

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY
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February 28, 2011

VIA ELECTRONIC FILING

Honorable Kimberly D. Bose, Secretary
Nathaniel J. Davis, Sr., Deputy Secretary
FEDERAL ENERGY REGULATORY COMMISSION
888 First Street, NE
Washington, DC 20426

Re: **Lake Chelan Hydroelectric Project No. 637**
Article 405 – 2010 Annual Flow and Water Temperature Report

Dear Secretary Bose and Deputy Secretary Davis:

The Federal Energy Regulatory Commission (Commission) issued the “Order Modifying and Approving Operations Compliance and Monitoring Plan (Plan), Article 405” on November 30, 2007. The Plan satisfied the License Article 405 requirement of the “Order on Offer of Settlement and Issuing New License”¹ (License) and “Order on Rehearing”² for the Lake Chelan Hydroelectric Project (Project) on November 6, 2006, and April 19, 2007, respectively.

Under Ordering Paragraph (B) modifying the Plan under Article 405, Chelan PUD is required to file the following report with the Commission.

(B) The licensee shall file annually with the Commission by February 28, beginning 2008, their Annual Flow Report. If construction of the low level outlet is not completed as scheduled and corresponding flow data is not available for the 2008 Annual Flow Report (to be filed with the Commission by February 28, 2009), the licensee shall provide a status update regarding associated construction activities and applicable extension of time request(s) in their associated report. Additionally, the report shall be coordinated with the reporting of water quality data and biological evaluations required under the Washington Department of Ecology’s 401 Water Quality Certificate Condition V.B and associated Quality Assurance Project Plan under license Article 401. The licensee shall allow the resource agencies, Tribes and non-governmental organizations specified under Article 405, 30 days to provide comments and/or recommendations on

¹ 117 FERC ¶ 62,129

² 119 FERC ¶ 61,055

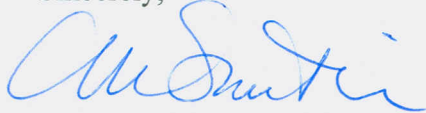
*Ms. Kimberly D. Bose, Secretary
Mr. Nathaniel J. Davis, Sr., Deputy Secretary
Federal Energy Regulatory Commission*

filing with the Commission. The filing shall include comments and/or recommendations from the consulted entities and the licensee's response to any comments. If the licensee does not adopt a recommendation, the report shall include the licensee's reasons, based on project-specific information. Based on review of the report, the Commission reserves the right to require changes to the project to ensure compliance with the license.

In accordance with the above Order requirement, Chelan PUD hereby files the 2010 Annual Flow and Water Temperature Report. A final draft of this report was provided to the resource agencies, Tribes and non-governmental organizations specified under Article 405 for a 30-day review period ending February 28, 2011. Appendix C provides the record of consultation.

Please do not hesitate to contact me or Steve Hays (509-661-4181) of my office regarding any questions or comments regarding this report.

Sincerely,



Michelle Smith
Licensing and Compliance Manager
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(509) 661-4180

cc: Erich Gaedeke, FERC-PRO

Enclosure: Lake Chelan 2010 Annual Flow and Water Temperature Report

LAKE CHELAN ANNUAL FLOW AND WATER TEMPERATURE REPORT 2010

LICENSE ARTICLES 405 & 408

Final

**LAKE CHELAN HYDROELECTRIC PROJECT
FERC Project No. 637**

February 28, 2011



**Public Utility District No. 1 of Chelan County
Wenatchee, Washington**

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EXECUTIVE SUMMARY

Chelan PUD received a new license (License) from the Federal Energy Regulatory Commission (FERC) on November 6, 2006, authorizing Chelan PUD to operate the Lake Chelan dam and powerhouse for a period of 50 years. The License conditions require that Chelan PUD provide minimum flows to the Chelan River and monitor those flows and water temperatures at various locations. The License required the construction of a Low Level Outlet at Chelan Dam, a Reach 4 habitat channel and spawning areas in the tailrace, and operations to protect aquatic life through flow ramping rates and powerhouse operations. The License also requires that Chelan PUD file an Annual Flow and Temperature Report with the FERC documenting compliance with these License requirements.

Minimum flows to the Chelan River of 80 cfs and 200 cfs were provided in accordance with the schedules described in License documents. Additional flow was provided from the Pump Station to the Reach 4 habitat channel for salmon and steelhead spawning during their respective spawning periods (October 15 – November 30 and March 15 – May 15). There were no deviations below minimum flow requirements in 2010.

Chelan PUD developed and refined operating criteria for compliance with the two inches per hour ramping rates and managed flow releases using those operating criteria in conjunction with onsite monitoring of actual flow level changes. Additional work to refine operating criteria necessary to meet ramping rates is planned for 2011.

Powerhouse operations for redd protection consisted of the operation of one turbine throughout most of the Chinook egg incubation period. Due to turbine and generator replacement work, the powerhouse did not operate for a three day period in February. To maintain circulation water over the redds in the tailrace, the Pump Station was operated during the third day.

During the steelhead spawning period, one turbine was operated on a nearly continuous basis. Steelhead did spawn in the Reach 4 habitat channel (11 redds), but no steelhead redds were observed in the tailrace. During the Chinook spawning period, powerhouse daily average flows were maintained above 2000 cfs from October 16 –December 31. A total count of 398 Chinook redds were counted in the Chelan River Reach 4 (115), tailrace (234), and downstream in the Chelan/Columbia River confluence and Columbia River (49).

Water temperatures were monitored at seven locations in the Chelan River and tailrace. The water released from the Low Level Outlet into the Chelan River was somewhat cooler during July and August than the average water temperature arriving at the Chelan Dam from the outlet of Lake Chelan. Water temperatures increased somewhat during transit from the upper end of Reach 1 to the end of Reach 3 during May – mid August, but decreased from mid August – October. Water temperatures neither increased nor decreased during transit through the Reach 4 habitat channel.

SECTION 1: INTRODUCTION

The Lake Chelan Hydroelectric Project (Project) is owned and operated by the Public Utility District No. 1 of Chelan County (Chelan PUD). The Federal Energy Regulatory Commission (FERC) license for operation of this project, issued on November 6, 2006, authorizes Chelan PUD to operate the Lake Chelan dam and powerhouse for a period of 50 years. As part of the normal operation of the Project, Chelan PUD withdraws water from Lake Chelan for power generation and discharges that water through the powerhouse into an excavated tailrace, which leads to the confluence of the Chelan River and the Columbia River. Flows released from the Chelan Dam follow the natural channel of the Chelan River, joining with the powerhouse tailrace flows and discharging to the Columbia River. As a requirement of the new License, minimum flows were established for the Chelan River and that flow was initiated on October 14, 2009.

License Article 405 required Chelan PUD to file an Operations Compliance Monitoring Plan (OCMP), which was to describe how Chelan PUD will comply with: (1) the instream flows, ramping rates, and tailrace flows as set forth in Article 7 of the Lake Chelan Settlement Agreement and Chapter 7 of the Comprehensive Plan attached to the Settlement Agreement; (2) and the lake levels as set forth in Article 8 of the Settlement Agreement and Chapter 8 of the Comprehensive Plan. The OCMP was to include the specifics of flow measurement techniques, electronic flow data posting, quarterly and annual reporting requirements, and an implementation schedule.

License Article 408 required Chelan PUD to file a Threatened and Endangered Species Protection Plan (TESPP), which was to: (1) describe how Chelan PUD will implement provisions for timely development of a system to release water at the Lake Chelan Dam or pump water from the project powerhouse tailrace to the Chelan River, and subsequent operation of that system at rates sufficient to continuously maintain flows equal to or greater than the flows required for Chelan River Reach 4; and (2) provide for monitoring of flows in the project tailrace and in Reach 4 of the Chelan River and annual reporting of the monitoring results, as set forth in Article 7 of the Lake Chelan Settlement Agreement and Chapter 7 of the Comprehensive Plan attached to the Settlement Agreement, and (3) timely determination of the need to take actions to improve water quality characteristics adversely affecting anadromous fish, and identification and implementation of appropriate actions.

The OCMP and TESPP were submitted to FERC on May 4, 2007 and FERC issued an order approving the TESPP on November 28, 2007 and an order modifying and approving the OCMP on November 30, 2007. Both the OCMP and TESPP require the recording and reporting of flows in the Chelan River, as related to meeting minimum flow requirements, protection of fish habitat and protection of salmon and steelhead eggs incubating in the tailrace. The FERC order approving the OCMP requires that Chelan PUD shall file an Annual Flow Report with the FERC by February 28 of each year. The TESPP includes annual reporting of water temperature monitoring required in the Lake Chelan Settlement Agreement. This Annual Flow and Temperature Report meet the flow and temperature reporting requirements of License Articles 405 and 408.

Chelan PUD manages the level of Lake Chelan and flow releases through the powerhouse and into the Chelan River channel at the dam for power generation and other purposes. License Article 405 requires management of lake levels with priority given to maintaining minimum flows in the Chelan River (initiated in 2009) and reducing high spillway flows into the Chelan River to protect fish habitat. The Annual Lake Level Report documents Chelan PUD's decisions regarding operation of the powerhouse for lake level management to meet these Chelan River objectives, as well as recreation and other requirements. The Annual Lake Level Report for the September 2009 – August 2010 Operating Cycle will be filed with FERC by February 28, 2011. This report is available at: http://www.chelanpud.org/departments/licensingCompliance/lc_implementation/ResourceDocuments/36078.pdf

This Annual Flow Report includes two sections that correspond to the flow reporting requirements of the FERC order: Section 2, Chelan River Instream Flows and Section 3, Powerhouse Tailrace Security Flows. Section 4 of this report contains the water temperature monitoring that was conducted in 2010.

SECTION 2: CHELAN RIVER INSTREAM FLOWS

2.1 Chelan River Instream Flows

Flow releases were provided throughout the year from the Low Level Outlet for minimum flows of at least 80 cfs in Reaches 1-3 (Figure 2-1). The runoff forecast for 2010 indicated an average water year, thus minimum flow releases to Reaches 1-3 were at least 200 cfs from May 15 – July 15. Additional flow was provided from the Pump Station to the Reach 4 habitat channel for salmon and steelhead spawning during their respective spawning periods (Figure 2-2). There were no deviations below minimum flow requirements in 2010.

Flows were released from the spillway and Low Level Outlet as needed for lake level control, beginning May 21 and concluding on August 20. These flow releases were managed to meet lake level target elevations and to avoid high spill levels that could damage the Reach 4 habitat channel. Flow releases for lake level control peaked at 5081 cfs daily average on June 27. Flow releases from the spillway and Low Level Outlet were also managed to provide two weekend whitewater boating events on September 11–12 and 25-26. Whitewater boating events scheduled for July were canceled due to high inflows that required spill levels that were too high for safe whitewater boating (7/10-11) and for lack of participant registration (7/24-25).

Spawning flows were provided for steelhead trout from March 15 – May 14 and for Chinook salmon from October 15-November 30. The spawning flows were provided through the combination of the Low Level Outlet flows and Pump Station flows, maintaining flow levels of at least 320 cfs. At the end of each spawning period, flows from the Pump Station were ramped down one pump at a time to avoid fish stranding. As flows were reduced on May 14 at the end of the steelhead spawning period, a fish rescue crew of 12 people was organized to remove Chinook salmon fry from eroded shoreline areas of the Reach 4 habitat channel. These eroded areas, which had developed from high spill events during the summer of 2009, were refilled and reshaped in late summer 2010 to eliminate these small fish entrapment areas. Steelhead trout adults were observed spawning in the Reach 4 habitat channel beginning in late April, with at least 11 redds observed. Steelhead spawning activity was concluded prior to the end of spawning flows on May 14. Chinook fry were present in the Reach 4 habitat channel from mid April through June. Chinook spawning began about October 15 and was completed prior to November 30. There were a total of 398 redds counted in the Chelan River and Columbia River at the confluence, of which 115 redds were counted in the Reach 4 habitat channel and upstream pool.

A tabulation of average daily flows from the Low Level Outlet, Pump Station, combined flows into Reaches 1-3 and Reach 4, powerhouse discharge, spill discharge and hourly lake levels and powerhouse tailwater levels are presented in Appendix A. Quarterly hourly data is available at the internet site: <http://www.chelanpud.org/lc-Resource-Documents-WaterQuality.cfm>.

Figure 2-1: Flow Releases to Reaches 1-3 of the Chelan River, 2010

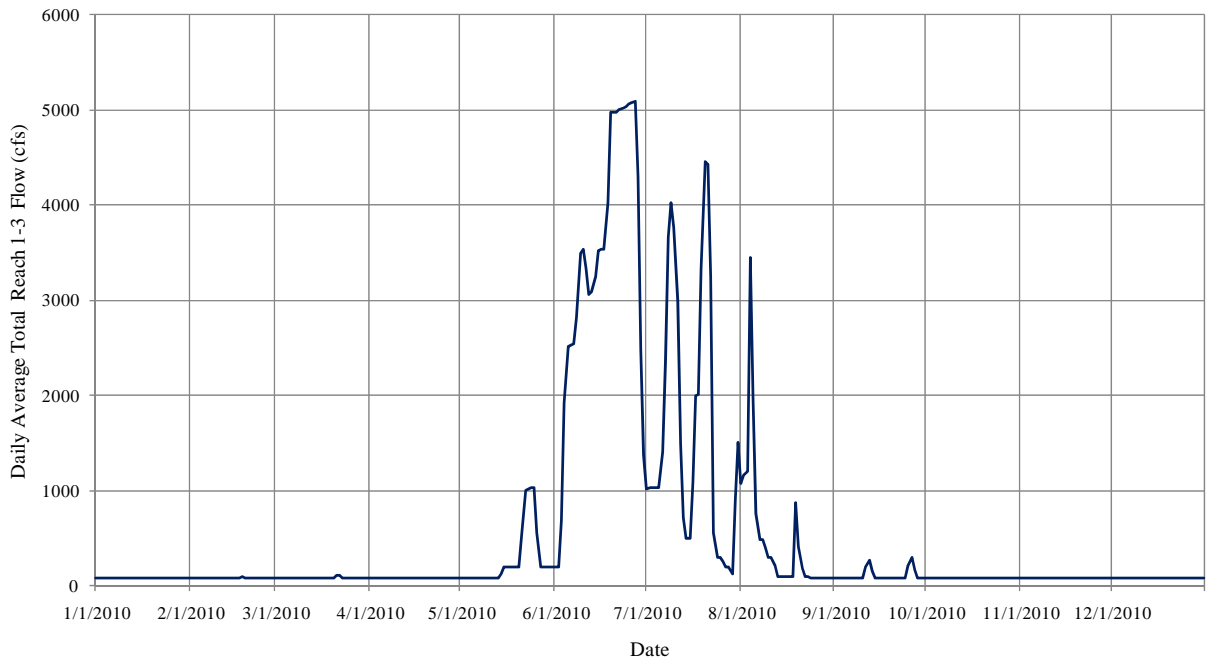
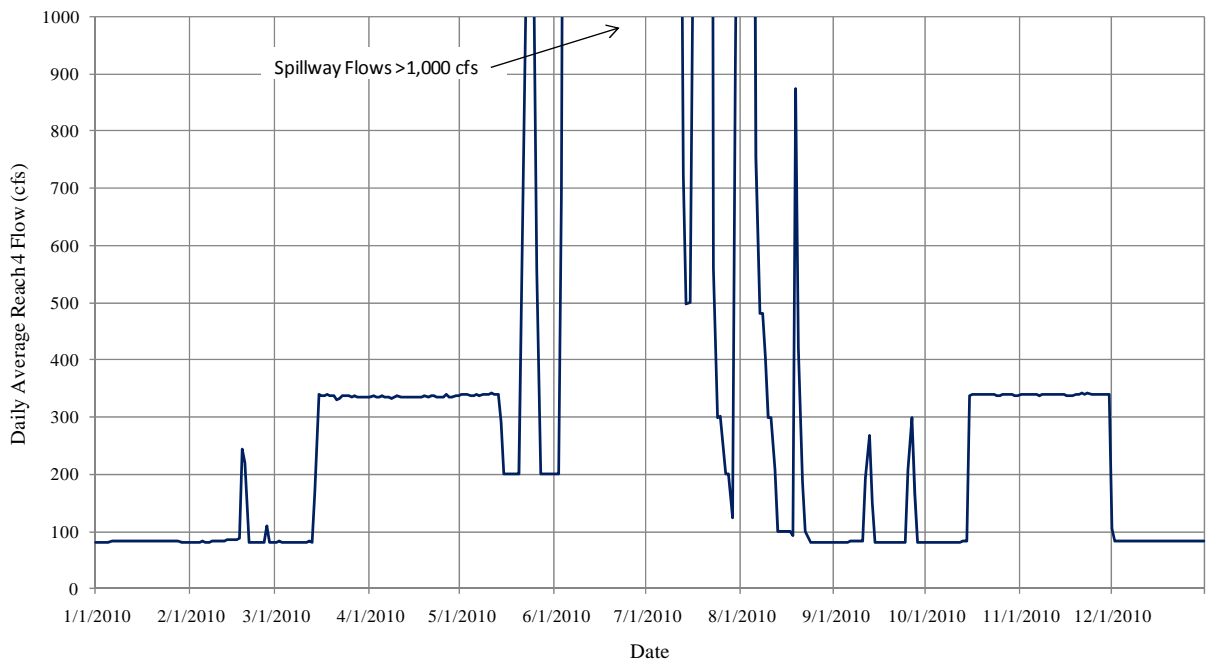


Figure 2-2: Flow Releases to Chelan River Reach 4, 2010



2.2 Chelan River Ramping Rates

The Lake Chelan Settlement Agreement requires that ramping rates are to be established for the Chelan River to protect aquatic organisms from rapid fluctuations in water levels. The ramping rates for decreases in water levels are initially set at approximately two inches per hour during the period when juvenile salmon and steelhead fry may be present. The OCMP states that the two inches per hour ramping rates will remain in effect until biological evaluations have determined the actual ramping rates necessary to prevent stranding of fish in the Chelan River. The locations in the Chelan River where water level changes will be measured to determine operating criteria for compliance with ramping rates will be determined in consultation with the Chelan River Fishery Forum. A study will be conducted to determine the operating criteria for changes in flow from the LLO, spillway and Pump Station. The results of this study will establish ramping procedures in terms of allowable flow reductions per hour for these sources of flow releases. Biological evaluations will determine the periods of time during the year when ramping rates will be applied to protect fry from stranding.

The year 2010 is the first full year of minimum flow operations for the Chelan River since completion of the Low Level Outlet, Reach 4 habitat channel, and Pump Station. Chinook salmon fry were present in the Reach 4 habitat channel during the months of April, May and June. Biological evaluations of fish populations in the Chelan River Reaches 1-3 are not scheduled to begin until 2012, but casual observations during the spring, summer and fall did not detect the presence of any juvenile fish. Chelan PUD had developed preliminary operating criteria for compliance with the two inches per hour ramping rates and managed flow releases using those preliminary operating criteria in conjunction with onsite monitoring of actual flow level changes. The preliminary operating criteria were revised several times over the season in response to observations and as experience was acquired with the new control systems at the Low Level Outlet and Pump Station.

Preliminary criteria for flow releases at the Chelan Dam (spillway) to meet two inches per hour ramping rates for Reaches 1-3 were developed in 2006 based on a field test with manual observations at several locations over several spill levels. These operating criteria (Table 2-1) were developed prior to construction of the Reach 4 habitat channel. In 2010, following construction of the Reach 4 habitat channel, Pump Station and Low Level Outlet, refinements to these operating criteria were developed based on water level monitoring at the Pump Station canal outlet structure. The most recent refinement of these criteria is shown in Table 2-2.

Additional ramping operational criteria are in development for transition from spawning flows in the Reach 4 habitat channel, provided by the Pump Station, to the minimum flow of 80 cfs coming from Reaches 1-3. The Pump Station has five pumps, with discharge rates of approximately 50 cfs each. Initial operations for turning off the pump station have been to shut off pumps sequentially at one-hour intervals. However, this reduces flow in 50 cfs increments and the pumps do not have variable flow capability to enable more gradual reduction in pump flow. Observations during the transition to minimum flows on December 1, 2010, determined that water levels decreased by 4-6 inches in the pool at the canal outlet structure as each pump was shut off, with the last pump having the greatest water level impact. There were no small fish in the Reach 4 habitat channel at this time of year and no fish were stranded during this event,

but these observed water level changes demonstrated the need for development of different operating criteria for the next time the Pump Station will be shut off at the end of spawning flows, scheduled for May 16, 2011. The operations that will be developed are to transition the source of spawning flows from the Pump Station to the Low Level Outlet prior to reducing flow levels in the Reach 4 habitat channel. The Low Level Outlet can then be used to slowly reduce flows in smaller increments over a longer time period to meet the two inches per hour ramping rate. The transition from Pump Station to Low Level Outlet will be a challenge because of the time lag of several hours between the input of flow at the Low Level Outlet at the upper end of Reach 1 and the arrival of that flow to the pool at the canal outlet structure. However, once the time differentials are determined by direct observation, the operating criteria can be developed and repeated as needed.

Table 2-1: Preliminary Ramping Criteria

Chelan River Ramping Rates Reaches 1-4 (11-6-06)			
Starting Flow cfs	Max. Flow Reduction cfs/hr	Starting Flow cfs	Max. Flow Reduction cfs/hr
6,000	500	2,000	250
5,500	500	1,750	250
5,000	300	1,500	250
4,700	300	1,250	250
4,400	400	1,000	250
4,000	300	750	250
3,700	300	500	250
3,400	400	250	170
3,000	500	80	-
2,500	500		

Table 2-2: Refined Ramping Criteria (August 2010)

Decreasing Spill Ramping Rate Restrictions	
Except for Plant Safety and System Reliability, the following are License Compliance ramping rate restrictions when reducing spill:	
Maximum Spill Reduction Ramping Rates	
Total Spill* cfs	Ramp Rate cfs/hr
1000 < Total Spill	250
500 < Total Spill ≤ 1000	100
300 < Total Spill ≤ 500	50
200 < Total Spill ≤ 300	35
80 < Total Spill ≤ 200	30
* Total Spill = Low Level Outlet + Spill Gates Note: Only reduce spill during daylight hours (to aid fish movement from potential entrapment areas).	

SECTION 3: POWERHOUSE TAILRACE SECURITY FLOWS

3.1 Powerhouse Operations

There were 129 salmon redds with eggs incubating in the tailrace from spawning that occurred in 2009. Based on the Chinook fry observed in April in both the Reach 4 habitat channel and in the tailrace, the incubation period for these eggs was probably concluded by mid April. Powerhouse operations during this incubation period were mostly limited to the discharge of one turbine because the second turbine and generator was being replaced. The powerhouse flows (Figure 3-1) during this incubation period for Chinook salmon eggs were maintained at the output of at least one unit except during the period from 0900 February 16 – 0900 February 19. Work on the replacement of the generator required this period of time with no generation from either powerhouse unit. During this time period, the Pump Station was operated from about 1100 on February 18 – 1400 February 19 to provide flow circulation over salmon eggs incubating in the tailrace spawning areas. The powerhouse was also operated for about two hours from 1900 – 2000 on February 18, which gave a pulse of higher water flows over the incubating eggs.

During the March 15 – May 15 spawning period for steelhead, the powerhouse operated at least one turbine with the exception of several temporary shutdowns for unit replacement work. The longest of these was a nine hour period on April 12. While steelhead spawning was observed in the Reach 4 habitat channel in 2010, with a count of 11 redds, there were no redds observed in the tailrace.

During the Chinook spawning period in 2010, powerhouse daily average flows were maintained above 2000 cfs from October 16 –December 31. A total count of 398 Chinook redds were estimated to have been deposited in the Chelan River Reach 4 (115), tailrace (234), and downstream in the Chelan/Columbia River confluence and Columbia River (49).

Water surface elevations in the tailrace can fluctuate by several feet over the course of a day due to changes in Columbia River flows that affect the backwater curve of the Rocky Reach reservoir. The water level fluctuations in the tailrace are somewhat reduced when the Chelan Powerhouse is operating. In past years, temporary dewatering of a few Chinook redds in shallow areas has been observed when the powerhouse was not operating and Columbia River flows were low. During tailrace spawning habitat construction in 2008 these areas were graded to prevent dewatering. The water levels in the tailrace remained above 708 feet most of the time and never dropped below 707 feet from January 1 – May 31. No dewatering of salmon redds was observed in 2010. The daily average tailwater levels measured at the powerhouse are shown in Figure 3-2.

Figure 3-1: Chelan Powerhouse Daily Average Flows, 2010

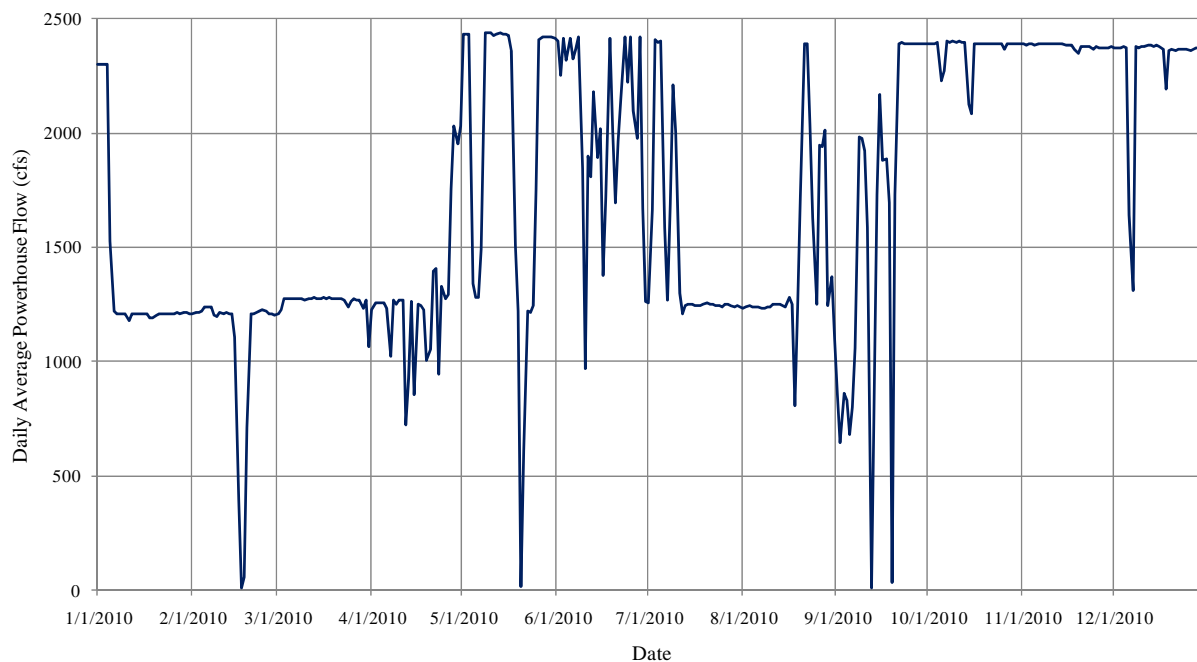
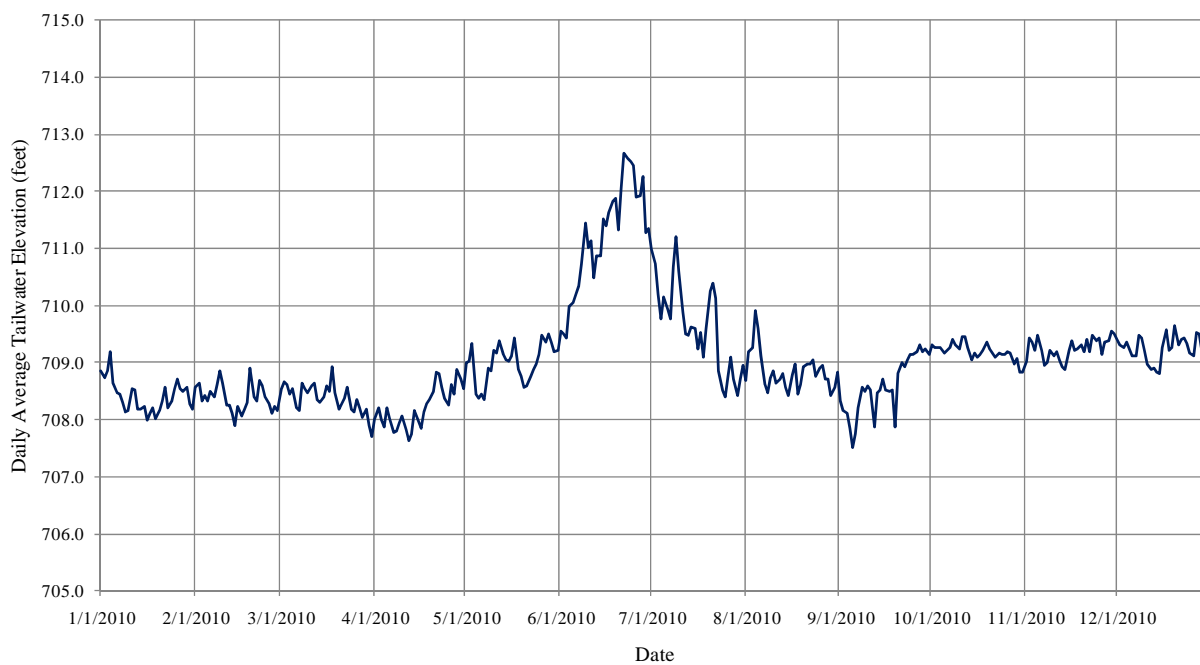


Figure 3-2: Chelan Powerhouse Daily Average Tailwater Elevations, 2010



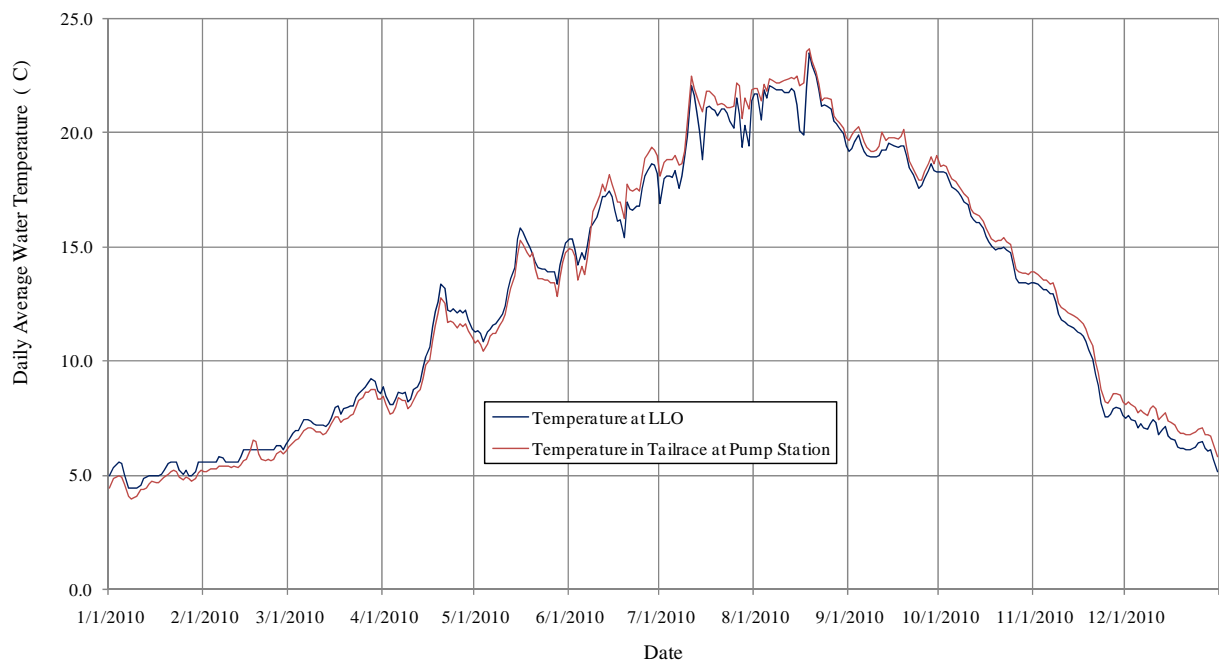
SECTION 4: WATER TEMPERATURE MONITORING

4.1 Water Temperatures Released to Chelan River and Tailrace

Automated water temperature monitoring equipment is currently installed at two locations, within the pipe that draws water from the base of the Chelan Dam and discharges to the Chelan River through the Low Level Outlet and in the Chelan Powerhouse Tailrace from a sensor mounted on the Pump Station intake screens. These monitoring locations measure the water temperatures that reflect the coolest water available for the Chelan River (Low Level Outlet temperature) and the average of water temperatures arriving at the face of Chelan Dam as drawn through the powerhouse intakes (Chelan Powerhouse Tailrace). A difference in these temperatures, except possibly during time periods when the powerhouse is not operating, is indicative of any stratification in water temperatures arriving at the face of Chelan Dam from the outlet of Lake Chelan. Water temperatures measured in the tailrace also represent the temperature of water that is being discharged to the Reach 4 habitat channel when the Pump Station is in operation.

Water temperatures from these sources (Figure 4-1) show that generally there was little stratification in water temperatures at the face of Chelan Dam, except during some days in the summer. Differences of less than one degree may be more reflective of the measurement error of the recording equipment than an actual difference in water temperature. There were a few days in July and August when water temperatures released from the Low Level Outlet were likely significantly cooler than the average water temperature arriving at Chelan Dam from the outlet of Lake Chelan. Daily average water temperatures measured from both locations peaked at 23.5 °C and 23.7 °C on August 19.

Figure 4-1: Low Level Outlet and Powerhouse Tailrace Water Temperatures



4.2 Water Temperatures in Chelan River Reaches 1-3

Water temperatures are monitored at three locations with temperature recording data loggers (Onset HOBO Water Temp Pro v2) that are set to record the water temperature at hourly intervals. These locations are at the top of Reach 1, which measures the temperature of water entering the Chelan River from the Low Level Outlet and the spillway. The location of this temperature logger is set below the mixing zone for these sources of water. The second location is at the end of Reach 1, which is the reach of the Chelan River that has the lowest gradient and least profile shading, thus the greatest potential for water temperature heating during the spring and summer. The third location is at the end of Reach 3, where the Chelan River exits the series of cascades and falls that are the upstream barrier to anadromous fish. The temperature loggers at each location are exchanged several times during the year to retrieve the data. These data are reported quarterly during most of the year, with monthly reporting for July, August and September. These data reports are available at <http://www.chelanpud.org/lc-Resource-Documents-WaterQuality.cfm>.

The water temperatures recorded at these locations demonstrate that some increases in water temperature during May – mid August, but cooling takes place from late August – October (Figure 4-2). This is not unexpected because the water exiting Lake Chelan is affected by the heat sink effect of the lake's large volume. Water in Lake Chelan is still warming from May – mid August, but then retains this heat through the late summer and fall, thus water exiting the lake is cooler than sustainable at equilibrium with ambient solar and air temperature conditions until mid August, then tends to be warmer than sustainable through September and October. The maximum daily average water temperatures recorded in 2010 were 23.5 °C, 22.9 °C and 22.8 °C, respectively from upstream to downstream locations. The highest hourly temperatures recorded were 23.8 °C, 24.7 °C, and 24.2 °C, respectively for the same locations.

4.3 Water Temperatures in Chelan River Reach 4 Habitat Channel

Water temperatures are monitored at hourly intervals at two locations (Onset HOBO Water Temp Pro v2), at the upper and lower end of the habitat channel. The upper location records the water temperature of from the pool below the end of Reach 3 and the mixed flows from that source and the Pump Station, when the pumps are in operation. The monitoring location at the end of the habitat channel is at the point where habitat channel flows enter into the tailrace, just upstream from where mixing of these flows is expected.

The daily average water temperature data from these locations did not show any evidence of heating as water passed through the habitat channel, despite the lack of any shade from vegetation under current, newly constructed, conditions (Figure 4-3). The maximum daily average temperatures recorded were 22.9 °C at the top and 22.8°C at the end of the habitat channel. The maximum hourly temperatures were 24.3 °C and 24.4 °C at the upper and lower ends of the habitat channel.

Figure 4-2: Chelan River Reaches 1-3 Daily Average Water Temperatures

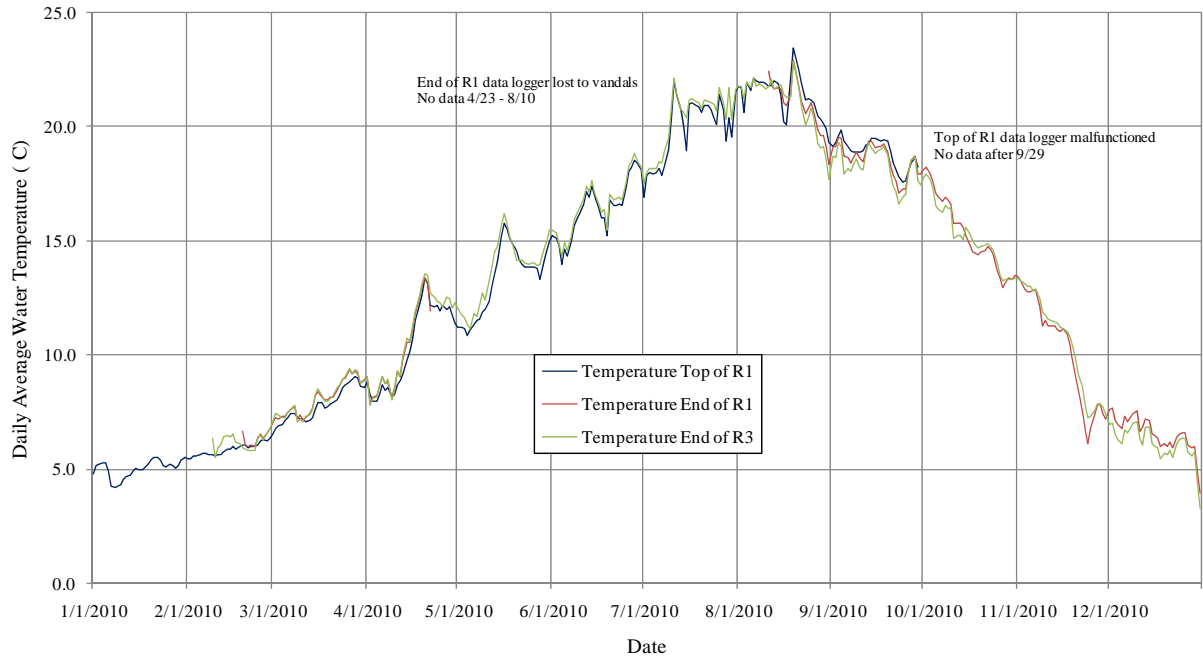
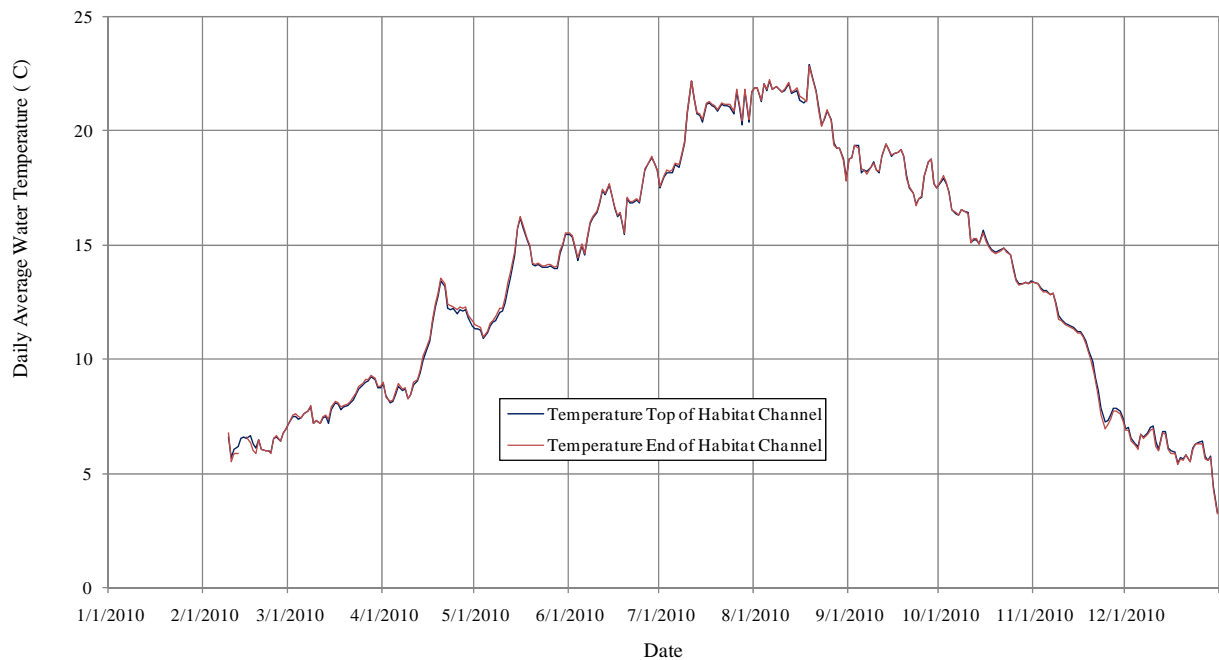


Figure 4-3: Reach 4 Habitat Channel



SECTION 5: SUMMARY

Flow releases were provided throughout the year from the Low Level Outlet for minimum flows of at least 80 cfs in Reaches 1-3. The runoff forecast for 2010 indicated an average water year, thus minimum flow releases to Reaches 1-3 were at least 200 cfs from May 15 – July 15. Additional flow was provided from the Pump Station to the Reach 4 habitat channel for salmon and steelhead spawning during their respective spawning periods (October 15 – November 30 and March 15 – May 15). There were no deviations below minimum flow requirements in 2010.

Flows were released from the spillway and Low Level Outlet as needed for lake level control, beginning May 21 and concluding on August 20. These flow releases were managed to meet lake level target elevations and to avoid high spill levels that could damage the Reach 4 habitat channel. Flow releases for lake level control peaked at 5081 cfs daily average on June 27. Flow releases from the spillway and Low Level Outlet were also managed to provide two weekend whitewater boating events on September 11–12 and 25-26.

Chelan PUD had developed preliminary operating criteria for compliance with the two inches per hour ramping rates and managed flow releases using those preliminary operating criteria in conjunction with onsite monitoring of actual flow level changes. The preliminary operating criteria were revised several times over the season in response to observations and as experience was acquired with the new control systems at the Low Level Outlet and Pump Station. Additional work to refine operating criteria necessary to meet ramping rates is planned for 2011.

Powerhouse operations for redd protection consisted of the operation of one turbine throughout most of the Chinook egg incubation period. Due to turbine and generator replacement work, the powerhouse did not operate for a three day period in February. To maintain circulation water over the redds in the tailrace, the Pump Station was operated during the third day.

During the steelhead spawning period, one turbine was operated on a nearly continuous basis. Steelhead did spawn in the Reach 4 habitat channel (11 redds), but no steelhead redds were observed in the tailrace. During the Chinook spawning period, powerhouse daily average flows were maintained above 2000 cfs from October 16 –December 31. A total count of 398 Chinook redds were counted in the Chelan River Reach 4 (115), tailrace (234), and downstream in the Chelan/Columbia River confluence and Columbia River (49).

Water temperatures were monitored at seven locations in the Chelan River and tailrace. The water released from the Low Level Outlet into the Chelan River was somewhat cooler during July and August than the average water temperature arriving at the Chelan Dam from the outlet of Lake Chelan. Water temperatures increased somewhat during transit from the upper end of Reach 1 to the end of Reach 3 during May – mid August, but decreased from mid August – October. Water temperatures neither increased nor decreased during transit through the Reach 4 habitat channel.

***APPENDIX A: DAILY AVERAGE LAKE CHELAN ELEVATIONS,
POWERHOUSE FLOWS, TAILWATER ELEVATIONS AND CHELAN
RIVER FLOWS FROM SPILL, LOW LEVEL OUTLET AND PUMPING
STATION***

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
1/1/2010	1093.0	2299	708.9	82	0	82	0	82
1/2/2010	1092.9	2301	708.7	82	0	82	0	82
1/3/2010	1092.8	2300	708.9	81	0	81	0	81
1/4/2010	1092.7	2301	709.2	81	0	81	0	81
1/5/2010	1092.6	1526	708.6	81	0	81	0	81
1/6/2010	1092.6	1224	708.5	82	0	82	0	82
1/7/2010	1092.5	1210	708.5	84	0	84	0	84
1/8/2010	1092.5	1210	708.3	84	0	84	0	84
1/9/2010	1092.4	1209	708.1	84	0	84	0	84
1/10/2010	1092.4	1210	708.2	84	0	84	0	84
1/11/2010	1092.4	1177	708.5	84	0	84	0	84
1/12/2010	1092.3	1212	708.5	84	0	84	0	84
1/13/2010	1092.3	1210	708.2	84	0	84	0	84
1/14/2010	1092.3	1211	708.2	83	0	83	0	83
1/15/2010	1092.2	1210	708.2	83	0	83	0	83
1/16/2010	1092.2	1208	708.0	83	0	83	0	83
1/17/2010	1092.2	1209	708.1	83	0	83	0	83
1/18/2010	1092.1	1190	708.2	83	0	83	0	83
1/19/2010	1092.1	1191	708.0	83	0	83	0	83
1/20/2010	1092.1	1201	708.2	83	0	83	0	83
1/21/2010	1092.1	1210	708.3	83	0	83	0	83
1/22/2010	1092.0	1211	708.6	83	0	83	0	83
1/23/2010	1092.0	1210	708.2	83	0	83	0	83
1/24/2010	1091.9	1211	708.3	83	0	83	0	83
1/25/2010	1091.9	1212	708.6	82	0	82	0	82
1/26/2010	1091.9	1210	708.7	82	0	82	0	82
1/27/2010	1091.8	1213	708.5	82	0	82	0	82
1/28/2010	1091.8	1212	708.5	82	0	82	0	82
1/29/2010	1091.7	1217	708.6	82	0	82	0	82
1/30/2010	1091.7	1213	708.3	82	0	82	0	82
1/31/2010	1091.7	1212	708.2	82	0	82	0	82
2/1/2010	1091.6	1212	708.6	82	0	82	0	82
2/2/2010	1091.6	1213	708.6	82	0	82	0	82
2/3/2010	1091.5	1214	708.3	82	0	82	0	82
2/4/2010	1091.5	1224	708.4	82	0	82	0	82
2/5/2010	1091.5	1240	708.3	82	0	82	2	84
2/6/2010	1091.4	1241	708.5	82	0	82	0	82
2/7/2010	1091.4	1240	708.4	82	0	82	0	82
2/8/2010	1091.3	1203	708.6	83	0	83	0	83
2/9/2010	1091.3	1197	708.8	84	0	84	0	84
2/10/2010	1091.2	1213	708.6	84	0	84	0	84
2/11/2010	1091.2	1210	708.3	84	0	84	0	84
2/12/2010	1091.2	1215	708.3	84	0	84	0	84
2/13/2010	1091.1	1211	708.1	85	0	85	0	85
2/14/2010	1091.1	1209	707.9	85	0	85	0	85
2/15/2010	1091.1	1107	708.2	85	0	85	0	85
2/16/2010	1091.1	397	708.1	86	0	86	0	86
2/17/2010	1091.1	10	708.2	88	0	88	0	88
2/18/2010	1091.1	59	708.3	90	0	90	153	244
2/19/2010	1091.1	710	708.9	81	0	81	139	219

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
2/20/2010	1091.1	1212	708.4	80	0	80	0	80
2/21/2010	1091.1	1212	708.3	80	0	80	0	80
2/22/2010	1091.0	1215	708.7	80	0	80	0	80
2/23/2010	1091.0	1219	708.6	80	0	80	0	80
2/24/2010	1091.0	1228	708.4	81	0	81	0	81
2/25/2010	1090.9	1219	708.3	81	0	81	0	81
2/26/2010	1090.9	1209	708.1	81	0	81	30	111
2/27/2010	1090.9	1208	708.2	81	0	81	0	81
2/28/2010	1090.9	1206	708.2	81	0	81	0	81
3/1/2010	1090.9	1211	708.5	81	0	81	0	81
3/2/2010	1090.8	1230	708.7	81	2	82	0	82
3/3/2010	1090.8	1275	708.6	81	0	81	0	81
3/4/2010	1090.8	1274	708.4	81	0	81	0	81
3/5/2010	1090.8	1276	708.5	81	0	81	0	81
3/6/2010	1090.7	1276	708.2	81	0	81	0	81
3/7/2010	1090.7	1276	708.2	81	0	81	0	81
3/8/2010	1090.7	1275	708.6	81	0	81	1	82
3/9/2010	1090.6	1274	708.5	81	0	81	0	81
3/10/2010	1090.6	1270	708.5	81	0	81	0	81
3/11/2010	1090.6	1273	708.6	81	0	81	0	81
3/12/2010	1090.6	1277	708.6	81	0	81	3	84
3/13/2010	1090.5	1280	708.4	81	0	81	0	81
3/14/2010	1090.5	1275	708.3	81	0	81	89	170
3/15/2010	1090.5	1278	708.4	81	0	81	258	339
3/16/2010	1090.4	1280	708.6	81	0	81	257	338
3/17/2010	1090.5	1278	708.5	81	0	81	256	337
3/18/2010	1090.4	1281	708.9	81	0	81	258	339
3/19/2010	1090.3	1278	708.5	81	0	81	257	338
3/20/2010	1090.3	1278	708.2	81	0	81	256	337
3/21/2010	1090.2	1278	708.3	106	0	106	223	329
3/22/2010	1090.2	1278	708.4	109	0	109	225	334
3/23/2010	1090.1	1271	708.6	81	0	81	257	338
3/24/2010	1090.1	1241	708.2	81	0	81	256	337
3/25/2010	1090.1	1266	708.1	81	0	81	255	336
3/26/2010	1090.1	1273	708.4	81	0	81	255	336
3/27/2010	1090.0	1267	708.2	81	0	81	256	337
3/28/2010	1090.0	1270	708.1	81	0	81	255	336
3/29/2010	1090.0	1231	708.2	81	0	81	255	336
3/30/2010	1090.0	1269	707.9	81	0	81	254	335
3/31/2010	1090.0	1065	707.7	81	0	81	253	334
4/1/2010	1090.0	1226	708.0	81	0	81	254	335
4/2/2010	1090.0	1257	708.2	81	0	81	255	337
4/3/2010	1090.0	1258	708.0	81	0	81	253	334
4/4/2010	1090.0	1256	707.9	81	0	81	255	336
4/5/2010	1090.0	1260	708.2	81	0	81	255	336
4/6/2010	1090.0	1233	708.0	81	0	81	254	335
4/7/2010	1090.0	1021	707.8	81	0	81	253	334
4/8/2010	1090.0	1270	707.8	81	0	81	253	334
4/9/2010	1089.9	1255	707.9	81	0	81	253	335
4/10/2010	1089.9	1272	708.1	81	0	81	255	336

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
4/11/2010	1089.9	1268	707.8	81	0	81	255	336
4/12/2010	1089.8	724	707.6	81	0	81	254	335
4/13/2010	1089.8	926	707.8	81	0	81	253	334
4/14/2010	1089.8	1266	708.2	81	0	81	254	335
4/15/2010	1089.8	855	708.0	81	0	81	254	335
4/16/2010	1089.8	1252	707.8	81	0	81	254	335
4/17/2010	1089.8	1245	708.1	81	0	81	254	335
4/18/2010	1089.9	1227	708.3	81	0	81	255	336
4/19/2010	1089.9	1008	708.3	81	0	81	255	336
4/20/2010	1090.1	1057	708.5	80	0	80	254	334
4/21/2010	1090.4	1394	708.8	80	0	80	257	337
4/22/2010	1090.6	1408	708.8	80	0	80	257	337
4/23/2010	1090.6	944	708.6	80	0	80	256	336
4/24/2010	1090.8	1331	708.4	81	0	81	253	334
4/25/2010	1090.8	1273	708.2	81	0	81	255	335
4/26/2010	1090.9	1292	708.6	83	0	83	256	339
4/27/2010	1091.1	1758	708.5	81	0	81	254	335
4/28/2010	1091.2	2033	708.9	81	0	81	254	336
4/29/2010	1091.4	1955	708.7	81	0	81	256	337
4/30/2010	1091.4	2033	708.5	81	0	81	256	338
5/1/2010	1091.4	2430	709.0	82	0	82	258	340
5/2/2010	1091.3	2430	709.0	82	0	82	257	339
5/3/2010	1091.5	2433	709.3	82	0	82	257	339
5/4/2010	1091.4	1343	708.5	82	0	82	255	338
5/5/2010	1091.5	1282	708.4	82	0	82	256	338
5/6/2010	1091.4	1283	708.5	82	0	82	256	339
5/7/2010	1091.5	1493	708.4	82	0	82	256	338
5/8/2010	1091.5	2439	708.9	82	0	82	257	339
5/9/2010	1091.5	2438	708.9	82	0	82	257	339
5/10/2010	1091.4	2435	709.2	82	0	82	258	340
5/11/2010	1091.4	2427	709.2	82	2	84	258	342
5/12/2010	1091.4	2435	709.4	82	0	82	259	341
5/13/2010	1091.4	2439	709.2	82	0	82	258	340
5/14/2010	1091.5	2434	709.1	131	0	131	162	293
5/15/2010	1091.6	2430	709.0	200	0	200	0	200
5/16/2010	1091.9	2429	709.1	200	0	200	0	200
5/17/2010	1092.2	2360	709.4	200	0	200	0	200
5/18/2010	1092.6	1510	708.9	200	0	200	0	200
5/19/2010	1093.1	1220	708.7	200	0	200	0	200
5/20/2010	1093.6	18	708.6	201	0	201	0	201
5/21/2010	1093.9	608	708.6	201	336	537	0	537
5/22/2010	1094.2	1223	708.8	201	807	1008	0	1008
5/23/2010	1094.3	1215	708.9	201	817	1018	0	1018
5/24/2010	1094.4	1248	709.0	201	825	1026	0	1026
5/25/2010	1094.5	1750	709.1	201	832	1033	0	1033
5/26/2010	1094.6	2410	709.5	200	357	558	0	558
5/27/2010	1094.6	2419	709.3	200	0	200	0	200
5/28/2010	1094.8	2418	709.5	200	0	200	0	200
5/29/2010	1095.0	2422	709.4	200	0	200	0	200
5/30/2010	1095.1	2418	709.2	200	0	200	0	200

	Lake Chelan Elevation	Powerhouse Tailrace Flow	Powerhouse Tailwater Elevation	Low Level Outlet Flow	Spill Flow	Chelan River Flow Reaches 1-3	Pump Station Flow	Chelan River Flow Reach 4
Date	(ft)	(cfs)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
5/31/2010	1095.2	2416	709.2	200	0	200	0	200
6/1/2010	1095.4	2401	709.6	200	0	200	0	200
6/2/2010	1095.7	2254	709.5	200	0	200	0	200
6/3/2010	1096.0	2413	709.4	200	488	688	0	688
6/4/2010	1096.3	2320	710.0	200	1725	1925	0	1925
6/5/2010	1096.4	2416	710.1	200	2316	2516	0	2516
6/6/2010	1096.5	2321	710.2	200	2328	2528	0	2528
6/7/2010	1096.6	2369	710.4	200	2345	2546	0	2546
6/8/2010	1096.7	2418	710.7	200	2622	2822	0	2822
6/9/2010	1096.8	1845	711.4	200	3296	3496	0	3496
6/10/2010	1097.0	971	711.0	200	3333	3533	0	3533
6/11/2010	1097.1	1900	711.1	200	3139	3339	0	3339
6/12/2010	1097.2	1808	710.5	200	2860	3060	0	3060
6/13/2010	1097.4	2178	710.9	200	2891	3091	0	3091
6/14/2010	1097.7	1894	710.9	200	3052	3252	0	3252
6/15/2010	1097.8	2017	711.5	200	3325	3525	0	3525
6/16/2010	1097.9	1378	711.4	200	3329	3529	0	3529
6/17/2010	1097.9	1722	711.6	200	3338	3538	0	3538
6/18/2010	1097.9	2415	711.8	200	3828	4028	0	4028
6/19/2010	1097.8	2011	711.9	200	4771	4971	0	4971
6/20/2010	1097.8	1695	711.3	200	4767	4967	0	4967
6/21/2010	1097.8	1965	712.0	200	4772	4972	0	4972
6/22/2010	1097.8	2149	712.7	200	4797	4997	0	4997
6/23/2010	1098.0	2420	712.6	200	4817	5017	0	5017
6/24/2010	1097.9	2223	712.5	200	4830	5030	0	5030
6/25/2010	1098.0	2422	712.5	200	4857	5057	0	5057
6/26/2010	1098.1	2098	711.9	200	4880	5080	0	5080
6/27/2010	1098.1	1978	711.9	200	4881	5081	0	5081
6/28/2010	1098.1	2423	712.3	200	4091	4291	0	4291
6/29/2010	1098.2	1671	711.3	200	2283	2483	0	2483
6/30/2010	1098.4	1266	711.3	200	1172	1372	0	1372
7/1/2010	1098.6	1260	711.0	200	822	1022	0	1022
7/2/2010	1098.7	1668	710.7	200	825	1025	0	1025
7/3/2010	1098.7	2410	710.2	200	827	1027	0	1027
7/4/2010	1098.8	2398	709.8	200	828	1028	0	1028
7/5/2010	1098.8	2400	710.1	200	828	1028	0	1028
7/6/2010	1098.8	1587	709.9	200	1209	1409	0	1409
7/7/2010	1098.8	1267	709.8	200	2160	2360	0	2360
7/8/2010	1098.9	1689	710.7	200	3469	3669	0	3669
7/9/2010	1098.9	2208	711.2	200	3823	4023	0	4023
7/10/2010	1099.0	2003	710.6	200	3563	3763	0	3763
7/11/2010	1099.1	1298	709.9	200	2790	2990	0	2990
7/12/2010	1099.3	1208	709.5	273	1213	1486	0	1486
7/13/2010	1099.4	1248	709.5	263	459	723	0	723
7/14/2010	1099.5	1252	709.6	96	403	499	0	499
7/15/2010	1099.6	1252	709.6	96	403	499	0	499
7/16/2010	1099.7	1245	709.3	222	867	1089	0	1089
7/17/2010	1099.7	1248	709.5	350	1652	2002	0	2002
7/18/2010	1099.8	1246	709.1	350	1660	2010	0	2010
7/19/2010	1099.7	1250	709.6	350	2990	3340	0	3340

	Lake Chelan Elevation	Powerhouse Tailrace Flow	Powerhouse Tailwater Elevation	Low Level Outlet Flow	Spill Flow	Chelan River Flow Reaches 1-3	Pump Station Flow	Chelan River Flow Reach 4
Date	(ft)	(cfs)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
7/20/2010	1099.6	1255	710.3	357	4100	4457	0	4457
7/21/2010	1099.5	1255	710.4	356	4073	4430	0	4430
7/22/2010	1099.4	1254	710.1	350	2903	3253	0	3253
7/23/2010	1099.4	1245	708.9	353	206	560	0	560
7/24/2010	1099.4	1244	708.5	300	0	300	0	300
7/25/2010	1099.5	1240	708.4	301	0	301	0	301
7/26/2010	1099.5	1249	708.8	252	0	252	0	252
7/27/2010	1099.6	1249	709.1	200	0	200	0	200
7/28/2010	1099.7	1247	708.7	200	0	200	0	200
7/29/2010	1099.8	1243	708.4	123	0	123	0	123
7/30/2010	1099.8	1245	708.7	260	647	908	0	908
7/31/2010	1099.8	1237	708.9	349	1159	1508	0	1508
8/1/2010	1099.9	1233	708.7	350	727	1077	0	1077
8/2/2010	1099.9	1240	709.2	350	808	1158	0	1158
8/3/2010	1099.9	1243	709.3	350	856	1206	0	1206
8/4/2010	1099.9	1243	709.9	350	3092	3442	0	3442
8/5/2010	1099.8	1242	709.6	350	1608	1958	0	1958
8/6/2010	1099.9	1238	709.1	403	352	755	0	755
8/7/2010	1099.9	1233	708.6	481	0	481	0	481
8/8/2010	1099.9	1235	708.5	481	0	481	0	481
8/9/2010	1099.9	1237	708.7	404	0	404	0	404
8/10/2010	1099.9	1240	708.8	300	0	300	0	300
8/11/2010	1099.9	1253	708.6	300	0	300	0	300
8/12/2010	1099.9	1252	708.7	208	0	208	0	208
8/13/2010	1099.9	1251	708.8	100	0	100	0	100
8/14/2010	1099.9	1248	708.6	100	0	100	0	100
8/15/2010	1099.9	1241	708.4	100	0	100	0	100
8/16/2010	1099.9	1279	708.8	100	0	100	0	100
8/17/2010	1099.9	1250	709.0	100	0	100	0	100
8/18/2010	1099.9	810	708.5	92	0	92	0	92
8/19/2010	1099.9	1240	708.6	81	794	875	0	875
8/20/2010	1099.9	1723	708.9	183	238	421	0	421
8/21/2010	1099.7	2392	709.0	185	0	185	0	185
8/22/2010	1099.7	2388	709.0	100	0	100	0	100
8/23/2010	1099.6	2038	709.1	91	0	91	0	91
8/24/2010	1099.4	1627	708.8	81	0	81	0	81
8/25/2010	1099.4	1251	708.9	81	0	81	0	81
8/26/2010	1099.4	1949	708.9	82	0	82	0	82
8/27/2010	1099.3	1939	708.7	82	0	82	0	82
8/28/2010	1099.2	2010	708.7	82	0	82	0	82
8/29/2010	1099.1	1245	708.4	82	0	82	0	82
8/30/2010	1099.1	1370	708.6	82	0	82	0	82
8/31/2010	1099.0	1103	708.8	82	0	82	0	82
9/1/2010	1099.0	861	708.3	82	0	82	0	82
9/2/2010	1099.0	644	708.2	82	0	82	0	82
9/3/2010	1099.0	859	708.1	82	0	82	0	82
9/4/2010	1099.0	830	707.9	82	0	82	0	82
9/5/2010	1099.0	682	707.5	82	0	82	0	82
9/6/2010	1098.9	800	707.8	82	0	82	0	82
9/7/2010	1098.9	1059	708.2	83	0	83	0	83

	Lake Chelan Elevation	Powerhouse Tailrace Flow	Powerhouse Tailwater Elevation	Low Level Outlet Flow	Spill Flow	Chelan River Flow Reaches 1-3	Pump Station Flow	Chelan River Flow Reach 4
Date	(ft)	(cfs)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
9/8/2010	1098.9	1984	708.6	83	0	83	0	83
9/9/2010	1098.9	1975	708.5	83	0	83	0	83
9/10/2010	1098.8	1925	708.6	83	0	83	0	83
9/11/2010	1098.7	1588	708.5	193	0	193	0	193
9/12/2010	1098.6	10	707.9	269	0	269	0	269
9/13/2010	1098.6	882	708.5	150	0	150	0	150
9/14/2010	1098.6	1733	708.5	80	0	80	0	80
9/15/2010	1098.5	2170	708.7	80	0	80	0	80
9/16/2010	1098.5	1882	708.5	81	0	81	0	81
9/17/2010	1098.4	1889	708.5	81	0	81	0	81
9/18/2010	1098.4	1696	708.5	81	0	81	0	81
9/19/2010	1098.4	33	707.9	82	0	82	0	82
9/20/2010	1098.5	1729	708.8	82	0	82	0	82
9/21/2010	1098.4	2391	709.0	82	0	82	0	82
9/22/2010	1098.3	2395	708.9	82	0	82	0	82
9/23/2010	1098.2	2393	709.1	82	0	82	0	82
9/24/2010	1098.2	2393	709.1	82	0	82	0	82
9/25/2010	1098.1	2392	709.1	208	0	208	0	208
9/26/2010	1098.0	2390	709.2	299	0	299	0	299
9/27/2010	1097.9	2390	709.3	166	0	166	0	166
9/28/2010	1097.8	2391	709.2	82	0	82	0	82
9/29/2010	1097.8	2392	709.2	82	0	82	0	82
9/30/2010	1097.7	2391	709.1	82	0	82	0	82
10/1/2010	1097.6	2390	709.3	82	0	82	0	82
10/2/2010	1097.5	2392	709.3	82	0	82	0	82
10/3/2010	1097.4	2390	709.3	82	0	82	0	82
10/4/2010	1097.3	2396	709.3	82	0	82	0	82
10/5/2010	1097.2	2229	709.2	82	0	82	0	82
10/6/2010	1097.0	2268	709.2	82	0	82	0	82
10/7/2010	1096.9	2399	709.3	82	0	82	0	82
10/8/2010	1096.8	2399	709.4	82	0	82	0	82
10/9/2010	1096.7	2399	709.3	82	0	82	0	82
10/10/2010	1096.7	2399	709.2	82	0	82	0	82
10/11/2010	1096.8	2400	709.5	82	0	82	0	82
10/12/2010	1096.7	2398	709.5	82	0	82	0	82
10/13/2010	1096.6	2396	709.3	82	0	82	2	84
10/14/2010	1096.5	2126	709.0	82	0	82	2	84
10/15/2010	1096.4	2082	709.2	82	0	82	256	338
10/16/2010	1096.3	2388	709.1	82	0	82	257	339
10/17/2010	1096.2	2390	709.2	82	0	82	258	339
10/18/2010	1096.1	2390	709.2	82	0	82	258	340
10/19/2010	1096.0	2390	709.4	82	0	82	258	340
10/20/2010	1095.9	2388	709.2	82	0	82	258	339
10/21/2010	1095.8	2389	709.2	82	0	82	258	339
10/22/2010	1095.7	2390	709.1	82	0	82	257	339
10/23/2010	1095.5	2390	709.2	82	0	82	257	339
10/24/2010	1095.4	2390	709.2	82	0	82	256	338
10/25/2010	1095.4	2388	709.1	82	0	82	256	338
10/26/2010	1095.2	2368	709.2	82	0	82	258	339
10/27/2010	1095.1	2389	709.2	82	0	82	259	340

	Lake Chelan Elevation	Powerhouse Tailrace Flow	Powerhouse Tailwater Elevation	Low Level Outlet Flow	Spill Flow	Chelan River Flow Reaches 1-3	Pump Station Flow	Chelan River Flow Reach 4
Date	(ft)	(cfs)	(ft)	(cfs)	(cfs)	(cfs)	(cfs)	(cfs)
10/28/2010	1095.0	2388	709.0	82	0	82	258	340
10/29/2010	1094.9	2390	709.1	82	0	82	258	340
10/30/2010	1094.8	2389	708.8	82	0	82	256	338
10/31/2010	1094.7	2390	708.8	82	0	82	256	337
11/1/2010	1094.6	2390	709.0	82	0	82	257	339
11/2/2010	1094.5	2386	709.4	82	0	82	259	340
11/3/2010	1094.4	2388	709.4	82	0	82	258	340
11/4/2010	1094.3	2388	709.2	82	0	82	258	340
11/5/2010	1094.2	2387	709.5	82	0	82	258	340
11/6/2010	1094.1	2388	709.2	82	0	82	258	339
11/7/2010	1094.1	2389	708.9	82	0	82	255	337
11/8/2010	1094.0	2388	709.0	82	0	82	257	339
11/9/2010	1093.9	2389	709.2	82	0	82	258	340
11/10/2010	1093.8	2388	709.1	82	0	82	257	339
11/11/2010	1093.7	2388	709.2	82	0	82	258	340
11/12/2010	1093.6	2390	709.0	82	0	82	257	339
11/13/2010	1093.5	2390	708.9	82	0	82	258	340
11/14/2010	1093.4	2390	708.9	82	0	82	257	339
11/15/2010	1093.3	2386	709.2	82	0	82	258	340
11/16/2010	1093.3	2386	709.4	82	0	82	256	338
11/17/2010	1094.2	2381	709.2	82	0	82	257	339
11/18/2010	1093.1	2364	709.2	82	0	82	256	338
11/19/2010	1093.0	2350	709.3	82	0	82	259	341
11/20/2010	1093.0	2377	709.2	82	0	82	258	340
11/21/2010	1092.9	2379	709.4	82	0	82	259	342
11/22/2010	1092.7	2377	709.2	82	0	82	259	341
11/23/2010	1092.7	2377	709.5	82	0	82	259	341
11/24/2010	1092.5	2368	709.4	82	0	82	258	340
11/25/2010	1092.4	2375	709.4	82	0	82	258	340
11/26/2010	1092.3	2373	709.1	82	0	82	256	339
11/27/2010	1092.2	2370	709.4	82	0	82	257	339
11/28/2010	1092.1	2373	709.4	82	0	82	257	339
11/29/2010	1092.0	2373	709.6	82	0	82	259	341
11/30/2010	1091.9	2376	709.5	82	0	82	258	340
12/1/2010	1091.8	2373	709.4	82	0	82	22	104
12/2/2010	1091.7	2370	709.3	82	0	82	0	82
12/3/2010	1091.6	2370	709.3	82	0	82	0	82
12/4/2010	1091.5	2375	709.3	82	0	82	0	82
12/5/2010	1091.4	2370	709.2	82	0	82	0	82
12/6/2010	1091.3	1640	709.1	82	0	82	0	82
12/7/2010	1091.2	1312	709.1	82	0	82	0	82
12/8/2010	1091.2	2380	709.5	82	0	82	0	82
12/9/2010	1091.1	2375	709.4	82	0	82	0	82
12/10/2010	1091.0	2378	709.2	82	0	82	0	82
12/11/2010	1090.9	2381	709.0	82	0	82	0	82
12/12/2010	1090.9	2382	708.9	82	0	82	0	82
12/13/2010	1090.9	2383	708.9	82	0	82	0	82
12/14/2010	1090.9	2381	708.8	82	0	82	0	82
12/15/2010	1090.8	2382	708.8	82	0	82	0	82
12/16/2010	1090.7	2377	709.3	82	0	82	0	82

Date	Lake Chelan Elevation (ft)	Powerhouse Tailrace Flow (cfs)	Powerhouse Tailwater Elevation (ft)	Low Level Outlet Flow (cfs)	Spill Flow (cfs)	Chelan River Flow Reaches 1-3 (cfs)	Pump Station Flow (cfs)	Chelan River Flow Reach 4 (cfs)
12/17/2010	1090.6	2365	709.6	82	0	82	0	82
12/18/2010	1090.5	2192	709.2	82	0	82	0	82
12/19/2010	1090.4	2358	709.3	82	0	82	0	82
12/20/2010	1090.3	2364	709.6	82	0	82	0	82
12/21/2010	1090.2	2362	709.3	82	0	82	0	82
12/22/2010	1090.1	2365	709.4	82	0	82	0	82
12/23/2010	1090.0	2365	709.4	82	0	82	0	82
12/24/2010	1089.9	2367	709.3	82	0	82	0	82
12/25/2010	1089.9	2366	709.2	82	0	82	0	82
12/26/2010	1089.8	2360	709.1	82	0	82	0	82
12/27/2010	1089.7	2369	709.5	82	0	82	0	82
12/28/2010	1089.6	2371	709.5	82	0	82	0	82
12/29/2010	1089.5	2371	709.2	82	0	82	0	82
12/30/2010	1089.4	2371	709.4	82	0	82	0	82
12/31/2010	1089.2	2371	709.4	82	0	82	0	82

APPENDIX B: DAILY AVERAGE WATER TEMPERATURES

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
1/1/2010	5.0	4.8	N/A	N/A	N/A	N/A	4.5	N/A
1/2/2010	5.3	5.2	N/A	N/A	N/A	N/A	4.8	N/A
1/3/2010	5.5	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/4/2010	5.6	5.3	N/A	N/A	N/A	N/A	5.0	N/A
1/5/2010	5.5	5.3	N/A	N/A	N/A	N/A	4.9	N/A
1/6/2010	5.0	4.9	N/A	N/A	N/A	N/A	4.6	N/A
1/7/2010	4.4	4.3	N/A	N/A	N/A	N/A	4.1	N/A
1/8/2010	4.4	4.2	N/A	N/A	N/A	N/A	4.0	N/A
1/9/2010	4.4	4.3	N/A	N/A	N/A	N/A	4.0	N/A
1/10/2010	4.4	4.3	N/A	N/A	N/A	N/A	4.1	N/A
1/11/2010	4.5	4.6	N/A	N/A	N/A	N/A	4.4	N/A
1/12/2010	4.8	4.7	N/A	N/A	N/A	N/A	4.4	N/A
1/13/2010	4.9	4.7	N/A	N/A	N/A	N/A	4.4	N/A
1/14/2010	5.0	4.9	N/A	N/A	N/A	N/A	4.6	N/A
1/15/2010	5.0	5.1	N/A	N/A	N/A	N/A	4.8	N/A
1/16/2010	5.0	5.0	N/A	N/A	N/A	N/A	4.7	N/A
1/17/2010	5.0	5.0	N/A	N/A	N/A	N/A	4.7	N/A
1/18/2010	5.0	5.1	N/A	N/A	N/A	N/A	4.8	N/A
1/19/2010	5.2	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/20/2010	5.5	5.4	N/A	N/A	N/A	N/A	5.1	N/A
1/21/2010	5.6	5.5	N/A	N/A	N/A	N/A	5.2	N/A
1/22/2010	5.6	5.5	N/A	N/A	N/A	N/A	5.2	N/A
1/23/2010	5.6	5.4	N/A	N/A	N/A	N/A	5.2	N/A
1/24/2010	5.2	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/25/2010	5.0	5.1	N/A	N/A	N/A	N/A	4.8	N/A
1/26/2010	5.2	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/27/2010	5.0	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/28/2010	5.0	5.1	N/A	N/A	N/A	N/A	4.8	N/A
1/29/2010	5.1	5.2	N/A	N/A	N/A	N/A	4.9	N/A
1/30/2010	5.6	5.4	N/A	N/A	N/A	N/A	5.1	N/A
1/31/2010	5.6	5.5	N/A	N/A	N/A	N/A	5.2	N/A
2/1/2010	5.6	5.5	N/A	N/A	N/A	N/A	5.2	N/A
2/2/2010	5.6	5.5	N/A	N/A	N/A	N/A	5.2	N/A
2/3/2010	5.6	5.6	N/A	N/A	N/A	N/A	5.3	N/A
2/4/2010	5.6	5.6	N/A	N/A	N/A	N/A	5.3	N/A
2/5/2010	5.6	5.6	N/A	N/A	N/A	N/A	5.3	N/A
2/6/2010	5.8	5.7	N/A	N/A	N/A	N/A	5.4	N/A
2/7/2010	5.7	5.7	N/A	N/A	N/A	N/A	5.4	N/A
2/8/2010	5.6	5.7	N/A	N/A	N/A	N/A	5.4	N/A
2/9/2010	5.6	5.6	N/A	6.4	6.6	6.8	5.4	6.2
2/10/2010	5.6	5.6	N/A	5.5	5.7	5.5	5.3	6.1
2/11/2010	5.6	5.7	N/A	5.9	6.1	5.9	5.4	6.2
2/12/2010	5.6	5.6	N/A	6.0	6.2	5.9	5.4	6.2
2/13/2010	5.8	5.8	N/A	6.4	6.5	N/A	5.5	6.2
2/14/2010	6.1	5.9	N/A	6.5	6.6	N/A	5.6	6.2
2/15/2010	6.1	5.9	N/A	6.4	6.6	6.6	5.7	6.2
2/16/2010	6.1	6.0	N/A	6.5	6.7	6.3	6.1	6.2
2/17/2010	6.1	5.9	N/A	6.2	6.3	6.0	6.5	6.3
2/18/2010	6.1	6.0	N/A	6.1	6.1	5.8	6.5	6.4
2/19/2010	6.1	6.0	6.6	5.9	6.5	6.5	6.0	6.5

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C)	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
2/20/2010	6.1	6.0	6.1	5.9	6.1	6.0	5.7	6.4
2/21/2010	6.1	6.0	6.0	5.8	6.0	6.0	5.6	6.3
2/22/2010	6.1	6.0	6.0	5.9	6.0	6.0	5.7	6.3
2/23/2010	6.1	6.0	6.0	5.8	5.9	5.9	5.7	6.3
2/24/2010	6.1	6.0	6.4	6.4	6.5	6.5	5.7	6.3
2/25/2010	6.3	6.2	6.6	6.5	6.6	6.6	5.9	6.3
2/26/2010	6.3	6.3	6.4	6.3	6.4	6.4	6.0	6.3
2/27/2010	6.1	6.2	6.6	6.6	6.8	6.8	5.9	6.3
2/28/2010	6.4	6.4	6.8	6.8	6.9	7.0	6.1	6.4
3/1/2010	6.6	6.6	7.0	7.1	7.2	7.2	6.2	6.4
3/2/2010	6.8	6.8	7.3	7.4	7.5	7.6	6.4	6.5
3/3/2010	7.0	6.9	7.2	7.4	7.5	7.6	6.5	6.5
3/4/2010	7.0	6.9	7.3	7.3	7.4	7.5	6.6	6.5
3/5/2010	7.2	7.1	7.3	7.3	7.4	7.5	6.8	6.6
3/6/2010	7.4	7.3	7.5	7.5	7.6	7.6	6.9	6.5
3/7/2010	7.5	7.4	7.6	7.6	7.7	7.8	7.1	6.6
3/8/2010	7.4	7.4	7.7	7.8	7.9	8.0	7.1	6.6
3/9/2010	7.3	7.3	7.2	7.1	7.2	7.2	7.0	6.7
3/10/2010	7.2	7.2	7.4	7.2	7.3	7.3	6.9	6.7
3/11/2010	7.2	7.2	7.2	7.1	7.2	7.2	6.9	6.8
3/12/2010	7.2	7.1	7.3	7.3	7.4	7.5	6.8	6.8
3/13/2010	7.1	7.1	7.4	7.4	7.5	7.5	6.8	6.8
3/14/2010	7.3	7.3	7.7	7.7	7.2	7.4	7.0	6.8
3/15/2010	7.5	7.6	8.2	8.3	7.8	7.9	7.2	7.2
3/16/2010	8.0	7.9	8.4	8.5	8.1	8.2	7.5	7.3
3/17/2010	8.1	7.9	8.2	8.2	8.1	8.1	7.6	7.4
3/18/2010	7.7	7.7	8.1	8.0	7.8	7.9	7.3	7.4
3/19/2010	7.9	7.8	8.0	8.0	7.9	8.0	7.4	7.4
3/20/2010	8.0	7.8	8.1	8.1	8.0	8.1	7.5	7.4
3/21/2010	8.0	7.9	8.2	8.2	8.1	8.2	7.6	7.5
3/22/2010	8.0	8.0	8.5	8.6	8.2	8.3	7.7	7.5
3/23/2010	8.4	8.3	8.7	8.7	8.4	8.5	7.9	7.6
3/24/2010	8.6	8.6	8.9	8.9	8.7	8.8	8.3	7.6
3/25/2010	8.8	8.7	9.0	9.0	8.9	8.9	8.4	7.7
3/26/2010	8.9	8.8	9.3	9.4	9.0	9.1	8.6	7.8
3/27/2010	9.1	8.9	9.2	9.2	9.1	9.1	8.6	7.8
3/28/2010	9.2	9.1	9.3	9.4	9.2	9.3	8.8	7.9
3/29/2010	9.1	9.0	9.2	9.3	9.1	9.2	8.7	8.0
3/30/2010	8.7	8.6	8.8	8.8	8.8	8.8	8.3	8.0
3/31/2010	8.6	8.6	8.9	8.9	8.8	8.8	8.4	8.0
4/1/2010	8.9	8.8	9.1	9.1	9.0	9.0	8.5	8.1
4/2/2010	8.4	8.3	7.9	7.8	8.4	8.3	8.1	8.1
4/3/2010	8.1	8.0	8.2	8.1	8.1	8.1	7.7	8.1
4/4/2010	8.1	8.0	8.2	8.2	8.2	8.2	7.7	8.1
4/5/2010	8.4	8.3	8.6	8.7	8.5	8.6	8.0	8.1
4/6/2010	8.6	8.7	9.1	9.1	8.8	8.9	8.4	8.1
4/7/2010	8.5	8.5	8.8	8.8	8.6	8.7	8.3	8.5
4/8/2010	8.6	8.6	8.8	8.9	8.7	8.8	8.3	8.1
4/9/2010	8.2	8.2	8.2	8.1	8.3	8.3	7.9	8.2
4/10/2010	8.4	8.3	8.6	8.5	8.4	8.5	8.0	8.2

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
4/11/2010	8.7	8.7	9.3	9.3	8.9	9.0	8.3	8.2
4/12/2010	8.9	8.9	9.1	9.1	9.1	9.1	8.6	8.7
4/13/2010	9.1	9.2	9.9	10.0	9.4	9.5	8.8	8.8
4/14/2010	9.7	9.8	10.6	10.7	9.9	10.1	9.2	8.5
4/15/2010	10.2	10.1	10.6	10.6	10.3	10.4	9.8	8.9
4/16/2010	10.6	10.7	11.1	11.2	10.8	10.9	10.1	8.7
4/17/2010	11.5	11.5	11.8	12.0	11.6	11.7	10.9	8.9
4/18/2010	12.1	12.2	12.5	12.6	12.3	12.4	11.6	9.2
4/19/2010	12.6	12.7	13.0	13.2	12.8	12.9	12.1	10.0
5/30/2010	14.7	14.6	N/A	15.0	15.0	15.1	14.3	14.1
5/31/2010	15.2	15.0	N/A	15.5	15.5	15.5	14.7	14.3
6/1/2010	15.3	15.3	N/A	15.4	15.4	15.5	14.9	14.4
6/2/2010	15.3	15.1	N/A	15.3	15.4	15.4	14.9	14.2
6/3/2010	14.9	14.8	N/A	14.9	14.9	14.9	14.5	14.0
6/4/2010	14.2	14.0	N/A	14.3	14.3	14.4	13.5	14.2
6/5/2010	14.8	14.7	N/A	15.0	15.0	15.1	14.2	14.6
6/6/2010	14.4	14.3	N/A	14.6	14.6	14.6	13.8	14.3
6/7/2010	15.0	15.0	N/A	15.3	15.3	15.3	14.5	14.7
6/8/2010	15.8	15.7	N/A	15.9	15.9	16.0	15.5	15.1
6/9/2010	16.0	15.9	N/A	16.2	16.2	16.2	16.5	14.9
6/10/2010	16.3	16.2	N/A	16.4	16.4	16.5	17.0	14.6
6/11/2010	16.7	16.6	N/A	16.9	16.9	16.9	17.3	14.8
6/12/2010	17.2	17.1	N/A	17.4	17.4	17.5	17.8	15.1
6/13/2010	17.2	16.9	N/A	17.2	17.2	17.3	17.5	15.3
6/14/2010	17.5	17.4	N/A	17.6	17.6	17.7	18.1	15.5
6/15/2010	17.2	17.0	N/A	17.1	17.1	17.2	17.8	15.7
6/16/2010	16.6	16.4	N/A	16.6	16.6	16.7	17.4	15.8
6/17/2010	16.1	16.0	N/A	16.3	16.3	16.3	16.9	15.8
6/18/2010	16.2	16.0	N/A	16.4	16.4	16.4	17.0	15.9
6/19/2010	15.4	15.3	N/A	15.5	15.5	15.5	16.2	15.7
6/20/2010	16.9	16.8	N/A	17.0	17.0	17.1	17.7	15.9
6/21/2010	16.7	16.6	N/A	16.8	16.8	16.9	17.5	15.9
6/22/2010	16.6	16.5	N/A	16.8	16.8	16.9	17.4	15.9
6/23/2010	16.8	16.6	N/A	16.9	16.9	17.0	17.6	16.1
6/24/2010	16.8	16.6	N/A	16.8	16.8	16.9	17.5	16.2
6/25/2010	17.6	17.3	N/A	17.5	17.6	17.6	18.2	16.3
6/26/2010	18.1	18.0	N/A	18.3	18.3	18.3	18.9	16.3
6/27/2010	18.3	18.2	N/A	18.5	18.5	18.5	19.1	16.6
6/28/2010	18.6	18.5	N/A	18.8	18.8	18.9	19.4	16.9
6/29/2010	18.6	18.4	N/A	18.5	18.6	18.6	19.2	16.6
6/30/2010	18.2	18.1	N/A	18.2	18.3	18.3	19.0	16.6
7/1/2010	16.9	16.9	N/A	17.5	17.5	17.6	18.1	16.6
7/2/2010	18.0	17.9	N/A	18.0	18.0	18.1	18.7	16.9
7/3/2010	18.1	18.0	N/A	18.2	18.2	18.3	18.8	17.0
7/4/2010	18.1	18.0	N/A	18.1	18.2	18.2	18.8	17.0
7/5/2010	18.0	18.0	N/A	18.2	18.2	18.3	18.8	17.1
7/6/2010	18.3	18.2	N/A	18.5	18.5	18.6	19.0	17.2
7/7/2010	17.6	17.9	N/A	18.4	18.4	18.5	18.6	17.3
7/8/2010	18.1	18.3	N/A	18.9	18.9	19.0	18.7	17.4
7/9/2010	18.9	19.0	N/A	19.5	19.5	19.5	19.2	17.5

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
7/10/2010	19.9	20.3	N/A	20.8	20.8	20.9	20.4	17.8
7/11/2010	22.0	22.0	N/A	22.1	22.2	22.2	22.5	18.1
7/12/2010	21.6	21.4	N/A	21.4	21.4	21.4	21.9	18.5
7/13/2010	20.9	20.8	N/A	20.7	20.8	20.8	21.6	18.7
7/14/2010	20.0	20.0	N/A	20.6	20.6	20.7	21.2	18.8
7/15/2010	18.8	19.0	N/A	20.4	20.4	20.5	20.9	18.8
7/16/2010	21.1	21.0	N/A	21.2	21.2	21.2	21.8	18.9
7/17/2010	21.2	21.0	N/A	21.2	21.2	21.3	21.8	19.3
7/18/2010	21.0	20.9	N/A	21.1	21.1	21.1	21.7	19.4
7/19/2010	21.0	20.9	N/A	21.0	21.1	21.1	21.6	19.8
7/20/2010	20.8	20.7	N/A	20.8	20.8	20.9	21.2	20.1
7/21/2010	21.0	21.0	N/A	21.2	21.2	21.2	21.3	20.1
7/22/2010	21.1	20.9	N/A	21.1	21.1	21.2	21.2	20.1
7/23/2010	20.9	20.8	N/A	21.1	21.1	21.2	21.1	19.8
7/24/2010	20.5	20.4	N/A	21.0	21.0	21.1	21.1	19.6
7/25/2010	20.2	20.1	N/A	20.7	20.7	20.8	21.2	19.6
7/26/2010	21.5	21.4	N/A	21.7	21.7	21.8	22.2	19.8
7/27/2010	20.8	20.7	N/A	21.1	21.0	21.2	22.1	19.8
7/28/2010	19.4	19.4	N/A	20.3	20.3	20.5	20.6	19.7
7/29/2010	20.3	20.4	N/A	21.7	21.7	21.8	21.5	20.0
7/30/2010	19.4	19.5	N/A	20.3	20.4	20.5	21.1	20.2
7/31/2010	21.4	21.5	N/A	21.6	21.7	21.7	21.9	20.8
8/1/2010	21.7	21.8	N/A	21.8	21.9	21.9	21.9	21.0
8/2/2010	21.7	21.7	N/A	21.8	21.9	21.9	21.9	21.3
8/3/2010	20.5	20.7	N/A	21.2	21.3	21.3	21.4	21.0
8/4/2010	21.9	21.9	N/A	22.0	22.0	22.0	22.1	21.6
8/5/2010	21.5	21.6	N/A	21.7	21.8	21.8	21.8	21.4
8/6/2010	22.1	22.1	N/A	22.1	22.2	22.2	22.4	21.6
8/7/2010	22.0	22.0	N/A	21.8	21.8	21.8	22.3	21.4
8/8/2010	21.8	21.9	N/A	21.9	21.9	21.9	22.2	21.3
8/9/2010	21.9	22.0	N/A	21.8	21.8	21.8	22.2	21.4
8/10/2010	21.9	21.9	N/A	21.7	21.7	21.7	22.2	21.5
8/11/2010	21.7	21.8	22.4	21.8	21.8	21.8	22.3	21.2
8/12/2010	21.8	21.8	21.8	22.0	22.1	22.1	22.3	21.2
8/13/2010	21.9	22.0	21.7	21.7	21.6	21.7	22.4	21.3
8/14/2010	21.8	21.9	21.7	21.7	21.7	21.8	22.4	21.2
8/15/2010	21.2	21.3	21.6	21.8	21.8	21.9	22.5	21.1
8/16/2010	20.1	20.2	21.1	21.4	21.3	21.5	22.0	21.1
8/17/2010	19.9	20.1	20.9	21.3	21.2	21.4	22.2	21.4
8/18/2010	22.0	22.0	21.4	21.3	21.3	21.3	23.6	21.1
8/19/2010	23.5	23.5	22.9	22.8	22.9	22.8	23.7	21.4
8/20/2010	23.0	22.9	22.4	22.3	22.4	22.4	23.1	22.0
8/21/2010	22.5	22.5	21.8	21.7	21.8	21.7	22.7	22.1
8/22/2010	21.9	21.9	21.1	20.9	21.0	20.8	22.1	21.8
8/23/2010	21.2	21.2	20.6	20.1	20.2	20.2	21.4	21.3
8/24/2010	21.2	21.2	20.8	20.4	20.5	20.6	21.5	21.2
8/25/2010	21.1	21.2	21.0	20.8	20.9	20.9	21.5	21.2
8/26/2010	21.1	21.1	20.6	20.4	20.5	20.5	21.4	21.1
8/27/2010	20.5	20.4	19.8	19.2	19.5	19.4	20.7	20.8
8/28/2010	20.4	20.3	19.6	19.1	19.2	19.2	20.6	20.7

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
8/29/2010	20.2	20.2	19.6	19.1	19.2	19.2	20.4	20.8
8/30/2010	20.0	19.9	19.1	18.6	18.8	18.7	20.2	20.5
8/31/2010	19.4	19.3	18.4	17.7	17.9	17.8	19.8	20.0
9/1/2010	19.2	19.2	19.1	18.7	18.8	18.8	19.7	20.4
9/2/2010	19.3	19.3	19.1	18.7	18.8	18.8	19.9	20.5
9/3/2010	19.6	19.6	19.6	19.3	19.3	19.4	20.1	20.5
9/4/2010	19.9	19.9	19.5	19.1	19.3	19.3	20.3	20.6
9/5/2010	19.5	19.4	18.7	17.9	18.2	18.3	20.0	20.4
9/6/2010	19.2	19.1	18.6	18.2	18.3	18.3	19.6	20.4
9/7/2010	19.0	19.0	18.4	18.1	18.2	18.1	19.4	20.1
9/8/2010	18.9	18.9	18.6	18.3	18.4	18.4	19.2	19.5
9/9/2010	18.9	18.9	18.9	18.6	18.7	18.6	19.2	19.5
9/10/2010	18.9	18.9	18.6	18.2	18.3	18.3	19.2	19.4
9/11/2010	19.0	18.9	18.4	18.1	18.2	18.2	19.4	19.4
9/12/2010	19.3	19.2	19.0	18.9	18.9	18.9	20.0	20.0
9/13/2010	19.2	19.2	19.4	19.3	19.4	19.4	19.7	19.7
9/14/2010	19.5	19.5	19.4	19.1	19.2	19.2	19.8	19.6
9/15/2010	19.5	19.5	19.0	18.8	18.9	18.9	19.8	19.5
9/16/2010	19.4	19.4	19.1	18.9	19.0	19.0	19.8	19.5
9/17/2010	19.4	19.4	19.2	19.0	19.1	19.1	19.7	19.5
9/18/2010	19.4	19.4	19.2	19.1	19.2	19.2	19.8	19.5
9/19/2010	19.4	19.4	18.9	18.8	18.9	18.9	20.2	19.7
9/20/2010	19.0	18.9	18.3	17.9	18.0	17.9	19.4	19.2
9/21/2010	18.4	18.4	17.9	17.4	17.5	17.5	18.7	18.8
9/22/2010	18.1	18.1	17.7	17.1	17.3	17.3	18.4	18.5
9/23/2010	17.9	17.8	17.1	16.6	16.8	16.7	18.2	18.3
9/24/2010	17.6	17.6	17.3	16.9	17.0	17.0	17.9	18.0
9/25/2010	17.7	17.6	17.3	17.0	17.1	17.2	17.9	18.0
9/26/2010	18.0	18.0	18.0	18.0	18.0	18.0	18.3	18.2
9/27/2010	18.3	18.4	18.6	18.6	18.6	18.6	18.6	18.4
9/28/2010	18.6	18.6	18.7	18.7	18.7	18.8	18.9	18.6
9/29/2010	18.3	18.2	17.9	17.7	17.7	17.7	18.6	18.4
9/30/2010	18.3	N/A	17.9	17.5	17.5	17.5	18.6	18.3
10/1/2010	18.3	N/A	18.1	17.7	17.7	17.8	18.5	18.3
10/2/2010	18.3	N/A	18.2	17.9	17.9	18.0	18.6	18.3
10/3/2010	18.2	N/A	18.0	17.7	17.7	17.7	18.5	18.2
10/4/2010	17.9	N/A	17.6	17.3	17.3	17.3	18.2	17.9
10/5/2010	17.6	N/A	17.1	16.5	16.5	16.6	18.0	17.6
10/6/2010	17.5	N/A	16.9	16.4	16.4	16.4	17.9	17.5
10/7/2010	17.4	N/A	16.8	16.3	16.3	16.3	17.7	17.4
10/8/2010	17.2	N/A	16.9	16.5	16.5	16.6	17.5	17.2
10/9/2010	17.0	N/A	16.8	16.5	16.5	16.5	17.3	17.0
10/10/2010	16.8	N/A	16.6	16.4	16.4	16.4	17.1	16.8
10/11/2010	16.4	N/A	15.7	15.1	15.1	15.1	16.7	16.4
10/12/2010	16.2	N/A	15.8	15.2	15.2	15.3	16.5	16.2
10/13/2010	16.1	N/A	15.7	15.2	15.2	15.3	16.4	16.1
10/14/2010	16.0	N/A	15.6	15.1	15.1	15.0	16.4	16.1
10/15/2010	15.8	N/A	15.3	15.6	15.6	15.5	16.1	15.8
10/16/2010	15.5	N/A	14.8	15.3	15.3	15.2	15.8	15.5
10/17/2010	15.2	N/A	14.5	15.0	15.0	14.9	15.6	15.3

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
10/18/2010	15.0	N/A	14.5	14.8	14.8	14.8	15.4	15.1
10/19/2010	14.8	N/A	14.4	14.7	14.7	14.6	15.2	14.9
10/20/2010	14.9	N/A	14.5	14.8	14.8	14.7	15.3	14.9
10/21/2010	14.9	N/A	14.6	14.8	14.8	14.8	15.3	15.0
10/22/2010	15.0	N/A	14.7	14.9	14.9	14.9	15.4	15.0
10/23/2010	14.9	N/A	14.6	14.7	14.7	14.7	15.2	14.9
10/24/2010	14.7	N/A	14.4	14.6	14.6	14.6	15.1	14.7
10/25/2010	14.2	N/A	13.7	14.0	14.0	13.9	14.6	14.2
10/26/2010	13.6	N/A	13.4	13.5	13.5	13.4	14.0	13.7
10/27/2010	13.4	N/A	13.0	13.3	13.3	13.2	13.9	13.5
10/28/2010	13.4	N/A	13.2	13.3	13.3	13.3	13.9	13.5
10/29/2010	13.4	N/A	13.4	13.3	13.3	13.3	13.8	13.5
10/30/2010	13.4	N/A	13.3	13.3	13.3	13.3	13.8	13.4
10/31/2010	13.5	N/A	13.5	13.4	13.4	13.4	13.9	13.5
11/1/2010	13.4	N/A	13.4	13.4	13.4	13.4	13.9	13.5
11/2/2010	13.3	N/A	13.3	13.3	13.3	13.3	13.8	13.4
11/3/2010	13.3	N/A	12.9	13.1	13.1	13.1	13.7	13.3
11/4/2010	13.1	N/A	12.8	13.0	13.0	13.0	13.6	13.2
11/5/2010	13.1	N/A	12.8	13.0	13.0	13.0	13.5	13.2
11/6/2010	12.9	N/A	12.9	12.9	12.9	12.8	13.4	13.0
11/7/2010	13.0	N/A	12.8	12.9	12.9	12.9	13.4	13.0
11/8/2010	12.6	N/A	12.1	12.5	12.5	12.4	13.1	12.7
11/9/2010	12.1	N/A	11.3	11.9	11.9	11.8	12.6	12.2
11/10/2010	11.8	N/A	11.5	11.8	11.8	11.7	12.3	11.9
11/11/2010	11.7	N/A	11.3	11.6	11.6	11.5	12.2	11.8
11/12/2010	11.6	N/A	11.3	11.5	11.5	11.5	12.1	11.7
11/13/2010	11.5	N/A	11.3	11.4	11.4	11.4	12.0	11.6
11/14/2010	11.5	N/A	11.1	11.4	11.4	11.3	12.0	11.6
11/15/2010	11.3	N/A	11.1	11.2	11.2	11.2	11.9	11.4
11/16/2010	11.2	N/A	11.1	11.2	11.2	11.1	11.8	11.3
11/17/2010	11.1	N/A	10.9	11.0	11.0	11.0	11.6	11.2
11/18/2010	10.9	N/A	10.4	10.8	10.8	10.7	11.4	11.0
11/19/2010	10.5	N/A	9.8	10.4	10.4	10.2	11.0	10.6
11/20/2010	10.1	N/A	9.0	9.9	9.9	9.7	10.7	10.2
11/21/2010	9.4	N/A	8.5	9.2	9.2	9.0	10.0	9.5
11/22/2010	8.9	N/A	7.6	8.6	8.6	8.3	9.5	9.0
11/23/2010	8.2	N/A	6.8	7.9	7.9	7.6	8.8	8.3
11/24/2010	7.5	N/A	6.1	7.3	7.3	7.0	8.2	7.7
11/25/2010	7.5	N/A	6.8	7.3	7.3	7.1	8.1	7.6
11/26/2010	7.7	N/A	7.4	7.5	7.5	7.4	8.3	7.8
11/27/2010	7.9	N/A	7.8	7.8	7.8	7.7	8.6	8.1
11/28/2010	8.0	N/A	7.9	7.8	7.8	7.7	8.6	8.1
11/29/2010	7.9	N/A	7.5	7.7	7.7	7.6	8.5	8.0
11/30/2010	7.6	N/A	7.2	7.4	7.4	7.3	8.2	7.7
12/1/2010	7.5	N/A	7.6	7.0	7.0	6.9	8.1	7.6
12/2/2010	7.6	N/A	7.7	7.0	7.0	6.9	8.2	7.7
12/3/2010	7.4	N/A	7.2	6.5	6.5	6.4	8.1	7.5
12/4/2010	7.4	N/A	6.9	6.3	6.3	6.2	8.0	7.5
12/5/2010	7.0	N/A	6.8	6.1	6.1	6.1	7.7	7.2
12/6/2010	7.2	N/A	7.3	6.7	6.7	6.7	7.9	7.4

Date	Low Level Outlet Pipe -Auto- (Deg. C)	Top of Reach 1 -Logger- (Deg. C))	End of Reach 1 -Logger- (Deg. C)	End of Reach 3 -Logger- (Deg. C)	Top of R4 Habitat Channel -Logger- (Deg. C)	End of R4 Habitat Channel -Logger- (Deg. C)	Tailrace at Pump Intake -Auto- (Deg. C)	Tailrace at Pump Intake -Logger- (Deg. C)
12/7/2010	7.1	N/A	7.1	6.6	6.6	6.5	7.7	7.2
12/8/2010	7.0	N/A	7.3	6.8	6.8	6.7	7.6	7.1
12/9/2010	7.3	N/A	7.4	7.0	7.0	6.9	7.9	7.3
12/10/2010	7.4	N/A	7.5	7.1	7.1	7.0	8.0	7.5
12/11/2010	7.4	N/A	6.7	6.4	6.4	6.2	8.0	7.4
12/12/2010	6.8	N/A	6.8	6.1	6.1	6.0	7.4	6.9
12/13/2010	7.0	N/A	7.2	6.8	6.8	6.8	7.6	7.1
12/14/2010	7.1	N/A	7.2	6.8	6.8	6.7	7.7	7.2
12/15/2010	6.7	N/A	6.5	6.1	6.1	6.0	7.4	6.8
12/16/2010	6.6	N/A	6.5	6.0	6.0	5.9	7.3	6.7
12/17/2010	6.6	N/A	6.3	5.9	5.9	5.9	7.2	6.7
12/18/2010	6.3	N/A	6.0	5.5	5.5	5.4	6.9	6.4
12/19/2010	6.2	N/A	6.1	5.7	5.7	5.7	6.8	6.3
12/20/2010	6.2	N/A	6.0	5.6	5.6	5.6	6.8	6.3
12/21/2010	6.1	N/A	6.2	5.8	5.8	5.8	6.8	6.2
12/22/2010	6.1	N/A	6.0	5.5	5.5	5.5	6.8	6.2
12/23/2010	6.2	N/A	6.4	6.1	6.1	6.1	6.8	6.3
12/24/2010	6.3	N/A	6.5	6.3	6.3	6.3	6.9	6.4
12/25/2010	6.4	N/A	6.6	6.3	6.3	6.3	7.0	6.5
12/26/2010	6.5	N/A	6.6	6.4	6.4	6.3	7.1	6.6
12/27/2010	6.2	N/A	6.1	5.7	5.7	5.6	6.8	6.3
12/28/2010	6.1	N/A	5.9	5.6	5.6	5.5	6.8	6.2
12/29/2010	6.1	N/A	6.0	5.7	5.7	5.7	6.7	6.2
12/30/2010	5.8	N/A	4.9	4.4	4.4	4.3	6.4	5.9
12/31/2010	5.2	N/A	4.0	3.3	3.3	3.3	5.8	5.2

APPENDIX C: CONSULTATION RECORD

Chelan PUD provided a draft of the 2009 Annual Flow Report to the USGS and members of the CRFF and LCRF in accordance with the requirements of the FERC Order Modifying and Approving Operations Compliance and Monitoring Plan, Article 405, under Ordering Paragraph (B):

“The licensee shall allow the resource agencies, Tribes and non-governmental organizations specified under Article 405, 30 days to provide comments and/or recommendations on their report before filing with the FERC. The filing shall include comments and/or recommendations from the consulted entities and the licensee’s response to any comments. If the licensee does not adopt a recommendation, the report shall include the licensee’s reasons, based on project-specific information.”

The following individuals were sent draft copies for review:

<i>NAME</i>	<i>AGENCY</i>	<i>Comments</i>
Armbruster, Lanny	Manson Parks and Recreation Department	
Caldwell, Brad	Washington State Department of Ecology	
Denniston, Gary	Lake Chelan Sportsman Association	
Domingue, Rich	National Marine Fisheries Services	
Drzymkowski, Robert	United States Geological Survey	
Eychner, Jim	Recreation and Conservation Office	
Fraser, Bill	Washington State Parks and Recreation Commission	
Glesne, Reed	National Park Service	
Goedde, Robert	City of Chelan	
Harris, Jim	Washington State Parks and Recreation Commission	
Heiner, Bruce	Washington State Department of Fish and Wildlife	
Irle, Pat	Washington State Department of Ecology	
Kastenholz, Joe	United States Department of Agriculture – Forest Service	
Lenz, Mallory	United States Department of Agriculture – Forest Service	
Lesmeister, Annelise	National Park Service	
Lewis, Steve	United States Fish and Wildlife Service	
Marco, Jerry	Confederated Tribes of the Colville Reservation	
Martinez, Alex	United States Department of Agriculture – Forest Service	
Merkle, Carl	Confederated Tribes of the Umatilla Indian Reservation	
Merz, Jonathan	Washington State Department of Ecology	
O’Keefe, Thomas	American Whitewater	
Rose, Bob	Yakama Indian Nation	
Uhlhorn, Richard	Lake Chelan Recreation Association	
Urness, Jim	Lake Chelan Recreation Association	
Viola, Art	Washington Department of Fish and Wildlife	