From: Fletcher, Tony [mailto:Tony.Fletcher@maine.gov]
Sent: Monday, September 06, 2010 10:27 AM
To: m.byron@litchfieldmaine.org
Cc: Bruce Doyle; Belserene, Mark; Ciomei, Nicholas
Subject: #0089 Tacoma Lake Dam condition and hazard Inspection - Aug 31, 2010

Dear Mr. Byron,

As promised, herewith my Condition and Hazard report:

Condition and Hazard assessment of Tacoma Lakes Dam, Litchfield, ME., on Tuesday August 31, 2010, at 10 AM.

Requested by the Town of Litchfield, 2400 Hallowell Road, Litchfield, ME 04350. Town manager: Mr. Mike Byron, Phone: 268-4721.

The Inspection was attended by:

- Michael Byron – Town Manager, Litchfield
- Glen Ridley
- Steve Ochmanski – Code enforcement officer
- Bruce Doyle – President, Tacoma Lakes Improvement Society
- Terry Averill – Dam Keeper
- Ron Ridley – Road Crew Foreman
- Nic Ciomei, Assistant Engineer, MEMA
- Tony Fletcher, State Dam Inspector, MEMA

Background:

The dam was originally built in 1885 as a power dam and modified in 1989. The dam was reclassified *a low hazard* dam by MEMA in 1999. The dam is now a recreational dam with some ability to control downstream flooding. The dam is a 11' high earth dam with a central, fenced, concrete spillway containing 6#, 4' wide gates. The normal pool operating depth is 7' above the dam outlet sill. The lake area is 2,580 acres, normal storage 9.520 acre feet and maximum storage 21,340 acre feet. The lake capacity is computed assuming the base area of the lake is 1,500 acres. The basin area is 15 square miles and the computed 100 year flood at the spillway is 300 cfs. The spillway has the overtopping capacity to discharge about 500 cfs before the dam overtops. The dam therefore does not have the capacity to pass the PMF unless the gates are controlled.

The dam owner is the Town of Litchfield who operate and maintain the dam.

Inspection.

The day was fine and warm. Following a spell of dry weather, the Lake was below normal operating level. There was no debris upstream of the spillway. The inspection began on the right (looking downstream) approach embankment, over the concrete road bridge, along the left embankment which curled upstream, to the left abutment, downstream of both the left and right embankments, to the right abutment and then to the visible upstream surfaces of the dam. The gates had been viewed from a distance downstream and were again viewed from their control gantry upstream of the concrete bridge. All gates have timber leaves, held vertically by guides secured upstream of the concrete piers. The gate on the extreme left is the only gate connected to a geared manual lifting mechanism. This gate consists of a single leaf, one stem, a geared rack and pinion, which can raise the gate vertically. The lifting mechanism is a manually operated cast iron reduction gear. This gate is locked and not in use. The capacity of this gate opened 1' with a 6.5' head would be about 65 cfs. The other five gates are split gates with a 2' upper gate and a 5' lower gate. The top gate is easily lifted with a lever. The lower 5' portion can be removed with apparent difficulty. The left split gate was tested by removing the top gate for a short while. discussions with the dam operator during the inspections revealed he understood the nature of the dam and operated the dam well.

Inspection findings:

1) Both approach embankments were overgrown with brush and large trees making surface inspection difficult.

2) The top of the left embankment appeared lower that the top of the bridge. Assuming it was not built like that, either settlement or erosion has occurred. Extreme floods would overtop this embankment first with the possibility of erosion failure.

3) The top of the spillway road road bridge did not show signs of cracking or movement or horizontal misalignment.

4) Downstream rip rap appeared to be sound where visible.

5) From the toe of the left embankment, no excessive leakage was noted from the embankment. The downstream wing walls of the spillway had developed diagonal cracks springing from the apex of the wall, indicating differential settlement.

6) The downstream pool was lower than the spillway sill and some undermining of this slab was noted.

7) Excessive leakage was noted from the left (unused) gate. The cause could not be seen but could be the seals, timber rot or seat failure.

8) The split gates also leaked.

9) Dam Hazard: On the day I also did brief downstream reconnaissance, inspected Purgatory dam which appears to be failing, and estimated the size of the downstream town road bridge. My later estimate for a 10' wide breach in fair weather conditions yielded a flow of 600 cfs. This will overtop Purgatory dam but will be safely conveyed by the bridge. The failure of one gate, for its full height, during normal operation, is an estimated 220 cfs, which is less than the 100 year flood. The rate of breach of the embankment is dependent on it construction. A breach is likely to be quick if the dam is composed mainly of river sediments, and more slowly if composed of rock. Since I don't know the composition of the dam, I have assumed a rapid rate of breach.

Conclusions:

1) The dam will remain a low potential hazard dam.

2) The dam is in fair to good condition. Dam operation is good. Points of concern are vegetation growing on the embankment surfaces, road is same or lower elevation than the spillway bridge deck, displacement of the left embankment rip rap, lack of rip rap in some areas as a protection from overtopping in extreme storms, cracks in the spillway concrete wing walls, hydraulic undercutting of the concrete spillway apron, gate leakage, an unserviceable left gate.

Recommendations:

1) Both non-overflow embankments be raised to a level above the concrete spillway bridge deck for their full length.

2) Riprap be to be placed or reset on both the upstream and downstream faces of the embankments as armoring against overtopping.

3) The spillway toe area, undercut by erosion, be protected against further erosion using concrete and rip rap.

4) Spillway wingwall foundations be underpinned with concrete to prevent further apex cracking.

5) The mechanical gate be restored for regular dam operation.

6) All gate leaves be inspected and replaced if found materially defective.

7) All gate guides be examined and replaced if found defective.

8) A spare split gate be provided.

9) The dam remain a "low" potential hazard dam.

10) The apparent ongoing deterioration of Purgatory dam downstream be investigated.

No costs have been done and it is suggested that the work be overseen by a competent engineer.

Once repairs commence, please let me know.

Thank you.

Tony Fletcher

Maine State Dam Inspector