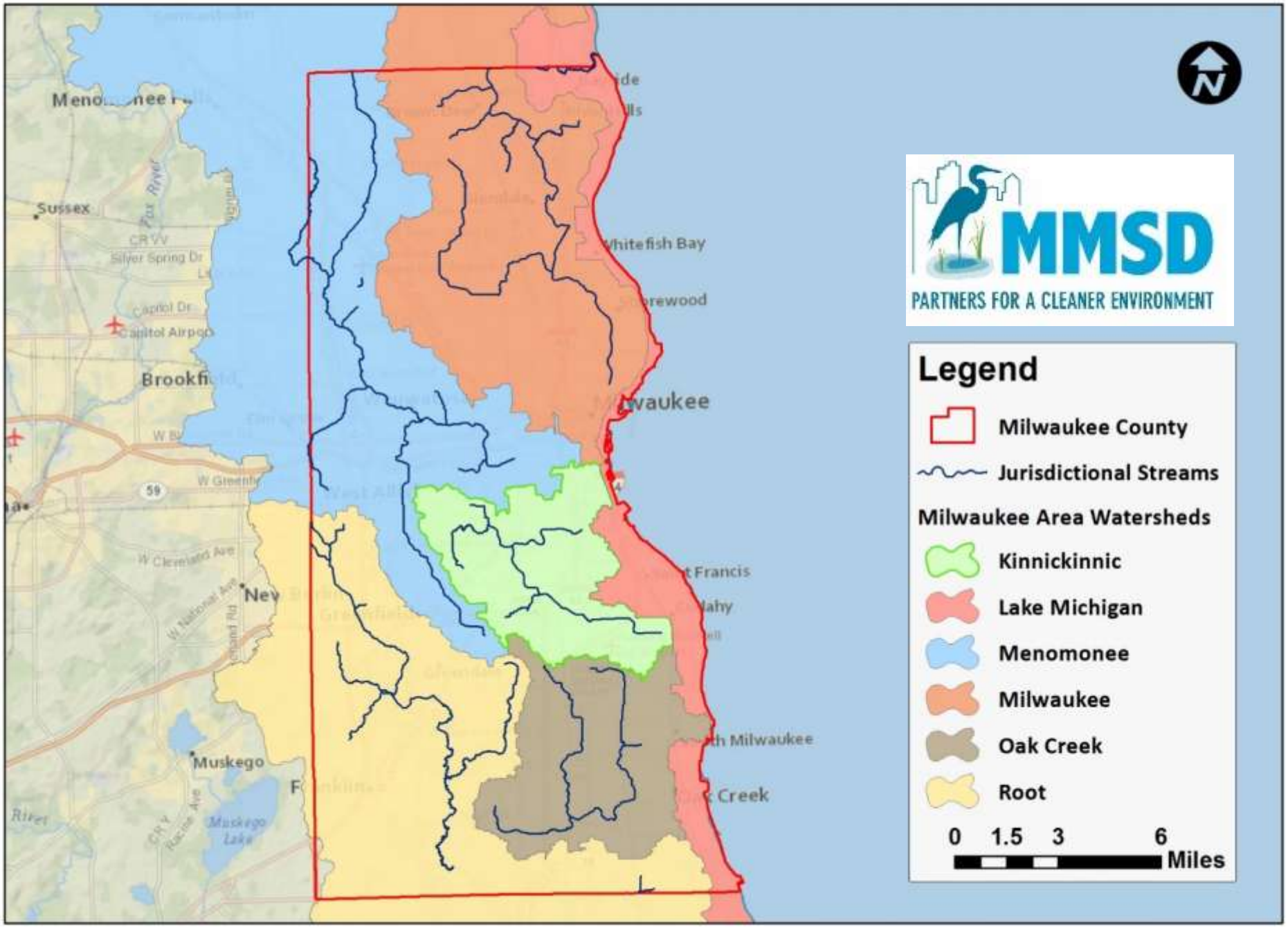
Kinnickinnic River Watershed:
Watershed Plan Update for Increasing Flood Risk

MMSD
PARTNERS FOR A CLEANER ENVIRONMENT

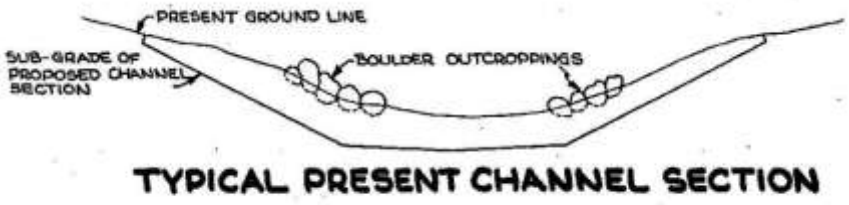
GRAEF

Hey and Associates, Inc.

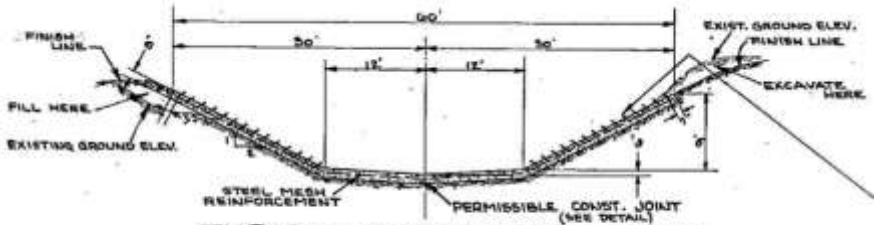

MMSD
PARTNERS FOR A CLEANER ENVIRONMENT
Legend
Milwaukee County
Jurisdictional Streams
Milwaukee Area Watersheds
Kinnickinnic
Lake Michigan
Menomonee
Milwaukee
Oak Creek
Root
0 1.5 3 6
Miles
Sussex
Whitefish Bay
Muskego
Muskego Lake
Capitol Airport
Silver Spring Dr
Capitol Dr
W Cleveland Ave
W National Ave
59

KK River Watershed

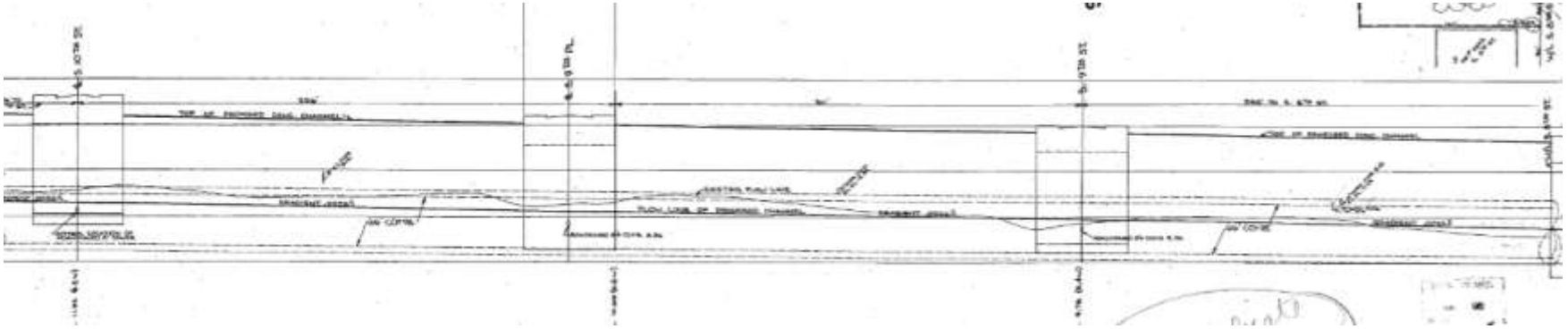
1960's Flood Mitigation Strategy
Remove anything that looks natural.



TYPICAL PRESENT CHANNEL SECTION

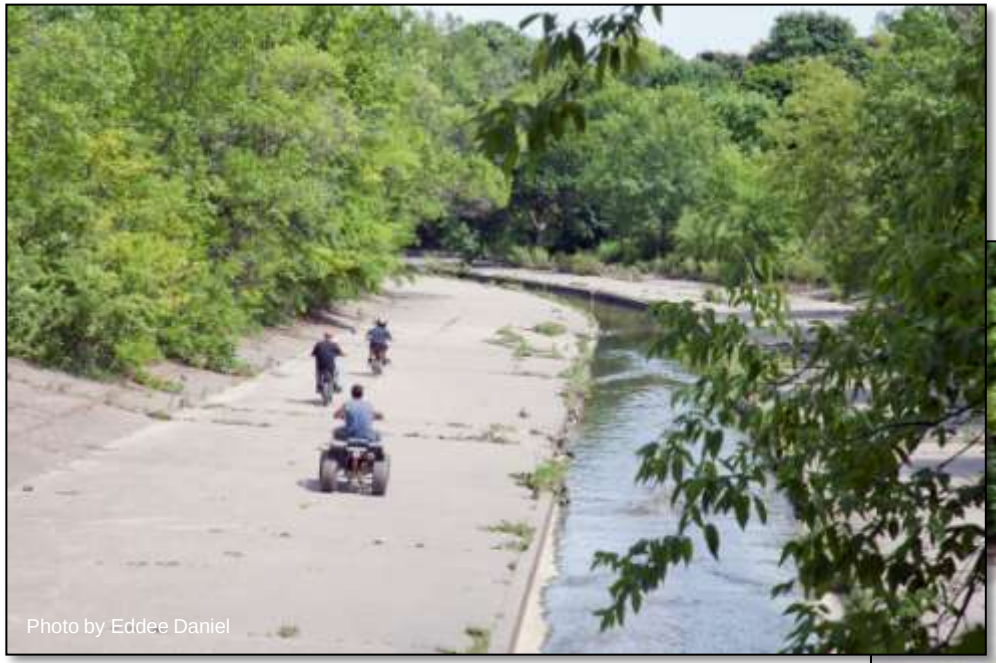


TYPICAL SECTION OF CHANNEL FROM S. 6TH ST. TO S. 8TH. ST.



1960’s Concrete Channel Lining – Kinnickinnic River

They did create recreational opportunities…



…but also Public Safety Concerns

Current Conditions

MMSD Watercourse Program

Objectives:

- Reduce flood risk for structures in 1% annual probability floodplain

- Incorporate natural functions into designs
  - Improve riparian & aquatic habitat
  - Improve public safety

What Has Been Done?

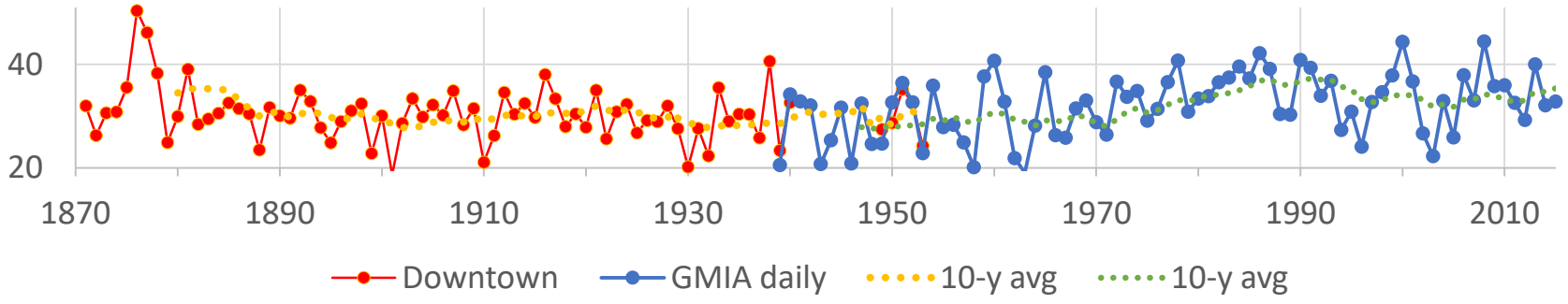
- The Kinnickinnic River Watershed Plan Update planning and engineering builds on existing plans and dovetails with ongoing efforts

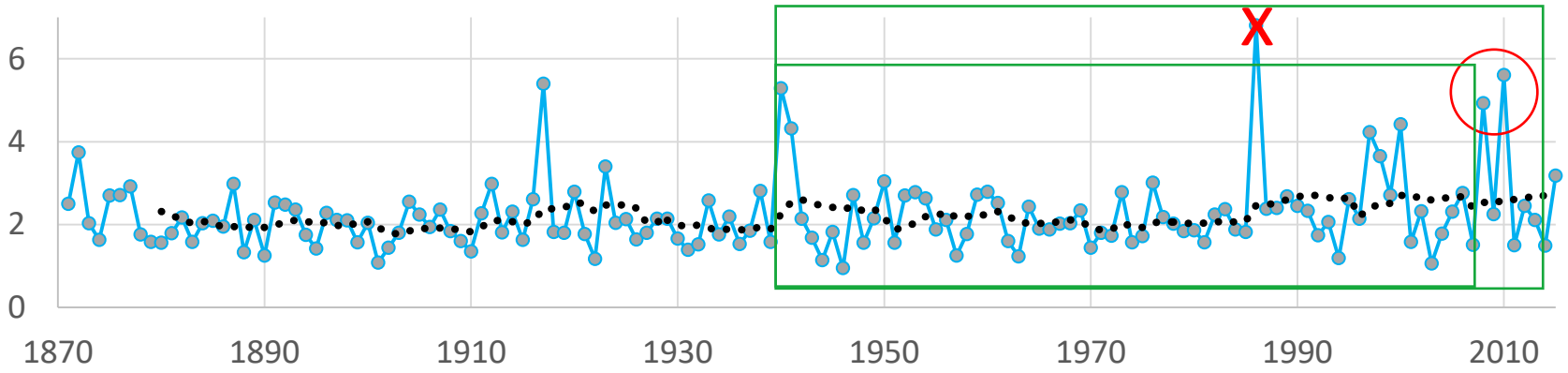
History of Watershed Planning for the KK

1980's	FEMA Floodplain
1999	Phase 1 Watercourse Management Plan
2005	Phase 2 Watercourse Management Plan
2007-'13	Various Engineering Studies/Designs
	Floodplain Mapping Update Underway
2014	Computed Flood Flows Increase 20-50%
2017	Updated Watershed Plan Completed

Engineering design project areas

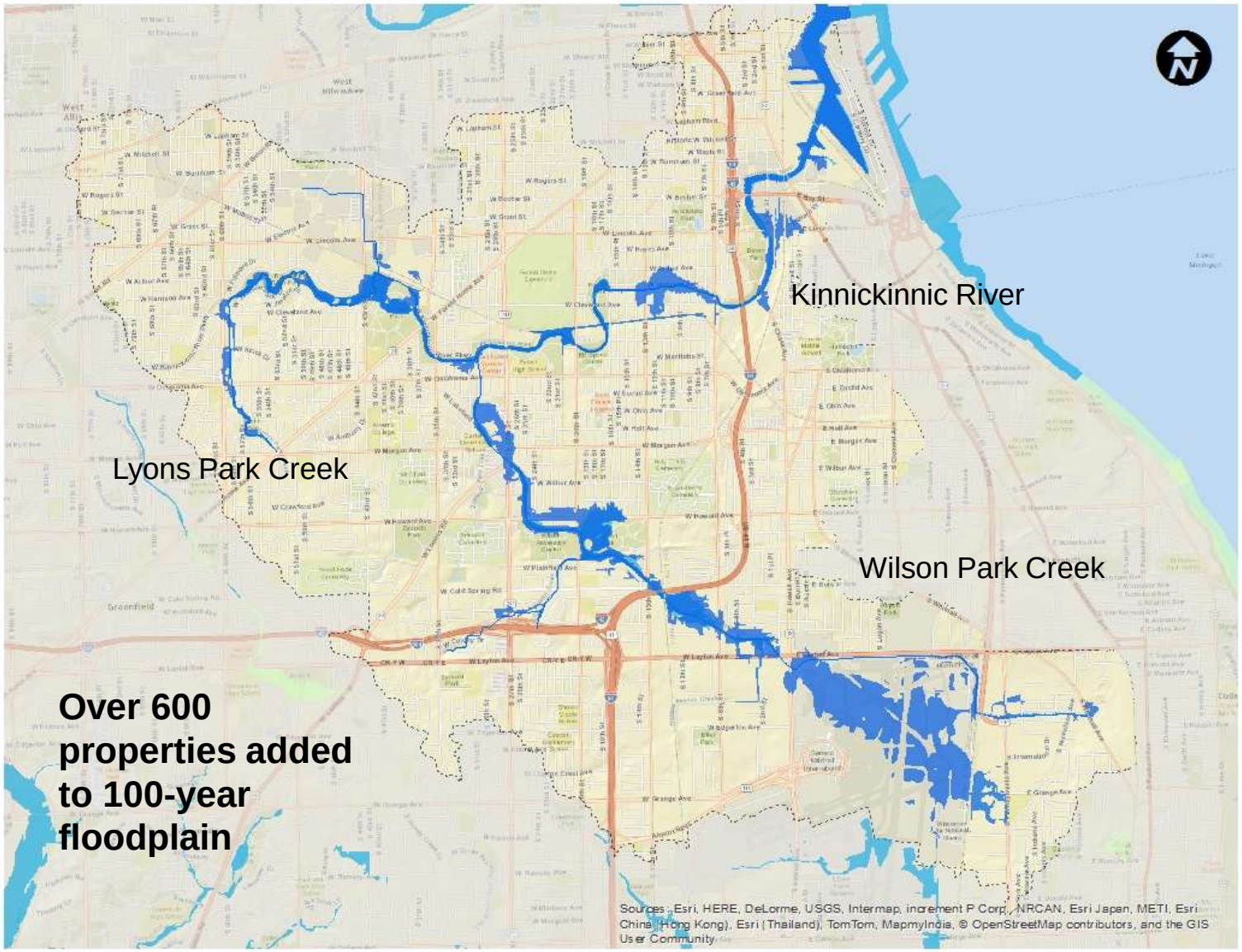
Milwaukee annual & maximum daily precipitation (inches)





New statistical analysis increased 1% Probability Flows 20% or more

Updated Flood Risk



KK River Watershed Plan Update Objectives

- Reduce Flood Risk to all structures subject to flooding in the 1% probability event (under the updated flood risk scenario)
- Improve Public Safety
- Improve Riparian & Aquatic Habitat
- Improve Natural Aesthetics of channel
- Leverage Additional Community Objectives

“Baseline” Conditions

Previous Recommendations

+

Remove All Concrete Channel

+

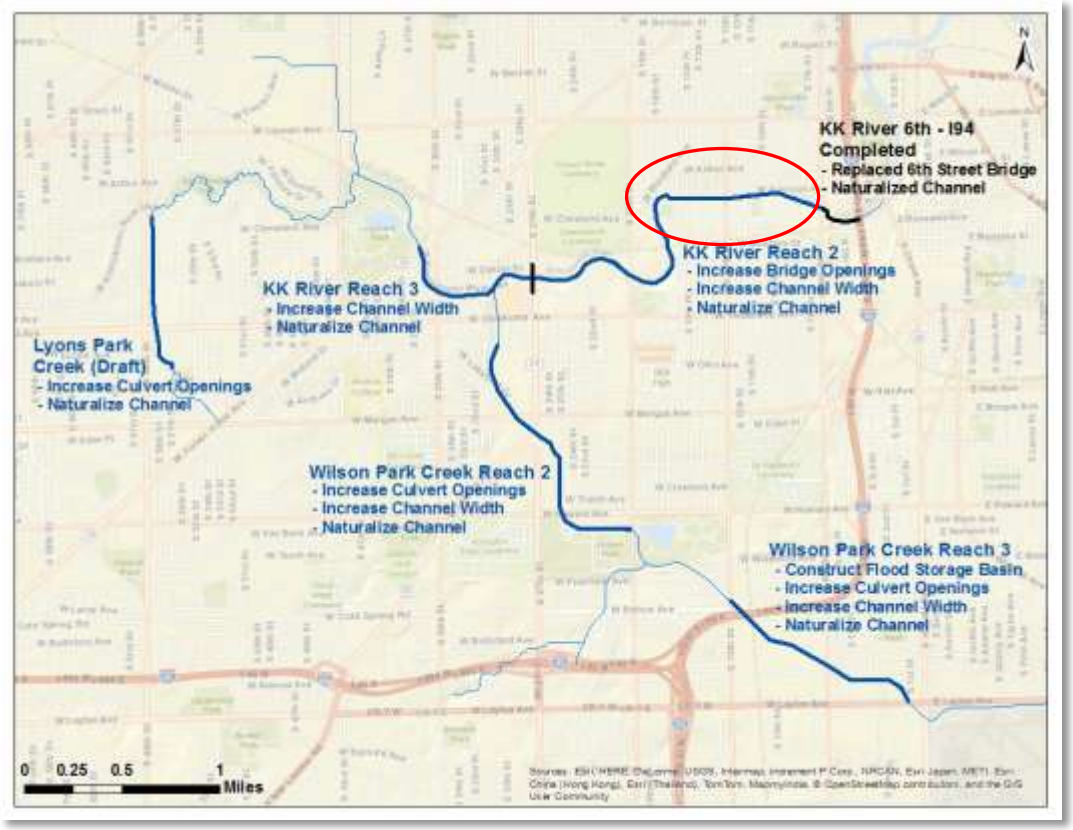
Increased Flood Flows

=

Baseline

$130-$160M

200+ structures still in floodplain



KK River: 6th – 16th

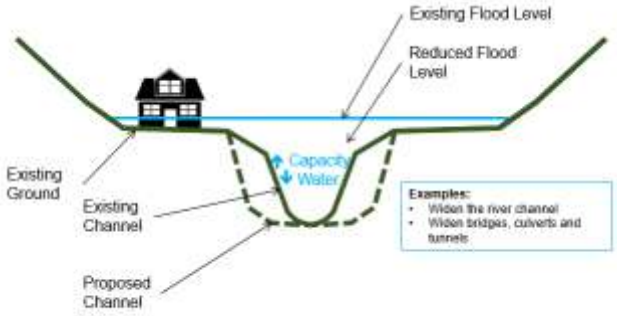
KK River: 6th St. – 16th St.
Preliminary Engineering and Community Outreach


Watershed Engineering Toolkit

Push it or Slow it
Block it
Buy it or Lift it
Store it

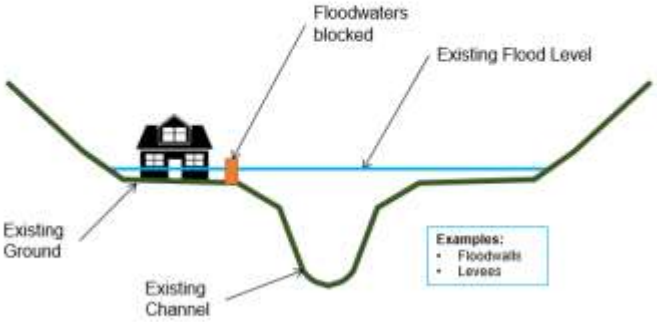
PUSH IT or SLOW IT: slow it down & make more space for the water

Increase waterway capacity → water surface elevations decrease



BLOCK IT: physical barriers

Block floodwaters from areas with buildings and structures



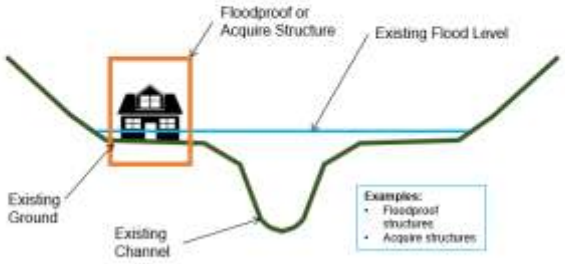
STORE IT: floodable areas store it by "retaining" or "detaining" on public (& sometimes private property)

Includes green infrastructure strategies

Reduce Flows → Water Surface Elevations decrease

BUY *IT* or LIFT *IT*: acquisition & flood proofing private property

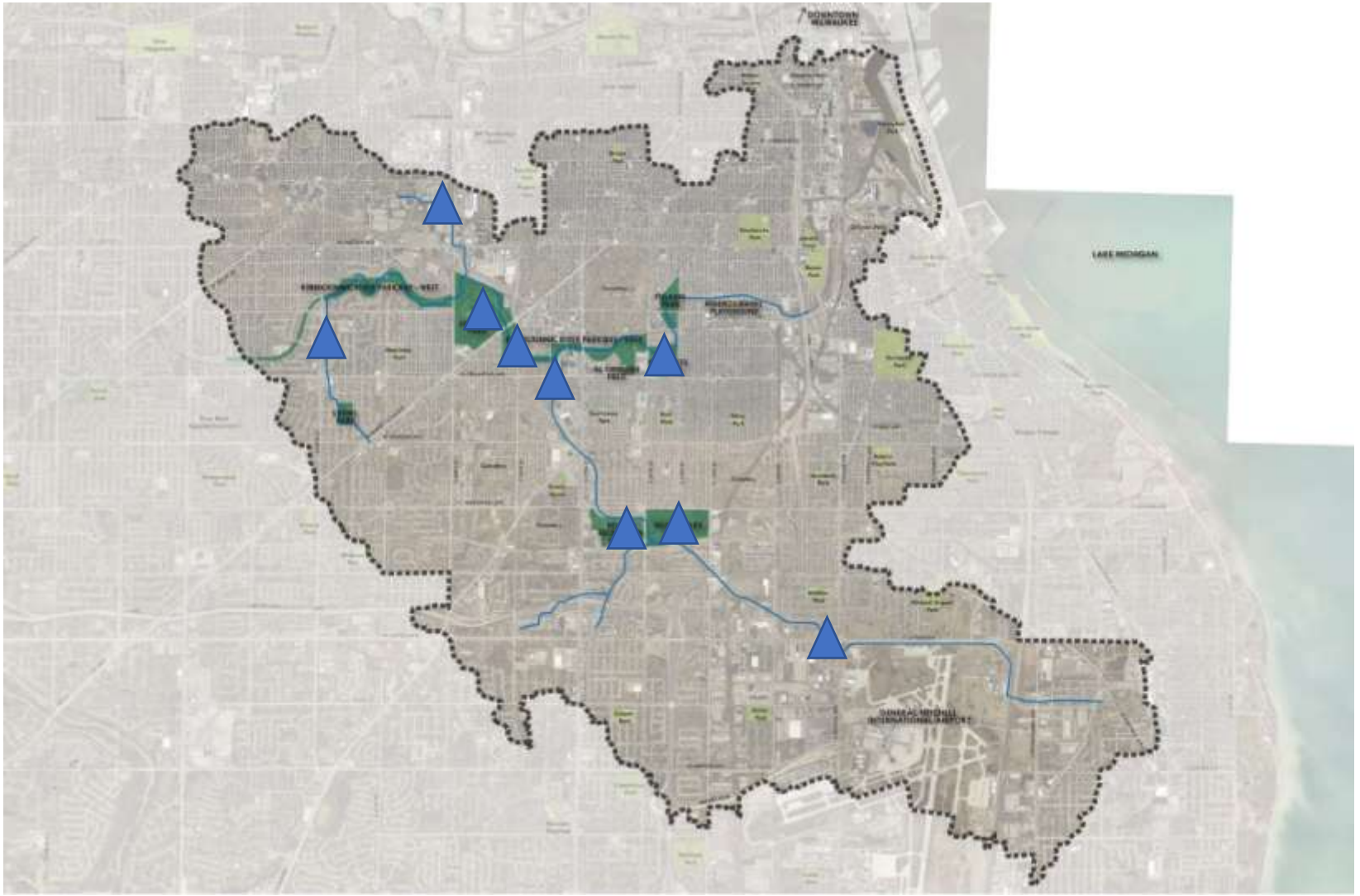
Floodproof or acquire damaged properties



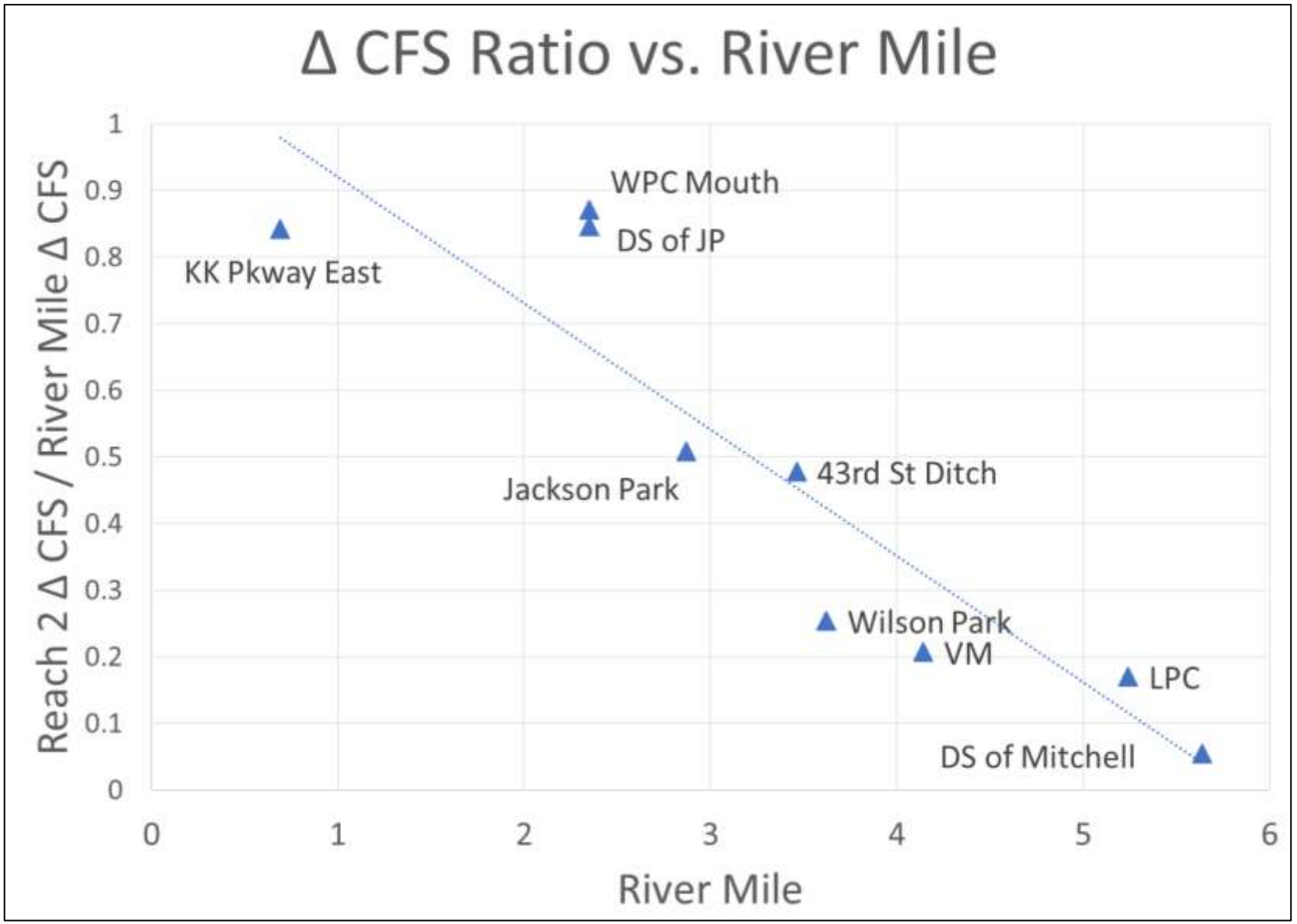
Storage

Storage options were a high priority in order to minimize acquisitions.

Storage Basin Conceptual Locations



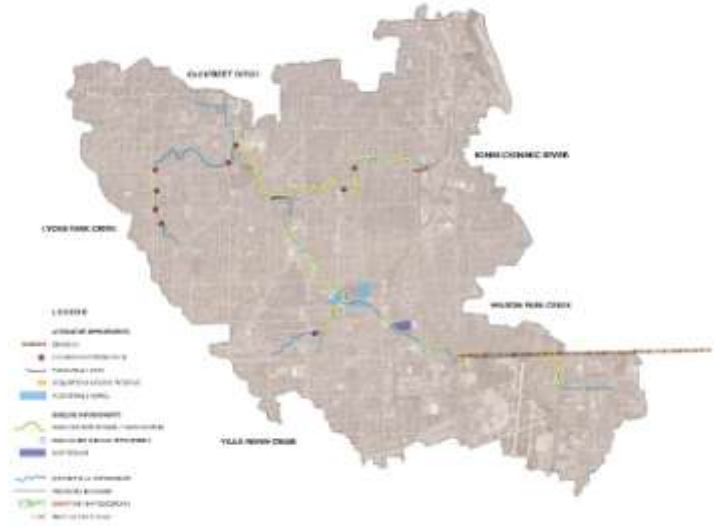
Reservoir Performance for Reach 2 Benefits



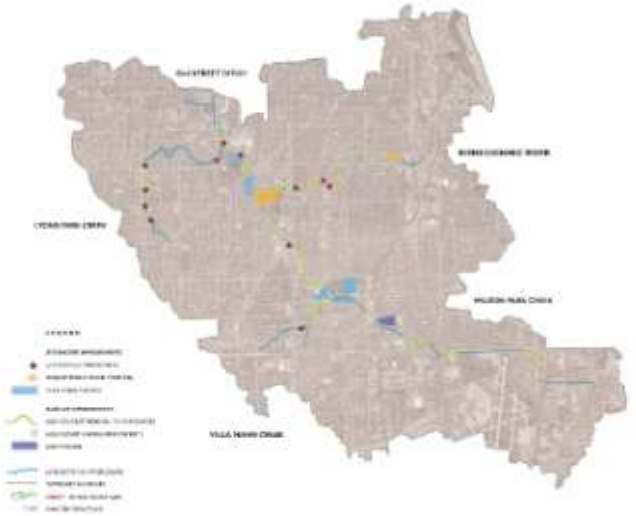
Alternative Development Process

Storage Alternative

Conveyance Alternative

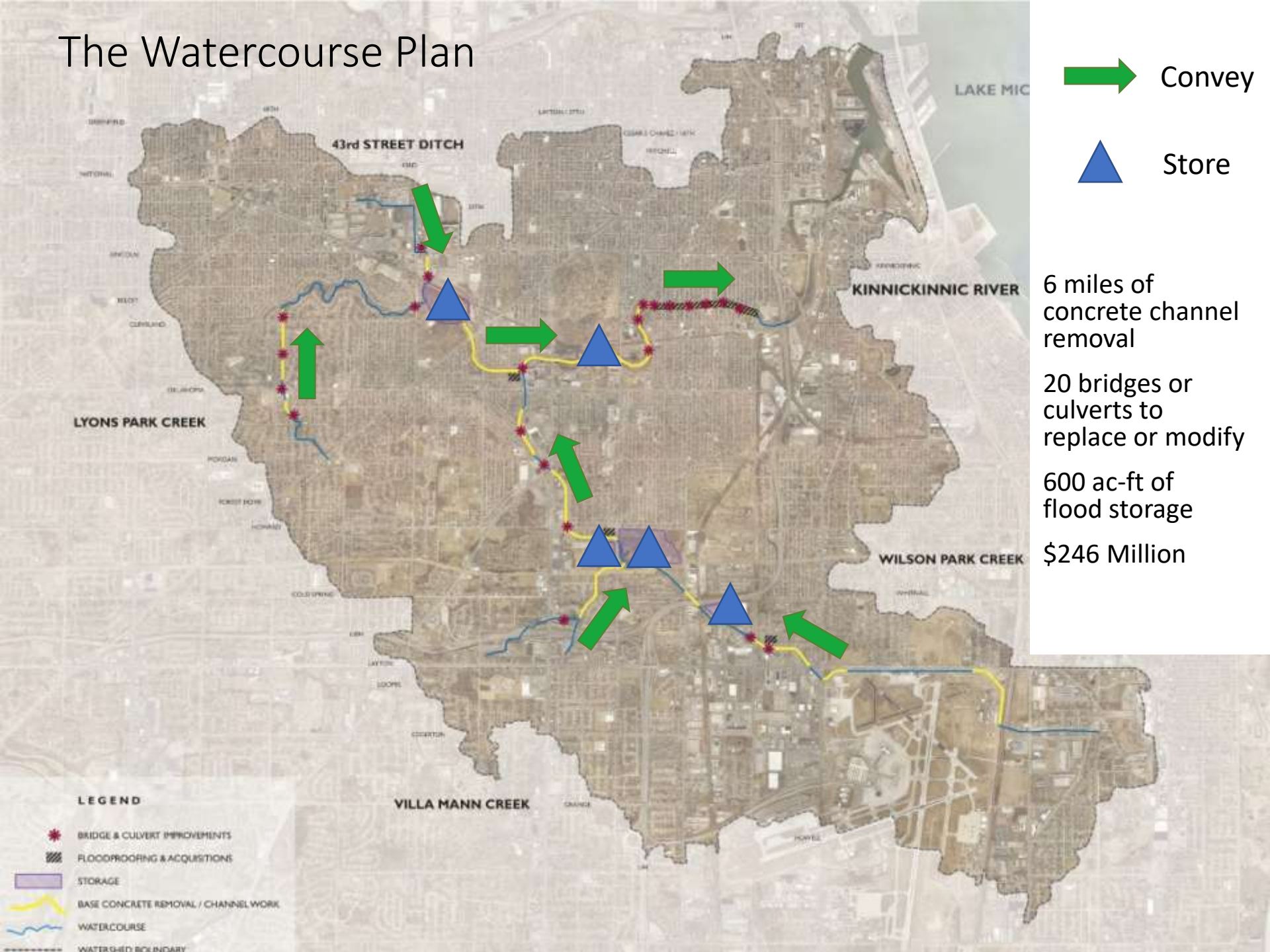


Diversion Alternative



Blended Alternative

The Watercourse Plan



Convey

Store

6 miles of concrete channel removal

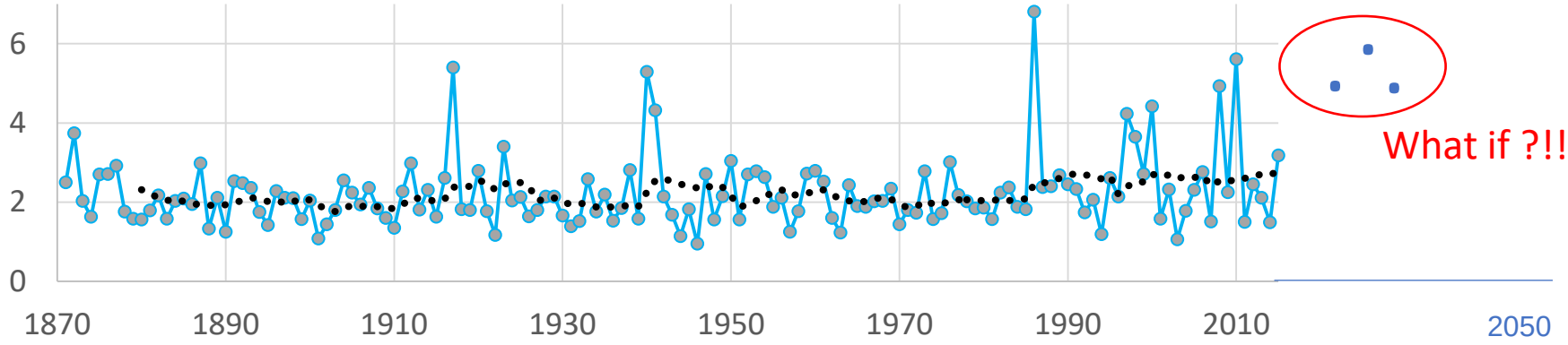
20 bridges or culverts to replace or modify

600 ac-ft of flood storage

$246 Million

Resiliency Planning

- What if flood risk continues to increase?
- Predicted 10% to 30% increases 100-year, 3-hour rainfall by 2050
- Proposed improvements were tested under these two scenarios
- Recommended improvements were adjusted to accommodate the low end future scenario



Multidisciplinary Collaboration

Agency Stakeholder Feedback

Collaboration between MMSD and Milwaukee County Parks was Essential to the Project

Combine MMSD & MCP agency efforts with stakeholder & community desires to reach the community goals:

Reduce flood risk

+

Make the river a community asset

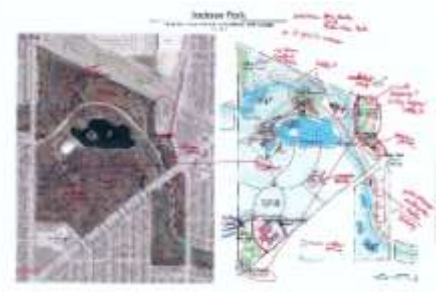
+

Enhance area parks

=

Neighborhood renaissance

Kinnickinnic River Watershed
Park System Vision Planning Process 2014-2017



Kinnickinnic River Watershed
Park System Vision Planning Process
2014-2017

Kinnickinnic River Watershed Park System Vision

Pulaski Park

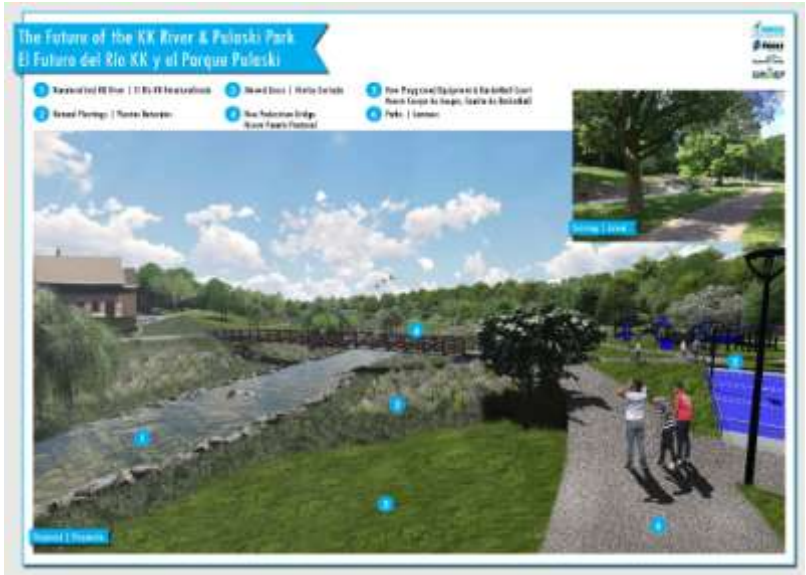
Kinnickinnic River Parkway East,
Al Simmons Field & KK Sports Center

Jackson Park

Kinnickinnic River Parkway West

Wilson Park

Final Design Process in 2017 & Construction beginning in 2018




Community Feedback

What We Heard from the Community...

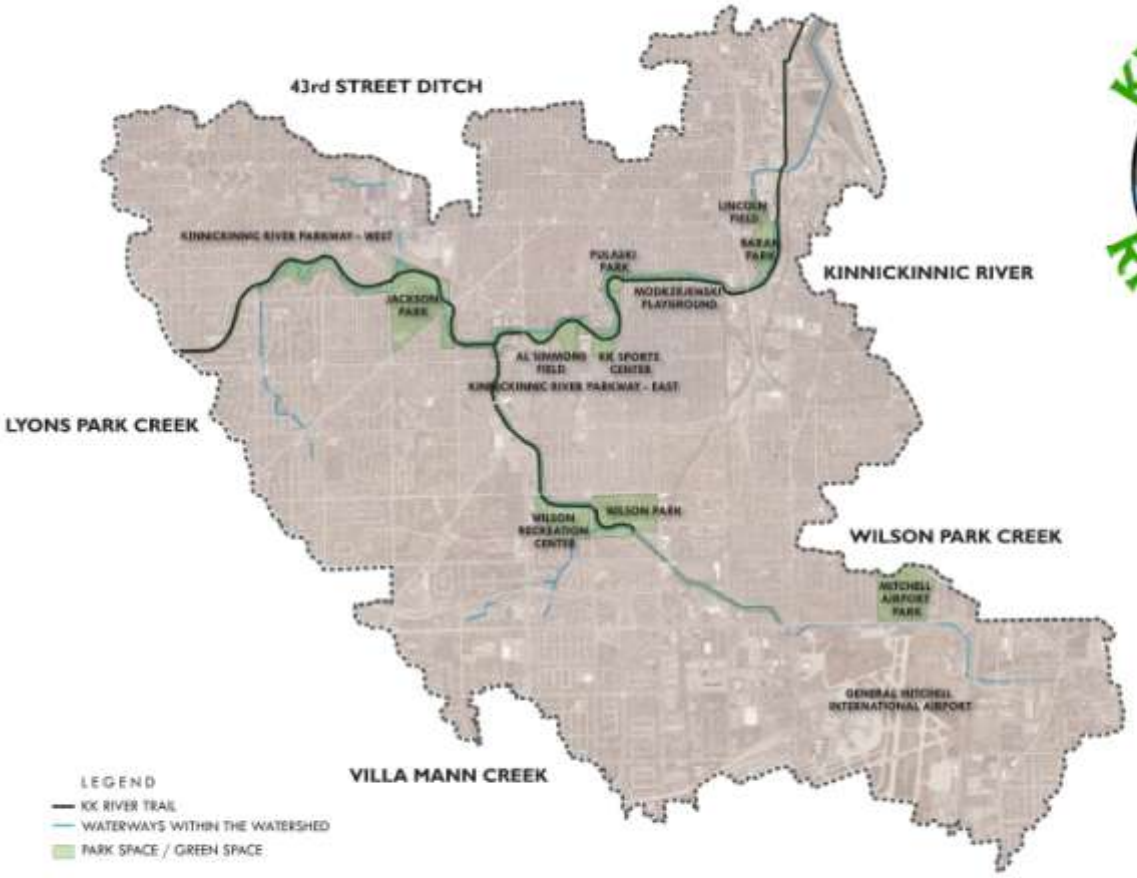

Make the KK River a Community Asset


De-channelize / Daylight / Re-naturalize


Save Older Growth Trees


Increased River Access and Safety


KK River Trail Extension



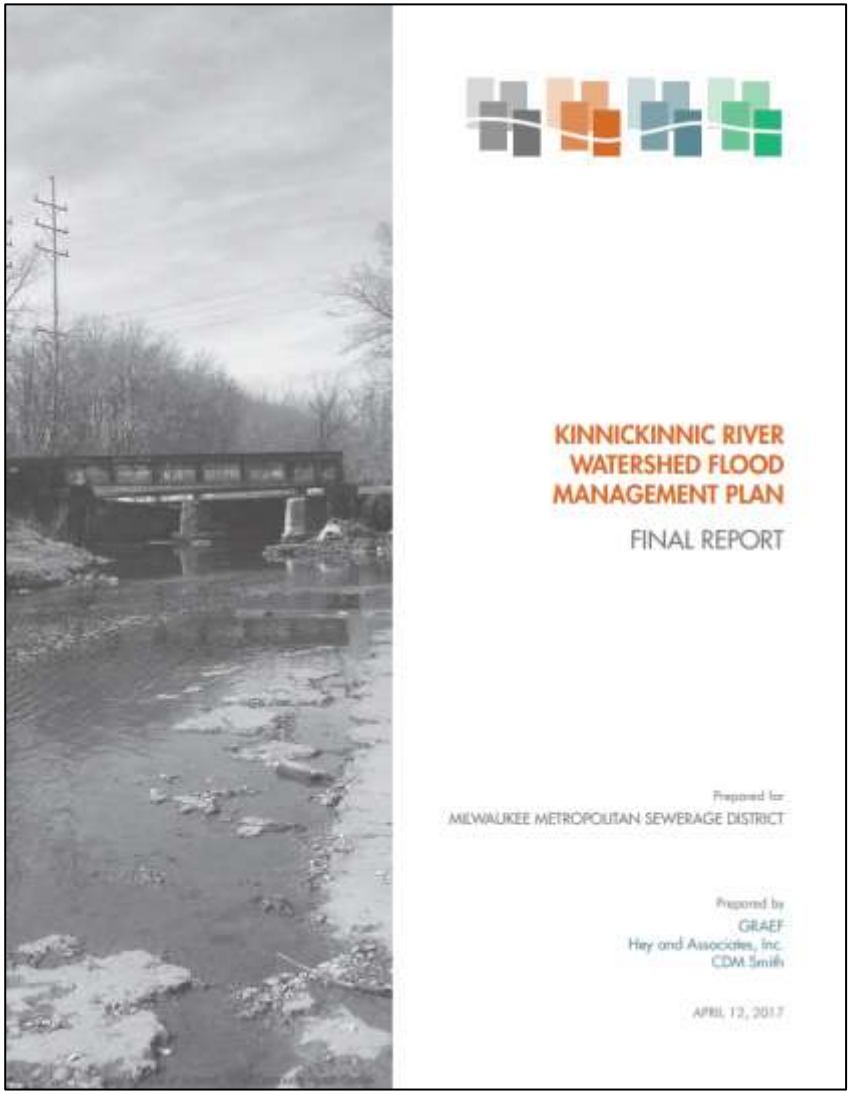
KINNICKINNIC RIVER TRAIL

Kinnickinnic River Watershed

PROPOSED KK RIVER TRAIL EXTENSION FROM S. 6TH STREET & CHASE AVENUE

Milwaukee, WI

Engineering, Planning and Community Involvement = Successful Plan for the Future of the Kinnickinnic River!



Thank you!

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GRAEF — Matt Bednarski, PE, ENV SP

MMSD PARTNERS FOR A CLEANER ENVIRONMENT — Patrick Elliott, PE, CFM