

ANNUAL REPORT OF OPERATIONS

FISH FACILITIES: 2009

Public Utility District No. 1 of Douglas County  
1151 Valley Mall Parkway  
East Wenatchee, Washington  
98802-4497

Wells Hydroelectric Project  
F.E.R.C. Project No. 2149

March 2010



# FISH FACILITIES OPERATIONS ANNUAL REPORT FOR 2009

## WELLS HYDROELECTRIC PROJECT NO. 2149

### Located on the Columbia River at River Mile 515.6

#### **I. FISH COUNT AND RIVER CONDITIONS**

**A.** Enumeration of adult salmon and steelhead using fish ladders at Wells Dam began on May 1 and continued through November 15. Counting was accomplished by reviewing digital video records of fish passing ladder windows. Monthly counts of each species for 24-hour and 16-hour count periods in 2009 are included in Tables 1 and 2, respectively. Table 3 shows the nighttime percent of total passage of adult salmon and steelhead. Adult steelhead, and spring, summer, and fall Chinook, and coho salmon were removed from the ladders for broodstock and are not included in the count summaries of Tables 1 and 2, but are listed in Table 4. Attachment A shows the 24-hour fish passage (0000-2400 PST) at Wells Dam by species by day from May 1 through November 15th. Attachment B shows the annual ladder counts of salmon and steelhead (16-hour count) at Wells Dam from 1967 through 2009. For comparison, Attachment C shows the 24-hour count totals for the years 1998 through 2009 (24-hour counts commenced in 1998).

**B.** Bull trout (*Salvelinus confluentus*) passage records were first initiated at Wells Dam in 1999. In 2009, 43 migratory-sized bull trout were counted between May 1 and November 15 (Table 5). Starting in the winter of 2004-2005, Public Utility District No. 1 of Douglas County (Douglas PUD), following a request from the U.S Fish and Wildlife Service (USFWS), has also been conducting winter bull trout counts (November 16 – April 30). During the past five years of winter bull trout counting, no bull trout have been observed using the fish ladders at Wells Dam.

**C.** Adult lamprey (*Lampetra tridentata*) passage records were first initiated at Wells Dam in 1995. Lamprey counts were recorded from May 1 through November 15, 2009, and daily passage numbers are shown in Table 6.

#### **II. PROJECT OPERATIONS**

##### **A. Adult Fish Passage Facilities**

The adult fish passage facilities were operated using the criteria documented in the Wells Habitat Conservation Plan (HCP), and in cooperation with the Fisheries Agencies and Tribes (See HCP Section 15, Appendix A: Adult Fish Passage Plan). Information from several years of radio-telemetry studies with both salmon and steelhead at Wells Dam showed that fishway passage time was reduced by closing the side entrance at both east and west fishways. Based upon approval of the Joint Fisheries Parties, who serve on the Wells HCP Coordinating Committee, a decision was made in 2001 to change the fishway-operation criteria at Wells Dam including the closure of the side entrance on each ladder and increasing the opening of the end gates from a six-foot opening to an eight-foot opening.

Routine inspection and maintenance was performed on the west fishway from February 4 through February 10, 2009, and on the east fishway from December 22, 2009 through January 5, 2010. Both fishways operated at criteria throughout the fish passage assessment period, except as follows: the east fishway on July 29 and 30, and the west fishway in early August, to accommodate repairs to the seals on the trash racks on the auxiliary-water-supply (AWS) chambers (see below); to install lamprey DIDSON cameras at both fishway entrances on August 20; replacement of a lamprey DIDSON camera on September 9; and finally, to remove the lamprey DIDSON equipment from both fishways on September 28.

In late July, an inspection of the pump gallery for the AWS of the east fishway revealed live, small jack sockeye; similarly, a few smaller fish were also observed in the AWS pump gallery of the west fishway. The discovery of these fish indicated a failure of one of the fish ladder barriers between the AWS and the fishway or tailrace, since the AWS is intended to be closed to fish access. A dive inspection on July 29 indicated that all diffusion grates were secure and in their proper position. However, the divers found and plugged a 2- to 3-inch gap around the lowest attraction-flow pipe through Pool #1 of the east ladder. Additionally, a dive inspection in the tailrace revealed that the seals along the top of the trash racks at the AWS intakes were severely worn, resulting in gaps of from 2 inches to 3.75 inches between the trash racks and the concrete on the tailrace side of the AWS pump gallery. These trash-rack seals were replaced on both the east and west fishways, as described above. After repairs were made to both potential locations, no further cases of fish entering the AWS system were observed.

## **B. Juvenile Bypass Facilities**

The juvenile bypass facilities at Wells Dam are designed to attract downstream-migrating fish (salmon, steelhead, bull trout and lamprey) before they enter the turbine intakes. The hydrocombine design of Wells Dam incorporates the spillways and powerhouse components of the dam into a single 1,130-foot-long section, where all flow through the dam must pass. Five spillways (Spillway 2, 4, 6, 8 and 10), located above paired turbine intakes, are equipped with bypass flow barriers. Because of the hydrocombine design, flow through the turbine intakes attracts juvenile salmonid migrants to the bypass facilities, where they are further attracted by water velocities at slotted bypass barriers and pass the project with a small volume of bypass flow.

Based upon the approval of the HCP Coordinating Committee, the spring bypass season started on April 12<sup>th</sup> at 0000 hours and ran continuously through June 13<sup>th</sup> at 2400 hours. The spring bypass operated for a total of 63 days and utilized a total discharge of 1.09 MAF, or 6.5 percent of total project discharge. During the spring bypass operation, there was forced spill during 22 hours or 1.5 percent of the season. The maximum total spill occurred on April 14 at 2100 hours with a volume of 50.0 kcfs and a total river flow of 199.3 kcfs.

Based upon the approval of the HCP Coordinating Committee, summer bypass operations began on June 14<sup>th</sup> at 0000 hours and ran until August 26<sup>th</sup> at 2400 hours, for a total of 74 days. There was 1.08 MAF, or 7.2 percent of the total discharge dedicated to summer bypass. During the summer bypass operating period, there were 18 hours or 1.0 percent of the hours with forced spill. The maximum total spill occurred on June 22 at 2100 hours with a volume of 29.4 kcfs and a total river flow was 214.0 kcfs.

The initiation and termination of the Wells bypass in 2009 was guided by the Wells HCP Coordinating Committee. Operation of the bypass system was strictly guided by the Bypass Operating Plan contained within Section 4.3 of the Wells HCP Agreement. The initiation and termination dates for the bypass system in 2009 were based upon 21 years of hydroacoustic and 14 years of species composition information collected on run patterns of juvenile hatchery and wild salmonids at Wells Dam. Based upon an analysis of the run-timing information at Wells Dam, the HCP Coordinating Committee agreed to initiate the Wells bypass system on April 12<sup>th</sup>. The analysis indicated that on average initiating the bypass system on April 12<sup>th</sup> would provide a non-turbine passage alternative for 95.5 percent of the spring emigrants. Similarly, shutting down the bypass system on August 26<sup>th</sup>, on average would provide bypass operation for 95 percent of the summer emigrants.

### **III. WATER QUALITY**

2009 daily water temperature and total dissolved gas readings from April 1 through November 15 are provided in Attachment D. Historically, water-temperature data were collected at the turbine cooling-water intake at Unit 5. A comparative analysis of water temperature data collected from the cooling-water intake and data collected in the Wells forebay and tailrace indicated that the historical water temperature sampling site (cooling water pipe) was recording temperatures several degrees Fahrenheit higher than river water temperatures collected at the two in-water monitoring stations. Since 2003, water temperatures have been measured at the intake for the fish-ladder attraction-flow pumps located in the tailrace of Wells Dam.

Total Dissolved Gas (TDG) data are reported for both the forebay and tailwater as the 12-hour high continuous average (12C-High) in percent TDG. High TDG values were seen at the tailrace TDG monitoring station in June and July (see Attachment D), but all TDG values remained in compliance with TDG water quality standards (WQS) throughout the spring and summer operation of the juvenile fish bypass system.

### **IV. FISH PRODUCTION**

The Washington Department of Fish and Wildlife (WDFW) is responsible for managing the commercial, sport, and non-game fish and wildlife resources of the State of Washington. The Wells and Methow hatcheries are owned and funded by Douglas PUD, and operated by WDFW. WDFW personnel provided the information on summer/fall Chinook and steelhead production at the Wells Hatchery (see Table 7) and spring Chinook production at the Methow Hatchery (see Table 8) in 2009.

### **V. FISH STUDIES AND PROGRAMS**

Douglas PUD funded several fish-related studies and programs during 2009. A summary of each follows.

#### **A. Sockeye Salmon Enhancement**

At the end of 2001, the Wells HCP Coordinating Committee agreed to shift the focus of Douglas PUD's sockeye responsibility from an experimental sockeye hatchery program located at Cassimer Bar to a water-management planning tool for the Canadian Okanagan River.

Inadequate and excessive water releases from Okanagan Lake was found to adversely affect the survival of both sockeye and Kokanee during the winter and spring months when eggs are incubating in gravels. The new plan involved working with the Canadian fisheries parties to develop a model-based flow-management program for use as a decision-making tool by river managers for preventing or minimizing the occurrence of damaging flows. The Fish Water Management Tool (FWMT) is the model developed to allow both fish and water managers, collectively, to determine how releases of water would affect Kokanee and sockeye resources, flood control, water-dependent recreation, and irrigators. During 2003, considerable effort was spent on the development of the FWMT and the estimation of physical and biological model parameters.

To determine if the FWMT model could improve water-release practices, retrospective analyses were performed during 2004 using historical monthly records collected over the past twenty-five water years. The retrospective analyses indicated that the average improvement in salmon egg-to-emergence survival from the implementation of the FWMT was on average 55 percent. According to the model, estimated smolt savings from using the FWMT were better in a wet year (75 percent) rather than a dry year (38 percent) because of the avoidance of egg scour. The best results from the FWMT retrospective analyses demonstrated a 443 percent improvement in salmon survival during one historic water year. In all years the FWMT provided greater than the 7 percent required mitigation for juvenile sockeye losses at Wells Dam. On October 5, 2004, the Parties to the Wells HCP via the Hatchery Committee approved the FWMT program as meeting Douglas PUD's sockeye hatchery mitigation responsibility for unavoidable juvenile sockeye losses at Wells Dam.

2009 was the fifth year that the FWMT was used by Canadian fisheries and water managers to guide water-release decisions for the Canadian Okanagan River. The Operational Team comprising water managers and fisheries scientists utilized the FWMT to make water-management decisions and, by the end of the season, the team members reaffirmed their support for annual operational deployment of the FWMT and the team approach to decision making. Despite atypical climatic and hydrologic conditions experienced during the first five years of implementation, the Operational Team has managed river flows and lake levels with the FWMT in a manner that effectively minimized property damage and fisheries losses. Thus, the real-time performance of the FWMT has consistently matched expectations based upon the retrospective analyses performed in 2004.

## **B. Adult Fishway PIT-Tag Detection System**

The National Marine Fisheries Service's (NMFS) 2000 Biological Opinion required that Douglas PUD to install adult PIT-tag detectors in the two adult fishways at Wells Dam. A PIT-tag detection system was installed in the winter of 2001-2002 and began collecting data during the 2002 adult migration. Analysis from tests of system performance indicated a detection efficiency of 99.9 percent.

Because the adult traps in each fishway are below the PIT-tag detection system, PIT-tagged fish diverted from the fishway at each trap were not monitored by the PIT-tag detection system. To increase the coverage of the system, additional PIT-tag detectors were installed in 2004 on the exit of each east and west fishway traps; the system on the trap on the west fishway was upgraded in 2008 to increase detection efficiency.

### **C. Northern Pikeminnow Removal in the Wells Tailrace and Reservoir**

Northern pikeminnow (*Ptychocheilus oregonensis*) have been identified as a major predator of juvenile salmonids in the Columbia Basin. As required by the Wells HCP, Douglas PUD continued the implementation of a program for removal of and data collection on northern pikeminnow from the Wells Project (tailrace and reservoir) in 2009. The pikeminnow-removal contractor used set-line gear to capture 19,068 northern pikeminnow in 2009. Of that total, 16,834 were at least 9 inches in fork length and 2,234 were less than 9 inches in fork length. These fish were captured during 3,283 hours of angling effort translating into an overall catch-per-unit-effort (CPUE) or fish-per-hour value of 5.8. Angling effort was determined by total hours spent to pull, check, and reset lines as well as travel and preparation time (tying hooks, assembling lines, etc.). More fish were captured in the Wells tailrace (10,521) than in Wells Reservoir (8,547), which includes the lower 1-mile section of the Methow River. From 1995 through 2009, the pikeminnow removal programs sponsored by Douglas PUD have resulted in the removal of approximately 193,000 pikeminnow from the Wells Project.

### **D. Lamprey Radio-telemetry Study**

Douglas PUD conducted a study in 2009 to enhance adult Pacific lamprey passage. The study assessed the effects of velocity reductions at fishway entrances on the attraction of adult lampreys to those entrances and their relative entrance success. Three entrance velocities (i.e., existing high, medium, and low) were assessed using Dual-frequency Identification Sonar (DIDSON) in a randomized-block design during the fall of 2009, with the goal of identifying optimal hydraulic conditions conducive to attraction to and entry of adult lampreys into the fishways at Wells Dam. Velocities at the fishway entrances were modulated by adjusting the water-surface elevations in the collection galleries relative to the tailrace water-surface elevation (referred to as the “head differential”); the head differential is 1.5 feet under routine operations. The HCP Coordinating Committee approved the study design, concluding that the study would not interfere with passage by adult salmonids (HCP Plan Species), and would provide valuable information regarding the behavior of lamprey at the fishway entrances. Study results demonstrated that a 1-foot head differential produced the most favorable velocities at the fishway entrances for lamprey attraction and entrance success. Salmonid entrance to the fishways was unaffected by the reduction in head differential from 1.5 to 1 foot.

### **E. Total Dissolved Gas Monitoring at Wells Dam**

In 2009, Douglas PUD completed the development of an operational plan for managing TDG at the Wells Project. The 2009 Wells Hydroelectric Project Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology on February 28<sup>th</sup>, 2009. The Wells Project GAP and its associated measures are intended to meet state water quality standards for TDG.

The Wells Project 2009 GAP introduced the latest numerical model developed by the University of Iowa’s IIHR-Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the tailrace of Wells Dam and further identify operational configurations that would minimize TDG production at the project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG fish spill waiver standards during the passage

season with flows up to 7Q-10 levels (246,000 cfs). Engineers determined that the most benign spillway operation at the Wells Project was the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through other spillbays in a defined pattern. These preferred TDG operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season as part of the GAP.

Average river flow at the Wells Project in 2009 was less variable and nearly 17 percent lower than the 15-year average. Monthly averages during the 2009 TDG monitoring season ranged from 53.5 kcfs in August to 146.6 kcfs in June, 12 percent and 28 percent lower than the 15-year average, respectively. The maximum hourly flows observed (219.6 kcfs in April) did not exceed the 7Q-10 value of 246.0 kcfs. Average spill at the Wells Project in 2009 was lower than the 15-year average. Average monthly spill ranged from 0.0 kcfs in late August following the fish passage season to 9.4 kcfs in June. Only on two occasions during the 2009 fish spill season did average daily spill exceed the approximate flows through the juvenile bypass system. On April 14<sup>th</sup> and June 22<sup>nd</sup> forced spill reached maximum hourly values of 55.3 and 39.4 kcfs, respectively, though daily spill still averaged roughly 15 kcfs. These were the only two appreciable spill events during the 2009 monitoring season, both caused by flow in excess of the power system needs. No hourly TDG measurements were recorded above 125 percent saturation, and the 12C-High daily values did not surpass 120 percent on any given day in the tailrace of Wells Dam. The 12C-High values at the forebay of Rocky Reach Dam did not surpass 115 percent on any given day when incoming waters from Chief Joseph Dam were in compliance (12C-High < 115 percent in the forebay of Wells Dam). Although 2009 was a relatively low flow year compared to the past 15 years (83 percent of the fifteen-year average), management of TDG levels in the Wells Project showed substantial improvements over similar years of river flow. The improvement of TDG management, despite an increasing frequency of TDG exceedances in water entering the Wells Project from Chief Joseph Dam, is confirmation that the newly implemented 2009 Wells Project Spill Playbook is providing a useful means to meet WQS within the Wells Project.

#### **F. Bull Trout Monitoring and Management Plan**

During 2009, Douglas PUD continued to implement the Wells Bull Trout Monitoring and Management Plan (Bull Trout Plan) based upon the plan approved by the USFWS and the Federal Energy Regulatory Commission (FERC) in 2005. The goal of the Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout (*Salvelinus confluentus*) associated with the operations of the Wells Hydroelectric Project (Wells Project) and associated facilities (Douglas PUD 2004). The Bull Trout Plan was prepared and implemented to meet monitoring requirements stipulated in a USFWS Biological Opinion (USFWS 2004) regarding implementation of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan. The USFWS Biological Opinion monitoring requirements were also incorporated by the FERC into the existing Wells Project license in 2004. The Bull Trout Plan was developed in collaboration with the USFWS, NMFS,

WDFW, the Colville Confederated Tribes, and the Yakama Nation, and was approved by the FERC.

The first objective of the Bull Trout Plan was to identify potential project-related impacts on upstream and downstream passage of adult bull trout (fish  $\geq 400$  mm in length) through Wells Dam and reservoir, and implement appropriate measures to monitor any incidental take of adult bull trout. To meet the first objective, radio-telemetry was used to monitor upstream and downstream passage, and off-season video counting was done in the Wells Project fishways during the winter. Between 2005 and 2008, 26 adult bull trout were trapped at Wells Dam and radio-tagged. Concurrent with the implementation of the Bull Trout Plan, the USFWS and Public Utility District No. 1 of Chelan County (Chelan PUD) radio-tagged and released 136 adult bull trout at other mid-Columbia River basin locations including the Methow River, and Rock Island and Rocky Reach dams (50 USFWS tags 2006-2008, 86 Chelan PUD tags 2005-2007).

From 2005 to 2008, 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam. Of these, 17 downstream and 41 upstream passage events occurred within one year of tagging and release. Of all tags released from 2001 to 2004, there were 2 downstream passage events and 41 upstream passage events. Of these, 2 downstream and 38 upstream passage events occurred within one year of release. The take estimates for the Wells Project were based upon the number of unique upstream and downstream passage events that took place within one year each bull trout being tagged and release. During the six year study and eight years of monitoring, 19 downstream and 79 upstream passage events took place at Wells Dam by radio-tagged bull trout within one year of release. Taking into account all observed passage events a total of 27 downstream and 93 upstream passage events took place at Wells Dam radio-tagged bull trout passed downstream through the turbines or spillways as no downstream passage events were recorded via the fishways. Out of the 19 downstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project. Out of the 79 upstream passage events that occurred within one year of tagging, zero bull trout injury or mortality was observed at the Wells Project.

Upstream passage of adult bull trout through the fish ladders at Wells Dam has historically occurred between early May and late October, with peak passage typically occurring in May and June. During the 2005 and 2008 study, 214 adult bull trout were counted passing upstream through Wells Dam. The proportion of the bull trout population at Wells Dam that was radio-tagged was 24 percent ( $52/214 = 0.24$ ).

Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod and time of year with rather predictable patterns of upstream and downstream movement. Because no take (injury or mortality) was observed during the study, there was no need to investigate how Project operations affected take at Wells Dam.

During the 2005-2008 monitoring period, no adult bull trout were counted during the 24-hour off-season fishway counting period (November 16 to April 30).

No upstream or downstream passage problems were identified during this study. Passage times upstream through the fishway appeared reasonable relative to the species migration and spawn timing. Because no passage problems were identified during the study, there was no need to develop recommendations to change or modify the fishway operations at Wells Dam.

The second objective was to assess project-related impacts on upstream and downstream passage of sub-adult bull trout (fish <400 mm in length). During the development of the Bull Trout Plan, stakeholders agreed that because of the inability to collect a sufficient sample size of sub-adult bull trout at Wells Dam, it was not feasible to assess sub-adult passage. However, when encountered at Wells Dam, or in tributary traps, sub-adult bull trout would be PIT-tagged. Douglas PUD provided funding, equipment, training, and coordination for the sub-adult bull trout PIT-tag program. From 2004 to July 2008, 67 sub-adult bull trout were PIT-tagged in the Methow River sub-basin during standard tributary smolt trapping operations. From August 2008 to December 2009, 41 sub-adult bull trout were PIT-tagged at screw traps or hook and line remote sampling taking place within the Methow Basin. Douglas PUD operated PIT-tag detection systems year-round within the Wells Dam fishways during the study period (2005 to 2009) and no PIT-tagged sub-adult bull trout were detected. Additionally, sub-adult bull trout were to be PIT-tagged opportunistically when encountered at the Wells Project; however, to date no sub-adult bull trout were encountered at Wells Dam.

Off-season (November 16 to April 30) video monitoring of the Wells Dam fishways for sub-adult bull trout was conducted during each of the years of this study including the winter of 2004 and 2005 as required by the Bull Trout Plan. Additional off-season counting took place during the winters of 2006, 2007, 2008 and 2009. To date, no sub-adult bull trout have been observed utilizing the fishways at Wells Dam.

The third objective was to investigate the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir. Field surveys were conducted at potential bull trout stranding sites during a period of low reservoir elevation. High resolution bathymetric information, reservoir elevations, backwater curves, and inflow patterns were used to identify potential stranding sites for the survey. No stranded or entrapped bull trout of any size were found during the field surveys conducted in 2006 and 2008. No surveys were conducted during 2005, 2007 or 2009 because river operations were not low enough to warrant a survey.

The fourth objective was to identify the core areas and local populations of bull trout that utilize the Wells Project. Data from radio-tagged bull trout tracked during the 2005 to 2008 study period were analyzed with data from the 2001 to 2004 study. Bull trout that pass Wells Dam (either upstream or downstream) migrated into the Methow, Entiat, and Wenatchee rivers during the spawning period. Observed tributary entrances of bull trout detected at Wells Dam from 2005 to 2008 were 86 percent Methow River, 10 percent Entiat River, and 2 percent Wenatchee River. Genetic samples of all fish tagged at Wells Dam were submitted to the USFWS for analysis. The USFWS is responsible for analyzing the genetic samples and providing those results. To further support this objective (Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the project area), Douglas PUD regularly coordinated bull trout data and monitoring activities with other agencies including the USFWS, and Chelan PUD).

In summary, no mortality or injury was observed for bull trout (adult and sub-adult) passing through or interacting with the operations of the Wells Project during the take monitoring studies conducted between 2001 and 2009. No incidental take of bull trout was observed at the Wells Project, and the Wells Project is presumed to be within the incidental take levels authorized by the USFWS Biological Opinion Incidental Take Statement (USFWS 2004).

**VI. EXPENSES for the 2009 Calendar Year**

**A. Fish Passage and Production Facilities and Non-study Expenses**

|   | Total Costs        |
|---|--------------------|
| 1. Operation of District Wells Hatchery a/c 537.2, 545.34 | \$1,399,117        |
| 2. Supervision of Fish & Game Facilities a/c 537.3        | \$269,012          |
| 3. Operation of District Methow Hatchery a/c 537.7, 545.5 | \$1,152,616        |
| 4. Fish Management a/c 537.9, 545.8                       | \$500,483          |
| 5. Maintenance of District Fish Facilities a/c 545.2      | \$203,624          |
| 6. Maintenance Miscellaneous Fish Related a/c 545.6       | \$3,841            |
| 7. Annual Debt Service on Fish and Game Plant             | \$3,521,572        |
| <b>Totals</b>   | <b>\$7,050,264</b> |

**B. Licensee Fisheries Study Costs**

|                                    |                    |
|------------------------------------|--------------------|
| 1. Fish Studies a/c 537.5          | \$418,420          |
| 2. Fish Studies – Methow a/c 537.6 | \$1,032,341        |
| <b>Total</b>                       | <b>\$1,450,761</b> |

**Table 1.** 2009 Wells Dam fish counts (24-hour count period) summarized by month.

| Month             | Chinook Salmon |              |               |              | Coho         | Sockeye      | Steelhead     |              | Total          |               |              |               |
|-------------------|----------------|--------------|---------------|--------------|--------------|--------------|---------------|--------------|----------------|---------------|--------------|---------------|
|                   | Spring         |              | Summer        |              |              |              | Fall          | All          |                | Hatchery      | Wild         |               |
|                   | Adults         | Jacks        | Adults        | Jacks        | Adults       | Jacks        | A+J           |              |                |               |              |               |
| May               | 2,093          | 1,030        |               |              |              |              | 3,123         |              | 22             | 48            | 70           |               |
| June              | 4,214          | 837          | 1,096         | 53           |              |              | 6,200         | 7,154        | 9              | 28            | 37           |               |
| July              |                |              | 19,572        | 2,386        |              |              | 21,958        | 126,162      | 264            | 238           | 502          |               |
| August            |                |              | 5,057         | 1,361        | 290          | 152          | 6,860         | 1,573        | 2,938          | 1,839         | 4,777        |               |
| September         |                |              |               |              | 2,221        | 1,541        | 3,762         | 209          | 46             | 10,833        | 5,159        | 15,992        |
| October           |                |              |               |              | 1,506        | 403          | 1,909         | 2,345        | 2              | 2,315         | 1,477        | 3,792         |
| November          |                |              |               |              | 198          | 15           | 212           | 435          |                | 120           | 132          | 252           |
| <b>Totals</b>     | <b>6,307</b>   | <b>1,867</b> | <b>25,725</b> | <b>3,800</b> | <b>4,215</b> | <b>2,111</b> | <b>44,025</b> | <b>2,989</b> | <b>134,937</b> | <b>16,501</b> | <b>8,921</b> | <b>25,422</b> |
| <b>Totals A+J</b> | <b>8,174</b>   |              | <b>29,525</b> |              | <b>6,326</b> |              |               |              |                |               |              |               |

Chinook counted per WDFW conversion dates: Spring Chinook May 1 - June 28; Summer Chinook June 29 - August 28; Fall Chinook August 29 - November 15

**Table 2.** 2009 Wells Dam fish counts (16 hour count period [0400 - 2000 PST]) summarized by month.

| Month      | Chinook Salmon |       |        |       |        |       |        | Coho  | Sockeye | Steelhead |       |
|------------|----------------|-------|--------|-------|--------|-------|--------|-------|---------|-----------|-------|
|            | Spring         |       | Summer |       | Fall   |       | All    |       |         | Hatchery  | Wild  |
|            | Adults         | Jacks | Adults | Jacks | Adults | Jacks | A+J    |       |         |           |       |
| May        | 2,031          | 1,023 |        |       |        |       | 3,054  |       |         | 19        | 37    |
| June       | 4,075          | 803   | 1,059  | 53    |        |       | 5,990  |       | 6,285   | 9         | 22    |
| July       |                |       | 18,704 | 2,298 |        |       | 21,002 |       | 109,331 | 250       | 215   |
| August     |                |       | 4,732  | 1,302 | 281    | 150   | 6,465  |       | 1,305   | 2,808     | 1,762 |
| September  |                |       |        |       | 2,141  | 1,462 | 3,603  | 195   | 42      | 10,116    | 4,819 |
| October    |                |       |        |       | 1,337  | 365   | 1,702  | 1,902 | 1       | 2,028     | 1,275 |
| November   |                |       |        |       | 166    | 12    | 178    | 318   |         | 105       | 113   |
| Total      | 6,106          | 1,826 | 24,495 | 3,653 | 3,925  | 1,989 | 41,994 | 2,415 | 116,964 | 15,335    | 8,243 |
| Totals A+J | 7,932          |       | 28,148 |       | 5,914  |       |        |       |         |           |       |

**Table 3.** 2009 Wells Dam fish counts summarized by percentage of night passage (% observed between 000 - 0400 and 2000 – 2400, PST)

| Month     | Chinook Salmon |       |        |       |        |       |     | Coho | Sockeye | Steelhead |      |
|-----------|----------------|-------|--------|-------|--------|-------|-----|------|---------|-----------|------|
|           | Spring         |       | Summer |       | Fall   |       | All |      |         | Hatchery  | Wild |
|           | Adults         | Jacks | Adults | Jacks | Adults | Jacks | A+J |      |         |           |      |
| May       | 3%             | 1%    |        |       |        |       | 2%  |      |         | 14%       | 23%  |
| June      | 3%             | 4%    | 3%     |       |        |       | 3%  |      | 12%     |           | 21%  |
| July      |                |       | 4%     | 4%    |        |       | 4%  |      | 13%     | 5%        | 10%  |
| August    |                |       | 6%     | 4%    | 3%     | 1%    | 6%  |      | 17%     | 4%        | 4%   |
| September |                |       |        |       | 4%     | 5%    | 4%  | 7%   | 9%      | 7%        | 7%   |
| October   |                |       |        |       | 11%    | 9%    | 11% | 19%  | 50%     | 12%       | 14%  |
| November  |                |       |        |       | 16%    | 20%   | 16% | 27%  |         | 13%       | 14%  |
| Total     | 3%             | 2%    | 5%     | 4%    | 7%     | 6%    | 5%  | 19%  | 13%     | 7%        | 8%   |

**Table 4.** Fish trapped from the ladders at Wells Dam and retained for broodstock (both Douglas PUD and other hatchery programs) and thus not included in the ladder counts in 2009.

| Species         | Chinook | Coho | Steelhead | Total |
|-----------------|---------|------|-----------|-------|
| Number retained | 473     | 160  | 367       | 1,000 |

**Table 5.** Passage of bull trout at Wells Dam, 2009

| Day          | April    | May      | June      | July     | Aug      | Sept     | Oct                 | Nov       |
|--------------|----------|----------|-----------|----------|----------|----------|---------------------|-----------|
| 1            |          | 0        | 1         | 1        | 0        | 0        | 0                   | 0         |
| 2            |          | 0        | 0         | 0        | 1        | 0        | 0                   | 0         |
| 3            |          | 0        | 2         | 0        | 0        | 0        | 0                   | 0         |
| 4            |          | 0        | 0         | 1        | 0        | 0        | 0                   | 0         |
| 5            |          | 0        | 3         | 1        | 0        | 0        | 0                   | 0         |
| 6            |          | 0        | 2         | 0        | 0        | 0        | 0                   | 0         |
| 7            |          | 0        | 2         | 0        | 0        | 0        | 0                   | 0         |
| 8            |          | 0        | 0         | 1        | 0        | 0        | 0                   | 0         |
| 9            |          | 0        | 1         | 0        | 0        | 0        | 0                   | 0         |
| 10           |          | 0        | 2         | 1        | 0        | 0        | 0                   | 0         |
| 11           |          | 0        | 1         | 0        | 0        | 0        | 0                   | 0         |
| 12           |          | 0        | 1         | 0        | 0        | 0        | 0                   | 0         |
| 13           |          | 0        | 2         | 1        | 0        | 0        | 0                   | 0         |
| 14           |          | 0        | 1         | 1        | 0        | 0        | 0                   | 0         |
| 15           | 0        | 0        | 1         | 0        | 0        | 0        | 0                   | 0         |
| 16           | 0        | 0        | 2         | 0        | 0        | 0        | 0                   |           |
| 17           | 0        | 0        | 3         | 0        | 0        | 0        | 0                   |           |
| 18           | 0        | 0        | 0         | 0        | 0        | 0        | 0                   |           |
| 19           | 0        | 0        | 1         | 0        | 0        | 0        | 0                   |           |
| 20           | 0        | 0        | 1         | 0        | 0        | 0        | 0                   |           |
| 21           | 0        | 0        | 2         | 0        | 0        | 0        | 0                   |           |
| 22           | 0        | 0        | 0         | 1        | 0        | 0        | 0                   |           |
| 23           | 0        | 0        | 1         | 0        | 0        | 0        | 0                   |           |
| 24           | 0        | 2        | 0         | 0        | 0        | 0        | 0                   |           |
| 25           | 0        | 0        | 0         | 0        | 0        | 0        | 0                   |           |
| 26           | 0        | 0        | 0         | 0        | 0        | 0        | 0                   |           |
| 27           | 0        | 1        | 1         | 0        | 0        | 0        | 0                   |           |
| 28           | 0        | 0        | 0         | 0        | 0        | 0        | 0                   |           |
| 29           | 0        | 0        | 0         | 0        | 0        | 0        | 0                   |           |
| 30           | 0        | 1        | 0         | 0        | 0        | 0        | 0                   |           |
| 31           |          | 0        |           | 0        | 0        |          | 0                   |           |
| <b>Total</b> | <b>0</b> | <b>4</b> | <b>30</b> | <b>8</b> | <b>1</b> | <b>0</b> | <b>0</b>            | <b>0</b>  |
|              |          |          |           |          |          |          | <b>Season total</b> | <b>43</b> |

**Table 6.** Passage of lamprey at Wells Dam, 2009

| Day          | April    | May      | June     | July     | Aug      | Sept                | Oct      | Nov      |
|--------------|----------|----------|----------|----------|----------|---------------------|----------|----------|
| 1            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 2            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 3            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 4            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 5            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 6            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 7            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 8            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 9            |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 10           |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 11           |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 12           |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 13           |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 14           |          | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 15           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        | 0        |
| 16           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 17           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 18           | 0        | 0        | 0        | 0        | 2        | 0                   | 0        |          |
| 19           | 0        | 0        | 0        | 0        | 1        | 0                   | 0        |          |
| 20           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 21           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 22           | 0        | 0        | 0        | 0        | 1        | 0                   | 0        |          |
| 23           | 0        | 0        | 0        | 0        | 1        | 0                   | 0        |          |
| 24           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 25           | 0        | 0        | 0        | 0        | 2        | 0                   | 0        |          |
| 26           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 27           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 28           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 29           | 0        | 0        | 0        | 1        | 0        | 0                   | 0        |          |
| 30           | 0        | 0        | 0        | 0        | 0        | 0                   | 0        |          |
| 31           |          | 0        |          | 1        | 0        |                     | 0        |          |
| <b>Total</b> | <b>0</b> | <b>0</b> | <b>0</b> | <b>2</b> | <b>7</b> | <b>0</b>            | <b>0</b> | <b>0</b> |
|              |          |          |          |          |          | <b>Season total</b> |          | <b>9</b> |

**Table 7.** Production from the Wells Hatchery in 2009

|  | Summer Chinook | Summer Steelhead<br>(2009 Brood) <sup>1</sup> |
|--|----------------|---|
| Adults spawned in 2009                         | 1,490          | 297   |
| Eggs taken, 2009                               | 3,261,800      | 921,376                                       |
| Eggs transferred, 2009                         | 2,125,200      | 77,346 <sup>2</sup>                           |
| Eggs transferred for Lake Chelan release, 2009 | 101,200        | NA  |
| Juveniles transferred (Ringold FH)             | NA             | 178,522 <sup>3</sup>                          |
| Juveniles released (yearlings), 2007 brood     | 310,063        | NA  |
| Juveniles released (subyearlings), 2008 brood  | 427,131        | 559,809                                       |

1. Adult steelhead collected at Wells Dam for broodstock are held until spawning during the following year. Steelhead spawned in 2009 (designated 2009 brood) were actually collected in 2008.

2. Transfer to the Winthrop National Fish Hatchery

3. Steelhead transferred to Ringold Hatchery.

**Table 8.** Spring Chinook production from the Methow Hatchery in 2008

|   | Twisp R. | Chewuch R.       | Methow R. |
|---|----------|------------------|-----------|
| Adults trapped, 2009 brood <sup>1</sup> | 40       | 276              |           |
| Adults spawned, 2009 brood              | 39       | 267 <sup>2</sup> |           |
| Eggs taken, 2009 brood                  | 70,966   | 593,930          |           |
| Juveniles released, 2007 brood          | 54,096   | 126,055          | 119,407   |

1. In 2009, spring Chinook adults were trapped at the West Ladder trap at Wells Dam, the Methow Hatchery outfall channel, the outfall from the Winthrop National Fish Hatchery, and the Twisp tributary trap. Twisp-origin fish collected at all locations were identified using genetic analysis. Only those fish collected from the West Ladder trap at Wells Dam were excluded from the fish passage summaries (see Tables 1-3).

2. All non-Twisp fish were categorized as Methow-Composite (MetComp).

**Attachment A.** Wells Dam daily fish passage (24-hour count) for May 2009.

| Date          | Chinook      |              | Coho     | Sockeye  | Steelhead  |            | Lamprey  |
|---------------|--------------|--------------|----------|----------|------------|------------|----------|
|               | Adults       | Jacks        |          |          | Ad-clipped | Ad-present |          |
| 1             | 0            | 0            | 0        | 0        | 3          | 2          | 0        |
| 2             | 0            | 0            | 0        | 0        | 3          | 0          | 0        |
| 3             | 0            | 0            | 0        | 0        | 2          | 3          | 0        |
| 4             | 0            | 0            | 0        | 0        | 1          | 2          | 0        |
| 5             | 0            | 0            | 0        | 0        | 1          | 1          | 0        |
| 6             | 0            | 0            | 0        | 0        | 0          | 2          | 0        |
| 7             | 0            | 0            | 0        | 0        | 1          | 0          | 0        |
| 8             | 0            | 0            | 0        | 0        | 1          | 3          | 0        |
| 9             | 0            | 0            | 0        | 0        | 1          | 1          | 0        |
| 10            | 1            | 0            | 0        | 0        | 1          | 2          | 0        |
| 11            | 0            | 0            | 0        | 0        | 1          | 1          | 0        |
| 12            | 2            | 0            | 0        | 0        | 2          | 4          | 0        |
| 13            | 3            | 0            | 0        | 0        | 0          | 1          | 0        |
| 14            | 31           | 4            | 0        | 0        | 0          | 2          | 0        |
| 15            | 11           | 3            | 0        | 0        | 0          | 2          | 0        |
| 16            | 27           | 6            | 0        | 0        | 0          | 2          | 0        |
| 17            | 57           | 11           | 0        | 0        | 1          | 3          | 0        |
| 18            | 18           | 3            | 0        | 0        | 0          | 1          | 0        |
| 19            | 69           | 24           | 0        | 0        | 1          | 1          | 0        |
| 20            | 44           | 26           | 0        | 0        | 1          | 2          | 0        |
| 21            | 246          | 82           | 0        | 0        | 1          | 3          | 0        |
| 22            | 212          | 42           | 0        | 0        | 1          | 0          | 0        |
| 23            | 286          | 32           | 0        | 0        | 0          | 2          | 0        |
| 24            | 143          | 15           | 0        | 0        | 0          | 0          | 0        |
| 25            | 315          | 62           | 0        | 0        | 0          | 3          | 0        |
| 26            | 72           | 48           | 0        | 0        | 0          | 1          | 0        |
| 27            | 134          | 143          | 0        | 0        | 0          | 2          | 0        |
| 28            | 135          | 94           | 0        | 0        | 0          | 0          | 0        |
| 29            | 124          | 162          | 0        | 0        | 0          | 1          | 0        |
| 30            | 64           | 132          | 0        | 0        | 0          | 0          | 0        |
| 31            | 99           | 141          | 0        | 0        | 0          | 1          | 0        |
| <b>Totals</b> | <b>2,093</b> | <b>1,030</b> | <b>0</b> | <b>0</b> | <b>22</b>  | <b>48</b>  | <b>0</b> |

**Attachment A. (continued).** Wells Dam daily fish passage (24-hour count) for June 2009.

| Date          | Chinook      |            | Coho     | Sockeye      | Steelhead  |            | Lamprey  |
|---------------|--------------|------------|----------|--------------|------------|------------|----------|
|               | Adults       | Jacks      |          |              | Ad-clipped | Ad-present |          |
| 1             | 20           | 58         | 0        | 0            | 0          | 3          | 0        |
| 2             | 66           | 73         | 0        | 0            | 0          | 0          | 0        |
| 3             | 22           | 82         | 0        | 0            | 1          | 1          | 0        |
| 4             | 55           | 141        | 0        | 0            | 1          | 0          | 0        |
| 5             | 80           | 67         | 0        | 0            | 0          | 0          | 0        |
| 6             | 37           | 31         | 0        | 0            | 0          | 0          | 0        |
| 7             | 42           | 19         | 0        | 0            | 0          | 2          | 0        |
| 8             | 41           | 10         | 0        | 0            | 1          | 1          | 0        |
| 9             | 55           | 38         | 0        | 0            | 0          | 0          | 0        |
| 10            | 36           | 32         | 0        | 0            | 1          | 1          | 0        |
| 11            | 40           | 39         | 0        | 0            | 0          | 3          | 0        |
| 12            | 51           | 17         | 0        | 0            | 0          | 0          | 0        |
| 13            | 41           | 5          | 0        | 0            | 2          | 1          | 0        |
| 14            | 30           | 5          | 0        | 0            | 0          | 1          | 0        |
| 15            | 15           | 5          | 0        | 2            | 0          | 1          | 0        |
| 16            | 17           | 13         | 0        | 3            | 0          | 2          | 0        |
| 17            | 99           | 14         | 0        | 8            | 0          | 0          | 0        |
| 18            | 65           | 29         | 0        | 22           | 0          | 0          | 0        |
| 19            | 95           | 19         | 0        | 22           | 0          | 1          | 0        |
| 20            | 145          | 12         | 0        | 66           | 0          | 0          | 0        |
| 21            | 347          | 4          | 0        | 116          | 1          | 3          | 0        |
| 22            | 212          | 3          | 0        | 69           | 1          | 3          | 0        |
| 23            | 204          | 15         | 0        | 205          | 0          | 1          | 0        |
| 24            | 276          | 14         | 0        | 270          | 0          | 1          | 0        |
| 25            | 391          | 17         | 0        | 367          | 0          | 0          | 0        |
| 26            | 548          | 23         | 0        | 314          | 0          | 2          | 0        |
| 27            | 652          | 39         | 0        | 752          | 0          | 1          | 0        |
| 28            | 532          | 13         | 0        | 1,182        | 0          | 0          | 0        |
| 29            | 739          | 26         | 0        | 1,511        | 0          | 0          | 0        |
| 30            | 357          | 27         | 0        | 2,245        | 1          | 0          | 0        |
| <b>Totals</b> | <b>5,310</b> | <b>890</b> | <b>0</b> | <b>7,154</b> | <b>9</b>   | <b>28</b>  | <b>0</b> |

**Attachment A. (continued).** Wells Dam daily fish passage (24-hour count) for July 2009.

| Date          | Chinook       |              | Coho     | Sockeye        | Steelhead  |            | Lamprey  |
|---------------|---------------|--------------|----------|----------------|------------|------------|----------|
|               | Adults        | Jacks        |          |                | Ad-clipped | Ad-present |          |
| 1             | 503           | 28           | 0        | 2482           | 1          | 1          | 0        |
| 2             | 1606          | 75           | 0        | 2501           | 0          | 0          | 0        |
| 3             | 1716          | 94           | 0        | 3501           | 0          | 0          | 0        |
| 4             | 1153          | 129          | 0        | 6765           | 1          | 1          | 0        |
| 5             | 1334          | 113          | 0        | 6916           | 1          | 1          | 0        |
| 6             | 457           | 44           | 0        | 5306           | 1          | 1          | 0        |
| 7             | 543           | 58           | 0        | 6007           | 3          | 3          | 0        |
| 8             | 664           | 72           | 0        | 6400           | 1          | 1          | 0        |
| 9             | 1251          | 66           | 0        | 7729           | 0          | 0          | 0        |
| 10            | 633           | 77           | 0        | 8968           | 3          | 3          | 0        |
| 11            | 662           | 88           | 0        | 9699           | 1          | 1          | 0        |
| 12            | 1185          | 137          | 0        | 7467           | 5          | 5          | 0        |
| 13            | 418           | 43           | 0        | 6754           | 1          | 1          | 0        |
| 14            | 158           | 54           | 0        | 6355           | 4          | 4          | 0        |
| 15            | 374           | 80           | 0        | 5318           | 4          | 4          | 0        |
| 16            | 621           | 92           | 0        | 6136           | 7          | 7          | 0        |
| 17            | 863           | 144          | 0        | 5707           | 7          | 7          | 0        |
| 18            | 1139          | 100          | 0        | 4225           | 6          | 6          | 0        |
| 19            | 411           | 93           | 0        | 4034           | 6          | 6          | 0        |
| 20            | 124           | 61           | 0        | 2745           | 5          | 5          | 0        |
| 21            | 147           | 72           | 0        | 2038           | 12         | 12         | 0        |
| 22            | 278           | 74           | 0        | 1802           | 10         | 10         | 0        |
| 23            | 1041          | 130          | 0        | 1814           | 26         | 26         | 0        |
| 24            | 502           | 61           | 0        | 1160           | 10         | 10         | 0        |
| 25            | 157           | 67           | 0        | 1031           | 13         | 13         | 0        |
| 26            | 231           | 52           | 0        | 899            | 25         | 25         | 0        |
| 27            | 352           | 59           | 0        | 631            | 7          | 7          | 0        |
| 28            | 102           | 41           | 0        | 470            | 24         | 24         | 0        |
| 29            | 113           | 33           | 0        | 354            | 17         | 17         | 1        |
| 30            | 232           | 66           | 0        | 519            | 24         | 24         | 0        |
| 31            | 602           | 83           | 0        | 429            | 39         | 39         | 1        |
| <b>Totals</b> | <b>19,572</b> | <b>2,386</b> | <b>0</b> | <b>126,162</b> | <b>264</b> | <b>264</b> | <b>2</b> |

**Attachment A. (continued).** Wells Dam daily fish passage (24-hour count) for August 2009.

| Date          | Chinook      |              | Coho     | Sockeye      | Steelhead    |              | Lamprey  |
|---------------|--------------|--------------|----------|--------------|--------------|--------------|----------|
|               | Adults       | Jacks        |          |              | Ad-clipped   | Ad-present   |          |
| 1             | 107          | 68           | 0        | 280          | 9            | 15           | 0        |
| 2             | 352          | 118          | 0        | 234          | 34           | 19           | 0        |
| 3             | 346          | 106          | 0        | 167          | 45           | 29           | 0        |
| 4             | 450          | 75           | 0        | 133          | 30           | 22           | 0        |
| 5             | 189          | 39           | 0        | 82           | 17           | 26           | 0        |
| 6             | 113          | 54           | 0        | 79           | 43           | 18           | 0        |
| 7             | 15           | 22           | 0        | 34           | 20           | 13           | 0        |
| 8             | 103          | 28           | 0        | 43           | 51           | 37           | 0        |
| 9             | 307          | 93           | 0        | 76           | 76           | 50           | 0        |
| 10            | 257          | 45           | 0        | 69           | 26           | 50           | 0        |
| 11            | 89           | 28           | 0        | 57           | 41           | 31           | 0        |
| 12            | 153          | 31           | 0        | 48           | 25           | 22           | 0        |
| 13            | 87           | 27           | 0        | 21           | 51           | 36           | 0        |
| 14            | 173          | 46           | 0        | 16           | 70           | 51           | 0        |
| 15            | 244          | 52           | 0        | 9            | 57           | 78           | 0        |
| 16            | 287          | 52           | 0        | 21           | 50           | 27           | 0        |
| 17            | 257          | 57           | 0        | 27           | 85           | 36           | 0        |
| 18            | 268          | 53           | 0        | 28           | 73           | 38           | 2        |
| 19            | 193          | 37           | 0        | 15           | 88           | 32           | 1        |
| 20            | 43           | 19           | 0        | 14           | 78           | 48           | 0        |
| 21            | 57           | 24           | 0        | 11           | 66           | 56           | 0        |
| 22            | 140          | 37           | 0        | 17           | 63           | 45           | 1        |
| 23            | 278          | 55           | 0        | 33           | 131          | 86           | 1        |
| 24            | 280          | 59           | 0        | 20           | 137          | 97           | 0        |
| 25            | 68           | 22           | 0        | 4            | 58           | 64           | 2        |
| 26            | 39           | 24           | 0        | 4            | 131          | 69           | 0        |
| 27            | 62           | 34           | 0        | 1            | 251          | 103          | 0        |
| 28            | 100          | 56           | 0        | 9            | 252          | 153          | 0        |
| 29            | 128          | 69           | 0        | 7            | 329          | 168          | 0        |
| 30            | 108          | 47           | 0        | 11           | 278          | 119          | 0        |
| 31            | 54           | 36           | 0        | 3            | 273          | 201          | 0        |
| <b>Totals</b> | <b>5,347</b> | <b>1,513</b> | <b>0</b> | <b>1,573</b> | <b>2,938</b> | <b>1,839</b> | <b>7</b> |

**Attachment A. (continued).** Wells Dam daily fish passage (24-hour count) for September 2009.

| Date          | Chinook      |              | Coho       | Sockeye   | Steelhead     |              | Lamprey  |
|---------------|--------------|--------------|------------|-----------|---------------|--------------|----------|
|               | Adults       | Jacks        |            |           | Ad-clipped    | Ad-present   |          |
| 1             | 155          | 68           | 0          | 4         | 292           | 134          | 0        |
| 2             | 97           | 101          | 0          | 7         | 485           | 227          | 0        |
| 3             | 185          | 59           | 0          | 6         | 396           | 173          | 0        |
| 4             | 109          | 62           | 0          | 0         | 339           | 185          | 0        |
| 5             | 53           | 116          | 0          | 2         | 449           | 248          | 0        |
| 6             | 211          | 88           | 0          | 1         | 362           | 200          | 0        |
| 7             | 155          | 65           | 0          | 2         | 627           | 258          | 0        |
| 8             | 46           | 80           | 0          | 2         | 619           | 241          | 0        |
| 9             | 56           | 90           | 0          | 1         | 374           | 150          | 0        |
| 10            | 180          | 82           | 0          | 7         | 636           | 287          | 0        |
| 11            | 75           | 76           | 0          | 6         | 686           | 450          | 0        |
| 12            | 46           | 60           | 1          | 0         | 540           | 253          | 0        |
| 13            | 76           | 34           | 2          | 2         | 420           | 197          | 0        |
| 14            | 31           | 33           | 0          | 1         | 194           | 104          | 0        |
| 15            | 70           | 39           | 4          | 0         | 223           | 164          | 0        |
| 16            | 36           | 47           | 0          | 2         | 349           | 123          | 0        |
| 17            | 49           | 44           | 6          | 0         | 385           | 194          | 0        |
| 18            | 85           | 54           | 7          | 0         | 536           | 254          | 0        |
| 19            | 143          | 51           | 12         | 0         | 338           | 153          | 0        |
| 20            | 48           | 19           | 12         | 0         | 295           | 113          | 0        |
| 21            | 22           | 22           | 3          | 0         | 263           | 95           | 0        |
| 22            | 18           | 21           | 7          | 1         | 217           | 90           | 0        |
| 23            | 37           | 26           | 14         | 1         | 354           | 156          | 0        |
| 24            | 12           | 25           | 10         | 0         | 182           | 82           | 0        |
| 25            | 62           | 25           | 13         | 1         | 139           | 92           | 0        |
| 26            | 38           | 31           | 34         | 0         | 319           | 176          | 0        |
| 27            | 54           | 45           | 29         | 0         | 228           | 119          | 0        |
| 28            | 19           | 21           | 17         | 0         | 186           | 69           | 0        |
| 29            | 37           | 32           | 20         | 0         | 277           | 130          | 0        |
| 30            | 16           | 25           | 18         | 0         | 123           | 42           | 0        |
| <b>Totals</b> | <b>2,221</b> | <b>1,541</b> | <b>209</b> | <b>46</b> | <b>10,833</b> | <b>5,159</b> | <b>0</b> |

**Attachment A. (continued).** Wells Dam daily fish passage (24-hour count) for October 2009.

| Date          | Chinook      |            | Coho         | Sockeye  | Steelhead    |              | Lamprey  |
|---------------|--------------|------------|--------------|----------|--------------|--------------|----------|
|               | Adults       | Jacks      |              |          | Ad-clipped   | Ad-present   |          |
| 1             | 27           | 26         | 28           | 0        | 165          | 88           | 0        |
| 2             | 52           | 21         | 30           | 0        | 245          | 118          | 0        |
| 3             | 51           | 19         | 40           | 0        | 179          | 115          | 0        |
| 4             | 184          | 24         | 49           | 0        | 175          | 106          | 0        |
| 5             | 21           | 20         | 22           | 0        | 70           | 61           | 0        |
| 6             | 20           | 15         | 27           | 1        | 96           | 49           | 0        |
| 7             | 22           | 16         | 28           | 0        | 122          | 82           | 0        |
| 8             | 23           | 10         | 40           | 0        | 124          | 59           | 0        |
| 9             | 21           | 28         | 41           | 0        | 111          | 55           | 0        |
| 10            | 17           | 8          | 54           | 0        | 81           | 41           | 0        |
| 11            | 23           | 16         | 99           | 0        | 121          | 81           | 0        |
| 12            | 34           | 13         | 65           | 0        | 70           | 29           | 0        |
| 13            | 36           | 8          | 48           | 0        | 70           | 48           | 0        |
| 14            | 48           | 5          | 39           | 0        | 65           | 37           | 0        |
| 15            | 43           | 17         | 102          | 0        | 36           | 38           | 0        |
| 16            | 56           | 10         | 110          | 0        | 55           | 40           | 0        |
| 17            | 50           | 11         | 103          | 0        | 89           | 60           | 0        |
| 18            | 45           | 20         | 116          | 0        | 46           | 54           | 0        |
| 19            | 55           | 15         | 82           | 1        | 36           | 24           | 0        |
| 20            | 57           | 12         | 109          | 0        | 26           | 42           | 0        |
| 21            | 89           | 18         | 82           | 0        | 51           | 38           | 0        |
| 22            | 76           | 6          | 99           | 0        | 60           | 46           | 0        |
| 23            | 79           | 12         | 80           | 0        | 38           | 42           | 0        |
| 24            | 38           | 8          | 76           | 0        | 16           | 10           | 0        |
| 25            | 37           | 10         | 88           | 0        | 27           | 29           | 0        |
| 26            | 14           | 3          | 80           | 0        | 21           | 4            | 0        |
| 27            | 38           | 5          | 69           | 0        | 24           | 17           | 0        |
| 28            | 45           | 8          | 120          | 0        | 23           | 4            | 0        |
| 29            | 78           | 6          | 150          | 0        | 36           | 17           | 0        |
| 30            | 71           | 4          | 153          | 0        | 30           | 22           | 0        |
| 31            | 56           | 9          | 116          | 0        | 7            | 21           | 0        |
| <b>Totals</b> | <b>1,506</b> | <b>403</b> | <b>2,345</b> | <b>2</b> | <b>2,315</b> | <b>1,477</b> | <b>0</b> |

**Attachment A. (concluded).** Wells Dam daily fish passage (24-hour count) for November 1-15, 2009.

| Date          | Chinook    |           | Coho       | Sockeye  | Steelhead  |            | Lamprey  |
|---------------|------------|-----------|------------|----------|------------|------------|----------|
|               | Adults     | Jacks     |            |          | Ad-clipped | Ad-present |          |
| 1             | 63         | 7         | 76         | 0        | 14         | 10         | 0        |
| 2             | 51         | 0         | 106        | 0        | 10         | 15         | 0        |
| 3             | 14         | 3         | 58         | 0        | 11         | 12         | 0        |
| 4             | 26         | 0         | 38         | 0        | 18         | 18         | 0        |
| 5             | 14         | 0         | 27         | 0        | 12         | 9          | 0        |
| 6             | 4          | 2         | 35         | 0        | 9          | 12         | 0        |
| 7             | 11         | 0         | 20         | 0        | 4          | 10         | 0        |
| 8             | 7          | 2         | 28         | 0        | 13         | 11         | 0        |
| 9             | 2          | 0         | 29         | 0        | 4          | 6          | 0        |
| 10            | 0          | 0         | 12         | 0        | 6          | 6          | 0        |
| 11            | 1          | 0         | 3          | 0        | 3          | 6          | 0        |
| 12            | 4          | 0         | 1          | 0        | 6          | 4          | 0        |
| 13            | 0          | 1         | 0          | 0        | 4          | 8          | 0        |
| 14            | 1          | 0         | 1          | 0        | 5          | 1          | 0        |
| 15            | 0          | 0         | 1          | 0        | 1          | 4          | 0        |
| <b>Totals</b> | <b>198</b> | <b>15</b> | <b>435</b> | <b>0</b> | <b>120</b> | <b>132</b> | <b>0</b> |

**Attachment B. Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 16-hour Daily Count Period (1967-2009)**

| Year  | Chinook Spring | Chinook Summer | Chinook Fall | Chinook Trapped | Chinook Total | Coho <sup>1</sup> | Sockeye | Steelhead | Steelhead Trapped | Steelhead Total | Total Salmonids | Count Dates Include: |
|-------|----------------|----------------|--------------|-----------------|---------------|-------------------|---------|-----------|-------------------|-----------------|-----------------|----------------------|
| 1967  | 1,157          | 12,504         | 2,732        | 2,004           | 18,397        | 255               | 113,232 | 1,474     | 171               | 1,645           | 133,529         | 5/21-11/19           |
| 1968  | 4,931          | 8,922          | 2,623        | 2,277           | 18,753        | 221               | 81,530  | 2,112     | 413               | 2,525           | 103,029         | 5/01-11/15           |
| 1969  | 3,599          | 6,846          | 2,929        | 2,873           | 16,247        | 29                | 17,352  | 1,391     | 530               | 1,921           | 35,549          | 5/01-11/15           |
| 1970  | 2,670          | 8,003          | 4,388        | 1,745           | 16,806        | 62                | 50,667  | 1,597     | 399               | 1,996           | 69,531          | 5/01-11/15           |
| 1971  | 3,168          | 5,988          | 2,030        | 1,793           | 12,979        | 161               | 48,172  | 3,782     | 358               | 4,140           | 65,452          | 4/30-11/15           |
| 1972  | 3,616          | 4,141          | 2,419        | 1,694           | 11,870        | 665               | 33,398  | 1,894     | 354               | 2,248           | 48,181          | 4/30-11/15           |
| 1973  | 2,937          | 5,052          | 2,650        | 2,088           | 12,727        | 331               | 37,178  | 1,820     | 627               | 2,447           | 52,683          | 4/30-11/15           |
| 1974  | 3,420          | 4,567          | 1,114        | 2,893           | 11,994        | 112               | 16,716  | 580       | 260               | 840             | 29,662          | 5/01-10/31           |
| 1975  | 2,225          | 8,522          | 3,806        | 3,253           | 17,806        | 25                | 22,286  | 517       | 227               | 744             | 40,861          | 5/01-10/31           |
| 1976  | 2,759          | 7,901          | 3,843        | 2,518           | 17,021        | 99                | 27,619  | 4,664     | 337               | 5,001           | 49,740          | 5/01-11/15           |
| 1977  | 4,211          | 7,527          | 3,260        | 2,628           | 17,626        | 68                | 21,973  | 5,282     | 355               | 5,637           | 45,304          | 5/01-11/15           |
| 1978  | 3,615          | 6,419          | 1,336        | 2,259           | 13,629        | 77                | 7,458   | 1,621     | 356               | 1,977           | 23,141          | 5/01-10/31           |
| 1979  | 1,103          | 10,080         | 1,108        | 2,352           | 14,643        | 63                | 22,655  | 3,695     | 367               | 4,062           | 41,423          | 5/01-11/16           |
| 1980  | 1,182          | 4,892          | 709          | 1,827           | 8,610         | 82                | 26,573  | 3,443     | 372               | 3,815           | 39,080          | 5/01-11/22           |
| 1981  | 1,935          | 4,276          | 686          | 1,533           | 8,430         | 26                | 28,234  | 4,096     | 650               | 4,746           | 41,436          | 5/01-11/22           |
| 1982  | 2,401          | 3,349          | 2,064        | 700             | 8,514         | 357               | 19,005  | 7,984     | 590               | 8,574           | 36,450          | 5/01-11/22           |
| 1983  | 2,869          | 2,821          | 1,150        | 942             | 7,782         | 82                | 27,925  | 19,525    | 670               | 20,195          | 55,984          | 5/01-11/30           |
| 1984  | 3,280          | 5,941          | 1,812        | 1,094           | 12,127        | 104               | 81,054  | 16,632    | 690               | 17,322          | 110,607         | 5/01-11/25           |
| 1985  | 5,257          | 4,456          | 2,097        | 1,689           | 13,499        | 72                | 53,170  | 19,867    | 750               | 20,617          | 87,358          | 5/01-11/22           |
| 1986  | 3,150          | 4,178          | 1,143        | 1,118           | 9,589         | 87                | 34,876  | 13,303    | 650               | 13,953          | 58,505          | 5/01-11/14           |
| 1987  | 2,344          | 3,142          | 3,253        | 1,275           | 10,014        | 42                | 39,948  | 5,493     | 603               | 6,096           | 56,100          | 5/01-11/13           |
| 1988  | 3,036          | 2,775          | 1,935        | 1,364           | 9,110         | 75                | 33,980  | 4,401     | 651               | 5,052           | 48,217          | 5/01-10/31           |
| 1989  | 1,740          | 3,333          | 1,435        | 2,147           | 8,655         | 14                | 15,895  | 4,600     | 716               | 5,316           | 29,880          | 5/01-10/31           |
| 1990  | 981            | 3,354          | 749          | 1,109           | 6,193         | 32                | 7,597   | 3,815     | 735               | 4,550           | 18,372          | 5/01-11/07           |
| 1991  | 779            | 2,028          | 827          | 1,525           | 5,159         | 21                | 27,492  | 7,751     | 726               | 8,477           | 41,149          | 5/01-11/15           |
| 1992  | 1,623          | 1,967          | 1,503        | 895             | 7,980         | 28                | 41,844  | 7,027     | 658               | 7,685           | 57,537          | 5/01-11/15           |
| 1993  | 2,444          | 3,603          | 1,228        | 1,780           | 9,055         | 19                | 28,038  | 2,494     | 633               | 3,127           | 40,239          | 5/01-11/16           |
| 1994  | 257            | 4,891          | 3,017        | 2,287           | 10,452        | 3                 | 1,662   | 2,163     | 620               | 2,783           | 14,900          | 5/01-11/15           |
| 1995  | 103            | 3,076          | 1,229        | 2,164           | 6,572         | 6                 | 4,801   | 942       | 619               | 1,561           | 12,940          | 5/01-11/15           |
| 1996  | *              | 2,389          | 917          | 1,665           | 4,971         | 4                 | 17,703  | 4,128     | 509               | 4,637           | 27,315          | 5/01-11/15           |
| 1997  | 971            | 2,721          | 766          | 1,655           | 6,113         | 8                 | 25,754  | 4,107     | 630               | 4,737           | 36,612          | 5/01-11/15           |
| 1998  | *              | 3,799          | 1,067        | 1,559           | 6,425         | 0                 | 4,135   | 2,520     | 460               | 2,980           | 13,540          | 5/01-11/15           |
| 1999  | 345            | 7,787          | 2,548        | 938             | 11,618        | 224               | 12,388  | 3,504     | 416               | 3,920           | 28,150          | 5/01-11/15           |
| 2000  | 2,435          | 9,673          | 3,049        | 1,327           | 16,484        | 0                 | 53,351  | 5,575     | 369               | 5,944           | 75,779          | 5/01-11/15           |
| 2001  | 10,414         | 35,990         | 8,634        | 556             | 55,594        | 473               | 64,819  | 16,251    | 392               | 16,643          | 137,529         | 5/01-11/15           |
| 2002  | 7,098          | 59,540         | 5,573        | 556             | 72,767        | 104               | 9,594   | 8,253     | 373               | 8,626           | 91,091          | 5/01-11/15           |
| 2003  | 4,480          | 43,480         | 7,397        | 556             | 55,913        | 137               | 24,684  | 8,721     | 374               | 9,095           | 89,829          | 5/01-11/15           |
| 2004  | 2,493          | 31,172         | 5,265        | 558             | 39,488        | 234               | 64,959  | 7,825     | 452               | 8,277           | 112,958         | 5/01-11/15           |
| 2005  | 4,831          | 30,842         | 3,110        | 563             | 39,346        | 273               | 46,891  | 6,331     | 417               | 6,748           | 93,258          | 5/01-11/15           |
| 2006  | 3,996          | 26,345         | 4,658        | 575             | 35,574        | 399               | 18,880  | 5,877     | 368               | 6,245           | 61,098          | 5/01-11/15           |
| 2007  | 2,543          | 15,866         | 2,356        | 521             | 21,286        | 2,033             | 19,106  | 6,574     | 379               | 6,953           | 49,378          | 5/01-11/15           |
| 2008  | 2,739          | 20,954         | 5,788        | 415             | 29,896        | 925               | 145,067 | 8,622     | 370               | 8,992           | 207,924         | 5/01-11/15           |
| 2009  | 7,932          | 28,148         | 5,914        | 473             | 41,994        | 2,415             | 116,964 | 23,578    | 367               | 23,945          | 185,791         | 5/01-11/15           |
| Mean  | 3,002          | 11,006         | 2,700        | 1,529           | 18,144        | 243               | 37,131  | 6,182     | 488               | 6,670           | 62,723          |                      |
| Gmean | 2,200          | 6,999          | 2,158        | 1,320           | 14,126        | 43                | 26,533  | 4,299     | 462               | 4,916           | 51,144          |                      |

Chinook counts include jacks. WDFW counting dates: spring Chinook, May1-June 28; summer Chinook, June 29-August 28; Fall Chinook, August 29-November 15.

\*All spring Chinook were trapped for broodstock at Wells Dam; 387 in 1996, and 363 in 1998.

<sup>1</sup>Does not include numbers of coho trapped at Wells Dam by the Yakama Nation for hatchery broodstock; 160 in 2009.

**Attachment C.** Wells Dam Annual Ladder Counts of Salmon and Steelhead for a 24-hour Daily Count Period from 1998-2007.

| Year | Chinook Spring | Chinook Summer | Chinook Fall | Chinook Trapped | Chinook Total | Coho <sup>1</sup> | Sockeye | Steelhead | Steelhead Trapped | Steelhead Total | Total Salmonids | Count Dates Include |
|------|----------------|----------------|--------------|-----------------|---------------|-------------------|---------|-----------|-------------------|-----------------|-----------------|---------------------|
| 1998 | *              | 4,108          | 1,200        | 1,582           | 6,890         | 0                 | 4,669   | 2,984     | 460               | 3,444           | 15,003          | 5/01-11/15          |
| 1999 | 345            | 7,787          | 2,548        | 938             | 11,618        | 224               | 12,388  | 3,504     | 416               | 3,920           | 28,150          | 5/01-11/15          |
| 2000 | 2,587          | 10,156         | 3,418        | 1,327           | 17,488        | 0                 | 59,944  | 6,280     | 369               | 6,649           | 84,081          | 5/01-11/15          |
| 2001 | 10,871         | 38,126         | 9,591        | 556             | 59,144        | 612               | 74,490  | 18,528    | 392               | 18,920          | 153,166         | 5/01-11/15          |
| 2002 | 7,626          | 62,623         | 6,472        | 556             | 77,277        | 132               | 10,768  | 9,478     | 373               | 9,851           | 98,028          | 5/01-11/15          |
| 2003 | 4,702          | 46,391         | 8,253        | 556             | 59,902        | 168               | 28,977  | 9,963     | 374               | 10,337          | 99,384          | 5/01-11/15          |
| 2004 | 4,793          | 32,847         | 5,777        | 558             | 43,975        | 291               | 78,053  | 9,317     | 452               | 9,769           | 132,088         | 5/01-11/15          |
| 2005 | 4,996          | 31,763         | 3,461        | 563             | 40,783        | 348               | 55,559  | 7,203     | 417               | 7,620           | 104,310         | 5/01-11/15          |
| 2006 | 4,376          | 27,196         | 5,043        | 575             | 37,190        | 409               | 22,075  | 6,674     | 368               | 7,042           | 66,716          | 5/01-11/15          |
| 2007 | 2,793          | 16,817         | 2,670        | 521             | 22,801        | 2,432             | 22,273  | 7,500     | 379               | 7,879           | 55,385          | 5/01-11/15          |
| 2008 | 3,134          | 22,435         | 6,423        | 415             | 32,407        | 1,191             | 165,334 | 9,808     | 370               | 10,178          | 209,110         | 5/01-11/15          |
| 2009 | 8,174          | 29,525         | 6,326        | 473             | 44,498        | 2,989             | 134,937 | 25,422    | 367               | 25,789          | 208,213         | 5/01-11/15          |

Chinook counts include jacks. WDFW counting dates: spring Chinook, May1-June 28; summer Chinook, June 29-August 28; Fall Chinook, August 29-November 15.

\*All spring Chinook were trapped for broodstock at Wells Dam; 387 in 1996, and 363 in 1998.

<sup>1</sup>Does not include numbers of coho trapped at Wells Dam by the Yakama Nation for hatchery broodstock; 160 in 2009.

**Attachment D.** Wells Dam Daily Water Quality Report, 2009

| Day         | April            |                 |                  | May              |                 |                  | June             |                 |                  | July             |                 |                  |
|-------------|------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|
|             | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  |
|             |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |
| 1           | 3.6              | 102.3           | 105.1            | 6.6              | 110.1           | 111.4            | 11.6             | 108.7           | 110.6            | 15.4             | 113.6           | 114.4            |
| 2           | 3.7              | 103.1           | 103.8            | 6.8              | 109.9           | 111.2            | 11.9             | 108.6           | 110.5            | 15.4             | 114.9           | 115.8            |
| 3           | 3.8              | 102.7           | 103.4            | 6.9              | 109.3           | 110.7            | 11.6             | 108.7           | 110.7            | 15.5             | 115.3           | 116.1            |
| 4           | 4.1              | 103.1           | 103.7            | 7.2              | 108.1           | 109.8            | 11.8             | 109.7           | 111.5            | 15.8             | 116.2           | 116.9            |
| 5           | 4.3              | 103.6           | 104.6            | 7.2              | 108.1           | 109.6            | 12.7             | 110.7           | 112.6            | 15.8             | 116.7           | 117.5            |
| 6           | 4.4              | 104.5           | 105              | 7.6              | 106.7           | 108              | 12.7             | 110             | 112              | 15.8             | 116             | 116.4            |
| 7           | 4.6              | 106             | 106.5            | 7.7              | 106.3           | 107.7            | 12.8             | 110.7           | 112              | 15.7             | 114.4           | 115.3            |
| 8           | 4.6              | 106.6           | 107              | 7.9              | 107             | 108.8            | 12.7             | 110.2           | 112.2            | 15.7             | 114             | 115.1            |
| 9           | 4.6              | 106.3           | 106.6            | 8.1              | 107.4           | 109              | 13               | 110.3           | 112.1            | 15.6             | 113.1           | 114.5            |
| 10          | 4.7              | 107.1           | 107.3            | 8.2              | 108.3           | 110.1            | 13.2             | 110.3           | 112.1            | 15.6             | 112.6           | 114.2            |
| 11          | 4.7              | 106.4           | 107              | 8.2              | 109             | 110.8            | 13.4             | 110.7           | 112.2            | 15.8             | 113.4           | 115              |
| 12          | 4.6              | 104.7           | 106.6            | 8.2              | 107.6           | 109.5            | 13.6             | 110.6           | 112.3            | 16               | 113.7           | 114.9            |
| 13          | 4.7              | 104.3           | 106.3            | 8.2              | 106.3           | 108.2            | 13.8             | 111.2           | 113              | 16.2             | 111.8           | 113.4            |
| 14          | 4.7              | 104             | 107.8            | 8.4              | 107             | 108.9            | 13.7             | 111.2           | 112.7            | 16.3             | 111             | 112.5            |
| 15          | 4.7              | 104             | 106.4            | 8.6              | 106.1           | 107.9            | 14.2             | 111.2           | 112.6            | 16.5             | 111.4           | 113.1            |
| 16          | 4.8              | 104.2           | 106.5            | 8.6              | 106.9           | 108.8            | 14.3             | 111.5           | 113.4            | 16.5             | 112             | 113.9            |
| 17          | 5                | 103.9           | 105.7            | 9                | 107.8           | 109.6            | 14.2             | 111.2           | 113.8            | 17.1             | 112.2           | 114              |
| 18          | 5.1              | 103.5           | 105.3            | 9.5              | 109             | 110.7            | 13.8             | 111.7           | 113.4            | 17.4             | 111.5           | 113.8            |
| 19          | 5.3              | 104.5           | 106.2            | 9.7              | 108             | 109.8            | 14               | 112.4           | 114              | 17.7             | 111             | 113.5            |
| 20          | 5.4              | 104.9           | 107.2            | 9.9              | 106.5           | 108.3            | 14.1             | 112.9           | 114.3            | 17.5             | 110.9           | 113              |
| 21          | 5.5              | 105.8           | 108.1            | 10.2             | 107.1           | 109              | 13.8             | 111.9           | 113.6            | 17.4             | 111.6           | 114.1            |
| 22          | 5.7              | 106.4           | 108.5            | 10.2             | 107.5           | 109.5            | 13.7             | 110.8           | 113.2            | 17.4             | 111.4           | 114              |
| 23          | 5.7              | 105.3           | 107.5            | 10               | 108.4           | 110.4            | 14.1             | 111.4           | 113.5            | 17.4             | 111.9           | 114.5            |
| 24          | 5.6              | 105.1           | 107.9            | 10               | 108.3           | 110.3            | 14.3             | 112.9           | 114.6            | 17               | 111.8           | 113.2            |
| 25          | 5.9              | 105.5           | 107.3            | 10.6             | 108.2           | 110.4            | 14.4             | 111.6           | 113.2            | 17.1             | 110.6           | 111.9            |
| 26          | 5.7              | 104.9           | 107              | 10.8             | 107.4           | 109.7            | 14.6             | 111.9           | 113.2            | 17.3             | 110.9           | 112.2            |
| 27          | 5.9              | 105.8           | 108              | 10.7             | 107.2           | 109.4            | 14.9             | 111.8           | 113.2            | 17.5             | 111.8           | 113.3            |
| 28          | 6                | 105.2           | 107.2            | 10.9             | 108.2           | 110.2            | 14.7             | 112.6           | 113.5            | 17.2             | 112.6           | 114.3            |
| 29          | 6                | 105.4           | 106.9            | 11.2             | 108.8           | 110.7            | 14.4             | 114.2           | 115.7            | 17.3             | 112.8           | 114.3            |
| 30          | 6.3              | 107.5           | 109.1            | 11               | 108.5           | 110.5            | 14.8             | 114.4           | 115.5            | 17.6             | 112             | 113.9            |
| 31          | .                | .               | .                | 11.3             | 108.6           | 110.6            | .                | .               | .                | 17.9             | 111.3           | 113              |
| <b>Mean</b> | 5                | 104.9           | 106.5            | 9                | 107.9           | 109.6            | 13.5             | 111.1           | 112.8            | 16.6             | 112.7           | 114.2            |

Attachment D. (continued). Wells Dam Daily Water Quality Report, 2009

| Day         | August           |                 |                  | September        |                 |                  | October          |                 |                  | November         |                 |                  |
|-------------|------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|------------------|-----------------|------------------|
|             | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  | Temp (C)<br>Mean | TDG%            |                  |
|             |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |                  | Forebay<br>Mean | Tailrace<br>Mean |
| 1           | 18.3             | 111.2           | 113.1            | 19.3             | 106.5           | 107.6            | 10.3             | 98.7            | 100.8            | .                | .               | 93.2             |
| 2           | 18.4             | 111.1           | 113.2            | 19.3             | 105.6           | 107.2            | 10.3             | 99.4            | 101.5            | .                | .               | 93.3             |
| 3           | 18.6             | 111.1           | 113.2            | 19.3             | 104.9           | 106.3            | 10.3             | 99.4            | 101.6            | .                | .               | 93.2             |
| 4           | 18.7             | 110.6           | 112.4            | 19.3             | 105.1           | 105.8            | 10.3             | 99.6            | 101.7            | .                | .               | 93.9             |
| 5           | 18.5             | 110.3           | 112.4            | 19               | 104             | 105.8            | 10.3             | 98.9            | 101              | .                | .               | 95.1             |
| 6           | 18               | 110.5           | 112.3            | 18.8             | 103.5           | 105.2            | 10.3             | 99.2            | 101.3            | .                | .               | 95.1             |
| 7           | 17.7             | 110.6           | 112              | 18.7             | 101.6           | 103.7            | 10.3             | 99.2            | 101.3            | .                | .               | 94.8             |
| 8           | 17.9             | 109.1           | 110.3            | 18.6             | 101.2           | 102.3            | 10.3             | 98.9            | 101.1            | .                | .               | 93.9             |
| 9           | 18.3             | 108.8           | 110.6            | 18.5             | 101.1           | 102.4            | 10.3             | 98.2            | 100.4            | .                | .               | 94.1             |
| 10          | 18.2             | 108.2           | 109.8            | 18.7             | 101.5           | 102.7            | 10.3             | 98.2            | 100.3            | .                | .               | 94.1             |
| 11          | 18.1             | 107.2           | 109.2            | 19               | 101.8           | 103.7            | 10.3             | 98.9            | 101              | .                | .               | 94.4             |
| 12          | 18               | 107             | 109              | 18.8             | 104.2           | 105.2            | 10.3             | 99.3            | 101.5            | .                | .               | 94.4             |
| 13          | 17.9             | 107.5           | 109.3            | 18.8             | 105.1           | 107.3            | 10.3             | 100.1           | 102.3            | .                | .               | 94.5             |
| 14          | 17.5             | 107.3           | 108.9            | 18.9             | 105.4           | 106.5            | 10.3             | 99.7            | 101.9            | .                | .               | 93.5             |
| 15          | 17.6             | 107.7           | 109.6            | 18.7             | 104.6           | 105.1            | 10.3             | 98.3            | 100.4            | .                | .               | 93.4             |
| 16          | 17.9             | 106.9           | 108.6            | 18.9             | 104.9           | 106              | 10.3             | 98.4            | 100.5            | .                | .               | 94.5             |
| 17          | 17.9             | 107.3           | 109.1            | 19               | 103.9           | 105.1            | 10.3             | 99.4            | 101.6            | .                | .               | 95.1             |
| 18          | 18               | 108             | 110              | 18.8             | 103.2           | 104.4            | 10.3             | 99.5            | 101.6            | .                | .               | 94.1             |
| 19          | 17.9             | 108.5           | 110.7            | 18.8             | 102.6           | 104.3            | 10.3             | 99.5            | 101.6            | .                | .               | 94.5             |
| 20          | 17.7             | 109.2           | 111.1            | 18.7             | 101.6           | 103.6            | 10.3             | 98.9            | 101              | .                | .               | 95.5             |
| 21          | 17.8             | 109.2           | 110.8            | 18.5             | 101.9           | 102.6            | 10.3             | 99              | 101.2            | .                | .               | 94.6             |
| 22          | 18.4             | 107.8           | 109.9            | 18.6             | 101.3           | 102.7            | 10.3             | 98.6            | 100.7            | .                | .               | 94.6             |
| 23          | 18.7             | 107.1           | 109              | 18.8             | 102.3           | 103              | 10.3             | 99.1            | 101.2            | .                | .               | 93               |
| 24          | 18.9             | 106.3           | 108.4            | 18.8             | 102.5           | 102.9            | 10.3             | 98.5            | 100.7            | .                | .               | 92.9             |
| 25          | 19               | 105.8           | 108              | 24.5             | 100.5           | 101.9            | 10.3             | 98              | 100.2            | .                | .               | 93.3             |
| 26          | 18.8             | 104.9           | 107.3            | 21.1             | 100.4           | 102.5            | 10.3             | 99.6            | 101.8            | .                | .               | 94.1             |
| 27          | 18.7             | 105.1           | 105.9            | 16.5             | 100.4           | 102.2            | 10.3             | 99.1            | 97.3             | .                | .               | 93.8             |
| 28          | 18.5             | 106.3           | 107              | 10.4             | 100.7           | 102.9            | .                | .               | 93.5             | .                | .               | 93.1             |
| 29          | 18.7             | 105.6           | 106.7            | 10.3             | 100             | 102.2            | .                | .               | 93.9             | .                | .               | 93               |
| 30          | 19               | 106.6           | 107              | 10.3             | 98.9            | 101              | .                | .               | 94.3             | .                | .               | 93.5             |
| 31          | 19.1             | 105.4           | 107.6            | .                | .               | .                | .                | .               | 94.7             | .                | .               | .                |
| <b>Mean</b> | 18.3             | 108             | 109.8            | 18.2             | 102.7           | 104.1            | 10.3             | 99              | 100.1            | .                | .               | 94               |