

February 2006

APPENDIX A

SPECIAL PROJECT OPERATIONS AND STUDIES

February 2006

February 2006

APPENDIX A: BONNEVILLE

February 2006

Bonneville Dam¹

1. Special Project Operations.

RCC will coordinate needed changes with the projects and authorize operations in teletype regulations.

1.1. Spring Creek Hatchery Release. The first hatchery release is expected to occur in early March, followed by special operations for juvenile fish passage as coordinated with the fish agencies through TMT. Project operations for fish passage will be defined by RCC teletype prior to the release.

1.2. Spill. Spill for fish passage will be provided during the spring and summer outmigration seasons in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM.

2. Studies.

2.1. Bonneville Rehab Biological Testing (also testing under the Turbine Survival Program. Currently, five (5) PH1 units have been rehabilitated with Minimum Gap Runner (MGR) Turbines. Units 1, 3-6 have been completed. Unit 2 is to return to service starting in late March 2006 and unit 10 was taken out of service in September. Prior to unit 2 returning to service it will need to be operated under several hydraulic loads for Hi-pot/exciter tests as well as heat runs for acceptance testing. These tests may involve testing above and below the 1% efficiency turbine limits for short periods of time in late February to early March. Load rejection tests maybe included in this sequence but are not always necessary. Average duration of acceptance testing is short, (less than 4 hours per test period) and normally is 7-14 days in length. Any testing outside of the proposed schedule above will be brought to the attention of the FPOM group for their approval and comment. Previous testing of the same nature has been approved through the FPOM program since the inception of the rehab program.

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2.2. Bonneville Dam Second Powerhouse TSP Sensor Fish Research

Program. During the month of March 2006, a two-day study will be completed by PNNL\DOE researchers along with Normandeau and Associates. The work entails releasing balloon tagged sensor fish through main unit 16 at the Second Powerhouse. Approximately 180 sensors will be released via a release hose into the turbine intake of the unit and retrieved in the B2 tailrace via recapture boats. No special unit operation outside the 1% turbine operating range will be needed nor requested. A short unit outage will be necessary to facilitate the installation of the release hose into the gateway slot.

2.3. Spillway Survival Study. Acoustic telemetry will be used to estimate the survival of yearling chinook salmon that pass through the spillway and dam. The purpose of this study is to evaluate the effect of spilling 100 kcfs 24-hours per day during the spring migration. No special operations will be required. Fish for this work will be collected at JDA and transported to TDA for holding and release. BRZ access to install fixed-site antennas will be required prior to the spill season. In-season battery changes will be necessary in the BON forebay equipment approximately every two weeks requiring a BRZ permit for forebay access.

2.4. PIT Detection Evaluation. As part of the Bradford Island ladder adult PIT tag detection system evaluations, 200-250 fall Chinook, Steelhead, and Coho will be radio-tagged in the AFF and release back into the ladder during the peak of the run from late August to mid September.

2.5. Lamprey Passage Evaluations. From early June to the end of August, 1000-2000 adult Lamprey will be captured and tagged with half-duplex PIT tags and released below the dam to evaluate overall passage, including use of the prototype Lamprey Passage Systems (LPS). During the winter maintenance period installation and movement of half-plex PIT detection systems will occur in both ladders. The prototype LPS at the downstream WA shore ladder entrance will be installed by the middle of May. A permanent version of the Bradford Island makeup water supply channel LPS will also be installed by the middle of May and run until at least October 1.

2.6. Adult Studies Evaluations. South Fork Salmon River hatchery summer Chinook, PIT-tagged for future spawning success evaluations in previous years, will be separated by code at the AFF, morphometrically measured, and a subsample will have a miniature temperature recorder attached to the dorsal fin. Resampling of these fish will occur at LGR and on the spawning grounds.

2.7 Sea Lion Predation. Beginning when the first sea lion return to Bonneville Dam until the last sea lion leaves, usually mid-February until June 1, exclusion gates will be installed at all downstream slots of all entrances. During the in-water work period and into March, acoustic deterrent devices will be mounted in quiet water locations in the vicinity of ladder entrances. In addition, NMFS-approved sea lion harassment activities will occur from land during sea lion season. From about mid-March to mid-May a random-block design test of acoustics and harassment vs. no acoustic and harassment will occur to test the efficacy of these sea lion deterrent efforts. Around 350 spring Chinook will be radio-tagged and released during the spring run to see if there are any negative effects on fish passage from the efforts being taken to reduce predation by sea lions.

2.8. 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 evaluations may not proceed. Therefore, a final description of studies and outages being conducted will be coordinated with the region through AFEP (FFDRWG and SRWG), prior to April 1. All special operation requests or schedule changes will be coordinated with the fisheries agencies and tribes through the AFEP and with RCC and BPA.

February 2006

APPENDIX A: THE DALLES

February 2006

The Dalles Dam¹

1. Special Project Operations

RCC will coordinate needed changes with the projects and authorize operations in teletype regulations.

1.1. Spill. Spill for fish passage will be provided during the spring and summer outmigration seasons in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. New spill patterns were developed in 2003 for the modified spillway that will put most of the spill discharge through Bays 1-6.

2. Studies.

Four research efforts will occur in 2006 including: 1) a survival study to determine the effects of a vortex that forms during spillway operation in Bay 6 will occur in mid-April to early May; 2) a pilot study to assess the survival and detection probability of acoustic-tagged fish released below The Dalles Dam; 3) a hydroacoustic study during the entire fish passage season at spill bays 1-6 to determine the distribution of fish passing through the spillway; and 4) a radio-telemetry study to evaluate fish behavior and survival following passage through the spillway.

2.1. Spillwall Evaluation. A direct survival and injury evaluation using balloon tags for yearling Chinook released into Bays 4 and 6 will start in late April and conclude in early May. As part of this study, autonomous sensors will also be released through the Bay 6 release hose and recaptured in the spillway tailrace. BRZ access to track fish in the tailrace and release controls will be required. For the acoustic-tag pilot study, no special operations will be required. Fish for this work will be collected at JDA and transported to TDA for holding so some space may be required near a water source. A spillway passage survival evaluation using radio-telemetry for yearling Chinook released in the forebay may occur. BRZ access to install fixed-site antennas will be required prior to the spill season. And finally, a hydroacoustic study may occur during the fish passage season to determine the horizontal and

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vertical distribution of fish passing over the spillway. Special operations are not anticipated but will be coordinated if needed for this effort.

2.2. Adult Lamprey Studies Exit area half-duplex PIT antennas and receivers will be placed to monitor adult lamprey passage.

2.3. Equipment Installation and Maintenance.

Installation of hydroacoustic transducers and radio telemetry equipment will begin in January 2006 at The Dalles Dam. Installation of hydroacoustic transducers in Spill bays 1-6 will not require divers or outages of units but will require access into the BRZ.

Geotechnical evaluation and exploration of potential anchor locations for a BGS prototype will be performed during the in-water work period in TDA forebay starting in February. This work will require a barge mounted drill rig for borings and may require in-season outages. BRZ access will be required.

2.4. 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 evaluations may not proceed. Therefore, a final description of studies and outages being conducted will be coordinated with the region through AFEP (FFDRWG and SRWG) prior to April 1. All special operation requests or schedule changes will be coordinated with the fisheries agencies and tribes through the AFEP and with RCC and BPA.

February 2006

APPENDIX A: JOHN DAY

February 2006

John Day Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the spring and summer outmigration seasons in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM.

2. Studies.

2.1. Fish passage studies planned for John Day in 2006 include: 1) an acoustic-tag study to estimate survival through a turbine unit and the immediate tailrace of JDA. No special operations will be requested for this work. This study will begin in late April with releases of yearling chinook salmon and will end in June. Following the spring work subyearling chinook salmon will be released in the tailrace of JDA to estimate survival and detection probabilities below JDA for calculation of sample sizes for future survival studies. Fish for this study will be collected and tagged at the JDA SMF. Holding of fish prior to release will also be required. 2) Biological Index Testing will be conducted at JDA in 2006 to include the release of balloon-tagged fish and sensor fish through a single turbine unit at 3 operating points (peak efficiency, the lower portion of the 1% range, and the upper portion of the range). Releases for this work are currently scheduled to be complete by the start of the spill season (10 April). Currently, Unit 9 is planned for testing under both studies and a release mechanism will be installed prior to the start of the early survival work. A short unit outage will be necessary to facilitate the installation of the release hose into the gatewell slot. A release mechanism will be required for the front-roll release and will be installed in April prior to the spill season and removed following the last release in late May. Special operations and/or outages required for installation and removal of release equipment will be coordinated through the FPOM group.

2.2. Adult Lamprey Studies Exit area half-duplex PIT antennas and receivers will be placed to monitor adult lamprey passage.

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2.3. 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 evaluations may not proceed. Therefore, a final description of studies and outages being conducted will be coordinated with the region through AFEP (FFDRWG and SRWG), prior to April 1. All special operation requests or schedule changes will be coordinated with the fisheries agencies and tribes through the AFEP and with RCC and BPA.

February 2006

APPENDIX A: MCNARY

February 2006

McNary Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. During periods of high river flow, spill volumes and the elevation of McNary 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 facility below the dam.

1.2. Doble Tests. Two transformer banks and their respective turbine units will be taken out of service for Doble testing in 2006: T2, units 3 and 4; and T5, units 9 and 10. The outages are tentatively scheduled for August 7-9 for T2 and August 14-16 for T5.

1.3. Rehabilitation of Spillway Gates. Rehabilitation of three or four spillway gates is scheduled to begin in May or June 2006, if funding is available. The work involves resurfacing wheels, installing low-friction seals, and painting. One gate would be rehabbed at a time, over about a four-week period. A gate would be removed from its slot for rehab and be replaced with a spare gate. This swapping of gates would require a four to six hour outage in one spillway bay at a time, about one swap per month. All 22 spillway bays would be operable except during the gate swap.

1.4. Rehabilitation of Auxiliary Water Supply Pump 3. Bearing failure on pump 3 has caused significant damage to the guide bearings and pump shaft. A construction contract for repairs was awarded in November 2005. Approximately ten months are required to complete the disassembly and repair of the pump, with a return to service anticipated in August 2006. Pumps 1 and 2 will be available for spring passage and all three pumps available for the fall season. Fishway criteria can be maintained with only two of the three pumps operating.

1.5. Reconstruction of Washington Shore Fish Counting Station. The fish counting station will be reconstructed from January 12 to March 31, 2006, requiring a ladder outage during this time. The fish guidance structure and fish counting window will also be

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modified to incorporate three "window" style PIT antennas to provide improved detection of adult fish passage. The Oregon shore ladder will continue to provide fish passage, except from January 9-19 when it will be out of service for maintenance.

2. Studies.

2.1. Evaluation of Prototype Traveling Vertical Barrier Screen.

Evaluation of a prototype traveling vertical barrier screen will continue in 2006. Prior to the evaluation, an outlet flow control (OFC) device will be constructed and installed in the unit 4A headgate slot. The OFC will allow gatewell discharge to be regulated as unit discharge increases. In addition, a new orifice trap, identical to the unit 4 trap constructed in 2005, will be constructed in unit 5. Construction of the new trap will begin in January and be completed prior to water-up of the collection channel. Using identical traps to sample A-slots in units 4 and 5 will enable more direct comparisons of descaling to be made between standard and prototype VBSSs. Condition of run of river fish will be monitored in both units 4 and 5 beginning in April and continuing through July. Unit 4 will be operated under a 2-day randomized block study design alternating randomly between high (80 MW, outside 1% range) and low (62 MW, upper 1%) unit discharge treatments. Unit 5 will operate continuously at 62 MW throughout the evaluation. A unit operations treatment schedule will be developed prior to study.

2.2. Evaluation of Juvenile Salmonid Passage and Survival.

A passage and survival study to evaluate 12- (UPA) versus 24-hour spill will be conducted during the spring of 2006. During the summer, evaluation will continue of two project operations yet to be determined. Equipment setup and installation requiring diving and considerable boat activity in the forebay BRZ will begin in February and continue through mid-April. The spring evaluation will begin in April and continue into early June. Summer evaluation will begin later in June and continue until August. During the evaluation, juvenile salmonids will be collected at the juvenile fish facility for tagging. The facility will alternate between days of primary bypass and secondary bypass in the spring (April 1 to approximately June 20). Within this time period (approximately April 17 to June 9) during days of primary bypass, the facility will switch to secondary bypass for up to a few hours each day to collect additional fish for tagging. Tagged individuals will be released upstream of the project and monitored as they enter the forebay and pass the project. Also during the evaluation, boat access to the forebay BRZ will be required regularly for equipment maintenance. Regional coordination will be ongoing to determine an appropriate 24-hour

spill level for spring and operations for summer. A spill operations treatment schedule will be developed prior to study.

February 2006

APPENDIX A: ICE HARBOR

February 2006

Ice Harbor Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. Also see paragraph 2.1 below for scheduled testing of the new removable spillway weir.

1.2. Doble Tests. To complete Doble testing in 2006, line 3 and turbine units 5 and 6 will be taken out of service. The tentative dates are September 11-14.

1.3. Index Testing. Index testing of two turbine units is scheduled for 2006. The testing of one unit in one of the families is scheduled for January 2006 and another unit in the other family in March 2006. Units 1 to 3 are in one family, and units 4 to 6 in another. The purpose of index testing is to determine turbine unit performance so that the unit can be operated at peak efficiency.

1.4. North Shore Adult Fishway - Rehabilitation of Auxiliary Water Supply Pump 2. The gear reducer for pump 2 failed on October 31, 2005 due to a fractured input shaft. Repair requires disassembly of the motor and gear reducer from the pump shaft, and returning the gear reducer to the factory. A minimum repair schedule of two months is anticipated, beginning in December 2005. More repair time will be required if new gears must be fabricated. Normally, only two of the three AWS pumps are operated. However, the north shore fishway will not have one-pump redundancy with pump 2 out of service.

2. Studies.

2.1. Removable Spillway Weir (RSW) Passage and Survival Evaluation. A new RSW was installed in spillbay 2 at Ice Harbor in 2005. Radio telemetry, hydroacoustic and balloon tag studies will estimate the passage and survival rates of fish passing over the RSW, spillway and through the powerhouse. The tainter gate at spillbay 2, when operated, will be either fully open or fully closed. The flow over the RSW will be regulated by the project

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forebay elevation and not by the tainter gate. Projected flow through the RSW at the anticipated forebay elevation of MOP + 1 foot will be around 8,000 cfs. Project operations (spill levels and possibly patterns) will change according to a randomized block schedule. Details of the schedule and operations are not available at this time, but will be developed through the SRWG and FFDRWG. Spill operation will likely involve two operations including the RSW and varying levels of "training" spill. Specifics will be coordinated with the fishery agencies and others as needed.

2.2. Smolt Responses to Hydrodynamic and Physical Characteristics of Forebay Flow Nets Upstream of Surface Flow Outlets. This study by Battelle will examine fish movement and hydraulic variables upstream of the removable spillway weir (a "surface flow outlet" similar to the corner collector at Bonneville Dam and sluiceway at The Dalles Dam). DIDSON and ADCP equipment will be installed on a barge for data collection. The barge will be anchored to one of the piers adjacent to the RSW. Installation activities will be coordinated with dam operations. Barge access by researchers after installation will only occur if electronic problems need to be fixed and will be coordinated with project staff. The barge can be accessed via a man basket picked from a crane. A trailer will be placed on the spillway to control and operate equipment. Deployment of the barge and equipment would need to occur during February-March. Data collection will focus on determining a water velocity threshold that causes rejection at surface flow entrances and providing hydraulic guidelines for future designs. A similar study will take place at Lower Granite Dam.

February 2006

APPENDIX A: LOWER MONUMENTAL

February 2006

Lower Monumental Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. During periods of high river flow, spill volumes and the elevation of Lower Monumental 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 facility below the dam.

1.2. Dam Safety Inspection. The Corps will inspect concrete structures and embankment riprap upstream and downstream from Lower Monumental Dam on April 11, 2006. Low forebay and tailwater elevations, and perhaps a 4-8 hour spill stoppage, will be needed during the inspection. This will be coordinated through the RCC. The spillway backup emergency generator may also be tested the same day, or up to 30 days prior to April 11. This involves briefly opening and closing as many spillway gates as possible over a 1-2 stop range.

1.3. Doble Tests. Transformer bank T2 is scheduled to be Doble tested July 24-28, 2006. This will involve all generation of all six turbine units for part of the first day only. One turbine unit will be running at speed-no-load to provide station service. After that, units 1-4 will be available for generation. Units 5 and 6 will be off line the duration of the week.

2. Studies.

2.1. Lower Monumental Survival Study. A radio telemetry survival study will be conducted with yearling Chinook through Lower Monumental Dam during the spring of 2006. Radio telemetry equipment setup will begin in February and continue until mid-April. Smolts will be radio tagged, released upstream of the project, and monitored as they pass the project beginning in mid-April. Spill using a high-gate opening alternate bay configuration will be evaluated to confirm acceptable spillway survival under the operation.

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2.2. Evaluation of Bulk Spill for Direct Injury Using Balloon Tagged Juvenile Salmonids. Hi-Z balloon tag tests can be used to quickly evaluate a passageway to determine if direct injury is occurring. This work will be undertaken during spring at a time when it does not interfere with radio tag survival study fish. Spill requirements for this study is interrupted and discontinuous, needing to be shut down to recover research fish in the tailrace. Setup will occur for approximately one week before the testing begins, likely in late May.

2.3. Evaluation of Bulk Spill Passage at Lower Monumental Dam Using Sensor Fish. Sensor fish will be released during the same timing and conditions as the juvenile salmon used for the direct injury testing. Testing will therefore occur at a time during the spring not to interfere with radio tag survival studies. Sensor fish will precisely document the physical environment that smolts are being passed through for the direct injury testing. The setup will be identical to the direct injury study and will require nothing additional.

2.4. Effects of Stratification in the Lower Monumental Pool on Behavior of Subyearling Chinook During Summer. An acoustic tag study to look for correlation between subyearling Chinook movement and water circulation patterns is planned for the summer of 2006. Acoustic telemetry equipment will be set up during May-June for detection of fish movement within the forebay and areas upstream.

February 2006

APPENDIX A: LITTLE GOOSE

February 2006

Little Goose Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM.

1.2. Doble Tests. Transformer bank T1 will be Doble tested in 2006. This will involve all generation of all six turbine units. The plant will be off line from 0600-1700 hours each day from August 21 to 25. One turbine unit will be running at speed-no-load to provide station service. Transformer bank T2 will also be tested in 2006. Units 5 and 6 will be off line continuously each day from June 26 to 30. A short outage (2 hours) will be needed June 26 to isolate T2 bank from the system and hang clearance cards. Afterwards, the line will be restored.

2. Studies.

2.1 A Study to Determine Migration Behavior and Survival of Juvenile Salmonids. Using fish tagged and released at Lower Granite Dam, the goals of this study include: (1) Determine the timing and route of passage for yearling Chinook salmon, sub-yearling Chinook salmon and juvenile steelhead relative to spill and powerhouse operations; (2) Estimate route-specific survival of hatchery yearling and sub-yearling Chinook salmon and hatchery juvenile steelhead; (3) Determine the effects of dam operations (e.g. varying flows, pool levels, and spill volumes) on smolt approach paths in the forebay of Little Goose Dam. This includes passage and survival estimates during two treatments of dam operations.

During the in-water work window and before March 31 hydroacoustic transducers will be installed in order to monitor fish passage through all spill bays, through the turbines and the juvenile fish bypass system. The proposed hydroacoustic study may occur during the entire fish passage season at spill bays 1 - 8.

Radio tag antennas will be placed on the dam in order to cover all passage routes, as well as in the forebay and tailrace of Little Goose Dam. Trolley pipes need to be attached to the dam

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next to spill bays 1 and 8. Diving will be required for this work, requiring the shut down of turbine unit 6 adjacent to spill bay 1, as well as terminating any spill that may be occurring in spill bay 7. The research biologists may also need access to the BRZ for hydroacoustic transducer placement if barges are necessary to obtain the passage information needed.

February 2006

APPENDIX A: LOWER GRANITE

February 2006

Lower Granite Dam¹

1. Special Project Operations.

1.1. Spill. Spill for fish passage will be provided during the outmigration season in accordance with spill specifications in Appendix E and as coordinated through TMT. Alternative spill patterns to control dissolved gas levels or change fish passage conditions will be coordinated through the FPOM. 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 facility below the dam.

1.2. Dam Safety Inspection. The Corps will inspect concrete structures and embankment riprap upstream and downstream from Lower Granite Dam on May 23, 2006. Low forebay and tailwater elevations will be needed during the inspection and this will be coordinated through the RCC. The spillway backup emergency generator may also be tested the same day, or up to 30 days prior to May 23. This involves briefly opening and closing as many spillway gates as possible over a 1-2 stop range.

1.3. Doble Tests. Transformer bank T2 will be Doble tested in 2006. Transformer T-1 will be out of service concurrently to install 12 vapor guard "boots" on the buss work joints of the three phases. This will involve loss of all unit generation continuously from August 28 to September 2.

1.4. Fish Ladder Modification. The fish ladder's transition and junction pools will be modified in January and February 2006. New aluminum weir crests will be installed on the lower 11 weirs in the transition pool. The junction pool will be outfitted with new steel walls, two vertical picketed leads, and diffuser grating. The purpose is to improve adult fish passage by reducing delay as fish negotiate the two pools. The ladder is expected to be out of service from January 3 to February 17.

1.5. Adult Fish Trap Expansion. The Corps anticipates awarding a design-build contract for expanding the adult fish trap at Lower Granite. A contractor will design, construct, and performance test the new facility. Construction will begin in the fall of 2006, with completion by March 1, 2007. Fish passage and normal trap operations will not be affected during

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construction. A primary purpose is to provide additional holding capacity for obtaining fall Chinook broodstock.

1.6. Unit 2 Rewind. Unit 2 will be out of service from January 17 to November 30 for rewind work. The outage may extend into 2007.

1.7. Unit 4 Cavitation Repair. Unit 4 will be out of service from October 6, 2006 to March 6, 2007 for cavitation repair.

1.8. Spillway Gate Rehabilitation. If funding is available, the spillway gates will be rehabbed in 2006 and possibly 2007. One gate would be taken out of service at a time. Further regional coordination will occur when necessary.

2. Studies.

2.1. Removable Spillway Weir Operation. The Removable Spillway Weir (RSW) was installed in the summer of 2001. It underwent extensive biological testing in spring 2002 and 2003. During February and March 2004, the Behavioral Guidance Structure was moved to the north two units and the depth decreased along part of its length. The 2006 biological test will likely take place between mid-April and early June. The expected forebay elevation during testing will be between 734 and 735 feet, providing approximately 6,700 to 7,700 cfs over the RSW. A specific study design has not been finalized at this time, but will likely involve 24 hour per day operation of the RSW, along with some level of "training spill", most likely around 12 kcfs. Monitoring will likely consist of radio-telemetry and hydroacoustics. Monitoring will focus on RSW efficiency and effectiveness, and fish behavior in the vicinity of the RSW and relocated BGS. The evaluation may involve periodic removal of the BGS, which would likely result in short-term (1 - 3 hours) outages at units 5 and 6. A summer test of the RSW and BGS may also take place. This would occur sometime between mid-June and late July and would most likely run for 3 or 4 weeks. Radio-telemetry and hydroacoustics would again be used to assess RSW performance. Project operations would most likely include the RSW (between 6,000 and 7,700 cfs) and some level of training spill, 24 hours per day.

2.2. A Study to Compare SARs of In-river Migrating Versus Transported Snake River Juvenile Salmonids. The goal of this study is to compare SARs of Snake River juvenile salmon that migrate in-river compared to those transported around dams of the FCRPS. In 2006, approximately 30,000 wild yearling Chinook salmon and 30,000 wild steelhead will be PIT-tagged at Lower Granite Dam for a transportation group. Also in 2006, the BPA

funded "survival" study will mark and take lengths of approximately 10,000 wild yearling Chinook and steelhead at Lower Granite Dam to be released into the tailrace for the in-river group. Recapture and measurement of in-river migrants at Bonneville Dam will estimate migration growth rates.

2.3. A Study to Compare SARs of Snake River Fall Chinook Salmon Under Alternative Transportation and Dam Operational Strategies.

The goal of this study is to provide statistically valid information on SARs of Snake River fall Chinook salmon under two alternative management strategies: transportation and in-river migration under prevailing operational conditions. A component of this study will compare SARs of PIT-tagged wild and surrogate-sized hatchery-reared subyearling Chinook salmon. The separation-by-code system at Lower Granite will be used to recapture at least 30 fish to calculate condition factor and growth.

2.4. A Study to Understand the Early Life History of Snake River Fall Chinook Salmon.

In 2006, as part of the study to compare SARs of Snake River fall Chinook salmon under alternative transportation and dam operational strategies, NOAA Fisheries will collect scale samples and fork length data from PIT tagged fall Chinook salmon at the adult trap from mid-August through the fall trapping season. Prior to the return of adult fall Chinook salmon, PIT tag codes of all tagged juveniles will be added to the sort-by-code system. Coordination with operations for adult collection will be required at Lower Granite Dam when adults are collected. All activities will be coordinated with other researchers and managers to minimize impacts from this research.

2.5. Alternate Barge Release Strategies.

In 2006, NOAA Fisheries will PIT tag yearling Chinook salmon and steelhead to evaluate if an alternate release site for barged fish improves survival. In addition, Battelle will acoustically tag 2,000 fish. The study will require one 2000 series barge for transporting the smolts downriver to near Astoria Bridge for release, and a separate towboat will be contracted to move this barge downriver for the release. The control group will be transported in a barge hold with all other collected fish for release at Skamania. Six separate alternate site releases on an ebb tide are planned and tagging will occur five days prior on the following dates (Sundays): 4/23, 4/30, 5/7, 5/14, 5/21, 5/28. Tagging will require the use of an additional raceway for the fish being loaded onto the 2000 series barge. Arrangements have been made to use the NOAA PIT tagging buildings and personnel for the PIT marking. Acoustic marking and BKD sampling will need to take place either in the wet lab or the shed used for gas bubble monitoring. This study may require an increase in the normal

facility sampling rate in order to get the required number of fish on marking days. The study will require coordination with other onsite researchers and the project biological staff and this effort has already been initiated.

2.6. Smolt Responses to Hydrodynamic and Physical Characteristics of Forebay Flow Nets Upstream of Surface Flow Outlets. This study by Battelle will examine fish movement and hydraulic variables upstream of the removable spillway weir (a "surface flow outlet" similar to the corner collector at Bonneville Dam and sluiceway at The Dalles Dam). DIDSON and ADCP equipment will be installed on a barge for data collection. The barge will be anchored to one of the piers adjacent to the RSW. Installation activities will be coordinated with dam operations. Barge access by researchers after installation will only occur if electronic problems need to be fixed and will be coordinated with project staff. The barge can be accessed via a man basket picked from a crane. A trailer will be placed on the spillway to control and operate equipment. Deployment of the barge and equipment would need to occur during February-March. Data collection will focus on determining a water velocity threshold that causes rejection at surface flow entrances and providing hydraulic guidelines for future designs. A similar study will take place at Ice Harbor Dam.