

# State, Federal and Tribal Fishery Agencies Joint Technical Staff Memorandum

*Columbia River Inter-Tribal Fish Commission  
Idaho Department of Fish and Game  
Washington Department of Fish and Wildlife  
NOAA National Marine Fisheries Service*

*Oregon Department of Fish and Wildlife  
Nez Perce Tribe  
Yakama Nation  
Confederated Tribes of the Colville  
Reservation*

TO: Ms. Beth Coffey  
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FROM:

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SUBJECT: McNary Spillway Hoists and Modified Spill Patterns

DATE: April 18, 2023

## **Overview**

Regional fish managers request that the Army Corps of Engineers (COE) evaluate the proposed spill pattern modifications at McNary Dam (Fish Passage Plan change form 23MCN001, see attached) with regional parties. The physical model would be the preferred option since that was the primary tool that was used in the development of the spill patterns that were identified in the 2020 Proposed Action under the Fish Passage Plan and evaluated by the Biological Opinions (BiOp).

Regional fish managers request the COE identify funding and resources to accelerate the replacement process for the McNary hoists without sacrificing funding for other planned Operational and Maintenance activities and Columbia River Fish Mitigation (CRFM) projects. Funding will be needed now and in the out years.

The COE should consider and discuss with regional partners a possible parallel path. While the gate hoists are being replaced, the existing hoists could be rehabbed thus reducing their risk of failure and allowing for increased usage. This would decrease the time that the spill pattern would need to be altered and reduce negative impacts resulting from the modified spill pattern.

Regional fish managers also request the COE provide regular scheduled updates for the proposed replacement schedule as well as critical milestones for return to service of the spill hoists and other critical spillway features. This would help inform regional partners when further review or modifications to the spill patterns may be necessary.

## **Background:**

The COE informed regional fish managers through the Fish Passage Operations & Maintenance (FPOM) forum that issues with the McNary spillway hoists would necessitate alterations to the spill pattern for 2023 and proceeding future years (estimated up to 10 yrs. or longer). The attached July 2020 memorandum from the COE outlines the design deficiencies with these hoists. These issues were identified and there was an attempt to remedy the issue during 2003 - 2005. The COE has submitted a change form for the 2023 Fish Passage Plan (attached; 23MCN001) that outlines the modifications to the spill patterns planned for this and future years.

The regional fish managers understand the challenge that these hoists pose but have concerns that the proposed spill patterns have not been evaluated with either the available physical or computer models (physical modeling is the preferred tool), specifically for their impacts on fish passage and dissolved gas production. Spill patterns are carefully designed to create the best possible tailrace hydraulics for both a juvenile (egress) and adult (attraction to ladder entrances) salmon standpoint to reduce impacts to both life-stages. The McNary spill patterns were designed with the regional manager's assistance and have been tested to ensure they provide high survival for juveniles passing the spillway and produce minimal adult delay. Spill patterns can be very sensitive to flow levels, powerhouse operations, and local bathymetry and are designed to take these into account. The modified patterns were designed to reduce hoist usage and prevent additional failure. While this is an important consideration, the modified MCN spill

patterns need to be reviewed using the tools the region has available and used in the past to develop the spill patterns to ensure we have the best possible patterns for fish passage, given the current constraints for 2023 and future years. Additionally, modeling may help to understand if some further modification to spill patterns within these constraints is necessary to provide effective egress conditions.

The COE has stated the replacement of the hoists will start in 2025 and could take 10 years or longer to complete, thus any negative impacts from this modification will be felt far into the future, likely through the life of the 2020 CRS BiOp. Fish managers request that funding sources and a repair schedule be provided and updated regularly as necessary. A regularly updated funding and maintenance schedule will help managers to track progress, prioritize funding, and potentially minimize any negative impacts to fish. Any option to accelerate the replacement time frame to reduce the impact posed by these hoists should be pursued.

CC

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## Fish Passage Plan (FPP) Change Form

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**Change Form # & Title:** 23MCN001 – Reduced Auto Operation of Spillway Hoists & Cranes  
**Date Submitted:** 1-DEC-2022 (*revised and resubmitted* [22MCN005](#));  
REVISED 6-FEB-2023; **REVISED 7-MAR-2023**

**Project:** McNary Dam  
**Requester Name, Agency:** Chris Peery, Corps NWW  
**Final Action:** **9-FEB-2023 - Finalized for implementation (see Comments)**

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**FPP SECTION:** MCN section 2.2.1 (Spill Management)

### **JUSTIFICATION FOR CHANGE:**

Testing conducted 2003-2005 showed that McNary Dam spillway hoists have been operated above their rated capacity since installation. Following recent failure of Spillway Hoist 6 and resulting McNary Lock and Dam Spillway Gate Hoist Rehabilitation site inspection, it was recommended that use of all spillway hoists be minimized until hoists have been replaced.

The engineering analysis report on Hoist #6 identified macro pitting on gear contact surfaces that will increase friction as more wear and tear is experienced. Sheave bearings are also showing signs of failure due to being operated in a 100% duty cycle environment, beyond designed operational loading capability, for over 20 years.

This inspection has identified conditions of unacceptable risk to our critical Emergency Action Plan (EAP) response equipment and Project personnel. The risk of continuing to operate all hoists in an auto response mode, is no longer acceptable due to the level of risk to personnel, equipment, and downstream stake holders. As a result, McNary Dam has modified the spill patterns to reduce the use of auto response mode in the interim until the spillbay hoists can be upgraded or replaced to achieve the appropriate lifting capacity, a process estimated to take up to 10 years. In general, the modified patterns uses only four or five spillbay hoists set to auto mode at a time, with the remaining spillbays in manual mode. Auto-mode gates and hoists will be used to accommodate small changes in flow within defined flow bands. As flow changes to either higher or lower bands, manual-mode gates will be adjusted accordingly, manually.

Spill operations described here are intended to reduce risk to personnel and prolong operational life of the spillway gate hoists. These operations have not been evaluated to estimate the degradation to fish passage and tailrace egress conditions.

**March 7, 2023:** Revised to add footnote to interim spill pattern table per FPAC request.

**PROPOSED CHANGES:** *See following pages for edits to existing FPP text in track changes.*

## 2.2. Spill Management

2.2.1. Spring and summer spill operations for juvenile fish passage are defined in the *Fish Operations Plan* (FOP), included in the Fish Passage Plan as **Appendix E**. Spill at McNary Dam will be distributed in spill patterns defined in **Tables MCN-7, -8, -9, -10**, except as noted below in **section 2.2.1.1**.

### 2.2.1.1. Interim Spillway Hoist Operation - Minimization of Unsafe Operating Practices.

As an interim operation until hoists are repaired or replaced so they are no longer in an overloaded condition, McNary spillway hoists will be separated into two control groups: Macro-Spill (mManual/dogged) and Micro-Spill (Auto) modes. There are currently 3 spillbays that are manually adjusted – Bays 2, 6, and 16. Two of the remaining 19 spillbays serve TSW1 and TSW2 until they are removed, typically in early June. This provides a total of 17 spillbays with functioning hoists until early June, then 19 spillbays for the remaining of the spill season that can be rotated through Macro/MicroManual and Auto mode assignments, as described below. During spring and summer spill, April 10–August 31, four or five (during June) of these spillbays will be operated in Aauto/micro-adjusted mode each month according to the rotation schedule below. The change will occur during the first full week of the month. Hoists will initially be set to the average openings identified in the applicable interim spill patterns in **Table MCN-11**. Gate operation categories are as follows:

- i. ManualMacro Gates – ManualMacro gates will be set at the mid-point of the 50 kcfs spill block associated with the current flow level and manually dogged and will not be adjusted for 30 days or until there is a delta of 50 kcfs (+/- 25 kcfs) of current settings. All ManualMacro gates will be raised or lowered with a safety observer stationed at the spillway deck, in the event of sustained flow increases more than the difference of designated spill limits, when one or more of the following occur:
  - A. Present for more than 72 hours.
  - B. All AutoMicro Gate openings exceed an increase of 2+ “stops” per AutoMicro Gate beyond normal flow settings of Spillway Gate stops identified in Spill Pattern Table settings and if flows are expected to increase for 72 hours or more.
  - C. Expected flows are at peak delta and are predicted to rise beyond a max spill delta of 30 kcfs.
- ii. AutoMicro Gates – AutoMicro gates will be set at the pattern associated with the current spill and flow rate in **Table MCN-11** and will be left in auto-response mode for approximately 30 days before being rotated to the next spillway gate assignment. See gate rotation schedule below:

### 1.1.1.1. Interim Spillway Hoist Operation / Minimization of Unsafe Operating Practices.

- i. As an interim operation until overloaded hoists are repaired or replaced so they are no longer in an overloaded condition, McNary spillway hoists will be separated into two control groups: **Manual** (dogged off and manually adjusted) and **Auto**. Currently, of the 22 spillbays at McNary Dam, three are Manual (Bays 2, 6, and 16) and two serve TSW1 and TSW2 until

they are removed, typically in early June. This provides a total of 17 spillbays with functioning hoists until early June, then 19 spillbays for the remaining of the spill season that can be rotated through Manual and Auto mode assignments, as described below. During spring and summer spill, April 10–August 31, four or five (during June) of these spillbays will be operated in Auto-adjusted mode each month according to the rotation schedule below. The change will occur during the first full week of the month. Hoists will initially be set to the average openings identified in the applicable interim spill patterns in

Table MCN-1. Gate operation categories are as follows:

**i. Manual Gates** – Manual gates will be set at the mid-point of the 50 kcfs spill block associated with the current flow level and manually dogged and will not be adjusted for 30 days or until there is a delta of 50 kcfs (+/- 25 kcfs) of current settings. All Manual gates will be raised or lowered with a safety observer stationed at the spillway deck, in the event of sustained flow increases more than the difference of designated spill limits, when one or more of the following occur:

A. Present for more than 72 hours.

B. All Auto Gate openings exceed an increase of 2+ “stops” per Auto Gate beyond normal flow settings of Spillway Gate stops identified in Spill Pattern Table settings and if flows are expected to increase for 72 hours or more.

C. Expected flows are at peak delta and are predicted to rise beyond a max spill delta of 30 kcfs.

**ii. Auto Gates** – Auto gates will be set at the pattern associated with the current spill and flow rate in

iv. Table MCN-1 and will be left in auto-response mode for approximately 30 days before being rotated to the next spillway gate assignment. See gate rotation schedule below:

Rotation schedule for gates in Manual (Dogged) and Auto<sup>a</sup> adjustment modes:

		Crane 7					No Hoist					Crane 6					TSW	TSW					
Mode	First week of:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
Macro/Dogged	April																		Open	Open			
Micro/Auto	May																		Open	Open			
	June																		Open	Open			
	July																						
	Aug																						

<sup>a</sup> Auto mode bays will be adjusted through their operational range as required. Desired spill volumes will be achieved by adjusting a single automatic bay one stop at a time. Automatic bays will operate within one stop of each other.



Table MCN-1. Interim McNary Dam Manual/AutoMicro/Macro Spill Patterns with Bays 2, 6, and 16 Locked. See section 0 for more information (added July 2022).

APRIL <u>Manual/AutoMicro/Macro</u> Spill Patterns with TSWs (# Gate Stops per Spillbay) <sup>c</sup>																						Total Stops (#)	Total Spill (kcfs)
Bays 2, 6, and 16 locked at 4 or 6 stops (manually adjusted)																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 <sup>b</sup>	20 <sup>b</sup>	21	22		
2	4		2	2			2	1	2		2	2		2	4	2	2	TSW	TSW	2		31	78.5
2	4	3	2	2		3	2	1	2	3	2	2		2	4	2	2	TSW	TSW	2	3	43	100.9
2	4	6	2	2		6	2	1	2	6	2	2		2	4	2	2	TSW	TSW	2	6	55	120.1
3	4	0	3	3	6	0	3	3	3	0	3	3	3	3	4	3	4	TSW	TSW	4	0	55	120.0
3	4	3	3	3	6	3	3	3	3	3	3	3	3	3	4	3	4	TSW	TSW	4	3	67	142.4
3	4	6	3	3	6	6	3	3	3	6	3	3	3	3	4	3	4	TSW	TSW	4	6	79	161.6
4	4	2	4	5	6	2	4	5	5	1	5	4	5	4	4	4	5	TSW	TSW	5	2	80	162.5
4	4	5	4	5	6	5	4	5	5	4	5	4	5	4	4	4	5	TSW	TSW	5	5	92	182.4
4	4	8	4	5	6	8	4	5	5	7	5	4	5	4	4	4	5	TSW	TSW	5	8	104	201.9
6	4	3	6	6	6	3	6	6	6	2	6	6	6	6	6	6	6	TSW	TSW	6	3	105	203.1
6	4	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	TSW	TSW	6	6	117	222.4
6	4	9	6	6	6	9	6	6	6	8	6	6	6	6	6	6	6	TSW	TSW	6	9	129	242.0
7	6	5	8	7	6	4	7	7	7	4	7	7	7	7	6	8	8	TSW	TSW	8	4	130	243.6
7	6	8	8	7	6	7	7	7	7	7	7	7	7	7	6	8	8	TSW	TSW	8	7	142	262.9
7	6	11	8	7	6	10	7	7	7	10	7	7	7	7	6	8	8	TSW	TSW	8	10	154	282.3

MAY <u>Manual/AutoMicro/Macro</u> Spill Patterns with TSWs (# Gate Stops per Spillbay) <sup>c</sup>																						Total Stops (#)	Total Spill (kcfs)
Bays 2, 6, and 16 locked at 4 or 6 stops (manually adjusted)																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 <sup>b</sup>	20 <sup>b</sup>	21	22		
2	4	2		2		3	2	1		2	2	1		2	4		2	TSW	TSW	2		31	78.5
2	4	2	3	2		3	2	1	3	2	2	1	3	2	4	3	2	TSW	TSW	2		43	100.7
2	4	2	6	2		3	2	1	6	2	2	1	6	2	4	6	2	TSW	TSW	2		55	120.1
3	4	3	0	3	6	3	3	3	0	3	3	3	0	3	4	0	4	TSW	TSW	4	3	55	120.0
3	4	3	3	3	6	3	3	3	3	3	3	3	3	3	4	3	4	TSW	TSW	4	3	67	142.4
3	4	3	6	3	6	3	3	3	6	3	3	3	6	3	4	6	4	TSW	TSW	4	3	79	161.6
4	4	5	1	5	6	5	4	5	2	4	5	4	2	4	4	1	5	TSW	TSW	5	5	80	162.5
4	4	5	4	5	6	5	4	5	5	4	5	4	5	4	4	4	5	TSW	TSW	5	5	92	182.4
4	4	5	7	5	6	5	4	5	8	4	5	4	8	4	4	7	5	TSW	TSW	5	5	104	201.9
6	4	6	3	6	6	6	6	6	3	5	6	6	3	6	6	3	6	TSW	TSW	6	6	105	203.1
6	4	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	TSW	TSW	6	6	117	222.4
6	4	6	9	6	6	6	6	6	9	5	6	6	9	6	6	9	6	TSW	TSW	6	6	129	242.0
7	6	8	5	7	6	7	7	7	4	7	7	7	4	7	6	5	8	TSW	TSW	8	7	130	243.6
7	6	8	8	7	6	7	7	7	7	7	7	7	7	7	6	8	8	TSW	TSW	8	7	142	262.9
7	6	8	11	7	6	7	7	7	10	7	7	7	10	7	6	11	8	TSW	TSW	8	7	154	282.3

JUNE <u>Manual/AutoMicro/Macro</u> Spill Patterns with TSWs (# Gate Stops per Spillbay) <sup>c</sup>																						Total Stops (#)	Total Spill (kcfs)
Bays 2, 6, and 16 locked at 4 or 6 stops (manually adjusted)																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19 <sup>b</sup>	20 <sup>b</sup>	21	22		
2	4	2	2			2	2		2	1		2		2	4	2		TSW	TSW	2	2	31	78.5
2	4	2	2	3		2	2	3	2	1	3	2		2	4	2	3	TSW	TSW	2	2	43	100.7
2	4	2	2	6		2	2	6	2	1	6	2		2	4	2	6	TSW	TSW	2	2	55	120.1
3	4	3	3	0	6	3	3	0	3	3	0	3	3	3	4	3	1	TSW	TSW	4	3	55	120.0
3	4	3	3	3	6	3	3	3	3	3	3	3	3	3	4	3	4	TSW	TSW	4	3	67	142.4
3	4	3	3	6	6	3	3	6	3	3	6	3	3	3	4	3	7	TSW	TSW	4	3	79	161.6

4	4	5	4	2	6	5	4	2	5	4	2	4	5	4	4	4	2	TSW	TSW	5	5	80	162.5
4	4	5	4	5	6	5	4	5	5	4	5	4	5	4	4	4	5	TSW	TSW	5	5	92	182.4
4	4	5	4	8	6	5	4	8	5	4	8	4	5	4	4	4	8	TSW	TSW	5	5	104	201.9
6	4	6	6	3	6	6	6	3	6	5	3	6	6	6	6	6	3	TSW	TSW	6	6	105	203.1
6	4	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	6	TSW	TSW	6	6	117	222.4
6	4	6	6	9	6	6	6	9	6	5	9	6	6	6	6	6	9	TSW	TSW	6	6	129	242.0
7	6	8	8	4	6	7	7	4	7	7	4	7	7	7	6	8	5	TSW	TSW	8	7	130	243.6
7	6	8	8	7	6	7	7	7	7	7	7	7	7	7	6	8	8	TSW	TSW	8	7	142	262.9
7	6	8	8	10	6	7	7	10	7	7	10	7	7	7	6	8	11	TSW	TSW	8	7	154	282.3

Manual/AutoMicro/Macro Spill Patterns with NO TSWs (# Gate Stops per Spillbay) <sup>ε</sup>																						Total Stops (#)	Total Spill <sup>a</sup> (kcfs)
Bays 2, 6, and 16 locked at 3 or 5 stops																							
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
3	5		2		3	2		2		2	2		3	2	3	2		3		2		36	68.0
3	5	1	2		3	2	1	2		2	2	1	3	2	3	2		3	1	2		40	76.0
3	5	2	2		3	2	2	2		2	2	2	3	2	3	2		3	2	2		44	83.6
3	5	3	2		3	2	3	2		2	2	3	3	2	3	2		3	3	2		48	90.4
3	5	4	2		3	2	4	2		2	2	4	3	2	3	2		3	4	2		52	96.8
4	5	2	2	3	3	3	0	3	2	2	3	0	3	3	3	3	2	3	0	3	2	54	101.0
4	5	3	2	3	3	3	1	3	2	2	3	1	3	3	3	3	2	3	1	3	2	58	108.7
4	5	4	2	3	3	3	2	3	2	2	3	2	3	3	3	3	2	3	2	3	2	62	116.0
4	5	5	2	3	3	3	3	3	2	2	3	3	3	3	3	3	2	3	3	3	2	66	122.7
4	5	6	2	3	3	3	4	3	2	2	3	4	3	3	3	3	2	3	4	3	2	70	129.1
4	5	3	4	3	3	4	2	4	3	3	4	2	3	3	3	4	3	4	2	3	3	72	132.5
4	5	4	4	3	3	4	3	4	3	3	4	3	3	3	3	4	3	4	3	3	3	76	139.2
4	5	5	4	3	3	4	4	4	3	3	4	4	3	3	3	4	3	4	4	3	3	80	145.6
4	5	6	4	3	3	4	5	4	3	3	4	5	3	3	3	4	3	4	5	3	3	84	152.0
4	5	7	4	3	3	4	6	4	3	3	4	6	3	3	3	4	3	4	6	3	3	88	158.4

<sup>a</sup> Spill (kcfs) is calculated as a function of the total number of gate stops + TSW spill at forebay elevation 339 ft.

<sup>b</sup> Bays 19-20 with TSWs = approx 19.2 kcfs spill (9.6 kcfs/bay) at forebay 339'. Raise tainter gates 3-5 ft above water surface to ensure free flow through the TSWs.

<sup>c</sup> Auto mode bays will be adjusted through their operational range as required. Desired spill volumes will be achieved by adjusting a single automatic bay one stop at a time. Automatic bays will operate within one stop of each other.

## COMMENTS:

November 10, 2022 - FPOM;

Condor requested that wording be added that this is a temporary change until hoists and cranes can be updated/repared and to include previous spill pattern tables.

3-FEB-2023 FPOM FPP Meeting:

Lorz – these patterns are degrading what we should be doing. “Temporary” in this case is on the order of 10 years, which is extremely concerning.

Peery – working with project manager to make repairs. This is getting a lot of attention and is a high priority. More updates at next FPOM.

Van Dyke – what is the difference between micro and macro?

Peery – difference is how often they are adjusted. Macro gates are changed less frequently because they are dogged off and manually adjusted due to hoist issues. Micro gates are automatically adjusted.

Van Dyke – **it would be clearer to change it from micro/macro to auto/manual.**

Peery – yes, that makes sense. Will make that change.

Van Dyke - what are tailrace impacts?

Peery – no modeling has been done. This isn’t how we’d like to operate the spillway but have to.

Hesse – these patterns are a degradation over multiple salmon generations. **Request adding to Justification section to state that the modified spill patterns have not been evaluated to estimate effects to fish passage and tailrace egress conditions.**

Peery - will do that.

Conder – **would like more language that this is truly temporary and not the default patterns.**

Ebel – echo Jay’s concerns. Ten years is two generations of salmon, and nearly the duration of the BiOp. At this point, in 2023, this is nearly the remaining duration of the Proposed Action.

There was general agreement that the expected 10 years needed for repairs is too long and all efforts are needed to restore original spill patterns ASAP.

**Peery will make requested edits and add to next week’s FPOM with more updates.**

6-FEB-2023 email from Chris Peery to FPOM:

“Attached is the McNary Spill FPP change form modified per our discussion at last Friday’s meeting, for your review. We will discuss at Thursday’s FPOM meeting.”

9-FEB-2023 FPOM:

Peery - plan is to repair hoist 6 before spring spill this year.

Hesse – this is a degradation to fish passage. Objects to this change and wants a path for elevation. Extremely frustrated that the Corps has not committed to ERDC modeling yet.

FPOM objects to this change and has very significant concerns with the Corps implementing these spill patterns and not prioritizing ERDC modeling. The assumption is that these patterns are a significant degradation to fish passage conditions. Evaluating at ERDC will provide information on the level of those impacts and a potential to explore other alternatives that could have less adverse impacts to fish. They are looking for a path to elevate to RIOG. Peery is developing a memo summarizing the situation and current plan. He will send to FPOM as soon as it's finalized (possibly next week). Salmon managers can use the regional forum process to elevate this issue at any time.

**RECORD OF FINAL ACTION:**

Finalized for inclusion in the 2023 FPP and implementation. FPOM does not support these spill patterns. Any future changes will be coordinated in a separate change form.

March 7, 2023: Revised to add footnote to interim spill pattern table per FPAC request.



DEPARTMENT OF THE ARMY  
U.S. ARMY CORPS OF ENGINEERS, WALLA WALLA DISTRICT  
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CENWW-ECD-M

01 JULY 2020

MEMORANDUM FOR

MCNARY LOCK AND DAM, CHIEF OF TECH (CENWW-ODM/Bill Dull)

SUBJECT: McNary Lock and Dam Spillway Gate Hoist Safety

1. There are 20 spillway gate hoists at McNary dam, 16 of them were manufactured and installed by Ederer Inc. in 1974, and the remaining four were manufactured and installed by Transco Industries in 2003. Both Ederer and Transco hoists were originally designed for a total load capacity of 350,000 lbs. Testing done in 2003 to 2005 showed that most of the hoists have been operating above their rated capacity. The worst case being 485,000 lbs. (139% of rated capacity). This load is based on the dead end of the wire rope and does not account for sheave friction. If the sheave friction of 96.15% efficiency as specified in EM 1110-2-3200 (Wire Rope for Civil Structures) accounted for, the worst case would be 560,000 lbs. (160% of rated capacity). It is a violation of OSHA to operate a hoist above its designed capacity.
2. The overload condition occurs during hoisting of the gate due to higher than predicted side seal and roller friction forces. Some of the gates have been rehabbed, but testing in 2005 showed that in most cases the hoists were still overloaded after the gates were rehabbed. Worst case was 473,000 lbs. (135% of rated capacity). While lowering and holding the gate in position the hoist is not overloaded because the friction is reducing the load on the hoist. The highest risk of failure is during hoisting, but since the overload has been occurring for so long, failure of the hoist can occur any time that the hoist is under load.
3. Likely modes of failure include brake, gearbox, coupling or wire rope failure. The uncontrolled release of mechanical energy can cause parts of the components to fly in all directions with the potential to cause serious injury or death to anyone on or near the hoist that fails.
4. A project is currently under way to replace the hoists with new hoists that have the required capacity to operate the gates, but it will take several years to complete.
5. Risk Mitigation. The following recommended hazard controls will help to reduce the probability of injury or death to personnel.

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SUBJECT: McNary Lock and Dam Spillway Hoist Safety

a. Recommend inspection of the wire ropes annually. Since the factor of safety of the wire rope is below the required 5:1 safety factor, the condition of the wire rope is critical.

b. Recommend access to the top of the hoist or work in front of the hoist only when the hoist and each adjacent hoist is unloaded and locked out to zero energy state per Hazardous Energy Control Program requirements. The hoist may be unloaded by either dogging the gate in position or lowering it to the sill.

c. Install warning lights and audible alarms to prevent travel in front of a spillway hoist when a gate is being hoisted or lowered. Warning lights and audible alarms should activate in enough time before gate movement to allow a person traveling on the roadway upstream of the gates or the walkway downstream of the gates to move beyond the adjacent spill bay.

6. Residual Risk Assessment: Using the Risk Assessment Code Matrix from EM 385-1-1, the following is the Residual Risk level that remains once the above mitigation measures have been implemented:

a. Severity: A hoist failure with personnel nearby carries the potential of a "Catastrophic" outcome in that can result in serious injuries or fatalities.

b. Probability: The probability of a Catastrophic (serious injury or fatality) event occurring is reduced to "Unlikely" by not allowing employees to work on or near these hoists while they are loaded and requiring employees crossing the spillway to be beyond the adjacent spill bay any time that the hoist is being operated.

c. The residual risk level for this particular exposure with hazards controls in place is assessed as "Moderate."

If you have any questions, please contact David Kloewer at 509-527-7498 or [david.j.kloewer@usace.army.mil](mailto:david.j.kloewer@usace.army.mil) .

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CENWW-ECD-M

SUBJECT: McNary Lock and Dam Spillway Hoist Safety

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EM 385-1-1 Risk Assessment Matrix

Overall Risk Assessment Code (RAC) (Use highest code)					
Risk Assessment Code (RAC) Matrix					
Severity	Probability				
	Frequent	Likely	Occasional	Seldom	Unlikely
Catastrophic	E	E	H	H	M
Critical	E	H	H	M	L
Marginal	H	M	M	L	L
Negligible	M	L	L	L	L