Evaluation of Physical Separation Alternatives

for the Great Lakes and Mississippi River Basins in the CAWS

IAFSM Conference

March 15, 2012

Two Facts

1. Over 100 years ago, the flow direction of the Chicago River was reversed creating a continuous water connection

2. There is a bidirectional movement of aquatic invasive species between basins

Aquatic Invasive Species

Non-indigenous species, or "non-native", plants or animals that adversely affect the ecology of…

HDR

Agenda

- Background and Purpose
- Separation Alternatives
- Economics
- Status and Next Steps

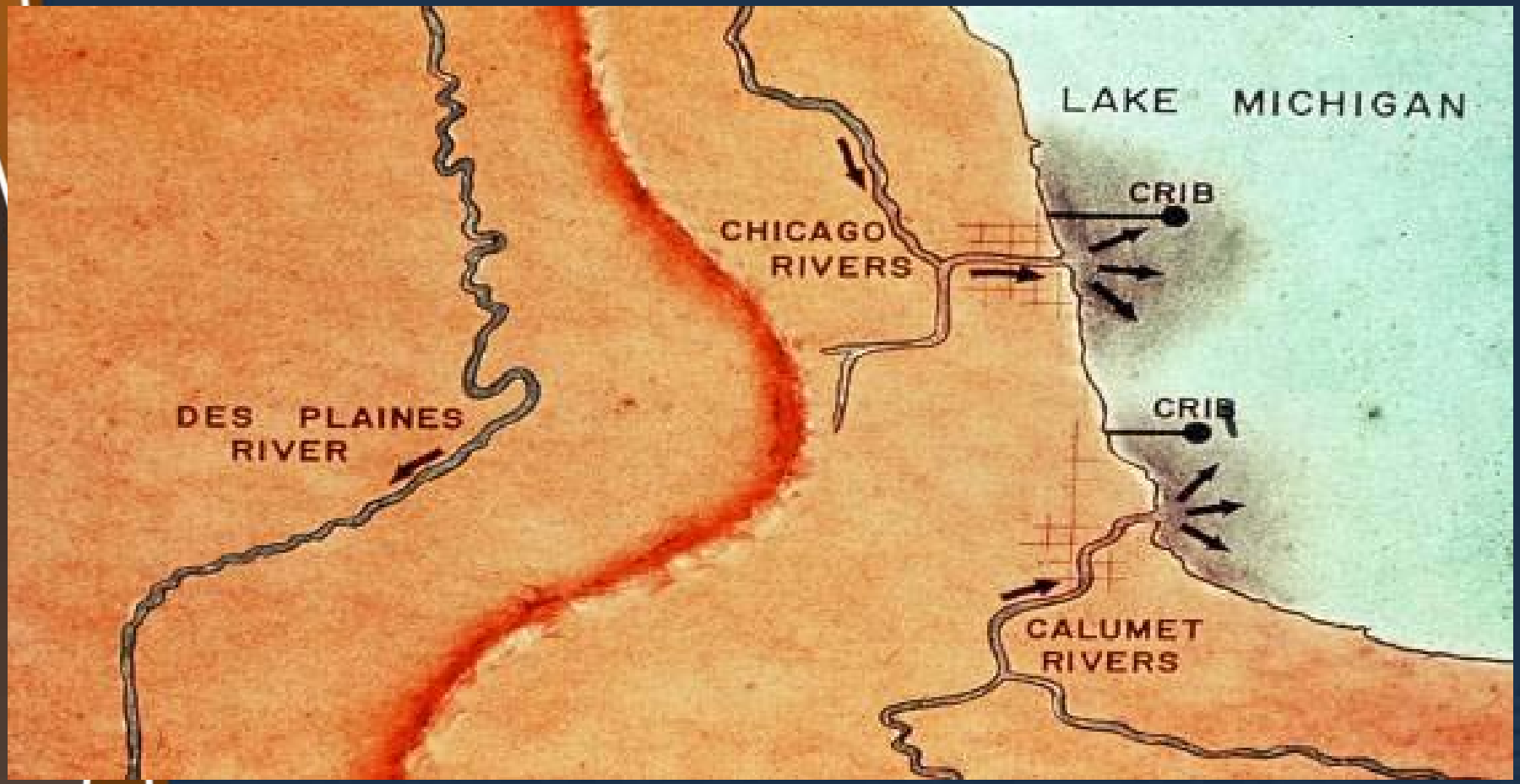
What is the Separation Study?

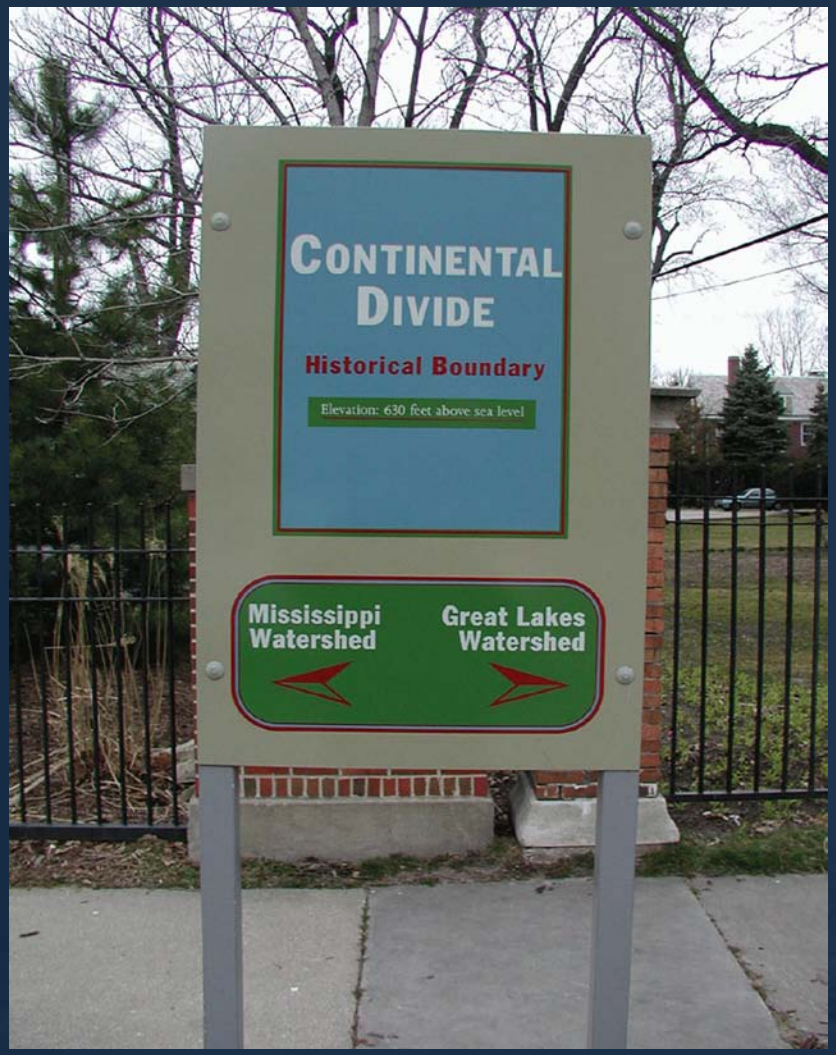
Purpose: Develop and evaluate options for *physical separation* of the Great Lakes and Mississippi River Basins in the *CAWS*.

What is the study focus area?

Chicago Area Waterway System-
"The CAWS"

Pre-CAWS 1860-1900




CONTINENTAL
DIVIDE
Historical Boundary
Elevation: 630 feet above sea level
Mississippi
Watershed
Great Lakes
Watershed

CAWS


NORTH SHORE CHANNEL
WILMETTE
LAKE MICHIGAN
CRIB
CHICAGO RIVERS
CRIB
DES PLAINES RIVER
MAIN CHANNEL
O'BRIEN LOCK
CALUMET RIVERS
CALUMET SAG CHANNEL
LOCKPORT

Project Goals

- Prevent the transfer of aquatic invasive species via the Chicago Area Waterway System (CAWS)
- Improve flood management
- Improve water quality
- Improve transportation (i.e., movement of goods, materials and people)

What are the challenges of the study?

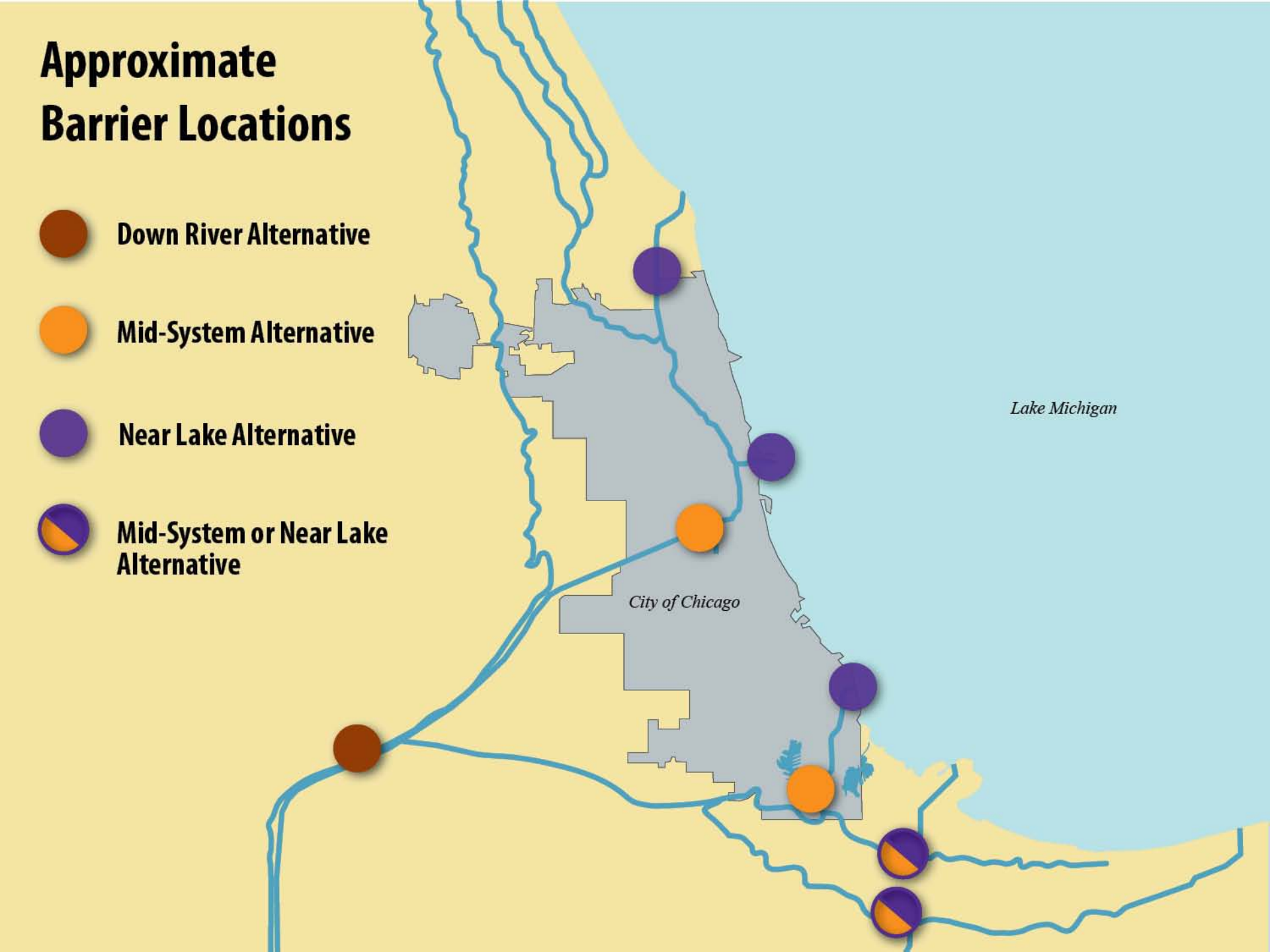
- Flood Management
- Water Quality
- Transportation

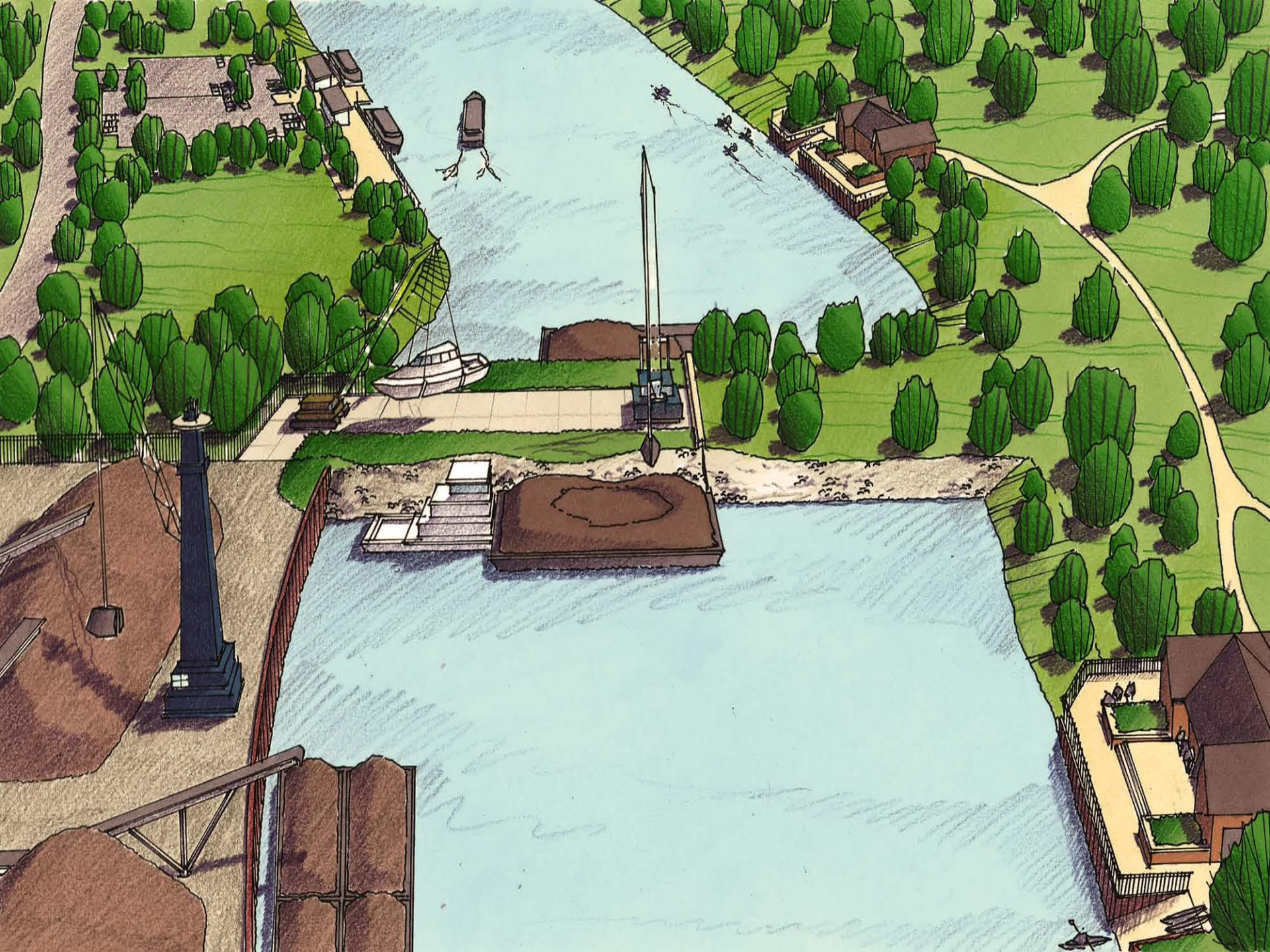
Study Objectives

- Establish baseline conditions
- Provide at least three options for physical separation
- Estimate economic cost and benefits
- Provide summarized document

Alternative Evaluation

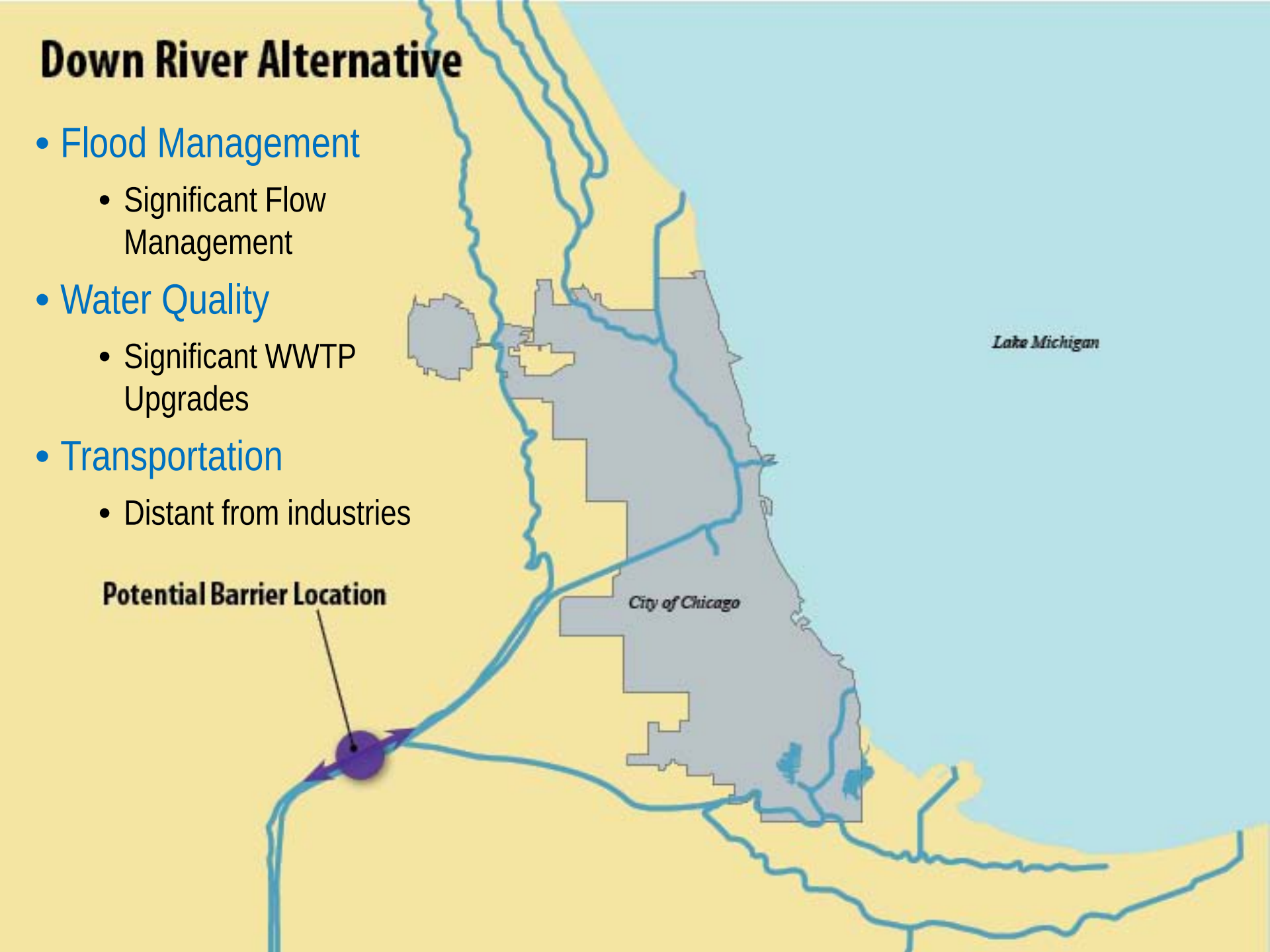
- Barrier Locations
- Associated Infrastructure Improvements
  - Flood Management
  - Water Quality
  - Transportation
- Timeline for Implementation
  - Improvements required prior to barrier installation
  - Dependencies (e.g. TARP)
- Economic Analysis
  - Incremental costs to existing commitments
  - Long-term qualitative beneficial return on investments


Approximate Barrier Locations
Down River Alternative
Mid-System Alternative
Near Lake Alternative
Mid-System or Near Lake Alternative
Lake Michigan
City of Chicago

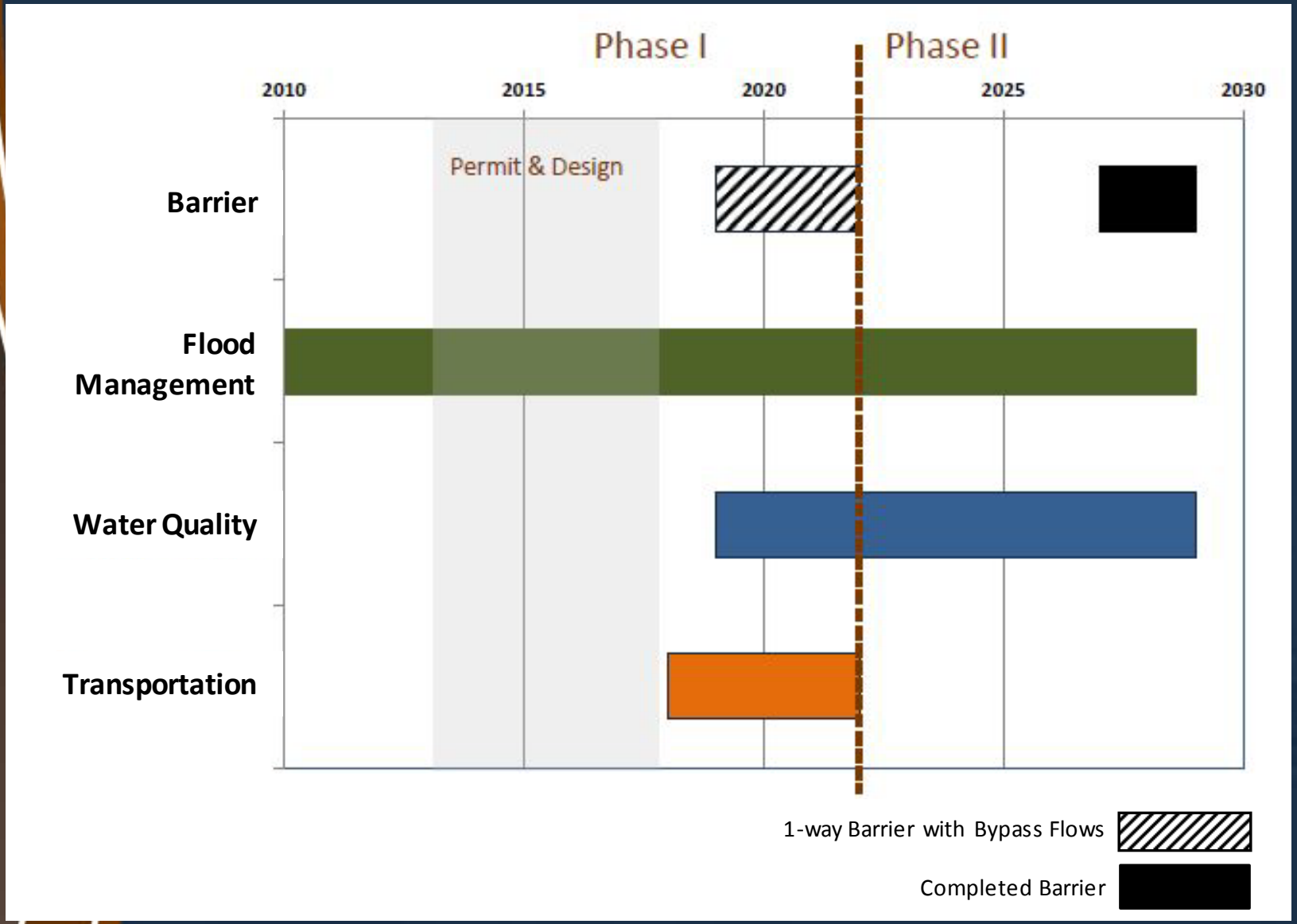


Down River Alternative

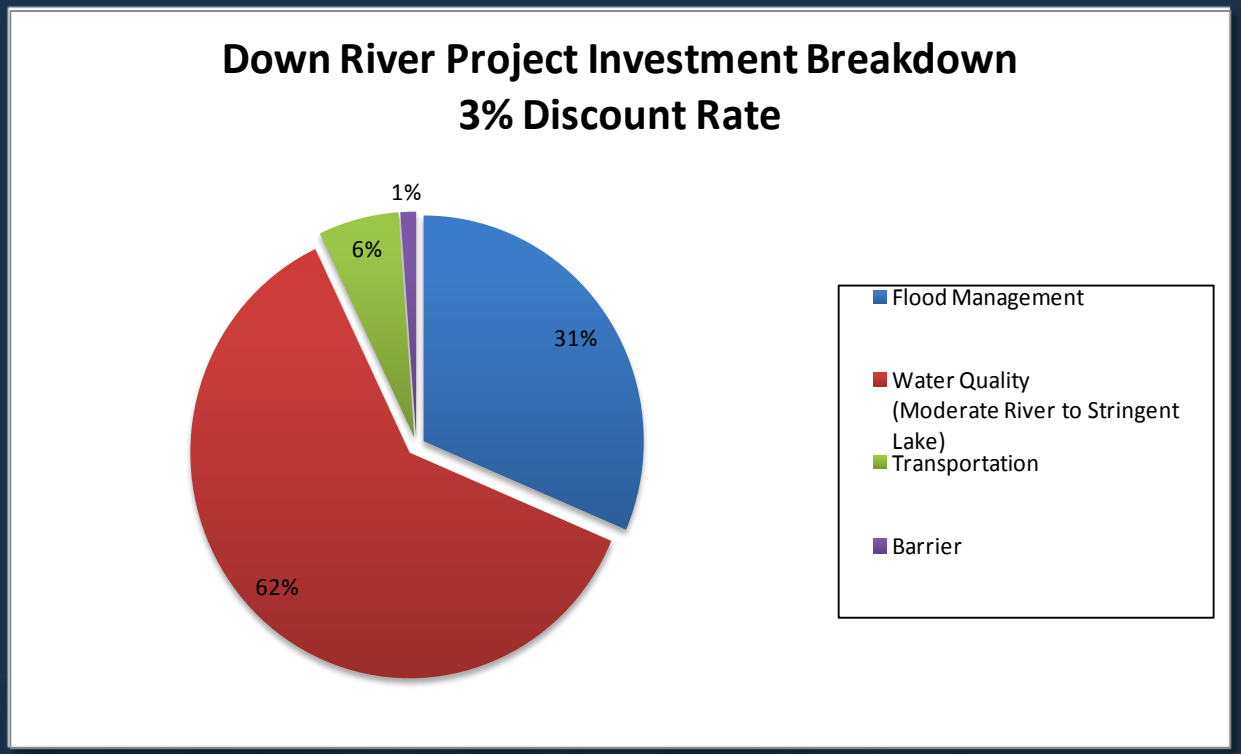
- Flood Management
  - Significant Flow Management
- Water Quality
  - Significant WWTP Upgrades
- Transportation
  - Distant from industries



Down River Alternative Timeline



Down River Alternative Project Investments*

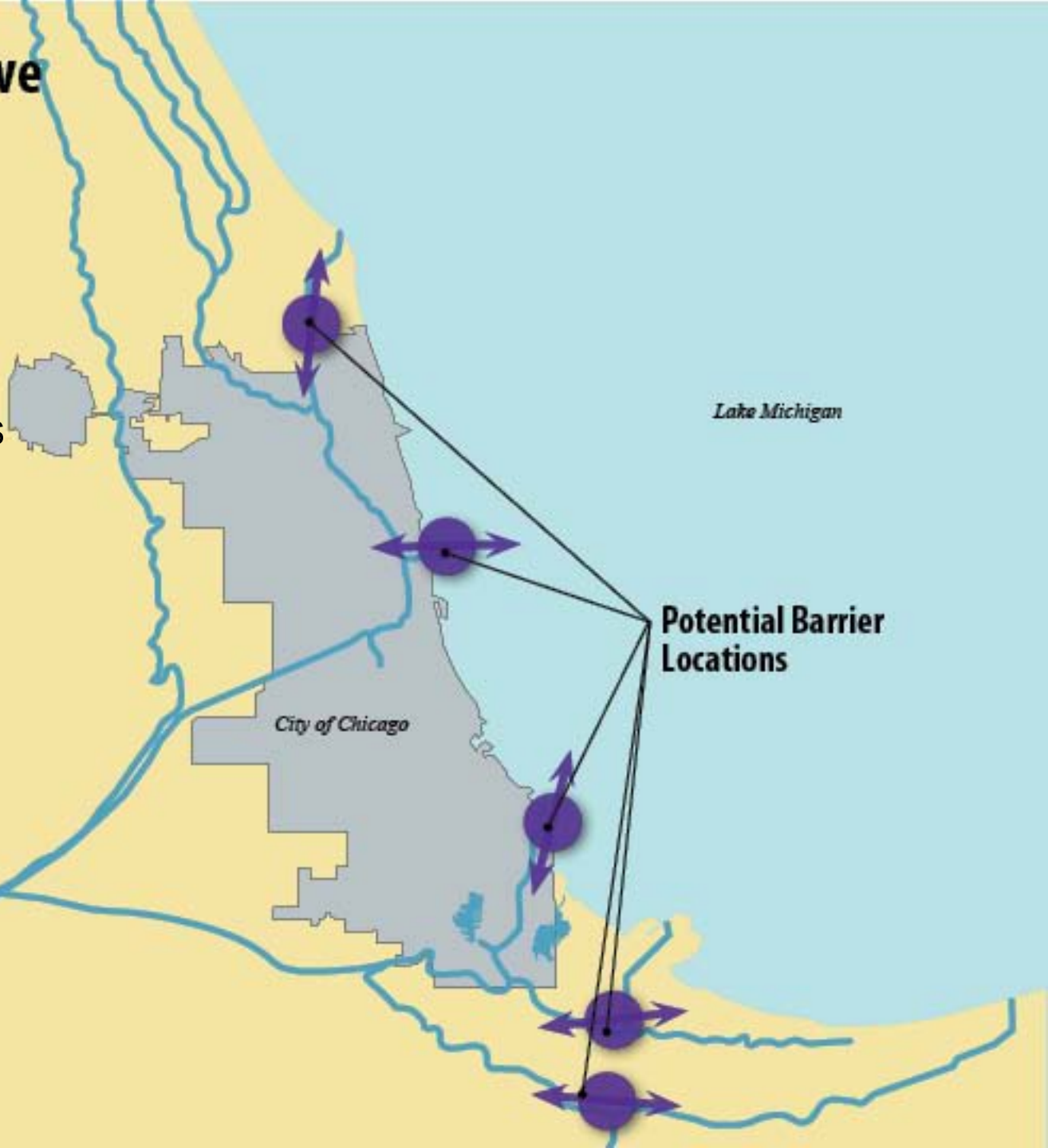


Area	Investment (billion $)
Flood Management	$2.98
Water Quality	$5.85
Transportation	$0.56
Barrier	$0.11
Total	$9.50

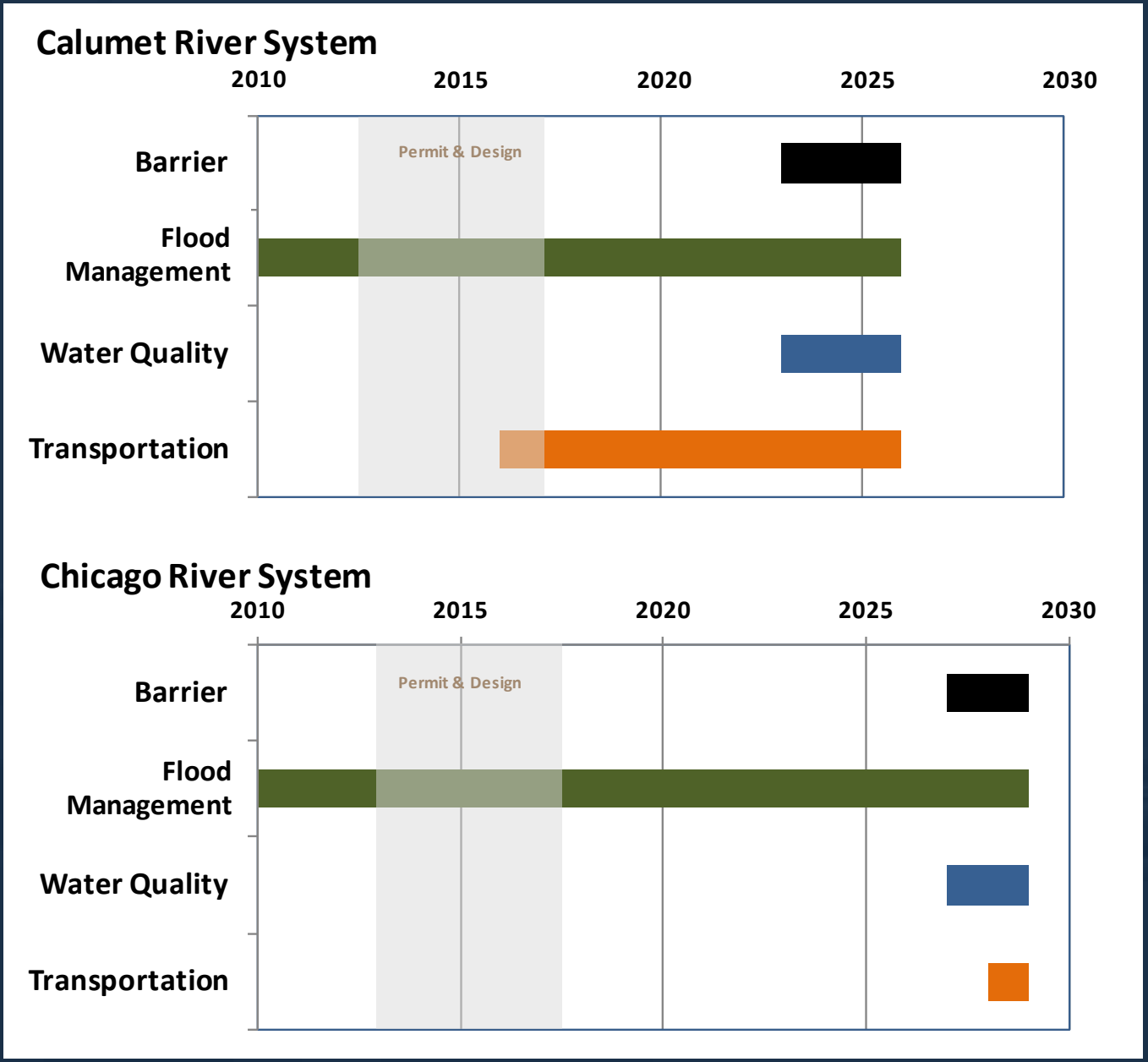
*All Investments Represent Median Values with 3% Discount Rate

Near Lake Alternative

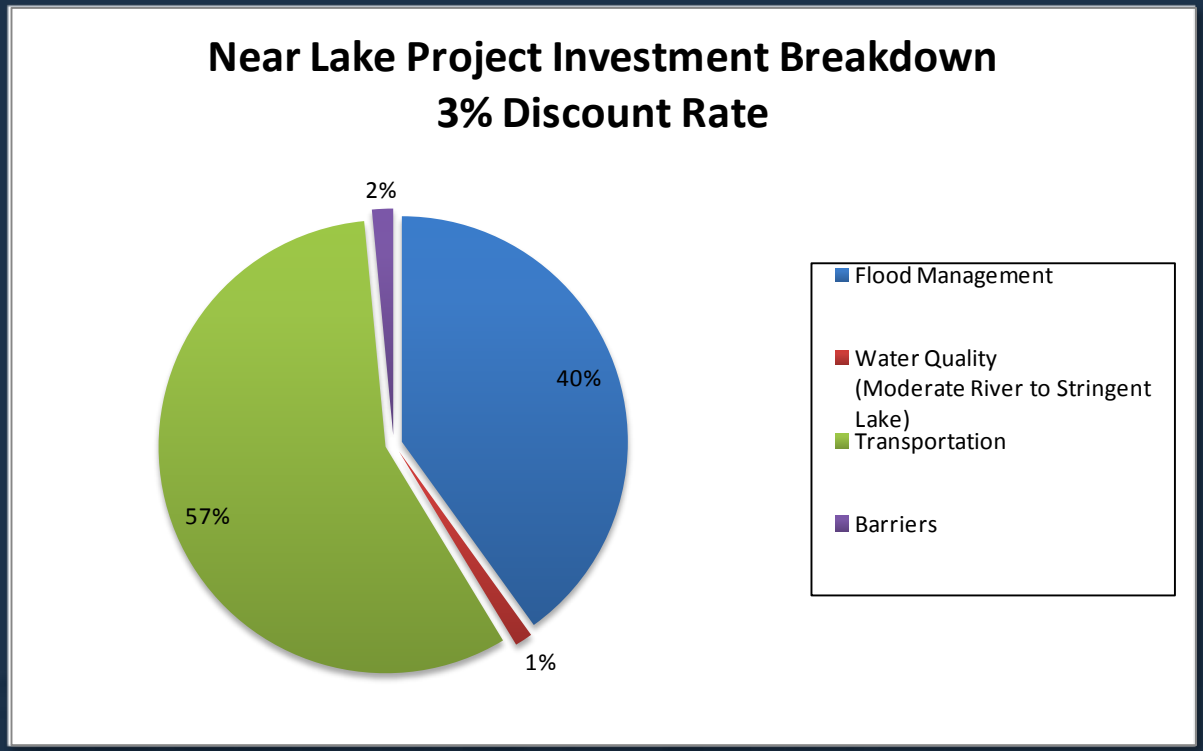
- Flood Management
  - Significant Flow Management
- Water Quality
  - Limited Requirements
- Transportation
  - Significant port and use impacts



Near Lake Alternative Timeline



Near Lake Alternative Project Investments*

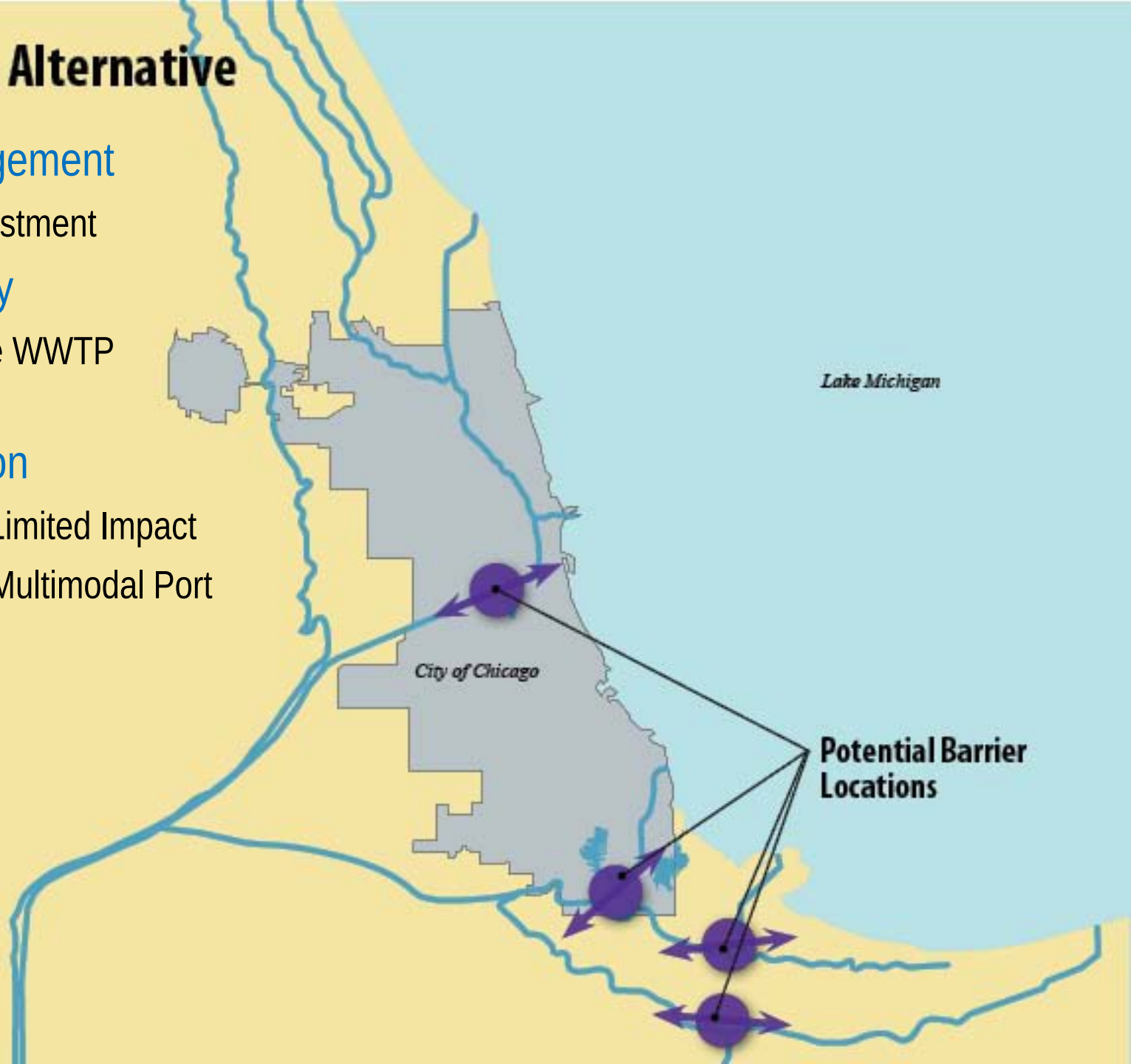


Area	Investment (billion $)
Flood Management	$3.82
Water Quality	$0.12
Transportation	$5.45
Barrier	$0.14
Total	$9.54

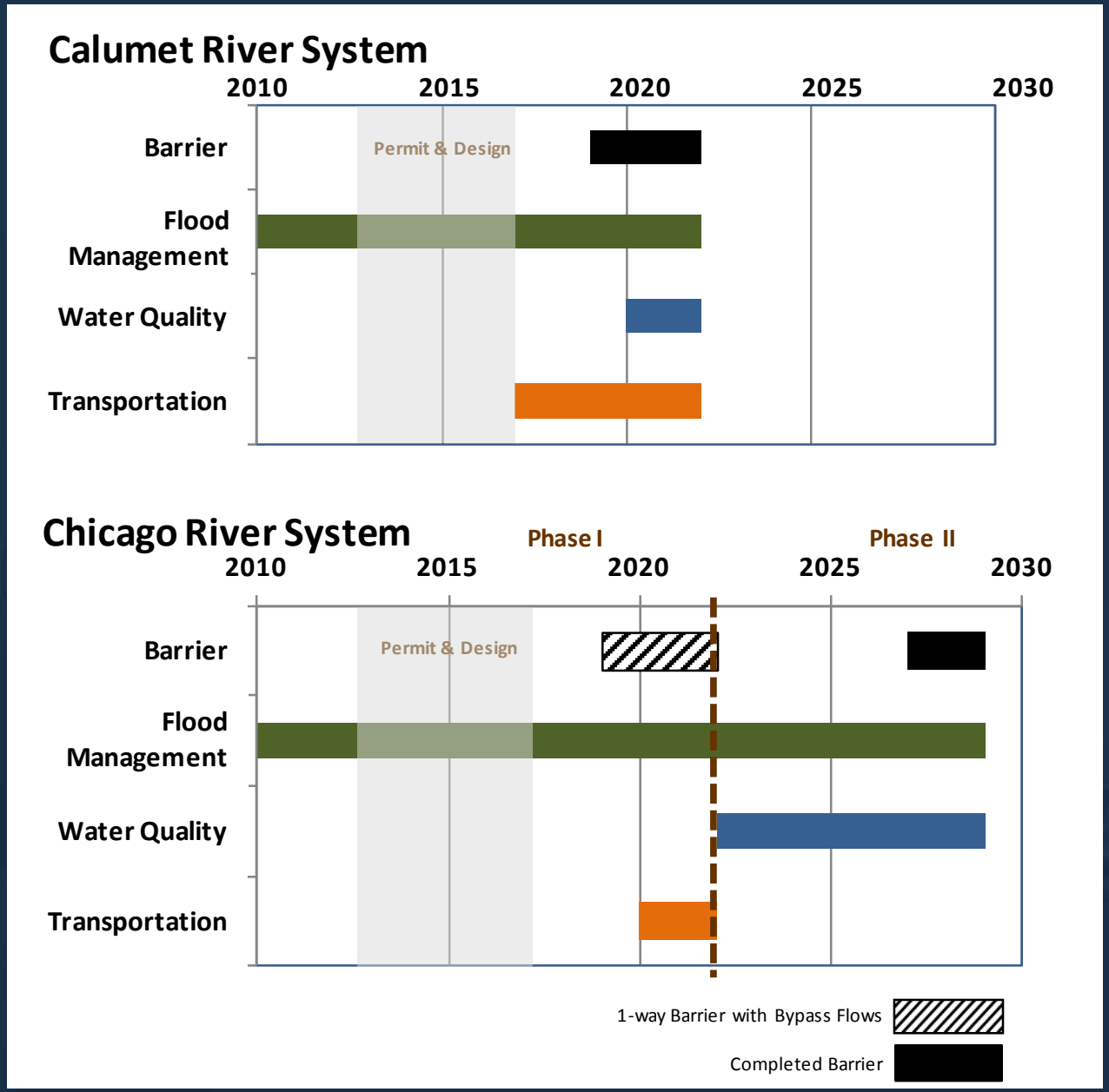
*All Investments Represent Median Values with 3% Discount Rate

Mid-System Alternative

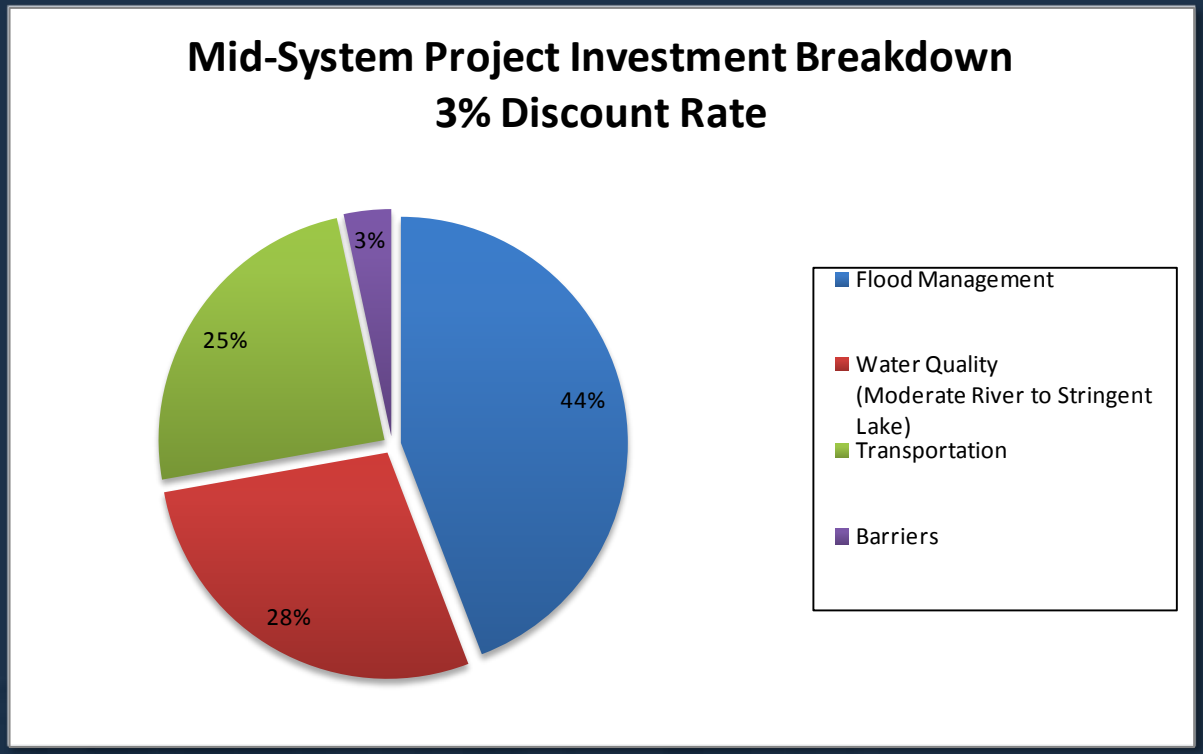
- Flood Management
  - Least Investment
- Water Quality
  - North Side WWTP Upgrades
- Transportation
  - Chicago: Limited Impact
  - Calumet: Multimodal Port



Mid-System Alternative Timeline

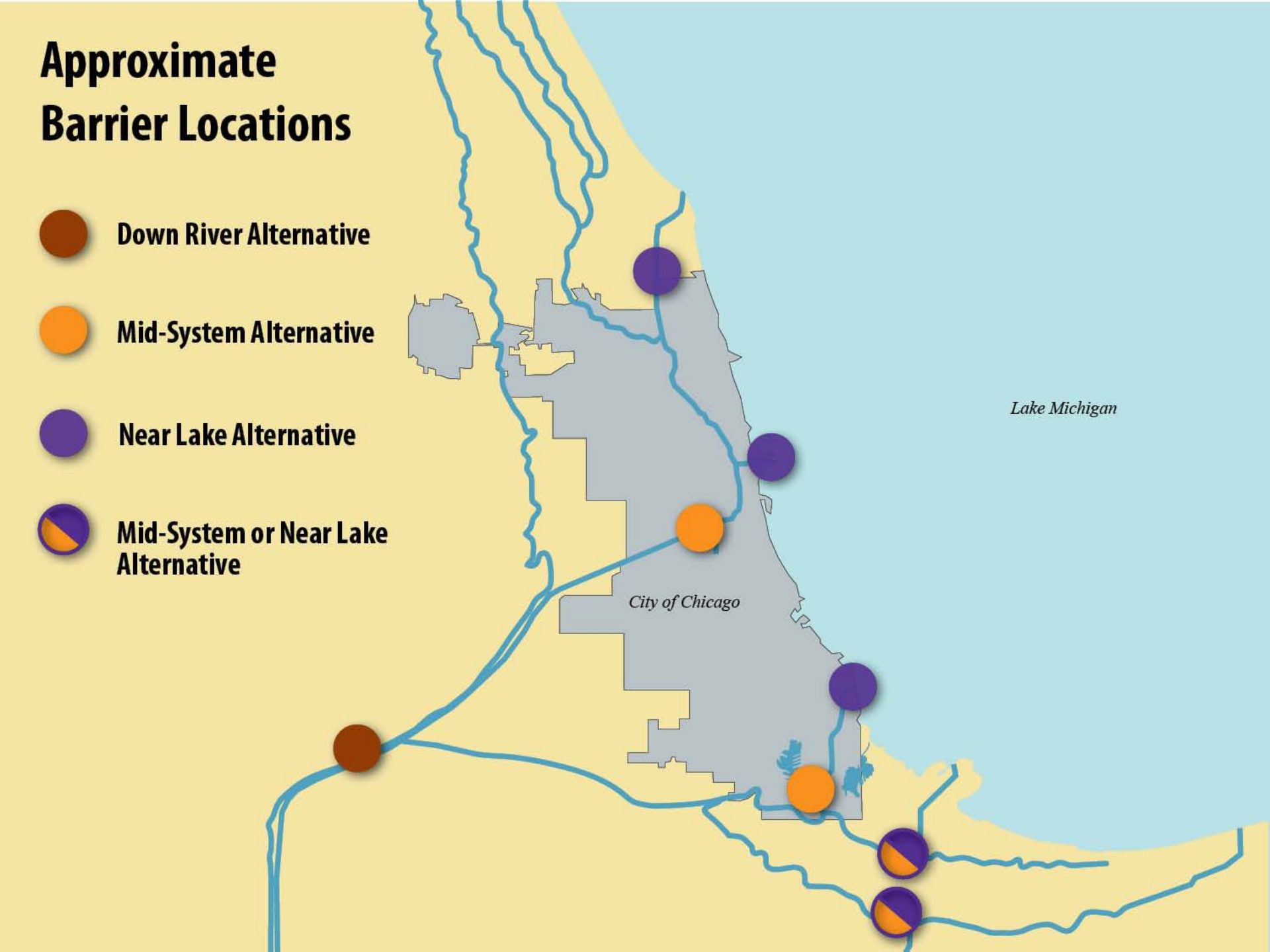


Mid System Alternative Project Investments*



Area	Investment (billion $)
Flood Management	$1.89
Water Quality	$1.20
Transportation	$1.04
Barrier	$0.14
Total	$4.27

*All Investments Represent Median Values with 3% Discount Rate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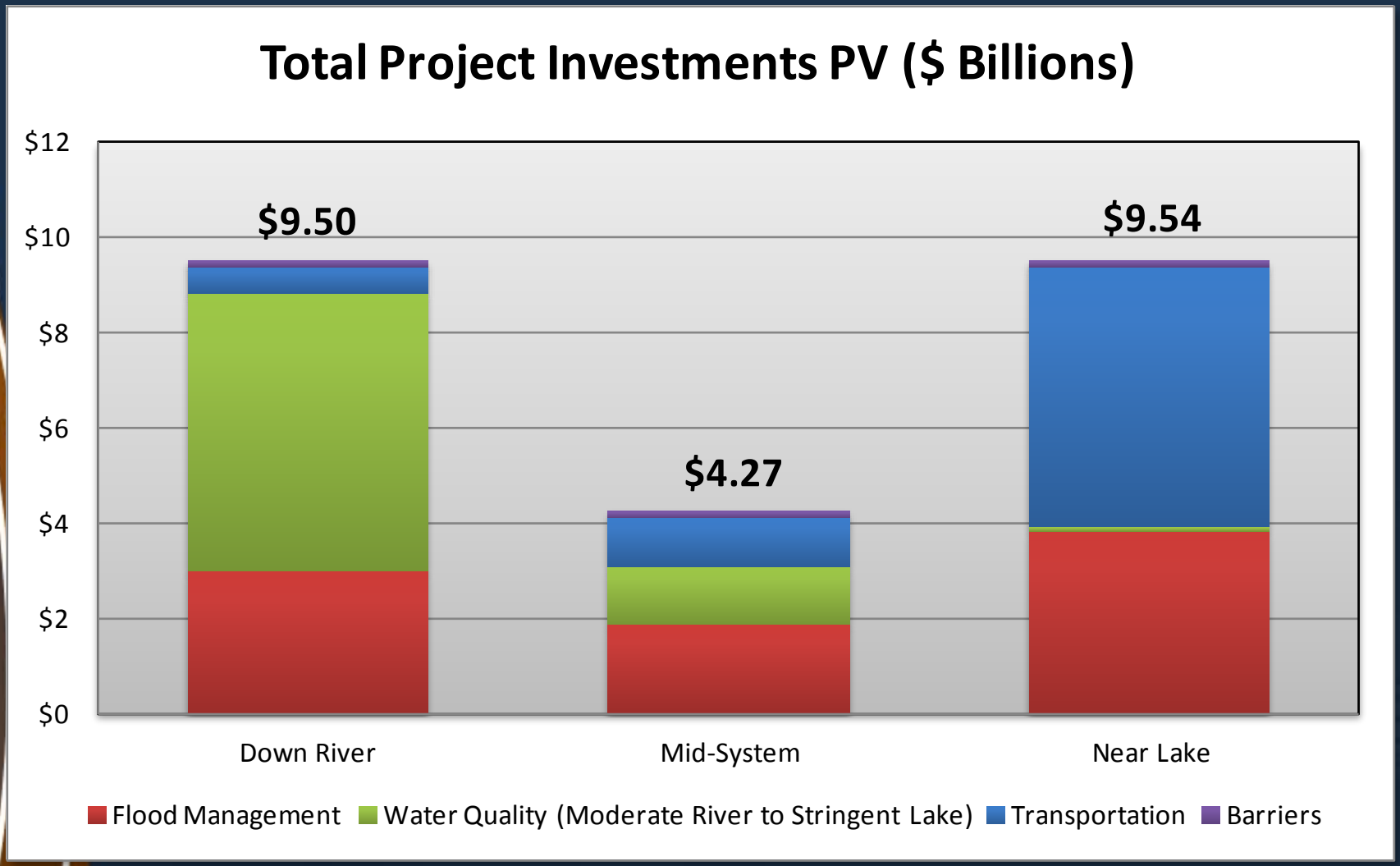
Total Project Investments* by Alternative



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Economics

Case Study Approach to AIS Risk

- No empirical evidence of future risk of AIS damage
- Developed a variety of economic benefit estimates using scenarios from the literature
- Two scenarios:
  - Reduced AIS risk benefit from 2030-2059
  - Reduced AIS risk benefit from 2030 - perpetuity

Annual AIS Damage Per Year in Great Lakes (only)	PV of Benefits To 2059 ($B)	PV of Benefits Perpetuity ($B)
$12 M (Sea Lamprey, low)	$0.14	$0.23
$18 M (Sea Lamprey, high)	$0.21	$0.34
$150 M (all transportation borne)	$1.73	$2.85
$300 M (Zebra Mussel, low)	$3.45	$5.70
$500 M (Zebra Mussel, high)	$5.76	$9.51

Willingness to Pay for Reduced AIS Risk

- No estimates of WTP for reducing AIS transfer between basins
- Project costs are localized in the Chicago area but the AIS benefits span across both basins
- What would society (households) have to be willing to pay per year for reduced AIS transfer risk to offset the project costs?
  - Moderate River / Stringent Lake Scenario for Down River and Mid-System
  - WTP Estimates from now to 2059

Alternative	Great Lakes Basin	Great Lakes and Mississippi River Basins
Down River Alternative	$24.50	$8.74
Mid-System Alternative	$11.01	$3.93
Near Lake Alternative	$24.60	$8.77

Status and Next Steps

- Report released January 31, 2012
- Briefings for decision makers
- Coordination with USACE (GLMRIS) and MWRD

Summary

- Study focused on physical separation and driven by AIS
- Alternatives illustrate range of issues
- Potential benefits and cost to society
- Inform and collaborate with decision makers

Questions & Discussion

More information: www.glc.org/caws