

## State of Wisconsin \ DEPARTMENT OF NATURAL RESOURCES

Jim Doyle, Governor  
Matthew J. Frank, Secretary  
Gloria L. McCutcheon, Regional Director

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Return Receipt Requested

FILE REF: 8600

July 28, 2009

Ms. Sue Black, Director  
Milwaukee County Parks Department  
9480 Watertown Plank Road  
Wauwatosa, WI 53226

Dear Ms. Black:

Public health and safety concerns require the Department to ensure that the Estabrook Dam meets acceptable design standards. An Order to Repair or Abandon the Estabrook Dam is attached to this letter. This Order establishes:

- A deadline for completing a drawdown of the Estabrook Dam
- A requirement that a professional engineer registered in the State of Wisconsin complete and certify plans and specifications for repairs identified in the October 16, 2007, revised work schedule
- A requirement that a competent contractor complete repairs in accordance with approved plans and specifications
- A requirement that a professional engineer registered in the State of Wisconsin certify that the repairs are completed and conform to the approved engineering plans
- A deadline for performing detailed stability analyses for the entire structure under all loading conditions

The impoundment shall not be refilled until all repairs identified in the October 16, 2007, revised work schedule have been completed. The authorization to refill the impoundment cannot be granted until the detailed stability analyses are reviewed and approved by the Department. If the analyses conclude that structural improvements to the dam are needed to meet stability requirements, it may be necessary to complete these modifications prior to refilling the impoundment. After receiving the stability analyses, the Department will identify and outline any additional requirements and deadlines in writing. The impoundment shall remain drawn down until the Department provides written authorization that requirements of the Order are complete.

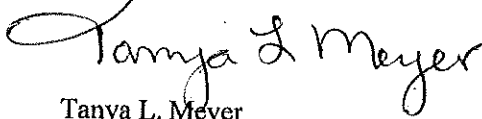
The Order allows Milwaukee County the option to consider dam abandonment. State law and Wisconsin Supreme Court decisions make it clear that the dam owner decides whether to repair or abandon their dam.

While deadlines for completing the project stages are included in the Order, we encourage the County to proceed in an expeditious manner. For example, the County may begin by concentrating efforts on removing debris and sediment behind the fixed crest spillway and completing the stability analyses under all loading conditions. Past experience has shown that stability analyses inform dam owners about full repairs needed at the dam. Owners can then refine cost estimates and make fully informed long-term financial decisions regarding the dam.

Please note that prior to performing any work on the dam, you must receive Department approval of the plans and specifications.

If you have any questions regarding this Order, please contact Tanya Meyer at (414) 263-8641. Thank you for your cooperation.

Sincerely,



Tanya L. Meyer  
Water Management Engineer  
Milwaukee Service Center



William D. Sturtevant, P.E.  
State Dam Safety Engineer  
Bureau of Watershed Management

cc: Milwaukee County Parks, Energy and Environment Committee  
Milwaukee County Supervisor Willie Johnson, Jr.  
Mr. Jim Keegan, Chief of Planning, Policy and Development – Milwaukee County Parks Department  
Mr. Greg High, Director – Milwaukee County Architectural, Engineering, & Environmental Services  
Ms Julie Esch, Senior Research Analyst – Milwaukee County Board of Supervisors  
Ms. Gloria McCutcheon, Regional Director – DNR Southeast Region Headquarters  
Ms. Meg Galloway, Dam Safety & Floodplain Section Chief – DNR GEF II, WT/3

**BEFORE THE  
DEPARTMENT OF NATURAL RESOURCES**

IN THE MATTER of the Unsafe Condition of the  
Estabrook Dam, Located on the Milwaukee River,  
Milwaukee County.

**ORDER FOR DAM REPAIR  
OR ABANDONMENT**

**FINDINGS OF FACT**

The Department finds that:

1. The Estabrook Dam is located on the Milwaukee River in the Northwest Quarter of the Northeast Quarter of Section 5, Township 7 North, Range 22 East, in the Cities of Glendale and Milwaukee, Milwaukee County. The Estabrook Dam impounds the Milwaukee River.
2. The Estabrook Dam has an estimated hazard rating of low. The dam consists of a gated spillway section, an overflow weir spillway section, and concrete tripods. The gated spillway section is approximately 220 feet in length with 10 vertical steel slide gates. The sinuous overflow weir spillway section is approximately 580 feet in length. It is concrete with rubble stone masonry and has stoplog sections near the left end, which are approximately 88 feet in length. A row of 28 concrete tripods, also known as "ice breakers", is located upstream of the gated spillway section.
3. The Estabrook Dam is currently owned by Milwaukee County. The Milwaukee County Parks Department, 9480 Watertown Plank Road, Wauwatosa, WI 53226, oversees the inspection, operation, and maintenance of the Estabrook Dam.
4. An inspection of the dam was performed by Department of Natural Resources (Department) Dam Safety Staff on July 13, 1994. The following deficiencies were noted and deadlines were established:
  - a. Remove debris -- fixed crest spillway (May 1, 1995)
  - b. Repair concrete -- all piers (October 1, 1997)
  - c. Remove trees and brush -- all abutments (June 1, 1995)
  - d. Install dam warning and portage signs (June 1, 1995)
  - e. Develop Inspection, Operation and Maintenance Plan (October 1, 1996)
  - f. Establish benchmarks (June 1, 1996)
  - g. Monitor seepage at gated spillway abutment (Ongoing)A detailed explanation of the inspection findings is provided in the January 23, 1995, Dam Safety Inspection Report. Many of the deficiencies require the dam owner to employ the services of a professional engineer registered in the State of Wisconsin to design the repairs.
5. An inspection of the dam was performed by Department Dam Safety Staff on October 27, 2004 and the following deficiencies were noted and deadlines were established:
  - a. Remove debris -- fixed crest spillway (December 31, 2005)
  - b. Repair concrete -- all piers (December 31, 2006)
  - c. Remove trees and shrubs -- all abutments (June 1, 2005)
  - d. Install dam warning and portage signs (March 1, 2005)
  - e. Develop Inspection, Operation and Maintenance Plan (December 31, 2005)
  - f. Complete structural analysis of the dam (December 31, 2005)
  - g. Complete scour/undermining analysis (December 31, 2005)
  - h. Replace stoplogs and supports -- fixed crest spillway (December 31, 2005)

5. (Continued)

- i. Repair or remove ice breakers. If removal is proposed, complete structural analysis of the dam including ice and debris loading on the gated spillway prior to removal. (December 31, 2006)
- j. Stabilize erosion at banks – abutments of gated spillway (June 1, 2005)
- k. Sandblast and clean gates, clean or replace gate seals, repair Gates #6 and #7, and install manual override for all gates (December 31, 2006)
- l. Rebuild concrete access stairs (December 31, 2005)
- m. Work with the Department to review the operational water level order for the dam (No deadline established)

A detailed explanation of the inspection findings is provided in the November 22, 2004, Dam Safety Inspection Report. Many of the deficiencies require the dam owner to employ the services of a professional engineer registered in the State of Wisconsin to design the repairs.

6. Milwaukee County completed the following work by the dates noted:
- a. Installed dam warning and portage signs (Approximately June 2005)
  - b. Completed structural analysis (September 8, 2006)
    - \* Findings of Fact, Sections 9 and 10 provide additional information regarding the stability analysis
  - c. Completed scour/undermining analysis (September 8, 2006)
  - d. Repaired and upgraded gates (2001-2002)
  - e. Repaired stoplogs and supports – fixed crest spillway (July 10, 2009)
  - f. Removed accumulated woody debris upstream of the ice breakers (Occurs annually, typically in May)
7. Deadlines for outstanding repairs have passed. A time extension was granted to Milwaukee County for completing the required repairs to accommodate the Milwaukee County budget process. The time extensions are provided in an October 16, 2007, Revised Work Schedule. A number of deadlines on the Revised Work Schedule have also passed.
8. To date, Milwaukee County has not budgeted the money necessary to complete all repairs required in the Dam Safety Inspection Reports.
9. In addition to Department dam safety inspections, Milwaukee County contracted with STS Consultants, Ltd., to perform an engineering evaluation and scour/undermining analysis for the Estabrook Dam. The September 8, 2006, report detailed results of the condition evaluation and stability analysis, provided recommended repairs, and detailed an opinion of probable costs for recommended repairs. Findings of Fact, Section 10 provides additional information regarding the stability analysis. The following repairs were recommended in the executive summary:
- a. Remove and replace deteriorated concrete on abutments, operating bridge deck, and piers of the gated spillway section.
  - b. Repair expansion joints on spillway operating deck and replace missing expansion joint material.
  - c. Sandblast and paint spillway gates. Drill drain holes in horizontal cross members to promote drainage.
  - d. Place riprap along left bank downstream of gated spillway and left and right banks upstream of gated spillway to prevent further undercutting.
  - e. Replace overflow spillway flashboards and repair bent supports. Repair surface deterioration of concrete on overflow weir crest.
  - f. Repair deterioration of tops of ice breakers.
  - g. Remove accumulation of woody debris upstream of overflow spillway section.

9. (Continued)  
Repairs recommended by STS Consultants, Ltd., that were not previously identified in the Department 1995 and 2004 Dam Safety Inspection Reports were added to the October 16, 2007, Revised Work Schedule.
10. STS Consultants, Ltd., completed a stability analysis of Estabrook Dam and summarized the findings in the September 8, 2006, engineering evaluation. The report states that the gated spillway section was found to be stable for overturning and sliding under normal pool conditions (e.g., normal water levels with gates closed). Under full pool conditions with ice loading, the section was found to be unstable. Based upon these preliminary findings, the Department requires a detailed stability analyses for the Estabrook Dam under all loading conditions. The requirement for detailed stability analyses is identified in the October 16, 2007, Revised Work Schedule and the established deadline is October 1, 2010.
11. The accumulation of woody debris behind the fixed crest spillway has reduced the hydraulic capacity of the dam. The woody debris could cause extreme loading conditions of the fixed crest spillway. The woody debris is co-mingled with contaminated sediment and man-made debris. The debris has not been removed since at least the 1994 Department Dam Safety Inspection, resulting in 15 years without annual maintenance for debris removal behind the fixed crest spillway.
12. On September 25, 2008, Department personnel evaluated Estabrook Dam to assess possible damage to a section of the fixed crest spillway. The dam was determined to have stoplogs missing from one section of the fixed crest spillway. The partial failure of a portion of the dam caused an uncontrolled release of water from the impoundment. The Department issued a Repair Order on September 26, 2008. Repairs were completed on July 10, 2009.
13. Another partial failure of a portion of the dam occurred during the 2008-2009 winter season. One ice breaker is no longer intact.
14. The dam in its present condition is not sufficiently strong and is unsafe and dangerous to life, health and property.

### **CONCLUSIONS OF LAW**

The Department concludes that:

1. The Department of Natural Resources has authority pursuant to sections 31.02 and 31.19, Wisconsin Statutes, to inspect or cause an inspection to be made of any dam or reservoir.
2. The Department of Natural Resources has authority pursuant to sections 31.02 and 31.19, Wisconsin Statutes, to order alterations and repairs to any dam that is not sufficiently strong or is unsafe and is dangerous to life, health and property.
3. The Department of Natural Resources has authority pursuant to sections 31.02 and 31.19, Wisconsin Statutes, to order the drawdown of the impoundment above a dam that is not sufficiently strong or is unsafe and dangerous to life, health and property.

## ORDER

It is therefore ordered that:

1. The owner of the Estabrook Dam shall maintain the current drawn down condition of the impoundment by keeping all gates fully open and secured in place. With this Order in effect, the dam shall remain drawn down until all conditions within the Order are in compliance. The owner shall inspect the dam on a daily basis to ensure that no additional materials to obstruct flow are placed in the structure, and shall promptly remove any such obstructions found. Obstructions could include debris carried in the channel or unauthorized activities to re-impound water.
2. As required in the October 16, 2007, Revised Work Schedule, the owner of the Estabrook Dam shall engage the services of a professional engineer registered in the State of Wisconsin to perform detailed stability analyses for the entire structure under all loading conditions in compliance with chapter NR 333, Wisconsin Administrative Code. The stability analyses must be submitted for Department review and approval by **October 1, 2010**.
3. The owner of Estabrook Dam shall engage the services of a professional engineer registered in the State of Wisconsin to inspect the dam and to develop plans and specifications in compliance with chapter NR 333, Wisconsin Administrative Code, for repair of the dam. Repairs shall include items identified on the October 16, 2007, Revised Work Schedule. The owner must submit those plans and specifications to the Department of Natural Resources for review and approval by **July 29, 2011**.
4. Upon review and approval of the plans and specifications by the Department, the owner shall select a competent contractor to repair the structure in accordance with the approved plans and specifications by **July 27, 2012**. All permits necessary for construction and sediment removal shall be obtained from the Southeast Region Office, Milwaukee, prior to initiation of construction, including proper testing, removal, transport, and disposal of contaminated sediment.
5. The owner shall provide the Department with documentation and photographs demonstrating that the work has been completed in accordance with the approved plans and specifications. A professional engineer registered in the State of Wisconsin shall certify that the repairs are completed as designed.
6. The impoundment shall not be refilled until all repairs identified in the October 16, 2007, revised work schedule have been completed. The authorization to refill the impoundment cannot be granted until the detailed stability analyses are reviewed and approved by the Department. After receiving the stability analyses, the Department will identify and outline any additional requirements and deadlines in writing. The impoundment shall remain drawn down until the Department provides written authorization that requirements of this Order are complete.
7. Not more than 10 days after the completion of the repairs of the Estabrook Dam, the owner of the Estabrook Dam shall submit an Inspection, Operation and Maintenance Plan and an Emergency Action Plan to the Department for review and approval.
8. In lieu of provisions 2 through 5 and provision 7 of this Order, the owner of the Estabrook Dam shall submit an application for a permit to abandon the dam pursuant to section 31.185, Wisconsin Statutes, by **January 28, 2011**. If an application is submitted, the owner of the Estabrook Dam shall remain responsible for the dam until a permit to abandon the dam is issued and all the conditions of that permit have been met.
9. The owner of the Estabrook Dam shall provide the Department written notification of its intent to repair or abandon the dam, by **January 28, 2011**.

### NOTICE OF APPEAL RIGHTS

If you believe that you have the right to challenge this decision, you should know that Wisconsin statutes and administrative rules establish time periods within which requests to review Department decisions must be filed.

To request a contested case hearing pursuant to section 227.42, Wisconsin Statutes, you have 30 days after the decision is mailed or otherwise served by the Department of Natural Resources. The filing of a request for a contested case hearing is not a prerequisite for judicial review and does not extend the 30-day period for filing a petition for judicial review.

This decision was mailed on July 28, 2009.

**STATE OF WISCONSIN DEPARTMENT OF NATURAL RESOURCES**  
For the Secretary

By Tanya L. Meyer July 28, 2009  
Tanya L. Meyer Date  
Water Management Engineer  
Milwaukee Service Center

By William D. Sturtevant 7/28/09  
William D. Sturtevant, P.E. Date  
State Dam Safety Engineer  
Bureau of Watershed Management