# Fish Passage Plan (FPP) Change Request Form

**Change Form # & Title**: 17MCN001 – Updated Spill Patterns with No TSWs

**Date Submitted**: November 2, 2016

**Project**: McNary

**Requester Name, Agency**: Bill Gersbach, USACE

**Final Action:** **APPROVED – December 8, 2016**

**FPP SECTION**: Table MCN-9. McNary Dam Spill Patterns with No TSWs.

**JUSTIFICATION**: When spill rates during summer reside within the 65-75 kcfs range, there is constant spillgate shuffling, creating unnecessary wear and tear on spillway operation mechanisms.

This system presently operates in a manner that creates an over-taxed load bearing system. This request is to alter the pattern to a more gradual shift between gates being used without adding additional concerns for fish passage.

The Spillway gate system was not designed for a 100% duty cycle operating environment, but was designed to make a change, lower to dogging ears, and reduce the weight off the cables and brake systems, until the next spill change was required. Our present operations are hyper-accurate and reactive, forcing spillgates to be braking between each spill change order and then hanging on the cables/drivetrain until the next spill change order.

This revised pattern will address making a more gradual change to the spill pattern yet minimize the overall impact to tailrace conditions, and the subsequent fish passage conditions.

**PROPOSED CHANGE**:  Table MCN-9 has been updated to reflect results of ERDC modelling. (See table on following pages)

**Comments**: (listed oldest to newest)

10/24/16 email from Brian Fletcher, Tidewater, to Ryan Laughery, Corps NWW:

From: Brian Fletcher

Subject: Spill patterns

Ryan,

I have not had the opportunity to meet with Fred at Shaver to personally review the spill pattern changes propose for 2017. I am confident that the changes to the spill patterns that were developed will not have an adverse effect on navigation and should soften the vessel’s approach between the 60 and 70 kcfs. I compared the new and existing patterns against my notes and found no irregularities outside of what we modeled so proceed with formalizing the changes if you haven’t already. As discussed, the navigation friendly spill pattern will remain in effect in 2017 if the vessel operator finds it necessary for safe navigation. Tidewater’s vessel crews will be briefed on the changes in spill patterns at our training session this coming March. I appreciated having the opportunity to participate in the modeling.

Best Regards,

Brian W. Fletcher, Port Captain, Tidewater Barge Lines

11/10/16 FPOM: Fredricks sent out the ERDC trip report. This will be discussed at FFDRWG. Navigation already gave input on the spill pattern *[see email above]*. The existing spill pattern is the spring plan but adapted for summer. *STATUS*: pending discussion at FFDRWG 11/17.

11/17/16 FFDRWG: Fredricks reiterated that he sent out a trip report summarizing the ERDC modeling that resulted in these modified spill patterns. Overall, the modified patterns achieve the objective to eliminate the “dead-band” at low flows, and are similar enough to the previous patterns that there should be no change in fish survival. Also, these modified patterns should provide better navigation conditions than the existing FPP navigation patterns; however, the existing navigation spill pattern table will stay in the FPP for 2017 just in case barge operators run into trouble. FFDRWG supports this change form. *STATUS:* pending finalization at FPOM 12/8.

**RECORD OF FINAL ACTION**: APPROVED at FPOM Dec 8, 2016.

| **Table MCN-9 Spill Patterns with No TSWs (# Gate Stops per Spillbay)** | **Total Stops** | **Spill** a |
| --- | --- | --- |
| **1** b | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** | **15** | **16** | **17** | **18** | **19** | **20** | **21** | **22** b | **(#)** | **(kcfs)** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 3 |   |   |   | **3** | **5.6** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 4 |   |   |   | **4** | **7.2** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2 | 3 |   |   |   | **5** | **9.5** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2 | 4 |   |   |   | **6** | **11.1** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2 | 3 | 2 |   |   | **7** | **13.4** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2 | 4 | 2 |   |   | **8** | **15.0** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   | 1 |   |   | 2 | 4 | 2 |   |   | **9** | **17.0** |
|   |   |   |   |   |   |   |   |   |   |   |   |   |   | 2 |   |   | 2 | 4 | 2 |   |   | **10** | **18.9** |
|   |   |   |   |   |   |   |   |   |   |   |   |   | 1 | 2 |   |   | 2 | 4 | 2 |   |   | **11** | **20.9** |
|   |   |   |   |   |   |   |   |   |   |   |   |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **12** | **22.8** |
|   |   |   |   |   |   |   |   |   |   |   | 1 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **13** | **24.8** |
|   |   |   |   |   |   |   |   |   |   |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **14** | **26.7** |
|   |   |   |   |   |   |   |   |   | 1 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **15** | **28.7** |
|   |   |   |   |   |   |   |   |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **16** | **30.6** |
|   |   |   |   |   |   |   | 1 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **17** | **32.6** |
|   |   |   |   |   |   |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **18** | **34.5** |
|   |   |   |   |   | 1 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **19** | **36.5** |
|   |   |   |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **20** | **38.4** |
|   |   |   |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 5 | 2 |   |   | **21** | **40.0** |
|   | 2 |   |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **22** | **42.3** |
|   | 2 | 1 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **23** | **44.3** |
|   | 2 | 2 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **24** | **46.2** |
|   | 3 | 2 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **25** | **47.9** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 2 | 4 | 2 |   |   | **26** | **49.6** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 3 | 4 | 2 |   |   | **27** | **51.3** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   |   | 4 | 4 | 2 |   |   | **28** | **52.9** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 3 | 4 | 2 |   |   | **29** | **55.2** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 4 | 4 | 2 |   |   | **30** | **56.8** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 4 | 5 | 2 |   |   | **31** | **58.4** |
|   | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 5 | 5 | 2 |   |   | **32** | **60.0** |
| 2 | 3 | 3 |   |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 5 | 4 | 2 |   |   | **33** | **62.3** |
| 2 | 3 | 3 | 2 |   | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 4 | 4 | 2 |   |   | **34** | **64.6** |
| 2 | 3 | 3 | 2 | 2 | 2 |   | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 4 | 3 | 2 |   |   | **35** | **66.9** |
| 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |   | 2 |   | 2 |   | 2 | 2 |   | 2 | 3 | 3 | 2 |   |   | **36** | **69.2** |
| 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |   | 2 |   | 2 | 1 | 2 | 2 |   | 2 | 3 | 3 | 2 |   |   | **37** | **71.2** |
| 2 | 3 | 4 | 2 | 2 | 2 | 2 | 2 |   | 2 |   | 2 | 2 | 2 | 2 |   | 2 | 2 | 3 | 2 |   |   | **38** | **73.0** |
| 2 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   | 2 | 2 | 2 | 2 |   | 2 | 2 | 3 |   |   |   | **39** | **74.6** |
| 2 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **40** | **76.8** |
| 3 | 4 | 4 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **41** | **78.5** |
| 3 | 4 | 4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **42** | **80.2** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   |   | **43** | **81.2** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   |   | **44** | **82.9** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **45** | **85.1** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **46** | **86.8** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **47** | **88.5** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   |   | **48** | **90.2** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   | **49** | **92.4** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   |   | **50** | **94.1** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |   |   |   | **51** | **95.8** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |   |   | **52** | **98.0** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 2 |   |   | **53** | **99.7** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 |   |   | **54** | **101.4** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 |   |   | **55** | **103.1** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 |   | **56** | **105.3** |
| 3 | 5 | 5 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |   | **57** | **107.0** |
| 3 | 5 | 5 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |   | **58** | **108.7** |
| 3 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 |   | **59** | **110.4** |
| 3 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 |   | **60** | **112.1** |
| 3 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | **61** | **114.3** |
| 3 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **62** | **116.0** |
| 4 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **63** | **117.6** |
| 4 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **64** | **119.3** |
| 4 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **65** | **121.0** |
| 4 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **66** | **122.7** |
| 4 | 5 | 5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **67** | **124.4** |
| 4 | 5 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **68** | **126.0** |
| 4 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | **69** | **127.6** |
| 4 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | **70** | **129.3** |
| 4 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | **71** | **131.0** |
| 4 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | **72** | **132.7** |
| 4 | 6 | 6 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **73** | **134.4** |
| 4 | 6 | 6 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **74** | **136.0** |
| 4 | 6 | 6 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **75** | **137.6** |
| 4 | 6 | 6 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **76** | **139.2** |
| 4 | 6 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **77** | **140.8** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | **78** | **142.4** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | **79** | **144.0** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | **80** | **145.6** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | **81** | **147.2** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 3 | **82** | **148.8** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | **83** | **150.4** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 3 | **84** | **152.0** |
| 4 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | **85** | **153.6** |
| 5 | 7 | 7 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | **86** | **155.2** |
| 5 | 7 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | **87** | **156.9** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | **88** | **158.6** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | **89** | **160.2** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | **90** | **161.8** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | **91** | **163.4** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | **92** | **165.0** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | **93** | **166.6** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | **94** | **168.2** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | **95** | **169.8** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 4 | **96** | **171.4** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | **97** | **173.0** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | **98** | **174.6** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 5 | 4 | 5 | 4 | 4 | 4 | **99** | **176.2** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 4 | 4 | **100** | **177.8** |
| 5 | 8 | 8 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 4 | **101** | **179.4** |
| 5 | 8 | 8 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 4 | **102** | **181.0** |
| 5 | 8 | 8 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 4 | **103** | **182.6** |
| 5 | 8 | 8 | 4 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **104** | **184.2** |
| 5 | 8 | 8 | 4 | 3 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **105** | **185.8** |
| 5 | 8 | 8 | 4 | 3 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **106** | **187.4** |
| 5 | 8 | 8 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **107** | **189.0** |
| 5 | 8 | 8 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **108** | **190.6** |
| 6 | 8 | 8 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | **109** | **192.2** |
| 6 | 8 | 8 | 4 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | **110** | **193.8** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | **111** | **195.4** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | **112** | **197.0** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | **113** | **198.6** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 4 | **114** | **200.2** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 5 | 5 | 5 | 5 | **115** | **201.8** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 5 | 5 | 5 | 5 | **116** | **203.4** |
| 6 | 8 | 8 | 5 | 4 | 5 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 6 | 5 | 5 | 5 | **117** | **205.0** |
| 6 | 8 | 8 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 6 | 5 | 5 | 5 | **118** | **206.6** |
| 6 | 8 | 8 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 6 | 5 | 6 | 5 | 6 | 5 | 6 | 5 | 6 | 5 | **120** | **209.8** |
| 6 | 8 | 8 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 5 | **122** | **213.0** |
| 6 | 8 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 5 | **124** | **216.2** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 5 | 6 | 6 | 6 | 6 | 6 | 5 | 6 | 5 | **126** | **219.4** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 5 | **128** | **222.6** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | **130** | **225.8** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | **132** | **229.0** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 6 | 7 | 6 | 6 | 6 | 6 | **134** | **232.2** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 6 | 7 | 7 | 6 | 6 | 6 | **136** | **235.4** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | **138** | **238.6** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 7 | 7 | 7 | 6 | 6 | 6 | **140** | **241.8** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 7 | 7 | 7 | 6 | 6 | **142** | **245.1** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 6 | 6 | **144** | **248.5** |
| 7 | 9 | 8 | 5 | 5 | 5 | 5 | 6 | 6 | 7 | 6 | 7 | 6 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 6 | 6 | **146** | **251.7** |
| 7 | 9 | 8 | 6 | 5 | 6 | 5 | 6 | 6 | 7 | 6 | 7 | 6 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 6 | 6 | **148** | **254.9** |
| 7 | 9 | 8 | 6 | 5 | 6 | 5 | 6 | 6 | 7 | 6 | 7 | 7 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 7 | 6 | **150** | **258.1** |
| 7 | 9 | 8 | 6 | 5 | 6 | 5 | 6 | 6 | 7 | 6 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 7 | 7 | **152** | **261.4** |
| 7 | 9 | 8 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 6 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 8 | 7 | 7 | 7 | **154** | **264.6** |
| 7 | 9 | 8 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 7 | 8 | 8 | 8 | 7 | 8 | 7 | 7 | 7 | **156** | **267.9** |
| 7 | 9 | 8 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 7 | 7 | **158** | **271.3** |
| 7 | 9 | 8 | 6 | 6 | 6 | 6 | 6 | 6 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 7 | **160** | **274.7** |
| 7 | 9 | 8 | 6 | 6 | 7 | 6 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | 7 | **162** | **277.9** |
| 7 | 9 | 8 | 6 | 6 | 7 | 6 | 6 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | **164** | **281.3** |
| 7 | 9 | 8 | 7 | 6 | 7 | 6 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 7 | **166** | **284.5** |
| 7 | 9 | 8 | 7 | 6 | 7 | 6 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | **168** | **287.9** |
| 7 | 9 | 8 | 7 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | **170** | **291.1** |
| 8 | 9 | 8 | 7 | 7 | 7 | 7 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | **172** | **294.5** |
| 8 | 9 | 8 | 7 | 8 | 7 | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | **174** | **297.9** |
| 8 | 9 | 8 | 7 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | 8 | **176** | **301.3** |
| **a.** This table defines patterns in increments of 1-2 gate stops per row. Spill (kcfs) is calculated as a function of the total number of stops at forebay elevation 339 ft. |
| **b.** Bays 1, 22 *MAY* require special open/close sequence (pending field test verification). Open Bays 2–21 for ≥10 minutes, then open Bays 1, 22. Close Bays 1, 22 first.  |