Agenda

1. Project Background
2. Phase 1 Design
3. Navigation Simulation Modeling
4. Span Arrangement Study
5. Deck Width Study
1 Project Background
Project Background

[Map showing Smithland Bridge Location]
Project Background
Project Background
Project Background
Project Background

Proposed Bridge

Existing Bridge

[Diagrams showing the proposed and existing bridge designs, including lane widths and measurements.]
2 Phase 1 Design
Phase 1 Design
Phase 1 Design
Phase 1 Design
Phase 1 Design
3 Navigation Simulation Modeling
Navigation Simulation Modeling

- **Ohio River**
- **Smithland Dam**
- **S-Bend**
- **Smithland Bridge**
- **Cumberland River**
Navigation Simulation Modeling
Navigation Simulation Modeling

To Ohio River

Existing Pier

Existing Pier

Potential Pier Locations

To Ohio River
Navigation Simulation Modeling

Waters Edge

Waters Edge

Alignment 1

Existing Piers
Navigation Simulation Modeling
Navigation Simulation Modeling

Seamen’s Church Institute (SCI)

- Non-Profit organization founded in 1834
- Largest mariner’s service agency in North America
- Primary Missions
  - Pastoral Care
  - Maritime Education
  - Law & Advocacy
Navigation Simulation Modeling

- SCI - Maritime Education
  - State-of-the-Art facilities
    - Houston
    - Paducah
  - Simulation based training
  - Pilots navigate ships in real-time virtual environment
Navigation Simulation Modeling

• Providing Mariner training since 1916
Navigation Simulation Modeling

- Simulator training today
Navigation Simulation Modeling

- Database from real world data
- Electronic Navigation Chart
- CAD and GIS data
- Bathymetric Data
- Current Flow
- Aerial Photographs
- 3D Culture Models
Navigation Simulation Modeling

- Paducah training area
Navigation Simulation Modeling

- Can we hold the existing clearance based on preliminary USCG recommendations?
Navigation Simulation Modeling
Navigation Simulation Modeling

- Created simulation plan
  - Direction of travel
  - Day vs Night
  - Wind direction / Speed
  - Water elevation
  - Barge size
  - Flotilla size
- 54 total combinations
Navigation Simulation Modeling
Navigation Simulation Modeling
Navigation Simulation Modeling
Navigation Simulation Modeling
Navigation Simulation Modeling
Navigation Simulation Modeling
Navigation Simulation Modeling

SMITHLAND Bridge Project Run Evaluation Form

Pilot # Run # Date
Bridge Configuration: Location 1 Location 2
Northbound Southbound Day Night
Water Layer: High Flow Medium Flow Loaded Empty
Wind: MPH Direction

Circle the number that best describes the run just completed.

1. I had adequate maneuvering room through the bridge
   Extremely Satisfactory Satisfactory Neutral Not satisfactory Not at all satisfactory
   5 4 3 2 1
   If maneuvering room is not adequate, why?

2. The pier alignment is adequate for maneuvering under the bridge
   Extremely Satisfactory Satisfactory Neutral Not satisfactory Not at all satisfactory
   5 4 3 2 1
   If pier alignment is not adequate, why?

Vessel Controllability
3. I had adequate "stern-room" through the piers
   Extremely safe Safe Neutral Not safe Not at all safe
   5 4 3 2 1
   If "stern-room" was inadequate, why?

Additional considerations
4. Will this bridge obstruct the view of Aids To Navigation or other targets to hinder navigation?
   Extremely safe Safe Neutral Not safe Not at all safe
   5 4 3 2 1

Overall Safety
5. Why or why not overall safe?
   Extremely safe Safe Neutral Not safe Not at all safe
   5 4 3 2 1

6. Why or why not difficult?
   Not at all difficult Neutral Not safe Extremely difficult
   5 4 3 2 1

Stress Level
7. Why or why not stressful?
   Not at all stressful Neutral Extremely stressful
   5 4 3 2 1

Additional Comments

Kentucky Transportation Cabinet

Stantec
Navigation Simulation Modeling
Navigation Simulation Modeling
The entire process is interactive!
Navigation Simulation Modeling
Navigation Simulation Modeling
4 Span Arrangement Study
Span Arrangement Study

Pier in River - 570-ft Navigation Span
Span Arrangement Study

Pier in River - 570-ft Navigation Span

Plate Girder Alternate - $35M
Span Arrangement Study

No Piers in the River - 700-ft Navigation Span
Span Arrangement Study
Span Arrangement Study
Span Arrangement Study

Truss Alternate - $28M
5 Deck Width Study
Deck Width Study

TYPICAL SECTION – 44' ROADWAY & SHOULDER

TYPICAL SECTION – 30' ROADWAY & SHOULDER

KENTUCKY TRANSPORTATION CABINET

Stantec
Deck Width Study

- Global stability
- Uplift
- Drift
- Connection demand
Deck Width Study

- Stability
  - Strength 1 Buckling Factor – 36
  - Analytical Results w/ in ~10%
- Uplift
  - Strength 1 – None
- Drift
  - Equivalent to 44-ft roadway
- Connection demand
  - Approximate 50% increase
Deck Width Study

Single Span Truss: -$3.2M

Tied Arch: -$2.2M
Deck Width Study

Three-Span Segmental: +$5.3M

Three-Span Truss: +$7.4M
Deck Width Study

Three-Span Extradosed: +$12.7M
Deck Width Study

- Single Span Truss
  - 30-ft Roadway: -$3.2M
  - 40-ft Roadway: -$1.6M

40-ft Roadway width selected for operational & safety considerations
5 Questions