

**OPERATION AND MAINTENANCE PLAN  
XXXX LAKE DAM**

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## **I. INTRODUCTION AND DEFINITION OF GENERAL RESPONSIBILITIES**

### **A. Introduction**

This manual describes a plan of operation, maintenance, and inspection for the Village of **XXXX**, **XXXX** Lake Dam. This manual should be periodically reviewed and modified to reflect operational and structural changes. The inspection and maintenance forms, and other applicable figures are designed for easy revision.

This manual was prepared for the Village of **XXXX**, by **XXXX**. This manual was prepared to conform with Wisconsin Administrative Code, Department of Natural Resources Section, Chapter NR 333 Dam Design and Construction Standards, Paragraph NR 333.07, "Hydraulic Design and Safety Requirements ( 4) Safety Measures Requirements."

### **B. Purpose and Intent**

The purpose of operations and maintenance (O&M) plan is to provide the Village of **XXXX** Dam Operator and other officials with the following:

- Basic Guidelines which assist the operator / officials to
  - Perform routine and annual safety inspections
  - Properly document the inspections
  - Properly document maintenance related costs
  - Routinely observe river flows and determine gate operating levels.
- Guideline inspection checklist items for routine and annual safety inspections.
- A series of reproducible master forms which will assist documenting
  - Routine and annual safety inspections
  - Maintenance related costs

### **C. Description of the **XXXX** Lake Dam**

The **XXXX** Lake Dam is located in the SW ¼ of Section**XX**. **TXXN**, **RXXE**, on the **XXXX** River (See Figure 8 " As-Built Information"). The dam lies within village limits adjacent to the south right-of-way of the STH **XX** bridge. The dam is used for recreational opportunities, aesthetic values and to help govern water level conditions. There are approximately 490 square miles (313,600 acres) in the upstream drainage area. The watershed is comprised of crop and forest lands.

The **XXXX** River flows into **XXXX** Lake downstream from the dam. **XXXX** Lake flows into the **XXXX** River. There are scattered rural residences and agricultural buildings along the **XXXX** River.

The XXXX Lake Dam was designed by XXXX in 19XX for the Village of XXXX. XXXX, Wisconsin constructed the dam in 19XX. The structure is constructed of reinforced concrete, Steel "H" and sheet piles, and earthen embankment materials (See Figure 7 As-Built Information"). The dam is approximately XX feet long.

Water flows through XX refurbished tainter gates and XX splashboard bays. The tainter gates serve both to maintain lake levels and as emergency drawdown devices. The XX splashboard bays control headwater levels through removable splashboards. The average observed river flow is 360 cubic feet per second. The dam was designed to be submerged under 100-year flood conditions.

#### **D. Key Personnel and Their Responsibilities**

The Village XXXX is the Owner/Operator of this XXXX County Dam. The Village of XXXX is responsible for both the routine and other preventative maintenance and operation of the dam.

Only the Dam Operator and trained Village employees may operate the dam spillway levels. The Dam Operator and Village support staff are required to maintain and inspect the dam. The operator is responsible for routine, monthly and annual inspections. More thorough inspections are required after high river flow conditions have subsided. The operator also is responsible for routine weekly and day by day monitoring when high flow conditions exist.

The operator should notify adjacent upstream and downstream operators about changes to the gate levels. Flood water levels may require the operator to change gate operating levels. The operator should coordinate changes with adjacent dam operators.

The XXXX Lake Dam does not have an "Early Warning System Device". The operator and trained officials must be able to identify potentially dangerous river flow conditions. Potential flood conditions are characterized by the following:

- Extended periods of greater than average precipitation or combined melting periods with greater than average precipitation.
- Rapidly increasing headwater levels (greater than 2" increase per hour).

## **II. OPERATION**

Inspection, maintenance, and operation procedures are needed to ensure the public safety. Inspection is a requirement of maintenance. The operator can only reasonably maintain the dam in working order through active inspection. The following sections should be used to guide routine operation, inspection, maintenance, and emergency action.

### **A. Operational Procedures**

#### **1. General Surveillance Provisions**

The XXXX Dam is routinely observed each month and inspected twice a year. Thorough inspections also occur after high flow conditions have subsided.. Flow conditions are routinely monitored weekly and day by day when high flow conditions exist. Routine and required preventive maintenance is performed by the Department of Public Works. Site inspection and flow monitoring records are kept on file at the Village Department of Public Works.

##### **a. Adjacent Upstream "XXXX Dam"**

The adjacent upstream "XXXX Dam" has only a measuring strip gage device. The dam is operated by the XXXX County Park and Forestry Department. Listed below is the necessary contact information:

XXXX County Park and Forestry Department  
XXXX Parks Administrator  
XXXX Dam Operator  
XXXX  
XXXX, WI XXXX  
PH XXXX

##### **b. Early Warning System**

High water levels or increasing floodwater levels can be monitored by the measuring strip gage device. (The dam does not have an automatic warning device.) Upstream water levels (headwater) are controlled by tainter gates and splashboards. Adverse weather conditions may combine to create rising water conditions. The Dam Operator should be prepared to remove all splashboards in advance of high flow conditions. Higher than normal headwater conditions could prevent removing the splashboards.

The Dam Operator is responsible initiating and maintaining constant communication with the "XXXX Dam" Operator. Operation of both

dams, especially during flood flows, affects one another. Changes (and anticipated changes) in dam operation should be immediately communicated with the "XXXX Dam" Operator. The Dam Operator should also coordinate post flood dam operation with the "XXXX Dam" Operation.

Since an operator is not continuously on-site at the XXXX Dam, two upstream upstream spotters have been appointed by the XXXX Village Board. The spotters having ready access to the upstream end of the flowage and will monitor the water levels and immediately notify the XXXX Dam Operator of changes.

## **2. Response During Periods of Darkness**

The dam is not equipped with lights. Lights adjacent to STH XXXX and XXXX Street partially illuminate the dam. The Village Fire Department and County Sheriff Department have spotlight equipped vehicles if necessary. Hand-held flashlights could also aid night illumination.

## **3. Identification of Emergency**

The XXXX Lake Dam does not have an automated flood system. The Dam Operator and Village Officials will need to monitor weekly, monthly and seasonal weather conditions to help identify floodwater conditions. Flood conditions are characterized by significant increases in depth over relatively short periods of time. Depth increases in excess of 2" per hour need to be carefully evaluated. Listed below are important factors which require consideration in light of potential emergency flood situations:

- Initial Water Elevation and Gate Operation
- Previous Weather History (days and weeks) which includes past rainfall
- Predicted Weather
- Upstream and Downstream Dam Operation Procedures

## **4. Emergency Repair Supplies and Resources**

Dam repair materials are not stockpiled at the dam for emergencies. Minor repairs would be evaluated by the EAP Coordinator and Dam Operator. The Dam Operator would coordinate repairs. Heavy equipment is available from the Village of XXXX, XXXX County Highway Commission and local contractors. Repair materials would need to be obtained from nearby sources. The operator should have an identified source of embankment repair materials for emergency use.

Major repairs would be coordinated through the EAP Director and Dam Operator. XXXX constructed the dam in 19XX and could provide valuable assistance.

## **5. Coordination or Floodwater Flows**

Upstream flows may be regulated from the adjacent XXXX Dam. The XXXX Lake level can only be lowered through the tainter gates and splashboards during higher than normal flows. The dam has no headwater or tailwater gages or an automatic warning device. The XXXX upstream dam only has a measuring strip gage device. Upstream water levels (headwater) levels are controlled by the tainter gates and splashboards headwater. Adverse weather conditions may combine to create rising water conditions. The Dam Operator should be prepared to remove all splashboards in advance of high flow conditions. Higher than normal headwater conditions could prevent removing the splashboards.

In conjunction with the daily, weekly, and monthly monitoring of flows, the Dam Operator shall regulate lake levels accordingly by the use of the tainter gates and splashboards. The Dam Operator shall take action to release water when a 2 inch increase in the water level is recorded.

The Dam Operator is responsible for coordinating high water flows with the adjacent upstream and downstream dam operators.

## **6. Winter Drawdown**

Each splashboard should be removed during the fall before the lake freezes. Winter ice formation can damage splashboards. Spring thaws may also produce ice jam conditions at the dam. The boards should be removed to prevent damage to the splashboards.

The splashboards may be replaced in the spring after threats of ice damage have diminished. The tainter gates should additionally be opened prior to replacing the splashboards. Opening the tainter gates provides the following:

- Ensures proper tainter gate operation.
- Removes previously deposited silt materials from behind the tainter gates. This also prevents "clogging" of the dry fire hydrant.
- Allows detailed inspection and maintenance of the splashboards bays and the splashboard dowels.
- Allows removal of debris from the splashboard bays.

## B. Inspection

Inspection is a necessary part of operation since early detection of gradual changes can reduce maintenance costs. Routine inspections provide a way to monitor the dam performance. **All inspections should be performed by properly trained persons.**

Listed below are the several categories of inspections:

- Daily /Weekly
  - River flow observations
  - Precipitation Records
- Monthly
  - Operating Equipment
  - Safety Equipment
  - Performance and Superficial Structure
- Yearly
  - Structural
  - Operating and Safety Equipment
- 10 year Department of Natural Resources
- After High Flow Conditions have Subsided (post storm)

The categories are time based with increasing considerations. **Daily/weekly and monthly inspections** require little time to perform. These inspections provide insight on how the dam is operating under current weather conditions. They also provide insight if the dam is mechanically operable for emergencies. River flow conditions should also be regularly monitored. The water depth measuring strip on the upstream abutment provides the easiest way to consistently monitor water levels. Water levels and gate operating positions should be recorded on Figure 1 "Daily /Weekly Inspections Observations".

**Yearly inspections** are designed to evaluate how the dam performed throughout the year and what is the dam's condition. This inspection evaluates how the dam has changed from its original as-built plan condition. Detailed photo documentation provides a permanent record of changing conditions. Cracking conditions can be carefully monitored by placing a ruler within the photo. Larger scale repair and maintenance items should be identified for correction. These inspections are best performed mid-year after the higher spring flows have subsided. State code requires that copies of a thorough annual inspection report be submitted to the Wisconsin Department of Natural Resources (WDNR).

A ten-year WDNR inspection is required by Ch 31.19 State Statutes. The dam must be inspected by dam safety officials. This coordinated inspection thoroughly details a minimum of the following:

- Structures Integrity ( concrete, piling, up / downstream conditions )
- Dam Equipment Operation (gate operators, winches, etc. )
- Dam Safety Equipment Operation (fences, signage)

Post storm inspections should be made as soon as flood water conditions have subsided. This dam is susceptible to damage during high flow conditions because it is designed for submergence during the 100 year flood. Listed below are key elements to be inspected after storm flows have subsided:

- Vegetation: high flow damage
- Earthen Fill: slope, riprap, and abutment stability, seepage
- Tainter Gates: operation
- Flashboard Bays: board damage .Gate Openings: deposited debris

Figure 2 "Inspection and Maintenance Checklist" may be used for routine, annual, and post storm inspections.

## **1. Equipment**

The Dam Operator and qualified officials should be adequately equipped for inspection. The following are recommended inspection related equipment items:

- Camera with flash.
- Ruler with graduations large enough to be identified on photos
- Knives for prying cracks and removing materials
- Boat with 15 feet graduated rod to check upstream and downstream depths and scour locations.
- Blueprint copy of site map or Figure 3 "Site Plan" to note locations of problems and changing conditions.

## **C. Maintenance**

The XXXX Lake Dam is constructed of reinforced concrete and steel, fabricated components and earthen embankment materials. The dam has relatively few maintenance items and operating components. The dam has an estimated life of 100 years when properly maintained. Periodic maintenance and item replacement are expected and preventative maintenance activities will increase with time. Figure 2, "Inspection and Maintenance Checklist" lists these minimum items requiring maintenance.

Maintenance should be regularly performed. Routine, annual, and post storm inspection results will dictate how often and to what degree maintenance is required. Most items can be repaired by the Dam Operator or Village personnel. Larger repair items may be required by qualified contractors. Generally, questionable repair items should be inspected by a qualified engineer and if required, repaired by contractors. Figure 4 lists each inspection item with an average repair frequency and description. Figure 5 is a maintenance report which should be used to document maintenance activities.

### **1. Maintenance Frequency**

Maintenance should be routinely performed. Some items require more frequent attention than others. Figure 4 provides a guideline for how often features may require maintenance and repair.

- Waterproof filler materials may be removed from construction joints by flood waters and settling of the structure. Waterproof filler materials should be maintained as outlined by the contractors or product suppliers specifications.

### **2. Budget Considerations**

The XXXX Lake Dam is constructed of reinforced concrete and steel, fabricated components, and earthen embankment materials. Periodic maintenance and item replacement are expected. Preventive and regular maintenance items are both to be expected and will increase with time. The dam contractor and component fabricators will be able to provide guidelines for routine maintenance and replacement. The operator should expect to use expendable items as fencing, paint, lubrication, riprap materials, etc. Riprap, geotextile fabric and embankment fill materials should be stockpiled for both emergency and routine use. Other expendable items should be budgeted based on manufacturers recommendations and owners experience. Funds should be allocated for larger overhaul items and repairs even though they may not always be predicted.

#### **D. As-Built Plans and Photo Documentation**

The As-Built plans and photographs detail construction dimensions, materials, and installed conditions. The photos were selected to document how key features should be maintained. The photos are referenced to Figure 6, "Photo Documentation of As-Built Conditions"

Figure 7 "As-Built Information" summarizes as-built information for key dam features. As-Built plans and photo documentation are located with the Village of XXXX Dam Operator and Village Hall. Copies of the master As-built plans for the XXXX Lake Dam are on file with XXXX.

#### **E. Emergency Action Plan**

An Emergency Action Plan (EAP) was created to comply with State of Wisconsin Administrative Code, Department of Natural Resources Chapter NR 383. This code requires an EAP to be prepared by the local unit of government and concurred by the Division of Emergency Government.

The purpose of this EAP is to provide the Village of XXXX, XXXX County, and Emergency Warning Agency designated officials with specific guidelines for emergency action in the event that high flood water conditions on a dam failure occurs.

The intent of this plan is primarily to protect the lives of the Village of XXXX and XXXX County citizens and secondarily to reduce property damage.

The underlying intent of the plan is to provide a specific schedule of events to do the following:

1. Monitor/assess dam structure conditions to help predict dam behavior at all water level conditions.
2. Provide basic levels of required communication for various water level conditions (Including dam overflow, dam failure, etc.)
3. Provide for a required yearly coordination meeting between all emergency contacts, landowners directly affected by immediate dam failure, and designated safety officials.
4. Define each agencies/persons duties for public notification securing.
5. Provide detailed response actions for the particular emergency.

An observer other than the designated officials may notice unexpected high flows, potential dam failure or a dam failure. An observer noticing unusual behavior should

immediately notify the Village of **XXXX** Police Department at **XXXX**. Further action/response will depend on whether Condition A or B exists, as described below:

- Condition A: Failure of the **XXXX** Lake Dam is imminent or has occurred.
- Condition B: A potentially hazardous situation is developing at the **XXXX** Lake Dam.

### **III. FIGURES**

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