

APPENDIX A

SPECIAL PROJECT OPERATIONS AND STUDIES

APPENDIX A: BONNEVILLE

Bonneville Dam

1. Special Project Operations.

1.1. Spring Creek Hatchery Release. The first hatchery release is expected to occur on March 9, followed by 24-hour spill for juvenile fish passage until such time as passage rates drop back to low levels. Powerhouse operating priority, spill levels, and duration of special operations will be determined in coordination with fish agencies through TMT. Project operations for fish passage will be defined by RCC teletype prior to the release.

1.2. Spill. Spill will be provided continuously from April 20 through August 31 for spring and summer migrants as required in the National Marine Fisheries Service (NMFS) 1995 Biological Opinion, Section VIII.A.2, and 1998 Supplement. Daytime spill (see Section 2, Table BON-6 for spill hours) for juvenile fish passage will be 75,000 cfs and nighttime spill will be up to the 120% TDG cap (approximately 100,000 to 150,000 cfs). Discussions are ongoing concerning the daytime spill cap that was established to minimize adult fish fallback. In preparation for a regional decision that may change the daytime spill, COE and regional fish managers have developed study objectives and proposals that evaluate daytime spill to the 120% TDG cap. These objectives include: evaluate adult salmon and steelhead fallback rates, entrance use and project passage times; determine adult salmon and steelhead migration routes and depth distribution in response to dissolved gas in the tailrace; and estimate fish passage efficiency.

2. Studies.

2.1. Prototype Testing of ESBS at Bonneville First Powerhouse. In 2000, prototype testing of ESBS, streamlined trash racks, and new VBS will be continued at Bonneville I in MU8. Installation of ESBS and VBS will occur prior to the fish passage season.

FGE testing (NMFS) will begin approximately April 15 and conclude approximately July 15, depending on the number of fish collected. FGE tests will be conducted at night and will require the unit to be shut down for short periods nightly for removal and placement of fyke nets in the emergency bulkhead slot. This outage will be approximately one hour to place the fyke net, and one hour to remove the net nightly.

In addition to the fyke net test above, hydroacoustics

will be used to estimate FGE (WES and PNNL). For the WES deployment, transducers will be installed both on the ESBS and on the trash racks prior to the test start date of 24 April. Testing will be completed on 14 July. Installation on both the trash racks and ESBS will be concurrent with their delivery and will require a one-day outage. As always, several outages should be expected throughout the testing season to repair equipment.

The PNNL deployment will require a one-day unit outage to install 3 upward looking transducers to the lowest trash rack of slot 8B with a diver. In addition to the 3 upward looking transducers, a traversing split beam transducer will be mounted on a frame that will be lowered into the trash rack guides of 8B. This will allow the multiplexing split beam system to measure juvenile salmonid behavior in the near field regions upstream of the streamlined trash racks.

It is expected that Unit 8 will be available for normal operation during non-testing periods as a last on operation to meet project/regional needs.

There will also be additional outages required to remove and inspect the ESBS. The timing of these outages has not been determined, but may be as frequent as weekly during the testing period. These outages are expected to be short duration (2 - 3 hours) and limited to the time required to remove, inspect, and replace the ESBS.

2.2. Bonneville Rehab Biological Testing (also testing under the Turbine Survival Program). A repeat of the biological testing of the minimum gap runner installed in unit 6 is scheduled for fall of 2000. In addition to the biological testing, there will need to be commission testing in both units 4 and 10. The units will undergo a series of pre-startup tests that will require each unit's STSSs to be removed. A normal pre-start scenario is to mechanically roll the unit for 1 day. After the unit has been deemed structurally sound, the unit will be HIPOT tested for 2-3 days. After this test series is complete the unit is subjected to several load rejection tests that require the STSSs to be removed (2 days). The unit's STSSs will be reinstalled and then be advanced to a 72 hour run test, followed by the 100 day commissioning test.

2.3. Lower Columbia River Adult Study. Adult salmon, steelhead and lamprey will be captured at the adult fish monitoring facility and tagged with radio transmitters from April through September 2000. For adult salmon and steelhead evaluations, two tests are proposed in addition to general migration monitoring. These two tests are still under discussion in regional forums. They include evaluating fallback under two spill levels and assessing the effects of closing the First Powerhouse collection channel orifice and

sluice gates. If the regional discussions regarding increasing daytime spill (see section 1.2 above) result in removal of the 75 kcfs daytime spill cap, fallback rates will be compared between 75 kcfs spill and spill to the 120% TDG cap. The spill test will utilize a randomized block design, with 2-day treatments within 4-day blocks, from early April to early June. In addition to testing fallback under two spill conditions, project and powerhouse passage times will be compared under two first powerhouse adult fishway conditions: collection channel orifice/sluice gates open versus closed.

Adult Pacific lamprey passage will be evaluated using radio telemetry. Nighttime passage into the Cascades and Bradford Island fishways will be tested under two entrance heads. Entrance head will be lowered to 0.5 ft. between 2200 hours and 0430 hours on even days from April 4 to September 30 at Bradford Island. This operation will occur between 2200 hours and 0430 hours on odd days from April 4 to September 30 at Cascades Island. Entrance head will remain within FPP criteria (1.0-2.0 ft.) during all other days and times.

2.4. Fish Passage Efficiency. FPE will be evaluated at Bonneville Dam using hydroacoustic and radio telemetry techniques. At the spillway, gates 2, 4, 6, 7, 8, 10, 12, 14, 15, and 17 will each be sampled with one down-looking transducer per bay. Transducers will be mounted 26.5' below the top of spill gates and aimed 5 degrees upstream. Transducers will be at elevation 56.5' when the gate is closed and at elevation 69 ft when the gate is opened 12.5' (7 dogs). At the second powerhouse, one of three intakes at every turbine unit will be randomly selected for sampling. A pair of transducers will be mounted on the downstream side of trash racks 1 and 5. One transducer of each pair will be mounted at the vertical center of the uppermost trash rack and aimed downward to sample unguided juvenile salmon passing below the tip of the traveling screen. The second transducer of each pair will be mounted on the bottom of the fifth trash rack from the top and aimed upward to sample fish passing above the tip of the screen. At the first powerhouse, one of three intakes at turbines 7, 9, and 10 will be randomly selected for sampling. A pair of transducers will be mounted on the downstream side of trash racks 1 and 5. One transducer of each pair will be mounted at the top center of the uppermost trash rack and aimed downward to sample unguided juvenile salmon passing below the tip of the STS. The second transducer of each pair will be mounted at the bottom of the fifth trash rack from the top and aimed upward to sample fish passing above the tip of the screen. Hydroacoustic transducer installation will take approximately two weeks in late February and early March. Approximately three main turbine units must be out of service

at a time to allow for diver access and outages will occur between 0800 and 2000 hours. This work will be planned to occur before the spill season. For equipment removal in August, three turbine units will again be required out of service at a time from 0500 to 2000 hrs. Typically, we can expect approximately 12 transducer failures over a 3-month period. Each failure will require a turbine unit outage of approximately four hours. If a dive is required to repair the problem, the two adjacent units must be out of service as well.

2.5. Bonneville Second Powerhouse Vertical Distribution.

Vertical distribution of spring and summer juvenile migrants will be evaluated using hydroacoustic techniques at the second powerhouse. We are planning to monitor vertical distribution 1-3 and 10-15 meters upstream of trash racks on Units 14 and 17. Vertical distribution in the 1-3 meter range will only be measured for summer migrants, because TIEs will need to be removed for this element. TIEs create vortices that prohibit hydroacoustic monitoring near the face of the second powerhouse. Therefore, to monitor vertical distribution near the face of the powerhouse, TIE removal should start June 15 and be completed by June 20. Mounts for split beam transducers will be installed on pier noses adjacent to Units 14 and 17 during the February 28 - March 3 timeframe. It may be necessary for divers to install these mounts, and as such would require three main turbine units out of service for approximately 4 hours per unit. Two single-beam transducers on gimbal mounts will be deployed on the forebay floor approximately 10 meters upstream of Units 14 and 17. These transducers and mount will be deployed using a small tugboat. From April 1 to August 31, unit priority will be 11, 18, 17, 14, 12, 13, 15, and 16. The selection of Units 14 and 17 as test units is tentative and could change following assessment of second powerhouse forebay hydraulics at WES.

2.6. Prototype Surface Collector (PSC) at the First

Powerhouse. The PSC will extend across units 1-6 and extend 20' into the forebay beyond the piers. Deep vertical slots will be in front of the center intake (B) of units 1-6. The slots will be configured to be 20' wide and extend from the surface to elevation 32.5' msl. The goals for surface flow bypass research and development at the first powerhouse in 2000 are to (1) confirm the proof-of-concept for surface flow bypass at B1 that was established in 1998 and 1999; (2) maximize PSC efficiency; and (3) understand behavioral processes and mechanisms that affect performance and to aid future surface flow bypass designs. This will be a "process" study, not a "treatment" study. Fixed-aspect hydroacoustics will be used to estimate the number of juvenile salmon passing into the PSC, as

well the number passing under the PSC and into each of the three intakes of the turbine units. Multi-beam and split-beam hydroacoustics will be used to monitor three-dimensional behavior of fish entering or passing under the PSC. Radio telemetry will also be used to estimate PSC performance, and provide two-dimensional behavior of fish in the forebay in front of the PSC. Three-dimensional behavioral for species specific behavioral will be monitored with 3D sonic transmitters and tracking equipment.

The new PSC modules in front of units 1 and 2 were constructed and installed between December 1999 and February 2000. All units (1-6) will be configured by the end of March. Frequent unit outages will be required throughout this period because divers, boats, and barges will be working in the forebay. Additionally, it is expected that divers will be needed to make modifications and repairs to the PSC throughout March. The number or timing of outages for construction and repair can not be accurately estimated.

Units 1-6 will be operated as priority units for the study period, which is expected to last from mid-April to the end of July. Turbine units will be blocked loaded, with schedule and table to be supplied as planning process and schedule are confirmed, to attempt to keep the flows through the turbine units, and PSC in a steady state. The project forebay will need to have a soft constraint elevation with fluctuations at the first powerhouse not to exceed +/- 1.5 feet, with more narrow ranges during periods of peak inriver migration and test fish releases. Specific dates will be developed in coordination with RCC and BPA prior to the start of the study. The B slot sluice gate in each unit will be opened to assure positive flow into the sluiceway (elevation to be determined by Hydraulic Design; it may be necessary to change sluice gate elevations throughout the season depending on forebay elevations). The trash racks for the PSC will not be installed; thus, trash raking within the PSC will be necessary throughout the testing season. It is assumed that the units will need to be off-line during trash raking, and that each raking event will take approximately one to two hours.

Units 1-6 will generate at various project heads as shown in Table SPO-BON-1. This turbine operation will ensure a reasonable approximation of the flows experienced through the turbine and PSC during the 1998 fish passage season. This operational range is intended to keep the flow through the

Table SPO-BON-1. Bonneville first powerhouse unit 1 - 6 megawatt outputs at 40 - 62 ft. project head differentials.

Range of Project Heads (ft.)	Required MW Output for Units 1, 2, 3, and 5 (MW)	Required MW Output for Units 4 and 6 (MW)
40	26.7	28.2
41-42	27.8	29.4
43-45	29.7	31.7
46-49	32.4	34.7
50-53	35.4	38.0
54-58	38.6	41.6
59-62	42.0	45.2

turbine units with PSC structures within +/- 500 cfs of 10,100 cfs. The MW output requested falls within the 1% efficiency range of first powerhouse operations with STSs in place. Units 4 and 6 have different MW output requirements because they are minimum gap runner units and have a different MW vs. discharge relationship than the older units.

Hydroacoustic, radio telemetry, and 3D monitoring equipment will be installed prior to testing in April 2000. Divers will be used to install some of the hydroacoustic equipment, which will require unit outages during the winter and spring of 2000.

The researchers will operate multi-beam hydroacoustic equipment to evaluate swimming direction and speed of smolts within 50' of the PSC entrance. The behavioral sonar systems will be deployed on a small barge in the forebay upstream of each PSC entrance. The barge needs to be anchored 120' to 150' upstream of the PSC at unit 5 or 6. In addition to two upstream float and anchor lines, the barge also needs to be securely tied on the downstream end by lines to the forebay deck or PSC. Personnel from WES will run one electric power cable and several signal cables from the acoustic equipment on the barge along one of the downstream lines (above water) to the forebay deck. The powerhouse may need to be shut down during the anchoring activities.

2.7. Movement, Distribution, and Passage Behavior of Radio-Tagged Juvenile Salmonids at Bonneville Dam Associated with the

Surface Bypass Program. Access to the project Boat Restricted Zone (BRZ) will be required for conducting this study. Besides this, no specific operational requirements are expected.

2.8. Flat Plate PIT Tag Detection of Juvenile Salmonids at the First Powerhouse Smolt Monitoring DSM. The installation and testing of this equipment is not expected to require any special project operations. However, since this program is in the developmental phase, and water control within the DSM is questionable, possible problems with the operation may arise. In the case of needed repairs to the system, one or two occasions of one or two-hour reversal of flow through this system may be required to adjust the equipment. No serious effects to fish passage are expected.

2.9. All dates shown are approximate and could be advanced or delayed by a week or so depending on various factors such as river flows, contractor schedules, equipment failures, etc. Some of the evaluations may not proceed. Therefore, a final description of studies and outages being conducted will be coordinated with the region (FFDRWG, SRWG) prior to April 1. All special operation requests or schedule changes will be coordinated with the fish agencies and tribes through the AFEP (FFDRWG) and with RCC and BPA.

APPENDIX A: THE DALLES

The Dalles Dam

1. Special Project Operations - Spill. Spill will be provided continuously from April 20 through August 31 for spring and summer migrants as required in the National Marine Fisheries Service Biological Opinions or as modified to meet test conditions described in paragraph 2. Actual spill levels are being developed as part of ESA Section 7 consultations on hydrosystem operations to protect multiple listed species. They will be provided in a manner consistent with TDG management to avoid excessive gas supersaturation conditions.

2. Studies.

At the time of FPP publication, regional coordination for spill and survival studies at The Dalles Dam was ongoing. Although the studies, as described below, represent the current proposal, they may be modified upon completion of the regional coordination. Currently, we anticipate estimating passage and survival through the spillway and sluiceway operated under one condition that would be expected to result in relatively high survival. Spillway discharge will be fixed at a percentage of total river flow, and only the juvenile spill pattern will be used during the study. The ice and trash sluiceway forebay gates 1-1, 1-2, and 1-3 also will be open continuously throughout the study period. Additionally, intake occlusions will be evaluated for their ability to decrease turbine entrainment. The occlusion structures will be placed in front of both fish units and main units 1-5. All structures will be kept in place or removed above the water according to a random block design. Each treatment will last three days, a block will last six days. One full day will likely be required to move the occlusions in or out to set up for the next treatment. The turbine unit at an intake occlusion will need to be shut down each time the structure is moved.

2.1. Spillway and Sluiceway Survival Studies. Survival studies will be conducted at The Dalles Dam spillway and ice and trash sluiceway. PIT-tagged juvenile chinook and coho salmon will be released at three locations (north, middle, and south) 200m upstream of the spillway and directly into the ice and trash sluiceway. Control fish will be released in the tailrace near the highway bridge in the main channel. Recaptures will occur at the Bonneville Dam PIT tag detectors.

Radio tagged fish will also be released with the PIT tag study. These fish will yield data on tailrace movements, retention, and holding locations. Extensive tailrace equipment

and boating will be required.

2.2. FPE Evaluation. Hydroacoustic and radio telemetry techniques will be used to document salmonid behavioral responses to particular hydraulic flow fields. The hydroacoustic and radio telemetry FPE evaluations will also occur from April through August with the same schedule as that described above for survival studies. Therefore, the significance of this test will also be based on three-day treatments. Radio tagged juvenile salmonids will be released from the John Day Dam JBS for this evaluation. Test fish utilized for the John Day Dam evaluations will also be monitored at The Dalles Dam. Repairs to monitoring equipment can be expected and periodic turbine and spillbay outages may be requested to ensure proper data collection.

2.3. Behavioral studies. Two studies will be conducted to address detailed behavior in support the intake occlusion study and also to gather data on fish behavior relative to specific hydraulic conditions. These data will be analyzed with data generated by a computational fluid dynamics model.

Tracking split-beam sonar will be used to collect data within 15 m of the sluiceway. An acoustic Doppler current profiler will also be deployed near the sluiceway to monitor real time hydraulics.

Acoustic telemetry will be used to determine 3-dimensional positions of fish that are within 200 meters of the sluiceway and 2-dimensional positions for all sonic-tagged fish in the forebay.

2.4. Adult Salmon and Steelhead Passage Evaluations. Radio telemetry techniques will be used to evaluate adult salmon and steelhead passage through the project. The effects of special spillway operations for juvenile fish survival will be assessed for adult migrants by monitoring adult salmon and steelhead fallback rates, entrance use, and passage times at the project. Contingent on a hydraulic evaluation of the adult fish collection system, all floating orifices will be closed in 2000. Entrance use and passage times will be monitored and compared to previous years' data to ensure that adult migrants are not negatively affected.

2.5. Equipment Installation and Maintenance. Installation of hydroacoustic transducers, radio telemetry equipment, and the release mechanisms for the survival studies will begin in March at The Dalles Dam. Installation of spillway transducers will occur between mid-March and mid-April, spill gates will need to

be closed for the installation. The gate in one bay at a time will be closed. Installation of hydroacoustic equipment at the powerhouse and sluiceway will require turbine unit outages to allow for diver access. It will take approximately two weeks, from March 16 through 27, to install and align all of the transducers at the powerhouse. Three turbine units will be out of service for approximately 8 hours each day beginning at 0800 hrs. The fish units will be taken out of service on March 16 and 17 between 2000 and 0500 hours. Typically, we can expect approximately 12 transducer failures over the three-month period. Each failure will require a turbine unit outage of approximately four hours. If a dive is required to repair the problem, the two adjacent units will be out of service as well. Equipment will be removed between August 1 and 7 with procedures and outages similar to the installation outages discussed above, if it can be accomplished without manipulating the spill schedule. Equipment removal will be delayed until after the spill season if necessary to prevent interruptions to the other ongoing evaluations. Release hoses will also be installed in the ice and trash sluiceway from March 30 through April 10.

Additional turbine outages will be needed to install the tracking split-beam system. Units 1-3 will likely be needed off for half a day to install this system.

Acoustic telemetry hydrophones will be installed throughout the project. A total spillway closure may be needed to place hydrophones on the bottom of the forebay. Individual spill bay and turbine outages may also be necessary to install this equipment.

The number of spillway and turbine outages will be minimized as much as possible. We will attempt to install all equipment at a given location in one outage. However, this may not always be possible.

All dates are approximate and could be advanced or delayed by a week or so depending on various factors such as river flows, contractor schedules, equipment failures, etc. Some of the evaluations may not proceed, therefore, a final description of studies and outages being conducted will be coordinated with the region prior to April 1. All special operation requests or schedule changes will be coordinated with the fish agencies and tribes through the AFEP (FFDRWG), and with BPA and RCC.

Installation of the intake occlusion extensions will require lengthy outages of fish units and MU 1 - 6 over a 9-week construction period (approximately 31 January through 31 March).

APPENDIX A: JOHN DAY

John Day Dam

1. Special Project Operations - Spill. Spill will be provided from April 20 through August 31 for spring and summer migrants as required in the National Marine Fisheries Service Biological Opinions or as modified to meet test conditions described in paragraph 2. Between May 15 and July 31, spill will occur from 1900 to 0600 hours (11 hours total). Before and after that time period, spill will be for 12 hours nightly from 1800 to 0600 hours. At project flows up to 300,000 cfs, spill discharges will be 60% of instantaneous project flow. Above 300,000 cfs project flow, spill discharges will be 180,000 cfs (up to the hydraulic limit of the powerhouse). Spill will be provided in a manner consistent with TDG management to avoid excessive gas supersaturation conditions.

2. Studies.

At the time of FPP publication, regional coordination for spill and survival studies at John Day Dam was ongoing. Although the studies, as described below, represent the current proposal, they may be modified upon completion of the regional coordination.

2.1. Fish Passage Efficiency Studies. Hydroacoustic and radio telemetry methodologies will be used to survey fish behavior. For FPE studies, two spill conditions will be compared, in response to the 1998 Supplemental Biological Opinion measure to study 24-hour spill at John Day Dam. The specific spill levels and duration for the FPE study have not yet been agreed upon in the regional forum. Special operations required to support the FPE studies will be conducted outside of the juvenile fish migration period to the extent practicable. However, there will be some modification to standard project operation. Hydroacoustic and radio telemetry FPE evaluations will occur from May 1 through July 31 with a one-week break about the first week of June.

Hydroacoustic transducer installation will take approximately two weeks from March 16 through 27. Approximately three main turbine units at a time must be out of service to allow for diver access and outages will occur between 0800 and 2000 hours. The spillway transducers will be redesigned for 2000; therefore, there is potential for requiring spillway outages for installation and spill for testing. This work will be planned to occur before the spill season. Equipment removal at John Day Dam will be coordinated

with equipment removal at The Dalles Dam, and will occur from August 3 through 7, provided it does not interfere with the required spillway operations. Three turbine units will again be placed out of service at a time from 0500 to 2000 hrs. Typically, we can expect approximately 12 transducer failures over a 3-month period. Each failure will require a turbine unit outage of approximately four hours. If a dive is required to repair the problem, the two adjacent units must be out of service as well.

Release systems may need to be installed on three spillbays for the tailrace egress studies. Spillbays will need to be out of service. Again, this work will be schedule for before the spill season.

2.2. Adult Salmon and Steelhead Passage Evaluations. Radio telemetry techniques will be used to evaluate adult salmon and steelhead passage through the project. Adult salmon and steelhead fallback rates will be evaluated during 24-hour spill for juvenile passage studies. The specific spill levels and duration for these studies have not yet been agreed upon in the regional forum.

2.3. All dates shown are approximate and could be advanced or delayed, depending on factors such as river flow, contractor schedules, equipment failures, etc. Some evaluations may not proceed, therefore, a final description of studies and outages will be coordinated with the region (FFDRWG, SRWG) prior to April 1. All special operations requests or changes in the above schedules will be coordinated with the fish agencies and tribes through the AFEP (FFDRWG) and with BPA and the RCC.

APPENDIX A: MCNARY

McNary Dam

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the spring outmigration season in accordance with spill specifications in the NMFS Biological Opinion on hydrosystem operation (Appendix E) as updated in 2000 through ESA consultation and the TMT Water Management Plan. Special daytime or nighttime spill patterns may be implemented to control dissolved gas levels to agreed upon levels, while attempting to achieve desired spillway discharges. Alternative spill patterns to reduce TDG levels or to change tailrace conditions for fish passage should be coordinated through the TMT.

1.2. Installation of Data Acquisition and Control System (DACS) on Turbine Units. McNary project personnel are installing a DACS system on all turbine units at McNary Dam. One turbine unit at a time will be taken out of service, throughout the year, for approximately five weeks for installation of the equipment. Occasionally 2 turbine units will be taken out of service at the same time for several days to tie the equipment together into the transformer bank for the turbine units. This will increase the amount of water being spilled if river flows are above the powerhouse hydraulic capacity. DACS installation should be complete by March 2000.

1.3. Doble Tests. Transformer banks 3, 4, and 5 will be taken out of service, one at a time, and doble tested in September and October 2000. The two corresponding turbine units (5 and 6, 7 and 8, and 9 and 10) for each transformer bank will be out of service during the testing. Testing will take approximately 3 days per transformer bank.

1.4. Inspection of the Upstream Face of the Dam and the Embankment Riprap. The upstream face of the dam's embankment riprap is to be inspected by boat on or around April 11, 2000. The forebay water level will need to be near elevation 337 for the inspection.

1.5. PIT Tag Modifications. The McNary juvenile fish facility PIT tag detection system will be modified prior to the 2000 juvenile bypass season. A new electrical power supply and communication system will be installed. New electronics and antenna coils will also be installed as part of the change to the 134.2 kHz ISO system.

1.6. Installation of Bulkheads in Juvenile Collection Channel.

The ice and trash sluiceway gates along the McNary juvenile collection channel will be replaced with taller bulkheads between December 15, 1999 and February 29, 2000. The Contractor will start at turbine unit 14 and work towards turbine unit 1.

1.7. Cylindrical Dewatering Structure Construction. A prototype cylindrical dewatering structure will be constructed from January through June, 2000. The structure will be located on the north end of the powerhouse tailrace deck and will have a water supply system tied into the upper ice and trash sluiceway channel. The excess water from the juvenile collection channel primary dewatering structure that is routed to the north end of the ice and trash sluiceway will be used for the water supply for the test cylindrical dewatering structure. The Contractor will tap into existing, unused, pipes in the north end of the upper ice and trash sluiceway and route a 34-inch supply pipe to the tailrace deck. The water supply construction work should be completed by March 1, 2000. The rest of the prototype structure on the tailrace deck will be completed by June, 2000. Construction of the rest of the cylindrical dewatering structure work should not require any alterations to project operations. If construction of the water supply system is not completed by mid-March, when ESBS installation begins, excess water from the dewatering structure will be diverted through the south end of the sluiceway.

1.8. Gantry Crane Rail Replacement. A contractor will replace the rails for the gantry crane on the powerhouse intake deck during July and August 2000. The rails will be replaced in sections, 2 turbine units at a time, with each section taking approximately 8 days. When a rail section is being replaced, the gantry crane will be located on the larger usable section of crane rail, either north or south of ongoing work. The crane will be able to be used for normal crane activities, like pulling an ESBS or VBS, over the stretch of crane rail that it is sitting on. It will not be available for use on the section of the powerhouse that is on the other side of the ongoing crane rail replacement. Any work for that section of the powerhouse will have to wait until the section of crane rail being worked on is completed. If there is a problem with an ESBS or VBS that cannot be corrected without using the gantry crane, then the turbine unit will be taken out of service until work on the current section of crane rail is completed and the crane can be moved to correct the problem.

1.9. Installation of Beacon/Fish Release Pipes for Turbine

Passage/Survival Tests. Turbine unit 5 or another turbine unit may be taken out of service for several days in February to install a beacon for monitoring sonic tagged fish passing through the turbine unit. The turbine unit may be taken out of service and dewatered in late summer of 2000 (for approximately 3 weeks) to install fish release pipes for a turbine survival study. If the test is conducted, the turbine unit will be taken out of service again during the fall for approximately 3 weeks to remove the pipes.

2. Studies.

2.1. Turbine Passage/Survival Studies. A scintillation frame will be installed in one of the intake bays of turbine unit 5 (or another unit) in May or June and for releasing sonic tagged fish into the turbine intake. In another study, juvenile salmonids may be tagged with balloon tags and released through a series of release pipes into turbine unit 5 (or another unit) to measure survival of fish passing through different areas of the turbine unit. The release pipes will go from the forebay deck, down the B-slot head gate slot, and attach to the stay rings in the turbine scroll case. The test may take place during daylight hours over a three-week period in early fall of 2000. Turbine unit 5 will be out of service for approximately 3 weeks prior to the beginning of the test for installation of the release pipes. Turbine unit 5 may be operated outside of the daytime test hours when needed. Adjacent turbine units (4 and 6) should be operated when possible during fish releases to make retrieval in the tailrace easier. If the study is conducted, another three week outage of turbine unit 5 will be required after the completion of the test for removal of the release pipes.

2.2. Juvenile Fish Separator Evaluations. NMFS will be conducting research on design parameters for juvenile fish separators utilizing their two test separators located in the juvenile fish collection channel. These two separators are connected to two orifices in turbine unit 6. During testing periods, fish exiting the orifices will be routed through the separators. During non-testing periods, the fish will be either diverted around the separators into the collection channel or alternate gatewell orifices will be used. This study will take place from mid April through August 2000.

2.3. Effects of Extended Length Screens on the Behavior of Pacific Lamprey. This study is to determine if ESBS's impact Pacific lamprey at McNary Dam. The contractor will use video equipment to monitor the surfaces of the test ESBS and will evaluate lamprey behavior if they come in contact with the extended length submerged bar screen (ESBS) and during operation of the cleaning brushes. This work will require the installation of video cameras on the screens. In order to access the screens for installation, a turbine unit outage will be required at least three times during the fish season. Camera installation may be coordinated with other screen work to reduce the impacts to project operation.

2.4. Biological Performance of Modified Porosity Control Plates of Extended Length Submerged Bar Screens. Hydroacoustic evaluation of fish guidance efficiency (FGE) of ESBSs with new beveled perforated plates is tentatively planned for the summer of 2000. This research will require at least one but not more than three ESBS's to be modified with the new perforated plates. Screen modification, transducer installation, and evaluation will impact the operation of up to three turbine units. Test units will need to be operated continuously within the 1% peak efficiency curve. The experimental design may be similar to the testing proposed for Little Goose (refer to the Little Goose section 2.1 of this appendix) with one or more in-season screen switches or the design may be modified depending on the results of the Little Goose evaluation.

2.5. Prototype Testing of a Cylindrical Dewatering Screen. NMFS will evaluate the biological and debris handling performance of the new prototype cylindrical dewatering screen during the summer of 2000. Test fish will be obtained by gateway dipping. Operation of the prototype cylindrical dewatering screen requires using excess water from the juvenile collection channel primary dewatering structure. The cylindrical dewatering screen will not be completed prior to the water-up of the juvenile bypass facility. This study will not impact project operations.

APPENDIX A: ICE HARBOR

Ice Harbor Dam

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during spring and summer outmigration seasons, in accordance with spill specifications in the NMFS Biological Opinion on hydrosystem operations (Appendix E as updated in 2000 through ESA consultation and the TMT Water Management Plan. Special daytime and nighttime spill patterns may be implemented to control dissolved gas levels to agreed upon levels or to reduce tailrace eddy conditions, while attempting to achieve desired spillway discharges. Alternative spill patterns to reduce TDG levels or to change tailrace conditions for fish passage should be coordinated through the TMT.

1.2. Spillway Tainter Gate Inspection. A Contractor will inspect all the Ice Harbor spillway tainter gates during October through December 2000, outside of the spill season. Each spill gate will be taken out of service one at a time and inspected. A clearance tag will be issued and stop logs installed to unwater each spill gate for inspection. All wells, beams, and welds will be inspected.

2. Studies.

2.1. Spillway Survival Study. A combination of radio tags and PIT tags will be used to evaluate spillway survival at Ice Harbor and to partition relative survival between Ice Harbor and McNary dams. Two different spill levels may be evaluated as part of this study. Fish will be tagged at Lower Monumental Dam and released into the spillway and tailrace at Ice Harbor Dam. Fish will be monitored with radio receivers through the McNary reservoir and the PIT tag detection system at McNary Dam. Release hoses and support equipment will be installed in the spillway and tailrace at Ice Harbor Dam by April 1 and will remain in place until August. Stable flow conditions will be required for one hour prior to and after fish releases.

2.2. High Velocity Prototype Separator Study. The new prototype high velocity fish separator will be evaluated during 2000. Juvenile fish passing through the juvenile bypass system will be periodically diverted through the test facility as part of the evaluation. During non-test periods, juvenile fish will be bypassed through the main juvenile bypass flume. The study may require early operation of the prototype separator to test hydraulic conditions and new modifications prior to the juvenile

fish bypass season. During flow evaluations, all fish passing through the facilities will be bypassed directly back to the river with no additional handling.

2.3. Evaluation of Adult Salmon and Steelhead Migration Past the Snake and Columbia River Dams. Idaho Cooperative Fisheries Research Unit will monitor the passage of adult salmonids through the hydrosystem. Two spill levels may be evaluated at Ice Harbor Dam, 45 kcfs and 110 kcfs, to determine passage effectiveness with the newly completed spillway deflectors and training wall. Holding of adult fallbacks within the juvenile collection channel will also be evaluated. The study requires the installation of radio receivers and data loggers throughout the fishways and various locations on the dam. Equipment installation will occur prior to the fish season and is not expected to require special project operations. During March through November 2000, access needs to be provided at the tailrace and fishways for regular downloading of radio receivers.

2.4. Evaluation of Homing of Transported Fish and of Adult Fish Migration Characteristics. If there are an insufficient amount of tagged adult fish which enter the Snake River, supplemental tagging of adult fish is proposed for the evaluation of homing of transported fish and the evaluation of adult fish migration characteristics (depth and temperature monitoring tags). This will require the operation of the adult trap located in the Ice Harbor south shore fish ladder.

APPENDIX A: LOWER MONUMENTAL

Lower Monumental Dam

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the spring outmigration season under certain conditions of higher flow, according to specifications in the NMFS Biological Opinion on hydrosystem operation (Appendix E) as updated in 2000 through ESA consultation and the TMT Water Management Plan. Special nighttime spill patterns may be implemented to control dissolved gas levels to agreed upon levels, while attempting to achieve desired spillway discharges. Alternative spill patterns to reduce TDG levels or to change tailrace conditions for fish passage should be coordinated through the TMT. Nighttime spill levels may be reduced or curtailed for short periods of time on a daily or every other day basis in order to provide safe conditions for the towboat and fish barge to travel to and from the juvenile fish facilities and for loading the fish barge. Depending on flow levels, Lower Monumental pool may also need to be manipulated above MOP in order to control spill while the fish barge is loading.

1.2 Rewedging Generator Coils. The generator coils for turbine units 4, 5, and 6 at Lower Monumental will be rewedged beginning July 1, 2000, with completion expected around the end of December 2000. This work requires partially disassembling the generators. More than one turbine unit at a time may be taken out of service for this work.

1.3. Stilling Basin Survey. A hydrographic survey of the Lower Monumental stilling basin will take place during August or September 2000. This work should take approximately 1 day (6 to 8 hours). Acoustic mapping techniques will be used to map areas of erosion within and around the stilling basin. The survey will be conducted at night and special operations will be required to minimize flow through the stilling basin area. No spill will be allowed and turbine units on the north end of the powerhouse will be operated. Fishway auxiliary water may need to be curtailed for short periods of time while areas near the fishway entrances are being surveyed.

1.4. PIT Tag Modifications. The Lower Monumental juvenile fish facility PIT tag detection system will be modified prior to the 2000 juvenile bypass season (during the winter maintenance period). A new electrical power supply and communication system will be installed. Also, new electronics and antenna coils will also be installed as part of the change to the 134.2 kHz ISO system.

2. Studies.

2.1. Evaluation of Adult Salmon and Steelhead Migration Past the Snake and Columbia River Dams. Idaho Cooperative Fisheries Research Unit will continue to monitor the passage of adult salmonids through the hydrosystem. The 5 floating orifices (1,3, 5, 7, and 9 numbered from north to south) will be closed prior to the 2000 fish passage season. Once the orifices are closed, there will be no impact to project operations. The study requires the installation of radio receivers and data loggers throughout the fishway and various locations on the dam. The installation of equipment will take place prior to the fish passage season and is not anticipated to require special project operations. During March through November 2000, access needs to be provided at the tailrace and fishways for regular downloading of radio receivers.

2.2. Ice Harbor Spillway Survival Study. Juvenile fish will be removed from the Lower Monumental Dam daily sample and tagged with radio tags and PIT tags for a spillway survival study at Ice Harbor Dam.

APPENDIX A: LITTLE GOOSE

Little Goose Dam

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the spring outmigration season under certain conditions of higher flow, according to specifications in the NMFS Biological Opinion on hydrosystem operation (Appendix E) as updated in 2000 through ESA consultation and the TMT Water Management Plan. Special nighttime spill patterns may be implemented to control dissolved gas levels to agreed upon levels, while attempting to achieve desired spillway discharges. Alternative spill patterns to reduce TDG levels or to change tailrace conditions for fish passage should be coordinated through the TMT.

1.2. Repair of Powerhouse Transformers. The two banks of powerhouse transformers (T1 and T2) at Little Goose Dam require maintenance in 2000. The work includes replacing the seals on the transformer bushings, fixing oil leaks, and purifying the oil in the transformers. Warm, dry weather is required for this work as the transformers will be open and exposed to the weather. The maintenance work on each transformer is expected to take approximately 6 weeks to complete. T2 is scheduled to be maintained first, from approximately August 1 through September 15, and will require the outage of turbine units 5 and 6. During this work period, turbine units 1 through 4 will remain in operation and should be capable of passing river flows. Turbine units 1 through 4 will be out of service when T1 is maintained, between approximately September 15 and October 31. During the work period, turbine units 5 and 6 will remain in operation and should be capable of passing river flows.

1.3. Spillway Tainter Gate Inspection. A contractor will inspect all the Little Goose spillway tainter gates during January and February 2000, outside of the spill season. A clearance tag will be issued and stop logs installed prior to dewatering and inspecting each spillway tainter gate. Each spill gate will be taken out of service one at a time and inspected. All wells, beams, and welds will be inspected.

1.4. Installation of Forebay Debris Boom. A new forebay debris boom will be installed at Little Goose Dam between January and February 2000.

1.5. PIT Tag Modifications. The Little Goose Juvenile Fish Facility PIT tag detection system will be modified prior to the 2000 juvenile bypass season (during the winter maintenance

period). A new electrical power supply and communication system will be installed. New electronics and antenna coils will also be installed as part of the change to the 134.2 kHz ISO system.

2. Studies.

2.1 Fish Guidance Efficiency Testing. The perforated plate panel for the ESBSs have been redesigned to minimize vibration and bolt shearing. During 2000, 3 ESBSs will be outfitted with new perforated plate panels and their fish guidance efficiency (FGE) will be compared to 3 ESBSs with standard perforated plate panels. FGE tests will be in the B slots only. There will be a test screen in the B slot for turbine unit 1 and a control screen in the B slot for turbine unit 2. Turbine units 3-4 and 5-6 will have test screens and control screen paired in the same manner. Transducers will be installed on the ESBS frames with the ESBSs at deck level or in the screen repair pit prior to the fish passage season. Three screen swaps are planned during the test. Test and control screens will be swapped within the pairs. This will require turbine unit outages, most likely two at a time for 8 to 10 hours. Malfunctioning transducers may need to be repaired or replaced. This will require a turbine unit outage. The project will attempt to operate the turbines in pairs when possible.

2.2. Evaluation of Adult Salmon and Steelhead Migration Past the Snake and Columbia River Dams. Idaho Cooperative Fisheries Research Unit will continue to monitor the passage of adult salmonids through the hydrosystem. The 4 floating orifices (1, 4, 6, and 10 numbered from south to north end) will be closed prior to the 2000 fish passage season. The study requires the installation of radio receivers and data loggers throughout the fishway and various locations on the dam. The installation of equipment will take place prior to the fish season and are not anticipated to require special project operations. During March through November 2000, access needs to be provided at the tailrace and fishways for regular downloading of radio receivers.

APPENDIX A: LOWER GRANITE

Lower Granite Dam

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the spring outmigration season under certain conditions of higher flow, according to specifications in the NMFS Biological Opinion on hydrosystem operation (Appendix E) as updated in 2000 through ESA consultation and the TMT Water Management Plan. Special nighttime spill patterns may be implemented to control dissolved gas levels to agreed upon levels, while attempting to achieve desired spillway discharges. Alternative spill patterns to reduce TDG levels or to change tailrace conditions for fish passage should be coordinated through the TMT. During periods of high river flow, spill volumes and the elevation of Lower Granite reservoir may need to be manipulated on a daily or every other day basis to provide safe conditions for loading the fish barge at the juvenile fish facilities below the dam.

1.2. Surface Bypass Collector Operation. The surface bypass collector constructed in 1996 along with the simulated Wells intakes and the behavioral guidance structure will be tested during the spring of 2000. Anticipated operation of the surface bypass collector (SBC) includes passing 4,000 cfs through the structure and spillbay 1 along with approximately 2,000 cfs through spillbay 2 as training flow. During the spring juvenile fish spill period (paragraph 1.1 above), 20% of the instantaneous flow daily average flow will be spilled, including surface collector flow. The SBC will be tested with high and low turbine operation (turbine units 4 and 5) as a test variable. During testing, project operators will be requested to stay as close to the upper and lower ends of the 1% efficiency curve as possible. Turbine unit priority during the SBC test will be 4, 5, 1-3, 6. Four test conditions are proposed for 2000: 1) high turbine load and single entrance; 2) high turbine load and double entrance; 3) low turbine load and single entrance; and 4) low turbine load and double entrance. SBC operation will be continuous, except for entrance configuration changes, between about April 10 and May 27, 2000. These operations reflect options as included in an approved monitoring plan for 2000.

1.3. Rewedge Generator Coils. The Lower Granite generator coils for turbine unit 1 will be rewedged after July 1, 2000, and work completed before December 31, 2000. A four-month outage is required for rewedging. This work requires partially disassembling the generator.

1.4. Spillway Tainter Gate Inspection. A Contractor will inspect all of the Lower Granite spillway tainter gates from

approximately July 1 through the end of September 2000, outside of the spill season. A clearance tag will be issued and stop logs installed prior to dewatering and inspecting each gate. Spillway gates will be taken out of service one at a time and inspected. All wells, beams, and welds will be inspected.

1.5. PIT Tag Modifications. The Lower Granite juvenile fish facility PIT tag detection system will be modified prior to the 2000 juvenile bypass season (during the winter maintenance period). A new electrical power supply and communication system will be installed. New electronics and antenna coils will also be installed as part of the change to the 134.2 kHz ISO system.

2. Studies.

2.1. Evaluation of Juvenile Fish Transportation Versus In-River Survival. Juvenile spring/summer chinook and steelhead will be PIT tagged at the juvenile fish collection facility and then released into the river below the project for either in-river migration or collection and transportation at Little Goose Dam. Most fish will be tagged out of the east bank of raceways in NMFS's temporary tagging facilities. Tagging of fish from the raceways will be independent of any other facility sampling operations and will reduce the number of fish direct loaded into fish barges. At the beginning and end of the tagging operation, when fish numbers are low, fish will be tagged in the facility sampling room. This will require increasing the normal facility sampling rate in order to get the required number of fish on marking days. The adult fish trap will also be operated in 2000 to monitor adult returns of study fish tagged in previous years.

2.2. Evaluation of Adult Salmon and Steelhead Migration Past the Snake and Columbia River Dams. Idaho Cooperative Fisheries Research Unit will continue to monitor the passage of adult salmonids through the hydrosystem. Prior to the fish passage season, the submerged weirs in the lower end of the adult fish ladder will be modified to decrease the amount of flow over the top of the weirs and to increase flows through the orifices. It is hoped that this modification will reduce the rate of adult turn-around in the transition pool. This modification will remain in place throughout the fish passage season unless it creates poor passage conditions. This modification will be evaluated as part of the study. The study requires the installation of radio receivers and data loggers throughout the fishway and various locations on the dam. The installation of equipment will take place prior to the fish season and are not anticipated to require special project operations. During March through November 2000, access needs to be provided at the tailrace and fishways for regular downloading of radio receivers.