J.T. Myers Dam Major Rehab

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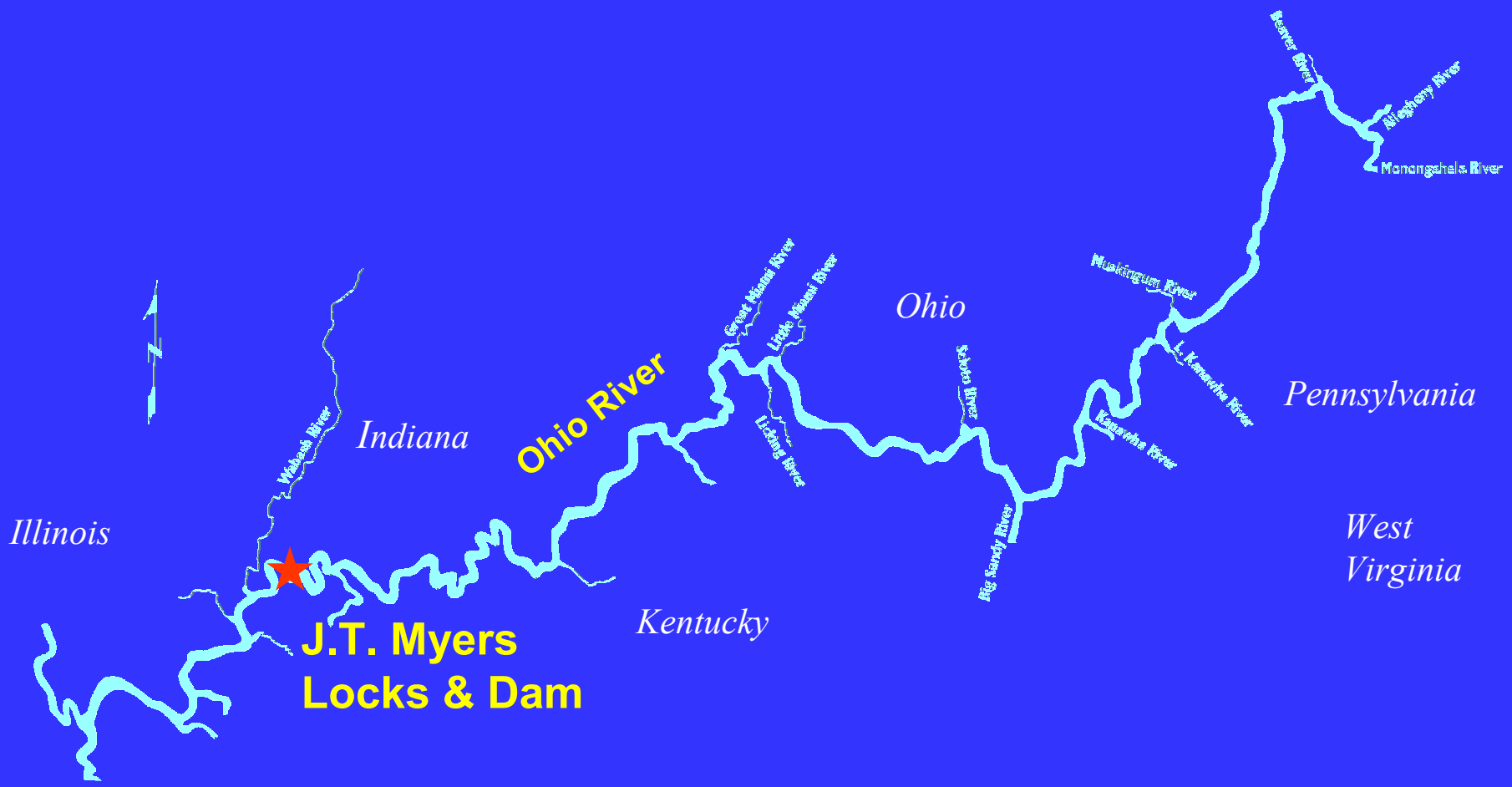
J.T. Myers Project Location




Project Information
Operational in 1972
10 Tainter Gate Bays
110’ x 1200’ Main Lock Chamber
110’ x 600’ Auxiliary Lock Chamber
Highest Tonnage Lock on Ohio with Small Auxiliary Lock
Roughly 70 million tons annually
Wabash Island
Kentucky Shore
Lock Chambers
Fixed Crest Weir
Gate Bay #10
Ohio River
Indiana Shore

John T. Myers Dam Rehab

Major Areas of Concern for J.T. Myers Dam

- ✓ Erosion of dam gate stilling basin slab below dewatering bulkheads
  - Potential for undermining of dam
  - Downstream of bulkhead slots where repairs can be made
  - Damage to end sill structure potential to scour below dam
- ✓ Stability of dam pier structures due to seismic loads and erosion
  - More detailed information regarding ground motions at site
  - More detailed mapping of faulting at site
  - More stringent criteria regarding uplift on structure
- ✓ Other items (mechanical & electrical upgrades) will be evaluated since there are significant concerns regarding long-term condition
- ✓ Evaluation of bulkhead crane girder seats

Erosion of Ohio River Stilling Basin Slabs

Widespread Problem Throughout Louisville District Ohio River Projects with J.T. Myers, Markland, Cannelton, and Newburgh Having the Most Significant Damage

Access to Make Repairs with Current Equipment Very Difficult and Unsafe. Need for Specialized Equipment and Funds.

Repairs Can Only Be Made During Low Water Periods

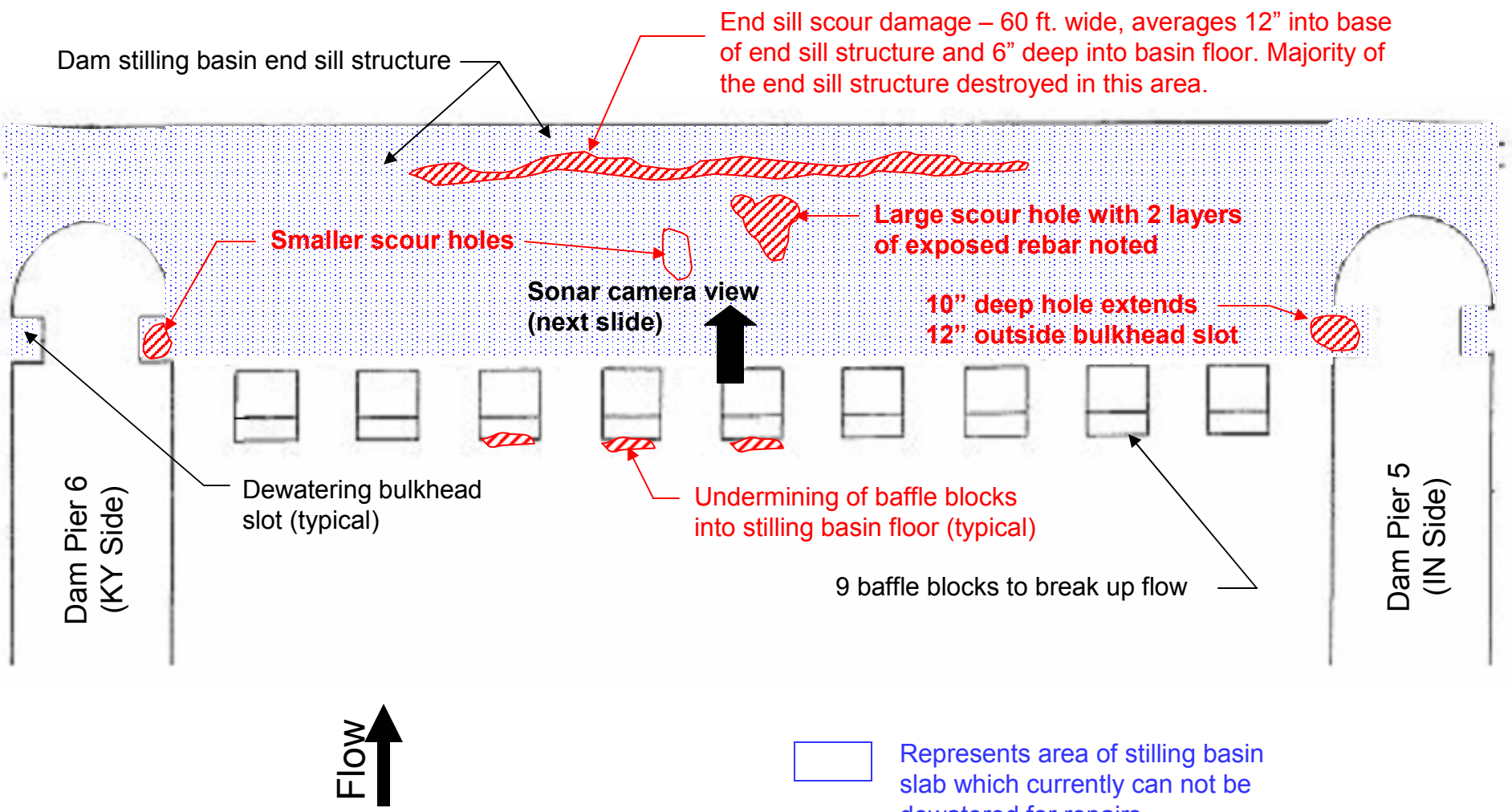
Some Small Repairs Made at Markland Site with a Dewatering Box

J.T. Myers Site First of Anticipated Follow-on Rehab Studies at Other Sites with Similar Problems

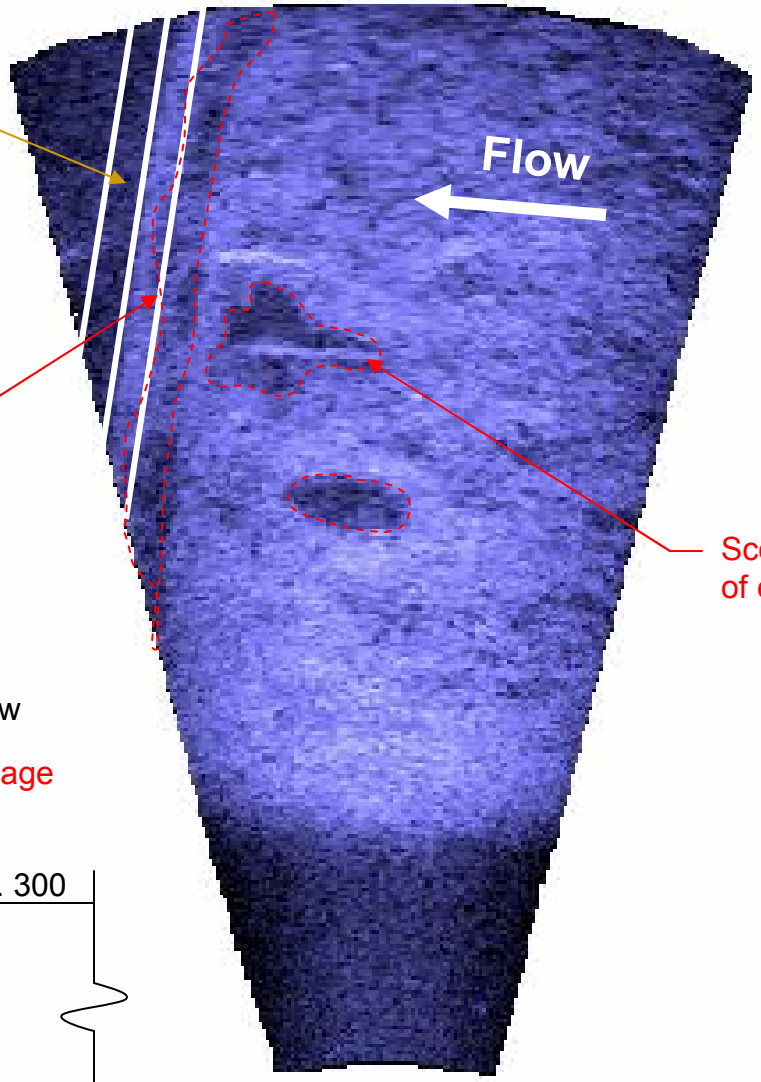
Potential for Catastrophic Outcomes without Future Repairs

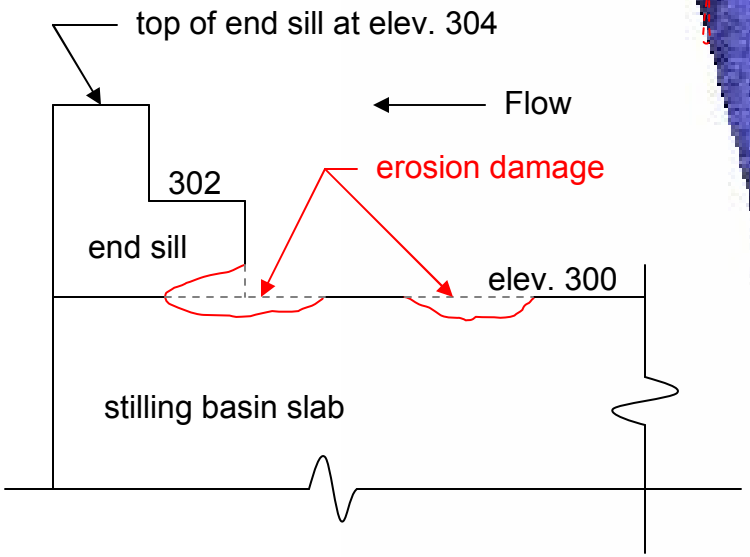
Erosion Damage at J.T. Myers

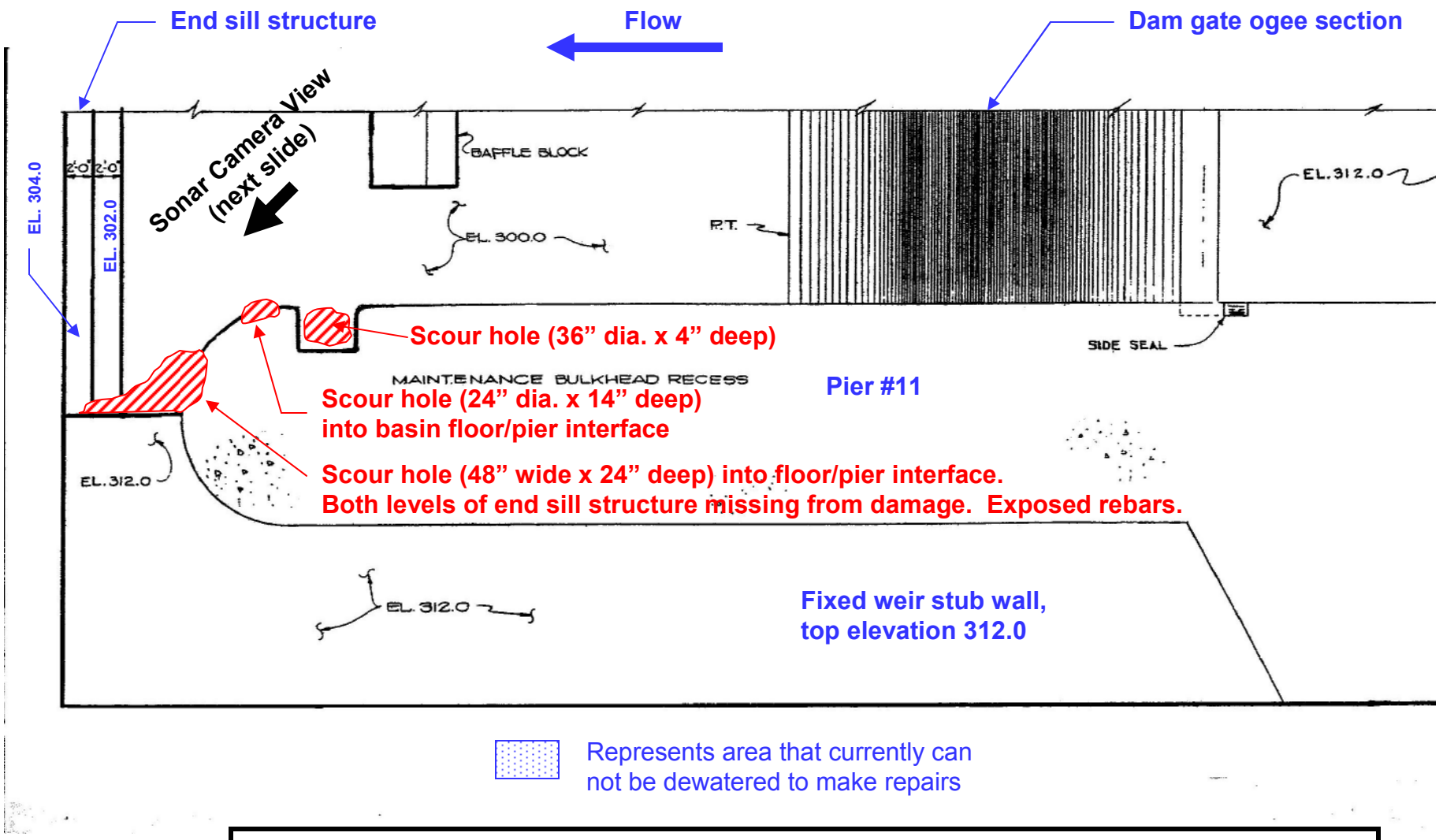
J.T. Myers Dam Gate Bay #6 Damage
Erosion of Stilling Basin / End Sill Structure



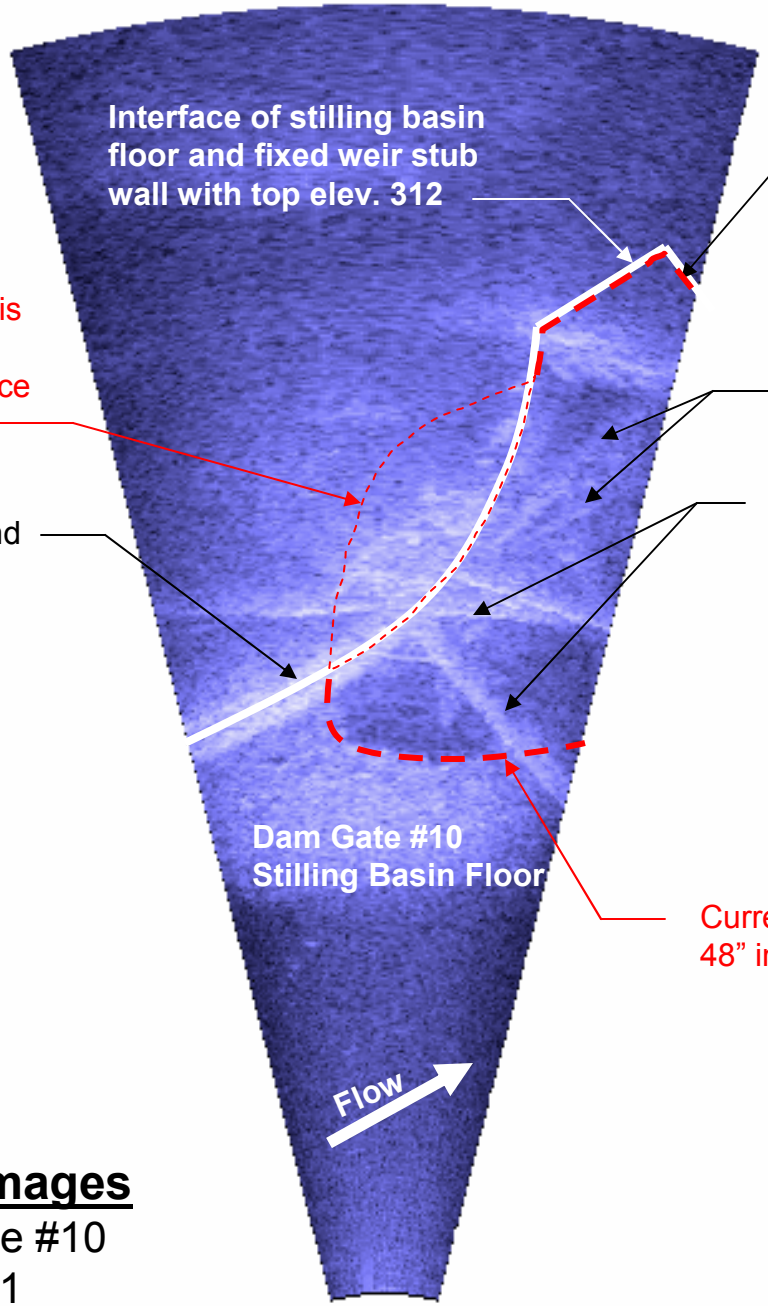
J.T. Myers Dam Gate Bay #6 Scour Image
Erosion of Stilling Basin / End Sill Structure







J.T. Myers Dam Gate Stilling Basin Scour Damage
Plan View of Gate #10 Floor / Pier #11 Area



J.T. Myers Dam Scour Images

Erosion Damage of Dam Gate #10
Stilling Basin Floor at Pier #11

Scour Damage and Repairs at Markland Dam

** Note: Markland Dam is a similar high-lift project on Ohio River very similar to J.T. Myers

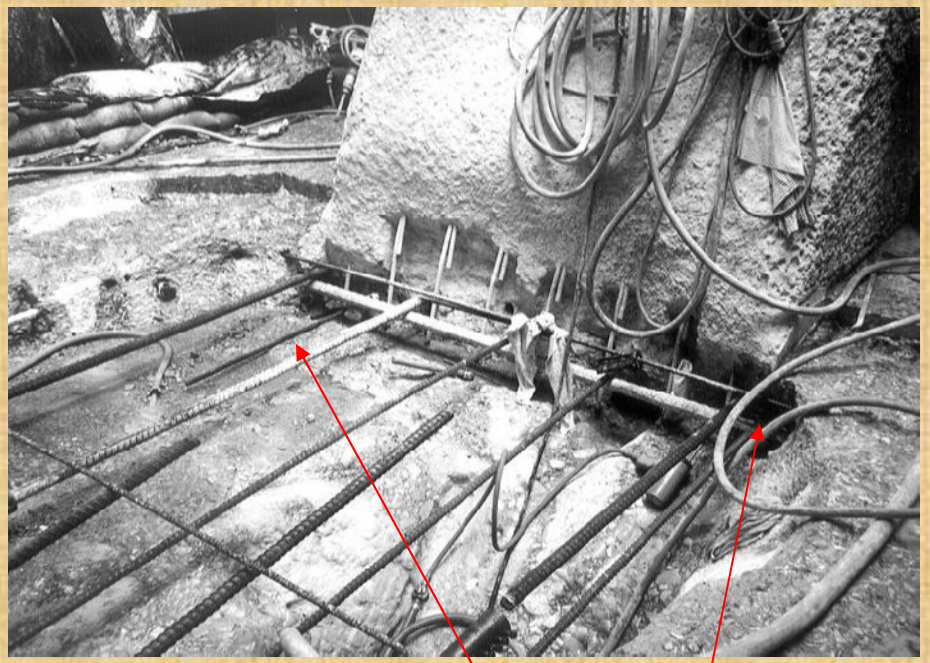
Scour Damage Repairs at Markland Dam

Temporary dewatering box built by LRS to make limited scour repairs around piers at the Markland Project.

Only allows for limited area of damage to be repaired. Not applicable for many other sites and types of erosion damage

Must be site adapted which is too costly and would not cover necessary areas

Markland Scour Damage



Note depth of scour hole around pier

Note scour below baffle block & stilling
Basin floor interface, exposed rebar, limits of scour hole

Scour Damage Repairs at Markland

Note close-up of damage of exposed and worn rebar in scour hole prior to repairs

Limits of scour hole and repair of missing and damaged rebar throughout entire area around nose pier

J.T. Myers Dam Rehab

Failure Mechanisms and Potential Impacts

Critical Features in Need of Evaluation for Rehab Study

- ✓ Scouring of Dam Stilling Basin and Piers
- ✓ Stability of the Dam Piers due for Various Load Cases Combined with Scour, Foundation Faults, and Previous Cofferdam Failures
- ✓ Electrical and Mechanical Upgrades Required for Various Issues
- ✓ Bulkhead Crane Bridge Seats

Failure Mechanisms Associated with Various Features

- ✓ Dam Scour – inability to dewater for repairs, increased erosion rate through time, potential for undermining of dam with catastrophic failure
- ✓ Dam Stability – potential for deep-seated sliding failure of dam due for various load cases due to heavy faulting, pier failure due to reduced shear capacity at erosion areas, potential for catastrophic failure of dam
- ✓ Electrical & Mechanical Upgrades – inability to find replacement parts for repairs, uneven distribution of load on tainter gate cables, reduced capacity to operate dam properly, potential for increased O/M and inability to effectively control pools

J.T. Myers Dam Rehab

Impacts Associated with Failure Modes

- ✓ Duration of loss of pool depends upon level of failure and inflows at time of failure, but 30 to 60 days duration is considered reasonable to block flow and rebuild pool levels while permanent repairs are undertaken

- ✓ Loss of navigation benefits alone would exceed $100 million not to mention pool loss impacts to industries and cities with water intakes
  - Multiple power plants, industry, and municipal intakes in J.T. Myers pool
  - Major handling facilities for navigation traffic
  - Potential for other damages (bank erosion, highways, bridges)

- ✓ Repair costs would most likely exceed $50 million to build temporary cofferdam and make repairs to damaged gate bays

- ✓ Expected overall costs would run into the hundreds of millions, if not billions of dollars, depending upon the severity of the failure

- ✓ Navigation pool loss can occur within 3 days during low inflow periods

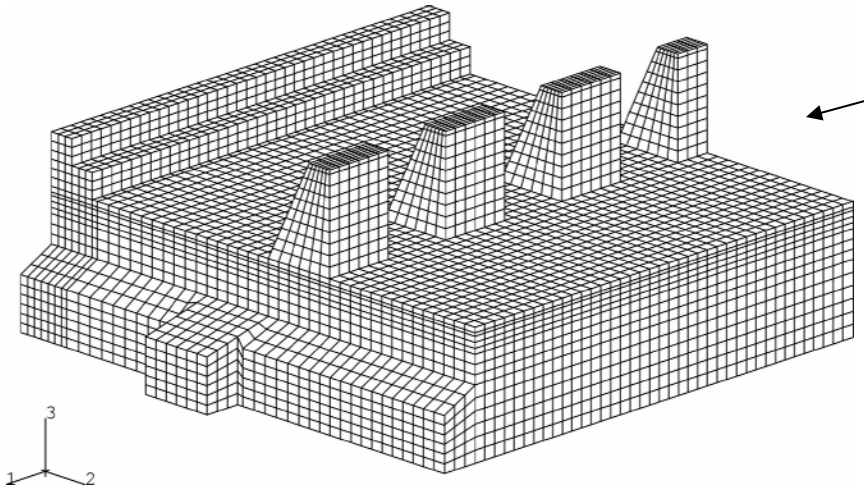
J.T. Myers Dam Rehab
Engineering Reliability Modeling

Development of Engineering Reliability Models

- ✓ Scouring of Dam Stilling – Analytical reliability model based upon detailed F.E. analysis of scouring action calibrated with test data and 1:100 navigation model from J.T. Myers Locks Improvements Project
- ✓ Stability of the Dam Piers – Analytical reliability model based upon wedge analysis and associated random variables for foundation strengths, passive resistance, lower pool fluctuations…
- ✓ Electrical and Mechanical Features – hazard rates to be developed by expert elicitation process
- ✓ Bulkhead Bridge Bearing Seats – analytical model with variations in concrete parameters, loads, deterioration rates, etc…

J.T. Myers Dam Rehab

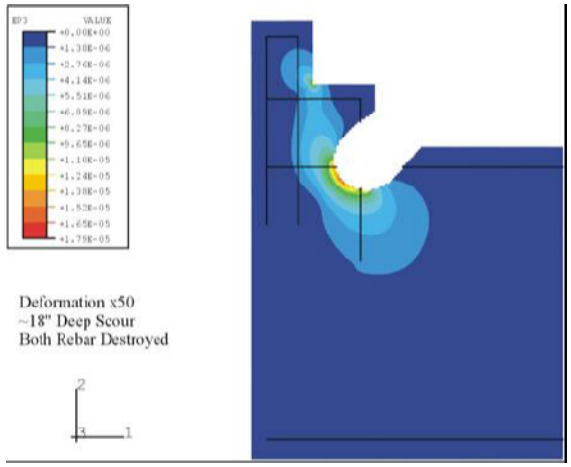
F.E. Analysis of Scouring Below Dam

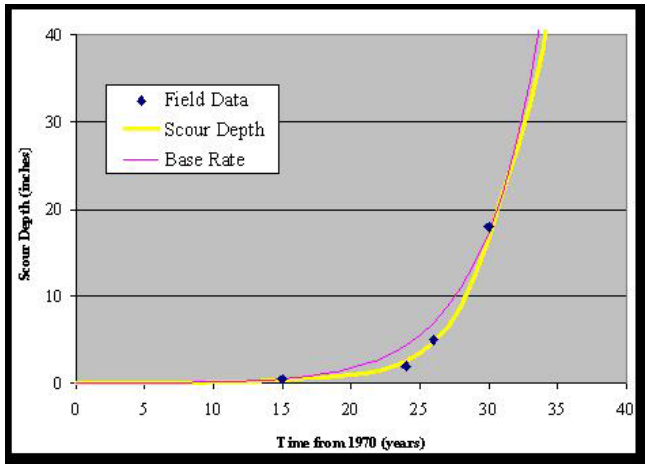


Global 3-D F.E. model of ½ stilling basin gate bay w/ baffle blocks and reinforcement features

FE model data output vs. field data and model tests

Refined local FE model evaluating concrete performance with continued scour





J.T. Myers Dam Rehab

Rehab Option to Improve Reliability

Anticipated Features of J.T. Myers Dam Rehabilitation

- ✓ Overall cost in the range of $25 to $35 million
- ✓ Specialized dewatering bulkhead and related equipment to make repairs to entire dam stilling basin - $12 to $15 million
- ✓ Anchoring of dam piers to improve stability - $8 to $10 million
- ✓ Mechanical and electrical upgrades as required - $3 to $8 million
- ✓ Repairs to bulkhead bridge bearing seats - $2 million +/-

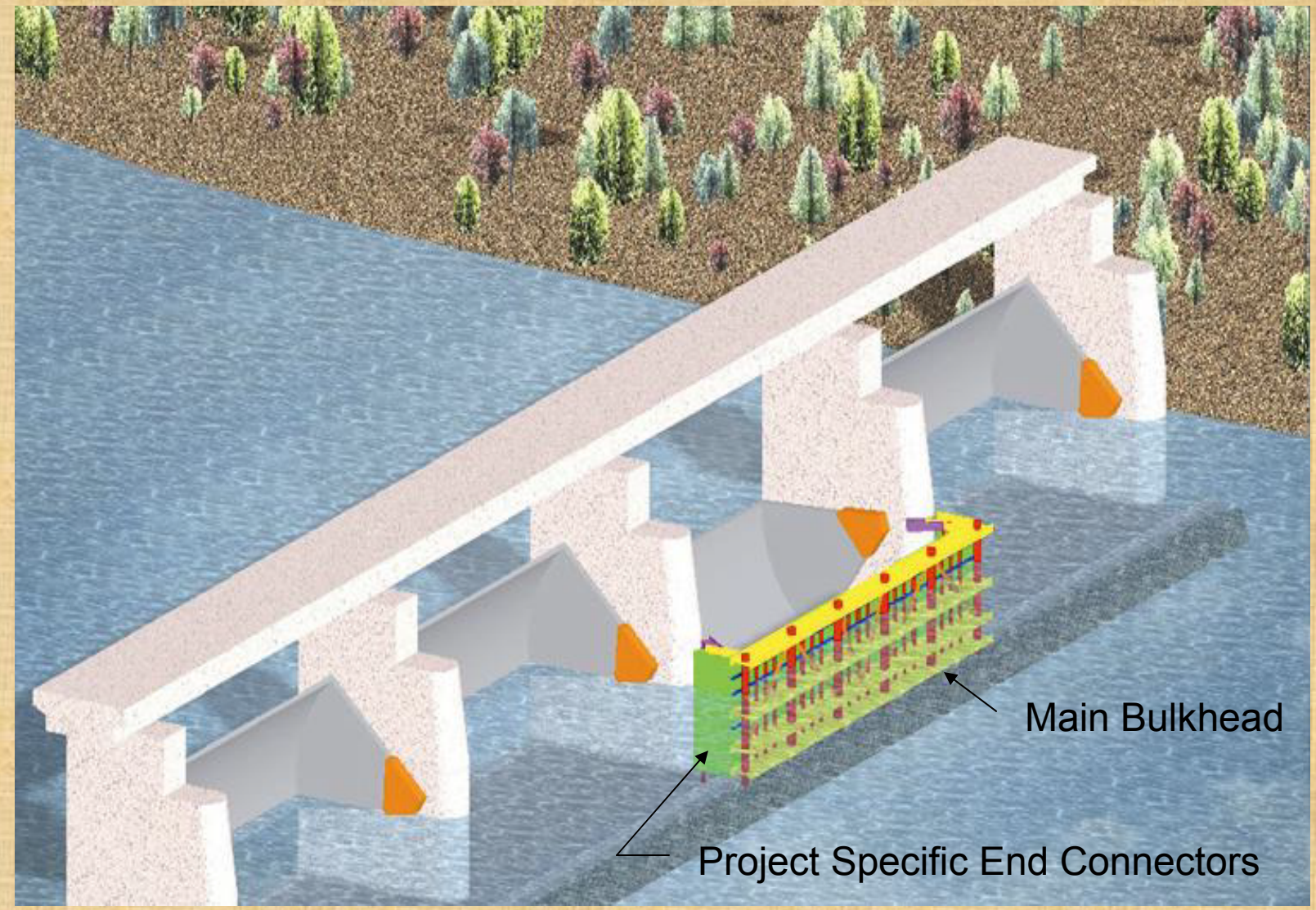
Specialized Dewatering Bulkhead

- ✓ Consists of main bulkhead with site-specific end connectors
- ✓ Main bulkhead would be a regional asset that could be used at multiple projects throughout LRD
- ✓ Allows repairs to be made to areas of the dam currently not accessible for maintenance repairs

Functional Criteria for the Bulkhead

- ✓ Allow for the Dewatering of an Entire Tainter Gate Dam Stilling Basin Bay
- ✓ Provides Unobstructed Access for Repair of Severe Scouring in the Stilling Basins
- ✓ Match Geometries of J.T. Myers, Markland, Cannelton and Newburgh Dams – Ohio River
- ✓ Be Adaptable for Use at Other Tainter Gate Dam Stilling Basin Bays

Dewatering Bulkhead Installed



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Current Status and Schedule

- ✓ Study Cost of Roughly $800k Over 3 Years. Three Years Required Due to Limited Funding Stream from Available O/M $$$ (could have been done in 2 years)
- ✓ Supporting Engineering Analysis Completed, Currently Developing Reliability Models
- ✓ Supporting Economic and Hydrologic Analysis Underway, as well as Environmental Review
- ✓ Report Planned for Completion in Spring 2006 Pending Available Funds

Thank You

Questions???

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