

State of Wisconsin
DEPARTMENT OF NATURAL RESOURCES
West Central Region
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July 16, 2019

Field File #: 55.15

Warren W. Wood, LTD
Cedar Lake Protection & Rehabilitation District
152 West Second St.
New Richmond, WI 54017

Subject: Cedar Lake Dam Inspection Report, Field File #55.15, Key Sequence No: 2160, Town of Star Prairie, St. Croix County, Wisconsin.

Dear Mr. Wood,

On behalf of the Wisconsin Department of Natural Resources (Department), I want to thank the Cedar Lake Protection & Rehabilitation District for reaching out to discuss the current status of the Cedar Lake Dam in the Town of Star Prairie, St. Croix County, Wisconsin. The district's cooperation and acknowledgment of the dam safety program is appreciated.

As promised during the meeting that occurred the morning of July 11, 2019, the following is the Department's findings based on a visual inspection of the Cedar Lake Dam, review of the field file, and onsite discussion.

Size Classification & Regulatory Requirements

According to the Department's records, the Cedar Lake Dam is currently classified as a **small dam**. The size classification of a dam is assigned based on the definition in NR 333, Wisconsin Administrative Code, which includes the structural height and maximum storage. Although formal plans have not been located at this time, there appears to be indication that the dam has a structural height of less than 6-ft., with a maximum storage of approximately 3300 acre-ft. A small dam is not subject to many of the requirements, particularly the inspection schedules identified in Ch. 31.19 Wisconsin Statutes, for large dams. However, small dams, such as the Cedar Lake Dam, are still subject to various provisions under Ch. 31 Wisconsin Statutes and NR 333 Wisconsin Administrative Code.

Dam Ownership & Historical Information

In July 1927, according to WP-290, the Railroad Commission of Wisconsin held a hearing to discuss the water levels on Cedar Lake and potential unauthorized raising of them. According to the October 11, 1927 document, the Commission ordered that a rock dam constructed by a landowner in the area remove said structure and refrain from maintaining it or any other obstruction which will affect the level of Cedar Lake. Then on June 3, 1949 the Public Service Commission granted a permit under Ch. 31.06 Wisconsin Statutes to the Cedar Lake Improvement Club to construct and maintain a dam at the outlet of Cedar Lake. However, at some point between 1949 and 1986, the ownership of the dam transferred to Ms. Marion L. McMurtrie, Trustee. The ownership was later transferred via permit 3-WC-85-1803 from Marion L. McMurtrie, Trustee to the Cedar Lake Protection & Rehabilitation District. This permit was issued on June 18, 1986 which the district is currently listed as the owner and operator of the Cedar Lake Dam.

Water Level Order

On July 8, 1987, the Department ordered that the Cedar Lake Protection & Rehabilitation District operate the Cedar Lake Dam in accordance with the water levels identified under docket 3-WC-86-1801. The order requires that the following water levels be maintained by law, under Ch. 31.02 Wisconsin Statutes:

- 1) Normal Water Level: 96.92-ft.**
- 2) Maximum Water Level: 97.16-ft.**

The water levels were established in reference to benchmark 632-F, which is described as a 2-inch square cut in the right abutment of the Cedar Lake Dam, about 2.5 feet right of the right end of the right gate. Its elevation is 98.76 ft, assumed datum (often referred to as a Local Datum). Benchmark 632-F was able to be located during the site visit on July 11, 2019, however the square cut was a bit worn and not surveyed at the time.

July 11, 2019 Dam Inspection Findings

As part of the onsite visit, which occurred on Thursday, July 11, 2019, Department Dam Safety Staff inspected the Cedar Lake Dam. Although there may have been various site visits, the dam does not appear to have been formally inspected since 1986, likely due to the fact that the Cedar Lake dam is a small dam and not subject to the recurring inspections required under Ch. 31.19 Wisconsin Statutes for large dams.

A formal survey was not completed during the inspection, however as mentioned previously, benchmark 632-F was able to be located on the right abutment of the dam. The square cut is worn, however can be found. According to the Department's records, this benchmark has an assumed elevation of 98.76-ft. Local Datum. The Department recommends that each dam have at least two permanent benchmarks, one on and one off the dam in a nearby location. The benchmarks should be referenced using the NAVD88 datum. Additionally, the staff gages for the dam, which are used to ensure that the ordered water levels are maintained, should be resurveyed and verified for accuracy.

A major portion of the inspection and discussion focused on the current condition of the concrete. The most notable deficiency was observed at the left abutment, referenced from left to right looking downstream. The abutment has a large transverse crack, allowing for movement of the concrete upstream. The concrete deterioration at the left abutment likely occurred years ago and attempts to repair it have been conducted. This is evident by a concrete portion located within the exposed crack, which appears to have broken away from the parent concrete material.

The condition of the left abutment is rather serious. This area has been and is highly susceptible to the freeze thaw cycle which may cause concrete to deteriorate at a faster pace. The concrete in the piers and abutments of the Cedar Lake Dam appear to be the original from 1949. It is not known if the concrete was reinforced, however a few steel pins on the concrete surface were found, indicating that the concrete may have been.

The right abutment of the dam does contain concrete deterioration, but not as significant as the left abutment. The concrete piers, between each stoplog bay, have also sustained significant scour and spalling mainly at the surface of the tailwater downstream. This area is also susceptible to freeze thaw, with the exposed aggregate, and should be repaired in a timely manner.

Provided that the concrete has been in place for 70 years, it is recommended that soundings or cores be taken to test the adequacy of the parent concrete material. If suitable, it may be able to be used for resurfacing of the concrete. If not, then a full replacement may be necessary.

In the mid-late 1990's, steel grates were installed in each stoplog bay. This was completed to prevent invasive carp species from migrating upstream into Cedar Lake. Some of the grates are bent and have sustained minor damage. These areas of the grates may be more susceptible to debris build up and cause additional backwater during high water events.

During the inspection, it was noted that rubber bumpers were installed on the upstream faces of the piers. This was likely to protect the dam from debris, ice, or other obstructions. It also appears to serve as part of the stop log slot. The bumpers are connected to steel members which are fastened to the concrete piers.

Dam Operation

During the July 11, 2019 site visit, there was discussion regarding the operability of the dam. According to the Cedar Lake Protection & Rehabilitation District, the steel stoplogs are difficult to remove. There was mention of installing metal brackets to allow for smoother operation. Department Dam Safety staff recommended that the condition of the concrete, which the brackets would be fastened to, be investigated first. Additionally, although brief, it was also recommended to perhaps look at a hoist or similar system to allow for easier operation of the stop logs.

It is important that the stop logs can be removed and operated. Particularly during high water events and to ensure the ordered water levels are maintained. If the stoplogs are not able to be removed, the dam may be losing additional capacity to pass larger flood flows.

The following are a list of directives to address deficiencies observed at the Cedar Lake Dam as well as recommended dates for completion.

DIRECTIVES

DATE DUE

1. Concrete Repair

December 31, 2021

The Cedar Lake Dam has sustained significant concrete deterioration since construction in 1949. The Department recommends that the Cedar Lake Protection & Rehabilitation District hire a professional engineer to complete a thorough review of the concrete and determine appropriate repair/reconstruction measures. Particular areas of interest include the left and right abutments and the downstream portion of the piers.

2. Vegetation Removal

Ongoing

2-3-inch in diameter trees were observed at the left abutment area. It is recommended that the trees be removed to prevent root growth and invasion at the abutment. In general, the vegetation appeared to be maintained adequately. It is recommended that the lake district continue to maintain and remove vegetation within the immediate vicinity of the Cedar Lake Dam.

3. Benchmarks & Staff Gage

December 31, 2019

The Department requires at least two permanent benchmarks be installed for each dam. It is recommended that one benchmark be located on and one off the dam in a nearby location. Benchmark 632-F was located during the July 11, 2019 inspection. The Department recommends this benchmark be resurveyed and be replaced with a

more permanent monument as the square cut is rather worn. Each benchmark should be referenced using the NAVD88 datum. In addition to the establishment and verification of the benchmarks, the staff gages should be verified. This will ensure that the ordered water levels are being maintained by law and allow for the Cedar Lake Protection & Rehabilitation District to operate the dam appropriately.

4. Steel Grates

Recommended

The steel grates within each stoplog bay were installed to prevent invasive carp from migrating upstream. The grates have sustained minor damage and deterioration, however in fair condition overall. The lake district may want to look at repairing the portions of the grates that are damaged to ensure operability. In addition, ensure that the debris is cleaned off the grates as appropriate so that the flood flow capacity is not reduced significantly.

5. Dam Signage

December 31, 2019

The Department recommends that a dam warning sign be installed on the dam. NR 330, Wisconsin Administrative Code details the requirements for dam signage and portage routes.

6. Stoplog Operation

Ongoing

During the July 11, 2019 onsite meeting, there was mention that the steel stoplogs are difficult to remove. It may be in the interest of the lake district to look at various mechanisms to assist with stop log operation. Options include a manual hoist, steel slots, etc. It is important that the dam can be operated appropriately to pass flood flows and maintain the water levels ordered by law.

If the Cedar Lake Protection & Rehabilitation District has any questions about this report or regarding operation and maintenance of the Cedar Lake Dam, please feel free to contact me at Michael.Rogney@wisconsin.gov or 715-210-2609.

Thank you for your continued cooperation.

Sincerely,



Michael Rogney, P.E.
Water Management Engineer
Wisconsin Department of Natural Resources
Eau Claire Service Center

Cc: Tanya Lourigan, P.E., WDNR, State Dam Safety Engineer



Downstream view of the Cedar Lake Dam



Upstream View of the Cedar Lake Dam



Upstream Impoundment of the Cedar Lake Dam



Benchmark 632-F, Square Cut on Right Abutment (Not Surveyed)



Crest of the Cedar Lake Dam. Wooden walkway and railing for access & operation.



Upstream View of Cedar Lake Dam. Note Bumpers on Piers & Tree at Left Abutment



Significant Cracks and Concrete Deterioration at Right Abutment



Steel pin found at Right Abutment. May be indication of Reinforcement.



Significant Cracks and Concrete Deterioration at Left Abutment



Significant Cracks and Concrete Deterioration at Left Abutment



Significant Cracks and Concrete Deterioration at Left Abutment



Significant Scour and Spalling on Downstream Piers

Name of Dam:	Inspection Date:
Inspectors:	Field File (F.F.) #:
Owner's Name:	Key Seq #:
Street:	Size:
City, State, Zip Code:	
County:	Phone:
Weather and Site conditions:	Email:

GENERAL		Action			
Item	N	Notes/ Observations	M	I	R
1 Monuments/Benchmarks	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location:					
Elevation:					
Datum:					
2 Pool Level	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Normal/Operating:					
Maximum:					
Minimum:					
3 Access Road	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4 Signage/ Security	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Portage:	<input type="checkbox"/>				
Dam Warning:	<input type="checkbox"/>				
Downstream Hazard:	<input type="checkbox"/>				
Fencing/Railings/Catwalks:	<input type="checkbox"/>				
5 Hazard Section	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A. D/S Development	<input type="checkbox"/>				
Density:					
Distance:					
Type:					
B. Channel Crossing	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Type:					
Dimensions:					
D/S distance:					
Traffic Level:					
C. Distance to nearest D/S community/impoundment:	<input type="checkbox"/>				
Name:					
D. Estimated Hazard (based on landuse):	<input type="checkbox"/>				

N = Noted; M= Monitor
I= Investigate; R= Repair
U/S = Upstream; D/S = Downstream
Referenced looking D/S: RT = Right; LT = Left

Additional Comments:

EMBANKMENTS

Description:		Action		
		M	I	R
Item	N	Location on Embankment and Deficiency		
1 Vegetation:		No problem		
A. Trees Quantity: Diameter: Location:	<input type="checkbox"/>			
B. Brush Quantity: Location:	<input type="checkbox"/>			
C. Ground cover Type: Quantity: Appearance:	<input type="checkbox"/>			
2 Erosion		No problem	Not applicable	Could not inspect
A. Wave erosion (Beaching): Scarp: Length/ Width: Location:	<input type="checkbox"/>			
B. Runoff Erosion (Gullies) Quantity: Length/ Width/ Depth: Location:	<input type="checkbox"/>			
3 Instabilities		No problem	Not applicable	Could not inspect
A. Slides Transverse: Longitudinal: Scarp: Length/ Width: Crack Length/ Width:	<input type="checkbox"/>			
B. Cracks: Transverse: Longitudinal: Length/ Width/ Depth: Location: Other:	<input type="checkbox"/>			
C. Bulges/ Depressions Size: Height/ Depth:	<input type="checkbox"/>			
D. Slope (Too Steep) U/S, D/S	<input type="checkbox"/>			

N= Noted; M= Monitor
 I= Investigate; R= Repair
 U/S = Upstream; D/S = Downstream
 Referenced looking D/S: RT = Right; LT = Left

Additional Comments:

Dam Inspection Checklist

Dam Name: _____ F.F. #: _____ Date: _____ Page ___ of ___

EMBANKMENTS (Cont.)							
Item	N	Notes/ Observations			Action		
					M	I	R
4 Slope Protection	<input type="checkbox"/>	No problem	Not applicable	Could not inspect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A. Type	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
B. Condition:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5 Other	<input type="checkbox"/>	No problem	Not applicable	Could not inspect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A. Rodent burrows	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Location:							
B. Ruts	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Length/ Width/ Depth:							
Location:							
C. Other	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6 Alignment	<input type="checkbox"/>	No problem	Not applicable	Could not inspect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
A. Vertical	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Low area:							
Elevation Difference:							
Location:							
B. Horizontal	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
C. Width	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Too narrow:							
Location:							
7 Toe	<input type="checkbox"/>	No problem	Not applicable	Could not inspect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Cracks/Slumps:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Embankment drains:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Type/Flow:							
Location:							
Seepage/ Wetness:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Hummocky:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8 Seepage	<input type="checkbox"/>	No problem	Not applicable	Could not inspect	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Wet area:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Boil:							
Sinkhole:							
Aquatic vegetation:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Rust colored deposits:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Other:							
Sediment in Flow:	<input type="checkbox"/>				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Flowrate:							
Location:							
<p>N= Noted; M= Monitor I= Investigate; R= Repair U/S = Upstream; D/S = Downstream Referenced looking D/S: RT = Right; LT = Left</p> <p>Additional Comments:</p>							
Dam Inspection Checklist							
Dam Name:		F.F. #:		Date:		Page ___ of ___	

SPILLWAY-PRINCIPAL - GATES					Action			
Item		N	Notes/ Observations			M	I	R
I Gates			No problem	Not applicable	Could not inspect thoroughly			
A. Types								
	Number and Size:							
B. Stoplogs								
	Dimensions:							
	Condition:							
C. Abutments								
	Condition: *							
	Seepage/wetness:							
D. Piers (number, shape)								
	Condition: *							
E. Operability								
	Type of Operator:							
	Condition:							
	Security(locked?):							
	Backup Operator:							
F. Access								
G. Condition								
	Rust:							
	Seals (leakage):							
H. Ice protection								
	Type:							
I. Debris								
	Prevention (Rack, boom, etc.)							
J. Condition of Flowway								
K. Drains								
	Type:							
	Flow rate:							
	Location:							
L. Other								

N= Noted; **M**= Monitor **Controlled** = Gated
I= Investigate; **R**= Repair **Uncontrolled** = Overflow
U/S = Upstream; **D/S** = Downstream
Referenced looking D/S: **RT** = Right; **LT** = Left

Additional Comments and/or Sketch:

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

