

Bourbanis Dam

NRCS EWP Path Forward



Pembina County Water Resource District
Board Meeting
5/19/2022

Bourbanis Dam – Current Issues

Primary Concern: Mitigate Risk of Future Breach

- Failing slip liner in the existing principal spillway conduit.
- Non-conforming riser control structure.
- Does not meet drawdown requirements.
- Erodeable earthen auxiliary spillway prior to current failure.
(*Current failure increases risks during future activation*)
- Slope stability issues were identified during the rehabilitation investigation.
- Economic viability of Bourbanis may be limited based on the on-going rehabilitation planning effort.
- Uncontrolled breach of Bourbanis will have downstream consequences, potentially through Cavalier.

Bourbanis Dam – Current Issues



**Observed failure
of slip liner**



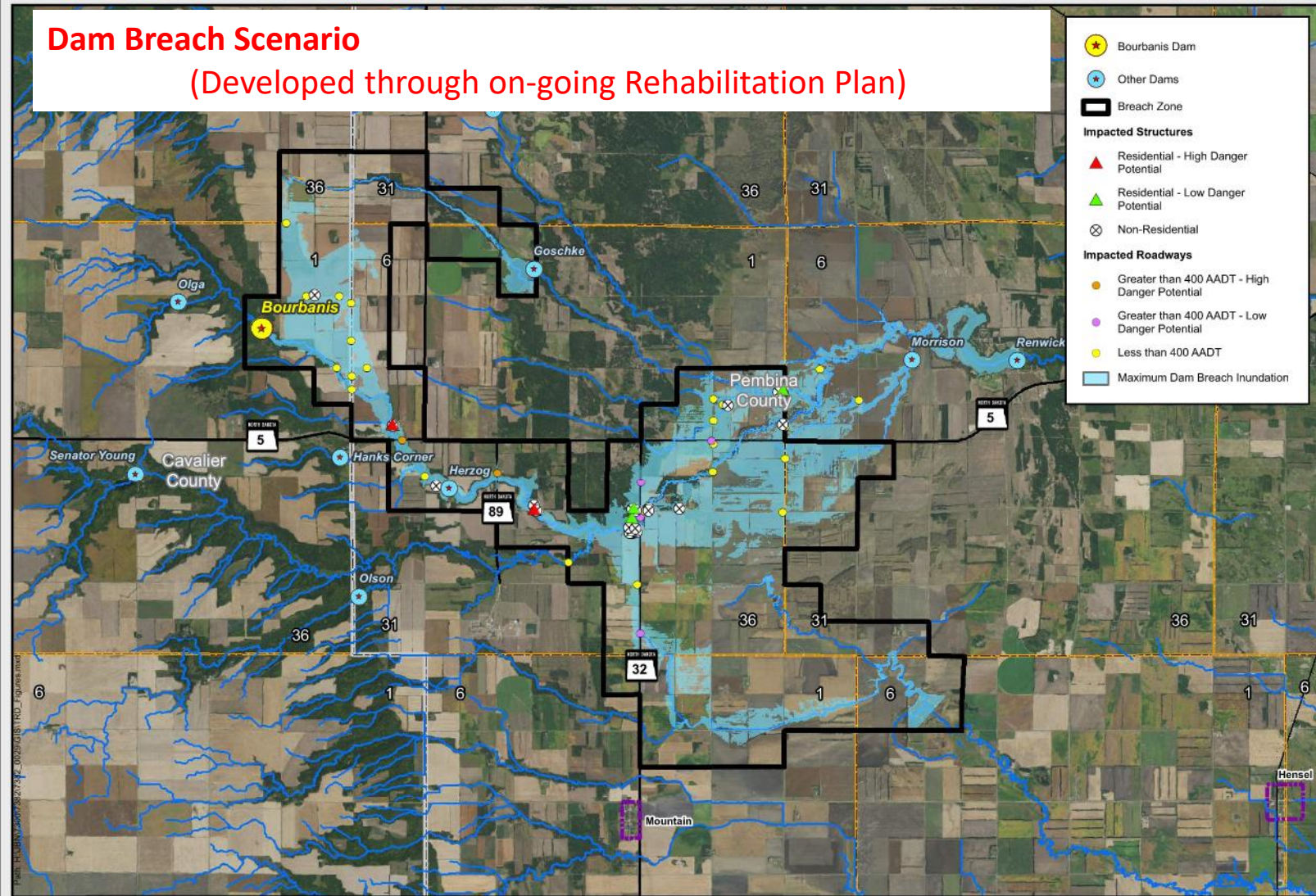
**Non-Conforming
Riser**

Bourbanis Principal Spillway

- Conduit slip lined due to failing as-built conduit.
- Observed failure of slip liner has been noted during recent inspections.
- Potential for continued degradation of slip liner during 2022 flood event (*unknown to the extent at this time*)
- Failed slip liner reduces hydraulic capacity of the principal spillway
- Increased potential risk of lateral flow through soil adjacent to conduit
- Non-conforming riser results in high potential for plugging and limits hydraulic efficiency

Dam Breach Scenario

(Developed through on-going Rehabilitation Plan)



- ★ Bourbanis Dam
- ★ Other Dams
- Breach Zone
- Impacted Structures**
- ▲ Residential - High Danger Potential
- ▲ Residential - Low Danger Potential
- ⊗ Non-Residential
- Impacted Roadways**
- Greater than 400 AADT - High Danger Potential
- Greater than 400 AADT - Low Danger Potential
- Less than 400 AADT
- Maximum Dam Breach Inundation

FG-6

Scale: AS SHOWN	Drawn by: BCK	Checked by: BTE	Project No: 7302-05.31.24	Date: 5/19/2021
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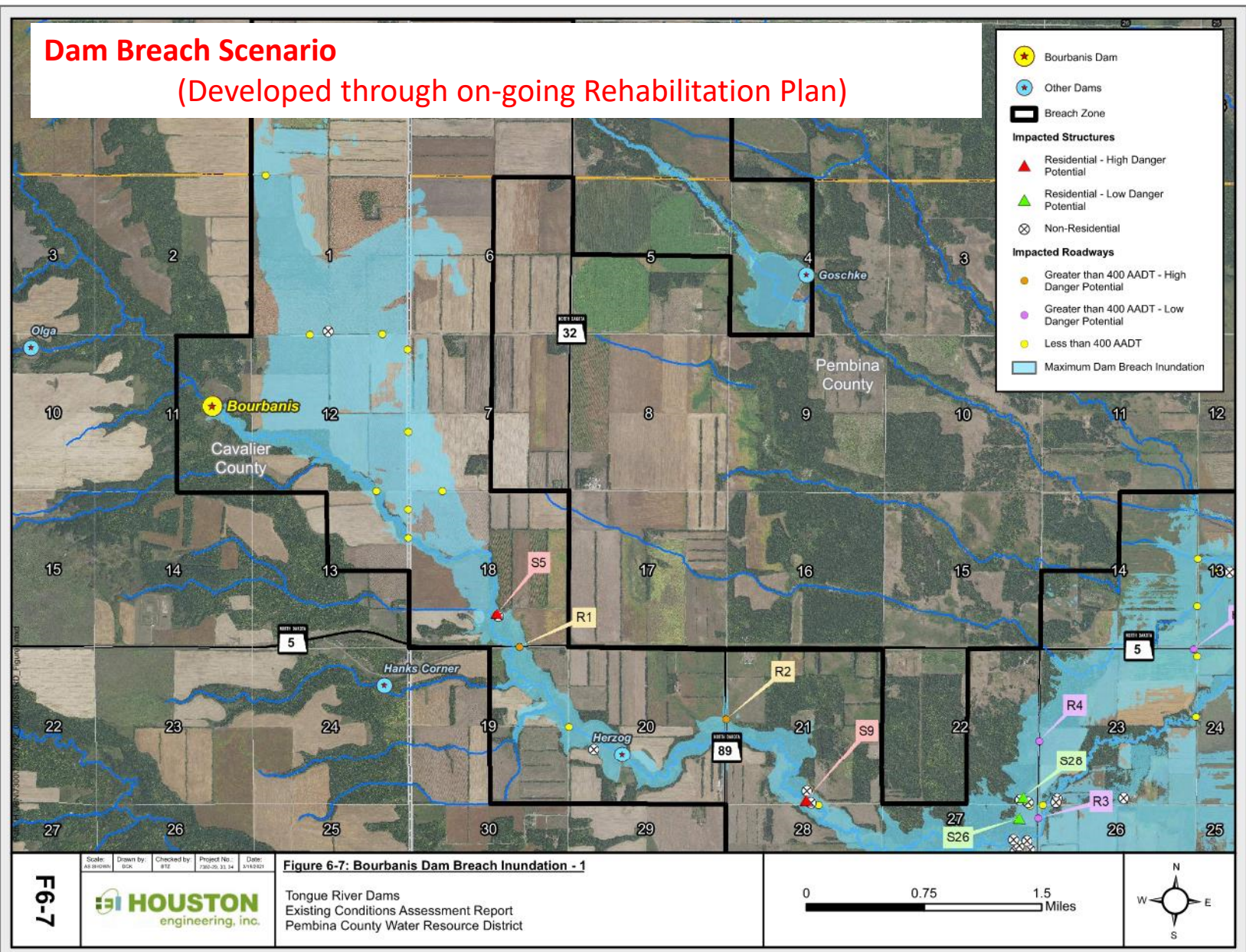
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Figure 6-6: Bourbanis Dam Breach Inundation - All

Tongue River Dams
Existing Conditions Assessment Report
Pembina County Water Resource District

0 1.5 3 Miles

Dam Breach Scenario (Developed through on-going Rehabilitation Plan)



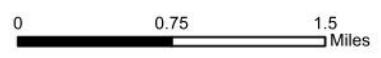
F6-7

Scale: AS SHOWN
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 Checked by: BTE
 Project No.: 7302-05.31.24
 Date: 01/19/2021

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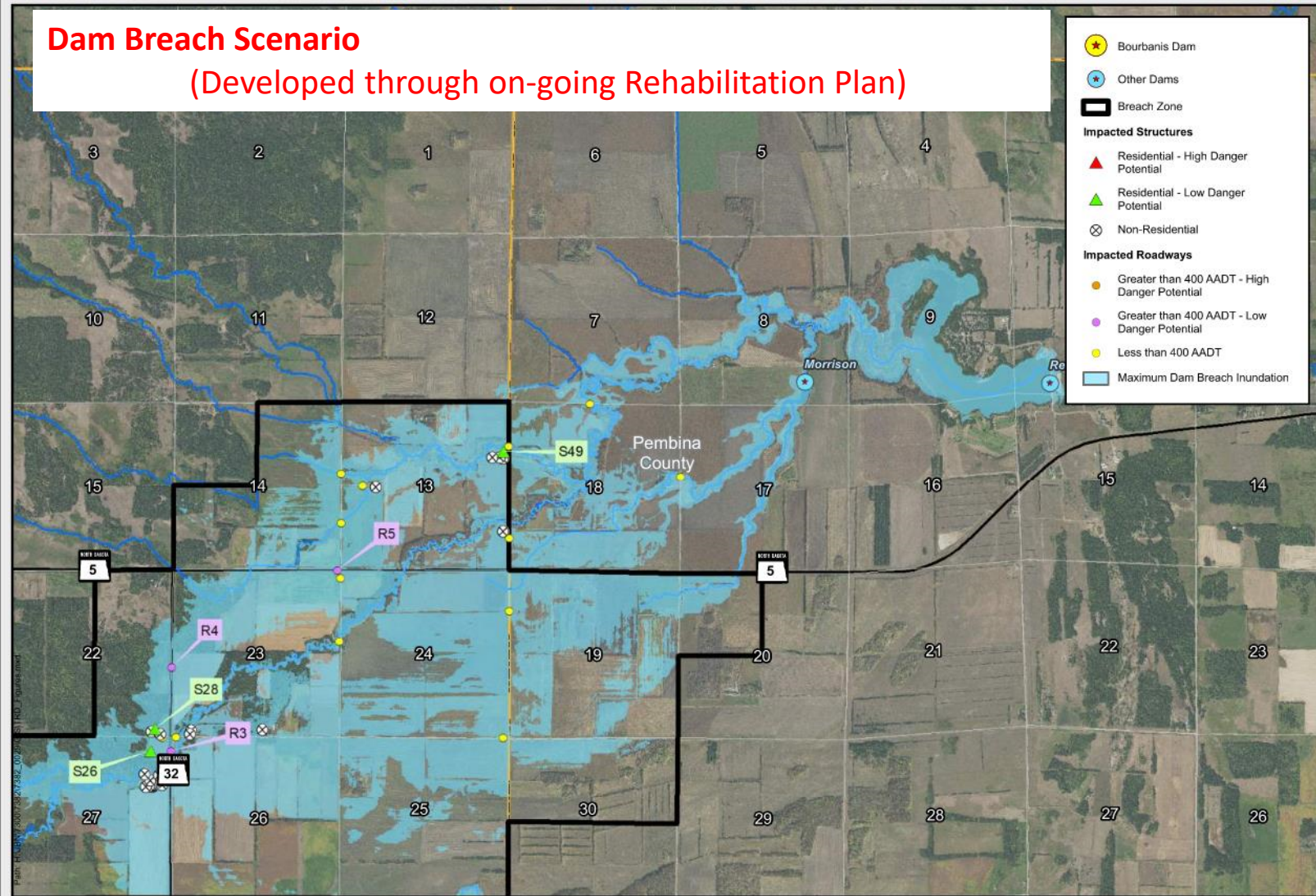
Figure 6-7: Bourbanis Dam Breach Inundation - 1

Tongue River Dams
 Existing Conditions Assessment Report
 Pembina County Water Resource District



Dam Breach Scenario

(Developed through on-going Rehabilitation Plan)



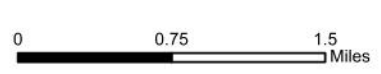
FG-8

Scale: As Shown	Drawn by: BCK	Checked by: BTE	Project No.: 730-20, 31, 34	Date: 01/19/21
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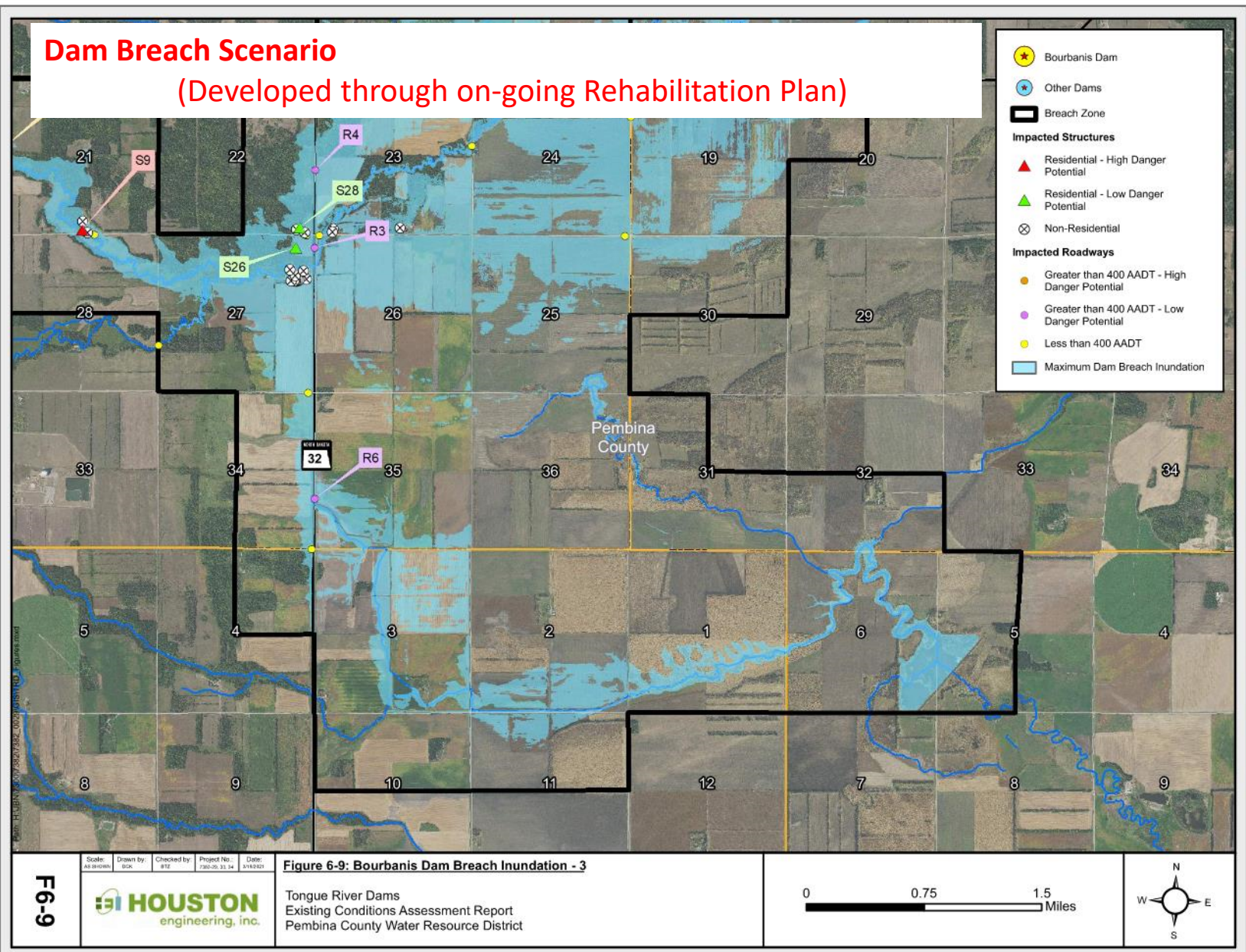
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Figure 6-8: Bourbanis Dam Breach Inundation -2

Tongue River Dams
Existing Conditions Assessment Report
Pembina County Water Resource District



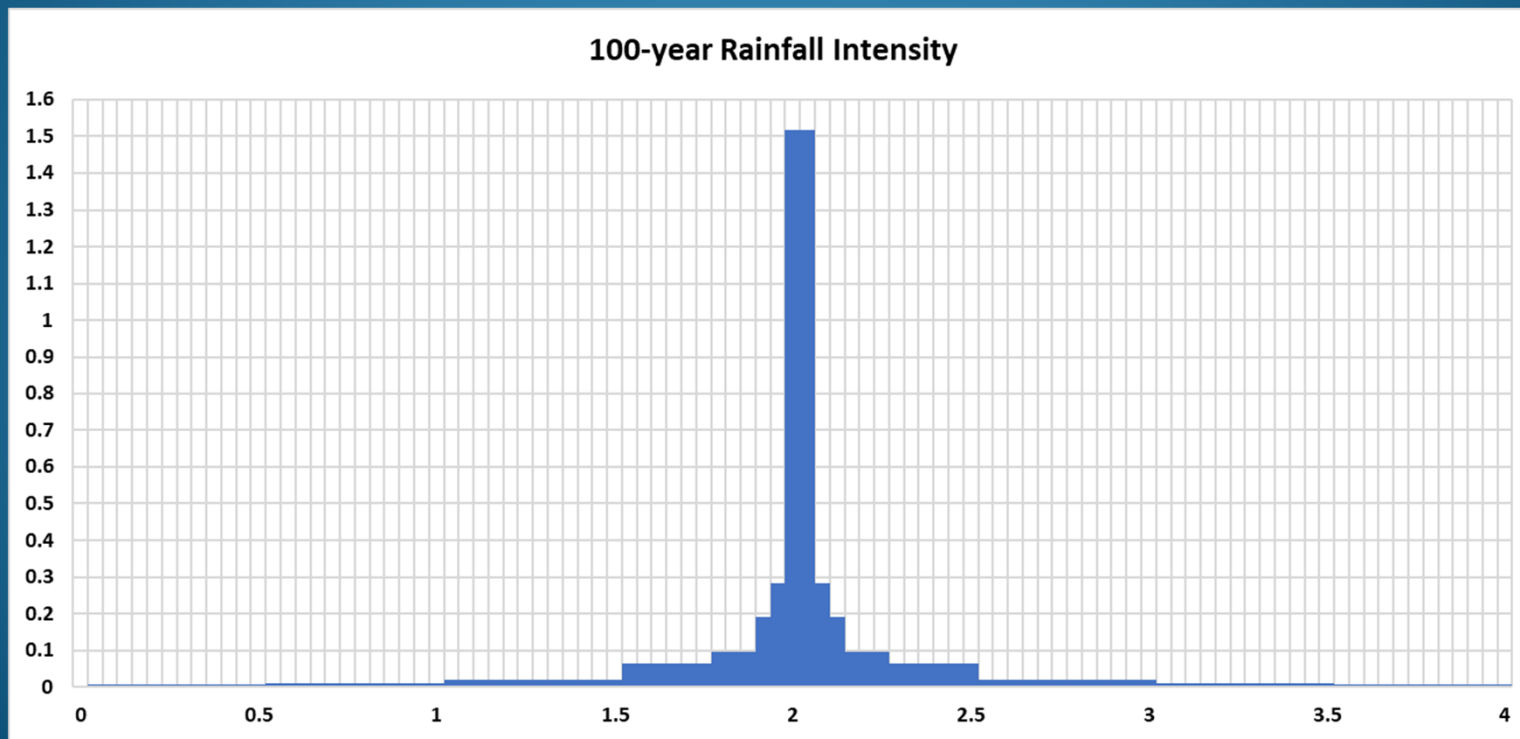
Dam Breach Scenario (Developed through on-going Rehabilitation Plan)

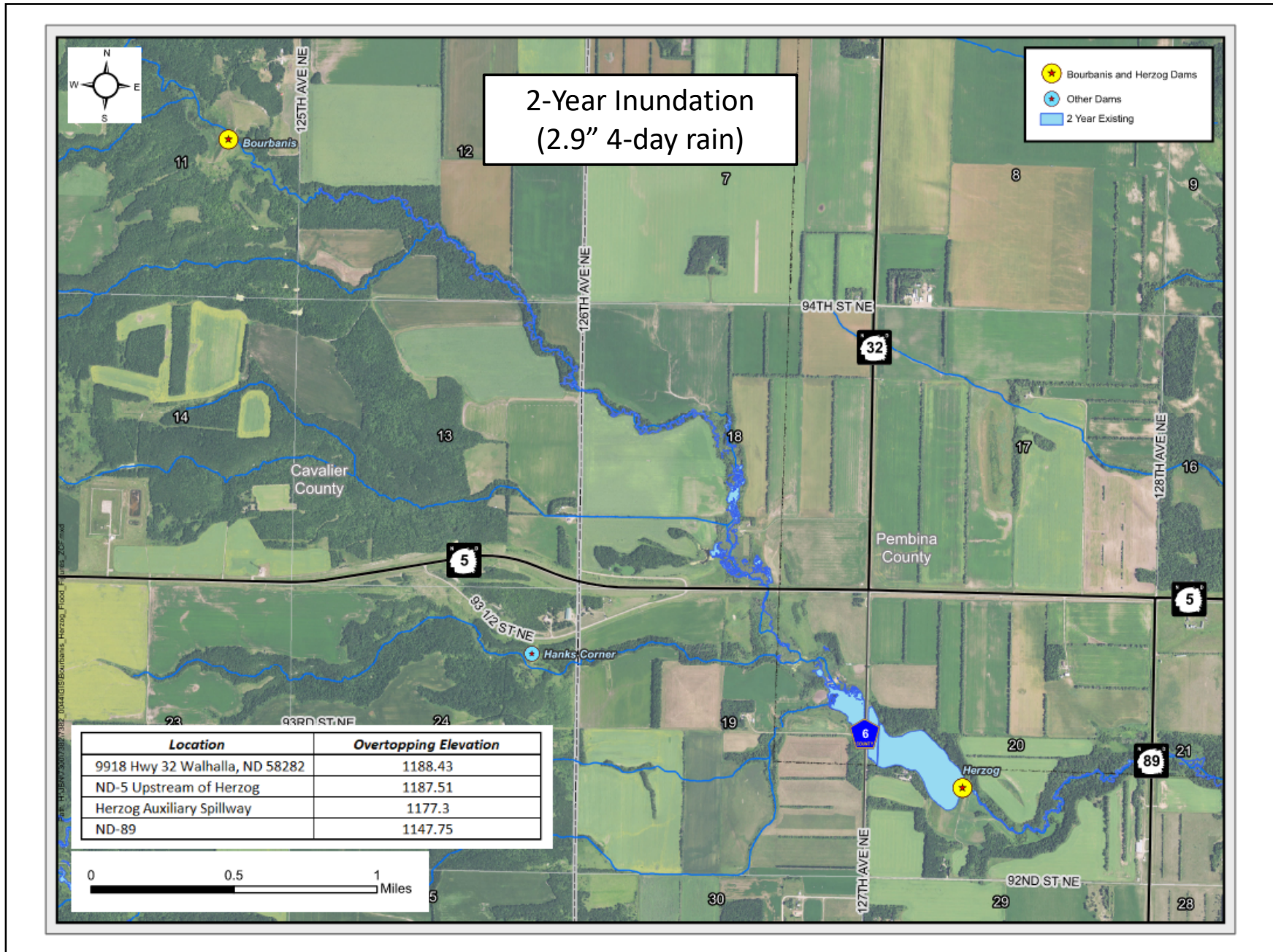


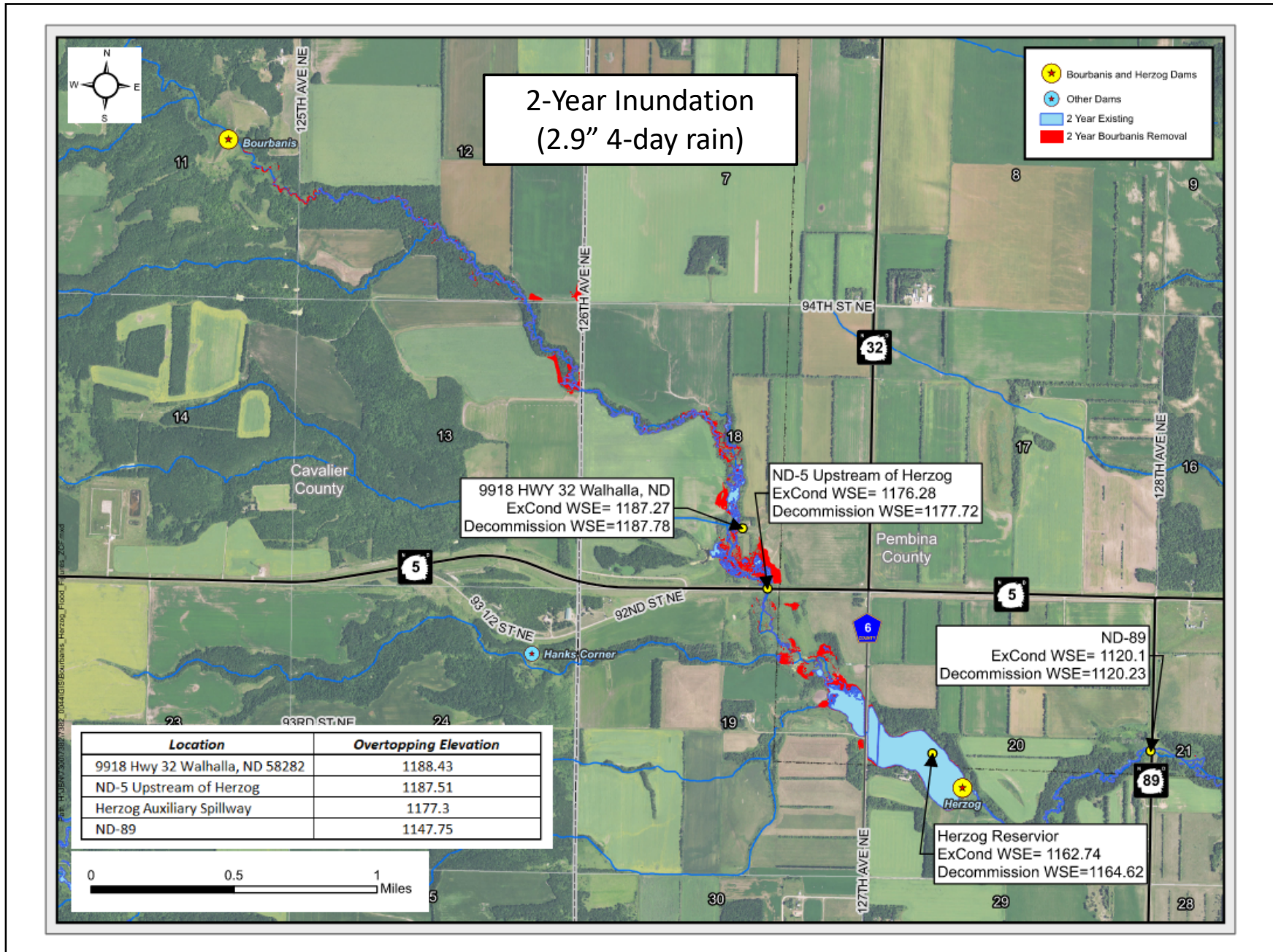
Hydraulic Impacts of Decommissioning

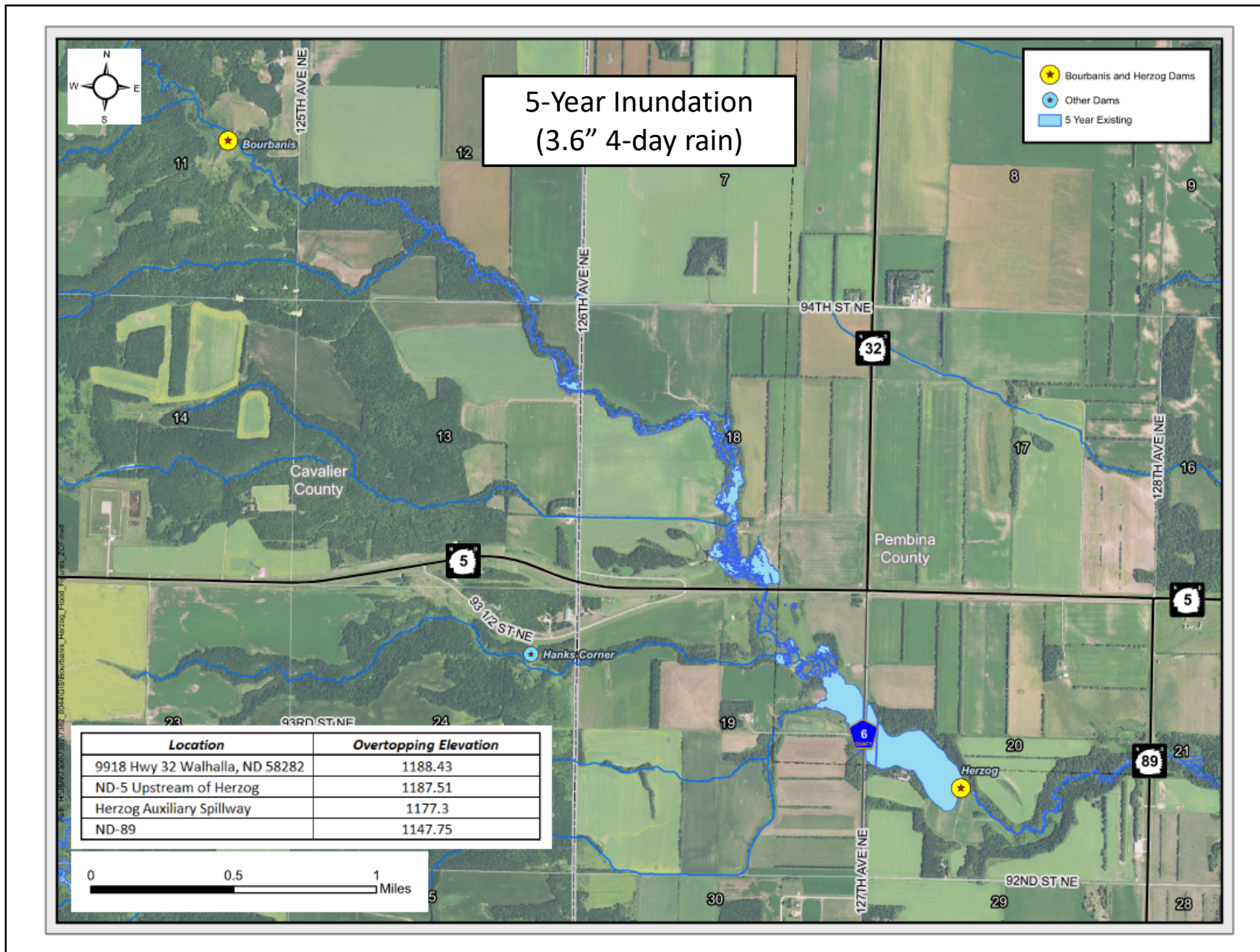
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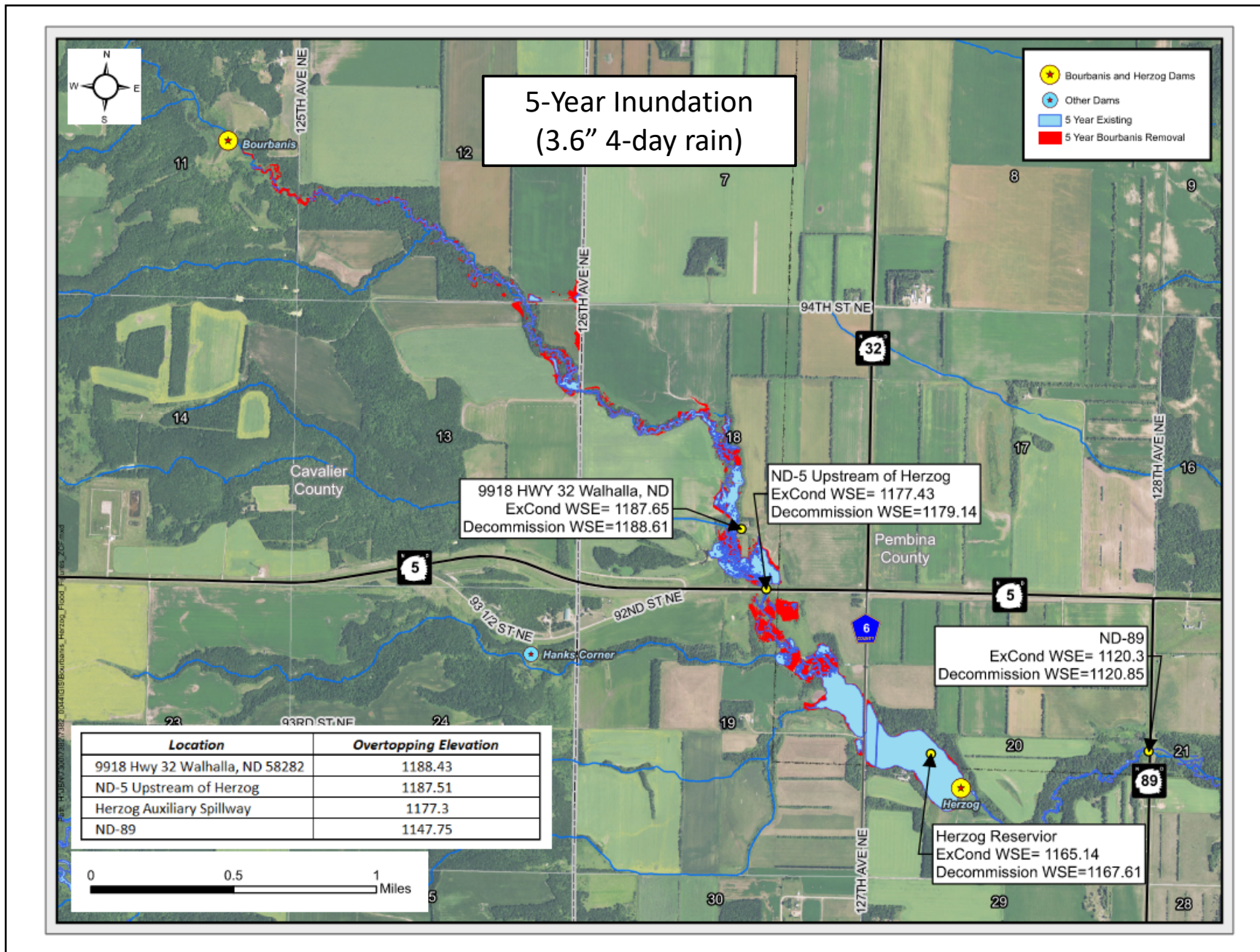
- Hydrology and Hydraulic models developed from the Rehabilitation Studies.
- 4-Day duration synthetic rainfall data used for 2-yr through 100-yr frequencies (Source: NOAA Atlas 14).
- Models assume “average” soil moisture conditions in the watershed.
- Intensities vary through the event (not uniformly applied).

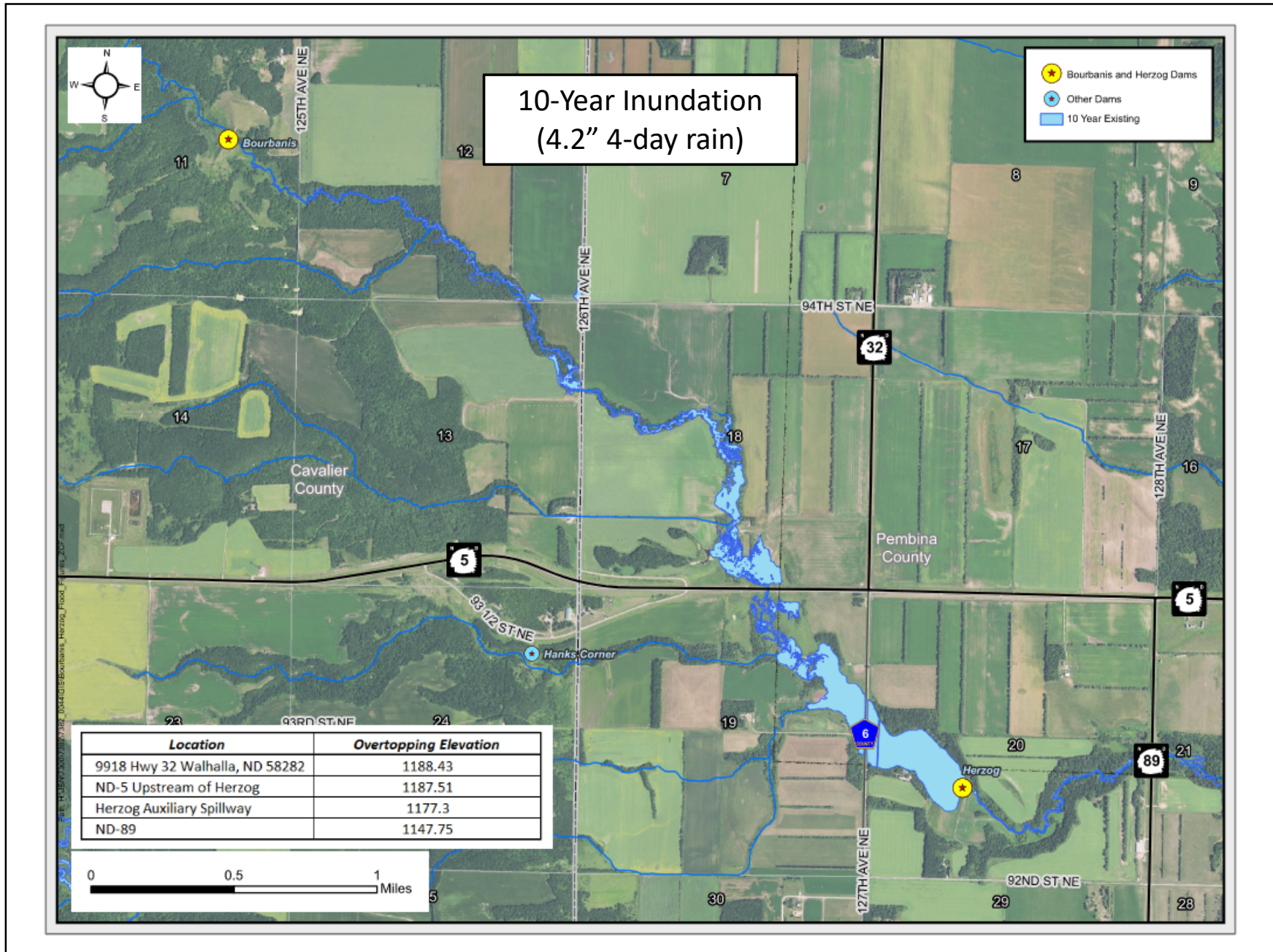


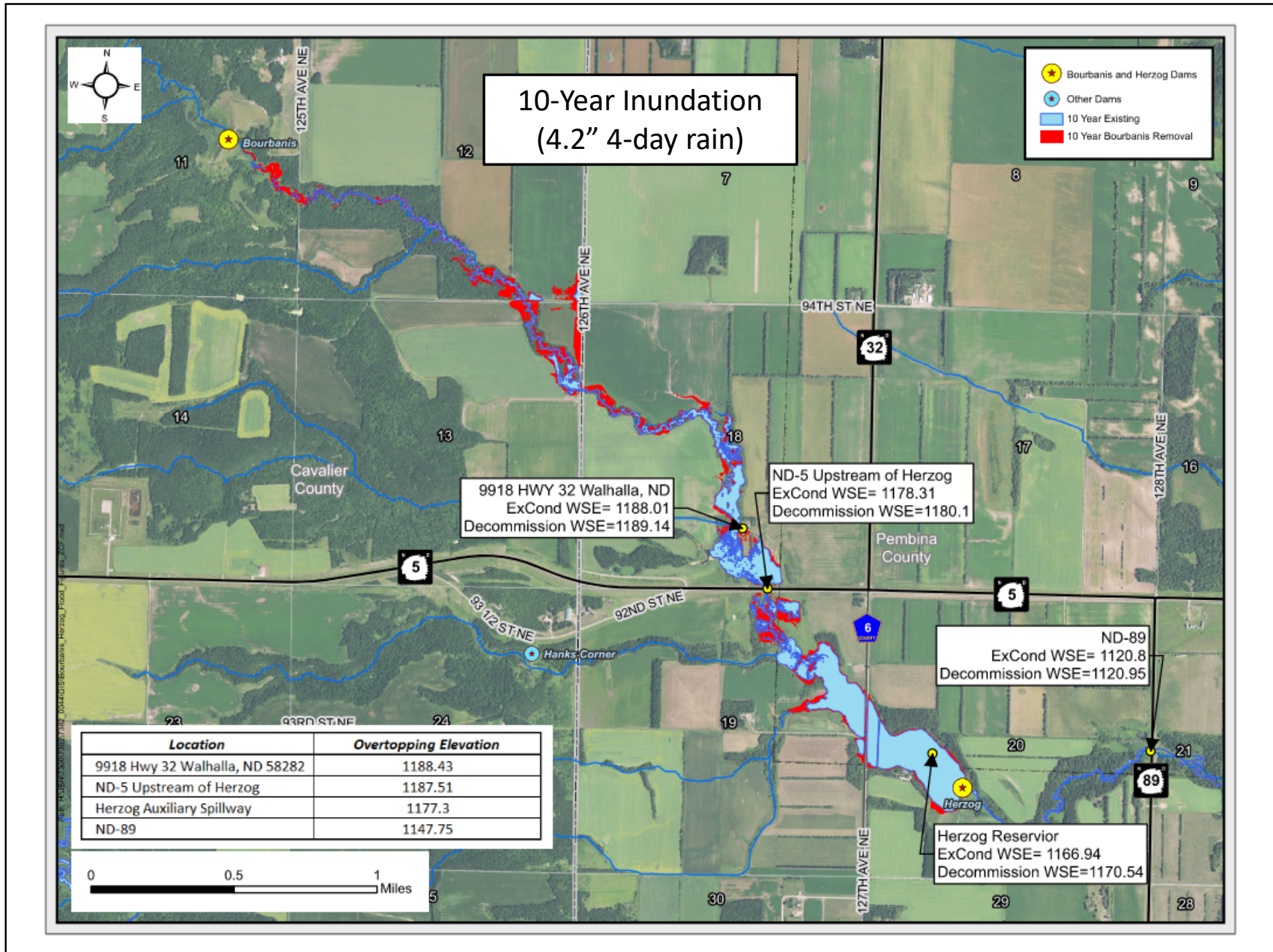


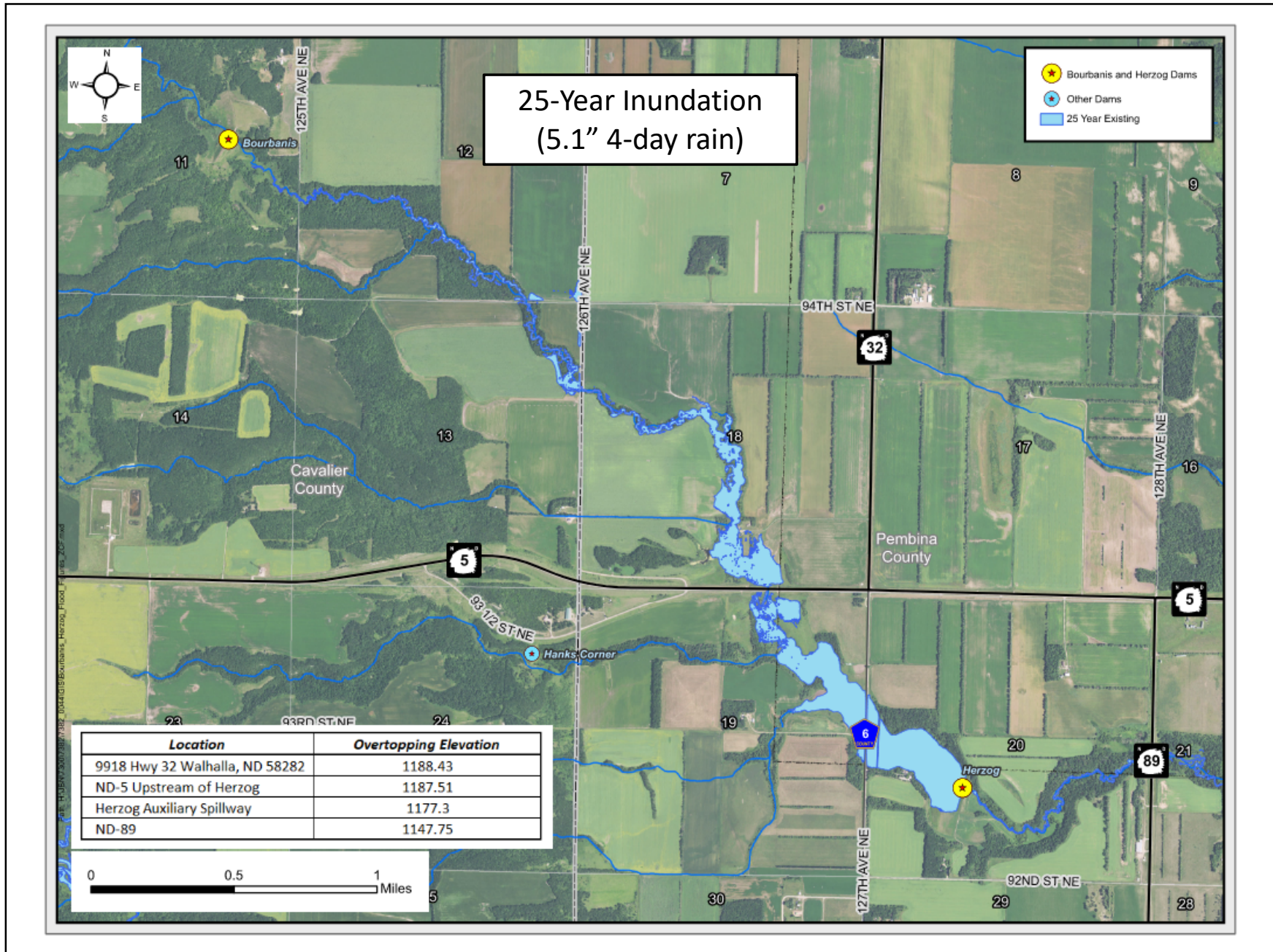


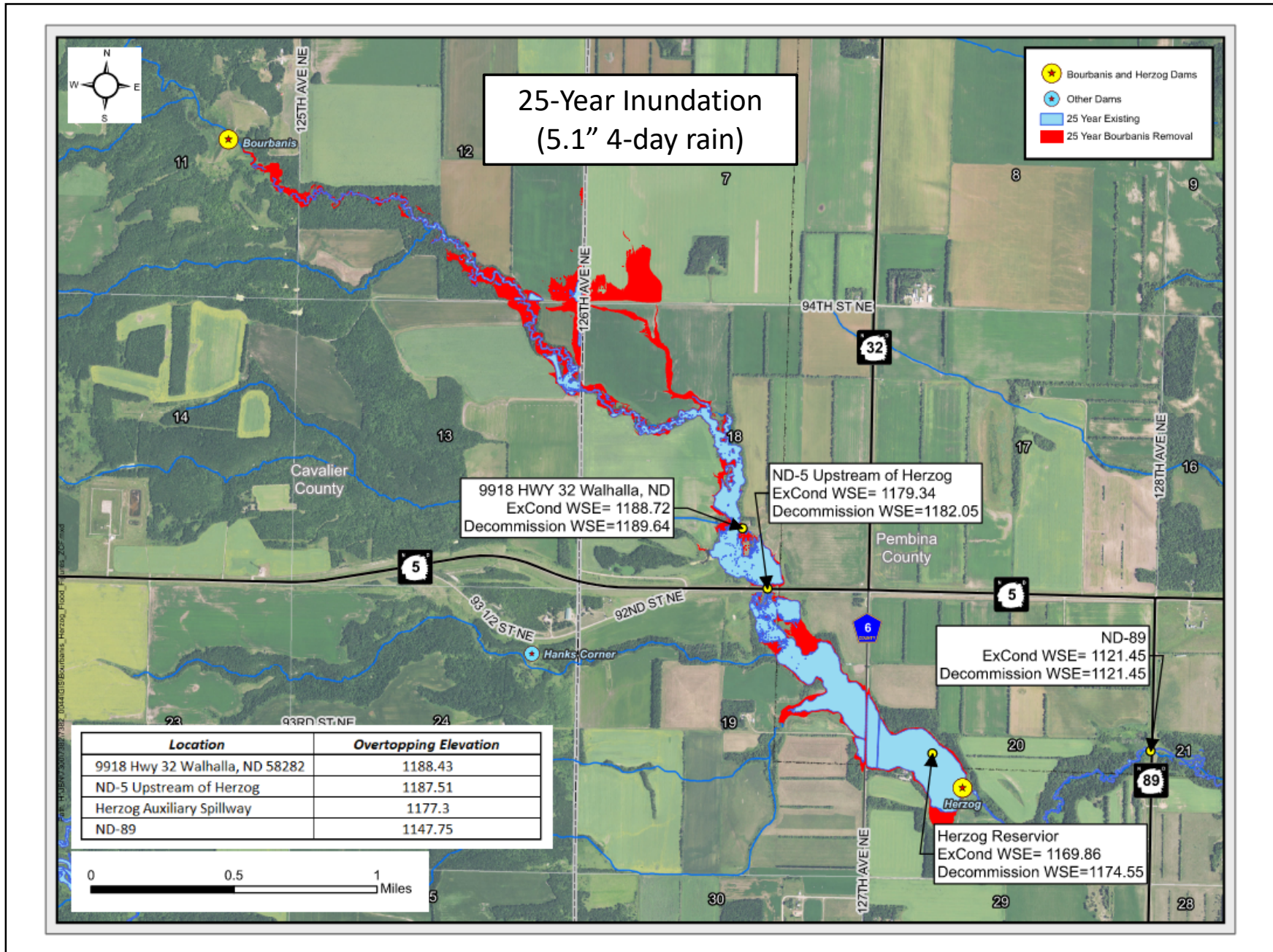


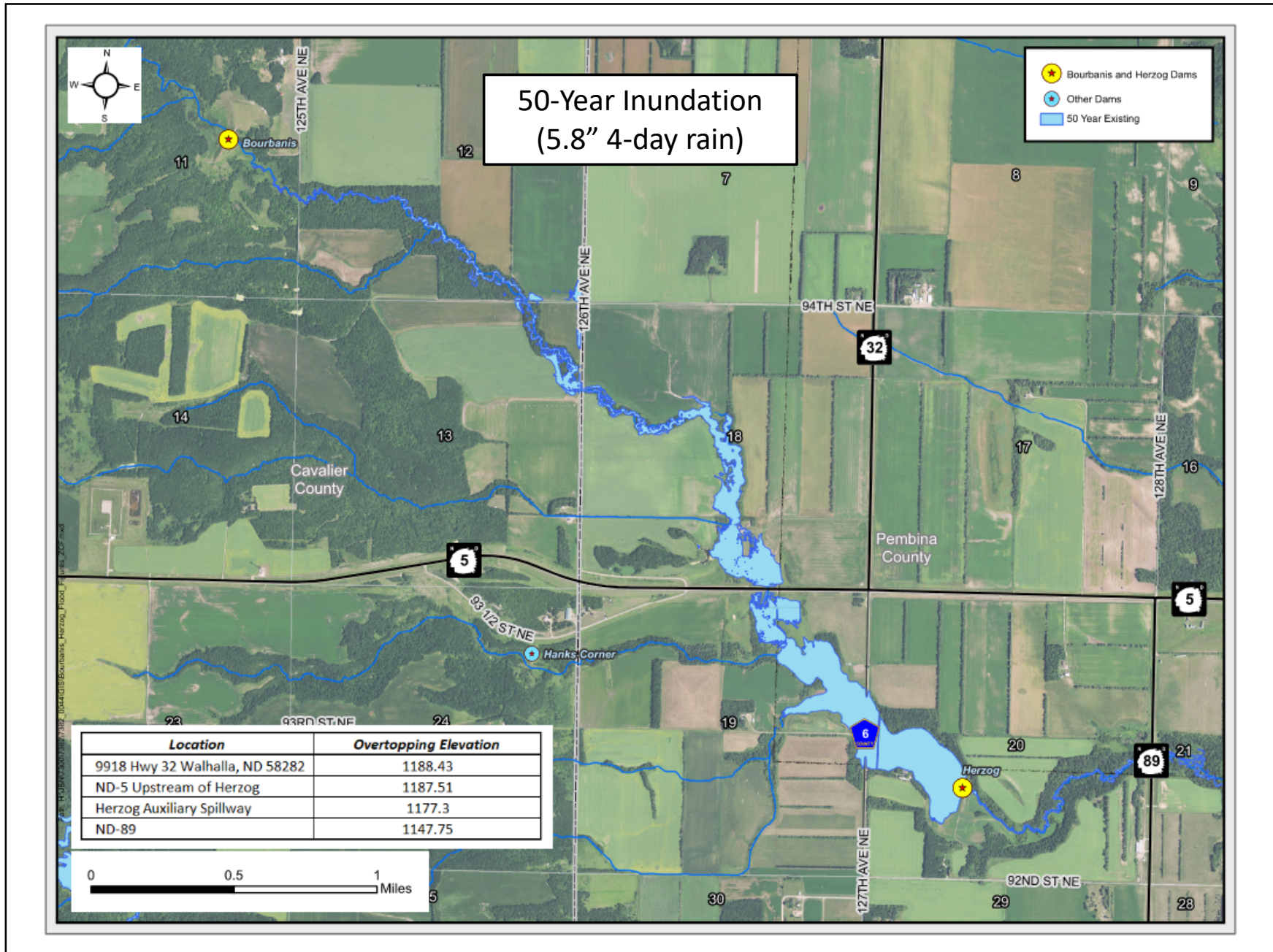


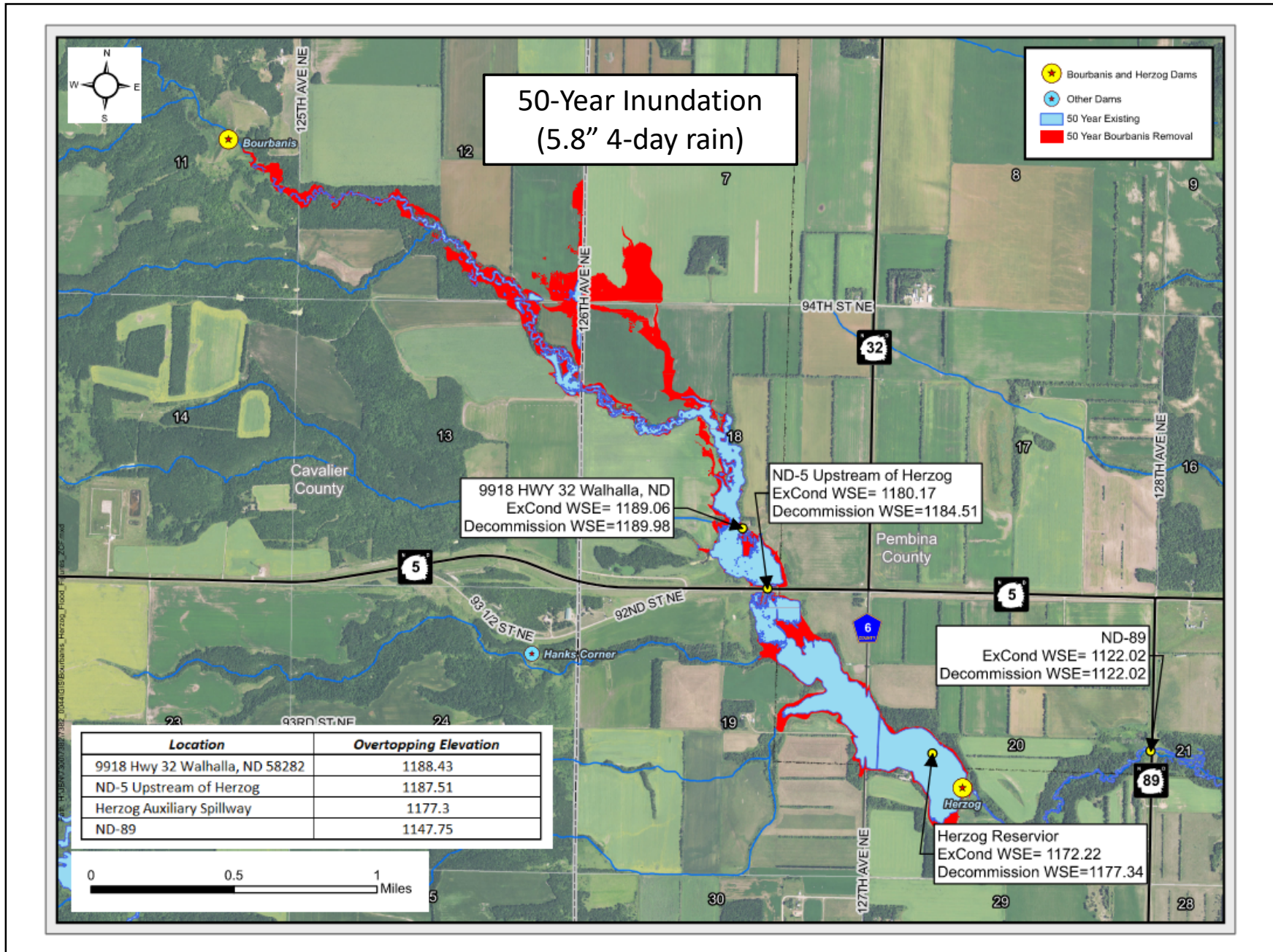


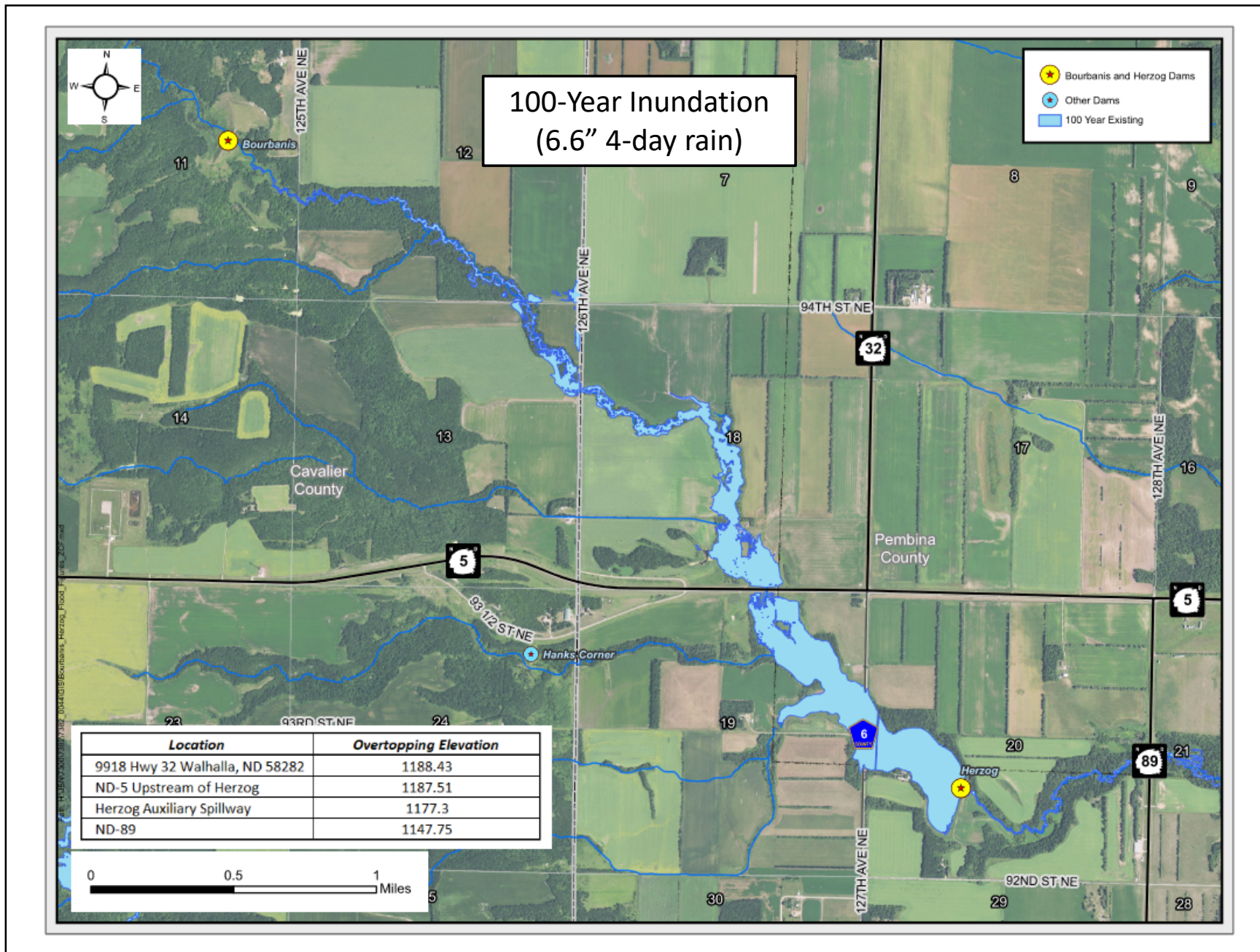


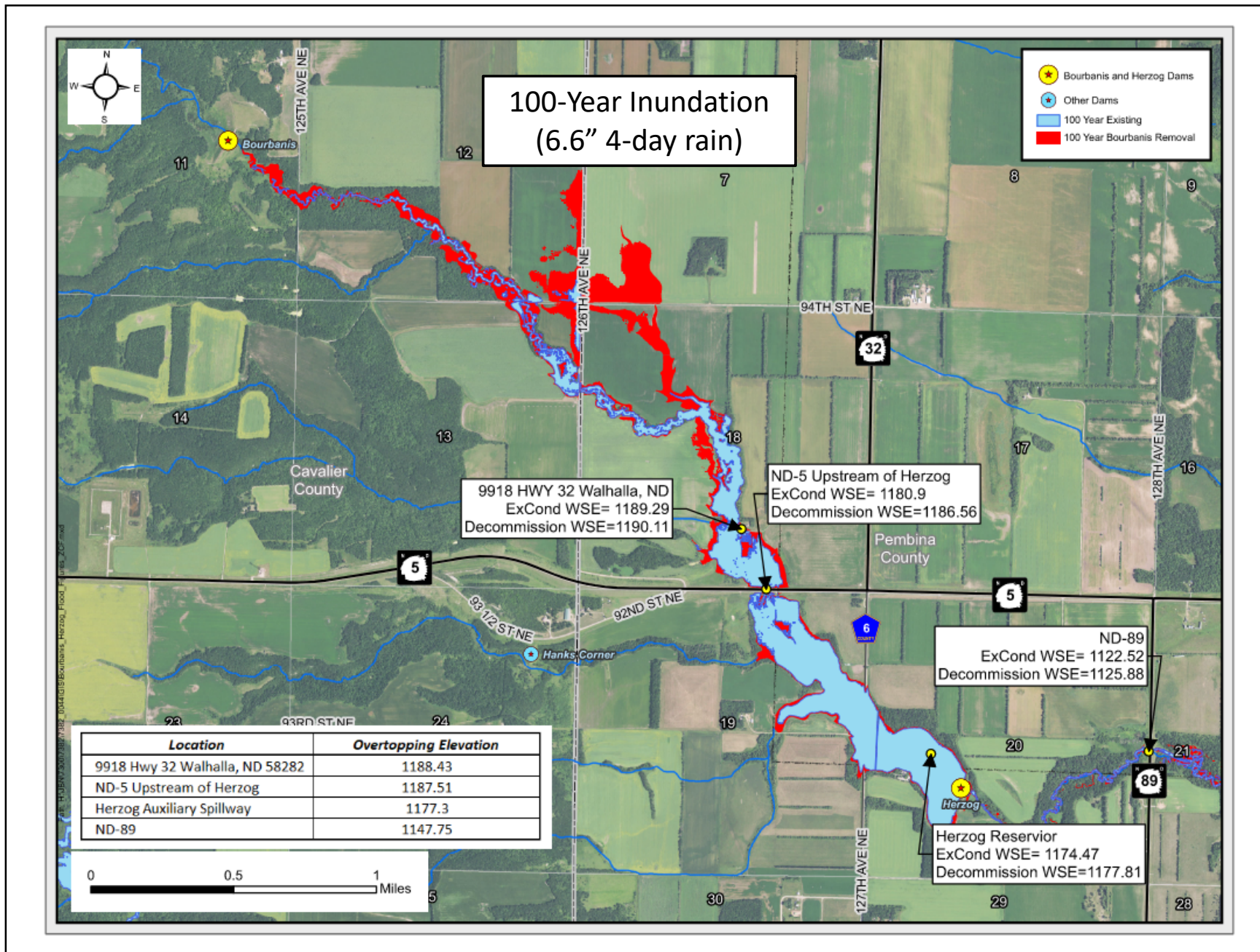








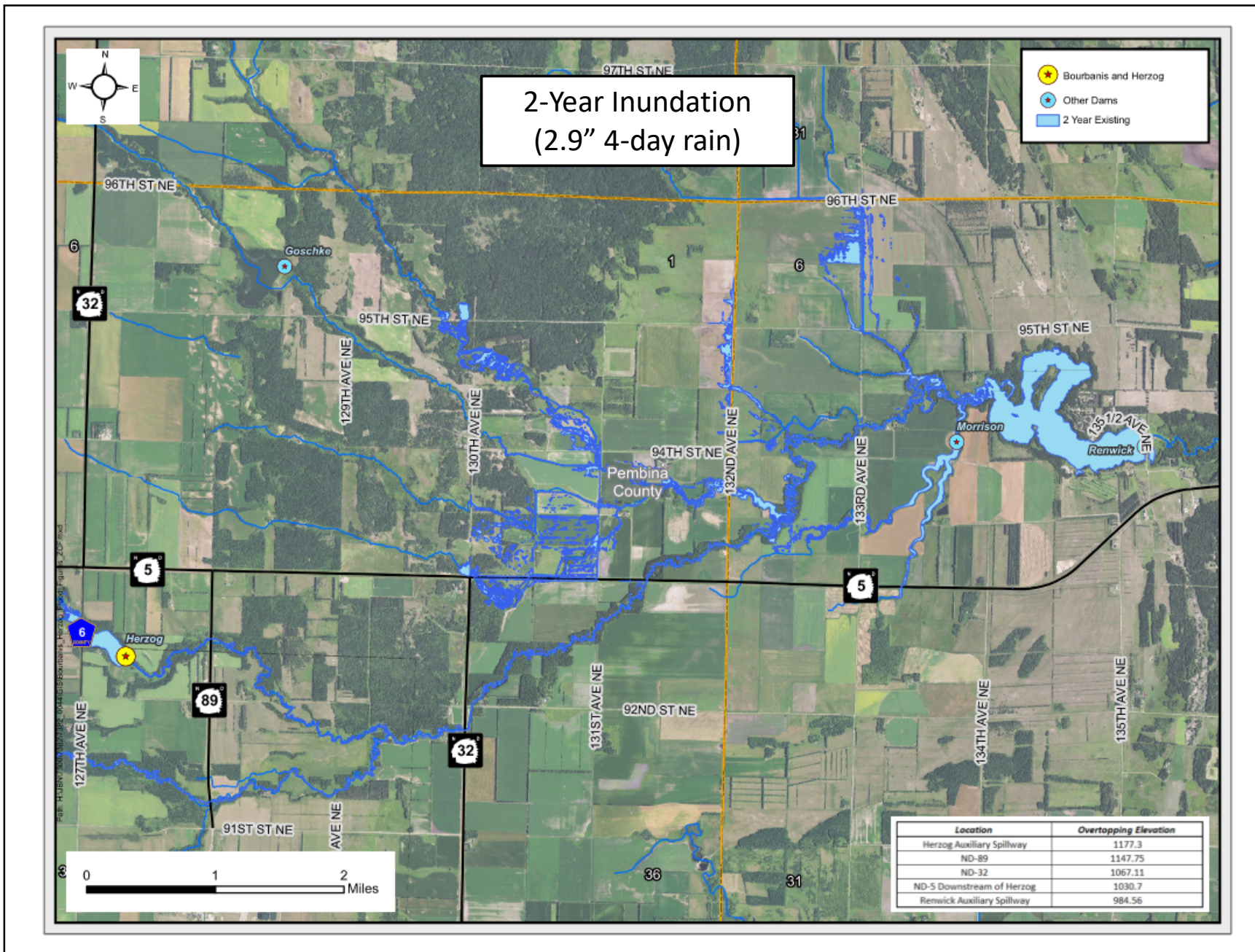


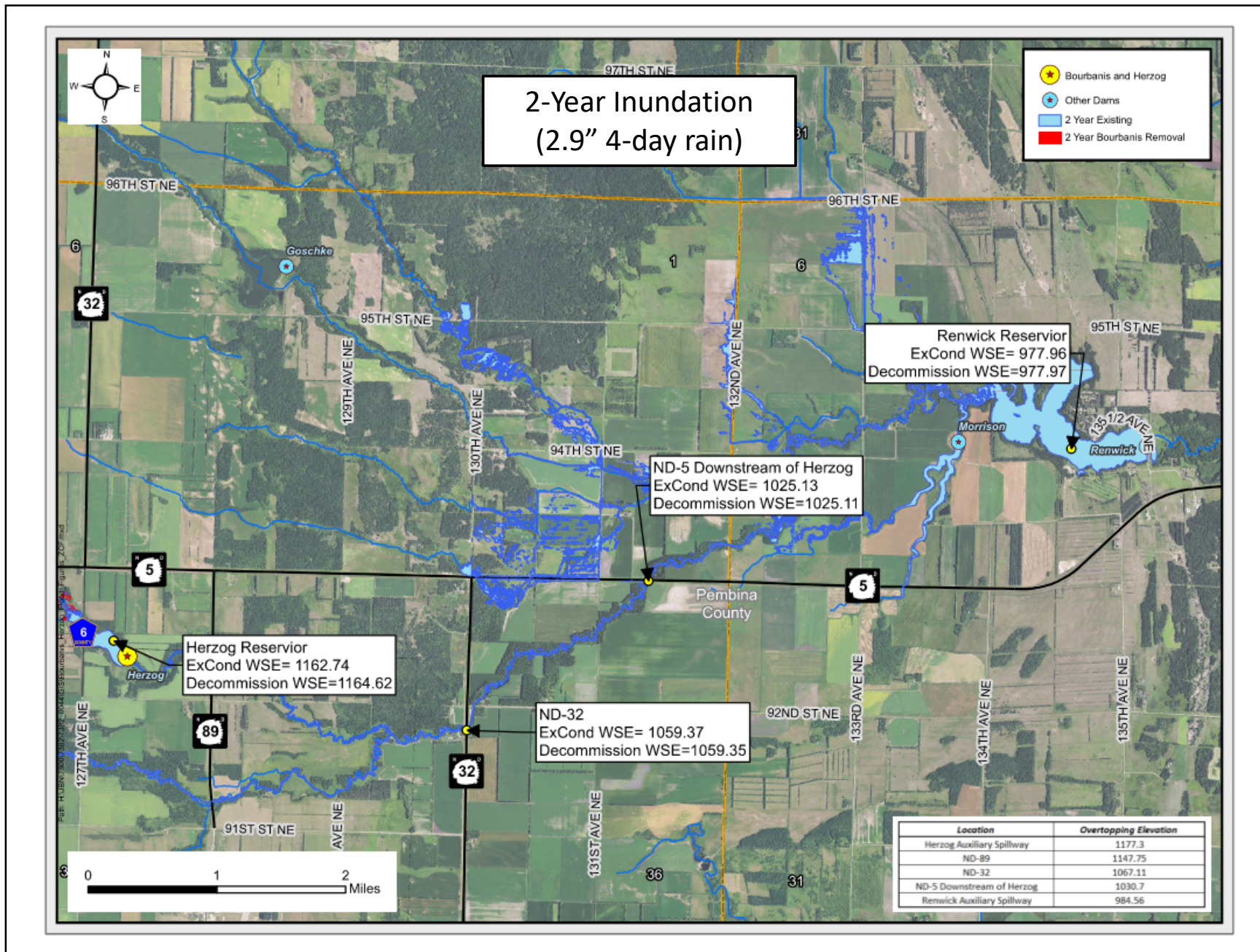


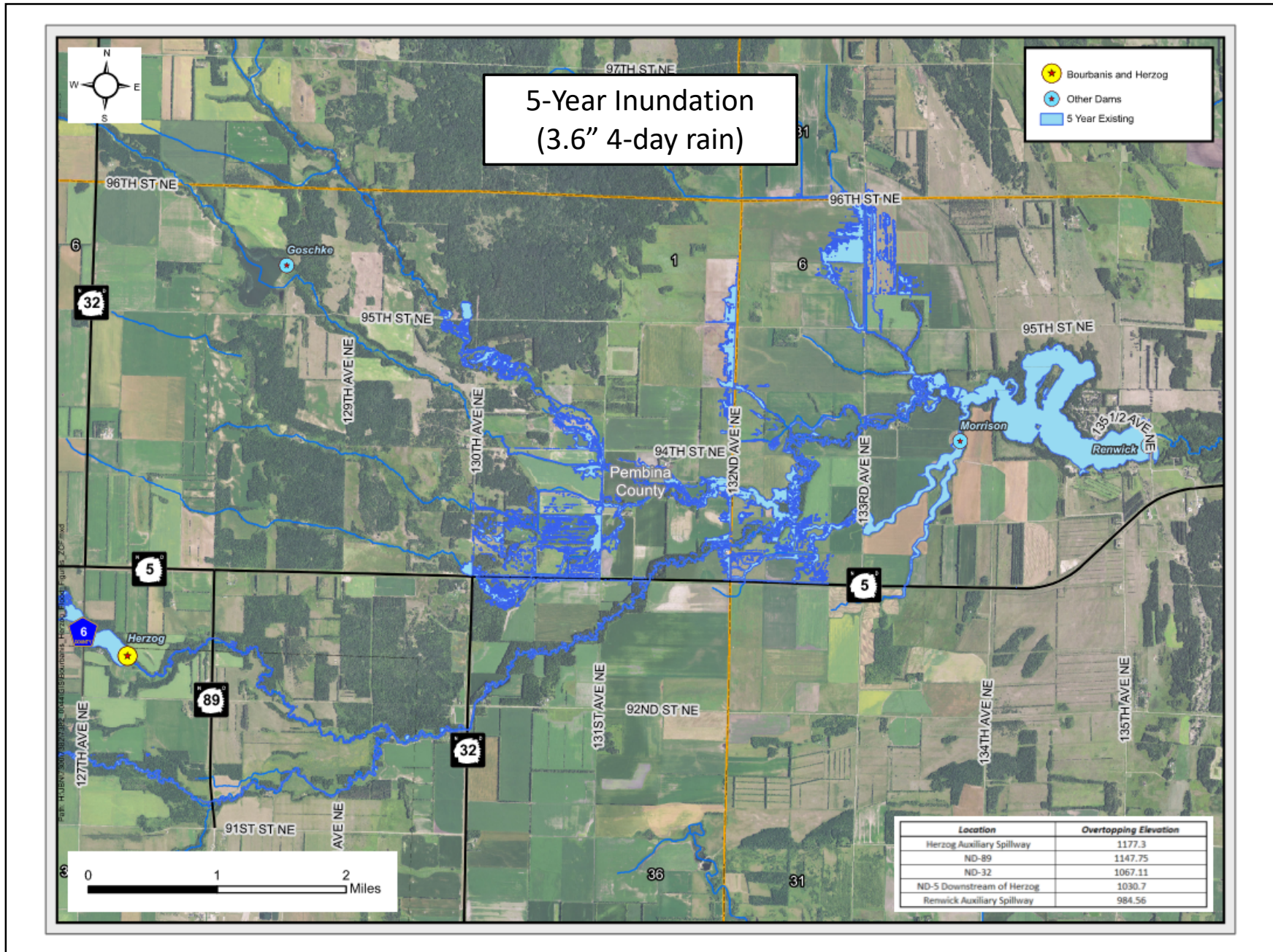
Hydraulic Impacts of Decommissioning

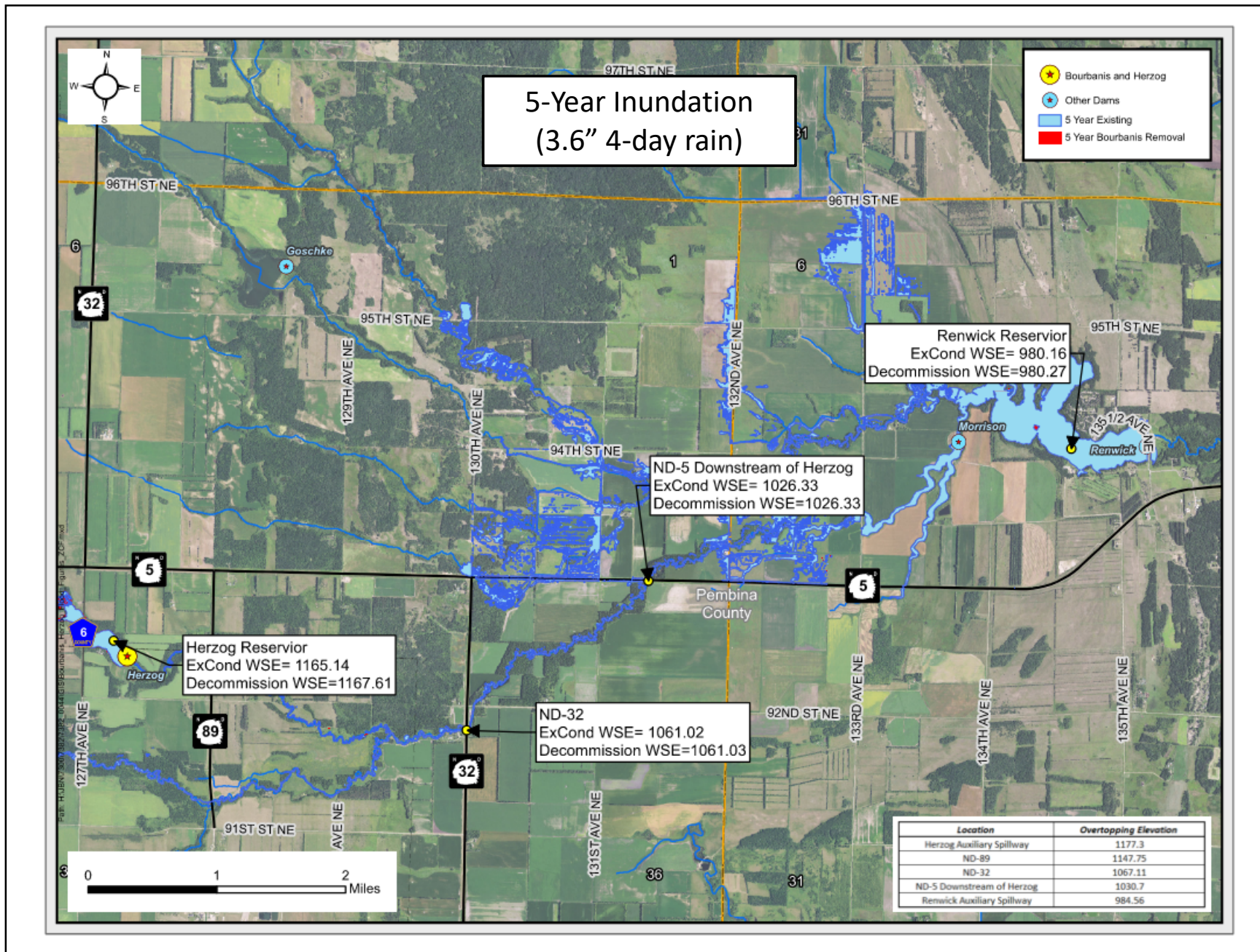
Findings (Upstream Area):

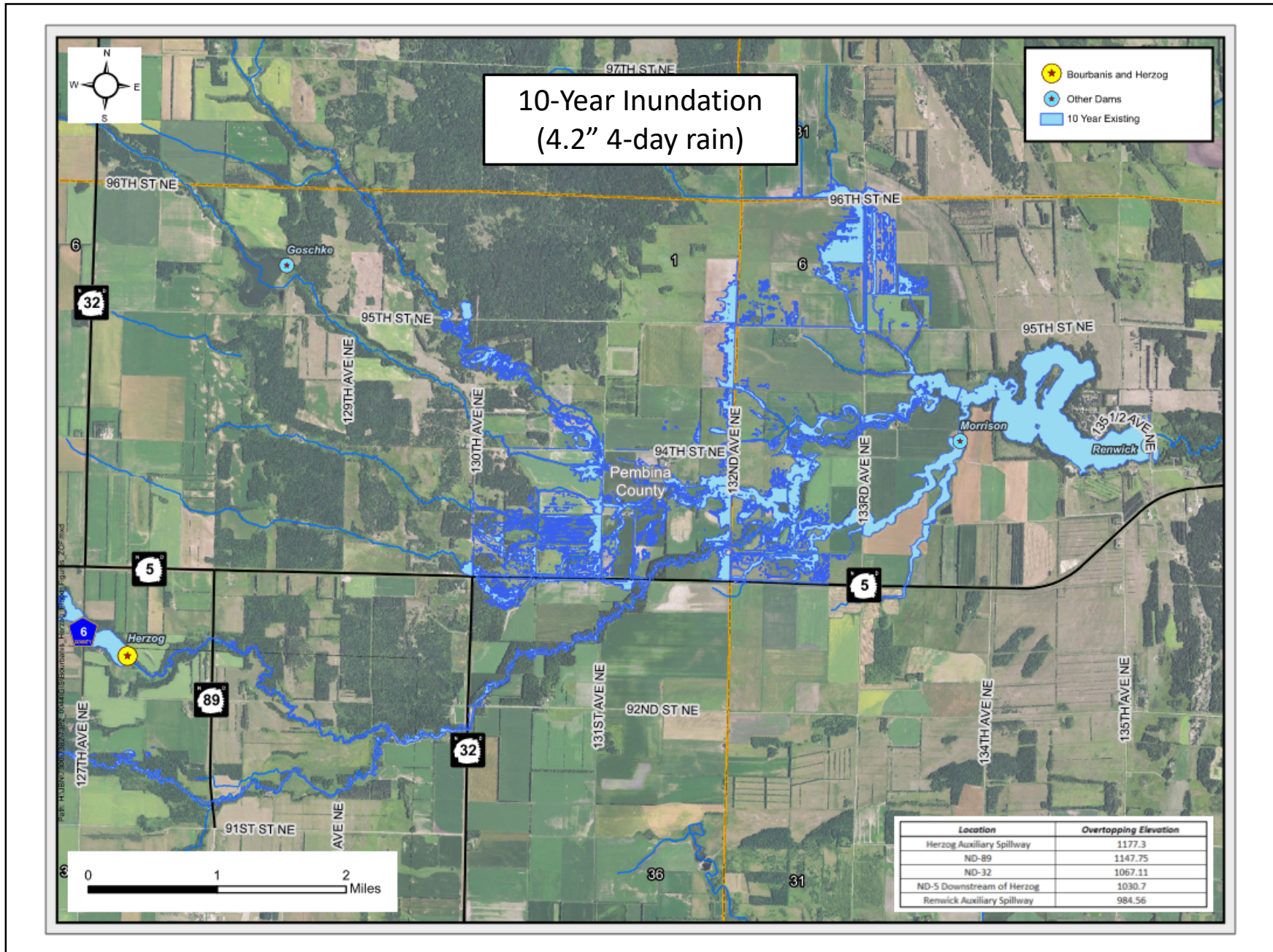
- ND Highway 5 Meets Stream Crossing Standards.
- ND Highway 89 Meets Stream Crossing Standards.
- Herzog ASW Activation during 50-year (+ 0.04') and 100-year (+ 0.51') event.
- Increased inundation acreage between Herzog and Bourbonis for all events.
- No structural impacts based on modeled events.

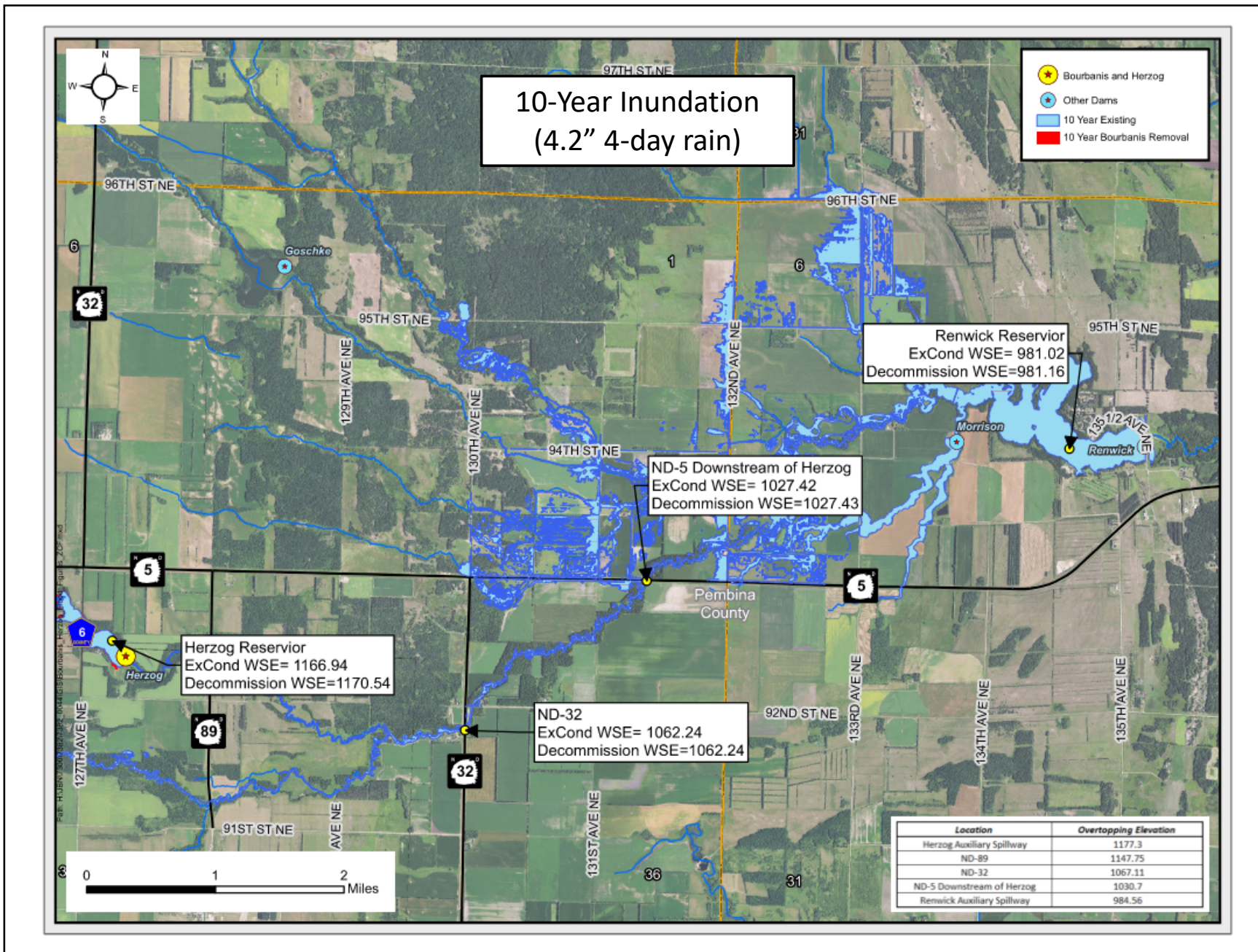


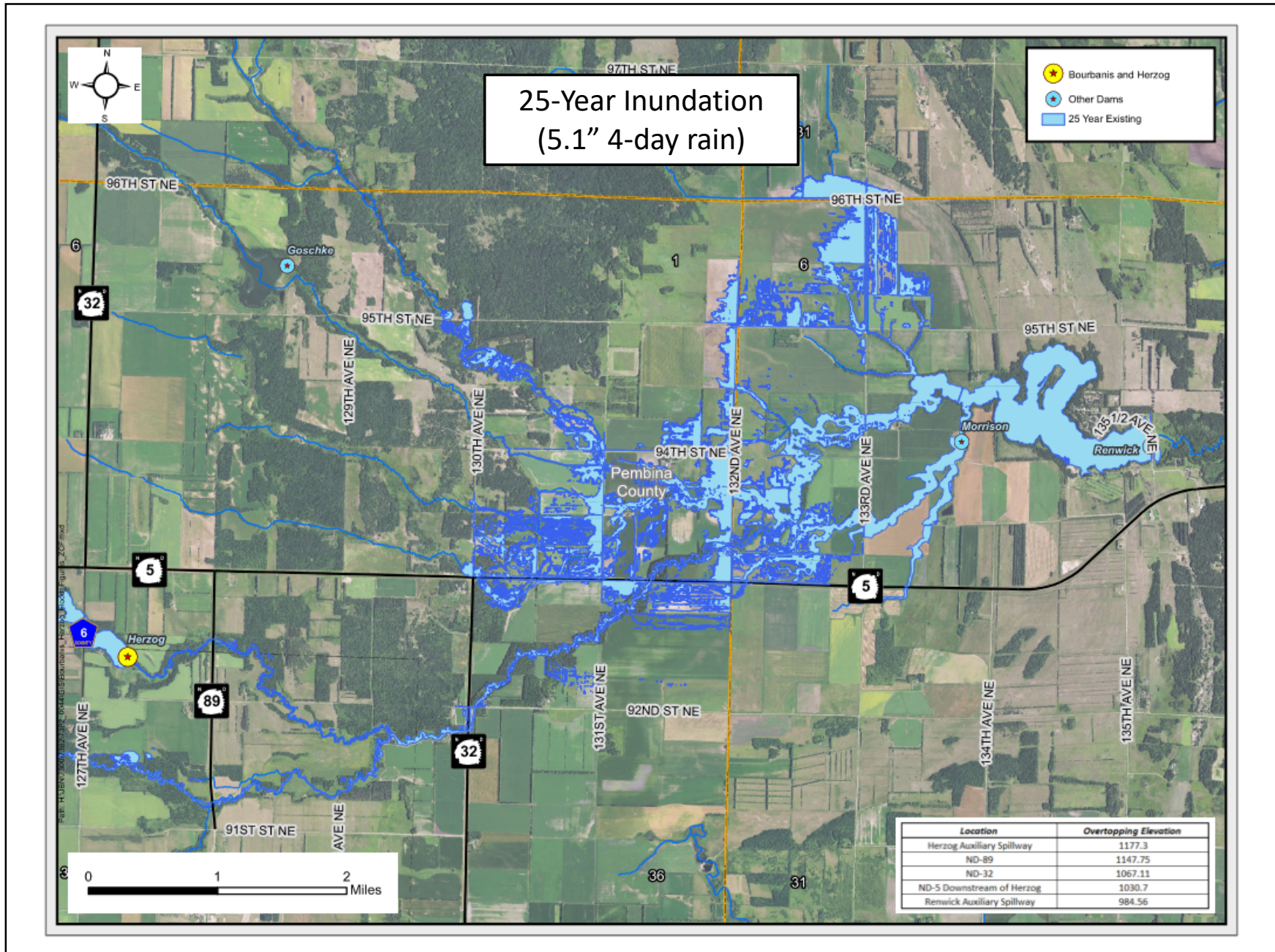


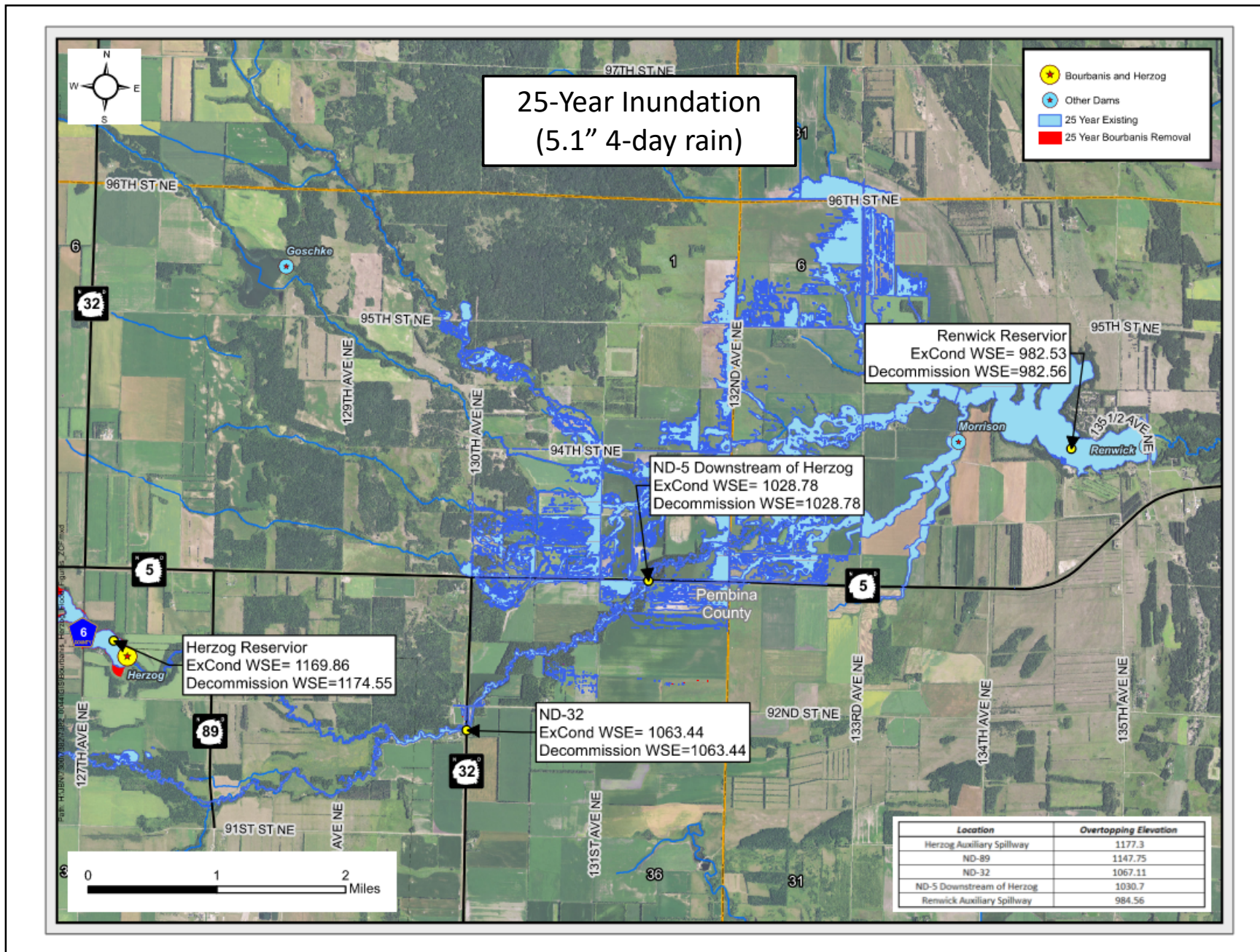


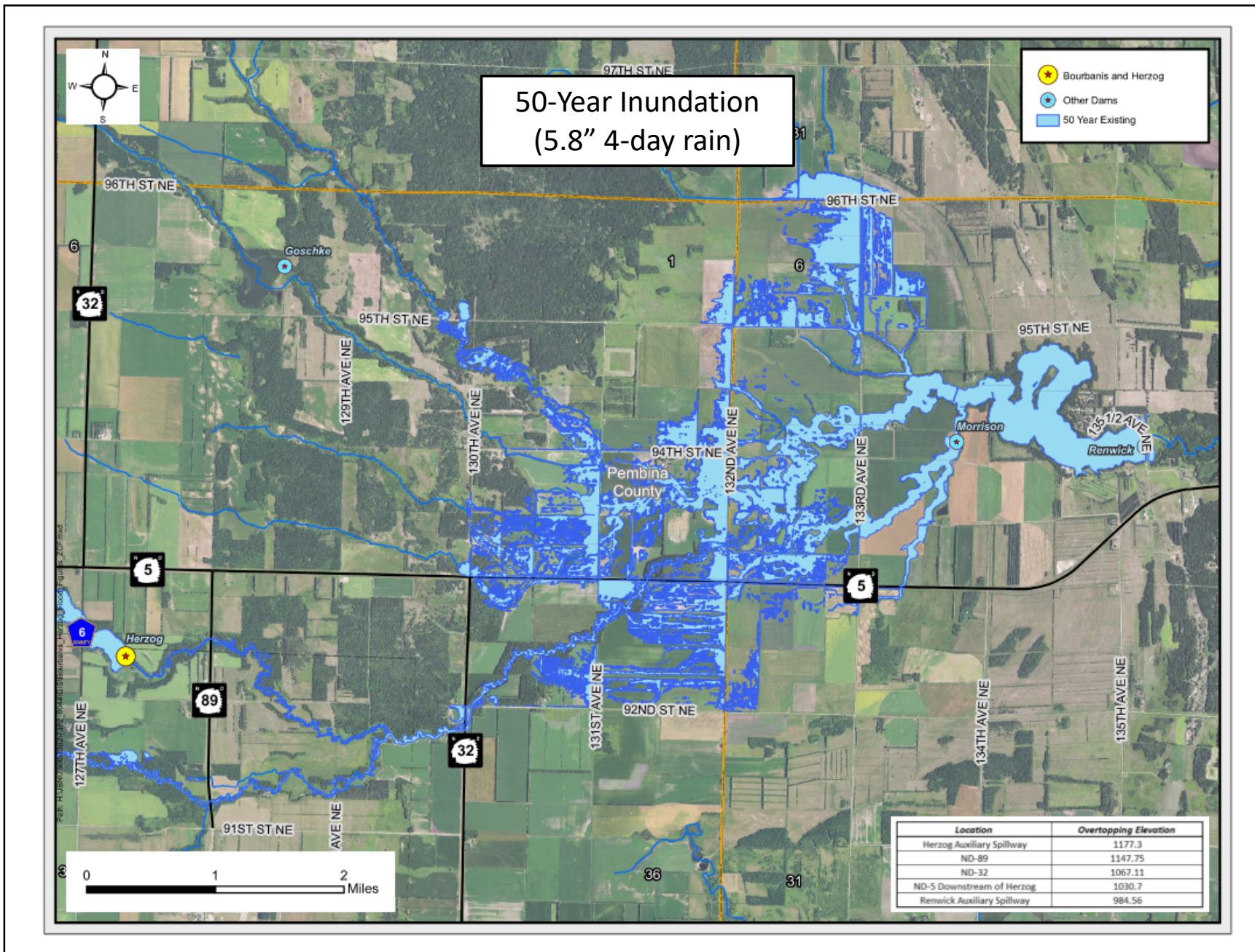


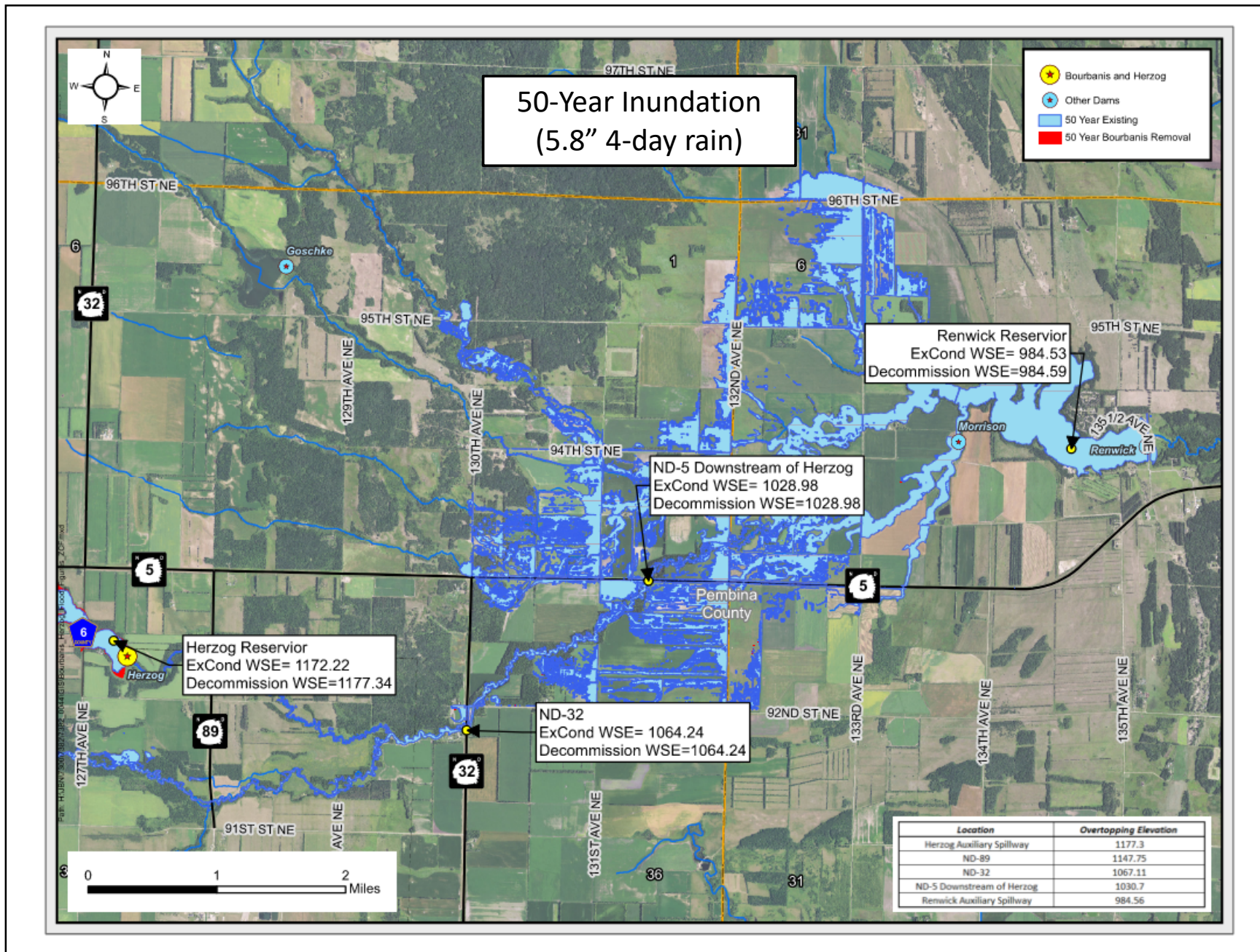


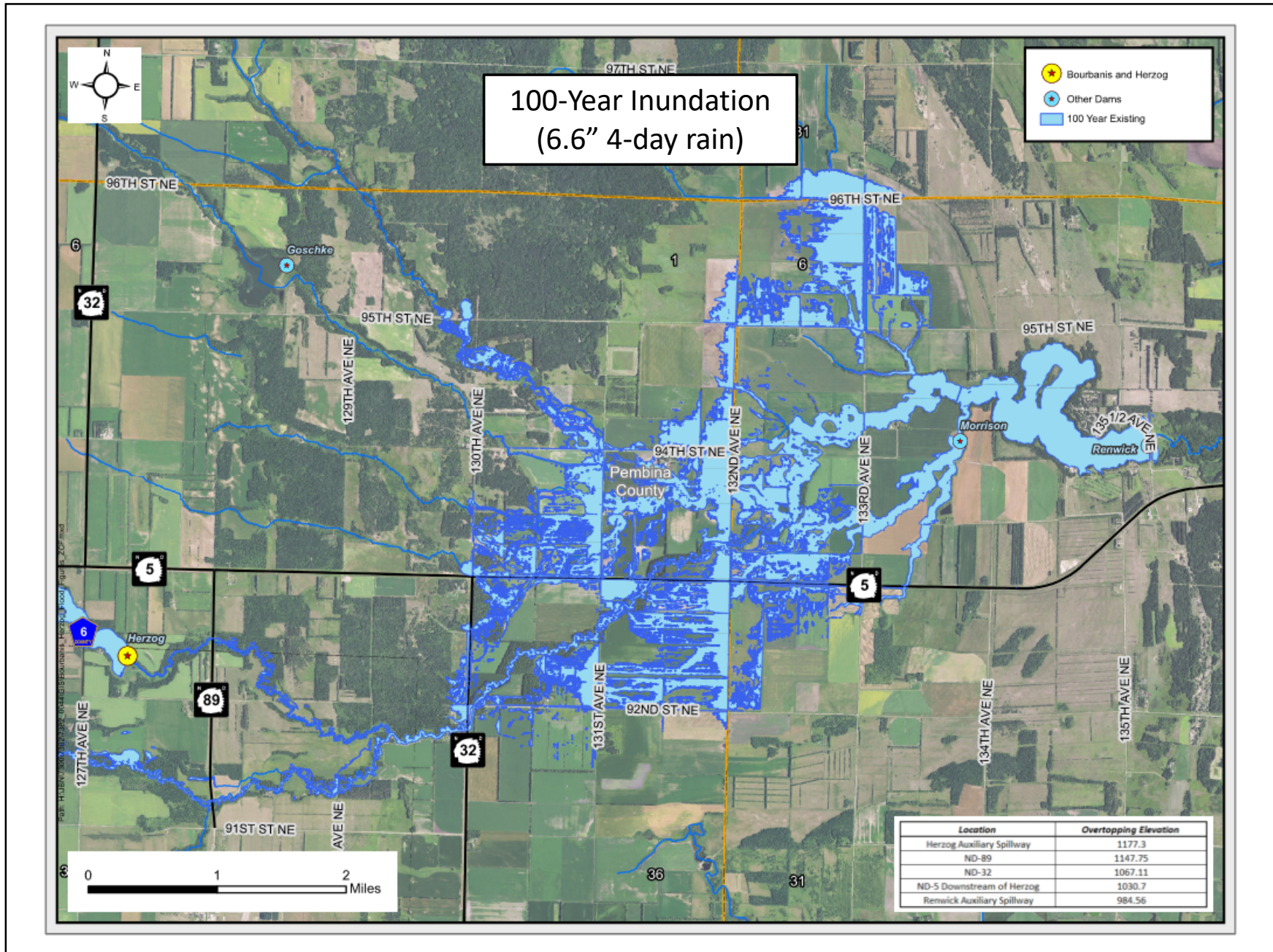


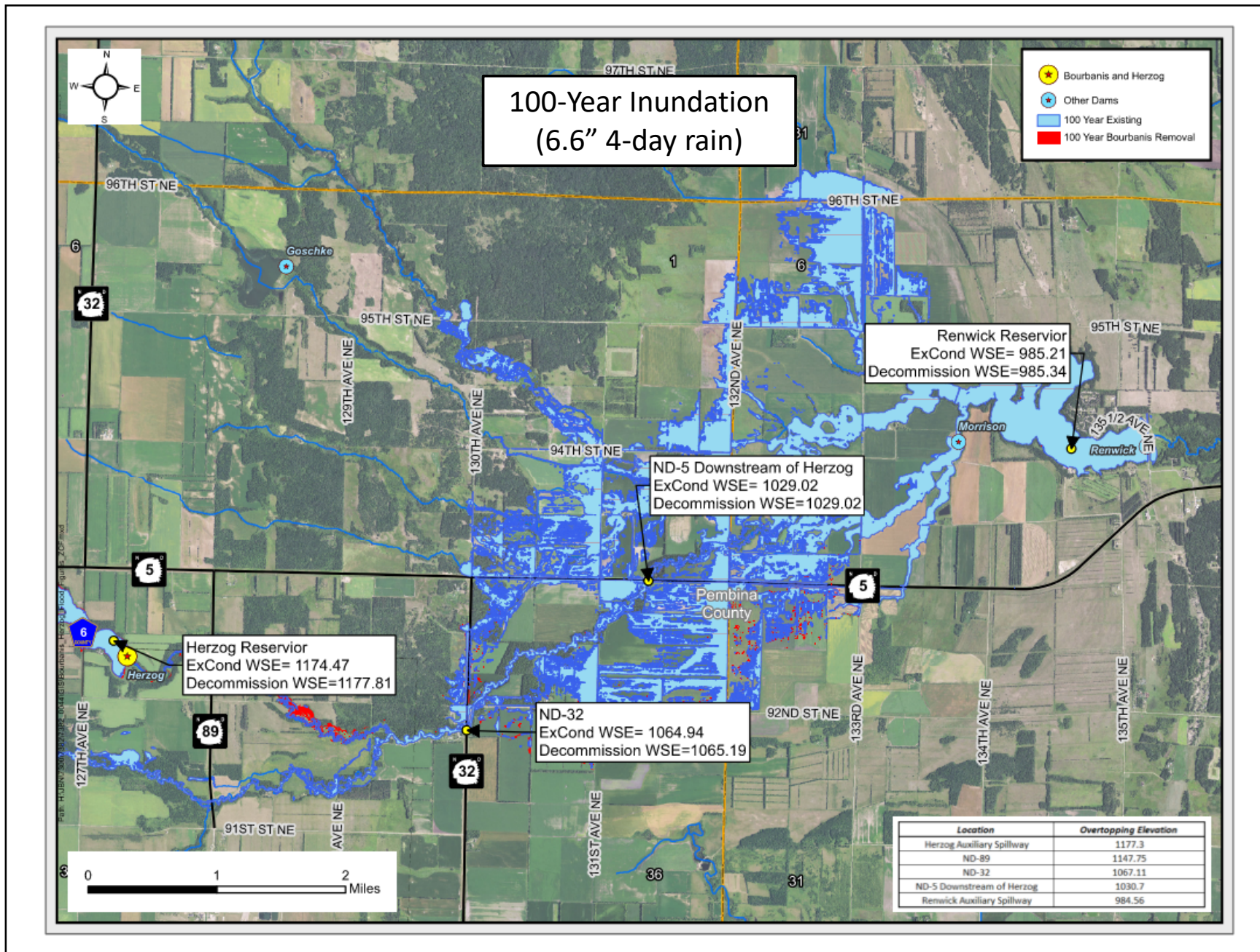


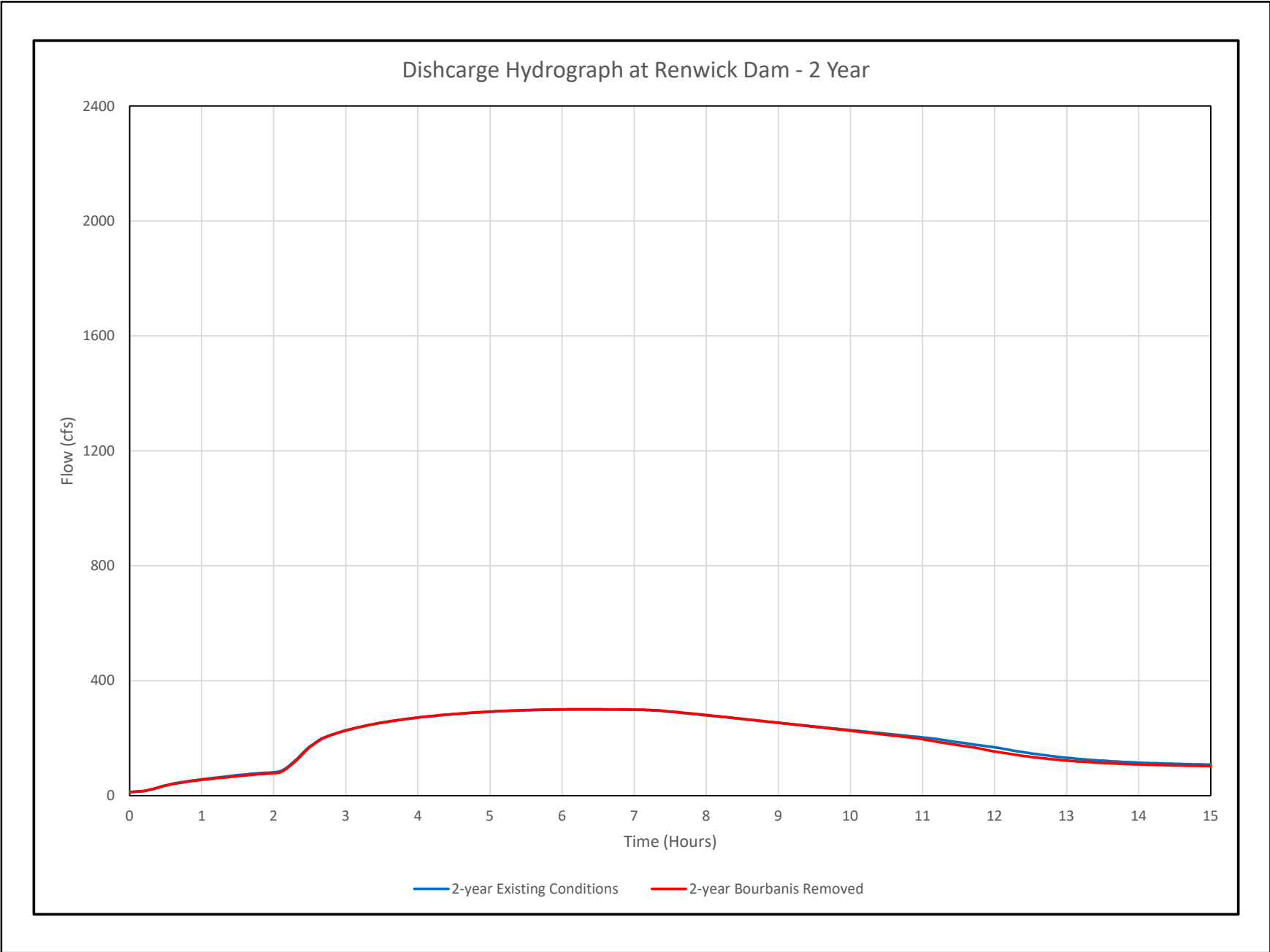


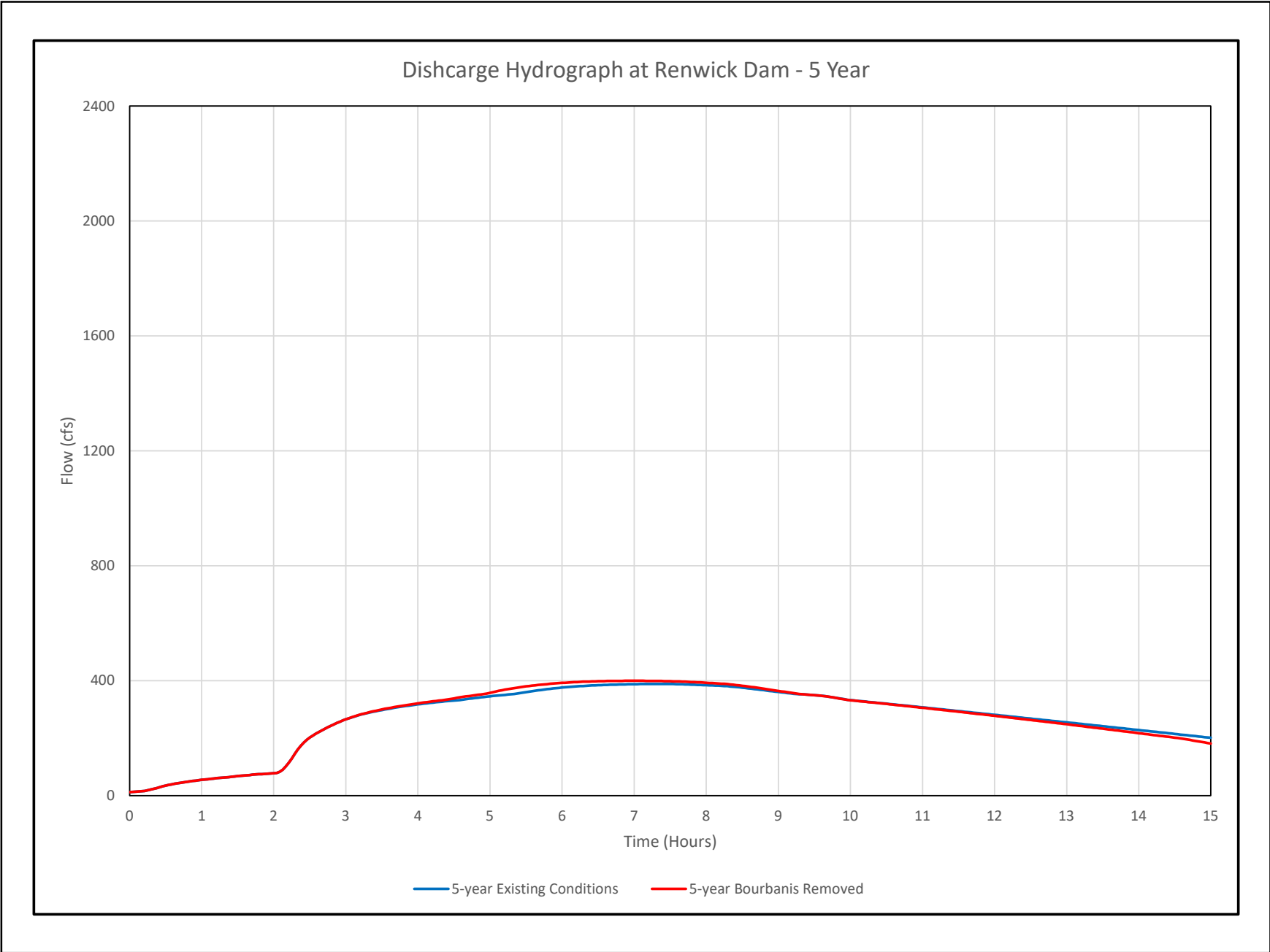


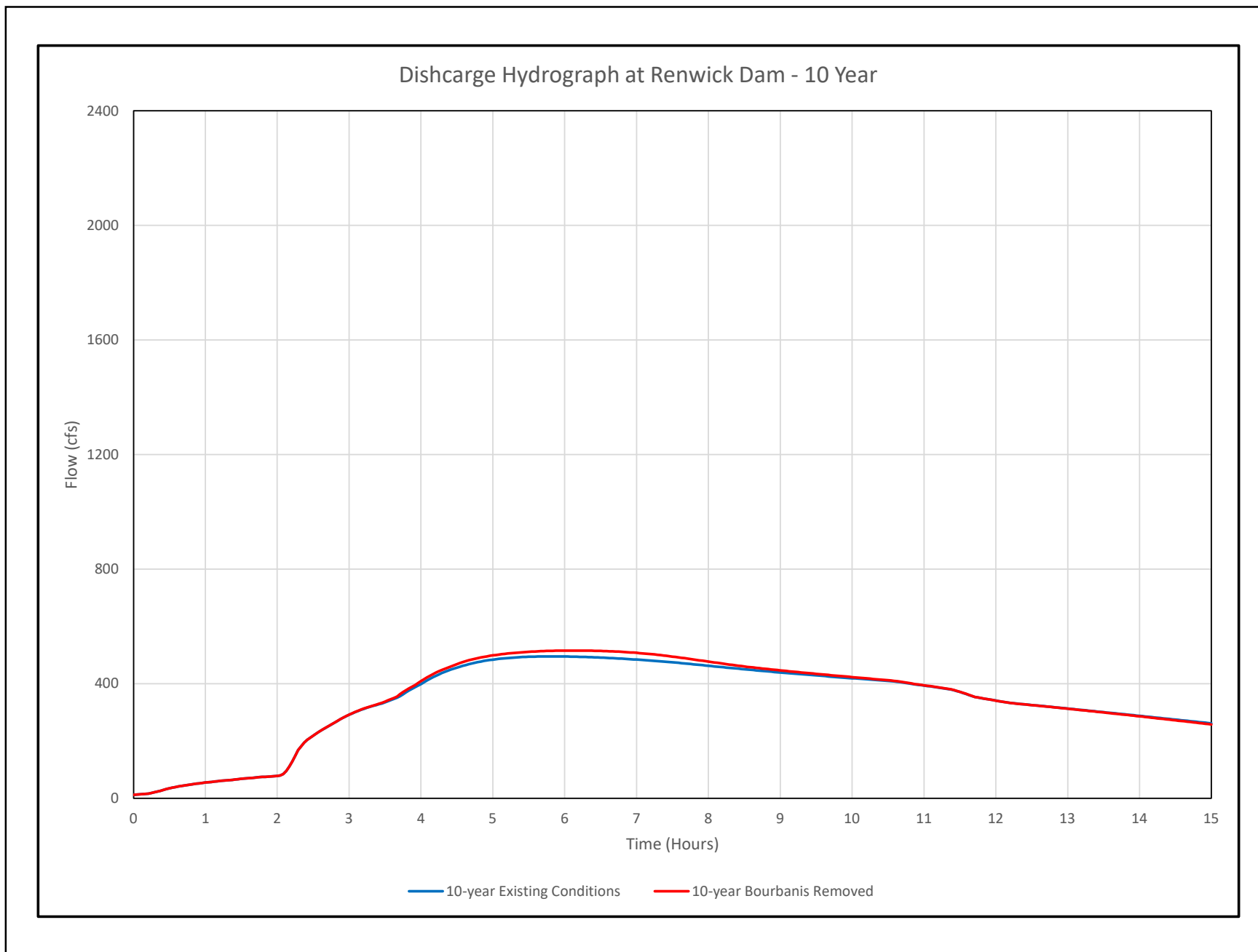


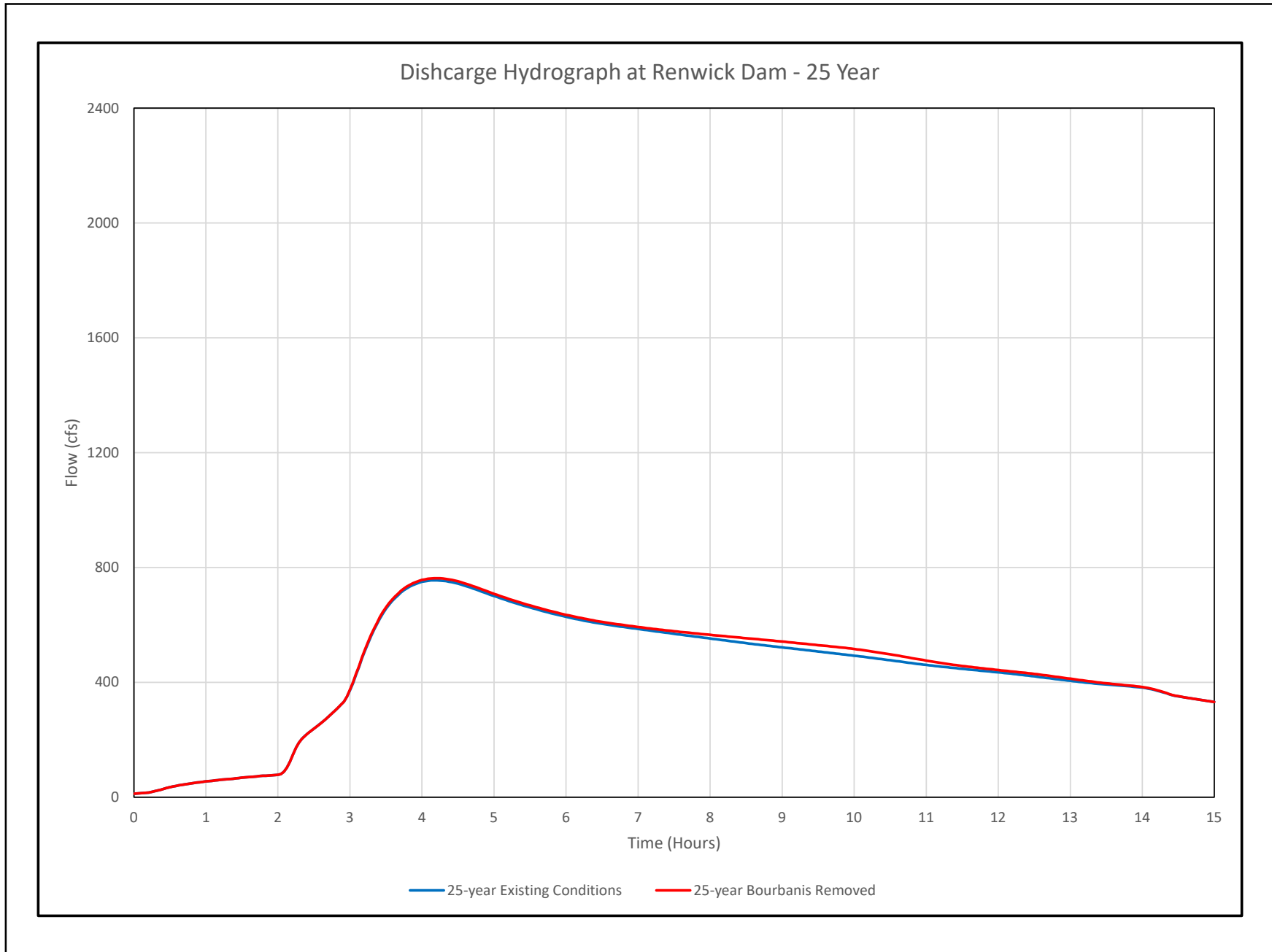


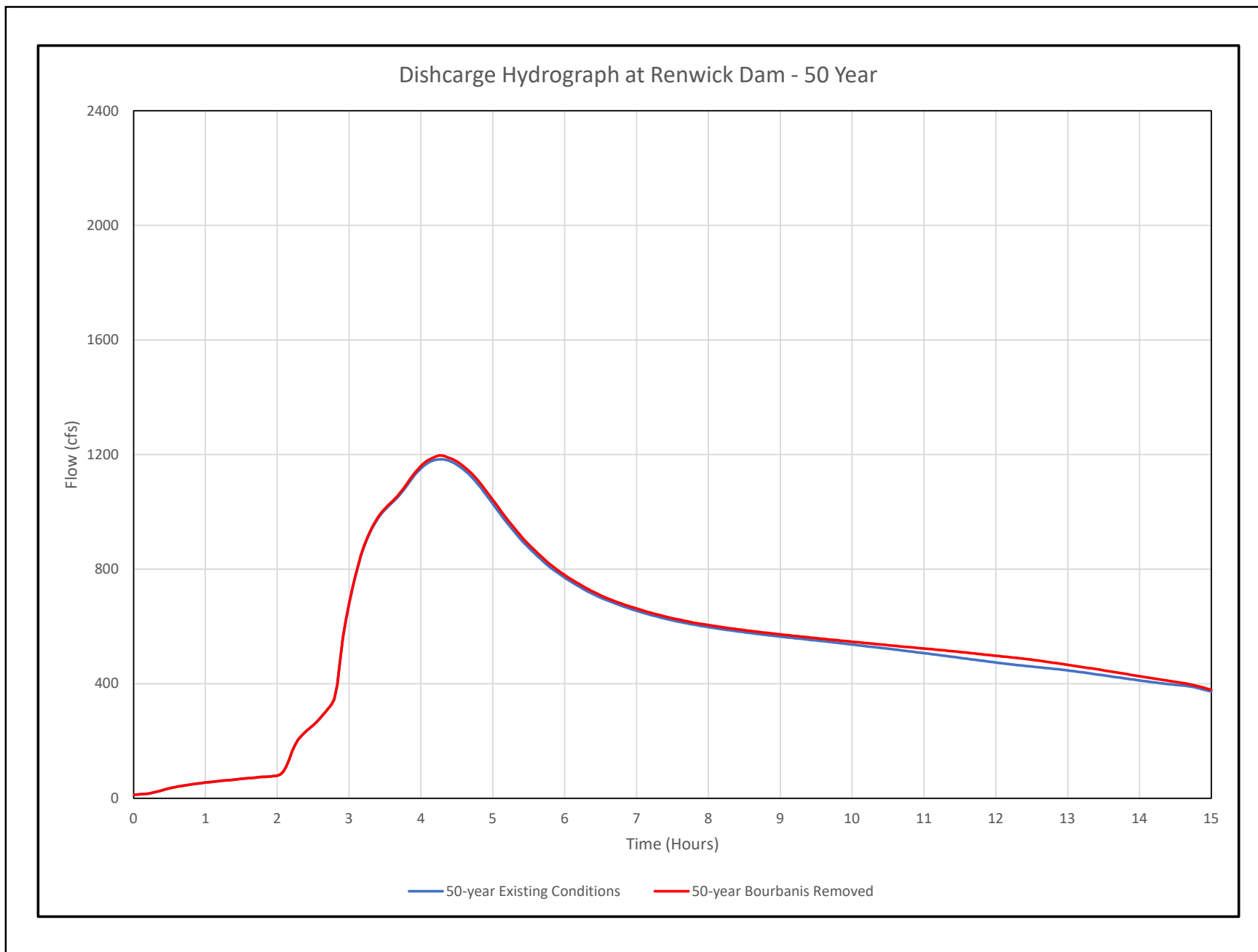


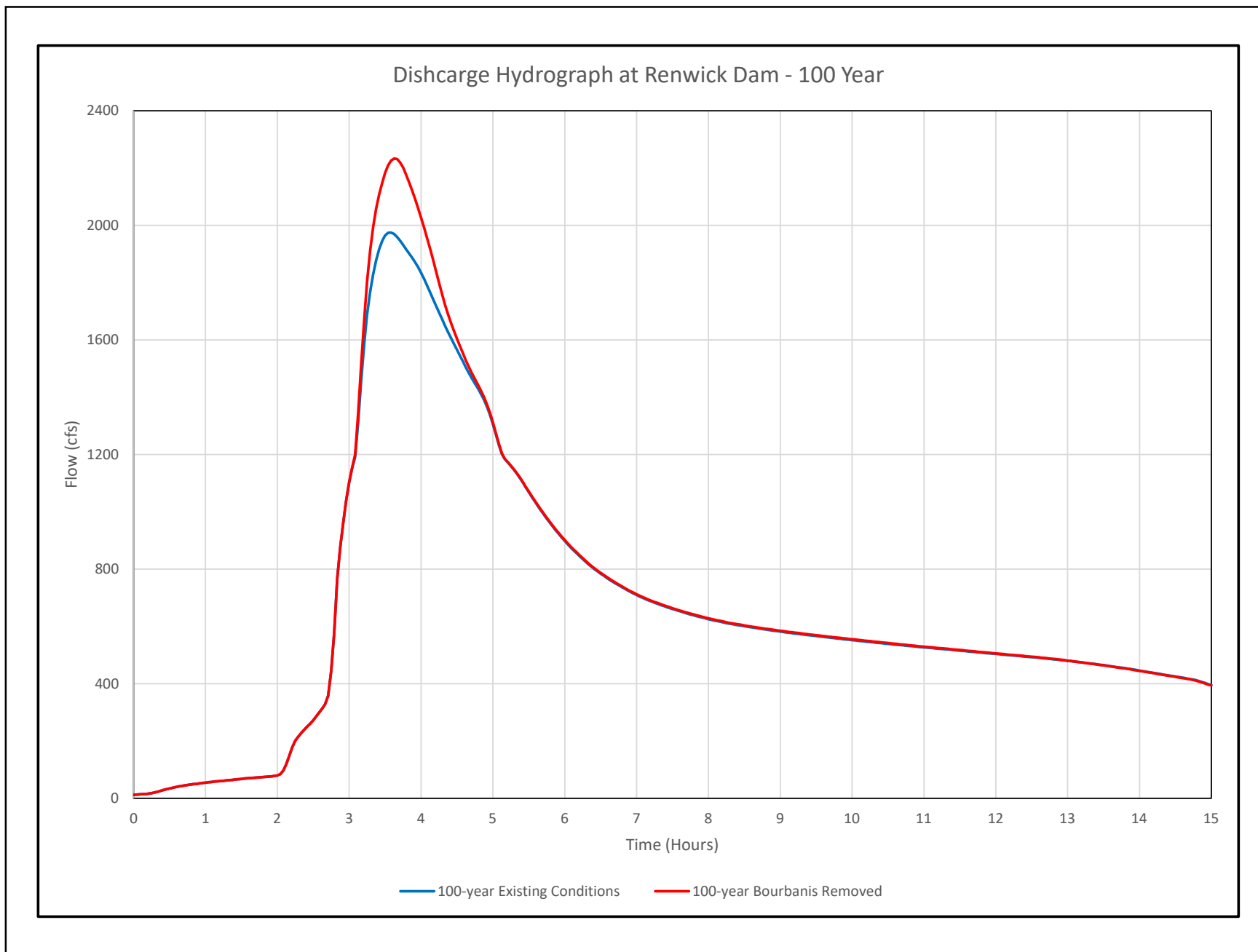












Hydraulic Impacts of Decommissioning

Findings (Upstream Area):

- ND Highway 5 Meets Stream Crossing Standards.
- ND Highway 89 Meets Stream Crossing Standards.
- Herzog ASW Activation during 50-year (+ 0.04') and 100-year (+ 0.51') scenarios.
- Increased inundation acreage between Herzog and Bourbanis for all events.
- No structural impacts based on modeled events.

Findings (Downstream Area):

- Negligible impacts through the 50-year scenario.
- Modest impacts between Renwick and Herzog during the 100-year scenario.
(Due to Herzog ASW activation)
- Does not result in any changes to crossings meeting the Stream Crossing Standards.
- Impacts downstream of Renwick Dam during the 100-year scenario.
(Due to Herzog ASW activation)

Decision for NRCS EWP – Path Forward

NRCS Emergency Watershed Protection Funding (Today's Decision):

- How best to mitigate risk?
- Implement immediately (2022).
- 3-5 year implications.
- Operate under worst case scenario (Decommission).
- As reservoir is drawn down, other viable options can be explored with better understanding of the principal spillway.
- Work needs to begin now to meet 220 day requirement for NRCS funding.

NRCS Watershed Rehabilitation Program (On-going):

- How to best mitigate risk and maximize flood damage reduction.
- Implement 3-5 years from today.
- Comprehensive vetting of alternatives (Decommissioning vs re-construction of Bourbanis, enhancements to Herzog, or combination thereof).
- Long term implication/benefits to the Watershed.