



# FISH PASSAGE CENTER

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## MEMORANDUM

TO: Salmon Managers  
FPOM  
Cal Sprague, COE Portland District  
Rex Baxter, COE Walla Walla District  
Chris Carlson, Grant Co PUD  
Chuck Peven, Chelan Co PUD  
Rick Klinge, Douglas Co PUD  
Fishway Inspectors: NMFS, WDFW, & ODFW

FROM: Larry Basham  
Fishway Inspection Coordinator

DATE: June 25, 2003

RE: **Fishway Inspections – March through May 2003**

Fishway inspections by the State and Federal fishery agencies began on a monthly basis starting in March at the Portland District Projects and in April at the PUD Projects as well as at the COE, Walla Walla District Projects. For the 2003 season, NMFS will complete fishway inspections of Bonneville, McNary, Priest Rapids, and Wanapum dams; WDFW will inspect Ice Harbor, Lower Monumental, Rock Island, Rocky Reach, and Wells dams; ODFW will inspect The Dalles, John Day, Little Goose and Lower Granite dams. Protocol remains similar to previous years at all projects regarding responsibilities to check in and out of the Projects, with tighter security measures in effect during the past two years. The fishway inspectors are expected to inform project biologists or other contact personnel at the individual projects when problems are noted during the inspections.

**Bonneville Dam** – Ed Meyer, NMFS, and I completed inspection of the adult and juvenile fish facilities on March 24; Ed Meyer completed the April inspection on the 22<sup>nd</sup> and I did the May inspection on the 14<sup>th</sup>. Flows ranged from 154.7 kcfs to 286.6 kcfs during the inspections, with spill of about 140 kcfs during the April and May inspections.

**Powerhouse I** – At the South end of the powerhouse collection channel Main entrance Gate 2 was submerged 8.3 ft to 12.9 ft from with head differentials measured from 1.0-1.3 ft (computer reading)

during the three inspections and was considered satisfactory for each. Weir Gate 64, located on the North end of the powerhouse, was submerged from 8.6 to 12.4 ft, with the head differential reported from 1.4 to 2.0 ft and was also within acceptable criteria ranges for weir depth and head differential. The water velocity meter in the north end of the powerhouse collection channel was not operating; however, the south end meter showed the water velocity was moving satisfactorily during the three inspections (velocity = 2.2 to 2.8 fps). Visually, the north shore appeared to fall within the 1.5 to 4.0 fps range. The five sluice gates are closed and will be for future inspections. The depth of water over the main Bradford fish ladder weirs was 0.9 to 1.0-ft, with 0.9 ft measured at the A-Branch and 0.8 to 1.1 ft at the B-Branch fish ladder for the March through May inspections (The B-Branch reading was about 0.2 ft low during the April inspection). The exit from the ladder had several sticks across the exit that required cleaning in March and April; with the picketed lead section at the count station reported clear of debris. On the March inspection, the count window required cleaning.

**B-Branch** – The March and April inspections did not include the computer reading from the Control room; however, it was available at least during the April inspection. Head differential was reported at 1.0 to 1.8 ft, and exceeded the 1.0 ft minimum head differential on all three inspections. With the spill in the spring and summer, it is nearly impossible to obtain an accurate reading from a staff gage in the tailwater. The main downstream entrances were operating to attract adult fish to the B-Branch fish ladder.

**Cascades Island** - The Cascades Island fishway entrance is similar in design to the B-Branch and computer readings are now available to assess elevations in the entrance and tailwater. The downstream entrances were operating during the inspections. Head differentials ranged from about 1.0 ft to 1.5 ft during the three inspections and fell within the criteria of 1.0 ft-2.0 ft. The depth of water over the ladder weirs was from 0.9 ft to 1.3 ft. These readings should have been closer to 1.0 ft than the 1.3 ft (May reading).

**WA shore fishway** –Normally, two small fish turbines supply about 5,000 cfs of water to four main entrance gates, two at each end of the powerhouse, and 12 floating orifice gates along the collection channel. In 2003, the project began the season operating with only one fish turbine on-line and the four entrance gates submerged nearly 9.0 ft below tailwater elevation and nearly 1.2 ft head differential. Major Stator repair was required on the turbine. The Unit was taken off-line at 3 a.m. on November 1 to begin the overhaul of the turbine and re-started just prior to April. A new operation was implemented in 2003, i.e., the orifice gates were plated off so that no flow was passing through the 12 gates. This operation was designed to allow the entrance gates to better meet criteria under the reduced flow. In April and May, the gates were operated at normal depths, i.e., at 13 ft submerged below tailwater with the head differential between 1.0 and 2.0 feet and a targeted head of 1.5 feet. The entrances were operated within the normal criteria ranges during the April/May inspections.

The water velocity was not reported; the system will be out of service until mid-summer. The exit from the fish ladder was clear of debris on 2 of 3 inspections with the exit requiring clearing of debris on the April inspection. The depth of water over the ladder weirs was 1.0 ft on each of the three inspections.

**Overall**, the depth of water over the weirs at several ladders was either higher or lower than recommended, i.e., 0.8 ft or in one case 1.3 ft rather than 1.0 ft  $\pm$ 0.1 ft (normal criteria). There were numerous sightings of sea lions in the tailwater of the powerhouses during the three inspections. At present the policy is one of no harassment at the project; two years of documenting presence and feeding habits of these sea lions have been completed by the COE.

**Juvenile System** – The juvenile bypass facilities were operating with all screens and orifices as required. The project was operating the low outfall during the initial three inspections, but was switched to the high outfall as flows increased in late May and through June. The ice/trash sluiceway was operating at the old

powerhouse. Debris was heavy and accumulating in the forebay of the WA shore powerhouse only during the March inspection. The project was dipping the trash in the gatewells as they were near the ½ covered criteria limit at several gatewells.

**The Dalles Dam** – Wayne VanderNaald, ODFW, is the new fishway inspector for The Dalles and John Day projects. Inspections of the fish facilities at The Dalles Dam were completed on March 26, April 23, and May 28. Project discharges ranged from 182 kcfs in March to a high of 310 kcfs in May. Two fish turbines were available or operating at the OR fishway with a single fish turbine operating at the WA fishway. Water temperatures were: 46, 50, and 58°F for the March-May time frame.

**Washington Shore** - Wasco PUD operates a single turbine unit that supplies water to the diffusion system in the lower WA shore fish ladder and then through main entrance Gate N-1 to the tailwater. Gate N-1 was submerged 8.2 ft, 8.7 ft, and 8.8 ft below tailwater elevation with corresponding head differential readings of 1.5 ft for the March-May inspections. The gate depth and head differential at Weir N-1 was operated within the proper criteria range for each inspection. The PUD trash racks had 0.4 ft head differential on the March and May inspections and 0.2 ft on the April inspection. The depth of water reported over the fish ladder weirs was 1.0 ft on each inspection date. The picketed leads at the count station had small amount of debris on the upstream and downstream pickets, while the exit from the fish ladder was reported with considerable debris during the March inspection and required cleaning.

**Oregon fishway** – Approximately 4,550 to 4,900 cfs of water was directed to the auxiliary water supply system via the fish turbines. On the initial inspection, one of the two fish turbines was taken off-line and readings of the gate entrances were subsequently way out of criteria until the fish turbine was re-started. The change was required to have diving in the forebay area (See spreadsheet for gate settings during the March inspection). Both fish turbines were operating by the time we returned from John Day Dam in late afternoon. The other two inspections were at normal conditions.

Gate depth readings at the Entrances, Gate S-1 and S-2 ranged from 8.0 to 10.4 ft submerged below tailwater elevation with the head differential readings of 1.3 and 1.9 ft. With spill concentrated on the North end of the spill basin, the South Entrance flow net reaches well out from the 2 entrance gates and should provide excellent attraction flows throughout the season.

At the West Entrance, Gates W-1 and W-2 were submerged 9.1 to 9.5 ft below tailwater elevation, with the head differential ranging from 1.3 ft to 1.8 ft using the Selsyns gages for the two inspection dates. The electronic velocity meter gave readings of 1.8 to 2.8 fps with the visual readings taken at the west end of the collection channel up to an estimated 3.0 fps.

The East fishway entrance operates two gates, E-2 and E-3. These gates were submerged 11.5 ft to 12.5 ft deep with the head differential from 1.2 to 1.4 ft. These gates continue to pass a large quantity of attraction flow for the adult fish approaching the eastern end of the powerhouse.

**All gates were operating within criteria ranges for proper depth and head differentials at the South, West and East Entrances for the April and May inspections. The March inspection showed a wide variant from the normal operation when the fish turbine was taken off-line due to diving operations at the dam.**

The exit from the fish ladder, as well as the picketed lead section of the counting station, was clear of debris with exception of the March inspection where a small amount of debris was building up on the exit trash racks. The project cleans the pickets on a daily basis or as needed depending on the amount of grasses and vegetation in the fish ladder. The depth of water over the fish ladder weirs was 1.1 ft to a high of 1.4 ft (shad were passing) and readings were considered satisfactory.

The normal sluice gates, Gates I-1, I-2, and I-3, were operating as required for juvenile fish passage at the project during the April/May inspections. The North shore juvenile fish facility was operating satisfactorily in bypass mode during the three inspections. Spill for juvenile fish was occurring during the inspections with the May spill not listed in the FPP; it was later learned that the disparity in

spillbay schedules was due to a survival study that was conducted from May 20-June 11. Additional spill was passed through the 1<sup>st</sup> eight gates during the study than the normal spill pattern.

**John Day Dam** – Wayne VanderNaald, ODFW, completed three inspections of the John Day adult and juvenile fish facilities this spring on the following days: March 26, April 23, and May 28. Project Q ranged from a low in March of 157 kcfs to a high of 301.8 kcfs during the May inspection. Turbidity was 6.5 ft during the March inspection. Three north shore (WA), and three south shore (OR), fish pumps were operating for the inspections.

**OR fishway** – During the three inspection dates, the South shore, SE-1, fishway entrance operated with the gate depths from 8.0 to 8.9 ft on the staff gages and 8.3 to 8.6 ft at the panel. Head differentials ranged between 1.2 ft and 1.5 ft using the staff gages and the panel readings. The gate depth and head at the South Entrance met criteria through the March to May inspections. The two main entrances at the north powerhouse (Gates NE-1 & NE-2) were submerged from 8.2 ft to 8.4 ft using the staff gages for the three inspections, with comparable readings of 8.2 ft to 8.3 ft submerged using the panel reading during the March and April inspections. During the May inspection, the panel reading was 2-ft less than the staff gage reading. This may have been due to a calibration problem at the panel control section. Head differentials ranged from 1.3 ft to 1.7 ft using the staff gages and 1.0 ft to 2.0 ft using the panel gages. With exception of the panel readings, all gate depths and head differentials fell within the criteria range for the North Powerhouse Entrances for the three inspection dates. Water velocity recorded along the powerhouse collection channel averaged from 1.5 to 2.0 fps for the inspections. Ten floating orifice gates were operating satisfactorily along the powerhouse collection channel. The picketed lead section at the counting station and the exit from the fish ladder was clear of debris during the three inspections. The depth of water over the weirs was 1.1 ft.

**WA fishway** – Gate N-1 operated during the three inspections at the WA shore fishway. The gate depths ranged between 8.9 ft and 10.5 ft with the head differential readings between 1.2 ft and 1.7 ft using the staff gages and LED gages. All gate depth and head differential readings fell within the proper criteria range for the three months. Readings from the WA shore fish ladder were as follows: the picketed lead section at the counting station and the exit from the fish ladder were clear of debris for all three inspections. The depth of water over the fish ladder weirs was 0.9 ft to 1.0 ft.

**Overall**, the OR and WA fishways were operating close to criteria at the fish ladders and main entrance gates for the March through May inspections. The LED readings and the staff gage readings showed good correlation at the North Shore entrance gate; however, the panel and staff gage readings varied considerably at the South and North powerhouse entrances. The site readings showed the gate depths and head differentials to be at satisfactory criteria during the March through May inspections. At the June FPOM meeting, the project biologist indicated that at the John Day north fishway, the project operated only 2 pumps due to problems encountered with the fish pumps from early May to early June. The project continues to work on resolving the fish pump issue.

**Juvenile Fish Facility** – The Smolt Monitoring facility was operating during the April and May inspections in sample mode.

**McNary Dam** – I substituted for Larry Swenson, NMFS, on the initial April inspection (April 23) with Larry Swenson completing the May inspection of the fishways on May 21st. Project Qs ranged from 213 kcfs to 176 kcfs with 49 kcfs spill during April and no spill during the May inspection. River temperature was 49°F and 53°F on the respective April and May inspections with turbidity readings from 4.3 ft to 4.9 ft. Fishway status reports were obtained prior to the inspections to compare on-site elevation readings with computer readings.

**Oregon Fishway** – Three fish pumps were operating with pump angles recorded at 22° during the April inspection date. About 450 cfs of water from the juvenile bypass system is added to the powerhouse collection channel flow at the north end of the powerhouse, near the North Entrance gates. Gravity flow water from the forebay is also added in the lower end of the OR fish ladder.

The South Powerhouse entrance gates were submerged 9.6 ft to 9.8 ft. for the respective April and May inspections with head differential readings of 1.1ft and 1.2 ft. Both months' readings were within criteria. The North Powerhouse entrances were reported with gate depths and head differentials of 10.3 ft with 1.4 ft during April and 9.2 ft depth and 1.4 ft head during April. Again, both months' inspections showed the gates operation within proper criteria range at the Oregon fishway entrances. (Shore). Most orifice gates along the collection channel were satisfactorily operating during the inspections; however, two of the orifices were slightly overtopped during the April inspection. The velocity reported at the south end of the collection channel was about 1.7 fps during the April inspection. The depth of water over the fish ladder weirs was 1.0 ft to 1.2 ft for the respective April and May inspection. The exit from the fish ladder and the fish counting facility leads were reported clear of debris for the two months.

**Washington Fishway** – The fish turbine operated by North Wasco PUD was operating during both inspections and supplying sufficient flow to the WA shore fishway entrances to meet criteria requirements. Entrances WFE-2 and WFE-3 were operating with head differentials of 1.6 ft and 1.4 ft and the gates submerged 9.7 ft and 9.9 ft for the respective April and May inspections. The exit from the fish ladder was reported with some amount of debris on the racks during May. The picketed leads at the count station required cleaning during the April inspection with 0.5 ft head loss between the pickets (normal is 0.3 ft.). The depth of water over the fish ladder weirs was 1.4 ft for the April inspection and a more normal 1.2 ft in May.

**Overall**, the adult fishway entrances at the OR and WA fishways were operating within normal criteria at main entrance gates with sufficient head differential and gate depth reported. Several floating orifice gates were overtopped with water during the April inspection. A Trouble Report was called in on the WA shore fish ladder exit section as the new Control System was not operating correctly, resulting in too much flow going down the ladder during the April inspection. Operators were working on the problem when we left the WA ladder.

**Juvenile Fish Facility** – Debris in front of the project was being removed during the April inspection. The project was dipping the trash and hauling it away from the dam. There were at least 3 grebes in the collection channel during the site visit in April. Larry Swenson reported that 116 grebes were counted in the forebay of the dam (May).

**Priest Rapids Dam** – Adult fish facilities were inspected at Priest Rapids Dam on April 22 by NMFS (Melissa Jundt) and on May 21 by FPC. Project discharge was 162 kcfs on both inspections with 63 kcfs spill for assisting adult fish passage downstream past the project during the May inspection. Water temperature was recorded at 46° and 51°F with the turbidity reading near 9.5 ft average for the April and May inspections, respectively. Five fish pumps (tailwater) and gravity-flow water (gravity intake gate about 6.0 ft open) supplied flow to the supply pool. This pool normally maintains about 6.5 ft head above the tailwater elevation; it was 6.8 ft average for the two inspections.

**Left Bank Fishway** – At each end of the powerhouse, a slotted entrance is open to attract adult fish into the fishway/channel that leads to the fish ladder. Gate LSE-4 was recorded with 1.1 ft and 1.3 ft head differentials and Gate LSE-2 with 0.8 ft and 1.2 ft head differentials using the staff gages. During the May inspection, the sensor tape readings were about 0.3 ft higher than the staff gage reading at Gate LSE-

4 (1.6 ft) and LSE-2 (1.5 ft). The May inspection showed the project operating within the normal criteria range of 1.0-2.0 ft with targeted elevations met for each entrance. In April, the project was less than 1.0 ft at the LSE-2 gate and at 1.1 ft at the LSE-4 gate. Water velocity reported at the eastern end of the collection channel was estimated at 2.5 fps and 1.7 fps in the given measured distance. So far, water velocity through that section of the channel has been far superior to operation during the last four inspections in 2002. The exit from the fish ladder was reported clear of debris during this inspection. The depth of water recorded over the ladder weirs was within criteria and reported at 1.1 ft for each inspection. One item that definitely requires more consideration in future is the loud noisy condition that exists at the west end of the powerhouse near gate LSE-2. With spill gate 22 operating wide open, the old side entrance should be sealed off or closed to the point that it does not make the loud banging as currently exists. At other downstream projects, gates have been sealed off to prevent the same loud noises in and around the adult fishway entrances. Incidentally, it looked as if adult fish could locate the LSE-2 opening even with this high spill through the one gate; an eddy does form below the powerhouse, but it is not severe. I was able to observe the new PIT tag installation at the project and all appeared to operating satisfactorily without extra periphery stuff hanging in the water.

**Right Bank Fishway** – Slotted entrance (RSE-1) was operating with 1.0 ft and 1.3 ft head differentials during the April and May inspections. The project was asked to increase the flow through the RO4 to allow the Entrance to operate at 1.5 ft head differential where possible. On the May inspection both staff gages and sensors were read. The fish ladder exit was reported clear of debris, and the picketed leads at the counting station were also clear of debris. The depth of water recorded over the fish ladder weirs was 1.1 ft and 1.0 ft respectively for the April and May inspections.

**Overall**, the adult fish passage facility required additional flow at the LSE-2 during the April inspection with the other gates operating within criteria ranges (1.0 to 2.0 ft). The Project should attempt to meet targeted flows at the Right and Left bank fishway entrances where possible. See concerns listed above relating to the noise factor that exists when spill from Bay 22 is wide open. The Priest Rapids and Wanapum Control Rooms now have excellent printouts of the fish facilities and real time elevations at the various sites in the fishway. Overall, these should further assist the inspectors in reporting and comparing readings at the projects. Great Job on this task goes to Grant County PUD.

**Wanapum Dam** – Inspections of the adult fish passage facilities were completed on April 22 and May 21 by NMFS (Melissa Jundt) and FPC, respectively. Project discharge was 163 kcfs and 115 kcfs, with 68 kcfs spill, and 11 kcfs spill through the sluice in April and May. Water temperature was reported at 45°F on the initial inspection and rose to 50°F by late May.

**Left Bank Fishway** – Two fish pumps were operating at 128-rpm average and sufficient flow volume was maintained in the adult fishway to meet criteria standards at the Main Entrances. The Entrance gates are slotted and rely on meeting head differential criteria of 1.0 to 2.0 ft (range) with the preferred target of 1.5 ft at the LSE-2 and 1.25 ft at LSE-3. During the two inspections, the LSE-2 Gate had 1.3 ft and 1.7 ft “head” while the LSE-3 Gate was reported with 1.5 ft and 1.6 ft head differential. Both gates met their targeted head differential and fell within the proper criteria range. Water velocity was estimated to be between 2.0 and 2.5 fps at the East end of the channel and maintained that velocity through the channel toward the West entrance (LSE-3). The exit from the East fish ladder was reported clear of debris on both inspection dates. The depth of water recorded over the fish ladder weirs was 1.2 ft and 1.1 ft during the respective April and May inspections.

**Right Bank Fishway** – Gravity-fed water from the forebay of the project supplies flow to main entrance gate (RSE-2). The head differentials were reported at 1.5 ft and 1.3 ft during the respective April and May inspections. Both readings were within the criteria range of 1.0 to 2.0 ft and met the targeted head of

1.3 ft. The exit from the fish ladder was clear of debris on both inspections. Depth of water over the fish ladder weirs was 1.2 and 1.1 ft for the two months and was within acceptable range.

**Overall**, fishways were operating within acceptable criteria range during the April and May inspections at Wanapum Dam.

**Rock Island Dam** – WDFW completed inspections of the adult fish facilities on April 29 and May 27. Project discharge was 160 kcfs and 174 kcfs with about 30 kcfs spill occurring during the respective April and May inspections. The spill season began on April 17 for the 2003 season. Seven or eight turbine units at the new, and 1 or 2 units at the old powerhouse were operating during the inspections. Turbidity ranged between 10 and 12 ft with the water temperature reading rising from 48° F in late April to 54°F by the late May inspection.

**Left Bank Fishway** – Water from the immediate forebay supplies flow through the diffusion system to the two downstream entrances. Gate depth criterion is: 6.0 ft minimum depth with the head differential maintained between 1 and 2 ft. For the respective April and May inspections, the gates were submerged 7.0 ft and 6.7 ft below tailwater with the  $\Delta H$  at 1.1 ft and 1.3 ft. The exit from the fish ladder and the picket lead section at the counting station were clear of debris. The depth of water over the ladder weirs was 1.1 ft on each inspection date. All readings at this fishway were within satisfactory criteria ranges during the two inspections.

**Middle Fishway** – Gravity-flow water from the forebay of the project is directed through a diffusion system to a downstream gate and side entrance. The downstream gate was submerged 8.9 ft and 9.0 ft (criteria = 8.5 ft or >) with the  $\Delta H$  reported at 1.3 ft and 1.2 ft for the respective April and May inspections. The side entrance is fixed-open and depends on “head” only to be within criteria. The gate depths and head differentials were within proper criteria range during the inspections. The exit from the fish ladder and the picket lead section at the counting window was reported clear of debris. The depth of water over the ladder weirs was 1.1 ft on each inspection date.

**Right Bank Fishway** – The gravity flow water (100% open) and three fish pumps at 100% open were supplying water to the Right Bank Fishway. The attraction water jet was operating as required. The three main entrances are fixed-open at 3-ft and require a minimum head differential of 1.0 ft to be within criteria. The Right Powerhouse Entrances were reported with 1.3 ft and 1.4 ft head differential, 1.0 ft and 1.1 ft head differential at the LPE, and 1.0 ft and 1.0 ft at the TRE (downstream) entrance during the respective April and May inspections. The tailwater elevation was close to the level that head differentials at the LPE and TRE will drop to below 1.0 ft minimum criteria; however, all readings taken at the entrances were found operating within acceptable criteria for the two months. The water velocity in the left powerhouse collection channel ranged from an estimated 4.0 fps to 4.8 fps (meter). The exit from the fish ladder and the picket lead section at the counting station was clear of debris. The depth of water recorded over the fish ladder weirs was 1.1 feet for each inspection date.

**Overall**, the adult fishway entrances were operating at satisfactory levels at the Left, Center, and Right Fishways for the April and May inspections. Operation of the juvenile bypass system at the new powerhouse has been plagued with problems during the 2003 season. Mortality rates were very high at times during this sampling season. The Project has replaced guides, seals, and other items on bypass gates R-11 and R-12. This has resulted in extra downtime for the bypass system. Chelan PUD should continue to improve juvenile passage conditions through their bypass system at Rock Island Right Powerhouse.

**Rocky Reach Dam** –WDFW completed inspections of the Rocky Reach adult fish facilities on April 29 and May 27. Project Q was only 102 kcfs and 92 kcfs with about 22-23 kcfs through spill and the remainder through turbines during the two inspection dates. The water temperature rose from 46° to 52°F from April to May with the turbidity averaging 16 ft for the two inspections. The project operated three fish pumps at 55-66% open with flow distributed to the LPEs, RPEs, and the spillway entrance.

**Fishway Entrances** -The left powerhouse entrance gates (LPE-1 and LPE-2) were submerged 10.9 ft below tailwater elevation on each inspection, with the head differential at 1.8 ft in April and 1.4 ft in May. Entrance depth (10-ft or >) and head differential (1-2 ft) criteria standards were met on the initial two inspection dates. The right powerhouse entrances (RPE-1 and RPE-2) are fixed-open at 3-ft and must maintain head differential between 1-2-ft to meet criteria standards. The RPEs were reported with 0.8 ft and 0.6 ft head differential during the respective April and May inspections and fell short of the minimum criteria standard of 1.0 ft. The spillway entrance, MSE, was operating with gate depths of 10.6 ft and 11.2 ft with the head differential at 1.6 ft and 1.7 ft, respectively. The same criteria of gate depth and head differential as for the LPEs applies for the Spillway entrance. The head differential and gate depth was satisfactory during the two inspections. Water velocity through the transportation channel was reported at 1.7 and 1.9 fps and fell within the range of 1.5-4.0 fps. The exit from the fish ladder and picket lead section was clear of debris. The depth of water over the ladder weirs was 1.0 ft on each inspection date. Orifice gates operating along the collection channel were in slots 1, 2, 3, 16, 18, and 20.

**Overall**, the fishway was operating at satisfactory criteria levels relating to gate depth and head differentials at the LPE and the MSE gates. Note: Main turbine Units 8-11 have been rehabbed and are now adjustable turbines. We need to revisit the fishway operating plans to assess whether Unit 11 should be first off/last on in the turbine operating priority. The RPE gates were reported with head differentials of 0.8 and 0.6 ft, well below the 1.0 ft minimum head criterion. Based on the channel elevations and tailwater elevations for the two inspections, it appeared that drop from the channel at the LPEs to the RPEs was about 1.3 ft while the drop in tailwater elevation from the LPEs to the RPEs was 0.3 ft. Obviously this will not allow the RPEs to maintain a 1.0 ft head differential without seriously changing hydraulics in the channel. This problem may go away as the season and flows change, but this is an item that should be discussed as how to improve head differentials at the RPEs.

**Wells Dam** – WDFW completed inspections of the adult fish facilities on April 28 and May 28. Project discharge was 149 kcfs and 160 kcfs with 10 kcfs spill and the remainder through the main turbine units for the two inspection dates. River temperature rose from 45° to 52°F with corresponding turbidity readings of 9 ft and 6.9 ft for the April and May inspections. To assess calibration of the computer readings, staff gages and deck sensor gages located at the entrance gates are read and recorded. These readings are then compared to the computer readings that are simultaneously phoned in from the shift operator. The readings should come within 0.2 ft of each other to assure calibration of the computer system on a normal inspection.

**East and West Fishways** – At the Wells project, both the east and west fishways are of similar design. Two fish pumps are located on each shore and supply attraction flow to the fishway entrances. The project indicated that fish pumps on both ends of the dam had worked satisfactorily through the May inspection date. The downstream gate operates at 8-ft open with head differential targeted for 1.5 ft at both fishway entrances.

At the **East** fishway, we found the channel elevations varied a maximum of 0.2 – 0.3 ft between the three readings. The tailwater staff gage varied about 0.2 ft from the control room and 0.3 ft from the deck gage, but overall, the head differentials from the deck gage, staff gage, computer reading ranged from 1.4 ft to 1.5 ft during the April inspection and was equal at 1.3 ft during the May inspection. Depth of water over the ladder weirs was 1.1 ft using the staff gage and the computer sensor. The east fish ladder reported a

differential through the exit pool to the forebay of 0.8 ft in April and 0.6 ft in May. The normal head through that exit trash rack ranges from 0.5 ft to 0.8 ft so the reading was near the norm for the two inspection dates. We did not observe buildup of debris or woody material on the exit trash rack.

At the **West** fishway, all measuring gages and computer readings were within 0.3 ft for channel and tailwater elevations. The head differential measured varied from 1.4ft/1.2ft at the deck gage, 1.3ft/1.2ft using the staff gage and 1.4ft/1.4ft for the computer during respective April/May inspections. The depth of water over the fish ladder weirs was 1.2ft/1.1ft and 1.2ft/1.2ft for the respective April/May readings. The exit from the west bank fish ladder had differentials of 0.8 ft and 0.7 ft for the two inspections. The trapping schedule given was: Monday to Wednesday – 0600h to 2200h on East Ladder beginning July 7.

**Overall**, the adult fish facilities were found operating slightly below the targeted head differential of 1.5 ft at the west and east fishway entrance gates, but well within the 1.0-2.0 ft range of operation. The depth of water over the ladder weirs was nearly normal at the East and West fish ladders, 1.1 ft to 1.2 ft for the two months. So far, operation of the depth of water over the ladder weirs has been improved from previous years. The project repaired valves and screens in the fish ladder over the winter maintenance season that have caused the higher than required depth of water at both ladders.

**Ice Harbor Dam** – WDFW completed inspections of the adult fish facilities on April 21 and May 29. Project Q was 85 kcfs and 169 kcfs with 44.5 kcfs (50% spill) and 90.2 kcfs (53.3% spill) during the respective April and May inspection dates. Three of six and 6 of 6 turbine units were operating during the inspections. Water temperature rose from 49°F to 54°F from April through May with turbidity reading of about 4.5 ft average for the combined inspections. Eight pumps were operating and supplying water to the South Shore and 2 of 3 pumps to the North Shore fishway. Each of the newly rebuilt fish pumps on the North Shore is capable of pumping about 50% more water than the old pumps were. As a result, only two pumps are required to provide flow to the fishway. The project has been testing each pump thoroughly and found a few anomalies that they are attempting to correct, with support from the factory representatives and consultants who designed them. In addition to normal pumped flow on the South Shore fishway, about 250 cfs of excess flow from the juvenile bypass system is shunted to the South fishway whenever the bypass system operates during the year.

**South Shore** – The single South Shore entrance was submerged 7.6 ft and 7.8 ft below tailwater with head differentials at 1.9 ft and 1.6 ft, respectively for the April and May inspections. The North powerhouse entrance was submerged 11.2 ft and 17.5 ft with 1.1 ft and 0.9 ft head differentials during the April and May dates. Seven orifice gates operate along the powerhouse collection channel. The water velocity through the powerhouse collection channel was reported as 1.9 fps for each inspection date. The fish ladder was reported with 1.1 ft depth of water over the weirs during each inspection. The exit trash rack and picketed leads at the count station were reported clear of debris. As a side note from the FPOM meeting, the COE indicated that there have been problems with operation of SFE-1 and the adjacent gate has been operating as a backup when required. It appears that a new motor is required for the SFE-1 system.

**North Shore** – The North Shore entrance was submerged 7.7 ft and 10.6 ft with 1.9 ft and 1.2 ft head differentials using the channel staff gage and the LED tailwater elevation, respectively for the April and May inspection. **The LED reading for the channel elevation was 1.0 ft different from the elevation read from the staff gage during the April inspection only.** The fish ladder was operated with 1.0 ft and 1.1 ft depth of water over the weirs for the two months and was satisfactory. The exit trash rack and picketed leads were clear of debris for the inspection dates.

**Overall**, the project was operating with reduced gate depths at the South shore where many of the adult fish enter the project's fishway. **Recommendation: Put set points on the South Shore entrance to**

**achieve a minimum of 8.5-9.0 ft with normal head differential of >1.0 ft. Head has not been a problem on the South Entrance.** The North Shore tailrace staff gage remains in need of repair. The project should track their calibration more closely to assure that elevations are correct on the equipment. For example, sensors may not be located close to the staff gages and differences arise in measurement and readings. In a couple of instances, the computer output did not match mechanical readout at the same site. Passage or perhaps a better term is hydraulics looks very poor at the North Powerhouse and North Shore Entrances under some spill schedules. Passage of adult fish into/through the North Powerhouse and the North Shore Entrances should be assessed under the varying spill and flow conditions via marked radio tagged fish.

**Lower Monumental Dam** – WDFW completed inspections of the adult and juvenile fish facilities on April 21 and May 29. Project Q was 59.1 kcfs and 129.3 kcfs with 30 kcfs spill each during the April and May inspection date. Water temperature rose from 51°F to 58°F from April through May with the turbidity reading at 3.4 ft average for the two months. Three turbine-driven pumps operating at 75-77 rpm average and overflow water from the juvenile bypass system supplied attraction water to the adult fishway.

**North Shore** – The entrance gates were submerged about 8.05 ft (average) below tailwater elevation with a head differential reading of 1.9 ft in April and 1.6 ft in May. The South Powerhouse entrance gates were on sill and submerged 7.2 ft in April with “head” at 1.5 ft and submerged 10.8 ft in May with the head differential at 1.0 ft. The water velocity through the powerhouse collection channel averaged 1.95 fps for the two months. All readings taken at the North shore entrance gates were considered satisfactory as the head differential fell within the range of 1.0 to 2.0 ft and the gate depth was more than the 8.0 ft minimum. The south powerhouse gates were on sill so no further depth could be attained; however, the head differential was 1.5 ft when the 7.2 ft gate depth was the maximum attained. The north fish ladder was reported with 1.0 and 1.1 ft depth of water over the ladder weirs during the individual April and May inspection date. The picketed lead section at the count station was clear of debris on both inspections. The North Shore fishway exit was even (elevation-wise) across the trash rack indicating build-up of debris should have been minimal.

**South Shore** – Flow to the South Shore entrance gates is provided from the North Shore water supply source plus the South fish ladder flow. Gate SSE-1 was on sill during both inspections. In April, the gate depth was 7.2 ft with the corresponding head differential at 1.4 ft while the May inspection showed the Gate submerged 10.8 ft with the head differential at 1.5 ft. Gate SSE-2 is a continuous open gate with a 6-ft opening. The south fish ladder was reported with 1.1 ft of water over the ladder weirs on each inspection date. The picketed leads and the exit from the fish ladder were clear of debris during the two inspections.

**Juvenile System** -No gatewells or operating orifices were reported with debris.

**Overall**, the adult fish facilities were operating within acceptable criteria ranges for the April and May 2003 inspections. **The WDFW inspector reported that during the May inspection, there were more than 40 dead smolts and one dead adult steelhead on the lower South Shore deck adjacent to the spillbay. Fish must be passing through the end spillbay and landing on the deck; this is apparently caused by the new flip lip setup and current spill schedule that calls for a large volume of water through that end bay. He indicated that the spill pattern was dumping large amounts of water onto the South Shore deck. The Project biologist was aware of the problem.**

**Potentially, this type of problem can be averted if the spill patterns are verified not only at WES, but also on site visits. It would appear that if the spill is that active near the training wall that many juvenile or adult fish can be injured or killed.**

**Little Goose Dam** – ODFW completed two inspections of the adult fish facilities this spring, on April 22 and May 20. Project discharge was 75 kcfs and 79 kcfs during the inspections with no daytime spill occurring during the inspection dates. Water temperature rose from 49°F to 52°F from April to May inspections and with the turbidity readings were 4.1 ft and 3.2 ft, respectively. Three turbine-driven pumps operating at 74-rpm average and excess flow from the juvenile bypass system were supplying water to the adult fishway in May, with only two pumps operating in April at 77.5 rpm.

**May inspection** -The South Shore fishway entrances, SSE-1 and SSE-2, were submerged 9.55 ft average with 1.3 ft head differential using the staff gage and 9.2 ft and 1.6 ft head using the FSC Board readings. Channel velocity recorded at the south end of the channel registered about 2.5 fps with water velocity reported at 2.0 fps at the north shore channel. North Powerhouse entrance gates, NPE-1 and NPE-2, were on sill and submerged 6.5 ft deep with 1.3 ft head differential using the staff gage and 6.15 ft submerged with 1.6 ft head differential using the FSC Board. The North Shore Entrances, NSE-1 and NSE-2, were submerged 6.0 ft average with the “head” at 1.2 ft with the FSC Board for the month. The exit from the fish ladder and the picket lead section at the counting station appeared clear of debris; the differential was 0.1 ft head loss across the exit trash rack and 0.1 ft between the upstream and downstream pickets. The depth of water over the ladder weirs was 1.2 ft.

**April inspection** – Only two fish pumps were operating during the April inspection and we found the facility operating at less than desirable levels. The head differentials were: 1.0 ft, 1.2 ft, and 1.2 ft at the entrances from South to North. All “head” readings were satisfactory. Because of reduced flow with the turbine pump out of service, gate depths at the South shore were: 8.1 ft at SSE-1, 7.2 ft At SSE-2; 6.5 ft at NPE-1, 4.2 ft at NPE-2; 6.1 ft at NSE-1 and 4.1 ft at NSE-2. Exit trash racks, picketed leads, and other areas were found clear of debris.

**Overall**, fish facilities were operating at less than required criteria during the April inspection. We questioned why the two gates were not set together, e.g., not set at the same elevation rather than 2-ft apart as seen at NPEs and NSEs. I thought that the project could meet minimal criteria standards with a 2-pump operation, but definitely could not on this occasion. The May inspection was satisfactory.

**Lower Granite Dam** –ODFW completed inspections of the adult fish facilities on April 22 and May 20. During the inspections, project Q was near 64 kcfs with no spill occurring. Water temperature ranged between 49-51°F (taken at the count station) with the turbidity reading at nearly 3.0 ft. Two electric fish pumps were supplying flow to the adult fishway entrances and powerhouse collection channel.

The **South Shore** entrances were submerged 8.0 ft and 7.9 ft with  $\Delta H$  of 1.6 ft for the respective April and May inspections. Staff gage and FSC Board readings were nearly equal for the two inspections at the SSEs. The exit from the fish ladder was clear of debris based on forebay elevation and first exit pool elevation (the difference would be head loss across the trash racks. There was some floating debris at the exit during the April inspection. Picket lead section at the counting station was reported with 0.1 ft head across the pickets and was clear of debris during each inspection. The depth of water over the fish ladder weirs was 0.9 ft and 1.0 ft for the respective April and May inspection.

The **North Powerhouse** entrances were on sill during both inspections with the weir depths at 7.3 ft and 7.6 ft using the FSC reading. The staff gage was within 0.1 ft of the FSC reading so no calibration was required. The  $\Delta H$  was 1.2 ft and 1.1 ft using staff gage and 1.0 ft and 1.1 ft using the FSC Board readings. The velocity in the powerhouse collection channel was about 1.0 fps at the south end of the powerhouse collection channel and between 1.9 and 2.0 fps at the North Shore. Four orifice gates were operating along the powerhouse collection channel [1, 4, 7 and 10].

At the **North Shore** , Gates NSE-1 and NSE-2 were submerged 7.0 ft below tailwater elevation during the inspection dates. On both inspections, the head differential reading was less than 1.0 ft, i.e., about 0.8 ft average for each inspection using the FSC Board and staff gage readings.

**Overall, the NSEs were operating with head differential that measured 0.8 ft (less than required 1.0 ft minimum) for the April and May inspections but gate depths were satisfactory at these entrances.** The SSEs had satisfactory gate depth and head differentials during both months; the NPEs also had satisfactory readings since the NPE gates were on sill so no further depth could be attained. The water velocity at the south end of the collection channel (1.0 fps on each inspection) was less than the 1.5 ft minimum criteria.