Northfield Flood Study
Phase 2 Update

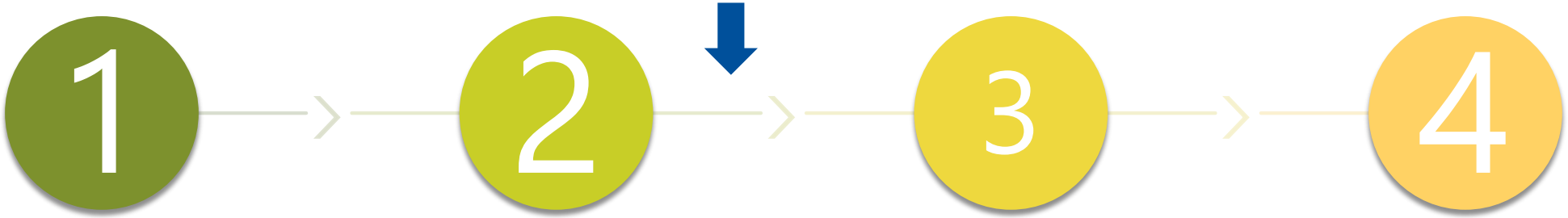
May 16, 2023

Overview

- Process/Background
- Hydrology Updates
- Future Flood Risk
- Carleton Alternatives
- Preferred Alternatives
- Benefit Cost Analysis
- Questions

Process

We are here.



Phase 1

- Feasibility Study
  - Alternatives Analysis
  - Public Engagement

Phase 2

- FEMA Benefit-Cost Analysis
- Hydrologic Analysis and Hydraulic model updates

Phase 3

- Pursue Funding

Phase 4

- Design/Permitting
- Construction

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Goals and priorities for alternatives

- Reduce the risk of damage to property from floods
- Reduce the use of emergency measures to combat floods
  - e.g., sandbags, temporary barriers
- Compatibility with Riverfront Plan goals
- Keep/improve public access to the river
- Support a vibrant downtown for visitors and residents
- Preserve historic structures

Flood History

2010 Flood

- 16,600 cubic feet per second

2016 Flood

- 16,300 cubic feet per second

Current FEMA FIS Discharge Frequency

Annual Exceedance Probability	Return Period	FIS Discharge (cubic feet per second) Period of Record 1980 to 1996
10%	10-year	7,780
2%	50-year	10,700
1%	**100-year**	**11,800**
2010 flood	*>500-year*	*16,600*
0.2%	500-year	14,200

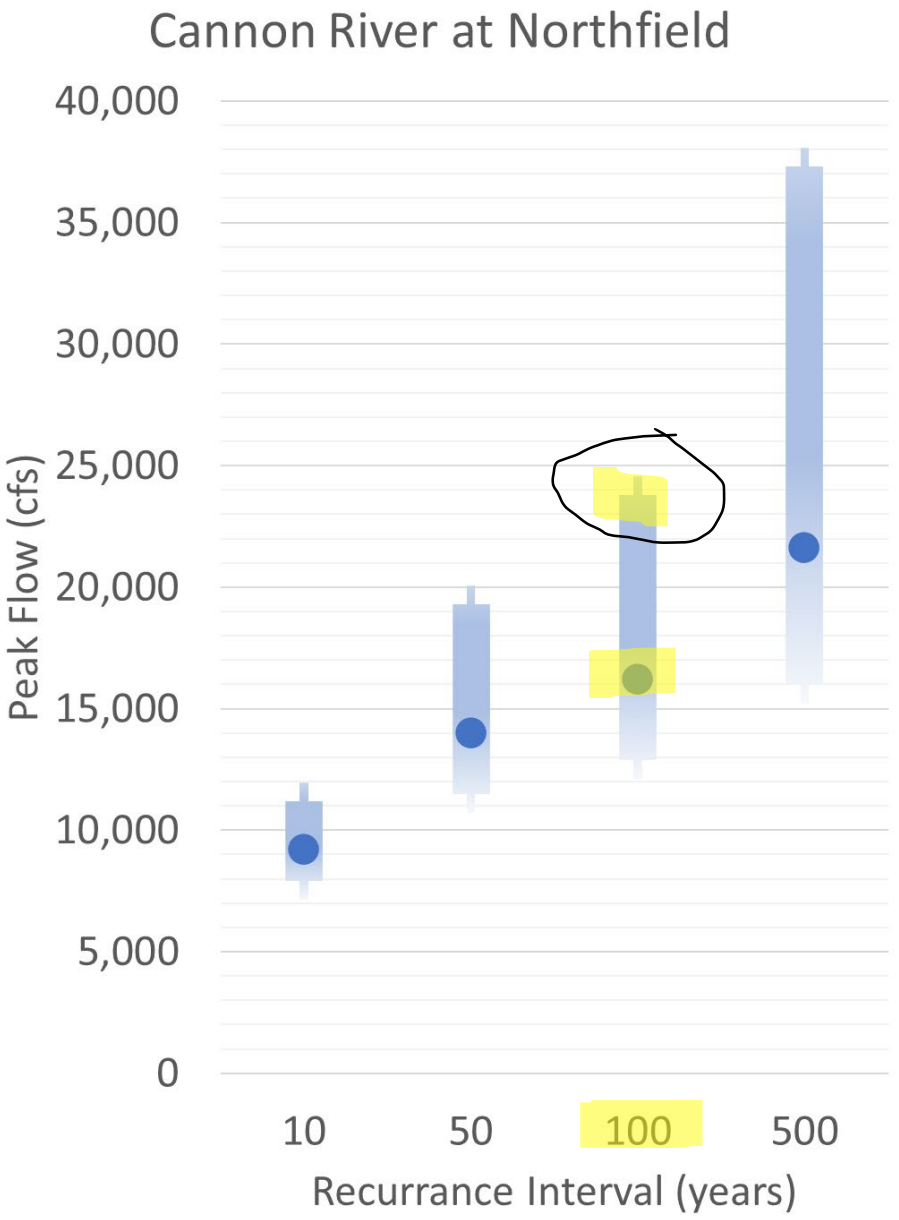
Updated Discharge Frequency Estimate

Annual Exceedance Probability	Return Period	FIS Discharge (cubic feet per second) Period of Record 1980 to 1996	Updated Discharge (cfs) Period of Record 1980 to 2020
10%	10-year	7,780 →	9,200
2%	50-year	10,700 →	14,000
1%	**100-year**	**11,800** →	**16,200**
2010 flood	*~100-year*	*16,600*	*16,600*
0.2%	500-year	14,200 →	21,600

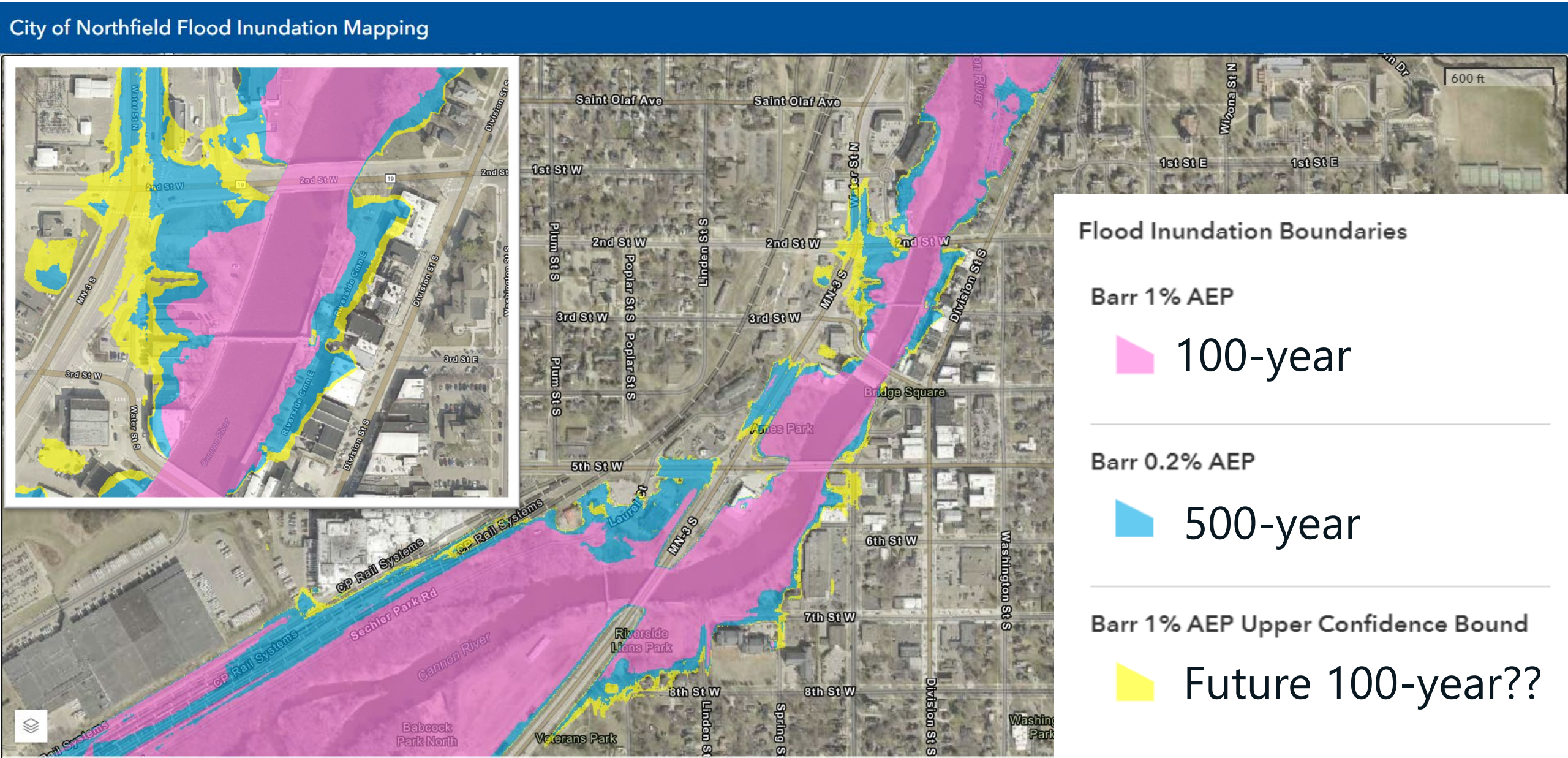
Potential Future Flood Risk, year 2100

- Future 100-year unlikely to be greater than 24,000 cfs

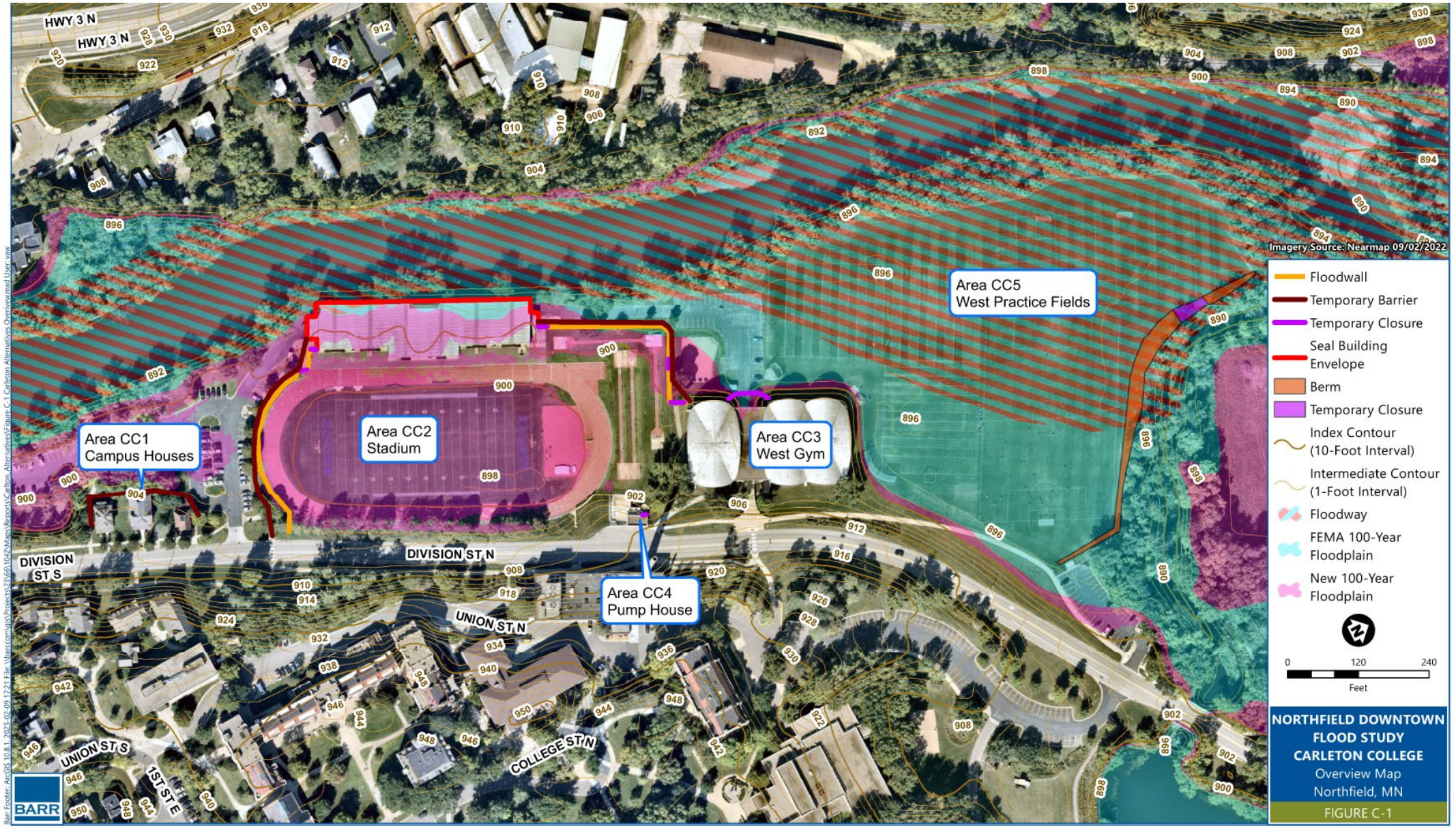
- Options
  - use current 500-year
  - use 100-year upper confidence limit



Potential Future Flood Risk Inundation Map Comparison

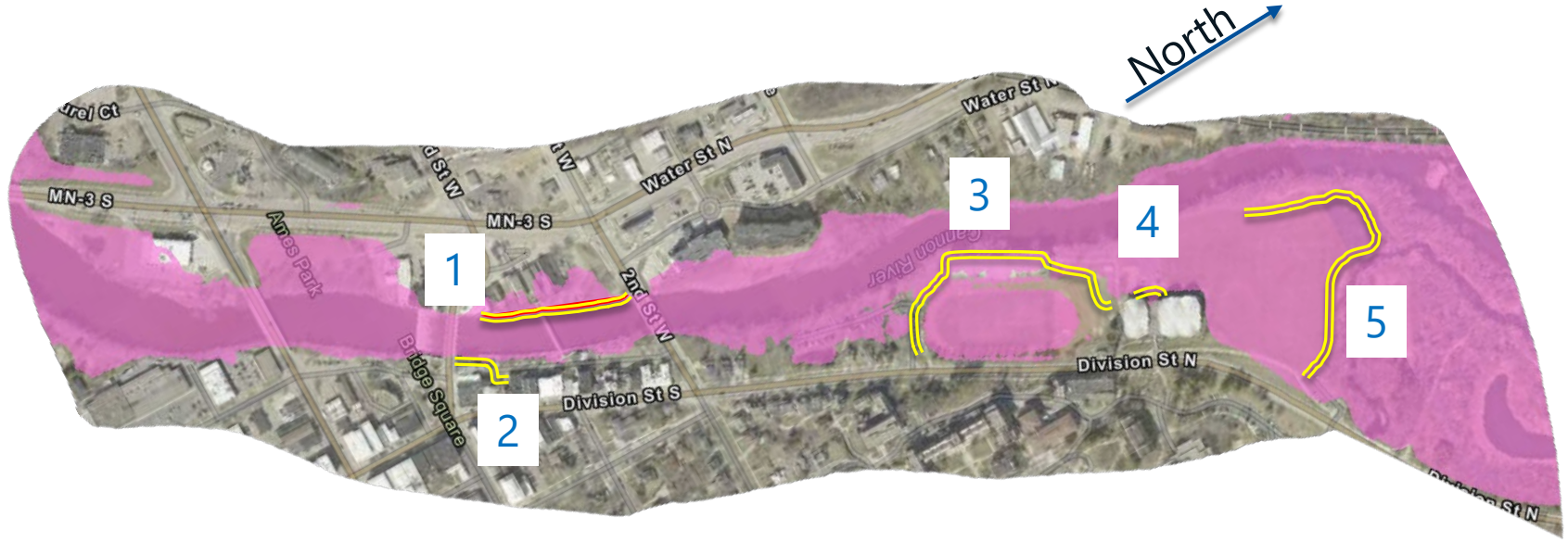


Carleton College Alternatives



Preferred Alternatives

1. West Bank Floodwall (Area 1)
2. Bridge Square Dry floodproofing (Area 2)
3. Stadium Floodwall (Area CC2)
4. West Gym Closure (Area CC3)
5. Practice Field Berm (Area CC5)



West Bank Floodwall (Area 1)

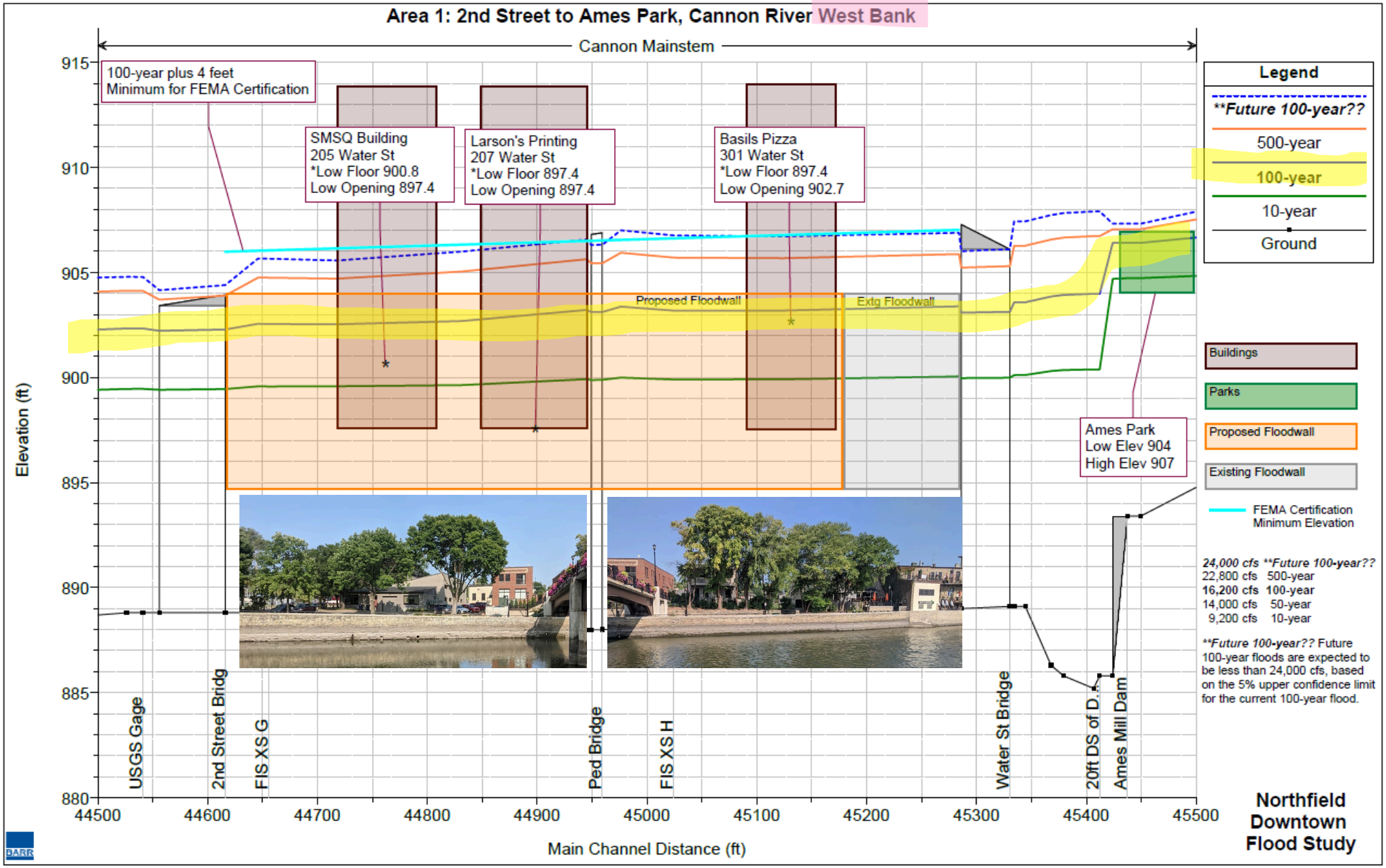
- Top of wall elevation 904
- 415 feet of floodwall
- one temporary closure
- interior drainage

possible add-ons

- *906 to 907 top elevation*
- *replace existing wall*
- *seepage mitigation system*

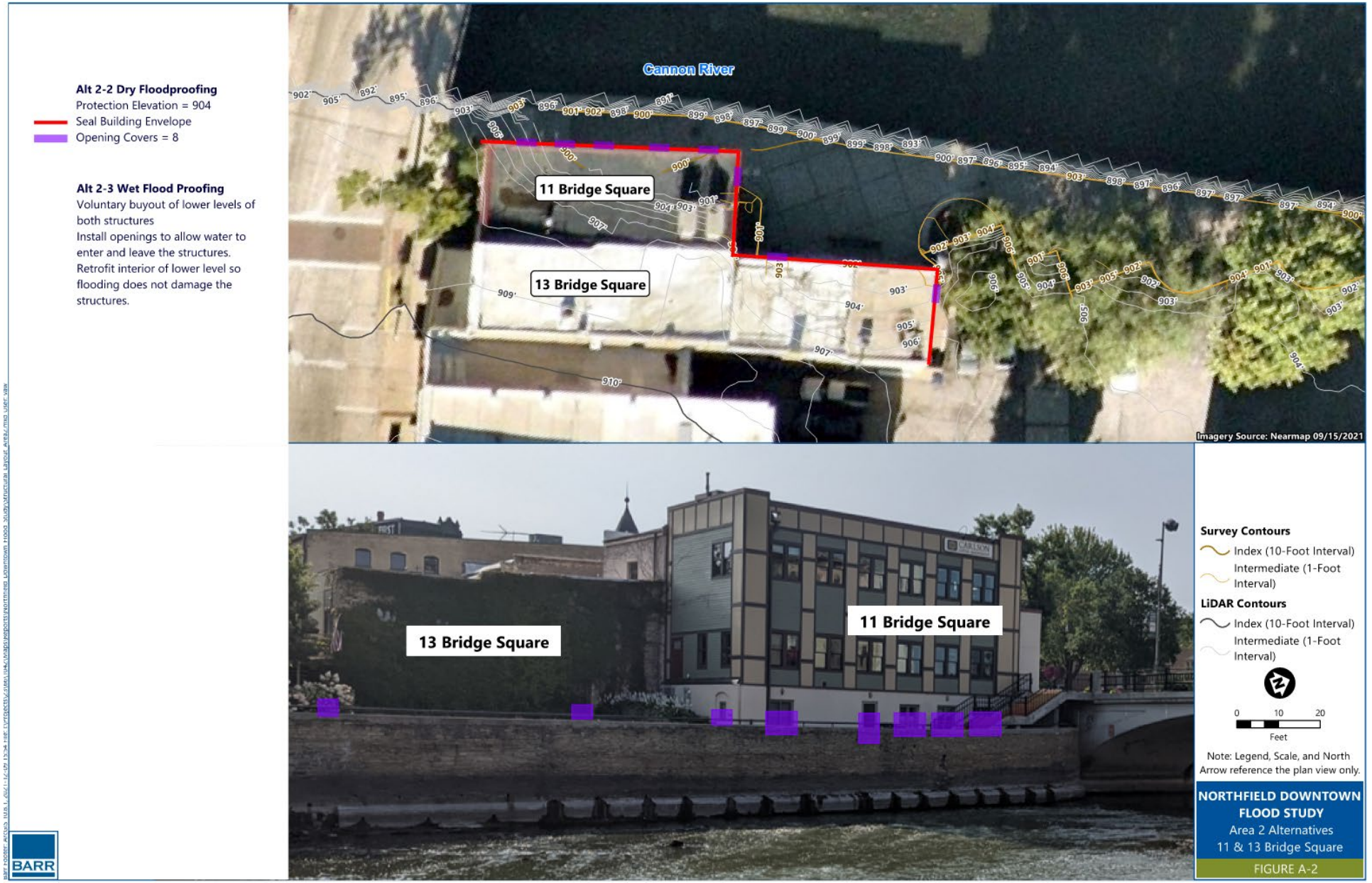
Flood levels

- floodwall top of elevation of 904 would have less than 1 foot of freeboard



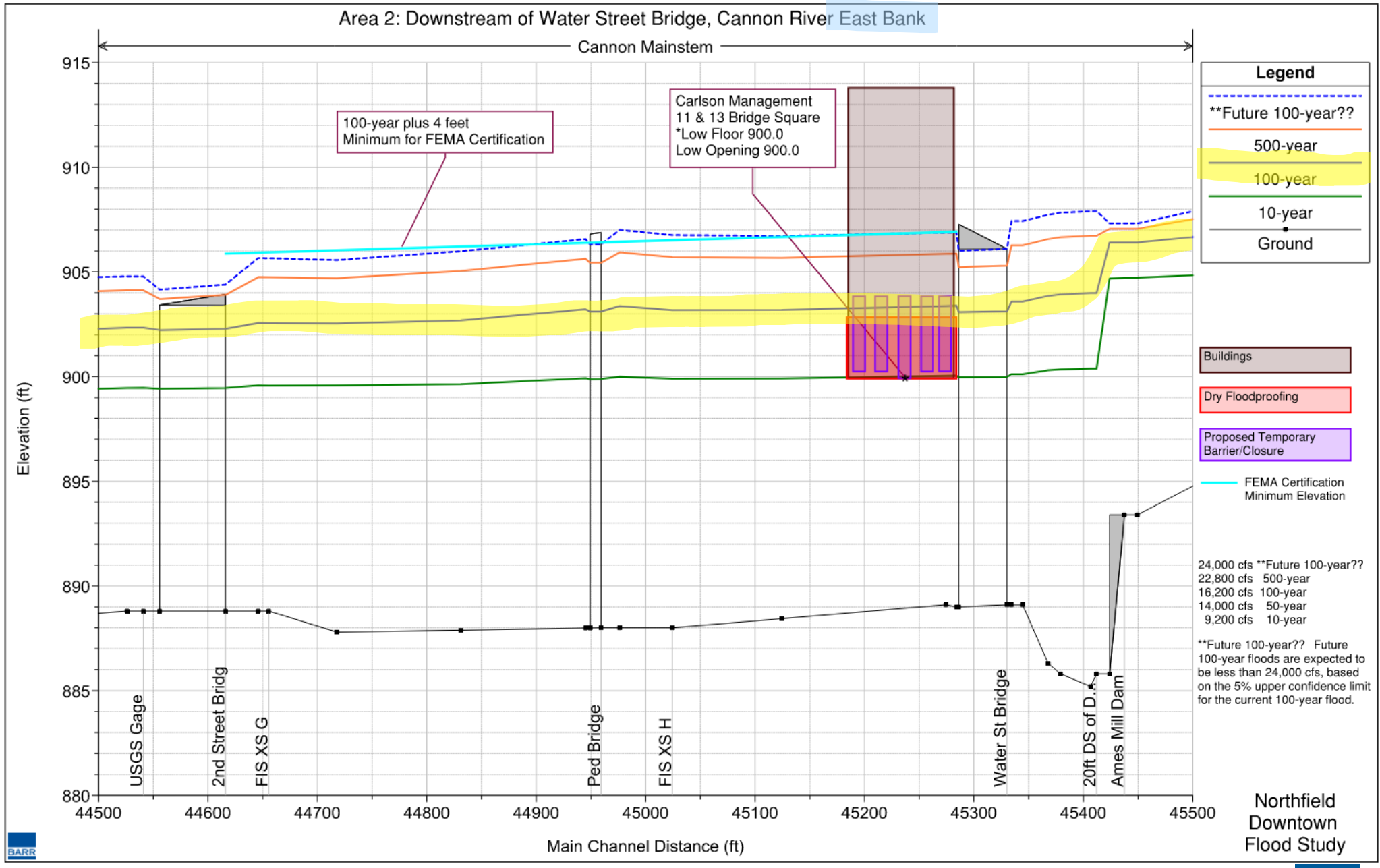
Bridge Square Dry Floodproofing (Area 2)

- structural reinforcement of walls
- impermeable covering up to 4 feet on exterior wall
- temporary covers over openings
- seepage mitigation system



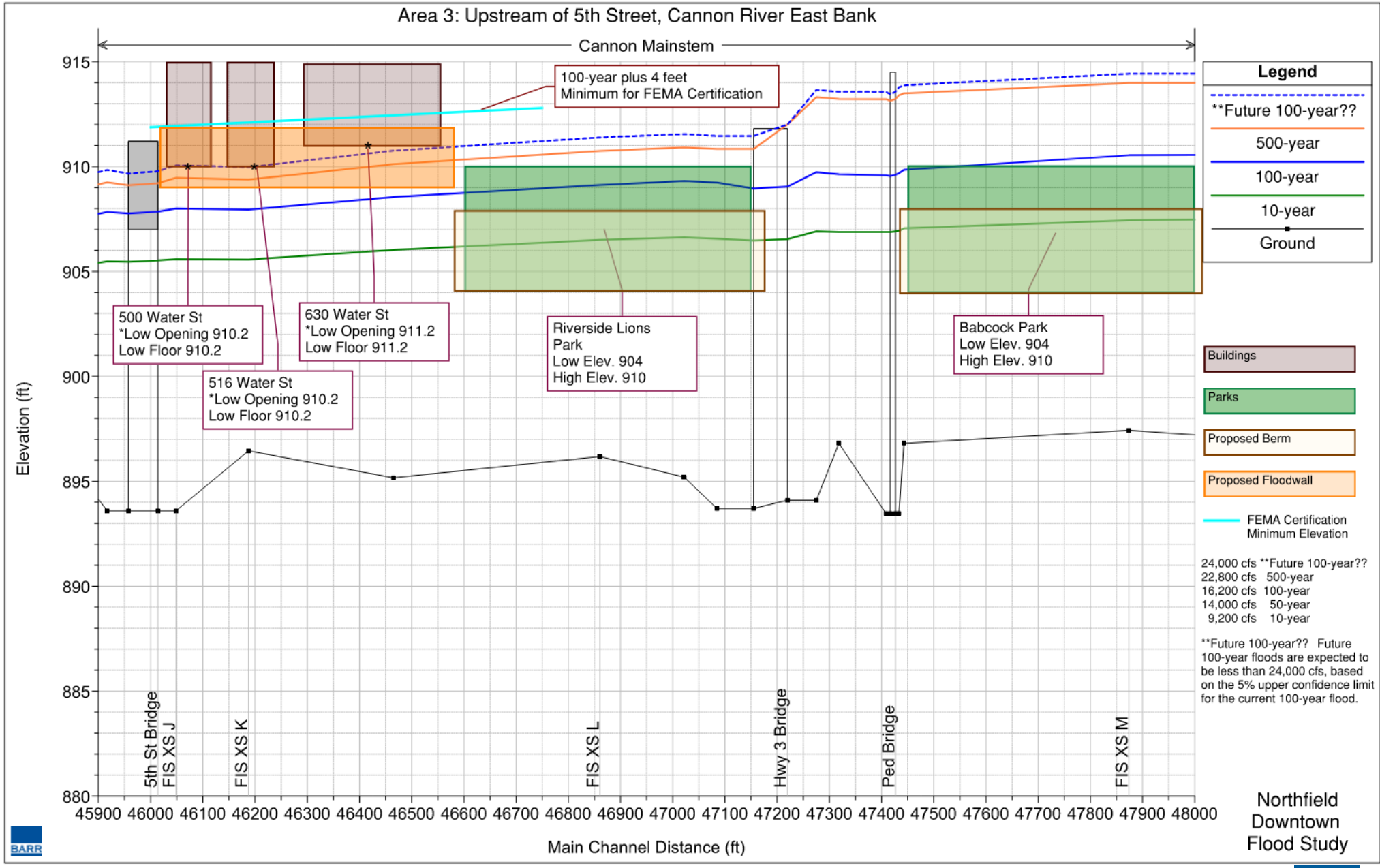
Flood levels

- Dry floodproofing would need to extend higher than recommended max of 3 feet



Area 3

- minimal benefit for Federal funding
- low floors are 2 feet above the current 100-year flood profile
- not recommended for further consideration



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Park flood mitigation

- Use updated hydraulic modeling to help screen redevelopment alternatives for parks

Ames

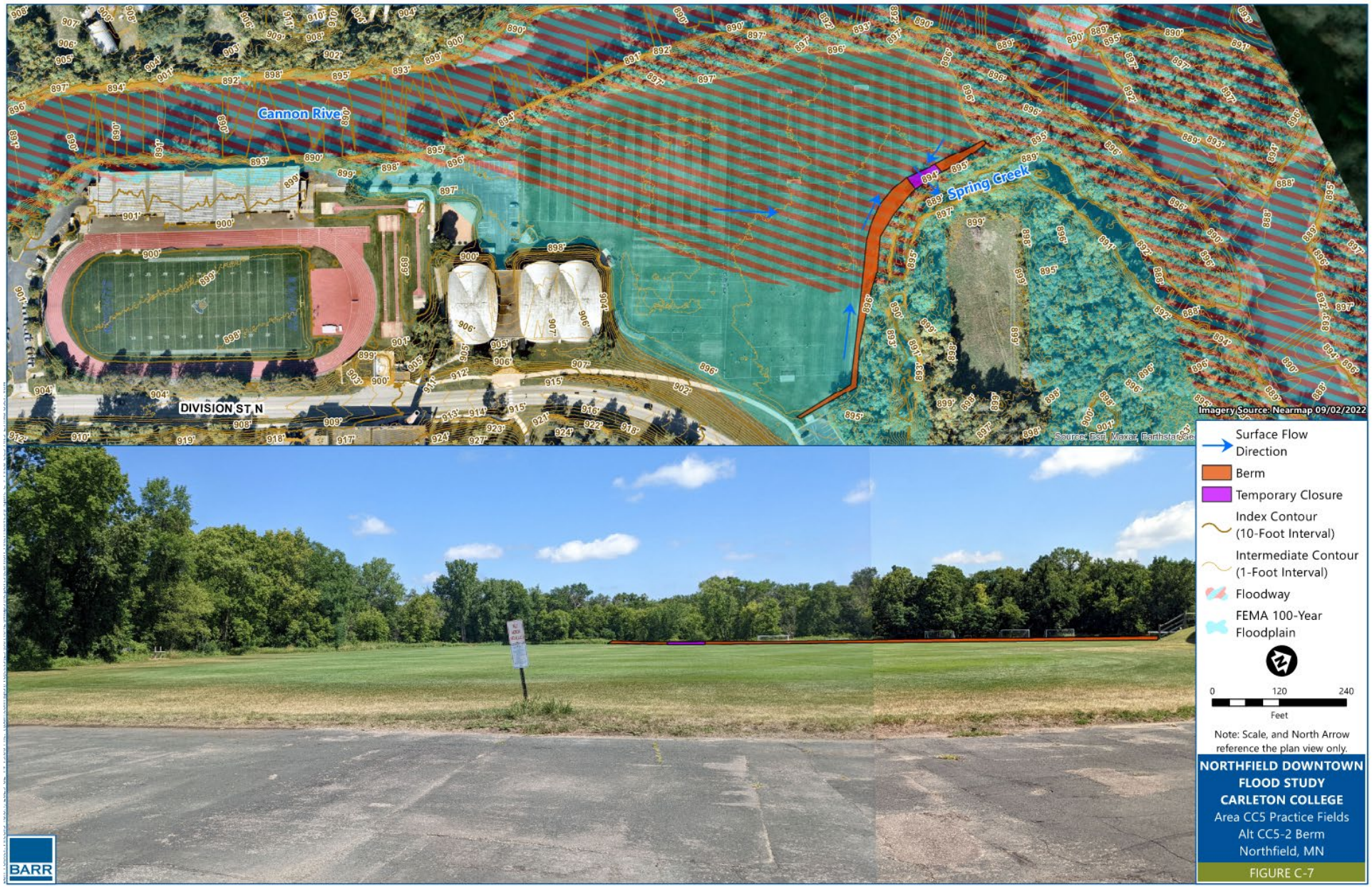
Riverside

Babcock

Stadium Floodwall & Dry Floodproofing (Area CC2)

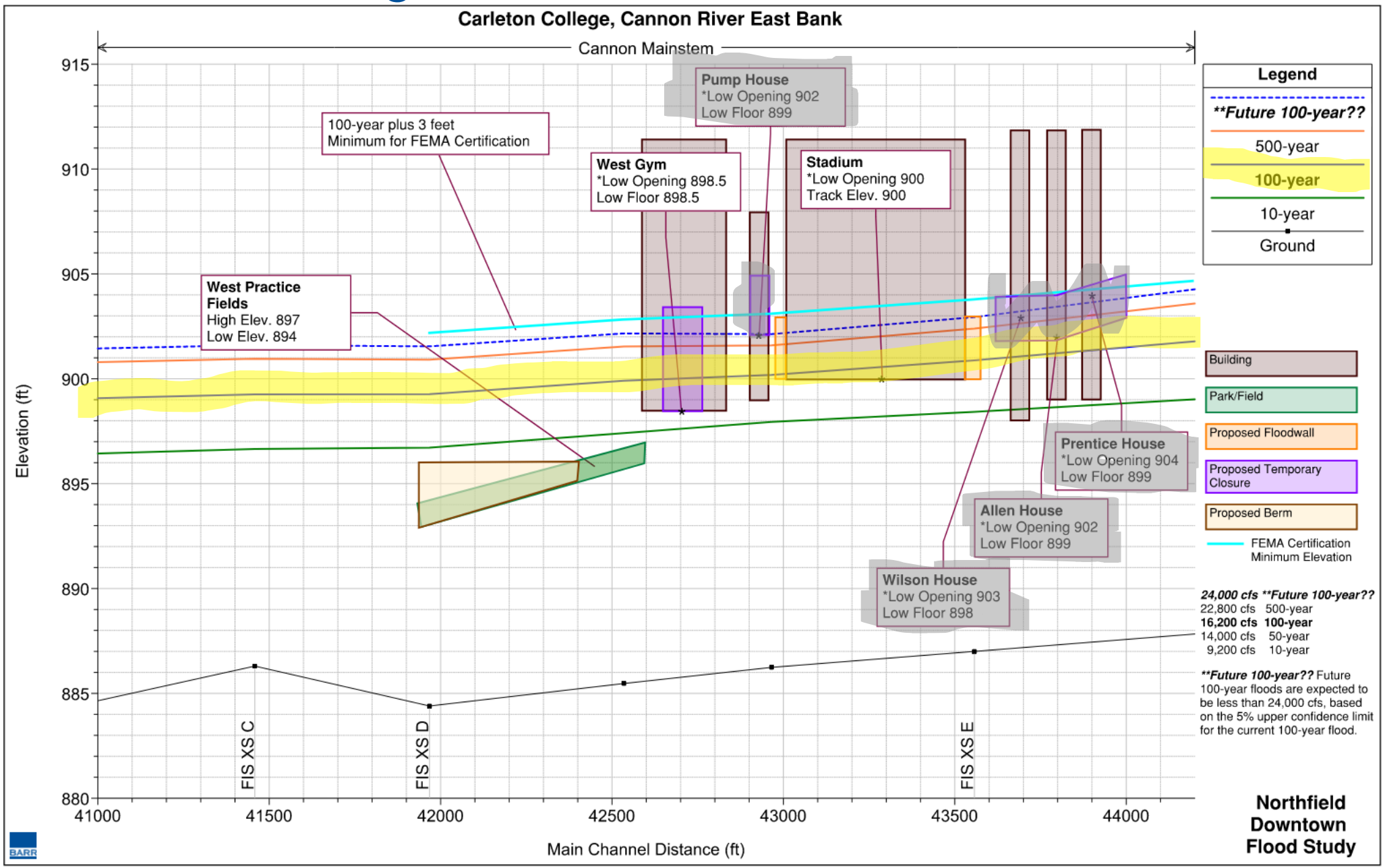
West Gym Closure (Area CC3)

West Practice Fields Berm (Area CC5)



Flood levels – Carleton College

- Stadium & Track
- West Gym
- West Practice Fields



Benefits Analysis Inputs/Gaps

Modeled Damages

- Building replacement value
- Building contents value
- Annual operating budget (displacement cost)
- Volunteer costs (during a flood)
- Flood Insurance Policy

Historical Damages

- Damage Frequency
- Pre-mitigation damages
- Post-mitigation damages

Benefit-Cost Analysis

Preferred Alternatives	Estimated Benefit	Cost Range	Benefit Cost Ratio Range
West Bank Floodwall	$9,900,000	$1.6M to $3M*	**3.3** to 6.3
Bridge Square Dry Floodproofing	$500,000	$0.7M to $1.1M	**0.5** to 0.7
Carleton (Stadium & West Gym)	$1,200,000	$1.5M to $2.9M	**0.5** to 0.9
Carleton West Practice Fields Berm	$1,000,000	$0.3M to $0.4M	**2.5** to 2.9
TOTAL	**$12,600,000**	**$4.1M to $7.2M**	**1.7 to 3.0**

Notes & Assumptions

- Benefits for downtown areas based on estimated damages based on low floor elevations
- Benefits for Carleton areas are based on historical damages from the 2010 flood
- Cost range includes estimated annual Operations & Maintenance costs
- Cost range assumes 50-year design life for projects
- *Costs would increase and BCR decrease if projects pursue higher levels of protection (e.g., elevation 906 west bank floodwall)

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Q&A/Discussion

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