UPDATE ON ALLEGHENY DAM 6 SCOUR REPAIRS AND REVIEW OF ALLEGHNEY DAM AND 5 SCOUR, PENNSYLVANIA

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& Project Manager Dam 6 Repairs
Allegheny Lock and Dam 6
Allegheny River Locks & Dam 5 and 6
Locations
ALLEGHEY DAM 6 PROJECT FACTS

- Built 1928
- Single Lock Chamber: 56’x360’
- Fixed Crest Dam: 992 ft long
- Built on Wood Piles & Cribbing
- Vertical Lift: 12.4 ft
- Primary Traffic: Recreational Navigation
- Secondary: Sand & Gravel, Magnetite
- Hydropower added 1989: 9.5 MW
Problem Requiring Emergency Repairs

**Prior Condition (Fall 2008):**
Severe Erosion & Undercutting = High Risk of Failure

Consequences:
- No Navigation
- No Recreational Boating
- Water intakes go dry
- Local wetlands lose water source
- No hydropower generation

- $3 million contract awarded Oct 2008 (later covered by 2009 stimulus funds coupled with hydropower firm funds)
AR Dam 6 Hydropower Plant

Coffer cell

Flow

Reach of Scour = 160’
FIRST TREMIE CONCRETE PLACEMENT – DAM 6

- **Tremie Tube**
- **1st Tremie Concrete**
- **Sand & Gravel Backfill**
- **PZC 26 Sheet Pile Wall**
- **Existing U/S Sheet Pile Wall**
- **Timber Piles**

**Dimensions:**
- U/P 769
- L/P 757
DOWNSTREAM STONE PROTECTION

PZC 26 Sheet Pile Wall

Sand & Gravel Backfill

2nd Tremie Concrete

1st Tremie Concrete

Top-Off Concrete

Derrick Stone

R-8 Rip Rap

Bedding stone

Timber Piles

Existing U/S Sheet Pile Wall

710

720

730

740

750

760

770

U/P 769

L/P 757
“Delivering sustainable, timely and efficient water resource solutions for over a decade.”

133 Slow Lane
Suite 15
Pittsburgh, Pennsylvania 15203
ALLEGHENY DAM 5 - ORIGINAL 1920’s CROSS SECTION
AR Dam 5 Background Information

• Hydro Electric Plant installed in the late 1980s at both AR5 and AR6 with similar design.
• After installation, both sites began experiencing an increase in measured scour.
• AR6’s scour was much worse than AR5.
• However, action was needed at Allegheny Dam 5 so conditions would not deteriorate.
Allegheny Dam 5 Project Goals

• Review existing data from the site
• Perform hydraulic model studies and 3D modeling
• Determine the exact cause of the scouring
• Mitigate the cause of the scouring & develop repair alternatives
Problem: Scouring

- Starts at hydropower wall
- Continues for ≈ 130’ across the dam
- Loss of cribbing
- Undercutting of dam at one area
  - 3ft deep x 4ft wide x 6ft upstream hole under dam

Reach of scour = 130 ft
Hydro Plant coffer cell at AR Dam 5
Existing Grading – 2D contours

Note: Smooth lines
Note: Area of scour

Flow
Existing Below Water Grading – 3D
The wall has a significant misalignment with cofferdam cell.
Hydraulic Flume Model

Water backing up the spillway caused by obstruction
Solution 1 -

Cut Portion of Coffer cell

DEMOLITION OF
CONCRETE CAP,
EXCAVATION OF FILL
SOIL, INSTALLATION
OF SHEET PILE, AND
DEMOLITION OF
EXISTING SHEET PILE
TO FOLLOW
CONSTRUCTION
SEQUENCE PER
CONTRACT DOCUMENTS

25.00
21.12

68.65°
ALLEGHENY RIVER

SEE CONSTRUCTION DOCUMENTS FOR FULL DETAILS

EXISTING DAM NO. 5

R14.29

46.12

68.65

HYDROELECTRIC FACILITY

ALLEGHENY LOCK AND DAM NO. 5
US ARMY CORPS OF ENGINEERS
PROPOSED WALL ALIGNMENT

SHEET 1-5
14 APRIL 2009
Solution 2 - Replace Missing Riprap

US 670 Geotextile - Will be placed on river bed.

R8 Riprap - Will be graded up from existing soil to el. 740 at edge of apron.

Derrick Stone - Between 2 - 6.5 tons with the average approx 3.5 ton.
Conceptual Design was Adopted and Stone Scour Protection Repair was Completed in 2010
Lessons Learned

• Require that hydropower developers perform detailed hydraulic model studies to predict project performance and future potential for scour at navigation dams

• Confirm by field inspection that hydropower construction conforms strictly to design details

• The “tie-in” of a hydropower structure into an existing dam is a critical area to inspect during construction. This should be done preferably in the dry (i.e. within a cofferdam)
• COMPLETED SCOUR PROTECTION
• DAM 6