# Fish Passage Plan (FPP) Change Request Form

**Change Form # & Title**: 19 AppI 001 – Add new Project Section for Dworshak

**Date Submitted**: 5/9/17; REVISED 12/18/17; 11/30/18; Last Revised 12/18/18

**Project**: Dworshak

**Requester Name, Agency**: Ann Setter, Corps NWW

**STATUS**:

**FPP SECTION**: New project section to merge with existing Appendix I.

**JUSTIFICATION**: Need guidance to manage operations to protect adult fish during operational testing and maintenance.

**PROPOSED CHANGE**: *see draft Appendix I on following pages.*

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

6/8/17 FPOM: The idea behind this change form is to provide dates when fish are present in order to plan maintenance. Dates are in the draft form; general run timing is included too. Setter clarified that the Corps will monitor all testing, even when air depression is used. FPOM coordination will only occur if testing requires “speed no load” (SNL) for an extended period. After one year of monitoring all testing (through June 2018), the Corps will bring the issue back to FPOM to consider revising the monitoring level. The project verified that using the air depression system doesn’t harm units. Conder would like to talk with IDFG and Nez Perce before sending comments. The language should read that risk is extremely minimal, not no risk.

12/18/17 FPOM Task Group meeting: Participants included Setter, Peery, Holdren, Chatfield, Stewart, Tuell, Wright, Conder, Bettin, Hesse, Statler, Morrill, Kiefer, and Van Dyke. After discussion, the recommendation is to continue monitoring unit testing, at least through fall 2018, then re-evaluate and revise the criteria as necessary based on collected data and observed fish impacts.

11/14/18 FPOM Task Group meeting: Participants included E. Van Dyke, J. Hesse, L. Sullivan, T. Condor, S. Bettin, J. Renholds, B. Johnson, L. Wright, B. Bellerud, E. Holdren, J. Thompson, C. Peery, C. Morrill, J. Chatfield, L. Stewart, D. Swank, R. Kiefer, A. Setter. Key points [18 DWR 07] from meeting discussion were distributed to FPOM, FPP change form will be updated and redistributed for any further comment and approval.

2/7/19 FPP Meeting: FPOM needed more time for review. Will be added to the agenda for next week’s FPOM meeting on 2/14. Charles Morrill, WDFW, via email: “Since this is a draft and follows the Dec meeting/conf call, perhaps a review, discussion and approval at Feb 14 FPOM is merited. If other co-managers are ok with current draft language, then WDFW is ok with approval.”

**Record of Final Action**:

**Dworshak Dam (DWR)**

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| **Project Acronym \*** | DWR |
| **Location** | North Fork Clearwater River (RM 1.9) - Ahsahka, ID |
| **Reservoir** | Dworshak Reservoir |
| **Available Flood Storage Space** | 2,016 kaf |
| **Forebay Normal Operating Range (ft)** | 1,445’ – 1,600’ |
| **Minimum Instantaneous Flow (kcfs)** | 1.0 kcfs |
| **Tailrace Rate of Change Limit (ft)** | 1 ft/hr at Peck gauge |
| **Turbine Units** | 3 Francis turbines |
| **Turbine Generating Capacity (MW)** | 400 MW (Units 1, 2 @ 90 MW each + Unit 3 @ 220 MW) |
| **Powerhouse Hydraulic Capacity (kcfs)** | 10.5 kcfs |
| **Spillbays (#)** | 2 Spill Gates + 3 Regulating Outlets (RO) |
| **Spillway Hydraulic Capacity (kcfs)** | Spill Gates = 150 kcfs; ROs = 40 kcfs |

\*Acronym designated by the US Army Corps of Engineers, Northwestern Division.

1. fish
   1. **Fish Hatcheries**
      1. Dworshak Dam was constructed without fish passage facilities and blocks access to anadromous fish spawning habitat on the North Fork Clearwater River above the dam. To mitigate for the loss of habitat, the Corps built the Dworshak National Fish Hatchery (DNFH) downstream of the dam at the confluence of the North Fork and Clearwater rivers. The DNFH is co-managed by the U.S. Fish & Wildlife Service and Nez Perce Tribe to raise B-run steelhead smolts for annual release. The Nez Perce Tribe also raises coho at DNFH. The DNFH and Clearwater Fish Hatchery (CFH) also raise and release both spring Chinook and B-run steelhead as part of the “*Lower Snake River Compensation Plan*”. The CFH is solely operated on reservoir water and shares any excess with DNFH. Providing water that is free of IHN disease is critical for successful hatchery operations.
      2. During large hatchery releases, the hatchery will coordinate with the Corps to request sufficient outflow from Dworshak Dam to promote downstream migration.
      3. The Corps NWW Water Management will notify hatchery staff when flows in the North Fork Clearwater River are anticipated to have elevated levels of total dissolved gas (TDG).
   2. **Adult Fish**
      1. Adult steelhead and spring Chinook often migrate up into the North Fork Clearwater River and hold below the dam as they physiologically stage for spawning, then migrate out to spawning areas. Adult steelhead are generally present in the tailrace from October through March, and adult spring Chinook from June through August.
      2. An investigation into adult steelhead mortalities that occurred in November 2016 (see *Memo for the Record* 16DWR01[[1]](#footnote-1)) indicated that fish may be able to swim into the draft tube during extended periods of low flow through a unit (e.g., multiple starts and stops for testing) and come into contact with the spinning turbine runner. As a result of this incident, the fish protection measures described below will be implemented.
2. Turbine Unit operations & Maintenance (O&M)
   1. **General**
      1. Hydroelectric power generation relies on converting mechanical energy, in the form of pressurized water, into electrical energy – water comes into contact with the turbine runner and supplies the mechanical energy to spin the unit. When starting a unit, water fills the draft tube and starts to spin the unit, providing a potential pathway for adult fish to reach the spinning turbine runner at a time when water velocity in the draft tube is relatively slow. To minimize any potential for injuring or killing adult fish, the project will implement fish protection measures during turbine operations, maintenance, and testing, as described below.
   2. **Turbine Unit Operations**
      1. Turbine units may be operated year-round in any order through their full operating range, within the appropriate ramping rates defined in the Water Control Manual.
      2. Units are operated at “speed no load” (SNL) after initial startup (opening the wicket gates) during the time it takes to adjust the generator voltage and frequency to synchronize with the grid. Before any generator breaker can be closed, the frequency (which is directly related to the speed the unit is rotating) and voltage must be adjusted to match the frequency and voltage of the Bulk Electrical System (BES) on the other side of the breaker. The time of response to voltage control impulses tends to be similar for various machines; however, the time of response to frequency (speed) control impulses varies fundamentally with the type and size of the machine. The generators at Dworshak Dam have large moments of inertia and long penstocks (water starting time) and the voltage and frequency must be adjusted multiple times to allow the generator to react to each adjustment in order to match the BES prior to closing the breaker. This process is called synchronizing the unit. *Due to the size and type of machines at Dworshak Dam, the duration of SNL from starting a unit to synchronizing with the grid may be up to 5 minutes.*
      3. Whenever starting or stopping a unit, the draft tube depression system will be used before opening the wicket gates (startup) or after closing the wicket gates (shutdown) in order to prevent adult fish from impacting the runner. The system uses compressed air to maintain the water level in the draft tube below the runner and takes approximately 30 seconds to 1 minute after initiation to lower (depress) the water to about 6 feet below the runner. Fish are prevented from contacting the runner in less time, as soon as the water level is below the runner.
      4. BPA may request that a unit operate in “synchronous condensed mode” (turbine is spun as a motor) for purposes of stabilizing the transmission system. The draft tube depression system is required during this mode. The request is situational and varies in frequency and duration.
   3. **Turbine Unit Maintenance** 
      1. If maintenance requires unwatering the draft tube, the project will implement procedures defined below in **Section 3** (*Fish Salvage Procedures for Turbine Unwatering*).
      2. Each unit requires annual preventative maintenance to maintain operational condition. The annual maintenance period is September 15 through the end of February to coincide with the refill period after summer flow augmentation and before flood control operations. Annual maintenance is typically performed one unit at a time and requires the unit out of service for 2–6 weeks. In addition, one unit each year requires a 4–6 week outage for cavitation repair.
      3. After maintenance is complete, testing is required to validate the unit is functioning properly. The required testing sequence is defined below in **Section 4** (*Unit Startup Procedure*). The duration of testing will be minimized to the extent possible, with no more than 5 minutes at SNL. During testing, the project will implement fish protection measures including use of the draft tube depression system. If testing is anticipated to require more than 5 minutes at SNL, or if the draft tube depression system is out of service, the operation will be monitored by trained staff and NPT or DFH staff will also be invited to assist with observation. Any testing > 5 mins in duration that is planned in advance will be coordinated with FPOM (see **Section 2.4**). Should testing with SNL extending > 5 mins not be planned but a specific problem is identified and require resolution, SNL >5 mins may occur to assist in resolution of a fix for the issue in order to limit the starts/stops affiliated with unit shutdown per the 5 min threshold. Should further monitoring disclose that starts/stops rather than SNL is the primary cause of adult fish mortality, the restriction on SNL will be reviewed.
      4. Cyclical maintenance (e.g., model validation and efficiency testing) typically involves starting and stopping a unit, which requires periods of SNL for up to 5 minutes. To the extent possible, cyclical maintenance testing will be performed when fish are less likely to be present in the tailrace (April, May, or September). If testing is performed outside of these months and is anticipated to require more than 5 minutes at SNL, the operation will be monitored by trained staff and coordinated with FPOM (see **Section 2.4**).
   4. **FPOM Coordination** 
      1. Coordination with FPOM is required for all turbine operations, maintenance, or testing that require periods of SNL longer than 5 minutes when adult fish are likely present in the tailrace (October–March and June–August).
      2. Prior to the operation, FPOM will be provided with a proposed sequence to review for potential adverse impacts. A Fisheries Biologist will monitor the operation for fish impacts and report findings to FPOM (see template for “*Dworshak Unit Maintenance Monitoring Form*” at the end of this Appendix). In the event of any observations of fish injury or mortality, the monitoring Biologist will immediately contact the Project Chief of Operations or authorized designee to suspend testing.
      3. In the event of an emergency that requires operating a unit at SNL for more than 5 minutes or for station power (light load with low flow through the draft tube) when adult fish are likely present in the tailrace (October–March and June–August), the project staff will coordinate with CENWW-OD-T and fill out a maintenance monitoring form identifying specific time interval(s) and develop a Memo for the Record (MFR) for distribution to FPOM (see MFR template in **FPP Chapter 1 – Overview**) if any mortality is noticed.
3. Fish Salvage Procedures for Turbine unwatering

Duplicate of Previous Appendix I

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| *OPERATING GUIDANCE #14* Dworshak Dam Fish Protection Procedures for Turbine Maintenance | | |
| Dworshak O&M Section | Date of Issue: March 2012 | Last Revision: 17 November 2011 |

* 1. The procedures below will be implemented to minimize the potential for fish to become trapped when unwatering a penstock/scrollcase for annual maintenance, repairs, or overhaul of a unit. If any fish are trapped, handling procedures and documentation requirements are defined below. **These activities will be followed to completion including the fish protection and recovery provisions outlined in this procedure, regardless of overtime requirements**.
  2. This procedure provides a general outline of the unwatering process itself and includes details for only those constraints specifically intended to promote fish survival. It is not intended to address the details of personnel safety policy or procedures, or any detailed operational instructions for the actual unwatering process. Personnel safety provisions are detailed in the appropriate activity hazard analysis. Details of the operational steps for unwatering are covered by separate Operating Procedures. All unwatering efforts will be adhered to in reducing the time incurred throughout the unwatering process.
  3. Hydroelectric turbines and water passages must be inspected and serviced periodically. This requires draining the water passages between the emergency (headgate) gates and the tailrace stoplogs. After the water reaches tail water level, the remaining water is drained to an unwatering sump and pumped out to the river. Any fish trapped in the draft tube area must be removed before being stranded or lost through drains. It is therefore desirable to minimize the number of fish involved in the draining process and then quickly salvage any fish that have been trapped.
  4. The DWR Operations & Maintenance (O&M) Section will coordinate with NWW District Operations Technical Support Branch and provide notification at least two weeks if possible in advance of any maintenance requiring unwatering or otherwise potentially affecting fish. District Operations will inform NOAA and other regional fishery agencies through Fish Passage Operations and Maintenance (FPOM) Team standard coordination process when any fish salvage operations are to occur.
  5. DWR O&M Section will notify LWG of the need to provide the LWG Fisheries Biologist to lead the planned turbine unit unwatering as soon as possible prior to the date of unwatering. LWG Fisheries Biologist will direct and coordinate the fish protection procedures and the recovery and release process. The exact location for any fish release will be identified and visited just before fish salvage operations begins. If a flume is used, there will need to be flushing flow and the impact velocity in the tailrace will need to be at a level that does not harm fish of the size anticipated in this salvage operation. The LWG Fisheries Biologist will conduct meetings and briefings as necessary to ensure all unwatering team members are familiar with this guidance, documenting entrapped fish, and the required ESA fish handling and recovery process.
  6. LWG Fisheries Biologist directs fish protection and recovery operations with the help of O&M personnel from the project. The LWG Fisheries Biologist may request additional personnel from USFWS Dworshak hatchery to work in concert with and assist with the activity at the discretion of the Dworshak Operations Manager. During the unwatering process, the LWG Fisheries Biologist will be present at the draft tube entry door and will direct and monitor water levels, and fish condition through the final stages of the draft tube unwatering.
  7. The night before a unit is to be unwatered, the operator will turn off lights overlooking the tailrace to reduce the attraction of smaller fish. Several hours before the unit is to be unwatered, the DWR Operations Section will contact BPA to get final approval for the outage and make sure all the clearance tags are ready to be placed. Early on the day of unwatering, the mechanics and operators will coordinate to lower the emergency gate and/or install the intake bulkhead. This will isolate the intake water passage from the forebay. At least one day in advance, the LWG Fisheries Biologist will ensure that adequate fish recovery equipment and personnel trained in fish handling are available for the unwatering and fish recovery event. Personnel to assist in the salvage procedure may come from local fish facilities and/or District Operations.
  8. When the turbine unit draft tube is to be unwatered, the operator will coordinate with local agencies (e.g., USFWS personnel from Dworshak Hatchery), RCC, and BPA to run the unit with the maximum possible load for 15 minutes to flush the scroll case and the draft tube of fish. In the case of unit 3, full load will not be achieved and 2.5 kcfs will be used to stay within the river rate-of-change restrictions. At pool elevation of 1520’ minimum discharge of 3.5kcfs is required to obtain stable operation and reduce gassing, at the same time a small unit would be cut back to allow for the rate of change which is still limited to 1’/hr on ramp up and down. The operator will close the penstock emergency gate (hydraulic headgate) to drain the water out of the penstock down to tailrace water elevation. Once a seal is confirmed by closing the unit wicket gates and monitoring penstock pressure and flow, the mechanics will place the tailrace stoplogs. The process from flushing the remaining water out of the penstock and confirmation of a seal through complete installation of tailrace stoplogs is estimated to take 4-6 hours barring any complications. All efforts in this step will be made to reduce the time involved from flushing to the installation of stoplogs via staging equipment, support supplies material and crews (units 1 & 2 have two stop logs each and unit 3 has four). If a seal is not obtained, the process, *including flushing*, must be repeated. Installation of the penstock maintenance bulkhead may be accomplished after the tailrace stoplogs are installed.
  9. Once seal is confirmed, the operator will open the penstock drain and the draft tube unwatering valve and start draining the draft tube thorough the unwatering sump. At the same time, the sump unwatering pumps will be initially reprogrammed to maintain water level in the draft tube to an elevation between 936-938 feet, depending on the unit, to provide a sanctuary pool. The draft tube is drained by gravity to the unwatering sump, so by restricting the unwatering sump to a minimum elevation of 936-938 feet, the draft tube is also restricted to this minimum elevation. The bottom of the draft tube is at an elevation of 929 feet for unit 3 and 933 feet for units 1 and 2, creating a large sanctuary pool between 3-7 feet deep for any trapped fish. The water level in the draft tube will be monitored remotely from the draft tube access door. At no time will the water level in the unwatering sump drop below 936 or 938 feet, depending on the unit, without all aspects of the fish recovery plan in place to include; recovery devices, insulated transport device, etc. Project personnel will have dip nets, lifting sling, and insulated fish carrying tank, and all other required fish recovery equipment and safety equipment at the unit during the final unwatering process.
  10. For safety reasons, the draft tube entry door will not be opened until confirmation that the tailrace stoplogs are sealed (i.e., the water level is verified to be below the draft tube man door petcock and a maximum of two unwatering pumps maintaining the water level in the sump). Once Operations has declared a satisfactory seal has been achieved, the mechanics will then open the draft tube access door, maintenance personnel will place a tube with a bubbling device turned on to provide additional oxygen to any trapped fish. The biologist will deploy sonar into the draft tube capable of viewing fish to determine if a large number of fish are present. If a large number of fish are present, the process will be reversed and the turbine will be readied to be re-run at night when fish are less likely to move into the unit. If an unusually large number of fish are not identified, maintenance personnel will prepare for access into the draft tube.
  11. When satisfied that all fish recovery preparations are in place, the LWG Fisheries Biologist will authorize the clearance holder to request the water level in the draft tube be lowered to 935 feet for units 1 and 2, and 931.5’ for unit 3, a level that allows for safe entry into the draft tube. Upon receiving the clearance holder’s request to lower the draft tube water elevation, the shift operator shall contact the LWG Fisheries Biologist to confirm that all fish recovery preparations are complete, and lowering the water level that allows safe entry is authorized. Once the level in the draft tube drops below 935 to 938 feet, the LWG Fisheries Biologist and project maintenance personnel will visually monitor the draft tube water level.
  12. When the water is down to a level where entry is safe, approximately two feet in depth, personnel should enter the draft tube through the draft tube access door to inspect for trapped fish. Any live fish will be netted one at a time with a knotless dip net and placed in a lifting sling that is sized to hold the fish and water. The sling will then be lifted vertically to the entry door then transferred directly to large insulated fish carrying tank full of river water with no more than ½ pound of fish per gallon of water in the tank at one time. The container will then be transported to the freight elevator, and be taken to the 1005-foot level erection floor, transferred to the release site as determined by the LWG Fisheries Biologist earlier and released into the tailwater, using a flume if necessary, as determined previously in **section 3.9.5**. All fish handling only once during the process. At all other times the fish transfer will be water to water. Adequate flushing flow must be maintained throughout each step the fish salvage process. If a large number of fish are involved, it may be necessary to remove the salvage personnel, allow a sanctuary pool to refill, allowing the fish to recover from the activity and low oxygen levels.
  13. When the LWG Fisheries Biologist has determined that either there are no fish in the draft tube or that all the fish have been safely removed, he will notify the shift operator that all fish recovery operations are complete. He will also notify the clearance holder that all fish protection restrictions on water levels in the draft tube and unwatering sump have been released.
  14. Other considerations for fish protection include the following:
      + 1. Annual routine maintenance work windows intended to minimize likelihood of trapping endangered species will be investigated to determine if work can be shifted to a time with less endangered species, although BPA power demands, requirements to control TDG and temperature in the river and hatchery, and provide flow augmentation somewhat limit the timing of unit outages. Unwatering work is recommended to occur as soon as possible during the month of September. Adjustments may be considered according to experience.
        2. The routine annual maintenance schedule will be submitted to NWW-OD-T Adult Fish Passage Coordinator for review.
        3. Within 24 hours of completion, fish salvage activities should be documented with a *Record of Fish Salvage Operations* (template at end of this Appendix) and submitted to NWW-OD-T Adult Fish Passage Coordinator. Records should be maintained with information to help predict the number of fish to be salvaged in upcoming unwatering activities. Records should also contain comments on how well the unwatering and fish recovery activities proceeded, any problems encountered, and observations on fish and holding conditions.
  15. Equipment required for performing this procedure:
      + 1. Hose attached to tailrace deck wash system (river water) to fill fish transfer tanks as needed.
        2. Two large, knotless fish nets, one for each worker.
        3. Two small, knotless fish nets, one for each worker.
        4. Two vinyl slings sized to hold fish and water.
        5. Headlamps for workers in draft tube.
        6. One radio.
        7. Waders for workers.
        8. Rubber or neoprene gloves for workers.
        9. Wristwatches.
        10. Thermometers.
        11. Hard hats, waders/rubber boots, neoprene gloves, rain gear for personnel entering draft tube.
        12. Fish bucket lifting gear (station at entry door).
        13. Two 4-wheel carts with 150-gallon fish tanks, approximately 1/3 full of water on each return from the tailrace or industrial water supply. Have supplemental oxygen system, air hoses, and air stones standing by at same location. The 4-wheel carts should have a portable source of oxygen and air hoses during transport to the release location.
        14. Hazardous atmosphere monitoring device for sensing inside draft tube (at entry door).
        15. *Record of Fish Salvage Operations* (see template at end of this Appendix).
  16. Personnel required for performing this procedure:
      + 1. Operators for lift line (lowers and raises fish).
        2. LWG Fisheries Biologist.
        3. Shift operator (ensures slow and proper timing of draft tube drainage).
        4. Four laborers (two inside draft tube to net fish into rubber lifting slings and at least two outside draft tube to transfer fish to release site).
  17. Fish Handling Procedures:
      + 1. Establish an unwatering coordinator, usually the LWG Fisheries Biologist.
        2. Roll the unit for about 15 minutes before lowering the emergency gate and tailrace stoplogs. (all done within 4-6 hours)
        3. Attend a safety meeting and discuss safe operating and Walla Walla District ESA fish handling policy and procedures. Be sure proper clearance procedures are discussed. Also, the draft tube area should be treated as a confined space.
        4. Begin draining the draft tube as described above. This requires several hours.
        5. Obtain a tailrace river temperature, draft tube reading.
        6. Allow the deck wash system to run until the water temperature matches within 2°F of the river temperature, then fill the fish transport tanks with this water.
        7. Ensure that unwatering is done very slowly once water is about 2 feet deep. Mechanics and LWG Fisheries Biologist will monitor water level throughout the unwatering process.
        8. Two workers enter the draft tube.
        9. Net fish into fish slings and lift them out of the draft tube via the rope hoist. Nets should be knotless and no more than one fish should be in a net at one time. When it is necessary to transport fish in sanctuary bags, ensure the bags contain a sufficient amount of water and that fish return to fresh water as soon as possible. Pour fish into the fish transfer tank. The LWG Fisheries Biologist will determine if water should be refreshed and if oxygen is needed by monitoring the overall fish condition. Generally from the draft tube to release in the river tailrace, it should take no more than 6 to 8 minutes to capture, transport and release a fish.
        10. The LWG Fisheries Biologist monitors the number of fish in the transfer tank and, considering the water temperature and holding time, determines when the fish should be taken to the tailrace to be released to the river. Fish placed in tanks and containers will not exceed ½ pound per gallon of water and will be released as soon as possible.
        11. When the fish transfer tank exits the powerhouse, use the deck wash system to refresh water and/or adjust water temperature as needed. Ensure that water temperature in the tank, deck wash system, flume flushing water is within 2oF of river temperature. May use frozen river ice in maintenance of water conditions during the transport of fish to the tailrace.
        12. Fish should not be netted more than once (once in salvage location and not again at release site). Preferred method of releasing fish should be via water-to-water transfer to the tailrace flume or the river.
        13. Complete the *Record of Fish Salvage Operations* (template at end of this Appendix). This is a permanent record.

1. Unit Startup Procedure

**1) 50/51E Exciter Relay Test:** With unit shutdown, jumper output contact on 50/51E (55A wire jumpered to P125).

Unit Actions: 86GX should roll, 65S should de‐energize (light should turn off on EHI connector).

Unit Alarms: Unit Lockout, Emergency Shutdown, and Regulator Trip on unit annunciator.

**2) 46E Exciter Relay Test:** With unit shutdown, jumper output contact on 46E (54E wire jumpered to P125).

Unit Actions: 86GX should roll, 65S should de‐energize (light should turn off on EHI connector).

Unit Alarms: Unit Lockout, Emergency Shutdown, and Regulator Trip on unit annunciator.

**3) 64F Exciter Relay Test:** With unit shutdown, jumper output contact on 64F (54B wire jumpered to P125) or press the trip/test button on the front of the 64F relay.

Unit Actions: None.

Unit Alarms: Field Ground on exciter annunciator. Regulator Trouble on unit annunciator.

**4) Mechanical Over‐speed Device (12 Device) Test:** With the unit shutdown, release gate lock & leave gates on squeeze. Pull flyballs out on 12 device (top of PMG) to activate the mechanical over‐speed.

Unit Actions: 86GX should roll, 65S should de‐energize (light should turn off on EHI connector).

Unit Alarms: Over‐speed, Unit Lockout, and Emergency Shutdown on unit annunciator.

**5) Anti‐creep Test:** With the unit shutdown leave gates on squeeze. Wiggle gear on top on PMG.

Unit Actions: High Lift pump should start, Head Gate should close.

Unit Alarms: Unit Creeping Detected, Governor Trouble on unit annunciator. Creep detected on digital

governor alarms.

**6) Incomplete Sequence Test:** Open terminal LL‐30 inside the digital governor cabinet. Start the unit depressed. The unit should trip after the incomplete sequence timer expires.

Unit Actions: 86GX should roll, 65S should de‐energize (light should turn off on EHI connector).

Unit Alarms: Unit Lockout and Emergency Shutdown, Incomplete Sequence, Regulator Trouble, Regulator Trip, and Exciter Field Breaker Open on unit annunciator. Incomplete Sequence on digital governor alarm.

**7) Auto Sync Test:** Start the unit depressed and let the governor bring the unit to SNL. Put the unit online with the auto synchronizer.

Unit Actions: Synchronizer should sync the unit to the line and close the XJ breaker in less than 60 sec.

Unit Alarms: None.

**8) 86GX Trip Test:** With the unit online, load the unit to ~1MW forward power. Pulse Out101 on SEL 300G.

Unit Actions: 86GX should roll, 65S should de‐energize (on EHI), and unit should shut down.

Unit Alarms: Unit Lockout and Emergency Shutdown, Regulator Trouble, Regulator Trip, and Exciter Field

Breaker Open on unit annunciator.

**9) Depression Test:** Start the unit depressed and put the unit online. Set gate limit to 0%. Once the gates are on squeeze, select the depression button on the digital governor HMI to depress the unit.

**10) PSS Test:** With the unit running and online, increase load on unit to values shown below. Watch PSS “on” LED (green LED) on PCB in regulator cabinet. PSS should turn on and off according to these values.

**a. Unit 1 & 2:** PSS on @37MW; PSS off @ 35MW.

**b. Unit 3:** PSS on @ 120MW; PSS off @ 112MW.

**11) AVR/Capability Curve Testing:** With unit online & the voltage regulator in auto, load unit with MW and +/‐ MVAR according to the test sheet. The regulator should swap to current mode, or the unit will alarm, or regulator will limit as the MVARS are changed. **Note:** The voltage in dam will increase/decrease due to MVAR changes. The ATS in dam may start dam diesel due to the voltage fluctuations.

**12) Maximum MVA Test:** Set the unit to the loading shown below and run for 1 hour. This is a WECC/NERC requirement. May need to depress another unit and pull VARS off the line to control the line voltage.

‐ **Unit 1/2:** 103.5 MW and +34.0 MVAR

‐ **Unit 3:** 253.0 MW and +83.0 MVAR

**Note on unit shutdown:** At 30% speed, the high lift pump should start and the 5 minute PLC brake timer should start. The brakes will engage after the 5 minute timer expires or when the unit speed reaches 20% ‐ whichever occurs first.Record of Fish Salvage Operations - Dworshak Dam

\*\*Submit this report to NWW-OD-T Adult Fish Passage Coordinator within 24 hours of fish recovery. FPOM must be notified immediately of any fish mortalities.

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| LWG Fisheries Biologist in Charge: | | | | Activity | | | Date | Time |
| Other Personnel: | | | | Emergency Gate in Place | | |  |  |
|  | | | | Tailrace Stoplogs Installed | | |  |  |
|  | | | | Draft Tube Door Open | | |  |  |
|  | | | | Fish Recovery Begins | | |  |  |
|  | | | | Fish Recovery Complete | | |  |  |
| Purpose of un-watering: | | | | | | | | |
| River Temperature:  (Note: Temperature of containers to be maintained within 2°F of river temperature.) | | | | | | | | |
| Problems/Comments: | | | | | | | | |
| **Species and Counts of Fish Released to Tailrace** | | | | | | | | |
| Species | Female | | Male | | | Comments | | |
| Clipped | Un-clipped | Clipped | | Un-clipped |
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| **Species and Counts of Fish Mortalities** | | | | | | | | |
| Species | Female | | Male | | | Comments | | |
| Clipped | Un-clipped | Clipped | | Un-clipped |
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DWORSHAK UNIT MAINTENANCE MONITORING FORM

Unit Tested: \_\_\_\_\_\_

Unit OOS Date / Time \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_

Unit RTS Date / Time \_\_\_\_\_\_\_\_\_\_\_\_/\_\_\_\_\_\_\_\_\_\_\_\_\_

Monitoring Biologist Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Location(s) of monitoring person observing operation: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Operation being monitored: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

WEATHER / WATER CONDITIONS

Cloud Cover: Yes / No

Air Temperature: \_\_\_\_°F

Glare on Water: Yes / No

Water Temperature: \_\_\_\_°F

Degree of Turbidity:

Comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

TESTING TYPE

Commissioning: Yes / No

Annual: Yes / No

WECC / NERC: Yes /No

Other: Yes /No (describe: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_)

Comments: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

SNL OPERATIONS

SNL = Speed No Load (if more than one occurrence, use table) .

Start time (hh:mm:ss) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ End time (hh:mm:ss) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Total time (hh:mm:ss) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Time at SNL per instance (if more than one):

|  |  |  |  |
| --- | --- | --- | --- |
| Run Number | Start Time (hh:mm:ss) | End Time (hh:mm:ss) | Total Time (hh:mm:ss) |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |

Other Comments (note here if issues with air depression system):\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

FISH ISSUES

**FISH LOSSES /INJURED**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Salmonids Recovered/NOT Recovered | | | | | |
| Chinook Unclipped | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ | Kokanee | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ |
| AVG SIZE |  |  | AVG SIZE |  |  |
| Chinook Clipped | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ | Steelhead Unclipped | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ |
| AVG SIZE |  |  | AVG SIZE |  |  |
| Coho | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ | Steelhead Clipped | Injured \_\_\_\_\_\_ | Dead \_\_\_\_\_\_ |
| AVG SIZE |  |  | AVG SIZE |  |  |

Describe external condition of injured or fish lost and whether recovery occurred: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Live fish seen in tailrace? Yes / No (if yes, how many? \_\_\_\_\_\_\_\_)

**\*\*\* If mortality is observed during testing, contact Operator to suspend testing. Contact District Ops to have them undertake informal consultation and regional coordination. Do not restart testing until District Ops informs on consultation results.**

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1. MFR 16DWR01 available online at: [pweb.crohms.org/tmt/documents/FPOM/2010/NWW%20Memos%20of%20Coordination%20and%20Notification/DWR%20MOC%20and%20MFR/](http://pweb.crohms.org/tmt/documents/FPOM/2010/NWW%20Memos%20of%20Coordination%20and%20Notification/DWR%20MOC%20and%20MFR/) [↑](#footnote-ref-1)