Moosehead Hydroelectric Project Condition Assessment

for the Town of Dover-Foxcroft


Right Abutment Seepage
Deterioration/of Log Sluice Walls
Approximately 10 ' of Apron Missing
Erosion of Bedrock
Loss of joint caulk
Erosion of spillway surface
Powerhouse
Flow
Deterioration of upstream face of sluice gate and fish passage structures; and deterioration of sluice gate left wall

Dam Inspection - Findings

- Horizontal & vertical alignment is good.
- Seepage through right abutment (less than 5 gpm).
- Loss of about 10 feet of concrete apron at right side of dam.
- Concrete surface erosion (crest and downstream face), concrete surface is generally sound.
- Erosion of bedrock along toe of dam, to depths up to 9 feet (no significant undercutting).

Dam Inspection – Findings (continued)

- Loss of caulking/sealant in joints between concrete monoliths.
- Concrete deterioration at the upstream face and left wall of the sluicegate structure and the upstream face of the fish passage structure.
- Concrete deterioration of the left and right walls of the log sluice, and seepage through the walls.

Dam Inspection – Findings (continued)

- Left abutment wall, also serving as powerhouse foundation wall, missing individual stones

Recommended Dam Remediation

- In Next 1-Year
  - ✓ Left Abutment Wall
    - Shore existing building structure from building interior as necessary
- In Next 1-to-3-Years
  - ✓ Left Abutment Wall
    - Fill voids with reinforced concrete
- In the Next 3-to-5 Years
  - ✓ Seepage Through Right Abutment
    - Place new concrete to fill voids, and
    - Pressure grout as required
  - ✓ Loss of Concrete Apron
    - Drill & grout rebars into existing concrete; place new concrete to original lines

Recommended Dam Remediation (continued)

- ✓ Erosion of Bedrock Downstream
  - Place concrete and/or heavy riprap to fill void
- ✓ Concrete Deterioration of Log Sluice Left & Right Walls
  - Remove all soft and deteriorated concrete
  - Drill & grout rebars into existing concrete; place new concrete to original lines
- ✓ Upstream face of dam and Left Sluicegate Structure Wall
  - Remove all soft and deteriorated concrete
  - Drill & grout rebars into existing concrete; place new concrete to original lines

Recommended Dam Remediation (continued)

- In Next 5-to-7 Years
  - ✓Concrete Surface Erosion, Crest and Downstream Face of Spillway
    - Remove any soft or unsound concrete
    - Drill & grout rebars into existing concrete; place new concrete to original lines

Powerhouse Inspection - Findings

- A section of the powerhouse roof has collapsed.
- Roof slab and beams are spalling in several areas exposing corroded rebar.
- Steel I-Beams supporting the generator floor have varying degrees of web and flange corrosion.
- Generator floor timber beam with marginal end support.

Powerhouse Inspection – Findings (continued)

- Individual wood planks are missing from the turbine floor and some planks show signs of rot.
- Vertical guides (I-Beams) for upstream bulkhead have significant corrosion of the web and flanges.
- Joints in the stone foundation wall show signs of deterioration and mortar loss.

Powerhouse Inspection – Findings (continued)

- Joint seepage observed through the left and right stone masonry foundation walls, at the upstream end powerhouse.

Recommended Powerhouse Remediation

- In Next 1-Year
  - ✓ Roof
    - Shore structure as required
    - Make roof watertight with tarps or similar to prevent additional damage
  - ✓ Generator Floor
    - Provide positive support for timber floor beam on upstream end of Powerhouse
  - ✓ Turbine Floor Deck
    - Replace missing and damaged floor planks, or
    - Close-off area to prevent access
- In Next 1-to-3-Years
  - ✓ Roof
    - Repair roof structure and install new roofing system

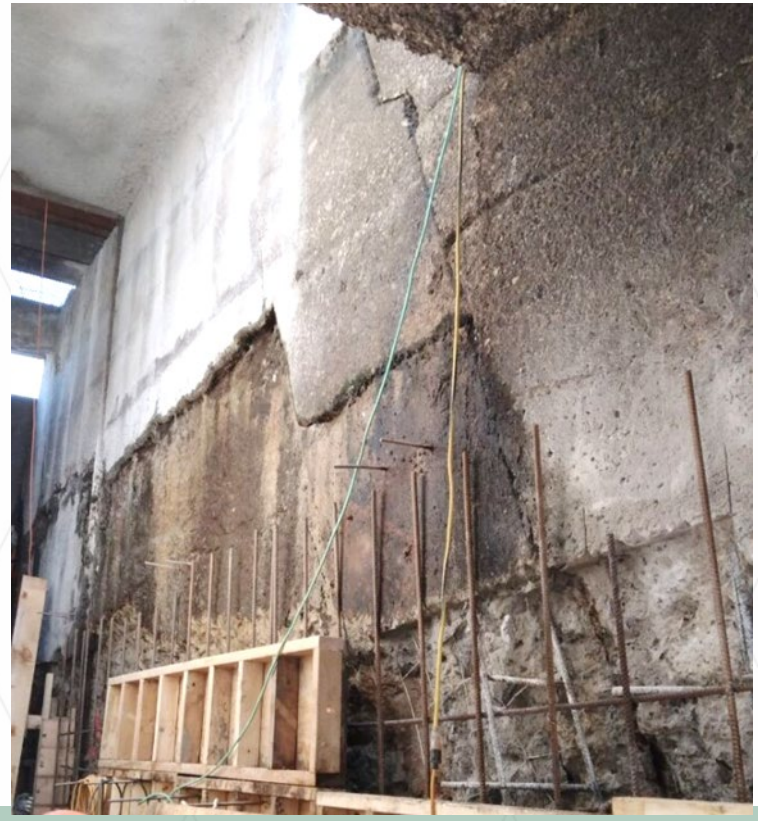
Recommended Powerhouse Remediation (Continued)

✓Stone Foundation Walls
- Pressure grout areas of walls with seepage, or
- Place concrete on exterior face of walls
- Repoint walls

- In Next 3-to-5 Years

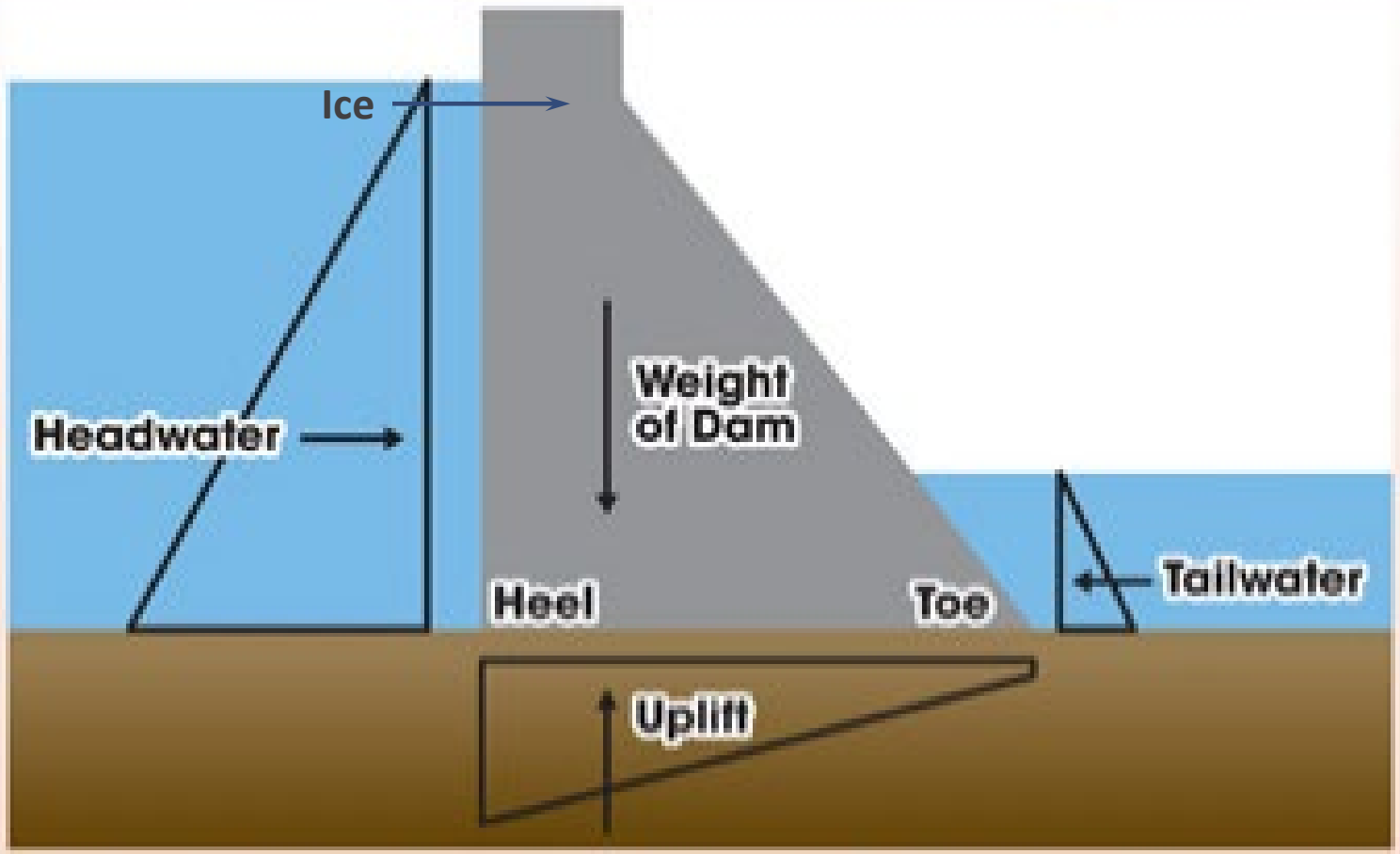
✓Corroded Structural Steel Framing
- Reinforce existing framing if possible, or
- Replace individual members

✓ Spalled concrete roof deck and beams
- Remove deteriorated concrete
- Splice-in new reinforcing to make up lost area of steel due to corrosion
- Patch with structural epoxy with minimum compressive strength of 4,500 psi



Stability Analysis of Dam

FIGURE 1 Typical Forces for a Gravity Dam



For any size of gravity dam, typical forces included in a two-dimensional stability analysis include headwater and tailwater, weight of the dam, and uplift.

Stability Analysis – DRAFT Results

Load Case	Sliding Safety Factor		Location of Resultant Force in Base (ft)	
	Calculated	Required	Calculated	Required
Normal Pool	3.59	1.5	7.1	Middle Half (3.5' – 10.4')
Winter Pool Plus Ice	1.73	1.5	1.4	
Design Flood[1]	0.25	1.5	Outside of Base	
Seismic	1.87	1.25	5.3	Within Base

1. Design Flood (100-year Flood) analysis based on Headwater and Tailwater elevations from FEMA

Recommended Stability Remedial Alternatives

Post-tensioned anchors installed through the body of a dam provides permanent tie downs to increase resistance to sliding and overturning. These anchors can consist of cable strands, high-strength threaded steel bars. The size, number, and makeup of the anchor system is established by engineering design calculations.

Recommended Stability Remedial Alternatives (continued)

Modify the dam's cross-section to add weight to the structure to improve the stability of the dam. This can be done using conventional mass or roller-compacted concrete. In conjunction with this, the hydraulic efficiency of the dam may be improved so greater amounts of water can pass over the dam more rapidly, resulting in a lower headwater elevation and a reduced driving force.

Recommended Stability Remedial Alternatives (continued)

Modify the dam's cross-section by removing concrete from the upper portion of the dam, lowering the crest elevation of the dam in order to permit greater amounts of water to pass over the dam more rapidly, resulting in a lower headwater elevation and a reduced driving force. The crest of the dam can be reconfigured to reduce the magnitude of ice load.

Questions?