# Fish Passage Plan (FPP) Change Form

**Change Form # & Title**: 22MCN005 – Reduced Auto Operation of Spillway Hoists & Cranes

**Date Submitted**: 7-June-2022 / REVISED 7-July-2022

**Project**: McNary Dam

**Requester Name, Agency**: William Gersbach, USACE McNary Lock and Dam

**Final Action:** APPROVED 14-July-2022

**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.

REVISED 7-July-2022 to add a table for July/August.

**Proposed 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**.

**2.2.1.1. Spillway Hoist Operation - Mitigation for the reduction of unsafe operating practices**. McNary Spillway hoists will be separated into 2 control groups, Macro Spill (manual/dogged) and Micro Spill (Auto).

There are currently 3 spillbays that are manually adjusted, Bays 2, 6, & 16. Two of the 19 remaining spillbays serve TSW1 and TSW2 through early June. This provides 17 spillbays with functioning hoists until early June and 19 spillbays for the remaining of the spill season that can be rotated through Macro/Micro assignments. Four or five (during June) of these spillbays will be operated in auto/micro-adjusted mode each month during the spill season April 10-August 31 according to the rotation schedule shown 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 spill tables: MCN-7, 8, 9 and 10. Gate operation categories are as follows:

**Macro Gates** – Macro 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 50kcfs (+/- 25 kcfs) of current settings.

All Macro 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:

1. Present for more than 72 hours.
2. Or - All Micro Gate openings exceed an increase of 2+ “stops” per Micro 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.
3. Or - Expected flows are at peak delta and are predicted to rise beyond a max spill delta of 30 kcfs.

**Micro Gates** – Micro gates will be set at the pattern associated with the current spill and flow rate in FPP Tables MCN-7, 8, 9, and 10, 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 macro and micro adjustment modes:



Spill Pattern Tables for Spring and Summer Spill

**Table MCN-April Micro/Macro**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table MCN‐7 Spill Patterns with TSWs (# Gate Stops per Spillbay) ‐ Bay 2, 6 and 16 locked at 4 or 6 stops**  **1** b **2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 c 20 c** | | | | | | | | | | | | | | | | | | | | **21** | **22** b | **Total Stops**  **(#)** | **Spill** a  **(kcfs)** |
| 2 | 4 | 0 | 2 | 2 | 0 | 0 | 2 | 1 | 2 | 0 | 2 | 2 | 0 | 2 | 4 | 2 | 2 | TSW | TSW | 2 | 0 | **31** | **78.5** |
| 2 | 4 | 3 | 2 | 2 | 0 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 0 | 2 | 4 | 2 | 2 | TSW | TSW | 2 | 3 | **43** | **100.9** |
| 2 | 4 | 6 | 2 | 2 | 0 | 6 | 2 | 1 | 2 | 6 | 2 | 2 | 0 | 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** |

**Table MCN-May Micro/Macro**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table MCN‐7 Spill Patterns with TSWs (# Gate Stops per Spillbay) ‐ Bay 2, 6 and 16 locked at 4 or 6 stops**  **1** b **2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 c 20 c** | | | | | | | | | | | | | | | | | | | | **21** | **22** b | **Total Stops**  **(#)** | **Spill** a  **(kcfs)** |
| 2 | 4 | 2 |  | 2 | 0 | 3 | 2 | 1 |  | 2 | 2 | 1 |  | 2 | 4 |  | 2 | TSW | TSW | 2 |  | **31** | **78.5** |
| 2 | 4 | 2 | 3 | 2 | 0 | 3 | 2 | 1 | 3 | 2 | 2 | 1 | 3 | 2 | 4 | 3 | 2 | TSW | TSW | 2 |  | **43** | **100.7** |
| 2 | 4 | 2 | 6 | 2 | 0 | 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** |

**Table MCN-June Micro/Macro**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table MCN‐7 Spill Patterns with TSWs (# Gate Stops per Spillbay) ‐ Bay 2, 6 and 16 locked at 4 or 6 stops**  **1** b **2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 c 20 c** | | | | | | | | | | | | | | | | | | | | **21** | **22** b | **Total Stops**  **(#)** | **Spill** a  **(kcfs)** |
| 2 | 4 | 2 | 2 | 0 | 0 | 2 | 2 | 0 | 2 | 1 | 0 | 2 | 0 | 2 | 4 | 2 | 0 | TSW | TSW | 2 | 2 | **31** | **78.5** |
| 2 | 4 | 2 | 2 | 3 | 0 | 2 | 2 | 3 | 2 | 1 | 3 | 2 | 0 | 2 | 4 | 2 | 3 | TSW | TSW | 2 | 2 | **43** | **100.7** |
| 2 | 4 | 2 | 2 | 6 | 0 | 2 | 2 | 6 | 2 | 1 | 6 | 2 | 0 | 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** |

**Table MCN-July/August - Micro/Macro**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Table MCN-7 Spill Patterns with TSWs (# Gate Stops per Spillbay) - Bay 2, 6 and 16 locked at 4 or 6 stops**  **1** b **2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 c 20 c** | | | | | | | | | | | | | | | | | | | | **21** | **22** b | **Total Stops**  **(#)** | **Spill** a  **(kcfs)** |
| 3 | 5 | 0 | 2 |  | 3 | 2 | 0 | 2 |  | 2 | 2 | 0 | 3 | 2 | 3 | 2 |  | 3 | 0 | 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** |

**COMMENTS**:

June 9, 2022 - FPOM:

Lorz understands the need but there’s got to be a better way than ruining tailrace hydraulics for potentially up to 10 years.

Peery relayed that Laughery acknowledges these operations are not good for hydraulics but were developed based on the project need to keep things functional.

Swank asked how much of a safety issue this is. Peery thinks it’s very close to a dam safety issue. They could lose one or more hoists at any time, same as what happened to hoist 6.

Johnson noted that risking failure means they could be forced into an even worse operation than what’s being proposed.

Swank asked if overloaded cranes could become an issue at other projects as well. Lorz pointed out that MCN has leaf gates while other projects have tainter gates (except BON), so it’s unlikely.

Peery hears the region’s concerns and will work with the project and leadership to communicate the issues and develop a plan. More to come.

July 7, 2022: Revised by Laughery to add a table for July/August spill.

July 14, 2022 - FPOM meeting: Peery reported that the project has a plan to replace the hoists. They’ll do a couple per year, starting this year, so will take up to ten years to do them all. In the meantime, they need a strategy to maintain dam safety and will start implementing these patterns on Monday, July 18 (assuming TSW removal is complete). The Corps recognizes the concerns with tailrace conditions and is open to having more discussion to improve these patterns.

Swank asked if spill can be monitored, especially next spring. Also would like to see a comparison of spill caps with these modified patterns versus with the old patterns. Since the new patterns have bigger gaps between changes, he’s wondering if that will result in not being able to spill up to the gas cap. Peery replied that Laughery took this into consideration when developing the patterns. RCC water quality team may be able to do a comparison.

**RECORD OF FINAL ACTION**: Approved at the FPOM meeting on July 14. Members aren’t supportive of the change but understand the project requirement. More discussion to improve the patterns will happen as needed.