From:	Steinmetz, Marcie
To:	"Irle, Pat (ECY)"; Coffin, Chris (ECY)
Cc:	Bitterman, Deborah; Sokolowski, Rosana; Smith, Michelle; Osborn, Jeff
Subject:	Final 2014 Gas Abatement Annual Report
Date:	Wednesday, December 31, 2014 7:26:39 AM
Attachments:	FINAL 2014 GAP Report 12_31_2014.pdf

PUBLIC UTILITY DISTRICT NO. 1 of CHELAN COUNTY

P.O. Box 1231, Wenatchee, WA 98807-1231 • 327 N. Wenatchee Ave., Wenatchee, WA 98801

(509) 663-8121 • Toll free 1-888-663-8121 • www.chelanpud.org

December 31, 2014

To: Patricia Irle, Washington State Department of Ecology

Chris Coffin, Washington State Department of Ecology

From: Marcie Steinmetz, Water Resources Specialist

Public Utility District No. 1 of Chelan County (Chelan PUD)

Re: Final 2014 Gas Abatement Annual Report for Rocky Reach and Rock Island Hydroelectric Projects

Ms. Irle and Mr. Coffin:

Attached please find the FINAL 2014 Gas Abatement Annual Report for Rocky Reach and Rock Island Hydroelectric Projects.

If you have any questions, please do not hesitate to contact me.

Thank you,

Marcie Steinmetz | **Water Resource Specialist**

Chelan Public Utility District | 327 N. Wenatchee Ave. | Wenatchee, WA 98801

509.661.4186 (w) | 509.280.1955 (c)| marcie.steinmetz@chelanpud.org

2014
GAS ABATEMENT ANNUAL REPORT

Final

ROCKY REACH HYDROELECTRIC PROJECT
FERC Project No. 2145
and
ROCK ISLAND HYDROELECTRIC PROJECT
FERC Project No. 943

December 31, 2014

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

Terms and Abbreviations

7Q10	highest seven consecutive day average flow with a 10-year recurrence frequency
cfs	cubic feet per second
CCT	Confederated Tribes of the Colville Reservation
Chelan PUD	Public Utility District No. 1 of Chelan County
Ecology	Washington State Department of Ecology
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FPC	Fish Passage Center
FMS	fixed monitoring station
GAP	Gas Abatement Plan
GBT	gas bubble trauma
HCP	Anadromous Fish Agreement and Habitat Conservation Plan
HCP CC	Habitat Conservation Plan Coordinating Committee
JBS	juvenile bypass system
kcfs	thousand cubic feet per second
msl	mean sea level
NMFS	National Marine Fisheries Service
project	Hydroelectric project
QA/QC	quality assurance/quality control
QAPP	Quality Assurance Project Plan
RM	river mile
RRFF	Rocky Reach Fish Forum
standards	Washington State water quality standards
TDG	total dissolved gas
USACE	United States Army Corps of Engineers
USFWS	United States Fish and Wildlife Service
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WQC	water quality certification
WQMP	Water Quality Management Plan

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

EXECUTIVE SUMMARY

This Gas Abatement Annual Report is being submitted to the Washington State Department of Ecology (Ecology) as required by the 401 Water Quality Certification (WQC) (Ecology, 2006) for the Rocky Reach Hydroelectric project (project) and the Gas Abatement Plans (GAPs) for Rocky Reach and Rock Island hydroelectric projects that were approved by Ecology in April 2014.

Chelan County Public Utility District No.1 (Chelan PUD) prepared this annual report to summarize the results of the operations and activities detailed in the 2014 GAPs. The intent of these actions was to meet TDG requirements and ensure that fish passage requirements are met as set forth in the Rocky Reach and Rock Island Habitat Conservation Plans (HCPs). Specific operations and activities contained in the 2014 GAPs and reported in this document include:

- Spill configurations and fish spill plan
- Fisheries Management (HCP)
- Biological Monitoring
- Involvement in water quality forums
- Physical Monitoring
- Gas abatement methods (operational and structural)

Mean daily flow discharges during the 2014 fish spill season were higher than the 2004-2013 average (about 108.4% of the last 10-year average at Rocky Reach, and 109.5% at Rock Island) over the entire fish spill season, April 1 – August 31.

In 2014, spill events at Rocky Reach were involuntary April 1 – May 23 (spring voluntary through the JBS), and both voluntary and involuntary May 24 – August 24 (end of summer fish spill). Of the total volume of water spilled April 1 – May 23, 100% was involuntary (river flows were used for the JBS). Between May 24 and the end of summer fish spill on August 24, 72% of the total volume spilled was voluntary, while 28% was involuntary spill for forebay elevation control and higher than average river flows.

Spill events at Rock Island were involuntary April 1 – April 16, voluntary and involuntary April 17 – August 24 (end of spring and summer fish spill periods), and involuntary after August 24 (end of summer fish spill). Of the total volume of water spilled April 1 – April 16, 100% was involuntary. Of the total volume of water spilled April 17 – May 23, 55% was voluntary and 45% was involuntary. Between May 24 and August 24, 92% of the total volume of water spilled was voluntary, while 8% was involuntary spill for forebay control and higher than average river flows.

To meet HCP summer spill requirements for subyearling (summer) Chinook, Chelan PUD spilled 9% of the daily average river flow continuously at Rocky Reach for a duration of time covering 95% of the subyearling Chinook outmigration in 2014. The summer spill program for subyearling Chinook began on May 24 and ended on August 24. The total percent daily river flow spilled during the summer spill season was approximately 13%, composed of 9% spill for fish, and 4% involuntary spill for forebay control and higher than average river flows.

Spill through modified spill gates remains the primary juvenile fish passage measure used to maintain HCP survival standards at the Rock Island project. Spring fish spill of 10% began on April 17 and continued through May 23. Total spill during the spring fish spill season amounted to 18.3%of the total river flow volume; however, only 10% was required for fish, while the remaining 8.3% was involuntary spill for forebay control and due to higher than average river flows.

Rock Island fish spill increased to 20% upon onset of the summer outmigration of subyearling Chinook. Summer spill began on May 24 and continued through August 24. Total spill volume during the summer fish spill season amounted to 22% of river flow; of which all but 2% was for fish.

Over the course of both spring and summer spill periods, data analysis showed that river flow entering the Rocky Reach forebay from upstream exceeded Washington State water quality criteria of 115% on 32 individual days. TDG exceeded the modified Washington State water quality TDG criteria (120%) on 11 days in the Rocky Reach tailrace, and 7 days in Rock Island tailrace (120%) during this monitoring period. Numeric criteria were exceeded on 29 days in the Wanapum forebay (115%). These exceedences did not necessarily result in noncompliance as many of the forebay exceedances occurred when the upstream dam's forebay exceeded 115%. After eliminating exceedances that occurred when the upstream forebay exceeded 115%, project compliance with the water quality TDG criteria was as follows:

Compliance Monitoring Location	Percent Compliant
Rocky Reach Tailrace (125%)	98.0%
Rocky Reach Tailrace (120%)	93.5%
Rock Island Forebay (115%)	95.0%
Rock Island Tailrace (125%)	100%
Rock Island Tailrace (120%)	95.2%
Wanapum Forebay (115%)	84.3%

SECTION 1: INTRODUCTION

1.1 Project Description

The Columbia River watershed lies east of the Cascade Mountains and west of the Rocky Mountains and encompasses parts of British Columbia, Idaho, Montana, Nevada, Oregon and Washington. The Rocky Reach and Rock Island projects are located in mid-Washington State on the mainstem of the Columbia River and are owned and operated by Chelan PUD. This area is 59 river miles (RM), from the forebay of Rocky Reach dam (RM 474) downstream to the forebay of Wanapum dam (RM 415) owned and operated by the Public Utility District No. 1 of Grant County (Figure 1-1). This included the 21 RM between Rocky Reach and Rock Island dams and 38 RM between Rock Island and Wanapum dams.

1.1.1 Rocky Reach Project Description

The powerhouse at Rocky Reach project contains a total of 11 vertical axis-generating units and is situated on the west half of the river parallel to the flow. The spillway houses 12 individually opening 170-ton tainter gates arranged on the east half of the river, perpendicular to the river flow (Figure 1-2). The normal maximum reservoir water surface elevation is 707 feet with an average tailrace water surface elevation of 618 feet, providing a gross head of 89 feet. The depth of the stilling basin immediately downstream of the project is approximately 40 feet at average tailwater elevation.

In 2003, Chelan PUD began operation of the Juvenile Fish Bypass (JBS), which continues to be the primary juvenile non-turbine passage route at Rocky Reach project. Testing completed during the first year of operation enabled Chelan PUD to determine the juvenile guidance efficiency of the JBS and estimate the level of spill necessary to meet the Rocky Reach Habitat Conservation Plan (HCP) survival standards. Voluntary spill is used at Rocky Reach to supplement the effectiveness of the JBS, when needed, to maintain survival goals of the RRHCP (See Section 2.3 for details). Due to the effectiveness of the JBS, Chelan PUD has reduced spill levels used to supplement the JBS for juvenile salmonid passage since 2007. During the migration season for yearling Chinook and steelhead (generally mid-April to early-June), Chelan PUD has not needed to use spill to supplement the JBS. During the subyearling Chinook migration (generally mid-June to mid/late August), a spill level of 9 percent of daily flow (reduced from 15 percent) has been provided.

The 2014 fish spill program at the Rocky Reach project was managed to maximize fish passage, maintain HCP requirements, minimize voluntary spill, and still stay within the terms of Ecology's TDG fish spill water quality criteria. Voluntary spill levels were managed in real time as detailed in the TDG Operational Plan (Appendix A) for the Rocky Reach project. When project operators observed instantaneous TDG levels that exceeded the criteria as set forth in the Plan, spill was reduced to the extent possible and TDG levels monitored.

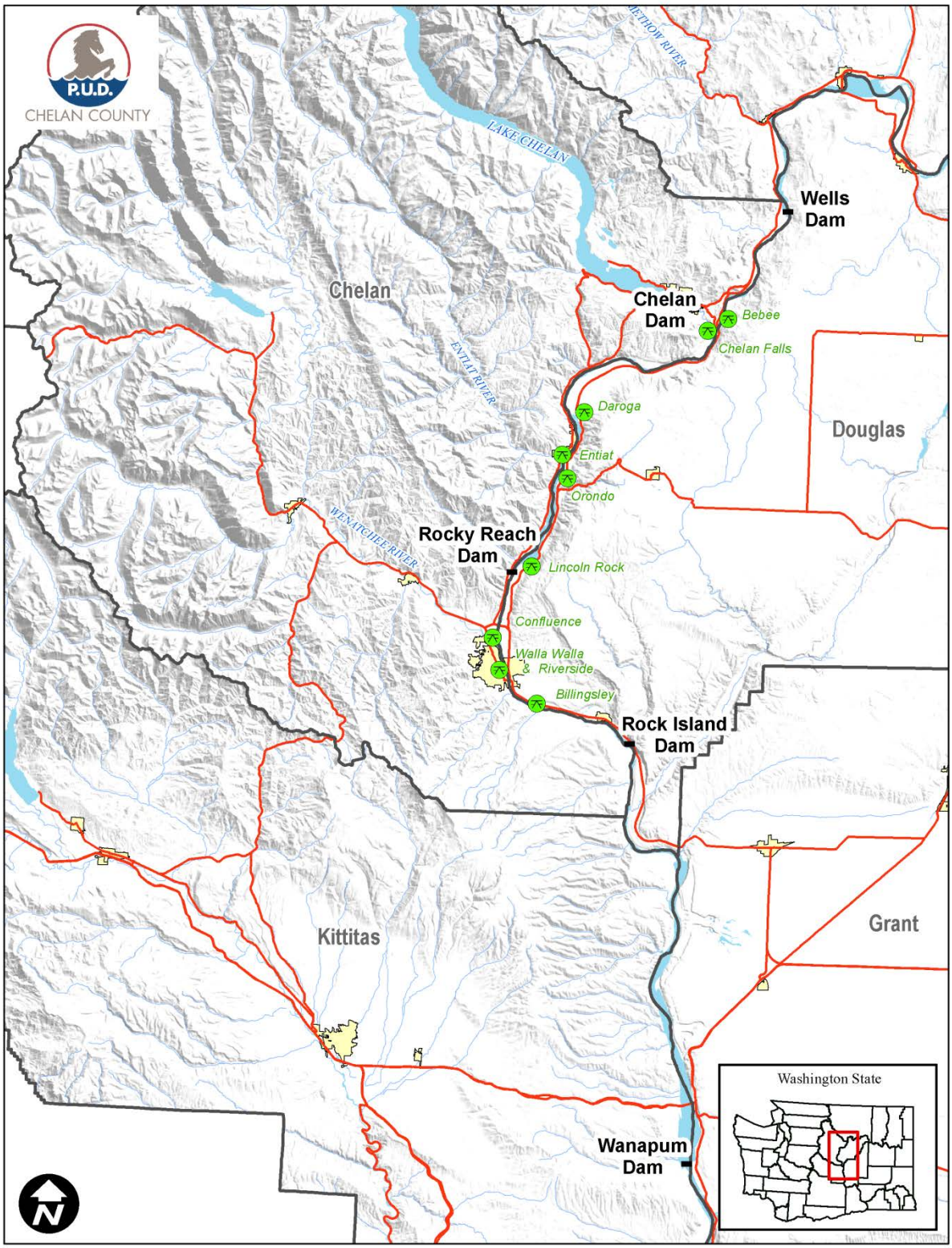

Figure 1-1: Project Location

1.1.2 Rock Island Project Description

Rock Island project consists of two separate powerhouses connected by a spillway. There are a total of 18 generating units; ten vertical axis Kaplan and Nagler turbines in the first powerhouse on the east shore, and eight horizontal axis bulb turbine generators in the second powerhouse on the west side of the river. The spillway is 1,184 feet long and houses 31 spillgates divided by a center adult fishway. The east spillway contains a total of 14 gates, arranged perpendicularly to the river flow. The west spillway has 17 gates, situated at a slight angle to the river flow. Spillways are either 33 or 55 feet deep and have two or three spillgates stacked in the gate slot. Lifting one or more of these crest gates regulates spill volume. Each gate is 30 feet wide by 11 or 22 feet high. A total of nine gates have been modified or constructed to provide relatively low volume (1,850 or 2,500 cubic feet per second (cfs)) surface spill for fish bypass. The normal maximum reservoir elevation of Rock Island project is 613 feet with a tailrace elevation of 572 feet and a head of 41 feet Tailrace bathymetry below Rock Island is complex and ranges in elevation from approximately 580 feet below bays 21-23 to approximately 520 feet below Bay 1. Chelan PUD has installed the following three TDG abatement structures at Rock Island:

1. Notched gates
   Gates 1, 16, 18, 24, 26, and 29 are equipped with notched gates that reduce TDG by reducing the volume of water necessary for voluntary fish passage.

2. Spill deflector in Bay 16
   The main objective for the design of this deflector was to reduce the uptake of TDG per total volume of water and to safely pass downstream migrants during the fish spill season. Studies conducted on the deflector have shown that it can reduce TDG by 2.7%.

3. Three Over/under gates
   The over/under gates are unique in that they pass water using the gate well as a water column. Water is released through a 6” gap at the bottom of the downstream gate slot below the surface of the tail water thus reducing total dissolved gas (TDG) when compared to water plunging through open spill gates. The gates are typically installed when fish spill begins in April and kept in place for the duration of the season. When in use the gates are installed at the south end of the spillway in slots 30, 31, and 32.

   Testing of the first gate installed indicated a reduction in TDG uptake by 8.5 - 13.5% points, as compared to the existing notched gate method, and by additional 2.5 - 4.5 % points as compared to deflectors. Fish passage survival tests performed indicated that overall survival was between 99% and 100%. Because the original Over/Under gate was successful at reducing TDG and maintaining fish survival, Chelan PUD made the decision to have three (gates 30, 31, 32) in place prior to the initiation of the 2007 spill season and have been utilized since.

1.2 Fixed Monitoring Stations

In accordance with Section 5.4.1(a) of the 401 WQC (Ecology, 2006), Chelan PUD currently operates and maintains four fixed-site water quality monitoring stations (FMS) that record barometric pressure (millimeters of mercury (mm/hg)), TDG (mm/hg), and temperature (°C). Barometric pressure, TDG, and temperature are recorded at 15 minute intervals, throughout the

year in accordance with Chelan PUD's Ecology and FERC approved Quality Assurance Project Plan (QAPP) (Chelan PUD, 2010b).

TDG data enables plant operators to adjust spill volumes to maintain gas levels to reduce the likelihood of exceeding the TDG criteria. These 15-minute intervals are averaged into hourly readings for use in compiling daily and 12-hour averages. All hourly data are forwarded to Chelan PUD headquarters building and then onto the US Army Corps of Engineers Reservoir Control Center and posted at their site on the World Wide Web:http://www.nwd-wc.usace.army.mil/report/tdg.htm.

Each Chelan PUD FMS is equipped with a Hydrolab® Minisonde® 5 enclosed in a submerged conduit (Figures 1-2 through 1-4). Multi-probes are connected to an automated system that allows Chelan PUD to monitor barometric pressure, TDG, and water temperature on an hourly basis. Probes are maintained and calibrated as outlined in the QAPP. For a complete description of the FMS see the QAPP (Chelan PUD, 2010b).

Forebay FMS were located at fixed sites on the upstream face of Rocky Reach and Rock Island projects (Figures 1-2 and 1-3, respectively). Dissolved gas probes were lowered down a conduit and secured to the upstream face of each project and submerged to a depth of approximately 15 feet

Tailrace monitoring stations are located downstream of both projects. The Rocky Reach monitoring station is located approximately one third of a mile downstream of the spillway on the juvenile fish bypass outfall (Figure 1-2), as required by the 401 WQC (Ecology, 2006). This location was chosen because it was the most feasible location near the end of the aerated zone, which is the compliance point for the Mid-Columbia TDG TMDL.

No bridge or other permanent in-water structure is available downriver of Rock Island project on which to attach a monitoring station. For this reason, Chelan PUD developed a monitoring station about 1.5 miles downriver from the project on the eastern shoreline (Figure 1-4). This FMS has two means of deploying the dissolved gas probe, a carriage system with a cable attached to an ecology block in the river, and a fixed pipe attached to the scaffold that holds the carriage system. The fixed pipe was installed August 25, 2014 due to the extreme fluctuations of the Rock Island tailrace as a result of the Wanapum drawdown emergency.

Figure 1-2: Rocky Reach project, forebay, tailrace and fixed monitoring stations.

Figure 1-3: Rock Island project, forebay, tailrace and fixed monitoring stations.

Figure 1-4: Rock Island project, tailrace fixed monitoring station.

1.3 *Wanapum Emergency Drawdown*

On February 27, 2014, Chelan PUD was notified by Grant PUD, that they intended to lower Wanapum Reservoir because of damage to a spillway monolith at Wanapum dam, thereby creating reduced tailwater elevations at Rock Island dam. With the drawdown, Rock Island experienced periods where they could not generate due to head differential constraints and was forced to spill river flows. This spill often increased TDG levels. Chelan PUD, while operating under the constraints of the emergency conditions of the Wanapum drawdown, to the best of their ability implemented temporary operating conditions to provide fish passage and reduce TDG.

1.4 *Regulatory Framework*

The Washington State water quality numeric criteria for TDG (Washington Administrative Code (WAC) 173-201A-200(1)(f)) address standards for the surface waters of Washington State. Under the water quality standards (standards), TDG shall not exceed 110 percent at any point of measurement in any state water body. However, the TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with an Ecology approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring plans. Ecology may approve, on a per application basis, a temporary exemption to the TDG standard (110 percent) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). On the Columbia and Snake rivers, there are three separate standards with regard to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125 percent as measured in any one hour period. Further, TDG shall not exceed 120 percent in the tailrace of a dam and shall not exceed 115 percent in the forebay of the next dam downstream as measured as an average of the 12 highest consecutive (12C-High) hourly readings in any one day (24-hour period).

It is important to note that the TDG water quality standards identified above are intended to help protect aquatic life designated uses within the project. This includes Ecology's allowance of higher TDG levels during the fish-spill season which allow dams to spill water to help achieve juvenile salmonid passage performance standards.

Specific passage performance (or survival) standards for the project are outlined in the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Rocky Reach project. Specifically, the HCP provides that Chelan PUD achieve and maintain Combined Adult and Juvenile project Survival. The Combined Adult Juvenile Survival standard is 91%. The ninety-one percent standard is composed of 98% adult project passage survival and 93% juvenile project survival.

Chelan PUD is currently in Phase III - Standards Achieved (the 91% adult-juvenile combined survival standard is achieved) for the spring migrating HCP species; sockeye, spring Chinook, and steelhead. Summer/fall subyearling Chinook are in Phase III - Additional Juvenile Studies, due to limitations on acoustic tag technology for subyearlings and the unpredictable migration behavior of these Upper Columbia River subyearling Chinook. Coho, the last HCP species, is in Phase III - Standards Achieved - Interim.

Achieving the survival standards as described above and in addition to meeting TDG numeric criteria as outlined in WAC 173-201A-200(1)(f), are an integral part of meeting the water quality standards (e.g. protection of designated uses) as described in the project's 401 WQC (Ecology, 2006).

1.4.1 7Q10 Flows

Section 5.4.1(b) of the 401 WQC (Ecology, 2006) and Washington Administrative Code (WAC) 173-201A-200(f)(i) states that the water quality criteria for TDG shall not apply when the stream flow exceeds the seven-day, ten-year frequency flood stage (7Q10). The 7Q10 flood flow for the Rocky Reach project was calculated to be 252 kcfs, and 264 kcfs at the Rock Island project.

1.4.2 Daily Total Dissolved Gas Compliance Value Calculation Method

Prior to 2008, the method used to calculate the daily TDG compliance value during the fish-spill season was based on the average of the twelve highest hourly values in a twenty-four hour period, starting at 0100 hours and ending at 2359 hours. This method was based on Ecology's 1997 water quality standards. In Ecology's 2006 revision to the water quality standards (which were not approved by the Environmental Protection Agency (EPA), and thus not effective, until 2008) the method for calculating the TDG compliance value was changed. The new method provided that the TDG compliance value be determined by calculating the average of the twelve highest consecutive hourly values in a twenty-four hour period. Prior to the 2008 fish-spill season, there was discussion amongst the Columbia and Snake River dam operators on how to properly implement the "rolling average" method, especially as it related to what time the rolling average began. There were concerns related to the addition of the previous day's last eleven hours to the compliance value calculation on the next day.

On May 21, 2008, Ecology requested, via memo, that all Columbia and Snake River dam operators use a rolling average method for calculating the twelve highest consecutive hourly TDG readings in a twenty-four hour period, beginning at 0100 hours, based on Ecology's 2006 revised water quality standards (Ecology, 2008). Using a rolling average method that begins at 0100 hours results in counting the hours 1400 through 2359 twice: in the average calculations on the day they occur and on the next reporting day. As a result, a TDG water quality standard exceedance may be indicated on two separate days based on the same group of hours.

The 2009-2013 Gas Abatement Annual Reports provide examples of how the "rolling average" method could create a TDG exceedance on two separate days based on the same grouping of hourly values during the applicable fish-spill season, using Chelan PUD's method for accounting for those occurrences. Appendix C provides a table detailing all "double –counting" instances and data losses for the 2014 fish-spill season.

SECTION 2: OPERATIONS

2.1 Description of 2014 Fish-Spill Season Flow Characteristics

Mean daily discharge during the 2014 fish spill season was compared to the 10-year average of mean daily discharge from 2004-2013, as measured at the Rocky Reach Hydroelectric project (Figure 2-1) and the Rock Island Hydroelectric project (Figure 2-2). Mean daily flow discharges during the 2014 fish spill season were higher than the 2004-2013 average (about 108.4% of average at Rocky Reach, and 109.5% of average at Rock Island) over the entire fish spill season.

Flow for all months during the spill season, with the exception of June, was higher than the monthly 10-year average at both projects. The maximum hourly flows observed at Rocky Reach and Rock Island during the spill season were 216 kcfs and 221 kcfs, respectively, on June 1. Of the 153 days during the spill season (April 1 – August 31), there were no instances where the daily average flows exceeded the 7Q10 value at Rocky Reach or Rock Island.

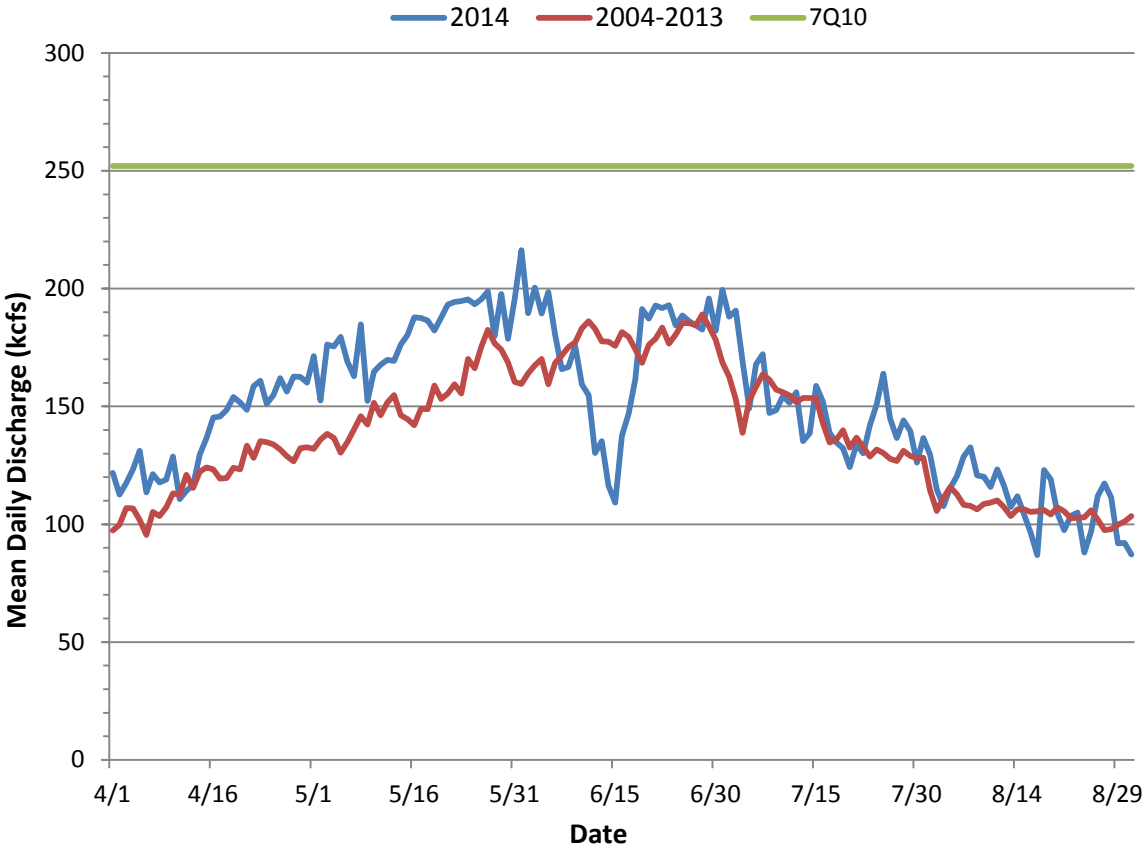

Figure 2-1: Comparison of 2014 vs. previous 10-year average (2004-2013) of mean daily discharge at Rocky Reach.

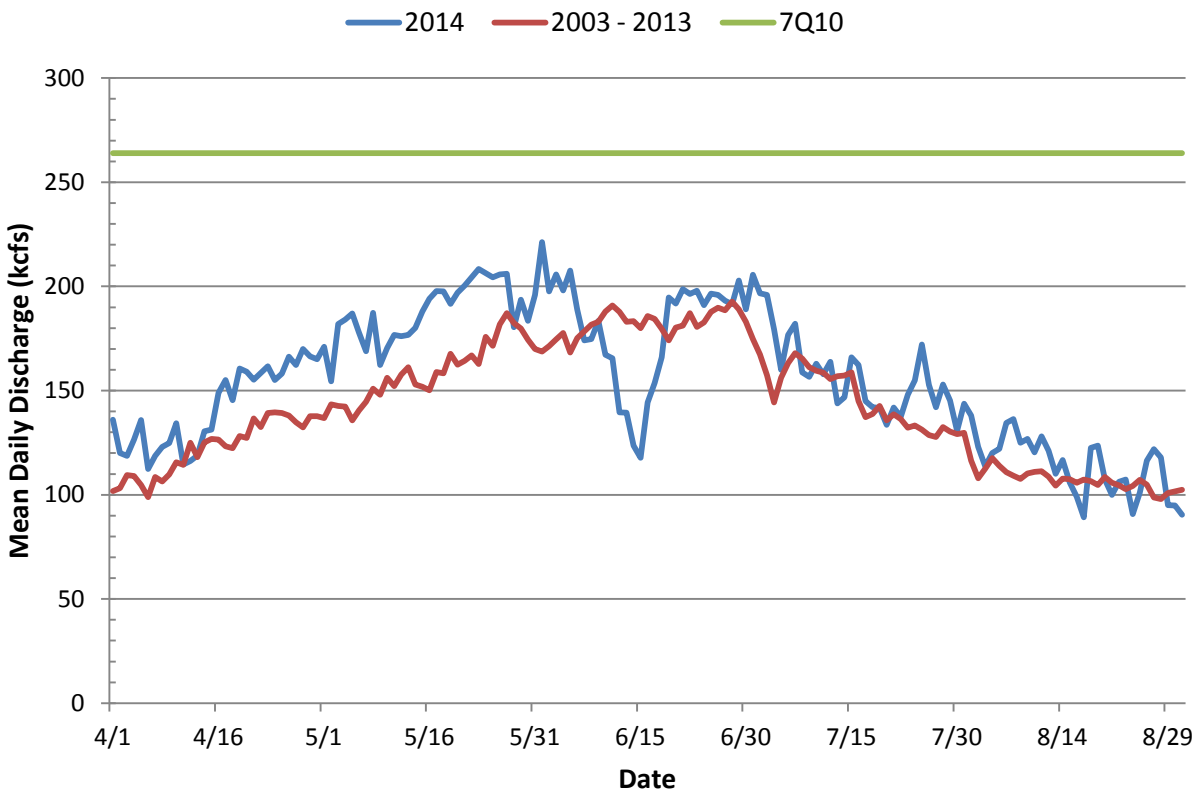

Figure 2-2: Comparison of 2014 vs. previous 10-year average (2004-2013) of mean daily discharge at Rock Island.

2.2 Spill Configurations

The spill levels for fish passage set forth below are subject to real-time modification to meet TDG standards, in accordance with a real-time operational plan. The project operators are instructed to monitor the tailrace TDG level and reduce spill if TDG levels specified in the TDG Operational Plan (Appendix A) are exceeded. The operators at the Rock Island Hydroelectric project are also instructed to inform the operators at Rocky Reach when the Rock Island forebay TDG level exceeds 115%. Since implementation of this plan, the number of TDG exceedances in the tailrace of each project has been reduced.

2.2.1 Rocky Reach

The standard spill configuration used at Rocky Reach uses gates 2-8 with a minimum discharge per spill bay of about 4 kcfs. The standard spill configuration was designed to create a crown-shaped pattern of turbulent flow below the spillway with decreasing velocities leading toward the fishway entrances.

This spill pattern provides favorable guidance conditions for adult migrant salmon and steelhead. The same pattern is used for juvenile fish passage spill. During spill operations, whether for juvenile fish passage, TDG management, or for other purposes, the gates are operated via a computer-automated system that follows the spill pattern. Gates 9-12 are used only in high flow conditions when gates 2-8 cannot pass enough water. The standard spill pattern was deviated from only when needed during high flow and spill events.

2.2.2 Rock Island

Spill at Rock Island is provided to cover 95% of the juvenile outmigration for steelhead, and sockeye, yearling and subyearling Chinook salmon.

Optimizing spill efficiency and reducing total dissolved gas (TDG) levels has been a key task for Chelan PUD at Rock Island dam. To accomplish this task, nine of the 32 spill gates have been modified with notches in the upper section of the spill gate, "notched" spill gates, in order to provide efficient spill that also provides high juvenile salmonid passage survival. In addition to notched spill gates, three spill gates have been modified to pass spill over one gate and under another, termed over/under spill gates, effectively passing juvenile fish and reducing TDG levels in the tailrace associated with spill.

2.2.2.1 Existing spill plan

The existing juvenile fish spill plan at Rock Island dam is implemented for normal forebay and tailwater elevations. The usual operating range for the Rock Island forebay is 612 ft to 613 feet mean sea level (msl) and tailwater is 570 feet. Spill for juvenile fish passage is provided from April through August each year.

Notched spill gates are numbers 1, 16, 18, 24, 26, and 29. These gates can be opened or closed sequentially by the operators using electric hoists. Over/under spill gates are numbers 30, 31 and 32. Once these gates are installed prior to the start of spring fish spill season, they remain open until the close of the season. A mechanic crew installs the gates (in their operating configuration) with a crane, so the operators themselves cannot sequentially open or close the over/under gates as they do with the notched gates. As a result, Rock Island can spill no less than 7.2 kilo cubic feet per second (kcfs; total discharge for the three gates) from the date of installation (late March/early April) to the date of removal (late August).

The spill gate pattern is a combination of over/under and notched spill gates. Starting with gate 32 nearest to Powerhouse 2, the preferred operating sequence is 32, 31, 30, 1, 26, 16, 18, 24, and 29.

The preferred opening sequence for the full spill gates is 17, 19, 20, 22, 25, 7, and 8. Gate 19 is currently undergoing repairs and would be temporarily moved to the end of the sequence.

2.2.2.2 Interim Spill Plan (Wanapum emergency drawdown)

With the conditions created by the drawdown of Wanapum's forebay, it was necessary for Chelan PUD to modify their spill plan for Rock Island. The interim fish spill plan was provided for modified forebay and tailwater elevations from April through August.

The spill gate pattern uses a combination of over/under and notched spill gates. The same operating sequence that is used during normal forebay/tailwater elevations was used during the interim operations period. However, notched gate 16 was not utilized under the abnormal conditions due to the exposure of the spill deflector with the low tailwater elevations as to avoid injury to juvenile fish coming into contact with the exposed deflector.

At the current forebay elevation of 609 feet, the spill volume of the notched gates was reduced. With a normal forebay elevation of 613 feet, the notched gates pass water at their full capacity. At

609 feet, the notched gates are at approximately 76% of their total capacity. The crests for the over/under gates are at 604 ft. These gates maintain their normal spill volume at the forebay elevation of 609 ft. With a lower total flow available through notched gates (i.e. 19 kcfs), additional spill flow was routed through the full width gates sooner to reach the target fish spill flow (when it exceeds 15 kcfs).

Based on observations of spill at the project on March 10, which occurred with a day average tailwater elevation of 556.19 feet, it was recommended discontinuing use of full width gates 17 and 20 for the purpose of safe juvenile fish passage. The spill pad for full gate 19 was exposed due to the low tailwater elevations created by the Wanapum reservoir drawdown in 2014. Given these observations and conditions, these three full width gates were not utilized but held in reserve for emergency headwater flood control if necessary to maintain safety of the project. Full width gates 22, 25, 7, and 8 remained in the sequence.

The new full gate sequence was 5, 12, 26, 22, 25, 7, and 8, or any combination of available automatic and manual full width gates that are conducive to safe, efficient dam operations and safe, good fish passage. If the dam needed to keep all automatic gates available for emergency responses, then the full gate sequence was limited to manually operated gates only.

2.3 Fish-Spill Programs

Specific passage performance (survival) standards for the project are outlined in the HCP for the Rocky Reach and Rock Island projects. Chelan PUD is required to meet and maintain survival standards for fish migrating through the projects. Reservoir and dam passage survival are the key components of project survival. Chelan PUD uses a different combination of tools to facilitate fish passage at the Rocky Reach and Rock Island projects because of each project's unique features. At Rocky Reach, passage is facilitated by the JBS, which is the primary method to increase juvenile dam passage survival. The efficiency of the JBS has allowed for a reduction in the amount and duration of spill at certain phases of the migration season, thereby reducing TDG levels.

At Rock Island, spill is still the preferred method of moving fish past the project, with most of the spill being passed through the modified "notched" spill gates. Results of survival studies conducted at Rock Island have enabled Chelan PUD to reduce voluntary (fish) spill in the spring from 20% of the daily average flow to 10% of the daily average flow. Summer spill at Rock Island remains at 20% of the daily average flow.

The fish spill programs implemented by Chelan PUD at each project are dictated by the timing and duration of each species of outmigration. In the spring (generally mid-April through early- June), yearling Chinook, steelhead and sockeye migrate past the projects, while subyearling Chinook migrate during the summer (generally mid-June to mid/late-August).

During the spring of 2014, Chelan PUD operated the JBS exclusively with no voluntary spill for yearling Chinook, steelhead, and sockeye passage. Spring fish-spill began at Rock Island dam on April 17, 2014 at 0001 hours and ended May 23, 2014 at 2400 hours (see Appendix D).

Summer fish-spill began on May 24, 2014 at 0001 hours immediately following the end of the spring fish-spill season and continued through 2400 hours on August 24, 2014 at both at Rocky Reach and Rock Island project (see Appendix D).

Tables 2-1 and 2-2 provide a summary of the 2014 fish-spill for Rocky Reach and Rock Island dams respectively.

Table 2-1: Summary of fish-spill operations at Rocky Reach.

Rocky Reach			
Date	**Juvenile Fish Passage Program**	**Quantity**	**Notes**
1–Apr	Juvenile Fish Bypass (JBS) Operation Began		Operated exclusively with no fish spill during the spring (April 1 – May 24)[1]
24–May	Summer Spill Initiated	9% of daily average river flow	Spill for sub-yearling (summer) Chinook
24–Aug	End of summer spill		
15–Sept	Juvenile Fish Bypass Operation Ended[2]		

Notes:
[1] The efficiency of the JBS has allowed for a reduction in the amount and duration of spill at certain phases of the migration season, thereby reducing TDG levels.
[2] In 2014, as directed by the HCP, Chelan PUD extended bypass operations outside of the normal operating period of 1 April to 31 August to assess achievement of bypass operations for 95% of the subyearling Chinook outmigration. The Rocky Reach JBS operated from 1 April through 15 September.

Table 2-2: Summary of fish-spill operations at Rock Island.

Rock Island		
Date	**Juvenile Fish Passage Program**	**Quantity**
1-Apr	Fish Bypass Operation Began[1]	
17-Apr	Spring Spill Initiated	10% daily average river flow
23-May	End of Spring Spill	
24-May	Start of Summer Spill	20% of daily average river flow
19-Aug	End of Summer Spill	
15-Sept	Fish Bypass Operation Ended[2]	

Notes:
[1] The efficiency of the JBS has allowed for a reduction in the amount and duration of spill at certain phases of the migration season, thereby reducing TDG levels.
[2] In 2014, as directed by the HCP, Chelan PUD extended bypass operations outside of the normal operating period of 1 April to 31 August to assess achievement of bypass operations for 95% of the subyearling Chinook outmigration. The Rock Island juvenile bypass facility at powerhouse 2 operated from 1 April through 15 September.

2.4 Fish Spill Quantities and Duration

Spill scenarios can be divided into two categories: fish spill (voluntary) and non-fish spill (involuntary). Non-fish/involuntary spill scenarios include, but are not limited to:

- Flow in excess of hydraulic capacity
- Plant load rejection spill
- Immediate replacement spill
- Maintenance spill
- Error in communication spill
- Spill past unloaded units

Definitions of these spills can be found in the 2014 Rocky Reach and Rock Island Gas Abatement Plans. Tables 2-3 and 2-4 show the monthly averages for river flow, total spill, fish spill, and other spill for the Rocky Reach and Rock Island projects.

Table 2-3: Average monthly total flow, spill, and percent of total flow spilled for different purposes at Rocky Reach, April 1 - August 31, 2013.

Month	Average Flow kcfs	Average Spill kcfs	Spill Purpose					
			Fish Spill			Other		
			Spill kcfs	% of flow	% of Total Spill	Spill kcfs	% of flow	% of Total Spill
April	**137.9**	**1.5**	**0.0**	**0.0**	**0.0**	**1.5**	**1.1**	**100.0**
May	**180.7**	**22.3**	**4.6**	**2.5**	**20.6**	**17.7**	**4**	**79.4**
June	**173.1**	**23.3**	**16.0**	**9.2**	**68.7**	**7.3**	**2.1**	**31.3**
July	**150.3**	**17.1**	**13.5**	**9.0**	**78.9**	**3.6**	**11**	**21.1**
August	**3401.9**	**263.1**	**246.5**	**7.2**	**93.7**	**16.6**	**0**	**6.3**

Table 2-4: Average monthly total flow, spill, and percent of total flow spilled for different purposes at Rock Island, April 1 - August 31, 2013.

Month	Average Flow kcfs	Average Spill kcfs	Spill Purpose					
			Fish Spill			Other		
			Spill kcfs	% of flow	% of Total Spill	Spill kcfs	% of flow	% of Total Spill
April	142.8	28.4	7.4	5.2	26.1	21.0	14.7	73.9
May	187.5	41.0	24.5	13.1	59.8	16.5	8.8	40.2
June	180.3	38.7	36.9	20.5	95.3	1.7	0.9	4.4
July	157.7	30.7	30.6	19.4	99.7	0.1	0.1	0.3
August	3511.1	592.8	549.1	15.6	92.6	43.7	1.2	7.4

2.4.1 Voluntary and Involuntary Spill

In 2014, spill events at Rocky Reach were involuntary April 1 – May 23 (voluntary in spring through the JBS), and both voluntary and involuntary May 24 – August 24 (end of summer fish spill period). Of the total volume of water spilled April 1 – May 23, 100% was involuntary (river flows were used for the JBS). Between May 24 and the end of summer fish spill on August 24, 72% of the total volume spilled was voluntary, while 28% was involuntary (forced) spill due to higher than average river flows.

Spill events at Rock Island were involuntary April 1 – April 16, voluntary and involuntary April 17 – August 24 (end of spring and summer fish spill periods), and involuntary after August 24 (end of summer fish spill). Of the total volume of water spilled April 1 – April 16, 100% was involuntary. Of the total volume of water spilled April 17 – May 23 (spring), 55% was voluntary and 45% was involuntary. Between May 24 and August 24 (summer), 92% of the total volume of water spilled was voluntary, while 8% was involuntary spill due to higher than average river flows.

To achieve HCP passage requirements for subyearling (summer) Chinook, Chelan PUD maintained a target spill level of 9% of daily average river flow at Rocky Reach for a duration covering 95% of the subyearling outmigration during the summer of 2014. The summer spill program for subyearling passage began on May 24 and ended on August 24. Percent daily river flow spilled during the summer period was 13%; 9% was the minimum spill requirement for fish, with the remaining 4% being involuntary (forced) spill due to higher than average river flows.

Spill through modified gates remains the primary fish passage measure used to meet Rock Island HCP survival standards at Rock Island project. Spring fish spill of 10% began on April 17 and was continued through May 24. Total spill during the spring fish spill season amounted to 18.3%; however, only 10% was spill for fish, while the remaining 8.3% was involuntary spill due to higher than average river flows.

Rock Island fish spill increased to 20% upon onset of the summer outmigration of subyearling Chinook. Summer spill began on May 24 and continued through August 24. Total spill during the summer fish spill season amounted to 22%; of which all but 2% was for fish.

SECTION 3: RESULTS

The following sections describe the 2014 fish-spill season flow characteristics compared to the previous ten-year average, the 2014 fish-spill season programs, the 2014 biological TDG monitoring results, and the TDG data for the fish-spill and non-fish spill seasons.

3.1 Biological Evaluations

The following sections provide a summary of fisheries management and results from gas bubble trauma (GBT) monitoring. Note that no survival studies were conducted in 2014.

3.1.1 Fisheries Management

No survival studies on spring migrants (yearling Chinook, steelhead, sockeye) were conducted in 2014 as HCP survival standards have been achieved for all three species at both projects. Additionally, due to tag technology limitations and uncertainties regarding their life history (outmigration behavior) no survival studies for summer/fall subyearling Chinook have been conducted since 2004.

3.1.2 Gas Bubble Trauma Monitoring

Gas bubble trauma (GBT) monitoring is not conducted on an annual basis at Rocky Reach dam. However, Section 5.4(1)(c) of the Rocky Reach 401 WQC (Ecology, 2006) requires Chelan PUD to develop and implement a plan to study GBT below Rocky Reach dam. Chelan PUD is currently working with Ecology to determine if this study is necessary in light of work on resident GBT that has been accomplished by others since the writing of the 401 WQC.

As part of the Fish Passage Center's (FPC) Smolt Monitoring Program at Rock Island, yearling and subyearling Chinook salmon and steelhead were examined for evidence of GBT between April 21 and August 26, 2014. Each week a random sample of up to 100 fish composed of both yearling Chinook salmon and steelhead were examined in April and May two days per week. In June, when the subyearling Chinook salmon collection exceeded the yearling Chinook collection, the sample was changed to subyearling Chinook. A random sample of up to 100 subyearling was examined two days per week. Examinations followed FPC standardized procedure as outlined by FPC (2009).

During 2014 monitoring, 3,277 smolts were examined for GBT. Of these, 19, or 0.58%, showed signs of GBT. Table 3-1 provides the summary results of 2012 GBT monitoring.

Table 3-1: Number salmon and steelhead smolts examined for external signs of GBT of at Rock Island dam in 2014.

Species	Number of fish examined	Fish with GBT		Location with GBT			
				Fins		Eyes	
		N	%	N	%	N	%
Chinook yearling	672	11	1.64%	11	1.64%	0	0.00%
Steelhead	726	3	0.41%	3	0.41%	0	0.00%
Chinook Sub-yearling	1879	5	0.27%	5	0.27%	0	0.00%
Total	3277	19	0.58%	19	0.58%	0	0.00%

3.2 Data Evaluation and Analyses

Data collection, quality assurance/quality controls (QA/QC), and analyses of TDG values were conducted in accordance with the QAPP for the FMS (Chelan PUD, 2010b). For this report, hourly TDG data recorded during 2014 were analyzed for apparent exceedances of current water quality standards.

All of the TDG sensors used during 2014 were calibrated and maintained in accordance with the methods and schedules described in the QAPP (Chelan PUD, 2010b). TDG sensors that did not pass calibration tests were sent back to the manufacture for repair and/or replaced prior to deployment. Calibration reports are included in Appendix B of this report. Suspect or clearly erroneous TDG values were omitted from the analysis, but are included, as well as explanation for omission, in Appendix C of this report.

The data QA/QC issues during the 2014 were related to either TDG probe communication or the probe being out of the water due to low flows and/or the Wanapum drawdown. Overall data loss for Chelan PUD operated FMS during the 2014 fish-spill season was 931 hourly readings (6.3% of the total available data collection hours). While the overall data loss for all of the FMS during the fish-spill season was 6.3%, the Rock Island FMS data loss was higher. Chelan PUD attributed these data losses to aging probes, and therefore replaced all four FMS TDG probes on June 18, 2014.

Overall data loss for the FMS during the 2014 non-fish spill season was 347 hourly readings (2.2% of the total available data collection hours).

Tables 3-2 and 3-3 display the number of TDG values that were omitted from the dataset due to QA/QC issues during the 2014 fish-spill season and non-fish spill season respectively.

Table 3-2: Overview of total dissolved gas data set during 2014 fish-spill season April 1 – August 31.

Location	Available data hours	Number of omitted/lost hourly readings[1]	Percent data loss (%)
RRFB	3,672	4	0.1
RRTR	3,672	3	0.08
RIFB	3,672	380	10.3
RITR	3,672	544	14.8
Total	14,688	931	6.3

Note: RRFB = Rocky Reach Forebay, RRTR = Rocky Reach Tailrace, RIFB = Rock Island Forebay, RITR = Rock Island Tailrace.
[1]See Appendix C for dates, times, and circumstances relating to omitted/lost data.

Table 3-3: Overview of total dissolved gas data set during 2014 non-fish spill season January 1- March 31 and September 1 – December 15.

Location	Available data hours	Number of omitted/lost hourly readings[1]	Percent data loss (%)
RRFB	4,704	17	0.4
RRTR	4,704	17	0.4
RIFB	4,704	56	1.2
RITR	4,704	257	5.5
Total	18,816	347	1.8

Notes: RRFB = Rocky Reach Forebay, RRTR = Rocky Reach Tailrace, RIFB = Rock Island Forebay, RITR = Rock Island Tailrace.
[1]See Appendix C for dates, times, and circumstances relating to omitted/lost data.

3.3 Total Dissolved Gas Monitoring During the Fish Spill Season

The following sections discuss the results of TDG monitoring from the 2014 fish-spill season within the project and at the Wanapum dam forbay compliance point location. Specific sections include TDG averages with associated figures for each FMS compliance point location, a breakdown of all TDG exceedances and possible explanations for those exceedances, and the connection between elevated TDG levels and involuntary spill during the 2014 fish-spill season. Summary values for all hourly average TDG measurements taken from each FMS during the 2014 fish-spill season are presented in Table 3-4 below.

Table 3-4: Summary of hourly averages total dissolved gas measurements from each FMS during the 2014 fish-spill season.

Location	Data Interval	Mean	Standard Deviation	Minimum	Maximum
RRFB	04/01 – 08/31	112.6	3.9	103.7	125.3
RRTR	04/01 – 08/31	115.2	4.8	104.4	126.3
RIFB	04/01 – 08/31	112.1	3.9	103.6	122.0
RITR	04/01 – 08/31	114.6	3.3	104.8	124.5
WANF	04/01 – 08/31	112.9	3.4	103.2	122.2

Notes: All values represent % saturation
RRFB = Rocky Reach forebay, RRTR = Rocky Reach tailrace, RIFB = Rock Island forebay, RRTR = Rocky Reach tailrace, WANF = Wanapum forebay

3.3.1 Total Dissolved Gas Averages

Total Dissolved Gas Averages during the Fish-Spill Season in Figures 3-1 through 3-9 display the average of the 12-highest consecutive hourly readings, spill vs. TDG, and a regression analysis of relationship between the total volume spilled to percent change in TDG. The average of the 12-highest consecutive hourly TDG readings from each day during the spring and summer fish-spill seasons from each FMS is presented in Appendix D of this report.

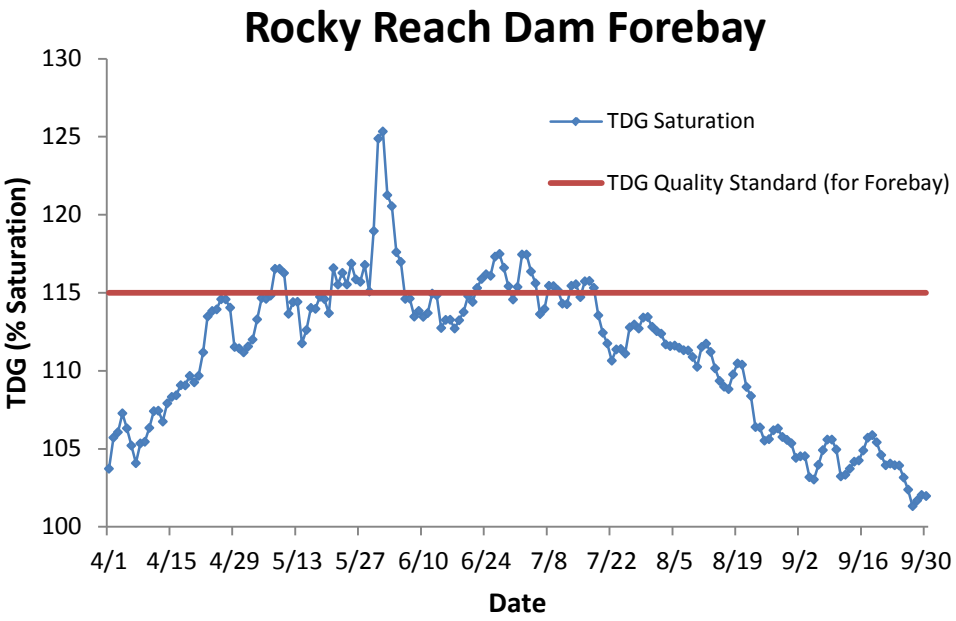

Figure 3-1: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rocky Reach dam forebay FMS.

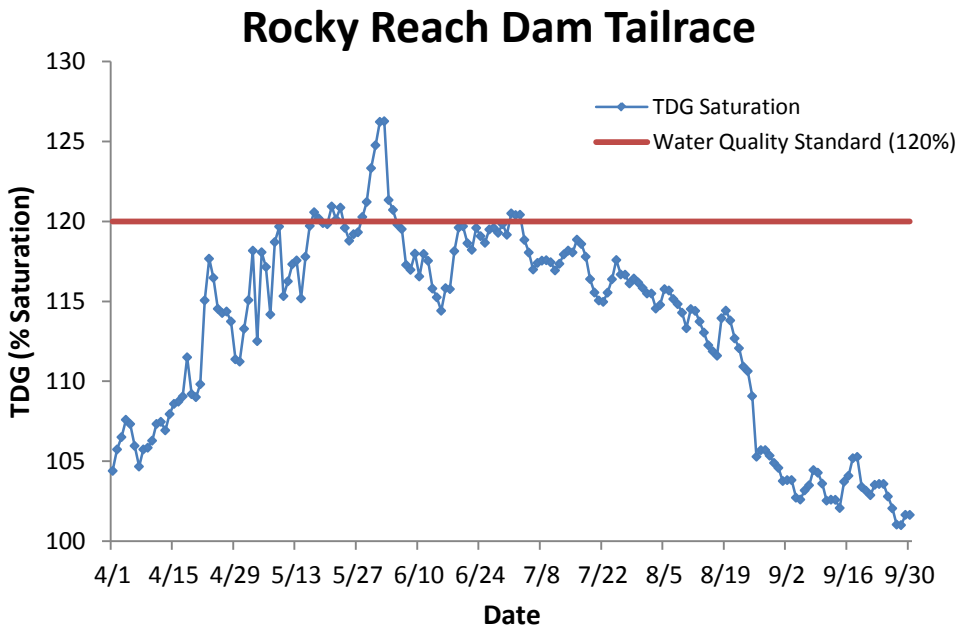

Figure 3-2: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rocky Reach dam tailrace FMS.

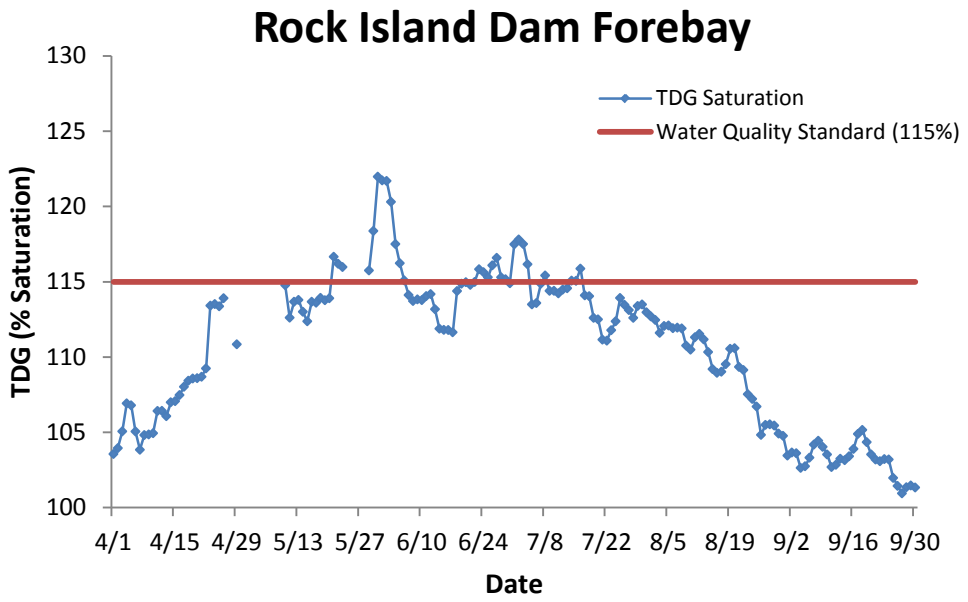

Figure 3-3: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rock Island dam forebay FMS.

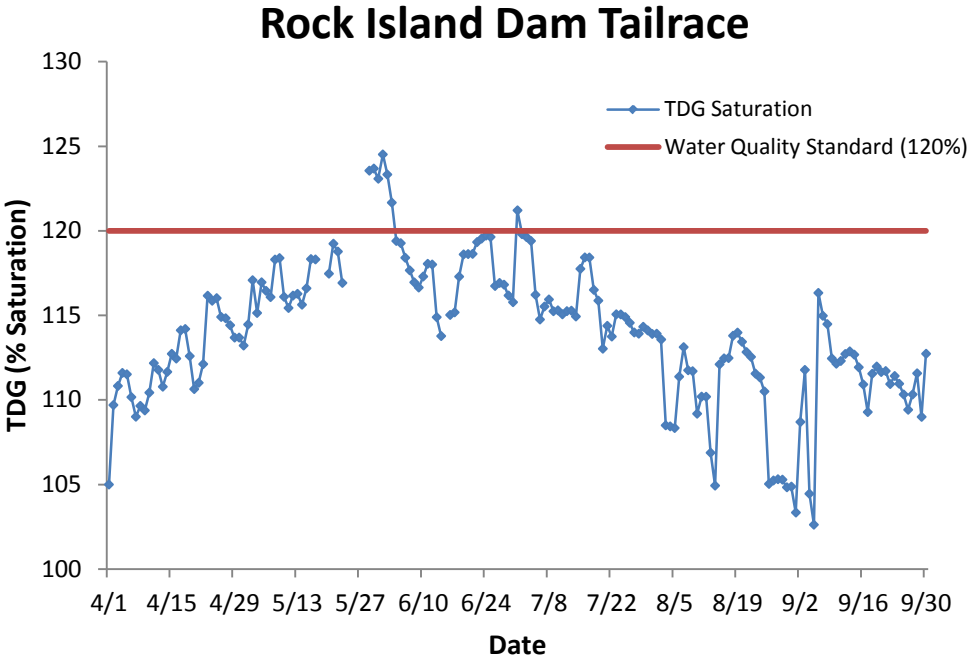

Figure 3-4: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rock Island dam tailrace FMS.

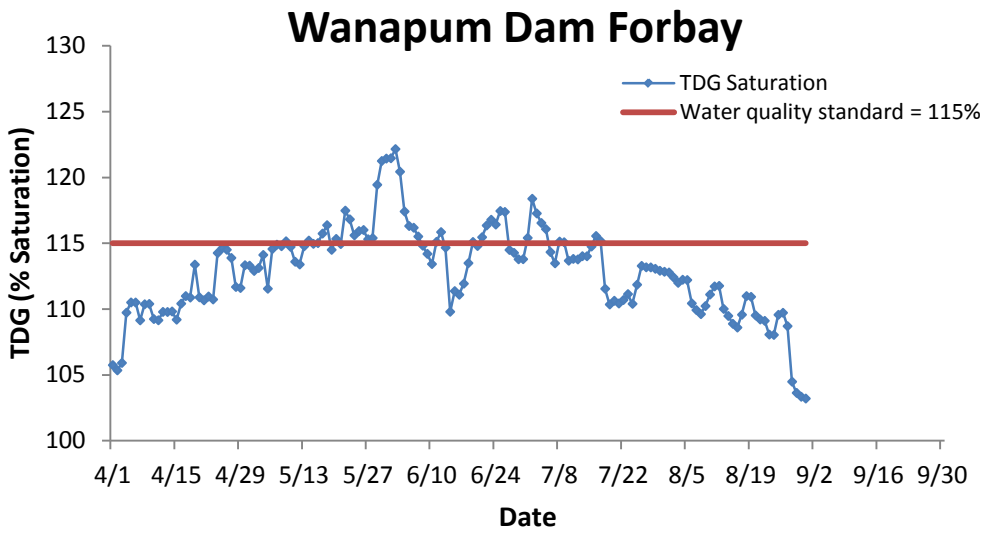

Figure 3-5: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Wanapum dam forebay FMS.

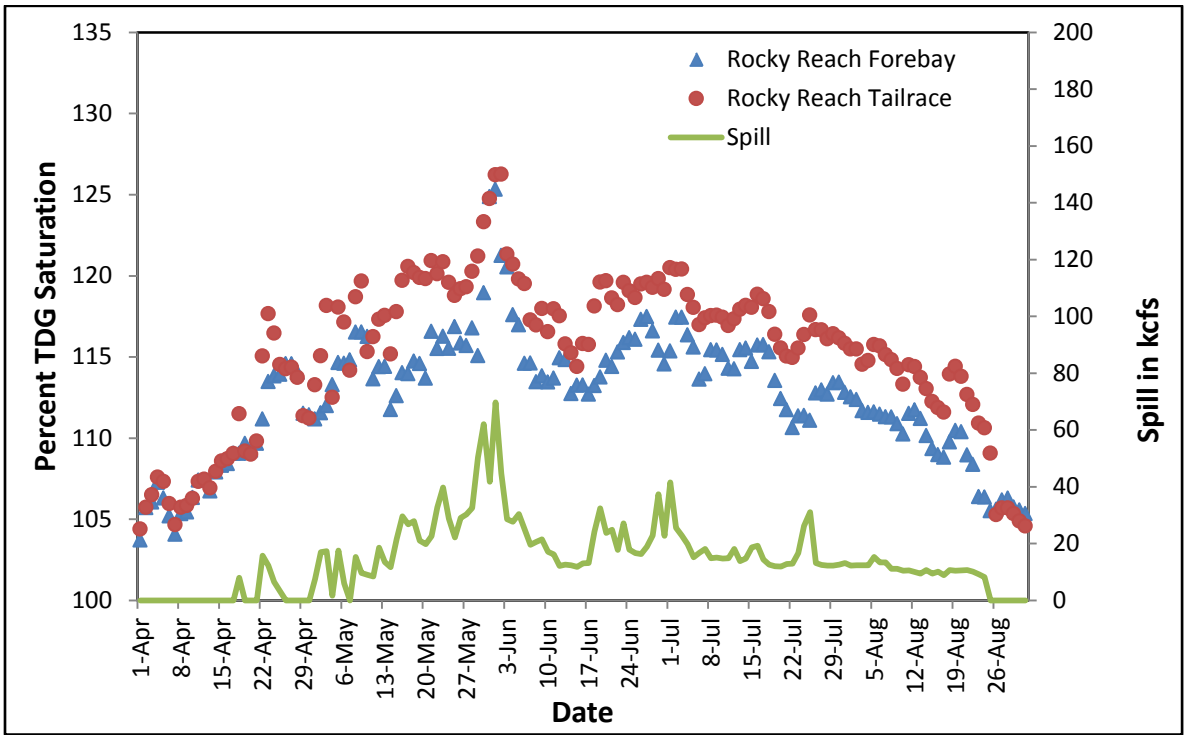

Figure 3-6: Spill and total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rocky Reach forebay and tailrace FMS.

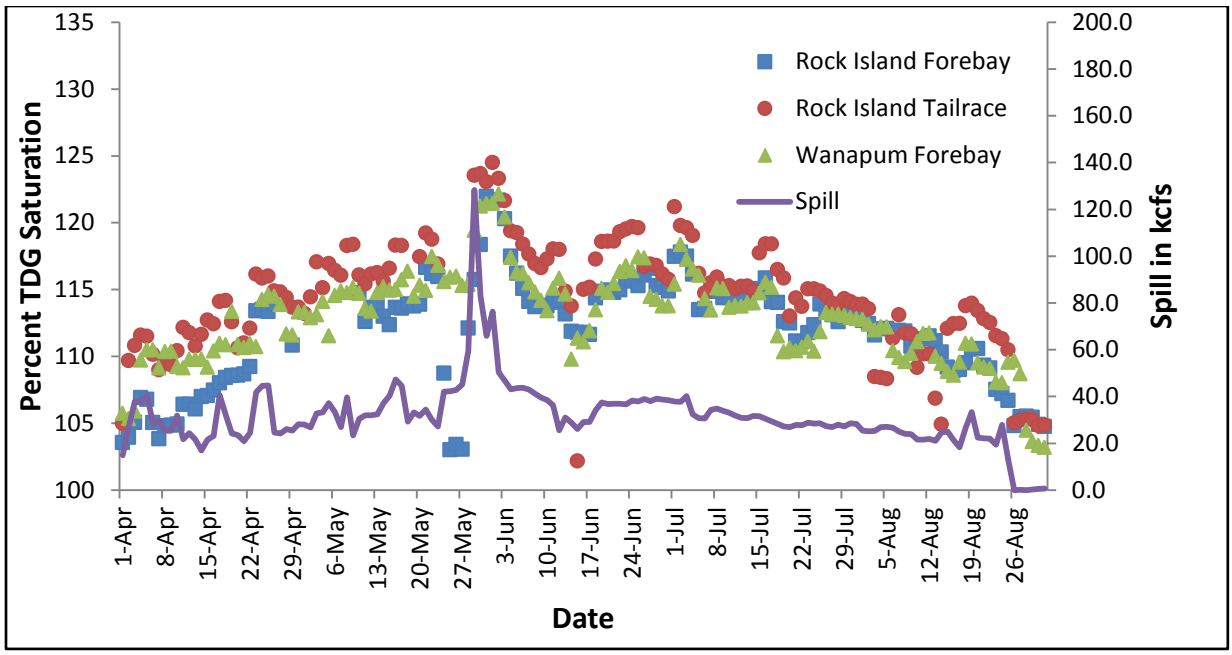

Figure 3-7: Spill and total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rocky Island forebay and tailrace and the Wanapum forebay FMS.

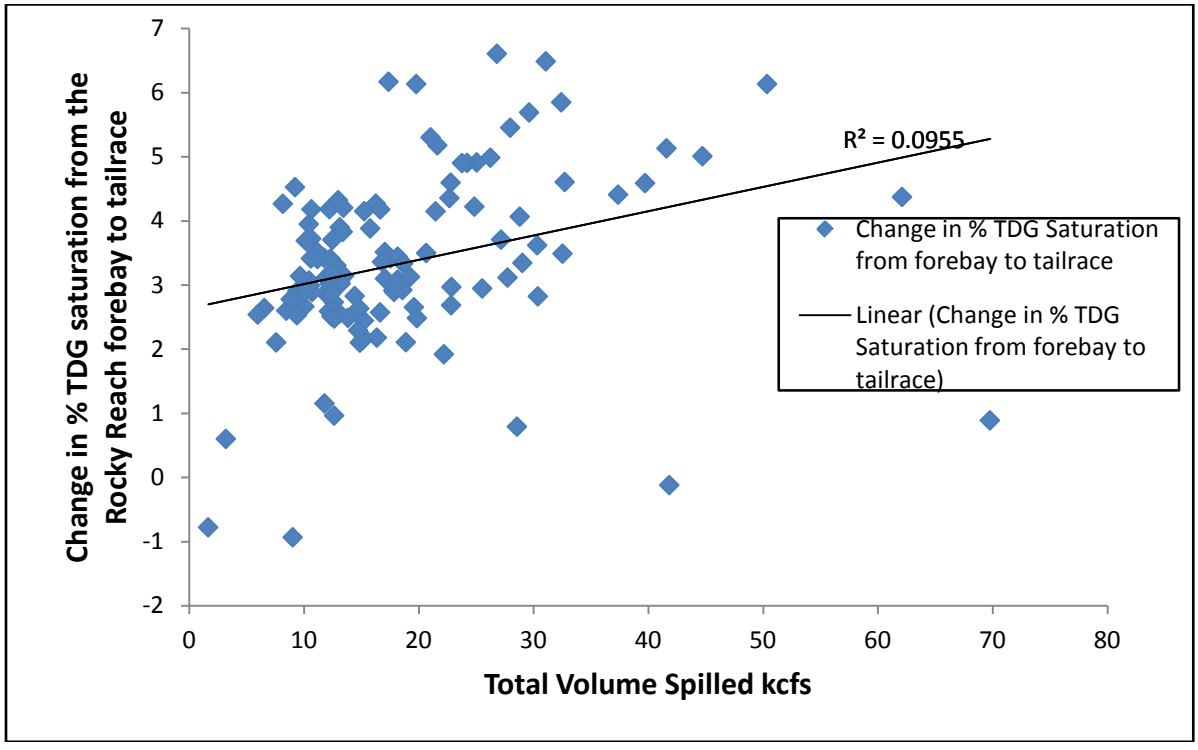

Figure 3-8: Regression analysis showing a moderate relationship between the total volume spilled to percent change in TDG at Rocky Reach forebay to tailrace.

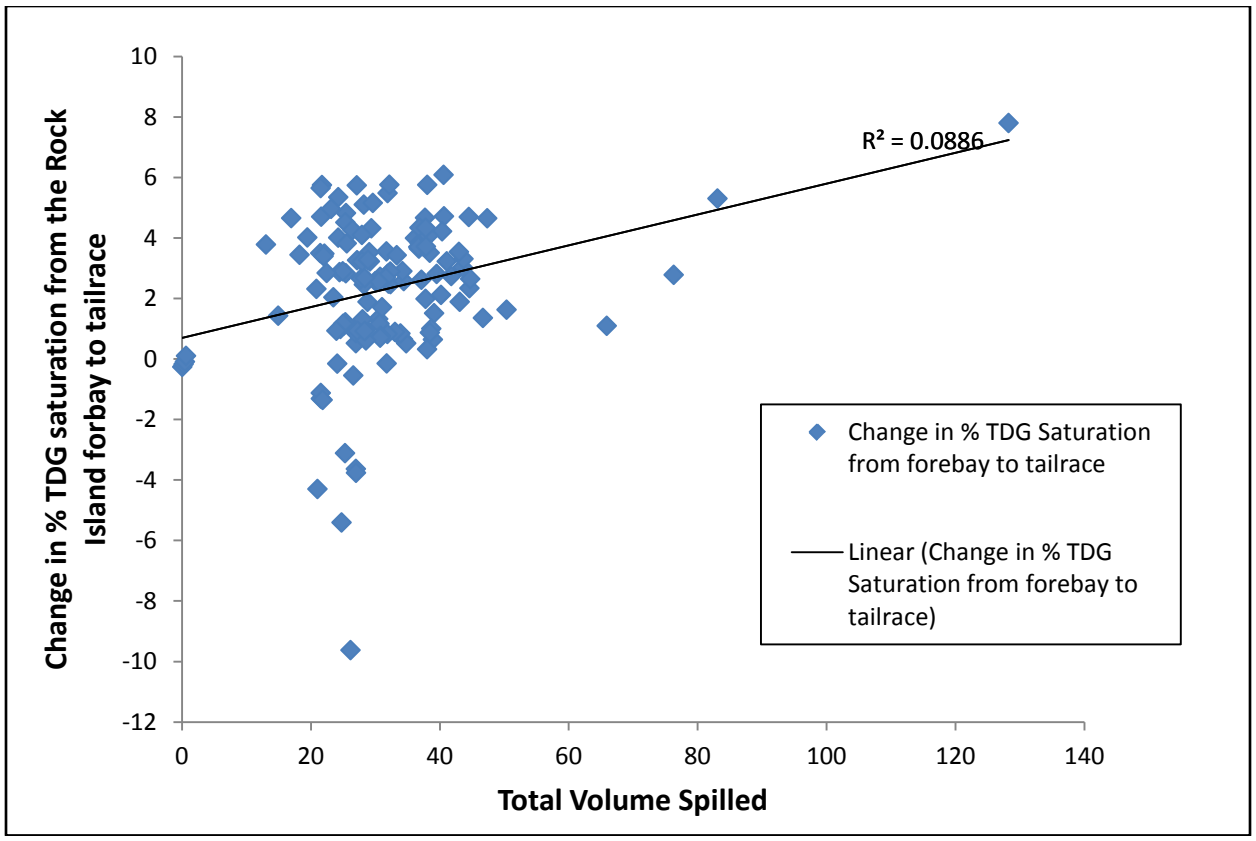

Figure 3-9: Regression analysis showing a moderate relationship between the total volume spilled to percent change in TDG at Rock Island forebay to tailrace.

3.3.2 Total Dissolved Gas Exceedances

Table 3-5 displays the total number of times TDG levels exceeded the current water quality standards during the 2014 fish-spill season as measured at each of Chelan PUD's FMS along with Wanapum dam forebay compliance point (owned/operated by Grant PUD). The total number of exceedances also reflects the omission of exceedances caused by the previous day's hourly values, if those same hourly values also created a 12-hour average TDG value above standards for the previous day. Appendix C within this report presents all omitted data with explanations of why they were omitted.

Table 3-5: Total number of times TDG levels exceeded the current water quality standards during the fish-spill season.

Location[1]	Number of 115 % /120% exceedances					Number of 125% exceedances		
	Spring Spill	Summer Spill	Total	Total # of days[2]	% below standard	Total hours	Total # of hours[2]	% below standard
RRTR	3	7	10	153	92.8	18	3,668	99.5
RIFB	2	5	7	141	95.0	0	3,669	100
RITR	0	7	7	146	95.2	0	3,292	100
WANF	4	20	24	153	84.3	0	3,128	100
total	9	39	48	593	91.9	18	13,757	99.9

[1]RRFB = Rocky Reach forebay, RRTR = Rocky Reach tailrace, RIFB = Rock Island forebay, RRTR = Rocky Reach tailrace, WANF = Wanapum forebay

[2] Based on total number of available days/hrs minus days/hrs omitted due to TDG membrane failures or other QA/QC issues.

Exceedances of TDG numeric criteria were minimal during the 2014 fish-spill season, with a total of 48 exceedances of the 115/120 % standard (91.9% below the standard). There were 18 exceedances of the 1-hour 125 % standard in the Rocky Reach tailrace only. The Wanapum forebay FMS accounted for the majority of exceedances (28 of 53 or 53%). More specifics on exceedances for the 2014 fish-spill season can be found in Appendix D of this report.

3.3.3 Discussion of Exceedances

Data analysis showed that water coming into the Rocky Reach forebay from upstream exceeded Washington State water quality criteria on 32 days (20.9% of the total number of days observed). TDG exceeded the modified Washington State TDG fish spill water quality criteria on 11 days (7.2% of the total number of days observed) in the Rocky Reach tailrace, 20 days (5.0% of the total number of days observed) in the Rock Island forebay, and 7 days (4.8% of the total numbers of days observed) in the Rock Island tailrace during this monitoring period. Numeric criteria were exceeded on 29 days (15.0% of the total number of days observed) in the Wanapum forebay (Grant County PUD). These exceedances of the water quality criteria did not necessarily result in noncompliance, as many of the forebay exceedances occurred when the upstream dam's forebay exceeded 115%. Spill upstream of each project resulted in occasionally high incoming TDG levels in the Rocky Reach and Rock Island forebays. Figure 3-6 shows the Rocky Reach forbay and the Rock Island forebay total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season.

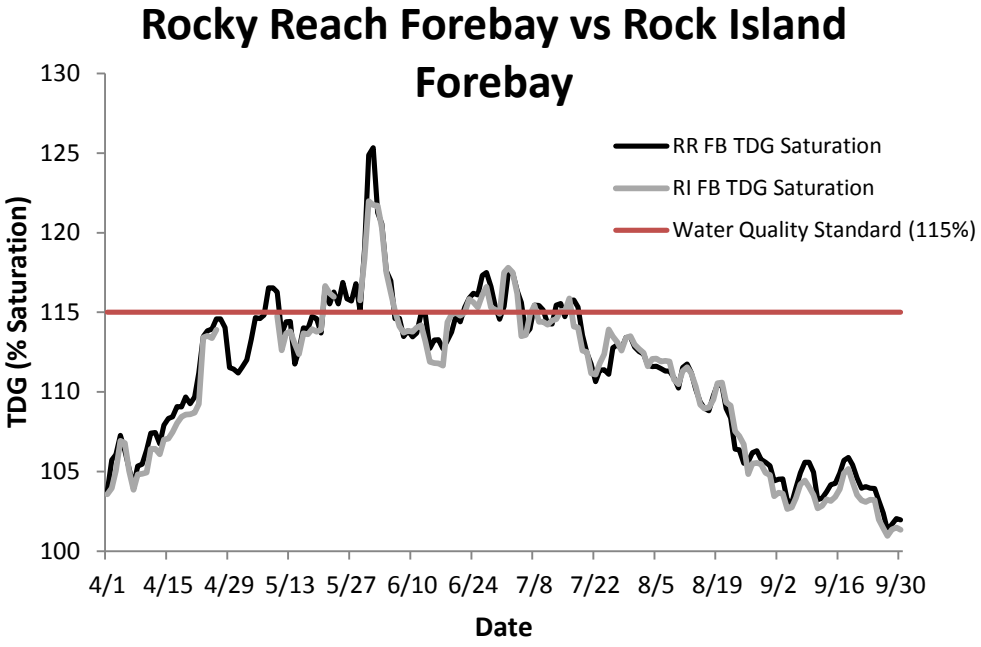

Figure 3-10: Total dissolved gas measurements (average of the 12-highest consecutive hourly TDG readings in a 24-hour period) from the 2014 fish-spill season recorded at the Rocky Reach and Rock Island dam forebays FMS.

When the upstream dam's forebay TDG exceeded 115%, TDG values for that 24-hour period were omitted from the data set used for determination of compliance.

Noncompliance at each FMS is further detailed in the following sections and summarized in Table 3-7 above.

3.3.3.3 Rocky Reach

Tailrace 125% Standard

Total hours of TDG data collected during the 2014 fish spill season in the Rocky Reach tailrace equaled 3,672. No hours were eliminated from the data set due to flows in exceedance of the 7Q10 flow. Hourly tailrace TDG levels exceeded 125% for 18 hours. Compliance with this standard was 99.9%.

Tailrace 120% Standard

TDG data was collected on 153 days during the 2014 fish-spill season in the Rocky Reach tailrace. None of the data was omitted from the data set due to flows exceeding the 7Q10 flows. The tailrace 12C-High TDG exceeded 120% on 11 days. Compliance with this standard was 92.8%.

Downstream (Rock Island) Forebay 115% Standard

TDG data was collected on 141 days during the 2013 fish spill season in the Rock Island forebay. However, of those 141 days 12 were omitted from the data set used for determination of compliance due to upstream forebay 12C-High TDG exceeding 115%. The Rock Island forebay 12C-High TDG exceeded 115% on 7 days. Compliance with this standard was 95.0%.

3.3.3.4 Rock Island

Tailrace 125% Standard

Total hours of TDG data collected during the 2014 fish spill season in the Rock Island tailrace equaled 3,669. No hours were omitted from the data set due to flows in exceedance of the 7Q10 flow. Hourly tailrace TDG levels exceeded 125% for 0 hours. Compliance with this standard was 100%.

Tailrace 120% Standard

TDG data was collected on 146 days during the 2014 fish spill season in the Rock Island tailrace. No days were omitted from the data set used for determination of compliance due to flows exceeding the 7Q10 flows. The tailrace 12C-High TDG exceeded 120% on 7 days. Compliance with this standard was 95.2%.

Downstream (Wanapum) Forebay 115% Standard

TDG data was collected on 153 days during the 2014 fish spill season in the Wanapum forebay. However, of those 153 days 5 were omitted from the data set used for determination of compliance due upstream forebay 12C-High TDG exceeding 115%. The Wanapum forebay 12C-High TDG exceeded 115% on 24 days. Compliance with this standard was 84.3%.

3.4 Total Dissolved Gas Monitoring During the Non-Fish Spill Season

As per WAC 173-201A-200(1)(f), total dissolved gas shall not exceed 110 percent of saturation at any point of sample collection (during the non-fish spill season).

Table 3-6 displays the total number of hours TDG levels exceeded the 110% water quality standard during the 2014 non fish-spill season as measured at each of Chelan PUD's FMS along with Wanapum dam forebay compliance point (owned/operated by Grant PUD). Appendix C within this report presents all omitted data with explanations of why they were omitted. Between January 1 and March 31, 2014, the 110% criterion was exceeded 7 hours out of a total of 2,157 hours in the Rocky Reach tailrace and no hours at the remaining sites. Overall compliance January 1 – March 31 was 99.7%.

Between September 1 and December 15, 2014, the 110% criterion was exceeded on 673 hours in the Rock Island tailrace and no hours at any of the other FMS. The Rock Island tailrace FMS experienced a loss of 45 hours of TDG data primarily because the probe was out of the water due to lower river flows and the emergency drawdown of Wanapum dam.

The majority of the hourly exceedances of the 110% criteria can be attributed to the emergency drawdown conditions of Wanapum dam. Rock Island experienced periods where they could not generate due to headwater constraints and was forced to spill a portion of daily river flows. This spill often increased TDG levels. To the extent possible, Chelan PUD's Rock Island Dam implemented temporary operating conditions to provide fish passage and irrigation while trying to reduce TDG.

Table 3-6: Total number of hours TDG levels exceeded the 110% water quality standards during the non fish-spill season.

Location[1]	Hours of 110 % exceedances			
	Date interval	Total hours exceeded	Total # of hours[2]	% below standard
RRTR	01/01 – 03/31	7	2,157	99.7
	09/1 – 12/15	0	2,530	100
Total		**7**	**4,687**	**99.9**
RIFB	01/01 – 03/31	0	2,107	100
	09/1 – 12/15	0	2,541	100
Total		**0**	**4,648**	**100**
RITR	01/01 – 03/31	0	1,948	100
	09/1 – 12/15	673	2,499	73.5
Total		**673**	**4,447**	**84.9**
WANF	01/01 – 03/31	0	2,160	100
	09/1 – 12/15	0	2,544	100
Total		**0**	**4,704**	**100**
Grand Total		**680**	**18,486**	**96.3**

[1]RRFB = Rocky Reach forebay, RRTR = Rocky Reach tailrace, RIFB = Rock Island forebay, RRTR = Rocky Reach tailrace, WANF = Wanapum forebay

[2] Based on total number of available hrs minus hrs omitted due to TDG membrane failures or other QA/QC issues.

SECTION 4: TOTAL DISSOLVED GAS ABATEMENT MEASURES AND CORRECTIVE ACTIONS IMPLEMENTED IN 2014

4.1 Operational

Due to the success of the juvenile bypass system at Rocky Reach and survival studies at both projects, Chelan PUD has been able to reduce spill at both Rocky Reach and Rock Island for at least a portion of the spill season, thereby reducing the generation of total dissolved gas in the project waters.

4.1.1 Rocky Reach

Results of survival studies have allowed Chelan PUD to greatly reduce spill for fish at Rocky Reach dam. The JBS is now operated exclusively, with no spill, for spring migrants; and spill during the summer migration has been reduced to 9% of the daily average flow. Spill levels from 2003 to 2014 are shown in Table 4-1 below. The JBS continues to be the most efficient non-turbine route for fish passage at the Rocky Reach project and does not require spill for its operation.

Table 4-1: Rocky Reach Fish Spill Comparison 2003-2014.

Year	Season	Spill Start Date	Spill Stop Date	Days of Spill	Spill Level[1]
2003	Spring	20-Apr	29-May	40	15% / 25%
2003	Summer	30-May	14-Aug	77	15%
Total				**117**	
2004	Spring	6-May	6-Jun	31.5	0% / 24%
2004	Summer	7-Jun	21-Aug	70	9%
Total				**101.5**	
2005	Spring	10-May	9-Jun	18.5	0% / 24% [2]
2005	Summer	10-Jun	15-Aug	67	9%
Total				**85.5**	
2006	Spring	2-May	1-Jun	19.0	0% / 24% [2]
2006	Summer	2-Jun	11-Aug	71	9%
Total				**90**	
2007	Spring	No Spill	No Spill	0	0%
2007	Summer	2-Jun	21-Aug	81	9%
Total				**81**	
2008	Spring	No Spill	No-Spill	0	0%
2008	Summer	8-Jun	31-Aug	81	9%
Total				**81**	
2009	Spring	No Spill	No Spill	0	0%
2009	Summer	10-Jun	31-Aug	78	9%
Total				**78**	

Year	Season	Spill Start Date	Spill Stop Date	Days of Spill	Spill Level[1]
2010	Spring	No Spill	No Spill	0	0%
2010	Summer	9-Jun	20-Aug	73	9%
Total				**73**	
2011	Spring	No Spill	No Spill	0	0%
2011	Summer	4-Jun	12-Aug	70	9%
Total				**70**	
2012	Spring	No Spill	No Spill	0	0%
2012	Summer	26-May	9-Aug	76	9%
Total				**76**	
2013	Spring	No Spill	No Spill	0	0%
2013	Summer	5-June	21-August	78	9%
Total				**78**	
2014	Spring	No Spill	No Spill	0	
2014	Summer	24-May	24 - August	93	9%
Total				**93**	

Notes: [1] Percentage of daily average river flow at Rocky Reach. Two values in this column represents two different spill levels during the season (first value is the spill level for yearling Chinook and steelhead, second value is the spill level for sockeye.)
[2]24 days of on/off spill test for sockeye

The goal of the Rocky Reach GAP (Appendix E) approved by Ecology in April of 2014 is to implement measures to achieve compliance with the Washington state water quality standards for TDG in the Columbia River at the project while continuing to meet the fish passage and survival standards set forth in the Rocky Reach HCP and Fish Management Plan. To meet this goal, Chelan PUD implemented the following operational measures:

1. Minimized voluntary spill – no fish (voluntary) spill planned for the spring migration, 9% of the daily average river flow for the summer migration.
2. During fish passage, managed voluntary spill levels in real time in an effort to continue meeting TDG numeric criteria, using the TDG Operational Plan (Appendix A).
3. Minimized spill, to the extent practicable, by scheduling maintenance based on predicted flows.
4. Avoided spill, to the extent practicable, by continuing to participate in the Hourly Coordination Agreement, to the extent it reduces TDG.
5. Maximized powerhouse discharge as appropriate up to 212 kcfs.
6. Continued the analysis of the three alternate spillway configurations that were tested in 2011 and 2012 (Chelan PUD, 2013b) to determine if any would be efficient at minimizing TDG. The report is being reviewed and Chelan PUD will be writing a proposal for using the flattened spill during flows above 50kcfs for review by the RRFF and HCP CC.

4.1.2 Rock Island

After meeting the HCP juvenile survival standards for all spring migrating species under a 20% spring spill regime in 2006, Chelan PUD has implemented a spill reduction study resulting in spring (voluntary) fish spill being reduced to 10% of the daily average river flow. Spill levels from 2003 to 2014 are shown in Table 4-2 below.

Table 4-2: Rock Island fish spill comparison, 2003-2014.

Year	Season	Spill Start Date	Spill Stop Date	Days of Spill	Spill Level[1]
2003	Spring	17-Apr	31-May	45	20%
2003	Summer	1-Jun	16-Aug	77	20%
Total				**122**	
2004	Spring	17-Apr	8-Jun	53	20%
2004	Summer	9-Jun	4-Aug	57	20%
Total				**110**	
2005	Spring	17-Apr	9-Jun	54	20%
2005	Summer	10-Jun	9-Aug	61	20%
Total				**115**	
2006	Spring	17-Apr	13-Jun	58	20%
2006	Summer	14-Jun	11-Aug	59	20%
Total				**117**	
2007	Spring	17-Apr	1-Jun	46	10%
2007	Summer	2-Jun	21-Aug	81	20%
Total				**127**	
2008	Spring	17-Apr	7-Jun	52	10%
2008	Summer	8-Jun	16-Aug	70	20%
Total				**122**	
2009	Spring	17-Apr	9-Jun	54	10%
2009	Summer	10-Jun	17-Aug	69	20%
Total				**123**	
2010	Spring	17-Apr	8-Jun	53	10%
2010	Summer	9-Jun	20-Aug	73	20%
Total				**126**	
2011	Spring	17-Apr	3-Jun	48	10%
2011	Summer	4-Jun	24-Aug	82	20%
Total				**130**	
2012	Spring	17-Apr	27-May	41	10%
2012	Summer	28-May	18-Aug	83	20%
Total				**124**	
2013	Spring	17-Apr	4-June	49	10%
2013	Summer	5-June	18-Aug	75	20%
Total				**124**	
2014	Spring	17-Apr	23 – May	37	10%
2014	Summer	24 - May	24 - Aug	93	20%
Total				**130**	
Notes: Percentage of daily average river flow at Rock Island					

The goal of the Rock Island GAP (Appendix F) approved by Ecology in April of 2014 is to implement measures to achieve compliance with the Washington state water quality standards for TDG in the Columbia River at the project while continuing to meet the fish passage and survival standards set forth in the Rock Island HCP and Fish Management Plan. To meet this goal, Chelan PUD implemented the following operational measures:

1. Minimized voluntary spill – due to the success thus far of the HCP survival studies, Chelan PUD has been able to reduce spring fish (voluntary) spill from 20% to 10% of the daily average river flow.
2. During fish passage, managed voluntary spill levels in real time in an effort to continue meeting TDG numeric criteria, using the TDG Operational Plan (Appendix A).
3. Minimized spill, to the extent practicable, by scheduling maintenance based on predicted flows.
4. Avoided spill, to the extent practicable, by continuing to participate in the Hourly Coordination Agreement, to the extent it reduces TDG.

As well as the Hourly Coordination Agreement, Chelan PUD participates in various water quality forums. The United States Army Corps of Engineers (USACE) hosts a year-end TDG Monitoring and Quality Assurance/Quality Control (QA/QC) meeting, at which presentations are made from the various agencies conducting TDG (and other water quality) monitoring within the Columbia River Basin. Topics included data completeness, quality, calibration results, new or improved monitoring methods, etc. Agencies presenting at this meeting included the USGS, USACE, other mid-Columbia River PUDs, and private consultants. Chelan PUD has participated in these yearend meetings.

Chelan PUD has also regularly attended the Transboundary Gas Group meetings since early in its history. Although the frequency of the Transboundary Gas Group meetings has lessened, Chelan PUD will attend the next scheduled meeting.

4.2 Structural

No structural modifications were made or utilized at Rocky Reach dam in 2014.

At Rock Island dam under normal operations, Chelan PUD utilizes notched gates, the spill deflector, and the Over/Under spill gates during fish spill operations. Chelan PUD was unable to follow these fish-spill operations in 2014 due to the Wanapum emergency drawdown. Upon the return of Wanapum reservoir to past operating elevations, Chelan PUD will resume fish-spill operations under the existing structural configuration. While operating under these fish-spill configurations over the course of the next several years (including the remainder of Phase I survival testing), Chelan PUD will determine the impact on TDG abatement resulting from the three existing Over/Under gates, before additional Over/Under gates are constructed, or other structural changes are made.

4.3 Corrective Actions

Actions taken to maintain/regain compliance with the TDG standards in 2014 included:

- Implementation of the TDG Operational Plan.

- Chelan PUD adjusted spill, as possible, at both projects; and adjusted gate configurations at Rock Island to reduce TDG, when possible. These actions were consistent with the Operational Plans for TDG.

- Attempted to maximize turbine flows by setting minimum generation requirements, which included establishing a common methodology for setting minimum generation requirements specific to Rocky Reach and Rock Island dams for the management of TDG. Each dam's minimum generation requirements were then allocated to power purchasers that receive a percentage of the projects' output. Mandating a high level of turbine usage during periods of high flow was, at times during 2014, an effective means of limiting involuntary spill and TDG impacts; however, during periods of very high-sustained flows, there was not adequate turbine capacity to sufficiently limit spill.

- Participation in regional spill/project operation meeting in the spring. This meeting brought together representatives from Natural Resources, Marketing, and Operations from Chelan, Douglas, and Grant PUDs, as well as representatives from Bonneville Power Association (BPA) and the Corps. Discussions included topics such as:
    - Each project's operational limitations, competing regulations, fish studies, and/or other natural resources requirements (e.g. Hanford Reach fall Chinook flow protection requirements).
    - The possibility of shifting generation away from those projects that produce relatively low levels of TDG to those that have the propensity to produce higher TDG levels (e.g. reevaluation of the regional Spill Priority List).
    - Each project's planned maintenance schedules and how it may limit ability to spill water through spillways and/or pass water through turbine units.

- Implementation of the Spill Priority List which included, for example, having the Mid-Columbia project (i.e. Grant, Chelan, and Douglas PUDs) operators working to coordinate spill to reduce the overall TDG on the entire Columbia River system. The Columbia River Basin projects Spill Priority List provided guidance to federal river operators when there was insufficient generation request available to pass the needed amount of water through the Federal Columbia River Power System. A mechanism through hourly coordination was used to shift load from the non-federal projects to the federal projects (by mutual agreement) to reduce the amount of spill (and TDG levels) that would otherwise occur at the federal projects using the Spill Priority List. Although this measure may not have resulted in direct decreases in TDG at Chelan PUD's projects (and in some cases it may have increased TDG within Chelan PUD's project if spill was shifted to Rocky Reach or Rock Island dam in order to reduce spill at another project within the system), it was meant to help mitigate high TDG levels throughout the entire Columbia River system.

Preemptive spill can be used to coordinate spill sought to manage both the spill rate and the forebay elevation for better TDG management. The spill rate could be stabilized if a project's storage was used to absorb flow fluctuations from upstream projects. Generally, a target operation of one foot from the allowed maximum at each project could be used. When flows spike high, the storage could be used to lower the need for spill; when flows drop, the storage quantities could be reestablished by maintaining spill rates. Allowing a greater amount of storage to absorb variations can be an effective method in stabilizing spill flows but it can also provide adequate time for adjusting spill to meet survival study objectives and TDG requirements.

SECTION 5: CONCLUSIONS

TDG values were slightly elevated throughout the mid-Columbia River for a portion of the 2014 fish-spill season due to a slightly higher than normal flows and the resultant spill. Flows did not exceed the 7Q10 flows established for Rocky Reach or Rock Island in 2014.

Spill upstream of each project resulted in occasionally high incoming TDG levels in the Rocky Reach, Rock Island, and Wanapum forebays. During the 2014 fish spill season, 38% of TDG exceedances in the Rock Island and Wanapum forebays occurred when incoming TDG levels exceeded numeric criteria. After eliminating these exceedances, project compliance with the modified water quality TDG criteria was as follows:

Compliance Monitoring Location	Percent Compliant
Rocky Reach Tailrace (125%)	98.0%
Rocky Reach Tailrace (120%)	92.8%
Rock Island Forebay (115%)	95.0%
Rock Island Tailrace (125%)	100%
Rock Island Tailrace (120%)	95.2%
Wanapum Forebay (115%)	84.9%

Chelan PUD undertook reasonable and feasible abatement measures to moderate high TDG levels (see Sections 3.7.1 and 4), including attempting to maximize powerhouse flows and reduce involuntary spill by selling power at reduced costs, participating in regional efforts to reduce TDG at each mid-Columbia River dam, and closely monitoring TDG and incoming flows.

Conditions at the Rock Island project due to the Wanapum emergency drawdown posed additional operational challenges. The 2014 fish-spill season was a unique year with many operational constraints and conditions unlike any other year. Chelan PUD's fisheries biologists and hydro operators acted quickly to develop interim spill measures to pass fish safely while maintaining compliance with TDG water quality standards.

Chelan PUD will continue to closely monitor TDG levels during the fish spill season in accordance with Ecology approved GAPs, the Rocky Reach 401 WQC (Ecology, 2006), and the Rocky Reach QAPP (Chelan PUD, 2010b).

SECTION 6: LIST OF LITERATURE

Chelan PUD. 2006. Rocky Reach Comprehensive Settlement Agreement, Attachment B, Rocky Reach Comprehensive Plan, Chapter 2, Water Quality Management Plan. Chelan PUD, Wenatchee, WA.

Chelan PUD. 2009. Gas Abatement Annual Report, Rocky Reach and Rock Island Hydroelectric Projects. Chelan PUD, Wenatchee, WA. http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/33799.pdf

Chelan PUD. 2010a. Gas Abatement Annual Report, Rocky Reach and Rock Island Hydroelectric Projects. Chelan PUD, Wenatchee, WA. http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/35658.pdf

Chelan PUD. 2010b. Quality Assurance Project Plan Rocky Reach Water Quality Monitoring and Reporting. Chelan PUD, Wenatchee, WA.

Chelan PUD. 2011. Gas Abatement Annual Report, Rocky Reach and Rock Island Hydroelectric Projects. Chelan PUD, Wenatchee, WA. http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/38065.pdf

Chelan PUD. 2012. Gas Abatement Annual Report, Rocky Reach and Rock Island Hydroelectric Projects. Chelan PUD, Wenatchee, WA. http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/39852.pdf

Chelan PUD. 2013a. Gas Abatement Annual Report, Rocky Reach and Rock Island Hydroelectric Projects. Chelan PUD, Wenatchee, WA. http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/41754.pdf

Chelan PUD. 2013b. Spill Data Evaluation Rocky Reach Dam 2011-2012. Prepared by Weitkamp, D.E. and Sullivan B.D, Parametrix, for Chelan PUD, Wenatchee, WA.

Fish Passage Center (FPC). 2009. Gas Bubble Trauma Monitoring Program Protocol for Juvenile Salmonids. April 2009. http://www.fpc.org/smolt/gasbubbletrauma.html.

Federal Energy Regulatory Commission (FERC). 2004. Orders Approving Anadromous Fish Agreements and Applications to Amend License for Public Utility District No. 1 of Chelan County, 107 FERC ¶ 61,280 and 61,281, Washington D.C.

Federal Energy Regulatory Commission (FERC). 2009. Order Issuing New License for Public Utility District No. 1 of Chelan County, 126 FERC ¶ 61,138, Washington D.C.

Schneider, Michael L. and Steven C. Wilhelms. 2005. Rocky Reach Dam: Operational and Structural Total Dissolved Gas Management. U.S. Army Engineer Research and Development Center, Vicksburg.

Washington State Department of Ecology (Ecology). 2006. Water Quality Certification for the Rocky Reach Project. Order No. 3155 dated March 17, 2006. http://www.chelanpud.org/documents/RR_Section_401_Water_Quality_Cert.pdf

Washington State Department of Ecology (Ecology). 2008. Memo to Columbia and Snake River Dam Operators; RE: Method for averaging 12 consecutive daily average high TDG readings in any one day. Sent by Mr. Chris Maynard on April 2, 2008.

Washington State Department of Ecology (Ecology). 2008a. Memo to Columbia and Snake River Dam Operators; RE: Clarification of WAC 201A-200(1)(f)(ii), Measuring Total Dissolved Gas (TDG) During Fish Spill on the Columbia and Snake Rivers. Sent by Susan Braley on May 21, 2008.

APPENDIX A: TDG OPERATIONAL PLANS

2014 Rocky Reach Operational Plan

for Total Dissolved Gas During Fish Spill Season

April 1 – August 31

(All spill between these dates is subject to the actions contained in this plan.)
(Applies only when not spilling for headwater control)

Protocol

1. If tailrace TDG average is greater than ***120% for the 6-hour average***
    - reduce spill by 3 kcfs
    - monitor for 1 hour
    - if the 6-hr average TDG >120%, reduce spill by another 2 kcfs
    - monitor for 1 hour
    - continue reducing spill by 2 kcfs until 6-hr average TDG is less than 120% for one full hour
    - **if after reducing spill to control TDG levels, TDG drops below 118% for one full hour, increase spill by 2 kcfs and monitor ****

2. If tailrace TDG is greater than ***125% for 1 hr***
    - follow protocol outlined above, but instead, use **one-hour TDG levels of 125%** as the metric
    - continue until TDG is less than 125% for 1 hr and until the 6-hr average TDG <120%

If you receive a call from RI advising that the RI forebay is out of compliance (greater than 115%) and the RR forebay is 115% or less, reduce spill by 3 kcfs. Two hours after reducing spill, call RI to determine what the RI forebay gas levels are. If still above 115%, reduce spill another 2 kcfs. If after reducing spill for this reason, the Rock Island forebay drops to less than 113%, Rock Island will call again and advise. At this point, increase back to the hourly spill volume target by increasing spill in the reverse order it was decreased. For example, if to bring the RI forebay back into compliance, it was necessary to reduce spill by a total of 5 kcfs, begin by increasing spill by 2 kcfs, wait two hours, and call RI to determine what the forebay TDG levels are. If TDG is still below 115%, increase spill by 3 kcfs (back to the target volume in this case). This will allow for a ramping effect, rather than an open/shut effect which could bump the Rock Island forebay TDG levels back out of compliance (>115%).

**** Note**: It will not be necessary to monitor for one full hour after re-opening gates if it appears that TDG is approaching the upper threshold, rather, the procedure will repeat upon reaching the threshold. It is anticipated that in time, the operators will "get a feel" for how much change in TDG will occur as a result of opening or closing gates and it will be possible to hold the TDG around 118% or 119% or so. Once the operators have this down, instead of closing a gate entirely, it may only be necessary to close partially, and visa versa for the opening process.

2014 Interim Rock Island Operational Plan

for Total Dissolved Gas During Fish Spill Season

(Applies only when not spilling for headwater control)

Protocol

1. If tailrace TDG average is greater than ***120% for the 6-hour average***
    - monitor for 2 hours, re-check 6-hour average
    - if TDG >120% for 6-hr average, reduce spill through a full gate by 3 kcfs
    - monitor for 1 hour, re-check 6-hour average
    - if TDG >120% for 6-hr average, reduce spill by another 3 kcfs through the same gate
    - monitor for 1 hr; re-check 6-hour average
    - if TDG >120% for 6-hr average, close the full gate
    - monitor for 1 hr; re-check 6-hour average
    - if TDG >120% for 6-hr average, repeat the above procedure on another full gate
    - **if after closing gates to control TDG levels, the TDG 1-hr average drops below 118%, re-open gates in the reverse order of closure****

2. If tailrace TDG is greater than ***125% for 1 hr***
    - follow protocol outlined above, but instead, use **one-hour TDG levels of 125%** as the metric
    - continue until TDG is less than 125% for 1 hr and until the 6-hr average TDG <120%

3. If forebay TDG exceeds 115% for greater than one hour, call Rocky Reach and advise that the RI forebay is exceeding the criteria. Rocky Reach will then reduce spill, but only if the RR forebay TDG is 115% or less. Once RI forebay TDG levels reduce to 113% call RR again so that they may return to previous spill operations.

4. If it becomes necessary to implement any further actions to attain TDG compliance, please contact Thad Mosey and Waikele Frantz immediately so they can determine the next steps to take.

**** Note**: It will not be necessary to monitor for one full hour after re-opening if it appears that TDG is approaching the upper threshold again, rather, the procedure will repeat upon reaching the threshold. It is anticipated that in time, the operators will "get a feel" for how much change in TDG will occur as a result of opening or closing gates and it will be possible to hold the TDG around 118% or 119% or so. Once the operators have this down, instead of closing a gate entirely, it may only be necessary to close partially, and visa versa for the opening process.

APPENDIX B: CALIBRATION REPORTS

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 24-Mar-14
Arrival Time: 10:10
Departure Time: 11:00

Site:
RRDW

	FMS ID	37606		37606	
	Time	10:20		10:55	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		752.0	749.0	751.6	749.0
Temp ºC			3.1		3.2
TDGsat			102.7		103.3
TDG mmHg			769.0		774.0

Comments:

Calibration Type: Field
Probe ID: 37606
Date: 24-Mar-14
BP Station: 751.8 mmHg
Time: 10:25

	Std	Initial	Final
Temperature ºC	3.83	3.7	N / C
TDG 100%	751.8	753	N / C
TDG 113%	851.8	853	N / C
TDG 126%	951.8	953	N / C
TDG 139%	1051.8	1053	N / C
Depth m	N/A		

Comments: New TDG membrane.
1039

Report created March 25, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 24-Mar-14
Arrival Time: 11:05
Departure Time: 11:35

Site:
RRH

FMS ID	37607		37607	
Time	11:05		11:30	
	2°std	FMS	2°std	FMS
Depth m				
BP mmHg	749.3	749.0	748.9	749.0
Temp °C		3.2		3.2
TDGsat		101.6		102.0
TDG mmHg		761.0		764.0

Comments:

Calibration Type: Field
Probe ID: 37607
Date: 24-Mar-14
BP Station: 749.4 mmHg
Time: 11:10

	Std	Initial	Final
Temperature °C	4.48	4.4	N / C
TDG 100%	749.4	749	N / C
TDG 113%	849.4	848	N / C
TDG 126%	949.4	948	N / C
TDG 139%	1049.4	1049	N / C
Depth m	N/A		

Comments: New TDG membrane.
1009

Report created March 25, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 24-Mar-14
Arrival Time: 12:45
Departure Time: 14:25

Site:
RIGW

FMS ID	32545		32545	
Time	13:00		14:15	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	751.8	753.0	750.8	753.0
Temp °C		3.4		3.4
TDGsat		102.8		102.9
TDG mmHg		774.0		775.0

Comments:

Calibration Type: Field
Probe ID: 32545
Date: 24-Mar-14
BP Station: 751.5 mmHg
Time: 13:20

	Std	Initial	Final
Temperature °C	5.56	5.4	N / C
TDG 100%	751.5	752	N / C
TDG 113%	851.5	852	N / C
TDG 126%	951.5	952	N / C
TDG 139%	1051.5	1052	N / C
Depth m	N/A		

Comments: New TDG membrane.
902

Report created March 25, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 24-Mar-14
Arrival Time: 14:50
Departure Time: 15:40

Site:
RIS

FMS ID	38641		38641	
Time	15:05		15:30	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	748.8	752.0	748.4	752.0
Temp ºC		3.3		3.4
TDGsat		102.3		103.5
TDG mmHg		769.0		778.0

Comments:

Calibration Type: Field
Probe ID: 38641
Date: 24-Mar-14
BP Station: 748.8 mmHg
Time: 15:10

	Std	Initial	Final
Temperature ºC	5.07	4.7	N / C
TDG 100%	748.8	751	749
TDG 113%	848.8	851	849
TDG 126%	948.8	952	949
TDG 139%	1048.8	1052	1049
Depth m	N/A		

Comments: New TDG membrane.
1025

Report created March 25, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 23-Apr-14
Arrival Time: 10:50
Departure Time: 11:50

Site:
RRDW

FMS ID	37606		37606	
Time	11:10		11:45	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	740.9	737.0	740.6	737.0
Temp ºC		6.6		6.6
TDGsat		114.8		111.9
TDG mmHg		846.0		825.0

Comments:

Calibration Type: Field
Probe ID: 37606
Date: 23-Apr-14
BP Station: 740.7 mmHg
Time: 11:15

	Std	Initial	Final
Temperature ºC	8.06	8	N / C
TDG 100%	740.7	741	N / C
TDG 113%	840.7	840	N / C
TDG 126%	940.7	940	N / C
TDG 139%	1040.7	1040	N / C
Depth m	N/A		

Comments: 917/1132

Report created May 04, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 23-Apr-14
Arrival Time: 12:00
Departure Time: 12:35

Site:
RRH

FMS ID	37607		37607	
Time	12:05		12:30	
	2°std	FMS	2°std	FMS
Depth m				
BP mmHg	739.0	737.0	739.1	737.0
Temp ºC		6.6		6.6
TDGsat		113.6		111.7
TDG mmHg		837.0		823.0

Comments:

Calibration Type: Field
Probe ID: 37607
Date: 23-Apr-14
BP Station: 738.9 mmHg
Time: 12:10

	Std	Initial	Final
Temperature ºC	7.9	7.8	N / C
TDG 100%	738.9	738	N / C
TDG 113%	838.9	838	N / C
TDG 126%	938.9	938	N / C
TDG 139%	1038.9	1038	N / C
Depth m	N/A		

Comments: 895/1152

Report created May 04, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 23-Apr-14
Arrival Time: 13:20
Departure Time: 15:15

Site:
RIGW

FMS ID	32545		32545	
Time	13:55		15:05	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	743.0	743.0	743.0	743.0
Temp ºC		6.6		6.7
TDGsat		114.4		114.0
TDG mmHg		850.0		847.0

Comments:

Calibration Type: Field
Date: 23-Apr-14
Time: 14:20

Probe ID: 32545
BP Station: 743.1 mmHg

	Std	**Initial**	**Final**
Temperature ºC	8.86	8.7	N / C
TDG 100%	743.1	743	N / C
TDG 113%	843.1	843	N / C
TDG 126%	943.1	943	N / C
TDG 139%	1043.1	1043	N / C
Depth m	N/A		

Comments: 886/1027

Report created May 04, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 23-Apr-14
Arrival Time: 15:30
Departure Time: 16:05

Site:
RIS

FMS ID	38641		38641	
Time	15:35		16:00	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	741.7	743.0	741.7	743.0
Temp ºC		6.6		6.6
TDGsat		113.5		112.2
TDG mmHg		843.0		834.0

Comments:

Calibration Type: Field
Probe ID: 38641
Date: 23-Apr-14
BP Station: 741.7 mmHg
Time: 15:40

	Std	Initial	Final
Temperature ºC	7.44	7.1	N / C
TDG 100%	741.7	740	742
TDG 113%	841.7	840	842
TDG 126%	941.7	940	942
TDG 139%	1041.7	1041	1042
Depth m	N/A		

Comments: 1026/1350

Report created May 04, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-May-14
Arrival Time: 14:45
Departure Time: 16:15

Site:
RIGW

FMS ID	32545		32546	
Time	15:10		16:00	
	2°std	FMS	2°std	FMS
Depth m				
BP mmHg	745.1	745.0	745.1	745.0
Temp ºC		11.5		11.5
TDGsat		119.2		118.1
TDG mmHg		888.0		880.0

Comments:

Calibration Type: Field
Probe ID: 32546
Date: 28-May-14
BP Station: 745.1 mmHg
Time: 15:15

	Std	Initial	Final
Temperature ºC	13.35	13.3	N / C
TDG 100%	745.1	745	745
TDG 113%	845.1	843	845
TDG 126%	945.1	943	945
TDG 139%	1045.1	1042	1045
Depth m	N/A		

Comments: 858/1106

Report created June 02, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-May-14
Arrival Time: 17:00
Departure Time: 17:35

Site:
RIS

FMS ID	47505		60048	
Time	17:00		17:20	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	745.0	746.0	745.1	746.0
Temp ºC		11.7		11.8
TDGsat		104.7		109.1
TDG mmHg		781.0		814.0

Comments:

Calibration Type: Field
Date: 28-May-14
Time: 15:45

Probe ID: 60048
BP Station: 745 mmHg

	Std	Initial	Final
Temperature ºC	14.32	14.3	N / C
TDG 100%	745	743	745
TDG 113%	845	842	845
TDG 126%	945	941	945
TDG 139%	1045	1041	1045
Depth m	N/A		

Comments: 949/1100

Report created June 02, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 18-Jun-14
Arrival Time: 10:00
Departure Time: 12:15

Site:
RIGW

	FMS ID	32546		65721	
	Time	10:00		11:44	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		744.4	745.0	744.4	745.0
Temp °C			13.2		13.5
TDGsat			112.9		107.4
TDG mmHg			841.0		800.0

Comments:

Calibration Type: Field
Probe ID: 65721
Date: 18-Jun-14
BP Station: 744.4 mmHg
Time: 9:30

	Std	Initial	Final
Temperature °C	14.84	15	N / C
TDG 100%	744.4	742	744
TDG 113%	844.4	840	844
TDG 126%	944.4	937	944
TDG 139%	1044.4	1034	1044
Depth m	N/A		

Comments: 864/1161
New probe.

Report created June 24, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 18-Jun-14
Arrival Time: 12:40
Departure Time: 13:10

Site:
RIS

FMS ID	60048		65719	
Time	12:45		13:10	
	2°std	FMS	2°std	FMS
Depth m				
BP mmHg	743.3	744.0	742.3	744.0
Temp ºC		13.5		13.6
TDGsat		112.9		110.9
TDG mmHg		840.0		825.0

Comments:

Calibration Type: Field
Probe ID: 65719
Date: 18-Jun-14
BP Station: 744.3 mmHg
Time: 9:50

	Std	Initial	Final
Temperature ºC	16.03	16.2	N / C
TDG 100%	744.3	753	744
TDG 113%	844.3	860	844
TDG 126%	944.3	966	944
TDG 139%	1044.3	1073	1044
Depth m	N/A		

Comments: 949/1157
New probe; calibrated at RIGW.

Report created June 24, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 18-Jun-14
Arrival Time: 15:10
Departure Time: 16:00

Site:
RRH

	FMS ID	37607		65720	
	Time	15:15		15:55	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		738.2	738.0	738.2	937.0
Temp °C			13.4		13.6
TDGsat			113.4		89.2
TDG mmHg			837.0		836.0

Comments:

Calibration Type: Field
Probe ID: 65720
Date: 18-Jun-14
BP Station: 744.4 mmHg
Time: 10:00

	Std	Initial	Final
Temperature °C	16.77	16.9	N / C
TDG 100%	744.4	743	744
TDG 113%	844.4	840	843
TDG 126%	944.4	938	943
TDG 139%	1044.4	1036	1044
Depth m	N/A		

Comments: 888/1138
New probe; calibrated at RIGW.

Report created June 24, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 18-Jun-14
Arrival Time: 14:25
Departure Time: 15:05

Site:
RRDW

	FMS ID	37606		65718	
	Time	14:30		15:00	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		740.3	738.0	740.2	738.0
Temp ºC			13.3		13.6
TDGsat			118.6		116.7
TDG mmHg			875.0		861.0

Comments:

Calibration Type: Field
Probe ID: 65718
Date: 18-Jun-14
BP Station: 744.2 mmHg
Time: 10:10

	Std	Initial	Final
Temperature ºC	17.47	17.6	N / C
TDG 100%	744.2	742	744
TDG 113%	844.2	839	843
TDG 126%	944.2	936	943
TDG 139%	1044.2	1034	1044
Depth m	N/A		

Comments: 934/1108
New probe; calibrated at RIGW.

Report created June 24, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-Jul-14
Arrival Time: 7:55
Departure Time: 8:40

Site:
RRDW

	FMS ID	65718		65718	
	Time	8:10		8:35	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		746.7	743.0	746.6	743.0
Temp ºC			18.2		18.2
TDGsat			113.6		111.7
TDG mmHg			844.0		830.0

Comments:

Calibration Type: Field
Probe ID: 65718
Date: 28-Jul-14
BP Station: 746.7 mmHg
Time: 8:15

	Std	Initial	Final
Temperature ºC	18.51	18.5	N / C
TDG 100%	746.7	746	N / C
TDG 113%	846.7	846	N / C
TDG 126%	946.7	946	N / C
TDG 139%	1046.7	1047	N / C
Depth m	N/A		

Comments: 941/1140

Report created August 08, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-Jul-14
Arrival Time: 8:50
Departure Time: 9:20

Site:
RRH

	FMS ID	65720		65720	
	Time	8:55		9:15	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		745.1	743.0	744.7	743.0
Temp ºC			18.2		18.2
TDGsat			111.6		109.8
TDG mmHg			829.0		816.0

Comments:

Calibration Type: Field
Probe ID: 65720
Date: 28-Jul-14
BP Station: 745.1 mmHg
Time: 9:00

	Std	Initial	Final
Temperature ºC	18.43	18.5	N / C
TDG 100%	745.1	745	N / C
TDG 113%	845.1	845	N / C
TDG 126%	945.1	945	N / C
TDG 139%	1045.1	1045	N / C
Depth m	N/A		

Comments: 949/1100

Report created August 08, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-Jul-14
Arrival Time: 9:55
Departure Time: 10:25

Site:
RIS

	FMS ID	65719		65719	
	Time	10:00		10:15	
		2°std	FMS	2°std	FMS
Depth m					
BP mmHg		747.1	748.0	746.6	748.0
Temp ºC			18.5		18.5
TDGsat			110.8		111.4
TDG mmHg			829.0		833.0

Comments:

Calibration Type: Field
Date: 28-Jul-14
Time: 10:05

Probe ID: 65719
BP Station: 747 mmHg

	Std	Initial	Final
Temperature ºC	18.55	18.7	N / C
TDG 100%	747	746	N / C
TDG 113%	847	846	N / C
TDG 126%	947	946	N / C
TDG 139%	1047	1047	N / C
Depth m	N/A		

Comments: 949/1111

Report created August 08, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 28-Jul-14
Arrival Time: 10:50
Departure Time: 11:55

Site:
RIGW

FMS ID	65721		65721	
Time	11:10		11:45	
	2°std	**FMS**	**2°std**	**FMS**
Depth m				
BP mmHg	747.2	747.0	747.0	747.0
Temp ºC		18.5		18.5
TDGsat		113.0		111.1
TDG mmHg		844.0		830.0

Comments:

Calibration Type: Field
Probe ID: 65721
Date: 28-Jul-14
BP Station: 747.1 mmHg
Time: 11:20

	Std	Initial	Final
Temperature ºC	20.51	20.6	N / C
TDG 100%	747.1	747	N / C
TDG 113%	847.1	847	N / C
TDG 126%	947.1	947	N / C
TDG 139%	1047.1	1047	N / C
Depth m	N/A		

Comments: 912/1129

Report created August 08, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 26-Aug-14
Arrival Time: 8:50
Departure Time: 9:40

Site:
RRDW

FMS ID	65718		65718	
Time	9:05		9:35	
	2ºstd	FMS	2ºstd	FMS
Depth m				
BP mmHg	746.5	743.0	746.2	743.0
Temp ºC		19.6		19.6
TDGsat		103.6		105.5
TDG mmHg		770.0		784.0

Comments:

Calibration Type: Field
Probe ID: 65718
Date: 26-Aug-14
BP Station: 746.4 mmHg
Time: 9:20

	Std	Initial	Final
Temperature ºC	19.6	19.7	N / C
TDG 100%	746.4	744	746
TDG 113%	846.4	845	846
TDG 126%	946.4	946	946
TDG 139%	1046.4	1047	1046
Depth m	N/A		

Comments: 940/1118

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 26-Aug-14
Arrival Time: 9:50
Departure Time: 10:25

Site:
RRH

FMS ID	65720		65720	
Time	9:55		10:20	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	744.4	743.0	744.0	743.0
Temp ºC		19.5		19.6
TDGsat		104.6		105.7
TDG mmHg		777.0		785.0

Comments:

Calibration Type: Field
Probe ID: 65720
Date: 26-Aug-14
BP Station: 744.4 mmHg
Time: 10:00

	Std	Initial	Final
Temperature ºC	20.6	20.5	N / C
TDG 100%	744.4	742	744
TDG 113%	844.4	843	844
TDG 126%	944.4	943	944
TDG 139%	1044.4	1044	1044
Depth m	N/A		

Comments: 889/1161

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 26-Aug-14
Arrival Time: 11:15
Departure Time: 11:45

Site:
RIS

FMS ID	65719		65719	
Time	11:20		11:40	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	746.4	748.0	746.2	747.0
Temp ºC		19.7		19.7
TDGsat		103.3		105.6
TDG mmHg		773.0		789.0

Comments:

Calibration Type: Field
Probe ID: 65719
Date: 26-Aug-14
BP Station: 746.6 mmHg
Time: 11:25

	Std	**Initial**	**Final**
Temperature ºC	19.98	20.1	N / C
TDG 100%	746.6	745	747
TDG 113%	846.6	846	847
TDG 126%	946.6	946	947
TDG 139%	1046.6	1047	1047
Depth m	N/A		

Comments: 934/1111

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 26-Aug-14
Arrival Time: 12:15
Departure Time: 14:00

Site:
RIGW

FMS ID	65721		65721	
Time	12:20		13:45	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	746.8	747.0	746.8	746.0
Temp ºC		19.7		19.7
TDGsat		103.6		101.9
TDG mmHg		774.0		760.0

Comments:

Calibration Type: Field
Probe ID: 65721
Date: 26-Aug-14
BP Station: 746.5 mmHg
Time: 12:50

	Std	**Initial**	**Final**
Temperature ºC	21.59	21.7	N / C
TDG 100%	746.5	746	N / C
TDG 113%	846.5	847	N / C
TDG 126%	946.5	947	N / C
TDG 139%	1046.5	1047	N / C
Depth m	N/A		

Comments: 883/1247

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 07-Oct-14
Arrival Time: 9:20
Departure Time: 10:20

Site:
RRDW

FMS ID	65718		65718	
Time	9:30		9:55	
	2ºstd	FMS	2ºstd	FMS
Depth m				
BP mmHg	743.7	740.0	743.5	740.0
Temp ºC		18.3		18.3
TDGsat		101.2		103.1
TDG mmHg		749.0		763.0

Comments:

Calibration Type: Field
Probe ID: 65718
Date: 07-Oct-14
BP Station: 743.6 mmHg
Time: 9:35

	Std	Initial	Final
Temperature ºC	18.23	18.3	N / C
TDG 100%	743.6	744	N / C
TDG 113%	843.6	844	N / C
TDG 126%	943.6	943	N / C
TDG 139%	1043.6	1043	N / C
Depth m	N/A		

Comments: 948/1109

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 07-Oct-14
Arrival Time: 10:30
Departure Time: 11:25

Site:
RRH

FMS ID	65720		65720	
Time	10:35		10:55	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	741.5	740.0	741.1	740.0
Temp ºC		18.3		18.3
TDGsat		100.8		102.3
TDG mmHg		746.0		757.0

Comments:

Calibration Type: Field
Probe ID: 65720
Date: 07-Oct-14
BP Station: 741.3 mmHg
Time: 10:40

	Std	Initial	Final
Temperature ºC	18.32	18.4	N / C
TDG 100%	741.3	742	N / C
TDG 113%	841.3	842	N / C
TDG 126%	941.3	941	N / C
TDG 139%	1041.3	1041	N / C
Depth m	N/A		

Comments: 934/1169

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 07-Oct-14
Arrival Time: 12:25
Departure Time: 12:55

Site:
RIS

FMS ID	65719		65719	
Time	12:30		12:50	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	742.8	743.0	742.5	743.0
Temp ºC		18.3		18.4
TDGsat		100.9		103.5
TDG mmHg		750.0		769.0

Comments:

Calibration Type: Field
Probe ID: 65719
Date: 07-Oct-14
BP Station: 742.7 mmHg
Time: 12:35

	Std	Initial	Final
Temperature ºC	18.9	19.1	N / C
TDG 100%	742.7	743	N / C
TDG 113%	842.7	843	N / C
TDG 126%	942.7	943	N / C
TDG 139%	1042.7	1042	N / C
Depth m	N/A		

Comments: 949/1132

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 07-Oct-14
Arrival Time: 13:20
Departure Time: 14:25

Site:
RIGW

FMS ID	65721		65721	
Time	13:30		14:20	
	2ºstd	FMS	2ºstd	FMS
Depth m				
BP mmHg	743.0	743.0	742.5	743.0
Temp ºC		18.3		18.3
TDGsat		100.9		101.6
TDG mmHg		750.0		755.0

Comments:

Calibration Type: Field
Probe ID: 65721
Date: 07-Oct-14
BP Station: 742.6 mmHg
Time: 13:55

	Std	Initial	Final
Temperature ºC	20.25	20.4	N / C
TDG 100%	742.6	742	743
TDG 113%	842.6	842	843
TDG 126%	942.6	943	943
TDG 139%	1042.6	1044	1043
Depth m	N/A		

Comments: 927/1105

Report created October 09, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 25-Nov-14
Arrival Time: 8:30
Departure Time: 9:20

Site:
RRDW

FMS ID	65718		65718	
Time	8:35		9:15	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	751.2	746.0		747.0
Temp ºC		11.8		11.8
TDGsat		96.2		98.4
TDG mmHg		718.0		735.0

Comments:

Calibration Type: Field
Probe ID: 65718
Date: 25-Nov-14
BP Station: 751.2 mmHg
Time: 9:50

	Std	Initial	Final
Temperature ºC	6.6	6.7	N / C
TDG 100%	751.2	750	N / C
TDG 113%	851.2	850	N / C
TDG 126%	951.2	950	N / C
TDG 139%	1051.2	1050	N / C
Depth m	N/A		

Comments: 961/1177

Report created December 01, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 25-Nov-14
Arrival Time: 9:25
Departure Time: 9:55

Site:
RRH

FMS ID	65720		65720	
Time	9:30		9:50	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	749.6	747.0		747.0
Temp ºC		11.7		11.7
TDGsat		95.2		97.6
TDG mmHg		711.0		729.0

Comments:

Calibration Type: Field
Probe ID: 65720
Date: 25-Nov-14
BP Station: 749.7 mmHg
Time: 9:35

	Std	**Initial**	**Final**
Temperature ºC	6.85	6.9	N / C
TDG 100%	749.7	750	N / C
TDG 113%	849.7	850	N / C
TDG 126%	949.7	950	N / C
TDG 139%	1049.7	1050	N / C
Depth m	N/A		

Comments: 897/1200

Report created December 01, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 25-Nov-14
Arrival Time: 10:20
Departure Time: 11:00

Site:
RIS

FMS ID	65719		65719	
Time	10:30		10:55	
	2ºstd	FMS	2ºstd	FMS
Depth m				
BP mmHg	753.0	754.0		754.0
Temp ºC		11.7		11.7
TDGsat		95.0		98.9
TDG mmHg		716.0		746.0

Comments:

Calibration Type: Field
Probe ID: 65719
Date: 25-Nov-14
BP Station: 753 mmHg
Time: 10:35

	Std	Initial	Final
Temperature ºC	7.35	7.5	N / C
TDG 100%	753	753	N / C
TDG 113%	853	853	N / C
TDG 126%	953	952	N / C
TDG 139%	1053	1052	N / C
Depth m	N/A		

Comments: 955/1153

Report created December 01, 2014

Columbia Basin Environmental

Site Visit / Calibration Report

Client: Public Utility District No. 1 of Chelan County

Date: 25-Nov-14
Arrival Time: 11:20
Departure Time: 12:35

Site:
RIGW

FMS ID	65721		65721	
Time	11:30		12:25	
	2ºstd	**FMS**	**2ºstd**	**FMS**
Depth m				
BP mmHg	754.5	754.0	754.3	754.0
Temp ºC		11.7		11.7
TDGsat		95.0		97.5
TDG mmHg		716.0		735.0

Comments: Deployed probe in new FMS pipe.

Calibration Type: Field
Probe ID: 65721
Date: 25-Nov-14
BP Station: 754.7 mmHg
Time: 11:50

	Std	Initial	Final
Temperature ºC	7.76	7.9	N / C
TDG 100%	754.7	752	755
TDG 113%	854.7	852	855
TDG 126%	954.7	951	955
TDG 139%	1054.7	1051	1055
Depth m	N/A		

Comments: 939/1141

Report created December 01, 2014

APPENDIX C: HOURLY DISSOLVED GAS LEVELS

Hourly Total Dissolved gas readings during the 2014 fish-spill season and non fish-spill season

Notes:
FONT = Exceedances of the water quality TDG numeric critera are in bold red. Note, all exceedances in the Rocky Reach Forebay are for the upstream Wells Dam Project
121.2 (119.6) = Instances of "double counting", value in parentheses represents the TDG value used to eliminate "double counting"
110.8 = Not counted toward exceedances because RR FB > 115 (for RI FB) or RI FB > 115 (for Wanapum FB).

FISH SPILL SEASON																							
2014	Rocky Reach Forebay			Rocky Reach Tailrace			Rock Island Forebay			Rock Island Tailrace			Wan FB	Average Daily Spill		Total Flow		% Flow Spilled		Rocky Reach		Rock Island	
	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	RR	RI	RR	RI	RR	RI	Fish	Other	Fish	Other
1-Apr	103.7	103.3	103.7	104.4	104.1	104.6	103.6	103.1	103.6	105.0	104.6	105.0	105.7	0.0	14.9	121.0	135.6	0.0	11.1	0	0	0	14.93
2-Apr	105.7	104.8	106.2	105.7	105.0	106.3	104.0	103.1	104.6	109.7	106.9	110.6	105.3	0.0	27.2	111.5	119.2	0.0	23.2	0	0	0	27.12
3-Apr	106.1	105.8	107.1	106.5	106.2	107.4	105.1	104.8	105.2	110.8	110.6	111.5	105.9	0.0	38.1	117.7	118.9	0.0	32.1	0	0	0	38.05
4-Apr	107.3	106.8	108.0	107.6	107.5	108.6	106.9	106.1	107.7	111.6	111.3	112.4	109.7	0.0	37.9	122.7	126.9	0.0	29.8	0	0	0	37.71
5-Apr	106.3	105.4	105.6	107.3	106.1	106.5	106.8	104.9	105.8	111.5	109.9	111.0	110.5	0.0	40.1	129.8	135.4	0.0	29.6	0	0	0	40.65
6-Apr	105.2	103.8	104.8	106.0	104.5	105.7	105.1	103.7	104.5	110.2	108.7	109.7	110.5	0.0	28.6	113.2	113.0	0.0	25.2	0	0	0	28.21
7-Apr	104.1	103.7	104.4	104.7	104.3	105.1	103.8	103.2	104.2	109.0	108.6	109.5	109.1	0.0	29.2	121.4	118.2	0.0	24.3	0	0	0	29.61
8-Apr	105.3	104.9	105.6	105.7	105.3	106.0	104.8	104.2	105.2	109.6	109.1	111.7	110.4	0.0	24.5	117.0	122.9	0.0	20.3	0	0	0	25.45
9-Apr	105.5	105.0	105.5	105.9	105.4	105.9	104.9	104.2	104.6	109.4	108.5	111.3	110.4	0.0	25.8	117.8	125.9	0.0	20.0	0	0	0	25.35
10-Apr	106.3	105.6	106.9	106.3	105.8	107.1	104.9	104.3	105.4	110.4	109.4	111.4	109.2	0.0	31.8	126.9	134.5	0.0	23.4	0	0	0	31.9
11-Apr	107.4	107.2	107.5	107.3	107.2	107.6	106.4	105.9	106.6	112.2	110.7	113.7	109.2	0.0	22.2	109.2	114.5	0.0	19.4	0	0	0	21.72
12-Apr	107.4	107.0	107.4	107.5	107.1	107.5	106.4	105.9	106.5	111.8	110.7	112.1	109.8	0.0	24.4	114.6	115.5	0.0	20.9	0	0	0	24.25
13-Apr	106.7	106.0	106.4	106.9	106.2	107.1	106.1	105.0	106.0	110.8	108.2	111.2	109.8	0.0	22.4	117.1	119.6	0.0	19.0	0	0	0	21.6
14-Apr	107.9	107.2	108.3	108.0	107.4	108.4	107.0	106.2	107.3	111.7	109.2	113.7	109.8	0.0	16.8	129.1	129.0	0.0	13.2	0	0	0	16.95
15-Apr	108.3	108.1	108.5	108.6	108.3	109.0	107.1	106.8	107.3	112.7	112.1	113.7	109.2	0.0	21.6	135.9	131.9	0.0	16.6	0	0	0	21.52
16-Apr	108.4	108.2	108.8	108.7	108.5	108.8	107.5	107.3	107.6	112.4	111.4	114.0	110.4	0.0	24.2	145.4	149.8	0.0	16.1	0	0	0	23.13
17-Apr	109.1	108.8	109.2	109.1	108.9	109.3	108.0	107.8	108.1	114.1	112.7	115.0	111.0	0.0	40.6	146.2	154.5	0.0	25.3	0	0	14.5	26.09
18-Apr	109.1	108.1	108.7	111.5	110.0	116.2	108.4	107.7	110.8	114.2	112.7	118.0	110.9	8.1	31.6	150.0	144.8	5.2	21.9	0	8.03	15.4	16.78
19-Apr	109.7	108.9	110.0	109.2	108.8	109.6	108.6	107.6	109.3	112.6	110.1	113.2	113.4	0.0	24.2	154.1	160.5	0.0	14.7	0	0	14.9	9.34
20-Apr	109.3	108.3	109.6	109.0	108.2	109.6	108.6	107.0	108.4	110.6	109.7	111.0	110.9	0.0	23.5	151.4	159.4	0.0	14.5	0	0	15.4	8.09
21-Apr	109.7	109.1	110.0	109.8	109.3	110.2	108.7	108.3	109.2	111.0	110.4	111.5	110.7	0.0	20.7	147.4	154.5	0.0	13.3	0	0	15.9	4.96
22-Apr	111.2	110.5	112.4	115.1	112.6	117.4	109.2	108.9	110.7	112.1	111.2	113.6	111.0	16.8	25.0	158.6	158.5	9.9	15.5	0	15.77	16.2	8.25
23-Apr	113.5	113.3	113.8	117.7	116.0	118.1	113.4	112.9	114.0	116.2	115.2	117.7	110.7	12.1	41.4	161.9	160.2	7.0	31.1	0	12.22	15.9	25.88
24-Apr	113.8	113.7	114.1	116.5	115.3	117.7	113.5	113.2	114.1	115.9	115.6	118.5	114.3	6.6	43.1	151.9	155.5	3.8	33.2	0	6.54	16.3	28.3
25-Apr	113.9	113.7	114.0	114.5	114.0	115.7	113.4	112.8	113.8	116.0	114.7	119.8	114.6	3.2	45.1	154.7	157.9	1.9	35.4	0	3.19	16.3	28.42
26-Apr	114.6	114.3	114.7	114.3	113.9	114.5	113.9	112.9	114.4	114.9	114.1	115.5	114.5	0.0	24.5	161.7	166.3	0.0	14.7	0	0	16.3	8.28
27-Apr	114.6	114.2	114.5	114.4	114.1	114.5			0.0	114.8	114.3	115.1	113.9	0.0	24.3	155.2	162.5	0.0	14.8	0	0	16.3	7.85
28-Apr	114.0	111.5	113.4	113.7	111.1	112.8		101.3	111.7	114.4	112.6	114.9	111.7	0.0	26.2	161.6	170.0	0.0	15.3	0	0.02	16.3	9.85
29-Apr	111.5	111.1	111.8	111.4	110.9	111.6	110.8	100.0	111.7	113.7	111.8	114.5	111.6	0.0	25.1	163.0	166.7	0.0	14.7	0	0	16.3	9.12
30-Apr	111.4	109.5	110.4	111.2	109.3	110.3		109.7	113.9	113.7	111.4	113.2	113.3	0.0	27.4	159.9	164.0	0.0	17.0	0	0	16.2	11.89
1-May	111.2	110.5	111.7	113.3	111.6	113.9		111.2	111.4	113.2	112.0	114.0	113.3	8.7	28.1	170.5	173.5	5.0	16.1	0	7.58	17.4	10.64
2-May	111.6	111.0	112.0	115.1	114.3	116.0			0.0	114.5	114.0	115.2	112.9	18.0	26.5	152.3	154.1	11.5	17.4	0	17.05	17.4	9.37
3-May	112.0	111.8	112.2	118.2	115.2	119.9			0.0	117.1	115.1	118.0	113.1	16.3	33.0	174.9	181.8	9.4	18.0	0	17.37	17.9	14.94
4-May	113.3	112.1	114.1	112.5	111.6	114.6			0.0	115.1	112.9	115.3	114.1	1.8	33.5	175.2	184.4	1.0	18.1	0	1.65	18.5	14.76

FISH SPILL SEASON																							
2014	Rocky Reach Forebay			Rocky Reach Tailrace			Rock Island Forebay			Rock Island Tailrace			Wan FB	Average Daily Spill		Total Flow		% Flow Spilled		Rocky Reach		Rock Island	
	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	RR	RI	RR	RI	RR	RI	Fish	Other	Fish	Other
5-May	114.7	114.5	114.8	118.1	117.4	118.9			0.0	117.0	116.1	117.5	111.5	17.3	36.9	179.5	186.4	9.6	19.6	0	17.53	17.8	19.34
6-May	114.6	114.4	114.7	117.2	115.7	117.1			0.0	116.4	115.7	116.8	114.6	5.9	33.6	168.8	178.2	3.6	18.7	0	5.97	17.2	16.13
7-May	114.8	114.5	114.9	114.2	113.4	113.9			0.0	116.1	114.6	116.2	114.9	0.0	26.2	163.2	168.4	0.0	15.2	0	0	18.5	8.48
8-May	116.5	115.9	116.6	118.7	117.3	120.0			0.0	118.3	117.0	119.0	114.8	16.4	41.0	185.7	188.8	8.5	21.5	0	15.25	17.4	22.25
9-May	116.5	116.4	116.6	119.7	117.2	120.8		114.2	116.1	118.4	116.7	117.9	115.2	8.2	22.8	149.9	161.2	4.9	13.9	0	9.66	16.7	6.61
10-May	116.3	114.8	116.0	115.3	114.9	116.3	114.8	112.8	114.1	116.1	115.3	116.7	114.7	10.1	30.9	165.2	170.8	5.8	17.9	0	9.02	17.9	12.55
11-May	113.7	112.3	112.8	116.3	114.3	116.7	112.6	111.4	112.5	115.4	114.1	115.9	113.6	7.8	31.6	166.2	176.1	4.5	17.8	0	8.46	18.7	13.23
12-May	114.4	113.6	114.6	117.3	115.9	117.6	113.7	111.9	114.2	116.2	114.5	116.7	113.4	19.3	32.0	169.9	176.6	11.3	18.1	0	18.58	18.4	13.64
13-May	114.4	112.8	114.2	117.6	115.6	118.4	113.8	112.8	113.8	116.3	115.6	116.9	114.8	12.6	32.1	168.2	176.4	7.1	18.1	0	13.5	18.7	13.65
14-May	111.8	110.6	111.2	115.2	113.4	115.7	113.0	109.8	111.6	115.6	114.1	116.7	115.2	12.0	37.2	175.5	180.3	6.8	20.5	0	11.75	17.9	19.25
15-May	112.6	111.7	113.2	117.8	116.9	118.1	112.4	111.2	113.0	116.6	115.5	118.0	115.0	21.5	39.8	179.5	186.9	11.9	21.1	0	21.62	18.7	21.66
16-May	114.0	113.7	114.4	119.7	119.2	120.7	113.7	112.9	114.3	118.3	116.8	118.8	115.0	30.3	47.7	187.4	194.3	16.0	24.4	0	29.62	20.3	27.06
17-May	114.0	113.6	114.0	120.6	119.3	121.3	113.6	113.1	114.0	118.3	118.0	118.8	115.7	26.1	44.2	186.0	197.9	14.0	22.4	0	26.81	20.7	23.8
18-May	114.7	114.5	114.9	120.6 (120.2)	119.3	120.6	113.9	113.2	114.4				116.4	28.3	29.3	185.8	197.4	15.2	14.8	0	27.97	21.1	8.19
19-May	114.6	113.6	114.1	119.9	118.9	120.0	113.8	112.9	113.8		117.5	118.3	114.5	21.1	33.6	182.8	192.4	11.7	17.3	0	21.03	20.9	12.37
20-May	113.7	113.2	114.0	119.8	119.2	120.1	113.9	113.0	114.6	117.5	115.7	117.8	115.3	19.8	31.2	187.0	196.0	10.6	15.8	0	19.78	18.7	13.02
21-May	116.6	115.9	117.4	120.9	120.4	122.0	116.7	115.2	118.2	119.2	117.3	121.3	114.9	23.2	34.9	194.5	199.9	11.9	17.3	0	22.67	19.2	15.21
22-May	115.5	115.4	115.9	120.1	119.7	121.1	116.2	115.3	116.9	118.8	117.2	119.7	117.5	32.4	30.2	193.4	204.2	16.8	14.7	0	32.72	19.8	10.2
23-May	116.3	115.7	116.6	120.9	119.8	122.2	116.0	112.1	115.6	116.9	115.7	116.2	116.8	40.2	27.4	193.7	208.6	20.4	13.0	0	39.72	20.4	6.83
24-May	115.5	114.9	116.1	121.2 (119.6)	119.1	120.6	108.8	100.3	111.4			0.0	115.6	28.1	42.7	194.6	207.0	14.5	20.7	17.6	11.2	41.8	0.29
25-May	116.9	116.4	117.0	118.8	118.5	119.0	103.0	102.3	105.6			0.0	115.9	22.1	42.4	193.4	205.0	11.5	20.7	17.6	4.59	41.6	0.63
26-May	115.9	114.1	115.0	119.2	118.3	120.7	103.4	101.3	103.3			0.0	116.0	28.6	43.1	194.1	205.0	14.6	21.1	17.6	11.43	41.4	1.4
27-May	115.7	115.3	115.9	119.3	119.0	120.0	103.1	102.0	103.8		118.2	119.0	115.3	30.2	45.2	198.4	205.1	15.2	22.1	17.6	12.72	41.2	3.92
28-May	116.8	116.0	117.1	120.3	119.8	120.9	112.1	109.4	115.5		118.7	122.1	115.4	33.0	64.5	179.6	182.3	18.1	36.0	17.6	14.93	40.8	18.62
29-May	115.1	114.2	115.7	121.2	121.0	121.6	115.8	115.2	116.4	123.6	122.6	124.7	119.4	50.3	128.5	197.6	193.9	25.6	66.2	16.4	33.95	38.4	89.84
30-May	119.0	117.5	122.3	123.3	122.5	124.1	118.4	117.4	118.9	123.7	122.0	123.6	121.3	62.1	81.0	178.2	183.1	34.9	43.8	18.3	43.81	42.4	40.68
31-May	124.9	123.9	126.4	124.8	124.4	125.8	122.0	120.9	122.6	123.1	122.6	123.5	121.4	41.4	66.2	196.0	197.2	21.2	33.5	18.4	23.43	42.8	23.1
1-Jun	125.3	119.6	125.9	126.2	125.5	126.8	121.7	121.0	122.3	124.5	123.6	125.0	121.5	70.8	75.5	216.3	220.1	32.6	34.0	18.8	50.97	43.8	32.49
2-Jun	121.3	120.7	122.2	126.3	123.5	126.6	121.7	120.5	122.1	123.3	121.8	124.8	122.2	43.8	49.6	189.1	196.9	22.3	25.4	19.4	25.32	45.4	4.96
3-Jun	120.6	119.2	121.0	121.3	120.9	121.6	120.3	117.6	119.5	121.7	120.0	122.5	120.4	28.8	46.3	200.2	205.2	14.3	22.5	18.3	10.26	43	3.69
4-Jun	117.6	116.9	117.7	120.7	119.8	121.2	117.5	116.0	117.1	120.5 (119.4)	118.6	120.2	117.4	27.1	43.4	187.3	197.4	14.6	22.0	17.9	9.84	42	1.09
5-Jun	117.0	114.4	116.1	119.8	119.0	120.0	116.2	114.7	116.0	119.3	117.8	119.0	116.3	30.4	43.7	196.2	207.3	15.3	21.1	18.2	12.18	42.8	0.75
6-Jun	114.6	113.9	114.9	119.5	117.3	118.0	115.1	113.5	114.6	118.4	116.8	118.0	116.2	24.9	43.0	178.6	187.5	14.0	23.1	18.1	6.95	42.6	1.08
7-Jun	114.6	113.6	114.3	117.3	116.9	117.6	114.1	113.3	114.2	117.7	116.4	117.5	115.5	19.4	43.1	164.5	174.0	11.7	24.7	18.2	1.38	42.8	0.17
8-Jun	113.5	113.1	113.8	117.0	116.4	117.5	113.7	112.7	114.4	117.0	115.6	117.0	114.8	21.1	40.8	166.2	174.0	12.6	23.6	16.9	3.75	40	1.08
9-Jun	113.8	113.5	114.0	118.0	117.0	119.2	113.8	113.0	114.9	116.6	115.7	117.4	114.2	21.5	39.8	174.0	183.9	12.3	21.6	16.6	4.87	39.2	0.31
10-Jun	113.5	113.2	113.6	116.6	116.1	116.9	113.8	112.1	113.1	117.3	115.9	118.4	113.4	17.0	38.5	158.0	166.6	10.7	23.2	16.2	0.86	38.2	0.24
11-Jun	113.7	113.3	113.8	118.0	116.9	118.5	114.1	112.8	114.7	118.0	116.3	118.7	115.1	16.3	35.9	145.4	155.5	11.2	23.2	15.4	0.86	36	0.15
12-Jun	115.0	114.4	115.3	117.5	115.7	117.2	114.2	113.1	113.9	118.0	109.8	116.6	115.9	12.1	24.9	128.4	139.4	9.5	18.0	12.18	0	25.57	0
13-Jun	114.8	113.1	114.1	115.8	114.9	116.0	113.2	111.8	112.4	114.9	109.8	115.4	114.7	12.6	30.2	134.0	141.0	9.5	21.4	12.6	0.03	29.8	1.24

FISH SPILL SEASON																							
2014	Rocky Reach Forebay			Rocky Reach Tailrace			Rock Island Forebay			Rock Island Tailrace			Wan FB	Average Daily Spill		Total Flow		% Flow Spilled		Rocky Reach		Rock Island	
	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	RR	RI	RR	RI	RR	RI	Fish	Other	Fish	Other
14-Jun	112.7	112.2	112.7	115.3	113.8	115.1	111.9	111.3	112.0	113.8	103.4	114.5	109.8	12.3	28.7	116.5	123.1	10.6	23.2	12.4	0	28.79	0
15-Jun	113.3	113.0	113.5	114.4	113.9	114.9	111.8	111.4	112.1	102.2	100.0	100.4	111.4	11.7	26.1	108.9	117.3	10.9	22.2	11.7	0.09	26.15	0
16-Jun	113.3	112.6	113.2	115.8	114.9	116.3	111.8	111.2	112.0	115.0	108.1	115.3	111.1	13.0	28.2	137.4	143.6	9.5	19.5	12.6	0.49	28.4	0.76
17-Jun	112.7	112.3	113.0	115.8	115.0	116.2	111.6	111.3	112.1	115.2	114.1	115.7	111.9	13.3	29.3	145.1	152.9	9.1	19.1	13.1	0.02	29.06	0
18-Jun	113.2	113.0	113.5	118.1	117.1	119.2	114.4	112.9	115.8	117.3	115.6	118.3	113.5	23.9	33.9	159.4	166.8	14.6	20.4	15.1	9.11	34	0.2
19-Jun	113.8	113.3	114.0	119.6	118.9	120.1	114.9	113.5	116.0	118.6	116.8	119.0	115.1	32.8	37.0	189.7	195.1	17.2	19.0	16	16.42	36.8	0.59
20-Jun	114.8	114.5	114.9	119.7	119.0	120.3	115.0	113.9	115.2	118.6	117.0	119.0	114.8	23.5	36.5	187.7	191.3	12.6	19.1	15.9	7.87	36.76	0
21-Jun	114.4	113.6	114.0	118.6	117.8	119.7	114.8	113.7	116.0	118.6	116.9	119.5	**115.5**	24.6	36.9	190.6	198.2	12.8	18.7	15.9	8.95	36.8	0.08
22-Jun	115.3	114.7	115.6	118.2	117.5	118.6	115.0	113.7	115.6	119.3	117.0	119.8	**116.4**	17.9	36.7	191.8	196.4	9.2	18.6	15.9	1.89	36.6	0.25
23-Jun	**115.9**	115.4	116.2	119.6	119.2	119.7	115.8	115.1	116.1	119.5	117.8	120.0	**116.8**	27.0	37.1	192.1	196.7	14.0	18.9	15.8	11.37	36.6	0.06
24-Jun	**116.2**	116.0	116.4	119.1	118.7	119.0	115.6	114.8	115.9	119.7	118.1	120.0	**116.4**	17.9	37.9	183.5	191.2	9.8	19.8	16.6	1.25	38.2	0.05
25-Jun	**116.1**	115.3	115.6	118.7	118.1	118.8	115.5 (115.3)	114.7	115.8	119.6	116.3	119.0	**117.5**	16.7	37.7	187.4	196.2	8.9	19.2	16.3	0.33	37.6	0.22
26-Jun	**117.3**	116.6	117.5	119.5	118.8	119.8	116.1	114.9	116.7	116.7	116.3	118.6	**117.4**	16.4	38.8	184.6	195.3	8.8	19.8	16.3	0.05	37.6	1.33
27-Jun	**117.5**	117.0	117.5	119.6	119.4	120.0	116.6	116.3	116.9	116.9	116.7	117.3	114.5	19.0	38.7	183.8	194.0	10.3	20.0	17	1.88	38.03	0
28-Jun	**116.6**	115.7	116.0	119.3	118.8	120.2	116.3 (115.3)	115.0	116.0	116.8	115.9	116.9	114.3	22.8	38.9	182.9	190.5	12.3	20.3	17	5.82	39	0.12
29-Jun	115.4	114.1	114.7	119.8	119.4	120.3	115.2	114.4	115.4	116.2	115.6	116.4	113.8	37.3	39.0	196.1	204.1	19.0	19.1	17	20.37	38.68	0
30-Jun	114.6	114.1	114.8	119.2	118.0	119.0	114.9	114.1	115.3	115.8	115.2	116.4	113.8	23.2	38.4	181.5	187.0	12.7	20.6	16.6	6.18	37.8	0.66
1-Jul	115.4	115.1	115.5	**120.5**	120.3	121.4	**117.5**	116.1	118.7	**121.2**	118.6	122.6	115.4	41.8	37.6	199.5	205.1	20.8	18.3	16.6	24.99	37.8	0.05
2-Jul	**117.5**	117.0	117.6	120.6 (120.4)	120.0	121.0	**117.8**	116.8	118.4	120.7 (119.8)	118.9	120.2	**118.4**	25.6	37.0	187.8	196.1	13.5	19.0	16.7	8.83	37.79	0
3-Jul	**117.5**	116.8	117.3	120.4	119.6	120.9	117.5	115.9	117.0	119.6	118.6	119.7	**117.3**	22.7	39.8	190.2	195.0	11.9	20.5	17.6	5.25	40	0.19
4-Jul	**116.4**	115.5	116.1	118.8	118.2	118.7	116.2	114.8	116.3	119.1	115.8	117.7	**116.5**	20.0	31.8	168.0	178.5	11.8	18.0	14	5.84	32.2	0.12
5-Jul	**115.6**	113.9	114.8	118.1	116.5	117.6	115.7 (113.5)	113.4	114.4	116.2	112.8	115.3	**116.1**	15.1	31.3	148.6	158.4	10.2		13.3	1.92	30.6	0.15
6-Jul	113.6	112.8	113.3	117.0	116.2	116.6	113.6	112.8	113.9	114.8	114.2	114.8	114.3	16.6	30.9	167.9	178.5	9.9	17.4	13.2	3.6	30.6	0.06
7-Jul	114.0	113.3	114.2	117.4	116.9	117.6	114.9	113.4	115.6	115.5	114.5	116.1	113.5	18.2	34.3	170.0	180.3	10.7	19.1	15	3.17	34.3	0
8-Jul	115.4	114.7	115.7	117.5	116.5	118.2	115.4	114.1	116.6	115.9	114.0	116.9	115.1	14.8	35.0	145.4	158.0	10.2	22.3	14.87	0	34.6	0.19
9-Jul	115.4	114.7	115.5	117.6	116.6	117.9	115.6 (114.4)	113.9	115.0	115.2	113.5	115.6	115.1	15.1	33.7	147.7	156.3	10.2	21.5	14.5	0.61	33.6	0.3
10-Jul	115.2	114.1	114.7	117.5	116.2	117.5	114.4	113.5	114.9	115.3	114.5	115.5	113.7	14.7	33.0	153.2	161.7	9.6	20.4	14.4	0.32	33.05	0
11-Jul	114.3	113.7	114.6	116.9	115.8	117.6	114.2	113.4	114.7	115.1	114.4	115.5	113.8	14.8	31.7	151.4	157.8	9.7	20.1	14	0.82	31.87	0
12-Jul	114.3	113.8	114.5	117.4	116.8	117.9	114.5	113.7	114.9	115.2	114.8	115.6	113.8	18.2	30.6	155.5	162.5	11.6	18.9	13.4	4.77	30.8	0.04
13-Jul	115.5	114.6	115.8	117.9	116.4	120.9	114.6	113.8	115.7	115.3	111.0	115.8	114.0	13.7	30.7	135.7	143.6	10.0	21.5	13.4	0.43	30.75	0
14-Jul	115.5	114.5	115.4	118.2	116.6	118.9	115.1	114.3	115.4	114.9	112.4	115.7	114.0	15.0	31.8	138.0	146.9	10.7	21.7	13.9	0.88	31.76	0
15-Jul	114.7	114.3	115.1	118.1	117.7	118.6	115.1	114.3	115.4	117.8	116.2	118.0	114.8	18.8	31.6	159.8	166.0	11.7	19.0	13.8	4.86	31.6	0.02
16-Jul	**115.7**	115.1	116.0	118.9	118.5	119.5	**115.9**	114.8	116.4	118.4	116.7	119.1	**115.6**	18.7	30.3	150.6	161.5	12.4	18.9	13.5	5.74	30.53	0
17-Jul	**115.8**	115.2	115.5	118.6	117.1	118.8	115.9 (114.1)	113.9	114.9	118.4	115.4	117.5	115.2	14.0	29.5	137.7	144.7	10.1	20.4	13	1.42	29.38	0
18-Jul	115.3	113.9	114.9	117.8	115.9	116.7	114.0	112.5	113.2	116.5	113.3	116.2	111.5	12.7	27.9	134.4	142.1	9.3	19.6	12.4	0.24	28.22	0
19-Jul	113.6	112.6	113.3	116.4	115.3	116.4	112.6	112.3	112.7	115.9	110.4	115.3	110.4	12.0	27.1	132.4	141.3	9.0	19.1	12	0.02	27	0.17
20-Jul	112.4	111.8	112.2	115.6	114.4	115.6	112.5	111.3	112.1	113.0	107.9	113.5	110.6	11.9	27.1	123.2	133.6	9.7	20.2	11.9	0.02	26.98	0

FISH SPILL SEASON																							
2014	Rocky Reach Forebay			Rocky Reach Tailrace			Rock Island Forebay			Rock Island Tailrace			Wan FB	Average Daily Spill		Total Flow		% Flow Spilled		Rocky Reach		Rock Island	
	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	24-hr Avg	High	12-hr Avg	RR	RI	RR	RI	RR	RI	Fish	Other	Fish	Other
21-Jul	111.8	110.7	111.5	115.1	114.1	115.2	111.2	110.4	111.6	114.4	109.1	114.8	110.4	12.9	27.7	134.0	140.9	9.5	19.7	12.2	0.63	27.8	0.14
22-Jul	110.7	110.3	110.7	115.0	114.0	115.3	111.1	110.1	110.8	113.7	108.7	114.2	110.7	13.0	27.6	129.9	136.2	10.0	20.4	12.2	0.78	27.77	0
23-Jul	111.4	111.2	111.5	115.5	115.1	115.9	111.8	111.3	112.5	115.1	112.2	115.6	111.1	17.9	28.9	142.0	149.1	12.4	19.5	12.7	3.95	28.6	0.27
24-Jul	111.4	111.1	111.4	116.4	116.4	117.5	112.4	111.6	113.1	115.1	112.4	114.6	110.4	26.3	28.2	151.3	154.9	17.4	18.1	12.5	13.74	28.37	0
25-Jul	111.1	110.9	111.3	117.6	117.2	118.2	113.9	112.9	114.3	114.9	114.2	115.1	111.9	30.4	28.2	162.2	172.0	18.5	16.5	12.6	18.47	28.54	0
26-Jul	112.8	111.9	113.2	116.7	115.6	117.1	113.5	111.6	113.6	114.6	112.2	114.7	113.3	13.1	27.3	145.0	153.0	9.1	17.9	12.1	1.02	27.32	0
27-Jul	113.0	112.3	112.9	116.7	115.5	116.8	113.1	112.3	113.0	114.0	111.0	114.3	113.2	12.6	27.1	136.5	142.3	9.2	19.0	12.1	0.37	26.96	0
28-Jul	112.7	112.3	113.2	116.1	114.9	116.5	112.6	112.0	113.4	113.9	110.0	114.6	113.2	12.3	27.1	143.1	152.2	8.6	18.0	12.2	0.1	27.4	0.61
29-Jul	113.4	112.7	113.9	116.4	115.5	117.0	113.4	112.7	114.1	114.3	110.5	115.0	113.1	12.3	27.3	138.8	145.1	8.9	18.8	12.2	0.08	27.25	0
30-Jul	113.4	112.5	113.1	116.2	115.2	116.4	113.5	112.6	113.6	114.1	107.4	114.6	112.9	12.6	28.5	125.5	130.2	10.1	21.9	12.6	0	28.4	0.14
31-Jul	112.8	112.1	112.9	115.8	115.0	116.0	113.0	112.2	113.1	113.9	109.5	114.2	112.8	13.5	28.3	137.4	144.1	9.8	19.6	12.5	0.71	28.2	0.15
1-Aug	112.5	112.0	112.7	115.5	114.8	115.8	112.7	112.2	112.9	113.9	108.5	114.0	112.8	12.2	25.4	128.8	138.1	9.5	18.4	11.2	1.06	25.2	0.15
2-Aug	112.4	111.6	112.1	115.5	114.0	115.3	112.5	111.5	112.2	113.6	105.2	113.0	112.4	12.5	25.0	114.4	123.0	10.9	20.2	11.2	1.21	25.1	0
3-Aug	111.7	111.1	111.6	114.6	113.6	114.7	111.6	111.2	111.9	108.5	102.2	112.9	112.0	12.4	25.4	107.3	113.5	11.6	22.3	11.2	1.14	25	0.3
4-Aug	111.6	111.3	111.8	114.8	114.0	115.1	112.1	111.4	112.6	108.4	104.2	113.5	112.2	12.4	26.9	116.1	119.6	10.8	22.6	12.1	0.28	26.98	0
5-Aug	111.6	111.4	111.9	115.8	114.8	117.0	112.1	111.4	112.6	108.3	104.1	113.6	112.2	16.0	26.9	122.3	122.3	12.5	22.2	12.1	3.15	27	0
6-Aug	111.5	111.2	111.5	115.7	115.0	116.1	111.9	111.3	112.5	111.4	107.0	113.8	110.4	13.7	26.3	128.4	133.1	11.0	19.9	11.9	1.53	26.58	0
7-Aug	111.3	111.0	111.5	115.1	114.7	115.5	112.0	111.1	112.5	113.1	108.3	113.7	109.9	13.0	24.8	130.8	136.3	10.1	18.2	11.2	2.18	25	0.01
8-Aug	111.3	110.8	111.2	114.8	113.6	116.1	111.9	110.6	111.1	111.8	105.3	113.0	109.6	11.0	24.0	120.6	124.9	9.4	19.3	10.7	0.39	24	0.09
9-Aug	110.9	109.9	110.7	114.3	112.7	114.2	110.8	109.9	110.8	111.7	105.1	112.7	110.2	11.2	24.2	119.5	125.8	9.5	19.3	10.6	0.58	23.96	0
10-Aug	110.3	110.0	110.5	113.3	112.4	114.2	110.5	109.9	111.0	109.2	102.8	112.6	111.1	10.4	21.9	115.6	120.7	9.2	18.4	9.3	1.15	20.8	0.75
11-Aug	111.5	110.9	112.0	114.5	113.3	115.4	111.3	110.5	111.8	110.2	105.1	112.9	111.7	10.5	21.4	124.2	127.9	8.5	16.8	9.7	0.85	21.54	0
12-Aug	111.7	111.2	111.6	114.4	113.2	114.7	111.5	111.0	111.6	110.2	103.6	112.8	111.8	10.1	21.5	115.7	120.2	8.8	17.9	9.7	0.34	21.83	0
13-Aug	111.2	110.3	110.9	113.7	111.8	114.2	111.2	110.1	110.6	106.9	101.6	112.3	110.0	9.1	20.8	107.8	109.8	8.1	18.9	9.39	0	21.02	0
14-Aug	110.2	109.5	110.0	113.1	111.8	113.2	110.3	109.1	110.2	104.9	101.5	114.0	109.5	10.3	24.8	110.6	114.6	9.4	21.7	10.3	0.41	23	1.76
15-Aug	109.4	108.9	109.3	112.3	111.1	112.5	109.2	108.8	109.5	112.1	106.9	112.6	108.9	9.4	24.7	102.7	105.7	9.0		9.43	0	22.2	2.75
16-Aug	109.0	108.7	109.5	111.9	111.2	112.5	109.0	108.6	109.3	112.5	111.6	112.9	108.6	10.2	21.6	96.4	99.0	10.6	21.7	9.8	0.3	21.46	0
17-Aug	108.8	108.4	109.9	111.6	110.6	112.4	109.0	108.2	109.1	112.5	110.0	112.4	109.6	8.7	18.4	87.7	89.4	10.0	20.5	8.4	0.45	18.24	0
18-Aug	109.8	109.0	110.2	113.9	112.4	114.7	109.5	108.8	110.5	113.8	112.5	114.4	111.0	10.5	26.1	123.5	121.8	8.7	21.5	10.4	0.25	23.2	3.27
19-Aug	110.5	110.4	110.6	114.4	113.2	115.4	110.6	110.1	111.0	114.0	112.4	119.3	110.9	10.3	31.8	117.6	122.5	9.3	31.2	10.4	0.02	23.2	10.12
20-Aug	110.4	109.3	110.0	113.8	111.9	114.5	110.6	109.3	110.3	113.4	110.4	113.7	109.5	10.4	22.4	105.2	107.6	10.2	21.0	10.3	0.3	22.45	0
21-Aug	109.0	108.4	109.1	112.7	111.4	113.4	109.3	108.4	109.4	112.8	111.4	112.9	109.2	10.6	21.8	97.0	99.3	10.9	21.8	9.9	0.73	22.1	0
22-Aug	108.4	106.7	107.4	112.1	110.5	112.2	109.1	107.7	109.2	112.5	111.1	112.6	109.1	10.2	22.0	104.6	106.4	9.8	20.6	10.1	0.06	21.8	0.18
23-Aug	106.4	106.0	107.1	110.9	110.0	111.6	107.5	106.5	107.6	111.6	109.9	111.5	108.1	9.1	19.3	104.3	106.9	8.8	17.9	9.22	0	19.45	0
24-Aug	106.4	105.9	106.3	110.6	108.9	109.8	107.2	106.7	107.5	111.3	109.2	117.4	108.0	8.0	28.2	86.7	90.0	9.7	34.9	8	0.16	18	9.92
25-Aug	105.5	104.7	105.3	109.1	104.6	107.2	106.7	105.2	106.5	110.5	106.2	120.6	109.6	0.0	12.1	96.3	101.8	0.0	16.8	0	0	0	13.03
26-Aug	105.6	105.1	105.8	105.3	104.6	105.5	104.8	104.0	105.0	105.0	103.7	104.8	109.7	0.0	0.0	111.9	115.9	0.0	0.0	0	0	0	0
27-Aug	106.2	105.8	106.5	105.7	105.3	106.1	105.5	105.0	105.9	105.2	104.8	105.6	108.7	0.0	0.0	118.1	121.7	0.0	0.0	0	0	0	0.05
28-Aug	106.3	105.9	106.3	105.7	105.3	105.6	105.5	105.1	105.8	105.3	105.0	105.6	104.5	0.0	0.0	110.1	117.6	0.0	0.0	0	0	0	0
29-Aug	105.8	105.7	105.8	105.4	104.8	105.3	105.5	104.8	105.3	105.3	104.7	106.4	103.6	0.0	0.8	91.8	95.3	0.0	0.6	0	0	0	0.26
30-Aug	105.6	105.4	105.6	104.9	104.6	105.0	104.9	104.5	105.0	104.8	104.3	105.0	103.3	0.0	0.0	92.3	94.5	0.0	0.1	0	0	0	0.46
31-Aug	105.4	104.5	105.0	104.6	103.6	104.2	104.8	103.6	104.7	104.9	103.7	109.0	103.2	0.0	1.1	86.9	91.3	0.0	1.0	0	0	0	0.63

2014 Hours of data lost at Rocky Reach and Rock Island Dams during the fish-spill season

Date	Rocky Reach			Rock Island		
	Forebay	Tailrace	Reason	Forebay	Tailrace	Reason
4/23/2014				1	2	Communication error
4/27/2014				24		Communication error
4/28/2014				12		Communication error
4/29/2014				12		Communication error
4/30/2014				15		Communication error
5/1/2014				19	1	Converted to a new data server
5/2/2014				24		Converted to a new data server
5/3/2014				24		Converted to a new data server
5/4/2014				24		Converted to a new data server
5/5/2014				24		Converted to a new data server
5/6/2014				24		Converted to a new data server
5/7/2014				24		Converted to a new data server
5/8/2014				24		Converted to a new data server
5/9/2014				10		Converted to a new data server
5/15/2014					1	Converted to a new data server
5/16/2014					9	Converted to a new data server
5/17/2014					9	Converted to a new data server
5/18/2014					24	Converted to a new data server
5/19/2014				1	1	Converted to a new data server
5/19/2014					11	Communication error
5/20/2014	1	1	Communication error	1	1	Communication error
5/23/2014				6	11	Communication error
5/24/2014				24	24	Communication error
5/25/2014				24	24	Communication error
5/26/2014				24	24	Communication error
5/27/2014				24	9	Communication error
5/28/2014				12	13	calibration
6/1/2014					1	Communication error
6/5/2014					1	Communication error
6/6/2014					1	Communication error
6/13/2014					7	Low flows
6/14/2014					18	Low flows
6/15/2014					24	Low flows
6/16/2014					11	SCADA server down
6/16/2014				1		SCADA server down
6/18/2014	1	1	calibration	1	3	calibration
6/20/2014					1	SCADA maintenance
6/23/2014					1	SCADA maintenance
7/5/2014				1	2	SCADA maintenance
7/13/2014					3	Low flows
7/14/2014					3	Low flows
7/18/2014					1	SCADA maintenance

Date	Rocky Reach			Rock Island		
	Forebay	Tailrace	Reason	Forebay	Tailrace	Reason
7/19/2014					5	Low flows
7/20/2014					10	Low flows
7/20/2014		1	SCADA maintenance			
7/21/2014					8	Low flows
7/22/2014					8	Low flows
7/23/2014					2	Low flows
7/25/2014					1	Site maintenance
7/26/2014					2	Low flows
7/27/2014					5	Low flows
7/28/2014	1		calibration		1	calibration
7/29/2014					6	Low flows
7/30/2014					11	Low flows
7/31/2014					10	Low flows
8/1/2014					9	Low flows
8/2/2014					14	Low flows
8/3/2014					19	Low flows
8/4/2014					16	Low flows
8/5/2014					16	Low flows
8/6/2014					11	Low flows
8/7/2014					8	Low flows
8/8/2014					14	Low flows
8/9/2014					14	Low flows
8/10/2014					18	Low flows
8/11/2014					13	Low flows
8/12/2014					17	Low flows
8/12/2014					1	Site maintenance
8/13/2014					17	Low flows
8/14/2014					21	Low flows
8/15/2014					10	Server patch
8/17/2014					2	Low flows
8/20/2014					4	Low flows
8/21/2014					1	Server patch
8/24/2014					4	Low flows
8/25/2014					3	Low flows
8/26/2014	1		Server patch		2	Server patch

Notes:
Calibration = probe is taken off line while calibration occurs
Communication error = probe not communicating/downloading data
Converted to a new data server (PI)= Chelan PUD upgraded to a new server to replace the old one
Low flows = with the Wanapum drawdown emergency, low flows and the carriage system of our Rock Island tailrace site, the probe was out of water
Server patch = Upgrades to the server
Site maintenance = while Chelan PUD was upgrading the carriage that holds the probe, it was disconnected
System Control and Data Acquisition (SCADA) server down = Chelan PUD's data server was down

2014 Total Dissolved Gas 110% Exceedances at Rocky Reach Dam Tailrace

Date and Time	Rocky Reach Spill	Total Flow	% Flow Spilled	% TDG
3/18/14 11:00	14.99	152.82	9.81	110.53
3/18/14 12:00	15.00	164.64	9.11	110.90
3/18/14 13:00	15.02	171.44	8.76	111.32
3/18/14 14:00	6.45	157.84	4.09	111.51
3/18/14 15:00	6.47	162.31	3.99	111.12
3/18/14 16:00	6.49	152.92	4.25	110.77
3/18/14 17:00	0.00	148.19	0.00	110.55

2014 Total Dissolved Gas 110% Exceedances at Rock Island Dam Tailrace

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/2/2014 4:00	29.05	81.07	35.83	111.84
9/2/2014 5:00	29.02	81.07	35.80	112.03
9/2/2014 6:00	26.38	81.07	32.54	112.02
9/2/2014 20:00	73.27	74.84	97.91	115.12
9/2/2014 21:00	74.68	76.19	98.02	115.8
9/2/2014 22:00	112	113.17	98.96	116
9/2/2014 23:00	72.38	113.77	63.62	118.96
9/3/2014 0:00	64.81	111.15	58.31	117.09
9/3/2014 1:00	48.59	94.17	51.60	116.19
9/3/2014 2:00	71.62	84.21	85.05	114.77
9/3/2014 3:00	48.06	51.69	92.97	116.01
9/3/2014 10:00	9.48	88.41	10.72	115.82
9/6/2014 2:00	43.43	44.92	96.69	114.03
9/6/2014 3:00	43.53	44.91	96.93	115.81
9/6/2014 4:00	43.53	44.90	96.95	115.76
9/6/2014 5:00	43.46	44.95	96.68	115.83
9/6/2014 6:00	43.48	45.01	96.60	115.9
9/6/2014 7:00	43.53	45.07	96.58	115.75
9/6/2014 8:00	43.58	45.13	96.56	115.79
9/6/2014 9:00	43.64	45.19	96.57	115.73
9/6/2014 10:00	43.69	45.25	96.55	115.9
9/6/2014 11:00	43.74	45.31	96.53	116.09
9/6/2014 12:00	43.79	45.37	96.52	116.22
9/6/2014 13:00	44.8	46.34	96.68	116.35
9/6/2014 14:00	126.03	127.35	98.96	116.43
9/6/2014 15:00	0	88.14	0.00	120.21
9/6/2014 23:00	43.93	45.36	96.85	115.75
9/7/2014 0:00	43.3	44.95	96.34	114.84
9/7/2014 1:00	43.29	44.71	96.83	114.44
9/7/2014 2:00	43.12	44.50	96.90	114.39
9/7/2014 3:00	42.87	44.29	96.79	114.3
9/7/2014 4:00	42.61	44.09	96.65	114.15
9/7/2014 5:00	42.35	43.88	96.51	114.21
9/7/2014 6:00	42.14	43.72	96.39	114.13
9/7/2014 7:00	42.06	43.59	96.49	114.08
9/7/2014 8:00	42.06	43.53	96.63	114.16
9/7/2014 9:00	42.13	43.63	96.57	114.29
9/7/2014 10:00	42.19	43.72	96.49	114.47
9/7/2014 11:00	42.26	43.82	96.43	114.69
9/7/2014 12:00	42.33	43.92	96.37	114.85
9/7/2014 13:00	42.39	44.02	96.29	114.95

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/7/2014 14:00	42.46	44.12	96.24	114.92
9/7/2014 15:00	42.53	44.22	96.18	114.99
9/7/2014 16:00	100.17	98.16	102.05	115.05
9/7/2014 17:00	0	80.07	0.00	119.13
9/7/2014 21:00	43.89	45.31	96.87	113.05
9/7/2014 22:00	43.05	44.77	96.16	115.27
9/7/2014 23:00	43.16	44.65	96.66	114.29
9/8/2014 0:00	43.22	44.59	96.92	114.14
9/8/2014 1:00	43.16	44.53	96.92	114.02
9/8/2014 2:00	43.09	44.47	96.90	114.04
9/8/2014 3:00	43.03	44.41	96.90	114
9/8/2014 4:00	42.88	44.34	96.72	114.02
9/8/2014 5:00	42.67	44.23	96.47	113.99
9/8/2014 6:00	42.99	44.47	96.67	113.87
9/8/2014 7:00	42.88	44.40	96.57	113.94
9/8/2014 8:00	42.77	44.33	96.48	113.97
9/8/2014 9:00	50.72	51.50	98.49	113.97
9/8/2014 10:00	113.18	114.71	98.67	115.33
9/8/2014 11:00	0	73.35	0.00	118.52
9/8/2014 21:00	42.83	44.34	96.58	113.63
9/8/2014 22:00	42.66	44.18	96.56	113.86
9/8/2014 23:00	43.11	44.56	96.74	113.47
9/9/2014 0:00	43.1	44.55	96.74	113.01
9/9/2014 1:00	43.09	44.55	96.73	111.87
9/9/2014 2:00	43.07	44.54	96.71	111.83
9/9/2014 3:00	43.06	44.53	96.70	111.94
9/9/2014 4:00	43.05	44.52	96.69	111.92
9/9/2014 5:00	43.03	44.51	96.67	111.99
9/9/2014 6:00	43.02	44.51	96.66	111.97
9/9/2014 7:00	43	44.52	96.58	111.95
9/9/2014 8:00	42.99	44.64	96.31	111.96
9/9/2014 9:00	44.36	45.72	97.02	112.28
9/9/2014 10:00	29.93	85.09	35.18	114.07
9/9/2014 11:00	0	67.54	0.00	111.9
9/9/2014 19:00	51.28	52.81	97.10	111.68
9/9/2014 20:00	43.38	44.90	96.61	113.13
9/9/2014 21:00	43.39	44.90	96.64	111.79
9/9/2014 22:00	43.4	44.90	96.66	112.01
9/9/2014 23:00	43.4	44.90	96.66	112.05
9/10/2014 0:00	43.41	44.90	96.68	111.98
9/10/2014 3:00	43.43	44.90	96.73	112.08
9/10/2014 4:00	43.44	44.91	96.72	112.07
9/10/2014 5:00	43.44	44.98	96.58	111.95

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/10/2014 6:00	43.44	45.04	96.44	111.92
9/10/2014 7:00	43.45	45.11	96.32	111.96
9/10/2014 8:00	45.18	45.87	98.50	112.11
9/10/2014 9:00	59.24	107.73	54.99	112.15
9/10/2014 10:00	0	75.75	0.00	113.41
9/10/2014 17:00	0	81.92	0.00	114.93
9/11/2014 0:00	44.01	45.38	96.99	111.69
9/11/2014 1:00	45.39	45.39	100.00	112.16
9/11/2014 2:00	45.39	45.39	100.00	112.41
9/11/2014 3:00	45.40	45.40	100.00	112.45
9/11/2014 4:00	45.41	45.41	100.00	112.42
9/11/2014 5:00	45.42	45.42	100.00	112.37
9/11/2014 6:00	45.44	45.44	100.00	112.39
9/11/2014 7:00	45.54	45.54	100.00	112.33
9/11/2014 8:00	45.64	45.64	100.00	112.27
9/11/2014 9:00	51.78	51.78	100.00	112.40
9/11/2014 10:00	131.27	131.27	100.00	113.79
9/11/2014 11:00	84.59	84.59	100.00	110.96
9/12/2014 0:00	41.82	43.37	96.43	111.5
9/12/2014 1:00	41.89	43.43	96.45	110.55
9/12/2014 3:00	43.51	44.87	96.97	110.87
9/12/2014 7:00	41.76	43.37	96.28	112.06
9/12/2014 8:00	43.04	44.00	97.81	111.59
9/12/2014 9:00	42.91	44.48	96.47	111.74
9/12/2014 10:00	42.94	44.66	96.16	112.23
9/12/2014 11:00	43.82	45.30	96.73	112.1
9/12/2014 12:00	44.02	45.43	96.89	112.15
9/12/2014 13:00	44.05	45.57	96.67	112.28
9/12/2014 14:00	54.58	55.97	97.52	112.31
9/12/2014 15:00	42.62	44.24	96.34	113.12
9/12/2014 16:00	44.22	45.66	96.84	113.77
9/12/2014 17:00	121.59	123.19	98.70	112.78
9/12/2014 18:00	32.2	89.38	36.02	116.45
9/12/2014 22:00	46.54	48.33	96.30	114.43
9/12/2014 23:00	46.11	47.54	96.98	113.94
9/13/2014 0:00	42.66	44.10	96.72	113.16
9/13/2014 1:00	42.61	43.92	97.02	112.91
9/13/2014 2:00	41.1	42.56	96.57	112.56
9/13/2014 3:00	41.08	42.51	96.63	112.37
9/13/2014 4:00	41.06	42.47	96.68	112.56
9/13/2014 5:00	41.03	42.42	96.72	112.56
9/13/2014 6:00	41.01	42.38	96.77	112.54
9/13/2014 7:00	40.55	42.01	96.53	112.49

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/13/2014 8:00	40.61	42.10	96.47	112.39
9/13/2014 9:00	40.67	42.19	96.41	112.56
9/13/2014 10:00	40.72	42.27	96.33	112.76
9/13/2014 11:00	40.78	42.36	96.27	113.03
9/13/2014 12:00	40.84	42.45	96.21	113.15
9/13/2014 13:00	40.9	42.54	96.15	113.23
9/13/2014 14:00	41.05	42.62	96.31	113.38
9/13/2014 15:00	44.04	45.65	96.47	113.42
9/13/2014 16:00	44.02	45.71	96.30	112.22
9/13/2014 17:00	44.1	45.77	96.34	112.19
9/13/2014 18:00	44.6	46.17	96.61	112.15
9/13/2014 19:00	44.92	46.62	96.36	112.12
9/13/2014 20:00	50.97	52.33	97.39	112.18
9/13/2014 21:00	56.19	57.60	97.55	113.02
9/13/2014 22:00	47.28	48.82	96.85	113.86
9/13/2014 23:00	47.35	48.78	97.06	113.29
9/14/2014 0:00	47.42	48.75	97.27	112.19
9/14/2014 1:00	47.49	48.71	97.49	112.11
9/14/2014 2:00	47.42	48.68	97.41	112.09
9/14/2014 3:00	47.34	48.65	97.31	111.97
9/14/2014 4:00	47.26	48.61	97.22	111.95
9/14/2014 5:00	47.18	48.58	97.12	111.94
9/14/2014 6:00	47.1	48.77	96.57	111.96
9/14/2014 7:00	43.23	44.91	96.25	111.74
9/14/2014 8:00	42.88	44.70	95.92	111.08
9/14/2014 9:00	43.14	44.68	96.55	111.01
9/14/2014 10:00	43.07	44.70	96.36	111.12
9/14/2014 11:00	43.22	44.56	97.00	111.33
9/14/2014 12:00	43.1	44.46	96.94	111.45
9/14/2014 13:00	41.22	42.70	96.53	111.72
9/14/2014 14:00	43.7	45.18	96.71	111.16
9/14/2014 15:00	43.05	44.60	96.53	111.86
9/14/2014 16:00	43.16	44.92	96.09	111.6
9/14/2014 17:00	48.53	49.85	97.35	111.46
9/14/2014 18:00	51.18	52.65	97.21	111.4
9/14/2014 19:00	51.27	52.75	97.20	111.86
9/14/2014 20:00	51.3	52.85	97.07	111.87
9/14/2014 21:00	51.34	52.95	96.96	111.85
9/14/2014 22:00	53.76	55.22	97.35	112.01
9/14/2014 23:00	53.61	55.07	97.35	112.23
9/15/2014 0:00	53.47	54.91	97.38	112.29
9/15/2014 1:00	53.32	54.75	97.38	112.39
9/15/2014 2:00	43.4	45.12	96.18	112.35

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/15/2014 3:00	43.44	45.16	96.20	111.23
9/15/2014 4:00	43.48	45.19	96.21	110.86
9/15/2014 5:00	43.52	45.23	96.23	110.74
9/15/2014 6:00	43.56	45.26	96.25	110.78
9/15/2014 7:00	43.6	45.29	96.26	110.81
9/15/2014 8:00	79.26	93.29	84.96	110.89
9/15/2014 9:00	7.82	89.33	8.75	114.41
9/16/2014 2:00	42.53	44.00	96.65	115.91
9/16/2014 3:00	37.58	39.07	96.19	115.19
9/16/2014 4:00	37.59	39.03	96.31	114.41
9/16/2014 5:00	37.6	38.99	96.43	114.3
9/16/2014 6:00	37.61	38.95	96.56	114.27
9/16/2014 7:00	37.62	38.91	96.68	114.17
9/16/2014 8:00	85.03	111.96	75.95	114.17
9/16/2014 9:00	0	88.05	0.00	112.01
9/17/2014 2:00	42.94	44.50	96.50	111.74
9/17/2014 3:00	43.03	44.70	96.27	111.04
9/17/2014 4:00	43.4	44.90	96.67	111.18
9/17/2014 5:00	43.55	45.11	96.55	111.15
9/17/2014 6:00	43.69	45.27	96.52	111.18
9/17/2014 7:00	43.82	45.33	96.66	111.16
9/17/2014 8:00	53.67	98.37	54.56	111.21
9/17/2014 22:00	44	45.50	96.70	111.64
9/17/2014 23:00	44	45.50	96.70	111.49
9/18/2014 0:00	44.01	45.50	96.72	111.74
9/18/2014 1:00	44.01	45.50	96.72	111.62
9/18/2014 2:00	44.02	45.50	96.74	111.63
9/18/2014 3:00	44.02	45.50	96.75	111.48
9/18/2014 4:00	44.03	45.50	96.76	111.48
9/18/2014 5:00	44.03	45.50	96.77	111.44
9/18/2014 6:00	44.03	45.53	96.71	111.53
9/18/2014 7:00	44.03	45.57	96.62	111.52
9/18/2014 8:00	44.03	45.62	96.52	111.49
9/18/2014 9:00	44.03	45.66	96.43	111.55
9/18/2014 10:00	44.03	45.71	96.34	111.55
9/18/2014 11:00	44.03	45.75	96.24	111.56
9/18/2014 12:00	44.98	46.45	96.82	111.7
9/18/2014 13:00	44.94	46.16	97.36	111.13
9/18/2014 17:00	44.18	47.20	93.59	111.22
9/18/2014 18:00	45.54	47.23	96.43	111.24
9/18/2014 19:00	45.64	47.26	96.57	111.11
9/18/2014 20:00	45.70	47.29	96.65	110.95
9/18/2014 21:00	45.71	47.31	96.61	110.85

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/18/2014 22:00	45.72	47.47	96.33	110.99
9/18/2014 23:00	45.74	50.30	90.93	111
9/19/2014 0:00	45.76	54.40	84.12	111.5
9/19/2014 1:00	48.61	47.52	102.30	112.11
9/19/2014 2:00	52.88	47.50	111.32	111.21
9/19/2014 3:00	46	47.49	96.87	111.03
9/19/2014 4:00	45.99	47.47	96.88	110.97
9/19/2014 5:00	45.98	47.45	96.89	111
9/19/2014 6:00	45.97	47.44	96.90	111.03
9/19/2014 7:00	45.96	47.42	96.92	111.01
9/19/2014 8:00	45.95	47.41	96.93	111.04
9/19/2014 9:00	121.05	121.36	99.75	111.1
9/19/2014 10:00	0	84.54	0.00	120.72
9/20/2014 0:00	44.69	46.29	96.54	111.47
9/20/2014 1:00	44.63	46.29	96.41	111.71
9/20/2014 2:00	44.68	46.29	96.53	111.45
9/20/2014 3:00	44.73	46.28	96.64	111.44
9/20/2014 4:00	44.77	46.28	96.74	111.42
9/20/2014 5:00	44.82	46.28	96.85	111.41
9/20/2014 6:00	44.87	46.27	96.97	111.33
9/20/2014 7:00	44.92	46.27	97.08	111.38
9/20/2014 8:00	44.97	46.28	97.16	111.42
9/20/2014 9:00	84.57	85.30	99.14	111.44
9/20/2014 10:00	0	74.06	0.00	120.29
9/21/2014 1:00	46.31	47.96	96.55	112.05
9/21/2014 2:00	45.21	46.72	96.77	112.24
9/21/2014 3:00	45.26	46.77	96.76	111.5
9/21/2014 4:00	45.31	46.83	96.76	111.37
9/21/2014 5:00	45.36	46.88	96.75	111.43
9/21/2014 6:00	45.41	46.94	96.74	111.41
9/21/2014 7:00	45.47	46.99	96.76	111.42
9/21/2014 8:00	45.52	47.05	96.75	111.42
9/21/2014 9:00	45.57	47.11	96.74	111.55
9/21/2014 10:00	74.11	75.73	97.86	111.9
9/21/2014 11:00	0	76.52	0.00	120.35
9/22/2014 0:00	45.9	47.34	96.96	111.95
9/22/2014 1:00	45.03	46.55	96.73	112.15
9/22/2014 2:00	45.05	46.58	96.72	111.56
9/22/2014 3:00	45.07	46.60	96.71	111.5
9/22/2014 4:00	45.08	46.63	96.68	111.54
9/22/2014 5:00	45.1	46.65	96.67	111.53
9/22/2014 6:00	45.12	46.68	96.66	111.52
9/22/2014 7:00	45.24	46.70	96.86	111.51

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/22/2014 8:00	102.36	106.19	96.40	111.44
9/22/2014 9:00	2.04	86.50	2.36	111.75
9/23/2014 0:00	44.5	46.10	96.53	111.94
9/23/2014 1:00	44.54	46.10	96.62	111.57
9/23/2014 2:00	44.59	46.10	96.72	111.46
9/23/2014 3:00	44.63	46.10	96.81	111.56
9/23/2014 4:00	44.67	46.12	96.85	111.57
9/23/2014 5:00	44.71	46.18	96.82	111.6
9/23/2014 6:00	44.76	46.23	96.82	111.56
9/23/2014 7:00	44.8	46.28	96.80	111.53
9/23/2014 8:00	44.96	46.53	96.62	111.53
9/23/2014 9:00	0	85.99	0.00	115.37
9/24/2014 0:00	42.11	43.63	96.52	114.3
9/24/2014 1:00	42.17	43.69	96.52	111.44
9/24/2014 10:00	49.49	51.10	96.84	110.99
9/24/2014 11:00	61.73	63.16	97.74	111.46
9/24/2014 12:00	76.66	164.78	46.52	113.21
9/24/2014 13:00	2.04	92.81	2.20	113.21
9/25/2014 0:00	43.11	44.74	96.37	112.81
9/25/2014 1:00	43.12	44.77	96.31	111.53
9/25/2014 2:00	43.13	44.81	96.25	111.01
9/25/2014 3:00	43.14	44.85	96.20	111.36
9/25/2014 4:00	43.17	44.88	96.19	111.16
9/25/2014 5:00	43.21	44.92	96.20	111.22
9/25/2014 6:00	43.26	44.95	96.23	111.25
9/25/2014 7:00	42.66	44.19	96.53	111.2
9/25/2014 8:00	33.42	45.81	72.96	111.1
9/25/2014 10:00	0	89.71	0.00	112.64
9/26/2014 1:00	42.78	44.40	96.36	111.26
9/26/2014 2:00	42.82	44.45	96.34	111.06
9/26/2014 3:00	42.85	44.50	96.30	111.02
9/26/2014 4:00	42.89	44.54	96.29	111.14
9/26/2014 5:00	42.92	44.59	96.25	111.1
9/26/2014 6:00	42.96	44.64	96.23	111.13
9/26/2014 7:00	42.99	44.69	96.19	111.14
9/26/2014 8:00	15.07	89.08	16.92	111.58
9/27/2014 1:00	47.87	49.43	96.85	111.27
9/27/2014 2:00	47.81	49.33	96.91	111.73
9/27/2014 3:00	47.75	49.24	96.97	111.85
9/27/2014 4:00	47.7	49.15	97.05	111.87
9/27/2014 5:00	47.64	49.05	97.12	111.86
9/27/2014 6:00	45.76	47.47	96.39	111.77
9/27/2014 7:00	45.74	47.47	96.35	111.4

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
9/27/2014 8:00	45.73	47.47	96.33	111.35
9/27/2014 9:00	74.28	75.02	99.01	111.45
9/27/2014 10:00	0	80.73	0.00	116.67
9/28/2014 2:00	50.77	52.21	97.23	111.67
9/28/2014 3:00	50.59	52.01	97.27	111.94
9/28/2014 4:00	50.4	51.81	97.28	111.62
9/28/2014 5:00	48.32	49.98	96.68	111.57
9/28/2014 6:00	48.14	49.49	97.28	111.3
9/28/2014 7:00	46.3	47.69	97.08	111.02
9/28/2014 8:00	45.61	47.12	96.79	110.83
9/28/2014 9:00	45.66	47.20	96.73	110.82
9/28/2014 10:00	45.71	47.29	96.67	110.88
9/28/2014 11:00	46.08	47.52	96.96	111.11
9/28/2014 12:00	46.54	48.02	96.92	111.24
9/28/2014 13:00	90.52	90.81	99.69	111.37
9/28/2014 14:00	0	94.62	0.00	115.18
9/29/2014 1:00	44.52	46.00	96.79	111.87
9/29/2014 2:00	44.5	45.99	96.75	112.16
9/29/2014 3:00	44.48	45.99	96.72	111.93
9/29/2014 4:00	44.46	45.99	96.68	111.92
9/29/2014 5:00	44.44	45.98	96.65	111.88
9/29/2014 6:00	44.42	45.98	96.61	111.92
9/29/2014 7:00	44.4	45.97	96.58	111.93
9/29/2014 8:00	27.02	112.49	24.02	113.34
9/29/2014 18:00	0	83.66	0.00	114.86
9/29/2014 23:00	41.64	43.19	96.42	110.66
9/30/2014 9:00	43.9	45.45	96.59	113.1
9/30/2014 10:00	44.17	45.63	96.81	112.07
9/30/2014 11:00	47.28	48.80	96.89	112.25
9/30/2014 12:00	47.35	48.90	96.82	112.39
9/30/2014 13:00	52.56	54.19	96.98	112.48
9/30/2014 14:00	62.36	63.76	97.81	112.77
9/30/2014 15:00	62.26	63.67	97.79	113.35
9/30/2014 16:00	55.99	57.40	97.54	113.42
9/30/2014 17:00	50.92	52.44	97.09	113.51
9/30/2014 18:00	51.02	52.53	97.12	112.72
9/30/2014 19:00	51.05	52.62	97.02	112.42
9/30/2014 20:00	51.06	52.71	96.88	112.3
9/30/2014 21:00	51.51	53.00	97.20	112.3
9/30/2014 22:00	51.96	53.32	97.45	112.4
9/30/2014 23:00	51.98	53.54	97.08	112.39
10/1/2014 0:00	49.09	50.36	97.48	112.45
10/1/2014 1:00	46.17	47.55	97.10	112.12

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/1/2014 2:00	46.02	47.43	97.03	111.55
10/1/2014 3:00	45.97	47.31	97.18	111.5
10/1/2014 4:00	45.06	46.58	96.74	111.51
10/1/2014 5:00	45.07	46.50	96.93	111.41
10/1/2014 6:00	45.07	46.42	97.09	111.29
10/1/2014 7:00	86.46	88.01	98.24	111.26
10/1/2014 8:00	0	98.00	0.00	118.84
10/2/2014 1:00	44.7	46.22	96.72	110.58
10/2/2014 2:00	44.7	46.22	96.70	110.55
10/2/2014 3:00	44.73	46.23	96.75	110.66
10/2/2014 4:00	44.75	46.24	96.78	110.72
10/2/2014 5:00	44.78	46.24	96.83	110.73
10/2/2014 6:00	44.8	46.25	96.86	110.65
10/2/2014 7:00	44.83	46.26	96.92	110.66
10/2/2014 8:00	68.76	69.73	98.61	110.69
10/2/2014 9:00	5.51	87.71	6.28	116.92
10/3/2014 2:00	46.99	48.57	96.76	111.36
10/3/2014 3:00	46.92	48.54	96.66	111.56
10/3/2014 4:00	46.85	48.52	96.56	111.67
10/3/2014 5:00	46.78	48.50	96.46	111.62
10/3/2014 6:00	46.68	48.48	96.30	111.6
10/3/2014 7:00	101.85	106.99	95.20	111.64
10/4/2014 2:00	42.39	44.04	96.26	111.08
10/4/2014 8:00	44.51	46.11	96.53	110.86
10/4/2014 9:00	44.5	46.68	95.32	110.98
10/4/2014 10:00	44.64	46.27	96.48	111.11
10/4/2014 11:00	46.92	48.31	97.13	111.09
10/4/2014 12:00	46.9	48.53	96.64	111.21
10/4/2014 13:00	54.54	55.74	97.84	111.22
10/4/2014 14:00	59.53	61.18	97.30	111.57
10/4/2014 15:00	109.55	134.20	81.63	113.94
10/4/2014 16:00	0	96.01	0.00	113.69
10/5/2014 1:00	44.13	45.70	96.57	110.59
10/5/2014 2:00	44.17	45.75	96.54	110.83
10/5/2014 3:00	44.21	45.81	96.50	110.87
10/5/2014 4:00	44.25	45.87	96.47	110.86
10/5/2014 5:00	44.29	45.93	96.44	110.72
10/5/2014 6:00	44.33	45.98	96.40	110.87
10/5/2014 7:00	54.41	55.81	97.50	110.83
10/5/2014 8:00	76.8	78.45	97.90	111.99
10/5/2014 9:00	88.48	89.88	98.45	115.57
10/5/2014 10:00	81.07	83.21	97.43	116.48
10/5/2014 11:00	51.29	52.81	97.12	116.15

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/5/2014 12:00	49.49	51.01	97.01	113.32
10/5/2014 13:00	49.27	50.74	97.10	112.34
10/5/2014 14:00	46.57	48.16	96.69	112.3
10/5/2014 15:00	93.35	92.13	101.32	113.1
10/5/2014 16:00	0	90.18	0.00	117.1
10/6/2014 4:00	48.44	49.96	96.96	111.69
10/6/2014 5:00	51.34	52.70	97.43	112.93
10/6/2014 6:00	51.34	52.83	97.17	113.19
10/6/2014 7:00	51.35	52.97	96.94	113.06
10/6/2014 8:00	104.35	102.49	101.82	113.02
10/6/2014 9:00	0	92.37	0.00	110.5
10/7/2014 3:00	45.68	47.19	96.80	111.27
10/7/2014 4:00	45.69	47.26	96.67	111.69
10/7/2014 5:00	45.7	47.34	96.54	111.69
10/7/2014 6:00	45.7	47.41	96.39	111.68
10/7/2014 7:00	36.17	118.18	30.61	112.98
10/8/2014 7:00	0	100.74	0.00	118.75
10/9/2014 6:00	45.33	47.09	96.26	112.08
10/9/2014 7:00	105.35	108.43	97.16	112.71
10/9/2014 8:00	0	98.47	0.00	113.13
10/10/2014 3:00	44.17	45.63	96.79	111.84
10/10/2014 4:00	44.18	45.65	96.78	111.85
10/10/2014 5:00	44.2	45.67	96.78	111.84
10/10/2014 6:00	44.21	45.69	96.77	111.9
10/10/2014 7:00	61.95	63.65	97.33	111.93
10/10/2014 8:00	0	96.98	0.00	116.43
10/11/2014 1:00	42.11	43.81	96.13	112.11
10/11/2014 2:00	42.11	43.79	96.16	112.3
10/11/2014 3:00	42.12	43.78	96.22	112.42
10/11/2014 4:00	42.13	43.76	96.27	112.43
10/11/2014 5:00	42.14	43.75	96.33	112.38
10/11/2014 6:00	42.14	43.73	96.36	112.35
10/11/2014 7:00	42.15	43.72	96.42	112.29
10/11/2014 8:00	42.16	43.70	96.47	112.35
10/11/2014 9:00	42.19	43.77	96.40	112.32
10/11/2014 10:00	42.21	43.84	96.28	112.37
10/11/2014 11:00	42.24	43.91	96.19	112.48
10/11/2014 12:00	42.27	43.98	96.10	112.64
10/11/2014 13:00	42.38	44.06	96.19	112.56
10/11/2014 14:00	41.41	42.84	96.66	112.56
10/11/2014 15:00	41.55	42.98	96.67	111.95
10/11/2014 16:00	41.92	43.41	96.57	111.94
10/11/2014 17:00	42.14	43.55	96.77	111.18

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/11/2014 18:00	42.35	43.94	96.39	111.31
10/11/2014 19:00	63.44	65.07	97.49	111.19
10/11/2014 20:00	64.34	65.80	97.78	113.72
10/11/2014 21:00	59.94	61.39	97.65	114.15
10/11/2014 22:00	59.33	60.77	97.64	113.64
10/11/2014 23:00	42.82	44.41	96.42	113.71
10/12/2014 0:00	45.71	45.60	100.25	111.96
10/12/2014 1:00	43.99	45.61	96.44	111.71
10/12/2014 2:00	44.06	45.53	96.78	110.55
10/12/2014 3:00	42.99	44.71	96.15	110.58
10/12/2014 4:00	43.34	44.89	96.55	111.03
10/12/2014 5:00	44.24	45.41	97.42	110.77
10/12/2014 6:00	43.67	45.19	96.63	110.88
10/12/2014 7:00	43.8	45.31	96.66	111.56
10/12/2014 8:00	43.92	45.43	96.68	111.68
10/12/2014 9:00	110.38	111.96	98.59	111.73
10/12/2014 10:00	0	88.68	0.00	113.38
10/12/2014 13:00	43.77	45.32	96.58	112.21
10/12/2014 14:00	43.73	45.27	96.59	112.38
10/12/2014 15:00	43.73	45.22	96.69	112.67
10/12/2014 16:00	59.85	58.58	102.18	112.56
10/12/2014 17:00	49.69	51.17	97.10	115.61
10/12/2014 18:00	42.36	44.05	96.16	114.46
10/12/2014 19:00	91.33	88.66	103.01	112.31
10/12/2014 20:00	0	96.73	0.00	119.28
10/13/2014 2:00	40.7	42.24	96.35	111.87
10/13/2014 3:00	43.18	44.52	96.99	111.98
10/13/2014 4:00	43.22	44.42	97.30	112.94
10/13/2014 5:00	39.02	42.17	92.53	113.17
10/13/2014 6:00	59.33	56.32	105.34	112.77
10/13/2014 7:00	0	94.80	0.00	116.74
10/14/2014 2:00	44.76	46.50	96.26	112.48
10/14/2014 3:00	43.82	45.49	96.33	112.51
10/14/2014 4:00	43.9	45.62	96.24	113.06
10/14/2014 5:00	43.99	45.74	96.17	114.66
10/14/2014 6:00	44.19	45.47	97.19	114.81
10/14/2014 7:00	44.26	45.68	96.89	113.42
10/14/2014 8:00	0	81.16	0.00	112.62
10/15/2014 3:00	42.58	44.15	96.45	111.78
10/15/2014 4:00	42.66	44.21	96.50	113.72
10/15/2014 5:00	42.74	44.26	96.56	114.19
10/15/2014 6:00	7.13	85.01	8.39	114.42
10/16/2014 1:00	41.93	43.53	96.32	112.02

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/16/2014 2:00	42.07	43.40	96.93	112.1
10/16/2014 3:00	40.68	41.99	96.87	112.18
10/16/2014 4:00	40.76	42.07	96.89	111.96
10/16/2014 5:00	40.85	42.14	96.93	112.04
10/16/2014 6:00	40.94	42.22	96.97	112.06
10/16/2014 7:00	33.54	129.70	25.86	112.15
10/17/2014 0:00	39.87	41.55	95.97	111.93
10/17/2014 1:00	39.96	41.65	95.95	111.54
10/17/2014 2:00	40.05	41.74	95.94	111.50
10/17/2014 3:00	40.31	41.84	96.35	111.48
10/17/2014 4:00	52.59	54.05	97.31	111.54
10/17/2014 5:00	52.57	54.08	97.21	113.51
10/17/2014 6:00	44.47	46.14	96.37	113.94
10/17/2014 7:00	64.8	65.41	99.07	112.43
10/17/2014 8:00	0	91.78	0.00	117.35
10/17/2014 22:00	52.32	53.59	97.63	112.10
10/17/2014 23:00	47.84	49.21	97.22	112.09
10/18/2014 0:00	46.29	47.65	97.14	112.33
10/18/2014 1:00	41.24	42.76	96.45	112.28
10/18/2014 3:00	41.52	43.08	96.38	112.15
10/18/2014 4:00	41.66	43.24	96.35	112.31
10/18/2014 5:00	41.84	43.37	96.47	112.46
10/18/2014 6:00	41.95	43.47	96.51	112.42
10/18/2014 7:00	44.58	46.25	96.39	112.4
10/18/2014 8:00	54.96	56.48	97.31	112.59
10/18/2014 9:00	54.43	56.07	97.08	113.46
10/18/2014 10:00	54.58	55.95	97.56	113.32
10/18/2014 11:00	46.13	47.52	97.07	113.03
10/18/2014 12:00	110.81	112.12	98.83	112.63
10/18/2014 13:00	0	80.00	0.00	114.38
10/18/2014 20:00	53.5	55.13	97.04	112.15
10/18/2014 21:00	47.8	49.31	96.94	112.47
10/18/2014 22:00	47.75	49.05	97.35	112.38
10/18/2014 23:00	44.02	45.56	96.62	112.25
10/19/2014 0:00	44.05	45.58	96.64	111.74
10/19/2014 1:00	44.08	45.61	96.65	111.78
10/19/2014 2:00	44.11	45.63	96.66	111.79
10/19/2014 3:00	44.14	45.66	96.67	111.84
10/19/2014 4:00	44.17	45.68	96.69	111.86
10/19/2014 5:00	44.2	45.71	96.70	111.82
10/19/2014 6:00	44.24	45.73	96.73	111.77
10/19/2014 7:00	44.27	45.75	96.76	111.71
10/19/2014 8:00	44.29	45.59	97.14	111.8

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/19/2014 9:00	44.48	45.73	97.28	111.83
10/19/2014 10:00	44.69	45.98	97.19	112.2
10/19/2014 11:00	44.69	46.14	96.85	112.36
10/19/2014 12:00	44.72	46.30	96.59	112.47
10/19/2014 13:00	44.89	46.54	96.46	112.56
10/19/2014 14:00	45.4	46.89	96.82	112.72
10/19/2014 15:00	45.44	46.97	96.75	112.74
10/19/2014 16:00	45.48	47.04	96.69	112.73
10/19/2014 17:00	45.52	47.11	96.62	112.55
10/19/2014 18:00	45.55	47.18	96.54	112.43
10/19/2014 19:00	45.66	47.32	96.49	112.34
10/19/2014 20:00	46.17	47.60	96.99	112.41
10/19/2014 21:00	46.7	48.19	96.90	112.49
10/19/2014 22:00	74.85	76.36	98.02	113.19
10/19/2014 23:00	66.57	67.91	98.02	115.85
10/20/2014 0:00	62.71	65.76	95.36	115.48
10/20/2014 1:00	45.15	46.65	96.78	114.48
10/20/2014 2:00	43.49	45.08	96.47	112.43
10/20/2014 3:00	43.5	45.09	96.47	112.37
10/20/2014 4:00	43.51	45.10	96.47	112.49
10/20/2014 5:00	43.53	45.12	96.49	112.39
10/20/2014 6:00	43.54	45.13	96.48	112.43
10/20/2014 7:00	81.77	82.84	98.70	112.41
10/20/2014 8:00	0	100.98	0.00	117.18
10/21/2014 1:00	46.64	48.03	97.10	111.58
10/21/2014 2:00	46.58	47.95	97.15	111.82
10/21/2014 3:00	46.51	47.86	97.18	112.24
10/21/2014 4:00	46.44	47.77	97.21	112.16
10/21/2014 5:00	46.37	47.69	97.24	112.12
10/21/2014 6:00	46.31	47.60	97.29	112.29
10/21/2014 7:00	58.72	60.15	97.62	112.2
10/21/2014 8:00	0	81.13	0.00	115.95
10/21/2014 22:00	46.18	47.61	96.99	112.46
10/21/2014 23:00	43.77	45.43	96.34	111.9
10/22/2014 0:00	43.79	45.43	96.40	111.8
10/22/2014 1:00	43.81	45.42	96.45	111.88
10/22/2014 2:00	43.83	45.42	96.50	111.92
10/22/2014 3:00	43.85	45.41	96.56	111.95
10/22/2014 4:00	43.87	45.41	96.61	111.82
10/22/2014 5:00	43.89	45.40	96.66	111.98
10/22/2014 6:00	43.91	45.40	96.72	111.96
10/22/2014 7:00	44.37	45.96	96.55	111.98
10/22/2014 8:00	33.46	35.76	93.56	112.02

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/22/2014 9:00	38.65	40.15	96.27	112.06
10/22/2014 20:00	44.89	46.42	96.71	112.02
10/22/2014 21:00	45.11	46.53	96.95	112.27
10/22/2014 22:00	45.27	46.63	97.07	112.67
10/22/2014 23:00	45.3	46.72	96.97	112.71
10/23/2014 0:00	45.33	46.76	96.94	112.6
10/23/2014 1:00	45.35	46.80	96.89	112.61
10/23/2014 2:00	45.38	46.85	96.87	112.52
10/23/2014 3:00	45.41	46.89	96.84	112.58
10/23/2014 4:00	45.43	46.93	96.79	112.66
10/23/2014 5:00	45.46	46.98	96.77	112.67
10/23/2014 6:00	45.44	47.02	96.64	112.68
10/23/2014 7:00	79.94	113.37	70.51	112.6
10/23/2014 8:00	0	101.31	0.00	110.67
10/23/2014 21:00	45.24	46.91	96.44	112.05
10/23/2014 22:00	45.23	46.82	96.60	112.22
10/23/2014 23:00	53.19	54.55	97.51	112.24
10/24/2014 0:00	53.32	54.70	97.48	112.77
10/24/2014 1:00	53.29	54.81	97.23	112.96
10/24/2014 2:00	53.12	54.53	97.42	112.93
10/24/2014 3:00	49.5	50.82	97.40	112.86
10/24/2014 4:00	44.98	46.38	96.98	112.35
10/24/2014 5:00	45.02	46.50	96.81	112.16
10/24/2014 6:00	45.05	46.63	96.61	112.17
10/24/2014 7:00	110.11	111.14	99.07	112.25
10/24/2014 8:00	0	89.42	0.00	115.68
10/25/2014 3:00	45.01	46.44	96.92	110.89
10/25/2014 4:00	44.96	46.55	96.58	112.33
10/25/2014 5:00	45.04	46.66	96.52	112.52
10/25/2014 6:00	45.15	46.77	96.53	112.57
10/25/2014 7:00	98.69	101.10	97.61	112.71
10/25/2014 21:00	44.75	46.26	96.74	111.94
10/25/2014 22:00	44.79	46.30	96.75	112.26
10/25/2014 23:00	44.84	46.34	96.77	112.26
10/26/2014 0:00	44.88	46.37	96.78	112.29
10/26/2014 1:00	44.92	46.41	96.78	112.37
10/26/2014 2:00	44.96	46.45	96.79	112.34
10/26/2014 3:00	45	46.49	96.79	112.28
10/26/2014 4:00	45.08	46.59	96.75	112.36
10/26/2014 5:00	45.15	46.71	96.66	112.35
10/26/2014 6:00	45.23	46.83	96.59	112.35
10/26/2014 7:00	45.3	46.94	96.50	112.4
10/26/2014 8:00	45.41	47.04	96.53	112.39

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
10/26/2014 9:00	45.48	47.08	96.59	112.37
10/26/2014 10:00	45.54	47.12	96.64	112.49
10/26/2014 11:00	45.6	47.16	96.69	112.54
10/26/2014 12:00	45.66	47.20	96.73	112.57
10/26/2014 13:00	49.38	50.67	97.46	112.84
10/26/2014 14:00	49.33	50.62	97.45	112.82
10/26/2014 15:00	49.28	50.58	97.43	112.63
10/26/2014 16:00	49.22	50.53	97.40	112.63
10/26/2014 17:00	49.17	50.49	97.38	112.61
10/26/2014 18:00	49.11	50.45	97.35	112.29
10/26/2014 19:00	48.08	49.40	97.32	112.35
10/26/2014 20:00	47.2	48.64	97.04	112.3
10/26/2014 21:00	46.71	48.25	96.81	112.22
10/26/2014 22:00	46.79	48.33	96.82	112.04
10/26/2014 23:00	46.87	48.40	96.83	112.1
10/27/2014 0:00	46.95	48.48	96.84	112.07
10/27/2014 1:00	47.03	48.56	96.85	112.12
10/27/2014 2:00	47.11	48.64	96.85	112.02
10/27/2014 3:00	47.19	48.72	96.86	112.14
10/27/2014 4:00	47.28	48.80	96.89	112.11
10/27/2014 5:00	47.37	48.88	96.92	112.14
10/27/2014 6:00	47.43	48.99	96.82	112.16
10/27/2014 7:00	47.55	49.13	96.77	112.13
10/27/2014 8:00	47.83	49.45	96.73	112.08
10/27/2014 9:00	114.7	115.75	99.09	112.25
10/27/2014 10:00	28.02	137.55	20.37	114.35
10/28/2014 4:00	45.05	46.48	96.91	112.03
10/28/2014 5:00	0.55	85.92	0.64	112.16
10/28/2014 23:00	53.89	55.39	97.29	113.15
10/29/2014 0:00	50.93	52.39	97.21	112.42
10/29/2014 1:00	50.8	52.21	97.31	112.25
10/29/2014 2:00	43.22	44.81	96.45	112.2
10/29/2014 3:00	43.26	44.86	96.44	111.66
10/29/2014 4:00	43.3	44.90	96.43	111.59
10/29/2014 5:00	43.34	44.95	96.42	111.61
10/29/2014 6:00	43.38	45.00	96.41	111.6
10/29/2014 8:00	17.81	103.52	17.20	114.74
11/2/2014 1:00	43.53	45.20	96.30	111.18
11/2/2014 2:00	43.59	45.20	96.43	111.58
11/2/2014 3:00	43.66	45.20	96.59	111.78
11/2/2014 4:00	43.72	45.20	96.72	111.75
11/2/2014 5:00	43.79	45.20	96.88	111.77
11/2/2014 6:00	54.56	56.06	97.33	111.87

Date and Time	Rock Island Spill	Total Flow	% Flow Spilled	% TDG
11/2/2014 7:00	48.04	49.42	97.22	112.68
11/2/2014 8:00	42.88	44.81	95.69	112.26
11/2/2014 9:00	42.74	44.34	96.40	111.91
11/2/2014 10:00	42.67	44.27	96.38	111.55
11/2/2014 11:00	42.6	44.21	96.36	111.69
11/2/2014 12:00	42.54	44.14	96.37	111.72
11/2/2014 13:00	42.47	44.08	96.35	111.67
11/2/2014 14:00	42.4	44.01	96.33	111.58
11/2/2014 15:00	42.41	43.95	96.50	111.49
11/2/2014 16:00	42.43	43.88	96.69	111.47
11/2/2014 17:00	42.45	43.93	96.63	111.41
11/2/2014 18:00	42.47	43.97	96.58	111.32
11/2/2014 19:00	42.49	44.02	96.53	111.42
11/2/2014 20:00	42.51	44.06	96.48	111.49
11/2/2014 21:00	42.53	44.11	96.43	111.42
11/2/2014 22:00	42.55	44.15	96.37	111.49
11/2/2014 23:00	42.71	44.23	96.57	111.39
11/3/2014 0:00	45.92	47.52	96.63	111.42
11/3/2014 1:00	45.94	47.56	96.59	111.95
11/3/2014 2:00	45.95	47.60	96.53	111.87
11/3/2014 3:00	46.05	47.65	96.65	111.87
11/3/2014 4:00	46.19	47.69	96.86	111.85
11/3/2014 5:00	46.34	48.00	96.54	111.88
11/3/2014 6:00	110.33	111.71	98.77	112.37
11/3/2014 7:00	0	121.54	0.00	115.56
11/4/2014 2:00	43.91	45.57	96.35	111.6
11/4/2014 3:00	55.48	56.96	97.39	112.61
11/4/2014 4:00	54.82	56.40	97.20	113.14
11/4/2014 5:00	96.63	98.26	98.34	112.55
11/4/2014 6:00	0	113.58	0.00	114.24

2014 Hours of data lost at Rocky Reach and Rock Island Dams during the non fish-spill season

Date	Rocky Reach			Rock Island		
	Forebay	Tailrace	Reason	Forebay	Tailrace	Reason
1-Jan				24		Communication error
2-Jan				11		Communication error
7-Jan					1	Communication error
20-Jan	1	1	SCADA server down	1	1	SCADA server down
27-Feb					6	Low flows
28-Feb					24	Low flows
24-Feb					2	Communication error
1-Mar					24	Low flows
2-Mar					24	Low flows
3-Mar					24	Low flows
4-Mar					24	Low flows
5-Mar					24	Low flows
6-Mar	1	1	Server patch		24	Low flows
7-Mar	1	1	Communication error		23	Low flows
7-Mar					1	Communication error
8-Mar					5	Low flows
11-Mar					3	Low flows
12-Mar				3		Communication error
13-Mar				14		Communication error
24-Mar					2	Communication error
3-Sep					5	Low flows
5-Sep					11	Low flows
12-Sep					3	Low flows
22-Sep					1	Server patch
25-Sep					1	Low flows
1-Oct					3	Low flows
7-Oct	3	3	Server test		1	Calibrations
7-Oct					1	Low flows
8-Oct					5	Low flows
9-Oct	2	2	Server test		3	Low flows
13-Oct	5	5	Server test			
14-Oct					1	Server patch
20-Oct	2	2	Server test			
22-Oct					1	Server patch
24-Oct					1	Server patch
28-Oct				1		Server patch
29-Oct					1	Server patch
30-Oct					2	Server patch
5-Nov					1	Server patch
6-Nov	1		Server patch			
12-Nov					1	Server patch

Date	Rocky Reach			Rock Island		
	Forebay	Tailrace	Reason	Forebay	Tailrace	Reason
13-Nov	1	1	Server patch		1	Server patch
25-Nov		1	Calibration	2	2	one hour of calibration, one hour of server test

Notes:
Calibration = probe is taken off line while calibration occurs
Communication error = probe not communicating/downloading data
Converted to a new data server (PI)= Chelan PUD upgraded to a new server to replace the old one
Low flows = with the Wanapum drawdown emergency, low flows and the carriage system of our Rock Island tailrace site, the probe was out of water
Server patch = Upgrades to the server
Site maintenance = while Chelan PUD was upgrading the carriage that holds the probe, it was disconnected
System Control and Data Acquisition (SCADA) server down = Chelan PUD's data server was down

APPENDIX D: 2014 FISH SPILL NOTIFICATION

ANCHOR QEA

720 Olive Way, Suite 1900
Seattle, Washington 98101
Phone 206.287.9130
Fax 206.287.9131
www.anchorqea.com

DRAFT MEMORANDUM

To:	Rock Island HCPs Coordinating Committee	**Date:**	May 12, 2014
From:	Michael Schiewe, Chair		
Cc:	Kristi Geris, Tom Kahler		
Re:	Draft Minutes of the April 14, 2014 HCPs Coordinating Committees Conference Call		

The Rock Island Hydroelectric Projects Habitat Conservation Plan (HCP) Coordinating Committee met by conference call on Monday, April 14, 2014, from 9:00 am to 9:30 am. Attendees are listed in Attachment A of these meeting minutes.

ACTION ITEM SUMMARY

- Lance Keller will verify that the estimated 4- to 5-foot clearance located between the bulkhead gate and the fishway wall is not constructed any narrower (Item II-A).

DECISION SUMMARY

- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to alter the location of the Rock Island left bank adult fishway modifications from the third slot to the first slot (Item II-A).
- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to extend the ladder outage at the Rock Island left bank adult fishway from April 15 to April 22, 2014 (Item II-B).
- The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to shift spring spill at Rock Island Dam from the left fish ladder to Powerhouse 1 on April 17, 2014, in the interest of safety for the construction crew working in the immediate area of the left fish ladder (Item II-C).

AGREEMENTS

- There were no agreements discussed during today's conference call.

I. Welcome

Mike Schiewe welcomed the Rock Island HCP Coordinating Committee. He said the purpose of this call is to obtain approval of: 1) a slight modification to the Rock Island Left Bank Adult Fishway Denil Plan; 2) an extended outage for the Rock Island left bank adult fishway; and 3) a slight deviation from Chelan PUD's 2014 Fish Spill Plan and Rock Island Interim Fish Passage Plan (IFPP).

II. Chelan PUD

A. Rock Island Left Bank Adult Fishway Denil Plan (Lance Keller)

Lance Keller said that a revised Rock Island Left Bank Adult Fishway Denil Plan was distributed to the Rock Island HCP Coordinating Committee by Kristi Geris late Friday, April 11, 2014. He explained that Chelan PUD's engineering and construction teams were concerned with the planned anchoring of the Rock Island left bank adult fishway denil, resulting in a slight modification to the original denil plan.

Keller said that the original plan was to utilize the third slot to install the denil extension, which involved anchoring the rest box and denil to the bedrock by drilling a 12-inch-diameter post into the bedrock. It was estimated that this could be accomplished by a driller from a mobile floating rig. However, when the drilling contractor investigated the site, he indicated that only a 10-inch-diameter post could be installed with the existing equipment. The driller said that a larger post would require the use of a larger crane to complete the work, which Keller indicated was not feasible because the area is too narrow. Keller said that Chelan PUD's engineering and construction teams raised concerns about the soundness and firmness of the anchored rest box and denil with the smaller post.

As an alternative, Keller said that Chelan PUD's engineering and construction teams suggested installing the denil in the first slot, but continue to modify the third slot to be used as an additional entrance. Keller said that the revised design allows the use of different anchoring and structural support in the tailrace, while continuing to provide the availability of the original two slots for the left bank adult fishway when tailwater elevations provide passage via the original ladder entrances. Keller said that the third slot will also be used as

the entrance during modifications to the first slot. He said that there will be no changes to the actual structures, with the exception of minor adjustments to the weir box; he added that fish attendants will still adjust flows based on tailwater elevation. He also noted that the revised plan moves away from drilling and mounting piers in the tailrace; instead, the denil extension will be mounted to I-beams that will be installed on existing infrastructure. Keller said that Chelan PUD's engineering and construction teams are more confident with the revised plan. He said that work on the third slot (right bank fishway) will be completed during nighttime hours in order to provide fish passage during all daytime hours. He said that when the denil structure is installed, a bulkhead and slide gate installed in the third slot will divert flow to the other entrances. He said that fish passage at the left bank fish ladder would be available 24 hours a day, 7 days a week during construction.

Bryan Nordlund asked if the denil extension will be outside of the turbine boil, and Keller indicated that it will be. Keller added that the extension will be on the ladder side of the turbine boil, upstream of the turbine boil. Nordlund also noted on the revised plan the area between the bulkhead gate and the fishway wall with an estimated 4- to 5-foot clearance that appears to be a potential pinch point, and he wanted to confirm that the area is not made any narrower. Keller said that he will verify those specifications. Keith Truscott added that deadspace in the west end of the upper rest box can also be eliminated in the back corner with an inside radius to turn the flow and adults. Nordlund asked, regarding the three slotted gates, for confirmation that the area around the gate closest to the powerhouse where the denil structure will be located (near the rectangle with an elevation of 547 feet) will not interfere with flow. Keller said that the area is part of the stabilization of the dam, and is out of the way of normal fishway operations. He added that these concrete structures are what the denil will be anchored to.

Kirk Truscott also noted the area with the 4- to 5-foot clearance where one point indicates "547 or add floor (non-removable)," and then just downstream from that point is "559.13." He asked if the invert elevation of that section of the ladder is 547 feet, if the "559.13" location is a deep pool, and if so, if that area could be turbulent. Keller explained that "559.13" is the elevation of the weir box, and the downstream concrete elevation is 547 feet. He said the plan is to fill that area to make the transition more fluid and linear. Nordlund

asked if Chelan PUD was planning to request approval for filling that area, and Keller replied no, that he believes that was a design note for the engineers to indicate there is a height difference there. Nordlund said he would prefer that the elevation remain at 547 feet opposed to adding to it.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to alter the location of the Rock Island left bank adult fishway modifications from the third slot to the first slot.

B. Rock Island Left Bank Adult Fishway Extended Outage (Lance Keller)

Lance Keller said that components of the revised Rock Island Left Bank Adult Fishway Denil Plan will require a longer ladder outage. He said that Chelan PUD's engineering and construction teams estimate that construction will require an outage until April 22, 2014 (the original target date was April 15, 2014). He said that the ladder can be re-watered on April 15, 2014, but once the needed parts arrive, the ladder would need to be dewatered and a fish rescue performed again. Keller suggested that it would be better for fish to keep the ladder out of service so it does not need to be taken out of service during the spring adult migration. He said if work is completed ahead of schedule, the ladder would be brought back online as soon as possible. Bryan Nordlund asked if this means there will be no fish passage at the left bank fish ladder until April 22, 2014, and Keller said that that was correct. Kirk Truscott asked if spring passage at the left bank ladder was de minimis anyway, and Keller said that was also correct.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to extend the ladder outage at the Rock Island left bank adult fishway from April 15 to April 22, 2014.

C. Rock Island Right Bank Adult Fishway Extension and Spring Spill (Lance Keller)

Lance Keller recalled that the installation of the denil structure at the tailrace entrance at the right bank adult fishway was completed at Rock Island Dam. He said that the construction crew is now working on the left powerhouse entrance at the right bank adult fishway, which is on schedule to be completed as planned by April 17, 2014. He said this is significant

because this is also the date that spring fish spill starts at Rock Island Dam. He said that per Chelan PUD's 2014 Fish Spill Plan and Rock Island IFPP, the over-under gates and notched gates are both to be used for spring spill. However, due to the location of the left powerhouse and the over-under and notched gates, dam operators have indicated that those gates will not be used because of safety concerns for the barge crew working in that area. Keller said that on April 17, 2014, dam operators instead plan to shift the 10% spill away from that area to Powerhouse 1. He added that this shift will likely result in more than 10% spill for that day.

The Rock Island HCP Coordinating Committee representatives present approved Chelan PUD's request to shift spring spill at Rock Island Dam from the center fish ladder to Powerhouse 1 on April 17, 2014, in light of safety considerations for the construction crew working in the immediate area of the left fish ladder.

List of Attachments

Attachment A List of Attendees

Attachment A
List of Attendees

Name	Organization
Mike Schiewe	Anchor QEA
Kristi Geris	Anchor QEA
Keith Truscott	Chelan PUD
Lance Keller*	Chelan PUD
Keith Truscott*	Chelan PUD
Todd West	Chelan PUD
Kirk Truscott*	Colville Confederated Tribes
Bryan Nordlund*	National Marine Fisheries Service
Scott Carlon*	National Marine Fisheries Service
Jim Craig*	U.S. Fish and Wildlife Service
Steve Lewis	U.S. Fish and Wildlife Service
Jeff Korth*	Washington Department of Fish and Wildlife
Bob Rose*	Yakama Nation

Notes:
* Denotes Coordinating Committees member or alternate

From: Hemstrom, Steven [mailto:steven.hemstrom@chelanpud.org]
Sent: Friday, May 23, 2014 2:43 PM
To: Kristi Geris; Mike Schiewe
Cc: Keller, Lance; Mosey, Thad; Truscott, Keith; Smith, Michelle
Subject: Chelan PUD to initiate fish spill at Rocky Reach and increase spill to 20% at Rock Island tonight, May 23, at midnight

Hi Kristi – Would you please forward this message to the HCP CC regarding Chelan PUD's start of summer spill at Rocky Reach and Rock Island tonight, thank you.

Chelan PUD will start Rocky Reach summer spill at 9% of day average river flow, tonight at midnight (May 24, 00:00).

Chelan PUD will also start the summer spill level at Rock Island, increasing from the spring spill level of 10% up to the 20% summer level, tonight at midnight.

Subyearling Chinook are showing now in the Rocky Reach Bypass System index count for the first time this morning from releases at the Wells Hatchery which started May 16 - 480,000 subyearlings, with approx 50% of release completed - and an additional 256,676 subyearlings from Chief Joe Hatchery which were released in the evening on May 21.

Please call or send an email if you have any questions on the Program.
Thank you.
Steve

From: Keller, Lance [mailto:Lance.Keller@chelanpud.org]
Sent: Monday, August 25, 2014 11:46 AM
To: Kristi Geris
Cc: Mosey, Thad; Hemstrom, Steven
Subject: End of summer fish spill at Rocky Reach and Rock Island on Sunday 8/24/2014 at midnight

Hello HCP CC,

On Sunday, August 24, 2014, juvenile bypass counts of subyearling Chinook at both Rocky Reach and Rock Island achieved their third day of counts ≤ 0.3% of their 2014 cumulative index counts in a consecutive five day block. Passage percentage estimations from DART were also in excess of 95% at Rocky Reach (99.7%) and Rock Island (99.0%). With all of the criteria needed to end fish spill at Rocky Reach and Rock Island being met, fish spill ended at Rocky Reach and Rock Island on Sunday, August 24, 2014 at midnight.

If you have any questions, please feel free to let me know. I will also be providing an update on this subject at tomorrow's HCP CC meeting.

Lance Keller
Fisheries Biologist II
Chelan County PUD #1
Office: 509-661-4299
Cell: 509-669-8722
E-mail: lance.keller@chelanpud.org

APPENDIX E: 2014 TOTAL DISSOLVED GAS ABATEMENT PLAN ROCKY REACH HYDROELECTRIC PROJECT

http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/42631.pdf

APPENDIX F: 2014 TOTAL DISSOLVED GAS ABATEMENT PLAN ROCK ISLAND HYDROELECTRIC PROJECT

http://www.chelanpud.org/departments/licensingCompliance/rr_implementation/ResourceDocuments/42631.pdf

APPENDIX G: RESPONSE TO COMMENTS

Department of Ecology Comment	Chelan PUD Response
Ecology did not have any comments on the draft, other than to update the annual report with the non fish-spill data through December 15, 2014.	The annual report has been updated with the non fish-spill data through December 15, 2014.