2024 Fish Passage Plan

Chapter 4 – John Day Dam

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John Day Dam *	
Project Acronym	JDA
River Mile (RM)	Columbia River – RM 215.6
Reservoir	Lake Umatilla
Minimum Instantaneous Flow (kcfs)	Dec–Feb: 12.5 kcfs \ Mar–Nov: 50 kcfs
Forebay Normal Operating Range (ft)	Nov–Jun: 260'–265' \ Jul–Oct: 265'–268'
Tailrace Rate of Change Limit (ft)	3'/hour
Powerhouse Length (ft)	1,975'
Powerhouse Hydraulic Capacity (kcfs)	322 kcfs
Turbine Units (#)	16 (Units 1-16 BLH Kaplan)
Turbine Generating Capacity (MW)	Rated: 2,160 MW (135 MW/unit) \ Maximum: 2,480 MW (155 MW/unit)
Gatewell Orifice Diameter (in)	One 14" orifice per gatewell (3 per unit) = 48 total
Spillway Length (ft)	1,228'
Spillway Hydraulic Capacity (kcfs)	2,250 kcfs
Spillbays (#)	20
Spillway Weirs (#)	2 Temporary Spillway Weirs (TSW) Bays 18, 19
Navigation Lock Length x Width (ft)	650' x 86'
Navigation Lock Max. Lift (ft)	113'

* More information for John Day Dam is available on the Corps Portland District website at: www.nwp.usace.army.mil/Locations/Columbia-River/John-Day/

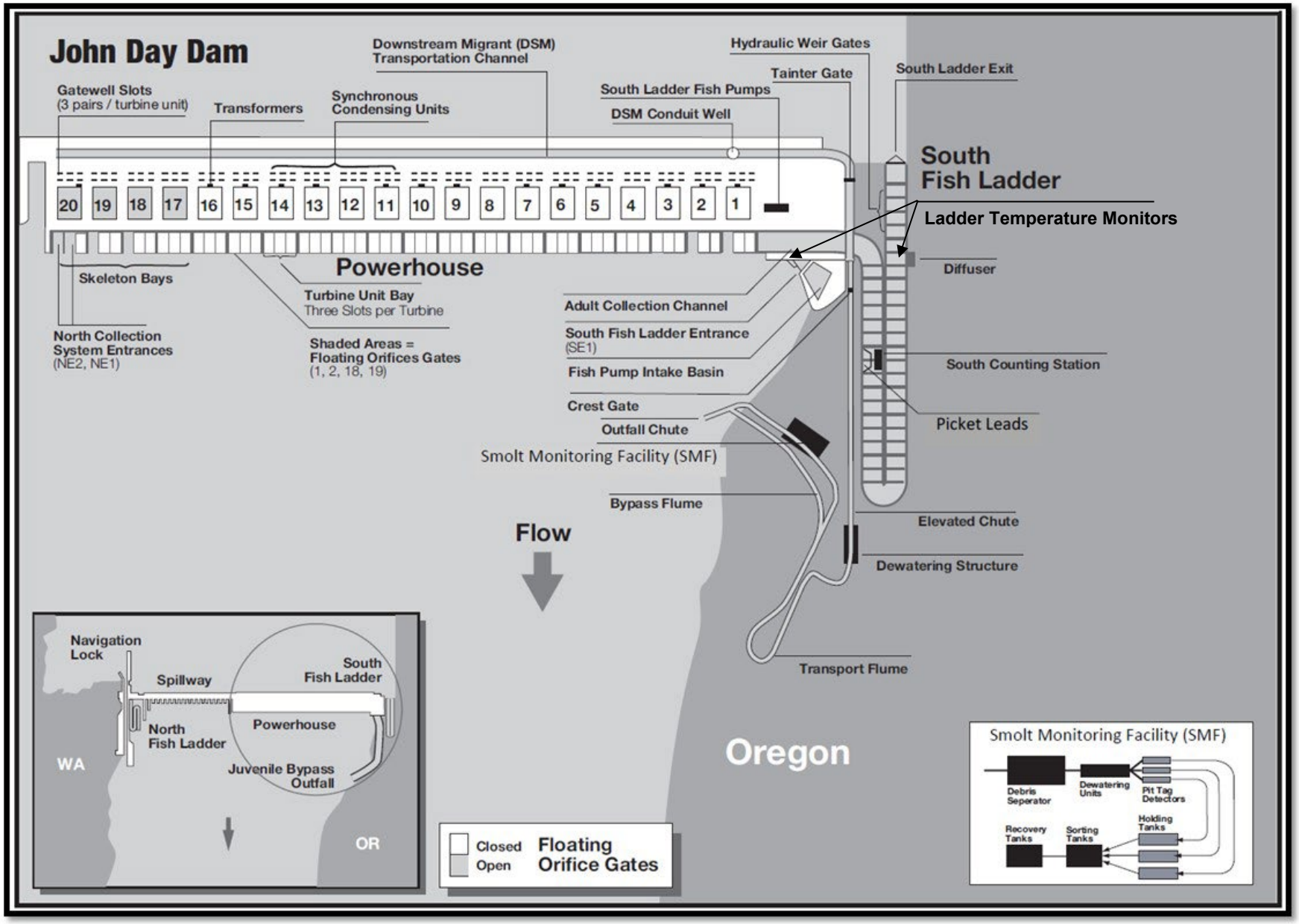


Figure JDA-1. John Day Dam South Fish Ladder, Powerhouse Collection System, and Juvenile Bypass System.

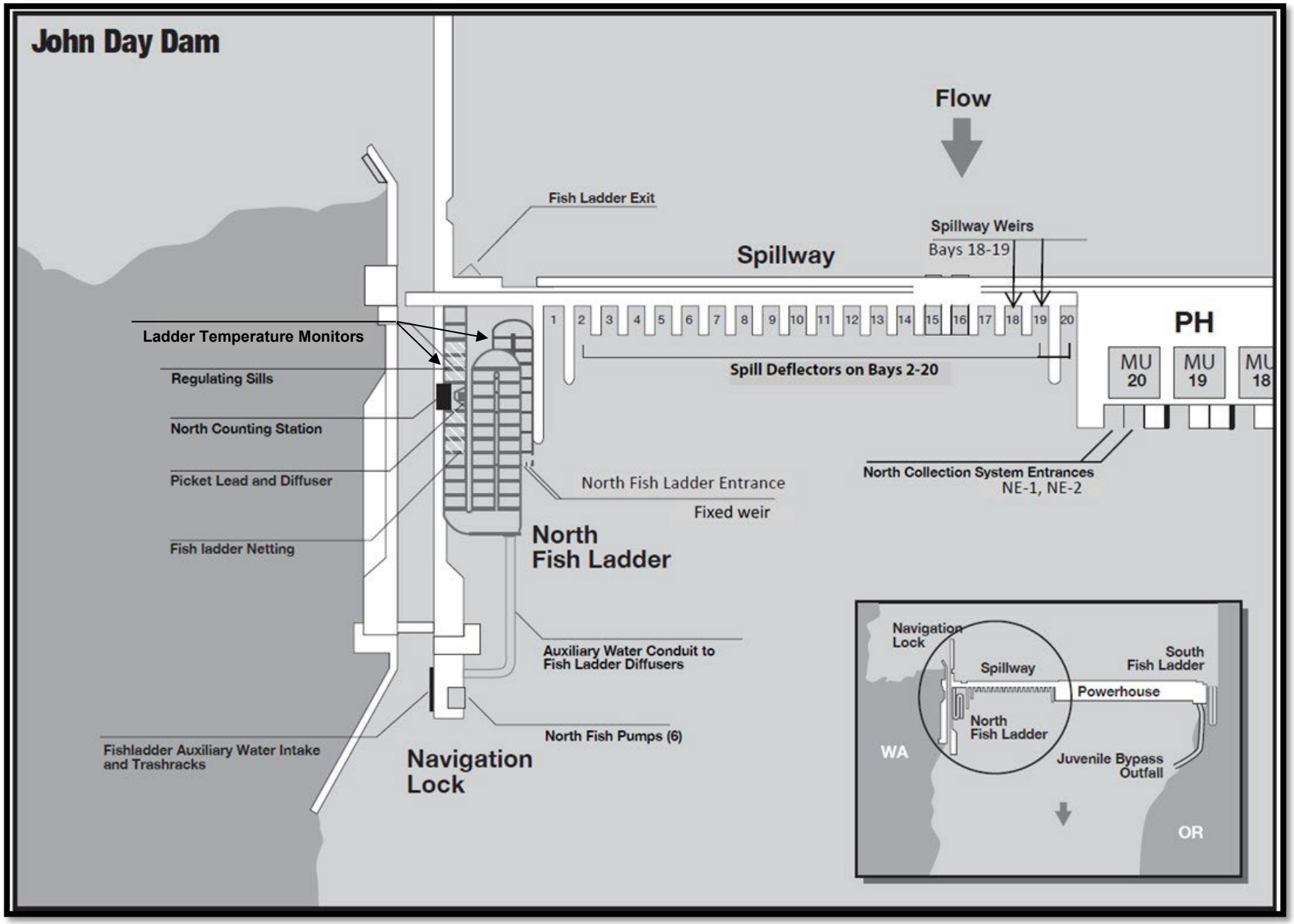
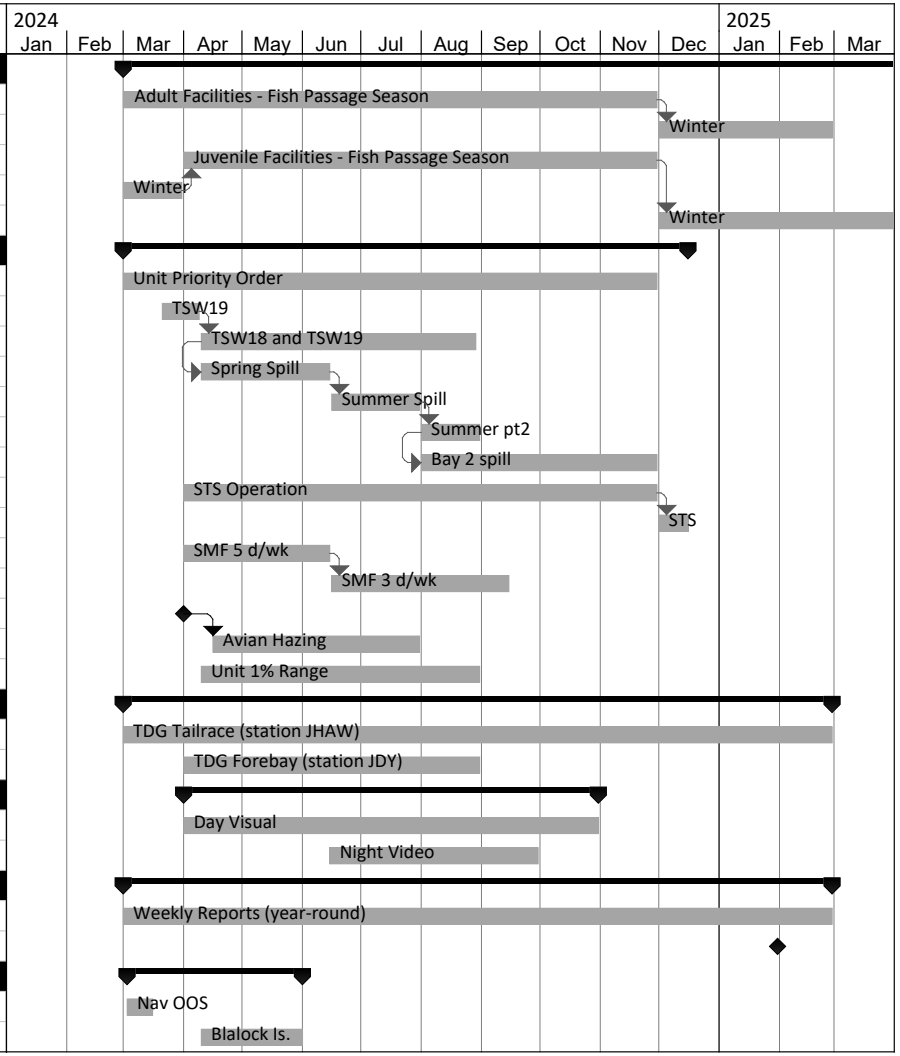


Figure JDA-2. John Day Dam Spillway and North Fish Ladder.

Table JDA-1. John Day Dam Schedule of Operations and Actions Defined in the 2024 Fish Passage Plan.

Task Name	Start	End	FPP Section
FISH PASSAGE FACILITIES	**Fri 3/1/24**	**Mon 3/31/25**	
Adult Facilities - Fish Passage Season	Fri 3/1/24	Sat 11/30/24	2.4.2
Adult Facilities - Winter Maintenance	Sun 12/1/24	Fri 2/28/25	2.4.1
Juvenile Facilities - Fish Passage Season	Mon 4/1/24	Sat 11/30/24	2.3.2
Juvenile Facilities - Winter Maintenance	Fri 3/1/24	Sun 3/31/24	2.3.1
	Sun 12/1/24	Mon 3/31/25	
PROJECT OPERATIONS FOR FISH PASSAGE	**Fri 3/1/24**	**Mon 12/16/24**	
Turbine unit priority order for fish	Fri 3/1/24	Sat 11/30/24	Table JDA-6
TSW in bay 19 for adult steelhead	Thu 3/21/24	Tue 4/9/24	2.3.2.4
TSWs in bays 18, 19	Wed 4/10/24	Thu 8/29/24	2.3.2.4
FOP Spring Spill	Wed 4/10/24	Sat 6/15/24	App E (FOP)
FOP Summer Spill	Sun 6/16/24	Wed 7/31/24	App E (FOP)
FOP Late Summer Spill	Thu 8/1/24	Sat 8/31/24	App E (FOP)
Spillbay 2 for adult attraction	Thu 8/1/24	Sat 11/30/24	2.2.3
STS Operation for Juveniles	Mon 4/1/24	Sat 11/30/24	2.3.2.1
STS Operation for Adult Fallbacks	Sun 12/1/24	Mon 12/16/24	2.3.1.1
Smolt Condition Monitoring 5 days/week	Mon 4/1/24	Sat 6/15/24	2.3.2.3
Smolt Condition Monitoring 3 days/week	Sun 6/16/24	Sun 9/15/24	2.3.2.3
Avian Wires installed NLT April 1	Mon 4/1/24	Mon 4/1/24	2.3.1.13
Avian Hazing	Tue 4/16/24	Wed 7/31/24	App L 5.2
Turbine unit 1% operating range	Wed 4/10/24	Sat 8/31/24	4.2
TDG MONITORING	**Fri 3/1/24**	**Fri 2/28/25**	
TDG Monitoring - Tailrace (year-round)	Fri 3/1/24	Fri 2/28/25	2.2.2
TDG Monitoring - Forebay	Mon 4/1/24	Sat 8/31/24	2.2.2
ADULT FISH COUNTING	**Mon 4/1/24**	**Thu 10/31/24**	
Day Visual 0500-2100 PDT	Mon 4/1/24	Thu 10/31/24	Table JDA-3
Night Video 2100-0500 PDT	Sat 6/15/24	Mon 9/30/24	Table JDA-3
REPORTS	**Fri 3/1/24**	**Fri 2/28/25**	
Weekly Reports (year-round)	Fri 3/1/24	Fri 2/28/25	2.5.2
Annual Report due NLT Jan 31	Fri 1/31/25	Fri 1/31/25	2.5.2
SPECIAL OPERATIONS	**Sun 3/3/24**	**Sat 6/1/24**	
Navigation Lock Outage	Sun 3/3/24	Sat 3/16/24	App A 1.4
Blalock Island Operation	Wed 4/10/24	Sat 6/1/24	App A 4.1.1



1. FISH PASSAGE INFORMATION

Fish passage facilities at John Day Lock & Dam are shown in **Figure JDA-1** and **JDA-2**. The annual schedule of project operations, maintenance, and other actions that are described in the Fish Passage Plan (FPP) and Appendices is in **Table JDA-1**.

1.1. Juvenile Fish Facilities and Migration Timing

1.1.1. Juvenile Facilities. The Juvenile Bypass System (JBS) at John Day Dam was completed in 1987 and the Smolt Monitoring Facility (SMF) was completed in 1998. Maintenance of the SMF is scheduled from December 1 through March 31 to minimize impact on downstream migrants. Maintenance of the JBS will start on the Monday of the 3rd week in December to reduce the possibility of adult fallbacks through turbine units.

Each of the project's 16 turbine units include one vertical barrier screen (VBS), one submersible traveling screen (STS), and three 14"-diameter orifices (one per gatewell).

During SMF juvenile fish sampling, flow with collected fish from the SMF is sent over the crest gate and down an elevated chute to the dewatering structure that reduces flow to 30 cubic feet per second (cfs) before entering the transport flume. A switch gate diverts fish to either the SMF or directly to the outfall (emergency bypass only). Fish diverted for sampling pass a fish/debris separator that directs debris and adult fish into a separate flume to the outfall. Juvenile fish are interrogated by PIT-tag detectors and diverted either to the SMF for sampling or the outfall. When the SMF is not in operation, the bypass collection conduit connects to a transport channel that carries fish to the tailrace (bypass mode). The differential between the forebay and bypass conduit is controlled by the tainter gate.

1.1.2. Juvenile Migration Timing & Counting. Juvenile salmonid passage timing at John Day has been determined by gatewell and SMF sampling (**Table JDA-2**). Sample collection will continue through September 15 and PIT-tag interrogation will continue through November 30 (weather permitting). The JBS will operate until the Monday of the 3rd week in December. Bull trout, lamprey, juvenile sturgeon, and non-listed fish are recorded as by-catch in the SMF report.

Results to-date of ongoing research show significant daytime passage during daytime operations. Juvenile fish passage increases dramatically at dusk and peaks around 2300–2400 hours with a long period of elevated passage until dawn when passage decreases. Gatewell sampling data[1] indicate that roughly 80% of juvenile migrants pass John Day Dam between 2100 and 0600 hours. During the peak spring juvenile migration period at John Day Dam, 40% of spring Chinook and steelhead passage occurred between 0700 and 2200 hours.

[1] Data are for powerhouse passage only. Recent radio-tracking and hydroacoustic data indicate different passage patterns for the spillway and project when spill is occurring 24 hours/day.

Table JDA-2. Juvenile Salmonid Passage Timing at John Day Dam for Most Recent 10 Years (based on daily & yearly collection data). *

Year	10%	50%	90%	# Days	10%	50%	90%	# Days
	Yearling Chinook				Subyearling Chinook			
2014	28-Apr	9-May	24-May	27	21-Jun	5-Jul	20-Jul	30
2015	20-Apr	13-May	24-May	35	10-Jun	23-Jun	30-Jun	21
2016	18-Apr	30-Apr	10-May	23	13-Jun	29-Jun	7-Jul	25
2017	24-Apr	8-May	18-May	25	9-Jun	1-Jul	15-Jul	37
2018 (March 1 start)	20-Apr	8-May	20-May	31	4-Jun	29-Jun	19-Jul	46
2019	19-Apr	7-May	23-May	35	8-Jun	30-Jun	16-Jul	39
2020	26-Apr	12-May	24-May	29	7-Jun	27-Jun	22-Jul	46
2021 (March 1 start)	3-May	15-May	2-Jun	31	10-Jun	28-Jun	4-Jul	25
2022	10-May	19-May	2-Jun	24	7-Jun	27-Jun	25-Jul	49
2023	7-Apr	1-May	24-May	48	31-May	21-Jun	10-Aug	72
MEDIAN (1998-2015) *	**28-Apr**	**14-May**	**29-May**	**32**	**16-Jun****	**29-Jun****	**28-Jul****	**43****
MIN (1998-2015) *	**20-Apr**	**6-May**	**22-May**	**24**	**6-Jun****	**27-Jun****	**20-Jul****	**31****
MAX (1998-2015) *	**6-May**	**27-May**	**20-Jun**	**46**	**27-Jun****	**30-Jul****	**22-Aug****	**59****
	Unclipped Steelhead				Clipped Steelhead			
2014	23-Apr	9-May	27-May	35	30-Apr	8-May	21-May	22
2015	16-Apr	18-May	28-May	43	28-Apr	14-May	28-May	31
2016	18-Apr	28-Apr	12-May	25	22-Apr	30-Apr	10-May	19
2017	24-Apr	6-May	28-May	35	24-Apr	4-May	22-May	29
2018 (March 1 start)	22-Apr	8-May	30-May	39	20-Apr	2-May	22-May	33
2019	21-Apr	27-Apr	21-May	31	19-Apr	25-Apr	11-May	23
2020	4-May	25-May	30-May	27	2-May	12-May	28-May	27
2021 (March 1 start)	3-May	19-May	4-Jun	33	29-Apr	9-May	31-May	33
2022	17-May	30-May	8-Jun	23	10-May	18-May	7-Jun	29
2023	19-Apr	11-May	26-May	38	3-May	9-May	24-May	22
MEDIAN (1998-2015) *	**26-Apr**	**13-May**	**29-May**	**34**	**29-Apr**	**14-May**	**29-May**	**31**
MIN (1998-2015) *	**16-Apr**	**1-May**	**19-May**	**24**	**15-Apr**	**2-May**	**15-May**	**21**
MAX (1998-2015) *	**6-May**	**28-May**	**8-Jun**	**51**	**7-May**	**29-May**	**10-Jun**	**44**
	Coho				Sockeye (Wild & Hatchery)			
2014	3-May	17-May	31-May	29	14-May	22-May	31-May	18
2015	23-Apr	20-May	4-Jun	43	11-May	20-May	27-May	17
2016	26-Apr	8-May	24-May	29	30-Apr	10-May	22-May	23
2017	2-May	18-May	1-Jun	31	30-Apr	14-May	24-May	25
2018 (March 1 start)	6-May	20-May	2-Jun	28	6-May	12-May	26-May	21
2019	27-Apr	17-May	6-Jun	41	5-May	19-May	31-May	27
2020	26-Apr	4-May	30-May	35	10-May	20-May	30-May	21
2021 (March 1 start)	5-May	17-May	4-Jun	31	9-May	23-May	2-Jun	25
2022	10-May	23-May	9-Jun	31	18-May	24-May	3-Jun	17
2023	5-May	25-May	9-Jun	36	11-May	24-May	1-Jun	22
MEDIAN (1998-2015) *	**8-May**	**22-May**	**5-Jun**	**30**	**10-May**	**21-May**	**2-Jun**	**24**
MIN (1998-2015) *	**23-Apr**	**13-May**	**31-May**	**24**	**30-Apr**	**11-May**	**25-May**	**16**
MAX (1998-2015) *	**17-May**	**3-Jun**	**14-Aug**	**90**	**1-Jun**	**14-Jun**	**27-Jun**	**41**

* **MEDIAN, MIN, MAX** for spring migrants based on 1998-2015 data only. Data from 2016-present excluded due to potential bias from every-other-day sampling and March sampling in 2018 and 2019.

** Subyearling Chinook based on 1998-2005 data only. Data from 2006-present excluded due to potential bias from missed sample days during high water temperature sampling protocols (per **Appendix K**).

1.2. Adult Fish Facilities and Migration Timing.

1.2.1. Adult Fish Passage Facilities. The John Day Dam adult fish facilities include a north shore ladder to pass fish from entrances at the north end of the spillway, and a south shore ladder to pass fish from entrances along a collection channel extending the full length of the powerhouse. Auxiliary water is pumped from the tailrace to all collection systems. South auxiliary water also includes forebay water from the fish turbines. Counting stations are provided in both fishways. Annual maintenance of adult fish facilities is scheduled December 1 through the end of February (winter maintenance period) to minimize impacts on upstream migrants.

1.2.2. Adult Fish Migration Timing & Counting.

1.2.2.1. Upstream migrants are present throughout the year and adult passage facilities are operated year-round. Counting of adult salmon, steelhead, bull trout, and lamprey occurs during the dates defined for the current year in **Table JDA-3** and daily counts are posted online.[2] The presence of other species (e.g., sturgeon) are recorded as comments and reported in the *Annual Fish Passage Report*.

1.2.2.2. Yearly counts through the most recent passage year are used to determine the earliest and latest dates of peak adult fish passage defined in **Table JDA-4**.

1.2.2.3. Time-of-day (diel) distributions of adult salmonid activity at John Day Dam fishway entrances and exits are shown in **Figure JDA-2**.

Table JDA-3. John Day Dam Adult Fish Count Schedule March 2024 – February 2025.

Count Period	Counting Method and Hours*
April 1 – October 31	Visual 0500–2100 hours (PDT)
June 15 – September 30	Night Video 2100–0500 hours (PDT)

*PST = Pacific Standard Time. PDT = Pacific Daylight Time, in effect during daylight saving time.

Table JDA-4. John Day Dam Adult Count Period and Peak Passage Timing (based on yearly counts since 1968, except lamprey since 2000).

Species	Count Period	Earliest Peak	Latest Peak
Spring Chinook	Apr 1 – Jun 5	Apr 14	May 24
Summer Chinook	Jun 6 – Aug 5	Jun 7	Aug 2
Fall Chinook	Aug 6 – Oct 31	Sep 2	Sep 25
Steelhead	Apr 1 – Oct 31	Aug 25	Oct 6
Sockeye	Apr 1 – Oct 31	Jun 21	Jul 10
Coho	Apr 1 – Oct 31	Sep 4	Oct 26
Lamprey	Apr 1 – Oct 31	Jun 30	Aug 12

[2] Daily adult salmon counts: https://www.fpc.org/currentdaily/HistFishTwo_7day-ytd_Adults.htm

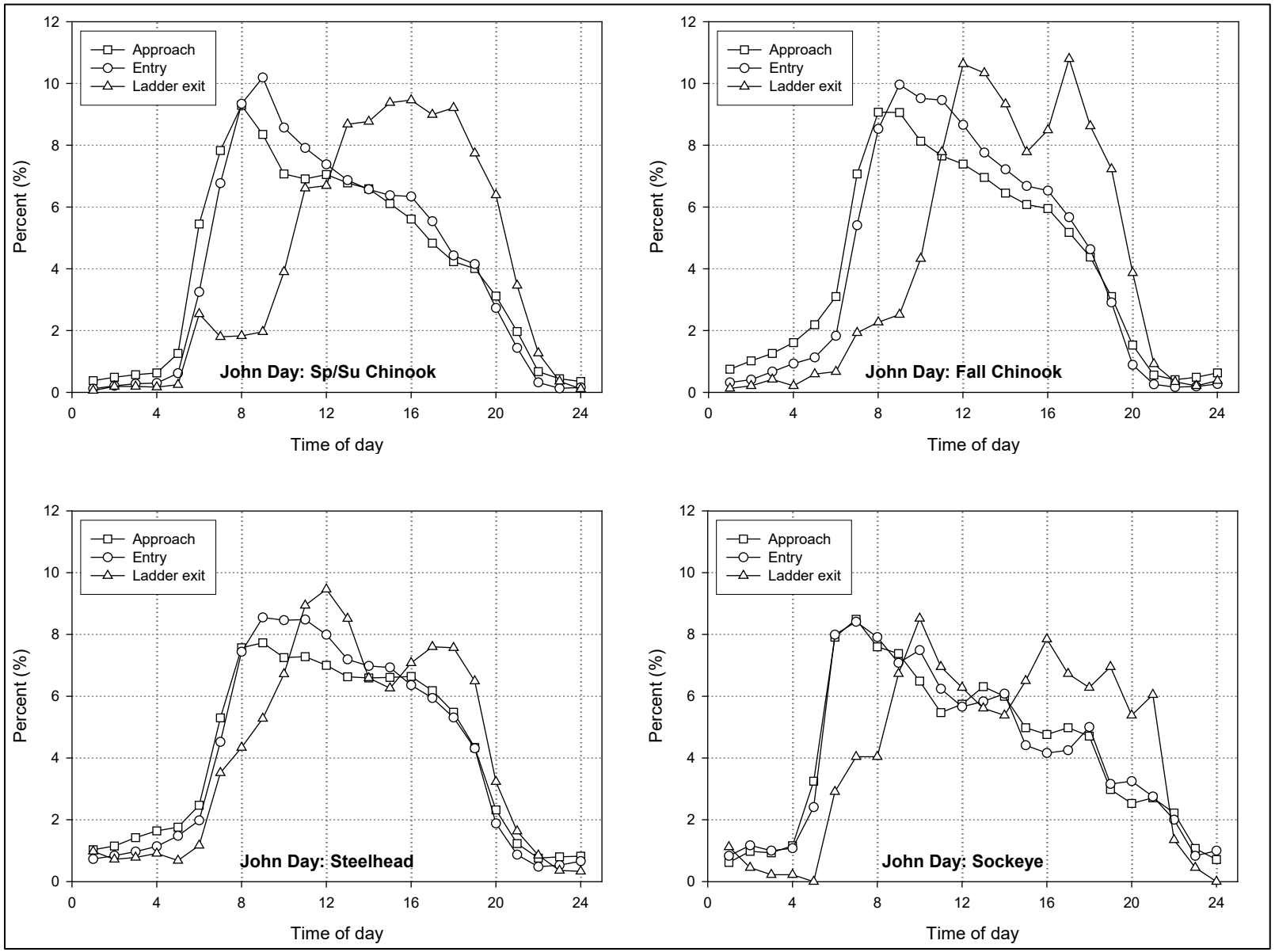


Figure JDA-3. Diel Distribution of Adult Salmonids at John Day Dam Fishway Entrances and Exits (*Keefer & Caudill 2008*) – report and summary letter available online at: pweb.crohms.org/tmt/documents/FPOM/2010/2013_FPOM_MEET/2013_JUN/

2. FISH FACILITIES OPERATION

2.1. General

2.1.1. Research, non-routine maintenance, fish-related activities, and construction will not be conducted within 100' of any fishway entrance or exit, within 50' of any other part of the adult fishway, or directly in, above, or adjacent to any fishway, unless coordinated with FPOM or FFDRWG by the Project, District Operations and/or Planning or Construction office. Alternate actions will be considered by District and Project biologists in conjunction with the regional fish agencies on a case-by-case basis.

2.1.2. Yearly special operations related to research are described as currently coordinated in **Appendix A - Special Project Operations & Studies**.

2.1.3. Emergency situations should be dealt with immediately by the Project in coordination with the Project and/or District biologist. If unavailable, the biologists will be informed immediately following the incident of steps taken to correct the situation. On a monthly basis, as necessary, the Project Biologist will provide FPOM a summary of any emergency actions undertaken.

2.1.4. All activities within boat restricted zones (BRZ) will be coordinated with the Project at least two weeks in advance, unless deemed an emergency (see **Chapter 1 - Overview**).

2.2. Spill Management

2.2.1. Spill operations for fish passage are defined in the *Fish Operations Plan* (FOP), included in the Fish Passage Plan as **Appendix E**. Spill patterns formulated with spillway deflectors in place for both adult and juvenile passage are defined in **Table JDA-8, JDA-9**. Spill pattern modifications for barge traffic entering the navigation lock have been coordinated with the fish agencies and tribes through the proper regional fish forums (e.g., TMT, FPOM, FFDRWG). Minimum spill is 30% April 10–August 15 to provide adequate conditions in the tailrace for juvenile egress.

2.2.2. Excessive total dissolved gas (TDG) may harm fish and will be controlled to the extent possible, subject to river conditions. Management tools include system-wide spill distribution through the Spill Priority List issued by the Corps Northwestern Division Reservoir Control Center (RCC), night and/or day spill limits, and shaping of spill. Monitoring of TDG at John Day Dam occurs during the periods defined in **Table JDA-1**, pursuant to the Corps' annual *TDG Management Plan* and the current *Dissolved Gas Monitoring Plan of Action*.[3]

2.2.3. From August 1 through November 30, adult fish attraction flow will be provided by spilling through Bay 2 open one stop (approximately 1.6 kcfs) during daylight hours defined in **Table JDA-5**.

[3] TDG Management Plan (Appendix 4 of the WMP): pweb.crohms.org/tmt/documents/wmp/
TDG Monitoring Plan of Action: www.nwd.usace.army.mil/Missions/Water/Columbia/Water-Quality/

Table JDA-5. Daytime Spill Hours for Adult Attraction at John Day Dam, Aug 15–Nov 30.

Date Range	Daytime Spill Hours	
	Begin	End
January 1–19	0700	1730
January 20 – February 14	0630	1800
February 15 – March 1	0600	1830
March 2 – Start DST [a]	0600	1930
Start DST [a] – Apr 2	0700	2030
April 3–20	0600	2130
April 21 – May 16	0600	2200
May 17 – June 30	0530	2230
July 1–31	0530	2300
August 1–15	0600	2245
August 16–31	0600	2130
September 1–16	0630	2100
September 17 – October 4	0700	2030
October 5–19	0730	2000
October 20–29	0730	1930
October 30 – End DST [a]	0730	1800
End DST [a] – December 31	0630	1700

a. DST = Daylight Saving Time, in effect from the second Sunday in March through the first Sunday in November.

2.3. Operating Criteria - Juvenile Fish Facilities

2.3.1. Juvenile Fish Facilities - Winter Maintenance Period (December 1 – March 31)

2.3.1.1. From December 1 until Monday of the third week in December, submersible traveling screens (STS) will remain in place and the juvenile bypass system (JBS) channel will operate for adult fallbacks, thereby shortening some aspects of the winter maintenance period. During this period, priority units will be screened to the extent practicable (barring operational failure). STSs will only be removed from non-priority units when necessary to begin maintenance. STSs may be removed starting on Monday of the third week in December.

2.3.1.2. All units are available to meet power demands.

2.3.1.3. Remove debris from the forebay, all trash racks, and gatewell slots so these areas are debris-free by April 1.

2.3.1.4. Inspect all VBSs for damage, holes, debris accumulations, or protrusions (video inspection is acceptable). Clean and repair when necessary.

2.3.1.5. Inspect and operate each STS. Install STSs in each intake slot of all operational units by April 1, unless otherwise coordinated with the fish agencies and tribes.

2.3.1.6. Inspect all gatewell orifices and orifice lighting systems. Clean and/or repair where necessary such that these systems are debris-free and operable on April 1.

2.3.1.7. Check automatic control calibration/operation for the DSM tainter gate and other necessary sensors weekly. Recalibrate as necessary and report summaries of equipment recalibration in the weekly SMF operation monitoring reports.

2.3.1.8. Dewater the downstream migrant (DSM) channel only when required for inspection, maintenance, or structural modifications (see **section 5**). Minimize the outage duration to the extent practicable.

2.3.1.9. Inspect and maintain DSM conduit tainter gate. Repair where necessary.

2.3.1.10. Inspect walls and floor of DSM conduit, raceway, and outfall. Correct any deficiencies.

2.3.1.11. Inspect spillbay gates and associated control system. Repair where necessary. Spillbays must be able to achieve FPP spill patterns on April 10, unless otherwise coordinated.

2.3.1.12. At the SMF, ensure all following items are fully operational:

i. Dewatering facilities, including weir gates, perforated plates, screens (free of holes or gaps), and screen cleaner brush system.

ii. All valves and auxiliary water systems.

iii. Flushing water valves and their perforated plates.

iv. All gates, including the crest, tainter, switch, and rotating gates.

v. Fish/debris separator, including perforated plates and adult passage chamber.

vi. PIT-tag detectors.

vii. All sampling building systems, including holding tanks, valves, and conduits (see specific list in the *SMF Operation & Maintenance Manual*).

2.3.1.13. Avian abatement measures shall be in place by April 1 or as soon as weather permits. For more information, see the *Predation Monitoring & Deterrence Action Plans* for John Day Dam in **Appendix L** (Table 2 and section 5).

2.3.2. Juvenile Fish Facilities – Fish Passage Season (April 1 – November 30)

2.3.2.1. STSs and VBSs.

i. Operate STSs from April 1 through November 30 for juvenile fish passage, and from December 1 until Monday of the third week in December for adult fallbacks. Do not operate units without a full complement of rotating STSs except to comply with other coordinated fish measures.

ii. Inspect each STS, VBS, and orifice once per month or every 720 hours run-time. Video inspections are acceptable. More frequent inspections may be required under the following conditions: deterioration of fish condition, increased debris load in JBS, or other indications of STS or VBS malfunction or failure.

iii. Operate Unit 2 when Unit 1 is out of service for STS inspection.

iv. Monitor each STS amp and/or watt meter readings at least once per shift.

v. If an STS or VBS is damaged, plugged, or non-operational, follow procedures in **section 3**.

vi. Include inspection reports in weekly fishway reports and provide to FPOM.

2.3.2.2. Gatewells and Orifices.

i. Open all gatewell orifices whenever STSs are deployed. If an orifice cannot be opened for any reason, the corresponding unit must be taken out of service within 1 hour until repairs are made.

ii. Inspect all STS gatewells daily.

iii. Clean gatewells before the gatewell water surface becomes 50% covered with debris. If due to the debris volume it is not possible to keep the gatewell surface at least 50% clear, clean gatewells at least once daily. Do not operate turbines that have a gatewell fully covered with debris except to comply with other coordinated

fish measures, and then only on a "last-on/first-off" basis. During cleaning, close the powerhouse gatewell orifices. After gatewell de-barking, cycle the orifice in that gatewell. Check gatewell drawdown.

iv. When using a dip basket for gatewell cleaning, coordinate with SMF staff.

v. Monitor and record juvenile mortality numbers in all gatewells as potential indicators of gatewell environment problems. Include mortality estimates in the weekly status reports.

vi. Measure gatewell drawdown across the trashrack at least once per week. Remove debris from forebay and trashracks as required to maintain gatewell drawdown < 1.5'. If VBS drawdown reaches 1.2', inspect the screen and prepare to clean as necessary.

vii. Close and open each orifice three times daily, or more frequently as determined by the Project Biologist if necessary due to debris accumulation in gatewells.

viii. If a unit goes out of service, keep orifices open in the associated gatewells unless that gatewell is dewatered.

ix. Inspect orifice lights daily to ensure they are operating. Replace all burned out orifice lights within 24 hours.

x. From April 1 through August 1, rake Units 1–5 monthly and Units 6–10 *or* 11–16 every other month. After August 1, rake units as determined necessary by ROV inspection or as needed to maintain gatewell drawdown in criteria. Perform additional raking whenever trash accumulations are suspected because of increased differential ≥ 1.5' across the trash racks, or as determined by the Project Biologist in response to increased juvenile fish descaling at the dam, deteriorating fish condition at the SMF, or increased tumbleweeds in the forebay.

xi. During raking, close the gatewell orifices of the unit being raked.

xii. If debris loads are obvious in the forebay, rake trash in front of the affected unit(s) weekly until the debris is removed. Debris accumulations in the forebay of 300 feet or more in any direction from the face of the dam will be removed within 48 hours. Continue debris removal efforts until the debris is cleared.

xiii. Make best efforts to keep all petroleum out of gatewells. Project environmental section will determine cleanup efforts if needed. Regardless of unit operating status, oil accumulations will be dealt with promptly.

xiv. Maintain the water level in the bypass conduit between 4.0' and 5.0' as measured at Unit 16.

2.3.2.3. Smolt Monitoring Facility (SMF).

i. From April 1 through September 15, Project fish personnel will monitor the SMF 10 hours/day, 5 days/week, to ensure proper functioning and to respond quickly in the event of an emergency.

ii. From April 1 through June 15, condition sampling will occur 5 days per week (Monday through Friday) for 6–8 hours with a target of 100 fish of the predominant species.

iii. From June 16 through September 15, condition sampling will occur 3 days per week (Monday, Wednesday, Friday) for 6-8 hours with a target of 100 fish of the predominant species.

iv. On-site staff will perform a walking inspection of the entire SMF system every two hours to ensure safe fish passage conditions. The system will be fully staffed while the SMF is in operation (i.e., crest gate deployed and secondary dewatering structure receiving fish-laden flow). When the SMF is in bypass mode, Project Fisheries staff will continue to perform daily inspections of the JBS to ensure the system is operating within criteria. Staff will pay particular attention to the following to ensure proper function of sampling system:

- Dewatering facilities, including screens, free of holes or gaps, and the screen cleaner brush system.
- All valves and auxiliary water systems.
- Flushing water valves and perforated plates.
- All gates, including crest, tainter, switch, and rotating gates.
- Fish/debris separator, including perforated plates and adult passage chamber.
- PIT-tag detectors.
- All sampling building systems, including holding tanks, valves, and conduits.
- During low to normal debris loads, the Primary Dewatering Screen (PDS) sweepers will be cycled twice per shift (six times per day). If higher debris loads, the frequency of screen sweeper cycling will be increased as determined by the Project Fisheries inspection.
- The fish/debris separator will be visually inspected every 30 minutes to prevent injury and/or mortality to fish. During high debris periods (likely during spring runoff), additional personnel may be required to keep the separator free of any obstructions to fish passage. The Project Biologist will decide to assign a person to remove debris from the separator for as long as necessary to ensure the safety of passing fish.

- When water temperatures are ≥ 70°F, all fish handling to remove adult fish from the PDS area will be coordinated through FPOM. The condition sampling will be reduced to two days per week (Monday and Thursday) until water temperatures drop below 69.5°F.

2.3.2.4. Temporary Spillway Weirs (TSWs).

i. John Day Dam has two temporary, or top, spillway weirs (TSWs) in spillbays 18 and 19 that provide surface passage routes for fish.

ii. When open, each TSW spills approximately 9.7 kcfs. Spill patterns with and without TSWs are in **Table JDA-8** and **JDA-9**, respectively.

iii. Opening and closing the TSWs requires a crew and gantry crane and must be done during daylight hours as weather allows.

iv. Crews will open one TSW in spillbay 19 as early as possible on the morning of March 21 (first day of surface spill, per **Appendix E**), then open the second TSW in spillbay 18 as early as possible on the morning of April 10 (first day of spring spill, per **Appendix E**).

v. During high flow, TSW removal is recommended before river flow exceeds 685 kcfs.

vi. Both TSWs will be closed on the last normal workday of summer spill (no later than August 31), as late in the day as possible. Spill will be maintained at the FOP summer spill rate through midnight on August 31 using the "No TSWs" patterns.

2.3.2.5. Avian Predation Management. Operate in accordance with the *Predation Monitoring and Deterrence Action Plans* for John Day Dam in **Appendix L** (Table 2 and section 5). Avian monitoring at John Day Dam will occur daily during the adult and juvenile fish passage season and hazing will occur daily from April 10 through July 31.

2.4. Operating Criteria - Adult Fish Facilities

2.4.1. Adult Fish Facilities - Winter Maintenance Period (December 1 – end of February)

2.4.1.1. Operate according to criteria for adult fish passage season in **section 2.4.2** below, except facilities may be dewatered or operated out of criteria for maintenance or repair. Outage periods will be minimized to the extent practicable. Only one of the two adult fish passage facilities may be out of service at a time. The other facility must be operated within passage season criteria unless otherwise coordinated with FPOM. However, Unit 2 may be operated in place of Unit 1 without special coordination when the south fishway is in service.

2.4.1.2. Inspect and calibrate all staff gauges, water level sensors, and indicators. Repair and/or clean where necessary.

2.4.1.3. Dewater and inspect all ladders and other dewatered sections of fish facilities for projections, debris, or plugged orifices that could injure or delay fish. Repair as needed.

2.4.1.4. Inspect ladder exits for debris and clean when necessary.

2.4.1.5. At the end of the adult fish counting season (see **Table JDA-3**), pull picket leads at counting stations and adjust crowders so that the counting slots are fully opened (this should be done shortly after adult fish counting ends). Reinstall picket leads at counting stations prior to watering up ladders during maintenance.

2.4.1.6. Repair or, when necessary, upgrade netting and padding at the top of the north fish ladders to address the fish jumping problem in this area.

2.4.1.7. Maximum head on attraction water intakes and trash racks at all ladder exits is 0.5'. Remove debris when significant amounts accumulate.

2.4.2. Adult Fish Facilities – Adult Fish Passage Season (March 1 – November 30).

2.4.2.1. Maintain staff gauges and water level indicators in readable condition at all water levels encountered during the fish passage season and check calibration weekly. When necessary, clean and/or recalibrate instruments as soon as practicable.

2.4.2.2. Maintain water depth over fish ladder weirs at 1.0’ ±0.1’. When the adult shad count at Bonneville Dam exceeds 5,000/day, increase water depth to 1.3’ ±0.1’.

2.4.2.3. Maintain main entrance weir depths at 8’ or greater below tailwater. Maintain tailwater elevation above 158’ msl to stay within criteria operating range for entrance weirs.

2.4.2.4. Maintain head on all entrances in the range of 1’–2’ (1.5’ optimum). When unable to achieve head criteria, refer to **section 3.2**.

2.4.2.5. Open floating orifice gates 1, 2, 18 and 19, and operate fish pumps to maintain fishway criteria. The system can be maintained using two fish pumps and leaving the 3rd as a backup. The entrance gate should be submerged 8’ deep or greater to be in criteria.

2.4.2.6. Maximum head on attraction water intakes and trashracks at all ladder exits is 0.5', with a maximum head on all picket leads of 0.3'. Remove significant debris build up.

2.4.2.7. Measure fishway channel water velocities at least three times per week (daily preferred) during adult fish passage season as part of the fishway inspection program. Velocities will be measured through all fishway channels that are supplemented by auxiliary water and results reported in the project weekly fishway status report. Maintain water velocity in the range of 1.5–4.0 feet per second (fps), 2 fps optimum, in all channels and the lower ends of fish ladders that are below the tailwater.

2.4.2.8. North Fishway. Maintain netting and padding for the North fishway to address the adult salmonid jumping problem. All holes in the netting large enough to catch or allow escapement of an adult salmonid must be closed. Provide adult attraction flow from August 15 through November 30 by spilling from Bay 2 open one stop (1.5 kcfs) during daylight hours defined in **Table JDA-5**.

2.4.2.9. South Fishway. Operate entrance weirs SE-1, NE-1, and NE-2 to maintain proper depths (>8') and entrance differentials (>1'-2').

2.4.2.10. Powerhouse. Operate entrances NE-1 and NE-2. Operate four powerhouse floating orifices, 1, 2, 18, and 19, and open associated auxiliary water diffusers (see also **section 2.4.2.5**). From 0400–2000 hours, operate Unit 1 near 100 MW (±10) to provide best entrance conditions. If additional load is required by BPA, Unit 1 may be operated above 100 MW, but it should be the last unit brought up to full load when demand increases and the first unit to reduce when demand decreases (see **Appendix C - Load Shaping Guidelines**).

2.4.2.11. Fishway Temperature Monitoring.

2.4.2.11.a. Measure water temperatures at the count stations of each ladder and include the weekly means in the status report. When water temperature reaches 70°F, all fish handling activities will be coordinated through FPOM prior to any action to verify protocols that will be followed.

2.4.2.11.b. From April 1 through October 31, measure water temperature at adult fishway entrances and exits and submit data to the Fish Passage Center (FPC) weekly for posting online.[4] Ensure the location of the monitors meets the following criteria:

i. Within 10 meters of all shore-oriented entrances and exits.

ii. Entrance monitor within 1 meter above the ladder floor and at least 10 meters downstream of ladder diffusers, if possible, to allow for sufficient mixing with surface water.

iii. Exit monitor within 1 meter above the ladder floor and above all diffusers to allow for sufficient mixing with surface water.

[4] FPC ladder temperature data website: www.fpc.org/smolt/smolt_queries/Q_ladderwatertempgraphv2.php

iv. If an existing temperature monitoring location is proposed to be used for either the exit or entrance, verify that the site accurately reflects water temperature within 10 meters of the entrance or exit.

2.4.2.12. Adult Fish Counting.

i. The current adult fish counting schedule is in **Table JDA-3**.

ii. Crowder ranges are: JDA-North = 18”–28”; JDA-South = 18”–30”

iii. When not counting, or if counting is temporarily discontinued due to unscheduled events, open the crowder to full count slot width. The crowder may remain in operating position during the counter’s hourly 10-minute break.

iv. During counting, open the crowder as far as possible to allow accurate counting, at least 18”. Do not close to less than 18” inches while counting. This will usually occur during high turbidity conditions to maintain count accuracy. If passage is impaired by narrow count slot conditions, open the count slot until proper passage conditions are achieved, despite reduced count accuracy. Project biologists, FFU, and the fish count supervisor shall coordinate to achieve optimum count slot passage and/or count accuracy conditions.

2.5. Fish Facilities Monitoring & Reporting

2.5.1. Monitoring.

2.5.1.1. During fish passage season, inspect fish passage facilities at least twice per day, seven days a week to ensure operation according to established criteria.

2.5.1.2. During the winter maintenance period, inspect fish facilities once a day, seven days a week. More frequent inspections of some facility components will occur per FPP criteria.

2.5.1.3. Additional fishway inspections may be performed by FFU and fish agencies.

2.5.1.4. Report results of all inspections and the readiness of the facilities for operation to FPOM at the meeting immediately prior to the fish passage season.

2.5.1.5. Continue to implement the zebra mussel monitoring program. These organisms are a serious problem elsewhere in the country and may become introduced into the Columbia River basin. Inspections should also be made when dewatering project facilities.

2.5.2. Reporting.

2.5.2.1. Weekly Reports. Project biologists shall prepare weekly reports throughout the year summarizing project and fish facility operations for each week (Sunday through Saturday), along with an evaluation of resulting fish passage conditions. The reports will be e-mailed to

CENWP-OD, CENWD-PDW-R (RCC), and other interested parties as soon as possible the following week. The weekly reports shall include:

i. Out-of-criteria situations and subsequent corrective actions.

ii. Equipment malfunctions, breakdowns, or damage, with a summary of resulting repairs.

iii. Adult fishway control calibrations.

iv. STS and VBS inspections.

v. AWS closures (i.e., cleaning times).

vi. Unusual activities at the project that may affect fish passage.

2.5.2.2. In-Season. Any adverse or negative impact to fish or fishways shall be reported in a *Memorandum for the Record* (MFR) prepared by Project biologists and sent to FPOM by the next working day, pursuant to the coordination process and template in **FPP Chapter 1 – Overview**.

2.5.2.3. Annual Report. Project biologists shall prepare an annual report by January 31 each year, summarizing fish facility operations for the previous year's winter maintenance period and fish passage season, December 1 through November 30. The annual report will also include all actions taken to discourage avian predation at the project, with an overview of the effectiveness of the actions. The annual report will be provided to CENWP-OD in time for distribution to FPOM members at the February meeting.

3. FISH FACILITIES MAINTENANCE

3.1. Fish Facilities Routine Maintenance

3.1.1. Routine maintenance of fish facilities will be conducted when fish passage has been documented to be at its lowest, to the extent practicable, to minimize fish impacts. Maintenance that occurs during juvenile or adult passage season that may affect fish passage will be included in the weekly reports, per **section 2.5.2**. If maintenance requires operating outside of FPP criteria, the work will be coordinated with FPOM per the procedures defined in **FPP Chapter 1– Overview**.

3.1.2. Submersible Traveling Screens (STS). The STS system may receive preventive maintenance or repair any time of the year as necessary. Most maintenance will occur during the winter maintenance period when all STSs may be removed from intakes. From April 1 through December 15, a turbine unit cannot operate without a full complement of functioning STSs.

3.1.3. Juvenile Bypass System (JBS). The JBS facilities may receive preventive maintenance at any time of the year as necessary in coordination with FPOM. During the juvenile fish passage season, this will normally be out-of-water work (e.g., maintenance of automatic systems, air lines, electrical systems, and monitoring equipment). During the winter maintenance period, the system is dewatered and visually inspected in all accessible areas for damaged equipment and areas that may cause potential problems to juvenile fish. Identified problems will be repaired by

project maintenance or the contractor as soon as possible. Extended repair projects will be coordinated through FPOM.

3.1.4. Turbines & Spillbays. Routine maintenance and repair of project turbines and spillbays is a regular and recurring process that requires extended outages (see **Turbine Maintenance section 4.3** and **Dewatering Plans section 5**). If maintenance requires operating outside of FPP criteria, the work will be coordinated with FPOM. Certain turbine and spillbay discharges are secondarily used to attract adult fish to fishway entrances, to keep predator fish from accumulating near juvenile release sites, and to move juveniles downstream away from the project. The maintenance schedules for these turbines and spillbays will reflect equal weight given to fish, power, and water management and will be coordinated with the appropriate fish agencies. Units 1, 2, and 5 should not be scheduled for maintenance during fish passage season.

3.1.5. Fishway Auxiliary Water Systems. John Day Dam has tailwater pump auxiliary water systems. Preventive maintenance and normal repair are carried out throughout the year. Trash racks for the AWS intakes will be raked when drawdown exceeds criteria. When practicable, rake trash racks during the time of day when fish passage is least affected. During the annual navigation lock maintenance outage, the north fish ladder auxiliary water is shut off for about half a day. This is required to allow divers to clean off the navigation lock discharge sill so that a bulkhead can be placed.

3.1.6. Adult Fish Collection Systems. Preventive maintenance and repairs occur throughout the year as needed. During the adult fish passage season, this maintenance will not result in failing to achieve fishway criteria unless coordinated with FPOM. During the winter maintenance period, an inspection will occur through dewatering or underwater diver or ROV, per discretion of the Project Biologists. One additional underwater diver/ROV will occur August 1-15. Timing of this inspection will be coordinated through FPOM. The Project Biologist or alternate Corps fish personnel will attend all dewatering and inspection activities potentially involving fish (**section 5**).

3.1.7. Adult Ladders and Count Stations. Adult fish ladders are dewatered once each year during the winter maintenance period. Unless specially coordinated, only one ladder will be dewatered at a time with the other ladder operating within criteria. During this time, the ladders are inspected for necessary maintenance needs and potential fish passage problems (e.g., blocked orifices, projections into the fishway that may injure fish, unstable weirs, damaged picket leads, exit gate problems, loose diffuser gratings, unreadable or damaged staff gauges, defective diffuser valves, and malfunctioning equipment at the counting stations). Potential problems identified throughout the passage year that do not impact fish passage, as well as those identified during the dewatered period, are repaired. Rake trash racks at ladder exits when criteria are exceeded. When practicable, rake trash racks during the time of day when fish passage would be least impacted. Clean fish count station windows, light panels, and crowder panels as needed to achieve accurate counts and, when practicable, during the time of day when fish passage is least impacted. Inspect north netting on ladders daily to prevent fish leaping and maintain as necessary. Include inspection summaries in the weekly report.

3.2. Fish Facilities Non-Routine Maintenance

3.2.1. Non-routine or unscheduled fish facility maintenance that may impact fish passage or operation of fish facilities (e.g., repair of diffuser gratings, etc.) shall be coordinated through FPOM on a case-by-case basis by Project and CENWP-OD biologists, per the coordination process described in **FPP Chapter 1–Overview**. The CENWP-OD biologists will be notified as soon as possible after it becomes apparent that non-routine maintenance or repairs are required. The Operations Project Manager has the authority to initiate work prior to notifying CENWP-OD when delay of work will result in unsafe situations for people, property, or fish.

3.2.2. Non-routine maintenance that affects fish passage will be included in the weekly reports.

3.2.2. Juvenile Bypass System (JBS).

3.2.2.1. The JBS is automatically controlled. If the automatic system fails, operate manually until automation is repaired.

3.2.2.2. If the orifices become plugged with debris, do not operate the turbine until it has been cleaned.

3.2.2.3. If an STS or VBS is found to be damaged or malfunctioning in an operating unit, the unit will be regarded as an unscreened unit. The screen will be repaired or replaced before returning the unit to service.

3.2.2.4. If the bypass system fails in the powerhouse conduit, tainter gate, or transportation outfall making the system unsafe for fish, a decision will be made in coordination with FPOM. During this emergency operating mode, minimize power generation to the extent practicable. If this operating mode is expected to last longer than four days, sequentially shut down all units required for generation, salvage fish from gatewells, remove STSs, and restart the unit. Close the orifice gates during this process.

3.2.3. Turbines and Spillbays.

3.2.3.1. Whenever Unit 1 is not operating, operate Unit 2 for adult attraction.

3.2.3.2. Between September 1 and the end of November, spillbay 2 may be closed for up to one workday for maintenance activities. During the outage, operate spillbay 5 for adult attraction flow. Efforts should be made to minimize the outage as much as possible.

3.2.3.3. If a spill gate becomes inoperable, the operators will make the necessary changes to accommodate spill and then immediately notify the operations supervisor and Project Biologist to determine the best spill pattern until repairs can be made. This interim operation shall be coordinated with the FPOM through the District biologist who will provide additional guidance to the project.

3.2.4. Fishway Auxiliary Water Systems. The fishway auxiliary water systems are mostly automated. If the automatic system fails, manually operate the system to maintain the fish facility within criteria until the automatic system is repaired. When this operation becomes necessary,

project personnel will increase the surveillance of the adult system to ensure that criteria are being met. In the event of an AWS failure during adult passage season, coordinate with FPOM to determine the best operation.

3.2.4.1. South Ladder: Assuming all three auxiliary water turbines are being used to meet criteria, operate as follows in the event of a failure of one or more turbines:

3.2.4.1.a. If one turbine fails, increase the output of the two remaining turbines to meet adult fishway criteria.

3.2.4.1.b. If two turbines fail, operate the adult fish facility as follows until a fishway head of 1' is achieved:

i. Increase discharge of remaining unit to maximum capacity.

ii. Close NE-1.

iii. Leave NE-2 at a depth of 8’.

iv. Close remaining floating submerged orifice gate entrances starting at north end.

v. Leave south powerhouse entrance weir (SE-1) at 8’ depth below tailwater surface.

vi. If criteria are still not achieved, reduce entrance weirs depth to 6’, then to 4’ if necessary, until more auxiliary water is available. Then reverse the above procedure.

3.2.4.1.c. If all three turbine units fail, operate as follows until repairs can be made:

i. Open SE-1 with the weir crest 6’ below the tailwater surface.

ii. Close NE1 and NE2.

iii. Place cross-channel bulkheads in powerhouse collection channel between Units 2 and 3.

iv. Close floating orifice gate in front of Unit 2, leaving the floating orifice gate in front of Unit 1 open.

3.2.4.2. North Ladder: The six AWS pumps installed in 2011 can achieve the optimal attraction criteria of 1.5’ at all tailrace elevations. There is a built-in contingency as one of the six pumps is always spare and will be automatically started by PLC in case of another pump's failure.

3.2.5. Powerhouse and Spillway Fish Collection Systems. John Day Dam contains several types of fishway entrances. If failures occur, in most cases the entrance can be operated manually by project personnel until repaired. When this operation becomes necessary, project personnel will increase surveillance of the adult system to ensure criteria are being met. If the failure will not allow the entrance to be operated manually, the gate will be maintained in an operational position to the extent possible. If this is not possible, the entrance will be repaired expediently and the entrance will be returned to manual or automatic control at the earliest possible date.

3.2.6. Adult Ladders and Count Stations. Pickets with excessive spacing (>1"), erosion of concrete around the picket leads, or missing pickets may allow fish into areas where they cannot escape. Repair will be required for picket lead failure at the south count station. In the instances of picket lead failure or concrete erosion, the timing and method of repair will depend upon the severity of the problem. The decision of whether to dewater the fishway for repairs will be made in coordination with FPOM.

3.2.7. Diffuser Gratings. Diffuser chambers for adding auxiliary water to ladders and collection channels are covered by gratings attached by several methods. Diffuser gratings are normally inspected during winter maintenance to ensure integrity. Inspections are done by either dewatering the fishway and/or collection channel, or by using video cameras and divers or other methods to inspect the gratings underwater. Diffuser gratings may come loose during fish passage season due to a variety of reasons. Daily inspections of the ladders and collection systems should include looking for flow changes that may indicate problems with diffuser gratings. If a diffuser grating is known to or suspected of having moved, creating an opening into a diffuser chamber, efforts must immediately be taken to correct the situation and minimize impacts on adult fish in the fishway. If possible, a video inspection should be made as soon as possible to determine the extent of the problem. If diffusers gratings are found to be missing or displaced, close the associated diffuser and develop a method of repair as coordinated with FPOM. Repair as quickly as possible unless coordinated differently.

4. TURBINE UNIT OPERATION & MAINTENANCE

4.1. Turbine Unit Priority Order

4.1.1. Turbine units will be operated in the order of priority defined in **Table JDA-6**, including time during synchronous condensing. If a unit is out of service for maintenance or repair, the next unit in the priority order shall be operated. Unit priority order may be coordinated differently for fish research, construction, or project maintenance.

Table JDA-6. John Day Dam Turbine Unit Priority Order.

Season	Unit Priority Order*
March 1 – November 30 Fish Passage Season	With TSWs: 5, 1, 3, 16, 14, 12, 10, 8, 15, 2, 11, 7, 4, 13, 9, 6 No TSWs: 1–4 any order, then 5–16 any order
December 1 – end of February Winter Maintenance Period	Any Order

*When a main unit is not available, the paired adjacent unit will be used to comply with requested priority.

4.2. Turbine Unit Operating Range

4.2.1. Turbine unit flow and power output at the lower and upper limits of the ±1% peak efficiency range, and at the operating limit, are defined in **Table JDA-7**, except units with locked runner blades (non-adjustable) are in **Table JDA-7-A**. Turbine units will be operated within these ranges according to *BPA's Load Shaping Guidelines* (**Appendix C**), as summarized below.

4.2.2. In-Season: April 10–August 31 (Spring/Summer Spill for Juvenile Fish Passage). Turbine units will be operated within ±1% of peak turbine efficiency (1% range), except under limited conditions and durations when turbines may be operated above the 1% range for the use of reserves or for TDG management during high flows (refer to **Appendix C** for more information). All required fish passage spill operations will be met prior to operating turbines above the 1% range.

At John Day Dam, if in-season operation outside the 1% range is necessary, units will be operated in order from north to south since juvenile passage through turbines decreases from south to north, making inefficient operation of Unit 16 least likely to impact fish. However, allowance will also be given to special project requirements for stable voltage control that requires load distribution between transformer banks. In-season operation outside the 1% range shall be recorded by Project personnel and provided to BPA on a weekly basis according to the *Guidelines*. Operation outside the 1% range may be necessary to:

i. Meet BPA load requests made pursuant to BPA's policy, statutory requirements, and *Load Shaping Guidelines* (**Appendix C**).

ii. If the draft tube is to be dewatered (**section 5.5**), the unit will be operated at full load > 1% (or at speed no load < 1% if not possible to load) for a minimum of 15 minutes prior to installing tail logs to flush fish from the unit.

iii. Operate a turbine unit solely to provide station service.

iv. Comply with other coordinated fish measures.

4.2.3. Off-Season: September 1–April 9. While not required to do so in the off-season, turbines will normally run within the 1% range since it is the optimum point for maximizing energy output of a given unit of water over time. Operation outside the 1% range is allowed if needed for power generation or other needs.

4.3. Turbine Unit Maintenance

4.3.1. Turbine unit maintenance schedules will be reviewed by Project and District biologists for fish impacts. If maintenance requires operating outside of FPP criteria, the work will be coordinated with FPOM per the procedures defined in **FPP Chapter 1–Overview**.

4.3.2. If the draft tube is to be dewatered (see **section 5.5**), the unit will be operated at full load above the 1% range (or at speed-no-load below the 1% range if not possible to load) for a minimum of 15 minutes prior to installing tail logs to flush fish from the unit.

4.3.3. Operational Testing. Some types of turbine maintenance require testing turbine operation throughout its full range before and after maintenance. Operational testing of a unit under maintenance is in addition to a unit in run status required for power plant reliability. Operational testing may deviate from FPP priority order and may require water that would otherwise be used for spill if the project is operating at minimum generation requirements. Water for operational testing will be used from powerhouse allocation when possible and diverted from spill only to the extent necessary to maintain generation system reliability.

i. Pre-Maintenance: Units may be operationally tested for up to 30 minutes by running at speed-no-load and various loads within the 1% range for pre-maintenance measurements and testing, and to allow all fish to move through the unit as defined in **section 5.5.2**.

ii. Post-Maintenance: After maintenance or repair, units may be operationally tested while in maintenance or forced outage status for up to a cumulative time of 30 minutes (within 1% range) before returning to operational status.

4.3.4. Wicket gate opening for functional testing of a watered-up unit will not exceed 15 minutes total open time.

Table JDA-7. John Day Dam Turbine Unit Power (MW) and Flow (cfs) at ±1% of Peak Turbine Efficiency (Lower and Upper Limits of 1% Range) and Operating Limits. [a]

Project	JDA Units 1–16 With STS (see footnote b for exceptions)						JDA Units 1–16 No STS (see footnote b for exceptions)					
Head	1% Lower Limit		1% Upper Limit		Operating Limit [c]		1% Lower Limit		1% Upper Limit		Operating Limit [c]	
(feet)	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs
80	67.6	11,608	98.9	17,000	120.9	21,451	67.9	11,615	103.1	17,649	123.9	21,880
81	68.3	11,573	102.2	17,333	123.2	21,563	68.7	11,595	106.3	17,950	126.4	22,036
82	68.9	11,530	105.6	17,667	125.6	21,702	69.4	11,567	109.7	18,275	129.0	22,218
83	69.5	11,479	109.1	18,017	128.1	21,845	70.2	11,539	113.1	18,589	131.6	22,402
84	70.1	11,430	112.5	18,336	130.8	22,013	70.9	11,506	116.4	18,888	134.0	22,550
85	70.7	11,381	115.6	18,597	133.2	22,131	71.7	11,477	119.5	19,144	136.5	22,746
86	71.3	11,332	118.5	18,817	135.1	22,131	72.4	11,445	122.5	19,367	138.5	22,792
87	71.9	11,283	121.0	18,986	136.4	22,009	73.1	11,414	125.3	19,577	139.8	22,674
88	72.5	11,231	123.6	19,148	137.7	21,876	73.8	11,383	128.1	19,760	141.2	22,589
89	73.1	11,186	125.7	19,237	139.1	21,766	74.5	11,353	130.7	19,919	142.5	22,446
90	73.6	11,136	127.8	19,337	140.6	21,679	75.2	11,327	133.0	20,030	143.6	22,176
91	74.2	11,091	129.7	19,389	141.8	21,536	75.9	11,297	135.3	20,129	144.8	21,985
92	74.8	11,042	131.6	19,442	142.9	21,372	76.6	11,269	137.2	20,174	146.1	21,864
93	75.3	10,992	133.6	19,512	143.9	21,231	77.4	11,241	138.9	20,187	147.1	21,727
94	75.8	10,945	135.6	19,567	145.0	21,107	78.1	11,213	140.5	20,176	148.0	21,556
95	76.4	10,903	137.6	19,627	145.9	20,968	78.8	11,191	141.8	20,132	148.8	21,369
96	77.1	10,867	139.7	19,701	146.7	20,819	79.7	11,176	142.7	20,026	149.6	21,182
97	77.7	10,837	141.9	19,782	147.5	20,683	80.5	11,165	143.5	19,909	150.4	21,017
98	78.5	10,812	144.1	19,858	148.3	20,541	81.4	11,158	144.6	19,820	151.0	20,855
99	79.1	10,785	146.5	19,967	149.1	20,378	82.3	11,153	145.8	19,758	151.6	20,699
100	79.8	10,757	149.1	20,087	149.7	20,194	83.2	11,146	147.4	19,759	152.3	20,551
101	80.5	10,732	151.4	20,180	150.4	20,017	84.0	11,139	149.3	19,792	153.0	20,401
102	81.2	10,709	153.7	20,270	151.0	19,852	84.9	11,135	151.1	19,817	153.6	20,245
103	81.9	10,682	156.2	20,377	151.7	19,691	85.8	11,133	153.1	19,858	154.2	20,059
104	83.0	10,717	155.7	20,104	152.3	19,593	86.6	11,119	155.3	19,940	154.7	19,819
105	84.0	10,741	155.5	19,877	152.9	19,489	87.3	11,095	158.2	20,098	155.2	19,575
106	85.0	10,752	155.8	19,714	153.5	19,374	88.2	11,095	158.8	19,985	155.6	19,438
107	85.9	10,769	155.9	19,537	154.0	19,258	89.0	11,087	159.6	19,886	156.1	19,299
108	86.8	10,780	156.1	19,374	154.5	19,145	89.8	11,079	160.2	19,776	156.5	19,168
109	87.8	10,794	156.1	19,193	155.0	19,038	90.6	11,072	161.1	19,693	157.0	19,045
110	88.7	10,809	156.1	19,030	155.5	18,935	91.4	11,068	162.0	19,629	157.4	18,936

a. Values provided by HDC (May 2022). Flow (cfs) is a calculated value based on turbine efficiency, project head, and power output (MW).

b. Units 3, 8, 9, 10, 11, 13, and 14 have locked runner blades and are restricted to an operating range of approximately 17-19 kcfs, as defined below in **Table JDA-7-A**. *Unit 4 is OOS for rehab and will be a fully adjustable Kaplan when it returns to service (estimated RTS 2024).*

c. "Operating Limit" (added Feb 2018) is the maximum safe operating point based on cavitation or generator limit. JDA units have a generator limit that restricts turbine output at higher heads. Values shaded in gray indicate the Operating Limit is below the 1% Upper Limit.

Table JDA-7-A. Operating Range for John Day Turbine Units 3, 8, 9, 10, 11, 13, and 14 with Locked Runner Blades (Non-Adjustable).[a]

Project Head (feet)	Unit 3 w/ Blades Hydraulically Locked at 29.1° (Dec 2020)								Unit 8 w/ Blades Welded at 29.4° (March 2017)							
	With STS				No STS				With STS				No STS			
	Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit	
	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs
80	103.5	18,039	107.7	18,769	103.5	17,961	107.7	18,688	106.3	18,435	110.9	19,239	106.3	18,435	110.9	19,239
81	104.8	18,010	109.0	18,728	104.8	17,932	109.0	18,653	107.7	18,413	112.2	19,186	107.7	18,417	112.2	19,190
82	106.1	17,979	110.2	18,685	106.1	17,906	110.3	18,609	109.1	18,392	113.5	19,133	109.1	18,400	113.5	19,141
83	107.4	17,949	111.5	18,648	107.5	17,881	111.6	18,568	110.5	18,371	114.8	19,086	110.5	18,383	114.8	19,098
84	108.6	17,919	112.9	18,616	108.8	17,855	113.0	18,539	111.9	18,350	116.1	19,042	112.0	18,367	116.2	19,058
85	109.9	17,891	114.2	18,589	110.1	17,830	114.3	18,513	113.3	18,328	117.5	19,005	113.4	18,348	117.6	19,025
86	111.7	17,933	115.9	18,615	111.9	17,872	116.0	18,541	115.0	18,355	119.2	19,025	115.1	18,380	119.3	19,048
87	113.4	17,969	117.6	18,643	113.6	17,914	117.8	18,572	116.7	18,381	120.9	19,041	116.9	18,410	121.0	19,068
88	115.1	18,005	119.4	18,676	115.3	17,949	119.5	18,601	118.3	18,404	122.5	19,055	118.6	18,437	122.7	19,086
89	116.8	18,037	121.1	18,704	117.0	17,985	121.3	18,636	120.0	18,427	124.2	19,067	120.3	18,464	124.4	19,102
90	118.5	18,070	122.8	18,736	118.8	18,021	123.0	18,665	121.7	18,448	125.9	19,078	122.0	18,489	126.1	19,117
91	119.8	18,058	124.3	18,743	120.1	18,012	124.5	18,674	122.9	18,411	127.1	19,040	123.2	18,457	127.4	19,083
92	121.1	18,043	125.8	18,750	121.5	18,002	126.1	18,684	124.2	18,375	128.4	19,004	124.5	18,425	128.7	19,051
93	122.4	18,029	127.3	18,755	122.8	17,989	127.6	18,694	125.4	18,341	129.7	18,970	125.8	18,394	130.1	19,020
94	123.7	18,013	128.8	18,762	124.1	17,976	129.1	18,701	126.7	18,306	131.0	18,938	127.0	18,363	131.4	18,993
95	124.9	17,994	130.3	18,770	125.4	17,962	130.6	18,710	127.9	18,271	132.4	18,909	128.3	18,332	132.8	18,968
96	126.5	18,018	131.9	18,782	127.0	17,988	132.3	18,725	129.6	18,294	134.0	18,919	130.0	18,359	134.4	18,982
97	128.1	18,041	133.5	18,797	128.7	18,013	133.9	18,741	131.2	18,317	135.6	18,926	131.7	18,386	136.1	18,993
98	129.8	18,064	135.1	18,813	130.3	18,037	135.6	18,761	132.9	18,337	137.3	18,940	133.4	18,410	137.8	19,010
99	131.4	18,085	136.8	18,837	132.0	18,061	137.3	18,786	134.6	18,359	139.0	18,954	135.2	18,437	139.5	19,028
100	133.0	18,107	138.6	18,868	133.6	18,085	139.0	18,819	136.2	18,376	140.7	18,975	136.8	18,458	141.3	19,053
101	134.6	18,134	140.2	18,890	135.3	18,115	140.7	18,843	137.8	18,395	142.4	18,998	138.4	18,473	142.9	19,072
102	136.2	18,159	141.9	18,915	136.9	18,143	142.4	18,869	139.4	18,411	144.1	19,024	140.0	18,485	144.6	19,095
103	137.9	18,187	143.6	18,938	138.6	18,172	144.1	18,894	141.0	18,427	145.8	19,052	141.6	18,497	146.3	19,119
104	139.5	18,209	145.3	18,967	140.2	18,195	145.9	18,925	142.6	18,443	147.6	19,081	143.1	18,509	148.0	19,143
105	141.1	18,230	147.0	18,997	141.9	18,218	147.6	18,957	144.2	18,456	149.3	19,111	144.7	18,518	149.8	19,170
106	142.3	18,217	148.6	19,030	143.1	18,203	149.2	18,986	145.5	18,447	151.0	19,147	145.9	18,505	151.4	19,202
107	143.4	18,197	150.3	19,064	144.2	18,182	150.8	19,015	146.7	18,434	152.7	19,187	147.2	18,487	153.1	19,238
108	144.5	18,171	151.9	19,097	145.3	18,154	152.5	19,046	147.9	18,415	154.5	19,229	148.3	18,464	154.9	19,276
109	145.5	18,137	153.5	19,132	146.3	18,119	154.1	19,077	149.1	18,393	155.3	19,149	149.5	18,438	155.3	19,149
110	146.5	18,096	155.2	19,168	147.3	18,077	155.7	19,109	150.2	18,365	155.3	18,978	150.6	18,406	155.3	18,978

Project Head (feet)	Unit 9 w/ Blades Welded at 29.0° (Sep 2015)								Unit 10 w/ Blades Welded at 29.1° (Dec 2020)							
	With STS				No STS				With STS				No STS			
	Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit	
	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs	MW	cfs
80	106.0	18,388	110.6	19,182	106.0	18,388	110.6	19,182	104.1	18,013	108.4	18,747	104.1	18,013	108.4	18,747
81	107.3	18,354	111.9	19,126	107.4	18,358	111.9	19,130	105.4	17,984	109.6	18,696	105.4	17,988	109.6	18,699
82	108.7	18,322	113.1	19,070	108.7	18,330	113.2	19,078	106.7	17,954	110.8	18,642	106.8	17,963	110.9	18,647
83	110.0	18,291	114.4	19,018	110.1	18,302	114.5	19,030	108.0	17,924	112.1	18,596	108.1	17,936	112.1	18,603
84	111.4	18,260	115.7	18,970	111.5	18,275	115.8	18,986	109.4	17,895	113.4	18,555	109.5	17,911	113.5	18,565
85	112.7	18,226	117.0	18,930	112.8	18,246	117.2	18,950	110.7	17,868	114.7	18,517	110.8	17,888	114.8	18,530
86	114.3	18,245	118.7	18,949	114.5	18,269	118.9	18,973	112.4	17,905	116.4	18,534	112.6	17,930	116.5	18,549
87	115.9	18,262	120.4	18,964	116.1	18,290	120.6	18,992	114.1	17,940	118.0	18,550	114.3	17,968	118.1	18,569
88	117.5	18,275	122.1	18,977	117.7	18,307	122.3	19,009	115.8	17,971	119.7	18,568	116.0	18,004	119.8	18,588
89	119.1	18,287	123.7	18,985	119.4	18,323	123.9	19,021	117.5	18,002	121.4	18,587	117.8	18,038	121.5	18,610
90	120.8	18,302	125.3	18,985	121.0	18,342	125.6	19,025	119.2	18,030	123.0	18,605	119.5	18,071	123.2	18,631
91	121.9	18,258	126.6	18,948	122.2	18,301	126.9	18,993	120.6	18,013	124.4	18,595	120.8	18,058	124.6	18,624
92	123.1	18,215	127.8	18,912	123.4	18,262	128.2	18,960	121.9	17,995	125.9	18,586	122.2	18,044	126.1	18,617
93	124.3	18,172	129.1	18,877	124.6	18,223	129.5	18,929	123.1	17,976	127.3	18,576	123.5	18,028	127.5	18,610
94	125.5	18,129	130.4	18,843	125.8	18,184	130.8	18,900	124.4	17,956	128.7	18,567	124.8	18,013	128.9	18,604
95	126.6	18,086	131.7	18,811	127.0	18,145	132.1	18,872	125.7	17,935	130.1	18,560	126.1	17,996	130.4	18,599
96	128.2	18,099	133.3	18,817	128.6	18,161	133.7	18,881	127.3	17,957	131.6	18,564	127.8	18,021	131.9	18,605
97	129.8	18,112	134.9	18,819	130.3	18,178	135.3	18,888	129.0	17,977	133.2	18,569	129.4	18,045	133.5	18,614
98	131.4	18,122	136.5	18,828	131.9	18,193	137.0	18,901	130.6	17,998	134.8	18,579	131.1	18,070	135.1	18,625
99	132.9	18,133	138.1	18,839	133.5	18,208	138.7	18,916	132.2	18,017	136.4	18,593	132.8	18,093	136.8	18,642
100	134.5	18,141	139.8	18,856	135.1	18,220	140.4	18,936	133.8	18,036	138.1	18,614	134.4	18,117	138.5	18,666
101	136.2	18,169	141.5	18,882	136.7	18,243	142.1	18,959	135.5	18,060	139.7	18,626	136.1	18,144	140.1	18,681
102	137.8	18,194	143.2	18,911	138.3	18,264	143.8	18,984	137.1	18,084	141.3	18,638	137.8	18,173	141.7	18,696
103	139.5	18,219	145.0	18,941	140.0	18,286	145.5	19,010	138.7	18,105	142.9	18,654	139.4	18,198	143.4	18,714
104	141.1	18,243	146.7	18,973	141.6	18,306	147.2	19,038	140.3	18,125	144.6	18,670	141.1	18,222	145.0	18,733
105	142.7	18,265	148.5	19,006	143.2	18,324	149.0	19,067	141.9	18,142	146.2	18,691	142.7	18,243	146.7	18,756
106	144.1	18,266	150.2	19,046	144.5	18,321	150.7	19,103	143.2	18,132	147.9	18,728	143.9	18,229	148.4	18,791
107	145.4	18,262	152.0	19,090	145.8	18,313	152.4	19,143	144.4	18,116	149.6	18,767	145.1	18,209	150.1	18,828
108	146.7	18,253	153.7	19,135	147.0	18,300	154.1	19,184	145.5	18,093	151.3	18,807	146.2	18,182	151.7	18,865
109	147.9	18,240	155.3	19,147	148.2	18,283	155.3	19,147	146.6	18,065	153.0	18,847	147.3	18,150	153.4	18,903
110	149.1	18,221	155.3	18,975	149.4	18,260	155.3	18,975	147.7	18,030	154.7	18,890	148.3	18,111	155.1	18,943

Project Head (feet)	Unit 11 w/ Blades Welded at 29.9° (April 2012)								Unit 13 w/ Blades Pinned at 29.5° (Jun 2023) and Unit 14 w/ Blades Welded at 29.6° (Aug 2019)							
	With STS				No STS				With STS				No STS			
	Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit		Lower Limit		Upper Limit	
	MW	MW	MW	MW	MW	MW	MW	MW	MW	cfs	MW	cfs	MW	cfs	MW	cfs
80	106.0	18,379	110.5	19,171	106.0	18,379	110.5	19,171	104.8	18,154	109.2	18,914	104.8	18,154	109.2	18,914
81	107.4	18,360	111.9	19,130	107.4	18,364	111.9	19,134	106.2	18,130	110.5	18,870	106.2	18,133	110.5	18,873
82	108.8	18,343	113.2	19,087	108.9	18,350	113.3	19,095	107.6	18,108	111.8	18,824	107.6	18,114	111.8	18,830
83	110.2	18,326	114.6	19,048	110.3	18,338	114.7	19,060	108.9	18,088	113.1	18,778	109.0	18,097	113.2	18,787
84	111.7	18,310	116.0	19,013	111.8	18,325	116.1	19,030	110.3	18,066	114.4	18,741	110.4	18,078	114.5	18,753
85	113.1	18,291	117.4	18,986	113.2	18,311	117.5	19,007	111.7	18,045	115.8	18,711	111.8	18,060	115.9	18,726
86	114.8	18,326	119.2	19,019	115.0	18,349	119.3	19,044	113.4	18,082	117.5	18,738	113.5	18,100	117.7	18,757
87	116.6	18,358	120.9	19,048	116.7	18,385	121.1	19,077	115.2	18,118	119.3	18,764	115.3	18,139	119.4	18,785
88	118.3	18,386	122.7	19,074	118.5	18,417	122.9	19,107	116.9	18,151	121.0	18,788	117.0	18,175	121.2	18,812
89	120.0	18,413	124.4	19,096	120.2	18,448	124.7	19,133	118.6	18,184	122.7	18,805	118.8	18,211	122.9	18,833
90	121.7	18,444	126.1	19,110	122.0	18,482	126.4	19,151	120.4	18,216	124.4	18,825	120.6	18,246	124.6	18,855
91	123.0	18,414	127.5	19,087	123.3	18,457	127.8	19,132	121.7	18,196	125.8	18,813	121.9	18,229	126.0	18,846
92	124.3	18,386	128.9	19,064	124.6	18,433	129.2	19,114	123.0	18,177	127.2	18,801	123.2	18,213	127.5	18,838
93	125.6	18,358	130.3	19,043	125.9	18,408	130.6	19,097	124.3	18,157	128.7	18,791	124.6	18,195	128.9	18,830
94	126.9	18,330	131.6	19,024	127.2	18,384	132.0	19,081	125.6	18,136	130.1	18,780	125.9	18,178	130.4	18,823
95	128.1	18,302	133.0	19,005	128.5	18,360	133.5	19,067	126.9	18,115	131.5	18,771	127.2	18,160	131.8	18,816
96	129.8	18,330	134.7	19,024	130.3	18,391	135.2	19,090	128.6	18,141	133.1	18,783	128.9	18,189	133.5	18,831
97	131.6	18,358	136.4	19,040	132.0	18,424	136.9	19,110	130.3	18,167	134.8	18,796	130.6	18,217	135.1	18,847
98	133.3	18,384	138.2	19,063	133.8	18,453	138.7	19,137	131.9	18,192	136.4	18,813	132.3	18,246	136.8	18,867
99	135.0	18,410	139.9	19,087	135.5	18,483	140.5	19,166	133.6	18,215	138.2	18,835	134.0	18,272	138.6	18,893
100	136.7	18,433	141.8	19,117	137.3	18,511	142.4	19,200	135.3	18,240	139.9	18,861	135.7	18,300	140.4	18,922
101	138.2	18,446	143.4	19,130	138.8	18,519	144.0	19,209	137.0	18,266	141.6	18,881	137.4	18,329	142.1	18,945
102	139.8	18,456	145.0	19,147	140.3	18,526	145.6	19,221	138.6	18,294	143.2	18,899	139.1	18,361	143.7	18,966
103	141.4	18,467	146.7	19,163	141.9	18,533	147.2	19,233	140.3	18,319	144.9	18,921	140.8	18,389	145.4	18,991
104	142.9	18,476	148.4	19,181	143.4	18,538	148.9	19,247	142.0	18,342	146.6	18,945	142.5	18,414	147.2	19,019
105	144.4	18,482	150.0	19,201	144.9	18,540	150.5	19,263	143.6	18,364	148.3	18,969	144.2	18,440	148.9	19,046
106	145.7	18,469	151.7	19,228	146.1	18,523	152.1	19,286	144.8	18,349	150.0	19,002	145.4	18,421	150.6	19,076
107	146.9	18,449	153.3	19,258	147.3	18,500	153.8	19,312	146.0	18,330	151.6	19,034	146.6	18,399	152.2	19,104
108	148.0	18,425	155.0	19,290	148.4	18,471	155.3	19,322	147.2	18,305	153.3	19,068	147.7	18,371	153.9	19,136
109	149.2	18,397	155.3	19,146	149.5	18,439	155.3	19,146	148.3	18,273	155.0	19,104	148.8	18,336	155.3	19,135
110	150.2	18,362	155.3	18,975	150.6	18,401	155.3	18,975	149.3	18,236	155.3	18,963	149.8	18,296	155.3	18,963

a. Units 3, 8, 9, 10, 11, 13, and 14 have runner blades that are locked at a fixed angle (non-adjustable) and are restricted to a smaller operating range until the unit is repaired. Values updated by HDC in May 2022 and June 2023 (Unit 13).

5. DEWATERING PLANS

5.1. General

5.1.1. *Guidelines for Dewatering and Fish Handling* (**Appendix F**) and project *Dewatering Plans*[5] have been developed by the projects and approved by FPOM and are followed for most project facility dewaterings. The appropriate plans are reviewed by participants before each salvage operation. The plans include consideration for fish safety and are consistent with the following general guidance.

5.1.2. The Project biologist and/or alternate Corps fish personnel will attend all project activities involving fish handling. Personnel shall remain present onsite during pumping operations to ensure stranding does not occur or a water level sensor that deactivates the dewatering process will be used. During the pumping or draining operation to dewater a portion or all, the water level will not be allowed to drop so low it strands fish. The fish agencies and tribes will be encouraged to participate in all ladder dewaterings.

5.2. Dewatering – Adult Fish Ladders

5.2.1. Prior to dewatering, when possible, operate ladders to be dewatered at orifice flow, with the AWS off, for at least 24 hours but not more than 108 hours. For non-routine or unscheduled maintenance, discontinue auxiliary water and operate ladder at reduced flow as long as possible for up to 72 hours prior to dewatering and follow guidance in **section 5.4**.

5.2.2. Project personnel will install head gates[6] to shut down ladder flow. Where possible, a flushing flow of 1"–2" will be maintained in the ladder until fish are rescued.

5.2.3. A Project biologist will ensure availability of fish rescue equipment and adequate numbers of personnel necessary to move fish out of the dewatered ladder. The Project Biologist or alternate Corps fish personnel will oversee fish rescue when the ladders are dewatered. The Project Biologist will invite fish agency and/or tribal biologists to participate in the dewatering activities. Juvenile fish will be transported and released in the tailrace and adults released in the forebay (except identifiable steelhead kelts should be released into the tailrace).

5.2.4. Orifice blocking devices, which are placed in the lower-most weirs to prevent fish from re-ascending the dewatered portion of the adult fishway, shall have ropes attached to them by project operations and be tied off to fishway railings. The blocking devices shall be removed just before the fishway is returned to service. These devices will be noted on the pre-water-up checklist maintained by Project fish biologists. This will prevent the orifice blocks from being unintentionally left in place following fishway water-up.

[5] Dewatering Plans: pweb.crohms.org/tmt/documents/FPOM/2010/

[6] Head gates may also be referred to as "operating" gates at some projects. The terms are interchangeable.

5.3. Dewatering – Powerhouse Fish Collection System

5.3.1. During the pumping or draining operation to dewater a portion or the entire collection channel, the water will not be allowed to drop to a level which strands fish. Personnel shall remain present onsite during pumping operations to ensure that stranding does not occur. The Project Biologist will assure that all necessary rescue equipment is available. The Project Biologist or alternate Corps fish personnel will provide technical guidance on fish safety and will assist directly in rescue operations.

5.4. Dewatering – Juvenile Bypass System (JBS)

5.4.1. When draining the juvenile bypass channel, it is typical to flush the channel with only Unit 16 bypass orifices open. Unit 16 gatewells will be dipped in advance to minimize the number of fish contained in this flushing water during fish passage season.

5.5. Dewatering – Smolt Monitoring Facility (SMF)

5.5.1. The SMF is dewatered annually for winter maintenance following STS adult fallback operation (Monday of the 3rd week in December). Dewatering is performed by raising the crest gate and bypassing fish down the ogee chute and out to the river. There are several steps that must be taken to ensure fish safety and to prevent equipment failure.

i. Open Valve-27, the adult drain flushing valve, and the ogee flushing valve.

ii. Slowly close the JBS tainter gate (about 0.5-feet/minute).

iii. Open primary dewatering station (PDS) weirs 1-4, close the transport flume gate, and remove the drain plugs.

iv. When the water level is no longer draining from weirs 1-4, open the high-capacity drain.

v. When the crest gate is completely dry raise it and pin it in place. If there is still water on the crest gate the extra weight will damage the crest gate.

vi. Crowd fish towards the fish drain (eastside of the PDS) from both the crest gate and the PDS simultaneously. Once all fish are near the drain, open the drain, and slowly crowd the fish until they have exited the system.

vii. Periodically check for any lamprey that may still be in the system over the next 48 hours.

5.6. Dewatering – Turbine Units

5.6.1. Gatewell Dipping: Remove juvenile fish from gatewell(s) that will be drained by use of a special dipping basket. During fish passage season, April 1–December 15, gatewell dipping is mandatory whether or not fish screens are installed. Dipping is not required during winter maintenance, December 16–March 31, when fish screens have been removed. To minimize the number of fish contained in the gatewell:

i. Shut down the turbine the previous evening/night and leave idle with all orifices open overnight if power demand allows.

ii. Keep orifices open during the removal of screens/STSs, during turbine spinning, and while gatewell dipping is performed.

iii. Close orifices only after gatewell dipping/fish removal has been completed and immediately before installing the bulkhead.

iv. It is strongly preferred that, if possible, two roller gates and one bulkhead are deployed to isolate a turbine for dewatering.

5.6.2. If the turbine draft tube is dewatered, operate unit at full load for a minimum of 15 minutes immediately prior to installing tail logs. If not possible to load, run unit at speed-no-load for a minimum of 15 minutes. Install the bottom two tail logs side-by-side prior to stacking the remainder to minimize risk of sturgeon entering the draft tube before dewatering. This is necessary for both scheduled and unscheduled outages.

5.6.3. If a turbine unit is idle and partially dewatered, and tail logs are to be put into place, an adequate safety pool may be maintained for up to 4 days to accommodate fish trapped in the draft tube. If longer timeframes are needed for the safety pool, project fisheries will coordinate with FPOM on a case-by-case basis. Adequate inspections will need to be conducted to ensure that the safety pool is maintained and fish are in good condition. Water levels in the draft tube will not be allowed to drop to a level that strands fish.

5.6.4. Fish rescue personnel will inspect dewatered turbine draft tubes, scroll cases, and intakes as soon as they can gain access and the water levels reach a depth permitting visual inspection. The Project Biologist or alternate fish personnel will provide technical guidance on fish safety and will directly participate in fish salvage. The Project Biologist will ensure that all necessary rescue equipment is available.

5.7. Dewatering – Navigation Lock

5.7.1. The navigation lock is frequently dewatered for routine maintenance in late February/early March, in conjunction with navigation lock outages at The Dalles and Bonneville dams. The area between the upstream bulkhead and the upstream gate is surveyed for fish as water levels allow. The lateral and pool areas on the floor of the lock are surveyed for fish from above. Most of these areas remain full of water, precluding the ability to implement successful fish salvage operations. Areas where water levels slowly decrease are accessed via crane when pool levels reach a depth of approximately 3 feet. The fill conduits are accessed and checked for fish only if needed and can be done safely. All salvaged fish are removed, transported via bag or tank, and released to the river.

6. FOREBAY DEBRIS REMOVAL

Debris at projects can impact fish passage conditions by plugging or blocking trash racks, VBSs, gatewell orifices, dewatering screens, separators, and facility piping resulting in impingement, injuries, and descaling of fish. Removing debris at its source in the forebay is sometimes necessary to maintain safe and efficient fish passage conditions, navigation, and other project activities. In this case, the only viable alternative is to spill to pass the debris. Special spill operations that don't follow the normal spill schedule or volume limits will be coordinated prior

to their execution. Normally, the project shall contact CENWP-OD at least two workdays prior to the day the special operation is required. Using information provided by the project, CENWP-OD will coordinate with FPOM and with RCC, as necessary. Once the coordination is complete, RCC will issue a teletype detailing the special operations.

7. RESPONSE TO HAZARDOUS MATERIALS SPILLS

John Day Project's guidance for responding to hazardous substance spills is contained in its *Emergency Spill Response Plan*. This guidance will be followed in case of a spill. In the event of a hazardous materials spill, the Project Biologist has the authority to make fishway adjustments outside of operating criteria as necessary to prevent contamination of the ladder until unified command is formed and consultation is established with FPOM. NOAA Fisheries will be notified within 24 hours of a ladder closure.

Project Fisheries will be contacted as soon as possible after a hazardous material release and prior to any modification to fishway operations. Project Fisheries will then contact the CENWP-OD biologist and FPOM. Attempts should be made to first contact the Project Biologist on duty. During fish passage season there is a Project Biologist on duty 7 days/week. If a Project Biologist cannot be reached by radio or in the office, attempts to contact Project Fisheries will occur in the following order (contact info available in the Control Room): Eric Grosvenor, Michael Lotspeich, Laura Ricketts.

Table JDA-8. [*page 1 of 11*] John Day Dam Spill Patterns with TSWs in Bays 18-19.

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
																	TSW	TSW		0	19.4
																	TSW	TSW	1	1	21
																	TSW	TSW	1.5	1.5	21.8
	1																TSW	TSW	1.5	2.5	23.4
	1	1															TSW	TSW	1.5	3.5	25
	1	1														1	TSW	TSW	1.5	4.5	26.6
	1	1													1	1	TSW	TSW	1.5	5.5	28.2
	1	1												1	1	1	TSW	TSW	1.5	6.5	29.8
	1	1											1	1	1	1	TSW	TSW	1.5	7.5	31.4
	1	1										1	1	1	1	1	TSW	TSW	1.5	8.5	33
	1	1									1	1	1	1	1	1	TSW	TSW	1.5	9.5	34.6
	1	1								1	1	1	1	1	1	1	TSW	TSW	1.5	10.5	36.2
	1	1							1	1	1	1	1	1	1	1	TSW	TSW	1.5	11.5	37.8
	1	1						1	1	1	1	1	1	1	1	1	TSW	TSW	1.5	12.5	39.4
	1	1					1	1	1	1	1	1	1	1	1	1	TSW	TSW	1.5	13.5	41
	1	1				1	1	1	1	1	1	1	1	1	1	1	TSW	TSW	1.5	14.5	42.6
	1	1	1			1	1	1	1	1	1	1	1	1	1	1	TSW	TSW	1.5	15.5	44.2
	1	1	1			1	1	1	1	1	1	1	1	1	1	1.5	TSW	TSW	1.5	16	45
	2	1	1			1	1	1	1	1	1	1	1	1	1	1.5	TSW	TSW	1.5	16.5	45.8
	2	1.5	1			1	1	1	1	1	1	1	1	1	1	1.5	TSW	TSW	1.5	17	46.6
	2	1.5	1	1		1	1	1	1	1	1	1	1	1	1	1.5	TSW	TSW	1.5	18	48.2
	2	1.5	1	1		1	1	1	1	1	1	1	1	1	1.5	1.5	TSW	TSW	1.5	18.5	49
	2	1.5	1.5	1		1	1	1	1	1	1	1	1	1	1.5	1.5	TSW	TSW	1.5	19	49.8
	2	1.5	1.5	1		1	1	1	1	1	1	1	1	1	1.5	1.5	TSW	TSW	2	19.5	50.6
	2	1.5	1.5	1		1	1	1	1	1	1	1	1	1	1.5	2	TSW	TSW	2	20	51.4
	2	1.5	1.5	1	1	1	1	1	1	1	1	1	1	1	1.5	2	TSW	TSW	2	21	53
	2	1.5	1.5	1.5	1	1	1	1	1	1	1	1	1	1	1.5	2	TSW	TSW	2	21.5	53.8
	2	1.5	1	1.5	1	1	1	1.5	1	1	1	1	1	1	1.5	2	TSW	TSW	2	22	54.6
	2	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1	1	1	1.5	2	TSW	TSW	2	22.5	55.4
	2	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1	1	1.5	1.5	2	TSW	TSW	2	23	56.2
	2	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1	1	1.5	2	2	TSW	TSW	2	23.5	57
	3	1.5	1	1.5	1	1.5	1	1.5	1	1	1	1	1	1.5	2	2	TSW	TSW	2	24	57.8
	3	1.5	1	1.5	1	1.5	1	1.5	1.5	1	1	1	1	1.5	2	2	TSW	TSW	2	24.5	58.6
	3	1.5	1	1.5	1	1.5	1.5	1.5	1.5	1	1	1	1	1.5	2	2	TSW	TSW	2	25	59.4
	3	1.5	1	1.5	1	1.5	1.5	1.5	1.5	1	1	1	1.5	1.5	2	2	TSW	TSW	2	25.5	60.2
	3	1.5	1	1.5	1	1.5	1.5	2	1.5	1	1	1	1.5	1.5	2	2	TSW	TSW	2	26	61
	3	1.5	1	1.5	1.5	1.5	1.5	2	1.5	1	1	1	1.5	1.5	2	2	TSW	TSW	2	26.5	61.8
	3	1.5	1	1.5	1.5	1.5	1.5	2	1.5	1	1	1.5	1.5	1.5	2	2	TSW	TSW	2	27	62.6
	3	1.5	1	1.5	1.5	1.5	1.5	2	1.5	1	1.5	1.5	1.5	1.5	2	2	TSW	TSW	2	27.5	63.4
	3	1.5	1	1.5	1.5	2	1.5	2	1.5	1	1.5	1.5	1.5	1.5	2	2	TSW	TSW	2	28	64.2
	3	1.5	1	1.5	1.5	2	1.5	2	1.5	1	1.5	1.5	1.5	1.5	2	2.5	TSW	TSW	2	28.5	65
	3	1.5	1	1.5	1.5	2	1.5	2	1.5	1	1.5	1.5	1.5	2	2	2.5	TSW	TSW	2	29	65.8

[a] Spill (kcfs) is calculated as a function of Total Stops + TSW spill. At Spill >305 kcfs, transition from pattern for juvenile fish to flood.
[b] Gates 1 & 20 blocked at 11 stops (10.3 ft opening).
[c] TSWs in Bays 18-19 = fixed spill of ~19.4 kcfs (~9.7 kcfs/bay). TSW removal recommended for flow > 685 kcfs. TSW does not affect spillway flood capacity until flow ≥ 1,492 kcfs.

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	3	1.5	1	1.5	1.5	2	1.5	2	1.5	1.5	1.5	1.5	1.5	2	2	2.5	TSW	TSW	2	**29.5**	**66.6**
	3	1.5	1.5	1.5	1.5	2	1.5	2	1.5	1.5	1.5	1.5	1.5	2	2	2.5	TSW	TSW	2	**30**	**67.4**
	3	1.5	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	1.5	2	2	2.5	TSW	TSW	2	**30.5**	**68.2**
	3	1.5	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2	2.5	TSW	TSW	2	**31**	**69**
	3	1.5	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2.5	2.5	TSW	TSW	2	**31.5**	**69.8**
	3	2	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2.5	2.5	TSW	TSW	2	**32**	**70.6**
	3	2	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	1.5	2	2	2.5	2.5	TSW	TSW	2.5	**32.5**	**71.4**
	3	2	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	2	2	2	2.5	2.5	TSW	TSW	2.5	**33**	**72.2**
	3	2	1.5	1.5	1.5	2	2	2	1.5	1.5	1.5	2	2	2	2.5	2.5	TSW	TSW	2.5	**33.5**	**73**
	3	2	1.5	2	1.5	2	2	2	1.5	1.5	1.5	2	2	2	2.5	2.5	TSW	TSW	2.5	**34**	**73.8**
	3	2	1.5	2	1.5	2	2	2	1.5	1.5	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**34.5**	**74.6**
	3	2	1.5	2	1.5	2	2	2	2	1.5	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**35**	**75.4**
	3	2	1.5	2	1.5	2	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**35.5**	**76.2**
	3	2	1.5	2	2	2	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**36**	**77**
	3	2	1.5	2	2	2.5	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**36.5**	**77.8**
	3	2	2	2	2	2.5	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**37**	**78.6**
	3	2.5	2	2	2	2.5	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**37.5**	**79.4**
	3	2.5	2	2	2.5	2.5	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**38**	**80.2**
	4	2.5	2	2	2.5	2.5	2	2	2	2	2	2	2	2	2.5	2.5	TSW	TSW	2.5	**38.5**	**81**
	4	2.5	2	2	2.5	2.5	2	2	2	2	2	2	2	2.5	2.5	2.5	TSW	TSW	2.5	**39**	**81.8**
	4	2.5	2	2	2.5	2.5	2.5	2	2	2	2	2	2	2.5	2.5	2.5	TSW	TSW	2.5	**39.5**	**82.6**
	4	2.5	2	2	2.5	2.5	2.5	2	2	2	2	2	2.5	2.5	2.5	2.5	TSW	TSW	2.5	**40**	**83.4**
	4	2.5	1.5	2	2.5	2.5	2.5	2.5	2	2	2	2.5	2.5	2.5	2.5	2.5	TSW	TSW	2.5	**40.5**	**84.2**
	4	2.5	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2	2.5	2.5	2.5	2.5	2.5	TSW	TSW	2.5	**41**	**85**
	4	2.5	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2	2.5	2.5	2.5	3	2.5	TSW	TSW	2.5	**41.5**	**85.8**
	4	2.5	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2	2.5	2.5	3	3	2.5	TSW	TSW	2.5	**42**	**86.6**
	4	2.5	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2.5	2.5	2.5	3	3	2.5	TSW	TSW	2.5	**42.5**	**87.4**
	4	3	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2.5	2.5	2.5	3	3	2.5	TSW	TSW	2.5	**43**	**88.2**
	4	3	1.5	2	2.5	2.5	2.5	2.5	2.5	2	2.5	2.5	3	3	3	2.5	TSW	TSW	2.5	**43.5**	**89**
	4	3	1.5	2	2.5	3	2.5	2.5	2.5	2	2.5	2.5	3	3	3	2.5	TSW	TSW	2.5	**44**	**89.8**
	4	3	1.5	2	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	2.5	TSW	TSW	2.5	**44.5**	**90.6**
	4	3	2	2	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	2.5	TSW	TSW	2.5	**45**	**91.4**
	4	3	2	2	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	TSW	TSW	2.5	**45.5**	**92.2**
	4	3	2	2.5	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3	3	TSW	TSW	2.5	**46**	**93**
	4	3	2	2.5	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3	TSW	TSW	2.5	**46.5**	**93.8**
	4	3.5	2	2.5	2.5	3	2.5	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3	TSW	TSW	2.5	**47**	**94.6**
	4	3.5	2	2.5	2.5	3	3	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3	TSW	TSW	2.5	**47.5**	**95.4**
	4	3.5	2	2.5	2.5	3	3	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**48**	**96.2**
	4	3.5	2	3	2.5	3	3	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**48.5**	**97**
	4	3.5	2.5	3	2.5	3	3	2.5	2.5	2.5	2.5	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**49**	**97.8**
	4	3.5	2.5	3	2.5	3	3	2.5	2.5	2.5	3	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**49.5**	**98.6**
	4	3.5	2.5	3	2.5	3	3	3	2.5	2.5	3	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**50**	**99.4**
	4	3.5	2.5	3	2.5	3	3	3	3	2.5	3	2.5	3	3	3.5	3.5	TSW	TSW	2.5	**50.5**	**100.2**
	4	3.5	2.5	3	2.5	3	3	3	3	2.5	3	3	3	3	3.5	3.5	TSW	TSW	2.5	**51**	**101**
	4	3.5	2.5	3.5	2.5	3	3	3	3	2.5	3	3	3	3	3.5	3.5	TSW	TSW	2.5	**51.5**	**101.8**
	4	3.5	3	3.5	2.5	3	3	3	3	2.5	3	3	3	3	3.5	3.5	TSW	TSW	2.5	**52**	**102.6**
	4	3.5	3	3.5	2.5	3	3	3	3	2.5	3	3	3	3	3.5	4	TSW	TSW	2.5	**52.5**	**103.4**
	4	3.5	3	3.5	2.5	3	3	3	3	2.5	3	3	3	3.5	3.5	4	TSW	TSW	2.5	**53**	**104.2**
	4	3.5	3	3.5	2.5	3	3	3	3	2.5	3	3	3	3.5	3.5	4	TSW	TSW	2.5	**53.5**	**105**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	3.5	3	3.5	2.5	3	3	3	3	3	3	3	3	3.5	3.5	4	TSW	TSW	2.5	**54**	**105.8**
	4	3.5	3	3.5	3	3	3	3	3	3	3	3	3	3.5	3.5	4	TSW	TSW	2.5	**54.5**	**106.6**
	4	3.5	3	3.5	3	3	3	3	3	3	3	3	3	3.5	4	4	TSW	TSW	2.5	**55**	**107.4**
	4	3.5	3	3.5	3	3	3	3	3	3	3	3	3.5	3.5	4	4	TSW	TSW	2.5	**55.5**	**108.2**
	4	4	3	3.5	3	3	3	3	3	3	3	3	3.5	3.5	4	4	TSW	TSW	2.5	**56**	**109**
	4	4	3	3.5	3	3	3	3	3	3	3.5	3	3.5	3.5	4	4	TSW	TSW	2.5	**56.5**	**109.8**
	4	4	3	3.5	3	3.5	3	3	3	3	3.5	3	3.5	3.5	4	4	TSW	TSW	2.5	**57**	**110.6**
	4	4	3	3.5	3	3.5	3	3	3	3.5	3.5	3	3.5	3.5	4	4	TSW	TSW	2.5	**57.5**	**111.4**
	4	4	3	3.5	3	3.5	3	3	3	3.5	3.5	3.5	3.5	3.5	4	4	TSW	TSW	2.5	**58**	**112.2**
	4	4	3	3.5	3.5	3.5	3	3	3	3.5	3.5	3.5	3.5	3.5	4	4	TSW	TSW	2.5	**58.5**	**113**
	4	4	3	3.5	3.5	3.5	3	3.5	3	3.5	3.5	3.5	3.5	3.5	4	4	TSW	TSW	2.5	**59**	**113.8**
	4	4	3	3.5	3.5	3.5	3	3.5	3	3.5	3.5	3.5	3.5	3.5	4	4.5	TSW	TSW	2.5	**59.5**	**114.6**
	4	4	3	3.5	3.5	3.5	3	3.5	3	3.5	3.5	3.5	3.5	3.5	4	4.5	TSW	TSW	3	**60**	**115.4**
	4	4	3	3.5	3.5	3.5	3	3.5	3	3.5	3.5	3.5	3.5	4	4	4.5	TSW	TSW	3	**60.5**	**116.2**
	4	4	3.5	3.5	3.5	3.5	3	3.5	3	3.5	3.5	3.5	3.5	4	4	4.5	TSW	TSW	3	**61**	**117**
	4	4	3.5	3.5	3.5	3.5	3.5	3.5	3	3.5	3.5	3.5	3.5	4	4	4.5	TSW	TSW	3	**61.5**	**117.8**
	4	4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4.5	TSW	TSW	3	**62**	**118.6**
	4	4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4.5	4.5	TSW	TSW	3	**62.5**	**119.4**
	4	4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4.5	4.5	TSW	TSW	3	**63**	**120.2**
	4	4.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4.5	4.5	TSW	TSW	3	**63.5**	**121**
	4	4.5	3.5	4	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	4	4	4.5	4.5	TSW	TSW	3	**64**	**121.8**
	4	4.5	3.5	4	3.5	3.5	3.5	3.5	3.5	3.5	4	3.5	4	4	4.5	4.5	TSW	TSW	3	**64.5**	**122.6**
	4	4.5	3.5	4	3.5	4	3.5	3.5	3.5	3.5	4	3.5	4	4	4.5	4.5	TSW	TSW	3	**65**	**123.4**
	4	4.5	3.5	4	3.5	4	3.5	3.5	3.5	4	4	3.5	4	4	4.5	4.5	TSW	TSW	3	**65.5**	**124.2**
	4	4.5	3.5	4	3.5	4	3.5	3.5	3.5	4	4	4	4	4	4.5	4.5	TSW	TSW	3	**66**	**125**
	4	4.5	3.5	4	4	4	3.5	3.5	3.5	4	4	4	4	4	4.5	4.5	TSW	TSW	3	**66.5**	**125.8**
	4	4.5	3.5	4	4	4	3.5	4	3.5	4	4	4	4	4	4.5	4.5	TSW	TSW	3	**67**	**126.6**
	4	4.5	3.5	4	4	4	3.5	4	3.5	4	4	4	4	4	4.5	5	TSW	TSW	3	**67.5**	**127.4**
	4	4.5	3.5	4	4	4	3.5	4	3.5	4	4	4	4	4	4.5	5	TSW	TSW	3.5	**68**	**128.2**
	4	4.5	3.5	4	4	4	3.5	4	3.5	4	4	4	4	4.5	4.5	5	TSW	TSW	3.5	**68.5**	**129**
	4	4.5	4	4	4	4	3.5	4	3.5	4	4	4	4	4.5	4.5	5	TSW	TSW	3.5	**69**	**129.8**
	4	4.5	4	4	4	4	4	4	3.5	4	4	4	4	4.5	4.5	5	TSW	TSW	3.5	**69.5**	**130.6**
	4	4.5	4	4	4	4	4	4	4	4	4	4	4	4.5	4.5	5	TSW	TSW	3.5	**70**	**131.4**
	4	4.5	4	4	4	4	4	4	4	4	4	4	4	4.5	5	5	TSW	TSW	3.5	**70.5**	**132.2**
	4	4.5	4	4	4	4	4	4	4	4	4	4	4.5	4.5	5	5	TSW	TSW	3.5	**71**	**133**
	4	5	4	4	4	4	4	4	4	4	4	4	4.5	4.5	5	5	TSW	TSW	3.5	**71.5**	**133.8**
	4	5	4	4.5	4	4	4	4	4	4	4	4	4.5	4.5	5	5	TSW	TSW	3.5	**72**	**134.6**
	4	5	4	4.5	4	4	4	4	4	4	4.5	4	4.5	4.5	5	5	TSW	TSW	3.5	**72.5**	**135.4**
	4	5	4	4.5	4	4.5	4	4	4	4	4.5	4	4.5	4.5	5	5	TSW	TSW	3.5	**73**	**136.2**
	4	5	4	4.5	4	4.5	4	4	4	4.5	4.5	4	4.5	4.5	5	5	TSW	TSW	3.5	**73.5**	**137**
	4	5	4	4.5	4	4.5	4	4	4	4.5	4.5	4.5	4.5	4.5	5	5	TSW	TSW	3.5	**74**	**137.8**
	4	5	4	4.5	4.5	4.5	4	4	4	4.5	4.5	4.5	4.5	4.5	5	5	TSW	TSW	3.5	**74.5**	**138.6**
	4	5	4	4.5	4.5	4.5	4	4.5	4	4.5	4.5	4.5	4.5	4.5	5	5	TSW	TSW	3.5	**75**	**139.4**
	4	5	4	4.5	4.5	4.5	4	4.5	4	4.5	4.5	4.5	4.5	4.5	5	5.5	TSW	TSW	3.5	**75.5**	**140.2**
	4	5	4	4.5	4.5	4.5	4	4.5	4	4.5	4.5	4.5	4.5	4.5	5	5.5	TSW	TSW	4	**76**	**141**
	4	5	4	4.5	4.5	4.5	4	4.5	4	4.5	4.5	4.5	4.5	5	5	5.5	TSW	TSW	4	**76.5**	**141.8**
	4	5	4.5	4.5	4.5	4.5	4	4.5	4	4.5	4.5	4.5	4.5	5	5	5.5	TSW	TSW	4	**77**	**142.6**
	4	5	4.5	4.5	4.5	4.5	4.5	4.5	4	4.5	4.5	4.5	4.5	5	5	5.5	TSW	TSW	4	**77.5**	**143.4**
	4	5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5	5.5	TSW	TSW	4	**78**	**144.2**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5.5	5.5	TSW	TSW	4	**78.5**	**145**
	4	5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5	5.5	5.5	TSW	TSW	4	**79**	**145.8**
	4	5.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5	5.5	5.5	TSW	TSW	4	**79.5**	**146.6**
	4	5.5	4.5	5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	4.5	5	5	5.5	5.5	TSW	TSW	4	**80**	**147.4**
	4	5.5	4.5	5	4.5	4.5	4.5	4.5	4.5	4.5	5	4.5	5	5	5.5	5.5	TSW	TSW	4	**80.5**	**148.2**
	4	5.5	4.5	5	4.5	5	4.5	4.5	4.5	4.5	5	4.5	5	5	5.5	5.5	TSW	TSW	4	**81**	**149**
	4	5.5	4.5	5	4.5	5	4.5	4.5	4.5	5	5	4.5	5	5	5.5	5.5	TSW	TSW	4	**81.5**	**149.8**
	4	5.5	4.5	5	4.5	5	4.5	4.5	4.5	5	5	5	5	5	5.5	5.5	TSW	TSW	4	**82**	**150.6**
	4	5.5	4.5	5	5	5	4.5	4.5	4.5	5	5	5	5	5	5.5	5.5	TSW	TSW	4	**82.5**	**151.4**
	4	5.5	4.5	5	5	5	4.5	5	4.5	5	5	5	5	5	5.5	5.5	TSW	TSW	4	**83**	**152.2**
	4	5.5	4.5	5	5	5	4.5	5	4.5	5	5	5	5	5	5.5	6	TSW	TSW	4	**83.5**	**153**
	4	5.5	4.5	5	5	5	4.5	5	4.5	5	5	5	5	5	5.5	6	TSW	TSW	4.5	**84**	**153.8**
	4	5.5	4.5	5	5	5	4.5	5	4.5	5	5	5	5	5.5	5.5	6	TSW	TSW	4.5	**84.5**	**154.6**
	4	5.5	5	5	5	5	4.5	5	4.5	5	5	5	5	5.5	5.5	6	TSW	TSW	4.5	**85**	**155.4**
	4	5.5	5	5	5	5	5	5	4.5	5	5	5	5	5.5	5.5	6	TSW	TSW	4.5	**85.5**	**156.2**
	4	5.5	5	5	5	5	5	5	5	5	5	5	5	5.5	5.5	6	TSW	TSW	4.5	**86**	**157**
	4	5.5	5	5	5	5	5	5	5	5	5	5	5	5.5	6	6	TSW	TSW	4.5	**86.5**	**157.8**
	4	5.5	5	5	5	5	5	5	5	5	5	5	5.5	5.5	6	6	TSW	TSW	4.5	**87**	**158.6**
	4	6	5	5	5	5	5	5	5	5	5	5	5.5	5.5	6	6	TSW	TSW	4.5	**87.5**	**159.4**
	4	6	5	5.5	5	5	5	5	5	5	5	5	5.5	5.5	6	6	TSW	TSW	4.5	**88**	**160.2**
	4	6	5	5.5	5	5	5	5	5	5	5.5	5	5.5	5.5	6	6	TSW	TSW	4.5	**88.5**	**161**
	4	6	5	5.5	5	5.5	5	5	5	5	5.5	5	5.5	5.5	6	6	TSW	TSW	4.5	**89**	**161.8**
	4	6	5	5.5	5	5.5	5	5	5	5.5	5.5	5	5.5	5.5	6	6	TSW	TSW	4.5	**89.5**	**162.6**
	4	6	5	5.5	5	5.5	5	5	5	5.5	5.5	5.5	5.5	5.5	6	6	TSW	TSW	4.5	**90**	**163.4**
	4	6	5	5.5	5.5	5.5	5	5	5	5.5	5.5	5.5	5.5	5.5	6	6	TSW	TSW	4.5	**90.5**	**164.2**
	4	6	5	5.5	5.5	5.5	5	5.5	5	5.5	5.5	5.5	5.5	5.5	6	6	TSW	TSW	4.5	**91**	**165**
	4	6	5	5.5	5.5	5.5	5	5.5	5	5.5	5.5	5.5	5.5	5.5	6	6.5	TSW	TSW	4.5	**91.5**	**165.8**
	4	6	5	5.5	5.5	5.5	5	5.5	5	5.5	5.5	5.5	5.5	5.5	6	6.5	TSW	TSW	5	**92**	**166.6**
	4	6	5	5.5	5.5	5.5	5	5.5	5	5.5	5.5	5.5	5.5	6	6	6.5	TSW	TSW	5	**92.5**	**167.4**
	4	6	5.5	5.5	5.5	5.5	5	5.5	5	5.5	5.5	5.5	5.5	6	6	6.5	TSW	TSW	5	**93**	**168.2**
	4	6	5.5	5.5	5.5	5.5	5.5	5.5	5	5.5	5.5	5.5	5.5	6	6	6.5	TSW	TSW	5	**93.5**	**169**
	4	6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6	6	6.5	TSW	TSW	5	**94**	**169.8**
	4	6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6	6.5	6.5	TSW	TSW	5	**94.5**	**170.6**
	4	6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6	6	6.5	6.5	TSW	TSW	5	**95**	**171.4**
	4	6	5.5	6	5.5	5.5	5.5	5.5	5.5	5.5	5.5	5.5	6	6	6.5	6.5	TSW	TSW	5	**95.5**	**172.2**
	4	6	5.5	6	5.5	5.5	5.5	5.5	5.5	5.5	6	5.5	6	6	6.5	6.5	TSW	TSW	5	**96**	**173**
	4	6	5.5	6	5.5	6	5.5	5.5	5.5	5.5	6	5.5	6	6	6.5	6.5	TSW	TSW	5	**96.5**	**173.8**
	4	6	5.5	6	5.5	6	5.5	5.5	5.5	6	6	5.5	6	6	6.5	6.5	TSW	TSW	5	**97**	**174.6**
	4	6	5.5	6	5.5	6	5.5	5.5	5.5	6	6	6	6	6	6.5	6.5	TSW	TSW	5	**97.5**	**175.4**
	4	6	5.5	6	6	6	5.5	5.5	5.5	6	6	6	6	6	6.5	6.5	TSW	TSW	5	**98**	**176.2**
	4	6	5.5	6	6	6	5.5	6	5.5	6	6	6	6	6	6.5	6.5	TSW	TSW	5	**98.5**	**177**
	4	6	5.5	6	6	6	5.5	6	5.5	6	6	6	6	6	6.5	7	TSW	TSW	5	**99**	**177.8**
	4	6	5.5	6	6	6	5.5	6	5.5	6	6	6	6	6	6.5	7	TSW	TSW	5.5	**99.5**	**178.6**
	4	6	5.5	6	6	6	5.5	6	5.5	6	6	6	6	6.5	6.5	7	TSW	TSW	5.5	**100**	**179.4**
	4	6	6	6	6	6	5.5	6	5.5	6	6	6	6	6.5	6.5	7	TSW	TSW	5.5	**100.5**	**180.2**
	4	6	6	6	6	6	6	6	5.5	6	6	6	6	6.5	6.5	7	TSW	TSW	5.5	**101**	**181**
	4	6	6	6	6	6	6	6	6	6	6	6	6	6.5	6.5	7	TSW	TSW	5.5	**101.5**	**181.8**
	4	6	6	6	6	6	6	6	6	6	6	6	6	6.5	7	7	TSW	TSW	5.5	**102**	**182.6**
	4	6	6	6	6	6	6	6	6	6	6	6	6.5	6.5	7	7	TSW	TSW	5.5	**102.5**	**183.4**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	6	6	6.5	6	6	6	6	6	6	6	6	6.5	6.5	7	7	TSW	TSW	5.5	**103**	**184.2**
	4	6	6	6.5	6	6	6	6	6	6	6.5	6	6.5	6.5	7	7	TSW	TSW	5.5	**103.5**	**185**
	4	6	6	6.5	6	6.5	6	6	6	6	6.5	6	6.5	6.5	7	7	TSW	TSW	5.5	**104**	**185.8**
	4	6	6	6.5	6	6.5	6	6	6	6.5	6.5	6	6.5	6.5	7	7	TSW	TSW	5.5	**104.5**	**186.6**
	4	6	6	6.5	6	6.5	6	6	6	6.5	6.5	6.5	6.5	6.5	7	7	TSW	TSW	5.5	**105**	**187.4**
	4	6	6	6.5	6.5	6.5	6	6	6	6.5	6.5	6.5	6.5	6.5	7	7	TSW	TSW	5.5	**105.5**	**188.2**
	4	6	6	6.5	6.5	6.5	6	6.5	6	6.5	6.5	6.5	6.5	6.5	7	7	TSW	TSW	5.5	**106**	**189**
	4	6	6	6.5	6.5	6.5	6	6.5	6	6.5	6.5	6.5	6.5	6.5	7	7.5	TSW	TSW	5.5	**106.5**	**189.8**
	4	6	6	6.5	6.5	6.5	6	6.5	6	6.5	6.5	6.5	6.5	6.5	7	7.5	TSW	TSW	6	**107**	**190.6**
	4	6	6	6.5	6.5	6.5	6	6.5	6	6.5	6.5	6.5	6.5	7	7	7.5	TSW	TSW	6	**107.5**	**191.4**
	4	6	6.5	6.5	6.5	6.5	6	6.5	6	6.5	6.5	6.5	6.5	7	7	7.5	TSW	TSW	6	**108**	**192.2**
	4	6	6.5	6.5	6.5	6.5	6.5	6.5	6	6.5	6.5	6.5	6.5	7	7	7.5	TSW	TSW	6	**108.5**	**193**
	4	6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7	7.5	TSW	TSW	6	**109**	**193.8**
	4	6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7.5	7.5	TSW	TSW	6	**109.5**	**194.6**
	4	6	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7	7.5	7.5	TSW	TSW	6	**110**	**195.4**
	4	6	6.5	7	6.5	6.5	6.5	6.5	6.5	6.5	6.5	6.5	7	7	7.5	7.5	TSW	TSW	6	**110.5**	**196.2**
	4	6	6.5	7	6.5	6.5	6.5	6.5	6.5	6.5	7	6.5	7	7	7.5	7.5	TSW	TSW	6	**111**	**197**
	4	6	6.5	7	6.5	7	6.5	6.5	6.5	6.5	7	6.5	7	7	7.5	7.5	TSW	TSW	6	**111.5**	**197.8**
	4	6	6.5	7	6.5	7	6.5	6.5	6.5	7	7	6.5	7	7	7.5	7.5	TSW	TSW	6	**112**	**198.6**
	4	6	6.5	7	6.5	7	6.5	6.5	6.5	7	7	7	7	7	7.5	7.5	TSW	TSW	6	**112.5**	**199.4**
	4	6	6.5	7	7	7	6.5	6.5	6.5	7	7	7	7	7	7.5	7.5	TSW	TSW	6	**113**	**200.2**
	4	6	6.5	7	7	7	6.5	7	6.5	7	7	7	7	7	7.5	7.5	TSW	TSW	6	**113.5**	**201**
	4	6	6.5	7	7	7	6.5	7	6.5	7	7	7	7	7	7.5	8	TSW	TSW	6	**114**	**201.8**
	4	6	6.5	7	7	7	6.5	7	6.5	7	7	7	7	7	7.5	8	TSW	TSW	6.5	**114.5**	**202.6**
	4	6	6.5	7	7	7	6.5	7	6.5	7	7	7	7	7.5	7.5	8	TSW	TSW	6.5	**115**	**203.4**
	4	6	7	7	7	7	6.5	7	6.5	7	7	7	7	7.5	7.5	8	TSW	TSW	6.5	**115.5**	**204.2**
	4	6	7	7	7	7	7	7	6.5	7	7	7	7	7.5	7.5	8	TSW	TSW	6.5	**116**	**205**
	4	6	7	7	7	7	7	7	7	7	7	7	7	7.5	7.5	8	TSW	TSW	6.5	**116.5**	**205.8**
	4	6	7	7	7	7	7	7	7	7	7	7	7	7.5	8	8	TSW	TSW	6.5	**117**	**206.6**
	4	6	7	7	7	7	7	7	7	7	7	7	7.5	7.5	8	8	TSW	TSW	6.5	**117.5**	**207.4**
	4	6	7	7.5	7	7	7	7	7	7	7	7	7.5	7.5	8	8	TSW	TSW	6.5	**118**	**208.2**
	4	6	7	7.5	7	7	7	7	7	7	7.5	7	7.5	7.5	8	8	TSW	TSW	6.5	**118.5**	**209**
	4	6	7	7.5	7	7.5	7	7	7	7	7.5	7	7.5	7.5	8	8	TSW	TSW	6.5	**119**	**209.8**
	4	6	7	7.5	7	7.5	7	7	7	7.5	7.5	7	7.5	7.5	8	8	TSW	TSW	6.5	**119.5**	**210.6**
	4	6	7	7.5	7	7.5	7	7	7	7.5	7.5	7.5	7.5	7.5	8	8	TSW	TSW	6.5	**120**	**211.4**
	4	6	7	7.5	7.5	7.5	7	7	7	7.5	7.5	7.5	7.5	7.5	8	8	TSW	TSW	6.5	**120.5**	**212.2**
	4	6	7	7.5	7.5	7.5	7	7.5	7	7.5	7.5	7.5	7.5	7.5	8	8	TSW	TSW	6.5	**121**	**213**
	4	6	7	7.5	7.5	7.5	7	7.5	7	7.5	7.5	7.5	7.5	7.5	8	8.5	TSW	TSW	6.5	**121.5**	**213.8**
	4	6	7	7.5	7.5	7.5	7	7.5	7	7.5	7.5	7.5	7.5	7.5	8	8.5	TSW	TSW	7	**122**	**214.6**
	4	6	7	7.5	7.5	7.5	7	7.5	7	7.5	7.5	7.5	7.5	8	8	8.5	TSW	TSW	7	**122.5**	**215.4**
	4	6	7.5	7.5	7.5	7.5	7	7.5	7	7.5	7.5	7.5	7.5	8	8	8.5	TSW	TSW	7	**123**	**216.2**
	4	6	7.5	7.5	7.5	7.5	7.5	7.5	7	7.5	7.5	7.5	7.5	8	8	8.5	TSW	TSW	7	**123.5**	**217**
	4	6	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8	8	8.5	TSW	TSW	7	**124**	**217.8**
	4	6	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8	8.5	8.5	TSW	TSW	7	**124.5**	**218.6**
	4	6	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8	8	8.5	8.5	TSW	TSW	7	**125**	**219.4**
	4	6	7.5	8	7.5	7.5	7.5	7.5	7.5	7.5	7.5	7.5	8	8	8.5	8.5	TSW	TSW	7	**125.5**	**220.2**
	4	6	7.5	8	7.5	7.5	7.5	7.5	7.5	7.5	8	7.5	8	8	8.5	8.5	TSW	TSW	7	**126**	**221**
	4	6	7.5	8	7.5	8	7.5	7.5	7.5	7.5	8	7.5	8	8	8.5	8.5	TSW	TSW	7	**126.5**	**221.8**
	4	6	7.5	8	7.5	8	7.5	7.5	7.5	8	8	7.5	8	8	8.5	8.5	TSW	TSW	7	**127**	**222.6**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	6	7.5	8	7.5	8	7.5	7.5	7.5	8	8	8	8	8	8.5	8.5	TSW	TSW	7	**127.5**	**223.4**
	4	6	7.5	8	8	8	7.5	7.5	7.5	8	8	8	8	8	8.5	8.5	TSW	TSW	7	**128**	**224.2**
	4	6	7.5	8	8	8	7.5	8	7.5	8	8	8	8	8	8.5	8.5	TSW	TSW	7	**128.5**	**225**
	4	6	7.5	8	8	8	7.5	8	7.5	8	8	8	8	8	8.5	9	TSW	TSW	7	**129**	**225.8**
	4	6	7.5	8	8	8	7.5	8	7.5	8	8	8	8	8	8.5	9	TSW	TSW	7.5	**129.5**	**226.6**
	4	6	7.5	8	8	8	7.5	8	7.5	8	8	8	8	8.5	8.5	9	TSW	TSW	7.5	**130**	**227.4**
	4	6	8	8	8	8	7.5	8	7.5	8	8	8	8	8.5	8.5	9	TSW	TSW	7.5	**130.5**	**228.2**
	4	6	8	8	8	8	8	8	7.5	8	8	8	8	8.5	8.5	9	TSW	TSW	7.5	**131**	**229**
	4	6	8	8	8	8	8	8	8	8	8	8	8	8.5	8.5	9	TSW	TSW	7.5	**131.5**	**229.8**
	4	6	8	8	8	8	8	8	8	8	8	8	8	8.5	9	9	TSW	TSW	7.5	**132**	**230.6**
	4	6	8	8	8	8	8	8	8	8	8	8	8.5	8.5	9	9	TSW	TSW	7.5	**132.5**	**231.4**
	4	6	8	8.5	8	8	8	8	8	8	8	8	8.5	8.5	9	9	TSW	TSW	7.5	**133**	**232.2**
	4	6	8	8.5	8	8	8	8	8	8	8.5	8	8.5	8.5	9	9	TSW	TSW	7.5	**133.5**	**233**
	4	6	8	8.5	8	8.5	8	8	8	8	8.5	8	8.5	8.5	9	9	TSW	TSW	7.5	**134**	**233.8**
	4	6	8	8.5	8	8.5	8	8	8	8.5	8.5	8	8.5	8.5	9	9	TSW	TSW	7.5	**134.5**	**234.6**
	4	6	8	8.5	8	8.5	8	8	8	8.5	8.5	8.5	8.5	8.5	9	9	TSW	TSW	7.5	**135**	**235.4**
	4	6	8	8.5	8.5	8.5	8	8	8	8.5	8.5	8.5	8.5	8.5	9	9	TSW	TSW	7.5	**135.5**	**236.2**
	4	6	8	8.5	8.5	8.5	8	8.5	8	8.5	8.5	8.5	8.5	8.5	9	9	TSW	TSW	7.5	**136**	**237**
	4	6	8	8.5	8.5	8.5	8	8.5	8	8.5	8.5	8.5	8.5	8.5	9	9.5	TSW	TSW	7.5	**136.5**	**237.8**
	4	6	8	8.5	8.5	8.5	8	8.5	8	8.5	8.5	8.5	8.5	8.5	9	9.5	TSW	TSW	8	**137**	**238.6**
	4	6	8	8.5	8.5	8.5	8	8.5	8	8.5	8.5	8.5	8.5	9	9	9.5	TSW	TSW	8	**137.5**	**239.4**
	4	6	8	8.5	8.5	8.5	8.5	8.5	8	8.5	8.5	8.5	8.5	9	9	9.5	TSW	TSW	8	**138**	**240.2**
	4	6	8	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9	9	9.5	TSW	TSW	8	**138.5**	**241**
	4	6	8	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9	9.5	9.5	TSW	TSW	8	**139**	**241.8**
	4	6	8	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9	9	9.5	9.5	TSW	TSW	8	**139.5**	**242.6**
	4	6	8	9	8.5	8.5	8.5	8.5	8.5	8.5	8.5	8.5	9	9	9.5	9.5	TSW	TSW	8	**140**	**243.4**
	4	6	8	9	8.5	8.5	8.5	8.5	8.5	8.5	9	8.5	9	9	9.5	9.5	TSW	TSW	8	**140.5**	**244.2**
	4	6	8	9	8.5	9	8.5	8.5	8.5	8.5	9	8.5	9	9	9.5	9.5	TSW	TSW	8	**141**	**245**
	4	6	8	9	8.5	9	8.5	8.5	8.5	9	9	8.5	9	9	9.5	9.5	TSW	TSW	8	**141.5**	**245.8**
	4	6	8	9	8.5	9	8.5	8.5	8.5	9	9	9	9	9	9.5	9.5	TSW	TSW	8	**142**	**246.6**
	4	6	8	9	9	9	8.5	8.5	8.5	9	9	9	9	9	9.5	9.5	TSW	TSW	8	**142.5**	**247.4**
	4	6	8	9	9	9	8.5	9	8.5	9	9	9	9	9	9.5	9.5	TSW	TSW	8	**143**	**248.2**
	4	6	8	9	9	9	8.5	9	8.5	9	9	9	9	9	9.5	10	TSW	TSW	8	**143.5**	**249**
	4	6	8	9	9	9	8.5	9	8.5	9	9	9	9	9	9.5	10	TSW	TSW	8.5	**144**	**249.8**
	4	6	8	9	9	9	8.5	9	8.5	9	9	9	9	9.5	9.5	10	TSW	TSW	8.5	**144.5**	**250.6**
	4	6	8	9	9	9	9	9	8.5	9	9	9	9	9.5	9.5	10	TSW	TSW	8.5	**145**	**251.4**
	4	6	8	9	9	9	9	9	9	9	9	9	9	9.5	9.5	10	TSW	TSW	8.5	**145.5**	**252.2**
	4	6	8	9	9	9	9	9	9	9	9	9	9	9.5	10	10	TSW	TSW	8.5	**146**	**253**
	4	6	8	9	9	9	9	9	9	9	9	9	9.5	9.5	10	10	TSW	TSW	8.5	**146.5**	**253.8**
	4	6	8	9.5	9	9	9	9	9	9	9	9	9.5	9.5	10	10	TSW	TSW	8.5	**147**	**254.6**
	4	6	8	9.5	9	9	9	9	9	9	9.5	9	9.5	9.5	10	10	TSW	TSW	8.5	**147.5**	**255.4**
	4	6	8	9.5	9	9.5	9	9	9	9	9.5	9	9.5	9.5	10	10	TSW	TSW	8.5	**148**	**256.2**
	4	6	8	9.5	9	9.5	9	9	9	9.5	9.5	9	9.5	9.5	10	10	TSW	TSW	8.5	**148.5**	**257**
	4	6	8	9.5	9	9.5	9	9	9	9.5	9.5	9.5	9.5	9.5	10	10	TSW	TSW	8.5	**149**	**257.8**
	4	6	8	9.5	9.5	9.5	9	9	9	9.5	9.5	9.5	9.5	9.5	10	10	TSW	TSW	8.5	**149.5**	**258.6**
	4	6	8	9.5	9.5	9.5	9	9.5	9	9.5	9.5	9.5	9.5	9.5	10	10	TSW	TSW	8.5	**150**	**259.4**
	4	6	8	9.5	9.5	9.5	9	9.5	9	9.5	9.5	9.5	9.5	9.5	10	11	TSW	TSW	8.5	**151**	**260.2**
	4	6	8	9.5	9.5	9.5	9	9.5	9	9.5	9.5	9.5	9.5	9.5	10	11	TSW	TSW	9	**151.5**	**261**
	4	6	8	9.5	9.5	9.5	9	9.5	9	9.5	9.5	9.5	9.5	10	10	11	TSW	TSW	9	**152**	**261.8**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	6	8	9.5	9.5	9.5	9.5	9.5	9	9.5	9.5	9.5	9.5	10	10	11	TSW	TSW	9	**152.5**	**262.6**
	4	6	8	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	10	10	11	TSW	TSW	9	**153**	**263.4**
	4	6	8	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	10	11	11	TSW	TSW	9	**154**	**264.2**
	4	6	8	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	10	10	11	11	TSW	TSW	9	**154.5**	**265**
	4	6	8	10	9.5	9.5	9.5	9.5	9.5	9.5	9.5	9.5	10	10	11	11	TSW	TSW	9	**155**	**265.8**
	4	6	8	10	9.5	9.5	9.5	9.5	9.5	9.5	10	9.5	10	10	11	11	TSW	TSW	9	**155.5**	**266.6**
	4	6	8	10	9.5	10	9.5	9.5	9.5	9.5	10	9.5	10	10	11	11	TSW	TSW	9	**156**	**267.4**
	4	6	8	10	9.5	10	9.5	9.5	9.5	10	10	9.5	10	10	11	11	TSW	TSW	9	**156.5**	**268.2**
	4	6	8	10	9.5	10	9.5	9.5	9.5	10	10	10	10	10	11	11	TSW	TSW	9	**157**	**269**
	4	6	8	10	10	10	9.5	9.5	9.5	10	10	10	10	10	11	11	TSW	TSW	9	**157.5**	**269.8**
	4	6	8	10	10	10	9.5	10	9.5	10	10	10	10	10	11	11	TSW	TSW	9	**158**	**270.6**
	4	6	8	10	10	10	9.5	10	9.5	10	10	10	10	10	11	11	TSW	TSW	9	**158**	**271.4**
	4	6	8	10	10	10	9.5	10	9.5	10	10	10	10	10	11	11	TSW	TSW	9.5	**158.5**	**272.2**
	4	6	8	10	10	10	9.5	10	9.5	10	10	10	10	11	11	11	TSW	TSW	9.5	**159.5**	**273**
	4	6	8	10	10	10	10	10	9.5	10	10	10	10	11	11	11	TSW	TSW	9.5	**160**	**273.8**
	4	6	8	10	10	10	10	10	10	10	10	10	10	11	11	11	TSW	TSW	9.5	**160.5**	**274.6**
	4	6	8	10	10	10	10	10	10	10	10	10	10	11	11	11	TSW	TSW	9.5	**160.5**	**275.4**
	4	6	8	10	10	10	10	10	10	10	10	10	11	11	11	11	TSW	TSW	9.5	**161.5**	**276.2**
	4	6	8	11	10	10	10	10	10	10	10	10	11	11	11	11	TSW	TSW	9.5	**162.5**	**277**
	4	6	8	11	10	10	10	10	10	10	11	10	11	11	11	11	TSW	TSW	9.5	**163.5**	**277.8**
	4	6	8	11	10	11	10	10	10	10	11	10	11	11	11	11	TSW	TSW	9.5	**164.5**	**278.6**
	4	6	8	11	10	11	10	10	10	11	11	10	11	11	11	11	TSW	TSW	9.5	**165.5**	**279.4**
	4	6	8	11	10	11	10	10	10	11	11	11	11	11	11	11	TSW	TSW	9.5	**166.5**	**280.2**
	4	6	8	11	11	11	10	10	10	11	11	11	11	11	11	11	TSW	TSW	9.5	**167.5**	**281**
	4	6	8	11	11	11	10	11	10	11	11	11	11	11	11	11	TSW	TSW	9.5	**168.5**	**281.8**
	4	6	8	11	11	11	10	11	10	11	11	11	11	11	11	12	TSW	TSW	9.5	**169.5**	**282.6**
	4	6	8	11	11	11	10	11	10	11	11	11	11	11	11	12	TSW	TSW	10	**170**	**283.4**
	4	6	8	11	11	11	10	11	10	11	11	11	11	11	11	12	TSW	TSW	10	**170**	**284.2**
	4	6	8	11	11	11	11	11	10	11	11	11	11	11	11	12	TSW	TSW	10	**171**	**285**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	11	12	TSW	TSW	10	**172**	**285.8**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**286.6**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**287.4**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**288.2**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**289**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**289.8**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**290.6**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**291.4**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**292.2**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**293**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10	**173**	**293.8**
	4	6	8	11	11	11	11	11	11	11	11	11	11	11	12	12	TSW	TSW	10.5	**173.5**	**294.6**
	4	6	8	11	11	11	11	11	11	11	11	11	11	12	12	12	TSW	TSW	10.5	**174.5**	**295.4**
	4	6	8	11	11	11	11	11	11	11	11	11	11	12	12	12	TSW	TSW	10.5	**174.5**	**296.2**
	4	6	8	11	11	11	11	11	11	11	11	11	11	12	12	12	TSW	TSW	10.5	**174.5**	**297**
	4	6	8	11	11	11	11	11	11	11	11	11	11	12	12	12	TSW	TSW	10.5	**174.5**	**297.8**
	4	6	8	11	11	11	11	11	11	11	11	11	12	12	12	12	TSW	TSW	10.5	**175.5**	**298.6**
	4	6	8	12	11	11	11	11	11	11	11	11	12	12	12	12	TSW	TSW	10.5	**176.5**	**299.4**
	4	6	8	12	11	11	11	11	11	11	12	11	12	12	12	12	TSW	TSW	10.5	**177.5**	**300.2**
	4	6	8	12	11	12	11	11	11	11	12	11	12	12	12	12	TSW	TSW	10.5	**178.5**	**301**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
	4	6	8	12	11	12	11	11	11	12	12	11	12	12	12	12	TSW	TSW	10.5	**179.5**	**301.8**
	4	6	8	12	11	12	11	11	11	12	12	12	12	12	12	12	TSW	TSW	10.5	**180.5**	**302.6**
	4	6	8	12	12	12	11	11	11	12	12	12	12	12	12	12	TSW	TSW	10.5	**181.5**	**303.4**
	4	6	8	12	12	12	11	12	11	12	12	12	12	12	12	12	TSW	TSW	10.5	**182.5**	**304.2**
	4	6	8	12	12	12	11	12	11	12	12	12	12	12	12	12	TSW	TSW	11	**183**	**305**
	4	6	8	12	12	12	12	12	11	12	12	12	12	12	12	12	TSW	TSW	11	**184**	**305.8**
	4	6	8	12	12	12	12	12	11	12	12	12	12	12	12	12	TSW	TSW	11	**184**	**306.6**
	4	6	8	12	12	12	12	12	11	12	12	12	12	12	12	12	TSW	TSW	11	**184**	**307.4**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**308.2**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**309**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**309.8**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**310.6**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**311.4**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**312.2**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**313**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**313.8**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**314.6**
	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**185**	**315.4**
1	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**186**	**317**
2	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**187**	**318.6**
3	4	6	8	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**188**	**320.2**
3	4	6	9	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**189**	**321.8**
4	4	6	9	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**190**	**323.4**
4	5	6	9	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**191**	**325**
4	5	7	9	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**192**	**326.6**
4	5	7	10	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**193**	**328.2**
5	5	7	10	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**194**	**329.8**
5	6	7	10	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**195**	**331.4**
5	6	8	10	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**196**	**333**
5	6	8	11	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**197**	**334.6**
6	6	8	11	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**198**	**336.2**
6	7	8	11	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**199**	**337.8**
6	7	9	11	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**200**	**339.4**
6	7	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**201**	**341**
7	7	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**202**	**342.6**
7	8	9	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**203**	**344.2**
7	8	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**204**	**345.8**
8	8	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**205**	**347.4**
8	9	10	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**206**	**349**
8	9	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**207**	**350.6**
9	9	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**208**	**352.2**
9	10	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**209**	**353.8**
10	10	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**210**	**355.4**
10	11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**211**	**357**
10	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**212**	**358.6**
11	11	12	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**213**	**360.2**
11	11	13	12	12	12	12	12	12	12	12	12	12	12	12	12	12	TSW	TSW	11	**214**	**361.8**
11	11	13	12	12	12	12	12	12	12	12	12	12	12	12	12	13	TSW	TSW	11	**215**	**363.4**
11	11	13	13	12	12	12	12	12	12	12	12	12	12	12	12	13	TSW	TSW	11	**216**	**365**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
11	11	13	13	12	12	12	12	12	12	12	12	12	12	13	12	13	TSW	TSW	11	**217**	**366.6**
11	11	13	13	13	12	12	12	12	12	12	12	12	12	13	12	13	TSW	TSW	11	**218**	**368.2**
11	11	13	13	13	12	12	13	12	12	12	12	12	12	13	12	13	TSW	TSW	11	**219**	**369.8**
11	11	13	13	13	12	12	13	12	13	12	12	12	12	13	12	13	TSW	TSW	11	**220**	**371.4**
11	11	13	13	13	12	12	13	12	13	12	13	12	12	13	12	13	TSW	TSW	11	**221**	**373**
11	11	13	13	13	13	12	13	12	13	12	13	12	12	13	12	13	TSW	TSW	11	**222**	**374.6**
11	11	13	13	13	13	12	13	12	13	12	13	12	12	13	13	13	TSW	TSW	11	**223**	**376.2**
11	11	13	13	13	13	13	13	12	13	12	13	12	12	13	13	13	TSW	TSW	11	**224**	**377.8**
11	11	13	13	13	13	13	13	12	13	12	13	12	13	13	13	13	TSW	TSW	11	**225**	**379.4**
11	11	13	13	13	13	13	13	13	13	12	13	12	13	13	13	13	TSW	TSW	11	**226**	**381**
11	11	13	13	13	13	13	13	13	13	13	13	12	13	13	13	13	TSW	TSW	11	**227**	**382.6**
11	11	13	13	13	13	13	13	13	13	13	13	13	13	13	13	13	TSW	TSW	11	**228**	**384.2**
11	11	14	13	13	13	13	13	13	13	13	13	13	13	13	13	13	TSW	TSW	11	**229**	**385.8**
11	11	14	13	13	13	13	13	13	13	13	13	13	13	13	13	14	TSW	TSW	11	**230**	**387.4**
11	11	14	14	13	13	13	13	13	13	13	13	13	13	13	13	14	TSW	TSW	11	**231**	**389**
11	11	14	14	13	13	13	13	13	13	13	13	13	13	14	13	14	TSW	TSW	11	**232**	**390.6**
11	11	14	14	14	13	13	13	13	13	13	13	13	13	14	13	14	TSW	TSW	11	**233**	**392.2**
11	11	14	14	14	13	13	14	13	13	13	13	13	13	14	13	14	TSW	TSW	11	**234**	**393.8**
11	11	14	14	14	13	13	14	13	14	13	13	13	13	14	13	14	TSW	TSW	11	**235**	**395.4**
11	11	14	14	14	13	13	14	13	14	13	14	13	13	14	13	14	TSW	TSW	11	**236**	**397**
11	11	14	14	14	14	13	14	13	14	13	14	13	13	14	13	14	TSW	TSW	11	**237**	**398.6**
11	11	14	14	14	14	13	14	13	14	13	14	13	13	14	14	14	TSW	TSW	11	**238**	**400.2**
11	11	14	14	14	14	14	14	13	14	13	14	13	13	14	14	14	TSW	TSW	11	**239**	**401.8**
11	11	14	14	14	14	14	14	13	14	13	14	13	14	14	14	14	TSW	TSW	11	**240**	**403.4**
11	11	14	14	14	14	14	14	14	14	13	14	13	14	14	14	14	TSW	TSW	11	**241**	**405**
11	11	14	14	14	14	14	14	14	14	14	14	13	14	14	14	14	TSW	TSW	11	**242**	**406.6**
11	11	14	14	14	14	14	14	14	14	14	14	14	14	14	14	14	TSW	TSW	11	**243**	**408.2**
11	11	15	14	14	14	14	14	14	14	14	14	14	14	14	14	14	TSW	TSW	11	**244**	**409.8**
11	11	15	14	14	14	14	14	14	14	14	14	14	14	14	14	15	TSW	TSW	11	**245**	**411.4**
11	11	15	15	14	14	14	14	14	14	14	14	14	14	14	14	15	TSW	TSW	11	**246**	**413**
11	11	15	15	14	14	14	14	14	14	14	14	14	14	15	14	15	TSW	TSW	11	**247**	**414.6**
11	11	15	15	15	14	14	14	14	14	14	14	14	14	15	14	15	TSW	TSW	11	**248**	**416.2**
11	11	15	15	15	14	14	15	14	14	14	14	14	14	15	14	15	TSW	TSW	11	**249**	**417.8**
11	11	15	15	15	14	14	15	14	15	14	14	14	14	15	14	15	TSW	TSW	11	**250**	**419.4**
11	11	15	15	15	14	14	15	14	15	14	15	14	14	15	14	15	TSW	TSW	11	**251**	**421**
11	11	15	15	15	15	14	15	14	15	14	15	14	14	15	14	15	TSW	TSW	11	**252**	**422.6**
11	11	15	15	15	15	14	15	14	15	14	15	14	14	15	15	15	TSW	TSW	11	**253**	**424.2**
11	11	15	15	15	15	15	15	14	15	14	15	14	14	15	15	15	TSW	TSW	11	**254**	**425.8**
11	11	15	15	15	15	15	15	14	15	14	15	14	15	15	15	15	TSW	TSW	11	**255**	**427.4**
11	11	15	15	15	15	15	15	15	15	14	15	14	15	15	15	15	TSW	TSW	11	**256**	**429**
11	11	15	15	15	15	15	15	15	15	15	15	14	15	15	15	15	TSW	TSW	11	**257**	**430.6**
11	11	15	15	15	15	15	15	15	15	15	15	15	15	15	15	15	TSW	TSW	11	**258**	**432.2**
11	11	16	15	15	15	15	15	15	15	15	15	15	15	15	15	15	TSW	TSW	11	**259**	**433.8**
11	11	16	15	15	15	15	15	15	15	15	15	15	15	15	15	16	TSW	TSW	11	**260**	**435.4**
11	11	16	16	15	15	15	15	15	15	15	15	15	15	15	15	16	TSW	TSW	11	**261**	**437**
11	11	16	16	15	15	15	15	15	15	15	15	15	15	16	15	16	TSW	TSW	11	**262**	**438.6**
11	11	16	16	16	15	15	15	15	15	15	15	15	15	16	15	16	TSW	TSW	11	**263**	**440.2**
11	11	16	16	16	15	15	16	15	15	15	15	15	15	16	15	16	TSW	TSW	11	**264**	**441.8**
11	11	16	16	16	15	15	16	15	16	15	15	15	15	16	15	16	TSW	TSW	11	**265**	**443.4**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
11	11	16	16	16	15	15	16	15	16	15	16	15	15	16	15	16	TSW	TSW	11	**266**	**445**
11	11	16	16	16	16	15	16	15	16	15	16	15	15	16	15	16	TSW	TSW	11	**267**	**446.6**
11	11	16	16	16	16	15	16	15	16	15	16	15	15	16	16	16	TSW	TSW	11	**268**	**448.2**
11	11	16	16	16	16	16	16	15	16	15	16	15	15	16	16	16	TSW	TSW	11	**269**	**449.8**
11	11	16	16	16	16	16	16	15	16	15	16	15	16	16	16	16	TSW	TSW	11	**270**	**451.4**
11	11	16	16	16	16	16	16	16	16	15	16	15	16	16	16	16	TSW	TSW	11	**271**	**453**
11	11	16	16	16	16	16	16	16	16	16	16	15	16	16	16	16	TSW	TSW	11	**272**	**454.6**
11	11	16	16	16	16	16	16	16	16	16	16	16	16	16	16	16	TSW	TSW	11	**273**	**456.2**
11	11	17	16	16	16	16	16	16	16	16	16	16	16	16	16	16	TSW	TSW	11	**274**	**457.8**
11	11	17	16	16	16	16	16	16	16	16	16	16	16	16	16	17	TSW	TSW	11	**275**	**459.4**
11	11	17	17	16	16	16	16	16	16	16	16	16	16	16	16	17	TSW	TSW	11	**276**	**461**
11	11	17	17	16	16	16	16	16	16	16	16	16	16	17	16	17	TSW	TSW	11	**277**	**462.6**
11	11	17	17	17	16	16	16	16	16	16	16	16	16	17	16	17	TSW	TSW	11	**278**	**464.2**
11	11	17	17	17	16	16	17	16	16	16	16	16	16	17	16	17	TSW	TSW	11	**279**	**465.8**
11	11	17	17	17	16	16	17	16	17	16	16	16	16	17	16	17	TSW	TSW	11	**280**	**467.4**
11	11	17	17	17	16	16	17	16	17	16	17	16	16	17	16	17	TSW	TSW	11	**281**	**469**
11	11	17	17	17	17	16	17	16	17	16	17	16	16	17	16	17	TSW	TSW	11	**282**	**470.6**
11	11	17	17	17	17	16	17	16	17	16	17	16	16	17	17	17	TSW	TSW	11	**283**	**472.2**
11	11	17	17	17	17	17	17	16	17	16	17	16	16	17	17	17	TSW	TSW	11	**284**	**473.8**
11	11	17	17	17	17	17	17	16	17	16	17	16	17	17	17	17	TSW	TSW	11	**285**	**475.4**
11	11	17	17	17	17	17	17	17	17	16	17	16	17	17	17	17	TSW	TSW	11	**286**	**477**
11	11	17	17	17	17	17	17	17	17	17	17	16	17	17	17	17	TSW	TSW	11	**287**	**478.6**
11	11	17	17	17	17	17	17	17	17	17	17	17	17	17	17	17	TSW	TSW	11	**288**	**480.2**
11	11	18	17	17	17	17	17	17	17	17	17	17	17	17	17	17	TSW	TSW	11	**289**	**481.8**
11	11	18	17	17	17	17	17	17	17	17	17	17	17	17	17	18	TSW	TSW	11	**290**	**483.4**
11	11	18	18	17	17	17	17	17	17	17	17	17	17	17	17	18	TSW	TSW	11	**291**	**485**
11	11	18	18	17	17	17	17	17	17	17	17	17	17	18	17	18	TSW	TSW	11	**292**	**486.6**
11	11	18	18	18	17	17	17	17	17	17	17	17	17	18	17	18	TSW	TSW	11	**293**	**488.2**
11	11	18	18	18	17	17	18	17	17	17	17	17	17	18	17	18	TSW	TSW	11	**294**	**489.8**
11	11	18	18	18	17	17	18	17	18	17	17	17	17	18	17	18	TSW	TSW	11	**295**	**491.4**
11	11	18	18	18	17	17	18	17	18	17	18	17	17	18	17	18	TSW	TSW	11	**296**	**493**
11	11	18	18	18	18	17	18	17	18	17	18	17	17	18	17	18	TSW	TSW	11	**297**	**494.6**
11	11	18	18	18	18	17	18	17	18	17	18	17	17	18	18	18	TSW	TSW	11	**298**	**496.2**
11	11	18	18	18	18	18	18	17	18	17	18	17	17	18	18	18	TSW	TSW	11	**299**	**497.8**
11	11	18	18	18	18	18	18	17	18	17	18	17	18	18	18	18	TSW	TSW	11	**300**	**499.4**
11	11	18	18	18	18	18	18	18	18	17	18	17	18	18	18	18	TSW	TSW	11	**301**	**501**
11	11	18	18	18	18	18	18	18	18	18	18	17	18	18	18	18	TSW	TSW	11	**302**	**502.6**
11	11	18	18	18	18	18	18	18	18	18	18	18	18	18	18	18	TSW	TSW	11	**303**	**504.2**
11	11	19	18	18	18	18	18	18	18	18	18	18	18	18	18	18	TSW	TSW	11	**304**	**505.8**
11	11	19	18	18	18	18	18	18	18	18	18	18	18	18	18	19	TSW	TSW	11	**305**	**507.4**
11	11	19	19	18	18	18	18	18	18	18	18	18	18	18	18	19	TSW	TSW	11	**306**	**509**
11	11	19	19	18	18	18	18	18	18	18	18	18	18	19	18	19	TSW	TSW	11	**307**	**510.6**
11	11	19	19	19	18	18	18	18	18	18	18	18	18	19	18	19	TSW	TSW	11	**308**	**512.2**
11	11	19	19	19	18	18	19	18	18	18	18	18	18	19	18	19	TSW	TSW	11	**309**	**513.8**
11	11	19	19	19	18	18	19	18	19	18	18	18	18	19	18	19	TSW	TSW	11	**310**	**515.4**
11	11	19	19	19	18	18	19	18	19	18	19	18	18	19	18	19	TSW	TSW	11	**311**	**517**
11	11	19	19	19	19	18	19	18	19	18	19	18	18	19	18	19	TSW	TSW	11	**312**	**518.6**
11	11	19	19	19	19	18	19	18	19	18	19	18	18	19	19	19	TSW	TSW	11	**313**	**520.2**
11	11	19	19	19	19	19	19	18	19	18	19	18	18	19	19	19	TSW	TSW	11	**314**	**521.8**

JDA Spill Patterns with TSWs in Bays 18, 19 - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18 [c]	19 [c]	20 [b]	Stops (#)	(kcfs)
11	11	19	19	19	19	19	19	18	19	18	19	18	19	19	19	19	TSW	TSW	11	**315**	**523.4**
11	11	19	19	19	19	19	19	19	19	18	19	18	19	19	19	19	TSW	TSW	11	**316**	**525**
11	11	19	19	19	19	19	19	19	19	19	19	18	19	19	19	19	TSW	TSW	11	**317**	**526.6**
11	11	19	19	19	19	19	19	19	19	19	19	19	19	19	19	19	TSW	TSW	11	**318**	**528.2**
11	11	20	19	19	19	19	19	19	19	19	19	19	19	19	19	19	TSW	TSW	11	**319**	**529.8**
11	11	20	19	19	19	19	19	19	19	19	19	19	19	19	19	20	TSW	TSW	11	**320**	**531.4**
11	11	20	20	19	19	19	19	19	19	19	19	19	19	19	19	20	TSW	TSW	11	**321**	**533**
11	11	20	20	19	19	19	19	19	19	19	19	19	19	20	19	20	TSW	TSW	11	**322**	**534.6**
11	11	20	20	20	19	19	19	19	19	19	19	19	19	20	19	20	TSW	TSW	11	**323**	**536.2**
11	11	20	20	20	19	19	20	19	19	19	19	19	19	20	19	20	TSW	TSW	11	**324**	**537.8**
11	11	20	20	20	19	19	20	19	20	19	19	19	19	20	19	20	TSW	TSW	11	**325**	**539.4**
11	11	20	20	20	19	19	20	19	20	19	20	19	19	20	19	20	TSW	TSW	11	**326**	**541**
11	11	20	20	20	20	19	20	19	20	19	20	19	19	20	19	20	TSW	TSW	11	**327**	**542.6**
11	11	20	20	20	20	19	20	19	20	19	20	19	19	20	20	20	TSW	TSW	11	**328**	**544.2**
11	11	20	20	20	20	20	20	19	20	19	20	19	19	20	20	20	TSW	TSW	11	**329**	**545.8**
11	11	20	20	20	20	20	20	19	20	19	20	19	20	20	20	20	TSW	TSW	11	**330**	**547.4**
11	11	20	20	20	20	20	20	20	20	19	20	19	20	20	20	20	TSW	TSW	11	**331**	**549**
11	11	20	20	20	20	20	20	20	20	20	20	19	20	20	20	20	TSW	TSW	11	**332**	**550.6**
11	11	20	20	20	20	20	20	20	20	20	20	20	20	20	20	20	TSW	TSW	11	**333**	**552.2**
11	11	21	20	20	20	20	20	20	20	20	20	20	20	20	20	20	TSW	TSW	11	**334**	**553.8**
11	11	21	20	20	20	20	20	20	20	20	20	20	20	20	20	21	TSW	TSW	11	**335**	**555.4**
11	11	21	21	20	20	20	20	20	20	20	20	20	20	20	20	21	TSW	TSW	11	**336**	**557**
11	11	21	21	20	20	20	20	20	20	20	20	20	20	21	20	21	TSW	TSW	11	**337**	**558.6**
11	11	21	21	21	20	20	20	20	20	20	20	20	20	21	20	21	TSW	TSW	11	**338**	**560.2**
11	11	21	21	21	20	20	21	20	20	20	20	20	20	21	20	21	TSW	TSW	11	**339**	**561.8**
11	11	21	21	21	20	20	21	20	21	20	20	20	20	21	20	21	TSW	TSW	11	**340**	**563.4**
11	11	21	21	21	20	20	21	20	21	20	21	20	20	21	20	21	TSW	TSW	11	**341**	**565**
11	11	21	21	21	21	20	21	20	21	20	21	20	20	21	20	21	TSW	TSW	11	**342**	**566.6**
11	11	21	21	21	21	20	21	20	21	20	21	20	20	21	21	21	TSW	TSW	11	**343**	**568.2**
11	11	21	21	21	21	21	21	20	21	20	21	20	20	21	21	21	TSW	TSW	11	**344**	**569.8**
11	11	21	21	21	21	21	21	20	21	20	21	20	21	21	21	21	TSW	TSW	11	**345**	**571.4**
11	11	21	21	21	21	21	21	21	21	20	21	20	21	21	21	21	TSW	TSW	11	**346**	**573**
11	11	21	21	21	21	21	21	21	21	21	21	20	21	21	21	21	TSW	TSW	11	**347**	**574.6**
11	11	21	21	21	21	21	21	21	21	21	21	21	21	21	21	21	TSW	TSW	11	**348**	**576.2**
11	11	22	21	21	21	21	21	21	21	21	21	21	21	21	21	21	TSW	TSW	11	**349**	**577.8**
11	11	22	21	21	21	21	21	21	21	21	21	21	21	21	21	22	TSW	TSW	11	**350**	**579.4**
11	11	22	22	21	21	21	21	21	21	21	21	21	21	21	21	22	TSW	TSW	11	**351**	**581**
11	11	22	22	21	21	21	21	21	21	21	21	21	21	22	21	22	TSW	TSW	11	**352**	**582.6**
11	11	22	22	22	21	21	21	21	21	21	21	21	21	22	21	22	TSW	TSW	11	**353**	**584.2**
11	11	22	22	22	21	21	22	21	21	21	21	21	21	22	21	22	TSW	TSW	11	**354**	**585.8**
11	11	22	22	22	21	21	22	21	22	21	21	21	21	22	21	22	TSW	TSW	11	**355**	**587.4**
11	11	22	22	22	21	21	22	21	22	21	22	21	21	22	21	22	TSW	TSW	11	**356**	**589**
11	11	22	22	22	22	21	22	21	22	21	22	21	21	22	21	22	TSW	TSW	11	**357**	**590.6**
11	11	22	22	22	22	21	22	21	22	21	22	21	21	22	22	22	TSW	TSW	11	**358**	**592.2**
11	11	22	22	22	22	22	22	21	22	21	22	21	21	22	22	22	TSW	TSW	11	**359**	**593.8**
11	11	22	22	22	22	22	22	21	22	21	22	21	22	22	22	22	TSW	TSW	11	**360**	**595.4**
11	11	22	22	22	22	22	22	22	22	21	22	21	22	22	22	22	TSW	TSW	11	**361**	**597**
11	11	22	22	22	22	22	22	22	22	22	22	21	22	22	22	22	TSW	TSW	11	**362**	**598.6**
11	11	22	22	22	22	22	22	22	22	22	22	22	22	22	22	22	TSW	TSW	11	**363**	**600.2**

Table JDA-9. [*page 1 of 8*] John Day Dam Spill Pattern with No TSWs (Bays 18-19 Closed).

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
	3	2	1														CLOSE	CLOSE		**6**	**9.6**
	3	2	2														CLOSE	CLOSE		**7**	**11.2**
	3	3	2														CLOSE	CLOSE		**8**	**12.8**
	3	3	2	1													CLOSE	CLOSE		**9**	**14.4**
	3	3	2	2													CLOSE	CLOSE		**10**	**16.0**
	3	3	2	2	1												CLOSE	CLOSE		**11**	**17.6**
	3	3	2	2	2												CLOSE	CLOSE		**12**	**19.2**
	3	3	2	2	2	1											CLOSE	CLOSE		**13**	**20.8**
	3	3	2	2	2	2											CLOSE	CLOSE		**14**	**22.4**
	3	3	2	2	2	2	1										CLOSE	CLOSE		**15**	**24.0**
	3	3	3	2	2	2	1										CLOSE	CLOSE		**16**	**25.6**
	3	3	3	2	2	2	2										CLOSE	CLOSE		**17**	**27.2**
	3	3	3	2	2	2	2	1									CLOSE	CLOSE		**18**	**28.8**
	3	3	3	3	2	2	2	1									CLOSE	CLOSE		**19**	**30.4**
	3	3	3	3	3	2	2	1									CLOSE	CLOSE		**20**	**32.0**
	3	3	3	3	3	2	2	2									CLOSE	CLOSE		**21**	**33.6**
	3	3	3	3	3	2	2	2	1								CLOSE	CLOSE		**22**	**35.2**
	3	3	3	3	3	2	2	2	2								CLOSE	CLOSE		**23**	**36.8**
	3	3	3	3	3	2	2	2	2	1							CLOSE	CLOSE		**24**	**38.4**
	3	3	3	3	3	2	2	2	2	2							CLOSE	CLOSE		**25**	**40.0**
	3	3	3	3	3	2	2	2	2	2	1						CLOSE	CLOSE		**26**	**41.6**
	3	3	3	3	3	2	2	2	2	2	2						CLOSE	CLOSE		**27**	**43.2**
	3	3	3	3	3	3	2	2	2	2	2						CLOSE	CLOSE		**28**	**44.8**
	3	3	3	3	3	3	2	2	2	2	2	1					CLOSE	CLOSE		**29**	**46.4**
	3	3	3	3	3	3	2	2	2	2	2	2					CLOSE	CLOSE		**30**	**48.0**
	3	3	3	3	3	3	2	2	2	2	2	2	1				CLOSE	CLOSE		**31**	**49.6**
	3	3	3	3	3	3	3	2	2	2	2	2	1				CLOSE	CLOSE		**32**	**51.2**
	3	3	3	3	3	3	3	2	2	2	2	2	2				CLOSE	CLOSE		**33**	**52.8**
	3	3	3	3	3	3	3	2	2	2	2	2	2	1			CLOSE	CLOSE		**34**	**54.4**
	3	3	3	3	3	3	3	2	2	2	2	2	2	2			CLOSE	CLOSE		**35**	**56.0**
	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1		CLOSE	CLOSE		**36**	**57.6**
	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2		CLOSE	CLOSE		**37**	**59.2**
	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**38**	**60.8**
	4	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**39**	**62.4**
	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**40**	**64.0**
	4	4	4	3	3	3	3	2	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**41**	**65.6**
	4	4	4	4	3	3	3	2	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**42**	**67.2**
	4	4	4	4	3	3	3	3	2	2	2	2	2	2	2	1	CLOSE	CLOSE		**43**	**68.8**
	4	4	4	4	3	3	3	3	3	2	2	2	2	2	2	1	CLOSE	CLOSE		**44**	**70.4**
	4	4	4	4	4	3	3	3	3	2	2	2	2	2	2	1	CLOSE	CLOSE		**45**	**72.0**
	4	5	4	4	4	3	3	3	3	2	2	2	2	2	2	1	CLOSE	CLOSE		**46**	**73.6**
	4	5	4	4	4	3	3	3	3	2	2	2	2	2	2	2	CLOSE	CLOSE		**47**	**75.2**
	4	5	4	4	4	3	3	3	3	3	2	2	2	2	2	2	CLOSE	CLOSE		**48**	**76.8**
	4	5	4	4	4	3	3	3	3	3	3	2	2	2	2	2	CLOSE	CLOSE		**49**	**78.4**

[a] Spill (kcfs) is calculated as a function of total stops + TSW spill. At Spill >305 kcfs, transition from pattern for juvenile fish to flood.
[b] Gates 1 & 20 blocked at 11 stops (10.3 ft opening).

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
	4	5	5	4	4	3	3	3	3	3	3	2	2	2	2	2	CLOSE	CLOSE		**50**	**80.0**
	4	5	5	4	4	4	3	3	3	3	3	2	2	2	2	2	CLOSE	CLOSE		**51**	**81.6**
	4	5	5	4	4	4	3	3	3	3	3	3	2	2	2	2	CLOSE	CLOSE		**52**	**83.2**
	4	5	5	4	4	4	3	3	3	3	3	3	3	2	2	2	CLOSE	CLOSE		**53**	**84.8**
	4	5	5	4	4	4	3	3	3	3	3	3	3	3	2	2	CLOSE	CLOSE		**54**	**86.4**
	4	5	5	4	4	4	3	3	3	3	3	3	3	3	3	2	CLOSE	CLOSE		**55**	**88.0**
	4	5	5	4	4	4	4	3	3	3	3	3	3	3	3	2	CLOSE	CLOSE		**56**	**89.6**
	4	5	5	4	4	4	4	4	3	3	3	3	3	3	3	2	CLOSE	CLOSE		**57**	**91.2**
	4	5	5	5	4	4	4	4	3	3	3	3	3	3	3	2	CLOSE	CLOSE		**58**	**92.8**
	4	5	5	5	4	4	4	4	4	3	3	3	3	3	3	2	CLOSE	CLOSE		**59**	**94.4**
	4	5	5	5	4	4	4	4	4	4	3	3	3	3	3	2	CLOSE	CLOSE		**60**	**96.0**
	4	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	CLOSE	CLOSE		**61**	**97.6**
	4	5	5	5	4	4	4	4	4	4	4	3	3	3	3	3	CLOSE	CLOSE		**62**	**99.2**
	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	CLOSE	CLOSE		**63**	**100.8**
	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	CLOSE	CLOSE		**64**	**102.4**
	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	CLOSE	CLOSE		**65**	**104.0**
	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	CLOSE	CLOSE		**66**	**105.6**
	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	5	CLOSE	CLOSE		**67**	**107.2**
	4	5	5	4	4	4	4	4	4	4	4	4	4	5	4	5	CLOSE	CLOSE		**68**	**108.8**
	4	5	5	5	4	4	4	4	4	4	4	4	4	5	4	5	CLOSE	CLOSE		**69**	**110.4**
	4	5	5	5	4	4	5	4	4	4	4	4	4	5	4	5	CLOSE	CLOSE		**70**	**112.0**
	4	5	5	5	4	4	5	4	5	4	4	4	4	5	4	5	CLOSE	CLOSE		**71**	**113.6**
	4	5	5	5	4	4	5	4	5	4	5	4	4	5	4	5	CLOSE	CLOSE		**72**	**115.2**
	4	5	5	5	5	4	5	4	5	4	5	4	4	5	4	5	CLOSE	CLOSE		**73**	**116.8**
	4	5	5	5	5	4	5	4	5	4	5	4	4	5	5	5	CLOSE	CLOSE		**74**	**118.4**
	4	5	5	5	5	5	5	4	5	4	5	4	4	5	5	5	CLOSE	CLOSE		**75**	**120.0**
	4	5	5	5	5	5	5	4	5	4	5	4	5	5	5	5	CLOSE	CLOSE		**76**	**121.6**
	4	5	5	5	5	5	5	5	5	4	5	4	5	5	5	5	CLOSE	CLOSE		**77**	**123.2**
	4	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	CLOSE	CLOSE		**78**	**124.8**
	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	CLOSE	CLOSE		**79**	**126.4**
	4	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	CLOSE	CLOSE		**80**	**128.0**
	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	CLOSE	CLOSE		**81**	**129.6**
	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5	6	CLOSE	CLOSE		**82**	**131.2**
	4	6	6	5	5	5	5	5	5	5	5	5	5	6	5	6	CLOSE	CLOSE		**83**	**132.8**
	4	6	6	6	5	5	5	5	5	5	5	5	5	6	5	6	CLOSE	CLOSE		**84**	**134.4**
	4	6	6	6	5	5	6	5	5	5	5	5	5	6	5	6	CLOSE	CLOSE		**85**	**136.0**
	4	6	6	6	5	5	6	5	6	5	5	5	5	6	5	6	CLOSE	CLOSE		**86**	**137.6**
	4	6	6	6	5	5	6	5	6	5	6	5	5	6	5	6	CLOSE	CLOSE		**87**	**139.2**
	4	6	6	6	6	5	6	5	6	5	6	5	5	6	5	6	CLOSE	CLOSE		**88**	**140.8**
	4	6	6	6	6	5	6	5	6	5	6	5	5	6	6	6	CLOSE	CLOSE		**89**	**142.4**
	4	6	6	6	6	6	6	5	6	5	6	5	5	6	6	6	CLOSE	CLOSE		**90**	**144.0**
	4	6	6	6	6	6	6	5	6	5	6	5	6	6	6	6	CLOSE	CLOSE		**91**	**145.6**
	4	6	6	6	6	6	6	6	6	5	6	5	6	6	6	6	CLOSE	CLOSE		**92**	**147.2**
	4	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	CLOSE	CLOSE		**93**	**148.8**
	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	CLOSE	CLOSE		**94**	**150.4**
	4	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	CLOSE	CLOSE		**95**	**152.0**
	4	6	7	6	6	6	6	6	6	6	6	6	6	6	6	7	CLOSE	CLOSE		**96**	**153.6**
	4	6	7	6	6	6	6	6	6	6	6	6	6	7	6	7	CLOSE	CLOSE		**97**	**155.2**
	4	6	7	7	6	6	6	6	6	6	6	6	6	7	6	7	CLOSE	CLOSE		**98**	**156.8**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
	4	6	7	7	6	6	7	6	6	6	6	6	6	7	6	7	CLOSE	CLOSE		**99**	**158.4**
	4	6	7	7	6	6	7	6	7	6	6	6	6	7	6	7	CLOSE	CLOSE		**100**	**160.0**
	4	6	7	7	6	6	7	6	7	6	7	6	6	7	6	7	CLOSE	CLOSE		**101**	**161.6**
	4	6	7	7	7	6	7	6	7	6	7	6	6	7	6	7	CLOSE	CLOSE		**102**	**163.2**
	4	6	7	7	7	6	7	6	7	6	7	6	6	7	7	7	CLOSE	CLOSE		**103**	**164.8**
	4	6	7	7	7	7	7	6	7	6	7	6	6	7	7	7	CLOSE	CLOSE		**104**	**166.4**
	4	6	7	7	7	7	7	6	7	6	7	6	7	7	7	7	CLOSE	CLOSE		**105**	**168.0**
	4	6	7	7	7	7	7	7	7	6	7	6	7	7	7	7	CLOSE	CLOSE		**106**	**169.6**
	4	6	7	7	7	7	7	7	7	7	7	6	7	7	7	7	CLOSE	CLOSE		**107**	**171.2**
	4	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	CLOSE	CLOSE		**108**	**172.8**
	4	6	8	7	7	7	7	7	7	7	7	7	7	7	7	7	CLOSE	CLOSE		**109**	**174.4**
	4	6	8	7	7	7	7	7	7	7	7	7	7	7	7	8	CLOSE	CLOSE		**110**	**176.0**
	4	6	8	7	7	7	7	7	7	7	7	7	7	8	7	8	CLOSE	CLOSE		**111**	**177.6**
	4	6	8	8	7	7	7	7	7	7	7	7	7	8	7	8	CLOSE	CLOSE		**112**	**179.2**
	4	6	8	8	7	7	8	7	7	7	7	7	7	8	7	8	CLOSE	CLOSE		**113**	**180.8**
	4	6	8	8	7	7	8	7	8	7	7	7	7	8	7	8	CLOSE	CLOSE		**114**	**182.4**
	4	6	8	8	7	7	8	7	8	7	8	7	7	8	7	8	CLOSE	CLOSE		**115**	**184.0**
	4	6	8	8	8	7	8	7	8	7	8	7	7	8	7	8	CLOSE	CLOSE		**116**	**185.6**
	4	6	8	8	8	7	8	7	8	7	8	7	7	8	8	8	CLOSE	CLOSE		**117**	**187.2**
	4	6	8	8	8	8	8	7	8	7	8	7	7	8	8	8	CLOSE	CLOSE		**118**	**188.8**
	4	6	8	8	8	8	8	7	8	7	8	7	8	8	8	8	CLOSE	CLOSE		**119**	**190.4**
	4	6	8	8	8	8	8	8	8	7	8	7	8	8	8	8	CLOSE	CLOSE		**120**	**192.0**
	4	6	8	8	8	8	8	8	8	8	8	7	8	8	8	8	CLOSE	CLOSE		**121**	**193.6**
	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	CLOSE	CLOSE		**122**	**195.2**
	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	9	CLOSE	CLOSE		**123**	**196.8**
	4	6	8	8	8	8	8	8	8	8	8	8	8	9	8	9	CLOSE	CLOSE		**124**	**198.4**
	4	6	8	9	8	8	8	8	8	8	8	8	8	9	8	9	CLOSE	CLOSE		**125**	**200.0**
	4	6	8	9	8	8	9	8	8	8	8	8	8	9	8	9	CLOSE	CLOSE		**126**	**201.6**
	4	6	8	9	8	8	9	8	9	8	8	8	8	9	8	9	CLOSE	CLOSE		**127**	**203.2**
	4	6	8	9	8	8	9	8	9	8	9	8	8	9	8	9	CLOSE	CLOSE		**128**	**204.8**
	4	6	8	9	9	8	9	8	9	8	9	8	8	9	8	9	CLOSE	CLOSE		**129**	**206.4**
	4	6	8	9	9	8	9	8	9	8	9	8	8	9	9	9	CLOSE	CLOSE		**130**	**208.0**
	4	6	8	9	9	9	9	8	9	8	9	8	8	9	9	9	CLOSE	CLOSE		**131**	**209.6**
	4	6	8	9	9	9	9	8	9	8	9	8	9	9	9	9	CLOSE	CLOSE		**132**	**211.2**
	4	6	8	9	9	9	9	9	9	8	9	8	9	9	9	9	CLOSE	CLOSE		**133**	**212.8**
	4	6	8	9	9	9	9	9	9	9	9	8	9	9	9	9	CLOSE	CLOSE		**134**	**214.4**
	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	9	CLOSE	CLOSE		**135**	**216.0**
	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	10	CLOSE	CLOSE		**136**	**217.6**
	4	6	8	9	9	9	9	9	9	9	9	9	9	10	9	10	CLOSE	CLOSE		**137**	**219.2**
	4	6	8	10	9	9	9	9	9	9	9	9	9	10	9	10	CLOSE	CLOSE		**138**	**220.8**
	4	6	8	10	9	9	10	9	9	9	9	9	9	10	9	10	CLOSE	CLOSE		**139**	**222.4**
	4	6	8	10	9	9	10	9	10	9	9	9	9	10	9	10	CLOSE	CLOSE		**140**	**224.0**
	4	6	8	10	9	9	10	9	10	9	10	9	9	10	9	10	CLOSE	CLOSE		**141**	**225.6**
	4	6	8	10	10	9	10	9	10	9	10	9	9	10	9	10	CLOSE	CLOSE		**142**	**227.2**
	4	6	8	10	10	9	10	9	10	9	10	9	9	10	10	10	CLOSE	CLOSE		**143**	**228.8**
	4	6	8	10	10	10	10	9	10	9	10	9	9	10	10	10	CLOSE	CLOSE		**144**	**230.4**
	4	6	8	10	10	10	10	9	10	9	10	9	10	10	10	10	CLOSE	CLOSE		**145**	**232.0**
	4	6	8	10	10	10	10	10	10	9	10	9	10	10	10	10	CLOSE	CLOSE		**146**	**233.6**
	4	6	8	10	10	10	10	10	10	10	10	9	10	10	10	10	CLOSE	CLOSE		**147**	**235.2**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	CLOSE	CLOSE		**148**	**236.8**
	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	11	CLOSE	CLOSE		**149**	**238.4**
	4	6	8	10	10	10	10	10	10	10	10	10	10	11	10	11	CLOSE	CLOSE		**150**	**240.0**
	4	6	8	10	10	10	11	10	10	10	10	10	10	11	10	11	CLOSE	CLOSE		**151**	**241.6**
	4	6	8	10	10	10	11	10	11	10	10	10	10	11	10	11	CLOSE	CLOSE		**152**	**243.2**
	4	6	8	10	10	10	11	10	11	10	11	10	10	11	10	11	CLOSE	CLOSE		**153**	**244.8**
	4	6	8	10	11	10	11	10	11	10	11	10	10	11	10	11	CLOSE	CLOSE		**154**	**246.4**
	4	6	8	10	11	10	11	10	11	10	11	10	10	11	11	11	CLOSE	CLOSE		**155**	**248.0**
	4	6	8	10	11	11	11	10	11	10	11	10	10	11	11	11	CLOSE	CLOSE		**156**	**249.6**
	4	6	8	10	11	11	11	10	11	10	11	10	11	11	11	11	CLOSE	CLOSE		**157**	**251.2**
	4	6	8	10	11	11	11	11	11	10	11	10	11	11	11	11	CLOSE	CLOSE		**158**	**252.8**
	4	6	8	10	11	11	11	11	11	11	11	10	11	11	11	11	CLOSE	CLOSE		**159**	**254.4**
	4	6	8	10	11	11	11	11	11	11	11	11	11	11	11	11	CLOSE	CLOSE		**160**	**256.0**
	4	6	8	10	11	11	11	11	11	11	11	11	11	12	11	11	CLOSE	CLOSE		**161**	**257.6**
	4	6	8	10	11	11	12	11	11	11	11	11	11	12	11	11	CLOSE	CLOSE		**162**	**259.2**
	4	6	8	10	11	11	12	11	12	11	11	11	11	12	11	11	CLOSE	CLOSE		**163**	**260.8**
	4	6	8	10	11	11	12	11	12	11	12	11	11	12	11	11	CLOSE	CLOSE		**164**	**262.4**
	4	6	8	10	12	11	12	11	12	11	12	11	11	12	11	11	CLOSE	CLOSE		**165**	**264.0**
	4	6	8	10	12	11	12	11	12	11	12	11	11	12	12	11	CLOSE	CLOSE		**166**	**265.6**
	4	6	8	10	12	12	12	11	12	11	12	11	11	12	12	11	CLOSE	CLOSE		**167**	**267.2**
	4	6	8	10	12	12	12	11	12	11	12	11	12	12	12	11	CLOSE	CLOSE		**168**	**268.8**
	4	6	8	10	12	12	12	12	12	11	12	11	12	12	12	11	CLOSE	CLOSE		**169**	**270.4**
	4	6	8	10	12	12	12	12	12	12	12	11	12	12	12	11	CLOSE	CLOSE		**170**	**272.0**
	4	6	8	10	12	12	12	12	12	12	12	12	12	12	12	11	CLOSE	CLOSE		**171**	**273.6**
	4	6	8	10	12	12	12	12	12	12	12	12	12	13	12	11	CLOSE	CLOSE		**172**	**275.2**
	4	6	8	10	12	12	13	12	12	12	12	12	12	13	12	11	CLOSE	CLOSE		**173**	**276.8**
	4	6	8	10	12	12	13	12	13	12	12	12	12	13	12	11	CLOSE	CLOSE		**174**	**278.4**
	4	6	8	10	12	12	13	12	13	12	13	12	12	13	12	11	CLOSE	CLOSE		**175**	**280.0**
	4	6	8	10	12	12	13	12	13	12	13	12	12	13	13	11	CLOSE	CLOSE		**176**	**281.6**
	4	6	8	10	12	13	13	12	13	12	13	12	12	13	13	11	CLOSE	CLOSE		**177**	**283.2**
	4	6	8	10	12	13	13	12	13	12	13	12	13	13	13	11	CLOSE	CLOSE		**178**	**284.8**
	4	6	8	10	12	13	13	13	13	12	13	12	13	13	13	11	CLOSE	CLOSE		**179**	**286.4**
	4	6	8	10	12	13	13	13	13	13	13	12	13	13	13	11	CLOSE	CLOSE		**180**	**288.0**
	4	6	8	10	12	13	13	13	13	13	13	13	13	13	13	11	CLOSE	CLOSE		**181**	**289.6**
	4	6	8	10	12	13	13	13	13	13	13	13	13	14	13	11	CLOSE	CLOSE		**182**	**291.2**
	4	6	8	10	12	13	14	13	13	13	13	13	13	14	13	11	CLOSE	CLOSE		**183**	**292.8**
	4	6	8	10	12	13	14	13	14	13	13	13	13	14	13	11	CLOSE	CLOSE		**184**	**294.4**
	4	6	8	10	12	13	14	13	14	13	14	13	13	14	13	11	CLOSE	CLOSE		**185**	**296.0**
	4	6	8	10	12	13	14	13	14	13	14	13	13	14	14	11	CLOSE	CLOSE		**186**	**297.6**
	4	6	8	10	12	14	14	13	14	13	14	13	13	14	14	11	CLOSE	CLOSE		**187**	**299.2**
	4	6	8	10	12	14	14	13	14	13	14	13	14	14	14	11	CLOSE	CLOSE		**188**	**300.8**
	4	6	8	10	12	14	14	14	14	13	14	13	14	14	14	11	CLOSE	CLOSE		**189**	**302.4**
	4	6	8	10	12	14	14	14	14	14	14	13	14	14	14	11	CLOSE	CLOSE		**190**	**304.0**
	4	6	8	10	12	14	14	14	14	14	14	14	14	14	14	11	CLOSE	CLOSE		**191**	**305.6**
	4	6	8	10	12	14	14	14	14	14	14	14	14	15	14	11	CLOSE	CLOSE		**192**	**307.2**
	4	6	8	10	12	14	15	14	14	14	14	14	14	15	14	11	CLOSE	CLOSE		**193**	**308.8**
	4	6	8	10	12	14	15	14	15	14	14	14	14	15	14	11	CLOSE	CLOSE		**194**	**310.4**
	4	6	8	10	12	14	15	14	15	14	15	14	14	15	14	11	CLOSE	CLOSE		**195**	**312.0**
	4	6	8	10	12	14	15	14	15	14	15	14	14	15	15	11	CLOSE	CLOSE		**196**	**313.6**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
	4	6	8	10	12	14	15	14	15	14	15	14	15	15	15	11	CLOSE	CLOSE		**197**	**315.2**
	4	6	8	10	12	14	15	15	15	14	15	14	15	15	15	11	CLOSE	CLOSE		**198**	**316.8**
	4	6	8	10	12	14	15	15	15	15	15	14	15	15	15	11	CLOSE	CLOSE		**199**	**318.4**
	4	6	8	10	12	14	15	15	15	15	15	15	15	15	15	11	CLOSE	CLOSE		**200**	**320.0**
	4	6	8	10	12	14	15	15	15	15	15	15	15	16	15	11	CLOSE	CLOSE		**201**	**321.6**
	4	6	8	10	12	14	16	15	15	15	15	15	15	16	15	11	CLOSE	CLOSE		**202**	**323.2**
	4	6	8	10	12	14	16	15	16	15	15	15	15	16	15	11	CLOSE	CLOSE		**203**	**324.8**
	4	6	8	10	12	14	16	15	16	15	16	15	15	16	15	11	CLOSE	CLOSE		**204**	**326.4**
	4	6	8	10	12	14	16	15	16	15	16	15	15	16	16	11	CLOSE	CLOSE		**205**	**328.0**
	4	6	8	10	12	14	16	15	16	15	16	15	16	16	16	11	CLOSE	CLOSE		**206**	**329.6**
	4	6	8	10	12	14	16	16	16	15	16	15	16	16	16	11	CLOSE	CLOSE		**207**	**331.2**
	4	6	8	10	12	14	16	16	16	16	16	15	16	16	16	11	CLOSE	CLOSE		**208**	**332.8**
	4	6	8	10	12	14	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**209**	**334.4**
	4	6	8	10	12	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**210**	**336.0**
	4	6	8	10	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**211**	**337.6**
	4	6	8	11	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**212**	**339.2**
	4	6	9	11	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**213**	**340.8**
	4	7	9	11	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**214**	**342.4**
	5	7	9	11	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**215**	**344.0**
1	5	7	9	11	13	15	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**216**	**345.6**
1	5	7	9	11	13	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**217**	**347.2**
1	5	7	9	11	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**218**	**348.8**
1	5	7	9	12	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**219**	**350.4**
1	5	7	10	12	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**220**	**352.0**
1	5	8	10	12	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**221**	**353.6**
1	6	8	10	12	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**222**	**355.2**
2	6	8	10	12	14	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**223**	**356.8**
2	6	8	10	12	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**224**	**358.4**
2	6	8	10	13	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**225**	**360.0**
2	6	8	11	13	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**226**	**361.6**
2	6	9	11	13	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**227**	**363.2**
2	7	9	11	13	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**228**	**364.8**
3	7	9	11	13	15	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**229**	**366.4**
3	7	9	11	13	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**230**	**368.0**
3	7	9	11	14	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**231**	**369.6**
3	7	9	12	14	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**232**	**371.2**
3	7	10	12	14	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**233**	**372.8**
3	8	10	12	14	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**234**	**374.4**
4	8	10	12	14	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**235**	**376.0**
4	8	10	12	15	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**236**	**377.6**
4	8	10	13	15	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**237**	**379.2**
4	8	11	13	15	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**238**	**380.8**
4	9	11	13	15	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**239**	**382.4**
5	9	11	13	15	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**240**	**384.0**
5	9	11	13	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**241**	**385.6**
5	9	11	14	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**242**	**387.2**
5	9	12	14	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**243**	**388.8**
5	10	12	14	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**244**	**390.4**
6	10	12	14	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**245**	**392.0**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
6	10	12	15	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**246**	**393.6**
6	10	13	15	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**247**	**395.2**
6	11	13	15	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**248**	**396.8**
7	11	13	15	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**249**	**398.4**
7	11	13	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**250**	**400.0**
7	11	14	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**251**	**401.6**
8	11	14	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**252**	**403.2**
8	11	15	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**253**	**404.8**
9	11	15	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**254**	**406.4**
9	11	16	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**255**	**408.0**
10	11	16	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**256**	**409.6**
11	11	16	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**257**	**411.2**
11	11	17	16	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**258**	**412.8**
11	11	17	17	16	16	16	16	16	16	16	16	16	16	16	16	11	CLOSE	CLOSE		**259**	**414.4**
11	11	17	17	16	16	16	16	16	16	16	16	16	16	17	16	11	CLOSE	CLOSE		**260**	**416.0**
11	11	17	17	17	16	16	16	16	16	16	16	16	16	17	16	11	CLOSE	CLOSE		**261**	**417.6**
11	11	17	17	17	16	16	17	16	16	16	16	16	16	17	16	11	CLOSE	CLOSE		**262**	**419.2**
11	11	17	17	17	16	16	17	16	17	16	16	16	16	17	16	11	CLOSE	CLOSE		**263**	**420.8**
11	11	17	17	17	16	16	17	16	17	16	17	16	16	17	16	11	CLOSE	CLOSE		**264**	**422.4**
11	11	17	17	17	17	16	17	16	17	16	17	16	16	17	16	11	CLOSE	CLOSE		**265**	**424.0**
11	11	17	17	17	17	16	17	16	17	16	17	16	16	17	17	11	CLOSE	CLOSE		**266**	**425.6**
11	11	17	17	17	17	17	17	16	17	16	17	16	16	17	17	11	CLOSE	CLOSE		**267**	**427.2**
11	11	17	17	17	17	17	17	16	17	16	17	16	17	17	17	11	CLOSE	CLOSE		**268**	**428.8**
11	11	17	17	17	17	17	17	17	17	16	17	16	17	17	17	11	CLOSE	CLOSE		**269**	**430.4**
11	11	17	17	17	17	17	17	17	17	17	17	16	17	17	17	11	CLOSE	CLOSE		**270**	**432.0**
11	11	17	17	17	17	17	17	17	17	17	17	17	17	17	17	11	CLOSE	CLOSE		**271**	**433.6**
11	11	18	17	17	17	17	17	17	17	17	17	17	17	17	17	11	CLOSE	CLOSE		**272**	**435.2**
11	11	18	18	17	17	17	17	17	17	17	17	17	17	17	17	11	CLOSE	CLOSE		**273**	**436.8**
11	11	18	18	17	17	17	17	17	17	17	17	17	17	18	17	11	CLOSE	CLOSE		**274**	**438.4**
11	11	18	18	18	17	17	17	17	17	17	17	17	17	18	17	11	CLOSE	CLOSE		**275**	**440.0**
11	11	18	18	18	17	17	18	17	17	17	17	17	17	18	17	11	CLOSE	CLOSE		**276**	**441.6**
11	11	18	18	18	17	17	18	17	18	17	17	17	17	18	17	11	CLOSE	CLOSE		**277**	**443.2**
11	11	18	18	18	17	17	18	17	18	17	18	17	17	18	17	11	CLOSE	CLOSE		**278**	**444.8**
11	11	18	18	18	18	17	18	17	18	17	18	17	17	18	17	11	CLOSE	CLOSE		**279**	**446.4**
11	11	18	18	18	18	17	18	17	18	17	18	17	17	18	18	11	CLOSE	CLOSE		**280**	**448.0**
11	11	18	18	18	18	18	18	17	18	17	18	17	17	18	18	11	CLOSE	CLOSE		**281**	**449.6**
11	11	18	18	18	18	18	18	17	18	17	18	17	18	18	18	11	CLOSE	CLOSE		**282**	**451.2**
11	11	18	18	18	18	18	18	18	18	17	18	17	18	18	18	11	CLOSE	CLOSE		**283**	**452.8**
11	11	18	18	18	18	18	18	18	18	18	18	17	18	18	18	11	CLOSE	CLOSE		**284**	**454.4**
11	11	18	18	18	18	18	18	18	18	18	18	18	18	18	18	11	CLOSE	CLOSE		**285**	**456.0**
11	11	19	18	18	18	18	18	18	18	18	18	18	18	18	18	11	CLOSE	CLOSE		**286**	**457.6**
11	11	19	19	18	18	18	18	18	18	18	18	18	18	18	18	11	CLOSE	CLOSE		**287**	**459.2**
11	11	19	19	18	18	18	18	18	18	18	18	18	18	19	18	11	CLOSE	CLOSE		**288**	**460.8**
11	11	19	19	19	18	18	18	18	18	18	18	18	18	19	18	11	CLOSE	CLOSE		**289**	**462.4**
11	11	19	19	19	18	18	19	18	18	18	18	18	18	19	18	11	CLOSE	CLOSE		**290**	**464.0**
11	11	19	19	19	18	18	19	18	19	18	18	18	18	19	18	11	CLOSE	CLOSE		**291**	**465.6**
11	11	19	19	19	18	18	19	18	19	18	19	18	18	19	18	11	CLOSE	CLOSE		**292**	**467.2**
11	11	19	19	19	19	18	19	18	19	18	19	18	18	19	18	11	CLOSE	CLOSE		**293**	**468.8**
11	11	19	19	19	19	18	19	18	19	18	19	18	18	19	19	11	CLOSE	CLOSE		**294**	**470.4**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
11	11	19	19	19	19	19	19	18	19	18	19	18	18	19	19	11	CLOSE	CLOSE		**295**	**472.0**
11	11	19	19	19	19	19	19	18	19	18	19	18	19	19	19	11	CLOSE	CLOSE		**296**	**473.6**
11	11	19	19	19	19	19	19	19	19	18	19	18	19	19	19	11	CLOSE	CLOSE		**297**	**475.2**
11	11	19	19	19	19	19	19	19	19	19	19	18	19	19	19	11	CLOSE	CLOSE		**298**	**476.8**
11	11	19	19	19	19	19	19	19	19	19	19	19	19	19	19	11	CLOSE	CLOSE		**299**	**478.4**
11	11	20	19	19	19	19	19	19	19	19	19	19	19	19	19	11	CLOSE	CLOSE		**300**	**480.0**
11	11	20	20	19	19	19	19	19	19	19	19	19	19	19	19	11	CLOSE	CLOSE		**301**	**481.6**
11	11	20	20	19	19	19	19	19	19	19	19	19	19	20	19	11	CLOSE	CLOSE		**302**	**483.2**
11	11	20	20	20	19	19	19	19	19	19	19	19	19	20	19	11	CLOSE	CLOSE		**303**	**484.8**
11	11	20	20	20	19	19	20	19	19	19	19	19	19	20	19	11	CLOSE	CLOSE		**304**	**486.4**
11	11	20	20	20	19	19	20	19	20	19	19	19	19	20	19	11	CLOSE	CLOSE		**305**	**488.0**
11	11	20	20	20	19	19	20	19	20	19	20	19	19	20	19	11	CLOSE	CLOSE		**306**	**489.6**
11	11	20	20	20	20	19	20	19	20	19	20	19	19	20	19	11	CLOSE	CLOSE		**307**	**491.2**
11	11	20	20	20	20	19	20	19	20	19	20	19	19	20	20	11	CLOSE	CLOSE		**308**	**492.8**
11	11	20	20	20	20	20	20	19	20	19	20	19	19	20	20	11	CLOSE	CLOSE		**309**	**494.4**
11	11	20	20	20	20	20	20	19	20	19	20	19	20	20	20	11	CLOSE	CLOSE		**310**	**496.0**
11	11	20	20	20	20	20	20	20	20	19	20	19	20	20	20	11	CLOSE	CLOSE		**311**	**497.6**
11	11	20	20	20	20	20	20	20	20	20	20	19	20	20	20	11	CLOSE	CLOSE		**312**	**499.2**
11	11	20	20	20	20	20	20	20	20	20	20	20	20	20	20	11	CLOSE	CLOSE		**313**	**500.8**
11	11	21	20	20	20	20	20	20	20	20	20	20	20	20	20	11	CLOSE	CLOSE		**314**	**502.4**
11	11	21	21	20	20	20	20	20	20	20	20	20	20	20	20	11	CLOSE	CLOSE		**315**	**504.0**
11	11	21	21	20	20	20	20	20	20	20	20	20	20	21	20	11	CLOSE	CLOSE		**316**	**505.6**
11	11	21	21	21	20	20	20	20	20	20	20	20	20	21	20	11	CLOSE	CLOSE		**317**	**507.2**
11	11	21	21	21	20	20	21	20	20	20	20	20	20	21	20	11	CLOSE	CLOSE		**318**	**508.8**
11	11	21	21	21	20	20	21	20	21	20	20	20	20	21	20	11	CLOSE	CLOSE		**319**	**510.4**
11	11	21	21	21	20	20	21	20	21	20	21	20	20	21	20	11	CLOSE	CLOSE		**320**	**512.0**
11	11	21	21	21	21	20	21	20	21	20	21	20	20	21	20	11	CLOSE	CLOSE		**321**	**513.6**
11	11	21	21	21	21	20	21	20	21	20	21	20	20	21	21	11	CLOSE	CLOSE		**322**	**515.2**
11	11	21	21	21	21	21	21	20	21	20	21	20	20	21	21	11	CLOSE	CLOSE		**323**	**516.8**
11	11	21	21	21	21	21	21	20	21	20	21	20	21	21	21	11	CLOSE	CLOSE		**324**	**518.4**
11	11	21	21	21	21	21	21	21	21	20	21	20	21	21	21	11	CLOSE	CLOSE		**325**	**520.0**
11	11	21	21	21	21	21	21	21	21	21	21	20	21	21	21	11	CLOSE	CLOSE		**326**	**521.6**
11	11	21	21	21	21	21	21	21	21	21	21	21	21	21	21	11	CLOSE	CLOSE		**327**	**523.2**
11	11	22	21	21	21	21	21	21	21	21	21	21	21	21	21	11	CLOSE	CLOSE		**328**	**524.8**
11	11	22	22	21	21	21	21	21	21	21	21	21	21	21	21	11	CLOSE	CLOSE		**329**	**526.4**
11	11	22	22	21	21	21	21	21	21	21	21	21	21	22	21	11	CLOSE	CLOSE		**330**	**528.0**
11	11	22	22	22	21	21	21	21	21	21	21	21	21	22	21	11	CLOSE	CLOSE		**331**	**529.6**
11	11	22	22	22	21	21	22	21	21	21	21	21	21	22	21	11	CLOSE	CLOSE		**332**	**531.2**
11	11	22	22	22	21	21	22	21	22	21	21	21	21	22	21	11	CLOSE	CLOSE		**333**	**532.8**
11	11	22	22	22	21	21	22	21	22	21	22	21	21	22	21	11	CLOSE	CLOSE		**334**	**534.4**
11	11	22	22	22	22	21	22	21	22	21	22	21	21	22	21	11	CLOSE	CLOSE		**335**	**536.0**
11	11	22	22	22	22	21	22	21	22	21	22	21	21	22	22	11	CLOSE	CLOSE		**336**	**537.6**
11	11	22	22	22	22	22	22	21	22	21	22	21	21	22	22	11	CLOSE	CLOSE		**337**	**539.2**
11	11	22	22	22	22	22	22	21	22	21	22	21	22	22	22	11	CLOSE	CLOSE		**338**	**540.8**
11	11	22	22	22	22	22	22	22	22	21	22	21	22	22	22	11	CLOSE	CLOSE		**339**	**542.4**
11	11	22	22	22	22	22	22	22	22	22	22	21	22	22	22	11	CLOSE	CLOSE		**340**	**544.0**
11	11	22	22	22	22	22	22	22	22	22	22	22	22	22	22	11	CLOSE	CLOSE		**341**	**545.6**
11	11	23	22	22	22	22	22	22	22	22	22	22	22	22	22	11	CLOSE	CLOSE		**342**	**547.2**
11	11	23	23	22	22	22	22	22	22	22	22	22	22	22	22	11	CLOSE	CLOSE		**343**	**548.8**

JDA Spill Patterns with No TSWs - # Gate Stops per Spillbay																				Total	Spill [a]
1 [b]	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	Stops (#)	(kcfs)
11	11	23	23	22	22	22	22	22	22	22	22	22	22	23	22	11	CLOSE	CLOSE		**344**	**550.4**
11	11	23	23	23	22	22	22	22	22	22	22	22	22	23	22	11	CLOSE	CLOSE		**345**	**552.0**
11	11	23	23	23	22	22	23	22	22	22	22	22	22	23	22	11	CLOSE	CLOSE		**346**	**553.6**
11	11	23	23	23	22	22	23	22	23	22	22	22	22	23	22	11	CLOSE	CLOSE		**347**	**555.2**
11	11	23	23	23	22	22	23	22	23	22	23	22	22	23	22	11	CLOSE	CLOSE		**348**	**556.8**
11	11	23	23	23	23	22	23	22	23	22	23	22	22	23	22	11	CLOSE	CLOSE		**349**	**558.4**
11	11	23	23	23	23	22	23	22	23	22	23	22	22	23	23	11	CLOSE	CLOSE		**350**	**560.0**
11	11	23	23	23	23	23	23	22	23	22	23	22	22	23	23	11	CLOSE	CLOSE		**351**	**561.6**
11	11	23	23	23	23	23	23	22	23	22	23	22	23	23	23	11	CLOSE	CLOSE		**352**	**563.2**
11	11	23	23	23	23	23	23	23	23	22	23	22	23	23	23	11	CLOSE	CLOSE		**353**	**564.8**
11	11	23	23	23	23	23	23	23	23	23	23	22	23	23	23	11	CLOSE	CLOSE		**354**	**566.4**
11	11	23	23	23	23	23	23	23	23	23	23	23	23	23	23	11	CLOSE	CLOSE		**355**	**568.0**
11	11	24	23	23	23	23	23	23	23	23	23	23	23	23	23	11	CLOSE	CLOSE		**356**	**569.6**
11	11	24	24	23	23	23	23	23	23	23	23	23	23	23	23	11	CLOSE	CLOSE		**357**	**571.2**
11	11	24	24	23	23	23	23	23	23	23	23	23	23	24	23	11	CLOSE	CLOSE		**358**	**572.8**
11	11	24	24	24	23	23	23	23	23	23	23	23	23	24	23	11	CLOSE	CLOSE		**359**	**574.4**
11	11	24	24	24	23	23	24	23	23	23	23	23	23	24	23	11	CLOSE	CLOSE		**360**	**576.0**
11	11	24	24	24	23	23	24	23	24	23	23	23	23	24	23	11	CLOSE	CLOSE		**361**	**577.6**
11	11	24	24	24	23	23	24	23	24	23	24	23	23	24	23	11	CLOSE	CLOSE		**362**	**579.2**
11	11	24	24	24	24	23	24	23	24	23	24	23	23	24	23	11	CLOSE	CLOSE		**363**	**580.8**
11	11	24	24	24	24	23	24	23	24	23	24	23	23	24	24	11	CLOSE	CLOSE		**364**	**582.4**
11	11	24	24	24	24	24	24	23	24	23	24	23	23	24	24	11	CLOSE	CLOSE		**365**	**584.0**
11	11	24	24	24	24	24	24	23	24	23	24	23	24	24	24	11	CLOSE	CLOSE		**366**	**585.6**
11	11	24	24	24	24	24	24	24	24	23	24	23	24	24	24	11	CLOSE	CLOSE		**367**	**587.2**
11	11	24	24	24	24	24	24	24	24	24	24	23	24	24	24	11	CLOSE	CLOSE		**368**	**588.8**
11	11	24	24	24	24	24	24	24	24	24	24	24	24	24	24	11	CLOSE	CLOSE		**369**	**590.4**
11	11	25	24	24	24	24	24	24	24	24	24	24	24	24	24	11	CLOSE	CLOSE		**370**	**592.0**
11	11	25	25	24	24	24	24	24	24	24	24	24	24	24	24	11	CLOSE	CLOSE		**371**	**593.6**
11	11	25	25	24	24	24	24	24	24	24	24	24	24	25	24	11	CLOSE	CLOSE		**372**	**595.2**
11	11	25	25	25	24	24	24	24	24	24	24	24	24	25	24	11	CLOSE	CLOSE		**373**	**596.8**
11	11	25	25	25	24	24	25	24	24	24	24	24	24	25	24	11	CLOSE	CLOSE		**374**	**598.4**
11	11	25	25	25	24	24	25	24	25	24	24	24	24	25	24	11	CLOSE	CLOSE		**375**	**600.0**