Chattahoochee River Dam Removal and Ecosystem Restoration Project: *Meeting Ecosystem Restoration and Recreation Goals*

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Project Background

- Proposed Project:
  - Removal of sections of the City Mills and Eagle and Phenix Dams on the Chattahoochee River
- Project Sponsors:
  - USACE, Phenix City, AL and Columbus, GA
- Primary Purpose:
  - Restore shoal habitat for aquatic species
  - Provide whitewater recreation opportunities

Project Location

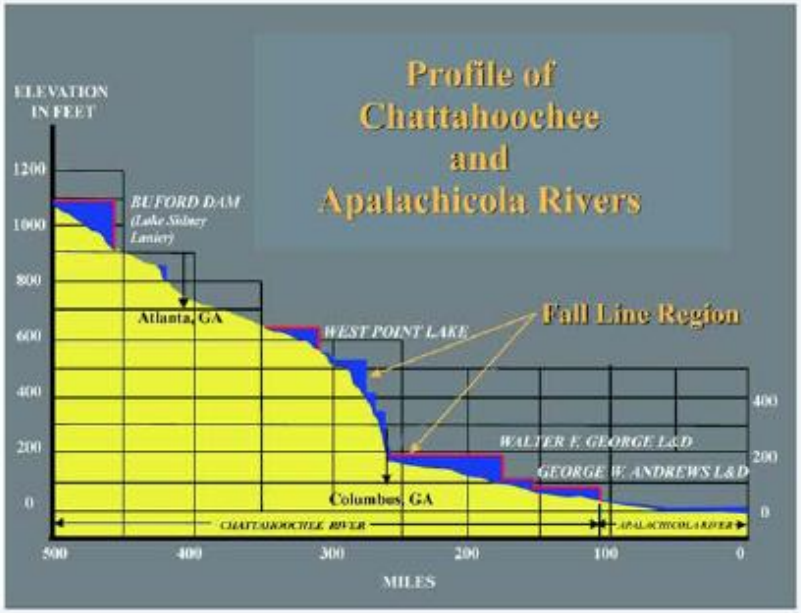
- Chattahoochee River near Columbus, GA

Chattahoochee Fall Line Region

- The Fall Line region is characterized by steep gradients and extensive rock outcrops. The Fall Line often creates water falls and rapids in rivers that pass through the region.
- The rock outcrops create Fall Line Shoals Habitat.
- Fall Line Shoals Habitat is limited to 30 miles on the Chattahoochee River.
- All of the Fall Line Habitat on the Chattahoochee are impounded, some of it since the early 1800s.
- This proposed project would restore 2.2 miles (7%) of Fall Line Shoals Habitat.

The Fall Line is the interface between the Piedmont and Sandhills regions.

Current river conditions (impounding) above City Mills



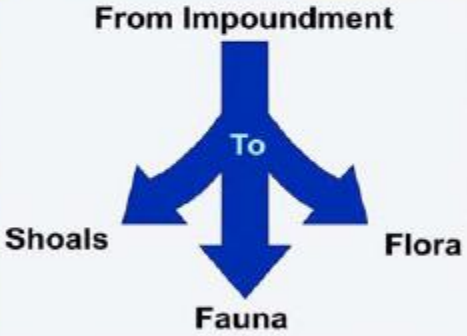
Fall Line bedrock outcrops along the Chattahoochee River.

Fall Line Shoals Habitat

Ecosystem Restoration Benefits

- **Proposed restoration of a portion of the Chattahoochee River will create a habitat for unique fish, invertebrates, and plant communities adapted to Fall Line Shoals.**

- **Many of these plants and animals are intolerant of the impounded river conditions present today.**



- **Two of the most important species that will be restored to the Fall Line Shoals Habitat are the Shoal Bass and the Shoals Spiderlily.**

- **Lower water levels will expose rocky outcrops and result in the return of species like the Shoals Spiderlily.**

Project Site

EXHIBIT 1

CHATTAHOOCHEE RIVER RESTORATION
OVERVIEW MAP

PLAN

2D Hydraulic Model Boundary

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North Highlands Dam and Tailrace


North Highlands Powerhouse and Tailrace

Tailrace below North Highlands Dam with power generation flows

City Mills Dam

850 ft long; 10 ft high; 1.4 mile, 110-acre run-of-river impoundment;
normal pool elevation is 226 ft NGVD

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City Mills Dam and Impoundment

Eagle and Phenix Dam

900 ft long – 512 ft overflow spillway; 17 ft high; 0.8 mile, 45-acre run-of-river impoundment; normal pool elevation is 215 ft NGVD

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Eagle & Phenix Dam and Impoundment

Project Vision

Study Timeline/Phased Approach

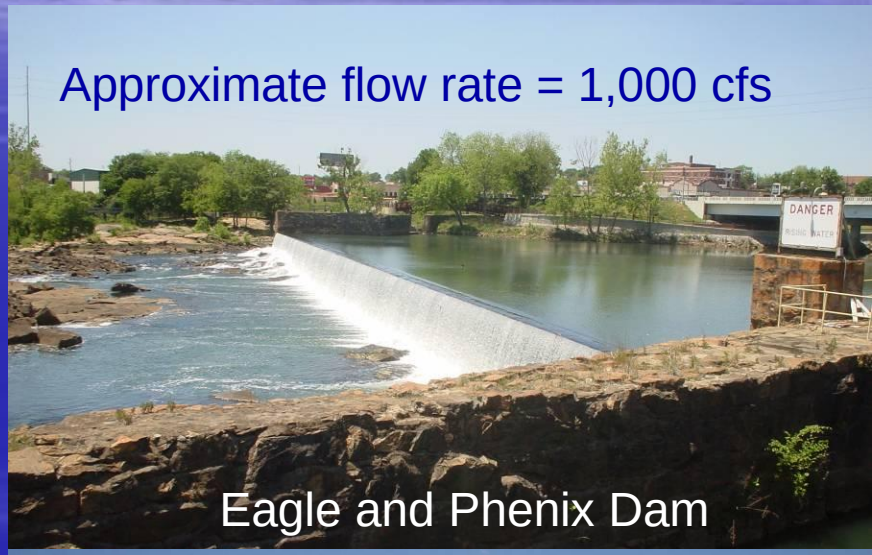
- 2004 – USACE completed EA and identified preferred alternative
- 2007 – Initiated Phase I Design Study
  - Updated project cost estimates ($22-27 million)
  - Evaluated alternative construction approaches
- 2008 – Continued Phase I Concept Design Studies
  - Sediment evaluation, H&H modeling, Detailed construction method evaluation, Construction sequencing evaluation
- 2009 -2010– Phase 2 Detailed Design
  - 50% design and permitting
- 2011-12 – Final Design and Construction

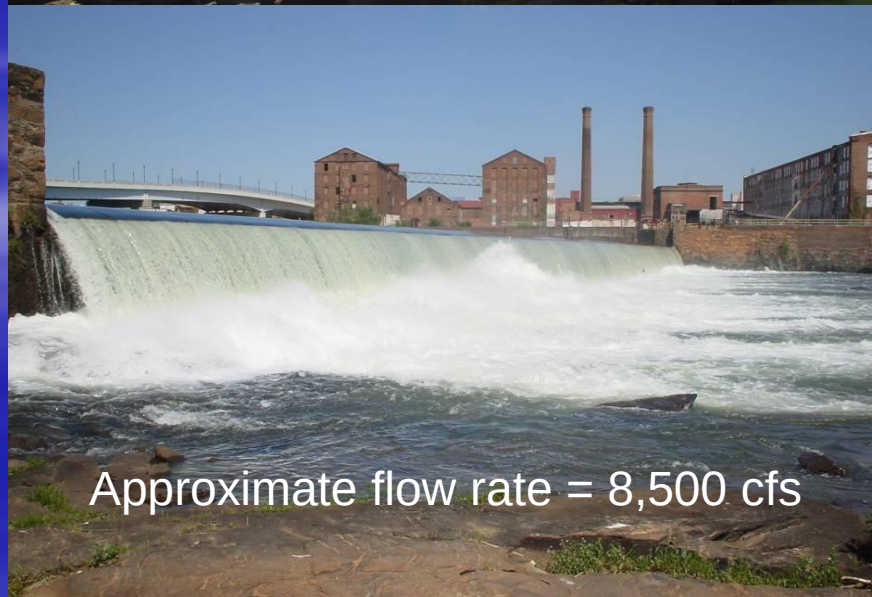
Key Concept Design Considerations

- Stream Flows – How to create habitat and whitewater recreation?
- Construction Methods and Sequencing – Can you build it in the river during the expected flows?
- Environmental Permitting –
  - 404 Permit (cost share partner)
  - 401 WQ Certification
  - ESA and NHPA
  - FERC License Surrenders

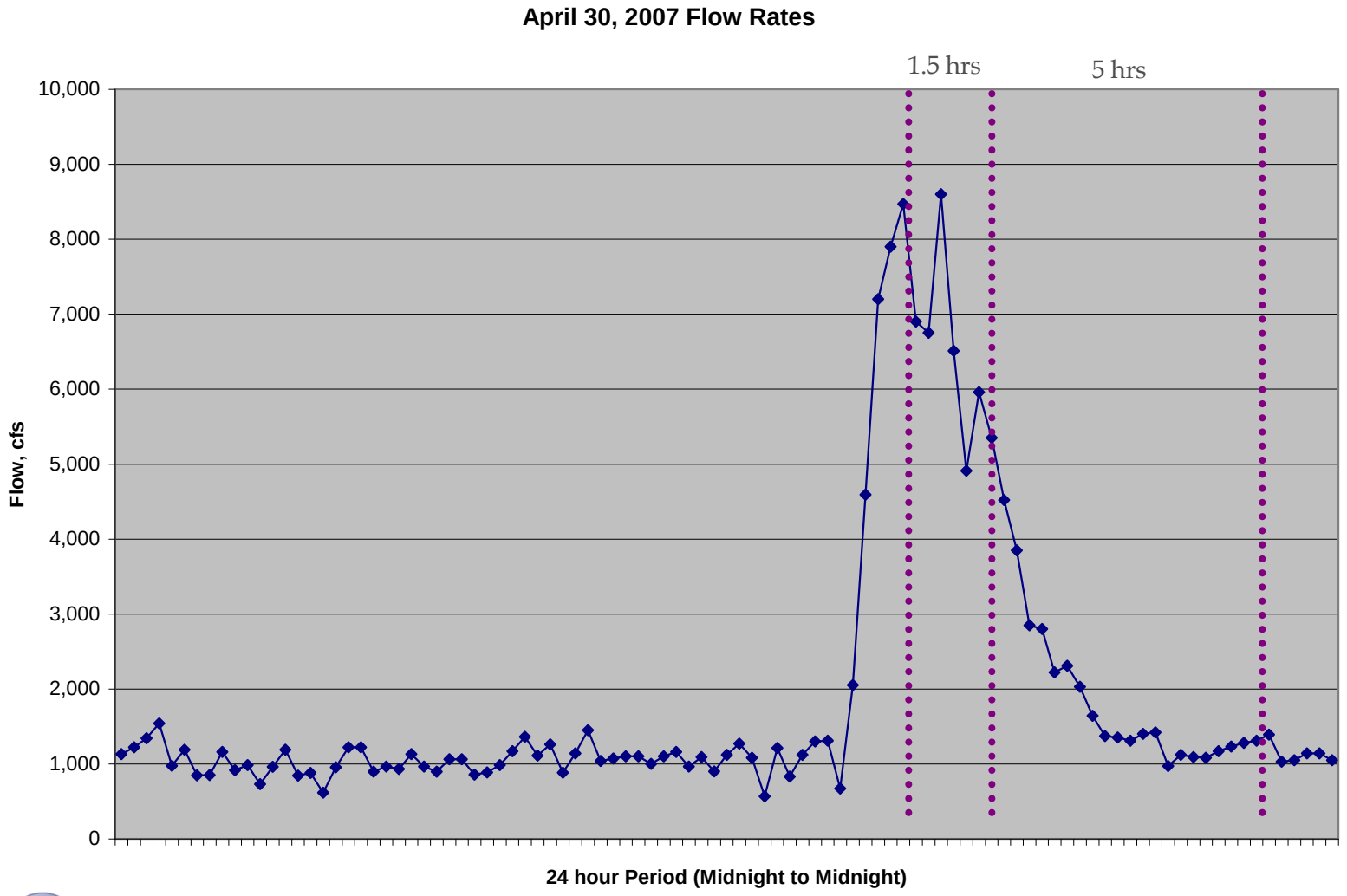
River Flow Conditions Drive Design and Construction

- Highly variable
- Range from <800 cfs to >10,000 cfs
- Daily and seasonal fluctuations
- Minimum flow requirements





Daily Flows Based on Upstream Power Generation



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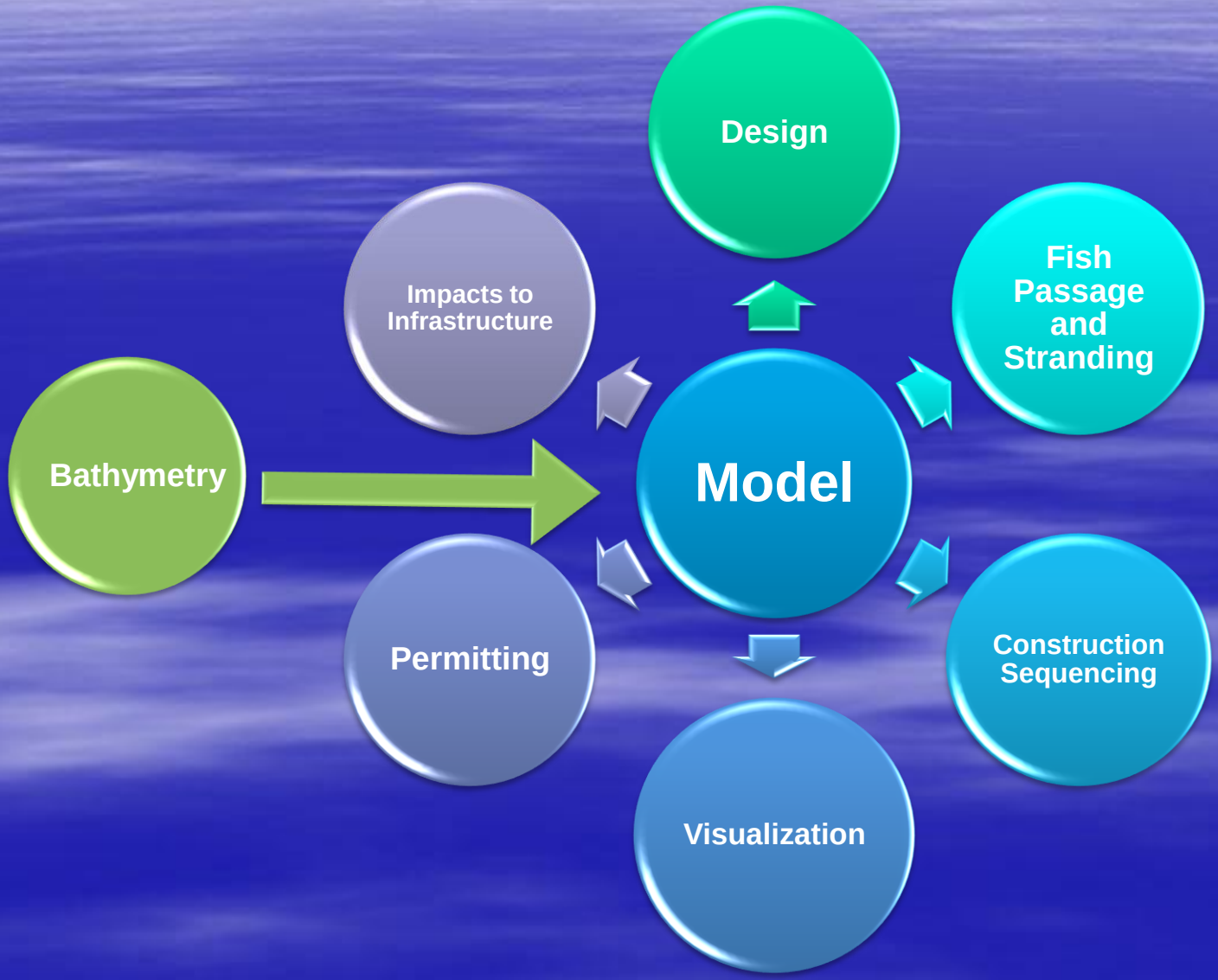
Hydraulic Modeling



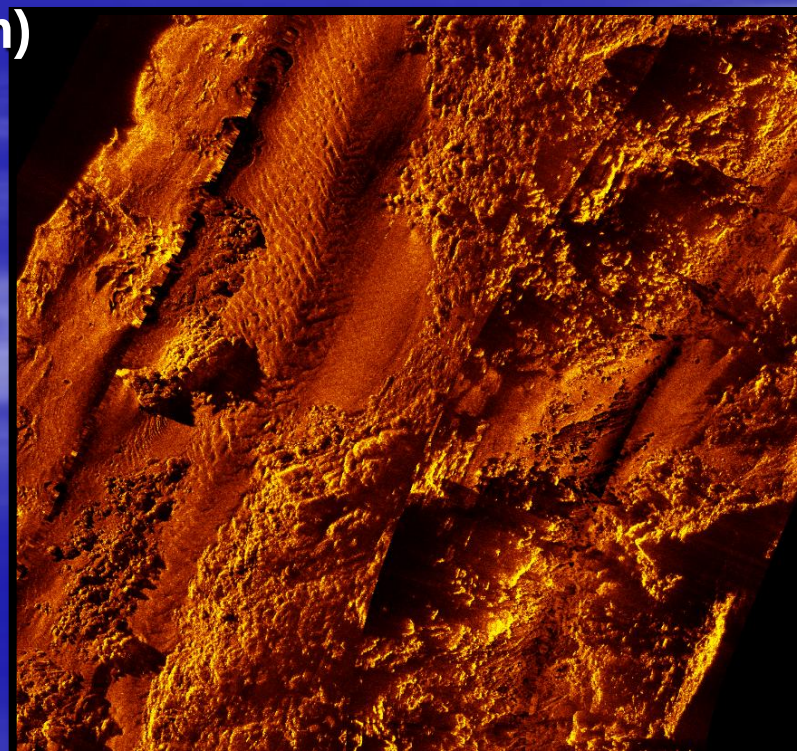
Bathymetric Survey

Four surveys: 2003, 2006, 2008, 2009, and 2010

Survey Methods:

- **Photogrametry**
- **Hydro-acoustic (single and multibeam)**
- **Side-scan sonar**
- **Traditional equipment**

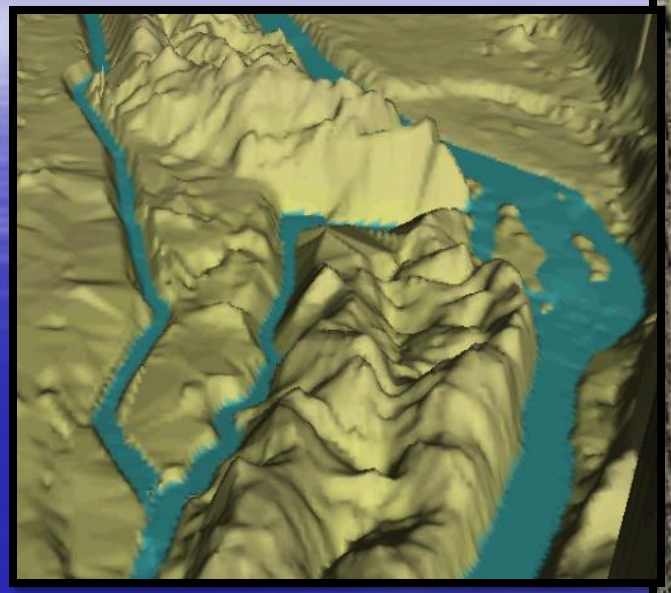
Stitched all data into a single DTM

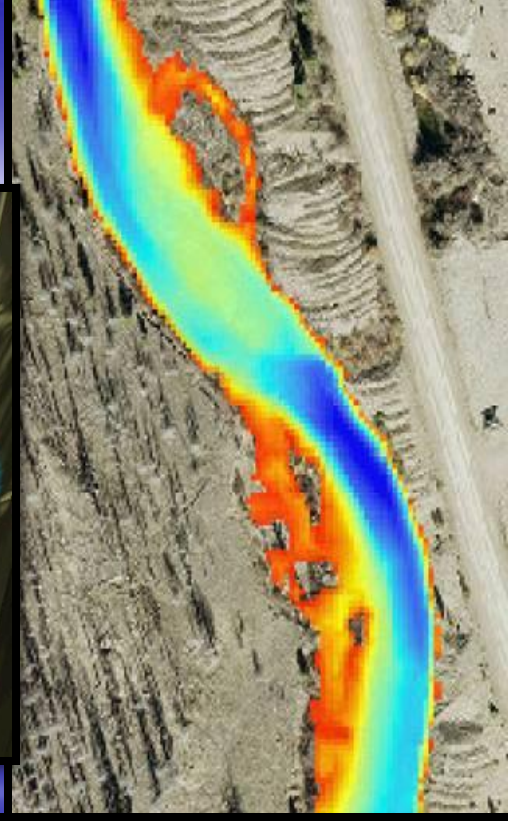


Data Collection

Flow suspended for 8 hours

Multi-Dimensional Modeling





2D surface-water modeling:

- MIKE 21 FM

Assumptions:

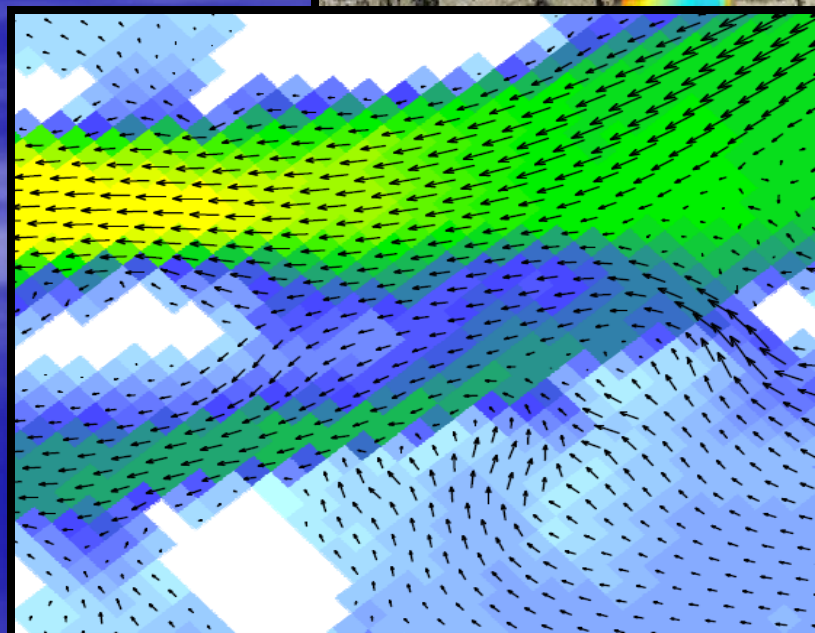
- 2D flow
- Depth-averaged hydraulics

Outputs:

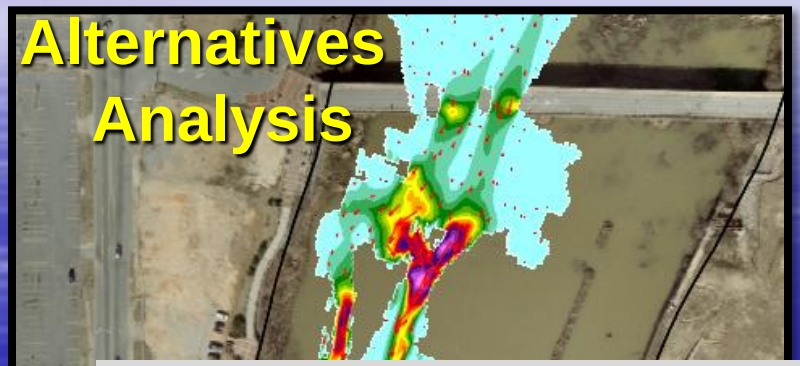
- 3 Types: Area, Line, and Point
- Water Surface Elevation, Depth, Velocity, Shear Stress, etc.
- Files are compatible with GIS and CAD

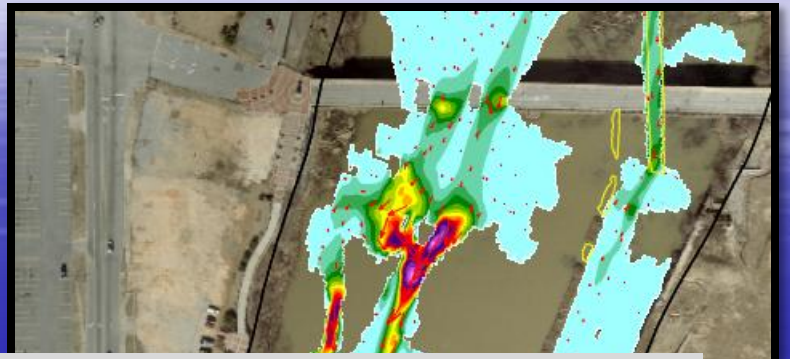
Limitations:

- Requires more data
- Grid cell size
- File size (inputs & results)
- Model run times
- Data overload…

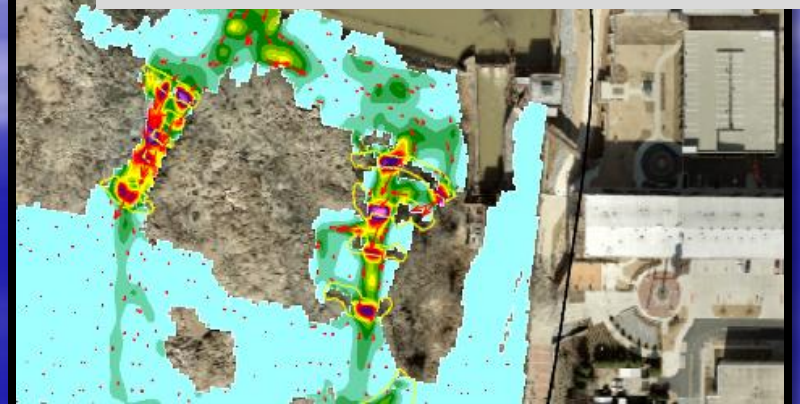


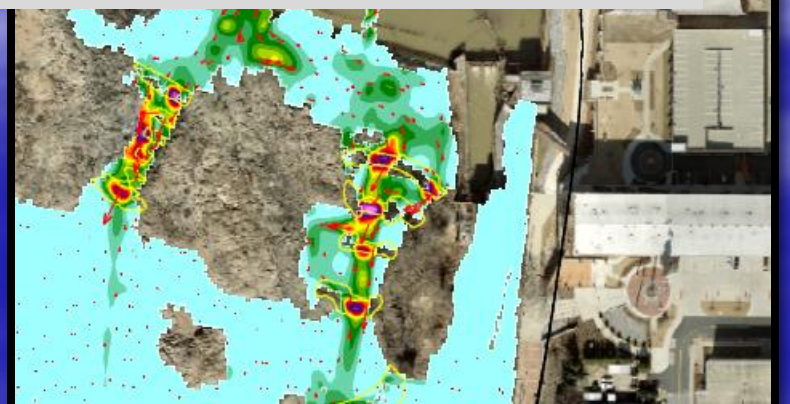
Design



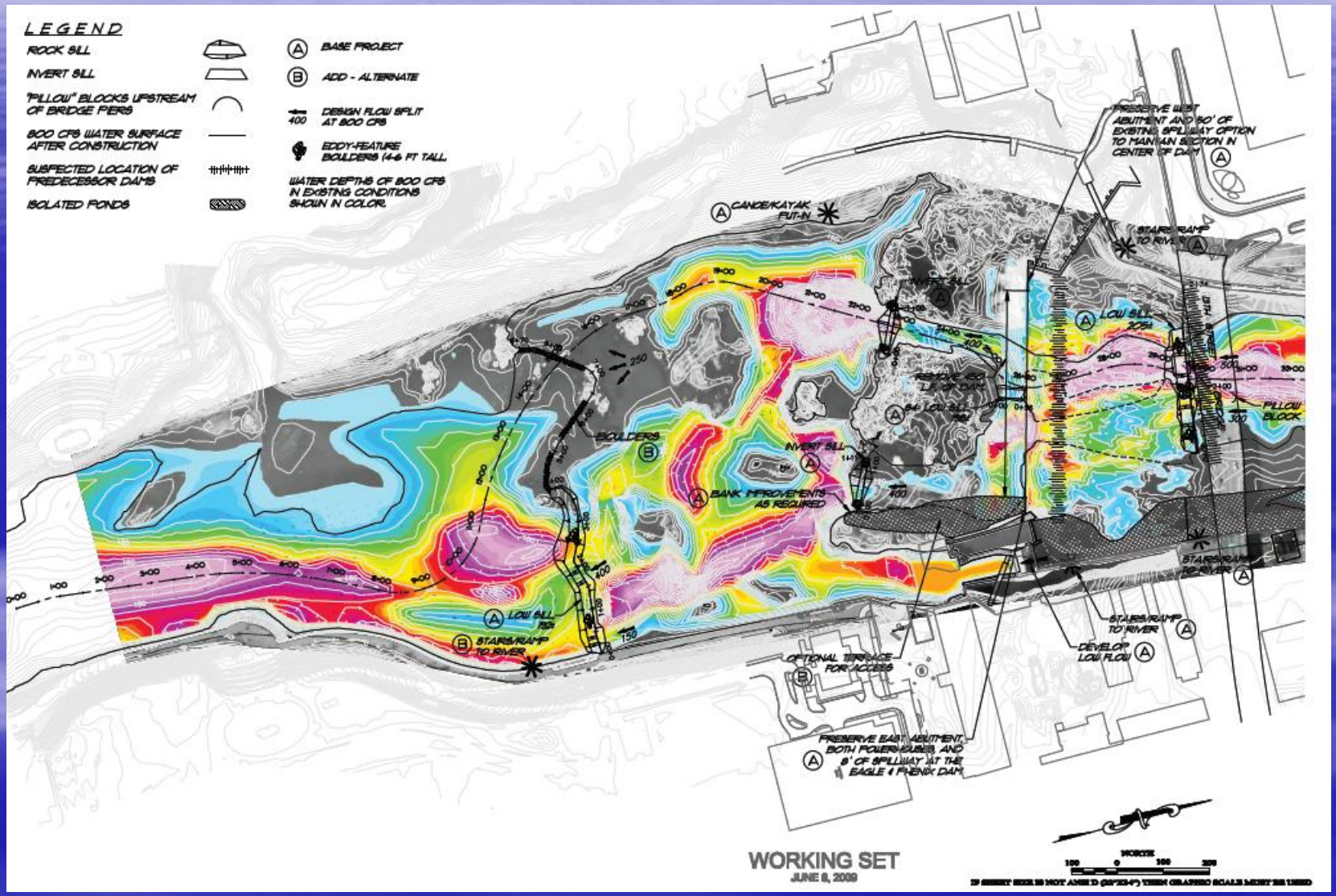


- Delivered 100+ result maps to-date with approximately 100 more maps to be delivered during final design
- Other design support deliverable include: profiles, DTM of water surface, and edge of water boundary

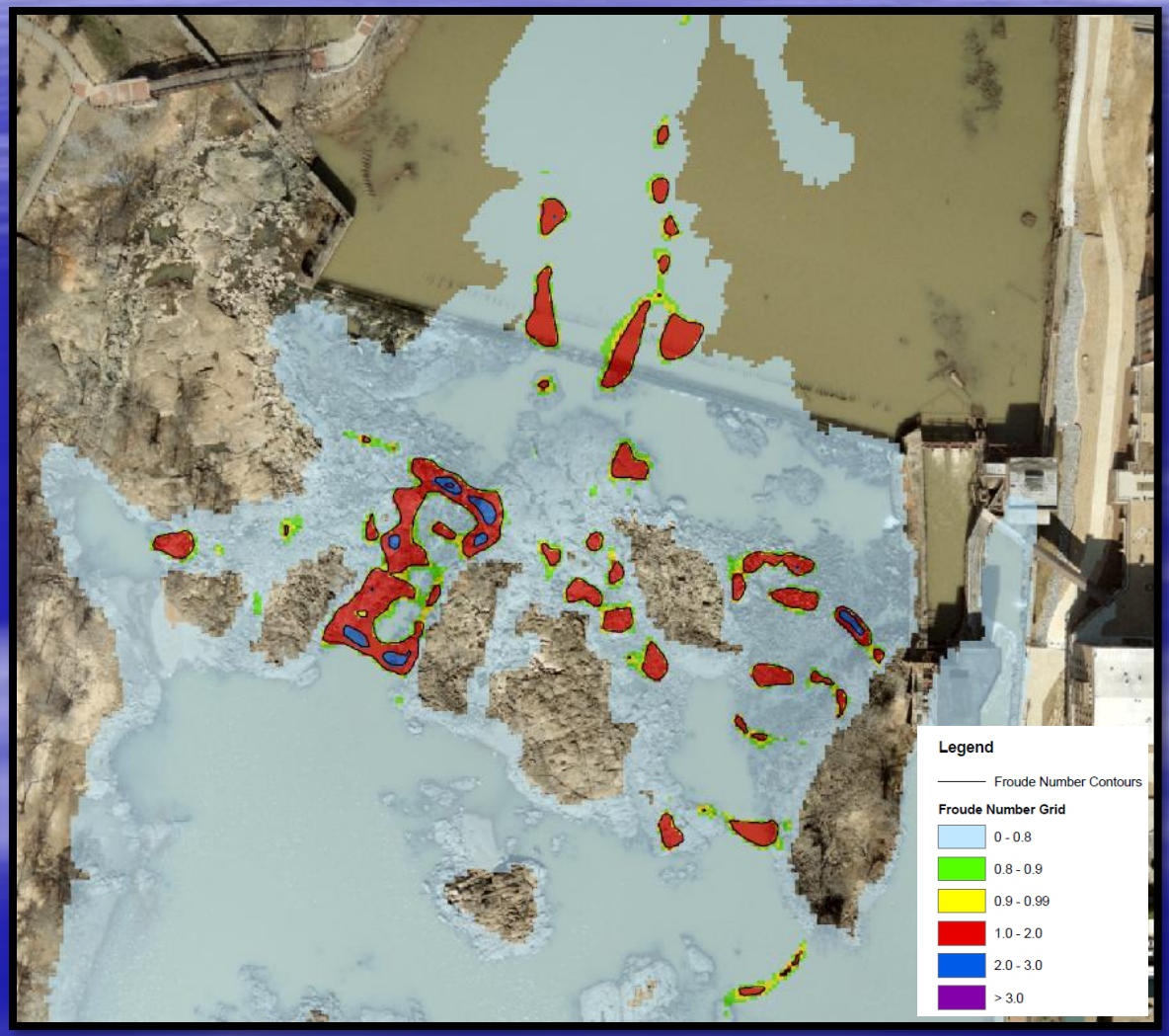




Design

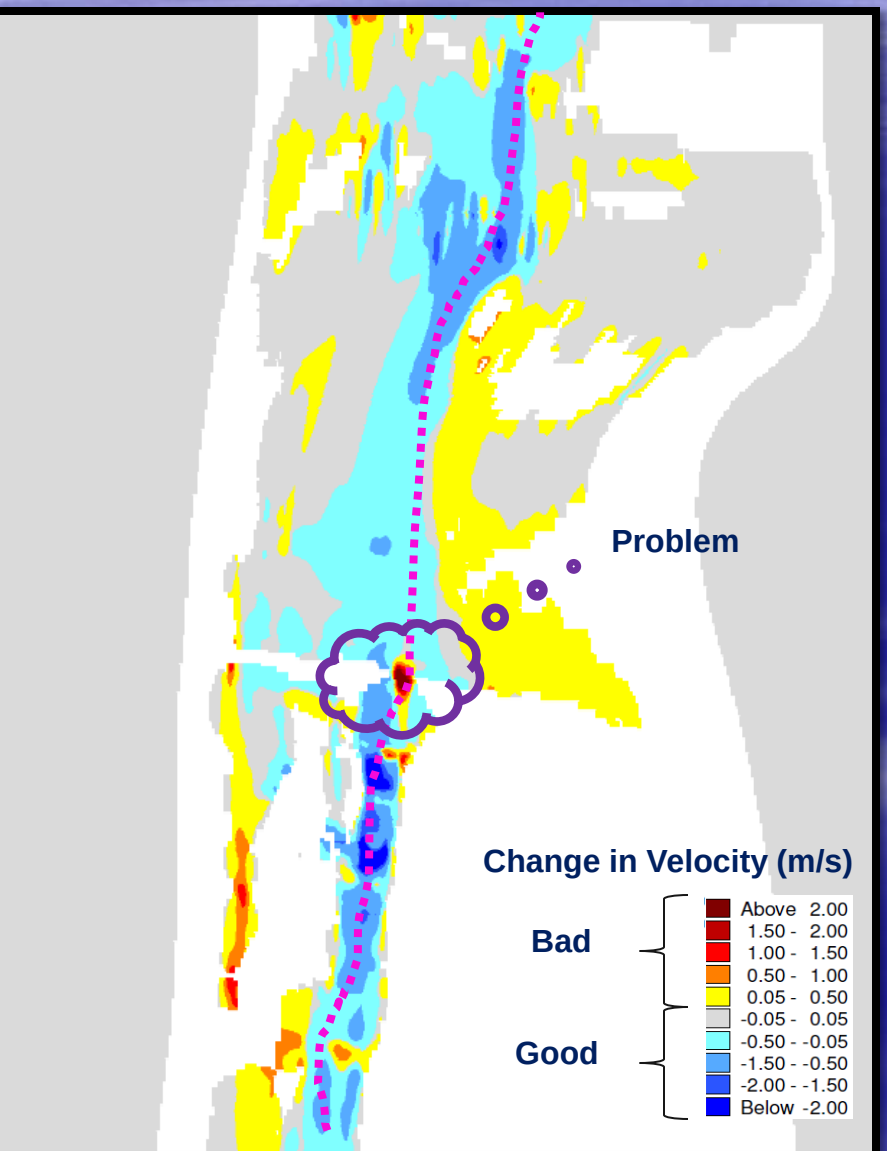

LEGEND
ROCK SILL
INVERT SILL
"PILLOW" BLOCKS UPSTREAM OF BRIDGE PIERS
800 CFS WATER SURFACE AFTER CONSTRUCTION
SUSPECTED LOCATION OF PREDECESSOR DAMS
ISOLATED PONDS
A BASE PROJECT
B ADD - ALTERNATE
400 DESIGN FLOW SPLIT AT 800 CFS
EDDY-FEATURE BOULDERS (4-6 FT TALL
WATER DEPTHS OF 800 CFS IN EXISTING CONDITIONS SHOWN IN COLOR.
A CANOE/KAYAK PUT-IN
PRESERVE WEST ABUTMENT AND 50' OF EXISTING SPILLWAY OPTION TO MAINTAIN SECTION IN CENTER OF DAM
STAIRS/RAMP TO RIVER
LOW SILL
PILLOW BLOCK
BOULDERS
INVERT SILL
BANK IMPROVEMENTS AS REQUIRED
LOW SILL
STAIRS/RAMP TO RIVER
OPTIONAL TERRACE FOR ACCESS
STAIRS/RAMP TO RIVER
DEVELOP LOW FLOW
PRESERVE EAST ABUTMENT, BOTH POWERHOUSES AND 8' OF SPILLWAY AT THE EAGLE & PHENIX DAM
WORKING SET
JUNE 8, 2009

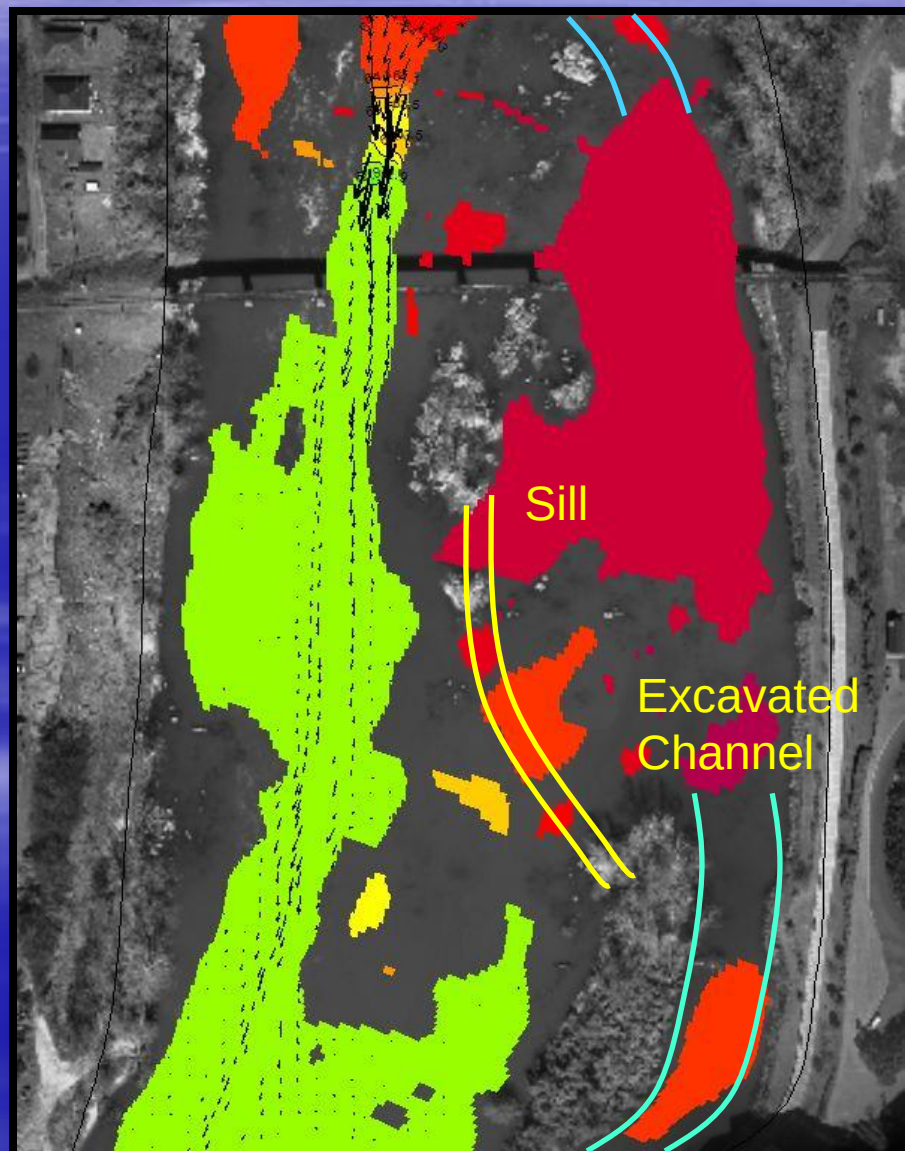
Design



- Where are the hydraulic the jumps?
- How strong are they?

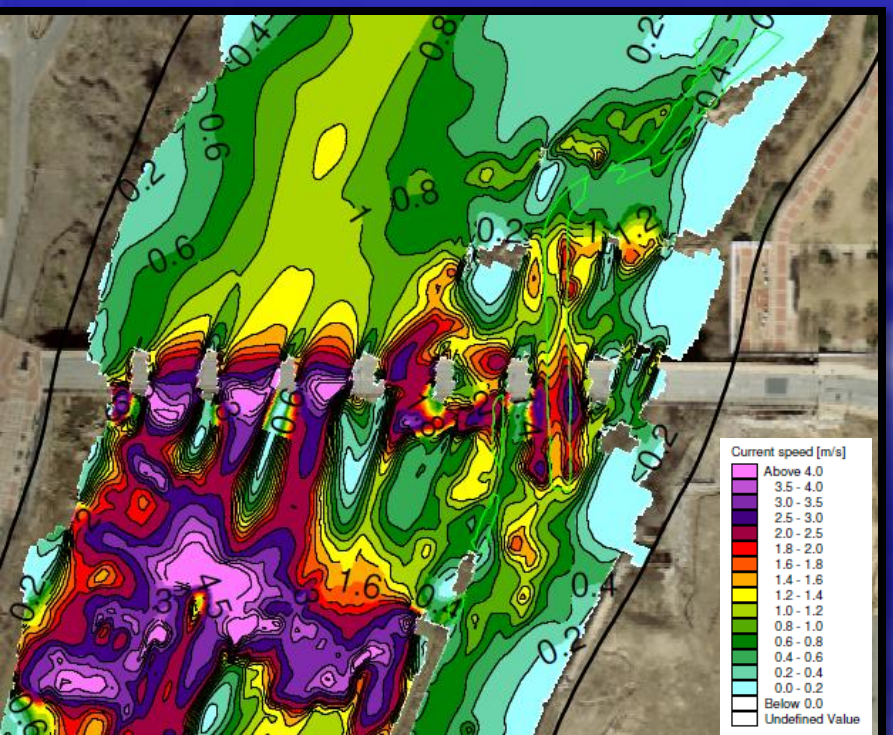
Fish Stranding and Passage

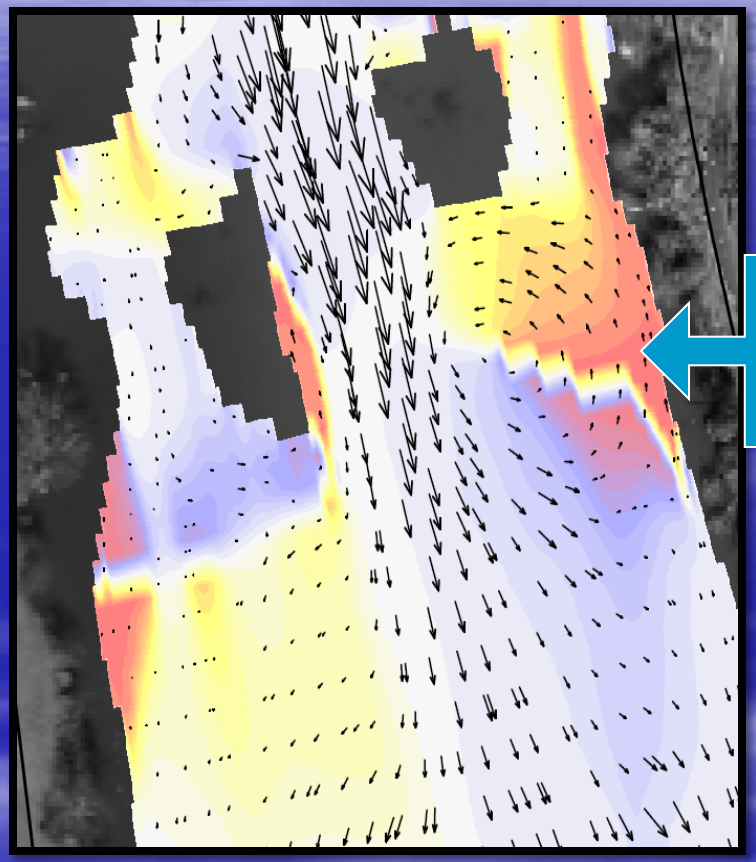




Impacts to Existing Infrastructure

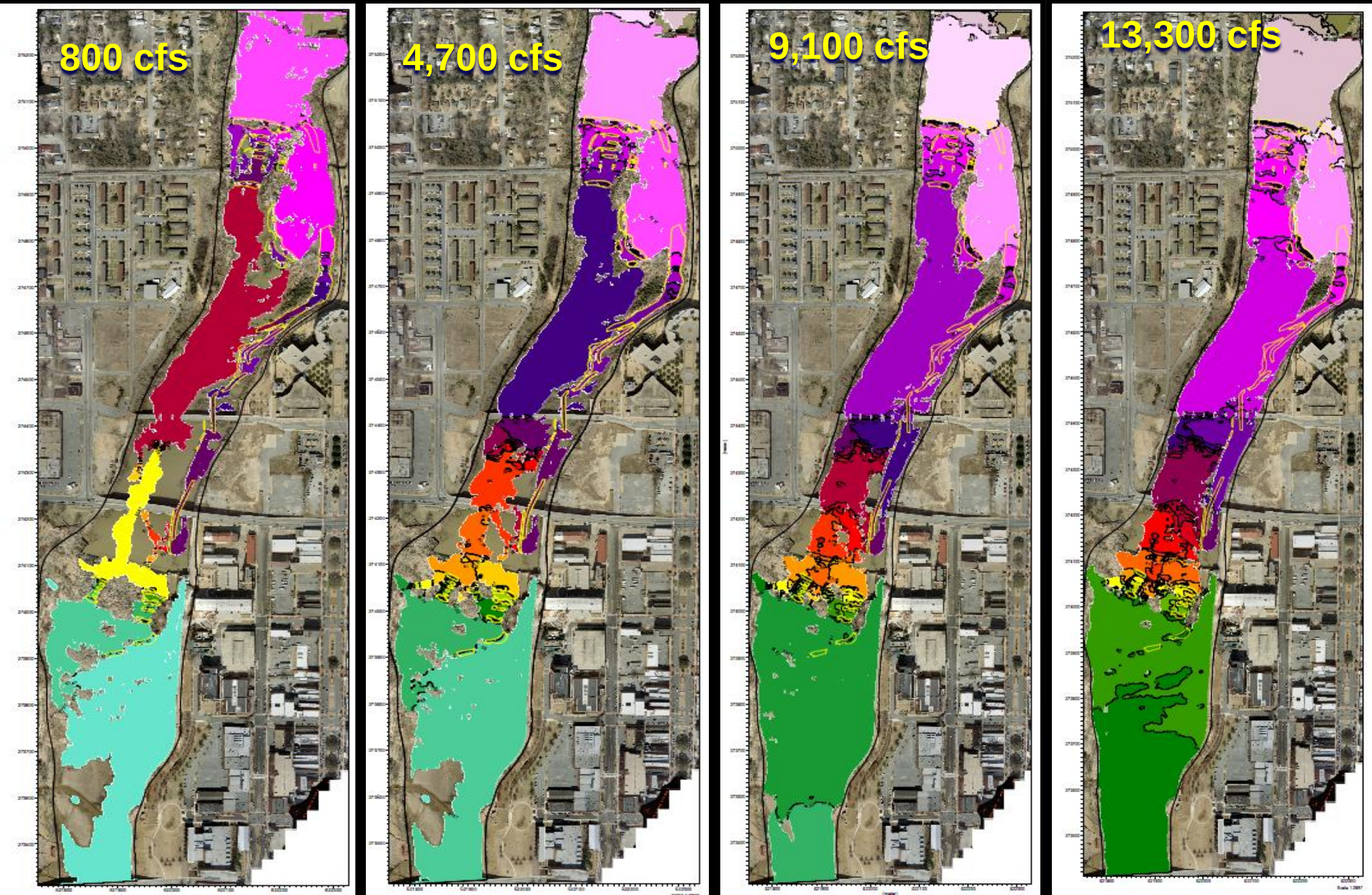
Bridge Piers and Foundation





Identified eddies and stagnant water at CSO's

Visualization of Post Dam Conditions



Construction Methods and Sequencing Evaluation Goals

- Control construction costs
- Minimize project risks to the contractor and owner
- Minimizes environmental impacts during construction
- Use construction methods and sequencing that are known, tested and applicable to this working environment
- Use methods and sequencing that respect worker safety
- Use approaches that promote efficient and timely progress
- Establish sequencing and use construction methods that respect the river and are chosen to “work with the river” as much as possible. *That is…don’t fight nature*.

Construction Sequencing and Methods

Example scenario:

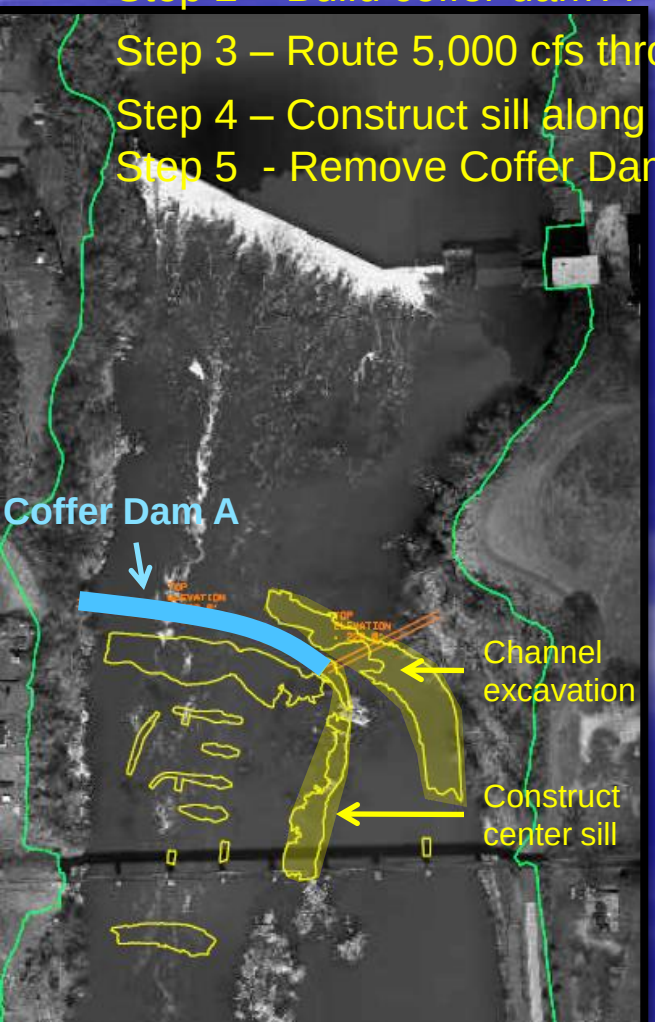
Step 1 – Construct center sill and excavate channel (in the wet)

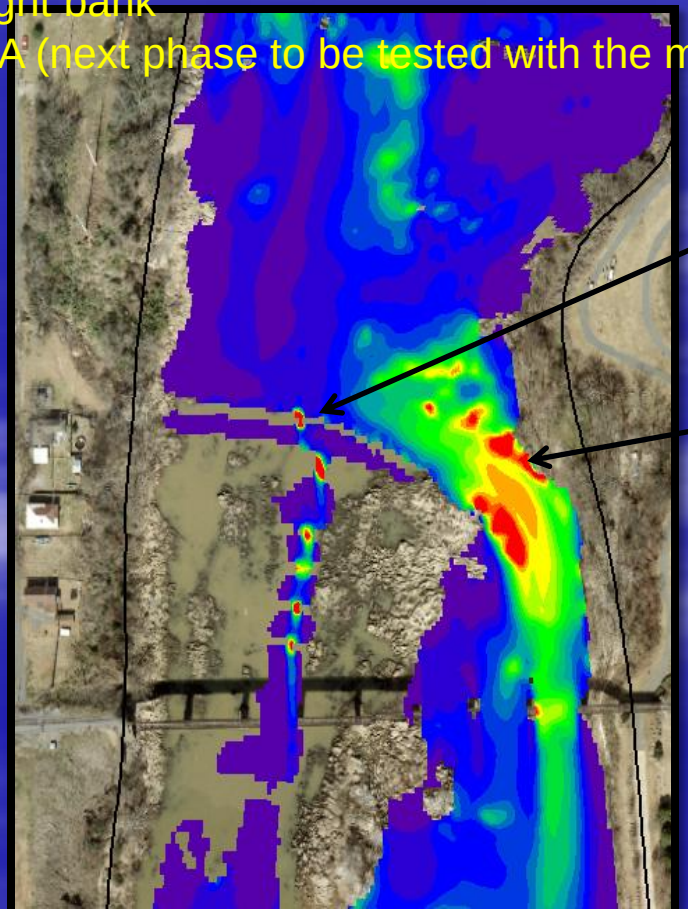
Step 2 – Build coffer dam A

Step 3 – Route 5,000 cfs through the newly excavated channel (test with model)

Step 4 – Construct sill along right bank

Step 5 - Remove Coffer Dam A (next phase to be tested with the model)





Need to increase the height of the coffer dam

Need to armor the banks

Permitting Considerations

- Section 404 Permit –
  - USACE decided individual permit required due to historic structures
  - Decided to use 1989 regulatory guidance letter
- CLOMR –
  - Fast track application development
  - Issues with historic models and FEMA reviewers
- FERC License Surrender(s)
  - Lengthy review process

Project Challenges

- Meeting mixed project objectives
  - Ecosystem restoration was USACE's primary objective
  - Local sponsor was focused on recreation
  - Agency staff (FWS, GA DNR, and GA EPD) supportive of restoration efforts but skeptical of recreation impacts
- Potential conflicts with upstream hydro power project
- Uncertainties in flows during construction

Summary

- Final design of the City Mills and Eagle and Phenix dam removal project is on-going
- Design and construction considerations have been driven by in-stream flows (and costs)
- 2-D hydraulic modeling results provided critical data
- Ecosystem restoration and recreation goals can be met
- Ultimately, costs will drive project elements in the final design.

Project Team Acknowledgements

- Ryan Mitchell
- Rick McLaughlin
- Joe Paine

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