Authority

Section 23a of the Rivers, Lakes and Streams Act (615 ILCS 5/23a) Authorizes IDNR to:

- Inspect Dams
- Establish Standards
- Issue Permits

for Construction, Repair, Operation and Maintenance of New and Existing Dams.
Purpose of Study

Run-of-River Dams Pose a Public Safety Hazard to Recreational Users.

Illinois Commissioned this Study to:

– Evaluate Existing Public Safety
– Consider Additional Public Safety Measures
– Evaluate Dam Removal/Modifications.
Scope of Study

Document:

- Existing Public Safety Measures
- Condition of the Dams
- Access for Emergency Services
- Portage and Launching Facilities
- Riverbed Conditions 500 Feet U/S and D/S
- If Hydropower Operations Impact Public Safety
Scope of Study

Develop:

- Non-structural Public Safety Options
- Temporary Structural Options
- Permanent Structural Options
- Temporary and Permanent Options for Each Dam
Growing AECOM Water while making a positive difference in the environment

Dams and Locations
Why a Hazard?

Standard Hydraulic Jump

- **Dam Crest**
- **Critical or Super-Critical Flow**
- **Run-of-river Dam**
- **Standard Hydraulic Jump**
  - A standing wave forms with turbulent, fast moving water.
- **Sub-Critical Flow**
- **Scour Hole**
  - A scour hole may form depending on the flow conditions, channel geometry, and river bed material.

A Safety Hazard Due to Turbulence

Growing AECOM Water while making a positive difference in the environment
Submerged Hydraulic Jump

Why a Hazard?

- Submerged Hydraulic Jump
- Reverse Flow: Flow direction splits and returns back to the dam face.
- Scour Hole: A scour hole may form depending on the flow conditions, channel geometry, and river bed material.

A Safety Hazard Due to a Strong Circulatory Nature
Dam Spillway Types

- Broad Crest with Vertical Face
- Broad Crest with Sloping Face
- Broad Crest with Stepped Face
- Narrow Crest with Sloping Face
- Rounded Ogee Crest with Sloping Face
Sample Inspection Figure
Public Safety Measures

- Signage
- Public Awareness Programs
- Temporary Structural Options
- Permanent Structural Options
Study Limitations

Not Considered:
- Right-of-Way (ROW) Acquisition
- Access for Construction
- Maintenance and Replacement
- Alternative Signage for Unique Situations
- Community Acceptance
General Signage Schematic
Example Signage

SEVERE
Drowning Hazard

SEVERE
Damage to Boat

DANGER!
Dam XXX ft Ahead

Growing AECOM Water while making a positive difference in the environment
Example Signage

DAM
Keep Back

Can Buoy
Collared Buoy

Growing AECOM Water while making a positive difference in the environment
Public Awareness Program

• Inform Recreational Users
• Target Owners and Emergency Responders
Temporary Rock Fill Structural Option

USACE Guidelines were used to Size the Rock Fill
Rock Fill Concept Criteria

- No U/S or D/S Increase in the 100-year Water Level
- Maintain Sub-critical Flow for the 1-, 2-, and 5-year Flow Events
- Must Prevent Formation of a Submerged Hydraulic Jump for the 1-, 2-, and 5-year Events
Permanent Structural Solutions
Full Bypass Channel

Growing AECOM Water while making a positive difference in the environment

Full Bypass Channel

Generic Full Bypass Channel with Concrete Steps

Profile View of Generic Full Bypass Channel with Natural Rock

Figure based on Garcia, et. al., 1999
Growing AECOM Water while making a positive difference in the environment

Full Bypass Channel

- Full Bypass Channel
  - Conveys 1, 2 & 5 year flow events
  - Provides river passage around the dam

- Natural Riffles or Concrete Steps

- Run-of-river Dam
  - Dam is not removed
  - Flows greater than the 5 yr event would overtop the dam
  - Roller may be present during high flows

- Optional Dam Face Modification
  - Reduces roller during high flows
  - Provides amenity during low flows

Full Bypass Option with Riffle Boulders
Riffle Pool Rock Ramp

Profile View of Riffle Pool Rock Ramp
(Parallel to Flow)
Riffle Pool Rock Ramp

Plan View of Riffle Pool Rock Ramp

Section of Riffle Pool Rock Ramp (Perpendicular to Flow)
In-Stream Bypass Channel

**Divider Wall**
Separates bypass from main channel

**Run-of-river Dam**
Dam is not removed
High flows would overtop
Roller present during high flows

**Optional Dam Face Modification**
Reduces roller during high flows

**Full Bypass Channel**
Originates at dam face
Extends downstream
Conveys 1, 2, and 5 yr flows

**Natural Riffles or Concrete Steps**

---

In-Stream Bypass Channel Generic Layout
Additional Structural Options

- Dam Face Modification
- Dam Removal
Acknowledgements

Dam Owners and Emergency Responders
Lieutenant Governor Pat Quinn’s Office
Capital Development Board of Illinois
Illinois Department of Natural Resources – Office of Water Resources

Subconsultants:
DLZ, Inc.
Maurer-Stutz, Inc.
Kabbes Engineering, Inc.
Milone & MacBroom