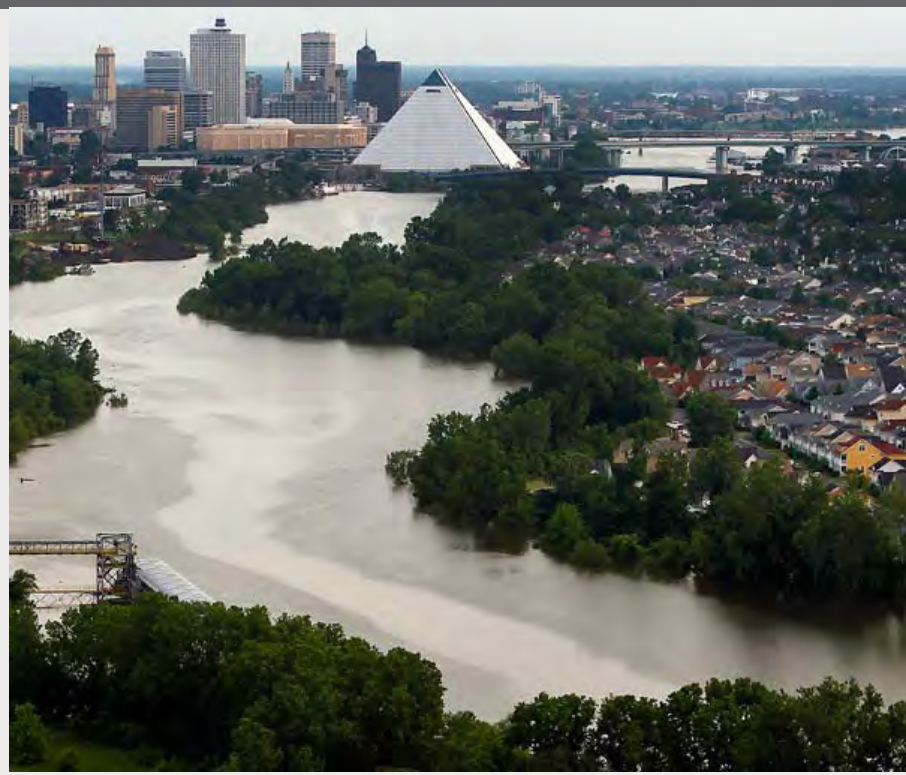
Historic Flood Event

2011

Historic Flooding Event



Mississippi River reaching historic stage

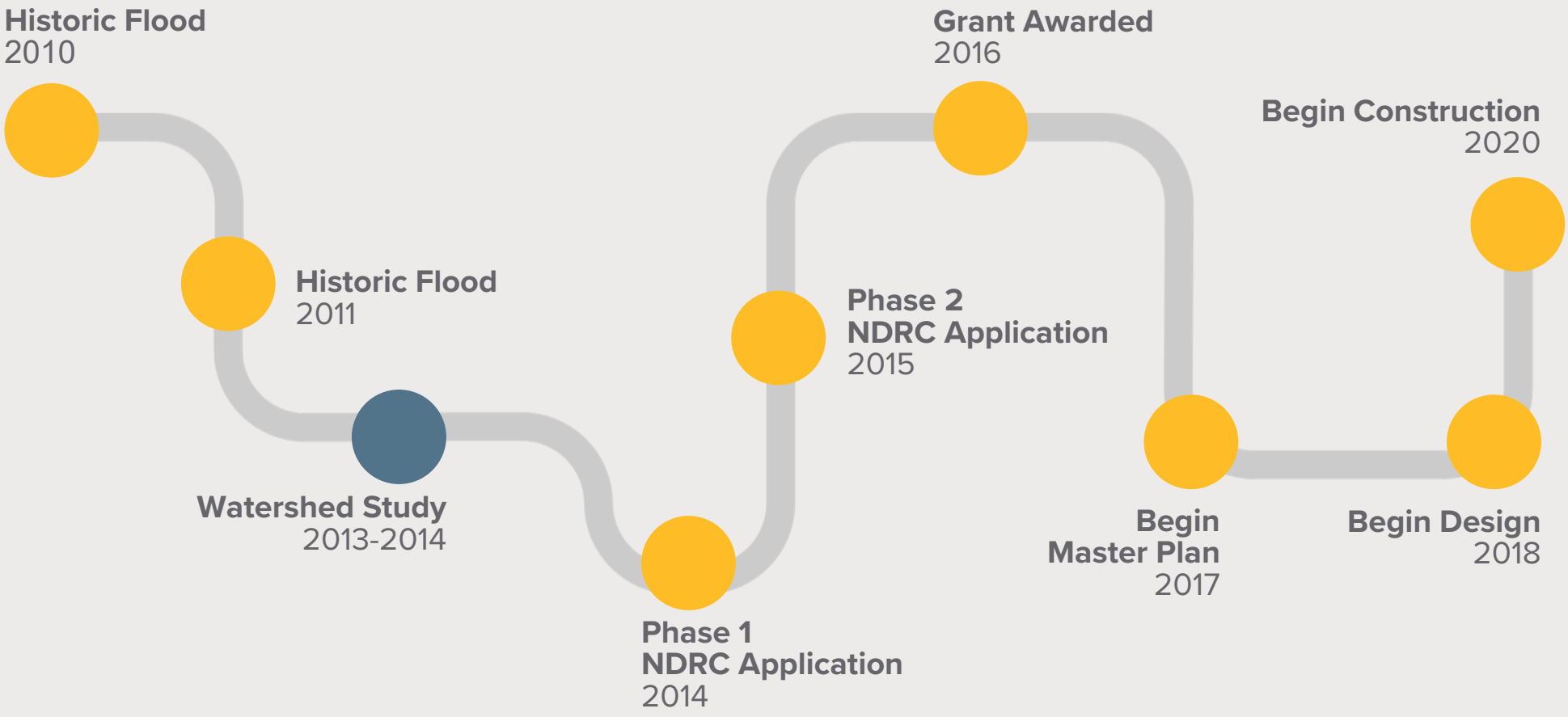


Over 11 inches of rain in one day

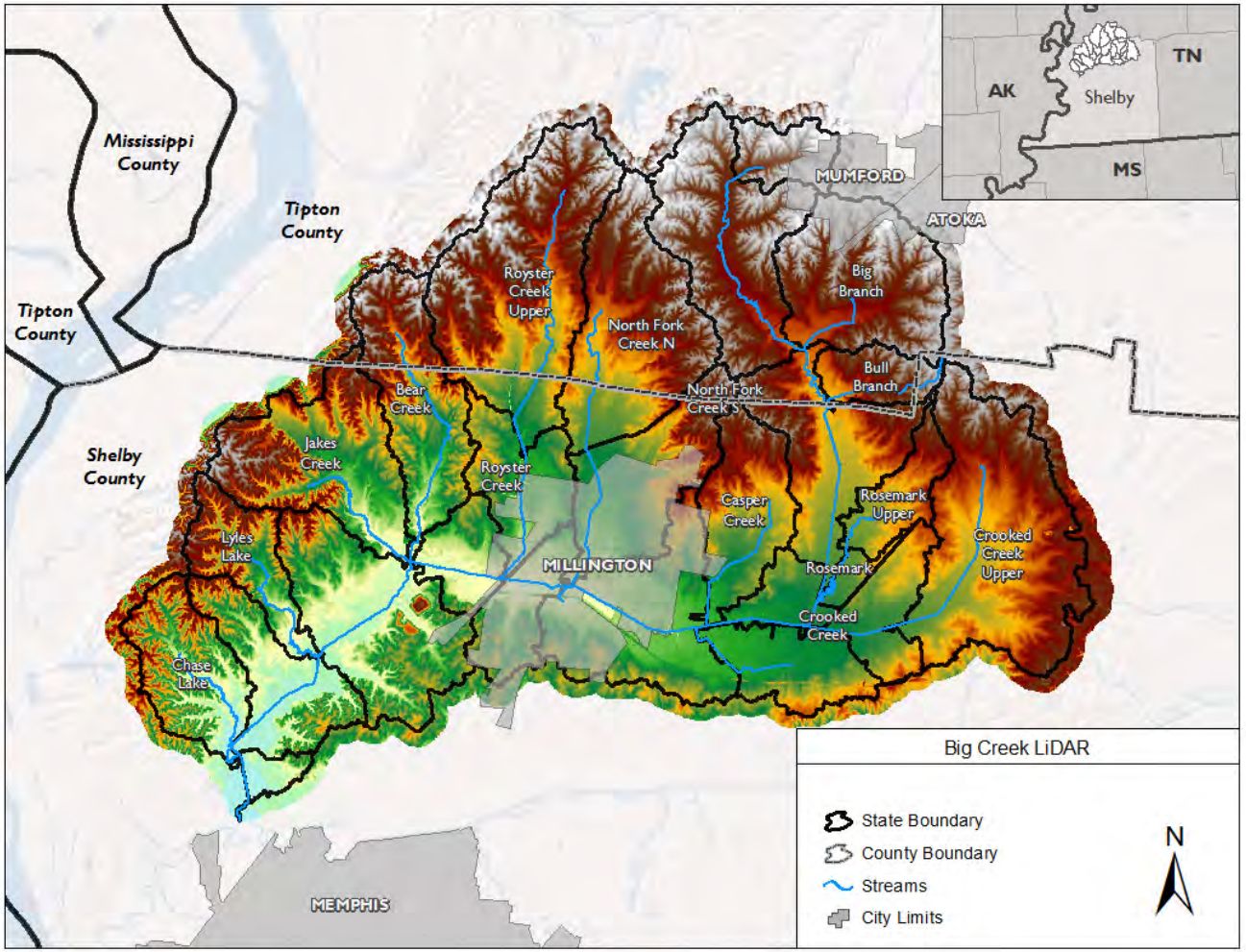
2011

Historic Flooding Event

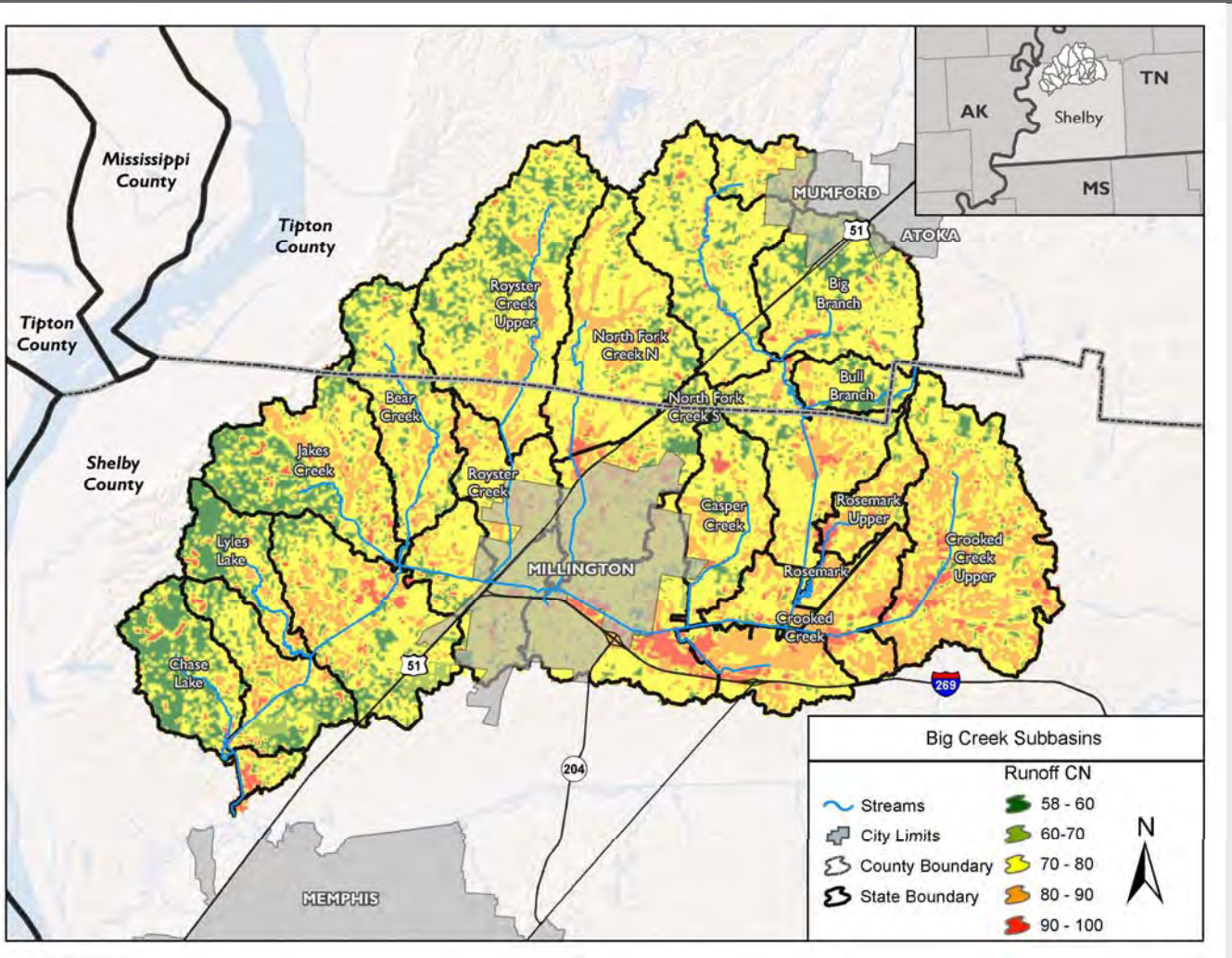
Project Path



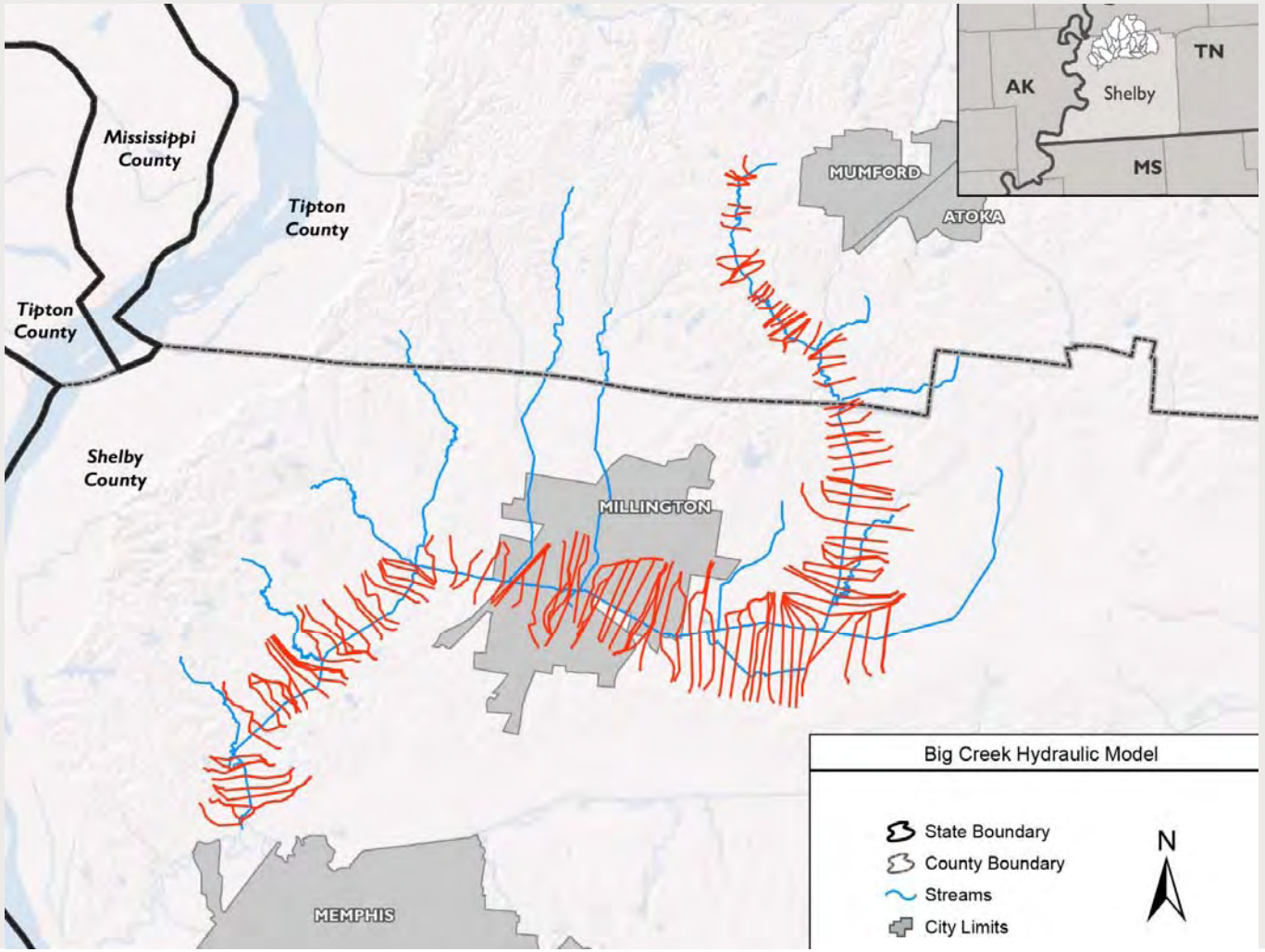
Big Creek Watershed



Curve Number Exhibit

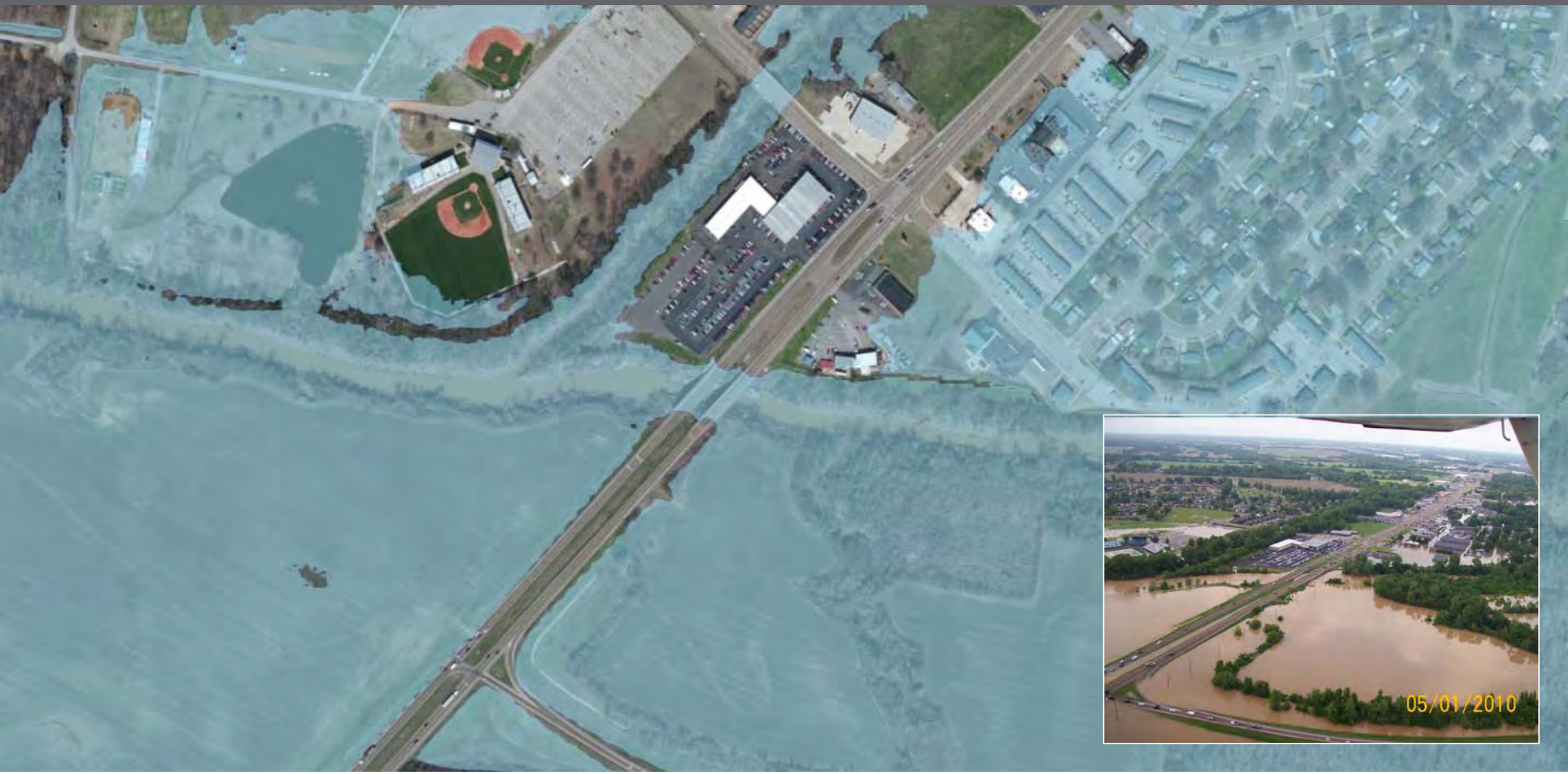


Hydraulic Model Schematic



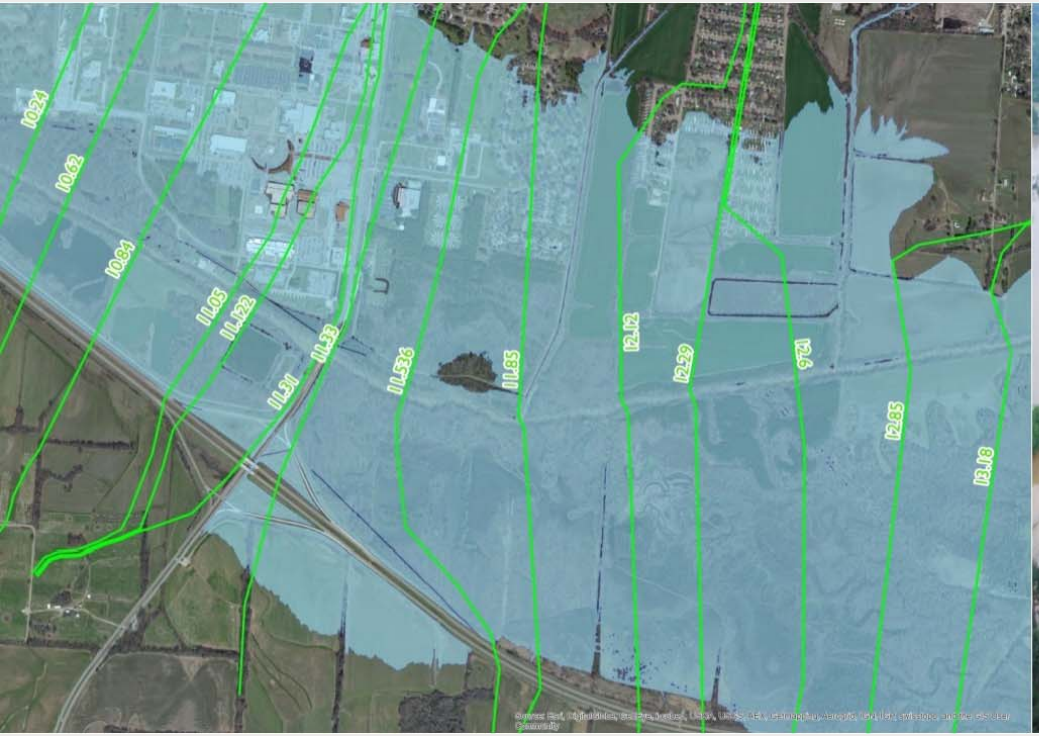
MAY 2010

Highway 51 Flood Inundation



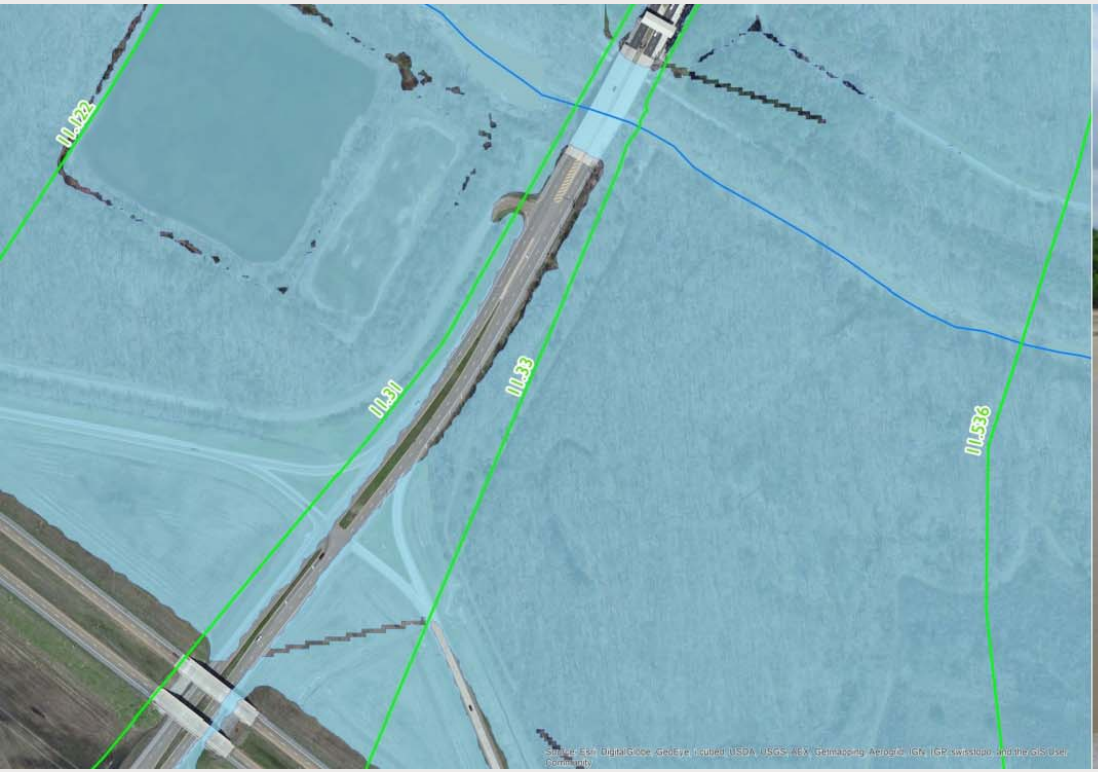
MAY 2010

Navy Base Inundation



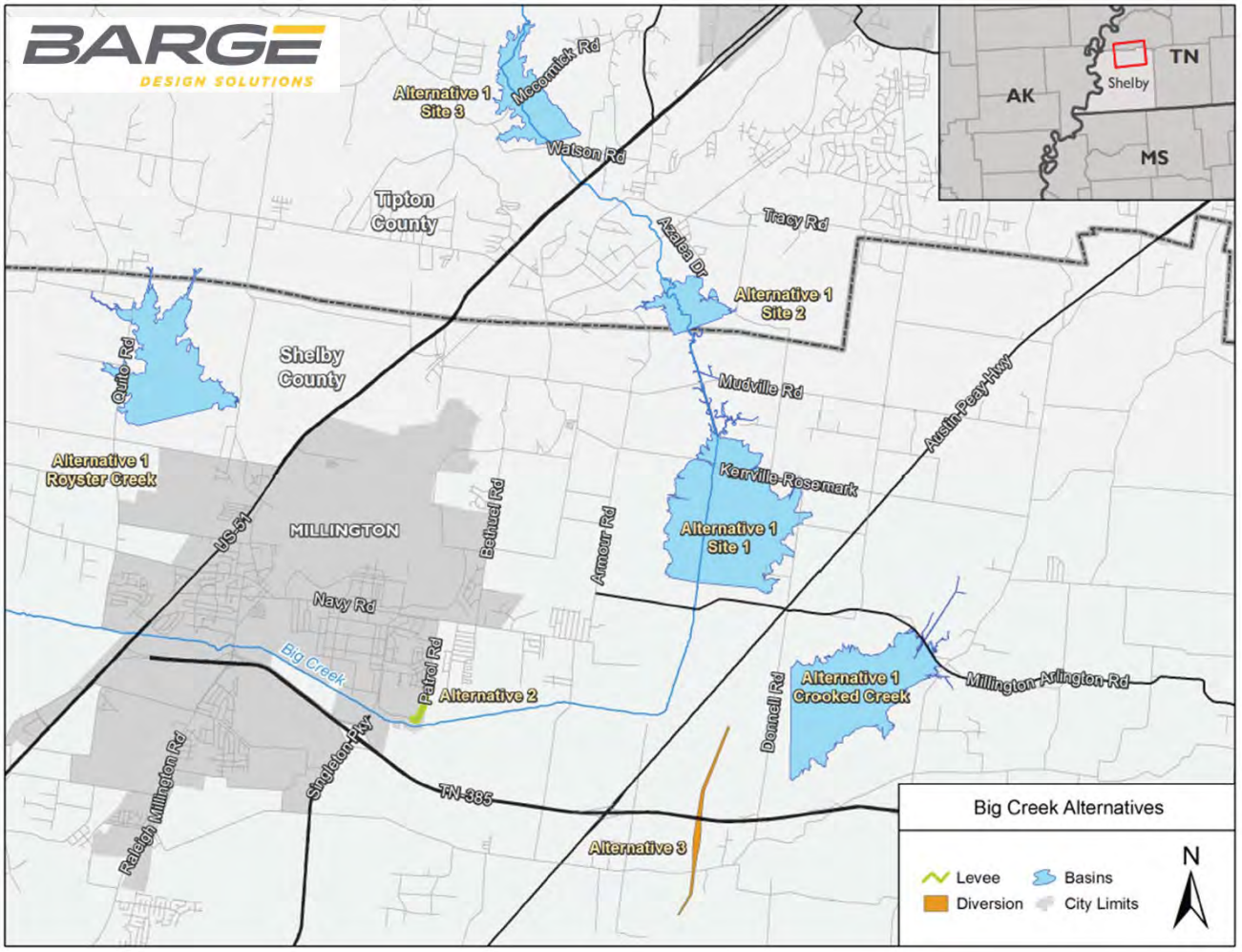
MAY 2010

Singleton Parkway Inundation



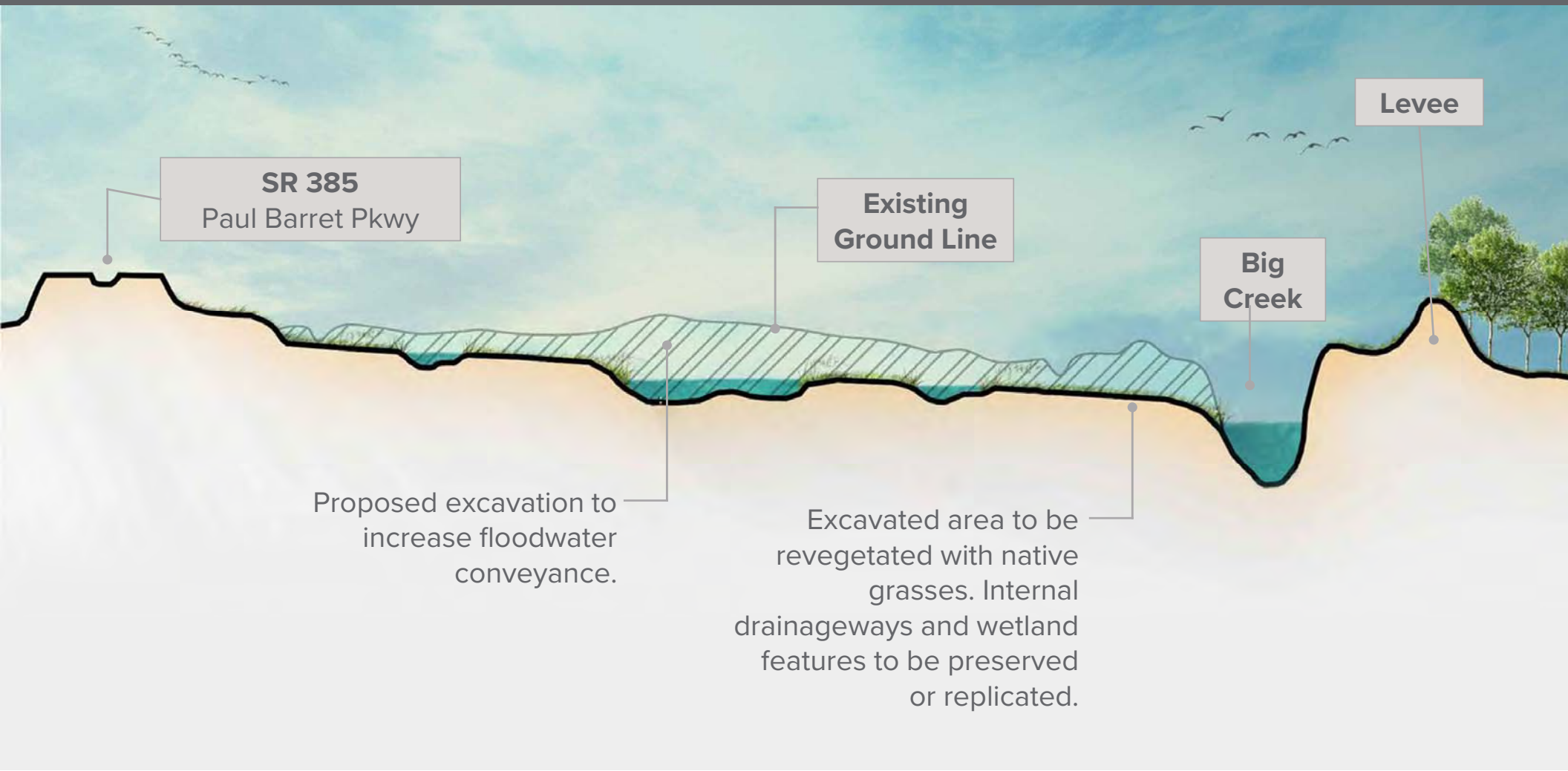
Alternatives

1. Regional Detention Facilities
2. Levee
3. High Flow Diversion
4. Combinations of Alternatives 1-3



ALTERNATIVE 4

Additional Storage

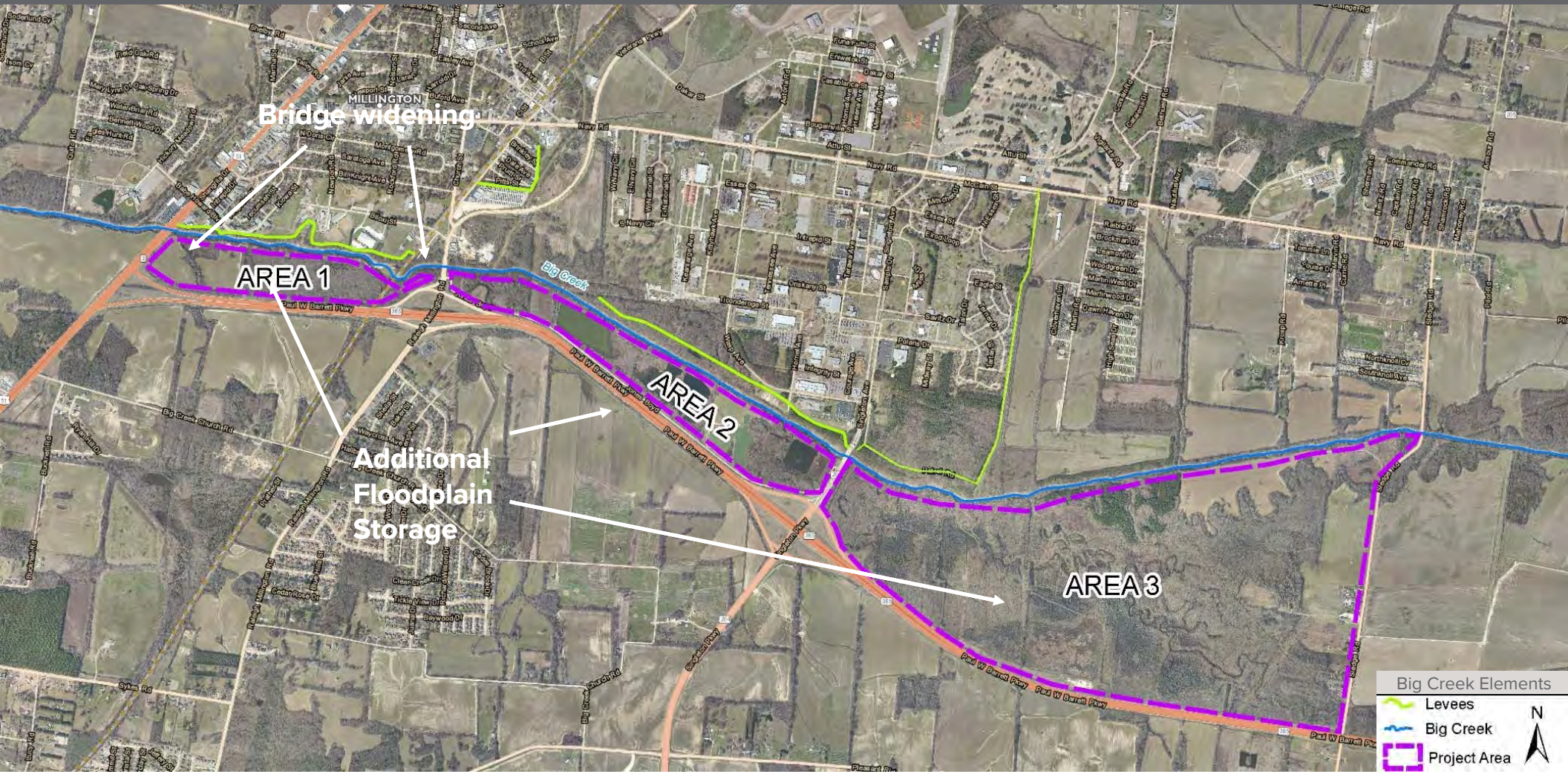


Evaluation Summary

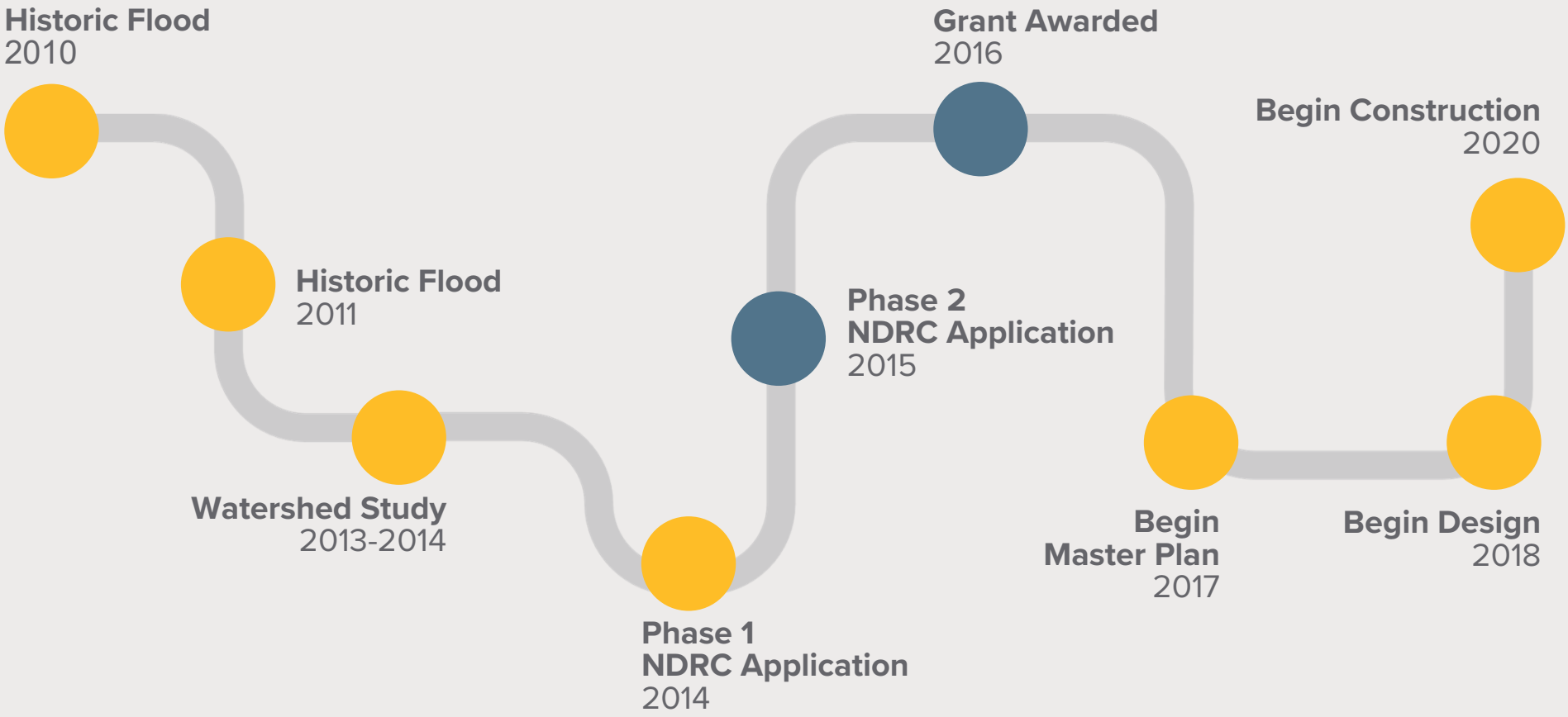
ALTERNATIVES	APPROX. EST'D. CONSTRUCTION COST	APPROXIMATE ESTIMATED LAND COST	APPROXIMATE TOTAL COST[1]	DECREASE IN WATER SURFACE ELEV. FOR 500-YR. STORM AT:		DECREASE IN WATER SURFACE ELEV. FOR MAY, 2010 STORM AT:	
				U.S. HWY 51	SINGLETON PKWY.	U.S. HWY 51	SINGLETON PKWY.
ALTERNATE #1-TEMPORARY DETENTION UPSTREAM							
Big Creek Dam #1	$2,970,000	$13,500,000	$16,470,000	0.08	1.07	0.96	1.52
Crooked Creek Dam	$2,380,000	$7,500,000	$9,880,000	0.12	1.36	0.00	0.89
Royster Creek Dam	$1,880,000	$5,250,000	$7,130,000	0.32	0.03	0.00	0.00
Big Crk. #1 & Crooked Crk. Dams	$5,350,000	$21,000,000	$26,350,000	0.27	2.15	1.26	2.69
Crooked Crk. & Royster C							
ALTERNATE #2-ENHANCE							
Alt. F-Excvtn., Rec. Impts., Imp. Hwy 51 & Ra-Mill							
Raise East Navy Base Lev	$36,900,000	$2,300,000	$39,200,000	0.40	2.90	0.33	1.89
ALTERNATE #3-HIGH FLO							
Crooked Creek Diversion	$11,970,000	$1,130,000	$13,100,000	0.12	1.36	1.25	1.04
ALTERNATE #4-INCRE SE SOUTH OVERBANK CONVEYANCE [2]							
Alt. A-Clear L B, Add Imprvmnts.	$13,200,000	$2,300,000	$15,500,000	0.39	0.80	N/A	0.47
Alt. B- xcavate LOB, Add Imprvmnts.	$34,700,000	$2,300,000	$37,000,000	0.40	2.70	N/A	1.44
Alt. F-Excvtn., Rec. Impts., Imp. Hwy 51 & Ra-Mill	$36,900,000	$2,300,000	$39,200,000	0.40	2.90	0.33	1.89

CHOSEN ALTERNATIVE

Project Area



Project Path



National Disaster Resiliency Competition

- $1 billion program administered by the U.S. Department of Housing and Urban Development
- Provides grants for communities to rebuild in a more meaningful way

Focuses on:

- Increased need for infrastructure resiliency
- The social and economic characteristics that allow communities to bounce back more quickly

Project Metrics

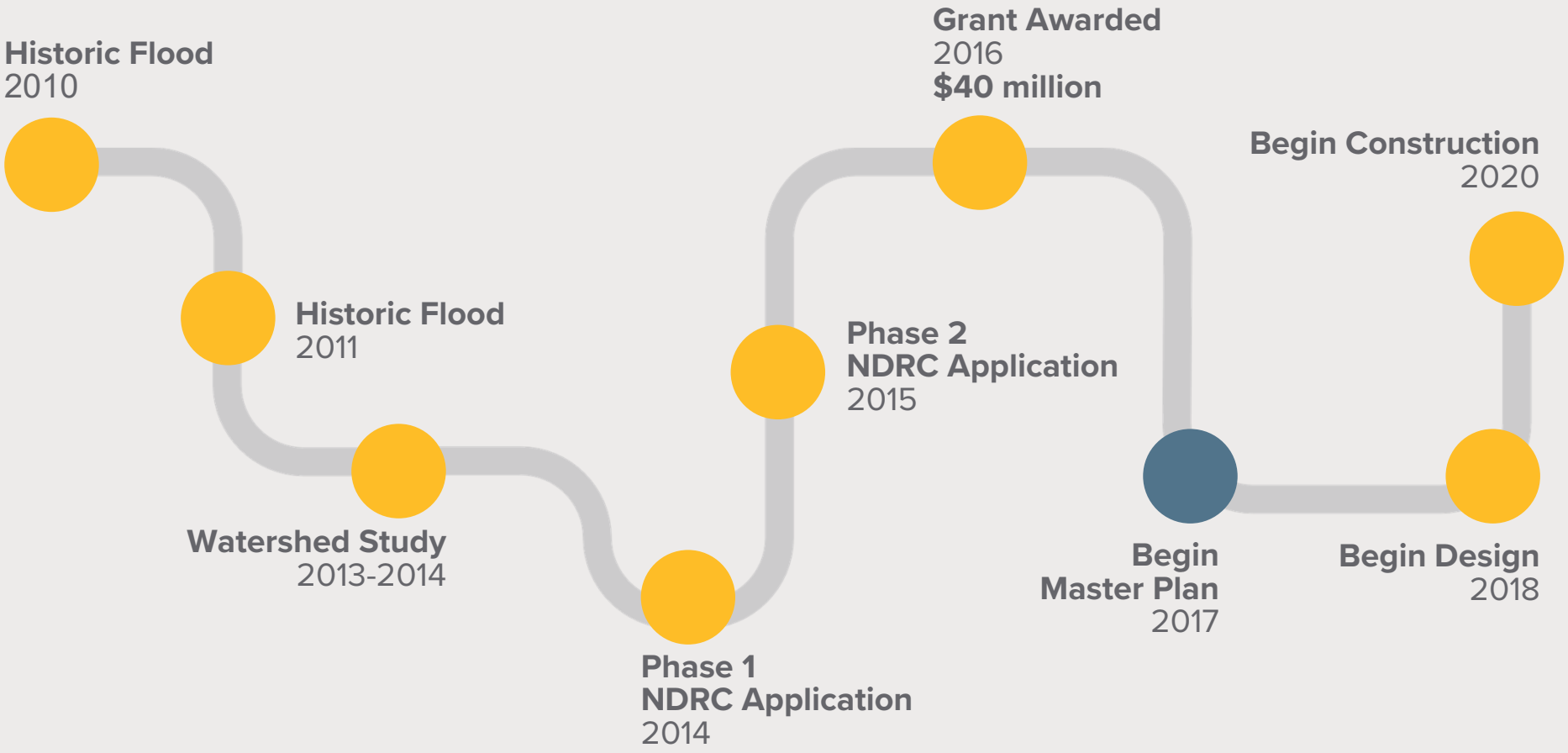
SOCIAL
Parks and Trails

ECONOMIC
Increase in Building Permits

ENVIRONMENTAL
Tree Mitigation

RESILIENCE
Flood Reduction

Project Path



Master Plan

Master Plan – Area #1

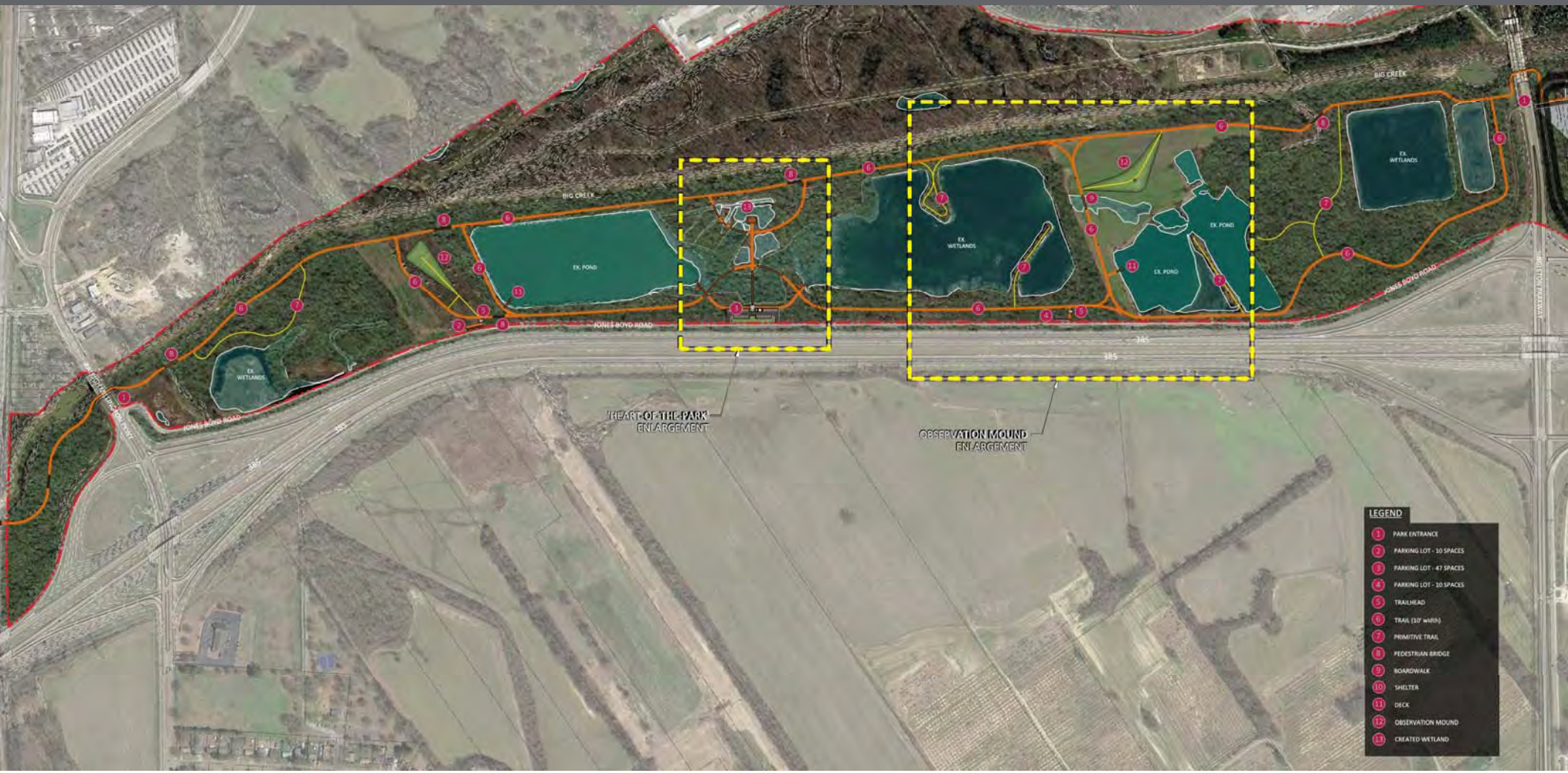
BIG CREEK - AREA 01
MILLINGTON, TN MASTER PLAN

NORTH

GRAPHIC SCALE

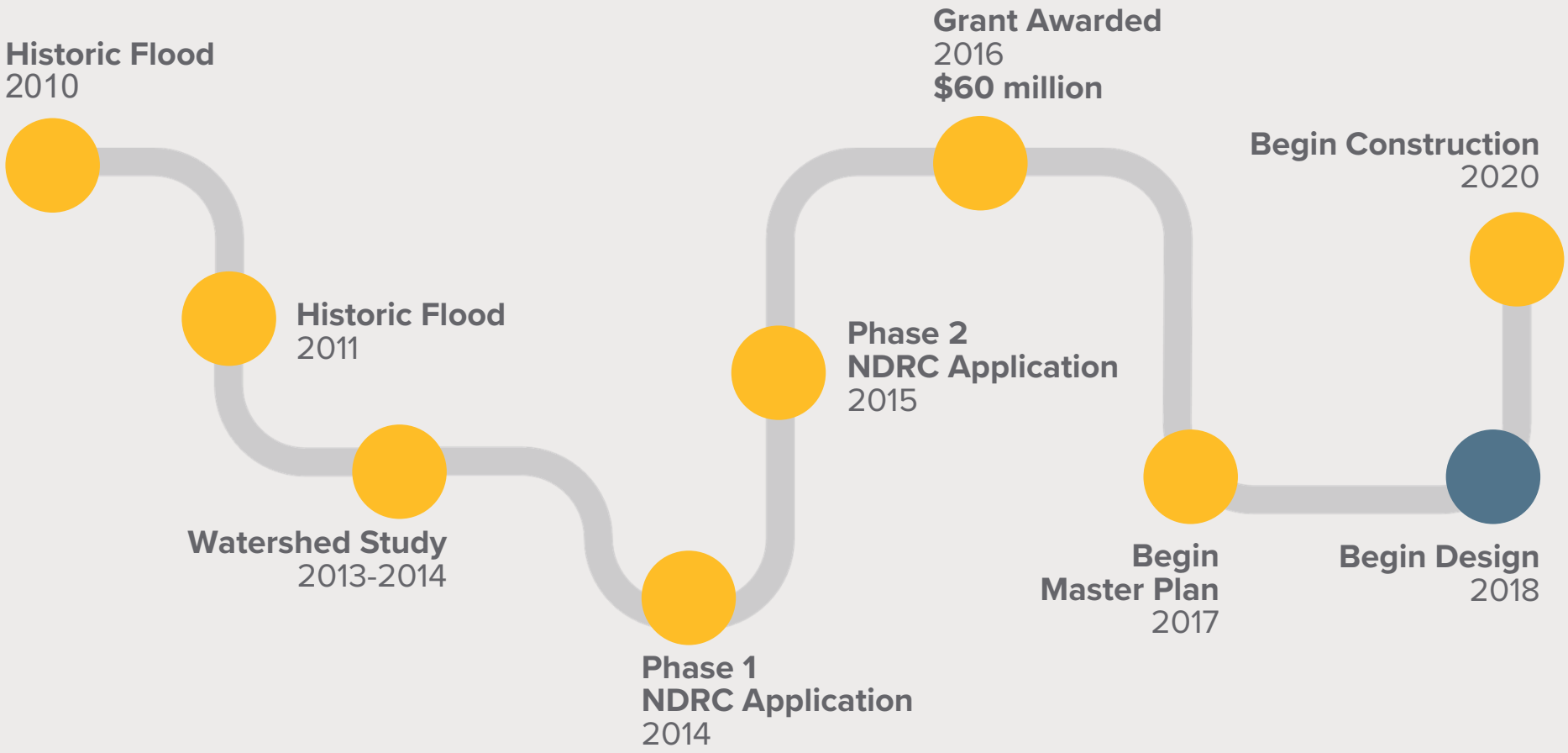
SCALE IN FEET

Master Plan – Area #2



Master Plan – Area #3

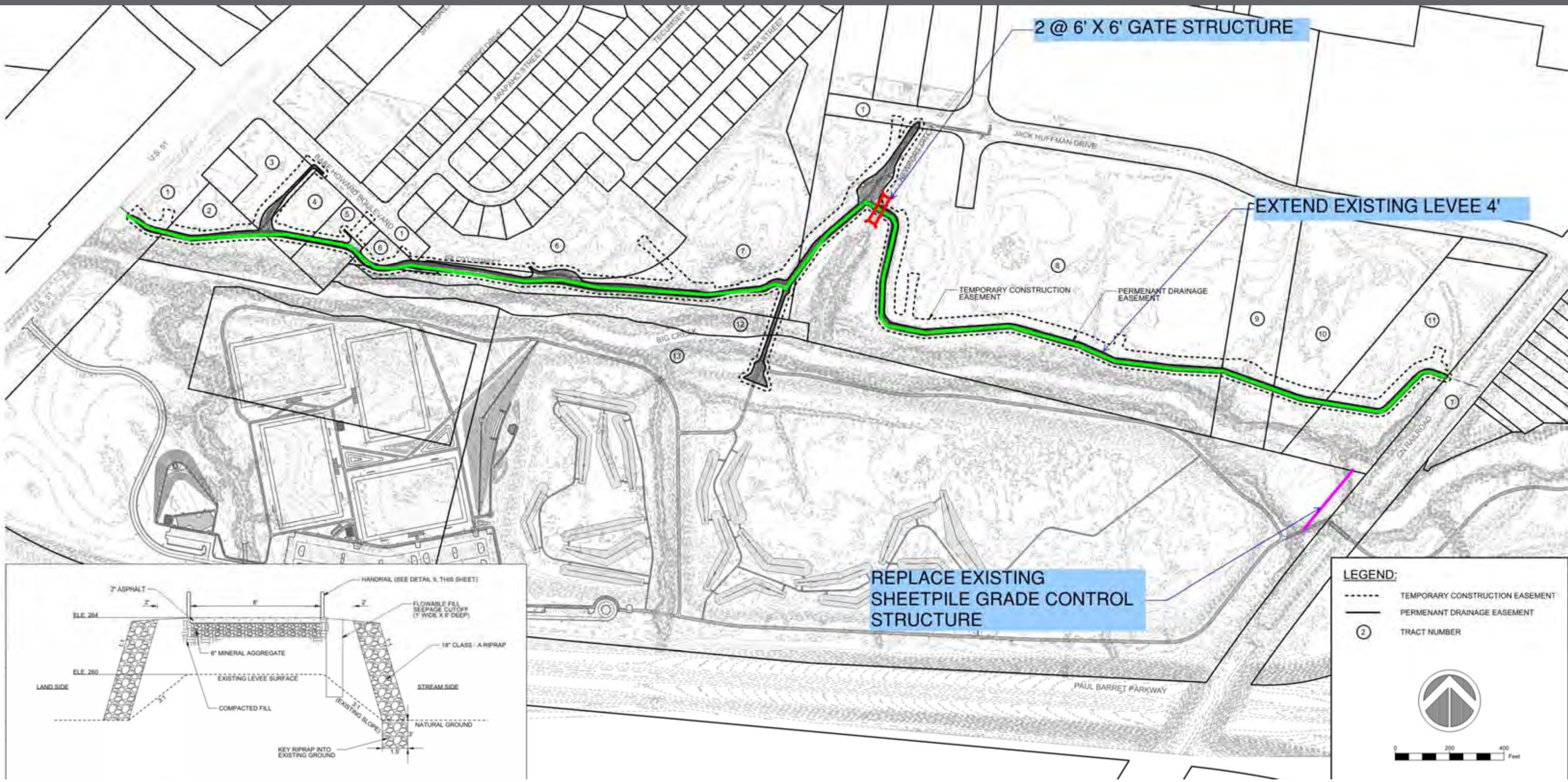
Project Path



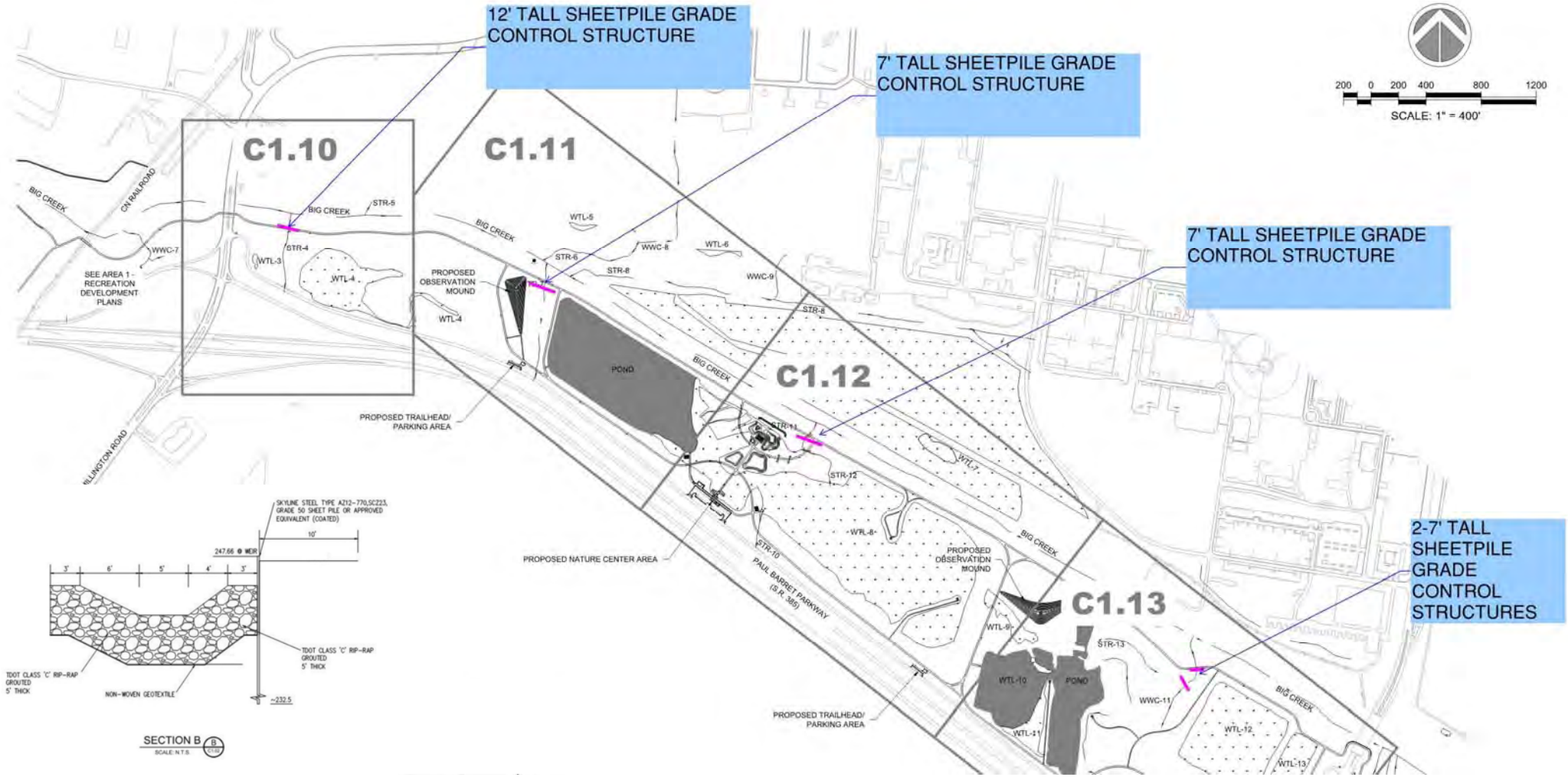
Where Are We Now?

- **Survey complete**
- **NEPA complete**
- **Permit applications prepared and submitted**
- **90% design prepared**

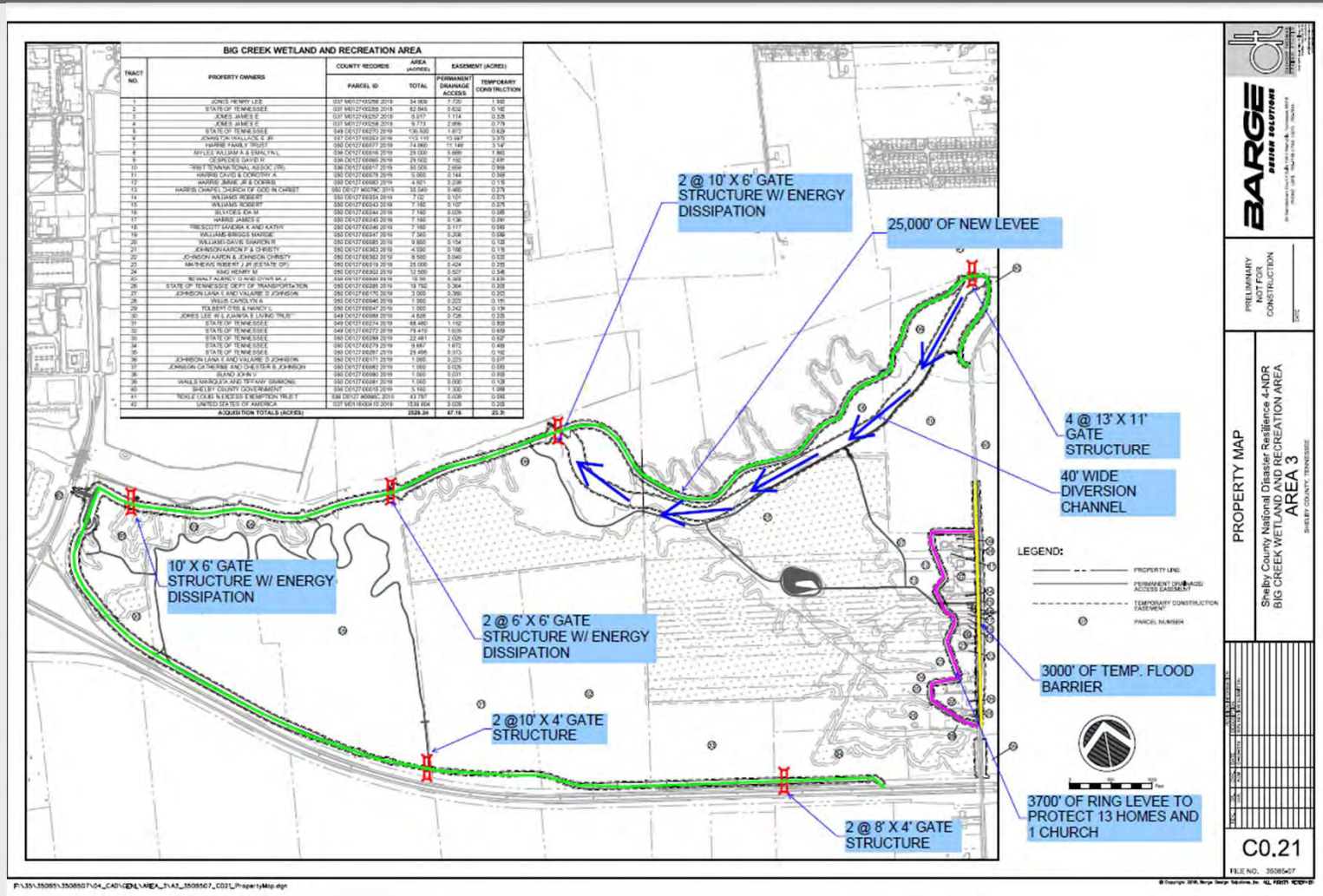
Area #1

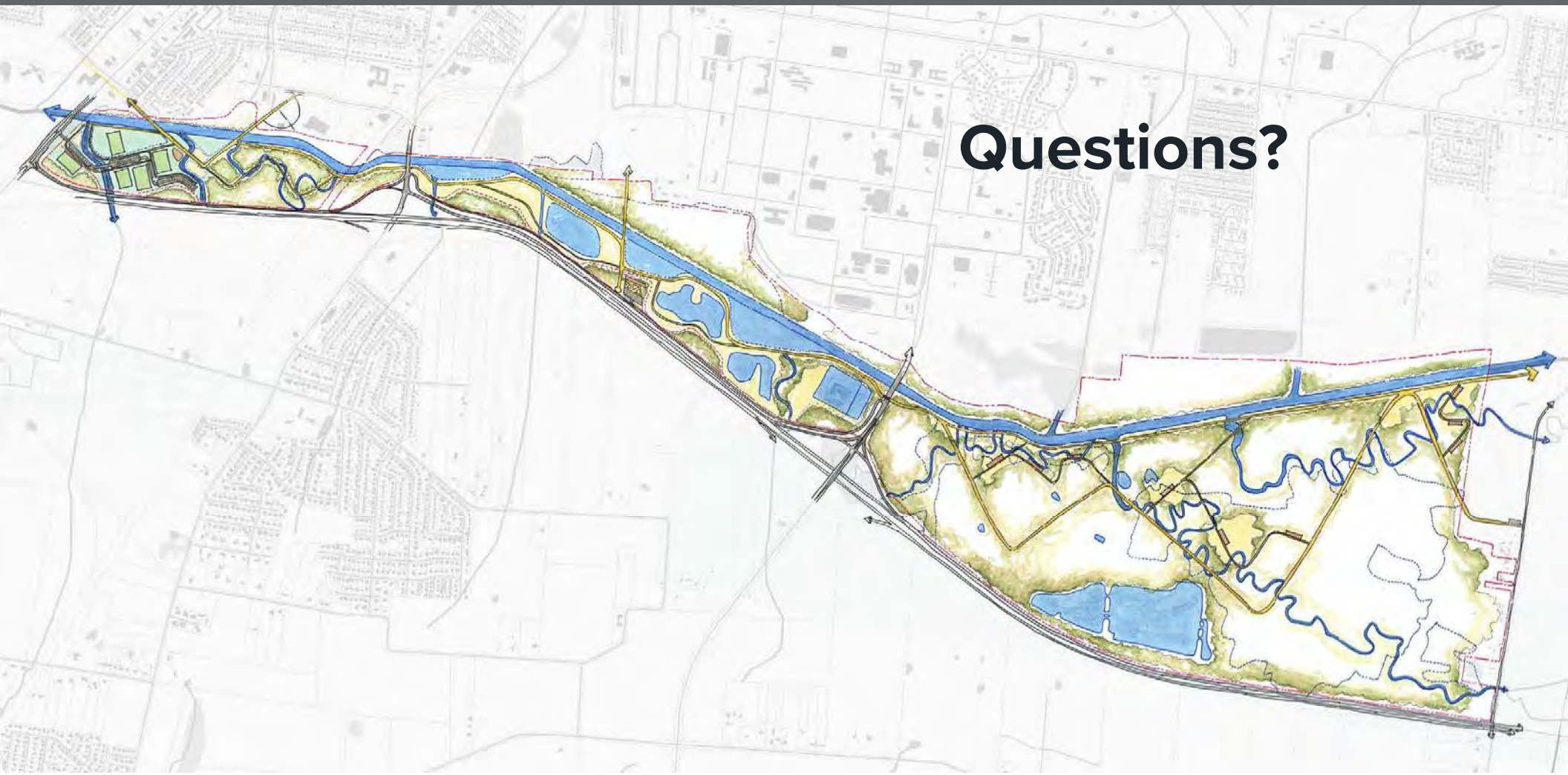

2 @ 6' X 6' GATE STRUCTURE
EXTEND EXISTING LEVEE 4'
REPLACE EXISTING SHEETPILE GRADE CONTROL STRUCTURE
JACK HUFFMAN DRIVE
PAUL BARRET PARKWAY
TEMPORARY CONSTRUCTION EASEMENT
PERMENANT DRAINAGE EASEMENT
LEGEND:
TEMPORARY CONSTRUCTION EASEMENT
PERMENANT DRAINAGE EASEMENT
TRACT NUMBER
ELE. 264
ELE. 260
LAND SIDE
STREAM SIDE
EXISTING LEVEE SURFACE
COMPACTED FILL
6" MINERAL AGGREGATE
18" CLASS - A RIPRAP
NATURAL GROUND
KEY RIPRAP INTO EXISTING GROUND

Area #2


12' TALL SHEETPILE GRADE CONTROL STRUCTURE
7' TALL SHEETPILE GRADE CONTROL STRUCTURE
7' TALL SHEETPILE GRADE CONTROL STRUCTURE
2-7' TALL SHEETPILE GRADE CONTROL STRUCTURES
C1.10
C1.11
C1.12
C1.13
200 0 200 400 800 1200
SCALE: 1" = 400'
BIG CREEK
CN RAILROAD
WWC-7
WTL-3
STR-4
STR-5
WTL-4
SEE AREA 1 - RECREATION DEVELOPMENT PLANS
PROPOSED OBSERVATION MOUND
WTL-5
STR-6
STR-8
WWC-8
WTL-6
WWC-9
STR-9
POND
PROPOSED TRAILHEAD/ PARKING AREA
STR-11
STR-12
WTL-7
WTL-8
PROPOSED NATURE CENTER AREA
STR-10
PAUL BARRET PARKWAY (S.R. 385)
PROPOSED OBSERVATION MOUND
WTL-9
STR-13
WTL-10
POND
WWC-11
WTL-11
PROPOSED TRAILHEAD/ PARKING AREA
WTL-12
WTL-13
SKYLINE STEEL TYPE AZ12-770,SC223, GRADE 50 SHEET PILE OR APPROVED EQUIVALENT (COATED)
247.66 WEIR
TDOT CLASS 'C' RIP-RAP GROUTED 5' THICK
NON-WOVEN GEOTEXTILE
~232.5
SECTION B
SCALE: N.T.S.

Area #3


BIG CREEK WETLAND AND RECREATION AREA
2 @ 10' X 6' GATE STRUCTURE W/ ENERGY DISSIPATION
25,000' OF NEW LEVEE
4 @ 13' X 11' GATE STRUCTURE
40' WIDE DIVERSION CHANNEL
10' X 6' GATE STRUCTURE W/ ENERGY DISSIPATION
2 @ 6' X 6' GATE STRUCTURE W/ ENERGY DISSIPATION
2 @10' X 4' GATE STRUCTURE
3000' OF TEMP. FLOOD BARRIER
2 @ 8' X 4' GATE STRUCTURE
3700' OF RING LEVEE TO PROTECT 13 HOMES AND 1 CHURCH
LEGEND:
PROPERTY LINE
PERMANENT DRAINAGE ACCESS EASEMENT
TEMPORARY CONSTRUCTION EASEMENT
PARCEL NUMBER
BARGE
PRELIMINARY NOT FOR CONSTRUCTION
PROPERTY MAP
Shelby County National Disaster Resilience 4-NDR
BIG CREEK WETLAND AND RECREATION AREA
AREA 3
SHELBY COUNTY, TENNESSEE
C0.21
FILE NO. 3508507



Questions?

Thank you.

BARGE
DESIGN SOLUTIONS

Evaluation Summary

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Big Crk. #1 & Crooked Crk. Dams	$5,350,000	$21,000,000	$26,350,000	0.27	2.15	1.26	2.69
Crooked Crk. & Royster Crk. Dams	$4,260,000	$12,750,000	$17,010,000	0.54	1.39	0.98	1.19
ALTERNATE #2-ENHANCED LEVEE PROTECTION							
Raise East Navy Base Levee	$340,000	$0	$340,000	0.00	0.00	0.00	0.00
ALTERNATE #3-HIGH FLOW DIVERSION							
Crooked Creek Diversion	$11,970,000	$1,130,000	$13,100,000	0.12	1.36	1.25	1.04
ALTERNATE #4-INCREASE SOUTH OVERBANK CONVEYANCE[2]							
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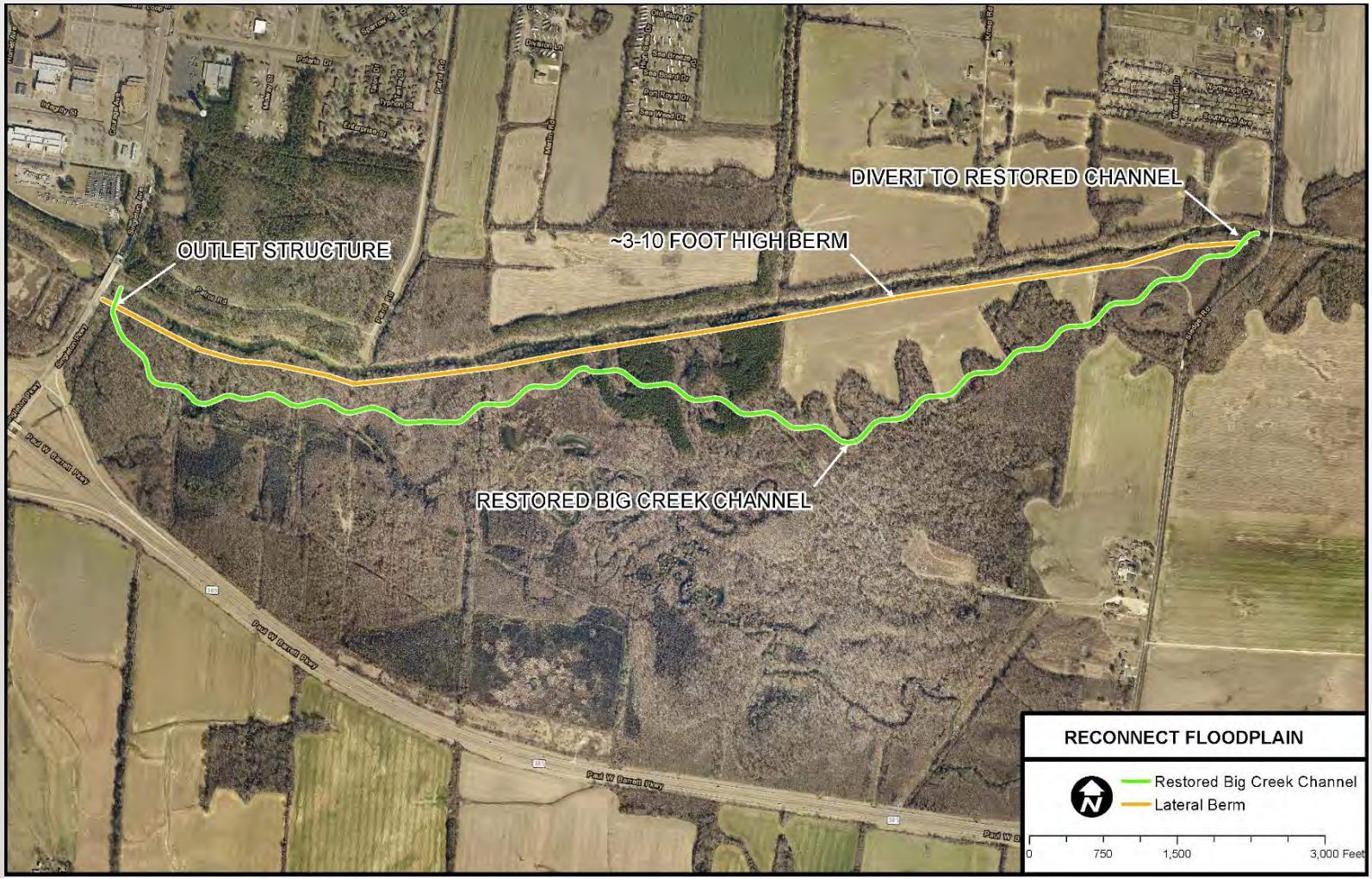
Alt. F-Excvtn., Rec. Impts., Imp. Hwy 51 & Ra-Mill	$36,900,000	$2,300,000	$39,200,000	0.40	2.90	0.33	1.89

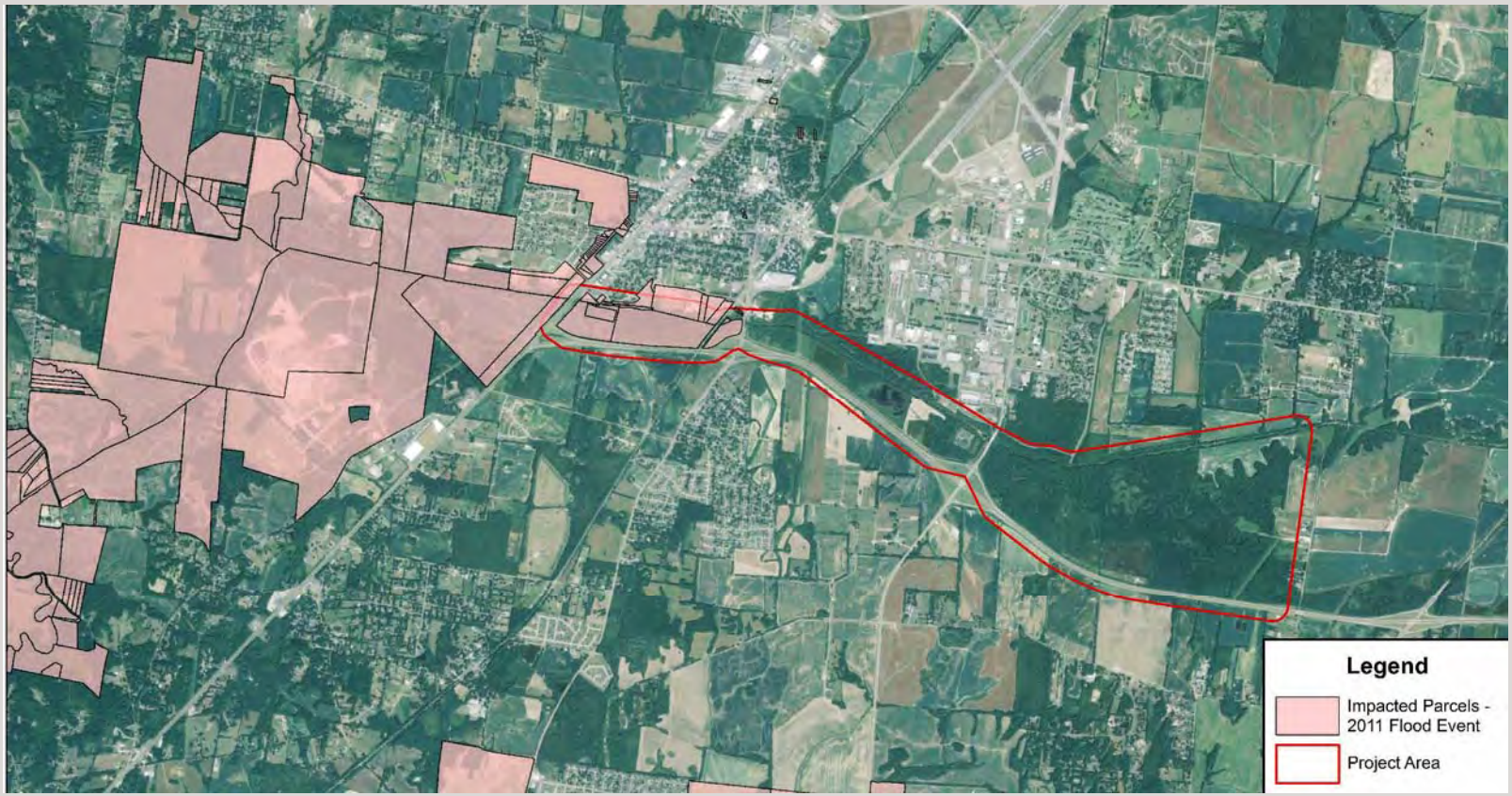
1. Design costs and construction contingincies are not included in these numbers.
2. Only the costs for Phase I of the Recreational Improvements are included here.

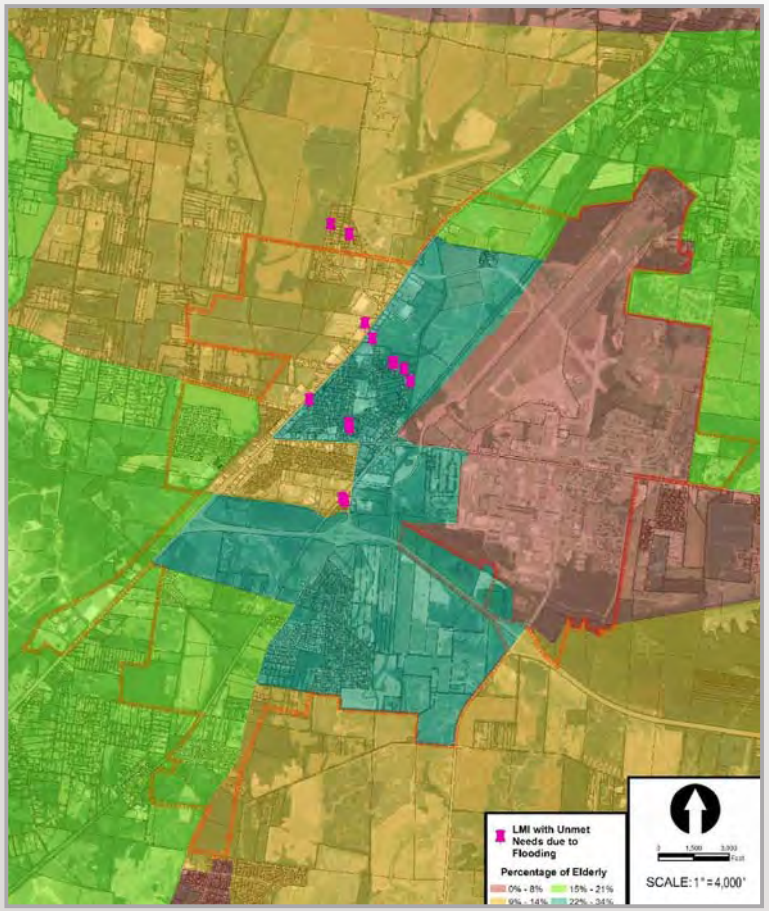
TDOT Mitigation Site

Area 3 - Reconnect Floodplain



2011 Flooding in the Millington Area



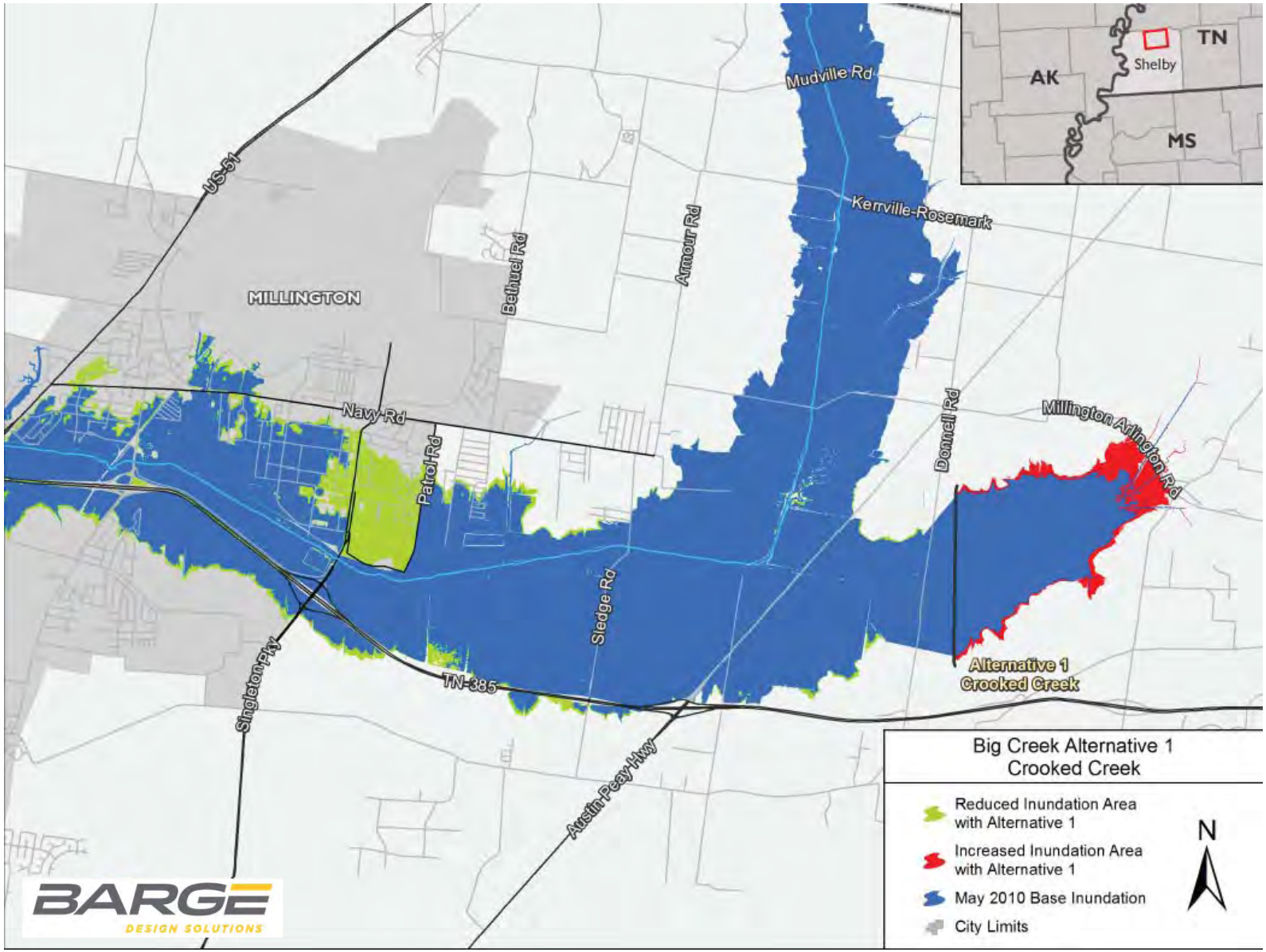


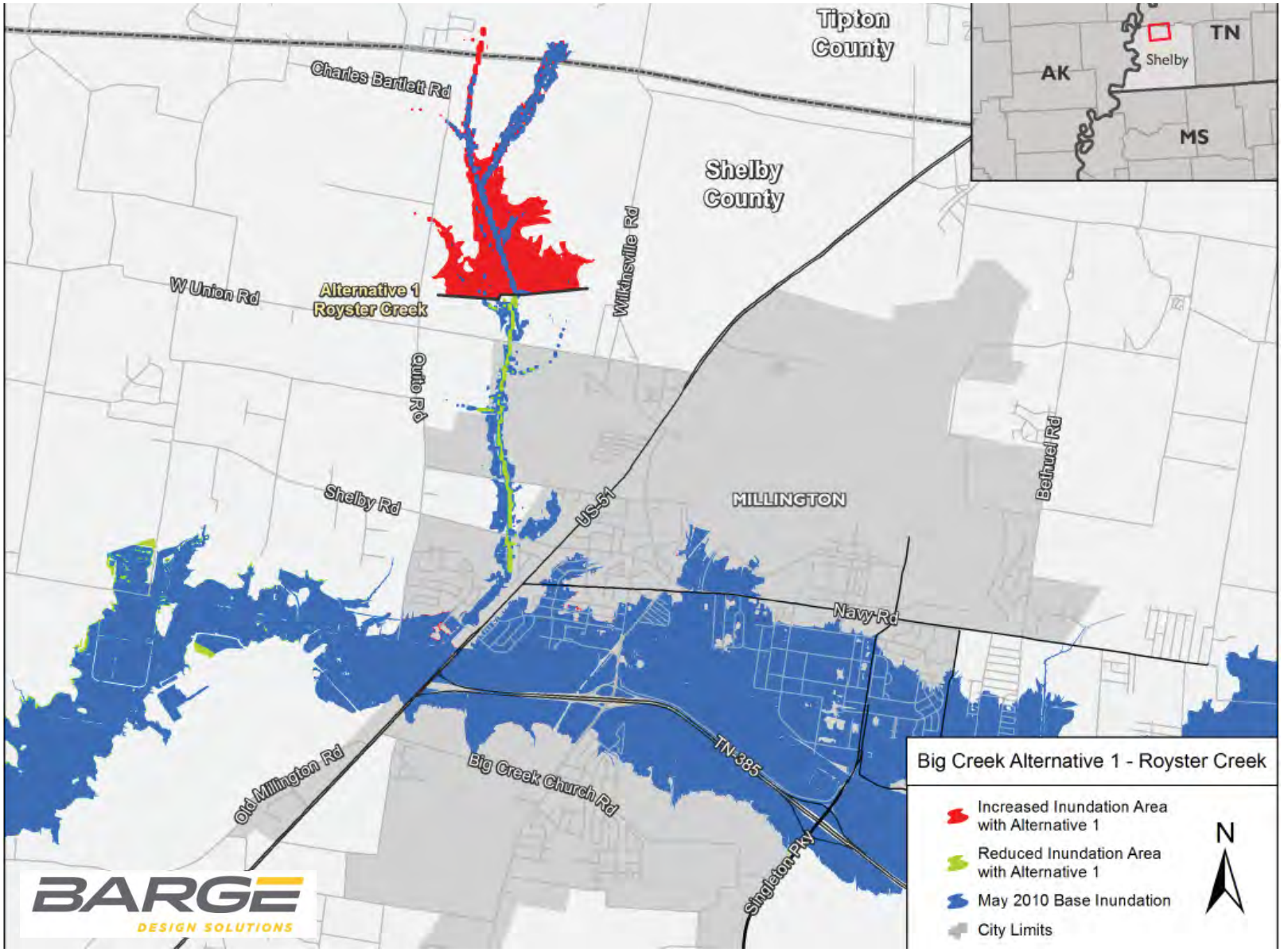
Big Creek

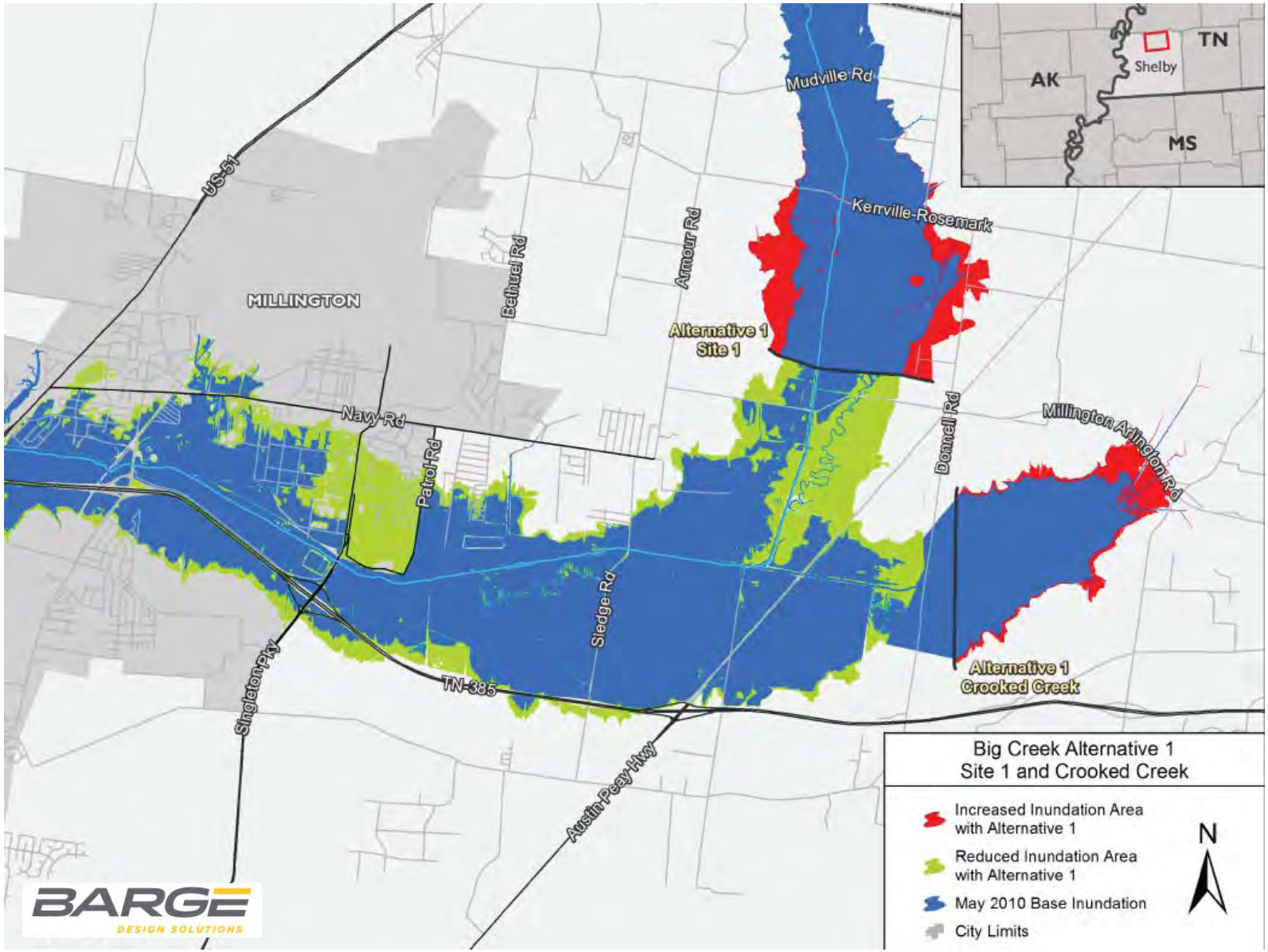
May 2011

Flood

The flood of 2011 left numerous unmet needs in the Millington Area where the majority of the community is comprised of LMI households


TN
Shelby
AK
MS
Mudville Rd
Kerrville-Rosemark
US-51
MILLINGTON
Bethuel Rd
Armour Rd
Navy Rd
Patrol Rd
Donnell Rd
Millington Arlington Rd
Sledge Rd
Singleton Pky
TN-385
Austin Peay Hwy
Alternative 1
Crooked Creek
Big Creek Alternative 1
Crooked Creek
Reduced Inundation Area with Alternative 1
Increased Inundation Area with Alternative 1
May 2010 Base Inundation
City Limits
N
BARGE
DESIGN SOLUTIONS


Tipton County
Shelby County
Charles Bartlett Rd
W Union Rd
Alternative 1
Royster Creek
Wilkinsville Rd
Ouio Rd
Shelby Rd
US-51
MILLINGTON
Bethuel Rd
Navy Rd
TN-385
Big Creek Church Rd
Old Millington Rd
Singleton Pky
TN
AK
MS
Shelby
Big Creek Alternative 1 - Royster Creek
Increased Inundation Area with Alternative 1
Reduced Inundation Area with Alternative 1
May 2010 Base Inundation
City Limits
N
BARGE
DESIGN SOLUTIONS


TN
Shelby
AK
MS
Mudville Rd
Kenville-Rosemark
US-51
Bethuel Rd
Armour Rd
MILLINGTON
Alternative 1
Site 1
Navy Rd
Patrol Rd
Donnell Rd
Millington Arlington Rd
Siedge Rd
Singleton Pky
TN-385
Austin Peay Hwy
Alternative 1
Crooked Creek
Big Creek Alternative 1
Site 1 and Crooked Creek
Increased Inundation Area
with Alternative 1
Reduced Inundation Area
with Alternative 1
May 2010 Base Inundation
City Limits
N
BARGE
DESIGN SOLUTIONS

Project Metrics

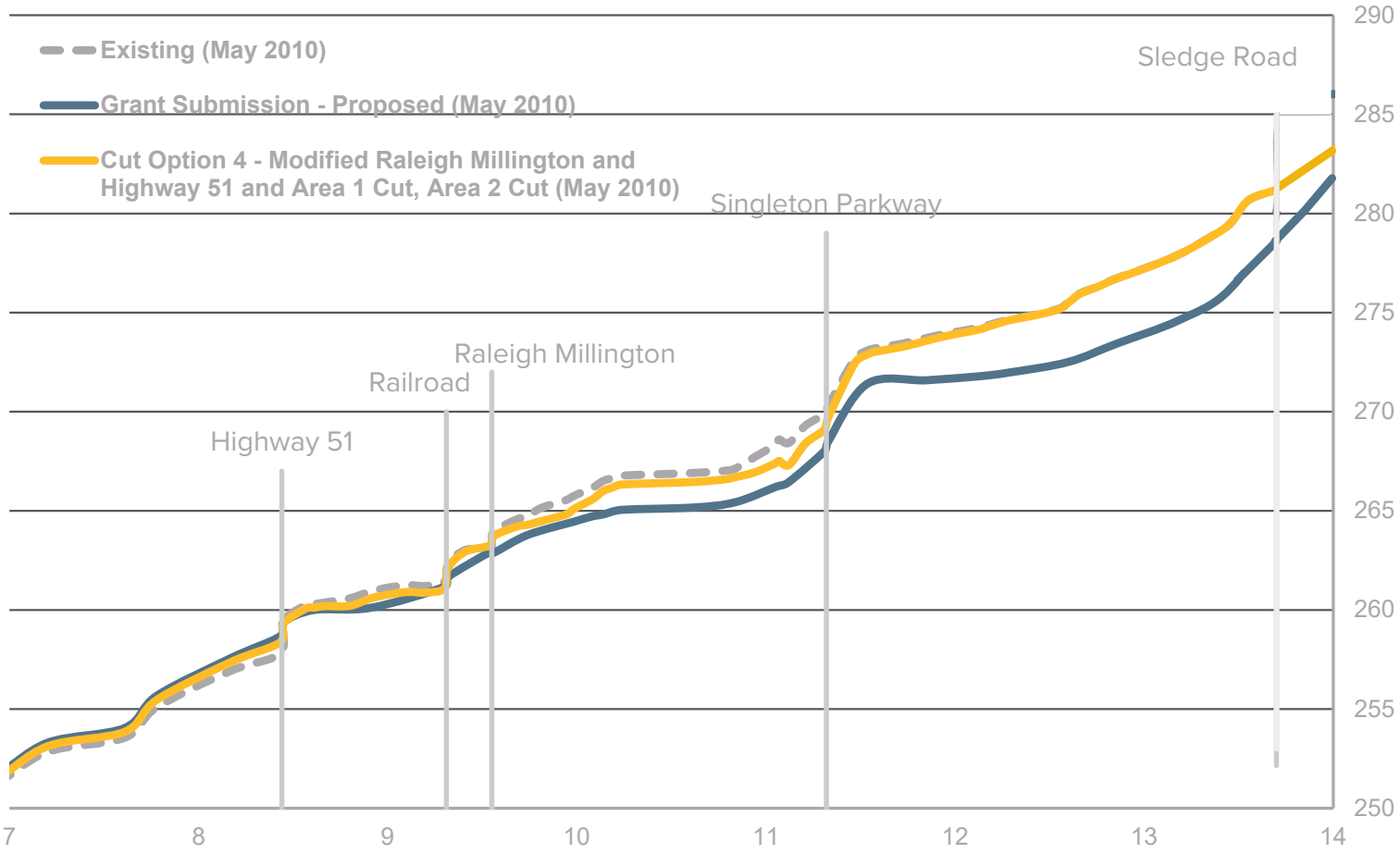
SOCIAL
Parks and Trails

ECONOMIC
Increase in Building Permits

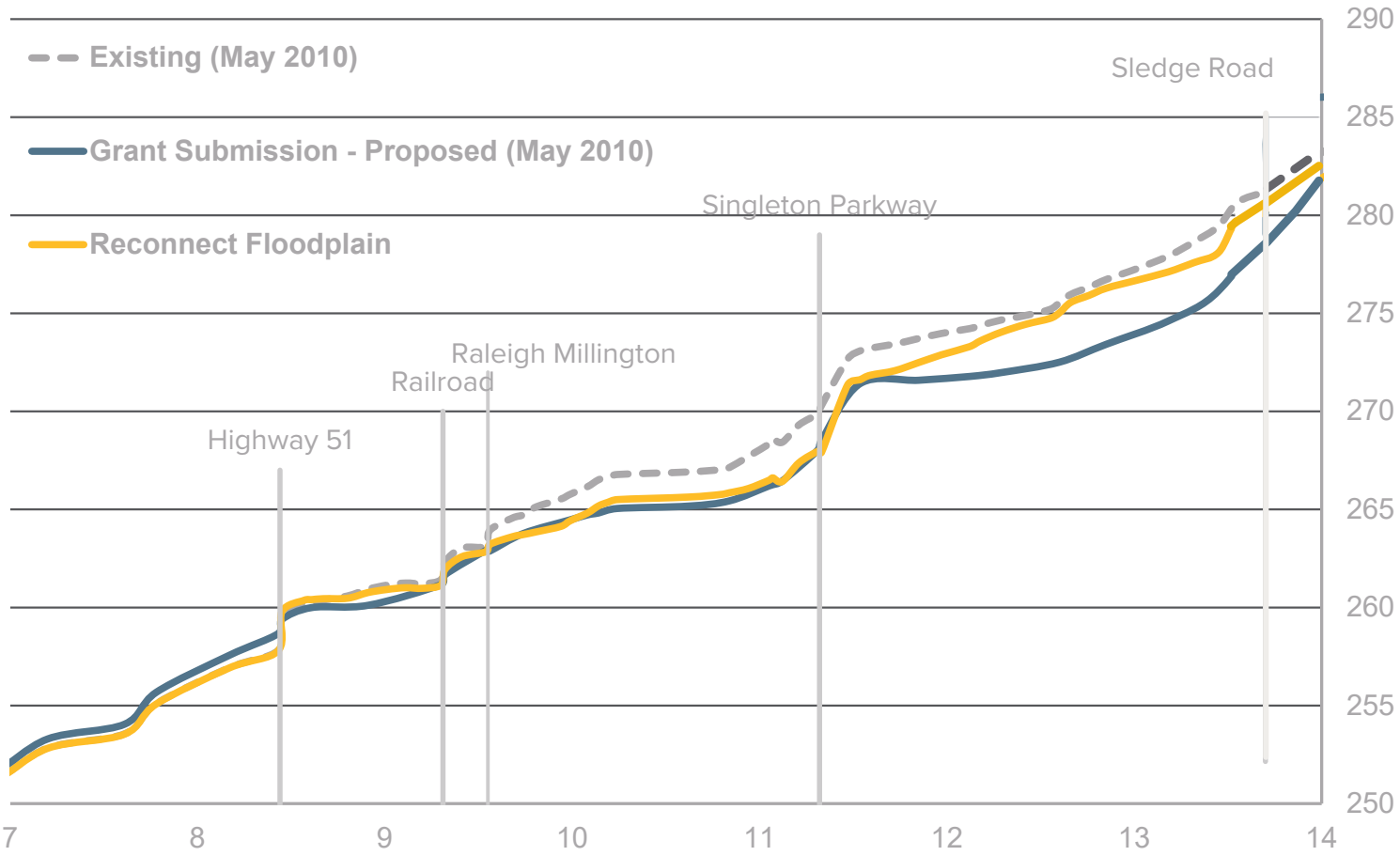
ENVIRONMENTAL
Tree Mitigation

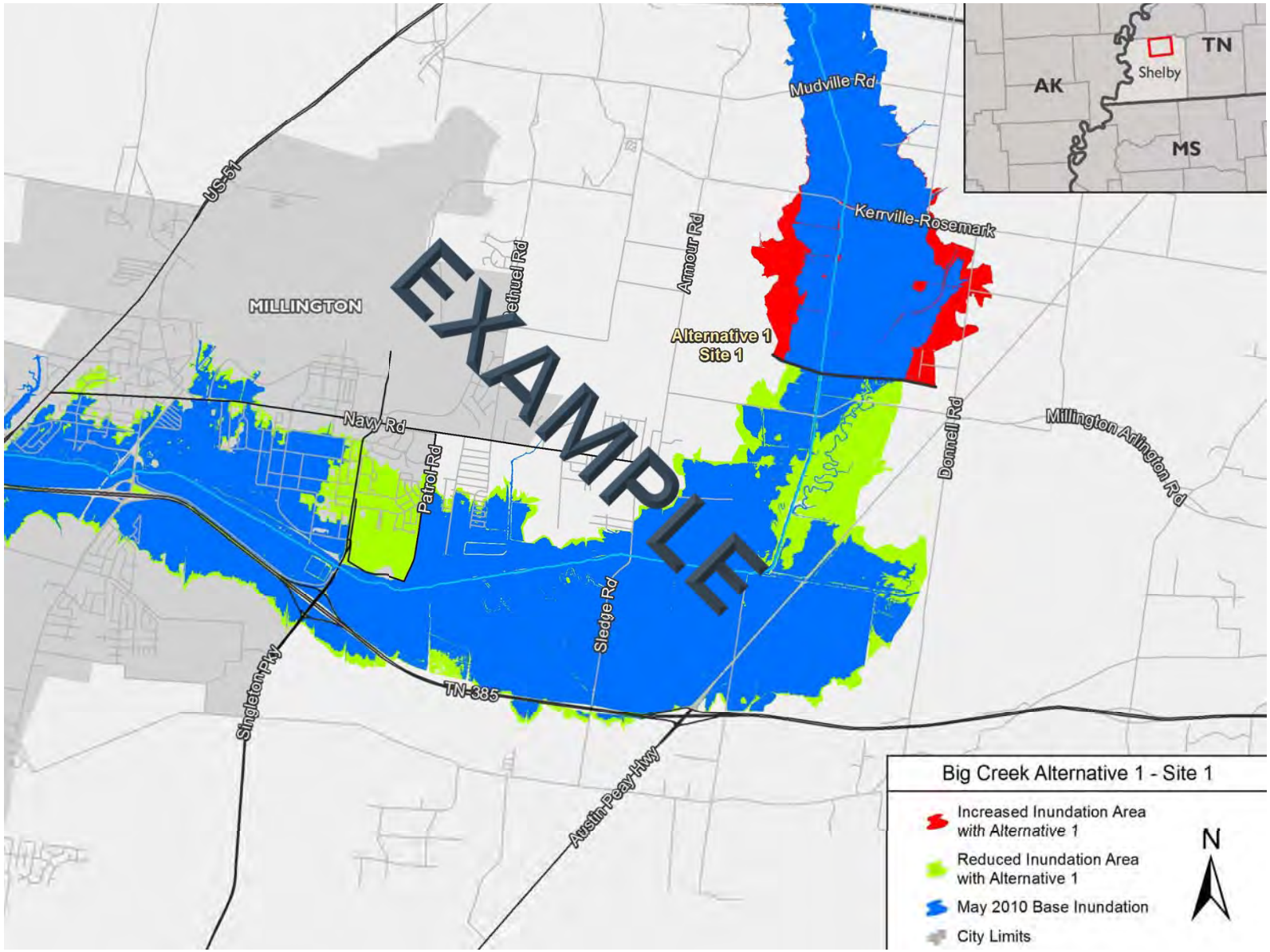
RESILIENCE
Flood Reduction

Exclusion of Area 3



Area 3 - Reconnect Floodplain

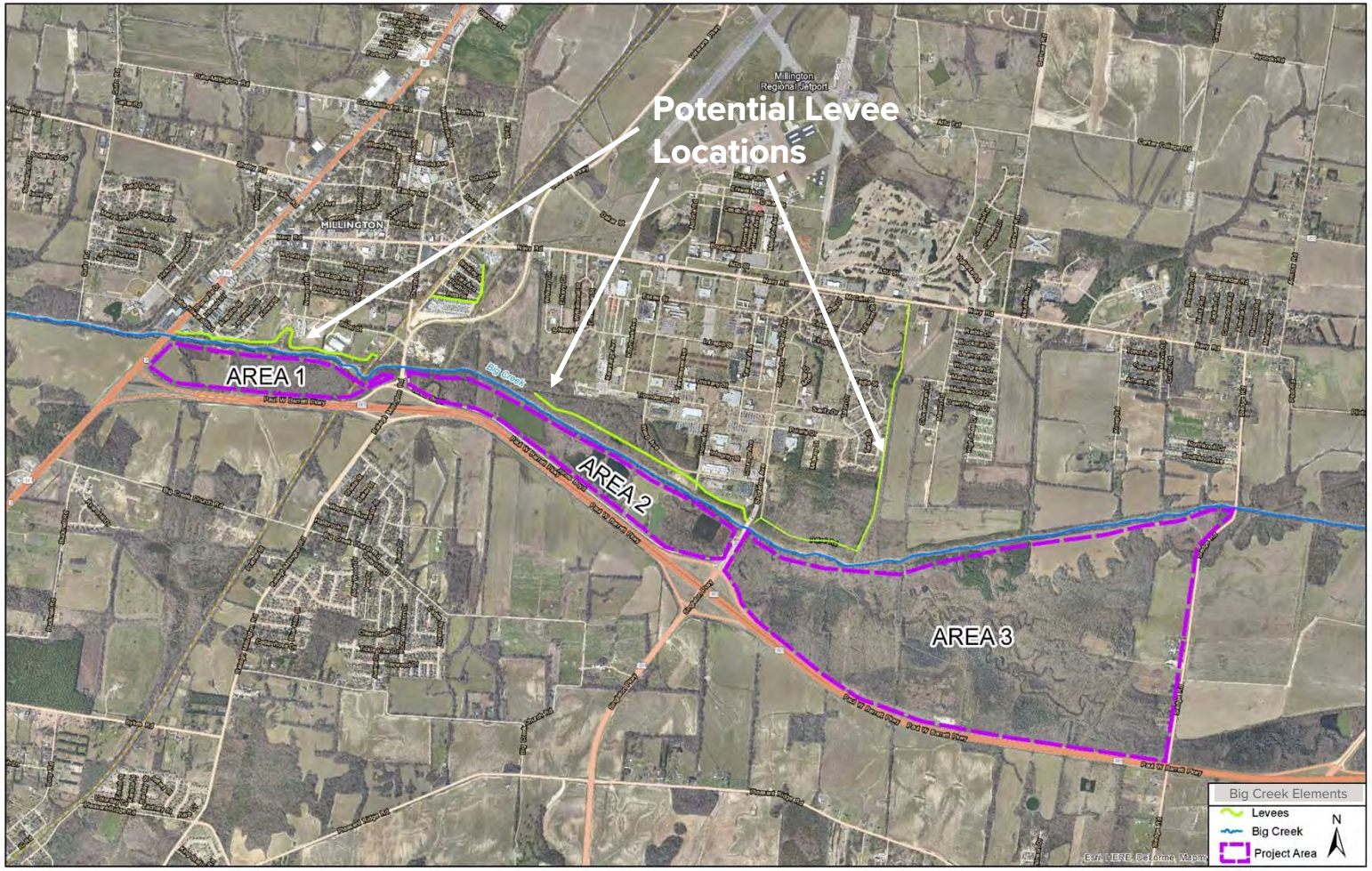


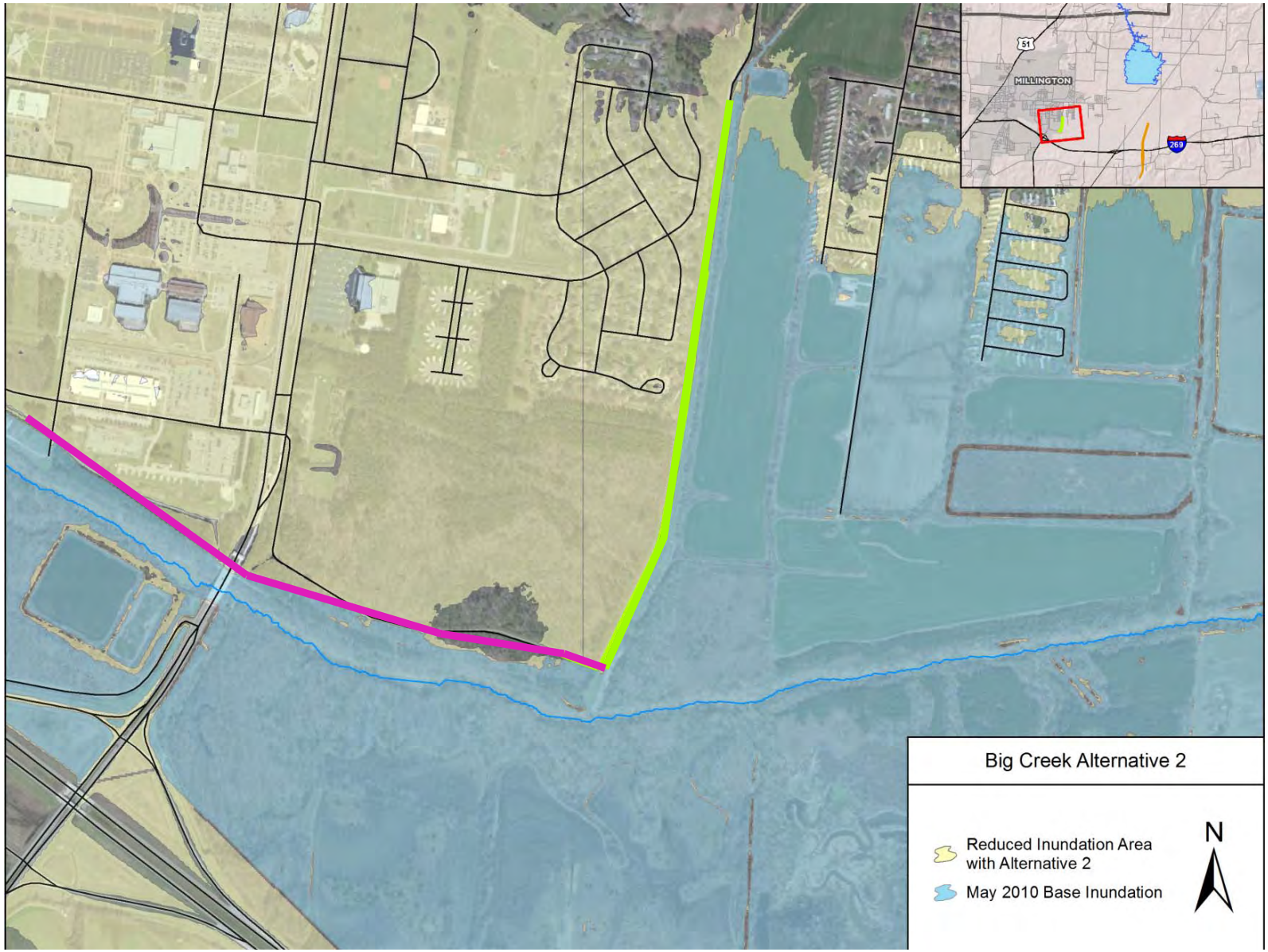

EXAMPLE
MILLINGTON
Mudville Rd
Kerrville-Rosemark
Alternative 1
Site 1
Armour Rd
Bethuel Rd
Navy Rd
Patrol Rd
Donnell Rd
Millington Arlington Rd
Sledge Rd
TN-385
Singleton Pky
Austin Peay Hwy
US-51
TN
AK
MS
Shelby
Big Creek Alternative 1 - Site 1
Increased Inundation Area with Alternative 1
Reduced Inundation Area with Alternative 1
May 2010 Base Inundation
City Limits
N

Upstream Detention Findings

- **BIG CREEK ALTERNATIVE 1**

- Effective at reducing water surface elevations
- Significant land acquisition
- Moderate to high total project cost depending on site or combination of sites selected
- Permitting Issues

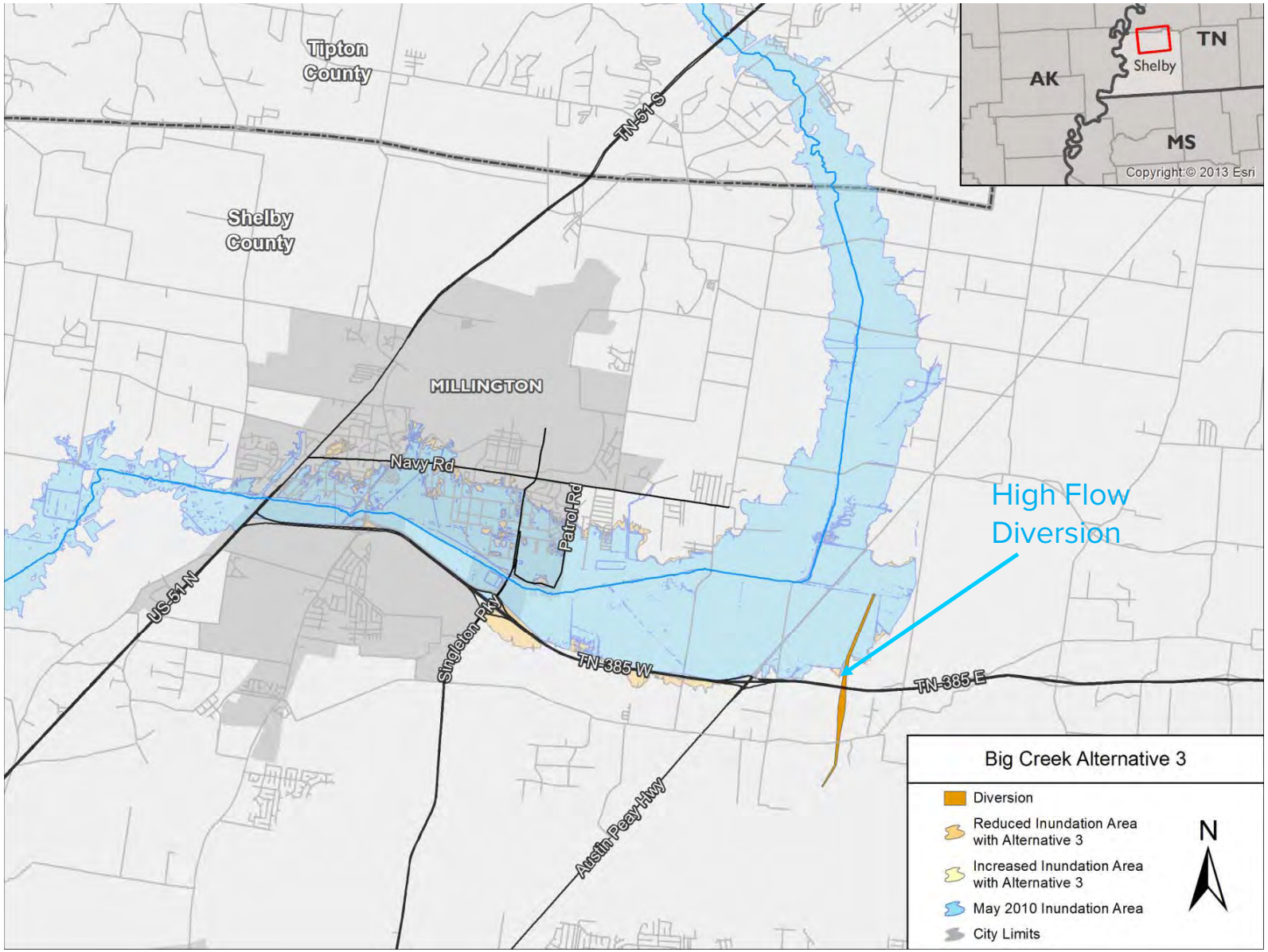

Potential Levee Locations
AREA 1
AREA 2
AREA 3
MILLINGTON
Millington Regional Jetport
Big Creek
Big Creek Elements
Levees
Big Creek
Project Area
N


MILLINGTON
51
269
Big Creek Alternative 2
Reduced Inundation Area with Alternative 2
May 2010 Base Inundation
N

Increase Levee Protection Findings

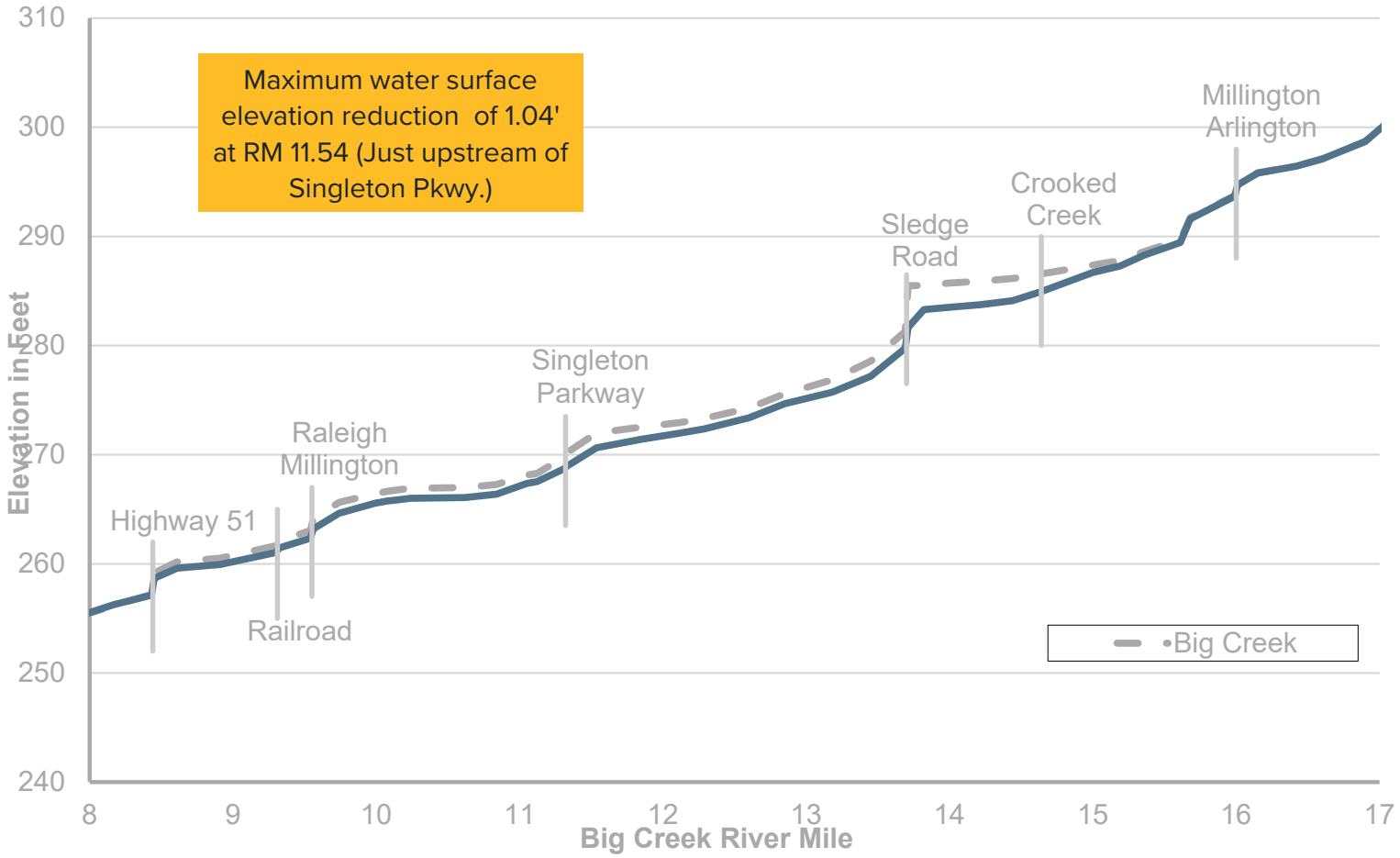
- **BIG CREEK ALTERNATIVE 2**

- Reduces flood risk at Navy base due to levee overtopping
- No significant effect on water surface elevations
- No land acquisition
- Lower project cost


Tipton County
Shelby County
MILLINGTON
Navy Rd
Patrol Rd
US-51-N
Singleton Pkwy
TN-385-W
TN-385-E
TN-51-S
Austin Peay Hwy
High Flow Diversion
TN
AK
MS
Shelby
Copyright:© 2013 Esri
Big Creek Alternative 3
Diversion
Reduced Inundation Area with Alternative 3
Increased Inundation Area with Alternative 3
May 2010 Inundation Area
City Limits
N

Big Creek Maximum Water Shed Profile

- **Alternative 3: *Diversion Installed on Crooked Creek May 2010 Flood Event***

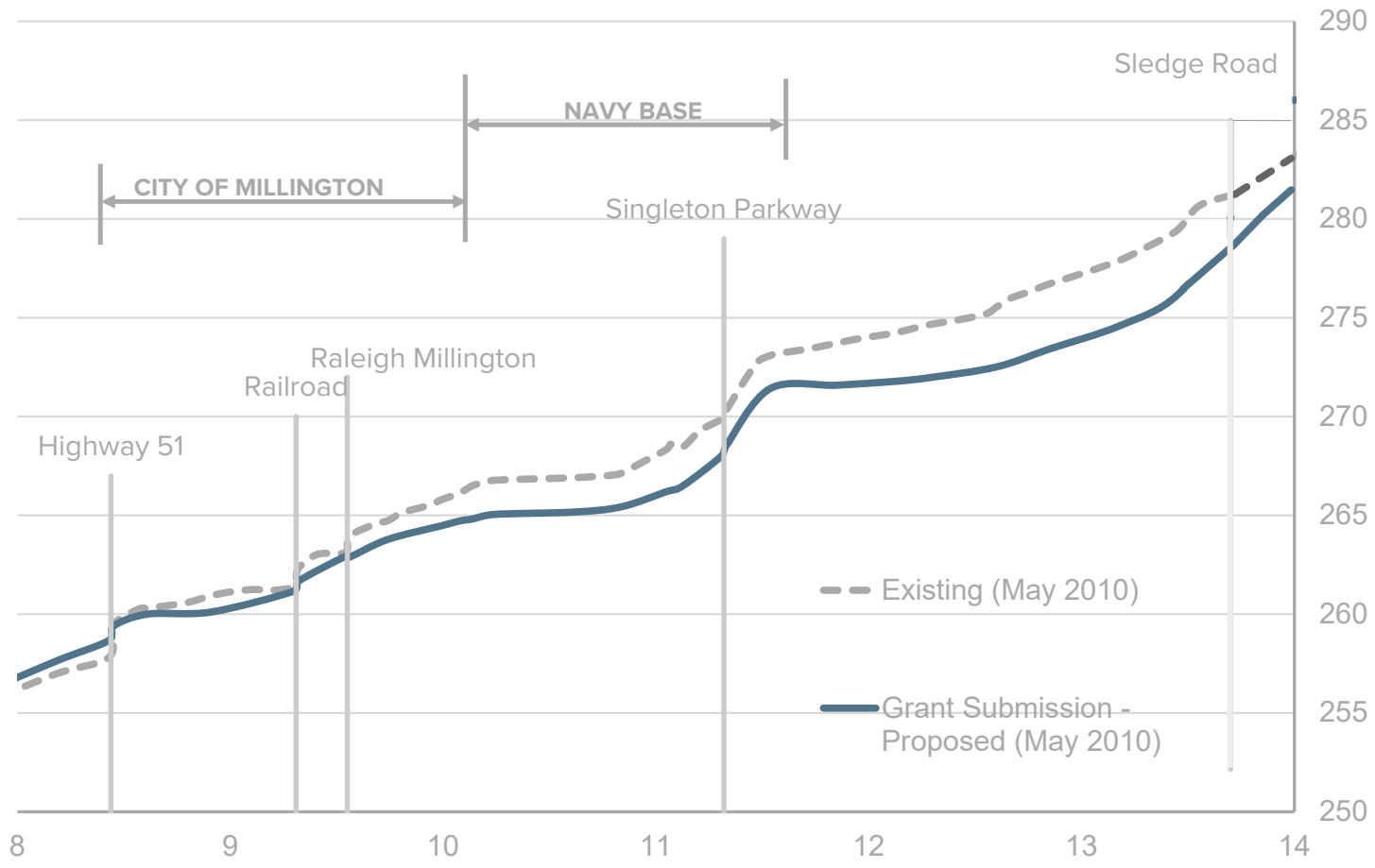


High Flow Diversion Findings

- **BIG CREEK ALTERNATIVE 3**

- Effective in reducing water surface elevations
- Minimal land acquisition
- High construction cost (two new bridges)

Flood Reduction



Increased Floodplain Storage Findings

- **BIG CREEK ALTERNATIVE 4**

- Effective in reducing water surface elevations
- Provided benefits to LMI households such as parks and trails
- Large land acquisition
- Expensive