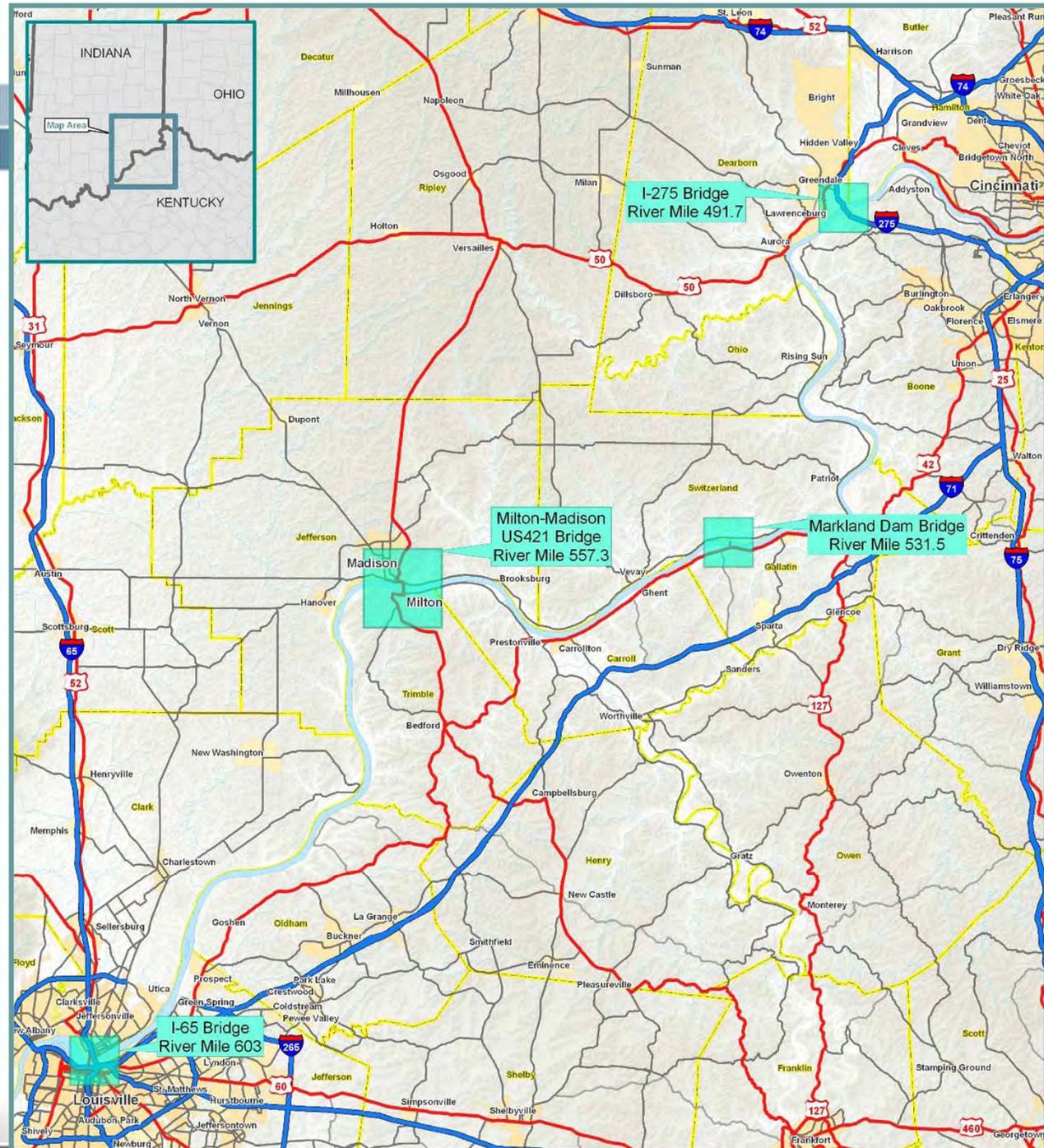




## Presentation Outline

- Study Area
- Bridge History
- Bridge Condition
- Project Selection Process
- Selected Alternative
- Pier Strengthening
- Section 106 and Section 6002 coordination
- Next Steps



# STUDY AREA

Two Historic Towns –  
One Community

One of two Ohio River  
bridges between  
Cincinnati and  
Louisville

I-65 Bridge - 46 miles  
Markland Dam - 26 miles  
I-275 Bridge – 65 miles



# CONNECTING TWO HISTORIC TOWNS THAT WORK AS ONE COMMUNITY

## MADISON, INDIANA

- Largest National Historic Landmark District with 1,800+ buildings
- Clifty Falls State Park & other tourist attractions, including Madison Regatta
- Population 12,600

## MILTON, KENTUCKY

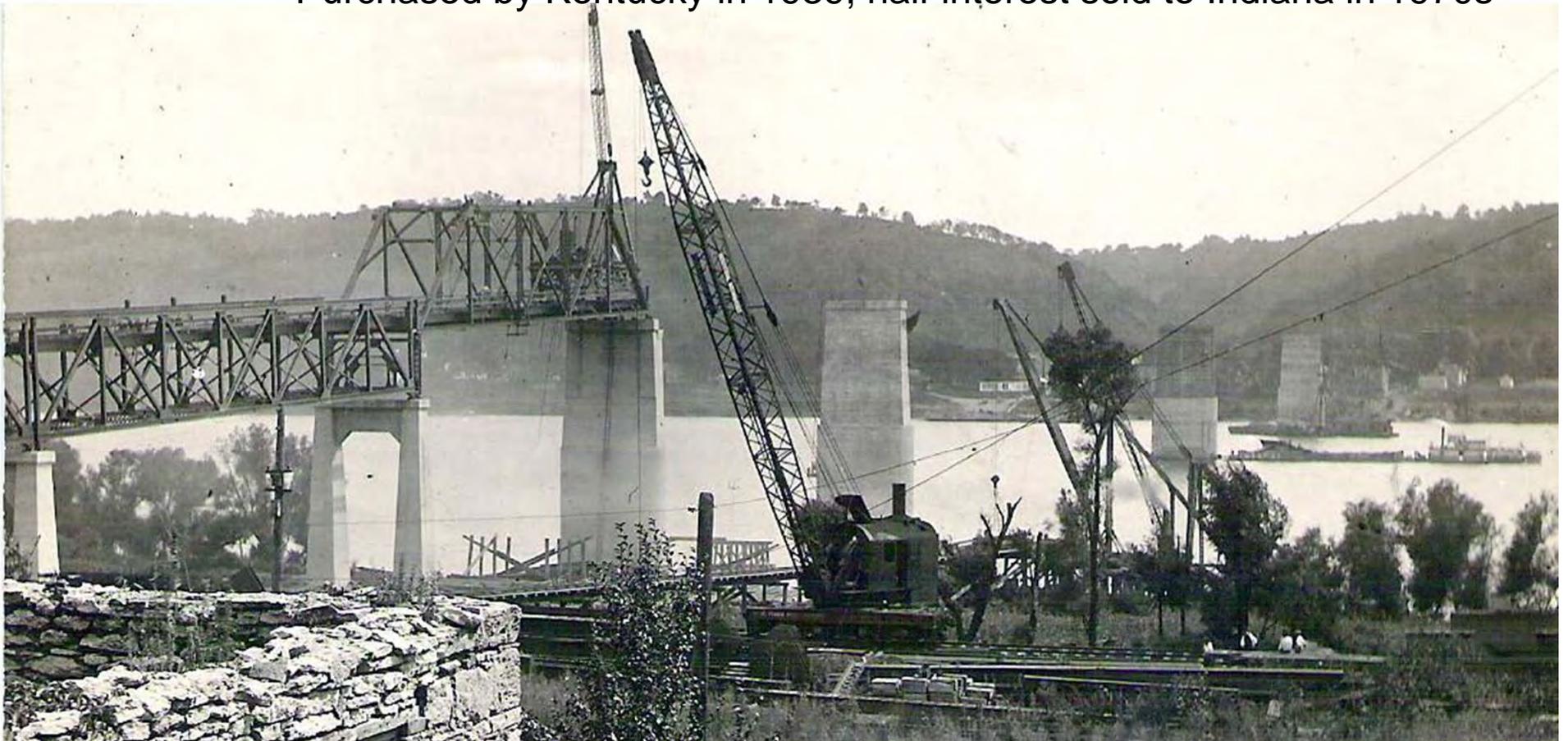
- Historic river town susceptible to flooding
- Rural community divided by 400 ft tall bluff
- Population 600





## US 421 BRIDGE HISTORY

- 3,181-foot long truss structure with two 10-foot wide travel lanes
- Built in 1929 by J. G. White through National Toll Bridge Company
  - Tolloed until 1949: 5¢ for pedestrians, 45¢ for vehicles
- Purchased by Kentucky in 1939; half interest sold to Indiana in 1970s

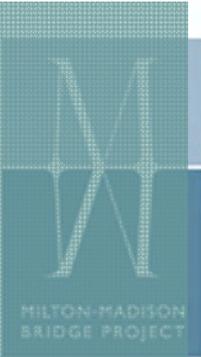




## US 421 BRIDGE TODAY

- 10,700 vpd (2008)
- 4% truck traffic
- *70% of bridge traffic destined for Madison*
- 48 reported crashes on bridge in 4 years, plus other minor accidents (trucks knocking off side view mirrors)
- Last major rehabilitation in 1997
- *Weight limit posted in April 2009 to prohibit trucks over 15 tons*

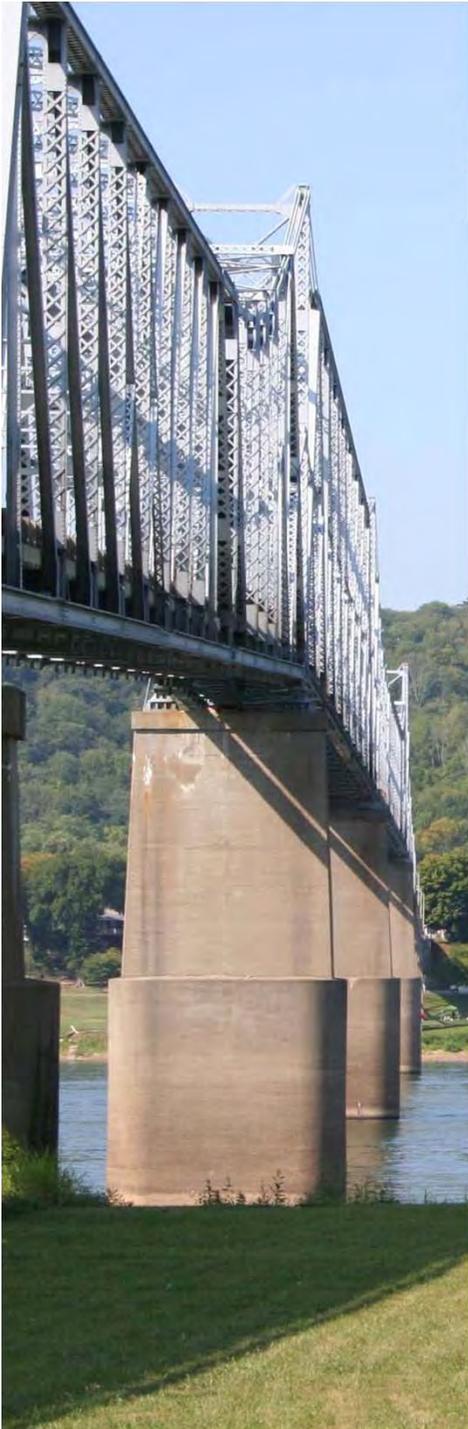




## US 421 BRIDGE CONDITION

- **2009 Sufficiency Rating of 6.5 out of 100 possible points**
- Since 1994, \$11.2 million invested in bridge
- Structurally Deficient & Functionally Obsolete
- **Remaining Service Life of the structure estimated at 10 years**





## MILTON-MADISON BRIDGE PROJECT

- Led by the “M3T” – leadership from KYTC, INDOT, and FHWA in both states
- Extensive coordination with
  - Stakeholders
  - Resource agencies,
  - Historic preservation groups,
  - Project Advisory Group
  - Members of the public
- Extensive media coordination
- Project Website

*States and FHWA agreed to regular meetings where key decisions were made*





## MANAGING EXPECTATIONS FROM THE BEGINNING

1. A Constructible & Affordable Bridge
2. Consensus among Agencies, Stakeholders, Public
3. Federally Approved Environmental Document
4. In the end, KYTC & INDOT will own one Bridge

### *NOT Project Purpose and Need*

*Clearly define what the project sponsors (KYTC/INDOT) expected from this project*



# MILTON-MADISON BRIDGE PROJECT PURPOSE AND NEED

- Improve or replace functionally obsolete/structurally deficient bridge
- Improve or maintain cross-river mobility and community connectivity
- Improve safety

*Developed with input from resource agencies, Project Advisory Group (PAG) members, local officials, and the public*





## CONSIDER EVERYONE'S IDEAS

1. Do Nothing
2. Rehabilitation
3. Superstructure Replacement
4. Multiple New Alignments (12)
5. Tunnel
6. Pontoon Bridge
7. TSM
8. Transit
9. Ferry

*Partnering Conference 2008*

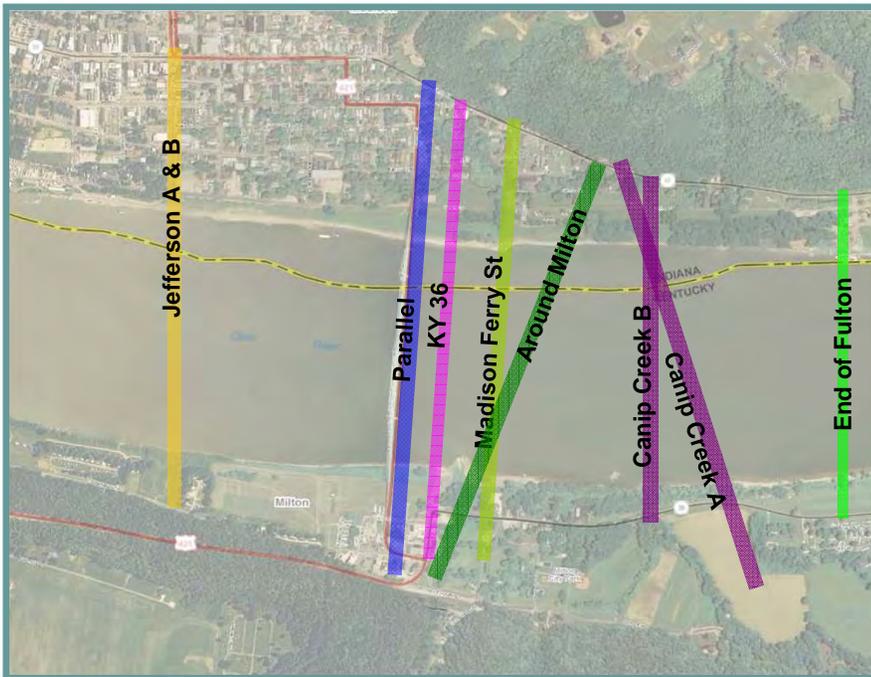
*Missouri DOT Presentation on  
Practical Solutions Inspires  
Superstructure Replacement  
Alternative*



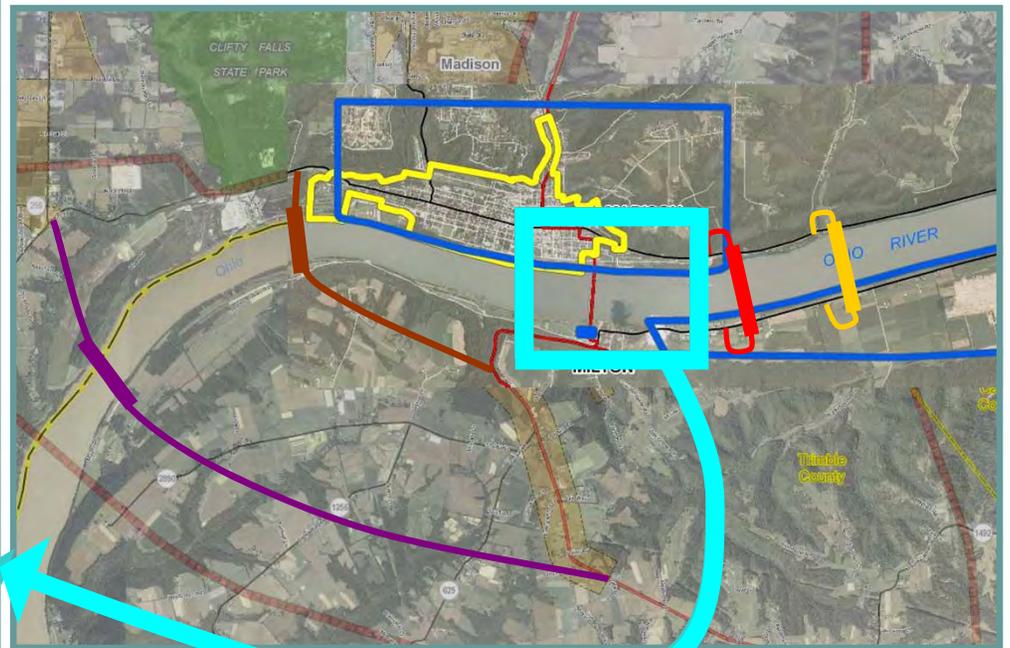


# INITIAL BRIDGE LOCATION ALTERNATIVES

**ALL alternatives considered**



Downtown Alternatives





## SCREENING OF ALTERNATIVES

*20 Alternatives were reduced to 5 for detailed study through:*

- Technical Analysis
- Input from PAG
- Agency Screening webinar
- Section 106 Screening webinar
- Agency/Section 106 comment period
- Public Input

*Costs were not part of initial screening*



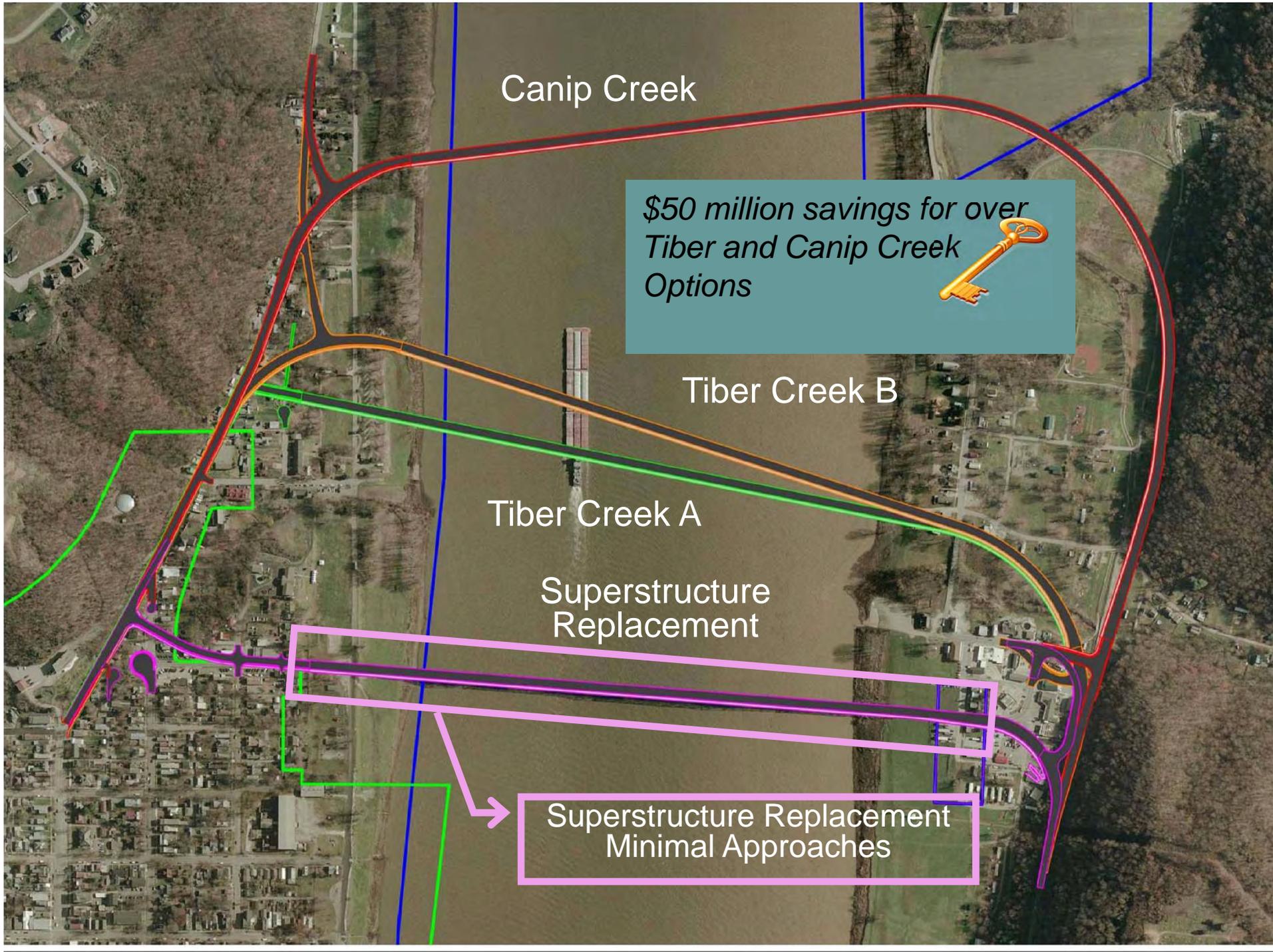


## KEY FINDING OF THE INITIAL SCREENING PROCESS

- Eight alternatives eliminated because they did not meet Purpose & Need
- Seven alternatives eliminated because they would have major impacts or face excessive challenges (Red Flags)

*Tell stakeholders why you made the decision*





Canip Creek

*\$50 million savings for over  
Tiber and Canip Creek  
Options*



Tiber Creek B

Tiber Creek A

Superstructure  
Replacement

Superstructure Replacement  
Minimal Approaches



## GAME CHANGERS

- Fracture Critical Inspection
- Diverse opinions on alternatives
- Superstructure replacement can be done
- Costs of Superstructure replacement much less than others
- Local officials wanted a bridge ASAP
- Project could be built to meet TIGER grant requirements

***Present availability of funding  
and practical timeline for  
construction***





## The Proposed Action

Based on a variety of factors, the **Superstructure Replacement with Minimal Approaches Alternative** is beginning to emerge as a leading option

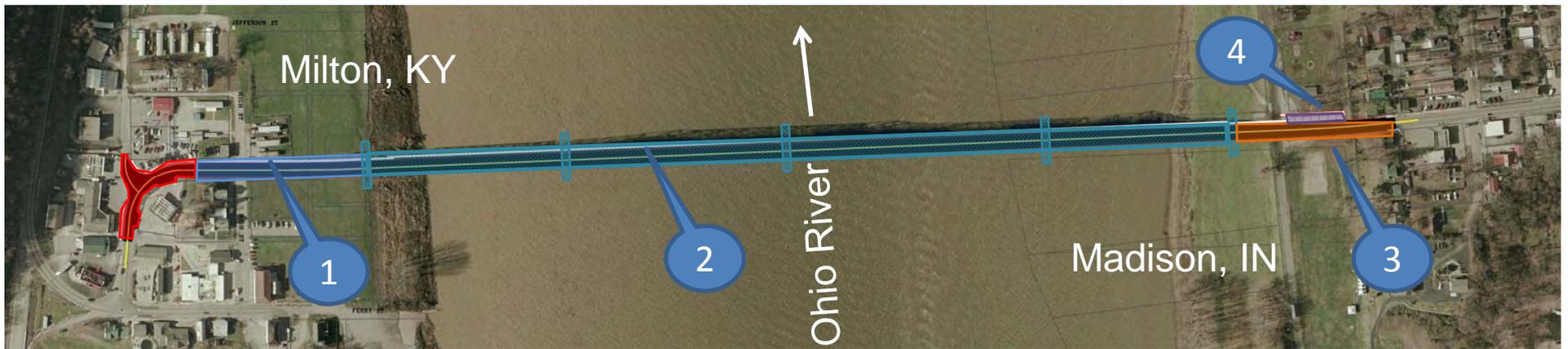
- Continued Bridge Deterioration
- Impacts to Historic Resources
- Impacts to Homes and Businesses
- Lowest Cost Alternative
- Availability of TIGER Grant
- Fastest Completion Time

*Affordability can be a criteria for a NEPA decision*





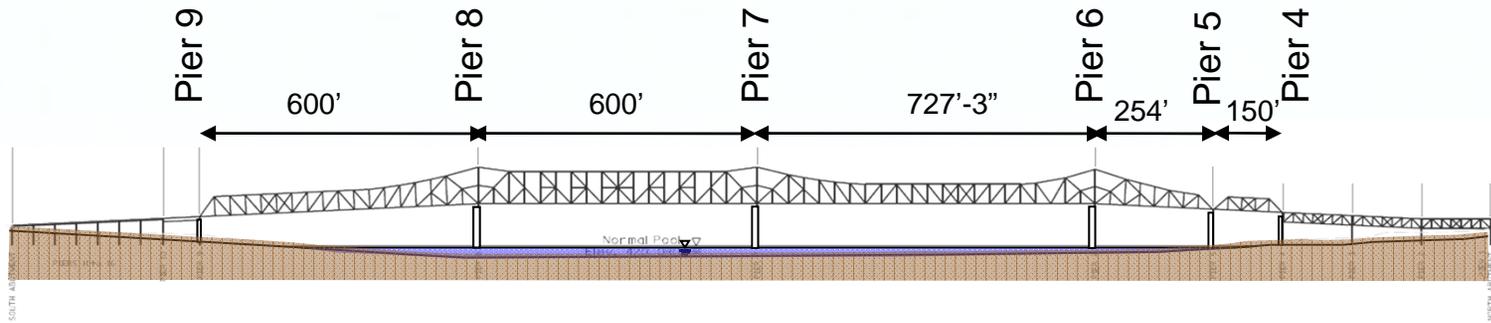
# Superstructure Replacement with Minimal Approaches



- Milton Approach re-construction
- Structure No. 1 replacement
- Structure No. 2 replacement
  - Scour Mitigation and Pier Strengthening
  - Superstructure Replacement
- Structure No. 3 replacement
- Construction of Structure No. 4

***No Right-of-Way  
required***

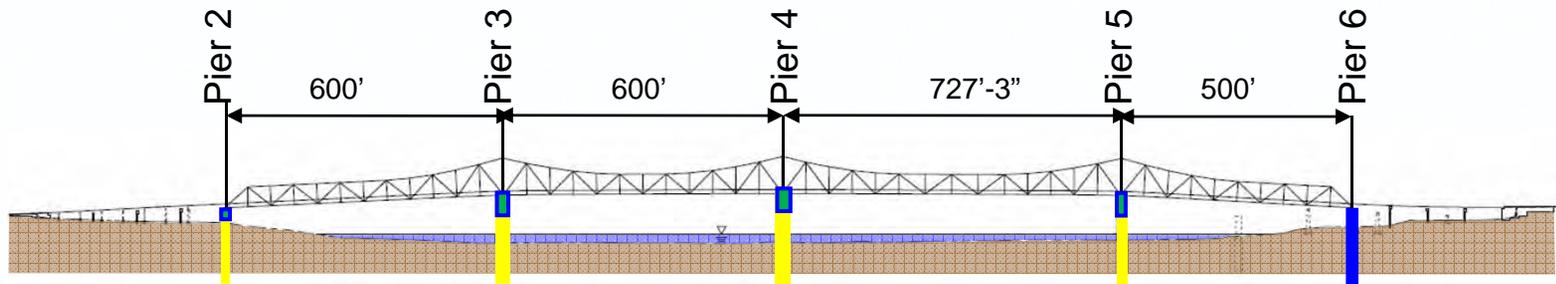




### Existing Bridge

Milton, KY

Madison, IN



### Proposed Bridge

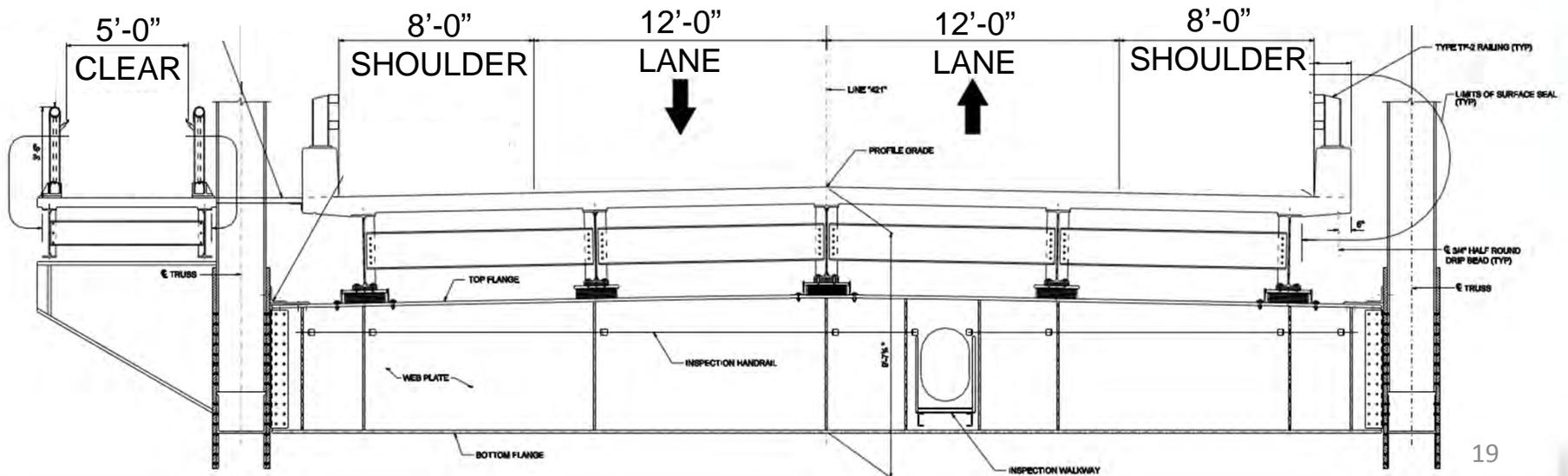
*Navigation Channel does not need to be widened*



- Strengthen Existing Pier
- New Pier Cap
- New Pier



***“Reasonable”  
expectation of traffic  
growth***





## Other Key Features of Superstructure Replacement with Minimal Approaches

1. Maximum 12 Month Closure
2. Temporary Ferry Service
3. Accommodate Peregrine Falcon
4. Numerous Section 106 commitments
5. Numerous environmental commitments



# View from Milton



Existing



Proposed



## Structure Design Requirements

1. Assure 75 year service life
2. Feasible
3. Permittable
4. Visually Acceptable
5. Develop Design Criteria



## Benefits of Pier Strengthening

- Piers are in good condition.
- Minimize impacts to historic properties.
- Cost effective
- Can maintain existing navigational channel.

***Avoided need for longer  
environmental process  
and more costly  
alignments***





## Pier Strengthening Considerations

- 75 year design life
- Design pier strengthening to accommodate all loading demands including wind and barge impact.
- Consideration of soil support loss (scour)
- Limited existing rock capacity.

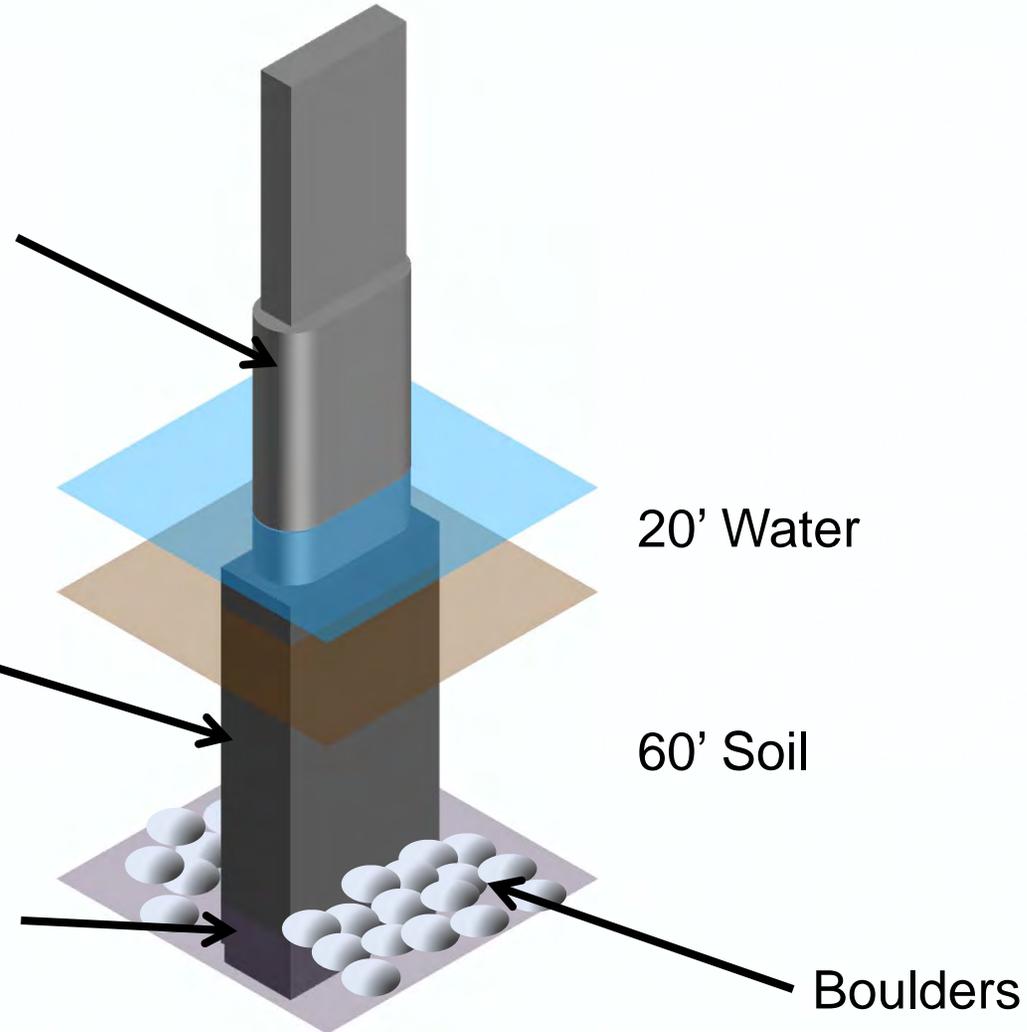


## Typical Existing River Piers

Existing Pier stem reinforcing extends 12' into caisson

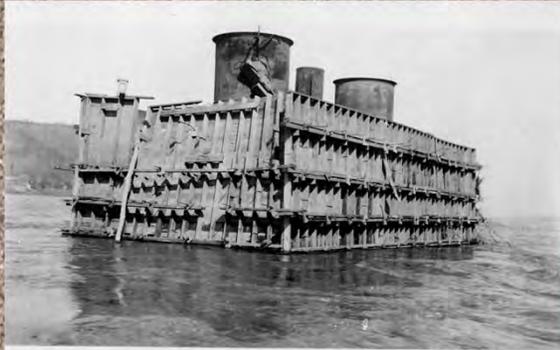
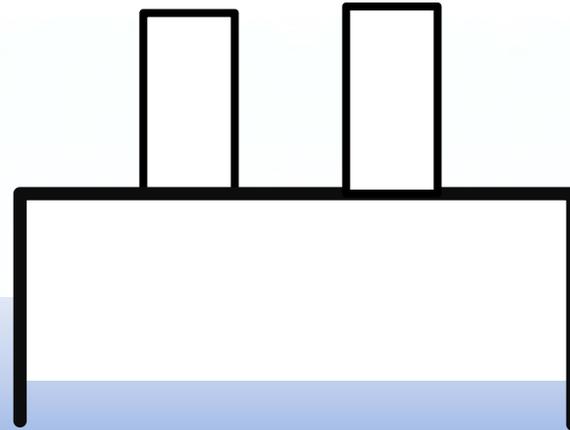
Un-reinforced Caisson

Un-reinforced Rock Socket 1.7'-6.7' deep



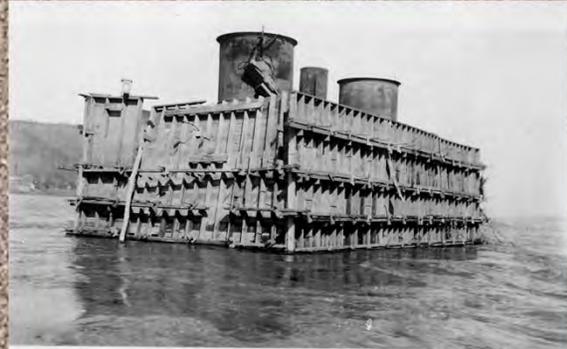
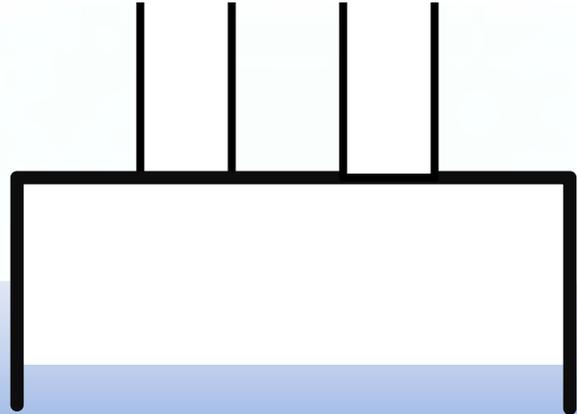


# Pier Construction Methods



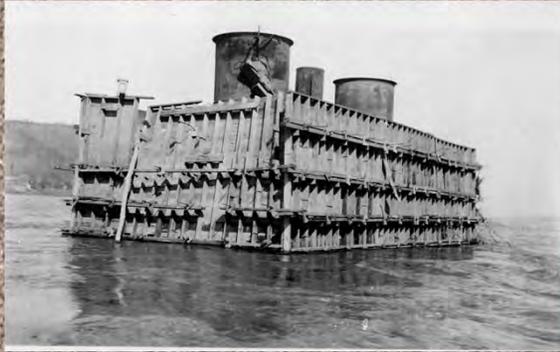
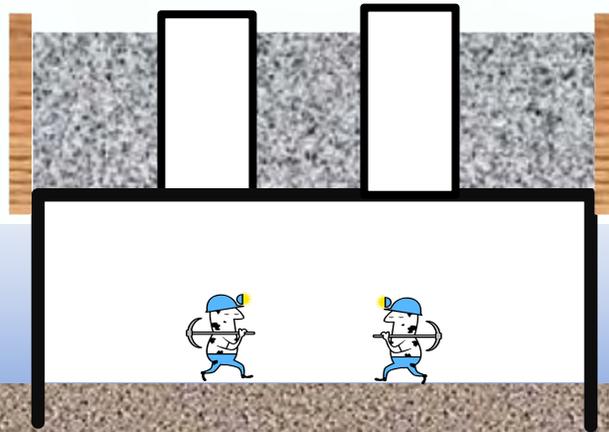


# Pier Construction Methods



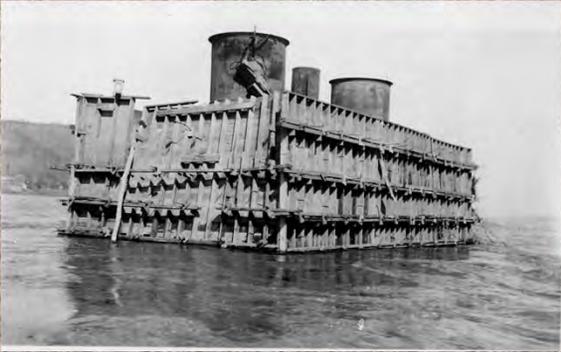
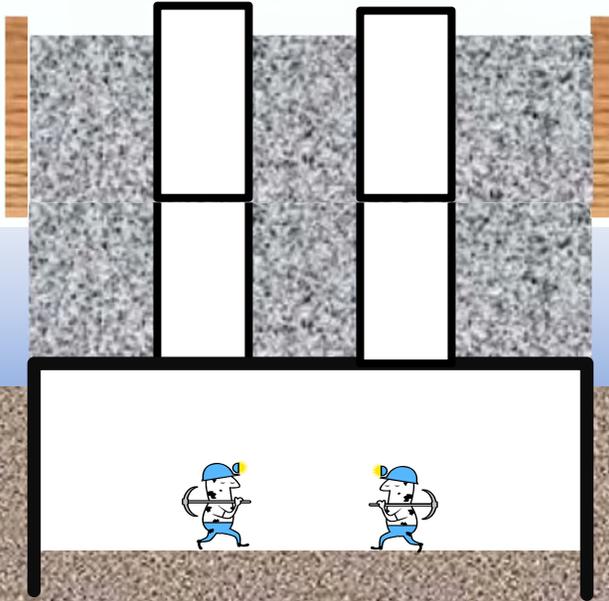


# Pier Construction Methods



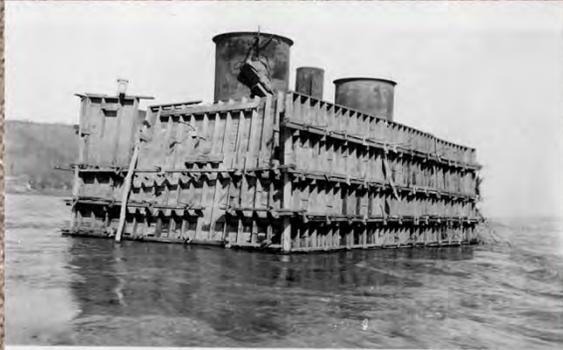
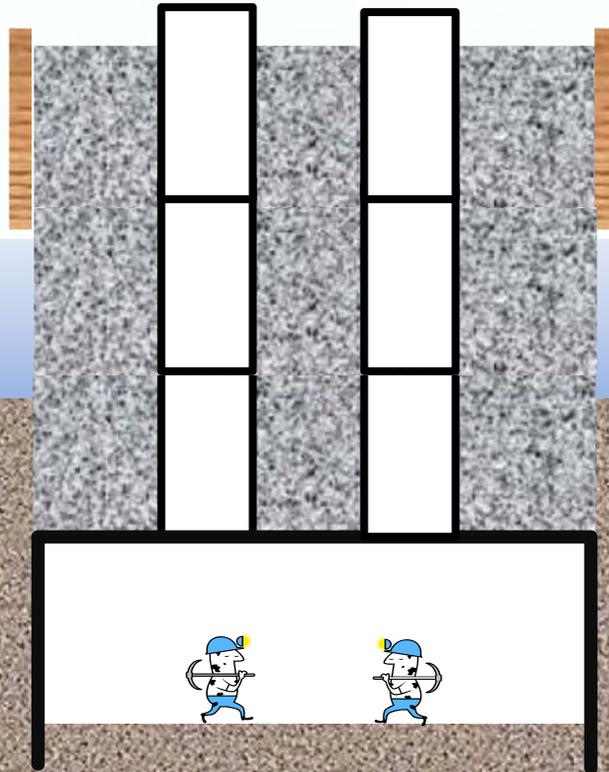


# Pier Construction Methods



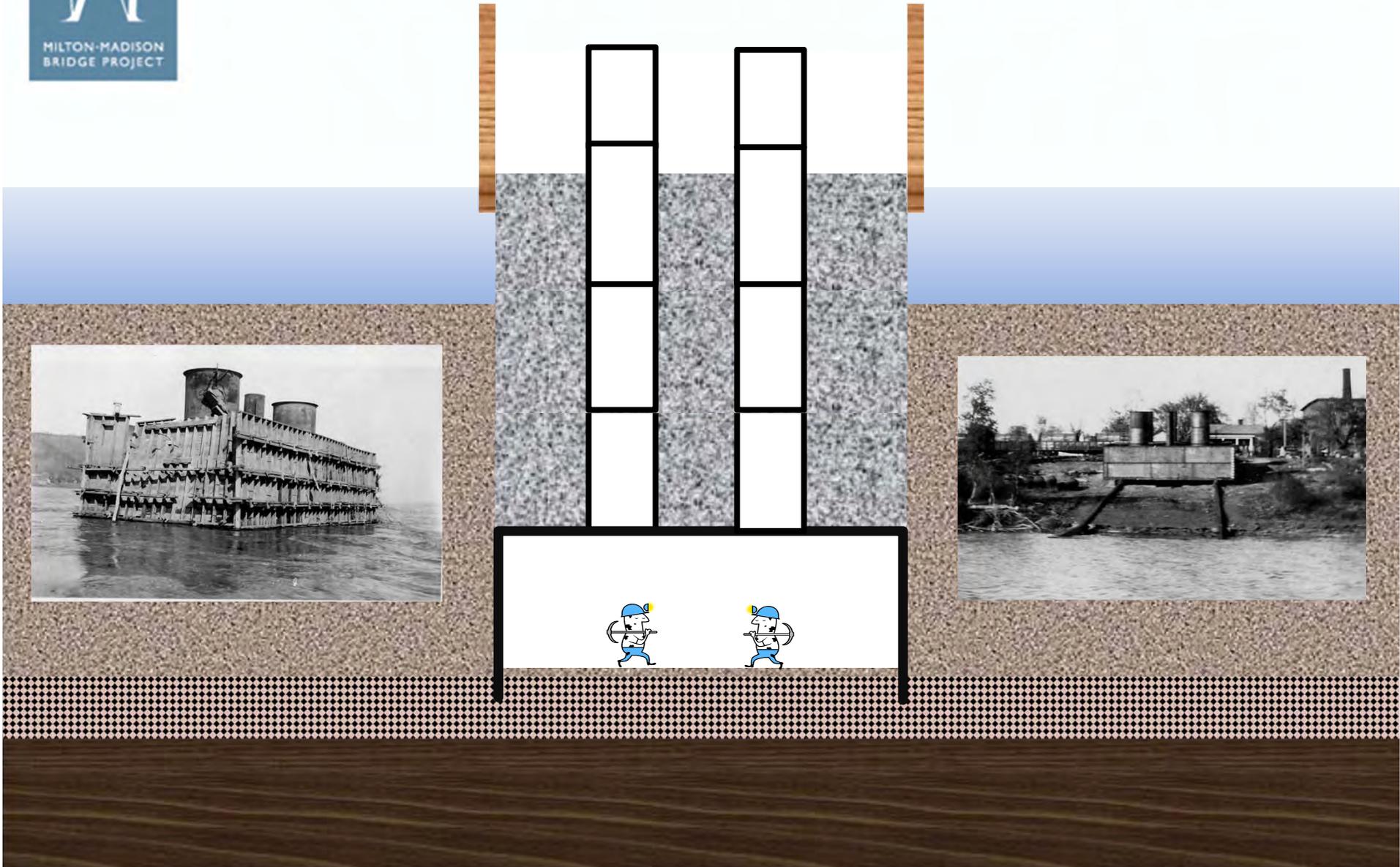


# Pier Construction Methods



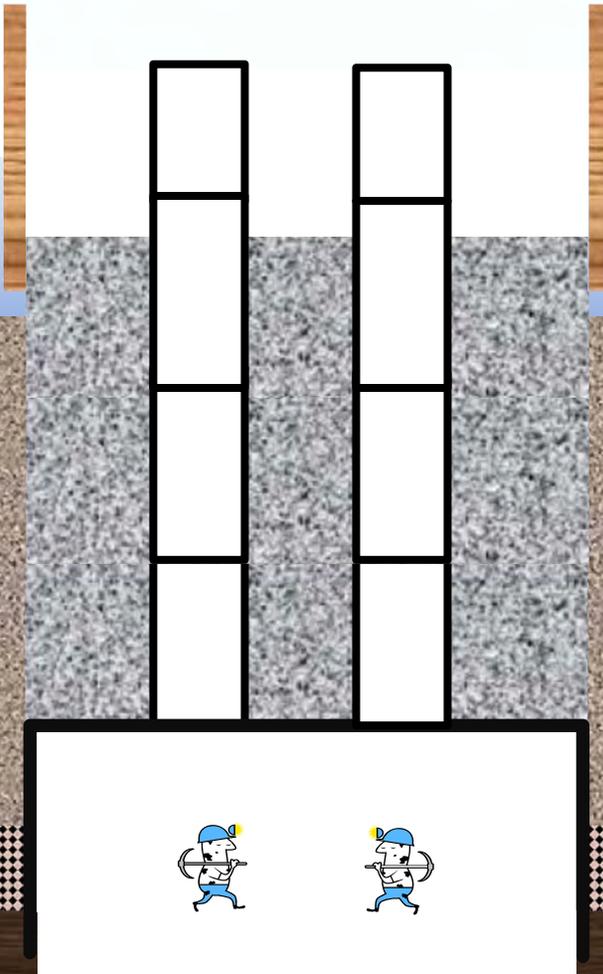
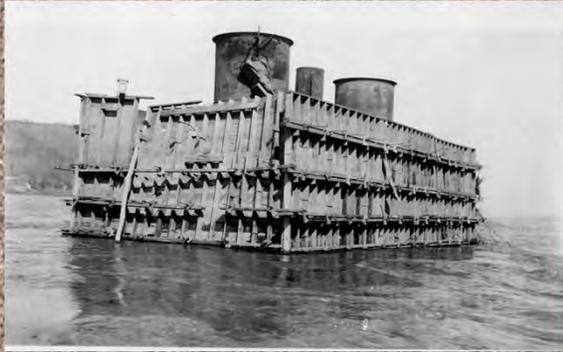


# Pier Construction Methods



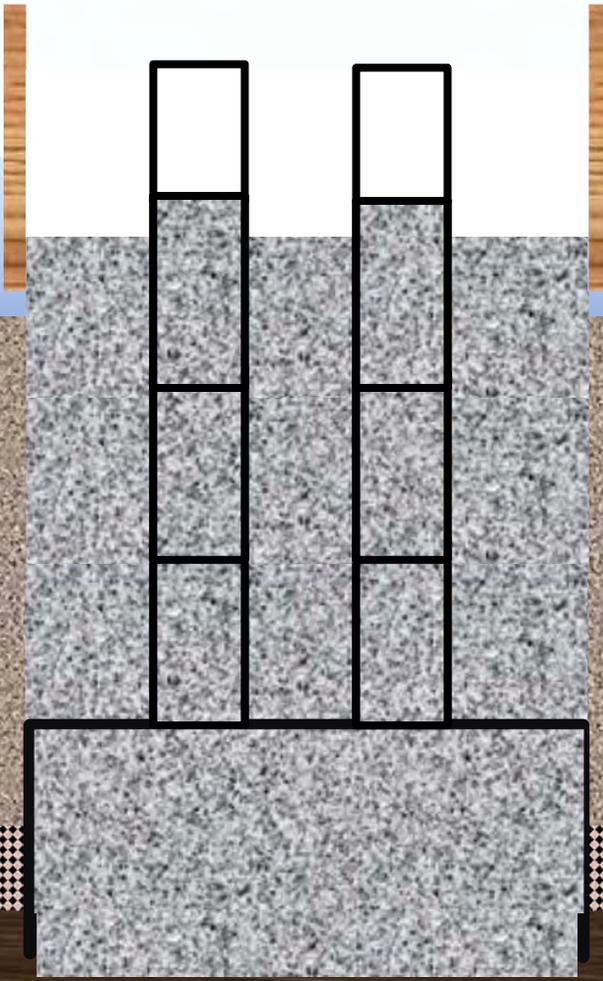
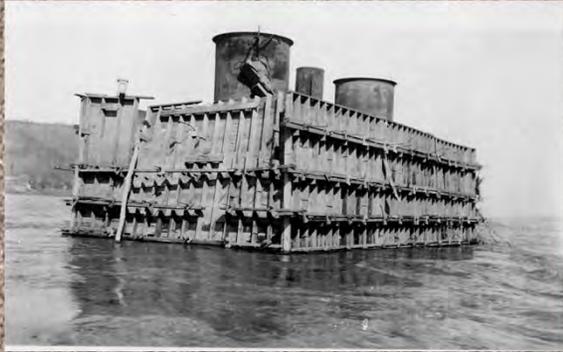


# Pier Construction Methods



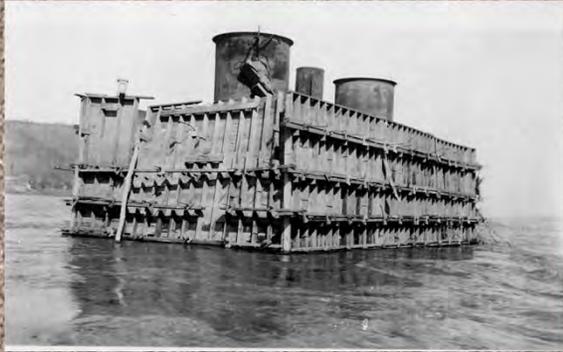
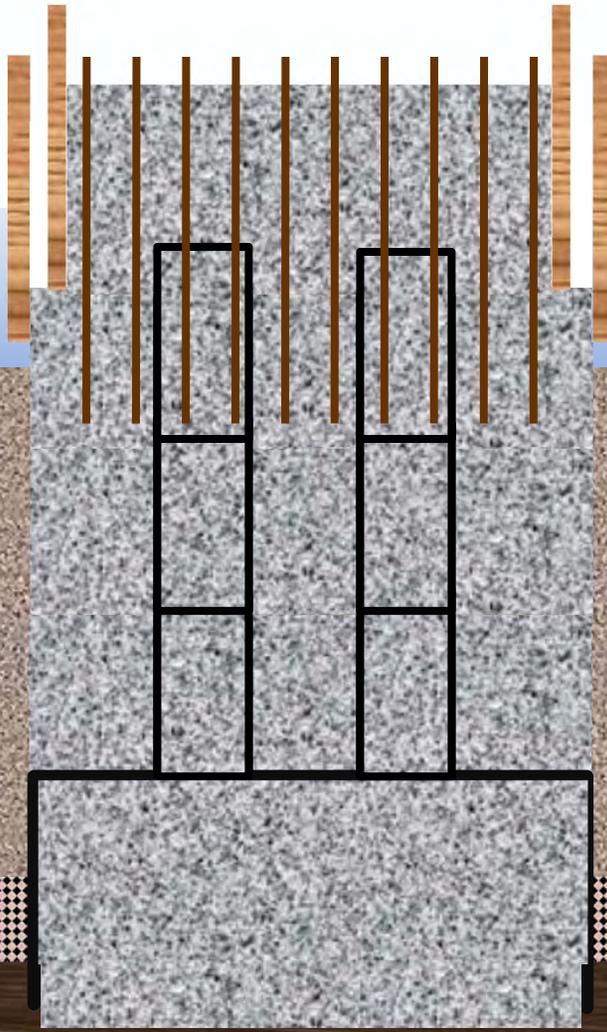


# Pier Construction Methods





# Pier Construction Methods





# Drilling through Piers





# Drilling through Piers



Caisson Chamber Roof



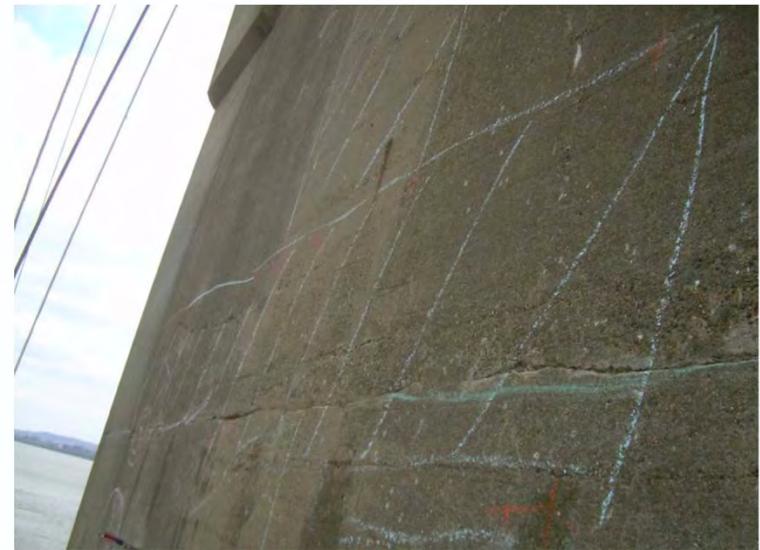
Bottom of Caisson

*Investment in coring & engineering was crucial in reuse of piers*

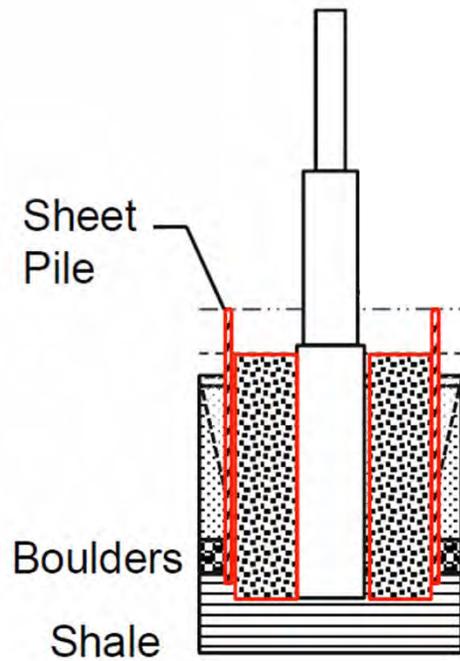




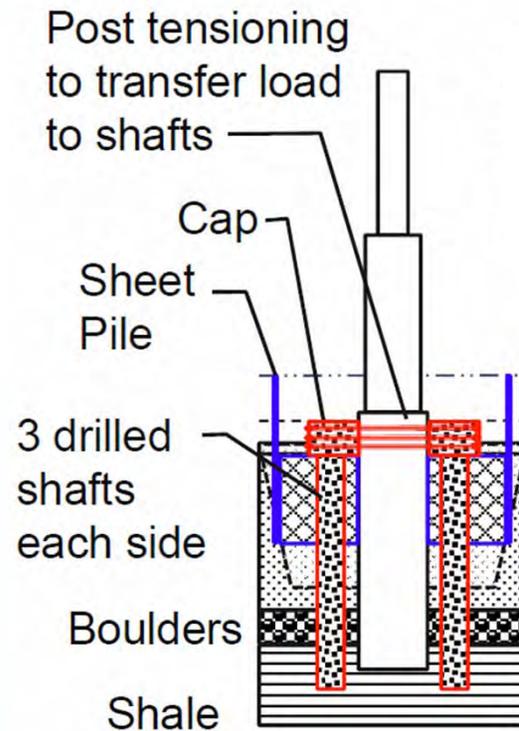
# Detailed Inspection of Piers



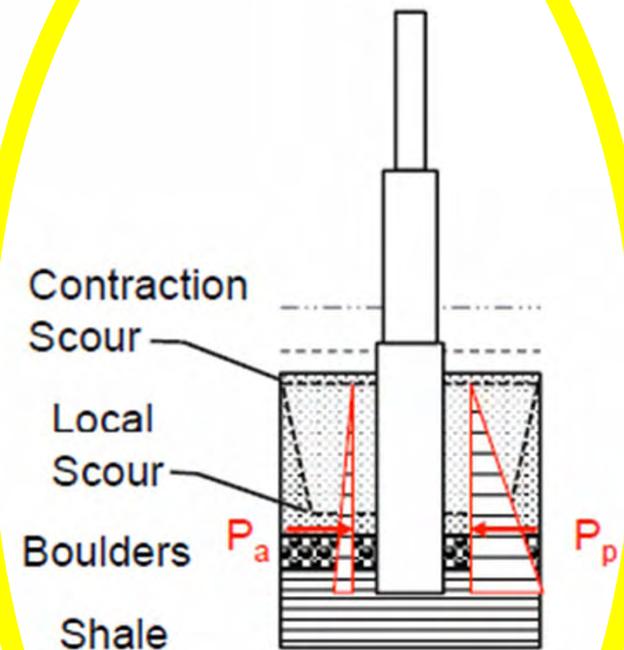
## Viabie Foundation Options Considered



**Encasement**



**Drilled Shafts**



**Soil Response**



## Soil Response

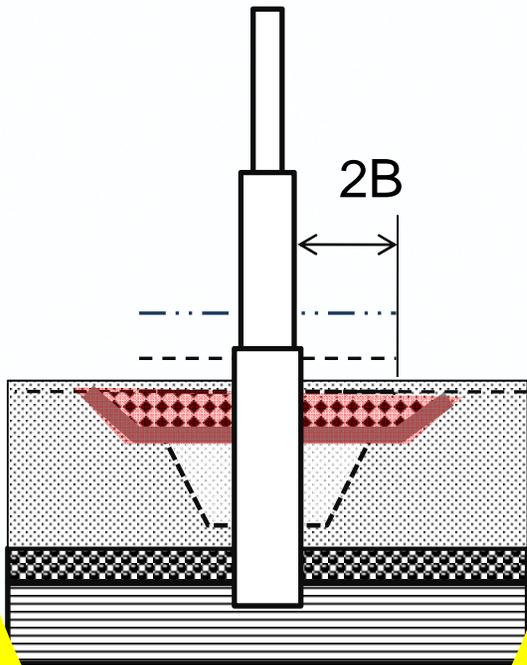
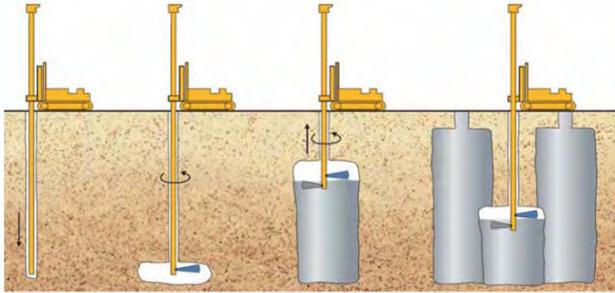
1. Scour Mitigation is required
  - Prevent scour (Soil provides resistance to loads)
  - Placed below
    - Future Dredge Depth (14ft below Normal Pool)
    - Contraction Scour (2.7ft below mudline)
2. Soil Structure Interaction methods
  - Developed Soil and Rock Parameters
  - 3D Finite Element Analysis

***Pier strengthening is more cost effective than constructing new piers***

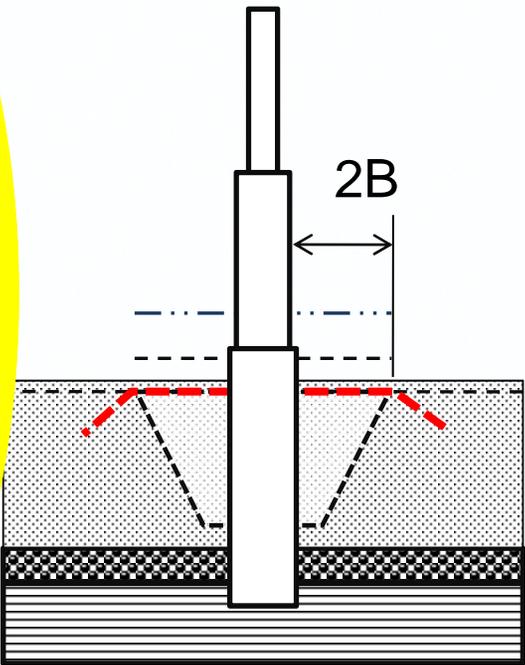




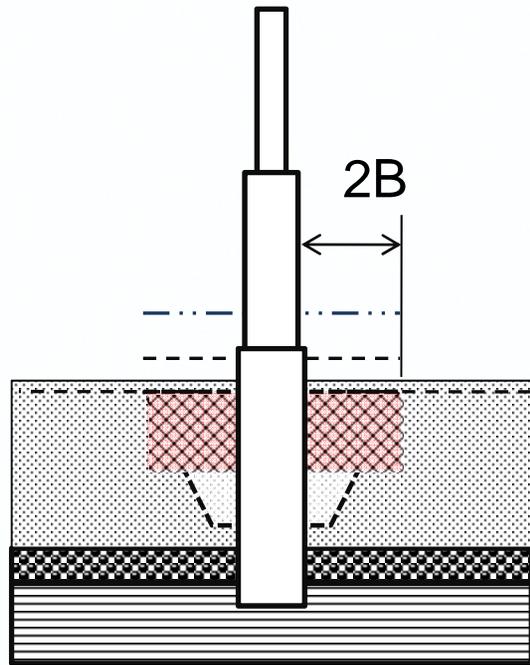
# 1) Scour Mitigation Measures



Rip Rap  
with Filter



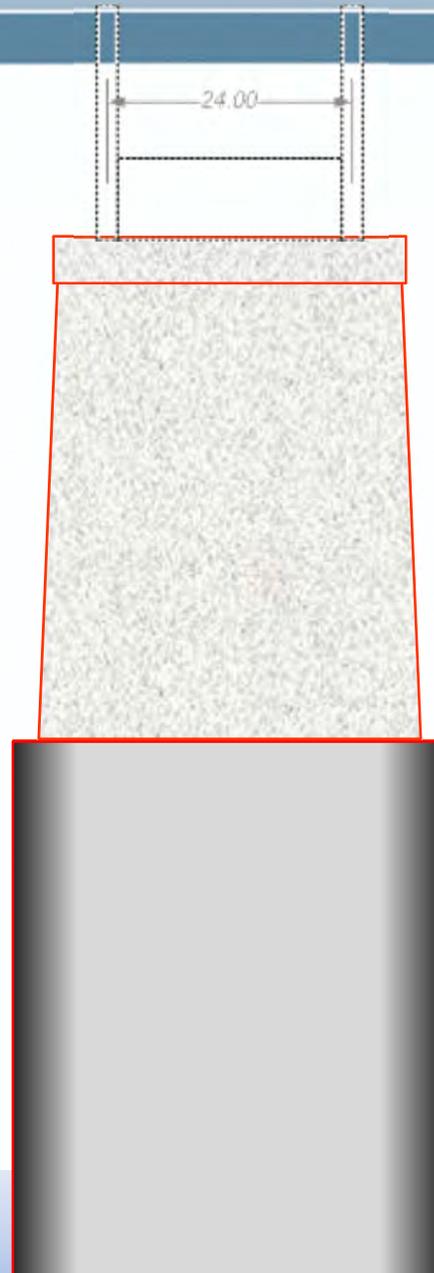
Articulated Block  
Mat



Jet Grouting

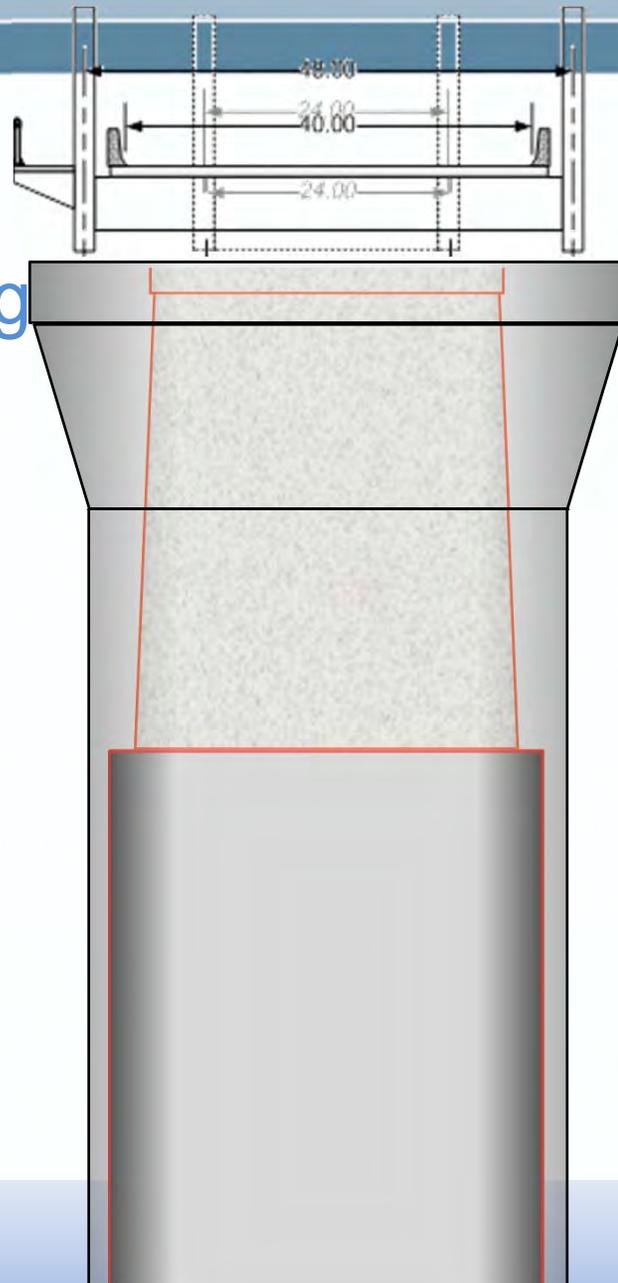


# Proposed Pier Strengthening



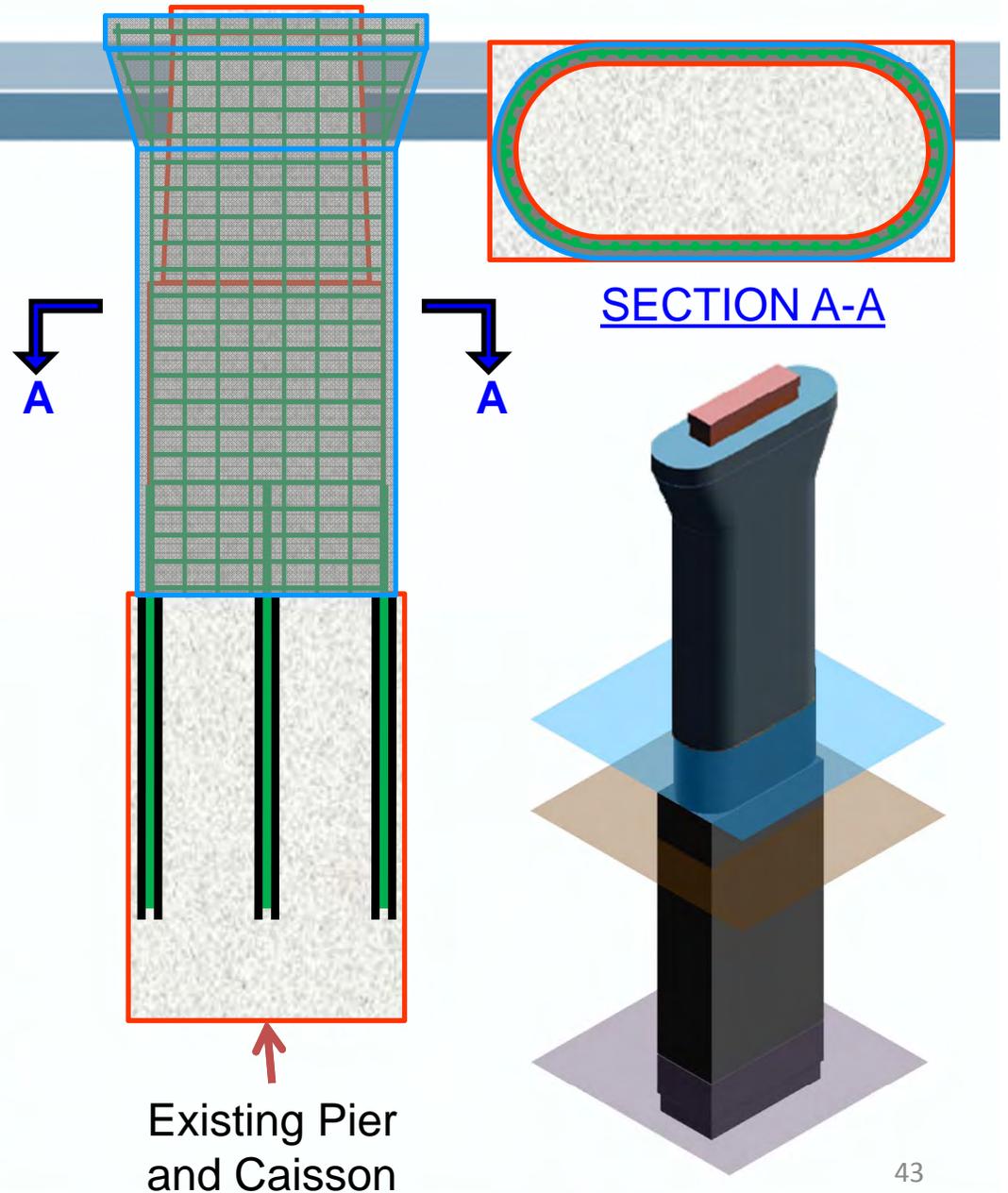


# Proposed Pier Strengthening



## Proposed Pier Strengthening

- 1) Drill holes into existing unreinforced caisson
- 2) Grout dowels into holes and extend above top of caisson
- 3) Add stem reinforcement
- 4) Form and cast collar and new cap





## Section 106 Commitments

1. 4 Span Truss Superstructure





## Section 106 Commitments

2. Truss Profile “appearance” is established
  - Panel Geometry
  - Truss Depth Requirements in scope
3. Truss shall be painted (Color # 35526)





## Section 106 Commitments

4. Sway Bracing shall be minimized
5. Specified INDOT TF-2 Railing
6. Aluminum Pedestrian Railing



*Sway Bracing, 100ft spacing*



*Sway Bracing Struts*

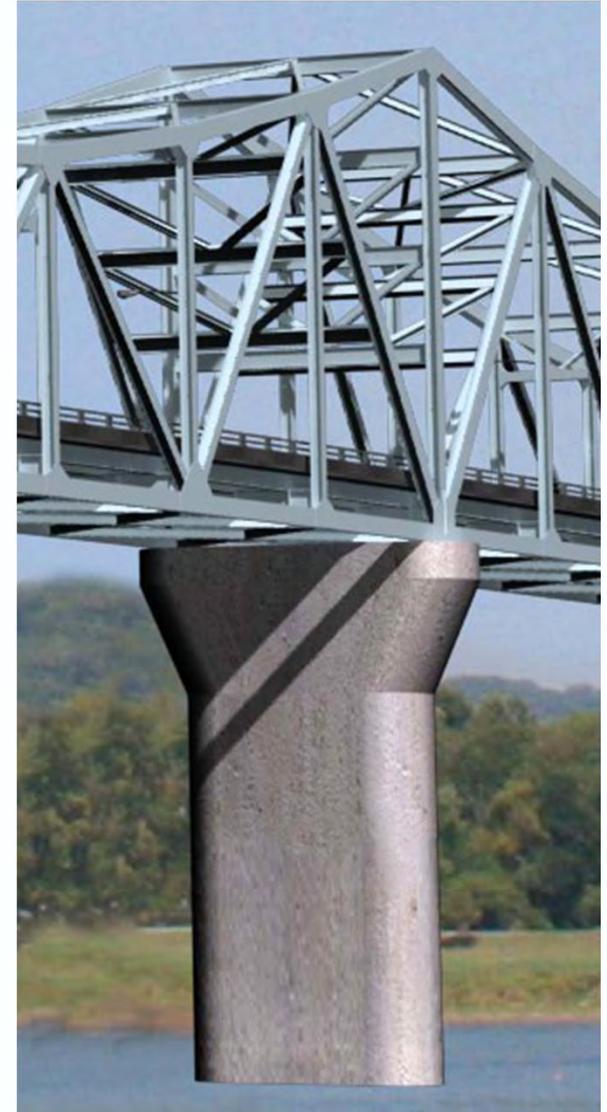


*Pedestrian View*



## Section 106 Commitments

7. Piers 2-5 encased and widened
8. Piers 2-5 shape similar to contract plans
9. Pier 6 shape similar to other piers
10. Ashlar form liners to be used on abutments, wing walls and any retaining walls





## Section 106 Consultation Process

July 2009 – December 2009

*Through a series of 4 meetings, consulting parties helped*

- Define the Area of Potential Effect (APE)
- Identify 80 eligible historic resources
- Determine project effects on eligible historic resources
- Develop mitigation measures

*At the September 2009 meeting, the group covered eligibility, preliminary effects, and began discussing mitigations.*



## Section 106 Consultation Process

### *Representation from:*

- Advisory Council on Historic Preservation
- National Park Service
- National Trust for Historic Preservation
- Native American Tribes
- State Historic Preservation Offices in KY & IN
- Indiana Historic Landmarks Foundation
- Local historic preservation groups
- Area Residents

*Total 30+ participants*





## Section 106 Consultation Process

### Strategies employed for building consensus:

- In person meetings facilitate active participation/ call-in option for out-of-town agencies participation
- Participants understood the need to replace the bridge.
- Circulating draft documents prior to meetings gave consulting parties time to review and formulate comments; kept meeting discussions focused on key topics
- Focused on essential issues: team began discussing potential mitigations at second Section 106 meeting
- Gave consideration to all proposed mitigation



## MITIGATIONS – IMPORTANT TO SUCCESS

- New truss superstructure mimicking historic truss profile
- Free Ferry Service operating 24/7 between Milton & Madison
  - Plan to minimize disruptions from traffic using ferry
  - Temporary modifications at campground & boat ramp to create docks
- Funding for local programs to offset economic impacts of closure
  - Tourism/Marketing campaign in both cities
  - Historic Preservation Officer for Madison
  - Local business assistance through Madison Main Street Program
- Commitment to follow Section 106-like process on any future approach improvement projects (not programmed in either STIP)
- Measures to offset loss of historic bridge
  - Preserve builder plates from existing bridge
  - Photo documentation of existing bridge
  - Restoration of 1929 film of original bridge opening ceremony



## MITIGATIONS – IMPORTANT TO SUCCESS

- Updates to National Register District forms in Milton and Madison
- Archaeological Testing
- Measures to reduce construction impacts
  - Vibration monitoring on historic structures
  - Limits for construction and noise during festivals
- Emergency medical service in Milton/Trimble County during closure
- Relocation of Peregrine Falcon nest boxes
- Planning study for pedestrian/bicycle facilities in Milton
- Planning for scenic overlook/walkways along riverfront in Milton
- Underwater survey to relocate Madison Regatta race course downriver during construction



BRIDGE PROJECT

## KEYS TO SUCCESS

**Sense of Urgency by everyone engaged!**

Use of Bi-State Project Management Team (KYTC, INDOT and FHWA) to make decisions

Use of Media Relations Firm to help shape and interpret our message to the media

Use of NEPA Legal Counsel trusted by FHWA General Counsel to review NEPA/Section 4f/ Section 106 documentation

Compressed Section 106 Consultation for eligibility, preliminary effects, and mitigations into two meetings



BRIDGE PROJECT

## KEYS TO SUCCESS

To meet the requirements for the stimulus program, the project schedule was dramatically accelerated.

NEPA process completed in 21 months, from initiation to signed FONSI. Field work, alternative selection, and final documents completed in 5 months.

Use of Section 6002 agency coordination process under SAFETEA-LU to expedite review periods and streamline permitting process/Concurrent Review of Documents

Use of Design-Build Contract to encourage innovation and meet construction timeline



- *Original Schedule had EA/FONSI completed in Fall 2012*
- FONSI Signed March 10, 2010
- All Permits Obtained – June 2010
- Design-Build Advertisement June 2010
- Letting - September 2010
- Begin Construction Fall 2010, with maximum 365-day bridge closure
- Bridge open to traffic September 2012
- Complete by May 2013



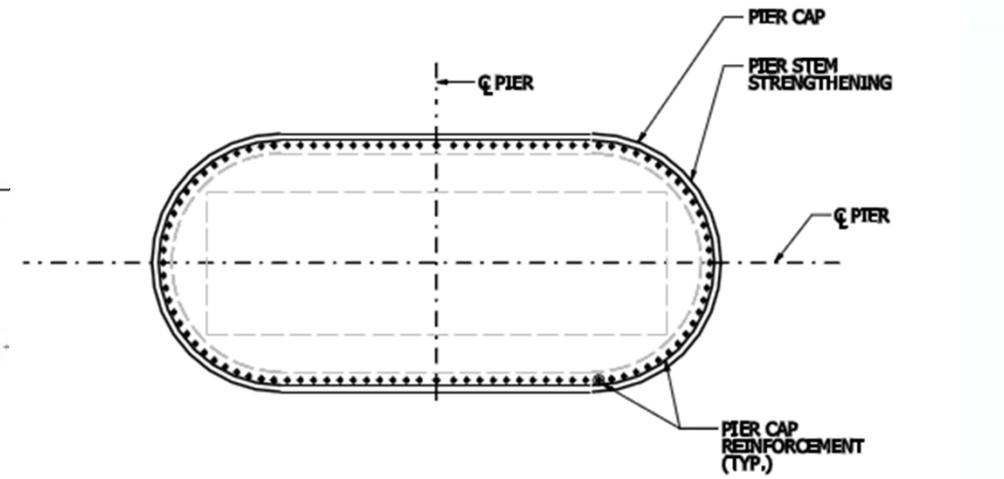
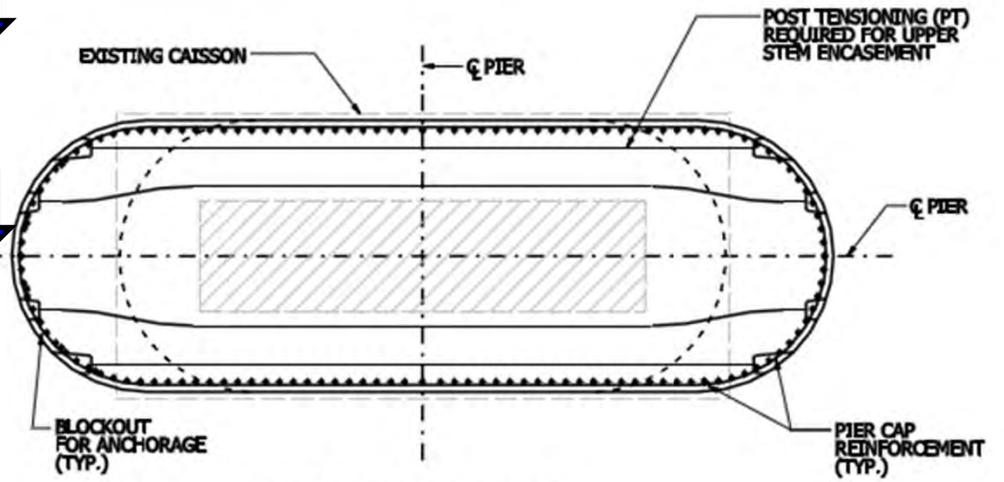
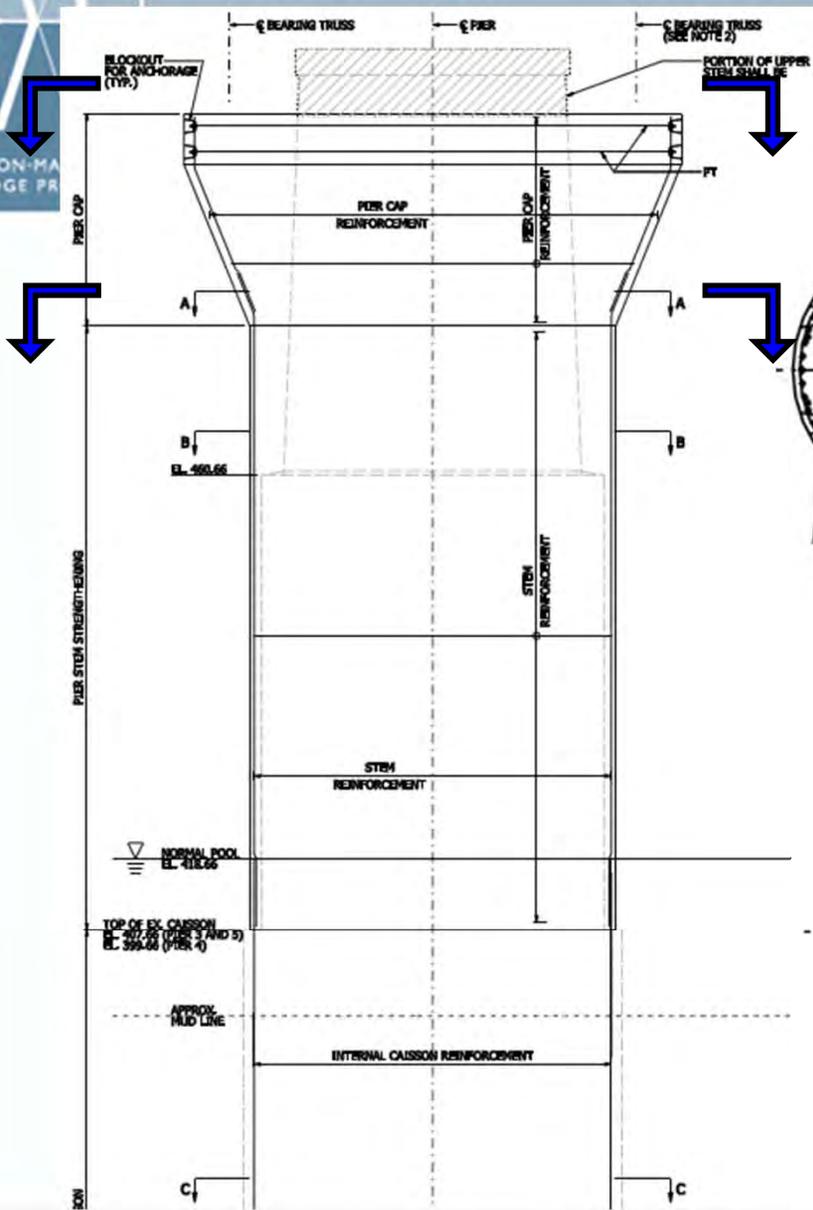
# Animation







# Proposed Pier Cap





## Key Project Documents

In-depth Engineering Study resulted in criteria and information documented in the following:

- A. Scope of Services
- B. Project Special Provisions
- C. Contract Bridge Drawings
- D. Contract Plan Details
- E. Project Specific Reports (Binding)
- F. Project Specific Reports (Information Only)



## Project Reports & Special Provisions:

### Binding Project Reports

- i. **FINAL REPORT - STUDY OF VESSEL COLLISION ON BRIDGE PIERS, MILTON MADISON BRIDGE, MARCH 2010 (BAKER)**
- ii. **WIND ENGINEERING STUDY - FINAL REPORT (RWDI)**
- iii. **MILTON-MADISON BRIDGE, GEOTECHNICAL OVERVIEW (KYTC/BAKER)**

### Other Project Specific Reports (Information Only)

- i. **PIER STRENGTHENING REPORT FOR EXISTING PIERS 6-9 (BAKER)**
- ii. **EXISTING PIERS SERVICE LIFE ASSESMENT (CTL)**
- iii. **FINAL ENVIRONMENT ASSESMENT REPORT FOR THE MILTON MADISON BRIDGE (WSA)**
- iv. **PRELIMINARY HYDRAULIC and SCOUR ANALYSIS REPORT (WSA)**

### Design Criteria Special Provisions (Binding)

- i. **STRUCTURE PERFORMANCE CRITERIA (SPC) FOR BRIDGE NO.2**
- ii. **STRENGTHENING OF EXISTING PIERS**



# Polling Summary

February 12, 2009, Public Meeting Participants at the Brown Gym in Madison

168 citizens attended

- 18 Public Advisory Group (PAG) Members
- 14 Section 106 Representatives
- 6 People on the PAG and serving as 106 Reps
- 130 Citizens

Keypads were used to collect data (overlap of groups)

- General public, PAG, Section 106 Parties

Preference scores

- Public and the PAG members were very similar
- Section 106 parties were statistically different
- Two models were built to understand the data
  - 1) Public and PAG
  - 2) Section 106

The results are intended to help designers understand visual/aesthetic preferences of participants.



# Polling Summary

## Bridge Concepts

- 18 bridge design concepts were presented
  - 6 arch designs
  - 1 truss-arch
  - 5 trusses
  - 6 cable-stay concepts
- Each concept included various combinations of bridge design properties
  - Visual complexity (low to high)
  - Color value (lightness to darkness)
  - Type of enclosure (overhead closed or open) “A” to “H”
  - Overall profile of the structure (number of peaks)



# Polling Summary

## General Observations

- More agreement on dislikes
- Preferred Cable-Stays (High Standard Deviation)
- Preferred profiles that repeat themselves
- Public/PAG and Section 106 average scores were often different
  - Higher highs and lower lows for Section 106 responses
- Process was well liked
  - 85% scored 7 or higher

# Polling Summary

## Arch Preference Summary

- Twin Arches Generally Preferred Over Singles

- Light Color preferred with Low to Moderate Complexity

- Single Arches

- “H” shape preferred with Light Colors and Low/Moderate Complexity

- Twin Arches

- “A” or “Modified A” shape preferred

01



02



03



04



05



06





# Polling Summary

## Truss Preference Summary

- More Haunches preferred
- Less Enclosure preferred
- Color & Haunches
  - Lighter Color Values preferred for Multiple Haunches (Peaks)
  - 106 preferred More Haunches regardless of Color
- Trusses slightly preferred by 106 Parties compared to Public
- Strongest Negatives generated by 3 of the Trusses shown

01



02



03



04



05



06

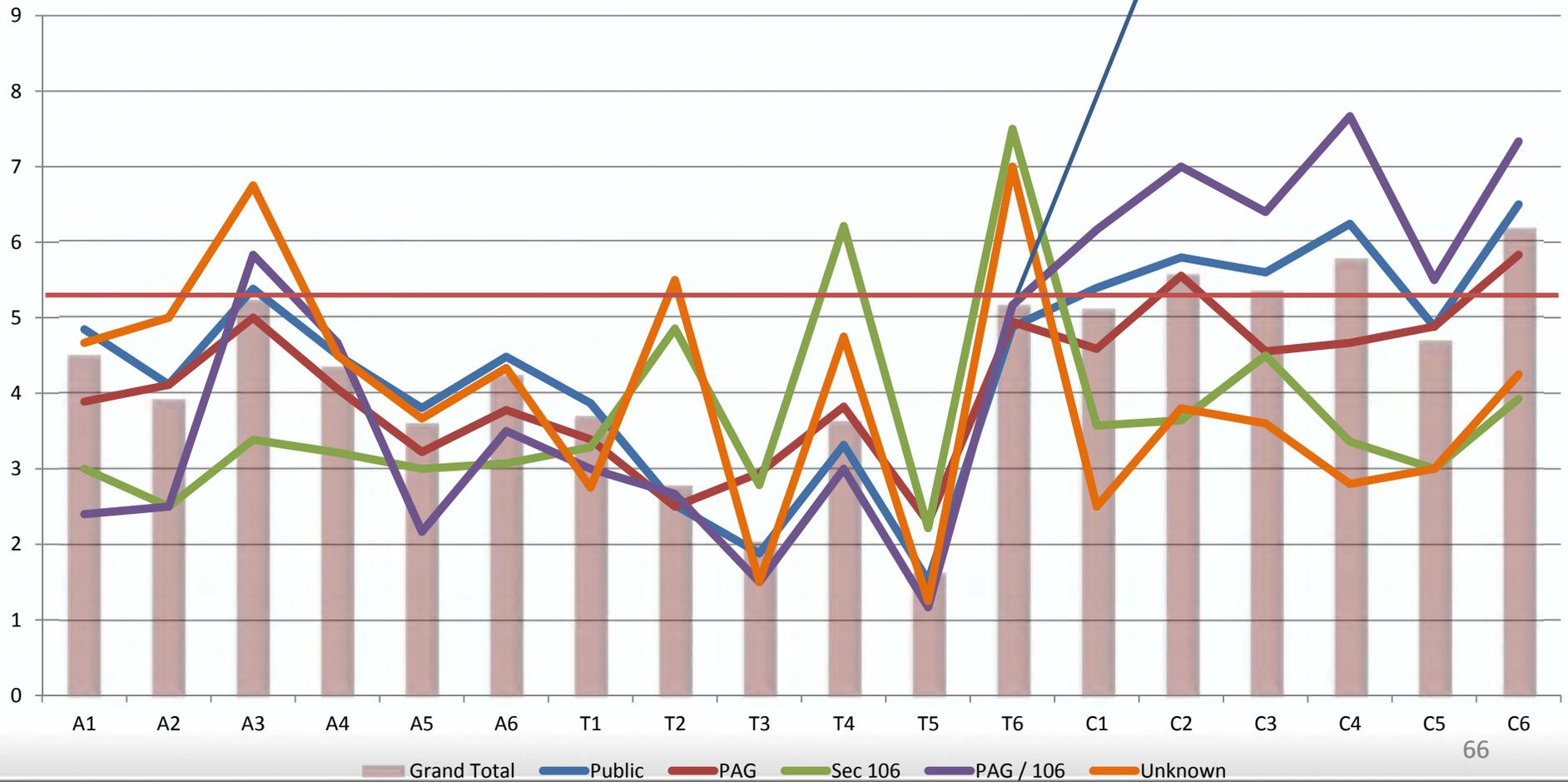




# Polling Summary

## Milton Madison Average Mean Scores

4 Span Truss Bridge  
Similar to the Existing





# Project Description and Overview



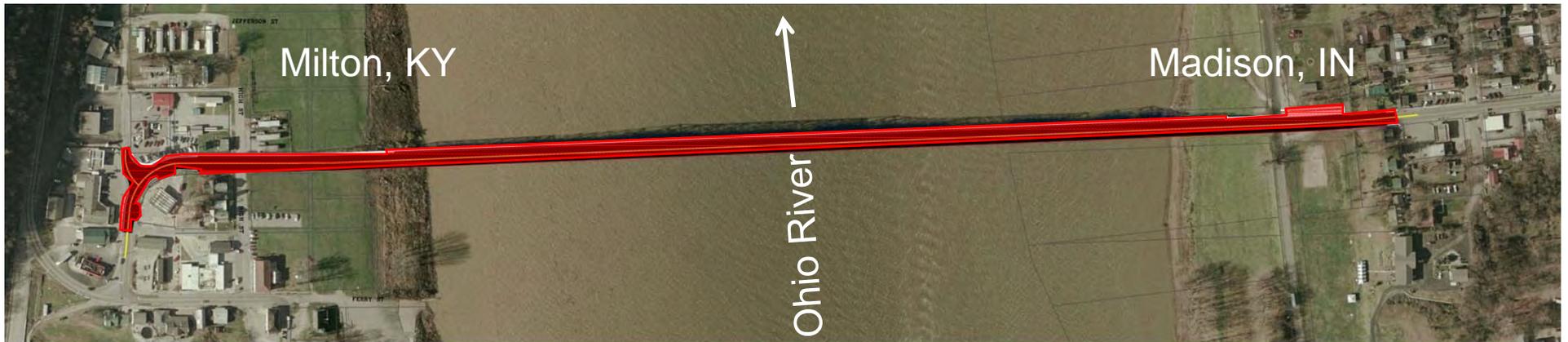


# View from Madison





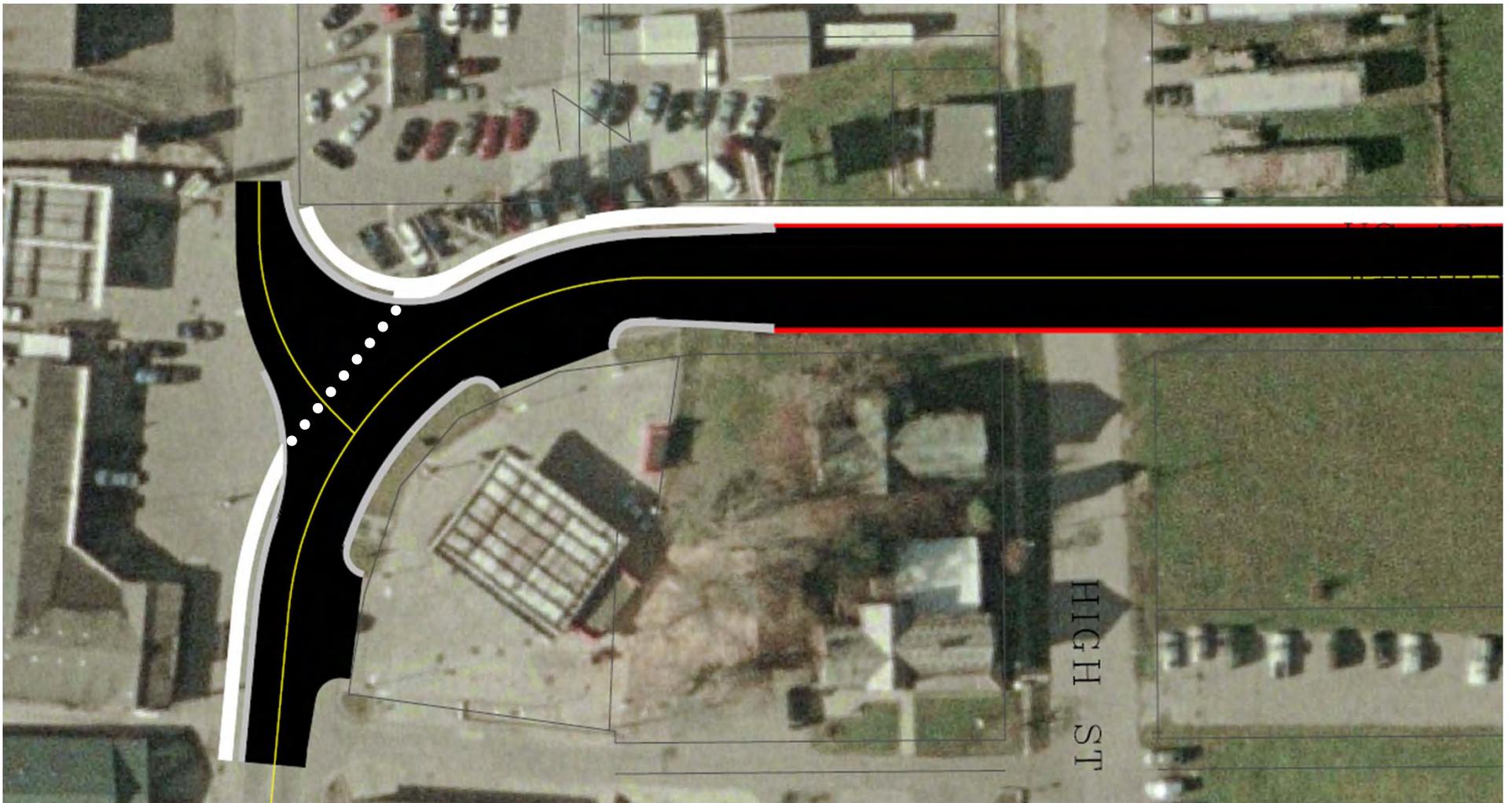
# Project Description and Overview



- Replace US 421 Bridge
  - Strengthen and widen existing piers
  - Improve roadway geometry
- No right of way Impacts
- Meet Tiger Grant schedule.
- Project length  $\approx$  0.696 miles.



# Sidewalk Connection in Milton

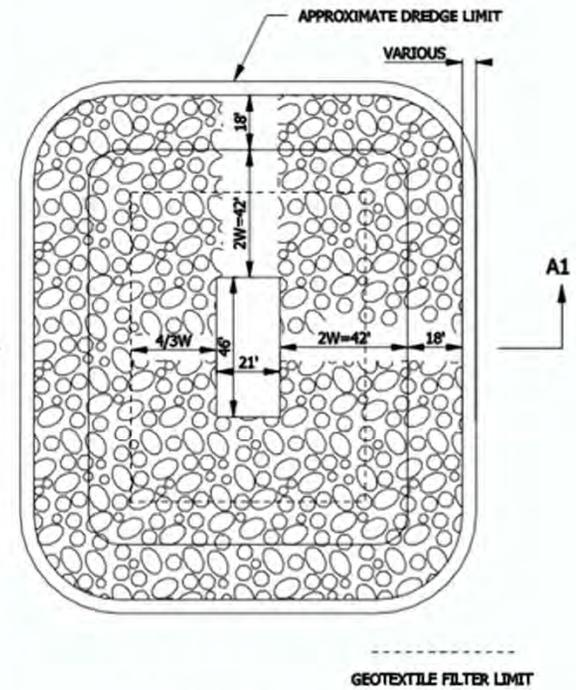
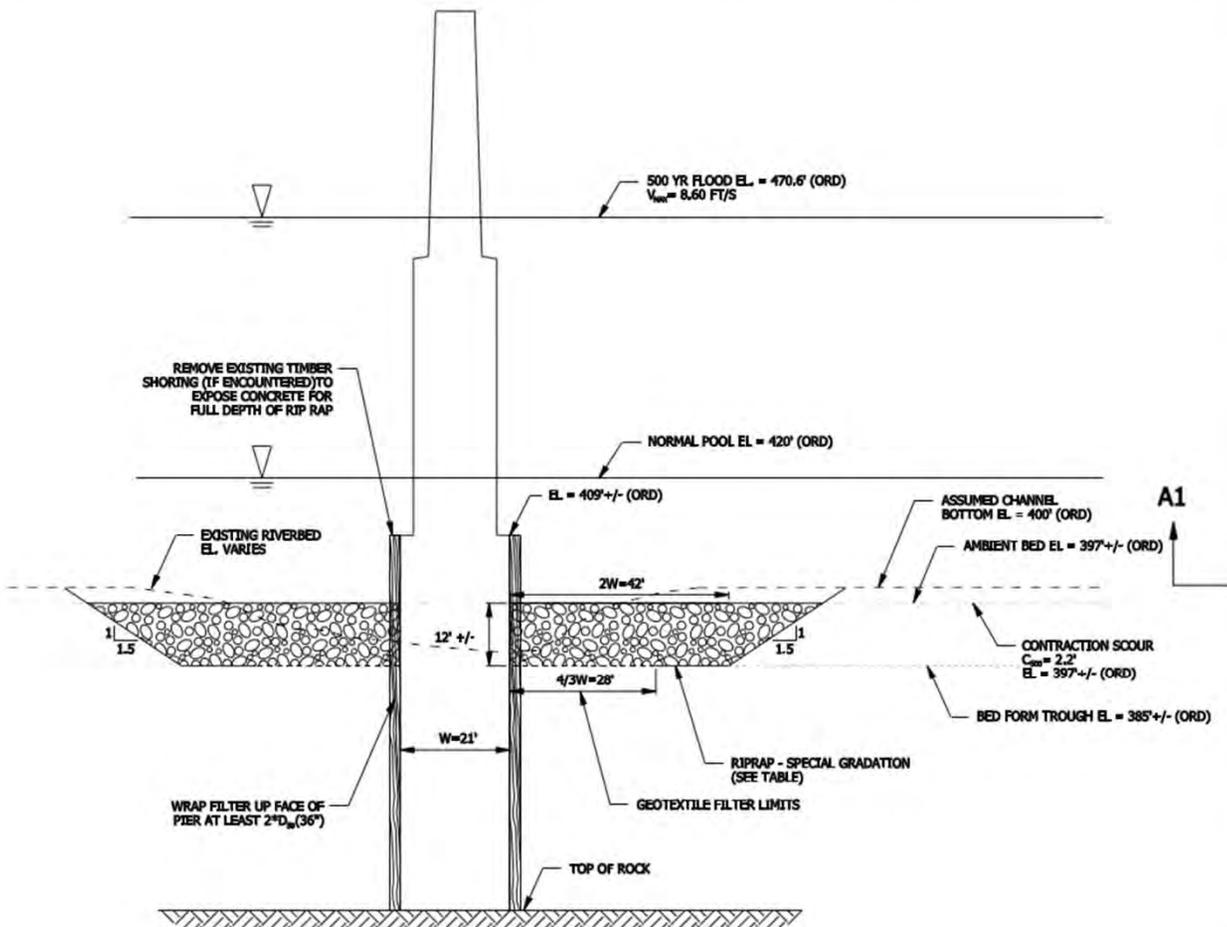




# Sidewalk Connection in Madison



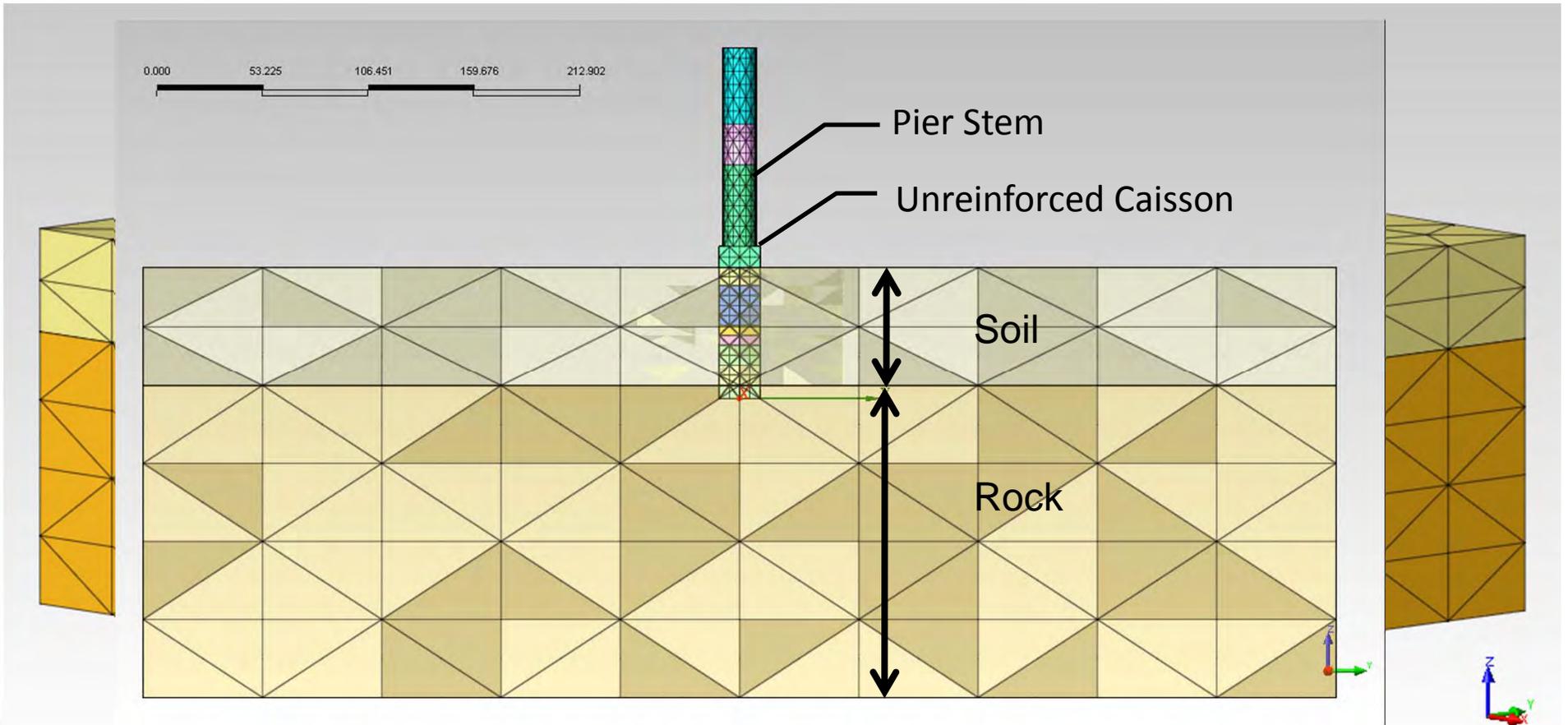
# Final Scour Design Sketch





# Analysis Methodology

- Finite Element Method Required





# Soil and Rock Response

