The Upper Mississippi River

Rock Island District

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USACE Disaster Operations Public Law 84-99

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Preparedness

The Flood Control and Coastal Emergency Act establishes an emergency fund for preparedness for emergency response to natural disasters; for flood fighting and rescue operations; for rehabilitation of flood control and hurricane protection structures. Disaster preparedness activities include coordination, planning, training and conduct of response exercises with local, state and federal agencies.

Funding for USACE emergency response under this authority is provided by Congress through the annual Energy and Water Development Appropriation Act.

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Response Activities

PL 84-99 allows the Corps of Engineers to supplement State and local entities in flood fighting urban and other non-agricultural areas under certain conditions.

All flood fight efforts require a Project Cooperation Agreement signed by the Public Sponsor and a requirement for the Sponsor to remove all flood fight material after the flood has receded.

PL 84-99 also authorizes emergency water support and drought assistance in certain situations and allows for "advance measures" assistance to prevent or reduce flood damage conditions of imminent threat of unusual flooding.

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Rehabilitation

Under the authority of PL 84-99, an eligible flood protection system can be rehabilitated if damaged by a flood event. The flood system would be restored to its pre-disaster status at no cost to the Federal system owner, and at 20% cost to the eligible non-Federal system owner.

All systems considered eligible for PL 84-99 rehabilitation assistance have to be in the Rehabilitation and Inspection Program prior to the flood event. Acceptable operation and maintenance by the public levee sponsor are verified by levee inspections conducted by the Corps on a regular basis.

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USACE conducts Two types of levee inspections

Using a Geographic Information Systems (GIS) / Global Positioning System (GPS)-based inspection tool that incorporates a standard levee inspection checklist. Levee sponsors are encouraged to be part of the inspection team.

Routine Inspection
(annually)

Periodic Inspection
(every 5 years)
Data Collection / Field Inspection / Final Report

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Inspection Ratings

Both Routine and Periodic Inspections result in a final inspection rating for operation and maintenance. The rating is based on the levee inspection checklist, which includes 125 specific items dealing with operation and maintenance of levee embankments, floodwalls, interior drainage, pump stations, and channels. Each levee segment receives an overall segment inspection rating of Acceptable, Minimally Acceptable, or Unacceptable.

A levee sponsor must maintain the levee to at least the *minimally acceptable* standard to remain eligible for federal rehabilitation assistance through the USACE Rehabilitation and Inspection Program (PL 84-99).

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Muscatine Urban Levee System Emergency Planning Assistance

US Army Corps of Engineers - Flood Plain Management Services

City of Muscatine Assistance Request FY09

Special Studies Federal Funding FY12 and FY13

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Muscatine Urban Levee System
Evaluation of Flooding Scenarios

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Engineering
Studies /Analyses

- Scope, Stakeholders, Feedback
- Structural / Geotechnical Evaluation
- GIS / LIDAR Data
- Hydraulic Modeling / Mapping
- Report w/ Technical Appendix

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System Evaluation

Residual Risk and Public Safety

- Periodic and Annual Inspection Reports
- Emergency Response Plan
- System Capacity Exceedance Provisions
- Critical Levee Failure Locations

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Flood Wave Progression

Hydraulic Modeling Products --

Identify threat to human life and safety characterized by flood wave progression and rapid increases in water depths.

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City of Muscatine - Muscatine Island Levee District – Louisa Co. D. D. #13

Federally authorized / Non-federally operated & maintained urban flood protection project, designed to withstand flood flows of a .5% chance flood event.

The flood protection main features are:

- Sand and Earthen levees (approximately 15 miles)
- Floodwalls at upstream railroad closure
- Interior drainage system
- 2 Closure Structures
- 1 Pump Station
- 14 Gatewells

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City of Muscatine – Muscatine Island Levee District Muscatine and Louisa Counties

Mississippi River Mile 455 to 442 -- approximately 15 miles of levee.

The levee system protects approximately 30,000 acres of developed industrial, agricultural, and residential land.

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National Levee Database

Rock Island District
Upper Mississippi River

33 Main-stem levee systems

440 miles field surveyed

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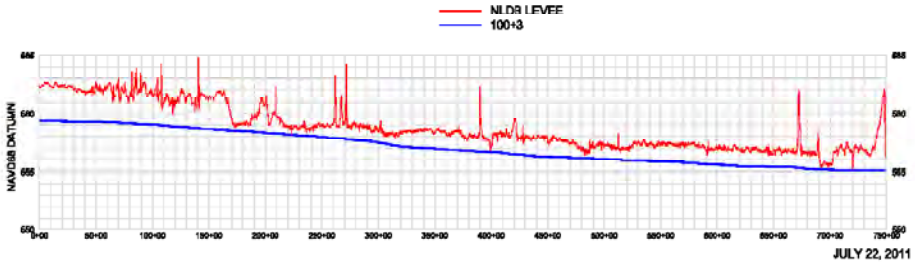

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Upper Mississippi River System Flow Frequency Study Area

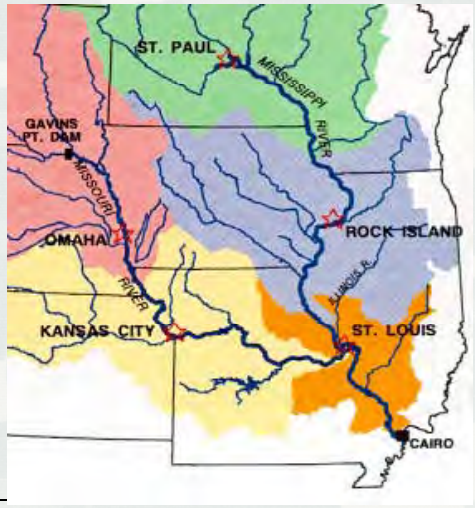
Upper Mississippi River

815 River Miles

Hydraulic Model

One dimensional HEC-RAS

Basis for FLO2-D



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Stakeholder Work Group

Muscatine County Stakeholders

Louisa County Stakeholders

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Breach Location

- ✓ **Location population/census data** (life/safety)
- ✓ **Critical Infrastructure** (Power Plants, etc)
- ✓ **Transportation** (Airport, Highways)
- ✓ **Manufacturing Facilities** (workforce/equipment)
- ✓ **Hazardous Material** (Chemicals, Petroleum)

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Breach Characteristics

- ➢ **Location of breach**
- ➢ **Depth of breach**
- ➢ **Width of breach**
- ➢ **Time for breach to fully form**

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Muscatine Island Urban Levee System Study Breach Analysis Muscatine Island Levee, Iowa

Flood Plain Management Services Special Study
Section 206 (PL 86-645) of the 1960 Flood Control Act as Amended

2-Dimensional Hydraulic Modeling Results

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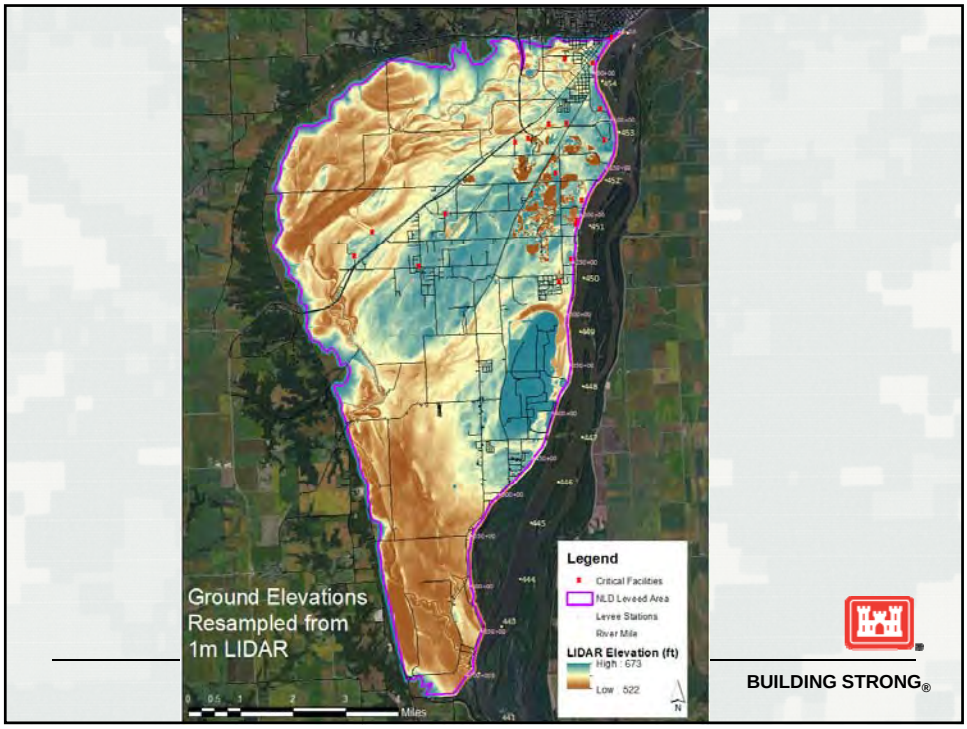
Ground Elevations
Resampled from
1m LIDAR
Legend
Critical Facilities
NLD Leveed Area
Levee Stations
River Mile
LIDAR Elevation (ft)
High : 673
Low : 522
Miles
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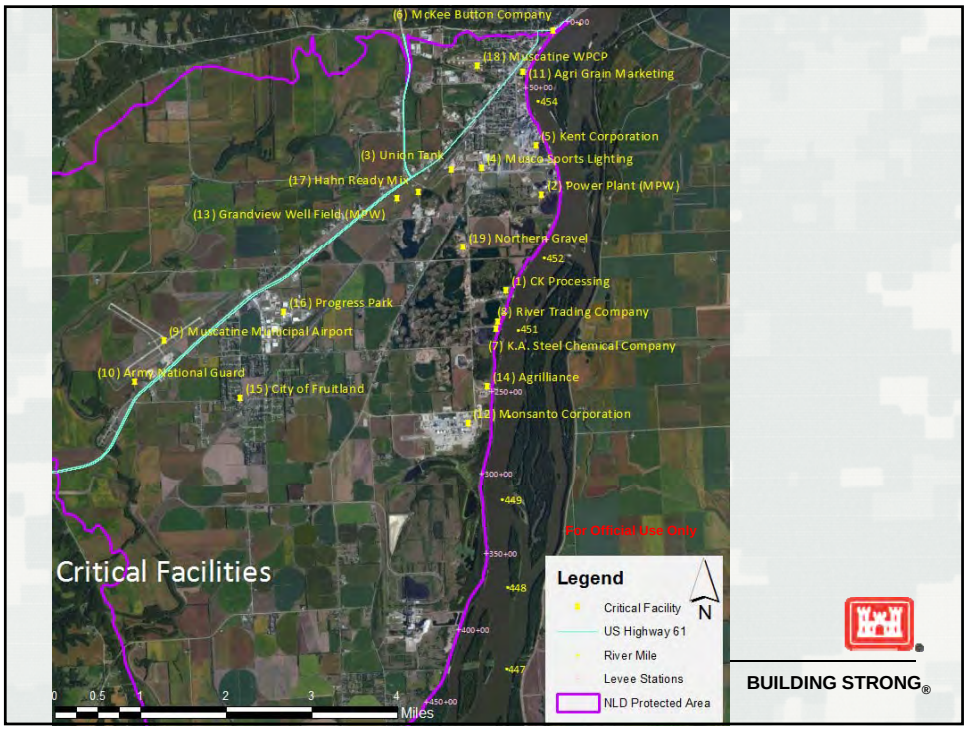
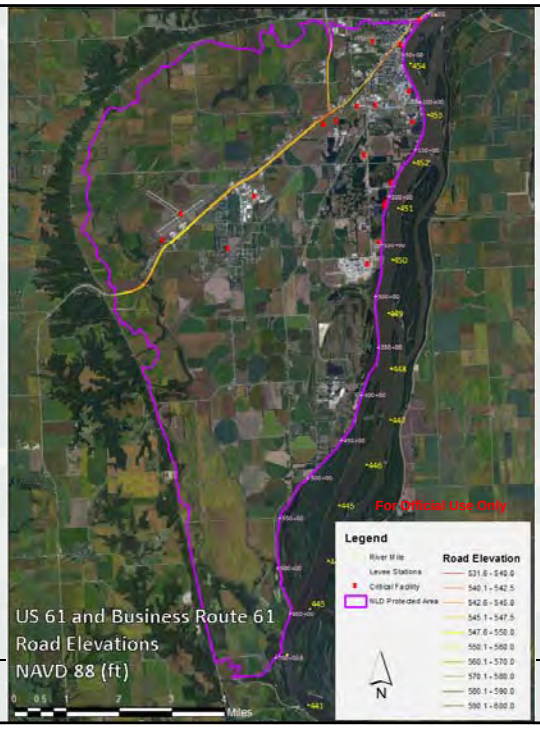

(6) McKee Button Company
(18) Muscatine WPCP
(11) Agri Grain Marketing
(5) Kent Corporation
(3) Union Tank
(4) Musco Sports Lighting
(17) Hahn Ready Mix
(2) Power Plant (MPW)
(13) Grandview Well Field (MPW)
(19) Northern Gravel
(1) CK Processing
(16) Progress Park
(8) River Trading Company
(9) Muscatine Municipal Airport
(7) K.A. Steel Chemical Company
(10) Army National Guard
(14) Agrilliance
(15) City of Fruitland
(12) Monsanto Corporation
For Official Use Only
Critical Facilities
Legend
Critical Facility
US Highway 61
River Mile
Levee Stations
NLD Protected Area
N
Miles
BUILDING STRONG®



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Time to Depth Summary

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Time From Breach Initiation to 1 ft Water Depth (Hours)

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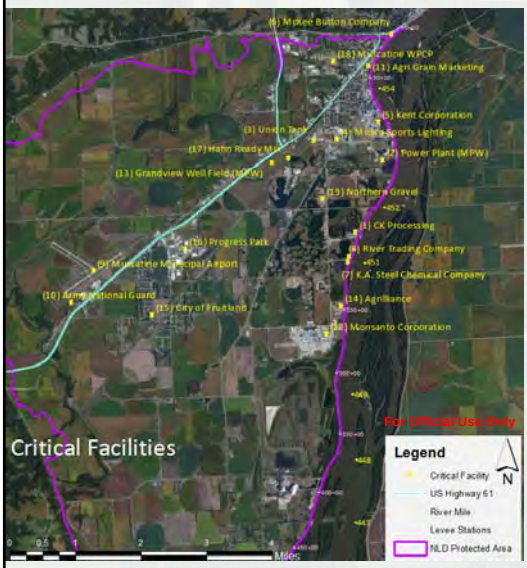

Name	ID Number	Breach Loc 1	Breach Loc 2	Breach Loc 3
CK PROCESSING	1	43	7	25
MUSCATINE POWER & WATER	2	83	40	186
UNION TANK CAR COMPANY	3	21	15	32
MUSCO SPORTS LIGHTING	4	62	35	47
KENT CORPORATION	5	63	37	59
MCKEE BUTTON COMPANY	6	64	39	110
K.A. STEEL CHEMICAL COMPANY	7	57	7	25
RIVER TRADING COMPANY	8	56	7	24
MUSCATINE MUNICIPAL AIRPORT	9	69	36	33
US ARMY NATIONAL GUARD	10	92	38	37
AGRI GRAIN MARKETING	11	57	38	62
MONSANTO	12	58	7	22
GRANDVIEW AVE WELL FIELD (MPW)	13	28	16	31
AGRILIANCE	14	73	9	24
CITY OF FRUITLAND	15	79	36	30
PROGRESS PARK	16	59	32	31
HAHN READY MIX	17	103	45	211
MUSCATINE WPCP	18	18	24	36
NORTHERN GRAVEL	19	93	37	171

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Breach Location 1

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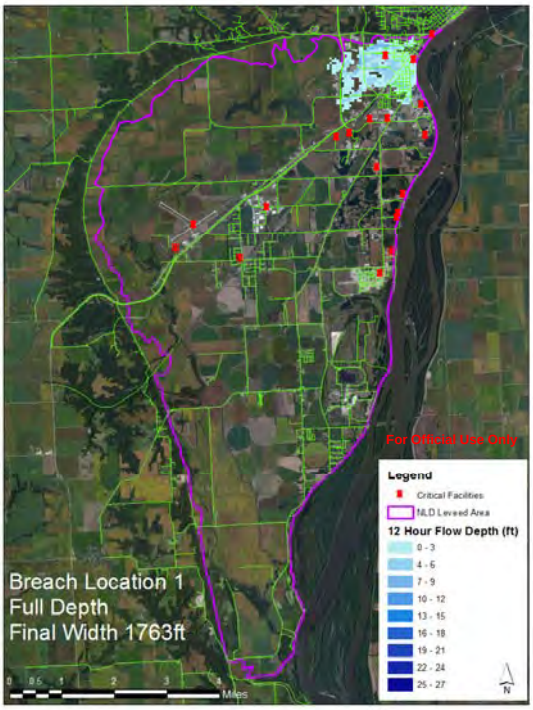
12 HR



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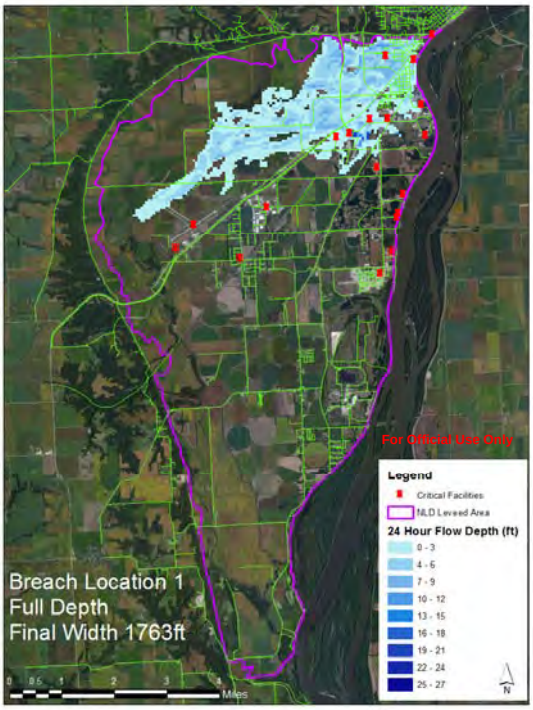
24 HR



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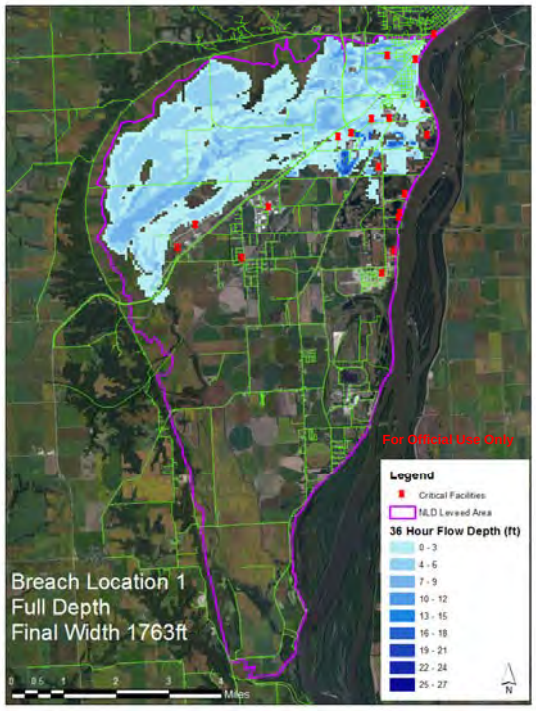
36 HR



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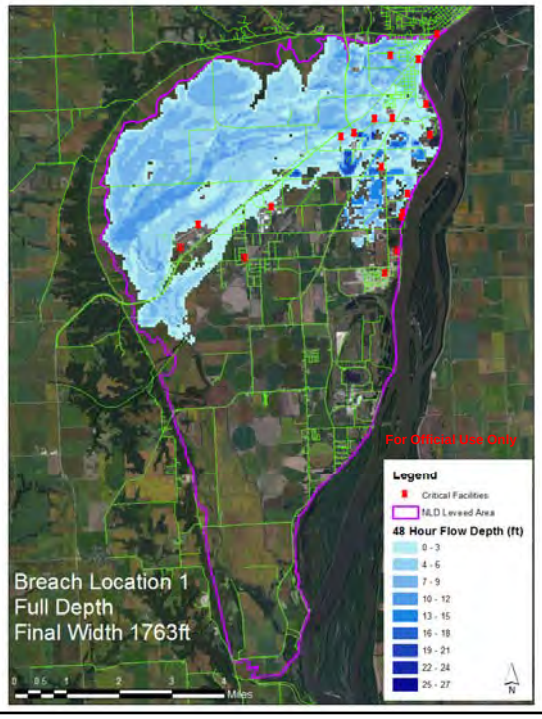
48 HR



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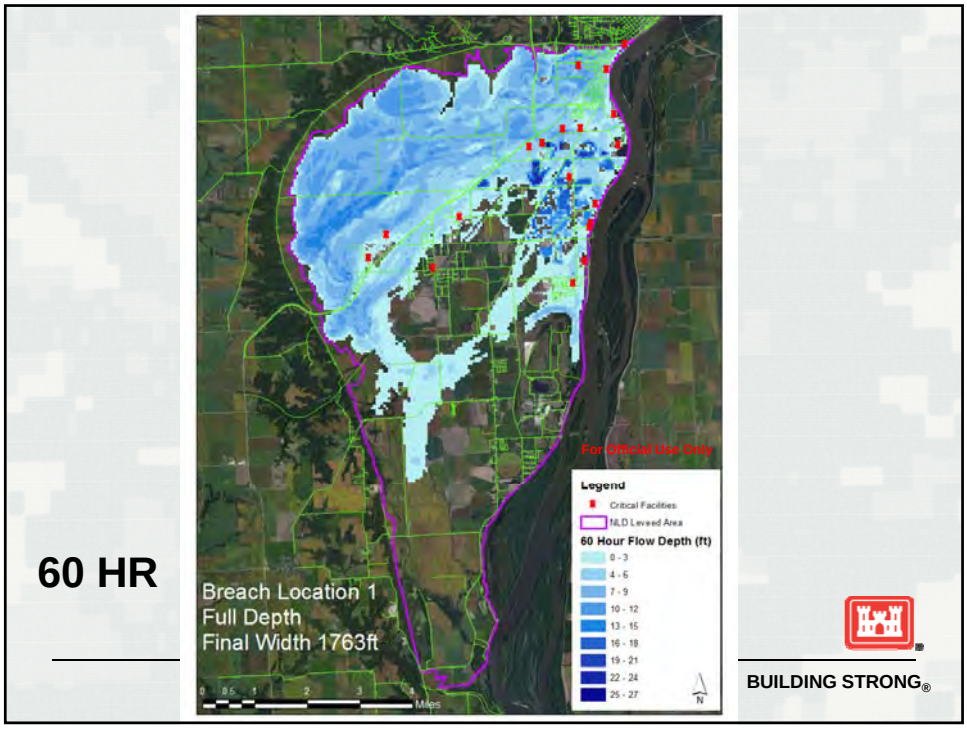
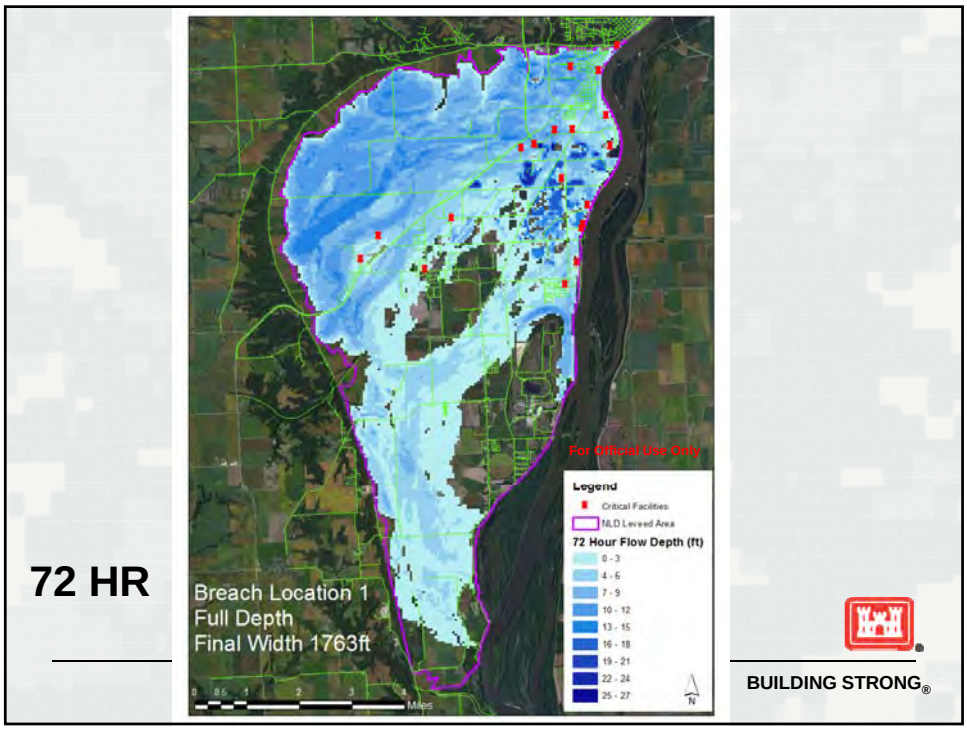
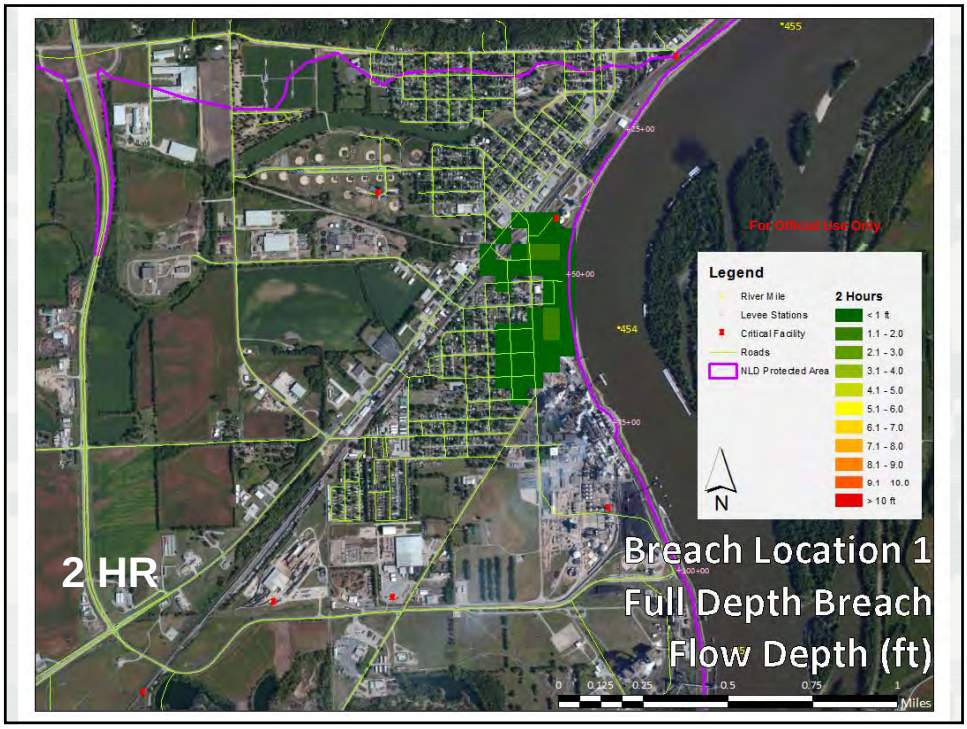
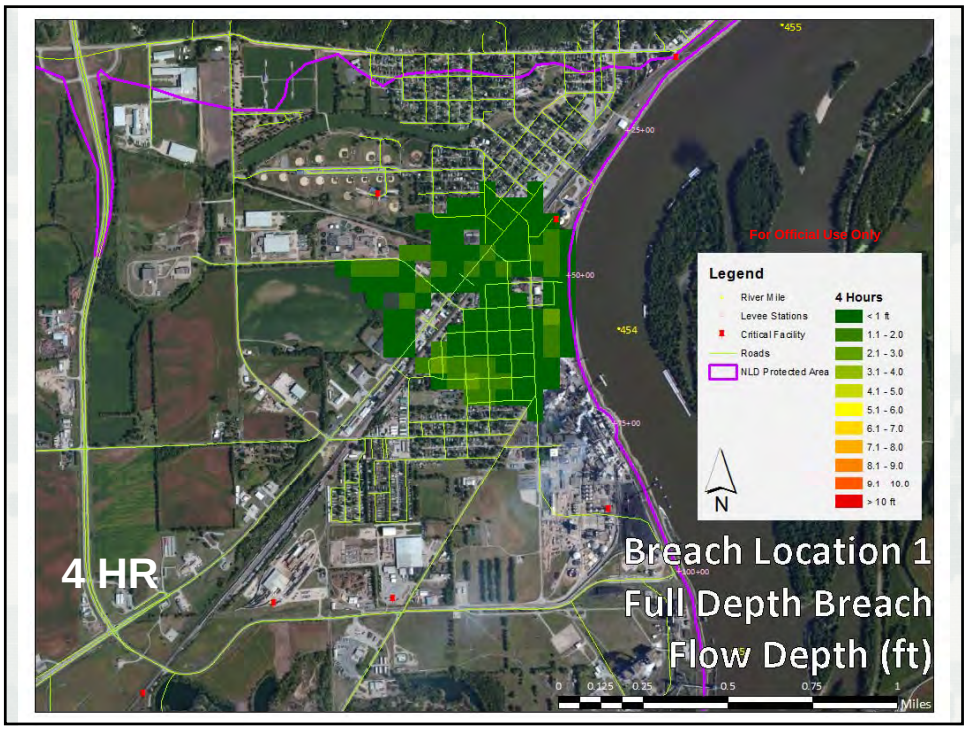
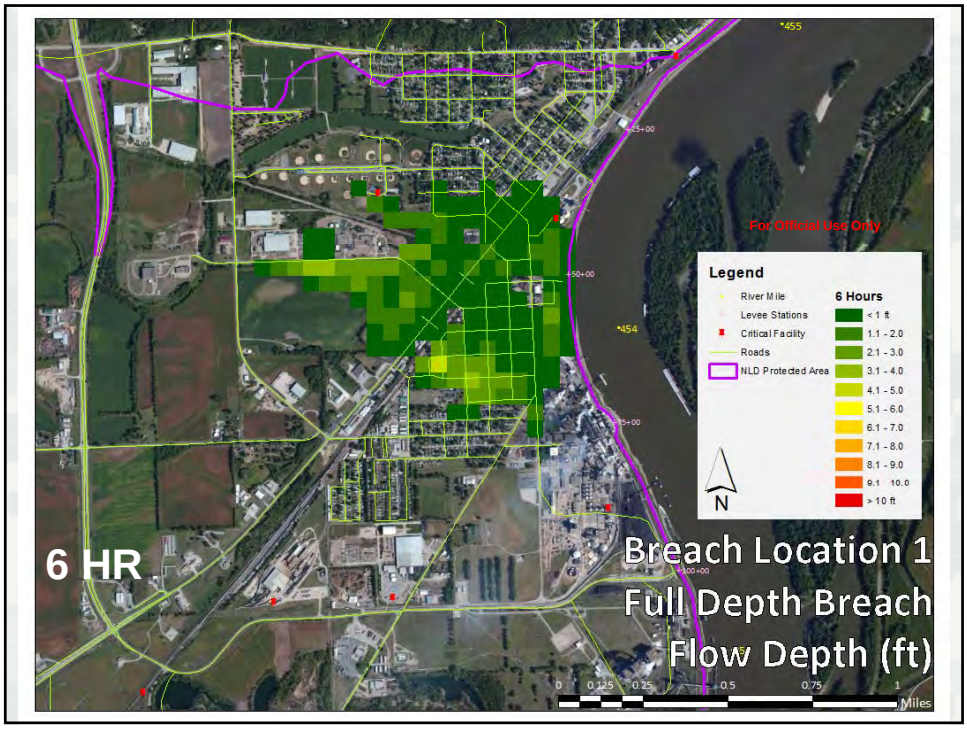
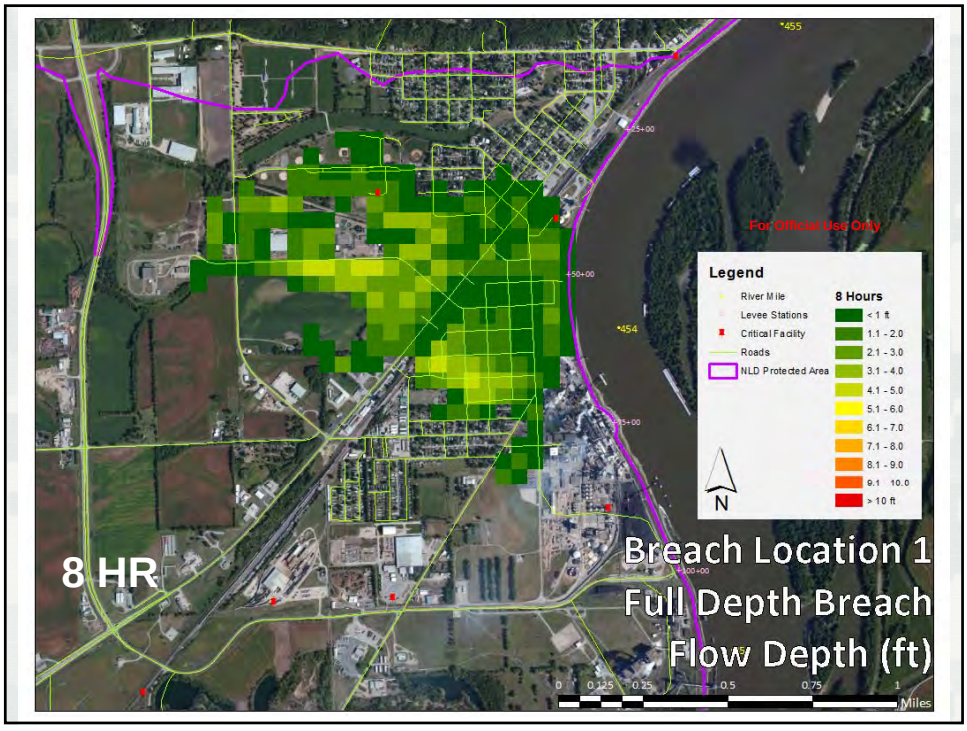

60 HR
Breach Location 1
Full Depth
Final Width 1763ft
For Official Use Only
Legend
Critical Facilities
NLD Leveed Area
60 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
25 - 27
Miles
BUILDING STRONG®


72 HR
Breach Location 1
Full Depth
Final Width 1763ft
For Official Use Only
Legend
Critical Facilities
NLD Leveed Area
72 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
25 - 27
Miles
BUILDING STRONG®


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
2 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
2 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
4 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
4 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
6 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
6 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles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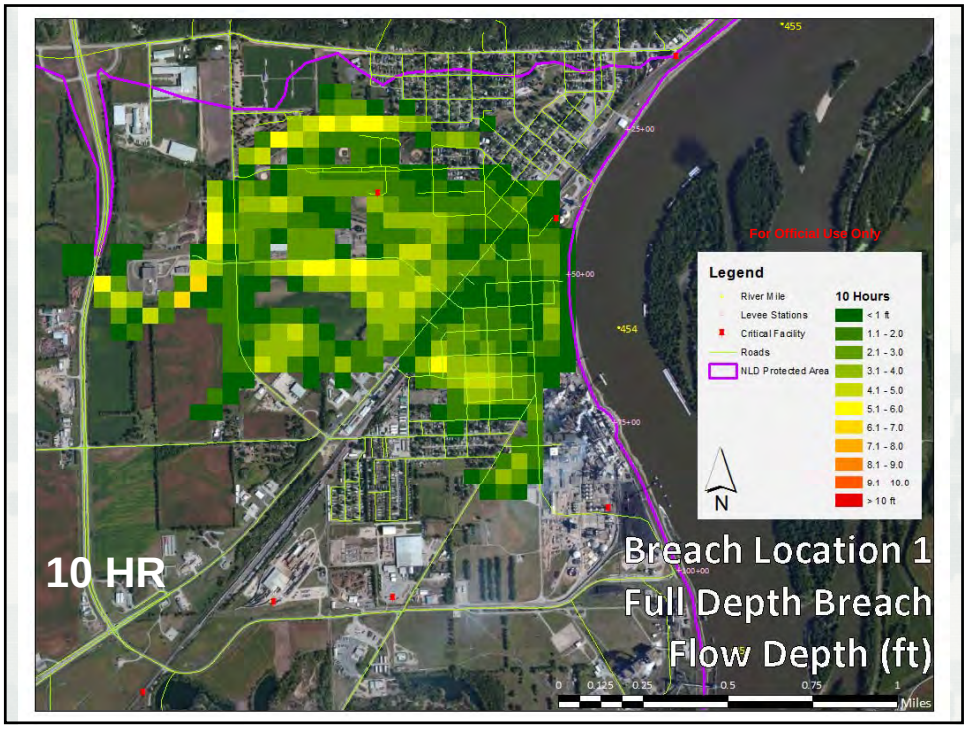
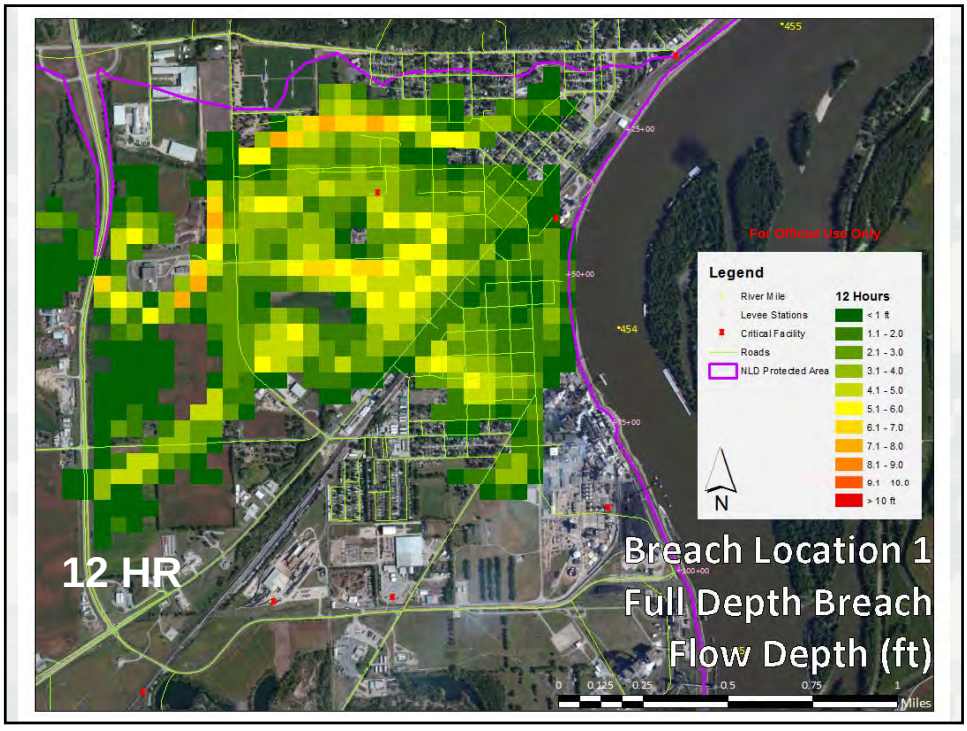
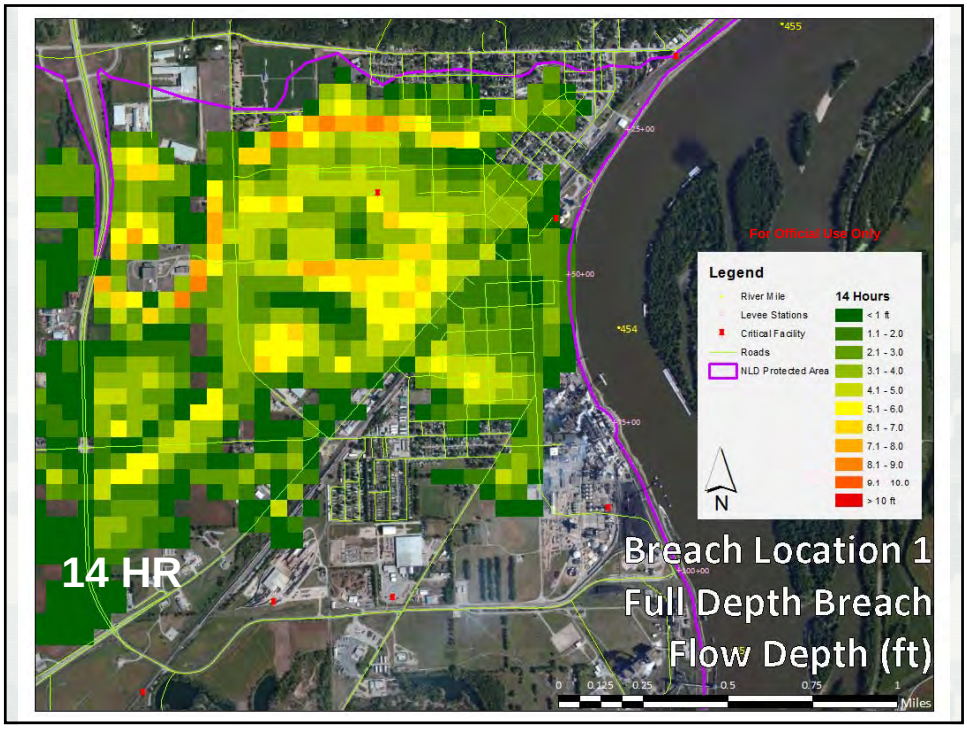
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
8 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
8 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
10 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
10 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
12 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
12 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles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Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
14 Hours
< 1 ft
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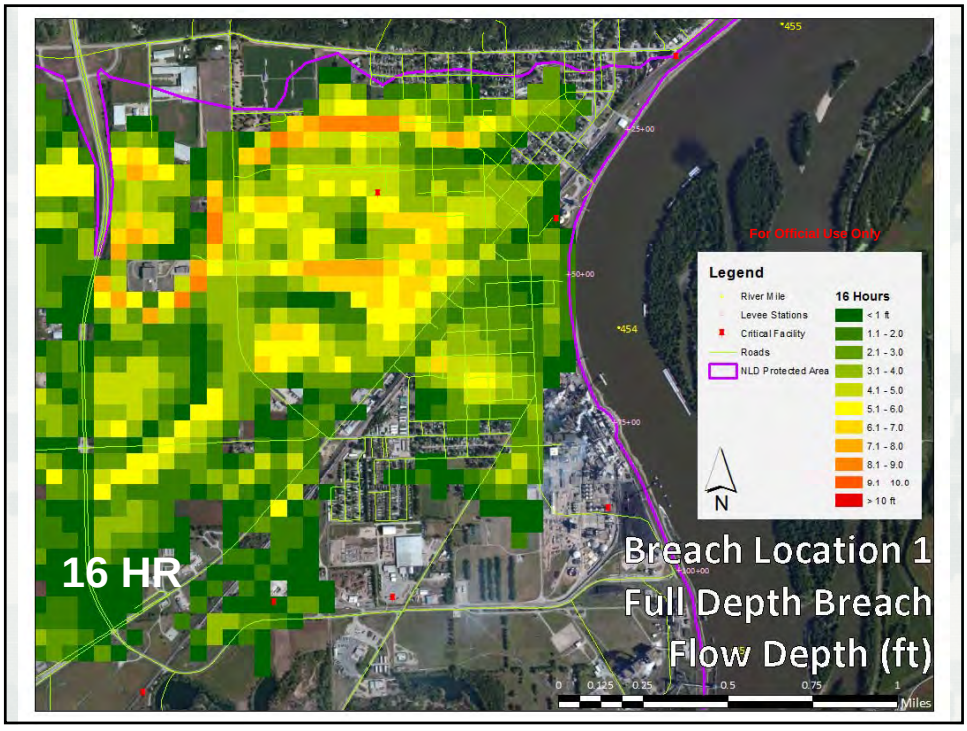
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
14 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles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Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
16 Hours
< 1 ft
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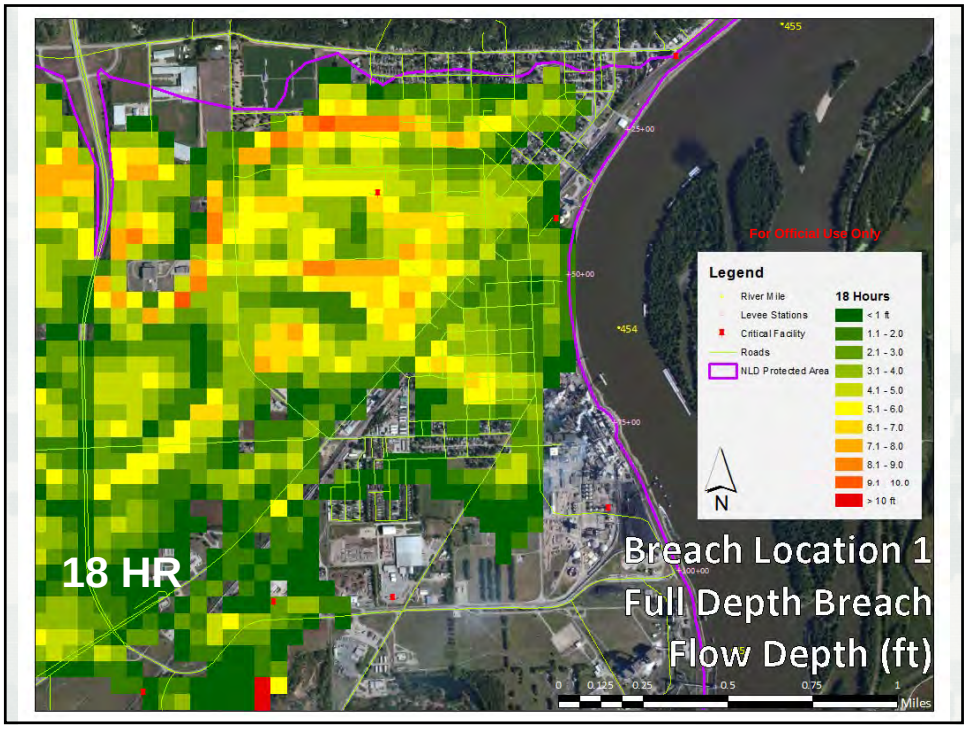
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 10.0
> 10 ft
N
16 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles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Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
18 Hours
< 1 ft
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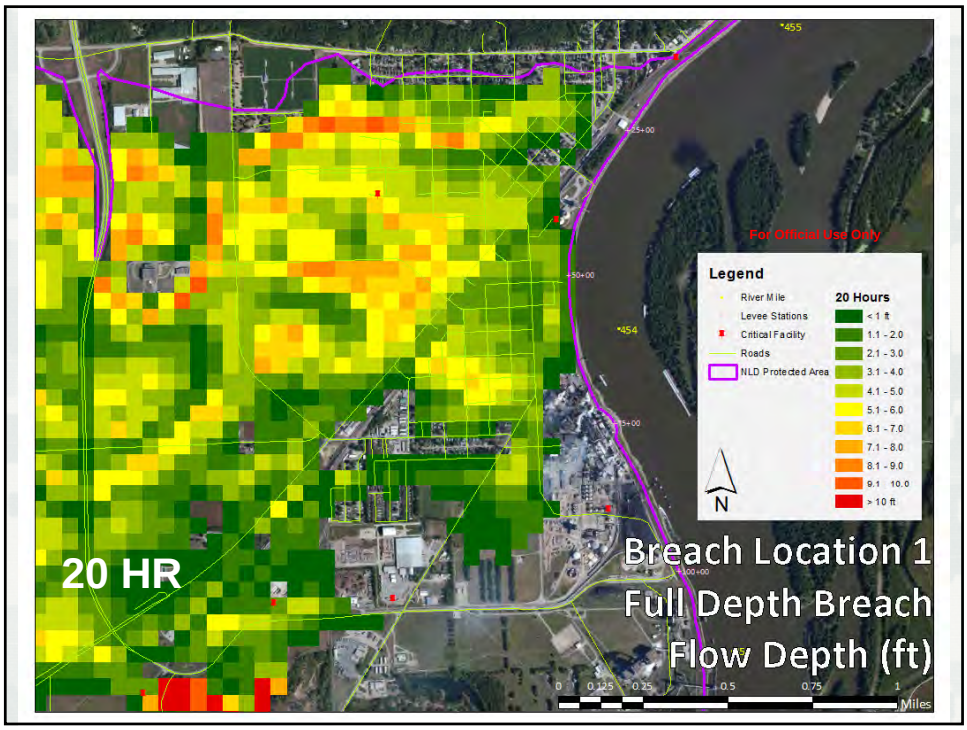
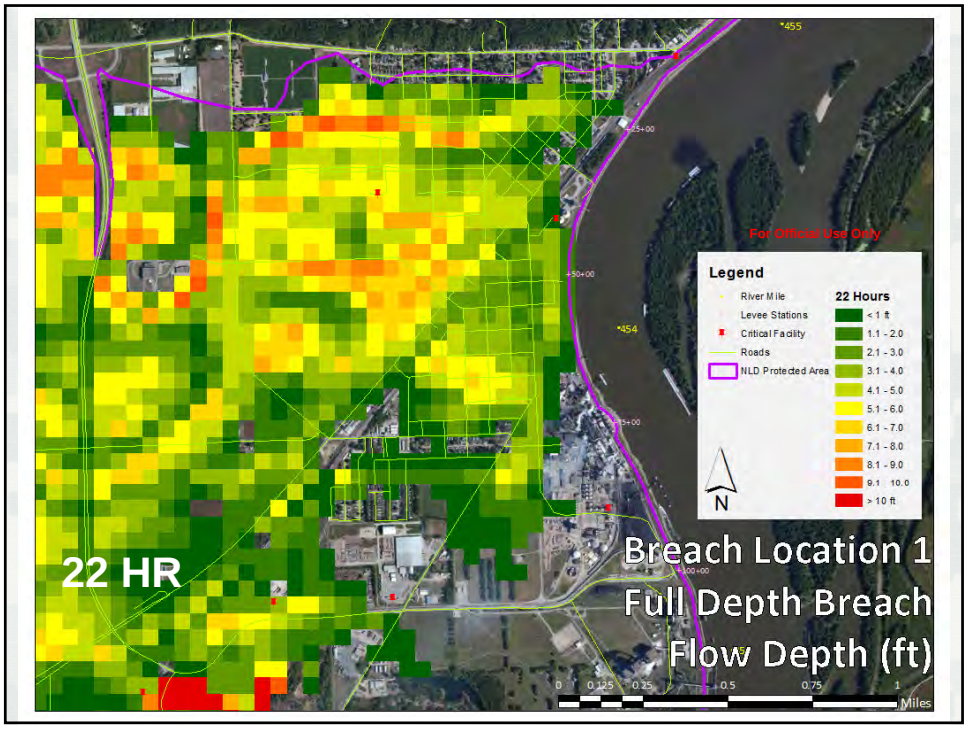
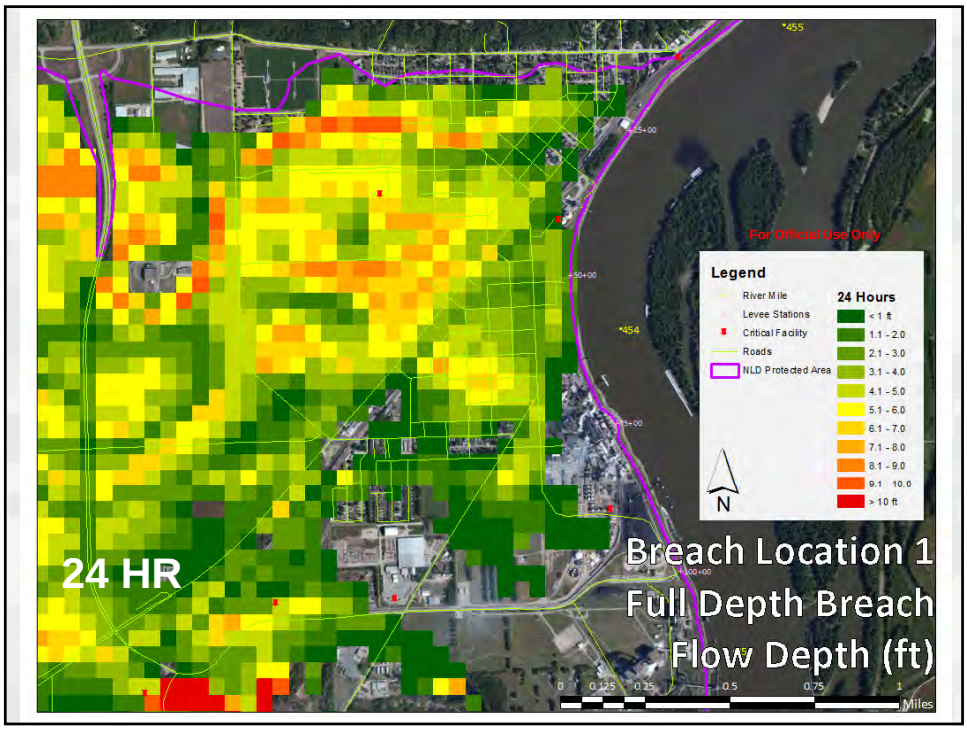
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
> 10 ft
N
18 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
20 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
> 10 ft
N
20 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
22 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
> 10 ft
N
22 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
24 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
> 10 ft
N
24 HR
Breach Location 1
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles

Breach Location 2

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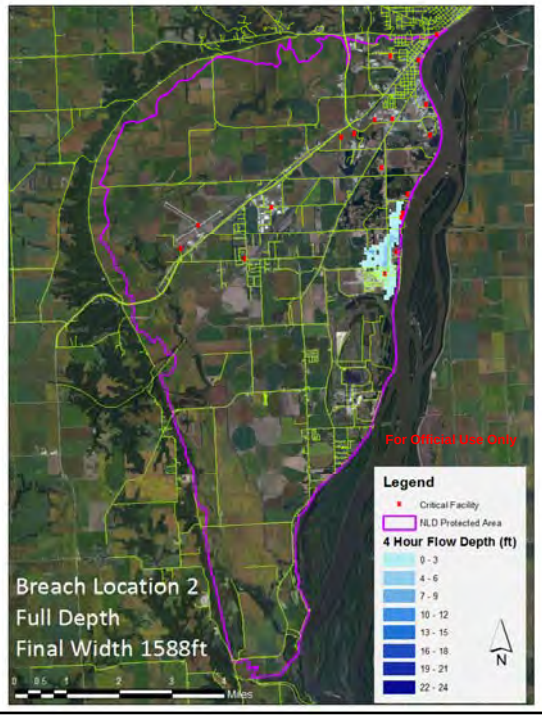
4 HR



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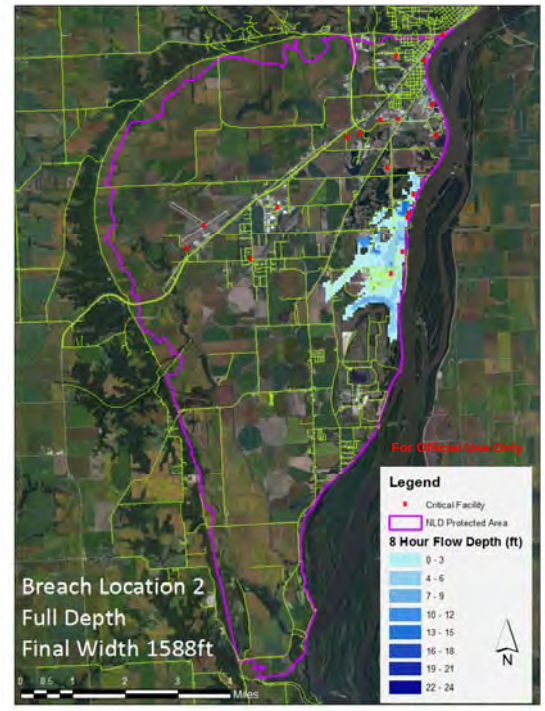
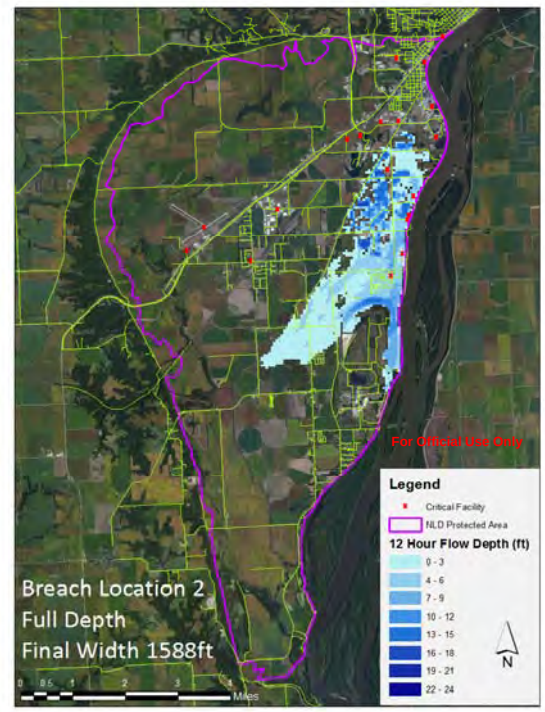
8 HR



BUILDING STRONG®

12 HR



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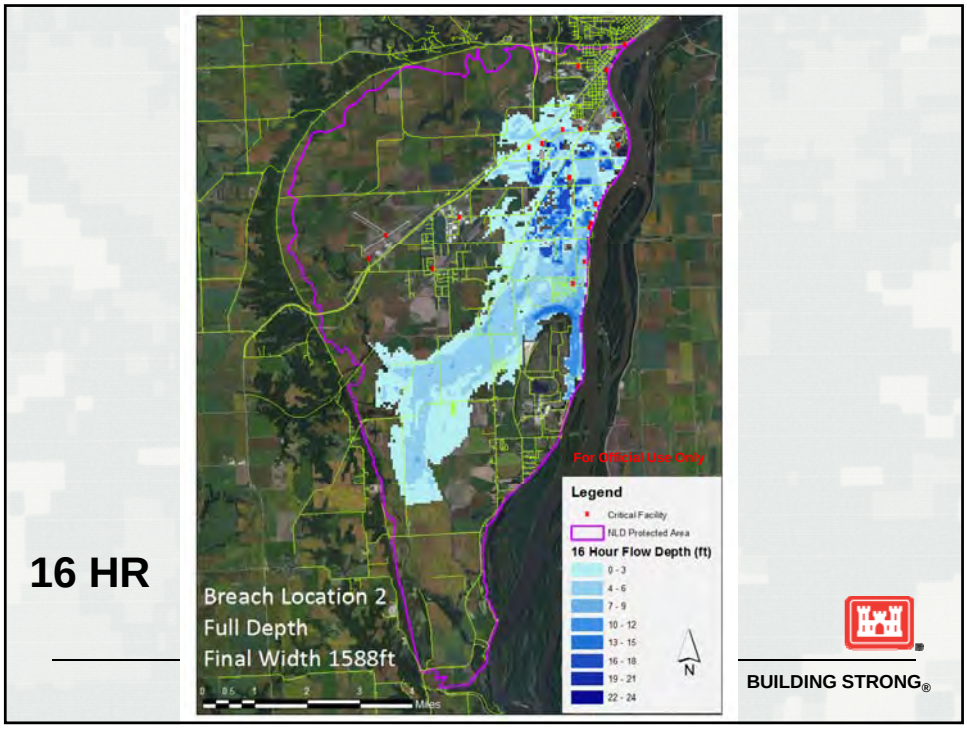
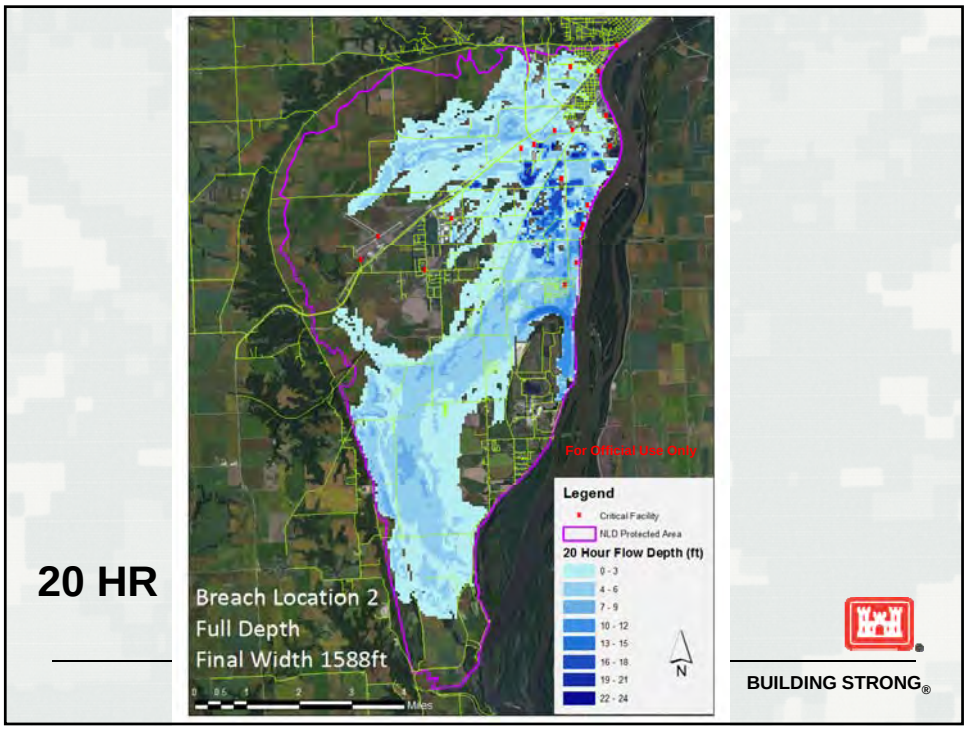
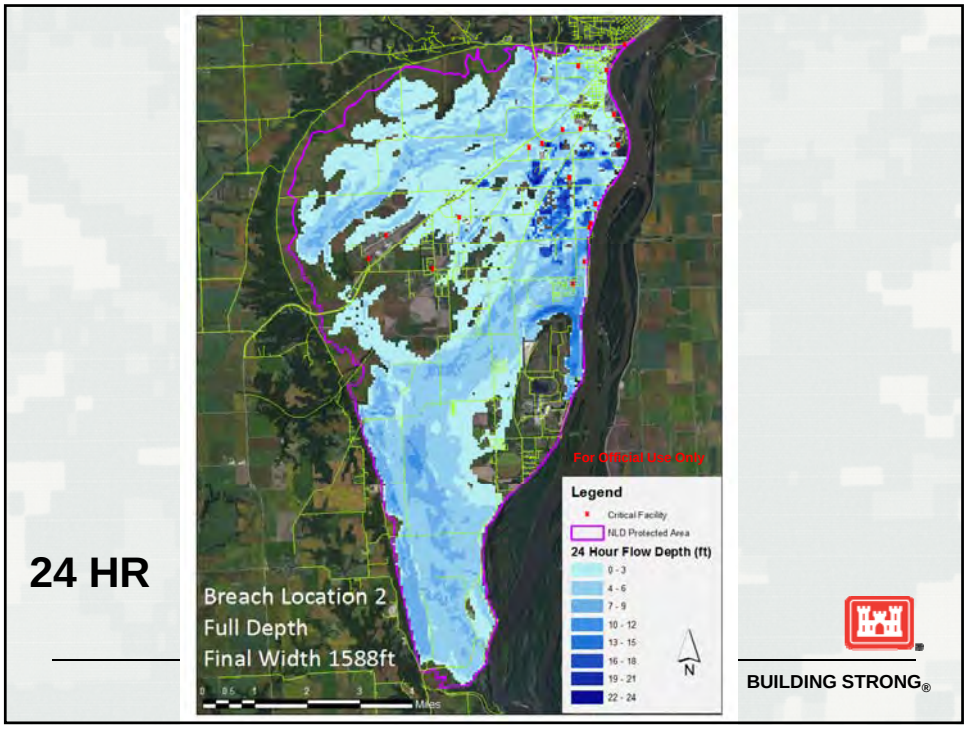
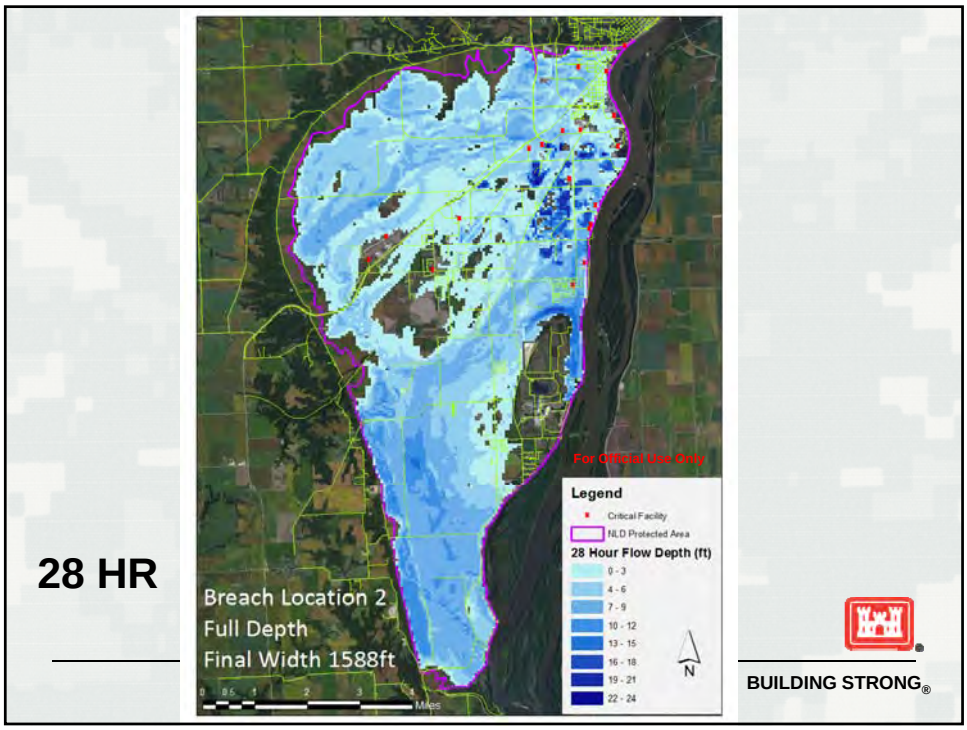
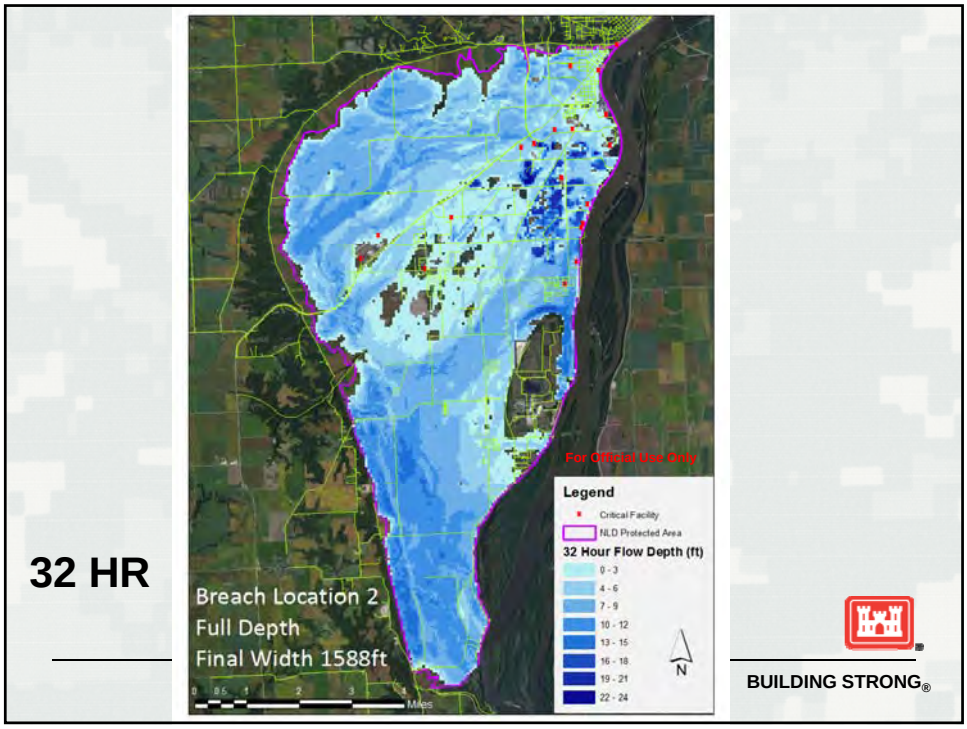
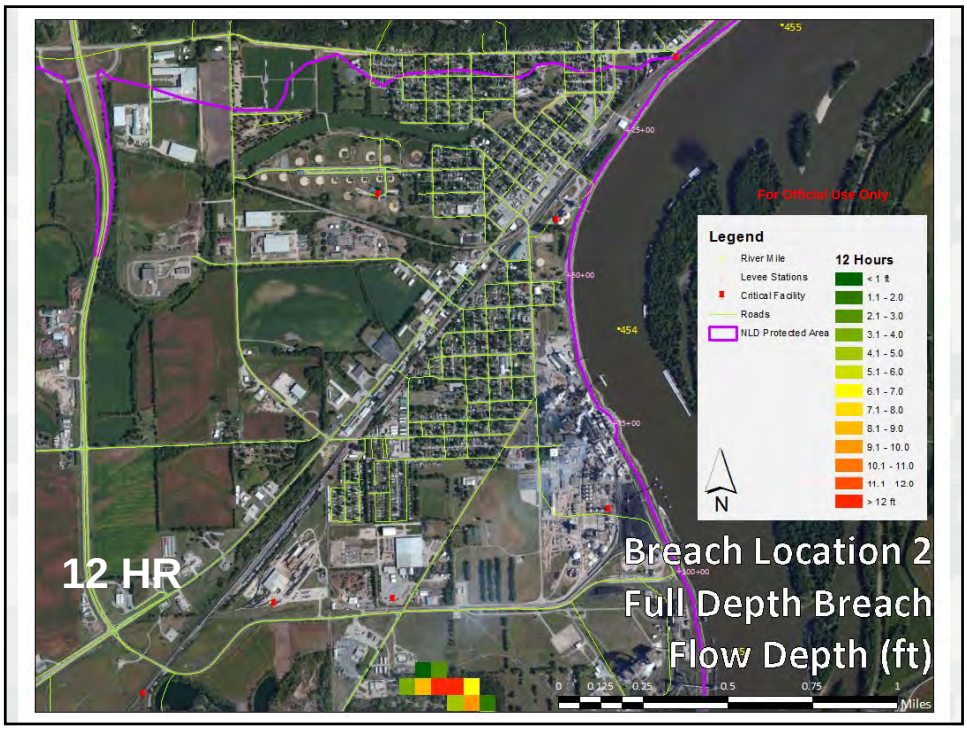

16 HR
Breach Location 2
Full Depth
Final Width 1588ft
For Official Use Only
Legend
Critical Facility
NLD Protected Area
16 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
BUILDING STRONG®

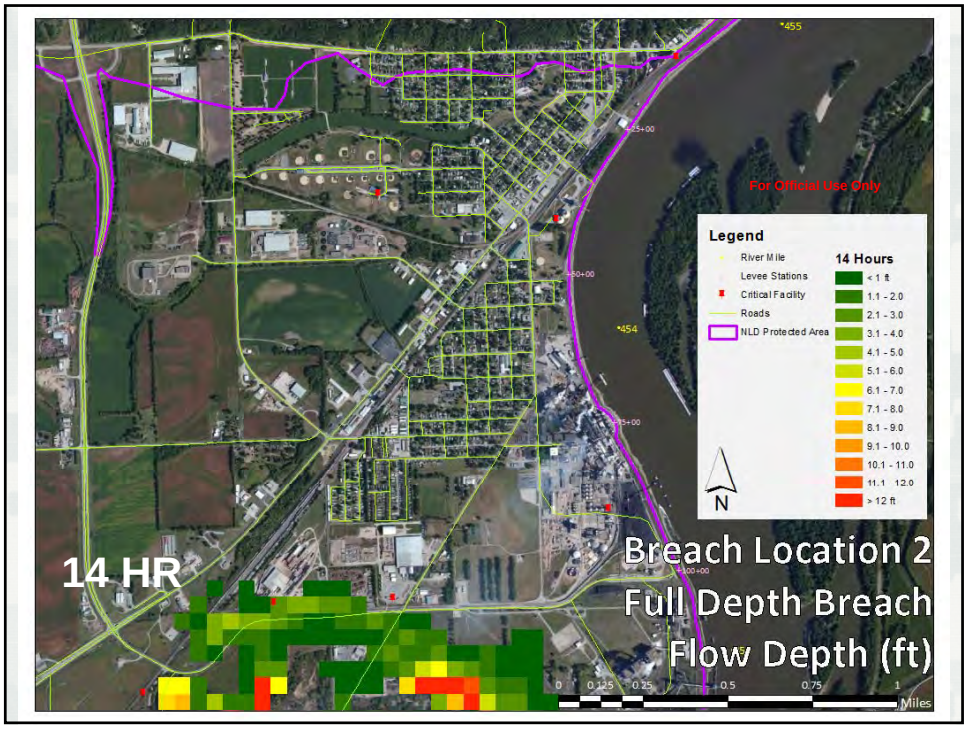

20 HR
Breach Location 2
Full Depth
Final Width 1588ft
For Official Use Only
Legend
Critical Facility
NLD Protected Area
20 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
BUILDING STRONG®

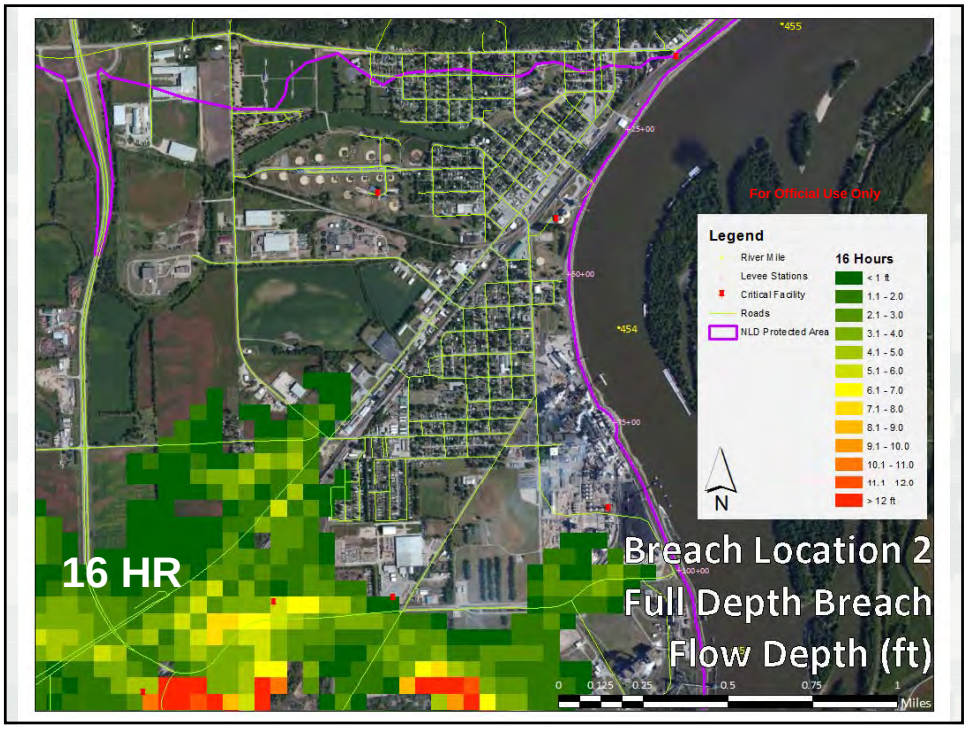

24 HR
Breach Location 2
Full Depth
Final Width 1588ft
For Official Use Only
Legend
Critical Facility
NLD Protected Area
24 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
BUILDING STRONG®

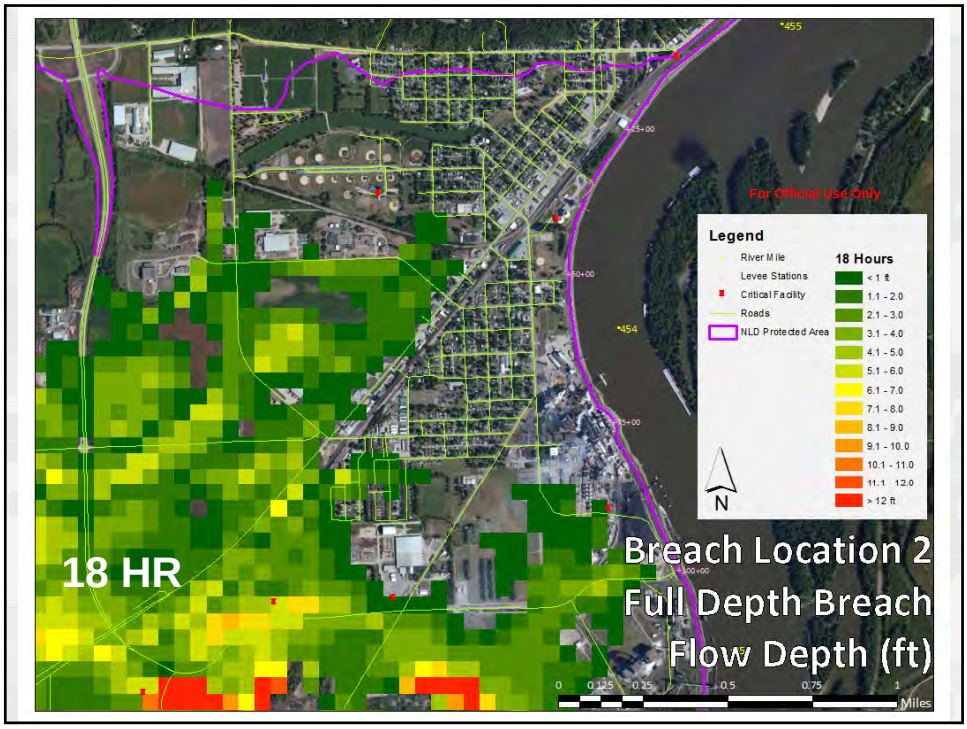

28 HR
Breach Location 2
Full Depth
Final Width 1588ft
For Official Use Only
Legend
Critical Facility
NLD Protected Area
28 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
BUILDING STRONG®

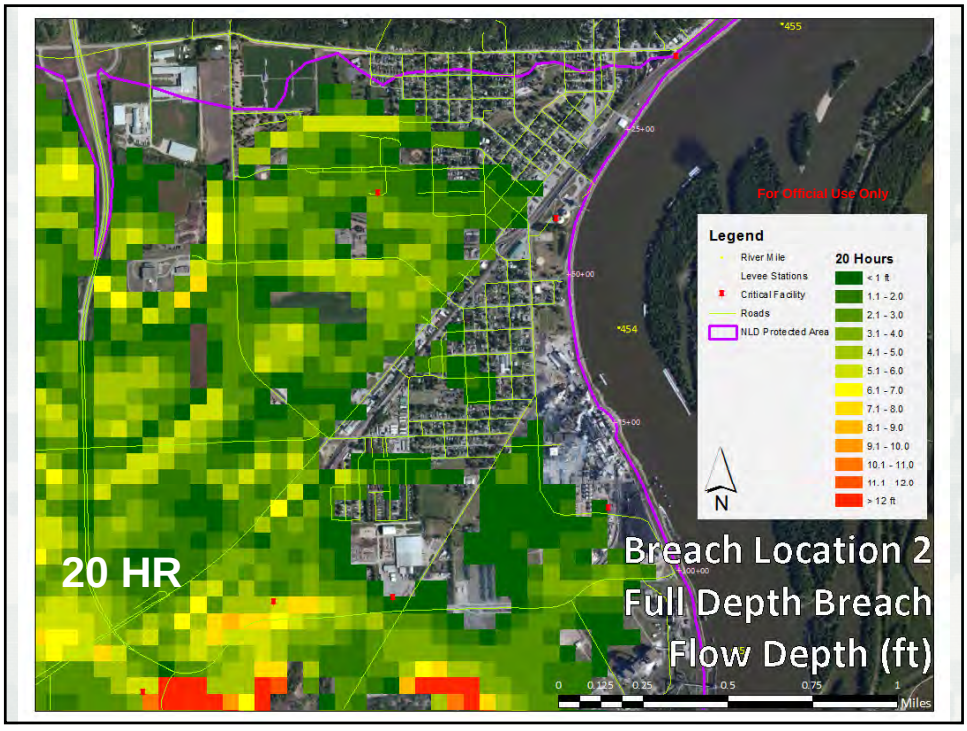

32 HR
Breach Location 2
Full Depth
Final Width 1588ft
For Official Use Only
Legend
Critical Facility
NLD Protected Area
32 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
BUILDING STRONG®

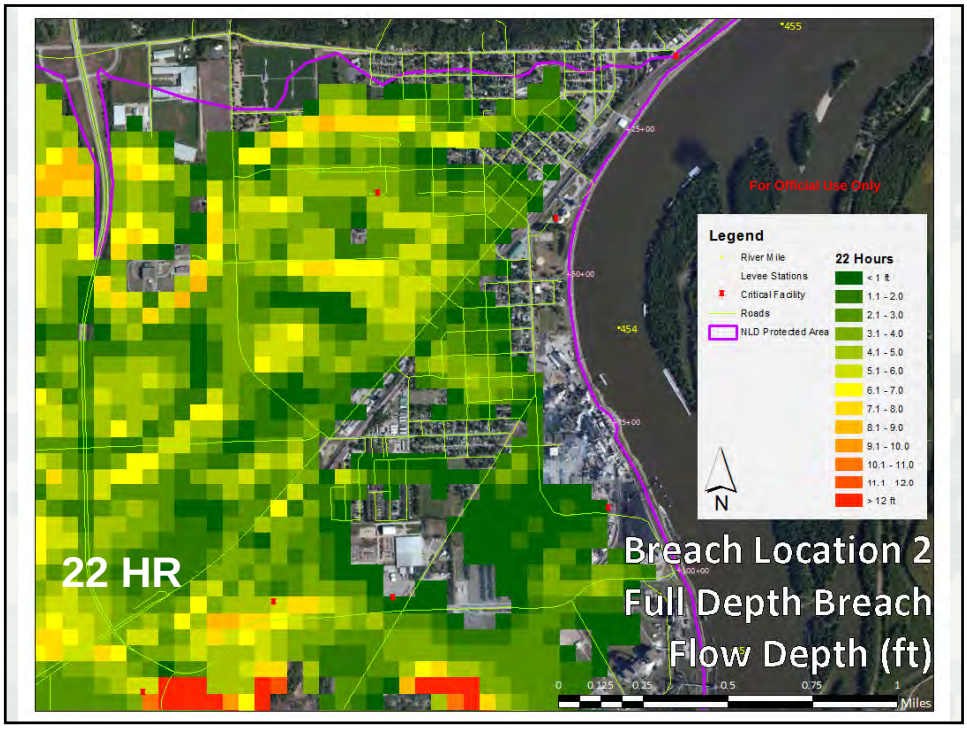

12 HR
For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
12 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 - 12.0
> 12 ft
N
Breach Location 2
Full Depth Breach
Flow Depth (ft)
Miles

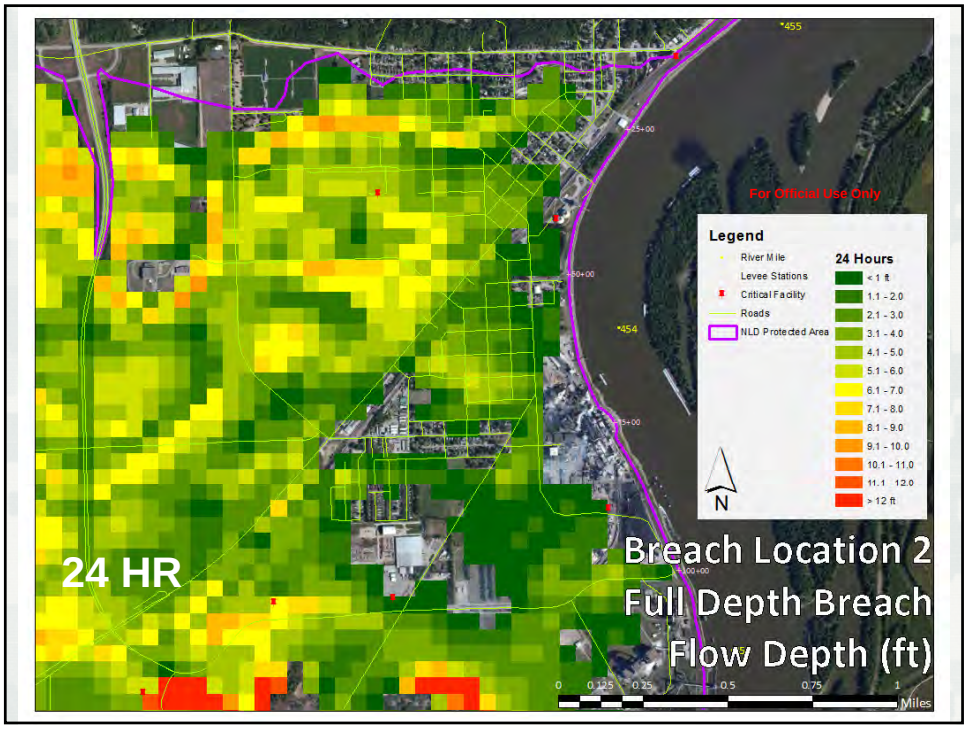

For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
14 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 12.0
> 12 ft
N
14 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
16 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 12.0
> 12 ft
N
16 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
18 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 12.0
> 12 ft
N
18 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
20 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 12.0
> 12 ft
N
20 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
22 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 - 12.0
> 12 ft
N
22 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles


For Official Use Only
Legend
River Mile
Levee Stations
Critical Facility
Roads
NLD Protected Area
24 Hours
< 1 ft
1.1 - 2.0
2.1 - 3.0
3.1 - 4.0
4.1 - 5.0
5.1 - 6.0
6.1 - 7.0
7.1 - 8.0
8.1 - 9.0
9.1 - 10.0
10.1 - 11.0
11.1 - 12.0
> 12 ft
N
24 HR
Breach Location 2
Full Depth Breach
Flow Depth (ft)
0 0.125 0.25 0.5 0.75 1
Miles

Breach Location 3

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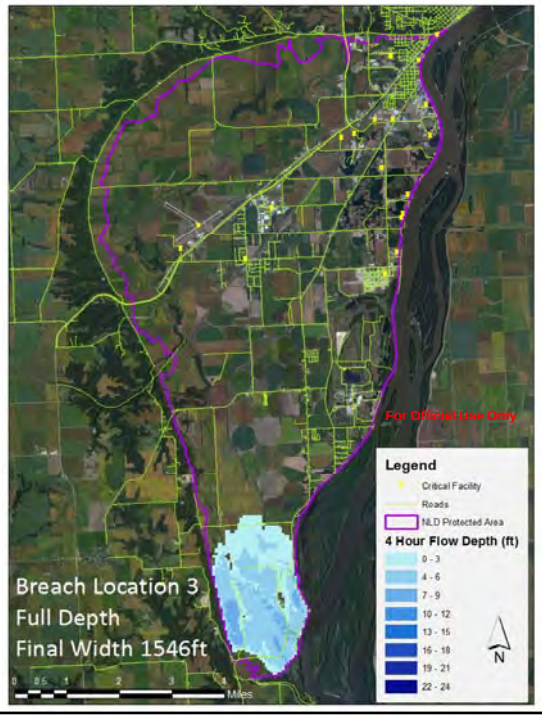
4 HR



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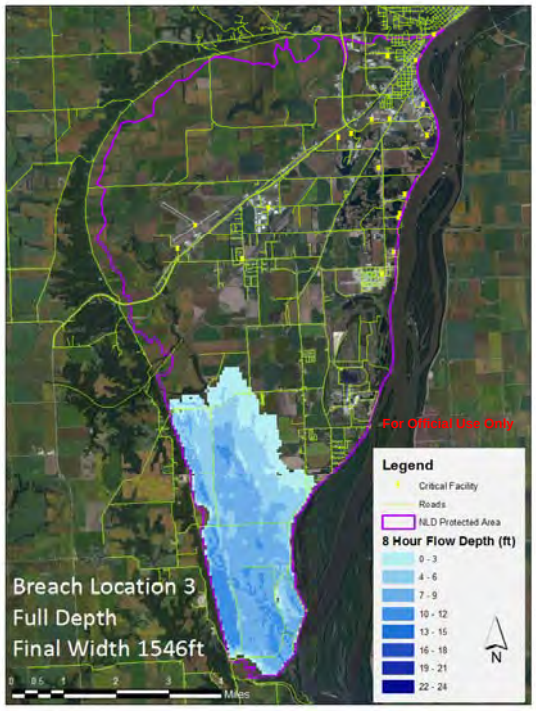
8 HR



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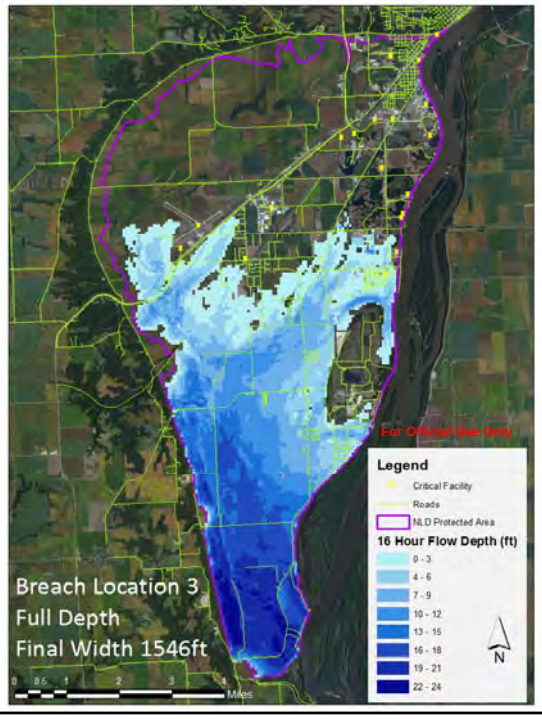
16 HR



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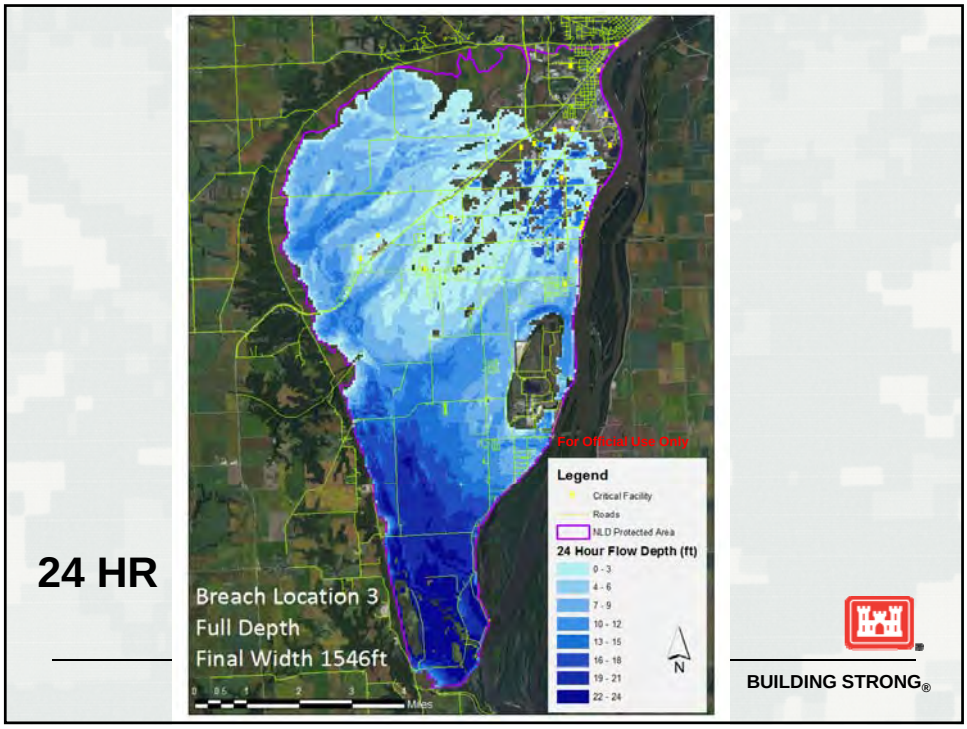
24 HR
Breach Location 3
Full Depth
Final Width 1546ft
For Official Use Only
Legend
Critical Facility
Roads
NLD Protected Area
24 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
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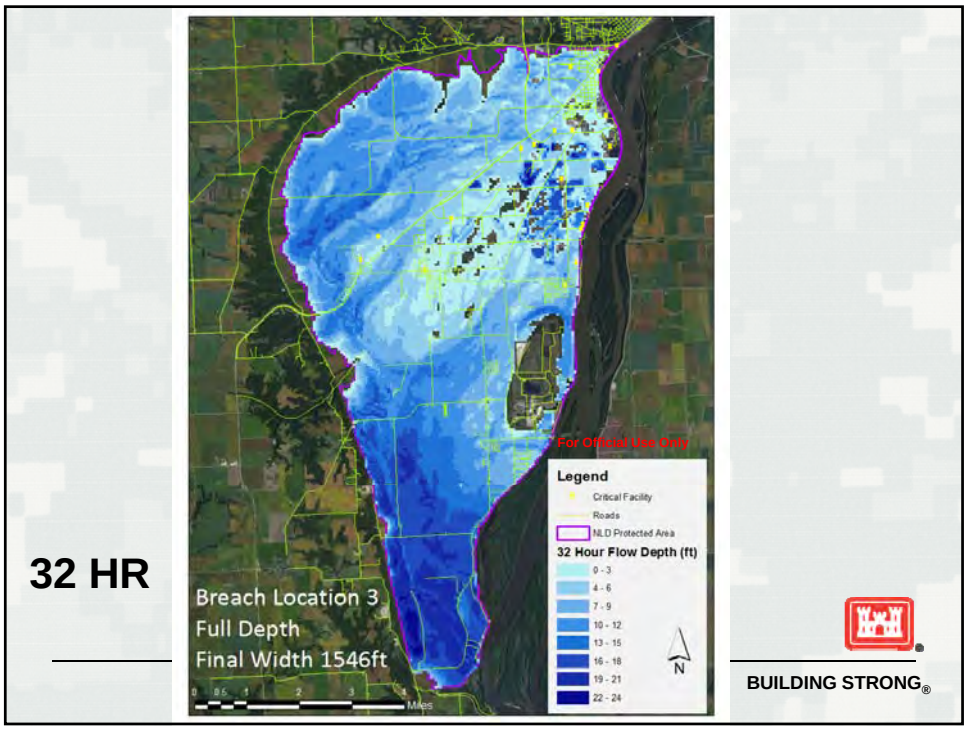
32 HR
Breach Location 3
Full Depth
Final Width 1546ft
For Official Use Only
Legend
Critical Facility
Roads
NLD Protected Area
32 Hour Flow Depth (ft)
0 - 3
4 - 6
7 - 9
10 - 12
13 - 15
16 - 18
19 - 21
22 - 24
N
Miles
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Conclusions

The study was not initiated because of any known imminent risk of failure to the levee protecting Muscatine Island.

Study deliverables include the analysis of failure scenarios, timing, and inundation mapping to serve as input for stakeholder's emergency preparedness planning, and selection of evacuation routes and procedures. Tables show time to 1ft and 2ft depth (in hours) for identified critical facilities.

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Questions?

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    rhill@muscatineiowa.gov

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