SECTION 4

JOHN DAY DAM

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John Day Dam

1. Fish Passage Information. The locations of fish passage facilities at John Day Lock and Dam are shown on Figures JDA-1 and JDA-2. Dates for project operations for fish purposes and special operations are listed in Table JDA-1.

1.1. Juvenile Fish Passage

1.1.1 Juvenile Bypass Facilities Description. Juvenile fish bypass facilities at John Day Dam, completed in 1987, include one vertical barrier screen (VBS), submersible traveling screen (STS) and one 14" diameter orifice per gatewell in each of the project’s 16 turbine units for a total of 48 orifices. The bypass collection conduit leads to a transport channel which carries collected juvenile fish to the river below the dam when the smolt monitoring facility is not in operation (bypass mode). Differential between the forebay and bypass conduit is controlled by the tainter gate, and has a criterion of 4' to 5' (water level in the conduit is measured at unit 16).

1.1.2 Smolt Monitoring Facilities Description. During the juvenile sampling season, flow with collected fish from the JBS is sent over the crest gate and down an elevated chute to the dewatering structure. Most of the flow is dewatered and the remaining water, 30 cfs, is directed to the transport flume and past a switch gate. This gate directs fish to either the sampling building or directly to the outfall (emergency bypass only). Fish diverted for sampling pass a fish and debris separator, where debris and adult fish are directed into a separate discharge flume, leading to the outfall. Juvenile fish are interrogated by PIT tag detectors and are diverted either to the outfall or to the laboratory building for sampling (shown in Figure JDA-1).

1.1.3. Juvenile Migration Timing. Juvenile passage timing has been determined by past gatewell and SMF sampling at John Day Dam (Table JDA-2.) Ongoing research shows that daytime operation shows significant daytime passage (results to date).Smolt monitoring facility operation will be discontinued on September 15 unless there is late season research or special PIT-tagged fish present in the river. Maintenance of juvenile fish facilities is scheduled from approximately December 16 through March to minimize impact on downstream migrants and reduce the possibility of adult fallbacks through turbine units.

reserved for Figure JDA-1

reserved for Figure JDA-2

Table JDA-1. Dates of project operations for fish purposes at John Day Dam, 2001.

Diel passage was monitored by hydroacoustics and gatewell sampling (see Section 7. Endnotes [a b c d]). Peak passage occurs between 2300 and 2400 hours with a long period of elevated passage until dawn when passage decreases. Passage increases dramatically at dusk (about 2000 hours). Gatewell sampling data indicate that roughly 80% of the juvenile migrants pass John Day Dam between 2100 and 0600 hours. For example, the weighted average passage for subyearling chinook during these hours in July and August, 1986, was 82%. However, some variation from this pattern has been noted. In 1984 daytime passage at John Day Dam increased beginning on May 23. During the peak spring juvenile migration period at John Day Dam, 40% of the spring chinook and steelhead daily passage occurred between 0700 and 2200 hours. Unit 3 gatewell sampling and hydroacoustic sampling confirmed the diel pattern. Note the above information is for powerhouse passage only. Recent radio-tracking and hydroacoustic information indicates different passage patterns for the spillway and project when spill is occurring 24 hours a day.

Table JDA-2. John Day Dam juvenile migration timing, 1994-2000.

% Past Project	Year/Date						
	1994	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**
Yearling Chinook							
10%	5/2	4/29	4/21	4/20	4/28	4/22	4/20
90%	6/18	5/29	5/28	5/28	6/2	5/31	5/28
Subyearling Chinook							
10%	7/8	6/8	5/12	5/1	6/11	6/18	6/6
90%	8/2	7/24	8/19	8/16	7/29	7/25	8/3
Steelhead (wild)							
10%	4/27	5/3	4/24	4/23	4/27	4/26	4/18
90%	5/26	5/25	5/24	5/24	5/29	6/5	5/28
Steelhead (hatchery)							
10%	5/9	5/7	4/28	4/27	5/4	4/29	4/15
90%	6/1	5/26	5/27	5/26	6/1	6/7	5/24
Coho							
10%	5/12	5/8	4/27	4/30	5/10	4/30	5/5
90%	5/29	5/21	5/21	6/9	6/2	6/2	6/8
Sockeye							
10%	5/11	5/9	5/3	5/10	5/8	5/10	4/30
90%	6/5	5/26	6/3	6/21	5/31	6/1	6/9

1.2. Adult Fish Passage.

1.2.1. Facilities Description. The adult fish passage facilities at John Day Dam include a north shore fish ladder, which passes fish from entrances at the north end of the spillway, and a south shore fish ladder which passes fish from entrances along a collection channel which extends the full length of the powerhouse. Auxiliary water is provided to all collection systems by pumping from the tailrace. South auxiliary water also includes forebay water from the fish turbines. Counting stations are provided in both fishways.

1.2.2. Adult Migration Timing. Upstream migrant fish are present at John Day Dam throughout the year. Adult passage facilities are operated year round. However, passage through the winter months is relatively light and there is no regular fish counting. Fish counting at John Day Dam normally extends from April 1 through October 31. The adult fish counting schedule is shown in Table JDA-3. Annual winter maintenance of adult fish facilities is scheduled from December 1 through February 28 (in-water work period) to minimize the impact on upstream migrants and to minimize adult fall chinook and steelhead fallback.

Table JDA-3. Adult fish counting schedule.

Period	Counting Method
April 1 - October 31	Visual count 16 hours/day (0400-2000 PST)
November 1 – March 31	No Counting

Table JDA-4 shows fish counting periods by species and earliest and latest recorded dates of peak passage, from fish count data compiled by the Corps.

Table JDA-4. John Day Dam adult migration timing, 1968-2000.

Species	Count Period	Earliest Peak	Latest Peak
Spring chinook	4/1 - 6/5	4/17	5/22
Summer Chinook	6/6 - 8/5	6/7	8/2
Fall Chinook	8/6 - 10/31	9/2	9/25
Steelhead	4/1 - 10/31	9/6	10/6
Sockeye	4/1 - 10/31	6/23	7/10
Coho	4/1 - 10/31	9/4	10/12

2. Project Operation.

2.1. General.

2.1.1. Research, non-routine maintenance, other fish related activities, and construction activities 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 concurred with by regional fish managers through ESA and other fish passage forums. Currently approved special operations are described in Appendix A. Alternate actions will be considered by district and project biologists in conjunction with the fish managers on a case by case basis. Emergency situations should be dealt with immediately by the project in coordination with the project or district biologist. If unavailable, the biologists will be informed of steps taken to correct the situation immediately following the incident. All activities within boat restricted zone (BRZ) will be coordinated in advance with the project.

2.2. Spill Management. Spill patterns formulated with spillway deflectors in place are provided in Table JDA-9. These will be used for both adult and juvenile patterns. Minimum spill of 25% is to provide adequate tailrace egress for juvenile salmonids. (NOTE: Spill operations have not been finalized for 2001 due to low flow predictions. FPOM coordination will be required to finalize spill operations, and an addendum to the FPP will be sent out detailing the final operation.)

2.3. Dissolved Gas Management and Control. Spill management requests will be based upon total dissolved gas (TDG) monitoring data and the observed condition of migrating juveniles and adults, along with juvenile migration monitoring data. Total TDG monitoring will be conducted by the Corps at the John Day Dam forebay and tailrace automated stations and reported every four hours from April 1 through September 15. Related data reported at the same time, includes volume and total project flow. The TDG monitoring system is described in detail in Appendix D. Excessive total TDG levels, which may harm fish, will be controlled to the extent possible, subject to river flow conditions. Control measures will include system spill allocations through the spill priority list issued by Reservoir Control Center (RCC), nighttime or daytime spill limits, and shaping of spill discharge.

2.4. Juvenile Fish Passage Facilities.

2.4.1. Operating Criteria.

2.4.1.1. Prior to Juvenile Fish Passage Season (December 1 through March).

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

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

c. Inspect each STS and operate on trial run (dogged off at deck level).

d. By April 1, place STSs in each intake slot of all operational units unless otherwise coordinated with the fish agencies and tribes.

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

f. Check automatic control calibration for the DSM tainter gate and other necessary sensors weekly and recalibrate as necessary. Report summaries of equipment recalibration in the weekly Smolt Monitoring Facility operation monitoring reports.

g. Inspect, maintain and, where necessary, repair the DSM conduit tainter gate.

h. Inspect and correct any deficiencies of walls and floor of DSM conduit, raceway, and outfall.

i. Inspect and, where necessary, repair spill gates and the associated control system. Spillways, except for coordinated exceptions, must be able to achieve standard spill patterns on April 1.

j. Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary in areas where avian lines are not practical. Continue operation of the avian water cannon on the JBS outfall throughout daylight hours through August 31. In August, if predatory birds are not present at the outfall, cannon operation may be terminated through FPOM coordination. If birds reappear, cannon operation will resume and FPOM notified. Avian abatement measures shall be in place by April 1.

k. The results of all inspections and the readiness of the facility for operation will be reported at the FPOM meeting immediately prior to the start of the juvenile fish passage season.

l. Smolt Monitoring Facility: Insure all of the following items are fully operational:

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

2. All valves and auxiliary water systems.

3. Flushing water valves and their perforated plates.

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

5. Fish and debris separator, including perforated plates and the adult passage chamber.

6. PIT tag detectors.

7. All sampling building systems, including holding tanks, valves, and conduits. (Note: A more specific list can be found in the Smolt Monitoring Facility Operation and Maintenance Manual.)

2.4.1.2. Juvenile Fish Passage Season (April 1 through November)

a. Measure gatewell drawdown a minimum of once per week. Remove debris from forebay and trash racks as required to maintain less than 1.5' of drawdown in gatewell.

b. Units 1 through 5 will be raked every two weeks between April 1 and July 1. Units 6 through 10 or units 11 through 16 will be alternately raked with units 1 through 5 from April 1 through July 1. After July 1, units will be raked as needed to avoid exceeding gatewell drawdown criterion.

c. Debris accumulations in the forebay of 300' or more in any direction from the face of the dam will be removed within 48 hours. Debris removal efforts should continue until the debris load has been removed.

d. If debris loads are obvious in the forebay, trash will be raked in front of the affected units weekly until the debris load has been removed.

e. Additional raking will occur whenever trash accumulations are suspected because of increased differential (1.5') across the trash racks, or as determined by the project biologist in reference to indicators such as increased juvenile fish descaling at the dam, deteriorating fish condition as noted by SMF personnel, or increased accumulations of tumbleweeds in the forebay. The STSs in units being raked will run continuously during raking operations. Gatewell orifices of the unit being raked must be closed during the raking operation.

f. Inspect each STS once per month (or 720 hours run time), and each VBS a minimum of once every two months (or 1440 hours run time). Video inspections are acceptable. VBS inspections will occur immediately prior to peaks in the juvenile fish migrations (early-May and early-July). Inspections will be concentrated on the priority units and those others with longer operating times. More frequent inspections may be required under the following conditions: deterioration of fish condition, increased debris load in bypass system, and other indications of STS or VBS malfunction or failure. If STS or VBS damage or plugging is detected, follow procedures in Section 3., Fish Facilities Maintenance. Records of inspections will be reported in weekly fishway status reports and provided to FPOM. Screen inspections will not occur in unit 1 until after 1200 hours. Unit 2 will operate when unit 1 is out of service for STS inspections.

g. Operate all gatewell orifices. Inspect orifice lights daily to assure that the orifice lights are operating. Replace all burned out orifice lights within 24 hours. Close and open each orifice three times daily, or as necessary due to heavy debris accumulations in gatewells.

h. Observe each STS amp and/or watt meter readings at least once per shift. If an STS failure occurs, then follow procedures in Section 3. Fish Facilities Maintenance.

i. Inspect all STS gatewells daily. The project will clean gatewells before the gatewell water surface becomes half covered with debris. If, due to the volume of debris, it is not possible to keep the gatewell surfaces at least clear, they will be cleaned at least once daily. Turbines with a gatewell fully covered with debris will not be operated except to be in compliance with other coordinated fish measures, and then only on a last on/first off basis. The powerhouse gatewell orifices will be closed during the cleaning operation. After debarking a gatewell, cycle the orifice in that gatewell. Check gatewell drawdown.

j. A slight oily sheen is commonly found in many gatewells. This may come from sources such as lubricated lifting beams. But, when unusual accumulations of oil (e.g., oil slick) occur in gate slots, the JBS orifice will be closed and the turbine unit will be shut down until cleaning is accomplished. Appropriate procedures to remove fish during this situation will be determined in coordination with FPC or NMFS. Regardless of unit operating status, oil accumulations will be dealt with promptly.

k. Coordinate gatewell cleaning with personnel operating the Smolt Monitoring Facility.

l. Reinstall or repair avian predator control lines in present locations as soon as possible following damage or removal. Install and maintain new avian predator control lines in locations determined to be significantly impacted by avian predators. Implement other avian abatement measures as necessary in areas where avian lines are not practical. These are performed under contract with the U.S. Department of Agriculture, Animal Damage Control. Abatement measures include selective hazing, pyrotechnics, propane cannon scare techniques, and lethal take where necessary. Maintain operation of the avian water cannon on the JBS outfall as needed. This could be delayed because of inclement weather and will be completed ASAP after the start of the juvenile fish passage season.

m. Turbine units without a full complement of rotating STSs will not operate, except to be in compliance with other coordinated fish measures.

n. Inspect facilities three times each day, unless other guidance is provided elsewhere within this plan for specific facilities. At least three inspections per week will be performed by project fish biologist or fish biological staff.

o. Smolt Monitoring Facility.

1. The smolt monitoring facility (SMF) will be monitored on a 24 hours per day, 7 days per week basis by the project fish personnel to ensure its proper functioning and provide quick response to an emergency. Therefore, a three shift (day, swing, graveyard) system will be implemented while the SMF is in operation (dewatering structure is not dewatered).

2. A person on duty will perform a walking inspection of the entire SMF system every two hours to ensure safe passage condition. An inspection form designated for this purpose will indicate the areas which need to be checked.

3. Particular attention will be paid to the fish/debris separator (FDS) which needs to be visually inspected every 30 minutes to prevent injury and/or mortality to passing fish.

4. During any high debris loading periods (likely during spring run off) additional personnel may be required to keep the FDS free of any obstruction to fish passage. The project biologist will decide to assign a person to remove debris from the FDS on a shift basis (possible constant, 24 hours/day presence) for as long as it is necessary to assure the safety of passing fish.

5. When river temperatures reach 70°F or greater, all fish handling will be coordinated through FPOM.

2.4.1.3. Winter Maintenance Season (December 16 through March).

a. To reduce adult fallback mortality, the juvenile bypass system, or DSM channel will operate from November 30 through December 15. Priority units will be left screened during this period to the extent practicable (barring operational failure), and screens from non-priority units will only be removed when necessary to begin maintenance. If units are required for operation during this period, and are unscreened, they will be operated on a last on/first off basis. After December 15, all STSs may be removed.

b. Dewater DSM channel only when required for inspection, maintenance, or structural modifications (see section 5. Dewatering Plans.; also, paragraph 3.2.1.2. Juvenile Bypass System). The outage period will be minimized to the extent practicable.

c. All units are available to meet power demands.

d. Inspect facilities twice per day. These are to be performed at least three times per week by project fish staff.

e. Smolt Monitoring Facility. Insure the proper function of sampling systems. Particular attention is directed toward the following:

1. Dewatering facilities, including the screens being free of holes or gaps, and the screen cleaner brush system.

2. All valves and auxiliary water systems.

3. Flushing water valves and their perforated plates.

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

5. Fish and debris separator, including perforated plates and the adult passage chamber.

6. Pit tag detectors.

7. All sampling building systems, including holding tanks, valves, and conduits.

8. Dewater the Primary Dewatering Structure every two (2) weeks after July 30 until termination of SMF operation to remove adult fish that have accumulated in the structure. Do not dewater facility if water temperature is 70° F or greater.

2.5. Adult Fish Passage Facilities.

2.5.1. Operating Criteria.

2.5.1.1. Prior to Adult Passage Period (December 16 through March).

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

b. Dewater and inspect all ladders and all other dewatered sections of fish facilities for projections, debris, or plugged orifices which could injure fish or slow their progress up the ladder. Repair deficiencies.

c. Inspect for and, when necessary, clear debris in ladder exits.

d. Reinstall picket leads at counting stations prior to watering up ladders during maintenance.

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

f. The results of all inspections and the readiness of the facility for operation will be reported at the FPOM meeting immediately prior to the fish passage season.

2.5.1.2. Adult Fish Passage Period (March 1 through November).

a. All Adult Facilities.

1. Water depth over fish ladder weirs: 1' +/-0.1'. When shad numbers exceed 5000 fish per day per count station, water depth should be increased to 1.3' +/- 0.1'. This criteria was established by the COE through FPOM in 2001 to allow more efficient lamprey passage through orifices for a longer period each season, as it shortens the window for higher flow operation. Lamprey are better able to negotiate orifices with the 1’+/- 0.1’ operation.

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

3. Head on all entrances: 1' to 2' (1.5' optimum). Refer to paragraph 3.3.1. when unable to achieve head criteria.

4. A water velocity of 1.5' to 4 fps per second (2 fps optimum) shall be maintained in all channels and the lower ends of the fish ladders which are below the tailwater.

5. Maximum of 0.5' head on attraction water intakes and trash racks at all the ladder exits, with a 0.3' maximum head on all picket leads. Debris shall be removed when significant amounts accumulate.

6. Staff gauges and water level indicators will be readable at all water levels encountered during the fish passage period, and calibration checked weekly. Recalibrate ASAP if out of calibration.

7. Main entrance weir depths: 8' or greater below tailwater. Maintain tailwater elevation greater than 158’msl to stay within criteria operation range for the entrance weirs.

8. Count station crowders shall be at maximum width that allows count or video tape accuracy. The minimum count slot width shall be no less than 18 inches. If passage is impaired by narrow count slot conditions, the count slot will be widened until proper passage conditions are achieved, despite count accuracy. Project biologists, FFU, and WDFW fish counters shall coordinate to achieve optimum count slot passage and/or count accuracy conditions. If counting is temporarily discontinued due to unscheduled events, the crowder shall be fully opened. The crowder shall remain in operating position during the counters’ hourly ten minute break periods. Leave fish passage slot lighted overnight after counting ends each day.

9. Inspect facilities three times each day. At least three inspections per week will be performed by project fish staff. After November 1, inspect facilities at lease twice per day.

10. Maintain netting and padding for both fishways that address the jumping problem. All holes in the netting large enough to catch or allow escapement of an adult salmonid must be closed.

b. North Fishway.

1. Operate one entrance weir (EW-1) at 8’or greater weir depth. Entrance head: 1’ to 2’ (1.5’ optimum). Testing will be conducted to determine if the use of one entrance at greater than 8’ depth allows better passage conditions. (Study plan will be developed through the AFEP Studies Review Work Group.)

2. Spill through bay 1 in the summer with a gate opening of one stop only during periods of regular spill. When no other spill is occurring, do not operate spill bay 1 during the summer. After August, spill from bay 1 for adult attraction from the hours of 0400 – 2000 hours will resume.

c. South Fishway. Operate entrance weir SE-1.

d. Powerhouse.

1. Operate entrances NE-1 and NE-2.

2. Operate ten powerhouse floating orifices (1, 2, 3, 6, 9, 12, 15, 17, 18, and 19) and open associated auxiliary water diffusers.

3. From 0400 to 2000 hours, operate unit 1 near 100 megawatts (+/- 10 MW) to facilitate best entrance conditions. If additional load is required, to meet the load requirements of the BPA administrator (in accordance with the BPA load shaping guidelines, Appendix C), to be in compliance with other coordinated fish measures, or to avoid forcing an unscreened unit to operate to provide required load, the 100MW limit may be exceeded. If unit 1 is operated at 155 MW, it should be the last to be brought up to full load when demand increases and the first to drop off when demand decreases.

2.5.1.3. Winter Operating Period and In-water Work Period (December 16 through February).

a. Adult Fish Facilities.

1. Operate according to fish passage season standards, except facilities may be dewatered or operated out of criteria for maintenance or repair. Outage periods will be minimized to the extent practicable.

2. Only one of the two adult fish passage facilities may be out of service at a time. The other facility must be operated at full passage season criteria unless specially coordinated with the fish agencies and tribes through FPOM. However, operation of unit 2 may be substituted for unit 1 without special coordination.

3. Pull picket leads at counting stations and have crowders adjusted such that the counting slots are fully open at the end of the counting season (this will be done shortly after adult fish counting ends).

4. Maximum of 0.5' head on attraction water intakes and trash racks at all ladder exits. Debris shall be removed when significant amounts accumulate.

5. Inspect the operating facilities twice per day. These are to be performed at least three times per week by project fish staff.

2.6. Facility Monitoring and Reporting. Project staff shall inspect fish passage facilities at the frequencies listed in the juvenile and adult fish facilities operating criteria sections. Additional fishway inspections may be performed by FFU and/or fish agencies. Project biologists shall prepare weekly reports, throughout the year, summarizing project operations. The weekly reports will provide an overview of how the project and the fish passage facilities operated during the week and an evaluation of resulting fish passage conditions. The reports shall include: any out of criteria situations observed and subsequent corrective actions taken; any equipment malfunctions, breakdowns, or damage along with a summary of resulting repair activities; adult fishway control calibrations; STS and VBS inspections; and any usual activities which occurred at the project which may affect fish passage. The weekly reports shall cover a Sunday through Saturday time period and shall be sent to CENWP-OP as soon as possible the following week via electronic mail, with a copy to RCC, Attention: Fish Team. The project biologist shall prepare an annual report by January 31 summarizing the operation of the project fish passage facilities for the previous year. The report will cover from the beginning of an adult fish facilities winter maintenance season to the beginning of the next winter

maintenance season. The annual report will be provided to CENWP-OP in time for distribution to FPOM members at the February meeting.

3. Fish Facilities Maintenance.

3.1. General.

3.1.1. Scheduled Maintenance. Scheduled fishway maintenance, to the extent practicable, will be conducted during periods when passage has been documented to be at its lowest to minimize impacts to migrating salmonids. Maintenance activities that occur during the fish passage period and that may effect fish passage, will be reported in the weekly reports (section 2.6).

3.1.1.1. Staff gauges will be installed, cleaned, and/or repaired as required.

3.1.1.2. A zebra mussel monitoring program will continue. This includes veliger sampling, colonization sample units, and dewatering inspections. These organisms have become a serious problem elsewhere in the country and may become introduced into the Columbia River basin.

3.2. Juvenile Fish Passage Facilities.

3.2.1. Scheduled Maintenance.

3.2.1.1. Submersible Traveling Screens. The STS system may receive preventive maintenance or repair at any time during the year as necessary. Most maintenance will occur during the winter maintenance period when all STSs may be removed from the intakes. During the designated juvenile passage season, a turbine unit cannot operate without a full compliment of functioning STSs.

3.2.1.2. Juvenile Bypass System. The juvenile bypass facilities may receive preventive maintenance at any time of the year as deemed necessary in coordination with FPOM. During the juvenile fish passage season, this will normally be above water work, such as maintenance of automatic systems, air lines, electrical systems, and monitoring equipment. During the winter maintenance period, the system is dewatered. The system is 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 contractor as soon as possible. Extended repair projects will be coordinated through FPOM.

3.2.1.3. Turbines and Spillway. Maintenance and routine repair of project turbines and spillways is a regular and recurring process which requires that units be shut down for extended periods of time (see section 5. Dewatering Plans). Maintenance schedules for these turbines and spillways will be coordinated through FPOM. Certain turbine and spillway discharges at the projects are secondarily used to attract adult fish near fishway entrances to keep predator fish from accumulating in the area of juvenile release sites and to move juveniles downstream away from the project. The maintenance schedules for these turbines and spillways will reflect equal weight given to fish, power, and water management and will be coordinated with the appropriate fish agencies. Units which should not be scheduled for maintenance during the fish passage season are 1, 2, and 5.

Some types of turbine maintenance will require testing turbine operation throughout the full operating range before returning it to normal service.

3.2.2. Unscheduled Maintenance. Unscheduled maintenance of facilities will be carried out as described below. Activities that will have a significant impact on juvenile fish passage shall be coordinated through FPOM on a case-by-case basis by project and CENWP-OP biologists. The CENWP-OP biologists will be notified as soon as possible after it becomes apparent that maintenance repairs are required. The Project Operations Manager has the authority to initiate work prior to notifying CENWP-OP when delay of the work will result in an unsafe situation for people, property, or fish. Information required by CENWP-OP includes:

a. Description of the problem.

b. Type of outage required.

c. Impact on facility operation.

d. Length of time for repairs.

e. Expected impacts on fish passage.

3.2.2.1. Submersible Traveling Screens. If an STS or VBS is damaged or inoperative 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. .

3.2.2.2. Juvenile Bypass System.

a. The juvenile bypass system is automatically controlled. If the automatic system fails, it will be operated manually until automation repairs are made. If the orifices become plugged with debris, the turbine will not be operated until it has been cleaned.

b. Inspect all STS gatewells daily. The project will clean gatewells before the water surface becomes one half covered with debris. If, due to the volume of debris, it is not possible to keep the gatewell surfaces at least half clear, they will be cleaned at least daily. Turbines with a gatewell fully covered with debris will not be operated except on a last on/first off basis if required to be in compliance with other coordinated fish measures. The gatewell orifices must be closed during the cleaning process. Juvenile mortality numbers will be monitored in all gatewells, as potential indicators of gatewell environment problems. Mortality estimates will be recorded and reported in the weekly status reports.

c. If the bypass system fails in the powerhouse conduit, tainter gate, or transportation outfall making the system unsafe for fish, an action decision will be made in coordination with the FPOM. During this emergency operating mode, power generation will be minimized to the extent practicable. If this operating mode is expected to last longer than four days, then all units required for generation will be sequentially shut down, fish salvaged from the gatewells, the STSs removed, and the unit restarted. The orifice gates will be closed during this process.

d. During fishway inspection activities, VBSs may be found plugged with debris, damaged or not properly seated. In these cases, the associated unit will be regarded as if unscreened and repairs will be made before returning the unit to operation.

3.2.2.3. Turbines and Spillways.

a. If a spill gate becomes inoperable, the operators will make the changes necessary to accommodate the spill and then immediately notify the operations supervisor and project biologist to determine the best pattern to follow 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.

b. Unit 2 will replace unit 1 for adult attraction whenever unit 1 is not operating.

3.3. Adult Passage Facilities.

3.3.1. Scheduled Maintenance. Maintenance activities that occur during the fish passage period and that may affect fish passage will be reported in the weekly reports (section 2.6).

3.3.1.1. 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.

3.3.1.2. Powerhouse and Spillway Fish Collection Systems. Preventive maintenance and repair occurs throughout the year as needed. During the adult fish passage season, this maintenance will not involve operation that will cause failure to comply with the adult fishway criteria, unless coordinated through the FPOM. During the winter maintenance season, an inspection will occur through dewatering or divers per discretion of the project biologists. One additional underwater diver or video inspection will occur during the middle of fish passage season. 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 (see section 5. Dewatering Plans).

3.3.1.3. Adult Fish Ladders and Counting Stations. The adult fish ladders will be 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 capable operating within criteria. During this time the ladders are inspected for necessary maintenance needs and potential fish passage problems. These include 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 then repaired. Trash racks at the ladder exits will be raked when criteria are exceeded. When practicable, rake trash racks during the time of day when fish passage would be least affected. Fish count station windows, light panels, and crowder panels will be cleaned, as needed, to achieve accurate counts and, when practicable, during the time of

day when fish passage is least affected. Netting installed on the ladders to prevent fish leaping will be inspected weekly and maintained when necessary. Summaries of inspections will be included in the weekly activity report.

3.3.2. Unscheduled Maintenance. Maintenance activities that occur during the fish passage period and that may affect fish passage will be reported in the weekly reports (section 2.6.). Unscheduled maintenance that will significantly affect the operation of a facility, such as repair of displaced diffuser gratings, will be coordinated through FPOM coordination procedures for unscheduled maintenance of adult facilities are the same as for juvenile facilities (section 3.2.2).

3.3.2.1. Fishway Auxiliary Water Systems. The fishway auxiliary water systems are mostly automated. If the automatic system fails, the system will be operated manually by project personnel. This will allow the fish facility to operate according to criteria while 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. The FPOM will work with the project to determine the best operation in the event of an AWS failure during the adult passage season.

a. South Ladder. If one of the three auxiliary water turbines fails, assuming all three turbines are being used to meet criteria, bulkheads will be installed in the failed turbine discharge conduit and the output of the two remaining turbines will be increased to meet adult fishway criteria. If a second turbine unit fails, bulkheads will be installed in that turbine intake conduit also and the adult fish facility will be operated as follows until a fishway head of 1' is achieved.

1. Increase discharge of the remaining unit to maximum capacity.

2. Close NE-1.

3. Raise the south powerhouse entrance weir (SE-1) in 1' increments to 6' depth below the tailwater surface.

4. Close the center five floating submerged orifice gate entrances starting at the north end (17, 15, 12, 9, 6).

5. If the above criteria are still not achieved, then leave in this configuration until more auxiliary water becomes available. Then reverse the above procedure.

If all three turbine units fail, bulkheads will be installed in the failed turbine discharge conduits and the adult fish facility will be operated as follows until repairs can be made.

1. SE-1 will be open with the weir crest 6' below the tailwater surface.

2. Cross channel bulkheads will be placed in the powerhouse collection channel between units 2 and 3.

3. The floating orifice gate in front of unit 2 will be closed, leaving the floating orifice gate in front of unit 1 open.

b. North Ladder. This system can not operate according to the adult fishway criteria under any conditions due to design limitations. Three of the six available pumps can be operated simultaneously. If one pump fails, one of the standby pumps will be started. This routine will be followed until the available pumps can no longer meet the adult fishway criteria. If this occurs, EW2 will be closed and EW1 will be set at the maximum weir depth needed to maintain fishway criteria.

3.3.2.2. Powerhouse and Spillway Fish Collection Systems. John Day Dam contains several types of fishway entrances. In most cases, if failures occur, the entrance can be operated manually by project personnel until repairs are made. When this operation becomes necessary, project personnel will increase the surveillance of the adult system to ensure criteria are being met. In those cases in which the failure will not allow the entrance to be operated manually, the gate will be maintained, to the extent possible, in an operational position. 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.

3.3.2.3. Adult Fish Ladders and Counting Stations. Pickets with excessive spacing (greater than 1"), erosion of concrete around the picket leads, or missing pickets can allow fish into areas where escape is not possible. The north count station upstream picket leads have an exit hatch that can be opened to allow fish to escape. Repair will be required for picket lead failure at the south count station. In the remaining 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 or not to dewater the fishway and repair any problem will be made in coordination with the FPOM.

3.3.2.4. Diffuser Gratings. Diffuser chambers for adding auxiliary water to fish ladders and collection channels are covered by gratings attached by several different methods. Diffuser gratings are normally inspected during the winter maintenance period to assure integrity. These 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 the fish passage season due to a variety of reasons. Daily inspections of fish ladders and collection systems should include looking for any flow changes which 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, creating openings into the diffuser chambers, a method of repair shall be developed and coordinated with the fish agencies and tribes through the established coordination procedure. Repairs shall be made as quickly as possible.

4. Turbine Unit Operation and Maintenance. Unit operating priority is shown in Table JDA-5, including that time when synchronous condensing occurs. Unit maintenance schedules will be reviewed by project and district biologists for fish impacts.

Table JDA-5. Turbine unit operating priority for John Day Dam.

Season	Time of Day	Unit Operating Priority
March 1 through November	24 hours/day	5, 1, 2, 3, then 4 and 6-16 in any order.
December 1 through February	0600-2000 hrs	5, 1, then unpaired units in any order
	2000-0600 hrs	5, 1, then any unit
April 15 through October	1800-0600 hrs	11-14 only run for synchronous condensing [a]

[a] At BPA's request, these units may be run to meet power demands.

4.1. Guidelines for operating units within the 1% turbine efficiency range at various heads are shown in Tables JDA-6 to JDA-8. To the extent technically feasible, turbines will be operated within +/- 1% of best turbine efficiency, unless operation outside of that range is necessary to meet load requirements of the BPA administrator, consistent with the BPA System Load Shaping Guidelines (Appendix C), or to comply with other coordinated fish measures. The System Load Shaping Guidelines apply between March 15 and October 31. However, during the rest of the year, the project will continue to operate units within the 1% turbine efficiency range, except as specifically requested by BPA for power production.

4.2. Juvenile fish passage decreases through units from south to north, making inefficient operation of unit 16 least likely to impact fish. Based on this, if it is necessary to select turbines to operate outside the 1% efficiency range, they will be selected in sequence from north to south. However, allowance will also be given to special project requirements for stable voltage control which require load distribution between transformer banks.

5. Dewatering Plans. Guidelines for dewatering and fish handling plans (Appendix G) have been developed and are followed for dewatering project facilities. These plans include consideration for fish safety and are consistent with the following general guidance. The appropriate plans are reviewed by participants before each salvage operation. The project fish biologist and/or alternate Corps fish personnel will attend all project activities involving fish handling. The fish agencies and tribes will be encouraged to participate in all ladder dewaterings.

Table JDA-6. Turbine units with standard-length submersible traveling screens installed.

Head (Feet)	Lower Generator Limits		Upper Generator Limits	
	MW	CFS	MW	CFS
85	75	12,168	137	22,317
86	76	12,168	140	22,441
87	76	12,010	141	22,331
88	77	12,009	142	22,238
89	78	12,006	144	22,151
90	79	12,003	145	22,067
91	79	11,872	146	21,982
92	80	11,874	149	22,106
93	81	11,878	150	22,023
94	82	11,887	151	21,943
95	83	11,897	152	21,866
96	83	11,790	154	21,792
97	84	11,803	155	21,724
98	85	11,813	155	21,478
99	86	11,814	155	21,237
100	86	11,713	155	21,024
101	87	11,717	155	20,816
102	88	11,720	155	20,588
103	89	11,723	155	20,365
104	89	11,628	155	20,146
105	90	11,733	155	19,954

NOTE: The turbine efficiency tables are being revised to reflect new information for John Day Dam. This table is based on data from Little Goose Dam.

Table JDA-7. Turbine units with extended-length submersible bar screens installed.

Head (Feet)	Lower Generator Limits		Upper Generator Limits	
	MW	CFS	MW	CFS
85	69	11,204	128	20,769
86	70	11,256	130	20,866
87	72	11,308	133	20,963
88	73	11,360	135	21,058
89	74	11,424	137	21,177
90	75	11,462	140	21,247
91	77	11,525	142	21,364
92	78	11,575	144	21,457
93	79	11,611	147	21,523
94	80	11,673	149	21,638
95	82	11,708	151	21,703
96	83	11,742	154	21,767
97	84	11,803	155	21,724
98	86	11,850	155	21,478
99	87	11,897	155	21,237
100	88	11,957	155	21,024
101	89	12,017	155	20,816
102	91	12,062	155	20,588
103	92	12,107	155	20,365
104	93	12,152	155	20,146
105	95	12,210	155	19,954

NOTE: The turbine efficiency tables are being revised to reflect new information for John Day Dam. This table is based on data from Little Goose Dam.

Table JDA-8. Turbine units without screens:

Head (Feet)	Lower Generator Limits		Upper Generator Limits	
	MW	CFS	MW	CFS
85	75	12,168	137	22,317
86	76	12,168	140	22,441
87	76	12,010	141	22,331
88	77	12,009	142	22,238
89	78	12,006	144	22,151
90	79	12,003	145	22,067
91	79	11,872	146	21,982
92	80	11,874	149	22,106
93	81	11,878	150	22,023
94	82	11,887	151	21,943
95	83	11,897	152	21,866
96	83	11,790	154	21,792
97	84	11,803	155	21,724
98	85	11,813	155	21,478
99	86	11,814	155	21,237
100	86	11,713	155	21,024
101	87	11,717	155	20,816
102	88	11,720	155	20,588
103	89	11,723	155	20,365
104	89	11,628	155	20,146
105	90	11,733	155	19,954

NOTE: The turbine efficiency tables are being revised to reflect new information for John Day Dam. This table is based on data from Little Goose Dam.

5.2. Adult Fish Ladders.

5.2.1. Scheduled Maintenance.

5.2.1.1. When possible, operate ladders to be dewatered at reduced flow for at least 24 hours, but not more than 96 hours prior to dewatering. Reduced flow is defined as less than criterion operation, but more than orifice flow.

5.2.1.2. The project biologist will assure that fish rescue equipment is available, and will coordinate to ensure adequate numbers of personnel will be available to move fish out of the dewatered ladder.

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

5.2.1.4. 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. Captured fish will then be transported to the forebay or tailwater, depending on the fish life stage (adults to forebay, juveniles to tailrace), for release. If a ladder is dewatered in the spring or summer, steelhead kelts should be released into the tailrace.

5.2.1.5. 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 accidentally left in place after fishway water-up.

5.2.2. Unscheduled Maintenance.

5.2.2.1. When possible, discontinue auxiliary water and operate ladder at reduced flow as long as possible up to 72 hours prior to dewatering.

5.2.2.2. Follow guidance in paragraphs 5.4.1.3. through 5.4.1.6.

5.3. Powerhouse Fish Collection System.

5.3.1. Scheduled Maintenance. During the pumping or draining operation to dewater a portion or all of the 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. Juvenile Bypass System.

5.4.1. Scheduled Maintenance. It is normal practice, when draining the juvenile bypass channel, to flush the channel with only the bypass orifices in bay 16 open. The associated gatewells will be dipped in advance to minimize the number of fish contained in this flushing water.

5.5. Turbines.

5.5.1. Remove juvenile fish from the gatewell(s) which will be drained. This is done by use of a special dipping basket. Immediately before setting the headgates, spin the unit to move fish out of the draft tube.

5.5.2. When possible, place head gates and tail logs immediately after the turbine unit is shut down if the draft tube is to be dewatered. This is necessary for both scheduled and unscheduled outages.

5.5.3. If the turbine unit draft tube is to be dewatered and the turbine unit has been idle for any length of time, it will be briefly operated when possible, at speed/no load, and stop logs will then be placed immediately.

5.5.4. 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 two weeks to accommodate fish trapped in the draft tube. 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.

5.5.5. 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 alternative fish personnel will provide technical guidance on fish safety and will directly participate in fish salvage.

5.5.6. The project biologist will assure that all necessary rescue equipment is available.

6. Forebay Debris Removal. Debris at projects can impact fish passage conditions. It can plug or block 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. Debris can be removed from the forebay by: physically encircling the debris with log booms and pulling it to shore with boats where it can be removed with a crane, removing the debris from the top of the dam using a crane and scoop, or passing the debris through the spillway with special powerhouse operations and spill. The preferred option is to remove debris at each project when possible to avoid passing a debris problem on to the next project downstream. This is not always possible at each project as some projects do not have forebay debris removal capability. In this case, the only viable alternative is to spill to pass the debris.

All special spills (other than normal spill patterns for ongoing spill operations) and project operations for passing debris will be coordinated prior to the operations taking place. Each project shall contact CENWP-OP at least two work days prior to the day they want the special project operations for spilling to pass debris. CENWP-OP shall coordinate the special operations with the FPOM. Project personnel shall provide CENWP-OP the reason for the debris spill request including an explanation of project facilities being impacted by the debris, the date and time of the requested spill, and any special powerhouse or other operations required to move the debris to the spillway. When a debris spill is coordinated and approved, RCC shall issue a teletype detailing the specifics of the special operations.

7. Endnotes.

[a] Hydroacoustic Monitoring of Downstream Migrant Juvenile Salmonids at John Day Dam in 1983. R. Magne et.al., US COE research Report. 35 pp. plus appendices.

[b] Hydroacoustic Monitoring of Downstream Migrant Juvenile Salmonids at John Day Dam 1984-85. R. Magne et. al. , US COE Research Report. 29 pp. plus appendices.

[c] Hydroacoustic Evaluation of Juvenile Salmonid Fish Passage at John Day Dam in Summer 1986. Sue Kuehl, BioSonics, Inc. Final Report. Prepared for US COE under Contract No. DACW57-86-C-0088. 61 pp. plus appendices.

[d] Hydroacoustic Evaluation of the Spill Program for Fish Passage at John Day Dam in 1987. L. Johnson et. al., Associated Fish Biologists, Inc. Final Report prepared for US COE under Contract No. DACW57-87-C-0077. 71 pp. plus appendices.

Table JDA-9. Spill patterns for John Day Dam.

Bay Number																				Stops	Kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
2	2	2																		6	9.6
2	3	2																		7	11.2
2	3	2	1																	8	12.8
2	3	2	2																	9	14.4
2	3	3	2																	10	16.0
2	3	3	2	1																11	17.6
2	3	3	2	2																12	19.2
2	3	3	2	2	1															13	20.8
2	3	3	2	2	2															14	22.4
2	3	3	2	2	2	1														15	24.0
2	3	3	2	2	2	2														16	25.6
2	3	3	2	2	2	2	1													17	27.2
2	3	3	3	2	2	2	1													18	28.8
2	3	3	3	2	2	2	2													19	30.4
2	3	3	3	2	2	2	2	1												20	32.0
2	3	3	3	3	2	2	2	1												21	33.6
2	3	3	3	3	3	2	2	1												22	35.2
2	3	3	3	3	3	2	2	2												23	36.8
2	3	3	3	3	3	2	2	2	1											24	38.4
2	3	3	3	3	3	2	2	2	2											25	40.0
2	3	3	3	3	3	2	2	2	2	1										26	41.6
2	3	3	3	3	3	2	2	2	2	2										27	43.2
2	3	3	3	3	3	2	2	2	2	2	1									28	44.8
2	3	3	3	3	3	2	2	2	2	2	2									29	46.4
2	3	3	3	3	3	3	2	2	2	2	2									30	48.0
2	3	3	3	3	3	3	2	2	2	2	2	1								31	49.6
2	3	3	3	3	3	3	2	2	2	2	2	2								32	51.2
2	3	3	3	3	3	3	2	2	2	2	2	2	1							33	52.8
2	3	3	3	3	3	3	3	2	2	2	2	2	1							34	54.4
2	3	3	3	3	3	3	3	2	2	2	2	2	2							35	56.0
2	3	3	3	3	3	3	3	2	2	2	2	2	2	1						36	57.6
2	3	3	3	3	3	3	3	2	2	2	2	2	2	2						37	59.2
2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	1					38	60.8
2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2					39	62.4
2	3	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1				40	64.0
2	4	3	3	3	3	3	3	2	2	2	2	2	2	2	2	1				41	65.6
2	4	4	3	3	3	3	3	2	2	2	2	2	2	2	2	1				42	67.2
2	4	4	4	3	3	3	3	2	2	2	2	2	2	2	2	1				43	68.8
2	4	4	4	4	3	3	3	2	2	2	2	2	2	2	2	1				44	70.4
2	4	4	4	4	3	3	3	3	2	2	2	2	2	2	2	1				45	72.0
2	4	4	4	4	3	3	3	3	3	2	2	2	2	2	2	1				46	73.6
2	4	4	4	4	4	3	3	3	3	2	2	2	2	2	2	1				47	75.2

Table JDA-9 (cont). Spill patterns for John Day Dam.

Bay Number																				Stops	Kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
2	4	5	4	4	4	3	3	3	3	2	2	2	2	2	2	1				48	76.8
2	4	5	4	4	4	3	3	3	3	2	2	2	2	2	2	2				49	78.4
2	4	5	4	4	4	3	3	3	3	2	2	2	2	2	2	2	1			50	80.0
2	4	5	4	4	4	3	3	3	3	3	2	2	2	2	2	2	1			51	81.6
2	4	5	4	4	4	3	3	3	3	3	3	2	2	2	2	2	1			52	83.2
2	4	5	5	4	4	3	3	3	3	3	3	2	2	2	2	2	1			53	84.8
2	4	5	5	4	4	4	3	3	3	3	3	2	2	2	2	2	1			54	86.4
2	4	5	5	4	4	4	3	3	3	3	3	3	2	2	2	2	1			55	88.0
2	4	5	5	4	4	4	3	3	3	3	3	3	3	2	2	2	1			56	89.6
2	4	5	5	4	4	4	3	3	3	3	3	3	3	3	2	2	1			57	91.2
2	4	5	5	4	4	4	3	3	3	3	3	3	3	3	3	2	1			58	92.8
2	4	5	5	4	4	4	4	3	3	3	3	3	3	3	3	2	1			59	94.4
2	4	5	5	4	4	4	4	4	3	3	3	3	3	3	3	2	1			60	96.0
2	4	5	5	5	4	4	4	4	3	3	3	3	3	3	3	2	1			61	97.6
2	4	5	5	5	4	4	4	4	3	3	3	3	3	3	3	2	2			62	99.2
2	4	5	5	5	4	4	4	4	4	3	3	3	3	3	3	2	2			63	100.8
2	4	5	5	5	4	4	4	4	4	3	3	3	3	3	3	2	2	1		64	102.4
2	4	5	5	5	4	4	4	4	4	4	3	3	3	3	3	2	2	1		65	104.0
2	4	5	5	5	4	4	4	4	4	4	3	3	3	3	3	3	2	1		66	105.6
2	4	5	5	5	4	4	4	4	4	4	4	3	3	3	3	3	2	1		67	107.2
2	4	4	4	4	3	3	4	3	4	3	3	3	3	4	3	4	3	4	3	68	108.8
2	4	4	4	4	3	3	4	3	4	3	4	3	3	4	3	4	3	4	3	69	110.4
2	4	4	4	4	4	3	4	3	4	3	4	3	3	4	3	4	3	4	3	70	112.0
2	4	4	4	4	4	3	4	3	4	3	4	3	3	4	3	4	4	4	3	71	113.6
2	4	4	4	4	4	3	4	3	4	3	4	3	3	4	4	4	4	4	3	72	115.2
2	4	4	4	4	4	3	4	3	4	3	4	3	4	4	4	4	4	4	3	73	116.8
2	4	4	4	4	4	4	4	3	4	3	4	3	4	4	4	4	4	4	3	74	118.4
2	4	4	4	4	4	4	4	4	4	3	4	3	4	4	4	4	4	4	3	75	120.0
2	4	4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	3	76	121.6
2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	3	77	123.2
2	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	78	124.8
2	4	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	79	126.4
2	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	80	128.0
2	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	5	4	81	129.6
2	4	5	5	4	4	4	4	4	4	4	4	4	4	4	4	5	4	5	4	82	131.2
2	4	5	5	4	4	4	4	4	4	4	4	4	4	5	4	5	4	5	4	83	132.8
2	4	5	5	5	4	4	4	4	4	4	4	4	4	5	4	5	4	5	4	84	134.4
2	4	5	5	5	4	4	5	4	4	4	4	4	4	5	4	5	4	5	4	85	136.0
2	4	5	5	5	4	4	5	4	5	4	4	4	4	5	4	5	4	5	4	86	137.6
2	4	5	5	5	4	4	5	4	5	4	5	4	4	5	4	5	4	5	4	87	139.2

Table JDA-9 (cont). Spill patterns for John Day Dam.

Bay Number																				Stops	Kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
2	4	5	5	5	5	4	5	4	5	4	5	4	4	5	4	5	4	5	4	88	140.8
2	4	5	5	5	5	4	5	4	5	4	5	4	4	5	4	5	5	5	4	89	142.4
2	4	5	5	5	5	4	5	4	5	4	5	4	4	5	5	5	5	5	4	90	144.0
2	4	5	5	5	5	5	5	4	5	4	5	4	4	5	5	5	5	5	4	91	145.6
2	4	5	5	5	5	5	5	4	5	4	5	4	5	5	5	5	5	5	4	92	147.2
2	4	5	5	5	5	5	5	5	5	4	5	4	5	5	5	5	5	5	4	93	148.8
2	4	5	5	5	5	5	5	5	5	5	5	4	5	5	5	5	5	5	4	94	150.4
2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	95	152.0
2	4	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	96	153.6
2	4	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	97	155.2
2	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	98	156.8
2	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5	5	5	6	5	99	158.4
2	4	6	6	5	5	5	5	5	5	5	5	5	5	5	5	6	5	6	5	100	160.0
2	4	6	6	5	5	5	5	5	5	5	5	5	5	6	5	6	5	6	5	101	161.6
2	4	6	6	6	5	5	5	5	5	5	5	5	5	6	5	6	5	6	5	102	163.2
2	4	6	6	6	5	5	6	5	5	5	5	5	5	6	5	6	5	6	5	103	164.8
2	4	6	6	6	5	5	6	5	6	5	5	5	5	6	5	6	5	6	5	104	166.4
2	4	6	6	6	5	5	6	5	6	5	6	5	5	6	5	6	5	6	5	105	168.0
2	4	6	6	6	6	5	6	5	6	5	6	5	5	6	5	6	5	6	5	106	169.6
2	4	6	6	6	6	5	6	5	6	5	6	5	5	6	5	6	6	6	5	107	171.2
2	4	6	6	6	6	5	6	5	6	5	6	5	5	6	6	6	6	6	5	108	172.8
2	4	6	6	6	6	6	6	5	6	5	6	5	5	6	6	6	6	6	5	109	174.4
2	4	6	6	6	6	6	6	5	6	5	6	5	6	6	6	6	6	6	5	110	176.0
2	4	6	6	6	6	6	6	6	6	5	6	5	6	6	6	6	6	6	5	111	177.6
2	4	6	6	6	6	6	6	6	6	6	6	5	6	6	6	6	6	6	5	112	179.2
2	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	5	113	180.8
2	4	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	114	182.4
2	4	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	6	115	184.0
2	4	6	7	6	6	6	6	6	6	6	6	6	6	6	6	6	6	7	6	116	185.6
2	4	6	7	6	6	6	6	6	6	6	6	6	6	6	6	7	6	7	6	117	187.2
2	4	6	7	6	6	6	6	6	6	6	6	6	6	7	6	7	6	7	6	118	188.8
2	4	6	7	7	6	6	6	6	6	6	6	6	6	7	6	7	6	7	6	119	190.4
2	4	6	7	7	6	6	7	6	6	6	6	6	6	7	6	7	6	7	6	120	192.0
2	4	6	7	7	6	6	7	6	7	6	6	6	6	7	6	7	6	7	6	121	193.6
2	4	6	7	7	6	6	7	6	7	6	7	6	6	7	6	7	6	7	6	122	195.2
2	4	6	7	7	7	6	7	6	7	6	7	6	6	7	6	7	6	7	6	123	196.8
2	4	6	7	7	7	6	7	6	7	6	7	6	6	7	6	7	7	7	6	124	198.4
2	4	6	7	7	7	6	7	6	7	6	7	6	6	7	7	7	7	7	6	125	200.0
2	4	6	7	7	7	7	7	6	7	6	7	6	6	7	7	7	7	7	6	126	201.6
2	4	6	7	7	7	7	7	6	7	6	7	6	7	7	7	7	7	7	6	127	203.2

Table JDA-9 (cont). Spill patterns for John Day Dam.

Bay Number																				Stops	Kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
2	4	6	7	7	7	7	7	7	7	6	7	6	7	7	7	7	7	7	6	128	204.8
2	4	6	7	7	7	7	7	7	7	7	7	6	7	7	7	7	7	7	6	129	206.4
2	4	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	6	130	208.0
2	4	6	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	131	209.6
2	4	6	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7	132	211.2
2	4	6	8	7	7	7	7	7	7	7	7	7	7	7	7	7	7	8	7	133	212.8
2	4	6	8	7	7	7	7	7	7	7	7	7	7	7	7	8	7	8	7	134	214.4
2	4	6	8	7	7	7	7	7	7	7	7	7	7	8	7	8	7	8	7	135	216.0
2	4	6	8	8	7	7	7	7	7	7	7	7	7	8	7	8	7	8	7	136	217.6
2	4	6	8	8	7	7	8	7	7	7	7	7	7	8	7	8	7	8	7	137	219.2
2	4	6	8	8	7	7	8	7	8	7	7	7	7	8	7	8	7	8	7	138	220.8
2	4	6	8	8	7	7	8	7	8	7	8	7	7	8	7	8	7	8	7	139	222.4
2	4	6	8	8	8	7	8	7	8	7	8	7	7	8	7	8	7	8	7	140	224.0
2	4	6	8	8	8	7	8	7	8	7	8	7	7	8	7	8	8	8	7	141	225.6
2	4	6	8	8	8	7	8	7	8	7	8	7	7	8	8	8	8	8	7	142	227.2
2	4	6	8	8	8	8	8	7	8	7	8	7	7	8	8	8	8	8	7	143	228.8
2	4	6	8	8	8	8	8	7	8	7	8	7	8	8	8	8	8	8	7	144	230.4
2	4	6	8	8	8	8	8	8	8	7	8	7	8	8	8	8	8	8	7	145	232.0
2	4	6	8	8	8	8	8	8	8	8	8	7	8	8	8	8	8	8	7	146	233.6
2	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	7	147	235.2
2	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	148	236.8
2	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	8	8	9	8	149	238.4
2	4	6	8	8	8	8	8	8	8	8	8	8	8	8	8	9	8	9	8	150	240.0
2	4	6	8	8	8	8	8	8	8	8	8	8	8	9	8	9	8	9	8	151	241.6
2	4	6	8	9	8	8	8	8	8	8	8	8	8	9	8	9	8	9	8	152	243.2
2	4	6	8	9	8	8	9	8	8	8	8	8	8	9	8	9	8	9	8	153	244.8
2	4	6	8	9	8	8	9	8	9	8	8	8	8	9	8	9	8	9	8	154	246.4
2	4	6	8	9	8	8	9	8	9	8	9	8	8	9	8	9	8	9	8	155	248.0
2	4	6	8	9	9	8	9	8	9	8	9	8	8	9	8	9	8	9	8	156	249.6
2	4	6	8	9	9	8	9	8	9	8	9	8	8	9	8	9	9	9	8	157	251.2
2	4	6	8	9	9	8	9	8	9	8	9	8	8	9	9	9	9	9	8	158	252.8
2	4	6	8	9	9	9	9	8	9	8	9	8	8	9	9	9	9	9	8	159	254.4
2	4	6	8	9	9	9	9	8	9	8	9	8	9	9	9	9	9	9	8	160	256.0
2	4	6	8	9	9	9	9	9	9	8	9	8	9	9	9	9	9	9	8	161	257.6
2	4	6	8	9	9	9	9	9	9	9	9	8	9	9	9	9	9	9	8	162	259.2
2	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	8	163	260.8
2	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	9	164	262.4
2	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	9	9	10	9	165	264.0
2	4	6	8	9	9	9	9	9	9	9	9	9	9	9	9	10	9	10	9	166	265.6
2	4	6	8	9	9	9	9	9	9	9	9	9	9	10	9	10	9	10	9	167	267.2

Table JDA-9 (cont). Spill patterns for John Day Dam.

Bay Number																				Stops	Kcfs
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20		
2	4	6	8	10	9	9	9	9	9	9	9	9	9	10	9	10	9	10	9	168	268.8
2	4	6	8	10	9	9	10	9	9	9	9	9	9	10	9	10	9	10	9	169	270.4
2	4	6	8	10	9	9	10	9	10	9	9	9	9	10	9	10	9	10	9	170	272.0
2	4	6	8	10	9	9	10	9	10	9	10	9	9	10	9	10	9	10	9	171	273.6
2	4	6	8	10	10	9	10	9	10	9	10	9	9	10	9	10	9	10	9	172	275.2
2	4	6	8	10	10	9	10	9	10	9	10	9	9	10	9	10	10	10	9	173	276.8
2	4	6	8	10	10	9	10	9	10	9	10	9	9	10	10	10	10	10	9	174	278.4
2	4	6	8	10	10	10	10	9	10	9	10	9	9	10	10	10	10	10	9	175	280.0
2	4	6	8	10	10	10	10	9	10	9	10	9	10	10	10	10	10	10	9	176	281.6
2	4	6	8	10	10	10	10	10	10	9	10	9	10	10	10	10	10	10	9	177	283.2
2	4	6	8	10	10	10	10	10	10	10	10	9	10	10	10	10	10	10	9	178	284.8
2	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	9	179	286.4
2	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	10	180	288.0
2	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	10	10	11	10	181	289.6
2	4	6	8	10	10	10	10	10	10	10	10	10	10	10	10	11	10	11	10	182	291.2
2	4	6	8	10	10	10	10	10	10	10	10	10	10	11	10	11	10	11	10	183	292.8
2	4	6	8	10	10	10	11	10	10	10	10	10	10	11	10	11	10	11	10	184	294.4
2	4	6	8	10	10	10	11	10	11	10	10	10	10	11	10	11	10	11	10	185	296.0
2	4	6	8	10	10	10	11	10	11	10	11	10	10	11	10	11	10	11	10	186	297.6
2	4	6	8	10	11	10	11	10	11	10	11	10	10	11	10	11	10	11	10	187	299.2