November 22, 2004

Sue Black, Parks Director  
Milwaukee County Park System  
9480 Watertown Plank Road  
Wauwatosa, WI 53226

Subject: Estabrook Dam, FF#40.08, Inspection Report

Dear Ms. Black:

Enclosed is a copy of the dam inspection report based on the Department of Natural Resources' inspection of the Estabrook Dam on October 27, 2004. The inspection report forms the basis for this Department dam safety report which identifies work that needs to be done on the dam and a schedule for when that work is to be completed. In our 1995 dam safety report to Milwaukee County, the Department estimated the Estabrook Dam to be a low hazard dam. We have no new information to date that would change this determination.

The following items need to be addressed:

1) The signing around the Estabrook Dam is inadequate per the requirements in Wisconsin Administrative Code NR 330. This deficiency was also noted in the 1995 dam safety report. At a minimum, the County needs to provide signs warning of the presence of the dam and directing people to a suitable portage route around the dam. We would also suggest that No Trespassing signs be strategically placed on the dam. I have enclosed a copy of NR 330 with this report. Proper signs must be installed by March 1, 2005.

2) All trees and shrubs must be removed from the area around the left and right abutments for the both the fixed crest spillway and gated sections of the dam. Removal is to include the complete removal of the stumps and the roots, filling the holes created with firmly compacted tight soils and adding topsoil and grass seed to stabilize the area. This problem and an explanation of its importance were discussed in the 1995 dam safety report. Department staff can assist the County in determining the extent of vegetation removal. Removal of the trees and shrubs must be completed by June 1, 2005.

3) There is extensive debris that must be removed from both the fixed crest spillway and the ice breakers upstream of the gated section of the dam (See photos #5, #6, #8 and #12 in the report). The debris appears to consist of large amounts of woody material (logs and large branches) but also a significant amount of man-made material (plastic bottles, tires, park table, etc.). The material will have to be mechanically removed and not burned off as was attempted a few years ago. Mechanical removal will most likely involve some dredging of the accumulated sediment in these areas. Since the Estabrook impoundment is contaminated with PCBs, sediment testing will be required to properly characterize the dredged material for disposal. The debris removal must be completed by December 31, 2005.
4) The ice breakers upstream of the gated section of the dam are very deteriorated (See photo #8 in the report). These structures must be removed or reconstructed by December 31, 2006. If removal is proposed, a structural analysis of the dam including ice and debris loading on the gated portion of the structure must be submitted to and approved by the Department prior to removal.

5) The gates on the dam require a variety of work. All the gates and their tracks are rusty and need to be sandblasted and cleaned. The gate seals should be cleaned or replaced as well. Gates #6 and #7 are currently inoperable and need to be repaired (See photos #3 and #4 in the report). There currently is no way to manually operate the gates. All of the gates must have a manual override. All of this work on the dam’s gates must be completed by December 31, 2006.

6) Most of the piers on the upstream side of the gate section had gunite applied to them some years ago. This material is now spalling and appears saturated which means it no longer is bonding to the concrete piers (See photos #1 and #2 in the report). All of the piers need to have this material removed and be repaired with concrete. The concrete needs to be at least 6 inches thick and mechanically bonded to the piers. The capacity of the gate section may not be reduced as a result of this repair. This work needs to be completed by December 31, 2006.

7) The left and right abutments of the gate section of the dam have erosion on the upstream and downstream side that must be repaired. The repair must consist of excavating the area down to cohesive soils, placing firmly compacted tight soils to the desired elevation and stabilizing with riprap. The works needs to be done by June 1, 2005.

8) There are cracks in the structure of the gate section of the dam need further evaluation (See photo #11). The location of these cracks was noted on page of the attached inspection report. The structural integrity of the dam must be evaluated by a structural engineer. A structural analysis needs to be done by December 31, 2005 (see #4 for more information).

9) The stoplogs and their supports on the fixed crest spillway section of the dam need to be replaced. This work must be completed by December 31, 2005.

10) The concrete access stairs on the left and right ends of the gate section of the dam have deteriorated to the point where they are unsafe (See photo #10). These stairs must be rebuilt by December 31, 2005.

11) Given the age of the Estabrook Dam and the high flows on the Milwaukee River earlier this year, the County needs to provide the Department with a scour/undermining analysis of the dam. This analysis must be completed by December 31, 2005.

12) The Estabrook Dam needs to have a written plan for regular operation, inspection and maintenance (OIM Plan). Maintenance should include all of those areas identified on the “Dam Inspection Checklists” included with this report. An OIM plan must be developed for the dam by December 31, 2005.

In addition to working with Milwaukee County to address these issues with the Estabrook Dam, the Department will be working with the County to develop an operational order for the dam. Various individuals and municipalities have requested Milwaukee County to operate the Estabrook Dam in different ways over the years. Frequently these requests have been contrary to each other and have caused environmental harm to the Milwaukee River. Based on this history, the Department will be working with Milwaukee County to establish an official operational order for the dam.
Linked to the issues with the Estabrook Dam and the establishment of an operational order is the contaminated sediment in the Estabrook Dam impoundment. Any long-term decisions regarding the dam and any conditions in an operational order must reflect how the contaminated sediment in the impoundment is to be remediated. Past studies of the impoundment by USGS and Baird & Associates have demonstrated that contaminated sediment moves downstream of the dam every time the gates are opened. The Department is currently finalizing a pre-remediation report of the Estabrook impoundment which characterized the sediments and estimated volumes for removal and remediation. We will provide Milwaukee County with a copy of this report once it is finalized.

The Department looks forward to working with Milwaukee County in addressing the issues with the Estabrook Dam and developing a plan to address the contaminated sediment in the impoundment. Hopefully we can create a project that will improve the environmental health of the Milwaukee River and increase the recreational opportunities along its corridor. If you have any questions, please call me at (414) 263-8652. Thank you.

Sincerely,

Michael J. Bruch, Jr.
Water Management Engineer

c: Jack Takerian – Milwaukee County Parks, Chief of Operations
   Greg High – Milwaukee County Parks, Director AE&ES Section
   Bill Sturtevant – WDNR/GEF2
   Jim Schmidt – WDNR/SER HQ
<table>
<thead>
<tr>
<th>Item</th>
<th>Notes/Observations</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Monuments/Benchmarks</td>
<td>File indicates multiple benchmarks. These were not verified during this inspection.</td>
</tr>
<tr>
<td>2 Pool Level</td>
<td>Impoundment was drawn down. Currently there is no operational order for this dam.</td>
</tr>
<tr>
<td>3 Access Road</td>
<td>There is adequate access on the north river bank, but the County has no access on the south river bank.</td>
</tr>
<tr>
<td>4 Signage/Security</td>
<td>- No signage noted except for gate operation. - Dam warning and portage signs need to be installed. - Dam is reasonably secure.</td>
</tr>
<tr>
<td>5 Hazard Section</td>
<td>Milwaukee River corridor D/S of Estabrook is almost entirely park land until downtown Milwaukee. Lake Michigan controls water levels once in the downtown area.</td>
</tr>
<tr>
<td>A. D/S Development</td>
<td>Milwaukee River corridor D/S of Estabrook is almost entirely park land until downtown Milwaukee. Lake Michigan controls water levels once in the downtown area.</td>
</tr>
<tr>
<td>B. Channel Crossing</td>
<td>Only large bridges well above the floodplain are D/S of Estabrook Dam.</td>
</tr>
<tr>
<td>C. Distance to nearest D/S community/impoundment</td>
<td>No impoundments D/S since North Ave. Dam was removed.</td>
</tr>
<tr>
<td>D. Estimated Hazard (based on land use)</td>
<td>Dam was assigned a low hazard rating in our 1995 inspection due to dam submergence during a 100-year flood.</td>
</tr>
</tbody>
</table>

**Action Suggestion**

1. Requires immediate action
2. Plan to do soon
3. Do when convenient

**Additional Comments:**

Concrete access stairs on the left and right ends of the gate section have deteriorated to the point of being unsafe and need to be rebuilt.
## Embankments

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Location on Embankment and Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vegetation:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Trees</td>
<td></td>
<td>- Small trees and shrubs on left embankment but only on the river bank, the rest is an access road. Some trees on center island near concrete abutments will have to be removed.</td>
</tr>
<tr>
<td>B. Brush</td>
<td></td>
<td>- Some on left embankment and center island will have to be removed.</td>
</tr>
<tr>
<td>C. Ground cover</td>
<td></td>
<td>Very little ground cover</td>
</tr>
<tr>
<td><strong>Erosion:</strong></td>
<td></td>
<td>No wave erosion noted. River banks are bare due to impoundment being drawn down each year.</td>
</tr>
<tr>
<td>A. Wave erosion</td>
<td></td>
<td>Erosion on left embankment where it meets the left concrete abutment both U/S and D/S.</td>
</tr>
<tr>
<td>B. Runoff Erosion</td>
<td></td>
<td>Erosion on left side of center island where it meets the right abutment of the gate section.</td>
</tr>
<tr>
<td><strong>Instabilities:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Slides</td>
<td></td>
<td>NONE OBSERVED</td>
</tr>
<tr>
<td>B. Cracks</td>
<td></td>
<td>NONE OBSERVED</td>
</tr>
<tr>
<td>C. Bulges/Depressions</td>
<td></td>
<td>NONE OBSERVED</td>
</tr>
<tr>
<td>D. Slope (Too Steep)</td>
<td></td>
<td>Slope of embankments adjacent to concrete abutments is steep and may need riprap to stabilize.</td>
</tr>
</tbody>
</table>

N= Noted; M= Monitor | Action Suggestion | 1. Requires immediate action | 2. Plan to do soon | 3. Do when convenient |
I= Investigate; R= Repair | F.F. #: 40.08 | Date: 10-27-2004 | Page 2 of 14

Dam Name: Estabrook
<table>
<thead>
<tr>
<th>Item</th>
<th>M</th>
<th>I</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>4</strong> Slope Protection</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Type (riparian, wave, embankment, concrete slab, loose formed concrete/shoulder):</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Condition:</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mainly riprap or natural vegetation.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate on center island, may need additional riprap on left embankment.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>5</strong> Other</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Rodent burrows (few, many)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NONE OBSERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Ruts</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Length/Width/Depth:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Minor ruts in road over left embankment.</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>C. Other</td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>6</strong> Alignment</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>A. Vertical</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low area:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Elevation Difference:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO PROBLEMS OBSERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Horizontal</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Width</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Too narrow:</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Location:</td>
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<tr>
<td><strong>7</strong> Toe</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cracks/Slumps:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Embankment drains:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type/Flow:</td>
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<td></td>
<td></td>
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<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seepage/Soil Type:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hummocky:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NO PROBLEMS OBSERVED</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8</strong> Seepage</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wet area:</td>
<td>X</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Boil:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sinkhole:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aquatic vegetation:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rust colored deposits:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sediment in Flow:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flowrate:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N= Noted; M= Monitor; Action Suggestion: I. Requires immediate action; L. Investigate; R= Repair; F.F. = Field File; RT = Right; LT = Left; U/S = Upstream; D/S = Downstream

Additional Comments:

**Dam Inspection Checklist**

Dam Name: ESTABROOK  F.F. #: 40.08  Date: 10-27-2004  Page 3 of 14
<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Notes/Observations</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed Crest</td>
<td>N</td>
<td>No problem</td>
<td></td>
</tr>
<tr>
<td>Top Width</td>
<td>Did not measure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Materials</td>
<td>Concrete with a flushboard section</td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Shape</td>
<td>Very sinuous overflow weir</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Debris</td>
<td>Massive amount of debris trapped W/S of the spillway. Major cleanout needed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Concrete Condition</td>
<td>D/S Face and crest appear to be in fair condition. W/S Face covered by debris so we could not inspect.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Flashboards</td>
<td>Wood</td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Abutments</td>
<td>Spillway is tied into riverbank on the right and the center island on the left. No problems observed at these points,</td>
<td></td>
<td></td>
</tr>
<tr>
<td>H. Drains</td>
<td>No problem</td>
<td>Not applicable</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Could not inspect</td>
<td></td>
</tr>
<tr>
<td>I. Other</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Action Suggestion**
1. Requires immediate action
2. Plan to do soon
3. Do when convenient

**N= Noted; M= Monitor**
- MT = Monitor T = Targetted
- IP= Investigate; R= Repair
- F.F.= Field File; RT = Right; LT = Left
- U/S = Upstream; D/S = Downstream
- Controlled = Gated
- Uncontrolled = Overflow

**Additional Comments:**

The entire structure should be fully evaluated once the debris is removed to verify there is no seepage, and that the spillway is still structurally sound.

**Dam Inspection Checklist**

**Dam Name:** Eスタブロック  **F.F. #:** 40.07  **Date:** 0-27-2004  **Page:** 4 of 14

*Type of Concrete Problems: Spalling, cracks, exposed rebar, misalignment, joints, bug holes, efflorescence, popouts, honeycombing, scaling, craze/map cracks, isolated crack, disintegration, other*
### Fillway-Principal - Gates

<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Notes/Observations</th>
<th>Action</th>
<th>M</th>
<th>I</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>A. Types (lift/slide, tainter(radial), stoplogs, leaf, roller, flashboards, needles, other):</td>
<td>X</td>
<td>List gates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number and Size:</td>
<td></td>
<td>10 gates, 11.6' x 7.5'</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Stoplogs</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions:</td>
<td></td>
<td>None on gate section</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>C. Abutments</td>
<td>X</td>
<td>Some spalling of concrete and wetness, no seepage observed but impoundment was drawn down.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seepage/wetness:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Piers (number, shape)</td>
<td>X</td>
<td>11 piers, granite spalling off all piers and very damp; granite will have to be removed and replaced with concrete</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Operability</td>
<td>X</td>
<td>2 of 10 gates not operable (#6 &amp; #7)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type of Operator:</td>
<td></td>
<td>Gates are power operated from a secure dewatered to the left of the dam.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Condition (chain, cable, hoists):</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Security (locked?):</td>
<td></td>
<td>No way to manually operate gates</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Backup Operator:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Access</td>
<td>X</td>
<td>Dam is locked and gated as are the operational controls, good access for maintenance.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G. Condition</td>
<td>X</td>
<td>Gates are very rusty and need to be sandblasted and cleaned. Seals should also be replaced.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rust:</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Seals (leakage):</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>H. Ice protection</td>
<td>X</td>
<td>Ice breakers placed U/S of the dam's gated section.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type (Heaters, Bubblers, Barriers, Other):</td>
<td></td>
<td>Ice breakers need major work.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I. Debris</td>
<td>X</td>
<td>Ice breakers also catch debris, major debris removal required</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prevention (Rack, boom, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>J. Condition of Flowway</td>
<td>X</td>
<td>Appeared free of any major debris except at the ice breakers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>K. Drains</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Type (Weep holes/Relief drains/Other):</td>
<td></td>
<td>None observed</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow rate:</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Location:</td>
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<td></td>
</tr>
<tr>
<td>L. Other</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N= Noted; M= Monitor  
I= Investigate; R= Repair  
F.F.= Field File; RT = Right; LT = Left  
U/S = Upstream; D/S = Downstream  
Controlled = Gated  
Uncontrolled = Overflow

**Action Suggestion:**
1. Requires immediate action  
2. Plan to do soon  
3. Do when convenient

Additional Comments and/or Sketch:

![Flow diagram](chart.png)

There are cracks in these locations on multiple supports in the gate section. Need to be evaluated by a structural engineer.

---

*Type of Concrete Problems:* Spalling, cracks, exposed rebar, misalignment, joints, bug holes, efflorescence, popouts, honeycombing, scaling, craze/map cracks, isolated crack, disintegration, other

**Dam Inspection Checklist**

Dam Name: ESTABROOK  
F.F.#: 40.0³  
Date: 10-27-2004  
Page 5 of 14
<table>
<thead>
<tr>
<th>Item</th>
<th>N</th>
<th>Notes/Observations</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Outlet Erosion Control</td>
<td>No problem</td>
<td>Not applicable</td>
</tr>
<tr>
<td>A. Type (open, endwall, plunge, pool, energy dissipation structure, rock lined channel, apron)</td>
<td>Only short concrete aprons were visible D/S of the gate section and fixed spillway section. Adequacy must be studied.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B. Scour</td>
<td>X</td>
<td>Not safe for us to inspect, must be evaluated by owner</td>
<td></td>
</tr>
<tr>
<td>C. Material</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b. Concrete</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dimensions/Location:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>D. Sidewall/Headwall</td>
<td>Misalignment: Location: Description:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>E. Separated Joint / Loss of Joint Material:</td>
<td>Unable to safely inspect</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F. Natural</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2</th>
<th>Undermining</th>
<th>No problem</th>
<th>Not applicable</th>
<th>Could not inspect thoroughly</th>
<th>M</th>
<th>I</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location:</td>
<td>X</td>
<td>Could not evaluate, must be studied</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

N= Noted; M= Monitor
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Additional Comments:

We do not have the proper safety equipment or training to evaluate the potential scour and undermining that may be occurring on the Estabrook Dam. Given the flows on the Milwaukee River in May and June of 2004 and citizen observations, Milwaukee County will have to hire a consultant to evaluate scour and undermining.

* Type of Concrete Problems: Spalling, cracks, exposed rebar, misalignment, joints, bug holes, efflorescence, popouts, honeycombing, scaling, craze/map cracks, isolated crack, disintegration, other

** Dam Inspection Checklist **

** Dam Name:** ESTABROOK  ** F.F.:** 40.08  ** Date:** 10-27-2004  ** Page:** 6 of 14
<table>
<thead>
<tr>
<th>PHOTO NO.</th>
<th>DESCRIPTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>U/S of gated section of the dam</td>
</tr>
<tr>
<td>2</td>
<td>Pier on U/S of gated section of the dam</td>
</tr>
<tr>
<td>3</td>
<td>D/S of gated section of the dam showing inoperable gates</td>
</tr>
<tr>
<td>4</td>
<td>Top of gated section of the dam showing no机械al for gates #6 and #7</td>
</tr>
<tr>
<td>5</td>
<td>Fixed crest spillway of the dam looking from center island to the right bank</td>
</tr>
<tr>
<td>6</td>
<td>Typical debris built up against the fixed crest spillway</td>
</tr>
<tr>
<td>7</td>
<td>Ice breakers as viewed from the top of the gated section of the dam</td>
</tr>
<tr>
<td>8</td>
<td>Close-up of ice breakers showing debris and deterioration</td>
</tr>
<tr>
<td>9</td>
<td>Stoplog section on the fixed crest spillway of the dam</td>
</tr>
<tr>
<td>10</td>
<td>Deteriorated access stairs on the left side of the gated section</td>
</tr>
<tr>
<td>11</td>
<td>Cracks in the concrete supports of the gated section of the dam</td>
</tr>
<tr>
<td>12</td>
<td>Typical debris U/S of the fixed crest spillway, note man-made garbage</td>
</tr>
</tbody>
</table>
Landowner: Milwaukee County
Location: Estabrook Dam
Date: 10-27-2004  Photos taken by: Michael Bruch

Photo No. 1

Photo No. 2
Landowner: Milwaukee County
Location: Estabrook Dam
Date: 10-27-2004    Photos taken by: Michael Bruch

Photo No. 3

Photo No. 4
Landowner: Milwaukee County
Location: Estabrook Dam
Date: 10-27-2004 Photos taken by: Michael Bruch

Photo No. 7

Photo No. 8
Landowner: Milwaukee County
Location: Estabrook Dam
Date: 10-27-2004 Photos taken by: Michael Bruch

Photo
No. 11

Photo
No. 12