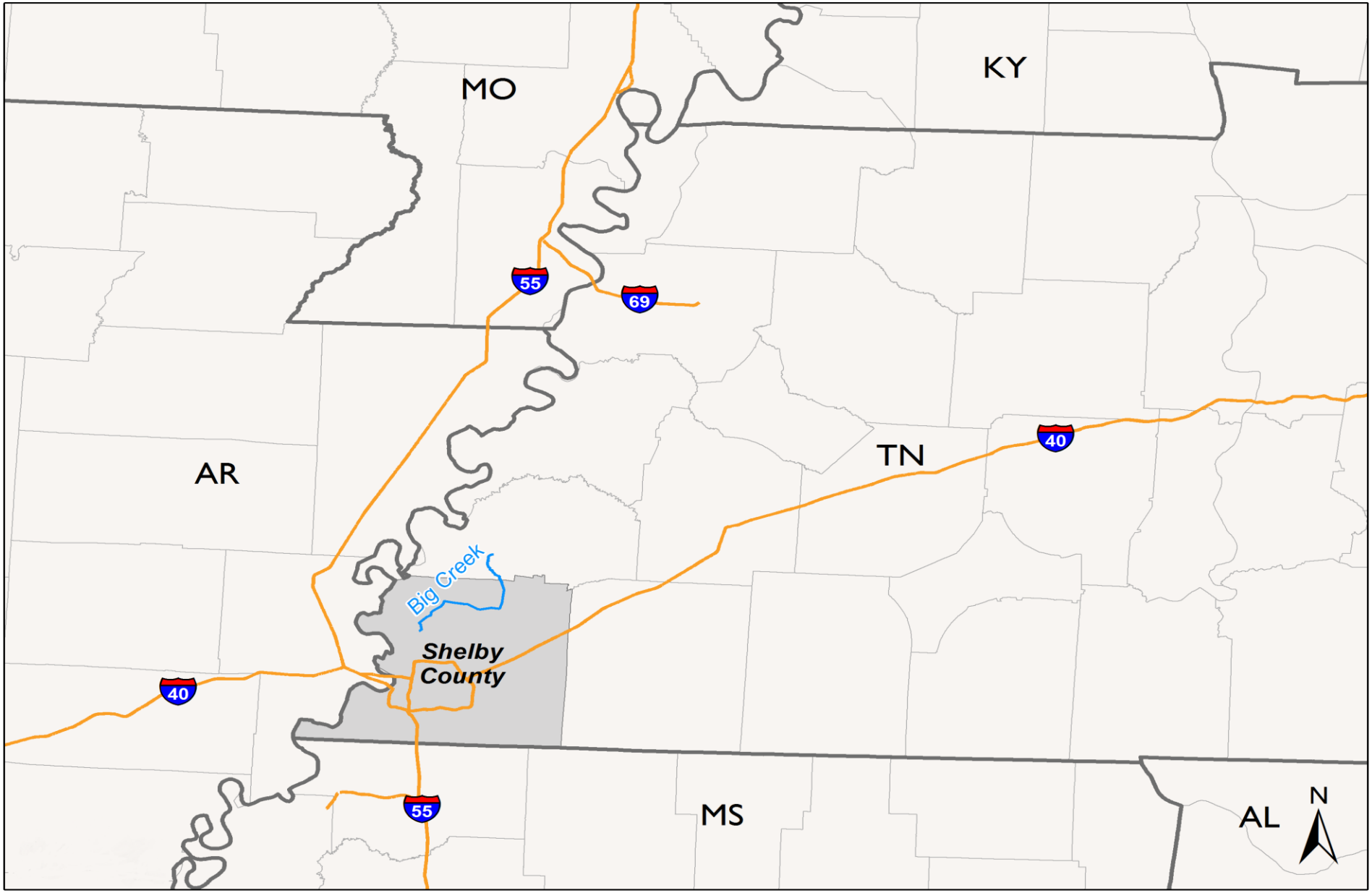
AL AFPM CONFERENCE

BIG CREEK DRAINAGE STUDY

October 2014

BWSC Barge Waggoner Sumner & Cannon, Inc.



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STUDY ELEMENTS

Big Creek basin data collection

Hydrologic modeling

Hydraulic modeling

Flood mitigation projects

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DATA COLLECTION

Data collected consisted of the following:

- GIS data for Shelby and Tipton counties
  - Lidar Data
  - Soils/Land Use Data
  - Nexrad Data
- Field survey channel cross-sections and bridge data
  - 75 additional cross-sections
- Drainage studies
  - Previous Corps studies

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HYDROLOGIC MODEL

HEC-HMS & HEC-GeoHMS Model used

100-year and 500-year design flows

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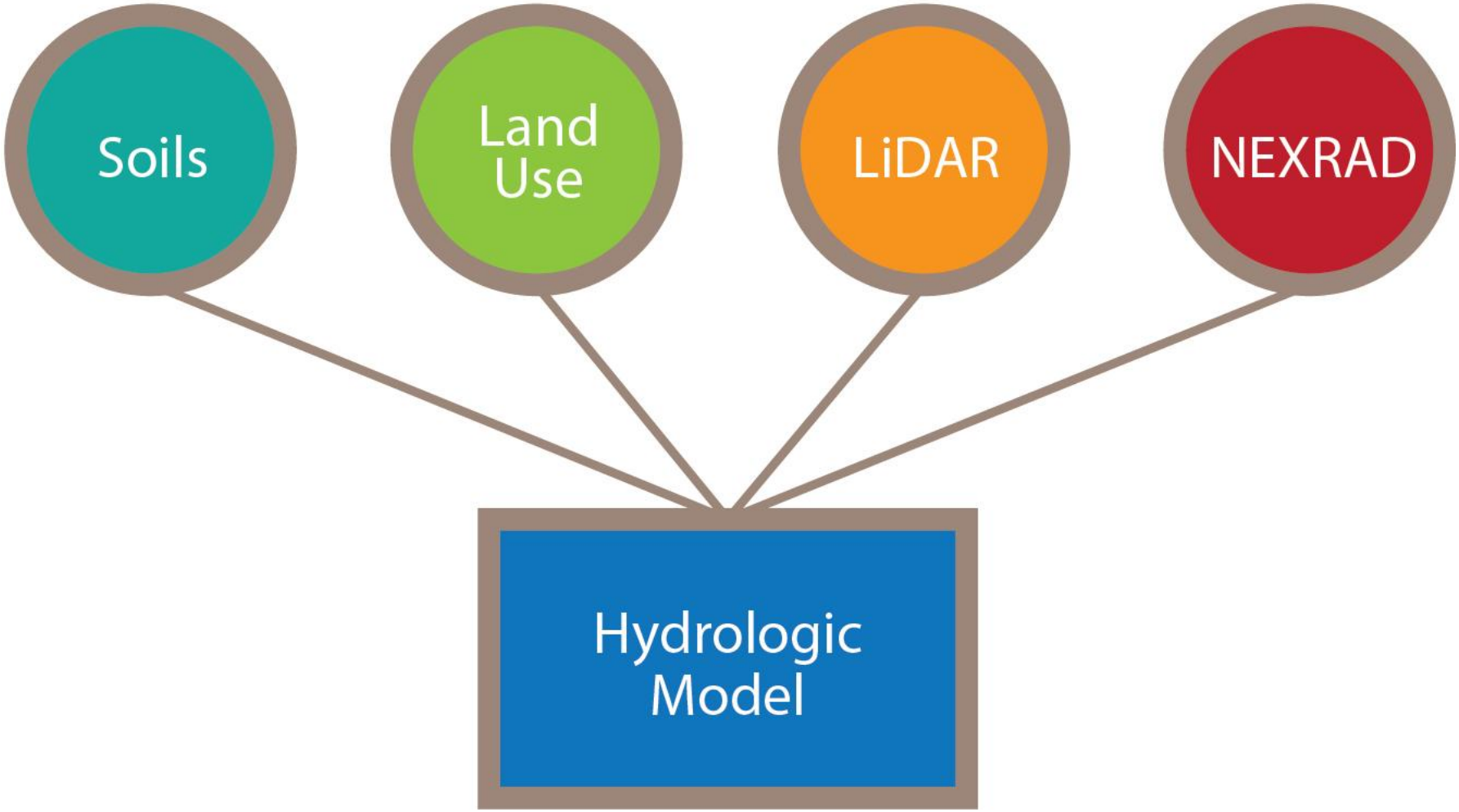
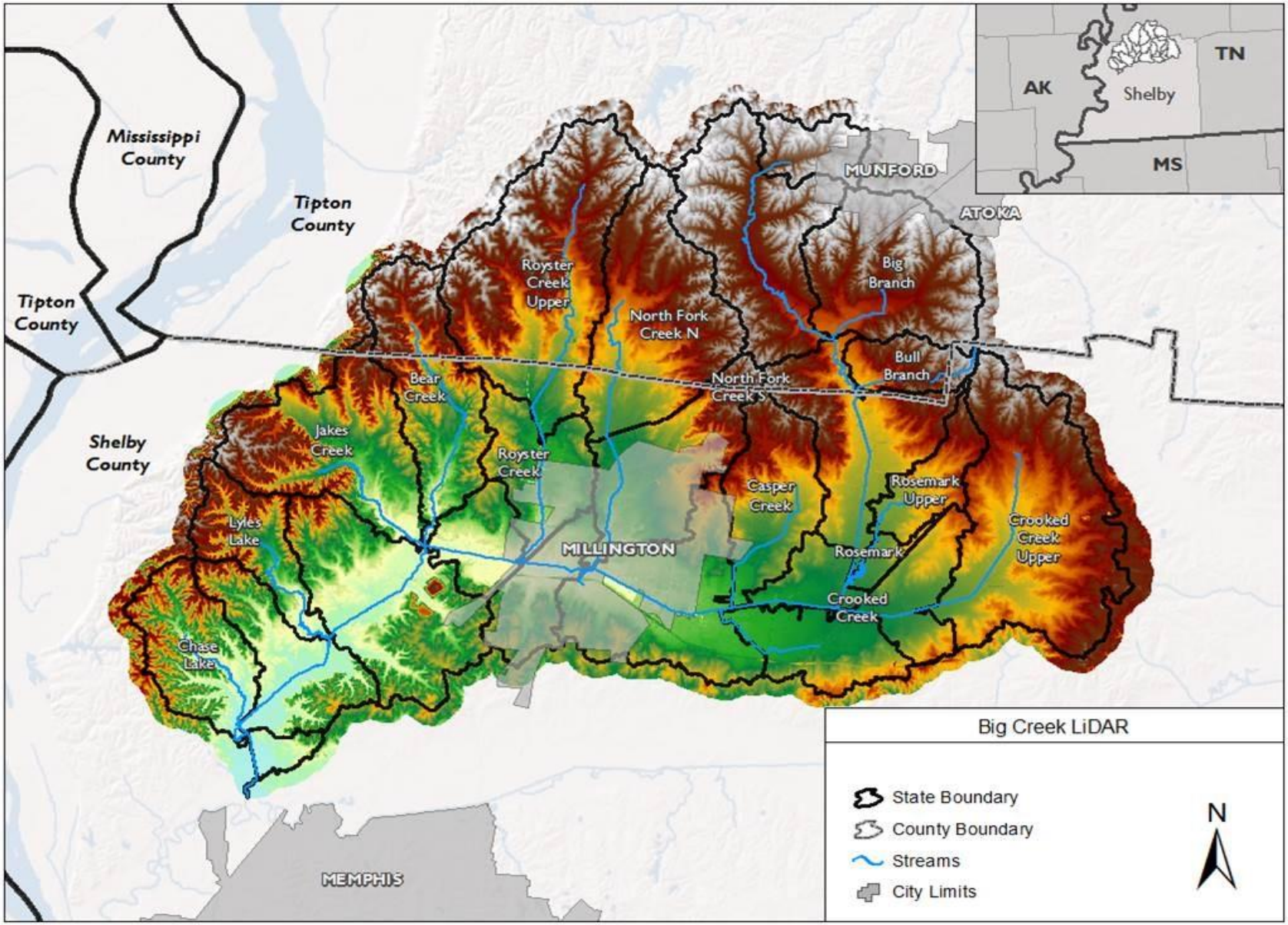
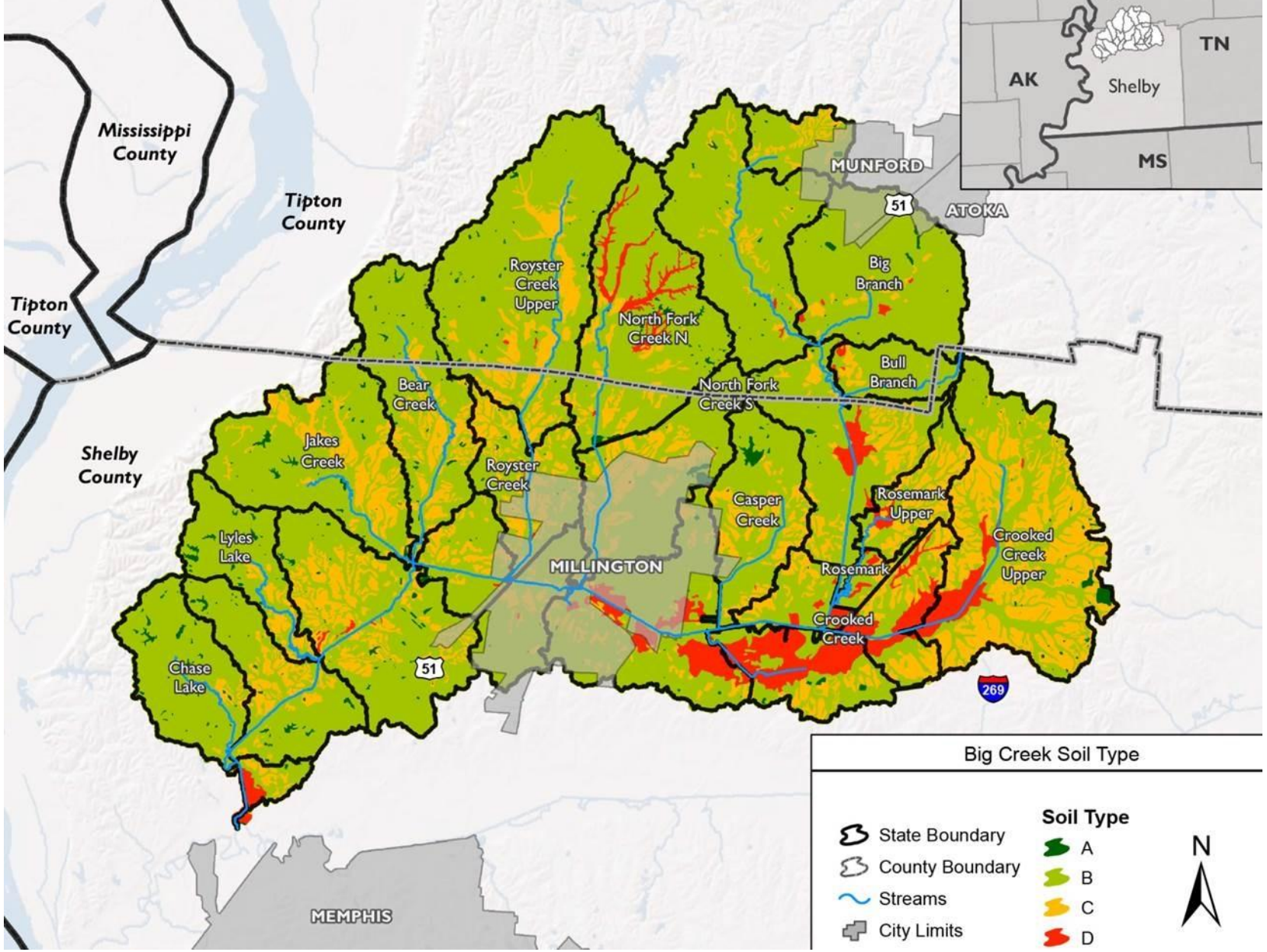
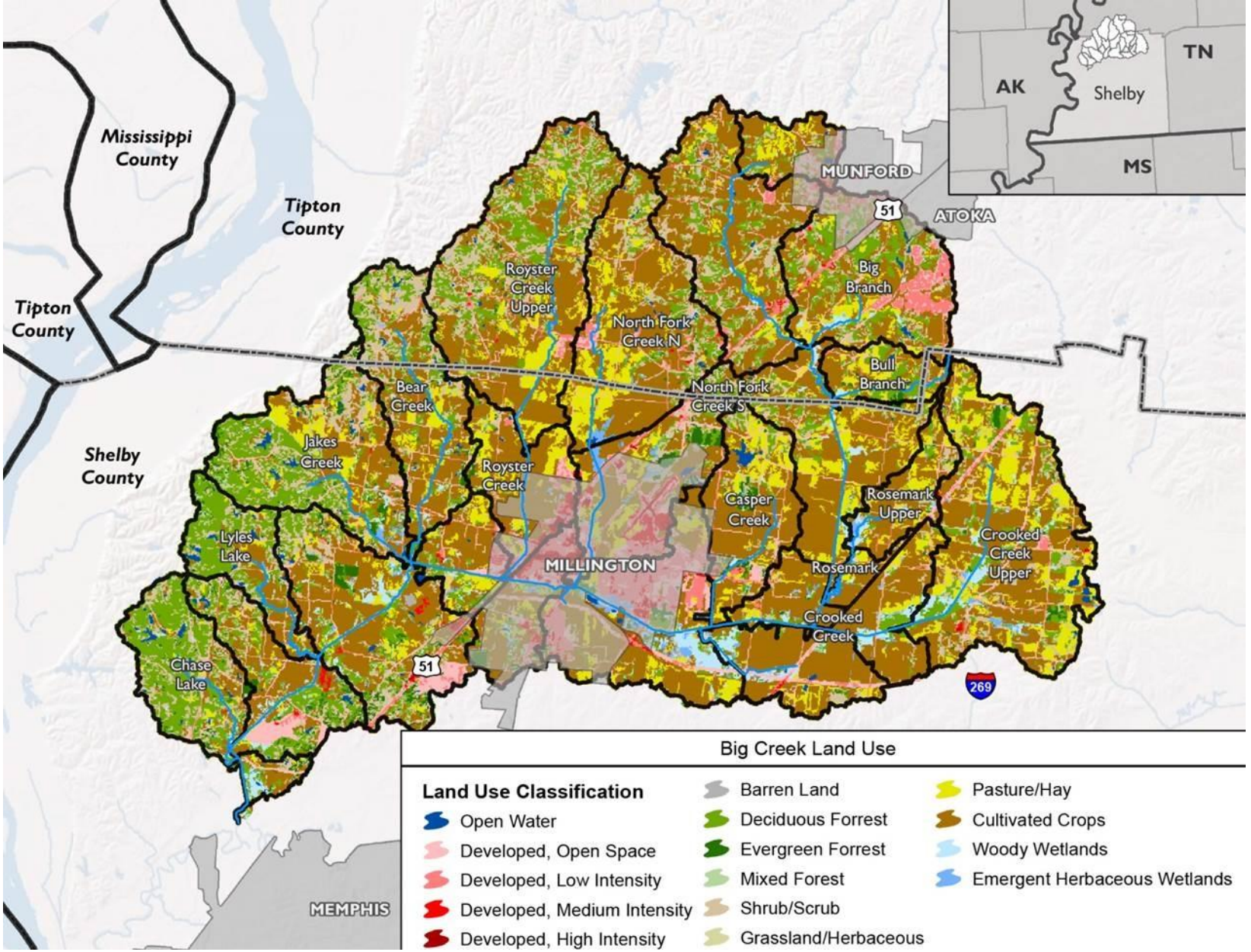
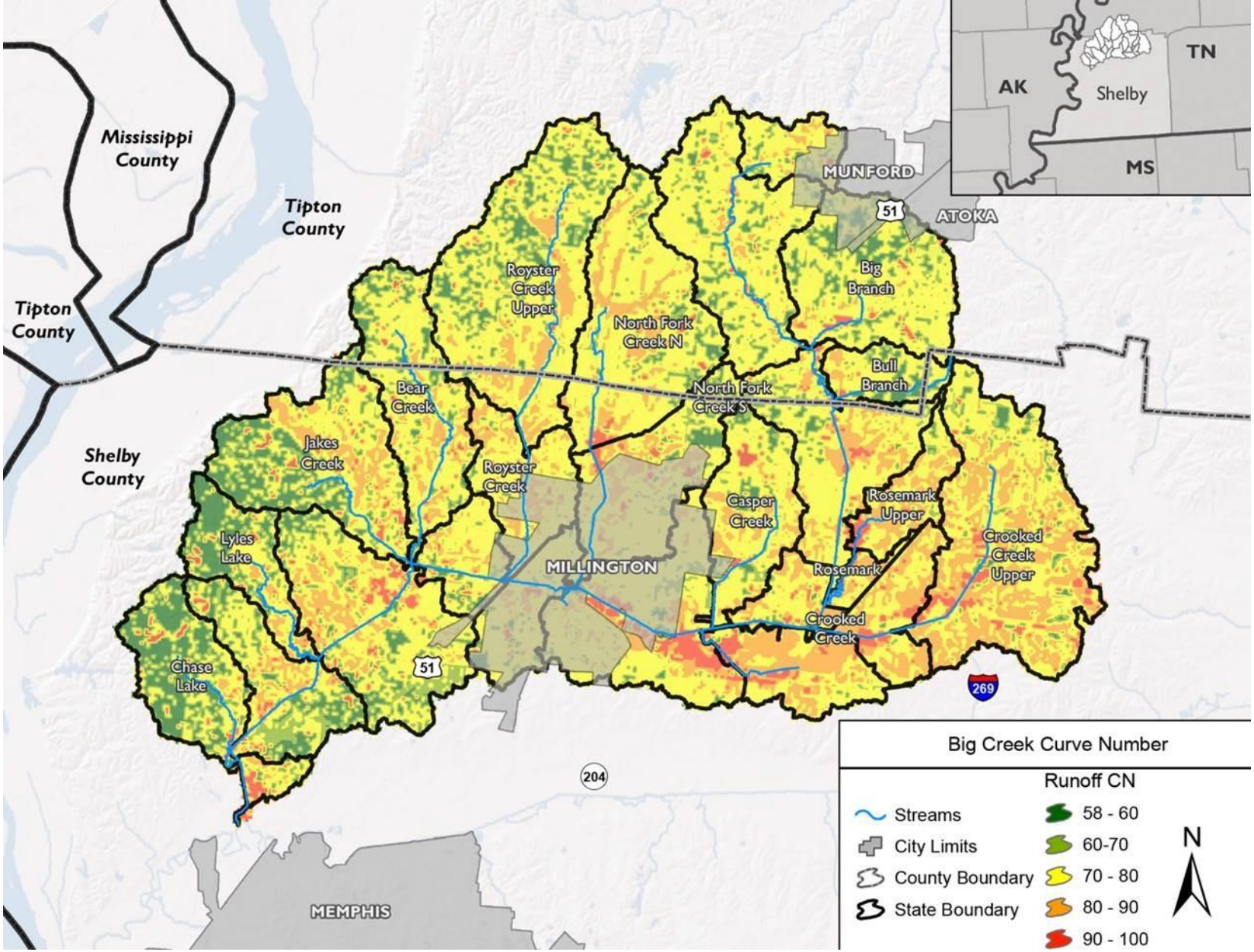
DATA

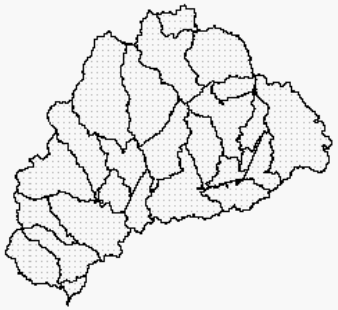



Mississippi County
Tipton County
Tipton County
Shelby County
MUNFORD
ATOKA
Royster Creek Upper
North Fork Creek N
Big Branch
Bull Branch
North Fork Creek S
Bear Creek
Jakes Creek
Royster Creek
Lyles Lake
MILLINGTON
Casper Creek
Rosemark Upper
Crooked Creek Upper
Rosemark
Crooked Creek
Chase Lake
MEMPHIS
AK
TN
MS
Shelby
Big Creek LiDAR
State Boundary
County Boundary
Streams
City Limits
N


Mississippi County
Tipton County
Tipton County
Shelby County
MUNFORD
ATOKA
51
Royster Creek Upper
North Fork Creek N
Big Branch
Bull Branch
North Fork Creek S
Bear Creek
Jakes Creek
Royster Creek
Casper Creek
Rosemark Upper
Crooked Creek Upper
Lyles Lake
MILLINGTON
Rosemark
Crooked Creek
Chase Lake
51
269
MEMPHIS
AK
TN
MS
Shelby
Big Creek Soil Type
State Boundary
County Boundary
Streams
City Limits
Soil Type
A
B
C
D
N


Mississippi County
Tipton County
Tipton County
Shelby County
MUNFORD
ATOKA
51
Royster Creek Upper
North Fork Creek N
Big Branch
Bull Branch
North Fork Creek S
Bear Creek
Jakes Creek
Royster Creek
Casper Creek
Rosemark Upper
Crooked Creek Upper
Lyles Lake
MILLINGTON
Rosemark
Crooked Creek
Chase Lake
51
269
MEMPHIS
TN
AK
Shelby
MS
Big Creek Land Use
Land Use Classification
Open Water
Developed, Open Space
Developed, Low Intensity
Developed, Medium Intensity
Developed, High Intensity
Barren Land
Deciduous Forrest
Evergreen Forrest
Mixed Forest
Shrub/Scrub
Grassland/Herbaceous
Pasture/Hay
Cultivated Crops
Woody Wetlands
Emergent Herbaceous Wetlands


Mississippi County
Tipton County
Tipton County
Shelby County
MUNFORD
ATOKA
51
Royster Creek Upper
North Fork Creek N
Big Branch
Bull Branch
North Fork Creek S
Bear Creek
Jakes Creek
Royster Creek
Casper Creek
Rosemark Upper
Crooked Creek Upper
Lyles Lake
MILLINGTON
Rosemark
Crooked Creek
Chase Lake
51
269
204
MEMPHIS
AK
TN
MS
Shelby
Big Creek Curve Number
Runoff CN
Streams
City Limits
County Boundary
State Boundary
58 - 60
60-70
70 - 80
80 - 90
90 - 100
N



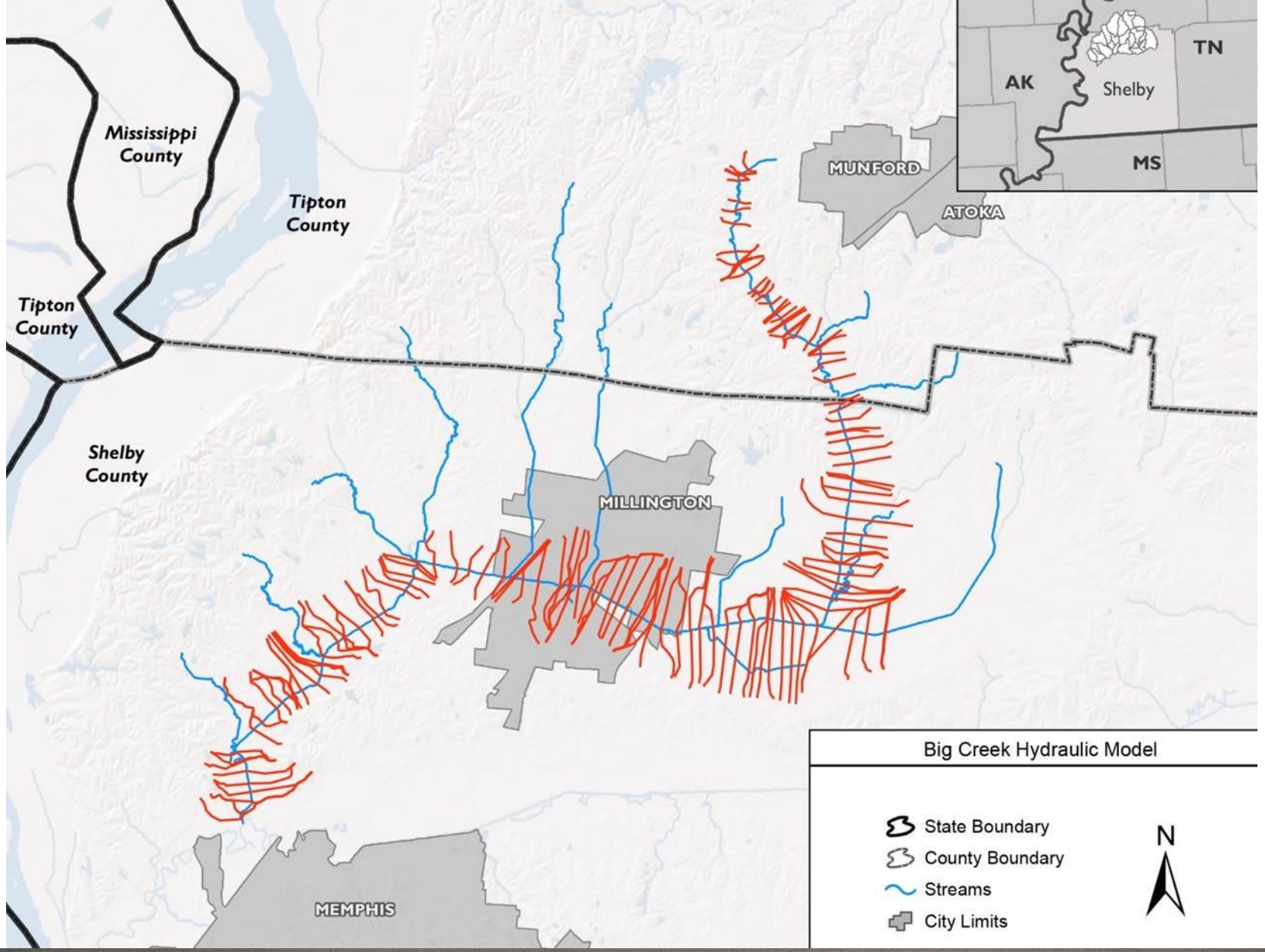
HYDRAULIC MODEL

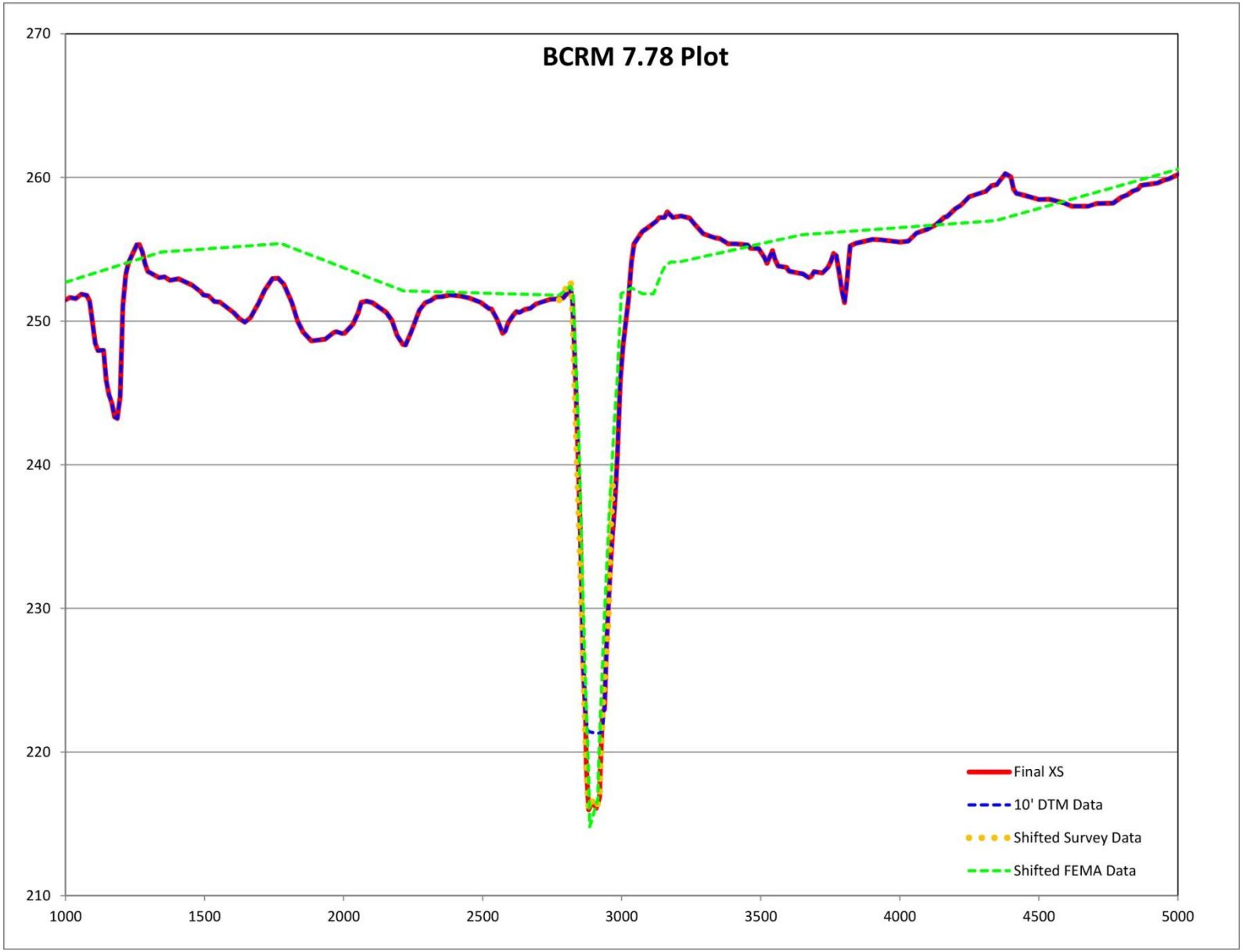
HEC-RAS & HEC-GeoRAS models for water surface elevations

Extended model upstream into Tipton County

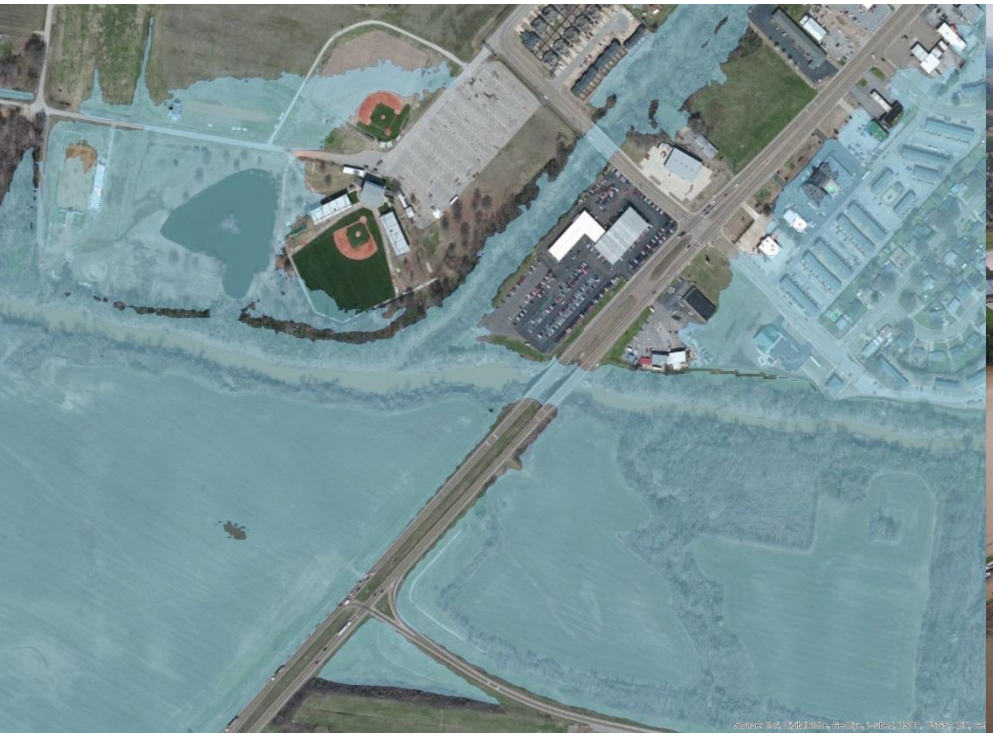
100-year and 500-year water surface elevations

May, 2010 water surface elevations for model validation

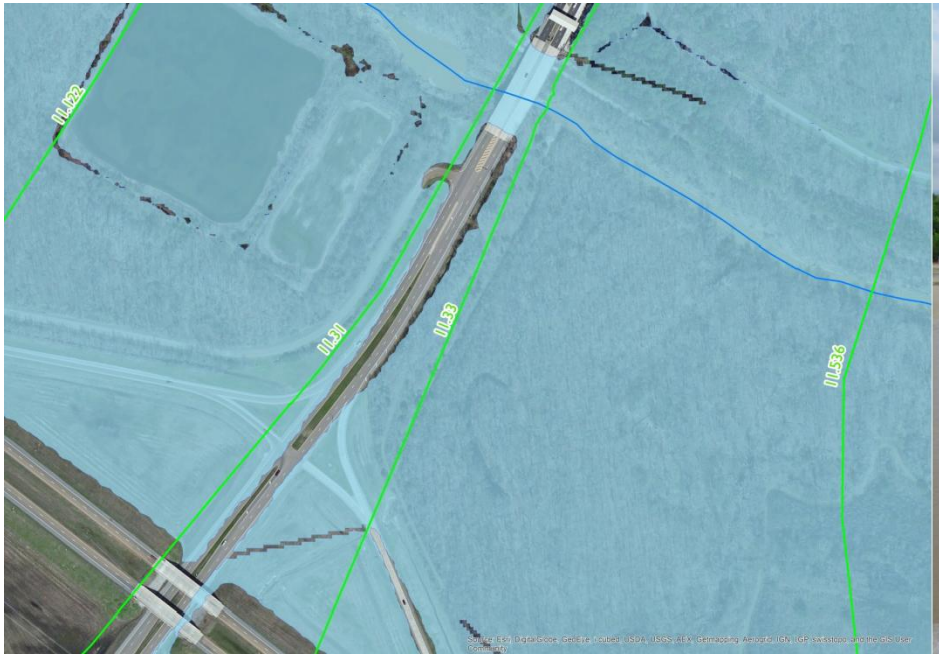

Mississippi County
Tipton County
Tipton County
Shelby County
MUNFORD
ATOKA
MILLINGTON
MEMPHIS
AK
TN
MS
Shelby
Big Creek Hydraulic Model
State Boundary
County Boundary
Streams
City Limits
N


BCRM 7.78 Plot
270
260
250
240
230
220
210
1000
1500
2000
2500
3000
3500
4000
4500
5000
Final XS
10' DTM Data
Shifted Survey Data
Shifted FEMA Data

MAY 2010 HIGHWAY 51 FLOOD INUNDATION



MAY 2010 SINGLETON PARKWAY



FLOODING MITIGATION

Identify flooding locations and conceptual projects to mitigate flooding

Mitigation alternatives

- Alternative 1 - Temporary detention upstream
- Alternative 2 - Enhanced protection
- Alternative 3 - Diversion of high flows

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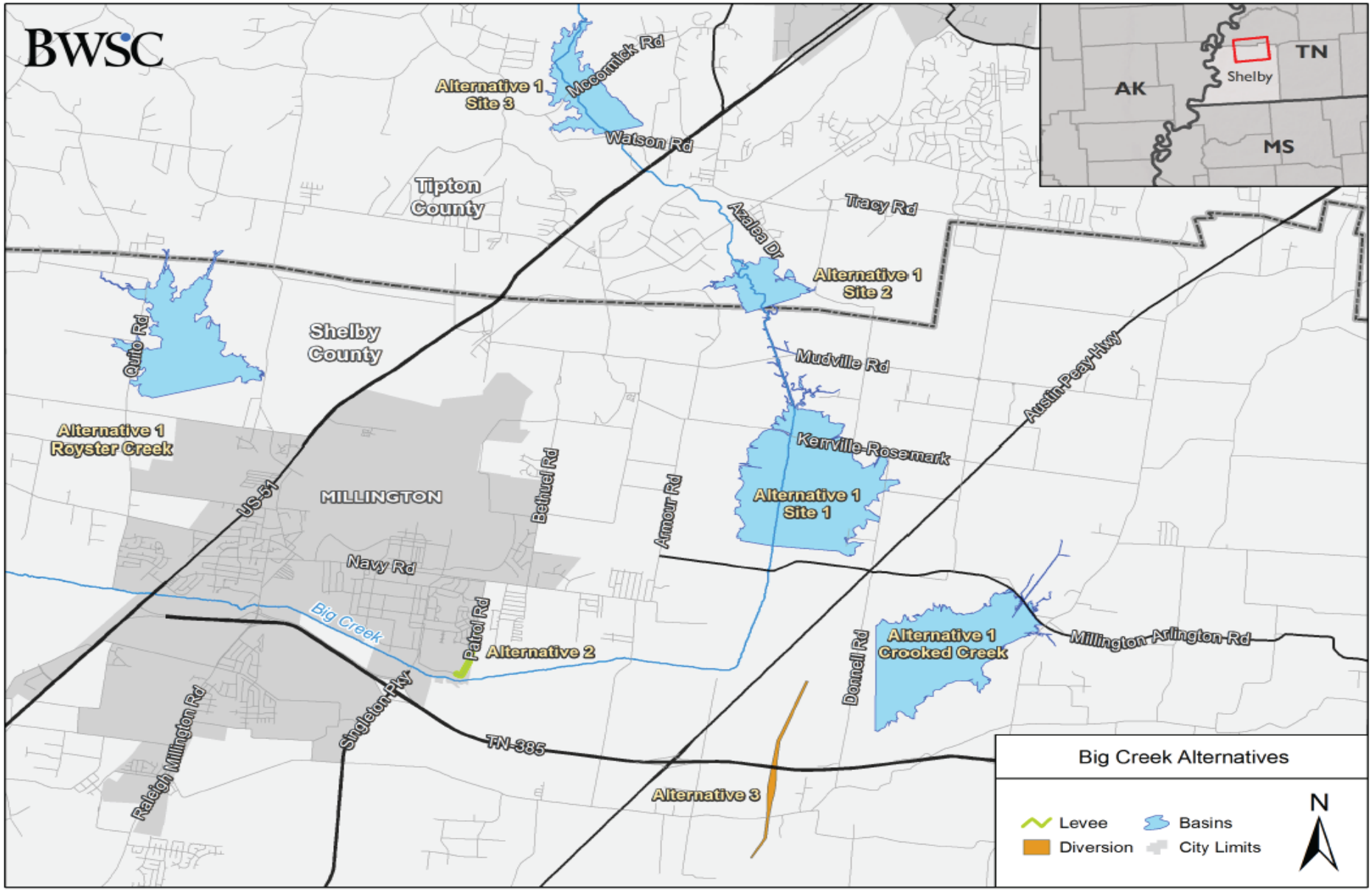
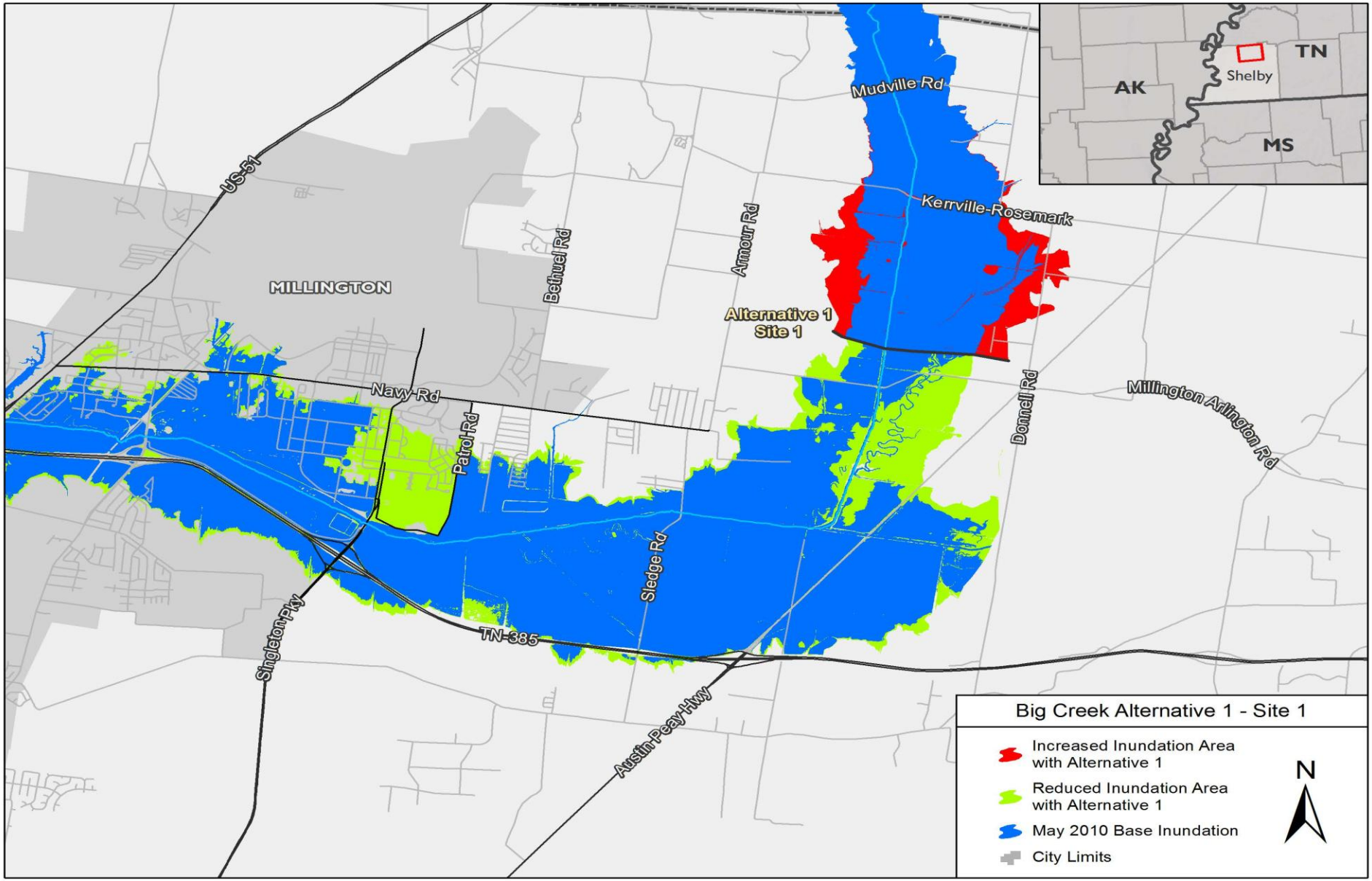
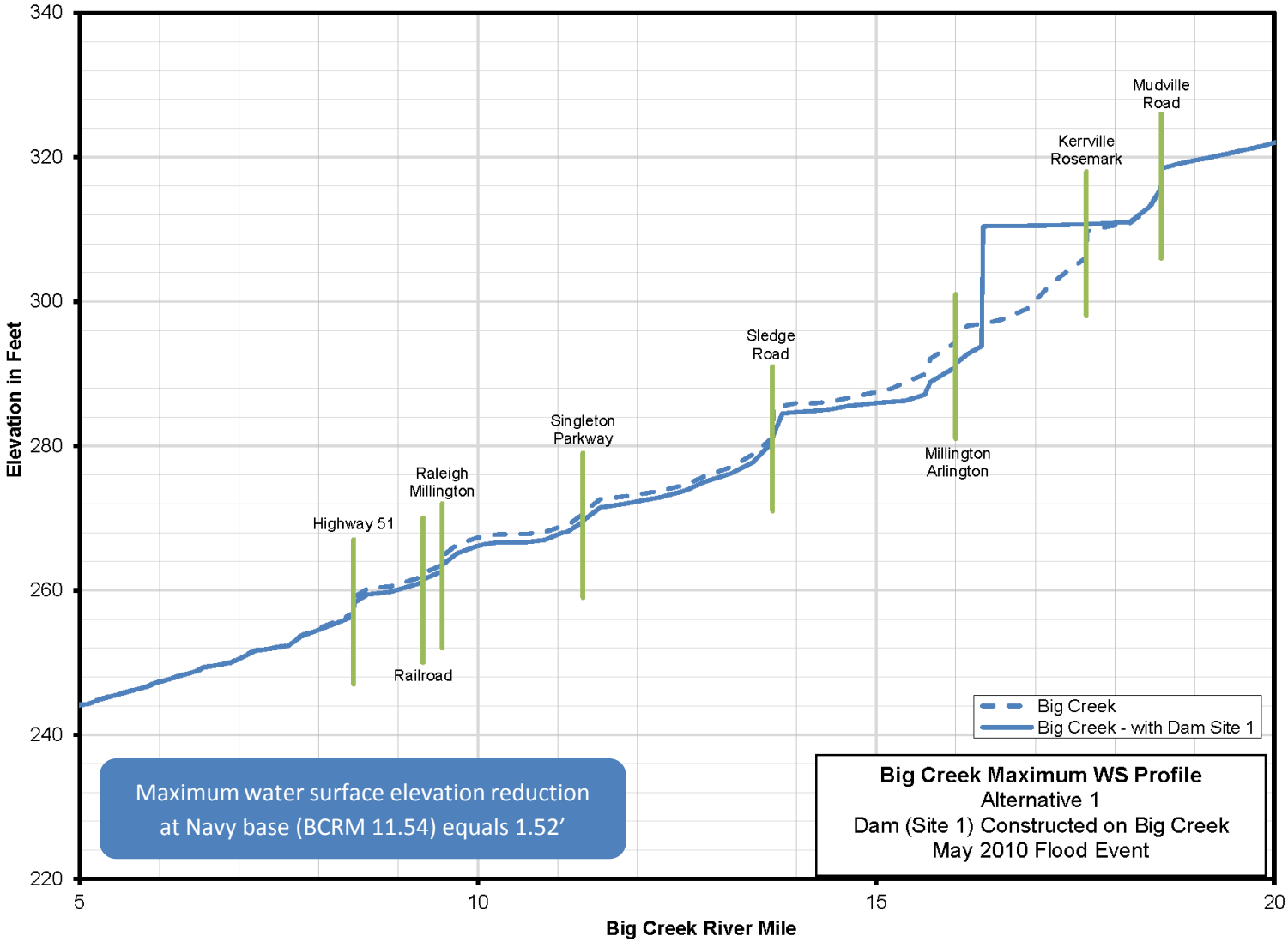

BWSC
Alternative 1
Site 3
Mccormick Rd
Watson Rd
Tipton
County
Tracy Rd
Azalea Dr
Alternative 1
Site 2
Quito Rd
Shelby
County
Mudville Rd
Austin Peay Hwy
Alternative 1
Royster Creek
US-51
MILLINGTON
Bethuel Rd
Armour Rd
Kerrville-Rosemark
Alternative 1
Site 1
Navy Rd
Big Creek
Patrol Rd
Alternative 2
Donnell Rd
Alternative 1
Crooked Creek
Millington Arlington Rd
Raleigh Millington Rd
Singleton Pky
TN-385
Alternative 3
AK
TN
MS
Shelby
Big Creek Alternatives
Levee
Basins
Diversion
City Limits
N


Mudville Rd
US-51
Kerrville-Rosemark
Armour Rd
Bethuel Rd
MILLINGTON
Alternative 1
Site 1
Navy Rd
Patrol Rd
Donnell Rd
Millington Arlington Rd
Sledge Rd
Singleton Pky
TN-385
Austin Peay Hwy
AK
TN
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


340
320
300
280
260
240
220
Elevation in Feet
5
10
15
20
Big Creek River Mile
Mudville Road
Kerrville Rosemark
Sledge Road
Singleton Parkway
Millington Arlington
Raleigh Millington
Highway 51
Railroad
Big Creek
Big Creek - with Dam Site 1
Maximum water surface elevation reduction at Navy base (BCRM 11.54) equals 1.52'
Big Creek Maximum WS Profile
Alternative 1
Dam (Site 1) Constructed on Big Creek
May 2010 Flood Event

BIG CREEK ALTERNATIVE 1 – FINDINGS

Effective at reducing water surface elevations

Significant land acquisition

Moderate to high total project cost depending on site or combination of sites selected

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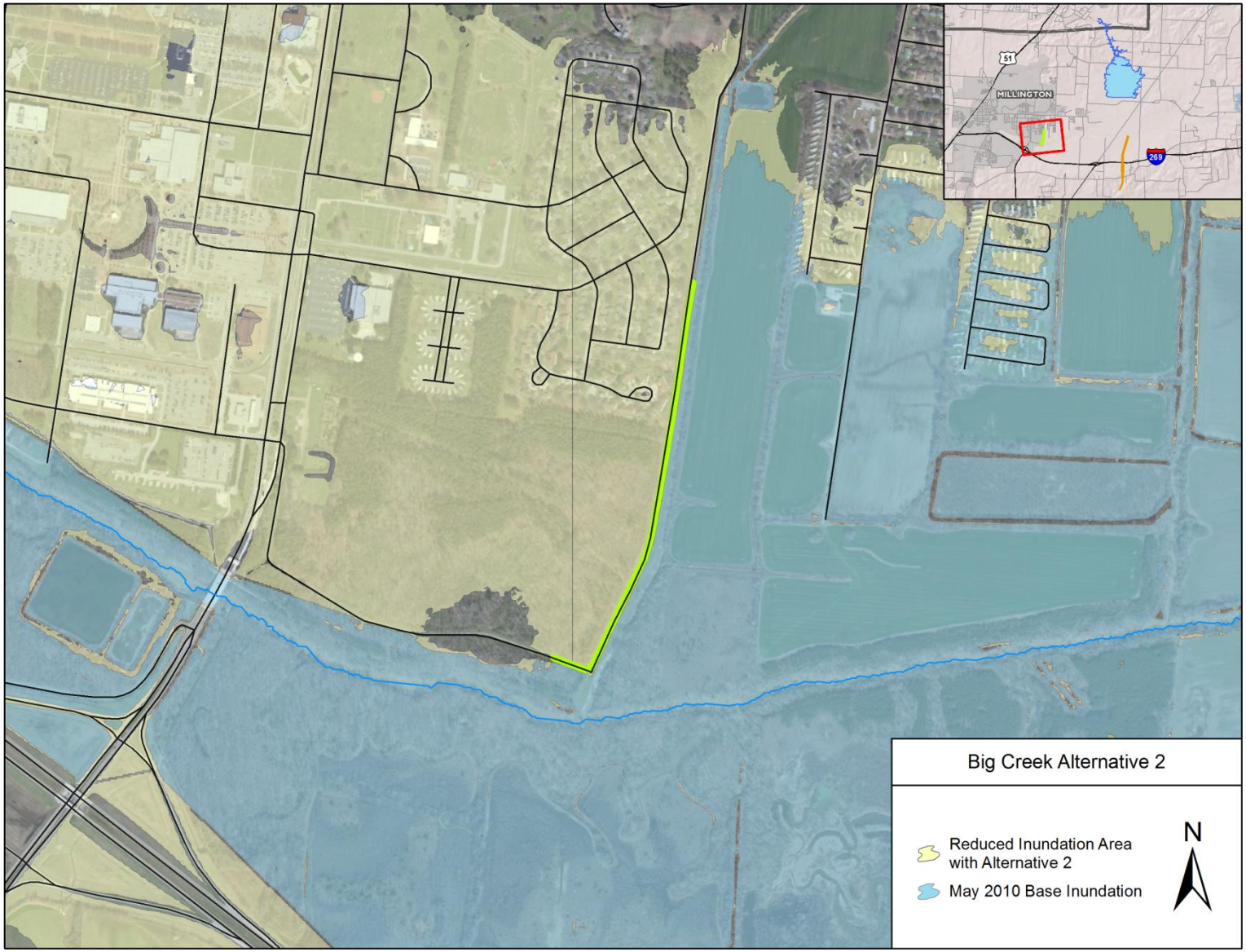
MILLINGTON
61
269
Big Creek Alternative 2
Reduced Inundation Area with Alternative 2
May 2010 Base Inundation
N

BIG CREEK ALTERNATIVE 2 – RAISE EAST LEVEE FINDINGS

Prevents flooding of Navy base due to levee overtopping

No significant effect on water surface elevations

No land acquisition

Lower project cost

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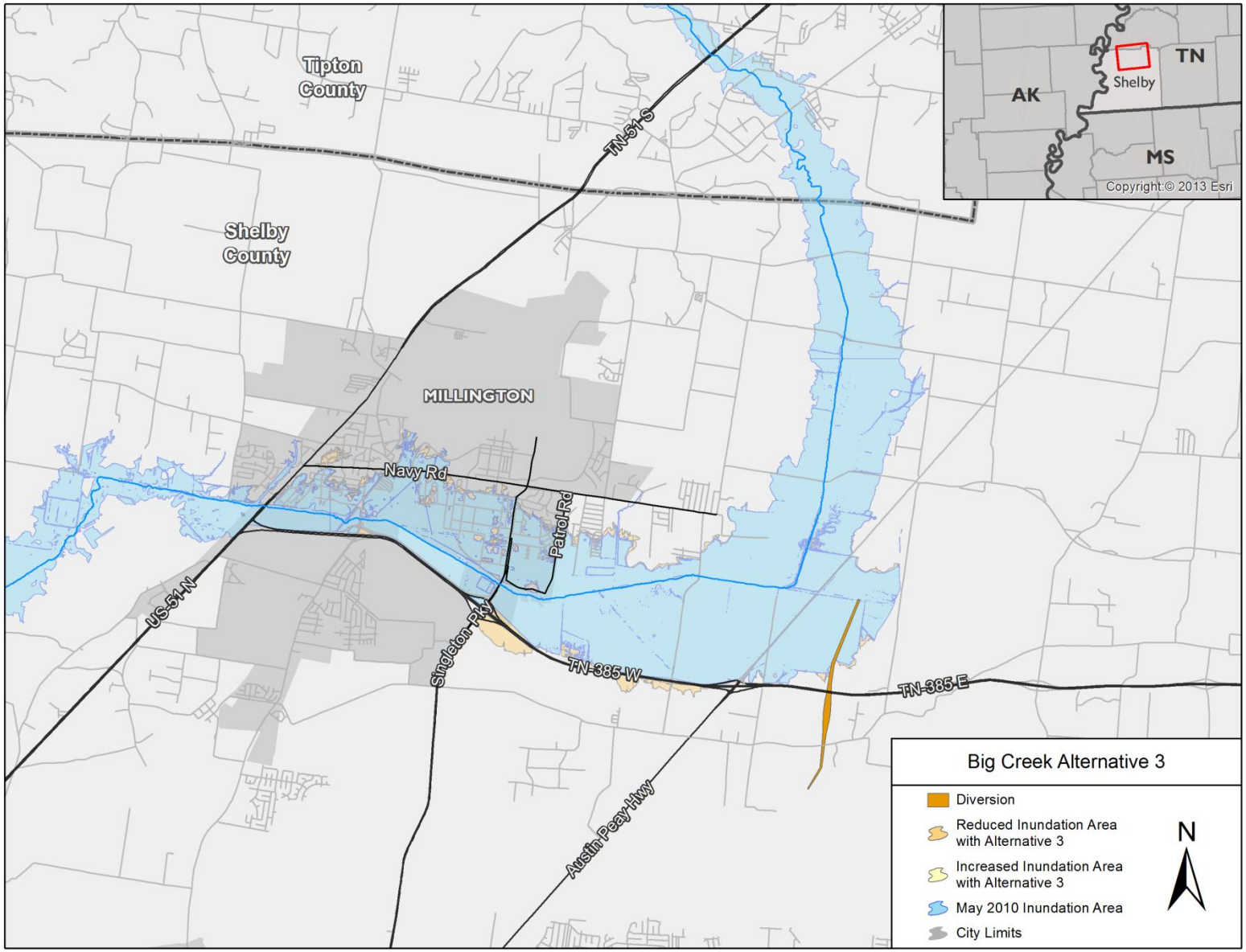
Tipton County
Shelby County
MILLINGTON
TN-51-S
Navy Rd
Patrol Rd
US-51-N
Singleton Pky
TN-385-W
TN-385-E
Austin Peay Hwy
AK
TN
Shelby
MS
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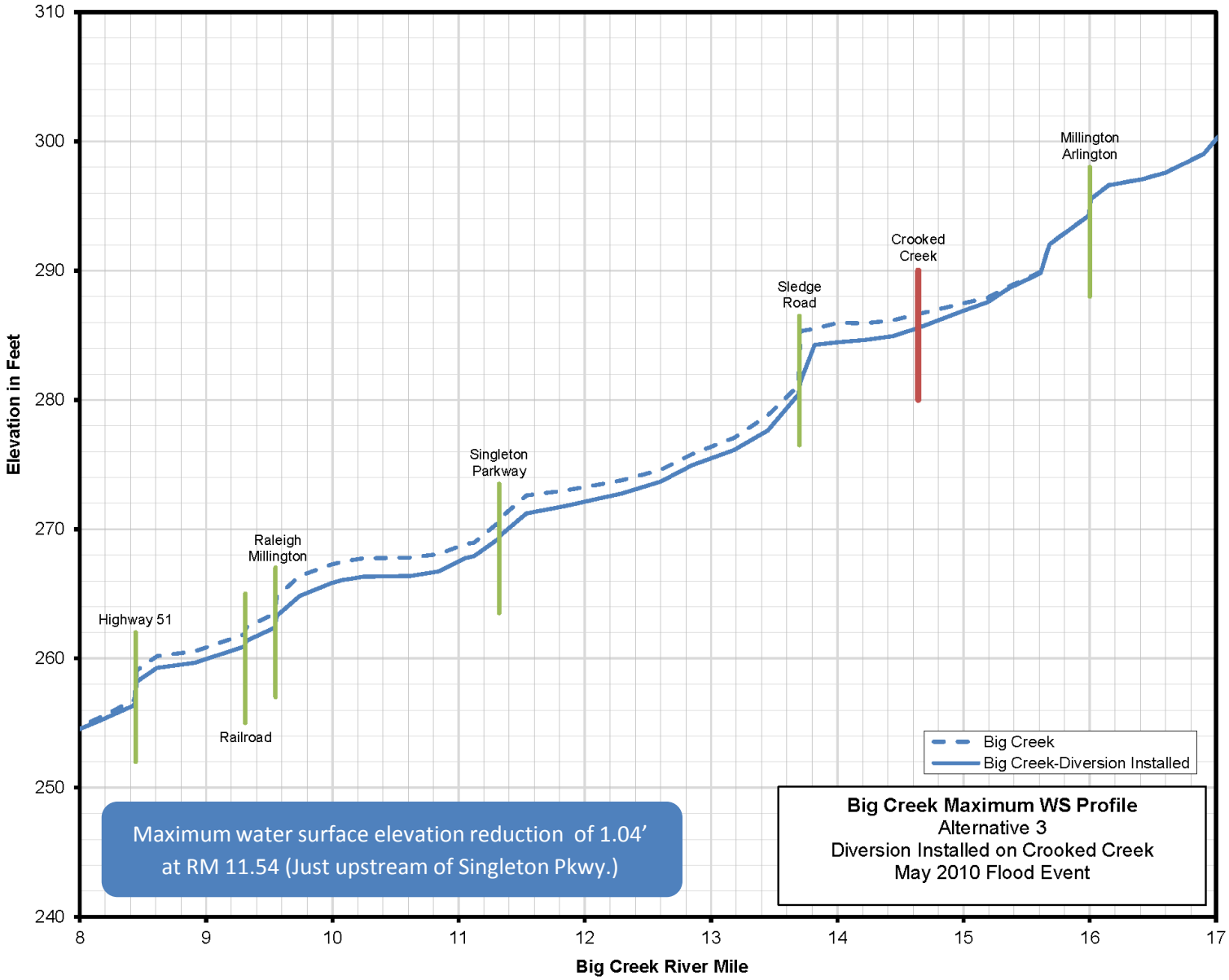
Big Creek Alternative 3
Diversion
Reduced Inundation Area with Alternative 3
Increased Inundation Area with Alternative 3
May 2010 Inundation Area
City Limits
N


310
300
290
280
270
260
250
240
Elevation in Feet
8
9
10
11
12
13
14
15
16
17
Big Creek River Mile
Highway 51
Railroad
Raleigh
Millington
Singleton
Parkway
Sledge
Road
Crooked
Creek
Millington
Arlington
Big Creek
Big Creek-Diversion Installed
Maximum water surface elevation reduction of 1.04'
at RM 11.54 (Just upstream of Singleton Pkwy.)
Big Creek Maximum WS Profile
Alternative 3
Diversion Installed on Crooked Creek
May 2010 Flood Event

BIG CREEK ALTERNATIVE 3 – HIGH FLOW DIVERSION FINDINGS

Effective in reducing water surface elevations

Minimal land acquisition

High construction cost (two new bridges)

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COMPARISON OF VARIOUS STUDY ALTERNATIVES
BIG CREEK DRAINAGE STUDY
SHELBY COUNTY TN GOVERNMENT

ALTERNATIVES	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	0.08	1.07	0.96	1.52
Crooked Creek Dam	0.12	1.36	0.00	0.89
Royster Creek Dam	0.32	0.03	0.00	0.00
Big Crk. #1 & Crooked Crk. Dams	0.27	2.15	1.26	2.69
Crooked Crk. & Royster Crk. Dams	0.54	1.39	0.98	1.19
ALTERNATE #2-ENHANCED LEVEE PROTECTION				
Raise East Navy Base Levee	0.00	0.00	0.00	0.00
ALTERNATE #3-HIGH FLOW DIVERSION				
Crooked Creek Diversion	0.12	1.36	1.25	1.04

WORK GOING FORWARD

Develop and evaluate additional potential projects

Evaluate combinations of projects

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Questions!

Adrian.Ward@bwsc.net
615-252-4329

BWSC Barge Waggoner Sumner & Cannon, Inc.