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Via Electronic Filing May 30, 2013

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 1st Street N.E.
Washington, D.C. 20426

Subject: **Wells Hydroelectric Project – FERC Project No. 2149**

2012 Aquatic Settlement Agreement Annual Report and 2012 Aquatic Settlement Agreement Management Plan Reports

Dear Secretary Bose:

Public Utility District No. 1 of Douglas County, Washington (Douglas PUD), licensee for the Wells Hydroelectric Project No. 2149 (Wells Project) respectfully submits the attached annual report of activities conducted during calendar year 2012 in compliance with Article 406 of the FERC license for the Wells Project, section 6.4 of the Clean Water Act section 401 Water Quality Certification (401 Certification) and section 11.7 of the Aquatic Settlement Agreement (ASA).

Article 406 of the license requires Douglas PUD to file with the FERC an annual report documenting the results of studies and measures completed during the previous calendar year pursuant to the Aquatic Settlement Agreement's White Sturgeon Management Plan (WSMP), Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), Resident Fish Management Plan (RFMP), Aquatic Nuisance Species Management Plan (ANSMP), and Water Quality Management Plan (WQMP) as required in whole or in part by Ordering Paragraph F and Appendix C, Ordering Paragraph G and Appendix D, and Ordering Paragraph H and Appendix E. The final ASA Annual Report for Calendar Year 2012 is attached as Appendix A to this letter. The final ASA Management Plan Reports for Calendar year 2012 are attached as Appendix B to this letter.

Article 406 of the license also requires Douglas PUD to provide documentation of consultation with the parties to the ASA plus the National Marine Fisheries Service (NMFS) and the Bureau of Indian Affairs (BIA).[1] Towards meeting these requirements, these agencies and tribes were provided an opportunity to review, provide comment and approve the annual report and six management plan reports. The pre-filing consultation record documenting the review and approval of the ASA annual report and annual management plan reports can be found in Appendix C to this letter.

[1] The signatory parties to the Aquatic Settlement Agreement include the United States Fish and Wildlife Service, Bureau of Land Management, Washington State Department of Ecology, Washington State Department of Fish and Wildlife, the Confederated Tribes of the Colville Reservation, the Confederated Tribes and Bands of the Yakama Nation, and Douglas PUD. The BIA is currently a non-voting observer within the ASA process.

In addition to meeting the requirements of Article 406 of the FERC license, the enclosed ASA annual report and associated management plan reports were developed to meet the requirements of section 6.4, 6.6 and 7 (b) of the 401 Certification, section 11.7 of the ASA and section 4.0 within each of the six aquatic resource management plans contained within the ASA.

If you have any questions or require further information related to the attached documents, please feel free to contact me at (509) 881-2208 or sbickford@dcpud.org.

Sincerely,

Shane Bickford
Natural Resources Supervisor

Enclosures:

(1) Appendix A – Annual Report Calendar Year 2012 Activities under the Aquatic Settlement Agreement for the Wells Hydroelectric Project, pg. 1-682.
(2) Appendix B – Aquatic Settlement Agreement 2012 Management Plan Reports, pg. 683-829.
(3) Appendix C – Pre-filing Consultation Record supporting the approval of the 2012 Aquatic Settlement Agreement Annual Report & 2012 Aquatic Settlement Agreement Management Plan Reports, pg. 830-853.

Cc: Mr. Douglas Johnson – FERC, Portland
Mr. Erich Gaedeke – FERC, Portland
Aquatic Settlement Work Group
Mr. Andrew Gingerich – Douglas PUD
Mr. Chas Kyger – Douglas PUD

APPENDIX A
ANNUAL REPORT CALENDAR YEAR 2012
ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT

ANNUAL REPORT CALENDAR YEAR 2012 ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT WELLS HYDROELECTRIC PROJECT FERC LICENSE NO. 2149

Prepared for

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April 2013

TABLE OF CONTENTS

List of Tables

List of Appendices

1 INTRODUCTION

The Wells Hydroelectric Project (Wells Project) is owned and operated by Public Utility District (PUD) No. 1 of Douglas County (Douglas PUD). The Aquatic Settlement Agreement (Agreement) for the relicensing of the Wells Project (Federal Energy Regulatory Commission [FERC] License No. 2149) was signed by Douglas PUD's commissioners on January 19, 2009, following the receipt of signatures from the Confederated Tribes of the Colville Reservation (CCT; November 10, 2008), Washington State Department of Ecology (Ecology; November 18, 2008), and Washington Department of Fish and Wildlife (WDFW; November 20, 2008). The Yakama Nation (YN) signed the Agreement on February 24, 2009; the U.S. Fish and Wildlife Service (USFWS) signed the Agreement on July 23, 2009; and the Bureau of Land Management (BLM) signed the Agreement on November 13, 2009. These signatory entities are collectively referred to as the Parties. Preparation of this report was funded by Douglas PUD as a requirement of the Agreement, and it is the fourth annual report to be developed for activities accomplished under the Agreement, covering the period from January 1, 2012, to December 31, 2012.

The Agreement is intended to resolve all aquatic resource issues related to compliance with all federal and state laws applicable to the issuance of a new operating license for the Wells Project that are not already addressed by the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Wells Project (HCP 2002), or other related agreements. The Agreement is the culmination of 3 years of collaborative discussions with stakeholders related to relicensing that began in March 2006.

The six Aquatic Resource Management Plans (White Sturgeon Management Plan, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, Aquatic Nuisance Species Management Plan, and Water Quality Management Plan) contained in Attachments B through G, respectively, of the Agreement, together with the HCP, function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act (CWA) Section 401 Water Quality Certification for the Wells Project. As of the effective date of the Agreement, pursuant to Section 5 of the Agreement (Term of License and this Agreement), the Parties agreed that the measures set forth in the Aquatic Resource Management Plans are adequate to identify and address Wells Project impacts to Aquatic Resources and are expected to achieve the goals and objectives set forth in each of the six

Aquatic Resource Management Plans. However, during the course of the New Operating License, there may be instances where the measures found in individual management plans may need to be adapted. In these instances, "Adaptive Management" as it is defined in the Agreement will be used to achieve the biological goals and objectives.

On December 18, 2009, Douglas PUD filed with FERC the Draft License Application (DLA) for the new operating license, which included this Agreement. A Final License Application (FLA) was filed with FERC on May 27, 2010, and included a Joint Offer of Settlement related to this Agreement by the Parties. Subject to the reservations of authority in Section 13 (Reservations of Authority) of the Agreement, the Agreement establishes Douglas PUD's obligations for the protection, mitigation, and enhancement of aquatic resources affected by Wells Project operations under the new operating license, as well as its obligations to comply with all related federal and state laws applicable to the issuance of the new operating license for the Wells Project. The Agreement also specifies procedures to be used by the Parties to ensure that the new operating license is implemented consistent with the Agreement and other laws.

In October 2011, FERC released the Final Environmental Impact Statement for the Wells Project license. In February 2012, Ecology issued the final CWA Section 401 Certification which included all HCP and Agreement measures, plus additional measures for monitoring temperature and dissolved gas, as recommended by Ecology. The final Biological Opinions under Section 10 of the Endangered Species Act (ESA) from USFWS and the National Marine Fisheries Service (NMFS) were filed with FERC on March 19, 2013, and March 7, 2012, respectively.

On November 9, 2012, FERC issued Douglas PUD their new Wells Project license (Appendix C). The term of the new license is 40 years. With the Priest Rapids Project and the Rocky Reach Project licenses both expiring in 2052, FERC concluded that it would be practical to put all three projects on a license term that coincides with the expiration of the Rocky Reach HCP (i.e., in 2052 or in 40 years)[1]. In addition, FERC's financial analysis determined that Douglas PUD settlement measures bound Douglas PUD to moderate measures for fish and

[1] Rock Island Project's license term expires in 2028, and thus could not be synchronized with the other projects.

wildlife and therefore not justifying a lengthier license term. The new license also stipulates additional review and approval processes that will affect timing and scheduling of project activities. In December 2012, Douglas PUD filed a request for re-hearing on the basis that the HCP was inappropriately left out of the economic analysis and must be considered when determining the cost of the measures that are authorized in the new license. Furthermore, the HCP expiration date was inappropriately stated in the license as 2052, when in fact it expires in 2054; and various state and federal agencies and affected tribes have expressed concerns that relicensing three of the four major Mid-Columbia River dams at the same time will pose an undue burden, will result in significant delay, and will not be in the public's best interest. It was also noted that the Wells HCP contains provisions that allow the agreement and its terms to be extended to match the term of the next long-term license, should the new license term extend beyond 2054.

2 PROGRESS TOWARD IMPLEMENTING THE AGREEMENT AND THE AQUATIC RESOURCE MANAGEMENT PLANS

Section 11.7 of the Agreement requires preparation of an annual report that includes all relevant materials associated with Agreement activities during the year. The following subsections describe activities that were implemented during 2012 in accordance with the Agreement and Aquatic Resource Management Plans.

2.1 2012 Aquatic Settlement Agreement Decisions, Agreements, and Milestones

In 2012, Douglas PUD completed actions required by their White Sturgeon, Bull Trout, Water Quality, Pacific Lamprey, Aquatic Nuisance Species (ANS), and Resident Fish Management Plans, as outlined in the 2012 Aquatic Settlement Agreement Action Plan (Appendix D).

Decisions, agreements, and milestones reached by the Aquatic Settlement Work Group (Aquatic SWG) during 2012 that are related to the Agreement are shown in Table 1 and are documented in the Aquatic SWG meeting minutes (Appendix A).

Table 1
2012 Summary of Decisions, Agreements, and Milestones – Aquatic SWG

Aquatic SWG Decisions, Agreements, and Milestones	Meeting Date
The 2012 Wells Aquatic Settlement Agreement Action Plan was approved by Aquatic SWG representatives present.	April 11, 2012
The Wells White Sturgeon Offspring Collection Plan statement of agreement was approved with incorporation of edits by Aquatic SWG representatives present.	June 14, 2012
The 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan was approved by Aquatic SWG representatives present.	October 10, 2012
The Aquatic SWG representatives present agreed to the proposed picketed lead modifications and count window improvements scheduled for the winter of 2012 to 2013.	November 13, 2012

2.1.1 White Sturgeon

In August 2010, the Aquatic SWG began working with Douglas PUD to develop a draft Request For Proposals (RFP), which would address implementation of the artificial propagation program identified in Phase 1 of the Wells Project White Sturgeon Management Plan. Douglas PUD indicated that after the Aquatic SWG approves the RFP, Douglas PUD will need to submit it to FERC for approval, along with the Supplementation Plan, prior to implementation of the program. Douglas PUD planned to implement the Wells Project White Sturgeon Management Plan in the first year following issuance of the new Wells Project Operating License with the stocking of juvenile white sturgeon subsequently scheduled to begin in Year 2 of the new license (2014), requiring collection of white sturgeon broodstock or larvae in 2013. On September 14, 2011, the Aquatic SWG recommended that Douglas PUD proceed with finalizing the RFP. On October 20 and 27, 2011, Douglas PUD advertised the RFP in local newspapers with a November 30, 2011 deadline for proposals.

In response to the RFP, Douglas PUD received two proposals, one from the YN, and one from the CCT and Golder Associates. At the December 12, 2011 Aquatic SWG meeting, Douglas PUD opened discussion regarding the technical merit of the two proposals. Douglas PUD indicated that both proposals had strengths and weakness and said that they were willing to support either proposal recommended by consensus of the Aquatic SWG. The Aquatic SWG agreed to review the proposals and, beginning with the January 9, 2012 meeting, to work toward selecting a preferred proposal. The selection of a proposal in early 2012 would allow for early implementation of broodstock collection activities in 2012 rather than in 2013, as required in the Wells Project White Sturgeon Management Plan.

In January 2012, the Aquatic SWG continued discussion of the YN and the CCT white sturgeon supplementation program proposals; the discussions included presentations by both proposal sponsors and a review of their attempts to consolidate their approaches into a joint proposal. After three months of intensive discussions, the Aquatic SWG was unable to reach consensus on a single white sturgeon broodstock collection plan for implementation in 2012. As a result, the early implementation of the White Sturgeon Management Plan was temporarily placed on hold until either a new license was issued or the Aquatic SWG could agree upon a broodstock/gamete collection plan.

In May 2012, Douglas PUD introduced a statement of agreement (SOA) to the Aquatic SWG to implement a multifaceted strategy for the collection of white sturgeon offspring in 2013, including the implementation of wild larval collection and adult broodstock collection. The proposed SOA met the goals and objectives of the White Sturgeon Management Plan, and also addressed the concerns and uncertainties that that were debated in early 2012. In June 2012, after several modifications and revisions by Douglas PUD, WDFW, the YN, and the CCT, the Aquatic SWG approved the Wells White Sturgeon Offspring Collection Plan SOA for implementation in 2013. White sturgeon contract development for 2013 is now underway between Douglas PUD, the YN, and the CCT to collect broodstock, fertilized eggs, and larval fish in June and July 2013. Hatchery modifications for rearing juvenile white sturgeon are also planned as a part of the Wells Hatchery modernization, and are expected be complete in time for the arrival of white sturgeon in 2013.

2.1.2 Installation of Half-duplex Passive Integrated Transponder Tag Detectors

In 2004, 2007, and 2008, adult lamprey passage evaluations were conducted using radio telemetry (RT) at the default, 1.5-foot head differential fishway operating condition at Wells Dam. Results indicated that once lamprey made it past the sills in the fishway entrances, approximately 90 percent remained in the fishway and proceeded up the ladder.

In 2009 and 2010, Douglas PUD investigated lamprey passage at Wells Dam fishways using Dual-Frequency Identification Sonar (DIDSON) camera technology. In 2009, both fishways entrances were monitored and passage was evaluated at the 0.5-, 1.0-, and 1.5-foot head differentials. Tests were conducted from 9:00 pm to 1:00 am, on August 21, 2009, through September 23, 2009. In 2010, fish passage was monitored once again at both fishway entrances; however, only two fishway entrance operating conditions were evaluated (1.0- and 1.5-foot head differentials). Also, in an attempt to increase sample size, the duration of monitoring and the hours of sampling per day were expanded to occur from 5:00 pm to 1:00 am, on August 7, 2010, through September 30, 2010. The combined 2009 and 2010 sample sizes were too small to yield statistically meaningful results; however, the observed behavior of the lamprey at the fishway entrance suggested that the lower head differential (1.0-foot) enhanced entrance efficiency. Results were summarized in the draft 2010 DIDSON Study

Report, and Douglas PUD presented a summary of the results at the Aquatic SWG July 13, 2011 meeting.

In 2011, based on the observed 2009 and 2010 results, the Aquatic SWG requested and received approval from the HCP Coordinating Committees of a change in fishway operations from a 1.5-foot head differential to a 1.0-foot head differential from 5:00 pm to 1:00 am, August 7, 2011, through September 30, 2011 (lamprey operations; also see Section 2.2.1). Lamprey operations were implemented 3 days following the date when the cumulative count of adult lamprey passing Rocky Reach Dam reached five individuals.

During review of the draft 2010 DIDSON Study Report, Aquatic SWG and HCP Coordinating Committees members commented on one primary concern regarding the possible effects on salmonid migration and delay from changes to the head differential at the Wells fishway entrances. Because head differential at the fishway entrances had been optimized for ESA-listed salmonids, analysis was requested to determine if the flow changes designed for lamprey and implemented in 2011 had a measureable effect on ESA-listed Upper Columbia River steelhead.

In 2012, Columbia Basin Research, in coordination with the University of Washington's School of Aquatic and Fishery Sciences, completed a report examining the possible effects of changes in fishway entrance water velocity on the passage counts of Chinook, coho, and sockeye salmon, and steelhead (Skalski, J. R., and R. L. Townsend, 2012; Appendix F). The report incorporated results from the draft 2010 DIDSON Study Report. Results of the analysis indicated that there were no statistically detectable effects on salmonids from reduced velocities at the fishway entrances during the study hours of operations. The HCP Wells Coordinating Committee and NMFS approved the report and once again implemented a 1.0-foot head differential at Wells Dam fishway entrances for the 2012 lamprey migration, to try to enhance lamprey entrance success as a best management practice.

In January 2012, Douglas PUD installed the new FS2020 Half-duplex Passive Integrated Transponder (HD PIT)-tag detection arrays in the west ladder of the Wells Fishway, and during the 2012/2013 winter fishway maintenance, the same arrays were installed in the east

ladder. The new HD PIT-tag detection arrays will aid additional investigations of adult lamprey passage at Wells Dam.

In October 2012, the Aquatic SWG approved the Wells Dam Adult Lamprey Passage and Enumeration Study Plan (Appendix F) for implementation in 2013; in part, the study will continue the evaluation of adult lamprey entrance and ladder passage efficiency under reduced Wells Project fishway entrance velocities using RT technology.

2.1.3 Wells Dam Adult Lamprey Passage and Enumeration Study Plan

As noted in Section 2.1.2, in October 2012, the Aquatic SWG approved the Wells Dam Adult Lamprey Passage and Enumeration Study Plan (Appendix F) for implementation in 2013. The study plan, developed by Douglas PUD and Longview Associates, employs active tagging of translocated adult lamprey to assess lamprey passage (Mitigation, and Enhancement measure [PME] 4.1.6 in the Pacific Lamprey Management Plan [PLMP]), and enumeration (PME 4.1.3 in the PLMP) at Wells Dam. Lamprey will be obtained from both Priest Rapids Dam and Bonneville Dam in order to provide a sufficient sample size, and to allow preliminary analysis of fish source. Fixed-station RT receivers and associated arrays for tagged fish monitoring will be deployed at a number of locations within the Wells Project fishways, and will also be located at the mouths of the Okanogan and the Methow rivers. Monitoring reports may, if requested, include analyses of information provided by the YN and WDFW on passage at the mouths of the Wenatchee and Entiat rivers. The study plan will continue the evaluation of passage efficiency under reduced Wells Project fishway entrance velocities using similar fishway operations as used for the DIDSON Study conducted in 2010 (Johnson et al. 2011); and the newly installed picketed leads and ramp at the count station will be evaluated for enumeration efficiency (described further in Section 2.1.5). The study is proposed for a single year and based on those results, a path forward for 2014 and beyond will be considered, including revisiting the configuration of the picketed lead and ramp at the count station; the need for installing IR cameras in the Wells fishway to improve enumeration; or the exploration of developing a correction factor, as outlined in the PLMP (PME 4.1.3).

2.1.4 Wells Dam Picketed Lead Modifications and Count Window Improvements

In November 2012, the Aquatic SWG agreed to proposed picketed lead modifications and count window improvements as an effort to improve enumeration of Pacific lamprey at Wells Dam and in preparation for the 2013 Wells Dam lamprey studies. Wells Dam count window improvements were proposed to improve enumeration by blocking access to a passage route that bypasses the count window. Modifications included: 1) placing narrower, 0.5-inch-spaced bar screens (0.6875-inch when measured on-center) over the existing 1–inch-spaced bar screens of the picketed leads that lead to fishway count stations; 2) securing an aluminum bar grating (with 0.5-inch-spaced bar screens) on to the existing louvers on both sides of the counting window; and 3) installing an 18-inch-wide aluminum plate or ramp on both the upstream and downstream face of the fish count louvers. In December 2012, modifications were installed in the west fish ladder; and in February 2013, modifications were installed in the east fish ladder.

2.2 Completed Studies 2012

2.2.1 Fishway Entrance Velocities Testing

Based on the observed results of the 2009 and 2010 adult lamprey passage studies using DIDSON camera technology, the Aquatic SWG requested approval from the HCP Coordinating Committees for a change in fishway operating conditions. Specifically, there was a request for reducing the fishway entrance head differential from a 1.5-foot to a 1.0-foot head differential from 5:00 pm to 1:00 am, on August 7, 2011, through September 30, 2011 (lamprey operations). Lamprey operations would be implemented 3 days following the date when the cumulative count of adult lamprey passing Rocky Reach Dam reached five individuals. As a condition of approving this change in fishway entrance operating conditions, the HCP Coordinating Committees requested that Douglas PUD empirically measure (rather than model) water velocities at the fishway entrances. Testing was conducted March 1 and 2, 2011, and velocities were measured under both low and high tailwater conditions at 1.0- and 1.5-foot head differentials using Acoustic Doppler Velocimeters (ADVs). The results were presented to the Aquatic SWG on April 13, 2011, and to the HCP Coordinating Committees on May 24, 2011, along with a memo documenting the test results. The results of the velocity tests, when compared to the

documented swimming performance for adult Pacific lamprey, suggested that the entire orifice area was passable for lamprey at both high and low tailwater elevations at the 1.0-foot head differential. The results suggested that passage conditions would likely be most difficult for lamprey at the 1.5-foot head differential at low tailwater elevations.

On July 26, 2011, the HCP Coordinating Committees approved the Aquatic SWG's request for a 1.0-foot operating condition for 2011, with the understanding that Douglas PUD would continue to develop plans to investigate lamprey passage using HD PIT-tag detection technology in future years. The HCP Coordinating Committees indicated they would not likely approve a permanent change in fishway operating criteria at the Wells fishway entrances until Douglas PUD conducted a study to evaluate the potential effects on salmonid passage. To address the concern of the HCP Coordinating Committees regarding potential negative effects to salmonids as a result of changes to fishway entrance operating conditions, in August 2011, Douglas PUD requested that Dr. John Skalski, of Columbia Basin Research, conduct a statistical analysis of passage times of adult salmonids at the 1.0-foot and 1.5-foot head differential entrance conditions. The analysis was to be designed to test if adult salmonid passage behavior was altered when operating the fishway entrance with a reduced head differential. Results from this analysis indicated that there were no statistically detectable effects on Chinook, coho, and sockeye salmon, or on steelhead from reduced velocities at the fishway entrances during the study hours of operations. Based on these results, the HCP Coordinating Committees approved a request to implement a reduced collection-gallery-to-tailwater head differential from 1.5 feet to 1.0 foot between 17:00 and 0:59 hours daily, starting three days after the day on which the cumulative passage of lamprey at Rocky Reach Dam equals five lamprey (the same operations as those approved in 2011). The 1.0-foot differential was implemented from August 6, 2012, to September 30, 2012.

2.2.2 2012 Total Dissolved Gas Monitoring

On April 6, 2012, Ecology approved Douglas PUD's 2012 Gas Abatement Plan (GAP; Appendix D). Spill operations for the 2012 spill season are outlined in the 2012 Spill Playbook (which is included as an appendix to the GAP). In December 2012, Douglas PUD reported to Ecology the results of measures implemented in 2012 to meet state water quality standards for total dissolved gas (TDG) during the bypass/spill season at the Wells Project;

these were reported in the Gas Abatement Plan 2012 Annual Report (Appendix F). The 2012 fish spill season at Wells Dam began at 0000 hours on April 12, 2012, and ended at 0000 hours on August 19, 2012, and was characterized by exceptionally high flows for the duration of the entire season. Large volumes of spill at Grand Coulee Dam resulted in flows entering the Wells Project with TDG levels already out of compliance (greater than 115 percent) on more than half of the days during the 130-day bypass season. Wells Dam also received flows with greater than 110 percent TDG on 124 days of the 130-day bypass season; and there were 56 days when flows at Wells Dam were above the 7Q-10 flood flow, including a 38-day uninterrupted stretch from June 19, 2012, to July 26, 2012.

Douglas PUD will continue monitoring TDG on an annual basis, providing annual reports as required by the Wells Dam 401 Water Quality Certification. Douglas PUD submitted the final 2013 GAP to Ecology before the February 28, 2013 deadline, as required by FERC License Order 2149-52. As part of the GAP, Douglas PUD is required to accompany the plan with a biological monitoring plan and, as such, is required to examine migrating salmonids for Gas Bubble Trauma (GBT) if TDG in the Wells tailrace exceeds 125 percent during any hour of the fish spill season. Results of monitoring for GBT are reported in the 2012 Wells Project Total Dissolved Gas Abatement Plan Annual Report and were filed with FERC prior to the February 28, 2013 deadline (Appendix F). Monitoring was initiated on May 3, 2012, and continued on days subsequent to 125 percent TDG exceedances in the tailrace of Wells Dam. On June 29, 2012, Douglas PUD switched to a 3 day-per-week schedule, as approved by Ecology, which continued into late July 2012. Fish were examined at Rocky Reach Dam over the course of the biological monitoring period, and all juvenile anadromous salmonids plan species (HCP) were examined, including spring and summer Chinook, steelhead, sockeye and coho. Similarly to 2011, coho appeared to be the most susceptible to elevated concentrations of TDG relative to other species at a given TDG concentration. Overall, GBT expression in juvenile salmonids examined at Rocky Reach was very mild with only 1.25 percent of all fish showing signs of GBT, including when TDG was above 130 percent in the Wells Dam tailrace. In addition, Douglas PUD monitored adult salmon at Wells Dam during hatchery broodstock activities. More than 800 adult salmon were handled in 2012 and none of them showed signs of GBT expression, even when TDG concentrations were above 125 percent.

2.2.3 2012 Bull Trout Monitoring and Management Plan/Bull Trout Management Plan

The final 2011 Bull Trout Monitoring and Management Plan (BTMMP) Annual Report (Appendix F) was filed with FERC in March 2012 and included monitoring through the end of 2011. Bull trout monitoring continued in 2012, and with the issuance of a new Wells Dam Operating License from FERC, Douglas PUD switched over to implementing the Bull Trout Management Plan (BTMP) that is outlined in the Aquatic Settlement Agreement, as well as complying with all of the new bull trout measures outlined in the new FERC license. Final BTMP results will be approved by the Aquatic SWG and filed with FERC no later than May 31, 2013. In addition to the BTMP results, Douglas PUD will also file with FERC elements of the 2012 BTMMP from when Douglas PUD was still operating under the previous license. Briefly in 2012, efforts included coordinating with regional groups, participating in bull trout recovery efforts, monitoring passage times and counts at Wells Dam fish count stations, and PIT-tagging bull trout at Wells Dam and off-site locations in Methow River tributaries (a coordinated effort with WDFW). Three adult bull trout were incidentally captured at Wells Dam and given a PIT tag during HCP hatchery operations. Fifty one untagged and 18 previously tagged adult bull trout were captured at the Twisp Weir in 2012 during offsite hatchery operations. All of these untagged bull trout were given a PIT tag and released after a short recovery period. Movements of tagged bull trout will be summarized in annual reporting.

2.2.4 Aquatic Nuisance Species Monitoring

In June 2010, the Aquatic SWG approved plans to implement ANS monitoring efforts consistent with proposed requirements contained in the ANS Monitoring Plan in the Settlement Agreement. Douglas PUD began early implementation of these projects in 2010 and 2011, and continued the work per the requirements of their 401 Water Quality Certification in 2012.

2.2.4.1 Crayfish

In late 2010, Douglas conducted an exploratory crayfish sampling effort in the Wells Reservoir using methods described in the Crayfish Survey Protocol and Identification Guide for Washington (Olden and Larson 2010). Sampling occurred over a two-day period with

one overnight sample. No native signal crayfish (*Pacifastacus leniusculus*) or non-native Northern crayfish (*Orconectes virilis*) were captured during this pilot effort (Douglas County PUD 2012). In June 2011, crayfish were collected incidental to beach seining subyearling Chinook (HCP-related activity), confirming the presence of the non-native northern crayfish (*Orconectes virilis*).

In January 2012, 14 crayfish, identified as Washington's native signal crayfish, were recovered in the west fishway of Wells Dam. In August and September 2012, the Wells Project Crayfish Distribution Pilot Study was conducted to collect baseline information on the relative abundance and distribution of all species of crayfish within the Wells Project, as described in the 2012 Wells Crayfish Study (Appendix F). Crayfish traps were deployed throughout five areas of the Wells Project for more than 800 trap-hours, resulting in zero crayfish captured; and more than 23 sampling hours of active capture at 19 sites resulted in the capture of seven non-native northern crayfish near the mouth of the Okanogan River. These results suggested that: 1) the traps that were used were ineffective at capturing crayfish in the Wells Project; and 2) two species of crayfish appear to inhabit the Wells Project, both in low abundance. Five native signal crayfish were also captured at Brewster Bridge in September 2012 during water temperature monitoring activities.

A database has been developed to document and track crayfish presence, species type, habitat use, and other applicable details regarding crayfish life history in the Wells Project.

2.2.4.2 Zebra/Quagga Mussels, Macrophytes, and Northern Pike

In 2011, Douglas PUD monitored for zebra and quagga mussels, as well as macrophytes, none of which were detected during 2011 ANS sampling efforts. In 2012, Douglas PUD continued early detection monitoring for zebra and quagga mussels using plankton tows for veligers and artificial substrate samplers, and, like in 2011, no zebra or quagga mussels were found in the samples collected.

2.2.4.3 Eurasian Milfoil

In September 2011, Douglas PUD conducted an aquatic plant survey. Eurasian milfoil was not dominant but was subdominant in 15 percent of the samples taken. In 2012, monitoring

for Eurasian watermilfoil (*Myriophylulum spicatum;* EWM) was performed as part of the Wells Project Crayfish Distribution Study. EWM was not observed to be dominant at any sample sites; however, as a measure required under the Recreation Management Plan, on August 16, 2012, the aquatic herbicide diquat dibromide was applied at the Pateros, Brewster, and Bridgeport swim areas.

2.3 Planned Monitoring and Studies 2013

Douglas PUD plans to complete actions required by their White Sturgeon, Bull Trout, Water Quality, Pacific Lamprey, ANS, and Resident Fish Management Plans, as outlined in the 2013 Aquatic Settlement Agreement Action Plan. Some of the management plans are further discussed in this section.

Douglas PUD will continue annual monitoring of TDG at the Wells Project as required by the Ecology-approved GAP and will transition to year-round monitoring for TDG and seasonal remote water temperature monitoring in 2013. Water quality monitoring is expected to begin in April 2013.

Douglas PUD plans to evaluate lamprey passage at Wells Dam in 2013 using translocated adult lamprey and HD PIT-tag detection, as described in Section 2.1.4. The FS2020 HD PIT-tag detection arrays installed in the Wells Dam east and west fishways equip the study with increased detection capabilities for evaluating lamprey passage efficiencies at Wells Dam, especially if fish pass after the expiration of their radio tag's battery. Fixed-station RT receivers and associated arrays will also be deployed at a number of locations within the Wells Project fishways, and will also be located at the mouth of the Okanogan and the Methow rivers. Wells Dam count window modifications to improve enumeration will also be evaluated during the 2013 lamprey studies to determine whether or not the modifications result in improved enumeration while still maintaining good passage efficiency. Douglas PUD intends to request approval from the HCP Coordinating Committees in 2013 for a modified night-time fishway operation during the peak of lamprey migration, similar to what was approved by the HCP in 2012. Based on the results of the 2013 lamprey studies, Douglas PUD may explore the possibility of using infrared cameras to monitor lamprey passage through the picketed lead area of the adult fishway in future years.

The original FERC license required the implementation of the BTMMP. The report submitted to FERC in spring 2013 will be the final report for that monitoring plan. Implementation of the BTMP and new license bull trout measures began in 2012 and will continue in 2013. Information regarding this program's activities will be provided to the Aquatic SWG as they occur. An annual report for the BTMP will be submitted to FERC and the Aquatic SWG in spring 2013, which will summarize the activities and results of 2012 and include the remaining elements of the BTMMP. Bull trout activities implemented during the first year of the new FERC license (2013) will be reported to the Aquatic SWG and FERC in the spring of 2014

In 2011, Douglas PUD planned a RT study for 2012 to evaluate adult bull trout passage conditions at the Twisp Weir in the Methow Basin, as required by Section 4.2.2 of the Aquatic Settlement Agreement Bull Trout Management Plan. However, poor PIT-tag detection efficiency, caused by extremely high water conditions experienced at the Twisp Weir during the spring freshets, prompted Douglas PUD and the USFWS to propose delaying the RT study at Twisp Weir until 2016, when an adult passage RT study at Wells Dam is scheduled to occur. Combining the weir and Wells Dam study together into one study would limit the number of study fish needed for each study and thus reduce surgery impacts on the wild bull trout population. In the interim, existing PIT-tag data will continue to be collected to be considered in planning for the 2016 study. Douglas PUD and USFWS plan to submit a letter to FERC requesting that the license requirement to conduct an RT passage study at the Twisp Weir in 2013 (Year 1 of the license) be delayed until 2016.

The new FERC license also requires Douglas PUD and the Aquatic SWG to develop a bull trout stranding and incidental encounter monitoring program by October 2013, to address License Article 402. Douglas PUD will work with the Aquatic SWG to develop this document prior to the fall deadline in 2013.

Douglas PUD will continue to support and implement ANS efforts in 2013. Monitoring of the spread of northern pike in the Upper Columbia River system will continue, with potential regional coordination and participation; and zebra and quagga mussel early-detection monitoring will continue in coordination with WDFW and Portland State University. In addition, the FERC license requires Douglas PUD to work closely with the

Aquatic SWG to develop a best management practices document for future construction activities within the Wells Project, in an effort to reduce the threat of introducing non-native species into the Wells Project. The new license also requires Douglas PUD to update educational signage and provide educational materials at public recreation facilities, such as boat launches. Finally in 2013, Douglas PUD will develop a response document that will guide measures taken in the event that a new non-native species is introduced to the Wells Project.

Douglas PUD is proposing upgrades to recreational boat launches located in Pateros and Carpenter Island. Due to concerns regarding potential impacts to lamprey while performing dredging activities, Douglas PUD plans to salvage lamprey found during these construction activities. Douglas PUD will work closely with WDFW and the Aquatic SWG to accomplish this task.

3 AGREEMENT ADMINISTRATION

This section lists events of note that occurred in 2012 related to the administration of the Agreement, and lists reports published in 2012 that relate to the Aquatic SWG.

3.1 HCP Coordination

In July 2012, the Aquatic SWG requested approval from the HCP Coordinating Committees for implementation of a 1.0-foot head differential from 5:00 pm to 1:00 am, starting three days after the day on which the cumulative passage of lamprey at Rocky Reach Dam equals five lamprey, and continuing through September 30, 2012, at the Wells fishway entrances in 2012 (lamprey operations). Following the results of a reanalysis that indicated there were no statistically detectable effects on salmonids from reduced velocities at the fishway entrances during the study hours of operations, the HCP Coordinating Committees approved implementation of lamprey operations for 2012.

3.2 Aquatic Settlement Work Group Members

A designated technical representative and a separate designated policy representative for each of the parties make up the Aquatic SWG, as established under the Agreement. The Aquatic SWG meets collectively to expedite the process for overseeing and guiding the implementation of the Agreement. The policy representatives will meet at least once annually during the term of the New Operating License to review progress and implementation of the Agreement. Minutes from the monthly meetings are compiled in Appendix A of this report. Appendix B lists current members of the Aquatic SWG.

3.3 Agreement-related Reports Published in Calendar Year 2012

The following documents were finalized by the Aquatic SWG in 2012 (Appendix F):

- 2011 Bull Trout Monitoring and Management Plan Annual Report
- 2012 Wells Project Total Dissolved Gas Abatement Plan (GAP)
- 2012 Assessment of Salmonid Passage Responses to Different Flow Velocities at Wells Dam Fishway Entrance
- 2012 Wells Project Total Dissolved Gas Abatement Plan (GAP) Annual Report
- 2012 Wells Project Crayfish Distribution Study
- 2013 Adult Lamprey Passage and Enumeration Study, Wells Dam

APPENDICES

APPENDIX A
AQUATIC SETTLEMENT WORK GROUP 2012 MEETING MINUTES AND CONFERENCE CALL MINUTES

Final Meeting Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: February 8, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the January 9, 2012, Aquatic SWG Meeting

I. Summary of Decisions

1. There were no decision items for today's meeting.

II. Summary of Action Items

1. Jason McLellan will email a copy of Crossman et al. 2011, to Carmen Andonaegui for distribution to the Aquatic SWG (Item III-2).

2. Mike Schiewe will email an invitation to Aquatic SWG Technical Representatives asking each to provide a recommendation on which of the two sturgeon supplementation proposals to select for implementation (Item III-3).

3. Chad Jackson will provide Beau Patterson with an email listing needed protocols (broodstock, water source, disease) and facility improvements to accommodate sturgeon rearing at the Wells Hatchery by April or May 2012 (Item III-4).

4. Andrew Gingerich will email a draft study proposal for evaluating bull trout passage at the Twisp Weir to Carmen Andonaegui for distribution to the Aquatic SWG (Item III-5).

5. Beau Patterson will email an invitation to tour the Wells west ladder fishway to Carmen Andonaegui for distribution to Aquatic SWG members (Item III-6).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. Beau Patterson asked Chad Jackson to provide an update on hatchery facility and operation needs associated with implementing either of the two white sturgeon supplementation proposals received in response to Douglas PUD's Request for Proposals.

Schiewe asked for comments on or changes to the draft December 12, 2011, conference call meeting minutes. There were no additional comments or edits and the minutes were approved as revised. Carmen Andonaegui will finalize the minutes and distribute them to the Aquatic SWG.

2. **Presentation of Sturgeon Supplementation Program RFP SOWs** (Bob Rose/Yakama Nation; Jason McLellan/Colville Confederated Tribes)**:** Bob Rose presented a summary of the Yakama Nation's white sturgeon supplementation program proposal. The Yakama Nation proposal centered around adult broodstock collection and spawning with delivery of fertilized eggs to Douglas PUD for rearing at Wells Hatchery. Rose described the Yakama Nation's experience and participation in the collection and spawning of adult broodstock over the last two years. He said that the Yakama Nation proposed to collect adult broodstock from below The Dalles Dam in 2011 and will coordinate the sturgeon collection efforts with Washington and Oregon. The Yakama Nation proposed to transfer captured adult sturgeon to the Yakama Nation Marion Drain Fish Facility for holding and spawning with a targeted delivery of 5,000 to 7,000 fertilized eggs to the Wells Hatchery for rearing. Rose said that the Yakama Nation was targeting adult collection to achieve a 6x6 mating cross but that a 3x3 mating cross would be acceptable. He said that temperature control devices would be installed on a couple of tanks in 2012 to experiment with their use in controlling ripening of females. Rose said that fertilized eggs would be furnished to Wells hatchery immediately following fertilization and commented that the Yakama Nation would likely hold some offspring at Marian Drain as an insurance plan.

   Rose said that the Yakama Nation thinks larval collection is a good idea but that they do not think that the strategy is ready to implement yet. He said that the Yakama Nation would like to discuss and develop a pilot program using larval collection during the summer of 2012, and that Chelan PUD has presented a similar pilot plan that they intend to implement in 2012. The Yakima Nation's plan would be to develop a draft preliminary strategy for blending larval collection into existing white sturgeon broodstock collection programs. A draft could be available for review by fisheries managers in early March or late spring of 2012, with a final strategy document available in early summer of 2012.

   Donella Miller described how the Yakama Nation proposed to approach spawning and release of collected adult sturgeon, describing the factors that go into determining when females are ready for spawning and describing the spawning process. She said that depending on size and maturity, a female could have from 100,000 to 1 million eggs, with a 10-foot female being the largest sized fish that can be handled at the Marion Drain Fish Facility. She said that a 10-foot fish could potentially contain several hundred thousand eggs. Rose said that the Marion Drain Fish Facility was a fully functional facility with power backup and staff experienced in all aspects of sturgeon

hatchery operation and management. He presented a proposed timeline for coordination, planning, permitting, and reporting and provided a proposal cost.

Jason McLellan presented the Colville Confederated Tribes' (CCT)/Golder Associates) white sturgeon supplementation program proposal (Attachment B). The CCT proposal focused on collection of larvae and their delivery to the Wells Hatchery for grow out. He said that their proposal was to collect sturgeon larvae from Wells, Wanapum, and Lake Roosevelt reservoirs. Modified D-ring plankton nets would be used for collection along with a net retrieval method, which McLellan said resulted in a 98 percent larvae survival rate.

Timing of collection would occur between July 1 and August 15 of a given year with the level of effort depending on the varying likelihood of encountering larvae at each proposed collection location. To minimize costs, collection efforts will be coordinated with ongoing Grant PUD and upper Columbia River collection efforts, and collection will stop when targets are reached. All larvae collected would be delivered to the Wells Hatchery for rearing. McLellan described protocols that would be implemented to address disease concerns, saying that to date there have been no disease outbreaks in the Lake Roosevelt white sturgeon supplementation program. He listed the permits that would be required to implement sturgeon collection and described CCT/Golder's expertise in handling permitting needs related to sturgeon collection.

McLellan identified himself as the assigned Project Manager and Larry Hildebrand of Golder Associate as the assigned Project Director. He said that support staff would include CCT and Golder Associates biologists and technicians with extensive expertise working with white sturgeon. He emphasized CCT/Golder Associates' commitment to safety and listed the following proposal deliverables: obtain permits; prepare and provide sampling equipment; deliver approximately 14,000 larvae to Wells Hatchery; and provide annual progress reports and permit compliance reporting.

McLellan suggested that larval collection was a better approach to obtaining juvenile sturgeon for use in the Wells sturgeon supplementation program than broodstock collection based on five arguments: 1) broodstock collection has a history of difficulty in terms of collection and selects adults based on size (<10 feet) for the safety of the fish and hatchery personal, and in addition selects for fish spatially and temporally, whereas larval collection avoids these biases; 2) recent research suggest that larval collection selects for more spawners than broodstock collection and that offspring are less related than broodstock crosses (Crossman et al. 2011); therefore, there are genetic advantages to larval collection when compared to broodstock collection methods; 3) larval collection reduces the capture, handling, and husbandry stressors on the adult population, since in larval collection no adults are handled; 4) the CCT proposal aims at capturing larval fish in Wells Reservoir thus increasing the probability that released fish will have genetic representation from the Wells Reservoir; and 5) a secondary benefit to

the CCT proposal is that Phase 1, Objective 3, of the Wells White Sturgeon Management Plan (WSMP) would be addressed since part of that monitoring and evaluation (M&E) plan is aimed at examining natural reproduction in Wells Reservoir.

Andrew Gingerich asked McLellan about ESA permits for incidental take of listed species. McLellan said that sturgeon collection using D-rings had been done in the lower Columbia River and the Snake River with no record of incidental collection of anadromous salmonids. He said that larval collection in the tailraces of Chief Joseph and Wanapum dams involved fishing near the bottom of the channel where salmonid juveniles are unlikely to be encountered, thereby minimizing potential for take of ESA-listed salmonids. Steve Lewis asked if the CCT/Golder Associates proposal had a contingency plan to collect adult broodstock in the Wells Reservoir if adequate numbers of larvae were not encountered at that location. McLellan said that he expected to be able to meet larval collection targets in the Wells Reservoir even with an estimated adult population of only 30 individuals, but that he would be open to adult collection if that were to be identified as a more viable alternative at some point.

3. **Discussion of Sturgeon Supplementation Program Proposals** (Beau Patterson): Beau Patterson requested any initial comments from the Aquatic SWG on the two sturgeon proposals. He said that Douglas PUD believed either proposal was adequate to fulfill the obligations in the Wells Project WSMP. Patterson said that Douglas PUD would consider costs when evaluating a proposal, but of greater concern were the technical merits of the proposals and the likelihood of their meeting program goals. He said that Douglas PUD would fund whichever proposal was preferred by the Aquatic SWG, since both could meet sturgeon supplementation program objectives.

   Steve Lewis asked if Douglas PUD was comfortable with the larval collection targets proposed. Patterson said that they were and that if higher than expected mortalities are experienced, the loss could be addressed by increasing the larval collection targets. Pat Irle said that she liked two things in the CCT/Golder Associates proposal; first, that they proposed to collect sturgeon from Wells Reservoir and then from locations more closely located to the Wells Project, and second, that they proposed to collect fish from more than one breeding population. The Aquatic SWG discussed the pros and cons of collecting sturgeon from the smaller but unexploited breeding groups in the upper Columbia River reservoirs as opposed to collecting sturgeon from the larger breeding groups in the lower Columbia River. Mike Schiewe said that there are two issues to consider when taking sturgeon from the natural environment for use in supplementation programs: amplifying genetic traits of a small population by collecting a large number of juveniles from small populations versus amplifying genetic traits by using only a small number of adults for broodstock. Patterson said that he is more comfortable with the genetic risks associated with supplementation using wild-spawned juveniles versus using juveniles produced from a small number of adult broodstock.

McLellan and Brett Nine said that a 3x3 cross would be minimum number of crosses acceptable for a breeding program.

Chad Jackson said that he could potentially support the use of Lake Roosevelt stock in Douglas PUD's sturgeon supplementation program given the appropriate coordination and agreement among appropriate river managers, and given that new genetic information indicated greater relatedness between upper/middle Columbia River sturgeon stocks; however, he said that he was not presenting WDFW's position. He said that WDFW Region 1 and Region 2 support was predicated on Douglas PUD's coordination with entities involved in downstream sturgeon supplementation programs as well. McLellan said that he had been talking with the Lake Roosevelt sturgeon program managers regarding the CCT/Golder Associates proposal and that the Lake Roosevelt group had indicated support for the Wells sturgeon supplementation program as long as coordination continues. Patterson said Douglas PUD preferred that the three parties with fish management authority in Wells Reservoir identify the best approach to supplementing the Wells white sturgeon population and then present that alternative to Douglas PUD and the Aquatic SWG for implementation. He said that Douglas PUD is willing to implement either proposal if there is agreement among the other Parties. Schiewe said that the Aquatic SWG must reach consensus to approve a proposal.

The Aquatic SWG discussed how to address conflicts of interest for two of the seven Aquatic SWG parties, the CCT and the Yakama Nation, who are proposal proponents. The Aquatic SWG does not have formal protocols for dealing with conflicts of interest; however, Schiewe said that typically, proponents recuse themselves. Patterson said that he preferred that all Aquatic SWG members participate in the discussion with proposal proponents recusing themselves only for the vote. McLellan said that CCT would be willing to recuse themselves from the vote. Donella Miller said that Bob Rose was the lead for the Yakama Nation position on this issue. Schiewe asked Miller to bring this issue to Rose's attention. Patterson said that the timeline for a decision on which sturgeon proposal to accept was tied to FERC license issuance; the current license expires May 31, 2012. If an agreement is reached early enough, FERC can condition the license according to the agreed upon conditions. Patterson said that Douglas PUD prefers the agreement be reflected in the new FERC license, if possible, which would mean agreeing on a proposal by about March 31, 2012.

Schiewe asked for preferences of Aquatic SWG representatives. Jackson said that he preferred the larval collection method, but that larval collection must be discussed and regionally coordinated with current efforts. Steve Lewis said that both the issue of where to collect fish for use in the Wells supplementation program and the issue of what was an appropriate level of coordination between Douglas PUD and other entities involved in Columbia River sturgeon supplementation efforts, needed to be considered. He said he thought that both proposals were good. Irle said she wanted to defer to WDFW for technical issues, but that she preferred the CCT proposal. She said that she

liked the idea of regional coordination proposed in the Yakama Nation proposal, but that she was concerned with the results of the 2010 broodstock collection efforts, which resulted in the collection of only two viable adult sturgeon from the Rocky Reach Reservoir. Schiewe asked if anyone saw a benefit to going forward in the first year with both methods of collection. Lewis said he liked the concept but did not think it would be feasible in terms of the FERC licensing process. Patterson agreed and said that Douglas PUD was opposed to funding redundant programs. Miller said that the Yakama Nation was not opposed to larval collection; however, they recommend continued implementation of a broodstock collection-based supplementation program before changing to another method.

Patterson asked that Schiewe request Aquatic SWG technical representatives email their recommendations for a preferred proposal to Schiewe to see whether or not there is consensus among the parties on which proposal to select. Schiewe will send an email to Aquatic SWG technical representatives no later than tomorrow, January 10, 2012, asking for their recommendation on a preferred proposal, with responses due within ten calendar days (January 20, 2012). Schiewe said that if needed, a conference call could be convened for further discussion. He reminded the Aquatic SWG that if consensus cannot be reached before the new Wells FERC license is issued, then the Aquatic SWG can lose some control over how the sturgeon supplementation program will be implemented. Patterson said that Douglas PUD was committed to the Aquatic Settlement and those Aquatic Settlement Agreement measures that extend beyond the FERC license. He said, however, that a potential problem exists if any Aquatic Settlement Agreement measure conflicts with the FERC license, in which case what is indicated in the FERC license would determine the default action. Patterson said that although FERC will require approval of each Aquatic Settlement Agreement management plan in the new license, Douglas PUD does not expect FERC to second-guess Aquatic SWG decisions.

4. **WDFW Update on Implications of Sturgeon Proposals on Sturgeon Health** (Chad Jackson)**:** Chad Jackson said that as plans are made to bring white sturgeon into a hatchery, facility modifications need to be identified and implemented. He said that this was a WDFW and Douglas PUD responsibility. Regardless of which proposal is selected, the Wells Hatchery would need to revise future broodstock documents, including hatchery program production targets, a quarantine station, and an adequate number of vessels, in a covered area, to accommodate juvenile rearing. A water source, river or well water, would need to be identified. If river water were used, an intake would need to be plumbed and an ultra-violet (UV) light or ozone treatment system would need to be added. If well water were used, a water heating system would need to be installed. Patterson said that Douglas PUD is aware of the need for protocols to be drafted and modifications made to the hatchery to accommodate sturgeon production. Jackson suggested scheduling a meeting between WDFW and Douglas PUD as soon as possible to discuss Wells Hatchery needs. By April or May 2012, Jackson will provide Patterson

with an email listing needed protocols (broodstock, water source, disease) and facility improvements to accommodate sturgeon rearing at the Wells Hatchery.

5. **Douglas PUD Study Proposal - Bull Trout Radio Telemetry Study at Twisp Weir in 2012** (Andrew Gingerich)**:** Andrew Gingerich said that Section 4.2.2 of the Bull Trout Management Plan directs Douglas PUD, in Year One of the new FERC license, to collect up to 10 adult bull trout for use in evaluating passage conditions at the Twisp Weir. Gingerich said that he had begun to draft a study plan to do this and would like to have a discussion among the Aquatic SWG representatives about options for collecting adult bull trout and a study design. He would like to have an approved study plan in time to start bull trout collection in 2012.

   Gingerich showed photographs of the Twisp Weir (Attachment C), described its operation, and suggested a tour of the weir in April 2012, once the weir trap boxes are installed. He said that the weir was currently used for steelhead and spring Chinook collection and for adult management for these species. He said that although the Bull Trout Management Plan called for the collection of 10 fish, Douglas PUD was proposing that 30 bull trout be collected in 2012. Gingerich showed a distribution of bull trout encounters at the Twisp Weir over the past two years; 87 fish were encountered in 2010 and 36 fish in 2011. He said that the drop in encounters between the two years was partially due to operations; during the extremely high flow conditions experienced in 2011, the trap boxes were not operable, and because of this, the yearly comparison is not practical.

   Gingerich said that the study purpose was to examine upstream and downstream movement of bull trout and incidental take associated with the Twisp Weir. He said that he was planning to design the study to allow a comparison between a treatment reach (weir reach) and control reaches (stream reaches without a weir) using radio telemetery. Gingerich said that travel times could be compared between selected control reaches and the weir reach. Steve Lewis asked if Douglas PUD would tag fish upstream of the weir to contribute to an understanding of downstream movement. Gingerich said that capturing bull trout other than at the weir required angling, which would require a lot of effort with low results. Lewis said that he supported collecting 30 bull trout at the Twisp Weir for use in the study and asked what operations would be used at the weir during the study and what analysis would be conducted. Gingerich said that normal operating conditions would be in effect during the study. He said that study details needed to be worked out, like tagging protocols and measures required to obtain an ESA take permit from the USFWS for the study. Gingerich will email Carmen Andonaegui the draft study proposal when completed for distribution to the Aquatic SWG.

6. **Update on Lamprey Activities at Wells Project** (Beau Patterson)**:** Beau Patterson said that during normal maintenance of the Wells fishways in December 2011 and January

2012, partial damage to the picketed leads caused by debris was reported in both the east and west ladders. He said Douglas PUD was investigating options to allow for counting lamprey that bypass the window by going through the picketed lead, which has been a long-standing concern. Lewis asked how many lamprey had been counted passing Wells Dam since January 2012. Patterson said that no fish have been counted since the single 2011 lamprey observation in early summer.

Andrew Gingerich said that the contractor hired to install the Half-Duplex (HD) PIT-tag detection arrays in the fish ladders was still trying to determine the best configuration to eliminate HD detection interference with the existing Full-Duplex (FD) detection arrays. Testing was taking place last week and work was currently being done on the design of the antennas. The west ladder will be down until February 14, 2012. Patterson said that he will send an email request to Aquatic SWG members asking if anyone was interested in a tour of the west fishway before it is rewatered.

Lewis asked about the status of talks on translocating adult lamprey for passage studies. Patterson said that Douglas PUD was still open to the idea and agreed that it was probably the only way to get enough fish for a valid lamprey passage study at the Wells Project. Patterson said he had spoken with both Chelan and Grant PUDs about collecting and translocating lamprey from their respective projects. He said that Chelan PUD asked when Douglas would be ready to do the work and that Grant PUD said they would provide lamprey as long as there were no agency or tribal objections. Lewis asked for a date when Douglas PUD would approach Chelan and Grant PUDs for a firm commitment to provide adult lamprey. Patterson said Douglas PUD would make the request in January 2013 for a study in summer 2013. He said that HD PIT tag detection arrays needed to be installed in both ladders before a valid study could be implemented and that this would occur during normal fishway maintenance in the winter of 2012/2013. Lewis asked about the possibility of Douglas PUD translocating and tagging lamprey sooner so they can start collecting whatever lamprey data they could get. Patterson said that he was willing to make the request but that there are concerns among the fisheries management agencies and tribes that mining lamprey be avoided to the greatest extent possible.

7. **New Douglas PUD Technical Representative to the Aquatic SWG**

Beau Patterson announced that he was moving to a new position at Douglas PUD, and that Andrew Gingerich would soon be taking over as the designated Technical Representative to the Aquatic SWG. Shane Bickford will notify the Aquatic SWG when the change occurs.

V. Next Meetings

1. Upcoming meetings: February 8, 2012 (conference call), March 14, 2012 (conference call), and April 11, 2012 (in-person).

List of Attachments

Attachment A – List of Attendees

Attachment B – CCT Wells Sturgeon Supplementation Proposal

Attachment C – Bull Trout Radio Telemetry Study Design Proposal presentation

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Carmen Andonaegui	Administrative	Anchor QEA, LLC
Andrew Gingerich	Alt. SWG Technical Rep.	Douglas PUD
Beau Patterson	SWG Technical Rep.	Douglas PUD
Patrick Verhey	SWG Policy Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Bob Rose*	SWG Technical Resource	Yakama Nation
Donella Miller*	SWG Technical Resource	Yakama Nation
Chad Jackson	SWG Technical Resource	Washington Department of Fish and Wildlife
Brett Nine	SWG Technical Resource	Colville Confederated Tribes
Pat Tonasket	SWG Technical Resource	Colville Confederated Tribes
Jason McLellan	SWG Technical Resource	Colville Confederated Tribes

*Participated by phone

JUVENILE COLUMBIA RIVER WHITE STURGEON (*ACIPENSER TRANSMONTANUS*) FOR POPULATION SUPPLEMENTATION IN THE WELLS RESERVOIR, COLUMBIA RIVER, WASHINGTON (RFP #11-19-W)

January 9, 2012

A Proposal Submitted by:

Jason McLellan, Confederated Tribes of the Colville Reservation

Larry Hildebrand, Golder Associates Ltd.

Outline

- Background
- Approach
  - Naturally Produced Larvae
  - Origin
  - Methods
  - Disease
  - Permitting
- Experience, Expertise, and Qualifications
- Equipment
- Tasks and Deliverables
- Summary

Background

- Small population, low natural recruitment (Jerald 2007)
- Conservation aquaculture common management technique
- Wells Hydroelectric Project White Sturgeon Management Plan

Purpose

- Fulfill requirements of the Aquatic Settlement Agreement (ASA) for the Wells Hydroelectric Project (FERC No. 2149)
  - Wells White Sturgeon Management Plan (WSMP)
  - Wells White Sturgeon Broodstock Collection and Breeding Plan

Approach – Naturally Produced Larvae

- Increasingly common
  - Address genetic conservation concerns
  - Lake sturgeon – Holtgren et al. (2007); Smith and Hobden (2011)
  - Upper Columbia River – (WDFW, unpublished data)
    - >10,000 larvae; 8 nights; S=98% nets; S=35% hatchery

- Our Reasons
  1. Decreased broodstock selection
  2. Increased genetic diversity
  3. Decreased stress on broodstock
  4. Greater likelihood Wells sturgeon represented
  5. Natural reproduction potential – Wells sturgeon

Decreased Broodstock Selection

- Small numbers
- Difficult to obtain
- Selection
  - Spatial
  - Temporal
  - Size

Increased Genetic Diversity

- Increased effective number of breeders (N_b) (spawners)
- Comparison of collection techniques (Crossman et al. 2011)
  - Lake sturgeon
  - Eggs/larvae - less relatedness
  - Eggs/larvae - higher N_b
- Being evaluated for white sturgeon – upper Columbia

Decreased Stress on Wild Broodstock

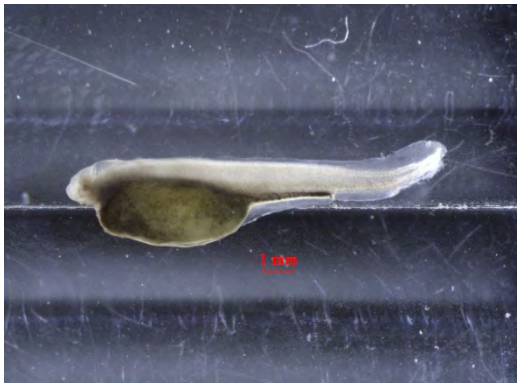
- Low numbers of adults in many potential source populations
- Handling can be stressful
- Desirable to limit handling stress

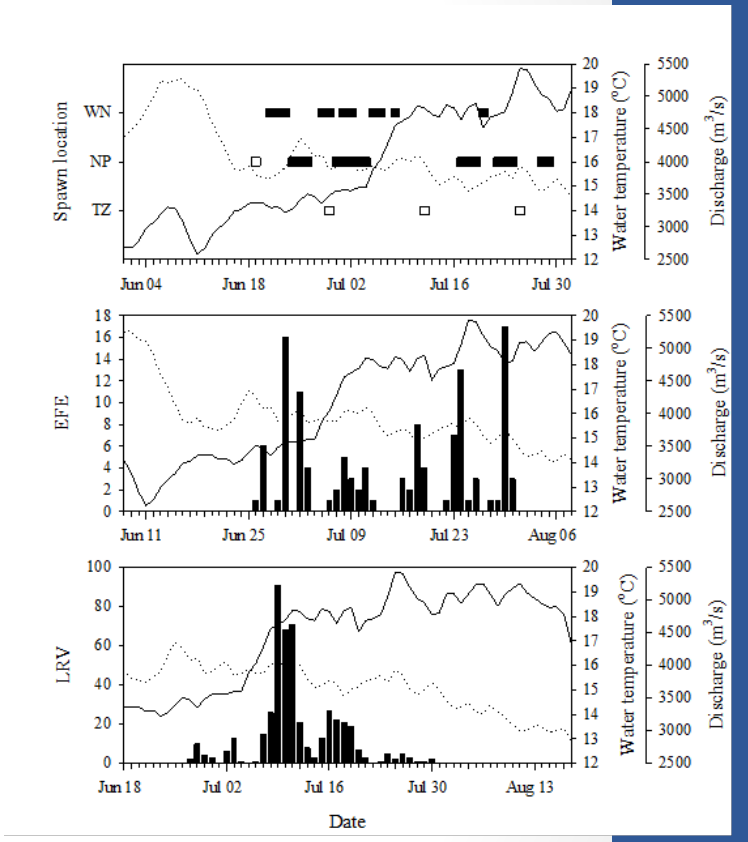
Greater Likelihood of Wells Representation

- Very low numbers of adults
  - Low probability of capturing adult broodstock
- Greater opportunity to capture drifting larvae
  - High fecundity
  - Ontogenetic behavior
- Applies to other locations as well (i.e. Wanapum)

Natural Reproduction Potential - Wells

- Secondary benefit
- Monitoring & Evaluation Program – WSMP
  - Phase I – Objective 3





Origin

- Wells Reservoir
  - Consistent with WSMP and Breeding Plan
  - High priority
  - Likely difficult to meet supplementation targets

- Wanapum Reservoir
  - Consistent with WSMP and Breeding Plan
  - Greatest potential of mid-Columbia populations
    - High abundance (n=551; 95% CI 314-1,460) (Golder 2003a, 2003b)
    - Documented annual spawning

- Upper Columbia River (Lake Roosevelt)
  - Consistent with WSMP and Breeding Plan
  - High numbers of larvae available
  - Genetically more similar to mid-Columbia sturgeon
  - Greater genetic diversity
  - Coordination with existing program

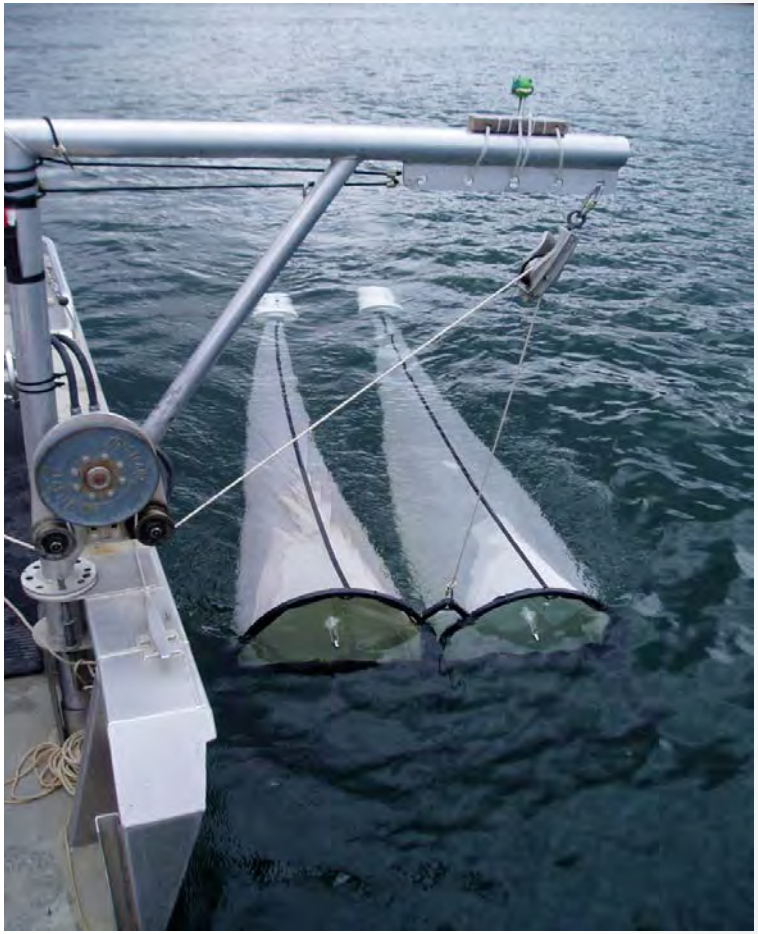
Method – Collection Targets

Source	No. Larvae	No. Yearlings*
Wells Reservoir	2,000	700
Wanapum Reservoir	6,000	2,100
Upper Columbia River	6,000	2,100
Total	14,000	4,900

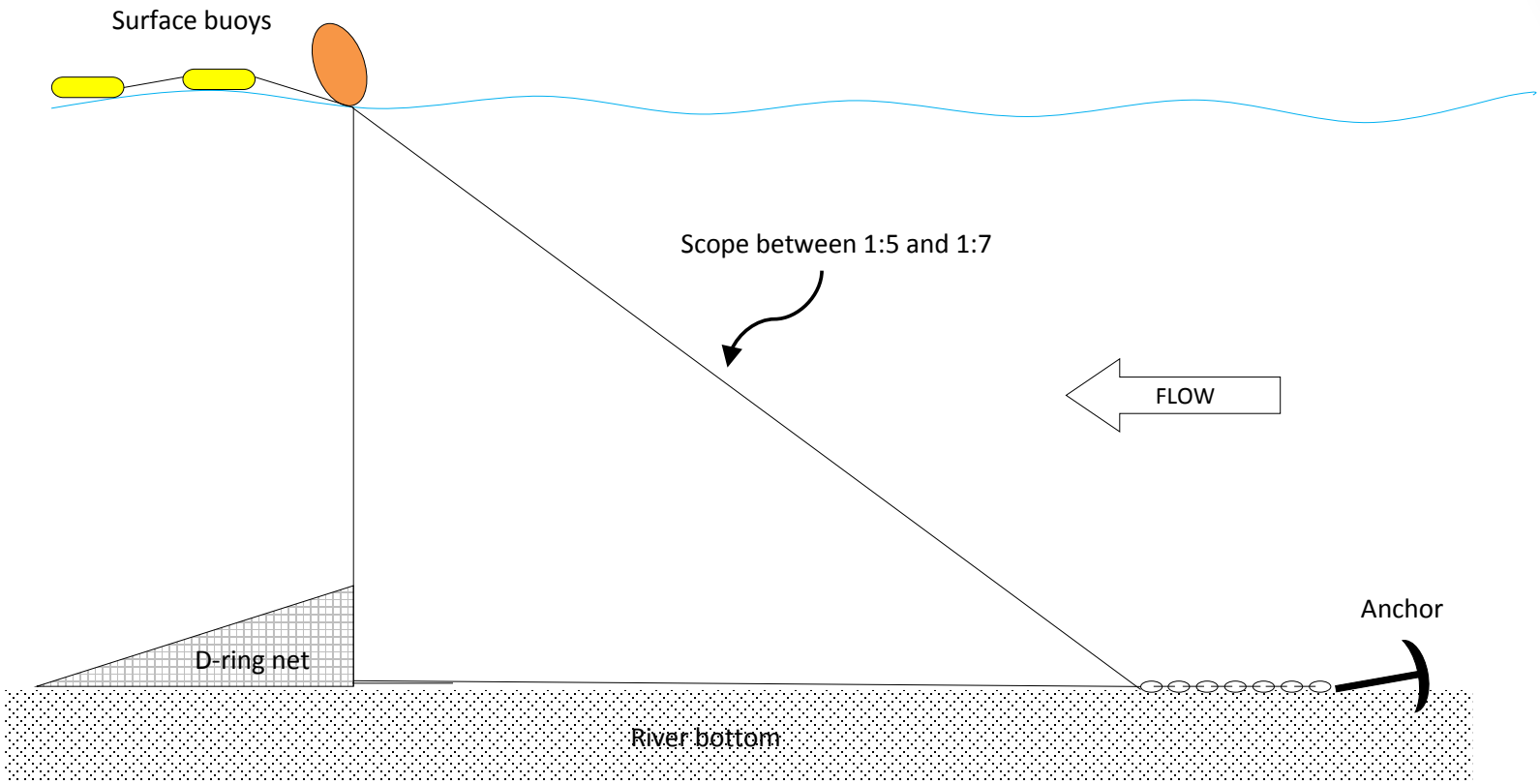
*Assumes 35% survival

Method – Sampling Equipment

- Modified D-ring plankton nets (Howell and McLellan, *in review*)



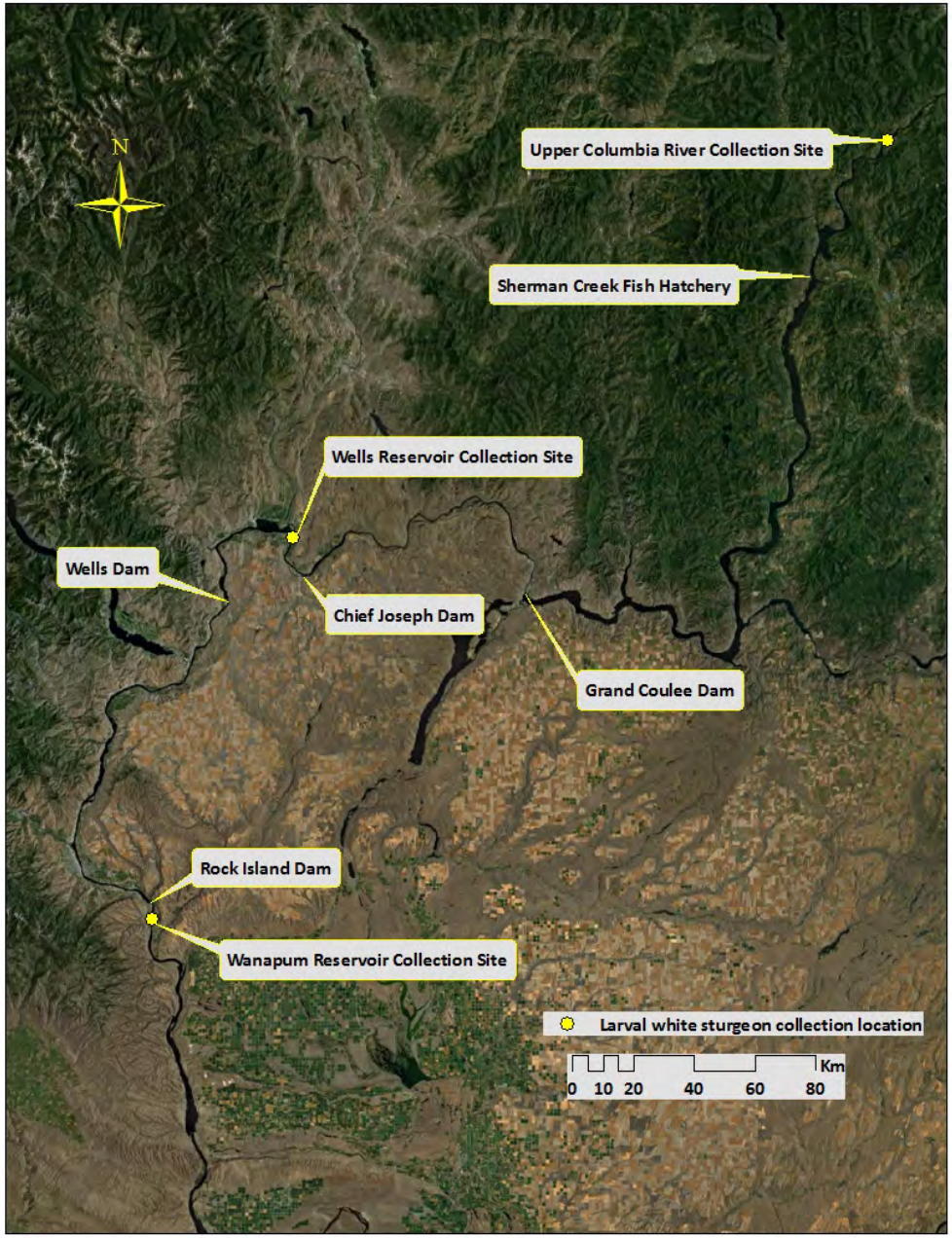
Methods – Mooring System



From Howell and McLellan (*in review*).

Method – Sample Design

- Wells
  - Downstream of Chief Joseph Dam
  - 6 frames – 12 nets
  - 30 nights between July 1 and August 15
- Wanapum
  - Downstream Rock Island Dam
  - 6 frames – 12 nets
  - 20 nights between July 1 and August 15
- Upper Columbia River
  - China Bend area
  - 6 frames – 12 nets
  - 10 nights between July 1 and August 15
- Collection to cease if total target achieved


N
Upper Columbia River Collection Site
Sherman Creek Fish Hatchery
Wells Reservoir Collection Site
Wells Dam
Chief Joseph Dam
Grand Coulee Dam
Rock Island Dam
Wanapum Reservoir Collection Site
Larval white sturgeon collection location
Km
0 10 20 40 60 80

Method – Delivery

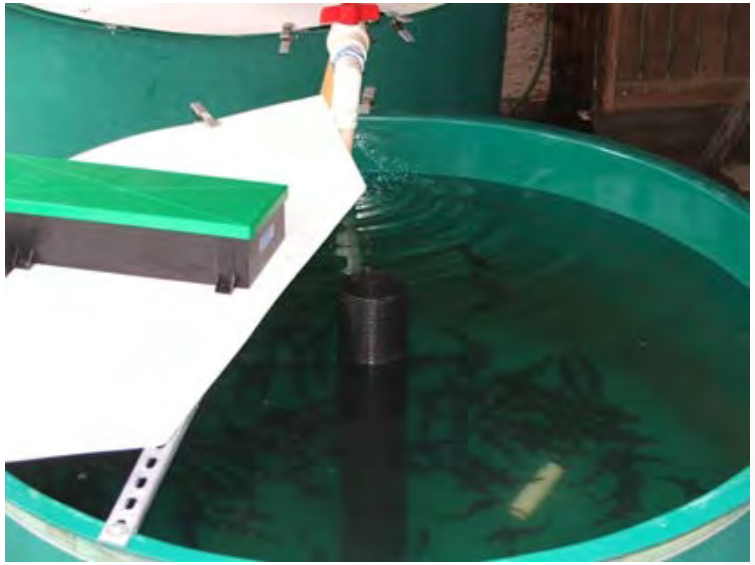
- Transported by vehicle in cylindrical insulated water coolers
  - 18.9 L (5 g) filled with river water
  - ~1,000 larvae per vessel
  - Partial water changes as necessary
    - Additional water and oxygen transported

- Wells and Wanapum
  - Directly to Wells Fish Hatchery

- Upper Columbia River
  - Directly to Sherman Creek Hatchery
  - Weekly transfers to Wells Fish Hatchery
  - Multiple alternatives available for discussion

Disease Concerns

- White sturgeon iridovirus (WSIV) and white sturgeon herpesvirus (WSHV)
- Risk regardless of fish origin
- Risk can be mitigated
  - Reduce rearing density
  - Reduce handling stress
  - Manage water source
- Upper Columbia River
  - No disease outbreaks to date
  - UV filtration of incoming water
  - Prophylactic treatments



Permitting

- Federal permits
  - Wells Reservoir – assume work under Douglas PUD's Sec. 10 permits
  - Wanapum Reservoir – we will obtain Sec. 10 permits
  - Upper Columbia – none needed
- WDFW Scientific Collection Permit
  - Will obtain for all locations, as necessary
- WDFW Fish Transport Permit
  - Will obtain to transport fish from all locations

Experience, Expertise, and Qualifications
Jason McLellan – Project Manager

- Sampled all life stages of sturgeon

- Principal role in WS research and conservation aquaculture program in Washington
  - Permitting
  - Broodstock capture
  - Marking strategies
  - Releases
  - Evaluation
  - Adaptive management

- Upper Columbia White Sturgeon Recovery Initiative Technical Working Group member

Experience, Expertise, and Qualifications
Larry Hildebrand - Project Director

- Sampled all life stages of white sturgeon

- Principal role in WS research and recovery programs in BC (since 1990) and in Washington (since 2000)
  - Study Design
  - Data analysis
  - Mark-recap studies
  - Recovery Planning
  - Adaptive management

- UCWSRI TWG member; founding member NAC WSCS

Staff Expertise

- Golder and CCT employ numerous biologists and technicians with extensive experience working with white sturgeon that will be available to participate on the project

- This depth of experience will ensure crew consistency and increase sample efficiency over the project duration

SAFETY

- **WORK SAFE, HOME SAFE**
  - Exemplary safety record in conducting what has the potential to be very hazardous work
  - Focus on crew training, using experienced staff, and actively promoting safe work practices
  - Results in reduced injuries and downtime

Specialized Equipment

What does expertise and specialized equipment provide?

- Efficiency
  - Greater sampling effort in less time
  - Greater survival of fish
- Safety
  - Established routine, equipment familiarity, and staff training
  - Large, safe work platform
  - Less strain on staff
- Permitting

Tasks and Deliverables

- Task 1 – Obtain applicable permits
  - Deliverable: permits to legally implement project
- Task 2 – Prepare sampling equipment
  - Deliverable: equipment to safely and efficiently capture white sturgeon larvae
- Task 3 – Capture and Delivery of White Sturgeon Larvae
  - Deliverable: ~14,000 naturally produced larvae delivered to Wells Fish Hatchery
- Task 4 – Reporting
  - Deliverable: Annual progress report and permit compliance reporting

Benefits of The Team

- **Passion**
- **Expertise**
- **Professionalism**
- **Proven Track Record**
- **Innovation**
- **Standardized Approach**
- **Familiarity With The Area and Issues**
- **Corporate Stability and Reliability**
- **Safety**
- **Cost Effectiveness**

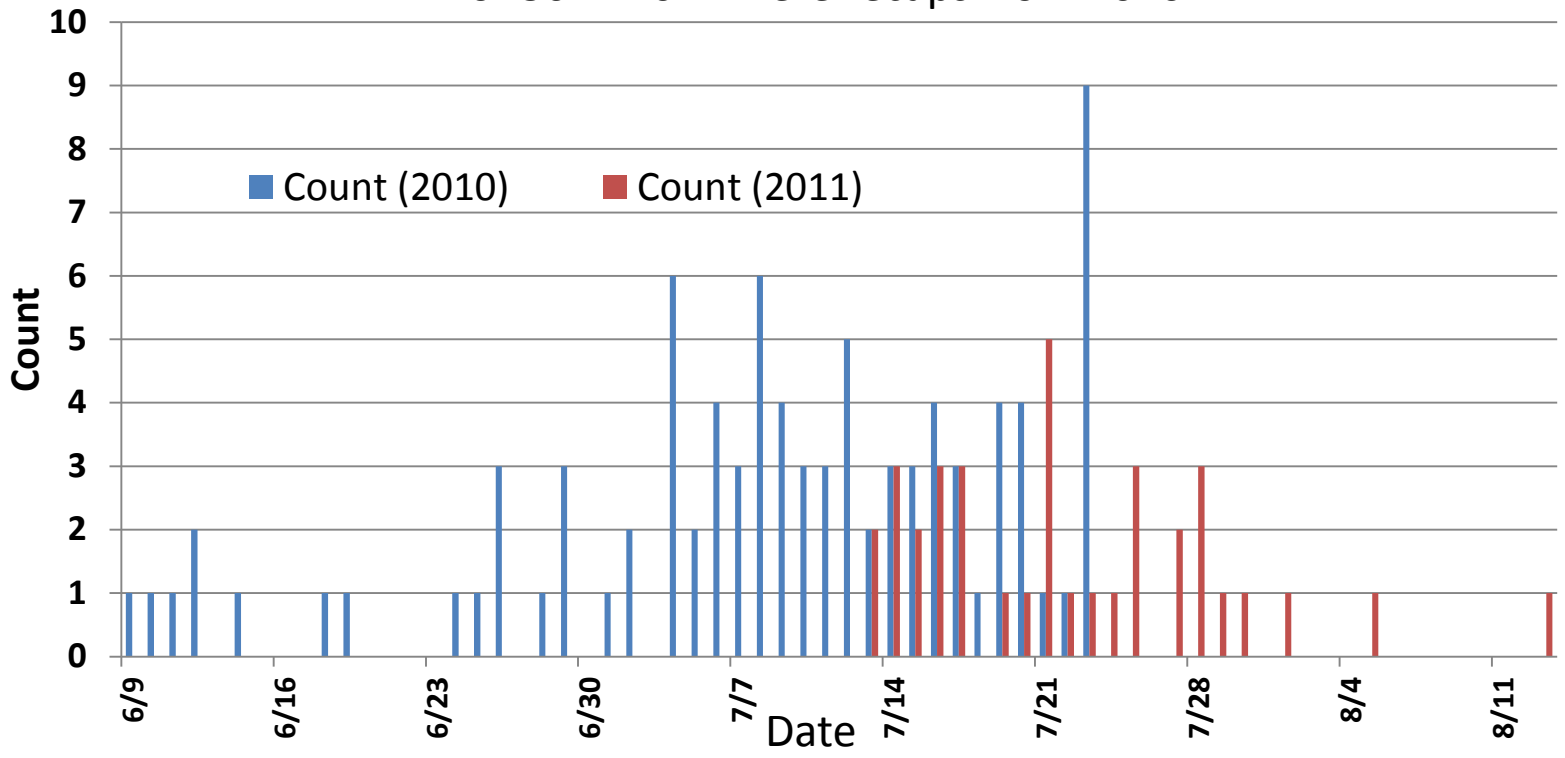
Questions?

- Twisp trap boxes installed Sept.
- Removed Aug.
- Used for SH and SCH brood collection- Captures Bull Trout incidentally June-Aug

- BTMP- N=10 fish RT tagged to examine take at the weir in year 1 of license. Propose N=30?

N= 87 (Range 440-790 Mean= 594 mm)	N= 36 (Range 420-720 Mean= 520 mm)

- 7 of 36 in 2011 were recaps from 2010



Study Design:

- Compare treatment (weir reach) to free flowing control reaches
- May be an opportunity to compare travel times to Entiat and other RT travel times in tribs

Final Meeting Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: March 26, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the February 8, 2012, Aquatic SWG Meeting

I. Summary of Decisions

1. There were no decisions made at today's meeting.

II. Summary of Action Items

1. Aquatic Settlement Work Group (Aquatic SWG) edits to the 2012 Aquatic Settlement Agreement Action Plan (Action Plan) are due to Andrew Gingerich by February 22, 2012 (Item III-2).

2. Andrew Gingerich will email a revised Action Plan to Carmen Andonaegui by February 29, 2012, for distribution to the Aquatic SWG for approval at the March 14, 2012, meeting (Item III-2).

3. The Washington Department of Fish and Wildlife (WDFW), the Yakama Nation, and the Colville Confederated Tribes (CCT) agreed to consider developing a joint proposal for implementation of the sturgeon supplementation program; a joint proposal would need to be distributed to the Aquatic SWG by March 2, 2012, for consideration at the March 14, 2012, meeting (Item III-3).

4. Aquatic SWG representatives will email any additional comments on the Draft Bull Trout Radio Telemetry Study to Andrew Gingerich by February 22, 2012 (Item III-4).

5. Andrew Gingerich will email to Aquatic SWG representatives a revised Draft Bull Trout Radio Telemetry Study for approval at the March 14, 2012, meeting (Item III-4).

6. Carmen Andonaegui will email the current list of designated work group representatives to each Aquatic SWG policy and technical representative, asking that they confirm the listed representative as current by the March 14, 2012, meeting (Item III-6).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are

listed in Attachment A to these minutes). Schiewe reviewed the agenda and added a review of the Aquatic SWG list of policy and technical committees' representatives. He asked for any additional agenda items. There were none.

Schiewe asked for comments on or changes to the revised draft January 9, 2012, meeting minutes. Carmen Andonaegui said she had received edits from Chad Jackson after the revised draft January 9, 2012, meeting minutes were emailed to Aquatic SWG representatives for approval at today's meeting. She said that these edits needed to be reviewed with the Aquatic SWG since they had not seen them, along with two comments by Pat Irle that needed explanation. The Aquatic SWG reviewed and approved revisions based on Jackson's edits. Regarding Irle's comments, Beau Patterson explained the relationship between the Federal Energy Regulatory Commission (FERC), the Aquatic SWG, and Douglas PUD. Patterson said that FERC will require its prior approval of individual measures contained in each Aquatic Settlement Agreement management plan prior to implementation by Douglas PUD. However, he said that Douglas PUD does not expect FERC will change management plan measures; rather that FERC retains that option within the Project license. Andonaegui will finalize the minutes as revised and approved for distribution to the Aquatic SWG.

2. **2012 Aquatic Settlement Agreement Action Plan** (Andrew Gingerich)**:** Andrew Gingerich said that the Action Plan was distributed by email to the Aquatic SWG by Carmen Andonaegui on Monday, January 6, 2012. He said that the Action Plan listed the Aquatic Settlement Agreement management plans' objectives through 2012. Gingerich said that the version he was handing out to the Aquatic SWG today was a revised version; he described the differences in the revised version from the version distributed on January 6, 2012.

   Donella Miller asked that the word "broodstock" be changed to "rearing" in line 1(c) under the White Sturgeon Management Plan section of the Action Plan, and Gingerich concurred. Gingerich also highlighted the fact that Douglas PUD will continue to carry out year-round counts of bull trout at Wells Dam fish ladder count windows, and confirmed that Douglas PUD would differentiate between subadult and adult bull trout. Comments or edits to the Action Plan should be sent to Gingerich by February 22, 2012. Gingerich said that he will send a revised Action Plan based on today's discussion to Andonaegui by February 29, 2012, for approval and finalization at the March 14, 2012, meeting.

3. **Sturgeon Supplementation Program Proposals Path Forward** (Beau Patterson): Beau Patterson opened the discussion by summarizing that two proposals had been received by Douglas PUD in response to the request for proposals (RFP) for the White Sturgeon Supplementation Program; one proposal from the Yakama Nation and the other from the CCT and Golder Associates. Following discussion at the January 9, 2012, meeting, Douglas PUD had requested that Mike Schiewe ask Aquatic SWG representatives to

email their recommendations for a preferred proposal to Schiewe to determine if there was consensus among the representatives on a preferred proposal. An email was circulated by Schiewe to the Parties on January 10, 2012 requesting a response by January 20, 2012. The result of the email request for recommendations was that there was no consensus among the Aquatic SWG representatives on a preferred proposal. Patterson said that Douglas PUD was open to any technically solid, cost-effective proposal, but that it would not move forward on either proposal without an Aquatic SWG consensus recommendation. In addition, he stated that Douglas PUD was unwilling to fund redundant programs.

Patrick Verhey said that an email had been sent by Bob Rose to Steve Lewis requesting that the U.S. Fish and Wildlife Service (USFWS) support the supplementation plan of the regional co-managers. He said that Lewis had replied that the USFWS had trust responsibilities to both tribes, but that the Aquatic SWG was a technical forum and his responsibility was to support the proposal with the best technical merit. In his opinion, the larval collection proposal submitted by CCT/Golder, had superior merit and he had cast his vote accordingly. Lewis asked Donella Miller if she thought Rose was receptive to dialogue with the members on the CCT/Golder proposal and if she thought a joint proposal would be something the Yakama Nation would support. Miller said that she thought the Yakama Nation would be receptive to a discussion of a joint proposal.

Verhey asked why the selection of a proposal would not go to dispute resolution rather than no action being taken. Patterson said that it was because there was no action taken by Douglas PUD to dispute, but rather a lack of consensus among the Aquatic SWG representatives as to which proposal to accept. Shane Bickford said that if the committee could not reach consensus on a path forward for selecting a contractor, FERC would compel Douglas PUD to act, upon issuance of a new license.

The group discussed previous regional sturgeon technical meetings that had been held and suggested that these meeting may be a good forum to use to resolve the current disagreement over the two supplementations proposals. Miller mentioned that Chelan PUD had hosted one of these meetings last year. Gingerich said that Douglas PUD was willing to participate in regional coordination efforts, but that agreement was needed at the Aquatic SWG level to move Douglas PUD's efforts forward. Jason McClellan indicated that the CCT were willing to work with WDFW and the Yakama Nation to develop a joint proposal for consideration by the Aquatic SWG.

Miller asked if the work proposal was to be for only 1 year. Patterson said that the original proposal was for 2 years, but that Douglas PUD would consider a 1-year proposal. Bickford stated that the group needed to be cognizant of contracting rules and that due to state laws governing bid awards, Douglas PUD could not simply select a new joint proposal from the competing contractors. Mike Schiewe asked when Douglas PUD would need a consensus proposal in order to meet scheduling needs for

implementation of the sturgeon supplementation program in 2012. Patterson said that if a consensus proposal were approved by the Aquatic SWG by the end of March 2012, there might be time to execute a contract in June 2012 to begin collecting broodstock or larvae in 2012. Schiewe reminded the group that, as required for meeting decision items, any new proposal to be considered for approval at the March 14, 2012, Aquatic SWG meeting would need to be distributed to members at least 10 days in advance of the meeting (by March 2, 2012). WDFW, the Yakama Nation, and the CCT agreed to consider developing a new supplementation proposal that could be supported by all three management entities, to be provided to the Aquatic SWG for consideration by March 2, 2012.

4. **Bull Trout Radio Telemetry Study at Twisp Weir Study Proposal** (Andrew Gingerich)**:** Andrew Gingerich said that he had spoken with WDFW and the USFWS about their comments on the draft Bull Trout Radio Telemetry Study for evaluating passage at the Twisp Weir. He said that if there were any more comments from Aquatic SWG representatives, to email the comments to him by February 22, 2012. Once all comments have been received, Gingerich said that he would revise and finalize the study for approval at the March 14, 2012, meeting. Gingerich noted that previous radio telemetry work showed that tagging and handling may alter the behaviors of bull trout, thus tagged fish may or may not be representative of the untagged populations and that this is always a risk when using a tagging technology. Steve Lewis asked about using Passive Integrated Transponder (PIT) tags given these concerns. Gingerich commented that he suspected that during the time that the Wells Aquatic Settlement Agreement was being drafted, members believed that radio-telemetry would provide more resolution of behaviors than PIT tags could provide, and concluded that using radio tags was the best method available for gathering the required information. Shane Bickford said that since FERC has stated that it would like to approve the study plan prior to implementation, Douglas PUD would like to be able to submit the study plan to FERC prior to the final license order being issued. Bickford said that if Douglas PUD had to wait until after the license order was issued to submit the study plan, FERC would require a 30-60 day review of the study plan, making conducting a bull trout study in 2012 very difficult. Gingerich said that the challenge will be to obtain a large enough sample size and to be able to locate the tagged fish. He said that Douglas PUD hoped to tag up to 30 fish and would continue this discussion with the USFWS.

5. **Update on Lamprey Activities at Wells Project** (Beau Patterson)**:** Beau Patterson said that Half-Duplex Passive Integrated Transponder (HD PIT) detectors are being installed in Pool 19 of the west fish ladder so that lamprey passage data can be collected during summer 2012. Full installation of the HD PIT detectors at Wells Dam will occur in late December 2012/early January 2013 so an adult lamprey dam passage study can be conducted in 2013, if fish are available. He said that Douglas PUD had been investigating using infrared video to count lamprey passage in the ladder. Rather than

try to enumerate lamprey through all passage routes, Patterson said that a more workable approach might be to count lamprey above and below the count window and count window pickets. The change of installation of the HD PIT detector from Pool 13 to Pool 19 was made because Pool 13 may be inundated on a high water year like 2011. Pool 19 will always be above the tailrace elevation during a high water year so lamprey will be forced to pass through the submerged orifice, which would be wired with a detection array. Steve Lewis asked why all passage routes could not be counted. Patterson said this is because Douglas PUD does not want to create any negative impacts to salmonid passage. RD Nelle asked where trans-located fish (if needed) might be obtained. Patterson said Douglas PUD is open to any source. Shane Bickford said Bonneville could be a preferred source because availability of adults was assured from that site. Mike Schiewe said there would be further discussion at future meetings regarding possible sources of adult lamprey for translocation.

6. **Aquatic SWG Policy and Technical Representatives** (Mike Schiewe)**:** Mike Schiewe said that he would like to review and update the list of policy and technical representatives for the Aquatic SWG. He said that he would like each person of sufficient authority to confirm that the listed policy and technical representative is current. Schiewe said that when there is a vote in the Aquatic SWG, that the designated representative must provide the vote. Schiewe said that Andonaegui would email the current list of designated work group representatives to each Aquatic SWG policy and technical representative, asking that they confirm the listed representative as current by the March 14, 2012, meeting. He said that Aquatic Settlement Agreement signatory parties could assign an alternate representative for each group if they would like, but that it is not required. He said that technical resource staff could also be provided, but that having someone listed as a technical resource was not necessary for that person to participate in an Aquatic SWG meeting.

IV. Next Meetings

1. Upcoming meetings: ***March 14, 2012 (conference call), April 11, 2012 (in-person), and May 9, 2012 (conference call).***

List of Attachments

Attachment A – List of Attendees

Attachment B – Draft Bull Trout Radio Telemetry Study Proposal

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Carmen Andonaegui	Administrative	Anchor QEA, LLC
Andrew Gingerich	SWG Alternate Technical Rep.	Douglas PUD
Beau Patterson	SWG Technical Rep.	Douglas PUD
Patrick Verhey	SWG Policy Rep.	Washington Department of Fish and Wildlife
Pat Irle*	SWG Technical Rep.	Washington State Department of Ecology
R.D. Nelle*	SWG Technical Resource	U.S. Fish and Wildlife Service
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Shane Bickford	SWG Policy Rep.	Douglas PUD
Donella Miller	SWG Technical Resource	Yakama Nation
Chad Jackson*	SWG Technical Resource	Washington Department of Fish and Wildlife
Pat Tonasket*	SWG Technical Resource	Colville Confederated Tribes
Jason McLellan*	Technical Resource	Colville Confederated Tribes

*Participated by phone

BULL TROUT PASSAGE AT THE TWISP RIVER WEIR STUDY PLAN

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

December, 2011

Prepared by:
Andrew Gingerich

Prepared for:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

For copies or question related to this Study Plan, contact:

Public Utility District No. 1 of Douglas County
Attn: Andrew Gingerich
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497
Phone: (509) 884-2323
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Table of Contents

List of Figures

List of Tables

ABSTRACT

The Twisp River Weir is located approximately 13 km upstream of the Twisp and Methow River confluence. The weir is operated from early March to the end of August annually as a steelhead and Chinook broodstock collection facility. In addition, the weir is used to support a multi-year steelhead reproductive success study. The weir is maintained and funded by Public Utility District No. 1 of Douglas County (Douglas PUD) and operated by the Washington Department of Fish and Wildlife. The Twisp River supports a population of threatened bull trout, which often make spawning migrations past the Twisp River Weir during the months of June to August. Following spawning, bull trout may move downstream past the weir site while seeking over wintering locations. To date, bull trout passage at the site has not be evaluated. Douglas PUD is proposing to address this information gap in 2012 as part of the first year implementation of the Bull Trout Management Plan. Should the new FERC license for the Wells Project be issued after April 15, 2012 then this study will be implemented during the 2013 bull trout passage season.

1.0 INTRODUCTION

1.1 Bull Trout Biology and Status

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon, Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the Mackenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat (USFWS et al. 2000), and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al. 1997). Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. Of all salmonids, bull trout are excellent indicators of water quality.

Because of historical declines of bull trout, on June 10, 1998 the U.S. Fish and Wildlife Services (USFWS) listed bull trout within the Columbia River basin as threatened under the Endangered Species Act (FR 63(111)). Bull trout decline has been observed can be contributed to human activities such as development, logging and agriculture that have degraded its habitat. Other factors contributing to their listing status include habitat degradation and fragmentation, blockage of migratory corridors, poor water quality and quantity, the effects of climate change, overfishing and past fisheries management practices, including the introduction of non-native species such as brown, lake and brook trout.

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species and evaluate whether distinct populations segments exist and merit the ESA’s protection. New critical habitat was proposed throughout the range of bull trout in January 14, 2010 (75 FR 2270), including all of the Wells Project waters except the Okanogan River since the Project is a migratory corridor and provided foraging and overwintering habitat.

1.2 Douglas Aquatic Settlement and Bull Trout Management Plan

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans within the Aquatic Settlement Agreement (ASA). The Agreement was developed as part of the Integrated License Process or ILP used to relicense the Wells Project. This study is being proposed in order to satisfy the requirements of the ASA and the new FERC license for the Wells Project .

During the development of the BTMP, the Aquatic Settlement Work Group (Aquatic SWG) focused on developing management priorities for resources potentially impacted by Project operations. Members of the Aquatic SWG include the USFWS, Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama), Bureau of Land Management (BLM) and Douglas PUD.

As part of the measures contained within the BTMP and new license, Douglas PUD is required in year one of the license to conduct a bull trout passage study at the Twisp River weir. One of the goals of this study is to determine the passage characteristics of bull trout at this site and to assess incidental take, if any associated with the collection of steelhead and spring Chinook broodstock.

1.3 Twisp River Weir

The Twisp River Weir is comprised of a series of hydraulically-controlled panels and two trap boxes. The panels of the weir are permanently installed and kept in the fully lowered position throughout the fall and winter. In the spring the trap boxes are installed, at which point the pickets are raised enough to encourage upstream migrating fish to swim along the sill and through the passage notches . Once in one of the two passage notches, the fish volitionally enter a trap boxes..

Douglas PUD installs the trap boxes around March 15th (installation occurred on March 17th in 2011). During the spring (March 15th to mid-June) the trap is operated by WDFW Science Division staff as part of Douglas PUD's steelhead broodstock collection activities, and for containment of hatchery-origin spawners. From mid-June to September operations are supervised by WDFW Methow Hatchery staff that collect spring Chinook salmon broodstock. The trap boxes are usually removed in early to mid-September and the slide gates (trap exit doors) on the traps are removed during the interim between the end of the Chinook trapping season and the removal of the traps. In 2011 the trap exit doors were removed on August 30th and the trap boxes were removed on September 19th.

During operation/trapping fish are sampled a minimum of once daily. The weir, however, is monitored throughout the day and adjusted, as needed, to maintain a barrier to upstream migration during changing flow levels, and to allow debris passage, as needed. During trapping, the panels are raised only enough to discourage fish from swimming over the weir and thereby avoiding the trap boxes. Depending on water levels, the panels are off the river bottom but still at a negative angle in relation to the river bed. This negative angle allows fish and debris moving downstream to pass safely over the weir. The weir is monitored throughout the day and raised and lowered for short periods of time to pass debris at the operator's discretion (debris loads can change quickly during spring freshets). The upstream exits of the trap boxes are protected by a temporary debris boom. The debris boom is installed and removed annually during the same days that the trap boxes are installed and removed. The weir is considered to be operating whenever the trap boxes are in and the trap box doors are closed. No trapping or fish sampling is conducted during high flow events because conditions are not safe for personnel to enter the traps to remove captured fish (see the below photo; Fig. 1). During 2011 the trap was

not operated from early June through the middle of July[1]. The weir is operated under guidelines specified in the annual Broodstock Collection Plan and the annual Monitoring and Evaluation Work Plan developed and approved by the Wells HCP Hatchery Committee (USFWS, NMFS, Tribal agencies, and Douglas PUD).

Figure 1. Twisp River Weir A) during September removal, illustrating the hydraulic pickets B) during a high flow event (not operating).

A) B)

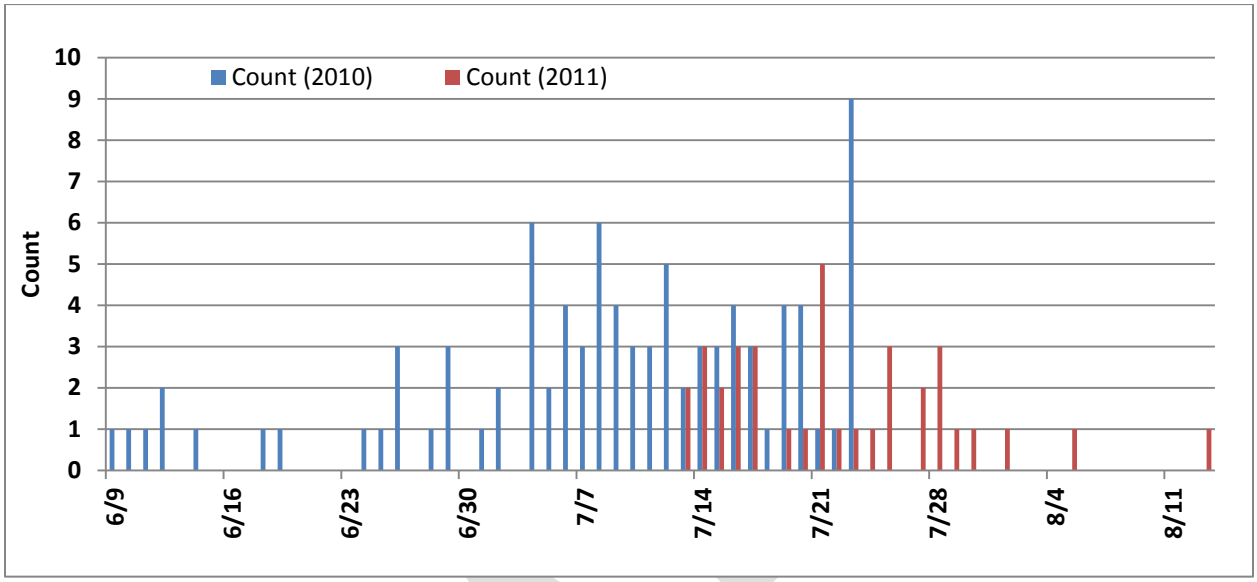
Note: During operation the pickets are lifted slightly off the river bottom to direct fishing into the traps, while still allowing downstream passage.

1.4 Bull Trout Encounters at the Weir (2010-2011)

Bull trout are encountered at the weir on a seasonal basis. However, yearly observation comparisons are precluded by inconsistent operations as a result of variable flows during times when bull trout migrate past the weir. Nevertheless, bull trout appear to primarily make upstream spawning migrations past the weir during the months of June and July. In 2010, 87 bull trout were encountered at the weir (mean = 594, range 440-790 mm). In 2011, during a high flow year only 26 fish were captured. Lower numbers observed in 2011 are likely attributed to higher flows that prevent the trap from being safely operated. Flows may have also delayed upstream migration to later in the season. Capture distribution for these two year are shown in (Figure 2).

[1] Actual dates of shut down due to high flows in 2011 are currently being gathered from the Washington Department of Fish and Wildlife's Twisp M&E office.

Figure 2. **Date distribution of bull trout captured in the Twisp River Weir in 2010 and 2011.**



2.0 GOALS, ASSUMPTIONS AND HYPOTHESES

2.1 Goals

The primary goal of the 2011 bull trout is outlined in measure 4.2.2 of the BTMP:

Douglas will conduct a one year radio telemetry study to assess passage and incidental take at off-Project adult collection facilities (Twisp River Weir). Douglas will capture and tag up to 10 adult migratory bull trout (>400 mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take.

If the Aquatic SWG and USFWS can agree, Douglas PUD will consider tagging up to 30 fish rather than the original 10, thus increasing sample size and maximizing statistical power.

2.2 Assumptions

1. Tagged bull trout are representative of the untagged population.
2. Adult bull trout are representative of smaller conspecifics.
3. Handling and moving captured bull trout downstream will not change migration behavior.
4. Environmental factors such as flow, water temperature do not mask any existing differences between behaviors found in Twisp river reaches.
5. Passage at the weir does not delay, harm, injure or cause mortality of migrating bull trout.

2.2.1 Life History Hypotheses

$H1_{alt}$: Travel times between the weir reach and control reaches (weir free) are significantly different, whereby the weir reach significantly slows bull trout when compared to travel time through all other control reaches.
$H1_o$: There is no difference in the travel times exhibited by bull trout traveling through the weir reach or any other control reach.

$H2_{alt}$: Lethal take occurs within or immediately after weir passage in the subsequent control reach, which can be attributed to weir stressors/experience.
$H2_o$: No mortality occurs in the Twisp River Weir or in the next upstream reach.

$H3_{alt}$: Downstream migration during a perceived post-spawn period is significantly slower through the weir reach than all other control or non-weir reaches.
$H3_o$: There is no difference in the downstream travel times exhibited by bull trout between the weir reach and any control reach.

3.0 METHODOLOGY

3.1 Capture and Release Details

Fish will be captured at the Twisp River Weir in the month of June and July. Tagging and fish availability will be coordinated between the contractor, the Douglas PUD's contract manager and the WDFW (weir operators). Historical information on fish availability will be provided to the contractor to assist in predicting tagging periods in June and July (e.g. see Figure 2). Tagging logistics will be proposed in the scope of work provided by the contractor but will follow the allowances provided by the USFWS for the overnight holding of fish to be tagged. For example, Douglas PUD will seek approval to hold fish overnight, which would allow the contractor to travel on a capture day and tag the following. Alternatively the contractor will be on hand for a three week period to complete the tagging.

After tagging, fish will be recovered and transported to a designated downstream location. All receiver stations will be operating to detect and monitor fish passage for at least one year. During the monitoring period the weir will be operated under guidelines specified in the annual Broodstock Collection Plan and the annual Monitoring and Evaluation Work Plan developed and approved by the Wells HCP Hatchery Committee.

Some basic needs such as recapture information and transporting assistance will be coordinated with the WDFW and the Douglas PUD's contract manager. Stations will be maintained by Douglas PUD staff and the contractor as agreed upon by the selected scope of work and budget. Stations will be checked routinely, data downloaded and backed up on at least two sources. Douglas PUD staff will be available periodically to facilitate this process.

3.2 Tagging Procedures

Tagging procedures will follow methods described in previous bull trout radio telemetry studies conducted at Wells Dam (LGL and Douglas PUD, 2007; 2008) and will consider recent advances in knowledge and understanding of fish health and condition (e.g., Cooke et al., 2011a; b; Harnish et al., 2011; Oldenburg et al., 2011; Wagner et al., 2011). Effort will be made to minimize impacts to fish's biological and physiological condition. Specific attention will be made by the contractor to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

During tagging a scale sample and small fin clip (genetic sample) will be taken by the contractor and preserved in ethanol and furnished to Douglas PUD. Other biological observations will be made and include but limited to sex (if determination can be made), fork length, total length, and fish weight.

Tags will be purchased by Douglas PUD from Lotek Wireless (New Market, Ontario). Tags (MCFT2-3BM) will have an expected tag life of 444 days and a pulse rate interval (PRI) of 5 seconds. Tags purchased will aim to have tag burden less than 2% of body mass (see estimates in Table 1) or half of the 4% is considered acceptable in tag studies (Brown et al., 2006). In addition, each fish will be given a 12 mm RFID PIT tag.

Table 1. Estimated tag burden using 8.0 gram MCFT2-3BM radio tags and 0.1 g PIT tag.

Fish TL (mm)	Fish Mass (g)*	Combined Pit Tag + RT Tag Mass (g)	**Tag burden**
400	594.9	8.1	1.36%
450	846.1	8.1	0.96%
500	1159.4	8.1	0.70%
550	1541.7	8.1	0.53%
600	1999.8	8.1	0.41%

* As determined from wild Walla Walla river bull trout length weight curves; where mass (g) = $9.87x10^{-6}x(TL)^{\wedge 2.99}$ (Budy et al. 2007).

3.3 Monitoring

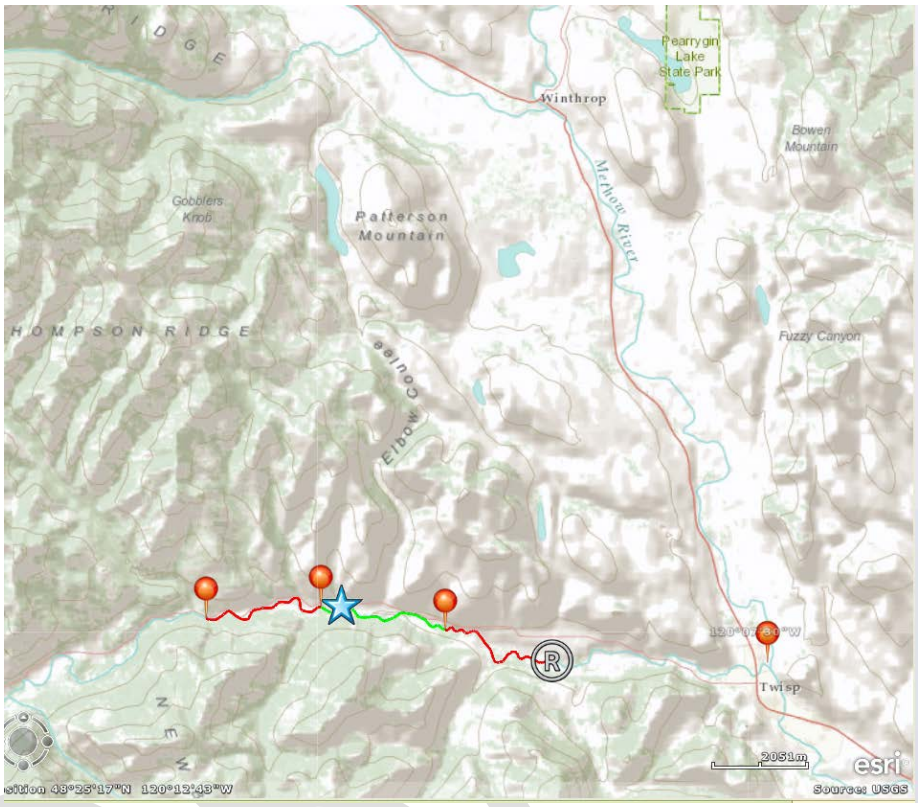
Monitoring will involve fixed station radio telemetry receivers. The number of stations will be appropriately justified within the scope of the hypotheses and goals or at the request and consultation of the Aquatic SWG.

Monitoring stations will be located proximal to temperature monitors and stream gauges in order to assess how environmental characteristics affect travel times through reaches.

3.3.1 Treatment and Control Reaches

Treatment and control stream reaches will be selected by separating the Methow and Twisp rivers (both above and below the weir) into similar length and hydrological condition (riffle, run, and pool) segments. At least three control reaches and one treatment reach will be defined (see Figure 3). The treatment reach will have the weir within it. In the example (see Figure 3), reaches are approximately 3 river kilometers in length. As fish swim through reaches, mean travel time will be determined and compared on a reach specific basis. Additional control reaches may be considered to increased sample size and address reach variability concerns.

Figure 3. **Example stream reach segmentation and release location (®), where the star represents the location of the Twisp River Weir, and orange pins represent estimate fixed radio telemetry stations. Reach segments above and below (red) the weir reach (green) will serve as controls and treatment reach(es) respectively.**



3.4 Statistical Analyses and Reporting

Statistical analyses and reporting will include but may not be limited to evaluation of mean travel times past the weir reach compared to lower or higher control reaches with similar habitat (riffle, run, pool), length and hydraulic conditions. The emphasis of the analyses will be made on passage criteria as outlined in the goals and hypothesize of this study plan. In addition, covariates and variables that lack laboratory control will be considered in statistical analyses. Some covariates might include but are not limited to:

1. tag and tagger effects,
2. changes in environmental conditions such as water temperature and stream flow,
3. fish sex and size morphology,
4. passage time of day,
5. weir operation (at times the weir may not be operating because of high flows).

An effort will be made in reporting to suggest whether these covariates potentially affected results, or fit into context of other response variables (i.e. reach travel time). Statistical significance will be evaluated to an alpha of 0.05 unless otherwise justified.

Reporting will be a collaborative effort between the contractor and the Douglas PUD contract manager for this study. The contractor will provide a draft report including an introduction, methods, results/statistical analyses, and discussion or conclusion sections within 60 days after the completion of the study; made available to the Douglas PUD's contract manager. All data and information collected from this study will be the property of Douglas PUD and any peer reviewed writing publications will be at consent of Douglas PUD. A draft will be furnished to the Aquatic SWG for comment before finalizing the document. See Table 2 for a more comprehensive timeline.

Table 2. Estimated timeline for study development, implementation and reporting.

		Parties Involved				
#	Item	DCPUD	ASWG	WDFW	Contractor	Date
1	Study Plan Development	X				Dec 2011/Jan 2012
2	Study Plan Review ASWG	X	X			Second week of Jan 2012
3	Study Plan Finalized	X	X			Second week of February 2012
4	Study Plan Distribution to Potential Contractors/Scope of work and budget request	X			X	Late February 2012
5	Scope of Work and budget deadline				X	March 15th 2012
6	Internal review and recommendation	X				Late March 2012
7	Professional Service Agreement Development	X				Late March/Early April 2012
8	Professional Service Agreement signed by contractor				X	Middle/late April 2012
9	Notice to Proceed delivered to contractor	X				Late April 2012
10	Scoping at site	X		X	X	May 2012
11	Capture/Tagging	X		X	X	June/July 2012
12	Monitoring	X			X	June 2012-August 31 2013
13	Draft report due to DCPUD				X	Oct 31 2013
14	Draft report due to ASWG	X	X			Second week Nov 2013
15	Report finalized	X			X	December 2013

4.0 REFERENCES

Brewin, P.A. and M.K. Brewin. 1997. Distribution maps for bull trout in Alberta. Pages 206-216 in: Mackay, W.C., M. D. Brewin and M. Monita, editors. Friends of the Bull Trout Conference Proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Calgary, Alberta, Canada.

Brown, R.S., D.R. Geist, K.A. Deters, and A. Grassell. 2006. Effects of surgically implanted acoustic transmitters. 2% of body mass on the swimming performance, survival, and growth of juvenile sockeye and Chinook salmon. Journal of Fish Biology 69:1626–1638.

Budy, P., R. Al-Chokhachy and G.P. Thiede. 2007. Bull trout population assessment in northeastern Oregon: a template for recovery planning. Annual Progress Report for 2006. USGS Utah Cooperative Fish and Wildlife Research Unit Department of Aquatic, Watershed, and Earth Resources Utah State University, Logan, Utah 84322-5210

Cavender, T.M. 1978. Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley) from the American Northwest. California Fish and Game 64:139-174.

Cooke, S.J., C.M. Woodley, M.B. Eppard, R.S. Brown, and J.L. Nielsen. 2011a. "Advancing the surgical implantation of electronic tags in fish: a gap analysis and research agenda based on a review of trends in intracoelomic tagging effects studies." Reviews in Fish Biology and Fisheries 21(1):127-151. doi:10.1007/s11160-010-9193-3

Cooke, S.J., G.N.Wagner, R.S. Brown, and K.A. Deters. 2011b. "Training considerations for the intracoelomic implantation of electronic tags in fish with a summary of common surgical errors." Reviews in Fish Biology and Fisheries 21(1):11-24. doi:10.1007/s11160-010-9184-4

Harnish, R.A., A.H.A. Colotelo, and R.S. Brown. 2011. "A review of polymer-based water conditioners for reduction of handling-related injury." Reviews in Fish Biology and Fisheries 21(1):43-49. doi:10.1007/s11160-010-9187-1

LGL and Douglas PUD. 2007. Wells Hydroelectric Project No. 2149 2006 Annual Report - Wells Bull Trout Monitoring and Management Plan. Report to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL and Douglas PUD. 2008. Wells bull trout monitoring and management plan 2005-2008 final report. Report to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

McPhail, J.D. and J.S. Baxter. 1996. A review of bull trout (Salvelinus confluentus) life history and habitat use in relation to compensation and improvement opportunities. Fisheries management report no. 104. University of British Columbia. Vancouver, B.C.

Oldenburg, E.W., A.H.A. Colotelo, R.S. Brown, and M.B. Eppard. 2011. "Holding of juvenile salmonids for surgical implantation of electronic tags: a review and recommendations." Reviews in Fish Biology and Fisheries 21:35-42. doi:10.1007/s11160-010-9186-2

Rieman, B.E., and J.D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S. Forest Service, Intermountain Research Station. General Technical Report INT-302.

Rieman, B.E., and J.D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions of American Fisheries Society. Vol. 124 (3): 285-296.

Rieman, B.E., D.C. Lee and R.F. Thurow. 1997. Distribution, status and likely future trends of bull trout within the Columbia River and Klamath Basins. North American Journal of Fisheries Management. 17(4): 1111-1125.

U.S. Fish and Wildlife Service, National Marine Fisheries Service, Plum Creek Timber Company, Inc., and CH2M Hill. 2000. Final Environmental Impact Statement and Native Fish Habitat Conservation Plan – Proposed Permit for Taking of Federally Listed Native Fish Species on Plum Creek Timber Company, Inc. Lands. September, 2000.

Wagner, G.N., S.J. Cooke, R.S. Brown, and K.A. Deters. 2011. "Surgical implantation techniques for electronic tags in fish." Reviews in Fish Biology and Fisheries 21(1):71-81. doi:10.1007/s11160-010-9191-5.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: April 11, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the March 14, 2012, Aquatic SWG Conference Call

I. Summary of Decisions

1. There were no decisions items approved at today's meeting.

II. Summary of Action Items

1. Carmen Andonaegui will distribute by email to the Aquatic Settlement Work Group (SWG) the revised draft February 28, 2012, Aquatic SWG meeting minutes for review and email approval by March 19, 2012 (Item III-1).

2. Carmen Andonaegui will distribute by email to the Aquatic SWG the revised Wells Project 2012 Aquatic Settlement Agreement Action Plan (2012 Action Plan), requesting an email vote for approval within 10 days (Item III-4).

3. Andrew Gingerich, Steve Lewis, Patrick Verhey, and Steve Rainey will discuss by conference call the draft Bull Trout Twisp Weir Radio Telemetry Study Proposal (Bull Trout Study Proposal) with the goal of reaching agreement on a draft study proposal. Carmen Andonaegui will distribute by email to the Aquatic SWG the revised Bull Trout Study Proposal, requesting an expedited 5-day review and email approval (Item III-5).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. He said that Tom Kahler would provide the lamprey update, which would be moved to the top of the agenda.

2. **Approval of Meeting Minutes** (Mike Schiewe): Mike Schiewe asked for comments on the draft February 8, 2012, meeting minutes. Because Carmen Andonaegui received comments from Douglas PUD after the comment deadline, she will email the revised

February 8, 2012, meeting minutes to the Aquatic SWG for a 5-day review. Emailed approval of the meeting minutes will be due to Andonaegui by March 19, 2012.

3. **Update on Lamprey Activities at Wells Project** (Tom Kahler)**:** Andrew Gingerich said that Douglas PUD completed installation of a Half-Duplex (HD) tag detector in Pool 19 of the Wells Dam west fishway. Tom Kahler provided a PowerPoint presentation showing design drawings of the installation and pictures of the installed detector. He explained that Douglas PUD designed the installation to avoid interference with salmon passage in the fishway, and to avoid interference with the existing Full Duplex (FD) passive integrated transponder (PIT)-tag detection system. Kahler said that Pool 19 was the first pool in the fish ladder that was located above possible inundation by the Wells Reservoir tailrace elevation. He explained that the HD detector antenna was designed as a low-profile antenna, creating surfaces that lamprey could attach to without creating abrupt hydraulic jumps that would make passage through the orifice difficult or impassable. Kahler said that Douglas PUD staff discussed the design with Bryan Nordlund and the HCP Coordinating Committees and concluded that the HD detector as designed and installed would not negatively affect lamprey or salmonid passage. Douglas PUD determined that both HD and FD tag detectors operated in the fishways without diminishing the high-detection efficiency of the FD detectors; the FD detectors are located in Pools 67 and 68 in the Wells Dam west fishway.

4. **2012 Aquatic Settlement Agreement Action Plan** (Andrew Gingerich)**:** Andrew Gingerich said that although he had hoped to have an updated 2012 Action Plan for approval at today's meeting, he needed additional input first from the Aquatic SWG on how to handle activities associated with the White Sturgeon Management Plan. He said that all the changes had been made to the 2012 Action Plan as agreed to at the February 8, 2012, meeting, but at that time he had assumed a white sturgeon supplementation Request for Proposals (RFP) would be approved by consensus of the Aquatic SWG in time to implement associated actions in 2012. Because that did not occur, Gingerich said his preference was to delete the White Sturgeon Management Plan activities from the 2012 Action Plan and distribute the revised version for a 10-day approval by email. The Aquatic SWG agreed. Carmen Andonaegui will distribute the revised Action Plan to the Aquatic SWG for approval by email; responses will be due to Andonaegui within 10 days of receipt of the email.

5. **Bull Trout Radio Telemetry Study at Twisp Weir Study Proposal** (Andrew Gingerich)**:** Andrew Gingerich said that following the February 8, 2012, Aquatic SWG meeting he had hoped to have a revised Bull Trout Study Proposal for approval at today's meeting, but that discussions with Steve Lewis were ongoing. Steve Rainey asked if the Bull Trout Study could be continued for more than 1 year. Gingerich said that the Bull Trout Management Plan calls for a 1-year study. He said that others had expressed interest in

a 2-year study as well and that Douglas PUD was not opposed to study that would span two migration seasons.

Rainey asked about current information on fall back, migration delays, and the ultimate fate of fish passage above the Twisp Weir. Shane Bickford explained the design of the Twisp Weir, noting that neither impingement nor fall back fish had been observed, and that there is 24-hour, lighted monitoring at the Twisp Weir during fish passage season. He said that since the redesign of the Twisp Weir 4 years ago, there has been no record of mortality related to downstream passage for spring Chinook or steelhead. Nor has there been any bull trout mortality associated with the new weir. Bickford said that the Twisp Weir is designed with two mid-channel traps to minimize passage delays. Rainey asked if passage at the weir had been evaluated using radio telemetry (RT) studies since the redesign. Bickford said that a passage evaluation had been conducted using PIT tags, indicating that the biggest concern noted with fish detected at the Twisp Weir was with straying of spring Chinook into other drainages. Rainey said that for bull trout, passage delay was the biggest concern and should be a major objective for the Bull Trout Study.

Rainey asked about PIT-tag detection efficiency during high-flow events at the Twisp Weir. Gingerich said that detection efficiency had been one consideration during discussions of the bull trout study design, in addition to the utility of PIT tags versus radio telemetry tags. Bickford summarized previous discussions with Lewis about this issue. He said that Douglas PUD was not opposed to using PIT tags but wanted to be sure that whichever tag was used in the study, it would provide results that could be used to answer the study questions. Gingerich said that there was already good information available on bull trout behavior from PIT-tag data collected over multiple years; he said that about 100 adult bull trout had been PIT-tagged at the weir in the years 2010 and 2011. Gingerich added that currently there was PIT-tag detection downstream of the Twisp Weir, and that the Washington Department of Fish and Wildlife (WDFW) and the U.S. Geological Survey (USGS) were possibly planning on implementing PIT-tag detection above the Twisp Weir in 2012. Gingerich said that he would continue discussions with Lewis.

Gingerich said that to implement the Bull Trout Study in 2012, an approved study plan would need to be sent to Federal Energy Regulatory Commission (FERC) this month so it could be included in the new license anticipated to be issued in May 2012. Rainey suggested that a conference call be scheduled with Lewis, himself, and Douglas PUD to further discuss the Bull Trout Study Plan. Gingerich agreed to schedule a conference call with Lewis, Rainey, Patrick Verhey (if available), and Douglas PUD staff, and when they have concurrence on the revised study plan, Gingerich will send it to Carmen Andonaegui for distribution by email to the Aquatic SWG for an expedited 5-day approval. Schiewe said that the email from Andonaegui should indicate that the Bull

Trout Study Plan had the concurrence of the U.S. Fish and Wildlife Service (USFWS) and Douglas PUD (and WDFW if they participate in the call).

6. **Status of the Sturgeon Supplementation Program Proposals** (Andrew Gingerich): Andrew Gingerich said that based on discussion at the February 8, 2012, Aquatic SWG meeting, he had hoped to have a sturgeon supplementation proposal developed collaboratively by the Yakama Nation and the Colville Confederated Tribes (CCT) by March 2, 2012, for consideration at today's meeting. He said, however, that he had not been notified that such a proposal had been prepared. Patrick Verhey said that Chad Jackson had just joined him on the call. Jason McLellan said that a collaborative plan was not yet in the works, but that CCT, Yakama Nation, and WDFW were initiating discussions. McLellan said that the CCT hopes to begin discussion in April 2012. Mike Schiewe said that since the opportunity to initiate the sturgeon supplementation plan in 2012 has passed, there is still the need to move forward with planning for implementation in 2013. Gingerich said that Douglas PUD hoped for an Aquatic SWG consensus proposal for 2013 because they would be driven by FERC license requirements at that point. Shane Bickford said that even though there has not been consensus on the approach to sturgeon supplementation, Douglas PUD was moving forward with Wells Hatchery modernizations that would allow for rearing eggs or larvae.

7. **Wells Project 401 Certification** (Shane Bickford): Shane Bickford gave an update on the status of the Wells Project Clean Water Act 401 Water Quality Certification (401 Cert). He said that the final 401 Cert was issued February 27, 2012, and filed by Douglas PUD with FERC on February 29, 2012. Bickford said that the final 401 Cert included all HCP and Aquatic Settlement Agreement measures plus additional measures for monitoring temperature and dissolved gas, which were added by the Washington State Department of Ecology (Ecology) and to which Douglas PUD agreed. He said that the National Oceanic and Atmospheric Administration (NOAA) filed the Biological Opinion for spring Chinook and steelhead on March 6, 2012, and that the bull trout biological opinion was expected to be filed by the USFWS on March 15 2012. Bickford said that FERC would then package and issue the new license order, which is expected in early May 2012.

8. **Updated Aquatic SWG Policy and Technical Representatives List** (Mike Schiewe)**:** Mike Schiewe said that WDFW planned to designate Patrick Verhey as their Aquatic SWG technical representative, with Chad Jackson as the alternate, and Jeff Korth as the policy representative. Shane Bickford confirmed that Douglas PUD had designated Andrew Gingerich as the technical representative with himself continuing as the policy representative and Beau Patterson as an alternate technical representative. Schiewe said that when the Aquatic SWG representatives list was finalized, it would be distributed by email to the Aquatic SWG. He emphasized that designated representatives would be required to vote for approval of decision items before the Aquatic SWG.

9. **Review of Aquatic SWG Chair** (Shane Bickford): Shane Bickford said that Section 11.3 of the Aquatic Settlement Agreement requires periodic review of the Aquatic SWG chair. He said that all Aquatic SWG representatives have approved renewing Anchor QEA's contract for Mike Schiewe to serve as Chair of the Aquatic SWG for an additional 3 years.

10. **2011 Aquatic Settlement Agreement Annual Report** (Andrew Gingerich): Andrew Gingerich reminded the Aquatic SWG that the 2011 Aquatic Settlement Agreement Annual Report was out for 30-day review (comments due April 13, 2012) and encouraged comments.

IV. Next Meetings

1. Upcoming meetings: ***April 11, 2012 (conference call); May 9, 2012 (conference call); and June 13, 2012 (conference call).***

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Carmen Andonaegui	Administrative	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Tom Kahler	SWG Technical Resource	Douglas PUD
Patrick Verhey	SWG Policy Rep.	Washington Department of Fish and Wildlife
Steve Rainey*	SWG Technical Resource	U.S. Fish and Wildlife Service contractor
Molly Hallock	SWG	Washington Department of Fish and Wildlife
Chad Jackson**	SWG Technical Resource	Washington Department of Fish and Wildlife
Keith Hatch***	Observer	Bureau of Indian Affairs
Jason McLellan	SWG Technical Resource	Colville Confederated Tribes

*Left the meeting after the bull trout study plan discussion ended

**Joined the meeting during the lamprey update discussion

***Joined the meeting as it was ending

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: May 11, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the April 11, 2012, Aquatic SWG Conference Call

The Aquatic SWG meeting was held by conference call on Wednesday, April 11, 2012, from 10:00 am to 12:00 pm. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Decisions

1. The 2012 Wells Aquatic Settlement Agreement Action Plan was approved by Aquatic SWG representatives present.

II. Summary of Action Items

1. Andrew Gingerich will finalize the 2012 Wells Aquatic Settlement Agreement Action Plan and email it to Carmen Andonaegui for distribution to the Aquatic SWG (Item III-2)
2. Carmen Andonaegui will contact the Steve Parker (Yakama Nation technical representative) and Bill Towey (Colville Confederated Tribes [CCT] technical representative) to remind them of Aquatic SWG voting protocols (Item III-2).
3. Andrew Gingerich will develop a study plan for a 2013 evaluation of bull trout passage at the Twisp Weir (Item III-3).
4. Andrew Gingerich will develop an implementation plan for the use of Infrared (IR) cameras for evaluating lamprey passage at Wells Dam (Item III-4).
5. Andrew Gingerich will develop a Wells lamprey passage study plan that includes a translocation component, in consultation with Bob Rose, Steve Lewis, and Molly Hallock (Item III-4).
6. Mike Schiewe will provide the Aquatic SWG with examples of conflict-of-interest policies to consider in the coming months (Item III-6).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. Andrew Gingerich added two items to the agenda:

   - White sturgeon update
   - Update on spill and bypass operations at Wells Dam

   Schiewe asked for comments on the draft March 14, 2012, conference call minutes. There were no additional comments or edits and the minutes were approved. Carmen Andonaegui will distribute them to the Aquatic SWG[1].

2. **2012 Wells Aquatic Settlement Agreement Action Plan** (Andrew Gingerich)**:** Andrew Gingerich reported that the version emailed by Carmen Andonaegui to the Aquatic SWG on March 30, 2012, included all input provided by Aquatic SWG members to date. There were no additional comments and the 2012 Wells Aquatic Settlement Agreement Action Plan was approved. Gingerich will finalize the 2012 Wells Aquatic Settlement Agreement Action Plan and email it to Andonaegui for distribution to the Aquatic SWG.

   The ASWG discussed the voting protocols for members not present during a vote. Mike Schiewe reviewed the Aquatic SWG voting protocols: 1) a 10-day advance notice for a decision item (the Aquatic SWG may approve a deferral of that lead time); 2) if a decision item is included on a meeting agenda, it is the responsibility of the Aquatic SWG representative to participate in the meeting and vote, or, if a representative cannot be present, his vote can be emailed to the chairperson prior to the meeting, or he can otherwise inform the chairperson of his vote preference; 3) an Aquatic SWG representative can request up to a 5-day delay on a vote; and 4) representatives not present or not providing a vote is an abstention and does not delay the vote. Andonaegui will contact Steve Parker (Yakama Nation technical representative) and Bill Towey (CCT technical representative) to remind them of Aquatic SWG voting protocols.

3. **Bull Trout Radio Telemetry Study at Twisp Weir** (Andrew Gingerich)**:** Andrew Gingerich said that, as discussed at the January, February, and March 2012 Aquatic SWG meetings, Douglas PUD has been working on a study plan to evaluate bull trout passage at the Twisp Weir, proposing to use an active tag (acoustic or radio telemetry) to track bull trout. He said that after the March meeting, and further discussion among Douglas PUD staff and the U.S. Fish and Wildlife Service (USFWS) by phone and with the Washington Department of Fish and Wildlife (WDFW) by email, that there is no agreement on a path

[1] The February 8, 2012, meeting minutes were approved by email on March 23, 2012, and distributed as final to the Aquatic SWG by email on March 26, 2012.

forward. Consequently, Gingerich said that Douglas PUD will wait until after the new Wells Project license was issued in 2013 to conduct a study to evaluate bull trout passage at the Twisp Weir. Steve Lewis agreed with Gingerich's characterization of the discussions, saying that the issue was whether to use radio tags or Passive Integrated Transponder (PIT) tags for the study. He said that deferring the study for one year will allow the USFWS and Douglas PUD to work towards agreement on the elements of the study plan and use existing PIT tag data to help inform a study in 2013. There were no comments from the Aquatic SWG.

4. **Update on Lamprey Activities at the Wells Project** (Andrew Gingerich)**:** Andrew Gingerich said that in response to a request by the HCP Coordinating Committees, Douglas PUD contracted Dr. John Skalski, Columbia Basin Research, to analyze the effects of reduced fishway entrance velocities on salmonid fish passage at Wells Dam. Gingerich said that the results of the analysis indicated that there were no statistically detectable effects on salmonids from reduced velocities at the fishway entrances (1.0- versus 1.5-foot head differentials) during the study hours of operations. The draft report of the analysis was forwarded to the National Marine Fisheries Service (NMFS) and to the HCP Coordinating Committees for review. Gingerich said that when the report is finalized, it will be distributed to the Aquatic SWG. He said that the results of the analysis can be used to support future requests by the Aquatic SWG to adjust night-time flows at the fishway entrances during the adult migration period to improve lamprey entrance efficiency.

   Gingerich said the Douglas PUD is planning to install infrared (IR) cameras in the Wells fishway during the winter of 2012/2013. He said that the cameras will probably be located below the count window and would be capable of detecting lamprey that are passing through the picketed lead and bypassing the counting window. Gingerich said Douglas PUD will evaluate the extent to which different camera locations allow the best vantage to view lamprey passage events; Mike Schiewe asked about the level of effort involved in reviewing the IR camera film record for lamprey detection. Shane Bickford responded that it takes twice as much effort to review the proposed IR camera film as to review video recordings of fish passage at the existing fish ladder counting windows because there may be as many as four additional cameras and that Douglas PUD will likely limit IR camera recording to the lamprey migration period from July through October. Schiewe suggested using the same trigger for starting the IR camera recording as used for initiating lamprey operations at Wells Dam, such as a certain number counted at Rocky Reach Dam. Gingerich will develop an implementation plan for the use of IR cameras to evaluate lamprey passage at Wells Dam.

   Gingerich said that by late summer 2012, Douglas PUD plans to develop a 2013 Wells lamprey passage study. He said that the study plan will likely involve translocation of adult lamprey captured at Bonneville Dam, and tagging with an active tag (acoustic or

RT) to study lamprey passage behavior in Wells fish ladder entrances. Gingerich said that he was not sure, but thought the U.S. Army Corps of Engineers (USACE) is planning to tag up to 100 lamprey in 2013 with juvenile salmon acoustic tags (JSAT) and that results from these fish may be useful in informing Douglas PUD's lamprey study. The Aquatic SWG discussed the pros and cons of collecting lamprey at Bonneville Dam versus at upriver dams such as Priest Rapids or Rock Island. Aquatic SWG members agreed that there was benefit to collecting lamprey over a range of run-times and locations, and will continue to discuss options over the next few months.

Regarding a suggestion by Bob Rose to translocate lamprey that will be collected and PIT-tagged at Bonneville this June by the Yakama Nation and the Umatilla into the Wells Reservoir, Bickford said that Douglas PUD would not be able to monitor passage at Wells Dam until 2013 with Half Duplex (HD)-PIT tag detection capabilities; HD-PIT detection devices will be in place in only one of the two fish ladders by the winter of 2012/2013. By the summer of 2013, Bickford said that Douglas PUD will have installed IR cameras, HD-PIT and active tag antenna arrays in both Wells fishways. He said that with three detection methods in place, Douglas PUD would be able to evaluate detection efficiency for the various tagging and detection methods. Combined with Skalski's analysis showing no statistically significant effect of night-time fishway entrance velocities (resulting from a 1.0- versus 1.5-foot head differential) on salmonid fishway passage, Bickford said that he expects approval from NMFS to implement lamprey operations (e.g., reduced head differential to benefit lamprey passage) at Wells Dam in 2013. He said that Douglas PUD would also be able to monitor lamprey movement into the mouths of the Okanogan, Methow, and Entiat rivers. Steve Lewis asked if there were plans by Douglas PUD to modify the picketed leads in the fish ladders. Bickford said that Douglas PUD was willing to discuss recommendations to modify the picketed leads, but that Douglas PUD places a high priority on avoiding changes that may result in the creation of passage problems in the Wells fish ladders where none currently exist. He said that lamprey passage is only problematic at the fishway entrances, not in the ladder itself, with lamprey passage taking only 4 to 5 hours once lamprey enter the ladder. Also, if the picketed lead were to be removed, the flow pattern within the fish ladder would change bringing the HCP Coordinating Commission into the discussion and possibly resulting in the cost and time of implementing another study for evaluating the effects on salmonids. Bickford said that 75 percent of lamprey successfully used the picked lead as the preferred passage route. He said that he was open to suggestions by the Aquatic SWG on how to count lamprey without modifying the existing salmon counting station. Molly Hallock said that she would hate to have the group change a preferred passage location for lamprey. Gingerich will develop a 2013 lamprey passage study plan in consultation with Bob Rose, Steve Lewis, and Molly Hallock.

Gingerich said that Douglas PUD was proposing to use HD-PIT tag detection for determining lamprey presence/absence only. He said initially that Douglas PUD was hoping to achieve near- 100 percent detection in the fishway entrance using HD-PIT tag detection; however, after further evaluation by the consultants overseeing the installation of the HD-PIT tag detection arrays in the Wells fish ladders, it was determined that the detection efficiency would be lower given the size of the entrance. Bickford said that Douglas PUD still believes there was benefit to continuing to monitor for HD-PIT tags given the use of HD tags in the lower Columbia River. He said that they are planning to update the current Full-Duplex- (FD) PIT tag detectors with 2020 detectors (capable of detecting both HD and FD-PIT tags) in both fish ladders once they are certain that the HD detection will not decrease FD-PIT tag detection efficiency. Bickford said that presently they can detect 100 percent of FD-PIT-tagged adult salmonids. Only pool 18 of the west fish ladder has a 2020 HD-PIT detector at this time.

5. **Updated Aquatic SWG Policy and Technical Representatives List** (Mike Schiewe)**:** Mike Schiewe thanked Aquatic SWG members for their help updating the Aquatic SWG policy and technical representatives list. Carmen Andonaegui will add Bob Rose to the list of Technical Support staff for the Aquatic SWG.

6. **White Sturgeon Update** (Andrew Gingerich): Andrew Gingerich said that although the Aquatic SWG was unable to reach consensus on a sturgeon broodstock collection plan for implementation in 2012, he encouraged continued discussion among Aquatic SWG members in anticipation of implementing sturgeon broodstock collection in 2013, when it will likely become a new Federal Energy Regulatory Commission (FERC) license requirement. Gingerich said that Douglas PUD would need a consensus plan by late July/early August 2012 in order to complete the project awards process and implement the project in 2013. He explained that another driver for getting a consensus sturgeon broodstock collection plan in place very soon is the on-going modernization of the Wells Hatchery. Gingerich said that it would be helpful to know what broodstock collection strategy would be implemented so that appropriate improvements could be made to the Wells Hatchery.

   Shane Bickford said that the two proposals received by Douglas PUD in response to the 2011 RFP were still available for consideration by the Aquatic SWG, but that when consensus was not reached by the Aquatic SWG by the March 2, 2012 deadline, the 2011 RFP process was terminated without awarding a contract; Douglas PUD's RFP process requires that a decision be made on RFP submissions within 90 days of the close of the RFP. Bickford said that Douglas PUD was hopeful that the Yakama Nation, CCT, and WDFW could come up with a fundable, joint proposal by July 2012. If an Aquatic SWG consensus proposal is not presented to Douglas PUD by July 2012, Bickford said that to meet anticipated new license requirements, Douglas PUD would bring forward a plan for consideration by the Aquatic SWG. Mike Schiewe suggested that, assuming a

new FERC license is issued by May 2012, development of a consensus sturgeon broodstock collection plan should be placed on future Aquatic SWG agendas to meet the July/August 2012 deadline.

Schiewe also suggested that, because the Aquatic SWG would be more involved in evaluating proposals when the new FERC license is in place, they consider adopting a conflict-of-interest policy. He said that he would provide the Aquatic SWG examples of conflict-of-interest policies to consider in the coming months. Schiewe will place on the May 2012 Aquatic SWG meeting agenda the following items: 1) development of a consensus sturgeon broodstock collection plan and 2) development of a conflict-of-interest policy.

The Aquatic SWG discussed the recent (April 2012) Grant PUD/Chelan PUD sturgeon coordination meeting. Pat Irle asked about Douglas PUD's interest in future participation in the joint meetings. Gingerich said that Douglas PUD intended to work within the Aquatic SWG forum to develop a sturgeon broodstock collection plan and to consider how the Wells broodstock collection plans link with other mid-Columbia sturgeon activities within the Aquatic SWG as well. Bickford said that Douglas PUD is willing to coordinate with Grant PUD and Chelan PUD, but that right now implementation of Douglas PUD's sturgeon supplementation program lagged behind that of the other PUDs due to different relicensing schedules. Bob Rose agreed that Douglas PUD should proceed with developing a sturgeon broodstock collection plan first within the Aquatic SWG. He said that, to the extent sturgeon supplementation by Grant PUD and Chelan PUD could inform the same type of efforts at the Wells Project, that that information should be taken into consideration by the Aquatic SWG. He said that the goal was the development of a timely consensus recommendation for a sturgeon broodstock collection strategy by the Aquatic SWG.

Steve Lewis asked for a summary of efforts to develop a combined Yakama Nation/CCT Wells Project sturgeon broodstock collection proposal in coordination with WDFW. Schiewe explained that there was a very short window of opportunity for the two parties to develop a joint proposal, and that no proposal was brought forward. Chad Jackson said WDFW's interest in a Wells sturgeon broodstock collection strategy was subject to normal, annual WDFW /tribal coordination. He said that due to workload issues, WDFW had not yet initiated calls to the tribes to schedule annual coordination meetings. Jackson said that WDFW was more interested in discussing with the tribes a general approach to sturgeon supplementation in the mid-Columbia River rather than what methodology to use to obtain broodstock for the Wells Project. Gingerich reiterated that Douglas PUD's interest was in receiving a proposal that could be evaluated by the Aquatic SWG based on technical merit and feasibility of implementation, and ultimately adopted by consensus of the Aquatic SWG. Rose said that WDFW and the Yakama Nation had spent almost 2 years discussing elements of

sturgeon supplementation for implementation in the mid-Columbia River, setting up priorities and criteria for when and how that should be done. Rose said that he did not see the development of a Wells Project sturgeon broodstock collection strategy as a Yakama Nation versus CCT issue, and that the Yakama Nation sturgeon broodstock collection proposal submitted in response to the RFP used the criteria and priorities developed in coordination with WDFW. He said there will be plenty of broodstock available following the 2012 Grant PUD/Chelan PUD sturgeon broodstock collection efforts if Douglas PUD would like to begin their sturgeon supplementation program in 2012. Gingerich said that Douglas PUD had to be respectful of the Aquatic SWG process and the Aquatic Settlement Agreement signatory Parties. He said that Douglas PUD had been prepared to accept either proposal submitted during the 2011 RFP process, but that without a consensus recommendation from the Aquatic SWG and without a license requirement, Douglas PUD cannot unilaterally choose a proposal.

7. **Wells Spill and Bypass Operations** (Andrew Gingerich): Andrew Gingerich said that spill at Wells Dam was initiated at midnight, April 9, 2012. He said that Douglas PUD had a Total Dissolved Gas (TDG) Abatement Plan in place and was monitoring TDG levels as required. The predicted discharge from Chief Joseph Dam during the week of April 9 is 140,000 cubic feet per second (cfs) to allow for drafting Grand Coulee Dam by early May 2012, to accommodate anticipated spring runoff. All five bypass bays are open at this time and measured TDG levels are within allowable limits.

8. **FERC License Update (Shane Bickford)**. Shane Bickford said that Douglas PUD was expecting issuance of the new Wells Project license in late April or early May. Bickford said that starting with the May 2012 ASWG meeting, Douglas PUD would move to aggressively implement actions required to meet license timelines. Schiewe suggested an in-person meeting in June to coincide with issuance of the new license.

IV. Next Meetings

1. Upcoming meetings: ***May 9, 2012 (conference call); June 13, 2012 (tentatively in-person); and July 11, 2012 (conference call).***

List of Attachments

Attachment A – List of Attendees

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Carmen Andonaegui	Administrative	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Bob Rose	SWG Technical Resource	Yakama Nation
Molly Hallock*	SWG Technical Resource	Washington Department of Fish and Wildlife
Chad Jackson	SWG Technical Resource	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington Department of Ecology
Steve Lewis	SWG Technical Rep.	Washington State Department of Ecology

*Was on the conference call only for the Lamprey Update agenda item.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: June 14, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the May 9, 2012, Aquatic SWG Conference Call

The May Aquatic Settlement Work Group (SWG) meeting was held by conference call on Wednesday, May 9, 2012, from 10:00 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Decisions

1. There were no decisions made at today's meeting.

II. Summary of Action Items

1. Andrew Gingerich will provide a list of Aquatic SWG members and agency staff who participated in the April 23, 2012 Twisp Weir site visit to Kristi Geris for inclusion in the Aquatic SWG record (Item III-3).

2. Andrew Gingerich will contact representatives of Washington Department of Fish and Wildlife (WDFW), the Yakama Nation, and the Colville Confederated Tribes (CCT) to set up a meeting for Monday, May 21, 2012, to further discuss and finalize the path forward for implementing the Wells Sturgeon Supplementation Plan and Statement of Agreement (SOA) (Item III-4).

3. Mike Schiewe will provide the Aquatic SWG with examples of conflict-of-interest policies to consider in the coming months (Item III-6).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. No additions were requested by those present; however,

Schiewe modified his agenda item (Item III-6) from a full discussion to a brief update. Schiewe explained that he is still in the process of collecting a broader range of examples of conflict-of-interest policies to facilitate his discussion.

Schiewe introduced Kristi Geris as new Anchor QEA support staff to the Aquatic SWG. Geris confirmed that all comments and revisions received on the draft April 11, 2012 conference call minutes were incorporated, and there were no outstanding items remaining to be discussed. The draft April 11, 2012 conference call minutes were approved as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **Update on Lamprey Activities at Wells Project** (Andrew Gingerich)**:** Andrew Gingerich provided the Aquatic SWG with a brief update on lamprey activities at the Wells Project. Gingerich said Douglas PUD is moving forward with the installation of infrared (IR) cameras in the Wells fishway, and, in coordination with Bao Le of Longview Associates, is developing a study plan for testing infrared monitoring at Wells Dam. Secondly, Douglas PUD is moving forward with the planning for a lamprey passage study using lamprey translocated from lower in the Columbia River. Le is also assisting with this study plan. Gingerich said that once the study plans are drafted he will consult the interested parties of the ASWG to formalize these drafts.

   Gingerich said the draft report on the effects of reduced head differential, and hence lower entrance velocities at the Wells Dam fishway, is being reviewed by the HCP Coordinating Committees and National Marine Fisheries Service (NMFS); Gingerich said that once the draft report has been approved by the HCP-CC, he will share the report with the Aquatic SWG. At that point, Gingerich said, the Aquatic SWG can decide if it wants to send a request to the HCP-CC requesting operational change in ladder conditions to improve passage conditions for lamprey in 2012.

3. **Twisp Weir Visit Recap** (Andrew Gingerich)**:** Andrew Gingerich reported that the Twisp Weir Site Visit on April 23, 2012, was well attended and a worthwhile exercise. Gingerich said there was good discussion on bull trout take and passage, and he hopes the visit provided good perspective for those in attendance. People in attendance included:

   Aquatic SWG Policy or Technical Representative Members:
   Patrick Verhey – WDFW
   Steve Lewis – USFWS
   Pat Irle – Ecology
   Jason McLellan – CCT
   Shane Bickford – Douglas PUD
   Andrew Gingerich – Douglas PUD

   Non-Aquatic SWG Members:

Steve Rainey – USFWS consultant (GEI consultants)
Mark Nelson – USFWS (bull trout and lamprey biologist)
Greg Mackey – Douglas PUD (fisheries biologist)
Holly McLellan – CCT (resident fish biologist)
Charlie Snow – WDFW (fish biologist and salmonid monitoring and evaluation [M&E] program manager)
Ben Goodman – WDFW (fish biologist)

4. **Sturgeon Direction and SOA Development** (Andrew Gingerich)**:** Andrew Gingerich provided Kristi Geris with the Wells White Sturgeon Offspring Collection Plan SOA, which Geris distributed by email to the Aquatic SWG on May 8, 2012 (Attachment B). Gingerich explained that Douglas PUD has been working to develop an SOA that the Aquatic SWG could agree on to allow Wells Hatchery equipment purchases and hatchery modifications to move forward this fiscal year. The draft SOA would commit Douglas PUD to implement a multifaceted strategy for the collection of white sturgeon offspring. This approach will include the implementation of wild larval collection and adult broodstock collection. Gingerich explained that this approach would meet the goals and objectives of the White Sturgeon Management Plan, and also would address the concerns and uncertainties that surfaced in earlier Aquatic SWG discussions. Gingerich said that this approach should also produce a genetically diverse population for planting in Wells Reservoir. Gingerich said there will likely be differential success in each program over time. He said that the stocking rates and rules were included to serve as examples, and were subject to revision. As proposed, after 4 years of implementing this dual-faceted approach, the Aquatic SWG would review and evaluate which approach to use in the future. Gingerich added that Table 1 in the SOA appendix includes hypothetical numbers to illustrate how certain scenarios might play out. Gingerich and Mike Schiewe opened the floor for discussion.

   Chad Jackson asked if Douglas PUD would accept detailed comments on the SOA. Gingerich indicated that Douglas PUD was open to comments, but that time was short. Shane Bickford added that Douglas PUD would like to discuss editorial comments on the SOA at this time because Douglas PUD needs agreement on the sturgeon SOA at the June Aquatic SWG meeting in order for Douglas PUD, HDR Engineering and WDWF to design, schedule and construct the necessary sturgeon infrastructure at the Wells Hatchery. In order to meet logistical and fiscal deadlines, the hatchery infrastructure needs to be ordered by the end of July 2012. Bickford said that if consensus is not reached, then Douglas PUD will either be forced to move forward without consensus, or would opt not to purchase materials during the current budget cycle which increases the risk of the facility not being ready to receive sturgeon in early 2013.

   Jackson indicated that he had some concerns about the example stocking rates included with the SOA. Bickford reiterated that Douglas PUD was only providing examples and was open to alternatives. Jackson said he conceptually agreed with the stocking rates

and rules as currently written, but was concerned that the SOA was setting up a competition and was not clear regarding how to transition to either a broodstock or larval collection approach. Jackson explained he would like better clarity on the rules. Bickford explained that he and Jeff Korth had formulated the rules, and that the numerical targets were examples they generally agreed upon. Gingerich said again that the numbers are open to change. He suggested that it was advantageous for all signatories of the Settlement Agreement move forward with a consensus plan now, and that, after 4 years, the Aquatic SWG could use the information acquired to adaptively manage the White Sturgeon Supplementation Plan.

Schiewe summarized Douglas PUD's request, asking the group if it approves going down a path in which Douglas PUD funds both programs for an interim period of 4 years. After 4 years, the Aquatic SWG would evaluate what has been accomplished, and then select a single path forward at that time. The real focus of today's discussion, Schiewe said, is whether there is any language in the SOA itself that needs to be modified.

Bob Rose said that he agreed with the first paragraph of the SOA; however, he was not prepared to agree with the second paragraph. Rose agrees there is valuable information to be gained in a 3- to 4-year program; however, he was not prepared to settle on a 4-year deal today. Rose suggested a willingness to approve a 1-year program for now, and develop additional guidelines on stocking rates and rules over the coming months. Rose reminded the group that they have had conversations about developing regional principles for a path forward, and Rose would like to see those regional principles embraced. At this point, Rose said, this SOA does not reflect that; the rules are overly prescriptive. Rose said he does not expect much disagreement; however, he stated again that he was just not ready to agree to the specific rules.

Gingerich asked Rose to elaborate on which rules he does not support. Rose said he does not see the relevance of having specific numbers from year to year. Rose said the numbers seem reasonable; however, he does not want those numbers limiting the ability of the Aquatic SWG to employ adaptive management strategies. Bickford said the numbers are optimistic. Rose explained that, regardless of the numbers, he would like the benefit of further discussion with additional people who would like to be included in this decision.

Steve Lewis stated that the SOA was inclusive of the approaches that were discussed in the past. He asked what the rationale was for a 4-year approach versus, for example, a 1-year approach? Gingerich said there are advantages to giving both programs more than 1 year, including determining how they perform over a range of changing environmental conditions. Lewis asked if Douglas PUD was set on 4 years; or would it accept 2 years? Bickford said that 3 years would be the minimum duration Douglas PUD would want to fund. Bickford said 3 years would allow the Aquatic SWG to evaluate the program and

infrastructure over a range of flows and other environmental conditions from year to year.

Bickford explained that Douglas PUD's fiscal year ends in August. Bickford explained that the sturgeon program, along with other similar programs that target genetic diversity, entails specific infrastructure requirements, including multiple rearing vessels and the water and electrical resources needed to support them. Douglas PUD has money in this year's budget to purchase sturgeon infrastructure and as such must take delivery of the new equipment by the end of the current fiscal year. The sturgeon infrastructure also needs to be installed this fall in order to avoid conflicting with the salmon and steelhead renovations scheduled at the hatchery.

Jason McLellan said that, overall, the CCT agrees with the concept of dual approaches, and has no issues with the time frame; the CCT sees the SOA as good scientific research. McLellan did express, however, concern with the stocking rates and rules. McLellan pointed out that certain stocking rates and rules outlined in the SOA deviate from the breeding plan. However, McLellan did not suggest those stocking rates and rules in the SOA needed to be removed; they just need to be more clearly reviewed and revised for internal consistency. Gingerich acknowledged the deviation and added that although the values are different, they are similar to other sturgeon breeding plans. McLellan shared with the group an example of methods employed in the Upper Columbia to increase diversity with limited rearing vessels. Gingerich agreed that McLellan's example could be an option and can be further discussed. Schiewe summarized the discussion thus far as having general agreement on the first paragraph of the SOA and technical concern with third paragraph.

Jackson expressed concern about the provision of equal funding for both approaches; he wanted to be sure that there was adequate funding for both approaches to succeed. Bickford said that there would be a total of about $170,000 available annually, and that the initial Yakama Nation proposal came in at less than half the total amount budgeted, which would be adequate for the amount that would be allocated to the broodstock approach, and that preliminary discussions with the CCT suggested they too could implement a larval collection approach for half the total amount budgeted.

Pat Irle expressed concern about the potential to transfer disease by moving fish from lower to upper reservoirs. She also mentioned a process led by Dani Evenson, Cramer Fish Sciences. At a Rocky Reach Fish Forum (RRFF) meeting, Irle said Evenson gave a brief overview of the purpose of the Columbia Basin White Sturgeon Framework document. Evenson noted that the Northwest Power and Conservation Council and the Independent Scientific Review Panel (ISRP) have expressed concern that the various sturgeon programs throughout the basin are not effectively complementary and coordinated. As a result, the ISRP directed that a comprehensive basin-wide sturgeon

framework be developed to provide appropriate coordination. Irle said Evenson shared with the RRFF an outline for the basin-wide sturgeon framework document.

In order to finalize the language in the SOA in a quick and efficient manner, Rose suggested that a small group convene to incorporate comments and find a common ground on the language of the SOA. Gingerich agreed and said he will contact representatives from WDFW, the Yakama Nation, and the CCT to set up a meeting for Monday, May 21, 2012, to further discuss and finalize the path forward for implementing the Wells Sturgeon Supplementation Plan and SOA.

5. **Water, Flow, and TDG Compliance Update** (Andrew Gingerich)**:** Andrew Gingerich directed the Aquatic SWG to the summary document containing graphs of flows and total dissolved gas (TDG) that Kristi Geris distributed to the Aquatic SWG by email on May 9, 2012, prior to this conference call (Attachment C).

   Gingerich reviewed Figure 1, pointing out the dramatic increase in flows at Wells Dam during April, substantially higher than the 10-year average for the month. Gingerich also noted the magnitude of short-term flow fluctuations, which he said makes hourly coordination much more difficult and greatly increases the potential for short-term exceedances of the TDG standard.

   Gingerich moved on to Figure 2 and highlighted the time period between May 1, 2012, and May 6, 2012, when hourly flows exceeded 246,000 cubic feet per second (CFS). He said that during this time period, the forebay TDG daily average was less than the 115 percent standard; however, on May 2, 2012, the Wells Dam tailwater exceeded the 125 percent hourly standard. Gingerich said that exceeding 125 percent TDG triggered a mandatory biological monitoring at Rocky Reach Dam. In response to this tailwater exceedance, on May 3, 2012, District staff sampled 60 fish (30 fish each from the 0800 and 0900 samples) at the Rocky Reach Juvenile Bypass sampling facility. The sample included 2 steelhead, 19 yearling Chinook, 28 coho, and 11 sockeye. No signs of gas bubble trauma (GBT) were observed in the fish sampled.

   Gingerich updated the Aquatic SWG on unit maintenance at Wells Dam. Shane Bickford mentioned that Wells Dam is currently an 8-unit plant because, in March, the U.S. Army Corps of Engineers conducted a spill test at Chief Joseph Dam that required Douglas PUD to delay captivation maintenance on Unit 2. As a result, Unit 2 is now offline to conduct its biennial maintenance. Bickford explained the difficulty in managing large flows, as is being experienced now, with a limited number of turbine units available.

   Gingerich concluded his discussion by recapping that, since May 1, 2012, although flows have been high, hourly TDG in the Wells Dam tailrace has only exceeded 125 percent once, requiring biological monitoring and GBT screening only once. As always, Gingerich said, performance is tied closely to incoming TDG and incoming flows, but Gingerich indicated that Douglas PUD was watching this closely. Pat Irle told Gingerich she

assumed she would be receiving additional details on TDG levels, and Gingerich confirmed he would keep Irle informed as the spring runoff season proceeded.

6. **Development of a conflict-of-interest policy** (Mike Schiewe): Mike Schiewe informed the Aquatic SWG that he is still compiling information on conflict-of-interest policies. Schiewe wants to provide to the group several examples to represent a broad range of conflict-of-interest policies, including policies from the National Institute of Health, the HCP Hatcheries Committees and Tributaries Committees, and the National Research Council. Schiewe will provide these policies to the group as a package in the coming months.

7. **Douglas PUD FERC License and Aquatic SWG June Meeting Details** (Mike Schiewe): Mike Schiewe asked Shane Bickford for an update on the status of Douglas PUD's Federal Energy Regulatory Commission (FERC) license. Bickford said he has not heard any recent updates from FERC and hopes to hear more before the June 2012 Aquatic SWG meeting. Schiewe suggested that the June 2012 Aquatic SWG meeting be held by phone conference instead of in person because the license has not yet arrived. Pat Irle requested that the June meeting date also be moved from the June 13 to June 14 to accommodate a Cle Elum Dam meeting that is scheduled for the same day. Irle said FERC will be in-state to attend the Cle Elum Dam meeting. The Aquatic SWG agreed to change the next Aquatic SWG meeting from Wednesday, June 13, 2012, to Thursday, June 14, 2012, to be held by conference call beginning at 10:00am.

IV. Next Meetings

1. Upcoming meetings: ***June 14, 2012 (conference call); July 11, 2012 (tentatively in-person); and August 8, 2012 (conference call).***

List of Attachments

Attachment A – List of Attendees

Attachment B – Draft Wells White Sturgeon offspring collection plan 2012 SOA

Attachment C – Update on flows TDG

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Administrative	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Bob Rose	SWG Technical Resource	Yakama Nation
Molly Hallock	SWG Technical Resource	Washington Department of Fish and Wildlife
Chad Jackson	SWG Alternative Technical Rep.	Washington Department of Fish and Wildlife
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Jason McLellan	SWG Technical Resource	Colville Confederated Tribes
Bao Le	DPUD Technical Resource	Longview Associates

Wells White Sturgeon Offspring Collection Plan

Statement of Agreement (SOA)

May 2012 for Implementation in 2013- 2016

Statement

The Aquatic Settlement workgroup agrees that Douglas PUD should implement a multifaceted strategy for the collection of sturgeon offspring starting in the spring/summer of 2013. This approach will include the implementation of a larval collection program and an adult brood collection program.

This multifaceted approach will be utilized for four years toward identifying the best strategy for the long-term supplementation of sturgeon in the Wells Project. Both the larval and broodstock programs will receive equal funding over this period. At the end of year four of these efforts (July 2016), the Aquatic Settlement Work Group will be tasked with reviewing the first four years of implementation toward identifying the best long-term offspring collection strategy for the Wells sturgeon supplementation program.

Appendix A

Background

The Aquatic Settlement Agreement, White Sturgeon Management Plan (WSMP) requires that Douglas PUD fund the collection of sturgeon offspring starting in 2013 toward the release of up to 5,000 juvenile sturgeon per year starting in the summer of 2014 and up to 20,000 by 2017. The intent of this program is to increase the abundance and genetic diversity of white sturgeon found within the Wells Project. In an effort to develop the most effective and beneficial long-term sturgeon supplementation strategy, Douglas PUD is proposing to implement a multifaceted offspring collection evaluation. This combined approach will utilized two primary offspring collection methods including both a larval collection strategy and an adult brood strategy. The goal of this study is to identify the best long-term supplementation strategy that will maximize the successful out planting of the required numbers of juvenile sturgeon while simultaneously increasing the genetic diversity of the offspring released into the Wells Project. Both programs will be funded by Douglas PUD for four years (2013-2016).

Both the larval collection and the broodstock collection programs will be funded equally. Larval fish or fertilized eggs will be delivered to Wells Hatchery within one day following capture or fertilization. Fish/gametes will be isolated according to Washington Department of Fish and Wildlife (WDFW) fish health requirements, and permitting to transfer fish will be obtained to follow other WDFW guidelines.

Over this four-year period the Wells Hatchery will be designed to accommodate up to 12 family units produced from a 6 x 6 brood cross and an additional 6 larval collection “groups”.

Stocking Rates and Rules

It is highly probable that over this four-year program differential success will occur among and within programs. To address differential success within and between programs the following stocking strategy will apply:

1. Neither program can represent more than 80% of the stocked fish in a given year (up to 4,000 fish in a year for either program). If one of the two programs produces no viable offspring, then only 4,000 fish from the alternative program will be stocked towards the 5,000 fish target identified in phase I of the WSMP.

2. For brood collection, up to 500 fish from a given family will be stocked in a given year, up to a total of 4,000 fish per year.

3. For larval collection, no more than 1,000 fish from a given collection location will be stocked out in a given year with a maximum of up to 4,000 fish combined for all five larval collection locations.

4. The larval program shall emphasize the use of fish from the lower and middle Columbia River. Should the collection effort be unable to collect sufficient numbers of larva from the middle or lower Columbia River to satisfy the entire larval component of the program, then up to 1,000 larval sturgeon from the Lake Roosevelt population could be used each year to support this four year experimental program.

5. If both populations produce a full complement of offspring, then each of the two programs will represent 50% of the fish stocked into the Wells Reservoir (2,500 brood offspring and 2,500 larval offspring).

Path forward in 2016

Following the four-year implementation program, the Aquatic Settlement Work Group will recommend a path forward and Douglas PUD will fund one of the two programs toward meeting the remaining phase I and phase II stocking goals of the WSMP[1].

[1] 4.1.2 "Within two years following issuance of the new license, Douglas shall release up to 5,000 yearling white sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG (total of up to 35,000 juvenile sturgeon during Phase I)."

4.3.1 "The number and frequency of yearlings released in Phase II of the white sturgeon supplementation program will range from 0 to 5,000 fish. Stocking rates shall be based on the results of the Phase I Monitoring and Evaluation Program (Section 4.2) and determination of carrying capacity (Section 4.3) and shall be consistent with the goal and objectives of the WSMP. The Phase II stocking rates can also be adjusted as determined by the Aquatic SWG."

Table 1. Example capture scenarios using Stocking Rates and Rules:

Larval Collection						**Brood Collection**				
Location	**2013**	**2014**	**2015**	**2016**		**Cross**	**2013**	**2014**	**2015**	**2016**
Wells week 1	500	5000	0	0		F1 x M1	25000	25000	25000	25000
Wanapum week 1	250	5000	0	0		F1 x M2	25000	0	25000	0
Rock Island week 1	2000	5000	0	0		F2 x M3	25000	0	25000	0
Priest Rapids week 1	3000	3000	0	0		F2 x M2	25000	0	25000	0
Rock Island week 2	0	3000	0	0		F3 x M4	25000	0	25000	0
Roosevelt week 1	5000	5000	0	0		F3 x M3	25000	0	25000	0
						F4 x M5	25000	0	25000	0
						F4 x M4	25000	0	25000	0
						F5 x M6	25000	0	25000	0
						F5 x M5	25000	0	25000	0
						F6 x M6	25000	0	25000	0
						F6 x M1	25000	0	25000	0
Hatchery survival						**Hatchery survival**				
Location	**2013**	**2014**	**2015**	**2015**		**Cross**	**2013**	**2014**	**2015**	**2015**
Wells week 1	175	1750	0	0		F1 x M1	18750	18750	18750	18750
Wanapum week 1	88	1750	0	0		F1 x M2	18750	0	18750	0
Rock Island week 1	700	1750	0	0		F2 x M3	18750	0	18750	0
Priest Rapids week 1	1050	1050	0	0		F2 x M2	18750	0	18750	0
Rock Island week 2	0	1050	0	0		F3 x M4	18750	0	18750	0
Roosevelt week 1	1750	1750	0	0		F3 x M3	18750	0	18750	0
						F4 x M5	18750	0	18750	0
						F4 x M4	18750	0	18750	0
						F5 x M6	18750	0	18750	0
						F5 x M5	18750	0	18750	0
						F6 x M6	18750	0	18750	0
						F6 x M1	18750	0	18750	0
Total available (each program)	3763	9100	0	0			112500	18750	112500	18750
Release (each program)	2500*	4000~	0	0			2500	500^	4000	500^
Total released in a given year (programs combined)							**5000**	**4500**	**4000**	**500**

*Only up to 1000 (in this case 478) of the 1750 fish from Roosevelt would be used to be consistent with "Stocking Rates and Rules" no. 4

~Given the availability no fish would be needed or used from Roosevelt

^Consistent with "Stocking Rates and Rules" no. 2

Figure 1. 2012 Flows at Wells and seasonal ten year average

In addition to being much higher than the 10-year average, there is a 200-400% greater magnitude of short term flow fluctuations. This makes hourly coordination much more difficult and greatly increases potential for short-term exceedances. It is likely this is another consequence of BPA load-following wind generation with CHJ/GC operations. When above-average flows are coupled with aggressive flood control operations, low demand and balancing intermittent wind generation, this is quite literally a perfect storm scenario for exceedances.

Again, exceeding 246 KCFS or 7Q10 values today, Wed May 9th.

Figure 2. Flows and TDG at Wells Dam: Fish spill 2012

Bypass Barrier:

- Consistent with the 2012 Spill Playbook and Ecology-approved 2012 Gas Abatement Plan, Juvenile Bypass System barriers were removed from Spillbay 6 on May 2nd. Barrier removal was to occur May 1, but was suspended due to safety issues with sustained high winds. This occurs to improve gas production (decrease it) when flows are predicted to be high and sustained.

Biological Monitoring:

- In response to May 2nd Wells tailwater exceedance of the 125% hourly standard, District staff sampled 30 fish each from the 0800 and 0900 samples at the Rocky Reach Juvenile Bypass sampling facility May 3rd.

- Sample included 2 steelhead, 19 yearling Chinook, 28 coho, and 11 sockeye. No GBT expression was observed in any of the fish sampled.

- Since no adult fish were being trapped at Wells no sampling was conducted.

Unit Maintenance:

- Currently 8 unit plant:
  - Unit 7 is offline for total rebuild
  - Unit 1 came back online last Thursday
  - Unit 2 is offline for biennial maintenance

- Max 168 KCFS though 8 units (if load exists)

- 123-172 KCFS over the last 8 days through units

- Spilling 43-142 KCFS in the month of May- well over fish spill requirements

- As always performance is tied closely to incoming TDG and incoming flows

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: July 11, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the June 14, 2012, Aquatic SWG Conference Call

The June Aquatic Settlement Work Group (SWG) meeting was held by conference call on Thursday, June 14, 2012, from 10:00 am to 11:00 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Andrew Gingerich will provide to Kristi Geris for distribution to the Aquatic SWG, a revised version of the approved Wells White Sturgeon Offspring Collection Plan Statement of Agreement (SOA) with incorporated redline edits agreed to by the Aquatic SWG (Item III-B).

2. Andrew Gingerich will prepare a draft Lamprey Study Plan, combining the installation of infrared (IR) cameras in the Wells fishway and the active tagging of translocated adult lamprey, to assess lamprey passage at Wells Dam no later than the August 8, 2012 Aquatic SWG meeting (Item III-D).

3. Andrew Gingerich will provide to Kristi Geris, for distribution to the Aquatic SWG, Dr. John Skalski's statistical analyses on the effects of reduced fishway entrance velocities on salmonid fish passage at Wells Dam (Item III-D).

II. Summary of Decisions

1. The Wells White Sturgeon Offspring Collection Plan SOA was approved with incorporation of edits by Aquatic SWG representatives present. Steve Parker, the designated Yakama Nation Technical Representative, gave his approval by email as distributed to the Aquatic SWG on June 13, 2012.

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. No additions were requested by those present. Kristi Geris reported that all comments and revisions received on the draft May 9, 2012 conference call minutes had been incorporated. Geris also reminded the Aquatic SWG that although attachments listed in the meeting minutes are not actually included in the minutes (aside from Attachment A – List of Attendees), attachments are filed in the administrative record and will be included in the annual report. Pat Irle notified the Aquatic SWG that her comments in Item III-D of the draft minutes were made to clarify their meaning. The draft May 9, 2012 conference call minutes were approved as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **Sturgeon SOA** (Andrew Gingerich)**:** Andrew Gingerich reviewed with the Aquatic SWG the Wells White Sturgeon Offspring Collection Plan SOA, which Kristi Geris distributed to the Aquatic SWG by email on June 1, 2012 (Attachment B). Gingerich said the review and revisions of the SOA involved a combined effort by Douglas PUD, Washington Department of Fish and Wildlife (WDFW), Yakama Nation (YN), and Colville Confederated Tribes (CCT). Gingerich said that the most notable change from the earlier draft SOA was the removal of the stocking rates and rules, which Gingerich explained were not really necessary at this stage, and he did not think that those details should prevent the group from moving forward. Gingerich noted that some of the background information of the SOA was also revised to incorporate comments and suggestions from the WDFW, CCT, and YN.

   Mike Schiewe said Steve Parker, the designated Yakama Nation Technical Representative, gave his approval of the SOA by email as distributed to the Aquatic SWG by Kristi Geris on June 13, 2012. Schiewe then asked the Aquatic SWG to share any comments or concerns about the SOA with the group. Jason McLellan, Pat Irle, and Gingerich (on behalf of Bob Rose) requested a few minor grammatical revisions, which are reflected in a redlined version of the SOA (Attachment C). The remaining Aquatic SWG representatives present had no additional comments or revision requests. The Aquatic SWG approved the Wells White Sturgeon Offspring Collection Plan SOA with the incorporation of the edits. Gingerich said he will provide a revised version of the approved Wells White Sturgeon Offspring Collection Plan SOA with incorporated redline edits as recommended by the Aquatic SWG to Kristi Geris for distribution to the Aquatic SWG (Attachment C).

3. **Water, Flow, and Total Dissolved Gas Compliance Update** (Andrew Gingerich)**:** Andrew Gingerich reviewed with the Aquatic SWG a water quality update for Wells Dam that Kristi Geris distributed to the Aquatic SWG, today, June 14, 2012, prior to the meeting. Gingerich said that for the month of May, the Chief Joseph Project has not consistently

met the 110 percent standard for total dissolved gas (TDG) in the Wells forebay, as shown in Figures 1 and 2 of Attachment D. Gingerich noted that hourly TDG levels in the Wells Dam forebay reached as high as 116 to 117 percent as a daily average. In the month of June, Gingerich said that, as shown in Figure 3 of Attachment D, hourly incoming TDG values are even higher. No hourly values during the month of June have been below 110 percent, with Wells forebay hourly TDG values as high as 118 percent.

Gingerich reviewed total flow at Wells Dam in 2012 compared to the 10-year average (2002 through 2011), as shown in Figure 5 of Attachment D. Gingerich noted that higher flows started earlier this year compared to the 10-year average. Gingerich said that on June 6, 2012, Corps' and BPA's predicted flows were forecasted to be 165,000 cubic feet per second (cfs) out of Chief Joseph Dam for the remainder of June. Based upon this prediction, Douglas PUD reinstalled bypass Barrier No. 6 on Thursday June 7, 2012, as required by the spill plan. However on Thursday and Friday (June 7, 2012 and June 8, 2012), Corps and BPA instead discharged flows in excess of 7Q10 at Wells Dam with the bypass barrier in, and subsequently poor TDG performance occurred. Gingerich said the barrier was removed once again on Monday June 11, 2012 in response to unpredicted high flows.

Gingerich said that, as required by the Gas Abatement Plan, exceedences of the 125 percent TDG trigger at Wells Dam require gas-bubble trauma (GBT) monitoring the day after the exceedance. Tables 1 and 2 of Attachment D show the days on which 125 percent TDG was exceeded and subsequent biological monitoring was implemented. Gingerich said on average 30 fish were sampled each day and may come from any of the samples that occur during the 0800, 0900, 1000, and 1100 samples at Rocky Reach Juvenile Bypass Facility. Gingerich said no TDG signs were observed in samples collected this year.

4. **Update on Lamprey Activities at Wells Project** (Andrew Gingerich)**:** Andrew Gingerich said Douglas PUD was working with Bao Le of Longview Associates to develop a Lamprey Study Plan, combining the installation of IR cameras in the Wells fishway and the active tagging of translocated adult lamprey, to assess lamprey passage and enumeration at Wells Dam. Gingerich said Douglas PUD plans to install IR cameras in Pool 66 of the east and west ladders of the Wells Dam fishway to improve accuracy of fish counts at Wells Dam. He said that the cameras are intended to detect lamprey that are passing through the picketed lead and bypassing the counting window. The active tagging of translocated adult lamprey is intended to study lamprey passage behavior in Wells fish ladders with specific emphasis on studying the efficiency of the entrances.

   Gingerich said the combined study plan has four primary objectives: 1) to document radio-tagged fish passage in the lower fishway and compare this passage to previous studies; 2) to evaluate entrance efficiency under different velocities; 3) to evaluate the efficiency of the IR camera in Pool 66 (i.e., compare active-pass fish counts to the

number of counts in the camera); and 4) to compare IR camera counts to the count window.

Steve Lewis asked about the feasibility of installing IR cameras in the bypass area around the picketed lead. Gingerich explained that the area is too large compared to the smaller area where the installation is currently planned. Gingerich said that he will prepare the draft Lamprey Study Plan no later than the August 8, 2012 Aquatic SWG meeting. Gingerich also said he will provide to Kristi Geris, for distribution to the Aquatic SWG, Dr. John Skalski's statistical analyses on the effects of reduced fishway entrance velocities on salmonid fish passage at Wells Dam.

5. **Douglas PUD FERC License and Aquatic SWG July Meeting Details** (Shane Bickford): Shane Bickford updated the Aquatic SWG on the status of the renewal of Douglas PUD's Federal Energy Regulatory Commission (FERC) license. Bickford said he was informed that, due to the demands of a new project in Alaska and limited staff, FERC will not be issuing a new license for Wells in the foreseeable future. Bickford said Douglas PUD has been directed by FERC to continue operations under the annual license, which requires operating under existing license conditions. Given this update, Mike Schiewe suggested that the July 11, 2012 Aquatic SWG meeting be held by phone conference instead of in person. The Aquatic SWG agreed to hold the July 11, 2012 meeting by conference call beginning at 10:00am.

IV. Next Meetings

1. Upcoming meetings: ***July 11, 2012 (conference call); August 8, 2012 (conference call); and September 12, 2012 (conference call)***.

List of Attachments

Attachment A – List of Attendees
Attachment B – Wells White Sturgeon Offspring Collection Plan SOA
Attachment C – Wells White Sturgeon Offspring Collection Plan SOA – redlines
Attachment D – Wells Dam Water Quality Update

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Administrative	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Jason McLellan	SWG Technical Resource	Colville Confederated Tribes

Wells White Sturgeon Offspring Collection Plan

Statement of Agreement (SOA)

May 2012 for Implementation in 2013- 2016

Statement

The Aquatic Settlement workgroup (Aquatic SWG) agrees that Douglas PUD should implement a multifaceted strategy for the collection of white sturgeon offspring starting in the spring/summer of 2013. This approach will include the implementation of wild larval collection and adult brood collection programs.

This multifaceted approach will be utilized for four years toward identifying the best strategy for the long-term supplementation of white sturgeon in the Wells Project. The Aquatic SWG will evaluate program implementation and progress towards achieving the objectives of the White Sturgeon Management Plan on an annual basis and to make any adjustments, if necessary. If necessary and appropriate, the Aquatic SWG will use adaptive management as defined in the Aquatic Settlement Agreement (ASA) to make such adjustments. At the end of year four of these efforts (July 2016), the Aquatic SWG will develop evaluation criteria, evaluate the results of the first four years of the multifaceted strategy, and identify the best long-term regional offspring collection strategy for the Wells sturgeon supplementation program.

Appendix A

Background

The Aquatic Settlement Agreement, White Sturgeon Management Plan (WSMP) requires that Douglas PUD fund the collection of white sturgeon offspring starting in 2013 toward the release of up to 5,000 juvenile sturgeon per year starting in the summer of 2014 and up to 20,000 by 2017. The intent of this program is to increase the abundance and genetic diversity of white sturgeon found within the Wells Project. In an effort to develop the most effective and beneficial long-term sturgeon supplementation strategy, Douglas PUD is proposing to implement a multifaceted offspring collection evaluation. This combined approach will utilize two primary offspring collection methods including both a wild larval collection and a wild adult broodstock collection strategies. The goal of this study is to identify the best long-term supplementation strategy that will maximize the successful out planting of the required numbers of juvenile sturgeon while simultaneously increasing the genetic diversity of the offspring released into the Wells Project. Both programs will be funded by Douglas PUD for four years (2013-2016).

Both the larval collection and the broodstock collection programs will be funded equally during the first two years. Larval fish or fertilized eggs will be delivered to Wells Hatchery within one day following capture or fertilization. Fish/gametes will be isolated from one another according to Washington Department of Fish and Wildlife (WDFW) fish health requirements, and permitting to transfer fish will be obtained to follow other WDFW guidelines.

Over this four-year period the Wells Hatchery will be designed to accommodate up to 6 maternal family units produced from wild broodstock (derived from a partial or full factorial mating strategy that includes up to 6 male and 6 female parents) and up to an additional 6 larval collection “groups”.

It is highly probable that over this four-year program differential success will occur among and within programs. To address differential success within and between programs the Aquatic SWG will be consulted annually to determine the numbers of fish to be stocked from each maternal family and collection group. Program leads and Douglas PUD will participate in the Regional White Sturgeon Technical Working Group. Technical information shared in this group may be brought to the ASWG by any regional white sturgeon technical workgroup member in order to assist in making informed decisions through adaptive management. The Aquatic SWG will evaluate program implementation and progress towards achieving the objectives of the White Sturgeon Management Plan. Aquatic Settlement Agreement signatories will make unanimous adjustments as required to remain consistent with the Aquatic Settlement Agreement.

Wells White Sturgeon Offspring Collection Plan

Statement of Agreement (SOA)

May 2012 for Implementation in 2013- 2016

Statement

The Aquatic Settlement workgroup (Aquatic SWG) agrees that Douglas PUD should implement a dual strategy for the collection of white sturgeon offspring starting in the spring/summer of 2013. This approach will include the implementation of wild larval collection and adult brood collection programs.

This two program approach will be utilized for four years toward identifying the best strategy for the long-term supplementation of white sturgeon in the Wells Project. The Aquatic SWG will evaluate program implementation and progress towards achieving the objectives of the White Sturgeon Management Plan on an annual basis and make any adjustments, if necessary. If necessary and appropriate, the Aquatic SWG will use adaptive management as defined in the Aquatic Settlement Agreement (ASA) to make such adjustments. By the end of year four of these efforts (July 2016), the Aquatic SWG will have developed evaluation criteria, evaluate the results of the first four years of the two programs, and identify the best long-term regional offspring collection strategy for the Wells sturgeon supplementation program.

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Appendix A

Background

The Aquatic Settlement Agreement, White Sturgeon Management Plan (WSMP) requires that Douglas PUD fund the collection of white sturgeon offspring starting in 2013 toward the release of up to 5,000 juvenile sturgeon per year starting in the summer of 2014 and up to 20,000 by 2017. The intent of this program is to increase the abundance and genetic diversity of white sturgeon found within the Wells Project. In an effort to develop the most effective and beneficial long-term sturgeon supplementation strategy, Douglas PUD is proposing to implement dual offspring collection evaluation. This combined approach will utilize two primary offspring collection methods including both wild larval collection and wild adult broodstock collection strategies. The goal of this study is to identify the best long-term supplementation strategy that will maximize the successful out planting of the required numbers of juvenile sturgeon and the genetic diversity of the offspring released into the Wells Project. Both programs will be funded by Douglas PUD for four years (2013-2016).

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Both the larval collection and the broodstock collection programs will be funded equally during the first two years. Larval fish or fertilized eggs will be delivered to Wells Hatchery within one day following capture or fertilization. Fish/gametes will be isolated from one another according to Washington Department of Fish and Wildlife (WDFW) fish health requirements, and permitting to transfer fish will be obtained to follow other WDFW guidelines.

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ASWG meeting 6-14-12
Water Quality Update

Incoming TDG (in the forebay) May and June 2012; meeting the 110% standard.

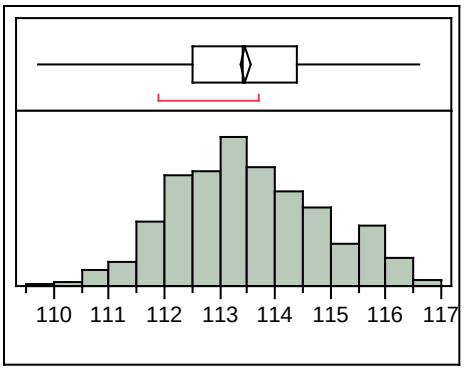

Figure 1. Hourly incoming TDG distribution observed in the Wells Dam forebay during the month of May 2012. The x-axis is TDG as a % and the Y-axis is frequency of value occurring. <2.0% of all hourly values were below the 110 % standard in May. Sample size is 718 hourly values recorded during month of May.

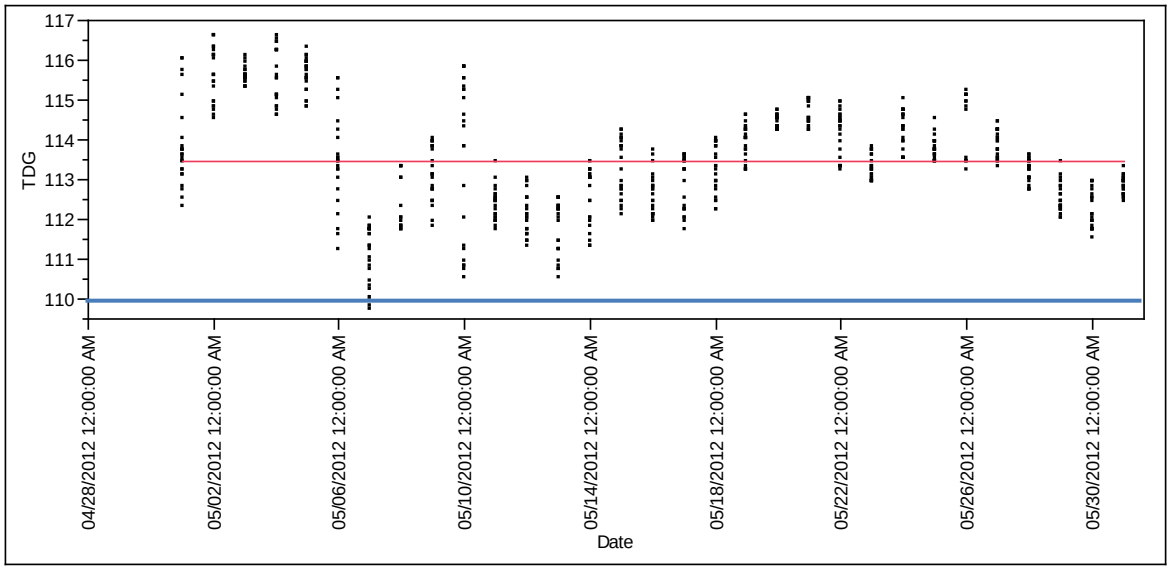

Figure 2. Wells Forebay hourly TDG values in May 2012. Where the red line is mean and the blue line is 110% standard. TDG is expressed as a % on the y-axis. Note: Each small black dot is an hourly value for a given day. Each day should have 24 dots.

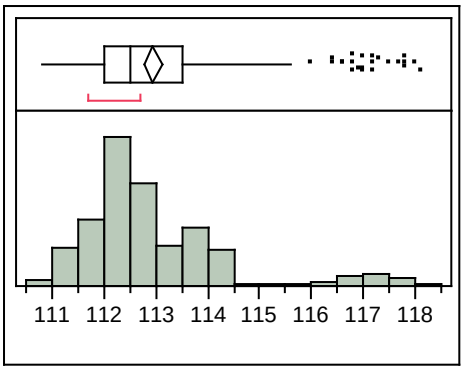

Figure 3. Hourly incoming TDG value distribution observed in the Wells Dam forebay during the month of June to date. The x-axis is TDG as a % and the Y-axis is frequency distribution. Over 12 days and 288 hourly samples and at no time has Wells receive water below 110.8%. i.e., All hourly values have been above the 110% standard.

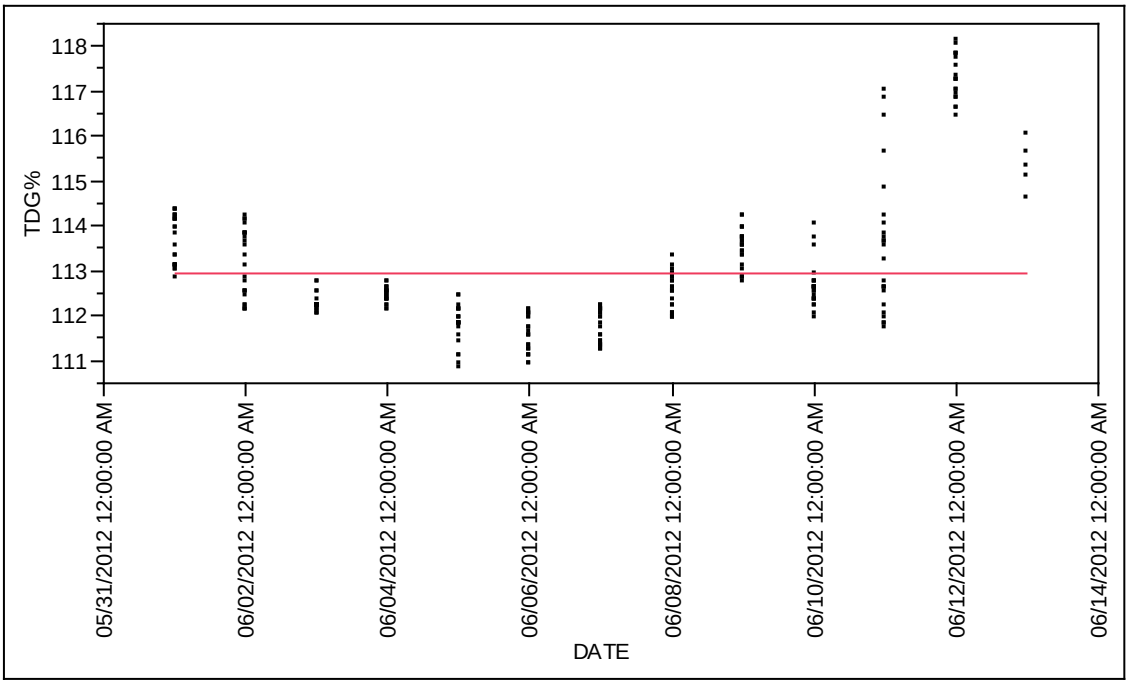

Figure 4. No hourly values in the month of June were below 110% in the Wells forebay. The red line is the average hourly value for the month of June to date. Note: Each small black dot is an hourly value for a given day. Each day should have 24 dots.

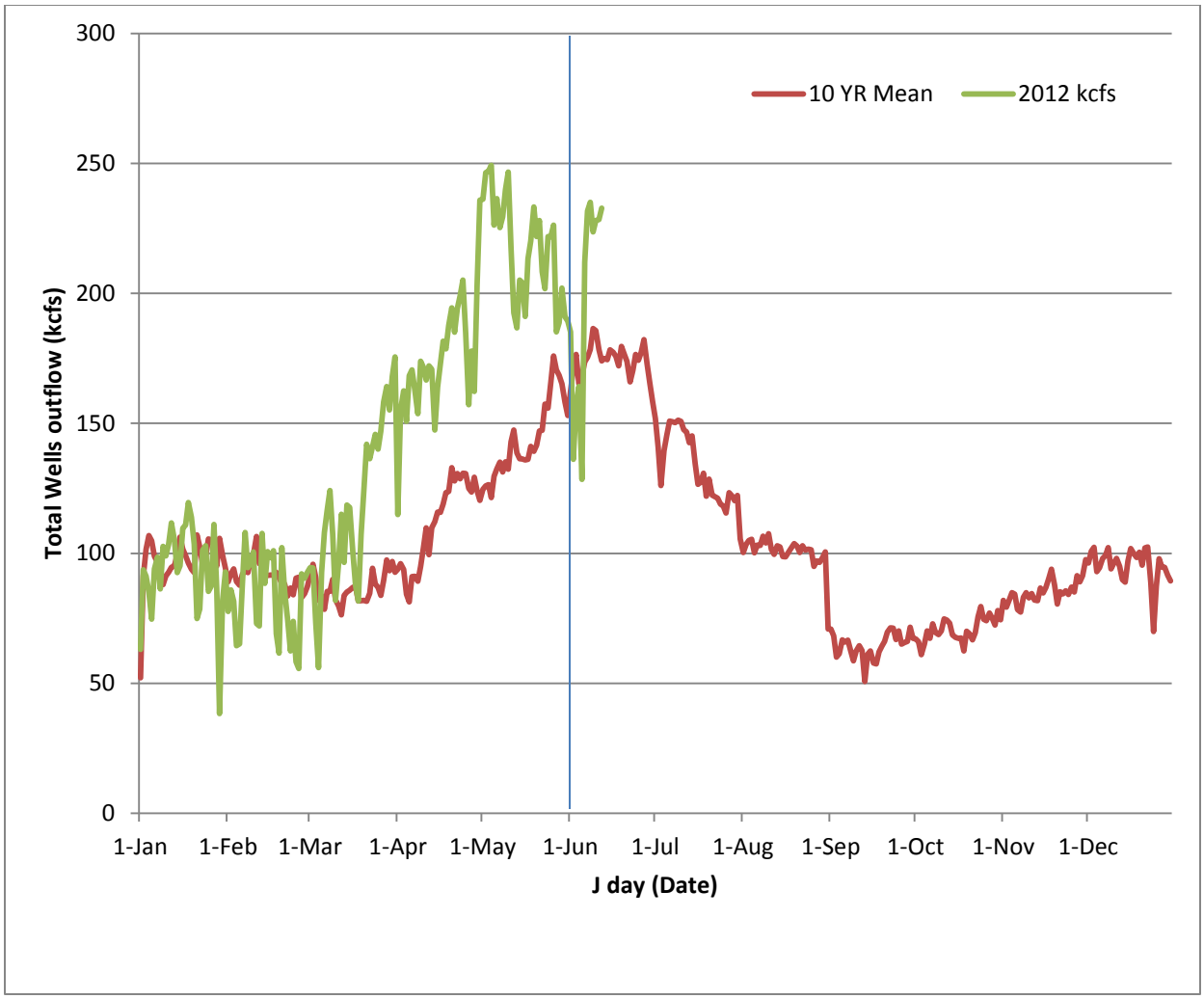

Figure 5. Total flow at Wells dam in 2012 compared to 10 year average (2002-2011)

- Predicted flows for the month of June were 165 kcfs out of CJD and 40 kcfs in spill or less at Wells. As such, DCPUD reinstalled bypass barrier number 6 on Thursday June 7th, as flows were increasing.
- On Thursday and Friday we had 7Q10 flows past the Project, with the bypass barrier in and saw poor TDG performance. Clearly, flows increased unexpectedly and Grand Coulee found some water.
- The barrier was removed again on Monday June 11th.
- Incoming TDG (forebay) continued to climb to 118% on Tuesday June 12th.

Table 1. Douglas County PUD TDG performance over the last three weeks

		Wells Forebay	Wells Downstream				Rocky Reach Forebay	Notes
Day of the Week	Date	TDG High (%)	TDG 12C high (%)	TDG High (%)	High Q(kcfs)	7Q10?	TDG High (%)	
Monday	21-May	115	121.6	122	237.5	N	122.6	
Tuesday	22-May	114.9	121.7	124	239.8	N	120.3	
Wednesday	23-May	113.8	120.5	122.8	228.6	N	120.7	
Thursday	24-May	115	121.2	122.9	242.7	N	120.2	
Friday	25-May	114.5	121.5	121.8	237.1	N	120.1	
Saturday	26-May	115.2	122.9*	124.2	249.8	Y	121.3*	
Sunday	27-May	114.4	117	118.2	199.2	N	Probe Failure	
Monday	28-May	113.6	117.2	117.8	211.1	N	Probe Failure	
Tuesday	29-May	113.4	116.8	118.7	222.8	N	Probe Failure	
Wednesday	30-May	112.9	116.6	118.3	220.8	N	Probe Failure	
Thursday	31-May	113.3	116.4	117.1	206.9	N	Probe Failure	
Friday	1-Jun	114.3	117.5	118.9	218.7	N	116.2	
Saturday	2-Jun	114.2	114.9	115.9	172.3	N	116^	
Sunday	3-Jun	112.7	115	116.3	204.0	N	115.4	
Monday	4-Jun	112.7	114.7	116.7	177.5	N	113.8	
Tuesday	5-Jun	112.4	113.3	113.9	196.6	N	114.6	
Wednesday	6-Jun	112.1	120.0	120.4	235.6	N	111.5	Nine Unit plant
Thursday	7-Jun	112.2	119.8	122	252.7	Y	118.2	Barrier in
Friday	8-Jun	113.3	122.3	**128.3**	253.3	Y	120.8	
Saturday	9-Jun	114.2	118.3	119.8	236.4	N	121.4^	
Sunday	10-Jun	114.2	116.9	117.3	239.4	N	115.8	
Monday	11-Jun	117.0	118.9	120.1	239.6	N	116.5	Barrier out
Tuesday	12-Jun	118.1	122.1	**125.5**	242.5	N	119.1	
Wednesday	13-Jun	116.0	120.3	124.5	255.8	Y	120.8	
Thursday	14-Jun							
Friday	15-Jun							
Saturday	16-Jun							
Sunday	17-Jun							

110% Wells forebay standard not met.

Flows past wells that exceeded 7Q10 conditions.

Violations- not considering 110% forebay standard.

^ High at Wells was lower than high at RRFB. Possible sensor issue?

Bold values indicated required biological monitoring.

Table 2. GBT monitoring over the 2012 spill season

Species	Sample date				
	5/3/2012	5/10/2012	5/18/2012	6/8/2012	6/13/2012
Yearling Chinook	19	13	21	3	0
coho	28	16	17	3	0
sockeye	11	10	14	6	9
steelhead	2	0	7	1	0
subyearling Chinook	0	0	0	37	19
Total sampled	**60**	**39**	**59**	**50**	**28**
Total showing GBT	**0**	**0**	**0**	**0**	**0**
Percent GBT	**0%**	**0%**	**0%**	**0%**	**0%**

Additionally, many hundred adult salmonids sampled at Wells during brood collection. No GBT symptoms.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: August 8, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the July 11, 2012 Aquatic SWG Conference Call

The July Aquatic Settlement Work Group (SWG) meeting was held by conference call on Wednesday, July 11, 2012, from 10:00 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Shane Bickford will introduce Chas Kyger, a new Douglas PUD Aquatic Resource Biologist, at the next Aquatic SWG meeting on August 8, 2012 (Item III-2).

2. Shane Bickford will provide to Kristi Geris for distribution to the Aquatic SWG the 2011 Federal Energy Regulatory Commission (FERC) Environmental Redispatch Order and the 2012 Environmental Redispatch Proposal (Item III-3).

3. Andrew Gingerich will prepare a draft Lamprey Study Plan, combining the installation of infrared (IR) cameras in the Wells fishway and the active tagging of translocated adult lamprey, to assess lamprey passage at Wells Dam, and Gingerich will distribute the draft plan to the Aquatic SWG prior to the August 8, 2012 Aquatic SWG meeting (Item III-4).

4. Andrew Gingerich will include in the draft Lamprey Study Plan a section addressing potential fish health concerns when working with adult lamprey, including measures that will be implemented to minimize impacts to the fish (Item III-4).

5. Andrew Gingerich will prepare a request for a Wells Dam operation to support lamprey passage for consideration by the HCP Coordinating Committees. The request will be similar to the 2011 request, and Gingerich will coordinate with Tom Kahler to present the request at either the July 2012 or August 2012 HCP Coordinating Committees meeting (Item III-4).

6. Pat Irle will provide to Kristi Geris for distribution to the Aquatic SWG the agenda for the Rocky Reach Fish Forum Juvenile Pacific Lamprey Seminar, scheduled for August 1, 2012, at the Chelan PUD headquarters in Wenatchee, Washington (Item III-7).

II. Summary of Decisions

1. There were no Statements of Agreements (SOAs) approved at today's meeting.

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe)**:** Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for any additional agenda items. The following revisions were made to the agenda:

    - Shane Bickford removed Douglas PUD's agenda item III-2 regarding the introduction of a new Douglas PUD Aquatic Resource Biologist, Chas Kyger. Kyger was out in the field and unavailable to attend today's meeting.
    - Pat Irle added a discussion of the Chelan PUD Rocky Reach Fish Forum White Sturgeon Update.

    Kristi Geris reported that all comments and revisions received on the draft June 14, 2012 conference call minutes had been incorporated. The draft June 14, 2012 conference call minutes were approved as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **New Aquatic Resource Biologist: Chas Kyger** (Shane Bickford)**:** Shane Bickford said that Chas Kyger, a new Douglas PUD Aquatic Resource Biologist, was working in the field tagging subyearling Chinook salmon, and was therefore unavailable to attend today's meeting. Bickford will introduce Kyger to the Aquatic SWG at the next Aquatic SWG meeting on August 8, 2012.

3. **Wells Water Quality and Flows Update** (Andrew Gingerich)**:** Andrew Gingerich reviewed the findings within the weekly Wells Dam water quality report (Attachment B). Douglas PUD submits this report to the Washington State Department of Ecology (Ecology) each week during the fish spill season. Kristi Geris distributed this report to the Aquatic SWG on July 10, 2012.

    Gingerich said that each year Douglas PUD requests a fish passage waiver to the 110 percent limit for total dissolved gas (TDG) saturation during the outmigration of juvenile salmon. This request is accompanied by a Gas Abatement Plan. Gingerich said the TDG exception for fish passage has three criteria: 1) TDG shall not exceed 125 percent saturation in the tailrace of the project as measured in any 1-hour period; 2) TDG shall not exceed 120 percent saturation in the tailrace of the project based on the average of

the twelve highest consecutive hourly readings in any one day (12C high); and 3) TDG shall not exceed 115 percent saturation in the forebay of the next downstream project during any hourly reading. These standards are required as long as flows at the dam are below the 7Q10 value (the highest 7-day average flow that occurs on average once every 10 years).

Gingerich said Table 1 of Attachment B shows that on all seven days of the week beginning on July 2, 2012, and ending on July 8, 2012, Wells Dam received water with TDG greater than 110 percent. Further, Gingerich said that all seven days had hourly 125 percent exceedences in the Wells Dam tailrace, and 115 percent downstream forebay exceedences in the Rocky Reach forebay. However, exceedences occurred on days when flows past Wells Dam were above the highest seven consecutive days average observed during a 10-year period (7Q10), which Gingerich added was 246,000 cubic feet per second (246 kcfs).

Gingerich reminded the Aquatic SWG, as discussed during the June 14, 2012 Aquatic SWG meeting, that the Wells Dam Gas Abatement Plan requires biological monitoring when the 125 percent hourly tailrace standard is exceeded. Gingerich said Table 2 of Attachment B shows very low (less than 5 percent) gas bubble trauma (GBT) expression observed in juvenile fish at Rocky Reach Dam to date despite high TDG values in the Wells tailrace. Gingerich also said that last year's GBT monitoring showed that species-specific differences occur at a given TDG value. For example GBT expression has been observed in coho salmon more often than in other sampled species in both 2011 and again this year.

Lastly, Gingerich said that Figures 2 and 3 in Attachment B show that the first half of the fish passage season has been characterized by greater than normal flows, largely due to water management above Grand Coulee and higher than average flows during the latter half of the spill season due to unanticipated rain events and higher than average snow pack in 2012.

Steve Rainey said he did not expect the TDG concentrations to be so high in the Wells forebay. Rainey asked what the gas concentrations were prior to the installation of the new spill deflectors at Chief Joseph Dam. Shane Bickford said historically, Chief Joseph Dam has not spilled; the dam only started spilling after the installation of the new spill deflectors. Bickford said Chief Joseph Dam is being used to reset TDG from Grand Coulee Dam. Bickford added that he had hoped Chief Joseph Dam would be kept below 115 percent all the time, but instead, gas levels are now higher than historical levels, largely because Chief Joseph Dam has become the preferred federal wind integration project.

Rainey said the Bonneville Power Administration (BPA) was trying to limit TDG by limiting wind turbine generation. Bickford said that FERC released an order in late 2011 directing BPA to stop using environmental redispatch to abate gas; so instead they are

spilling more water. Bickford said Chief Joseph Dam historically has been low on the spill priority list. However, because Chief Joseph Dam is used for environmental redispatch, it has since moved up the priority list, which, Bickford added, may not be beneficial to aquatic resources downstream of Chief Joseph Dam. Bickford said he will provide to Kristi Geris for distribution to the Aquatic SWG the 2011 FERC Environmental Redispatch Order and the 2012 Oversupply/Wind Integration Proposal.

Gingerich said that this year there are unprecedented flows compared to the 10 year and 30 year averages. He said there are a number of tools at Wells Dam to minimize TDG impact; however, those tools are only helpful up to certain flow levels. Bickford added that bypass barriers have been pulled to help with TDG, and flows are expected to decline provided there are no additional weather systems (e.g., thunderstorms). Bickford said that this year the area is breaking precipitation records; the recent high flows are largely due to heavy rain as opposed to snowmelt. Bickford said Chief Joseph Dam is expected to drop below 7Q10 by the weekend; however, Wells Dam will still be above 7Q10 throughout next week.

4. **Lamprey Study Plan Development Update** (Andrew Gingerich)**:** Andrew Gingerich said Douglas PUD is continuing to work with Bao Le of Longview Associates to develop a Lamprey Study Plan, combining the installation of IR cameras in the Wells fishways and the active tagging of translocated adult lamprey, to assess lamprey passage and enumeration at Wells Dam. Gingerich said the draft plan will be distributed to the Aquatic SWG prior to the August 8, 2012 Aquatic SWG meeting. Patrick Verhey noted that it would be beneficial for the study plan to include a section on lamprey handling and transportation, which would cover how to minimize disease and stressors on these fish. Gingerich also said he will include in the draft Lamprey Study Plan a section addressing potential fish health concerns when working with adult lamprey, including measures that will be implemented to minimize impacts to the fish.

   Request for Flow Differential Changes for Lamprey to the HCP: Andrew Gingerich said he will prepare a request for a Wells Dam operation to support lamprey passage for consideration by the HCP Coordinating Committees. The request will be similar to the 2011 request, and Gingerich will coordinate with Tom Kahler to present the request at the July 2012 HCP Coordinating Committees meeting.

   Dredging at Recreational Boat Launches in Pateros and Carpenter Island: Andrew Gingerich said Douglas PUD is proposing upgrades to two boat launches: one located in the town of Pateros, and the other at Carpenter Island. Gingerich said there is concern regarding potential impacts to lamprey while performing dredging activities. In response, Douglas PUD has requested loan of electro-shockers from Grant PUD that are specially designed for lamprey shocking, and Gingerich said Douglas PUD plans to conduct scoping activities to determine if lamprey occupy the area. Depending on the results of the study, a plan will be developed regarding dredging in the proposed areas,

which may include fish salvage in dredge materials. Shane Bickford said Douglas PUD is waiting on permitting, and the date for the work is not yet confirmed. However, he hopes to complete the scoping prior to this winter. Bickford suggested conducting the study in late August or early September because, historically, August has the lowest flows. Gingerich added that in terms of elevation change, there is not much difference between now and late summer/early fall.

5. **Head Differential Report Review Update** (Andrew Gingerich)**:** Andrew Gingerich briefly reviewed Dr. John Skalski's analyses of adult salmonid passage during the 2009 and 2010 lamprey studies conducted at the east and west fishways of the Wells Dam. Gingerich said Dr. Skalski's analyses indicated no significant differences in adult salmonid passage at either the 1.0- or 1.5-foot head differentials that were tested in both years. Dr. Skalski's final report was distributed to the Aquatic SWG by Kristi Geris on June 15, 2012.

   Steve Rainey pointed out that the analyses indicated a significant difference in entrance efficiency for steelhead at the 0.5-foot head differential tested in 2009. Gingerich acknowledged that steelhead did show a statistical difference in one of the two years (2009); however, the Aquatic SWG's interest was to determine whether a reduction in entrance velocity could potentially enhance lamprey passage, which resulted in eliminating consideration of the 0.5-foot differential in 2010. Mike Schiewe added that the HCP Coordinating Committees and National Marine Fisheries Service (NMFS) both approved the report. Schiewe said that the HCP Coordinating Committees are aware that this year they may receive from the Aquatic SWG a similar lamprey operation request as last year.

6. **Chelan PUD Rocky Reach Fish Forum White Sturgeon Update** (Pat Irle)**:** Pat Irle said that during the Chelan PUD Rocky Reach Fish Forum meeting held yesterday, July 10, 2012, Josh Murauskas reported that Chelan PUD destroyed juvenile sturgeon received from the Marion Drain Facility due to a disease outbreak. Consequently, Chelan Falls Hatchery was not accepting additional sturgeon at the facility until the site was fully sterilized. Irle emphasized the importance of being careful about bringing diseased fish into the system.

   Chad Jackson elaborated that in early June 2012, two batches of sturgeon were brought to Chelan Falls Hatchery. Shortly after the first batch hatched, the juvenile sturgeon developed hyper-inflated swim bladder. Final survival of the first batch was approximately 120 to 150 yearling white sturgeon. Jackson said that in order to backfill this loss, Chelan Falls Hatchery was authorized a second batch of sturgeon from Marion Drain. Two weeks after the transfer of the second batch of sturgeon, a Washington Department of Fish and Wildlife (WDFW) fish pathologist observed *Columnaris* and *Costia* infections while performing health exams on the transferred fish.

Jackson said that the origin of the *Columnaris* and *Costia* infections is unknown, and that *Columnaris* and *Costia* are common pathogens of fish in the natural and hatchery environments. Jackson speculated that the sturgeon transferred from Marion Drain to Chelan Falls Hatchery already had *Columnaris* and *Costia* and that the stress of the transfer precipitated the outbreaks. Jackson said the exact source is unknown because approximately two weeks passed from the time the sturgeon arrived at Chelan Fall Hatchery to when a WDFW fish pathologist performed the first health exam and detected the diseases. Jackson said treatments for *Columnaris* and *Costia* were not successful, and the sturgeon began exhibiting clinical signs of white sturgeon iridovirus (WSIV). The source of the WSIV is also unknown. Jackson said that WDFW fish health staff suspected it resulted from vertical transmission from mother to eggs. WDFW fish health staff recommended destruction of the juvenile sturgeon at the Chelan Falls Facility and sterilization of all the tanks and equipment. Juvenile white sturgeon infected with WSIV were destroyed sometime the week of June 4, 2012 and the rearing site was sterilized soon after. Fertilized eggs from the first spawning event (June 14, 2012) were imported into Chelan Hatchery that same day.

Jackson also updated the Aquatic SWG on the status of the Grant PUD sturgeon. Jackson said that it was his understanding that the Grant PUD sturgeon being held at Marion Drain have not exhibited any clinical symptoms of WSIV or other regulated pathogens of concern, other than potentially *Columnaris* and *Costia*. Jackson said that prior to releasing the Grant PUD sturgeon, Grant PUD is arranging with the Yakama Nation to have their fish tested for iridovirus, given the unexpected incidence of the disease at Chelan Falls Hatchery. Jackson said that further action will be determined based on the results of those analyses.

7. **Rocky Reach Fish Forum Juvenile Pacific Lamprey Seminar** (Pat Irle)**:** Pat Irle announced that the Rocky Reach Fish Forum Juvenile Pacific Lamprey Seminar is scheduled for August 1, 2012, at the Chelan PUD headquarters in Wenatchee, Washington. Irle said that several speakers, including Dr. Richard Beamish (Canada), will be presenting on culture of Pacific lamprey, effects of hydroelectric projects on lamprey passage, and monitoring and evaluation programs. The seminar is open to the public on August 1, 2012, and the meeting on August 2, 2012, is reserved for a Rocky Reach Fish Forum Lamprey Workshop. Irle said that as soon as the seminar agenda is available, she will provide it to Kristi Geris for distribution to the Aquatic SWG.

IV. Next Meetings

1. Upcoming meetings: ***August 8, 2012 (conference call); September 12, 2012 (conference call); and October 10, 2012 (conference call)***.

List of Attachments

Attachment A – List of Attendees

Attachment B – Wells Dam Weekly Water Quality Report

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Admin./ Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Chad Jackson†	Technical Support	Washington Department of Fish and Wildlife
Molly Hallock	Technical Support	Washington Department of Fish and Wildlife
Steve Rainey	Technical Support	U.S. Fish and Wildlife Service
RD Nelle	Technical Support	U.S. Fish and Wildlife Service
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Keith Hatch	Observer	Bureau of Indian Affairs

Notes:

† Joined for the Chelan PUD Rocky Reach Fish Forum White Sturgeon Update

Wells Hydroelectric Project FERC No. 2149
Fish Passage In-season TDG Report # 6

Update for July 2nd- 8th

Prepared by:

Beau Patterson and Andrew Gingerich
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497

Prepared for:

Pat Irle
Hydropower Projects Manager
Washington Department of Ecology
15 W. Yakima Avenue, Suite 200
Yakima, WA 98902-3452

July 9, 2012

Wells Hydroelectric Project

The Wells Hydroelectric Project (Project) is owned by Public Utility District No. 1 of Douglas County (Douglas PUD) and operated under License No. 2149 from the Federal Energy Regulatory Commission (FERC). The Project is located at river mile 515.6 on the Columbia River. The Project is the ninth hydroelectric project from the mouth of the Columbia River, and is the last project on the Columbia with fish passage facilities.

The Wells Project is a run-of-river hydroelectric project, with limited reservoir storage capacity and a 10 feet operating range. On average, daily inflows equal daily outflows. The Wells Project is a hydrocombine design, with eleven spillbays located vertically above ten Kaplan turbine units, with upstream fish passage facilities located at each end of the concrete dam structure. The maximum hydraulic capacity of the ten units is approximately 220,000 cubic feet per second (cfs); flows in excess of hydraulic capacity must be spilled through the spillbays.

Regulatory Framework

The Wells Project is required to meet the State of Washington Water Quality Standards (WQS) promulgated under Washington Administrative Code (WAC) Chapter 173-201A. The upper criterion for total dissolved gas (TDG) saturation is 110% when river flows are less than the highest seven consecutive days average observed during a ten-year period (7Q-10 flow). The 7Q-10 flow for the Wells Project is 246,000 cfs, based on the hydrologic records from 1930 to 1998.

Ecology may also approve an exception to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; fish passage spill is used to facilitate project passage survival. The TDG exception is considered by Ecology on a per-application basis and must be accompanied by an approved Gas Abatement Plan (WAC 173-201A-200(1) (f) (ii)). On the Columbia and Snake rivers, the TDG exception for fish passage has three standards during the fish passage (spill) season: (1) TDG shall not exceed 125% saturation in the tailrace of the project as measured in any one-hour period; (2) TDG shall not exceed 120% saturation in the tailrace of the project based on the average of the twelve highest consecutive hourly readings in any one day (12C-High); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings in any one day.

Ecology approved the 2012 Wells Project Gas Abatement Plan and TDG exception.

TDG Compliance

Juvenile fish bypass operations commenced on April 9. To date, the 2012 spill season has been characterized by above average flow volumes, due initially to increases in the runoff forecast between February and April, and subsequent aggressive drawdowns of Grand Coulee Reservoir to increase storage as late season runoff forecasts increased. Early season flows have been followed by above-average high flows during the historic peak of the hydrograph throughout June. Flows are expected to remain high at least through the balance of the month, with 7Q10 flows currently occurring at Wells

Dam and expected to continue through the week of July 9th 2012. Below is a summary of compliance up to July 8th 2012.

Wells Tailrace 120% 12C-High standard

During the week ending July 8th all seven days had 12C-High exceedances. However, all exceedances occurred on days when flows past Wells dam were above 7Q10 conditions (246 kcfs). On all seven days of the week Wells received water above 110% (Table 1).

Wells Tailrace 125% hourly standard

During the week ending July 8th all seven days had hourly 125% exceedances in the Wells tailrace. However, all exceedances occurred on days when flows past Wells dam were above 7Q10 conditions (246 kcfs). In addition, on all seven days of the week Wells received water above 110% (Table 1).

Rocky Reach forebay 115% standard

During the week ending July 8th all seven days had 115% downstream forebay exceedances in the Rocky Reach forebay. However, all exceedances occurred on days when flows past Wells dam were above 7Q10 conditions (246 kcfs). In addition, on all seven days of the week Wells received water above 110% (Table 1).

Table 1. Weekly TDG compliance table

				Wells Forebay	Wells Downstream		Rocky Reach Forebay	Notes
Day of the Week	Date	High Q(kcfs)	7Q10?	TDG High (%)	TDG 12C high (%)	TDG High (%)	TDG High (%)	
Monday	2-Jul	292.3	Y	120.8	130.8	**131.6**	129.1	
Tuesday	3-Jul	299.5	Y	120.2	131.3	**132.2**	128.2	
Wednesday	4-Jul	294.3	Y	119.6	130.6	**131**	129.8	
Thursday	5-Jul	300.5	Y	121.5	132.5	**133.7**	129.4	
Friday	6-Jul	284.3	Y	119.2	129.9	**131.6**	129.6	
Saturday	7-Jul	270.0	Y	119.1	124.5	**125.8**	127.8	
Sunday	8-Jul	275.6	Y	118.4	125.7	**126.9**	122.5	
110% Wells forebay standard not met.								
Flows past wells that exceeded 7Q10 conditions.								
Violations- not considering 110% forebay standard.								
Bold values indicated required biological monitoring. (Switched to a three day sample schedule on 6-28-12)								

Biological Monitoring

When the 125% hourly tailrace standard is exceeded, the Wells Gas Abatement Plan requires biological monitoring of juvenile salmonids sampled at the Rocky Reach Juvenile Fish Bypass Sampling Facility, and of adults trapped for broodstock at Wells Dam. Very low GBT expression has been observed in juvenile fish at Rocky Reach Dam to date, despite high TDG values in the Wells tailrace. Over 500 juvenile salmonids have been examined at Rocky Reach, 7 of which have shown mild GBT expression in caudal fin

rays (1.35%). An example of mild GBT expression observed is shown in Figure 1. Tabular results of juvenile sampling are presented (Table 2).

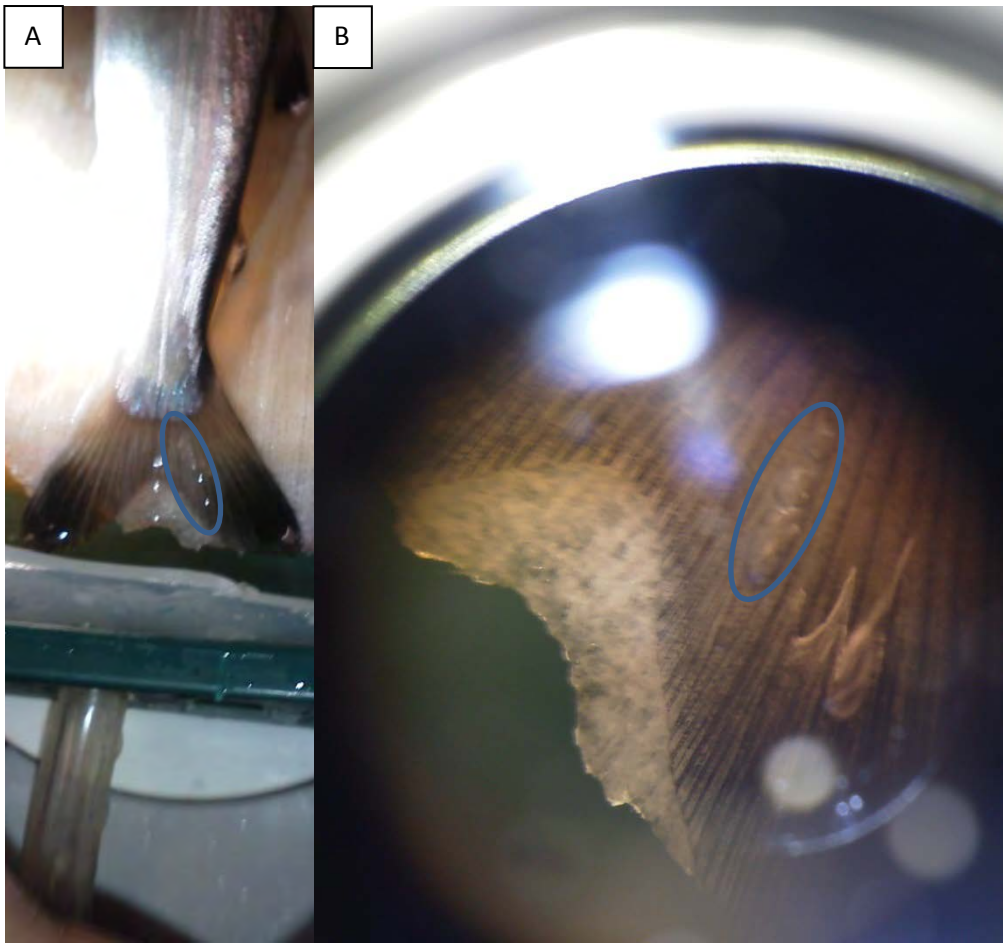

Figure 1. Mild GBT expression in a single coho caudal fin sampled 6-22-2012 at Rocky Reach Bypass Facility. Panel A shows expression at actual size and B shows fin through the magnifying scope. Emboli were present along one finray in the caudal fin as highlighted by blue ovals in A and B.

Table 2. GBT monitoring at Rocky Reach Juvenile Bypass Facility during 2012

		Species							
		yearling Chinook	coho	sockeye	steelhead	subyearling Chinook	**Total sampled**	**Total showing GBT**	**Percent GBT**
Sample date	**5/3/2012**	19	28	11	2	0	**60**	**0**	**0%**
	5/10/2012	13	16	10	0	0	**39**	**0**	**0%**
	5/18/2012	21	17	14	7	0	**59**	**0**	**0%**
	6/8/2012	3	3	6	1	37	**50**	**0**	**0%**
	6/13/2012	0	0	9	0	19	**28**	**0**	**0%**
	6/21/2012	0	1	6	0	6	**13**	**0**	**0%**
	6/22/2012	0	2	11	0	25	**38**	**0**	**0%**
	6/23/2012	0	1	1	0	32	**34**	**1**	**2.9%**
	6/24/2012	0	0	4	0	16	**20**	**0**	**0.0%**
	6/26/2012	0	0	3	0	14	**17**	**1**	**5.9%**
	6/27/2012	0	0	25	0	22	**47**	**1**	**2.1%**
	6/28/2012	0	0	5	0	15	**20**	**1**	**5.0%**
	6/29/2012	0	0	1	0	9	**10**	**0**	**0.0%**
	7/2/2012	0	0	3	0	8	**11**	**0**	**0.0%**
	7/4/2012	0	0	4	0	18	**22**	**1**	**4.5%**
	7/6/2012	0	0	1	0	31	**32**	**1**	**3.1%**
	7/9/2012	0	0	0	0	17	**17**	**1**	**5.9%**
Grand total							**517**	**7**	**1.35%**

Note. Sockeye after early June are largely adipose fin clipped kokanee stocked in Lake Roosevelt.

In addition, the Washington Department of Fish and Wildlife (WDFW) personnel trapped spring Chinook broodstock at Wells Dam on May 13th, 20th, 27th and June 3rd, 10th, 17th, and 24th. A total of 936 adult fish were handled. None of these fish showed signs of Gas Bubble Trauma. The WDFW continues to sample adult fish during trapping activities, even when TDG is in compliance.

Summary

The aggressive drawdown of the upper basin storage reservoirs coupled with above average flows have resulted in river flows exceeding normal conditions, resulting in very large volumes of spill at Wells Dam (greater than 100 kcfs at Wells). The first half of the fish passage season was characterized by above normal flows due to aggressive flood control efforts by the federal agencies including the drawdown of the Grand Coulee Reservoir (Figures 2 & 3). To date, the second half of the fish passage season has been characterized by high inflows (greater than 300 kcfs) into the federal system above Wells Dam and unusually high Methow and Okanogan river flows entering the Wells Project below Chief Joseph Dam (Figure 3). Together these three sources of water have combined to consistently exceed the 7Q10 flow value (246 kcfs) at Wells Dam.

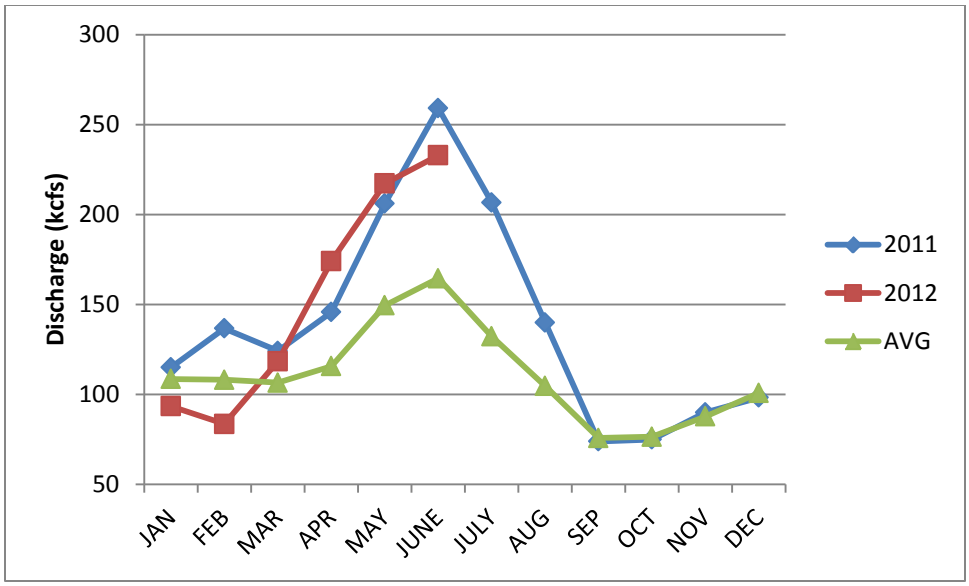

Figure 2. 2012 discharge profile at Wells Dam compared to 2011 and average (since 1969) profile

In addition to high flows, during the first half of the fish passage season, Wells Dam was operated as an 8-unit plant (April and May). April through early May is traditionally a good time of year for turbine maintenance since these months are normally characterized by lower flow volumes and low demand for electricity. All mid-Columbia PUDs had units out for maintenance when the runoff forecast increased dramatically in March and April. In addition to the Grand Coulee flood control operations, compliance below Wells was worsened by having high flows occur out of synch with the typical hydrograph.

Discharge at Wells Dam was expected to be less than 170 thousand cubic feet per second (kcfs) for the remainder of June however unanticipated rain on snow events dramatically increased the federal systems inflow and discharge estimates resulting in near flood conditions that came into conflict with the operation of the Wells Juvenile Fish Bypass System (Figure 3).

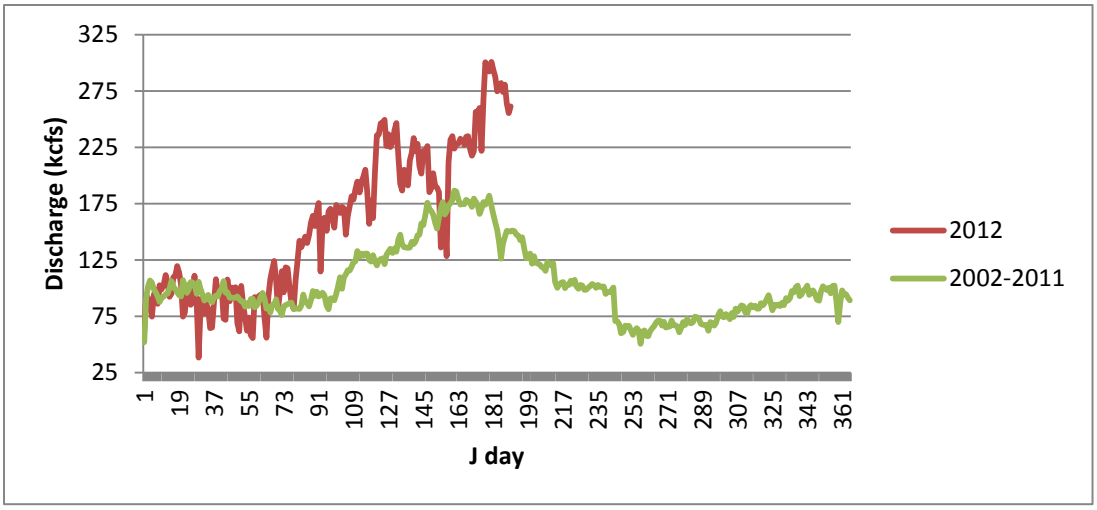

Figure 3. 2012 hydrograph at Wells dam compared to 10 year average

For example, in accordance with the Wells Habitat Conservation Plan, lower flow predictions required dam staff to return the bypass barrier (number 6) on Thursday June 7th. However, flows unexpectedly rose at Chief Joseph on Thursday and Friday (June 7th and 8th) exceeding 7Q10 values (over 246 kcfs). With the bypass barrier replaced, the Wells Project exhibited poor TDG performance. On Monday June 11th, dam staff removed the barrier to improve gas performance. Bypass barrier number 6 has been out since this time.

The Army Corps of Engineers (Corps) predicted flows for the weeks starting June 10th 18th and 2th to be greater than 200 kcfs. This forecast was updated to 240 kcfs during the week of June 18th. In addition to approximately 20 kcfs in side flows from the Okanogan and Methow river, total flow at Well is expected to be 250 kcfs for the upcoming weeks. As such, Wells Dam has been experiencing 7Q10 flows over the last week and is expected to continue to see these conditions.

Late during the week of June 4th, a 9th turbine unit was put back into service following the completion of cavitation and maintenance work. Current plant capacity is between 180-190 kcfs.

During the week of June 25th flows at Wells were routinely over 300 kcfs and were predicted to remain above 300 for the week. These flows are well above the 7Q10 flow threshold of 246 kcfs at Wells Dam. As such, Douglas PUD removed a third set of bypass barriers to improve TDG performance and maintain dam safety (barriers at unit 8). Currently three sets of bypass barriers are out at Wells Dam. Flows remained high for the week of July 8th and are expected to be above 7Q10 through July 14th.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: September 12, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the August 8, 2012 Aquatic SWG Conference Call

The August Aquatic Settlement Work Group (SWG) meeting was held by conference call on Wednesday, August 8, 2012, from 10:00 am to 12:15 pm. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Douglas PUD will provide a revised 2013 Wells Dam Adult Lamprey Passage and Translocation Study to the Aquatic SWG at least 10 days prior to the next Aquatic SWG meeting scheduled for September 12, 2012, along with a draft Statement of Agreement (SOA) approving the plan (Item III-4).

II. Summary of Decisions

1. There were no SOAs approved at today's meeting.

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe): Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for additional agenda items. The following revisions were made to the agenda:

    - Andrew Gingerich added two brief updates: 1) Bull Trout Radio Telemetry Study at Twisp Weir Update; and 2) 2011 Douglas PUD Pikeminnow Program Annual Report Update.
    - Bob Rose requested that the lamprey agenda items be discussed first.

    Kristi Geris reported that there was one outstanding comment remaining to be discussed on the draft July 11, 2012 conference call minutes regarding a revision

Douglas PUD requested to the Wells Water Quality and Flows Update. Gingerich clarified the comment regarding the definition of 7Q10, and the Aquatic SWG members present approved the July 11, 2012 conference call minutes as revised. Patrick Verhey approved the July conference call minutes by email as distributed to the Aquatic SWG on July 31, 2012. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **New Aquatic Resource Biologist: Chas Kyger** (Andrew Gingerich): Andrew Gingerich introduced Chas Kyger, a new Douglas PUD Aquatic Resource Biologist. Gingerich said Kyger came to Douglas PUD from the U.S. Bureau of Reclamation and that Kyger will be supporting the Aquatic SWG and its various management plans. Kyger said he is looking forward to working with the group.

3. **SOA Review: HCP-CC Decision on Lamprey Head Operation Change for 2012** (Andrew Gingerich)**:** Andrew Gingerich said that last month, Douglas PUD provided the Habitat Conservation Plan Coordinating Committees (HCP-CC) with a request to implement lamprey operations at Wells Dam during the 2012 lamprey migration that were the same as those approved in 2011. These changes include reducing the collection-gallery-to-tailwater head differential from 1.5 feet to 1.0 foot between 17:00 and 0:59 hours daily, starting three days after the day on which the cumulative passage of lamprey at Rocky Reach Dam equals five lamprey. Gingerich said the Coordinating Committees approved the SOA on July 24, 2012, and Kristi Geris distributed the final SOA to the Aquatic SWG the same day.

   Gingerich said that Rocky Reach recorded their fifth lamprey on July 31, 2012; however, due to the large sockeye run, the count was not posted until the evening of August 5, 2012. Therefore, lamprey operations commenced the evening of August 6, 2012. Gingerich said that, to date, 11 lamprey have passed Rock Island, 5 have passed Rocky Reach, 0 have passed Wells Dam, and 22,000 have passed Bonneville Dam. Gingerich added that flows at Bonneville Dam have dropped off significantly in the past week, and he expects to see an increase in passage up through the system.

4. **Pacific Lamprey Passage/Translocation Study Plan Discussion for September Meeting Decision/Vote/Approval** (Andrew Gingerich): Andrew Gingerich thanked Bao Le of Longview Associates and Chas Kyger for their support on developing this study plan. The 2013 Wells Dam Adult Lamprey Passage and Translocation Study (Attachment B) was distributed to the Aquatic SWG by Kristi Geris on July 30, 2012.

   Gingerich reviewed the study abstract and explained that Objective 1 of the study focuses on evaluating Pacific lamprey passage behavior through Wells Dam fishways, and also evaluates Pacific lamprey entrance efficiency with reduced Wells Project head differentials. He said Objective 2 of the study addresses lamprey bypassing the counting window through the picketed lead. Gingerich said in previous Aquatic SWG meetings

Molly Hallock had discussed that lamprey bypassing the window might simply be fish taking advantage of a preferred passageway.

Pat Irle asked Gingerich to clarify the term "picketed lead." Gingerich referred to Figure 1 in Attachment B and said that a picketed lead is a structure that guides fish to the counting window for effective enumeration. He said the structure has a series of narrow slats that allows water to flow through; and although the slats are too narrow for salmon to pass through, they are wide enough for lamprey to pass through, therein bypassing enumeration. Le added that the picketed lead also helps reduce flow at the counting window. He said full fishway flow at Wells Dam is on the order of 60 to 80 cubic feet per second (cfs). Le said that if full bypass flow were pinched down to the counting window only, it would likely impede fish passage.

Steve Rainey questioned the suggestion that the picketed lead might be a preferred passage route for lamprey. He said at several other dams the pickets have been modified to narrow the openings to prevent lamprey from using those routes. Rainey asked if the picketed lead bypass passage rate is known. Gingerich said that the current, known percentage of fish using the picketed lead bypass is based on a small sample size. He said this study would help to more accurately quantify the number of fish using the bypass. Rainey said it seems the main objective of the study is to develop a correction factor or percentage, and then decide a path forward, instead of just fixing the problem. Rainey asked if that alternative was discussed. Le explained that during early discussions, based on preliminary data, it was determined that this is not a passage issue; this is an enumeration issue. Le said that some lamprey prefer the counting window bypass because the environment through the picketed lead is attractive (e.g., flows are slightly lower, the area is dark, etc.). He said it would be good to determine how to easily enumerate these lamprey; however, forcing them into the count window may not be the best option. Le added that there have been no injuries observed in lamprey using the picketed lead bypass, and it will be beneficial to now determine exactly how many fish are using the window. Rainey asked if other variables have been considered such as ambient lighting, flows, and water temperatures. Hallock said she would like to proceed with the way the plan is currently written. She added that if lamprey prefer that route, and if it is less stressful, then we should determine a way to count them.

Gingerich continued his review of the study plan. He explained that Section 2 summarizes the past 10 to 12 years of Pacific lamprey studies, and Section 3 covers study goals, objectives, and hypotheses. Gingerich said that Section 4.1 addresses sample size, fish transport, and release locations. He said it is difficult to estimate how many fish will interact with the project, and that release locations were selected to encourage fish to interact with the project. Gingerich said that considering that the goal of this study is to assess passage at the project, two release locations were selected: one in the tailrace and one directly in the fishway. Gingerich said surgical technique is

addressed in Section 4.2; and he added that Patrick Verhey's comments regarding fish health were addressed largely in this section. Gingerich said that lamprey can be effectively anesthetized with reduced amounts of MS-222. He said these and other details on how to minimize stress levels to fish have been incorporated into the study plan. Rainey asked if this is a multiple-year study, and Gingerich replied that it is a one-year study; a path forward will be decided based on these results.

Gingerich reviewed Sections 4.3, 4.4, and 4.5. He noted that Figures 3 and 4 depict the proposed camera locations and camera placement. Gingerich added that implementing both passive integrated transponder (PIT) tagged fish and radio telemetry will increase confidence for enumeration. Gingerich said that Section 4.7 covers the study plan schedule, and he said that Douglas PUD would like to get this study approved in order to move forward with arranging the appropriate permitting and contracting necessary to start the study in 2013.

Bob Rose raised the question of how lamprey translocated from Bonneville Dam will perform in the Rocky Reach Reservoir, and whether they will be representative of lamprey naturally migrating to Rocky Reach Reservoir. Rose also noted the need to consider timing, such as the difference between early run and late run and whether there will be a holding period. Rose suggested incorporating behavioral objectives in the study plan. He suggested placing antennae at additional locations, including at the mouth of the Methow and in the Okanogan. Rose noted the value of observing how these fish behave in other locations, as well as how they interact with the Wells Project. Rose also asked about the possibility of installing antennae at the Entiat and Wenatchee rivers. He added that with antennae in these locations, if fish turn around, they can still be tracked. Rose also asked to consider releasing fish closer to Rocky Reach Dam, above the mouth of the Entiat River. Rose said he was not fully behind the notion of comparing Wells Dam passage to passage at other Columbia River dams, noting that Wells Dam is structurally very different. To a degree, Rose said, it does not matter what other dams are doing. Rose said that it would be beneficial instead to identify the approach criteria, and the milling and passage rates at each of the dams.

Gingerich explained that the comparison to other projects is text that came directly from criteria in the Pacific Lamprey Management Plan found in the Aquatic Settlement Agreement. He said the language can be revised if the Aquatic SWG is comfortable with it. Rose added that the fallback issue needs to be addressed, and each criterion needs to be explicit as to what is being compared to other Columbia River dams. Gingerich said he questioned whether fish moving downstream inferred "fallback." Also, Gingerich said Douglas PUD is not opposed to putting antennae at additional locations. He added that Douglas PUD might consider antenna installation on the Methow and Okanogan. Rose said the Yakama Nation (YN) and Washington Department of Fish and Wildlife (WDFW) are interested in the Wenatchee and Entiat rivers. He added that

Chelan PUD may also have an interest in these. Rose suggested keeping this idea on the table and exploring ways to fund it.

Gingerich reiterated that the proposed study is for one year; however, he added that the underwater infrared (IR) video cameras may need to be active for more than one year. Rose suggested that because the translocation strategy of this study incorporates a significant unknown, he asked Douglas PUD to consider this study as a pilot year, and plan to conduct a second year. Shane Bickford said this study is not required until a new license is issued; rather, Douglas PUD wants to move forward on improving passage at Wells. He added that this study is intended to inform structural modifications at Wells; not to study translocation *per se*. Bickford said the goal is to study passage at Wells to identify possible modifications for implementation in 2014, so that, by 2015, a follow-up study can be performed to evaluate whether the modifications work.

Hallock said she agrees with Rose that it would be beneficial to have the ability to track fish at the mouth of the Entiat River. Regarding fish source, she said she understands the concern about using Bonneville fish. Hallock suggested that it may be advantageous to use fish from closer upstream. Rose suggested using fish from both Bonneville and Priest Rapids for comparison. He added that there is bias if only the strongest, fittest fish are used. Rose also suggested first evaluating performance of the fish to obtain a better understanding of which source to use in the study. Hallock added that the study should use fish that are more likely to be at the project.

Gingerich said that the timing issues will be addressed by multiple releases as the study plan currently states. He added that tagging and anesthetizing fish translocated from any downstream dam will have some impacts and therefore a larger fish size is justified and consistent with previous tagging studies. Gingerich said the primary concern is to get fish that will interact with the project; and previous studies indicate that larger fish are more likely to interact. He added that comparing fish from Priest Rapids or other projects to those from Bonneville Dam is outside the scope of this study. Rose replied that answers to these questions add to the integrity of the study.

Irle suggested that given the breadth of this study as currently written, potential biases can be acknowledged now and addressed later. She said that, at this point, as the focus is to obtain baseline data, it is probably not possible to identify all biases with high confidence. Le said this study required test fish with the highest probability of interacting with the project, and Bonneville Dam is the best available option.

After a brief break, Bickford said that Douglas PUD will agree to monitor the mouth of the Okanogan and the Methow rivers, and will include subroutine analyses of information provided by the YN and WDFW on passage at the mouths of the Wenatchee and Entiat rivers. Bickford said Douglas PUD will also agree to include 25 fish from Priest Rapids, along with 100 fish from Bonneville. He said these numbers will provide a sufficient sample size at Wells, and allow preliminary analysis of fish source. He added

that tags will distinguish fish origin; and Gingerich added that tag duration is 162 days. Bickford said language will be incorporated into the study plan stating that the purpose of this study is to inform additional modifications at Wells, and that this is not a performance study.

Irle asked if perhaps the Objective 1A null hypothesis comparing passage metrics to other mainstem Columbia River projects is premature. Bickford said that hypothesis provides context when measuring passage at Wells. Irle asked if Douglas PUD has passage numbers for other projects, and Bickford said they do not; however, they will include them in the 2013 report.

Schiewe summarized Douglas PUD's proposed modifications to the proposal and asked for comments. Rainey again noted that some dams are modifying the spacing of the picketed leads. Bickford said Douglas PUD is not looking to alter the configuration of the fishway because of unknown potential impacts to passage of Endangered Species Act (ESA)-listed salmon. Bickford said Douglas PUD will be seeking approval of this plan at the September 12, 2012 meeting.

Schiewe concluded that Douglas PUD will provide a revised 2013 Wells Dam Adult Lamprey Passage and Translocation Study to the Aquatic SWG at least 10 days prior to the next Aquatic SWG meeting scheduled for September 12, 2012, along with a draft SOA approving the plan.

5. **Wells Water Quality and Flows Update** (Andrew Gingerich): Andrew Gingerich reviewed the findings summarized in the weekly Wells Dam water quality report (Attachment C), which Kristi Geris distributed to the Aquatic SWG on August 6, 2012. Gingerich said that Douglas PUD submits this report to Washington State Department of Ecology (Ecology) weekly during the fish spill season.

   Gingerich said that, as shown in Table 1 of Attachment C, during the seven days of the week ending August 5, 2012, flows at Wells Dam had come down; however, there were still elevated concentrations of total dissolved gas (TDG) in the Wells forebay. He added that, despite receiving water flows greater than 110 percent on each of the seven days, there were no 12C-high exceedences and no hourly values greater than 125 percent. Gingerich said that, during this same week (ending August 5), TDG concentrations exceeded 115 percent in the Rocky Reach forebay, but added that this week, on August 6, 2012, and August 7, 2012, TDG in the Rocky Reach forebay was at 114 to 115 percent.

   Gingerich said Table 2 of Attachment C shows low prevalence of signs of gas bubble trauma (GBT) in juvenile fish sampled at Rocky Reach Dam.

   Gingerich noted that Figure 2 of Attachment C shows that, for the month of July 2012, discharge at Wells Dam far exceeded the average discharge for the month (since 1969). Gingerich said that Figure 3 shows 2012 Wells Dam discharges compared to the 10-year

average, which he noted are also higher than the historical average. Gingerich said that as of August 5, 2012, discharge at Wells Dam was approximately 185,000 cfs (185 kcfs), which Gingerich said is still above the seasonal average. Gingerich added, however, that 185 kcfs is still more manageable in terms of TDG.

Gingerich said that Figure 4 of Attachment C is another way of depicting the dramatic flows seen at Wells Dam during the 2011 and 2012 spill season. He explained that for this figure, the dashed line serves as the "0-value." Gingerich noted that in April through June of 2012, almost 1.5 times as much water passed Wells Dam during those months when compared to the 42-year averages for the respective months; and July 2012 flows were almost two times higher than typical.

6. **Update: Zebra and Quagga Mussel Monitoring and Crayfish Distribution Monitoring Plan Development (401 Certification Requirement)** (Andrew Gingerich): Andrew Gingerich provided a brief update on the Wells Project Crayfish Distribution Study (Attachment D), that Kristi Geris distributed to the Aquatic SWG on August 6, 2012. Gingerich said that this study supports requirements outlined in the Wells Project 401 Certification issued by Ecology, and also is an action item contained in the Aquatic Settlement Agreement. Gingerich said that Douglas PUD's scientific collection permit expires soon, so he would like to move forward with this study. He said Douglas PUD plans to continue early detection monitoring for zebra mussels. He also said that, in an attempt to avoid the tampering with of sampling containers as was experienced in 2011, Douglas PUD plans to install the samplers more permanently with chains. Gingerich said Douglas PUD plans to continue using plankton tows in coordination with WDFW. He added that Douglas PUD will provide an update to the Aquatic SWG in October 2012.

   Jason McLellan suggested using information about habitat types in the Wells Project to predefine where sampling would occur. He also suggested that having four traps per location may further strengthen the study plan and increase statistical power in the study. Gingerich said that Pat Irle had provided similar comments via email and that Douglas PUD will use existing habitat data to determine where traps will be deployed. He added that traps may also be placed according to habitat type rather than having only four traps per location. Gingerich said Douglas PUD plans to move forward with this study and asked people to contact him with any further comments or questions.

7. **Bull Trout Radio Telemetry Study at Twisp Weir Update** (Andrew Gingerich): Andrew Gingerich said that Aquatic SWG members had the opportunity to visit the Twisp Weir on April 23, 2012. Gingerich said Douglas PUD still needs to determine whether to use radio telemetry tags or PIT tags for the study. He said Douglas PUD plans to discuss this matter with U.S. Fish and Wildlife Service (USFWS) and have a revised plan available to the Aquatic SWG soon. Mike Schiewe reminded the Aquatic SWG that they previously agreed to defer the discussion on the advantages and limitations of PIT tagging versus

radio tagging to the USFWS with Douglas PUD; however, a final decision would be made by the full Aquatic SWG.

8. **2011 Douglas PUD Pikeminnow Program Annual Report Update** (Andrew Gingerich): Andrew Gingerich announced that the Draft 2011 Douglas PUD Pikeminnow Program Annual Report was distributed to the HCP on July 23, 2012, for a 60-day review period. Gingerich said that once Douglas PUD receives and incorporates comments on the report, he will distribute the draft report to the Aquatic SWG.

IV. Next Meetings

1. Upcoming meetings: ***September 12, 2012 (conference call); October 10, 2012 (conference call); and November 14, 2012 (conference call)***.

List of Attachments

Attachment A – List of Attendees

Attachment B – 2013 Wells Dam Adult Lamprey Passage and Translocation Study

Attachment C – Wells Dam Weekly Water Quality Report

Attachment D – Wells Project Crayfish Distribution Study

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Admin./ Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Bao Le	Technical Support	Douglas PUD; Longview Associates
Chad Jackson	Technical Support	Washington Department of Fish and Wildlife
Molly Hallock	Technical Support	Washington Department of Fish and Wildlife
Steve Rainey	Technical Support	U.S. Fish and Wildlife Service
Bob Rose	Technical Support	Yakama Nation
Jason McClellan	Technical Support	Colville Confederated Tribes
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Keith Hatch	Observer	Bureau of Indian Affairs

ADULT LAMPREY PASSAGE AND TRANSLOCATION STUDY, WELLS DAM - 2013

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

August 1, 2012

Prepared by:
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Andrew Gingerich (Douglas County Public Utility District)

Prepared for:
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East Wenatchee, Washington

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Table of Contents

List of Figures

List of Tables

ABSTRACT

In an effort to better understand Pacific lamprey (*Lampetra tridentata*) behavior at Wells Dam, Public Utility District No. 1 of Douglas County (Douglas PUD), in consultation with the Aquatic Settlement Work Group, is proposing to conduct a multi-faceted adult lamprey passage study at Wells Dam in 2013. This study is intended to collect information necessary to implement Objective 1 of the Pacific Lamprey Management Plan (PLMP) found in the Aquatic Settlement Agreement (ASA).

The goal of the study is to evaluate the effect of the Wells Hydroelectric Project (Wells Project) and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    - Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    - Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
    - Evaluate enumeration efficiency of underwater infrared (IR) video cameras installed in fishway pool 66 in the east and west fishways of Wells Dam.
    - Develop a lamprey fish count correction factor at the salmon counting windows based upon the number of lamprey counted at the salmon count windows and the number counted by the new IR cameras located at pool 66 (weir immediately upstream of the count windows).

Implementation of the study is consistent with requirements contained within the Wells Project PLMP. The study results are intended to support the goal of the PLMP which is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license.

1.0 INTRODUCTION

1.1 Aquatic Settlement Agreement and Pacific Lamprey Management Plan

During the relicensing process for the Wells Hydroelectric Project (Wells Project or Project), Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with federal, state and tribal relicensing participants, developed six Aquatic Resource Management Plans in support of a comprehensive Aquatic Settlement Agreement (ASA). The Pacific Lamprey Management Plan (PLMP) is one of the six Aquatic Resource Management Plans contained within the ASA that directs the implementation of Protection, Mitigation, and Enhancement measures (PMEs) for Pacific lamprey (*Lampetra tridentata*) during the term of the new Wells Project operating license.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license. Objective 1 of the PLMP is to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. Pursuant to this objective, Douglas PUD is proposing to conduct an adult active tag study to 1) collect additional information on the passage characteristics and behavior of adult lamprey migrating through the Wells Project fishways (section 4.1.6 of the PLMP); and 2) to evaluate enumeration efficiency in the vicinity of the Wells Project fishway count windows (section 4.1.3 of the PLMP) toward identifying alternatives to improve adult lamprey count accuracy.

2.0 BACKGROUND

2.1 Wells Project Pacific Lamprey Passage Studies

As part of the Wells Project relicensing, Douglas PUD conducted several adult lamprey passage studies (2001-2003, 2007, and 2008) to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream migration and behavior as it relates to fishway passage, timing, and downstream passage events through the dam.

2.1.1 2001-2003 Pacific Lamprey Radio-telemetry Study

In 2004, Douglas PUD contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). Only 18 of these tagged fish were detected upstream at Wells Dam and many of the radio tags detected were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of

150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.1.2 2007-2008 Pacific Lamprey Radio-telemetry Study

In 2007, Douglas PUD contracted with LGL Limited to conduct another active tagging study. Twenty-one lamprey were captured, radio-tagged, and released from August to October. Tags used in this study had an expected tag life of 87 days. Of the twenty-one fish, 10 were released into the tailrace and 11 were released directly into the middle fishway section of the Wells fishways. One tailrace-released fish was recaptured and re-released into the fishway, bringing total in-ladder releases to twelve. Ten of the 12 (83%) lamprey released into the middle fishway section successfully ascended, with a median upper fishway passage time of 7.9 hours. Seven of the 10 (70%) lamprey released into the tailrace were detected at the outside of a fishway entrance. Only one of these seven (14%) lamprey entered into the collection gallery and ascended the fishway with a lower fishway passage time of 6.1 hours and upper fishway passage time of 5.9 hours.

During the 2007 study, a total of 11 radio-tagged adult Pacific lamprey passed the fish counting facilities in both fishways. Nine of these fish were detected by an antenna monitoring the count window bypass area (i.e., an area in the fishway accessed through a picketed lead just downstream of the count window which allows lamprey to migrate through the fish counting facilities undetected; Figure 1), although 3 fish were detected for less than 20 seconds and probably did not completely enter the bypass area. Eight of these lamprey were not observed at the count window, and 2 fish had zero detections on the above count window antenna (LGL and Douglas PUD 2008). The results suggested that visual detections at the count windows could be significantly lower (e.g., under estimating by 73% according to these data) than the actual total number of lamprey passing the fish counting facilities.

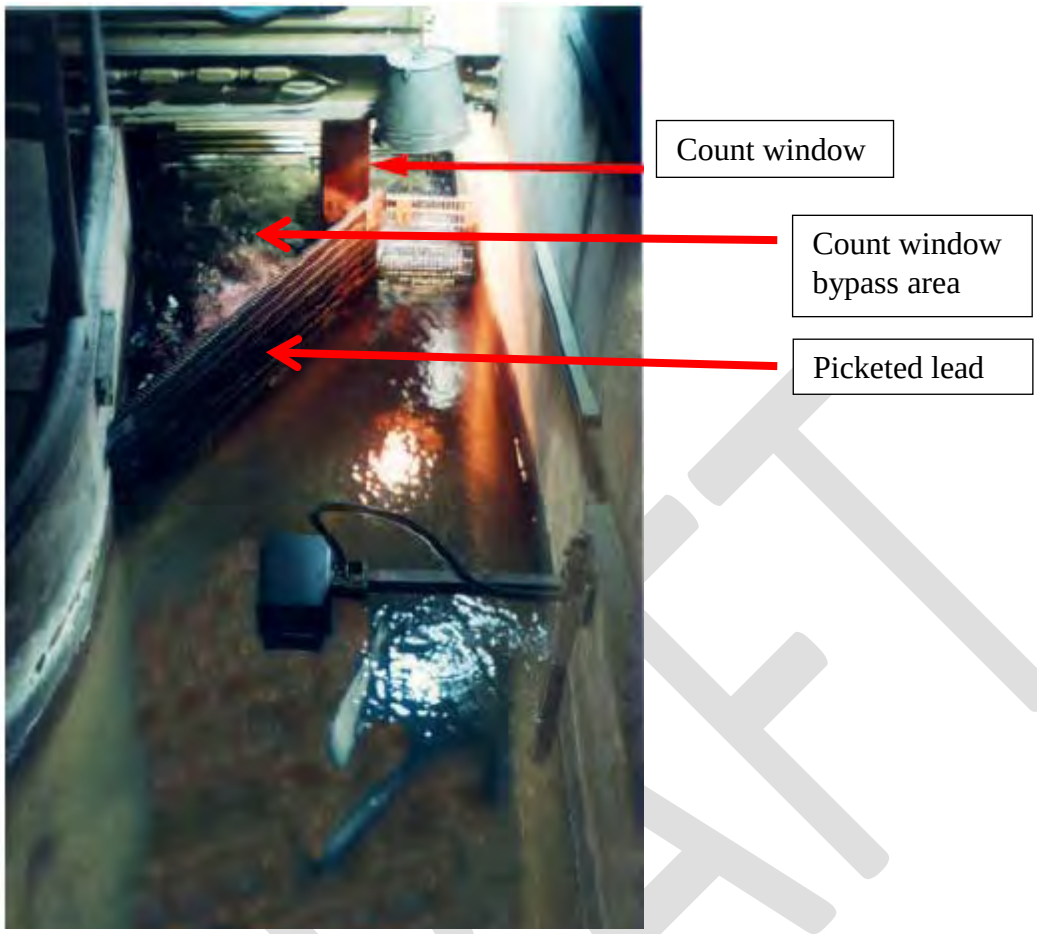

Figure 1. **Picketed lead immediately downstream of the fishway count window. Behind the picketed lead is the count window bypass area.**

In 2008, Douglas PUD conducted another adult lamprey passage study where 38 radio-tagged adult Pacific lamprey were released in the tailrace (n= 18) and fishways (n=20) of Wells Dam to continue an evaluation of behavior and passage performance, and to identify potential areas of passage impediment. In 2008, 15 lamprey approached the fishway from the tailrace, five (33%) of which entered the fishway. Movements within the collection gallery indicated that lamprey were able to move relatively unrestricted by flows. At least 11 of 19 (58%) lamprey which volitionally entered or were released in the collection gallery ascended to the lamprey trapping area in the middle fishway section. However, modifications to increase lamprey trapping efficiency effectively obstructed migration and 12 of 14 fish (86%) that encountered the lamprey traps were ultimately blocked. This artifact likely biased lower fishway passage times significantly. Upper fishway passage times of four radio-tagged lamprey that ascended past the trapping area were relatively fast (< 4 hours), except for one fish that ceased upstream movement during daylight hours. No fallbacks of fish that successfully ascended the fishway were observed for the second consecutive year. Overall, results indicate that any potential areas of impediment are restricted entirely to the entrance and lamprey trapping facility, as upper fishway passage efficiency was 100% for the second consecutive year.

During the 2008 study, of the four tagged lamprey that ascended into the upper fishway section, three bypassed the count window via the count window bypass area supporting the 2007 findings that a majority of lamprey that ascend Wells Dam may be uncounted (Robichaud et al. 2009). As concluded in the 2007 study, use of the count window bypass area appears to be an enumeration issue, rather than a passage concern (i.e., tagged fish generally move through this portion of the fishway efficiently and at above average speeds). The study recommended that further consideration should be given regarding effective monitoring of lamprey passage through the count window bypass area depending upon the importance of accurate counts at the Wells Project (LGL and Douglas PUD 2008).

The results of the 2007-2008 studies indicated that: 1) adult lamprey are having difficulty negotiating the fishway entrance; 2) lamprey passage in the fishway can be inhibited by the installation of lamprey traps on the bottom orifices within the middle section of the fishway (traps were removed in 2009); 3) lamprey are passing the middle and upper fishway sections at high rates, in a reasonable amount of time, and with negligible drop back within the ladder; and 4) a large proportion of the adult lamprey are bypassing the adult salmon counting windows (LGL and Douglas PUD 2008).

A comprehensive report was produced in February of 2009 (Robichaud et al. 2009). One of the recommendations by the researchers was to implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s) during the hours of peak lamprey activity (i.e., nighttime) and within the primary migratory period at Wells Dam (August-September).

2.1.3 2009-2010 Wells Project DIDSON Studies

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic Settlement Work Group (Aquatic SWG), prepared a plan to implement and evaluate measures to enhance entrance efficiency of adult Pacific lamprey at Wells Dam (Johnson et al. 2011). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam.

DIDSON units were deployed at Wells Dam fishway entrances during the peak of historic Pacific lamprey migration in 2009 (20 August to 24 September) and 2010 (7 August to 30 September). DIDSON was used to sample lamprey behavior and upstream passage events along the entire width of the fishway entrances and 1.3 m of vertical coverage above the sills (about 26% of the wetted vertical opening). Lamprey passage was examined relative to variable head differential treatments and entrance velocities. In 2009, three head differential treatments were tested: existing high (0.48 m; or 3.0 m/sec), moderate (0.31 m; or 2.4 m/sec) and low condition (0.15 m; or 1.8 m/sec) (Johnson et al. 2010). In 2010, only two of the 2009 treatments were used: existing high, and the moderate head differential conditions (Johnson et al. 2011). Treatments were grouped in 3-day blocks and lasted four hours each evening in 2009 (21:00 through 00:59). In 2010, the treatments were paired and lasted eight hours each evening (17:00 through 00:59). Data collected during the treatment periods were reviewed and all lamprey observations were described.

Combining both years, a total of seven lamprey observations were recorded where lamprey were observed to encounter the entrance sill heading upstream (N = 5 in 2009; and N = 2 in 2010). Five of these seven observations were in the east fishway and two were in the west fishway. Overall, five of the seven observations showed successful entry into the fishways (71%). During reduced head differential treatments, five observations were recorded with four of the five resulting in successful entry (80% efficiency). Three of three observations with the moderate head differential condition resulted in successful entry (100% entrance efficiency). During high head differential conditions, one of the two lamprey observed entered a fishway (50% entrance efficiency).

Four lamprey exhibited attach and burst behaviors (one during low (25%), two during moderate (50%) and one during high head differential conditions (25%)), all of which resulted in successful entry into the fishways. One of three lampreys that did not exhibit the former behavior successfully entered the fishway, under the moderate treatment condition. The other two lamprey that did not exhibit attach and burst behavior did not successfully enter the fishway.

Extremely low Columbia River basin lamprey runs in 2009 and 2010 resulted in few fish observed at Wells Dam (the ninth and last hydroelectric project on the Columbia River [river mile 516] with fish passage). Low sample sizes precluded statistical evaluation of these results. Nonetheless, operational modifications implemented in these two years of study suggest that lamprey entrance efficiency may be increased with lower head conditions. Pooling observations that occurred during reduced head differential treatments shows 80% (4 of 5) entrance efficiency compared to 50% (1 of 2) under the current operating condition (high condition). Study results suggest that reduced head differentials show promise in providing an environment conducive to upstream passage of lamprey.

3.0 GOALS, ASSUMPTIONS AND HYPOTHESES

3.1 Goals and Objectives

The goal of the 2013 Pacific lamprey study is to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    A. Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    B. Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
    A. Evaluate enumeration efficiency of underwater infrared (IR) video cameras installed in fishway pool 66 in the east and west fishways of Wells Dam.

B. Develop a lamprey fish count correction factor at the salmon counting windows based upon the number of lamprey counted at the salmon count windows and the number counted by the new IR cameras located at pool 66 (weir immediately upstream of the count windows).

3.2 Hypotheses

The following null and alternative hypotheses per each objective are as follows:

Objective 1A:

H_o: There is no difference in passage metrics (entrance efficiency and travel time) compared to other mainstem Columbia River projects.
H_{alt}: Passage metrics for lamprey differ compared to other mainstem Columbia River projects.

Objective 1B:

H_o: Flow differential has no effect on lamprey passage characteristics, with one entrance velocity treatment not providing improved entrance success than another entrance velocity treatment.
H_{alt}: Flow differential has an effect on lamprey passage characteristics, with one entrance velocity treatment providing better passage characteristics than another entrance velocity treatment.

Objective 2A:

H_o: There is no difference between detections and observation of tagged fish at the underwater IR video camera location.
H_{alt}: There is a difference between detections and observation of tagged fish at the underwater IR video camera location.

Objective 2B:

H_o: The proportion of tagged lamprey bypassing the count window is similar to previous studies.
H_{alt}: The proportion of tagged lamprey bypassing the count window is dissimilar to previous studies.

4.0 METHODOLOGY

4.1 Fish Source

Beginning in July 2013, adult Pacific lamprey will be captured at Bonneville Dam. Weekly sampling events over a four-week period in July will be conducted with a capture goal of at least

25 fish per event[1]. Fish captured at Bonneville Dam will be greater than 550 g. The size criteria is established for two reasons; first, Keefer et al. 2009 demonstrated that larger fish were two to four times more likely to pass upstream dams than smaller conspecifics; therefore, using larger fish is more representative of fish that would attempt to pass Wells Dam. Second, using larger fish will help minimize tag burden and therefore minimize the potential for mortality and effects to behavior and swimming performance. This will allow for fish used in the study to behave and perform more similarly to untagged fish.

Collecting fish from Bonneville Dam has four primary advantages:

1. Adult lamprey counts at Wells Dam in recent years have been extremely low (i.e., ranging from 1 to 35 fish since 2006), therefore, capturing and tagging a sufficient number of fish at the Wells Project for the study is not feasible.
2. Past efforts to capture lamprey at Wells Dam have negatively biased the result of the studies as the lamprey traps were highly effective at preventing upstream ladder passage of lamprey.
3. Past lamprey trapping activities at Wells Dam have incidentally captured ESA-listed anadromous salmonid species currently covered under the Wells Habitat Conservation Plan (HCP).
4. Given the primary objective of the study (i.e., evaluation of lamprey passage behavior within the Wells fishway), acquiring fish that are within their active migration window ensures the highest probability of interaction with the Wells fishway and therefore, the greatest chances of collecting sufficient data necessary to make informed management decisions related to the future of lamprey passage activities at Wells Dam.

It is assumed that fish captured at and transported from Bonneville Dam will be exhibiting upstream migratory behavior and will attempt to pass Wells Dam.

All fish captured at Bonneville Dam will be transported to the Wells Fish Hatchery for a minimum 16-hour acclimation period prior to tagging. Since most fish losses from hauling stress are caused by poor water quality and improper handling (Wynne and Wurts 2011), appropriate handling and transport protocols will be developed to ensure study fish in good health are delivered to the Wells Fish Hatchery.

Only adult lamprey in healthy condition (e.g., no signs of injury, etc.) should be collected for transport. All captured fish should be immediately placed in covered hauling tanks via nets. No anesthetics will be used during trapping operations as this can produce a biological response similar to that caused by stress (Wynne and Wurts 2011).

Covered tank(s) of an appropriate volume (to transport up to 25 lamprey) will be used to avoid stressors and disease transmission related to overcrowding. Each tank will be filled with river water and water temperature and dissolved oxygen will be measured prior to transport. During transport, both temperature and dissolved oxygen will be checked hourly, levels recorded, and

[1] Actual number will be based on statistical power analysis but will be at least 100 fish. Final sample size will also need to be approved by fish managers in the lower Columbia River.

adjustments to equipment will be made to maintain pre-transport water quality conditions. A final evaluation of fish and water quality conditions and total transport time will be noted upon delivery to the Wells Fish Hatchery.

4.2 Tagging and Release Procedures

Tagging procedures will follow methods described in previous lamprey radio-telemetry studies conducted at Wells Dam (LGL and Douglas PUD 2008) and will consider recent advances in knowledge and understanding of fish health and condition (e.g., Cooke et al. 2011a; b). An effort will be made to minimize impacts to the biological and physiological condition of the study fish. Specific attention will be made to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

Study fish will be tagged with model NTC-4-2L Nano Tags (Lotek® Newmarket, Ontario) or an equivalent providing less than 0.5% tag burden (tag mass/fish mass) and sufficient tag life. Tags have an expected life of 162 days at a pulse rate interval (PRI) of 5.0 seconds. Tag dimensions are 16mm (length) by 4mm (height) by 6mm (width) and weight 1.10 grams in air. In addition, each fish will be given a passive integrated transponder (PIT) tag with tag dimensions of 12mm by 2.12mm and weighing 0.1 grams. Total combined weight of both tags is 2.2 grams and a tag burden of less than 1% of body mass is proposed. Brown et al. (2006) noted that 4% is considered an acceptable burden for tagging studies, however tag burden should be minimized whenever possible.

After surgery, fish will be transferred to a covered tank with flow through river water for recovery (approximately one hour). For the purposes of the study, it is assumed that tagged fish are representative of untagged fish.

All tagged fish that have recovered from the tagging process will be transported by truck in a 113 L cooler filled with river water. An air tank and air stones will be used to maintain oxygen levels. Of the 100 tagged lamprey, 80 (twenty from each weekly sampling event) will be released on the right bank of the Columbia River at RM 514, 1.5 miles below Wells Dam (Figure 2). The remaining twenty fish (five from each weekly sampling event) will be released above the Wells fishway adult fish trap (Pool 41 in the west fishway and Pool 40 in the east fishway) in order to support count window enumeration efficiency and count window passage route study objectives (Objectives 3 and 4).

Figure 2. Release location of tagged Pacific lamprey at Columbia River RM 514.

4.3 Radio-telemetry

The movement and passage of radio-tagged lamprey (Objectives 1 and 2) will be documented by a combination of underwater and aerial antenna arrays (dipole and yagi antennas) at Wells Dam. Tag testing conducted by the contractor during installation will drive antenna location and placement.

4.3.1 Fixed-Station Telemetry Array

Fixed-station telemetry receivers and associated arrays similar to those used in past lamprey studies at Wells Dam (LGL and Douglas PUD 2008) will be deployed to monitor movements of radio-tagged lamprey at the Wells Dam fishway entrances, at select locations throughout the fishway, and at the fishway exits. Underwater dipole antennas will be used in the fishways.

Antennae arrays for tagged fish monitoring will be deployed at the following locations within the Wells Project fishways:

1. Outside fishway entrance
2. Inside fishway entrance
3. Collection gallery side gate
4. Pool 1 (collection gallery exit)
5. Pool 3 (serves as detection efficiency location for Pool 1)
6. Pool below the adult fish trap (Pool 39 in the west fishway and Pool 38 in the east fishway)
7. Below the video count window (lower portion of Pool 64 below count window)
8. Above the video count window (upper portion of Pool 64 above count window)
9. Within the count window bypass area behind the picketed lead
10. Fishway exit (Pool 72 or 73)

At the request of the Aquatic SWG, aerial antenna arrays can also be deployed at the mouths of the Methow and Okanogan rivers.

4.4 Fishway Entrance Velocities

In order to evaluate tagged entrance efficiency Pacific lamprey under reduced Wells Project fishway entrance velocities, fishway operations treatment conditions at Wells Dam will be similar to operations for the DIDSON Study conducted in 2010 (Johnson et al. 2011); two head differential treatments including the existing high condition (0.48 m), and a moderate condition (0.31 m) will be implemented. A treatment condition will occur over a 7-hour block (19:00 through 02:00) and will be changed daily (i.e., existing high condition one day and moderate condition the next day). Although the proposed fishway operations and daily hours of operation are consistent with past flow reduction studies, the proposed operating scenario for this component of the study must be reviewed and approved by the HCP Coordinating Committee. Fishway operations treatments will begin upon first release of tagged fish below Wells Dam.

4.5 Underwater Infrared Video

In recent years, underwater IR video monitoring has been effectively used by Pacific lamprey researchers to evaluate adult ladder escapement (Loge et al. 2011), efficacy of fishway modifications (LGL et al. 2011, ACOE 2011), and lamprey counts and passage behavior (Peery et al. 2011). Use of such non-invasive methods has been proven to be an effective means in providing a better understanding of lamprey behavior within fishway structures.

During the 2012-2013 Wells Dam ladder maintenance period (typically from December through January), a total of 4 underwater video cameras will be installed in the east and west Wells Dam fishways. In each fishway, two cameras will be installed on the upstream side of the weir wall separating Pool 65 and 66. These cameras will monitor the two submerged orifices of the Pool 65/66 weir wall (Figure 3). This location is immediately upstream of both the fish count window and the count window bypass area. In this section of the Wells fishway (Pools 57 to 73), pools function as control weirs allowing water discharges and therefore, upstream passage through

only the two submerged orifices near the bottom of the weir. Cameras (2) will be installed on the outer side of each orifice (2) and will face inward to create a lateral field of view (FOV) across its respective orifice (Figure 4). All cameras will have the ability to record full spectrum and infrared light. For each observation location, two IR lamps will be installed directly above each camera's FOV in order to provide sufficient lighting for enumeration during nighttime periods when adult lamprey migratory activity is highest.

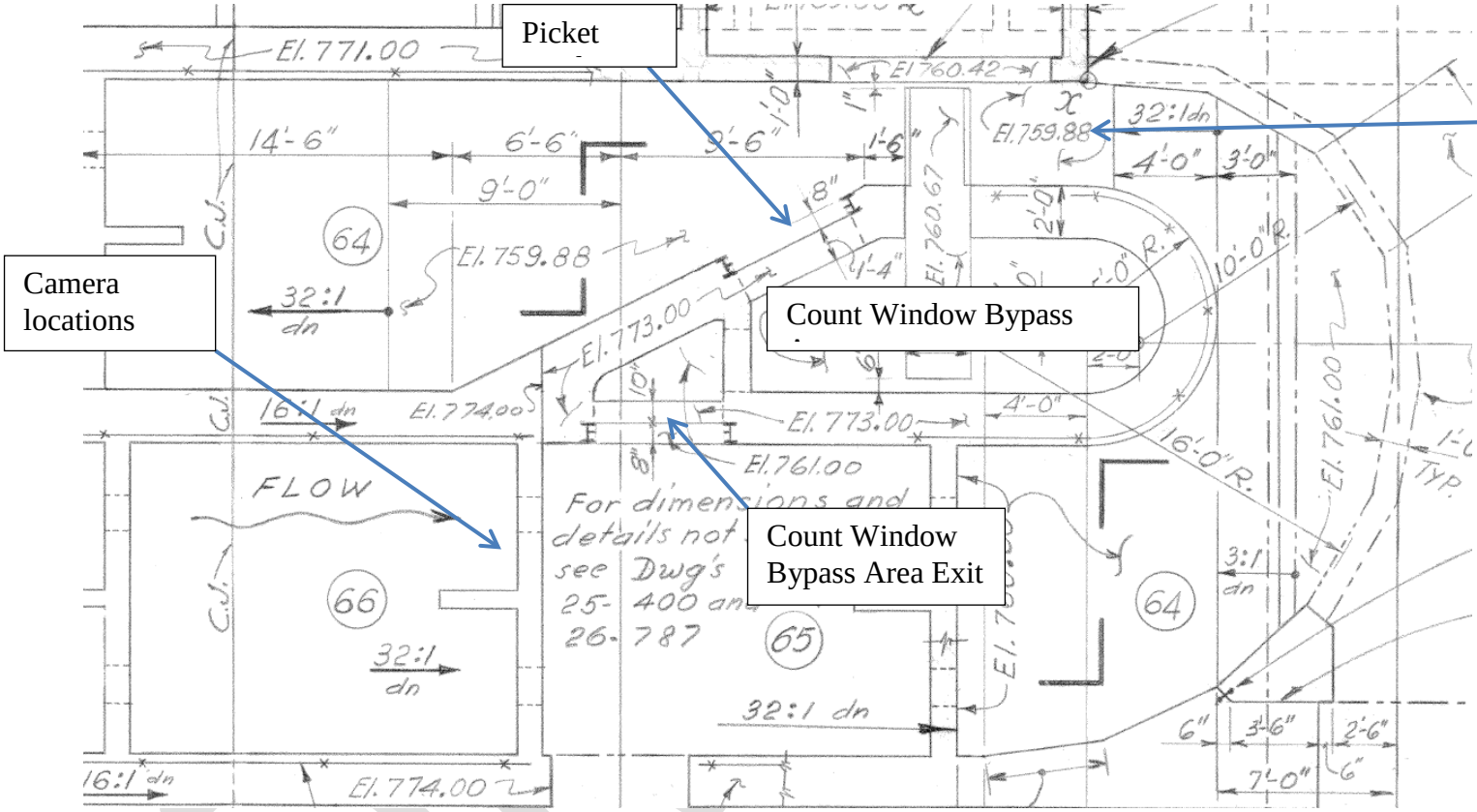

Figure 3. Overview of fish counting facilities area within the Wells west fishway. Picketed lead, count window, count window bypass area, intake gate, and proposed camera locations are identified.

Video data from the two cameras in each fishway will be collected using a standard digital video recorder (DVR) with a 1-2 TB storage capacity. Automated visual detection and classification software (i.e., AVEDac) will also be considered for post-processing of data. Data downloads will occur either manually or remotely depending upon site capabilities. Data collected from each camera will be stored as individual data files.

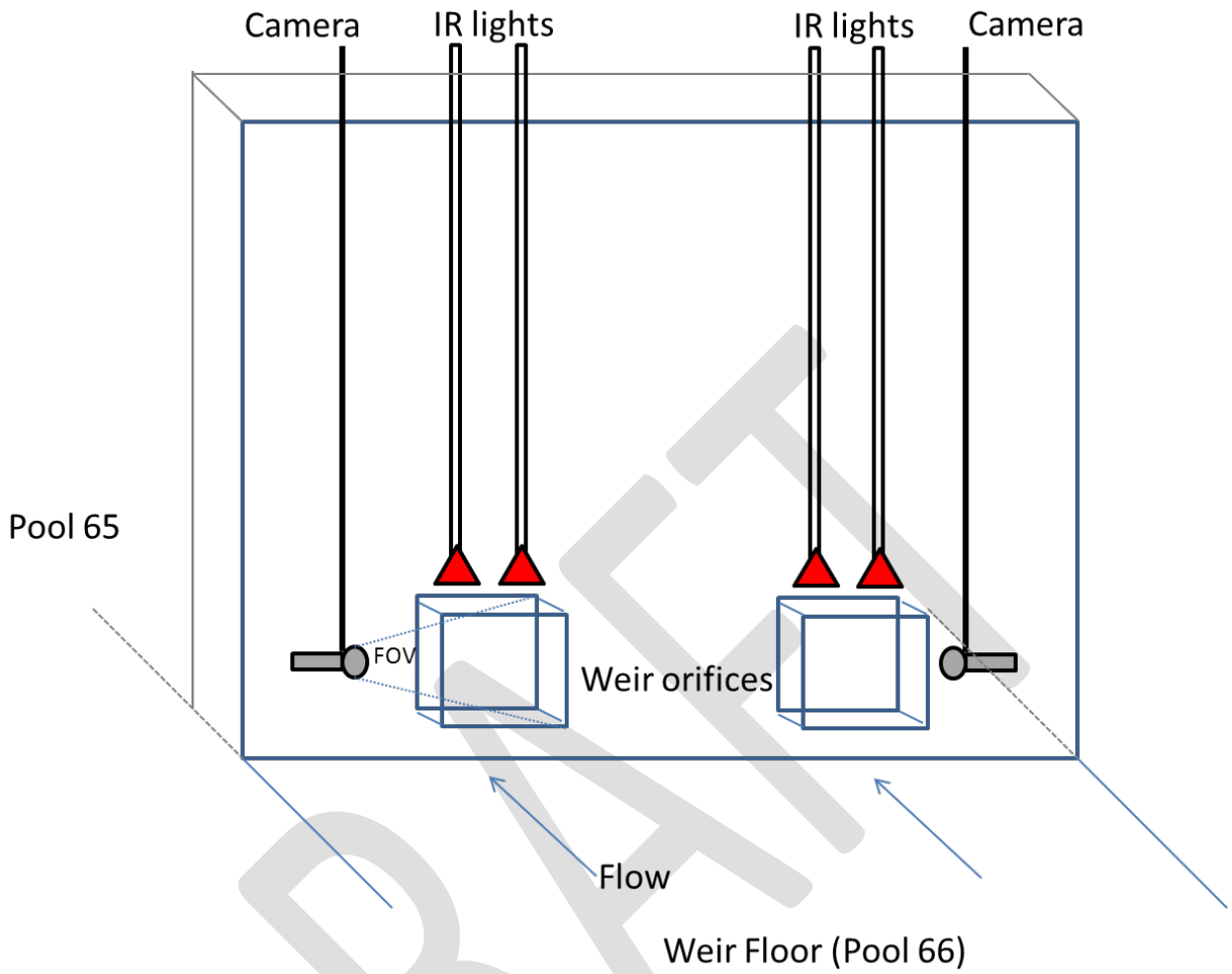

Figure 4. Camera and IR lamp placement relative to submerged orifices.

4.6 Statistical Analyses and Reporting

4.6.1 Passage Efficiency

Telemetry data collected during the study will be managed in an appropriate database where individual antennae will be grouped into "zones" that define pivotal areas of interest, such as individual fishway entrances and exits.

Numbers of fish detected at each zone will be summarized. Each time a fish is detected in a zone, the duration of the detection event (the amount of time the fish spent in the zone) will be calculated. The operational database will also be used to map movements of fish among zones. For every combination of among-zone movements, the number of times a fish performed that movement and the amount of time it took to get from one zone to the next, will be calculated.

Passage times will be calculated from benchmark dates and times corresponding to the first and last detection of a given radio-tagged lamprey at specific locations. At Wells Dam, benchmark times for lamprey passing the Project will be:

1. first detection at the fishway entrance (outside antenna). (Note that in order to be considered a treatment fish for the study, tagged fish must be detected at this location),
2. last detection at the fishway entrance (inside antenna),
3. first detection at the 'end of collection gallery' zone (Pool 1),
4. first detection at the 'adult fishway/middle fishway section' zone (Pool 39),
5. first detection at the 'below video count window' zone (lower portion of Pool 64),
6. first detection at the 'above video count window' zone (upper portion of Pool 64),
7. first detection at the 'count window bypass' zone,
8. last detection at the 'count window pass' zone – note same as #6,
9. first detection at the fishway exit (Pool 72 or 73), and
10. last detection at the fishway exit.

From these benchmark times, passage times can be calculated for the following segments:

1. Entrance passage time – Time 1 to 2
2. Collection gallery passage time – Time 2 to 3
3. Lower fishway passage time – Time 2 to 4
4. Passage from count window to exit – Time 5 to 10
5. Upper fishway passage time – Time 4 to 10
6. Project passage time – Time 1 to 10

To evaluate use of the count window bypass area, times can be calculated for the following segments:

1. Below count window to count window bypass – Time 5 to 7
2. Residence time in count window bypass area – Time 7 to 6
3. Count window bypass to exit – Time 7 to 10

The residence and passage times and route of passage (in count window area) for each radio-tagged lamprey will be determined by working backwards through a sequence of detections. The fishway of ultimate passage and the respective passage time will be determined by identifying a sequence of detections in the ascent of a fishway, starting with detections in a fishway exit zone.

4.6.2 Entrance Efficiency

Radio-telemetry data from entrance locations (i.e., outside and inside fishway entrance arrays) will be used to evaluate entrance efficiency of the two treatment conditions for fishway operations (i.e., existing and moderate). Tagged fish will be organized into release groups (4 weekly releases). The total number of tagged lamprey detected outside fishway entrances over the course of the study will serve as the total sample size for statistical analyses. Entrance efficiency will be calculated as the total number of successful entries of fish detected outside the

fishway entrances under each treatment condition (head differential). During the course of the study, successful entry will be defined as either a detection by the arrays outside the fishway entrances followed by a subsequent detection by the arrays inside the fishway entrances or a detection on the array inside of the fishway entrance. Difference in entrance efficiency between the two treatment conditions will be evaluated using statistical methods developed with assistance from the University of Washington school of Aquatic and Fisheries Sciences.

4.6.3 Camera Enumeration Efficiency

The efficiency of enumerating lamprey using underwater IR video cameras will be evaluated by examining observations of tagged fish via radio-telemetry detections at the "above video count window" location (upper portion of Pool 64 above count window) and comparing them to observations via the IR video camera locations (upstream weir wall in Pool 66). Enumeration efficiency will be reported as a percentage (i.e., tagged fish observed via IR video/tagged fish detected above video count window X 100). Given the low numbers of lamprey that have passed Wells Dam in recent years, confounding observations due to high numbers of passage events at this location during the study is not expected. Each fish ladder can be treated separately prior to grouping entrance numbers. If no significant difference is detected between the two fish ladders then the information from both ladders will be pooled by head differential treatments. Release groups will also be pooled together if statistically justified (either by low sample size or by insignificance lack of significant differences).

4.6.4 Passage via Count Window and Count Window Bypass

Radio-telemetry detection histories of tagged fish that have exited a Wells fishway will be used to determine passage route via either the count window or the count window bypass area. Passage times and route of passage (in count window area) for each radio-tagged lamprey will be determined by working backwards through a sequence of detections from the exit to below the video count window location (lower portion of Pool 64). Tagged lamprey that have exited the Wells fishways will have detection histories that suggest either use of the count window bypass area or use of the salmon count window. Results of the analysis will be reported as a ratio (i.e., count window bypass area: count window), will averaged (weighted average) with the results of previous Wells Project lamprey passage studies, and then used as a correction factor for future lamprey enumeration efforts at Wells Dam.

4.7 Schedule and Reporting

Reporting will be a collaborative effort between the contractor and the Douglas PUD contract manager for this study. The schedule for study planning and development, implementation, draft reporting, review, and final reporting are presented in Table 1 below.

Table 1. Estimated timeline for study development, implementation and reporting.

		Parties Involved			
#	Item	PUD	ASWG	Contractor	Date
1	Study Plan Development	X			July-August 2012
2	Study Plan Review Aquatic SWG	X	X		August 2012
3	Study Plan Finalized	X	X		September 2012
4	Contracting	X		X	September-November 2012
5	Telemetry/IR Installation	X		X	December 2012-January 2013
6	Study Implementation (capture, transport, tagging, monitoring)	X		X	June-October 2013
7	Draft Interim Report to PUD			X	January 2014
8	Draft Report to Aquatic SWG	X	X		February Meeting 2014
9	Final Report Integrating Changes from Review to PUD			X	March 2014
10	Final Report to Aquatic SWG	X	X		April Meeting 2014

5.0 REFERENCES

Army Corps of Engineers (ACOE). 2011. Pacific Lamprey Passage Improvements Implementation Plan. 2010 Final Progress Report. February 23, 2011.

Brown, R. S., D. R. Geist, K. A. Deters, and A. Grassell. 2006. Effects of surgically implanted acoustic transmitters .2% of body mass on the swimming performance, survival and growth of juvenile sockeye and Chinook salmon. Journal of Fish Biology 69: 1626–1638.

Cooke, S.J., C.M. Woodley, M.B. Eppard, R.S. Brown, and J.L. Nielsen. 2011a. "Advancing the surgical implantation of electronic tags in fish: a gap analysis and research agenda based on a review of trends in intracoelomic tagging effects studies." Reviews in Fish Biology and Fisheries 21(1):127-151. doi:10.1007/s11160-010-9193-3

Cooke, S.J., G.N.Wagner, R.S. Brown, and K.A. Deters. 2011b. "Training considerations for the intracoelomic implantation of electronic tags in fish with a summary of common surgical errors." Reviews in Fish Biology and Fisheries 21(1):11-24. doi:10.1007/s11160-010-9184-4

Johnson, P.N., B. Le, and J.G. Murauskas 2010. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Johnson, P.N., B. Le, and B. Patterson. 2011. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Keefer, M. L., M. L. Moser, C. T. Boggs, W. R. Daigle, and C. A. Peery. 2009. Effects of body size and river environment on the upstream migration of adult Pacific lampreys (Lampetra tridentata). North American Journal of Fisheries Management 29:1214-1224.

LGL Limited, Public Utility District No. 1 of Douglas County (Douglas PUD). 2008. Adult Pacific Lamprey Passage and Behavior Study Aquatic Issue 6.2.1.3. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL, Cramer Fish Sciences, Blue Leaf Environmental, and Long View Associates. 2011. Assessment of Pacific Lamprey Behavior and Passage Efficiency at Priest Rapids and Wanapum Dams. Prepared for Public Utility District No. 2 of Grant County.

Loge, F., C. Caudill, D. Thompson, and C. Boggs. 2011. Video Monitoring to Determine Pacific Lamprey Ladder Escapement and Behavior at McNary and Ice Harbor Dams. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Nass, B.L., C. Sliwinski, D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Techniques, 2004. Report prepared by LGL Limited, Sidney, B.C. Canada, for Public Utility District No. 1 of Douglas County, WA.

Peery, C., B. McIlraith, D. Thompson, and F. Loge. 2011. Use of Non-Invasive Methods to Evaluate Pacific Lamprey Counts and Passage Behavior at John Day Dam – 2011. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Robichaud, D., B. Nass, and Public Utility District No. 1 of Douglas County (Douglas PUD). 2009. Adult Pacific Lamprey Passage and Behavior Study. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Wynne, F.S. and W.A. Wurts. 2011. Transportation of Warmwater Fish: Equipment and Guidelines. SRAC Publication No. 390. January 2011.

Wells Hydroelectric Project FERC No. 2149
Fish Passage In-season TDG Report # 10

Update for July 30th- Aug 5th

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Aug 6th, 2012

Wells Hydroelectric Project

The Wells Hydroelectric Project (Project) is owned by Public Utility District No. 1 of Douglas County (Douglas PUD) and operated under License No. 2149 from the Federal Energy Regulatory Commission (FERC). The Project is located at river mile 515.6 on the Columbia River. The Project is the ninth hydroelectric project from the mouth of the Columbia River, and is the last project on the Columbia with fish passage facilities.

The Wells Project is a run-of-river hydroelectric project, with limited reservoir storage capacity and a 10 feet operating range. On average, daily inflows equal daily outflows. The Wells Project is a hydrocombine design, with eleven spillbays located vertically above ten Kaplan turbine units, with upstream fish passage facilities located at each end of the concrete dam structure. The maximum hydraulic capacity of the ten units is approximately 220,000 cubic feet per second (cfs); flows in excess of hydraulic capacity must be spilled through the spillbays.

Regulatory Framework

The Wells Project is required to meet the State of Washington Water Quality Standards (WQS) promulgated under Washington Administrative Code (WAC) Chapter 173-201A. The upper criterion for total dissolved gas (TDG) saturation is 110% when river flows are less than the highest seven consecutive days average observed during a ten-year period (7Q-10 flow). The 7Q-10 flow for the Wells Project is 246,000 cfs, based on the hydrologic records from 1930 to 1998.

Ecology may also approve an exception to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; fish passage spill is used to facilitate project passage survival. The TDG exception is considered by Ecology on a per-application basis and must be accompanied by an approved Gas Abatement Plan (WAC 173-201A-200(1) (f) (ii)). On the Columbia and Snake rivers, the TDG exception for fish passage has three standards during the fish passage (spill) season: (1) TDG shall not exceed 125% saturation in the tailrace of the project as measured in any one-hour period; (2) TDG shall not exceed 120% saturation in the tailrace of the project based on the average of the twelve highest consecutive hourly readings in any one day (12C-High); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings in any one day.

Ecology approved the 2012 Wells Project Gas Abatement Plan and TDG exception.

TDG Compliance

Juvenile fish bypass operations commenced on April 9. To date, the 2012 spill season has been characterized by above average flow volumes, due initially to increases in the runoff forecast between February and April, and subsequent aggressive drawdowns of Grand Coulee Reservoir to increase storage as late season runoff forecasts increased. Early season flows have been followed by above-average high flows during the historic peak of the hydrograph throughout June. Flows remained high

through the week of July 23rd 2012. After sustained 7Q10 flows at Wells Dam on Friday July 27th flows fell below 7Q10 values. Below is a summary of compliance up to Aug 5th 2012.

Wells Tailrace 120% 12C-High standard

During the week ending Aug 5th no 12C-high exceedances occurred at Wells, despite receiving water above 110% on each of the seven days (Table 1).

Wells Tailrace 125% hourly standard

During the week ending Aug 5th no hourly values above 125% were recorded at Wells, despite receiving water above 110% on each of the seven days (Table 1).

Rocky Reach forebay 115% standard

During the week ending Aug 5th all seven days had 115% downstream forebay exceedances in the Rocky Reach forebay. However, all exceedances occurred on days when Wells received water above 110% (Table 1).

Table 1. Weekly TDG compliance table

				Wells Forebay	Wells Downstream		Rocky Reach Forebay
Day of the Week	Date	High Q(kcfs)	7Q10?	TDG High (%)	TDG 12C high (%)	TDG High (%)	TDG High (%)
Monday	30-Jul	223.6	N	116.9	119	119.5	118.8
Tuesday	31-Jul	215.6	N	116.9	117.8	118.0	117.0
Wednesday	1-Aug	223.7	N	115.8	117.5	118.3	116.2
Thursday	2-Aug	215.2	N	115.6	116.6	117.5	116.1
Friday	3-Aug	193.8	N	115.2	115.7	115.9	115.2
Saturday	4-Aug	204.8	N	116.0	116.5	116.8	115.0
Sunday	5-Aug	203.3	N	116.6	117.1	117.6	115.7
110% Wells forebay standard not met.							
Flows past wells that exceeded 7Q10 conditions.							
Violations- not considering 110% forebay standard.							

Note. Bold values indicate required GBT monitoring. On 6-28-2012 Douglas PUD switched to a three day a week sampling schedule at Rocky Reach Juvenile Bypass Facility as a response to sustained exceedences. Following reduced gas levels, on 7-26-12 Douglas PUD switched back to sampling at Rocky Reach on the day following the exceedance. No GBT monitoring occurred during the week ending August 5th, since Well tailrace TDG values were below 125%.

Biological Monitoring

When the 125% hourly tailrace standard is exceeded, the Wells Gas Abatement Plan requires biological monitoring of juvenile salmonids sampled at the Rocky Reach Juvenile Fish Bypass Sampling Facility. In

addition, adults trapped during broodstock collection at Wells Dam are examined for signs of GBT. Very low GBT expression has been observed in juvenile fish at Rocky Reach Dam to date, despite high TDG values in the Wells tailrace. Over 550 juvenile salmonids have been examined at Rocky Reach, 7 of which have shown mild GBT expression in caudal fin rays (1.25 %). An example of mild GBT expression observed in June 2012 is shown in Figure 1. Tabular results of juvenile sampling are presented (Table 2).

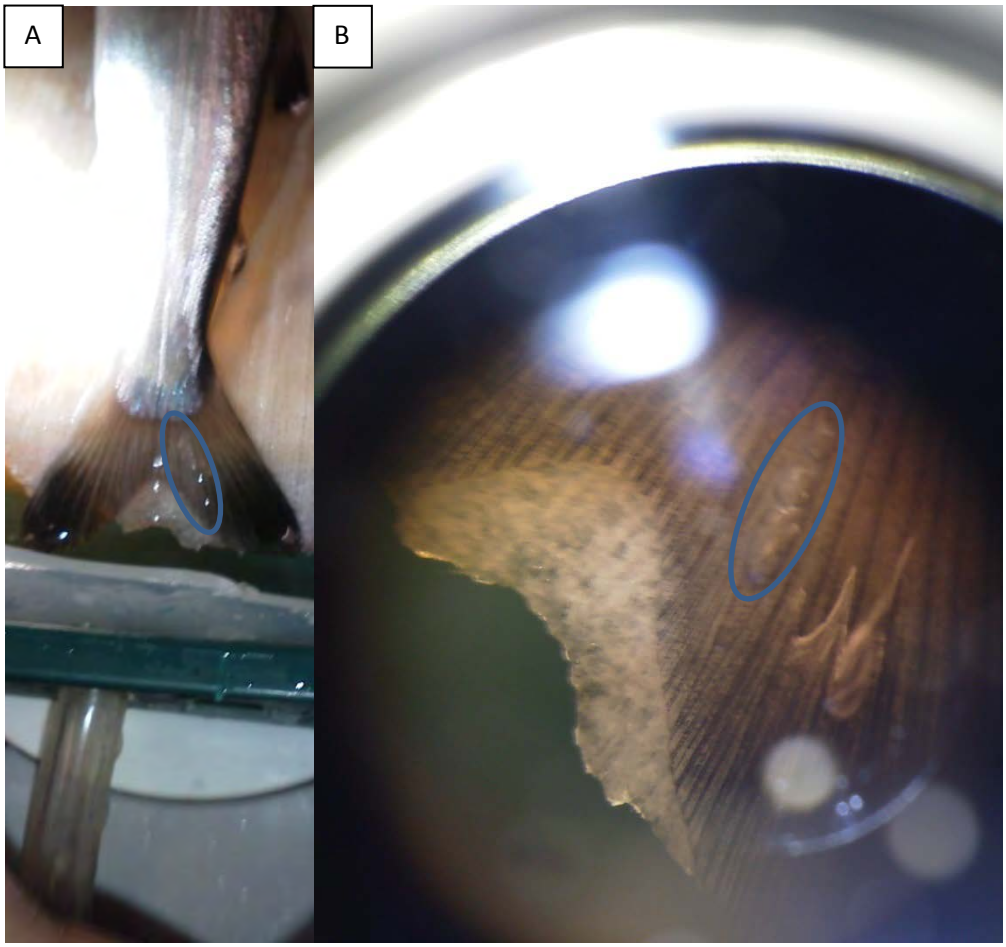

Figure 1. Mild GBT expression in a single coho caudal fin sampled 6-22-2012 at Rocky Reach Bypass Facility. Panel A shows expression at actual size and B shows fin through the magnifying scope. Emboli were present along one finray in the caudal fin as highlighted by blue ovals in A and B.

Table 2. GBT monitoring at Rocky Reach Juvenile Bypass Facility during 2012

	Species								
Sample Date	yearling Chinook	coho	sockeye	steelhead	subyearling Chinook	**Total sampled**	**Total showing GBT**	**Percent GBT**	**Rocky Reach Forebay TDG (% daily average)**
5/3/2012	19	28	11	2	0	**60**	**0**	**0%**	**123.1%**
5/10/2012	13	16	10	0	0	**39**	**0**	**0%**	**118.1%**
5/18/2012	21	17	14	7	0	**59**	**0**	**0%**	**121.4%**
6/8/2012	3	3	6	1	37	**50**	**0**	**0%**	**118.4%**
6/13/2012	0	0	9	0	19	**28**	**0**	**0%**	**NA**
6/21/2012	0	1	6	0	6	**13**	**0**	**0%**	**121.9%**
6/22/2012	0	2	11	0	25	**38**	**0**	**0%**	**122.3%**
6/23/2012	0	1	1	0	32	**34**	**1**	**2.9%**	**118.8%**
6/24/2012	0	0	4	0	16	**20**	**0**	**0.0%**	**122.3%**
6/26/2012	0	0	3	0	14	**17**	**1**	**5.9%**	**127.9%**
6/27/2012	0	0	25	0	22	**47**	**1**	**2.1%**	**129.6%**
6/28/2012	0	0	5	0	15	**20**	**1**	**5.0%**	**130.0%**
6/29/2012	0	0	1	0	9	**10**	**0**	**0.0%**	**130.6%**
7/2/2012	0	0	3	0	8	**11**	**0**	**0.0%**	**127.2%**
7/4/2012	0	0	4	0	18	**22**	**1**	**4.5%**	**127.3%**
7/6/2012	0	0	1	0	31	**32**	**1**	**3.1%**	**128.8%**
7/9/2012	0	0	0	0	17	**17**	**1**	**5.9%**	**123.0%**
7/11/2012	0	0	0	0	10	**10**	**0**	**0.0%**	**125.4%**
7/13/2012	0	0	0	0	5	**5**	**0**	**0.0%**	**124.4%**
7/16/2012	0	1	0	0	1	**2**	**0**	**0.0%**	**123.5%**
7/18/2012	0	0	0	0	9	**9**	**0**	**0.0%**	**124.6%**
7/20/2012	0	0	0	0	5	**5**	**0**	**0.0%**	**123.8%**
7/23/2012	0	0	2	0	3	**5**	**0**	**0.0%**	**122.5%**
7/25/2012	0	0	0	0	9	**9**	**0**	**0.0%**	**124.5%**
Grand total						**562**	**7**	**1.25%**	

Note. Sockeye after early June are largely adipose fin clipped kokanee stocked in Lake Roosevelt.

In addition, the Washington Department of Fish and Wildlife (WDFW) personnel trapped spring Chinook broodstock at Wells Dam on May 13th, 20th, 27th and June 3rd, 10th, 17th, and 24th. A total of 936 adult fish were handled. None of these fish showed signs of Gas Bubble Trauma. The WDFW continues to sample adult fish during trapping activities, even when TDG is in compliance.

Summary

The aggressive drawdown of the upper basin storage reservoirs coupled with above average flows have resulted in river flows exceeding normal conditions, resulting in very large volumes of spill at Wells Dam (greater than 100 kcfs at Wells). The first half of the fish passage season was characterized by above normal flows due to aggressive flood control efforts by the federal agencies including the drawdown of the Grand Coulee Reservoir (Figures 2 & 3). The second half of the fish passage season has been characterized by high inflows (often greater than 300 kcfs) into the federal system above Wells Dam and unusually high Methow and Okanogan river flows entering the Wells Project below Chief Joseph Dam.

(Figure 3). Together these three sources of water have combined to consistently exceed the 7Q10 flow value (246 kcfs) at Wells Dam.

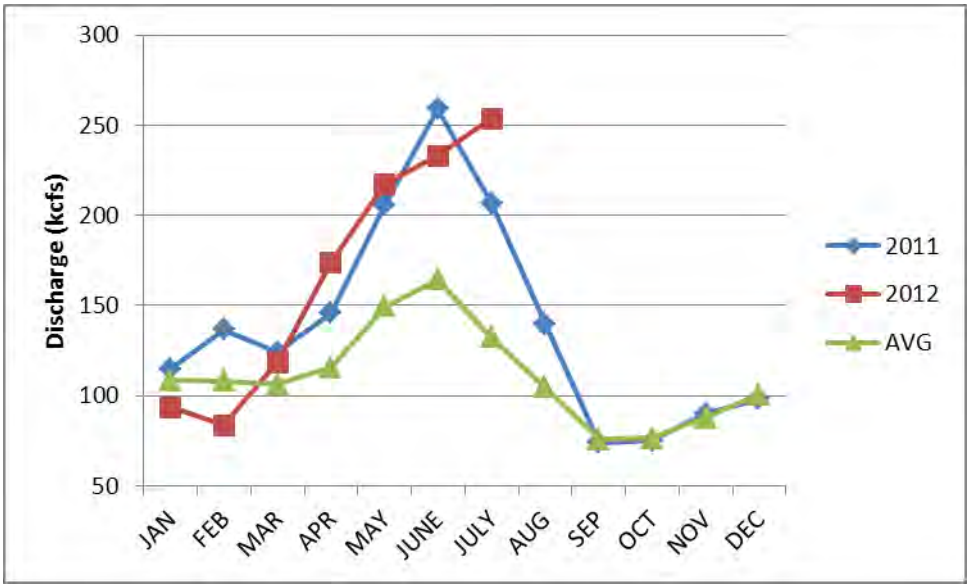

Figure 2. 2012 discharge profile at Wells Dam compared to 2011 and average (since 1969) profile

In addition to high flows, during the first half of the fish passage season, Wells Dam was operated as an 8-unit plant (April and May). April through early May is traditionally a good time of year for turbine maintenance since these months are normally characterized by lower flow volumes and low demand for electricity. All mid-Columbia PUDs had units out for maintenance when the runoff forecast increased dramatically in March and April. In addition to the Grand Coulee flood control operations, compliance below Wells was worsened by having high flows occur out of synch with the typical hydrograph.

Discharge at Wells Dam was expected to be less than 170 thousand cubic feet per second (kcfs) for the remainder of June, however unanticipated rain on snow events dramatically increased the federal systems inflow and discharge estimates resulting in near flood conditions that came into conflict with the operation of the Wells Juvenile Fish Bypass System (Figure 3).

Figure 3. 2012 hydrograph at Wells dam compared to 10 year average

For example, in accordance with the Wells Habitat Conservation Plan, lower flow predictions required dam staff to return the bypass barrier (number 6) on Thursday June 7th. However, flows unexpectedly rose at Chief Joseph on Thursday and Friday (June 7th and 8th) exceeding 7Q10 values (over 246 kcfs). With the bypass barrier replaced, the Wells Project exhibited poor TDG performance. On Monday June 11th, dam staff removed the barrier to improve gas performance.

The Army Corps of Engineers (Corps) predicted flows for the weeks starting June 10th 18th and 25th to be greater than 200 kcfs. This forecast was updated to 240 kcfs during the week of June 18th. In addition to approximately 20 kcfs in side flows from the Okanogan and Methow river, total flow at Wells was expected to be 250 kcfs for the upcoming weeks. During these weeks flow were often much higher than 250 kcfs.

Late during the week of June 4th, a 9th turbine unit was put back into service following the completion of cavitation and maintenance work. With nine units in service, current plant capacity is between 180-190 kcfs.

During the week of June 25th flows at Wells were routinely over 300 kcfs. Predicted flows for the next week were to be similar. As such, Douglas PUD removed a third set of bypass barriers to improve TDG performance and maintain dam safety (barriers at unit 8).

For early to mid- July, flows at Wells were above 7Q10 conditions. For the week of July 16th, flows from Chief Joe and side flow from Wells Reservoir tributaries produced flows at Wells that remained above 7Q10. As a result, Wells Dam spilled an estimated 84-100 kcfs throughout July. Grand Coulee water releases remained high through July as a result of heavy storms and precipitation events through July. Rain events have also caused the Okanogan and Methow to remain above average for July.

For the week of July 23, 2012, Douglas PUD expected flows at Wells to begin around 255 kcfs and move towards 240 kcfs by the end of the week. Side flows into the Wells project were around 10 kcfs for the beginning of the week.

Reductions in outflow from Grand Coulee and Chief Joseph Dam towards the end of the week of July 29th brought flows down below 7Q10 after five sustained weeks above this threshold. Flows were expected to be around 197 kcfs for the week starting July 30th. Due to a dramatic reduction in flows and as outlined in Douglas PUD's Spill Playbook, barrier 8 was replaced July 30th. In addition, barrier 4 was reinstalled July 31st. Barrier Number 6 (last barrier to be replaced), will be reinstalled August 6th, as a result of continued flow reduction.

Predicted flows for the week starting August 6th are 180 kcfs range. Side flows from the Methow and Okanogan should add approximately 5 kcfs. Unit and transformer maintenance will begin during the week of August 6th, which may reduce the powerhouse capacity at Wells. Further, Wells may see another increase in flows as a result of drafting at Grand Coulee dam to prepare for project maintenance. The target for GCL is 1283 msl (mean feet above sea level) by Sunday August 12th and current reservoir height is 1289 msl. Flows at Wells dam are currently at 155-188 kcfs to begin the week.

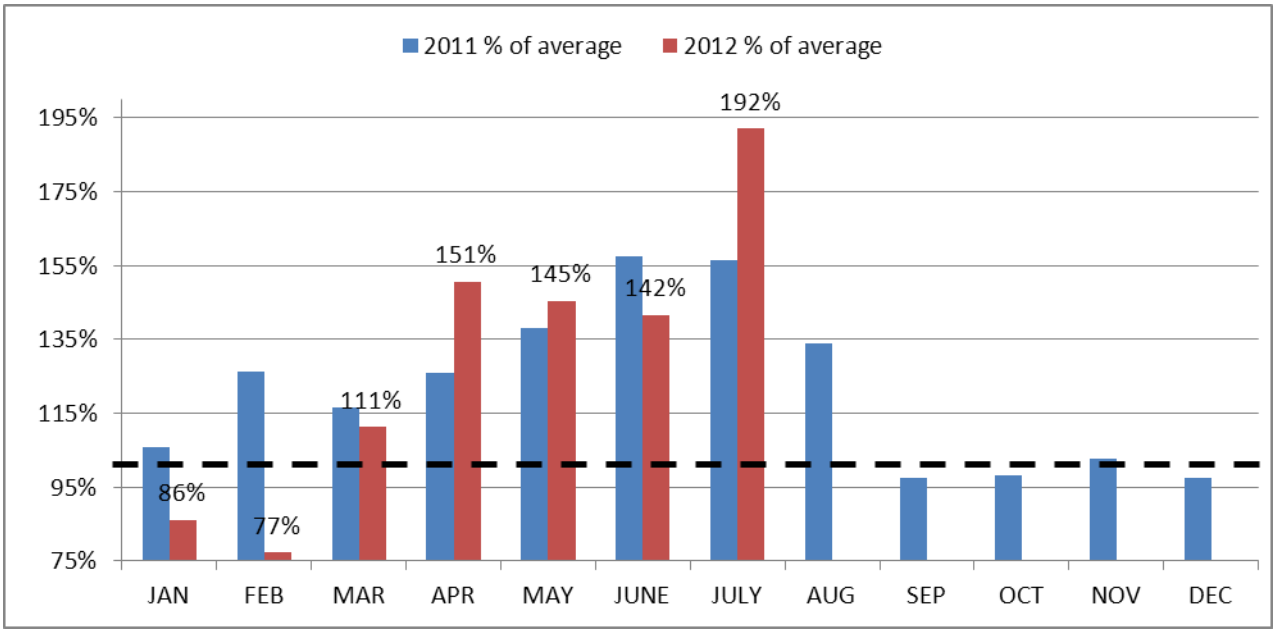

Figure 4. Percent of average monthly flow at Wells Dam during 2011 and 2012. Averages are derived from 1969-2011 data. The dashed line is 100 percent.

Figure 4 illustrates the dramatic flows seen at Wells Dam during the 2011 and 2012 spill season. For example, average flow passed Wells during the month of July is 132.2 kcfs (Figure 2). The previous July average maximum was 221.9 kcfs. In 2012 that record was broken with average flows of 253.8 kcfs at Wells Dam in July 2012, which equates to 192% above monthly average (Figure 4). Almost twice as much flow was observed at Wells Dam during the month of July than the average for this month. In addition,

April through June saw almost 1.5 times as much water pass Wells Dam during those months when compared to the 42 year averages for respective months.

WELLS PROJECT CRAYFISH DISTRIBUTION STUDY

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

August 6, 2012

Prepared by:
Chas Kyger and Andrew Gingerich (Douglas County Public Utility District)

Prepared for:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

1.0 INTRODUCTION

1.1 Aquatic Nuisance Species Management Plan and Clean Water Act Section 401 Certification

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). In addition, the ANSMP implementation supports requirements outlined in the recently issued Wells Project 401 Certification issued by the Washington Department of Ecology, in support of the Clean Water Act (DOE 2012).

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas County Public Utility District (DCPUD), in collaboration with the Aquatic SWG, has agreed to implement several protection, mitigation and enhancement measures (PMEs) in support of the ANSMP. In addition to the PMEs listed in the ANSMP, the Washington State Department of Ecology Section 401 Water Quality Certification for the Wells Hydroelectric Project includes an additional requirement to monitor non-native crayfish at appropriate locations within the Project area. In fulfillment of this requirement, and in an effort to describe the distribution of native and non-native crayfish in the Project, Douglas is proposing to conduct a crayfish distribution study in 2012.

2.0 BACKGROUND

Crayfishes of North America have received increased attention from fisheries biologists over recent decades, including their distribution in the Pacific Northwest (Larson and Olden 2011). The effects of non-native crayfish on biotic and abiotic processes within the Columbia Basin are not well known. Importantly however, crayfish are an important prey item for many species of native fish. Despite the presence of state regulations against the distribution and use of certain species of crayfish within Washington state, enforcement of these rules is complicated by an inability of the general public and enforcement personnel to identify the differences between native and non-native crayfish (Johnson et al. 2009). The proliferation of a non-native crayfish could be harmful to biota found within the Wells Project including the potential to reduce the abundance of native crayfish. Because of the potential for negative impacts on the ecosystem, biologist, researchers and regulators have placed an increasing emphasis on the collection of baseline crayfish abundance and relative distribution data. This plan serves to improve the baseline understanding that two species of crayfish currently inhabit the waters found within the Wells Project.

2.1 Crayfish in the Wells Project

In late 2010, Douglas conducted an exploratory crayfish sampling effort in the Wells Reservoir using methods described in the Crayfish Survey Protocol and Identification Guide for Washington (Olden and Larson 2010). Sampling occurred over a two day period with one overnight sample. No native signal crayfish (*Pacifastacus leniusculus*) or non-native Northern crayfish (*Orconectes virilis*) were captured during this pilot effort.

During seining activities in June 2011 near the Brewster swimming area, Douglas County PUD biologists captured a large crayfish with unusual morphological indicators. After careful examination and a series of pictures the crayfish was released. After providing the photos to Dr. Julian Olden (University of Washington) she confirmed that the unusual specimen collected near Brewster was a Northern, or Virile crayfish. Larson and Olden (2011) have similarly confirmed the presence of Virile crayfish in waters adjacent to the Wells Project including the Chelan, Methow and other upper Columbia River tributaries .

During January 2012, 14 crayfish were recovered in the west fishway of Wells dam. All of these crayfish were identified as Washington's native Signal crayfish. To date, no known specimens of the red swamp crayfish (*Procambarus clarkii*), rusty crayfish (*Orconectes rusticus*), or any other species have been intercepted in the Wells Project Area. However, these species have been found in other Pacific Northwest waterbodies.

Proposed sampling in 2012, per the requirements of the 2012 401 water quality certification, is aimed at collecting baseline information on the relative abundance and distribution of all species of crayfish within the Wells Project.

3.0 GOALS AND OBJECTIVES

The goal of the 2012 crayfish distribution analysis is to describe the distribution and relative abundance of crayfish in the Wells Project.

Specific objectives of the study include:

1. *Determine the presence/absence of Northern crayfish at multiple sites throughout the Project.*

2. *Compare relative abundance of Northern crayfish and signal crayfish at multiple sites throughout the Project.*

3. *Determine the type of habitats in the Project with the greatest occurrence and abundance of Northern crayfish.*

4. *Determine the presence and absence of other species of non-native crayfish within the Wells Project.*

4.0 METHODOLOGY

4.1 Sampling Methods

Sampling methods will follow guidelines described in the Crayfish Survey Protocol and Identification Guide for Washington (Olden and Larson 2010). Modified Gee minnow traps with 1.5 to 2 inch openings will be deployed to capture crayfish. Traps will be baited and attached to anchors to ensure contact with to bottom. Each trap will also be attached by rope to a numbered buoy for trap identification and retrieval.

Sampling will take place over a three week period in late August to early September. A sampling occasion will consist of an overnight trap set with retrieval the following morning. At least two sampling occasions will occur each week. Up to 20 traps will be deployed during each sampling occasion resulting in as many as 120 trap sets over the three week study. Traps will be set in 5 identified sampling areas within the Wells Project. Trap set locations within sample areas will be stratified by habitat type; two traps will be placed in open areas, and two traps will be placed in areas with aquatic macrophytes. Depending on characteristics of individual sampling areas, individual trap set locations will be chosen to represent a range of water depths and current velocities in each area. Using this strategy we will aim to represent all habitat types found within the Wells Project.

During retrieval of traps, site location will be recorded via map and handheld GPS. Sample site characteristics will also be recorded including: depth, water temperature, macrophyte type (if present), and qualitative measures of substrate size (sand, gravel, cobble, boulder) and current velocity (low, moderate, high). Captured crayfish will be identified to species and sex will be determined. Non-native crayfish species will be retained and destroyed. Non-target fish species captured incidentally will be identified, measured, and recorded. All native crayfish and non-target fish taxa will be released at the location of capture.

4.1.1 Sample Areas

The Project will be divided into five sample areas with each area sampled equally. The five sample areas will be:

1. Chief Joseph Tailrace – The area between the Chief Joseph tailrace and Washburn Island.
2. Bridgeport Bar – The area between Washburn Pond and Brewster Bridge launch.
3. Okanogan River – The area near and within the mouth of the Okanogon River.
4. Brewster-Pateros – The area between Brewster and Pateros.
5. Wells forebay – The area from Pateros to Wells Dam.

These sample areas were chosen to encompass the encompass all of the eco-regions found within the project. Within these areas, sampling will focus on areas where vectors for non-native crayfish introduction are most concentrated and suitable crayfish habitat is present.

4.2 Data Analyses

4.2.1 Crayfish Distribution and Abundance (Objective 1 and 2)

Raw data from trapping along with sample site locations will be used to produce a map of the distribution of both native and non-native crayfish species in the Project area. In addition to presence and absence data, the total catches of each species will also be displayed along with the proportion of catch of non-native/native crayfish captured and each site. If sufficient data are available, a one-way ANOVA will be used to compare mean native and non-native crayfish abundance among sample areas. Results will be summarized and shared with the ASWG. Results will be used to inform future activities associated with the implementation of the Aquatic Nuisance Species Management Plan for the Wells Project.

4.2.2 Crayfish Habitat Use (Objective 3)

Site characteristics collected during sampling will be used to examine relationships between habitat attributes and native and non-native crayfish presence and abundance. Catch data will be grouped by site habitat characteristics and mean crayfish presence and abundance will be compared using statistical methods which may include t-test, ANOVA, and linear regression depending on the type of variable examined and the data available. Habitat attributes of particular interest include presence of macrophytes, bottom substrate, and water temperature. Habitat preference data for Northern crayfish will be informative for determining areas in the Project that may be currently inhabited or have the greatest risk of colonization in the future.

5.0 REFERENCES

DOE (Washington Department of Ecology), 2012. Wells Hydroelectric Project (FERC No. 2149) 401 Certification/Order No. 8981. Issued February 27, 2012.

Johnson, B.M., R. Arlinghaus, and P.J. Martinez. 2009. Are we doing all we can to stem the tide of illegal fish stocking? Fisheries 34(8):390-394.

Larson, E.R., and J.D. Olden. 2011. The state of crayfish in the Pacific Northwest. Fisheries:36(2)60-73.

Olden, J.D. and E.R. Larson. 2010. Crayfish survey protocol and identification guide for Washington. School of Aquatic and Fisheries Sciences, University of Washington.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: October 10, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the September 12, 2012 Aquatic SWG Conference Call

The September Aquatic Settlement Work Group (SWG) meeting was held by conference call on Wednesday, September 12, 2012, from 10:00 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Douglas PUD will consult with the other PUDs regarding the optimal spacing of bars on screens used to guide lamprey into the counting stations in order to improve enumeration of adult lamprey passing in the fishways at Wells Dam (Item III-3).
2. Aquatic SWG representatives will provide comments and suggested revisions for the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan to Andrew Gingerich no later than Friday, September 21, 2012 (Item III-3).
3. Steve Lewis will provide to the Aquatic SWG his suggested revisions to the Objective 1B hypotheses for the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study (Item III-3).
4. Douglas PUD will distribute a revised 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan to the Aquatic SWG by October 1, 2012; the study plan will be considered for approval at the October 10, 2012 Aquatic SWG meeting (Item III-3).
5. Douglas PUD, in coordination with U.S. Fish and Wildlife Service (USFWS), will develop a draft letter to the Federal Energy Regulatory Commission (FERC) requesting rescheduling of the Bull Trout Radio Telemetry Study at the Twisp Weir until 2016 (Item III-6).

II. Summary of Decisions

1. There were no Statements of Agreement (SOAs) approved at today's meeting.

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe): Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for additional agenda items. No additions were requested by those present.

   Kristi Geris reported that all comments and revisions received on the draft August 8, 2012 conference call minutes had been incorporated and there were no outstanding comments remaining to be discussed. The Aquatic SWG members present approved the August 8, 2012 conference call minutes as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **Fish Bypass/Water Quality 2012 Wrap Up** (Andrew Gingerich): Andrew Gingerich reviewed the findings summarized in the Water Quality Update 2012 Bypass Season document (Attachment B) that was distributed to the Aquatic SWG by Kristi Geris prior to the meeting on September 12, 2012.

   Gingerich noted that the 2012 fish spill season at Wells Dam began at 0000 hours on April 12, 2012, and ended at 0000 hours on August 19, 2012. He said that Table 1 in Attachment B depicts very high mean monthly flows in 2012 at the Wells Project, compared to average monthly flows for the years 1969 to 2011 for the months of April through August. He said that Figure 1 in Attachment B shows that 2011 and 2012 average monthly flows for April through August are almost 1.5 times the volume of water typically passed at Wells Dam compared to the 42-year averages for these respective months; he also said that July flows were nearly 2 times higher than average flows for this month. Gingerich said that Table 2 in Attachment B compares average monthly flows in 2012 to flows from 1969 to 2011, and he clarified how the percent difference from the 16-year average was calculated.

   Gingerich explained that Douglas PUD aims to meet three water quality standards: 1) the rolling 12-C high total dissolved gas (TDG) standard of 120 percent in the Wells tailrace; 2) the 125 percent hourly maximum TDG standard in the Wells tailrace; and 3) the 115 percent hourly TDG maximum standard in the Rocky Reach forebay. Gingerich reviewed Table 3 in Attachment B and noted that the 115 percent hourly maximum in the Rocky Reach forebay standard was the standard where Wells had the poorest performance (Gingerich later clarified during the October 10, 2012 Aquatic SWG meeting, that the 115 percent standard is a 12C-high standard rather than an hourly standard). However, he noted that on 124 days of the 130-day bypass season, Wells received water greater than 110 percent TDG. Additionally, on more than half of the days during the 130-day bypass season, Wells received water greater than 115 percent TDG, which is already above the Rocky Reach forebay standard. Pat Irle noted that Washington State Department of Ecology (Ecology) has strict compliance standards for the PUDs. She added that regardless of whether a project receives water that exceeds a

water quality standard, the standard is not adjusted to allow a higher TDG concentration.

3. **Pacific Lamprey Passage Study Plan Discussion: Bar Screen vs. IR Camera Enumeration** (Andrew Gingerich)**:** Andrew Gingerich said that the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan (Attachment C) was revised based on comments received at the last Aquatic SWG meeting; the revised plan was distributed to the Aquatic SWG by Kristi Geris on September 4, 2012. Gingerich noted key revisions including the addition of fixed station telemetry receiver locations at the mouths of the Methow and Okanogan rivers; and the analysis of data from stations at the mouths of the Entiat and Wenatchee rivers. Gingerich also said that Grant PUD was receptive to the collection of additional fish from Priest Rapids Dam provided the fish managers there, including the Priest Rapids Fish Forum (PRFF), approved this collection.

   As recommended by the Aquatic SWG, Gingerich said Douglas PUD is proposing modifications to the picketed lead to investigate if lamprey can effectively be enumerated at the existing window. Gingerich said that data collected at the counting window will be compared to radio telemetry data to identify any differences in lamprey passage efficiency. Gingerich added that these proposed modifications to the picketed leads require coordination with the HCP Coordinating Committees due to potential impacts to Endangered Species Act (ESA)-listed salmon.

   Steve Rainey noted that Section 4.5 of Attachment C discusses modifying the diffuser from 0.5-inch to 0.25-inch around the picketed lead. Rainey said he thought the existing pickets used 1-inch spacing, and that a reduction to 0.5-inch would block lamprey passage. Gingerich said the spacing proposed in Attachment C was derived from existing studies at other facilities. However, he added that Douglas PUD is open to other sources of information if available. Rainey suggested consulting with Chelan PUD and Grant PUD to determine the spacing used at Rocky Reach Dam. Rainey said that 0.25-inch spacing could create a debris collection problem that would require frequent maintenance. Gingerich said that Douglas PUD will consult with the other PUDs to determine what bar spacing used on the screens guiding adult lamprey into the counting stations. Mike Schiewe added that the HCP Coordinating Committees can be briefed on this topic in case there are aspects of this modification that require further discussion from a salmon and steelhead passage perspective.

   Patrick Verhey asked if the picketed leads currently installed could be reinstalled if the new picketed leads were not beneficial or created a problem; Gingerich replied that the old picketed leads can be reinstalled. Verhey also noted that the picketed lead already reduces flow at the counting window, and that Wells Dam receives large amounts of debris in the forebay during certain times of the year.

   Pat Irle noted that the goals outlined in Section 3.1 of Attachment C were not consistent with the hypotheses, or the actual analyses planned. She added that the study

investigates behavior, yet the study does not require reporting on behavior. Irle also noted that the hypotheses include a comparison of Wells Dam to other projects, but there is no discussion of how that information will be obtained or how the projects will be compared. Irle suggested inserting text in Section 4 of Attachment C that identifies specific metrics to be compared with other projects. Gingerich thanked Irle for her comments and said that her specific comments are appreciated, and these modifications would be incorporated in the study plan. Irle agreed to send specific comments to Gingerich. Gingerich added that the primary objectives of the study are passage and enumeration, as required by the Wells Project 401 Certification and Douglas PUD's FERC license; and that these are the key to the analyses.

The Aquatic SWG representatives agreed to provide additional comments and suggested revisions to the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan (Attachment C) to Andrew Gingerich no later than Friday, September 21, 2012. Steve Lewis also said he will provide to the Aquatic SWG his suggested revisions to the Objective 1B hypotheses for Section 3.2 of Attachment C.

Lewis asked about the proposed tagging methods, and specifically the 162-day expected life of the radio telemetry (RT) tags at a pulse rate interval (PRI) of 5.0 seconds (Section 4.2 of Attachment C). Gingerich said that the PRI was selected to fit the scope of the study, and that 5.0 seconds is expected to provide the needed detection efficiency. Gingerich said Douglas PUD is also proposing passive integrated transponder (PIT) tagging of fish to facilitate possible fish detection in the event that radio tags have expired. Gingerich added that if RT tag battery life expires prior to fish entering the Methow River, PIT tags will still be detected provided flows are low enough to detect the PIT tags since PIT detection efficiency is a function of flows.

Lewis asked if the lamprey collected at Bonneville and Priest Rapids dams will be released on the same schedule. Gingerich said that there may be an opportunity to coordinate the releases; however, there are timing issues. Gingerich added that the Bonneville lamprey may all be released prior to collecting the Priest Rapids lamprey.

Regarding the placement of the antennae array in the collection gallery side gate of the Wells Project fishways (Section 4.3.1 of Attachment C), Lewis said that he thought the side gate is typically closed. Bickford responded that lamprey can access that area, and it would be beneficial to place an antenna array in that area to determine if lamprey use that area as a resting stop before continuing up the fishway.

Lewis asked if Douglas PUD planned to develop a schedule for regularly querying the PIT tag information system (PTAGIS) to determine if any of the tagged lamprey were detected at the PIT arrays in the Entiat and Methow rivers (Section 4.3.1 of Attachment C), or if queries would be conducted on a case-by-case basis. Gingerich replied that PTAGIS queries will be provided as part of reporting. Irle suggested that the language in Section 4.3.1 of Attachment C be revised to state this.

Lewis asked if the Wells Project fishway entrance velocities would be modified on a year-by-year basis (Section 4.4 of Attachment C), or if there was a plan to make the reduced velocity a permanent change. Gingerich said that Douglas PUD does not have the necessary empirical information to recommend to the HCP Coordinating Committees that one head differential treatment is more efficient than another. He added, however, that this study will contribute information on the potential benefits of reduced head differentials. Schiewe also added that the HCP Coordinating Committees have made it clear that if a change in head differentials at the Wells Project fishway entrances is proposed, then the HCP Coordinating Committees would require a study to evaluate whether the change in entrance velocity has a negative impact on salmon and/or steelhead passage.

Douglas PUD will distribute a revised 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan to the Aquatic SWG by October 1, 2012; the study plan will be considered for approval at the October 10, 2012 Aquatic SWG meeting.

4. **Wells Project Crayfish Distribution Pilot Update** (Chas Kyger): Chas Kyger updated the Aquatic SWG that on August 28 and 29, 2012, Douglas PUD deployed four traps at five sampling locations (equaling a total of 20 traps) in the Wells Reservoir, and captured zero crayfish. Kyger said that, based on these results, on August 31, 2012, Douglas PUD modified their sampling methods to include visually examining the underside of rocks at two locations. Kyger reported that this method of capture resulted in a total of seven non-native Northern crayfish (*Orconectes virilis*) being captured at the Okanogan River and Bridgeport Bar sampling locations; and bycatch species included sculpins (*Cottus sp*) and snails. He said that Douglas PUD is currently considering whether the absence of crayfish in the crayfish traps is a result of trap design issues, sample locations, or simply low densities of crayfish. He added that the study will continue for an additional few weeks.

   Pat Irle requested revisions to text in the 2012 Wells Crayfish Study including consistency in referencing crayfish species and more specific details on flow velocities at sample locations. Kyger explained the rationale for reporting velocities in broad ranges at the trap locations, but said that Douglas PUD will revise the language to be more specific where possible.

   Steve Lewis noted that the 2012 Wells Crayfish Study methodology reported that up to 20 traps would be deployed during each sampling event resulting in as many as 120 trap sets over the 3-week study. Kyger said that was the original plan; however, with such low capture success, Douglas PUD is instead focusing on verifying the effectiveness of the traps and trap placement. Andrew Gingerich added that the focus of this study is mainly to obtain baseline data. It was noted that Chelan PUD has been implementing a similar study in the Rocky Reach Reservoir and that they have observed the same results with no crayfish captured in their Rocky Reach crayfish traps.

5. **Sturgeon Contracting 2013 Planning Update: Hatchery Modifications and Contracting** (Andrew Gingerich): Andrew Gingerich said that 2013 sturgeon contract development is underway between Douglas PUD, the Yakama Nation (YN), and the Colville Confederated Tribes (CCT) to collect brood, fertilized eggs, and larval fish in June and July 2013. Gingerich added that Douglas PUD is also implementing hatchery modifications at Wells Hatchery, which will be complete in time for the start of the 2013 sturgeon arrival.

6. **Bull Trout Radio Telemetry Study at Twisp Weir Update** (Andrew Gingerich): Andrew Gingerich said that Douglas PUD met with USFWS on September 6, 2012, to discuss the bull trout RT study at the Twisp Weir. Gingerich said that information collected to date at the Twisp Weir indicate a PIT tag detection efficiency of about 21 percent with the existing arrays during the spring time when a study would be taking place. He added that this is problematic in regards to gathering passage characteristics at the weir. Gingerich said Douglas PUD and the USFWS is considering delaying the RT study at Twisp Weir until 2016 when an adult passage study at Wells Dam is scheduled. Combining the weir and Wells Dam study would limit the number of study fish needed for each study and thus reduce surgery impacts on wild bull trout. In the interim, existing PIT tag data can continue to be collected and can be considered in planning for the 2016 study. Gingerich said this proposed schedule requires additional approval from USFWS and FERC, as well as from the Aquatic SWG.

   Gingerich said that Douglas PUD, in coordination with USFWS, will develop a draft letter to FERC requesting delay of the Bull Trout RT Study at the Twisp Weir until 2016. Gingerich said that he will distribute the letter to the Aquatic SWG for review prior to submitting the letter to FERC.

7. **Douglas PUD FERC License and Future Aquatic SWG Meeting Details** (Shane Bickford): Shane Bickford said he has been in contact with FERC staff on a monthly basis; however, FERC has not disclosed any new information on the renewal of Douglas PUD's FERC license. Bickford added that he has heard from different sources that the license is very close, and will possibly be issued by October 2012. Bickford said that he has no new information on the content of the license and FERC has not contacted him with questions since March 2012. Mike Schiewe suggested that once Douglas PUD receives their FERC license, the Aquatic SWG may want to meet in person to discuss implementation strategies and the intent of various license conditions.

IV. Next Meetings

1. Upcoming meetings: ***October 10, 2012 (conference call); November 14, 2012 (conference call); and December 12, 2012 (conference call)***.

List of Attachments

Attachment A – List of Attendees

Attachment B – Water Quality Update 2012 Bypass Season

Attachment C – 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Admin./ Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Steve Rainey	Technical Support	Consultant, U.S. Fish and Wildlife Service
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology

Water quality update: Completion of fish bypass season 2012

Prepared by Douglas County PUD

For

The Aquatic Settlement Workgroup (ASWG)

September 12th 2012

ASWG conference call

1 OPERATIONS

1.1 Description of Fish-Spill Season Flow

The 2011 Fish Spill Season was April 12th through August 26th at Wells Dam. As required, TDG data was monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil). Historical data is available for download. Data from 1969 to 2011 (42 years) show that average monthly flows between April and August range from 51.9 to 348.7 kcfs at the Wells Project. During this time period, flows tend to be greater in June (mean 164.5 kcfs), and lowest in August (104.6, Table 1). Flows at the run-of-river Wells Project are determined by upstream storage release changes at Grand Coulee hydroelectric project, and minimally by tributary runoff.

Table 1 Monthly total river discharge (kcfs) from the Wells Project (April-August), 1969-2011.

Month	April	May	June	July	August
Mean Monthly Average (kcfs)	115.6	149.4	164.5	132.2	104.6
Minimum Monthly Average (kcfs)	51.9	55.2	73.7	53.4	63.9
Maximum Monthly Average (kcfs)	184.9	262.6	348.7	221.9	181.3

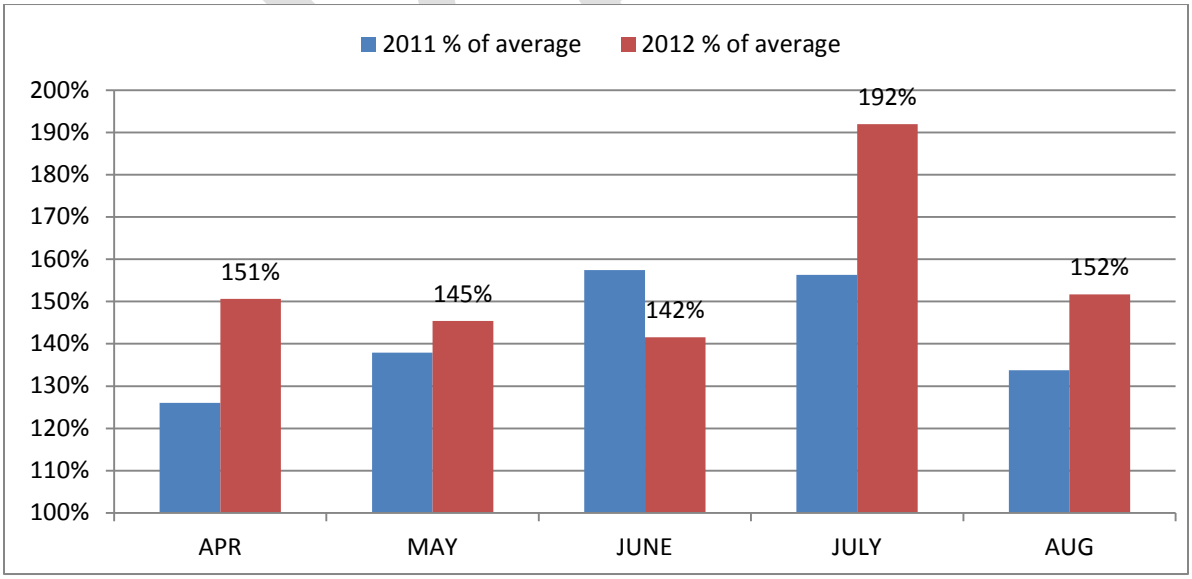

Figure 1. Average montly flow in 2010 and 2011 relative to historical average monthly flow at Wells Dam for the years 1969-2011.

Columbia River flows at Wells Dam in 2012 were the XX-highest on record. Average monthly river flow at the Wells Project was 51% higher in April and 92% higher in July than the 42-year average for respective months (Figure 1). The average flow in 2012 was 56% (74 kcfs) higher than the previous 42-year average (Table 2). Flows for all months during the spill season were higher than the monthly 42-year average. The maximum hourly flow observed during the spill season was 314.2 kcfs on June 25 and flows frequently exceeded the 7Q-10 value of 246.0 kcfs. The average monthly flow for all of July of 253.8 kcfs exceeded the 7Q-10 value for the Wells Project. Of the 130 days during the spill season, there were 56 days (43% of the monitoring period) where one or more hourly values were above 7Q-10 flows at the Wells Project, including a 38 day stretch from June 19 to July 26th. Of the 3120 hourly outflow values recorded during the 130 day spill season 863 (28%) had values above the 7Q-10 threshold.

Table 2. Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the previous 42-year average (1969-2011), by month.

Month	1969-2011 Mean	2012 Mean	Percent Difference from 16-Year Average
April	115.6	174.1	+51%
May	149.4	217.2	+45%
June	164.5	232.9	+42%
July	132.2	253.8	+92%
August	104.6	158.7	+52%
All	133.3	207.34	+56%

2 Compliance

Douglas PUD aims to meet three standards; 1) the rolling 12-c high standard of 120% in the Wells tailrace, 2) the 125% hourly maximum in the Wells Tailrace and 3) the 115% hourly maximum in the Rocky Reach Forebay. Data below has been summarized from 3120 hourly TDG values. This summary is also provided in tables 3 and 4.

2.1 120% 12-C High in the Wells Tailrace

There were a total of 65 days during the 130 day bypass season where the 120% 12-C high threshold was exceeded. Of those 51 occurred during days when 7Q-10 flows occurred on the same day. Therefore, Wells was out of compliance on 14 days out of 130 days (89% compliant). However, on 124 days of 130 Wells received water above 110% (95% of the days during fish bypass season).

2.1 125% Hourly in the Wells Tailrace

There were a total of 41 days during the 130 day bypass season where the 125% hourly maximum threshold was exceeded. Of those 38 occurred during days when 7Q-10 flows occurred on the same day. Therefore, Wells was out of compliance on 3 days out of 130 days (98% compliant). However, on 124 days of 130 Wells received water above 110% (95% of the days during fish bypass season).

2.1 115% Hourly in the Rocky Reach Forebay

There were a total of 95 days during the 130 day bypass season where the 115% hourly maximum at Rocky Reach Dam was exceeded. Of those, 53 occurred during days when 7Q-10 flows occurred on the same day. Therefore, Wells was out of compliance on 42 days out of 130 days (68% compliant). However, on 124 days of 130 Wells received water above 110% (95% of the days during fish bypass season). In addition on 72 days Wells received water above 115%, which is already above the Rocky Reach Forebay standard (Table 4).

Table 3. Douglas PUD Compliance for 2012 water quality during bypass at Wells Dam

	12 C High (120%)	125% hourly	115% Rocky Reach
Number of total violations	65	41	95
Occurred on 7Q10	51	38	53
Violations excluding 7Q10	14	3	42
Percent compliant	**89%**	**98%**	**68%**

Table 4. TDG Concentration of Water Received at Wells Dam during 2012 bypass

	TDG standard	Number of Violations	Days in Violation
USACE compliance	110%	124	95.38%
	115%	72	55.38%

ADULT LAMPREY PASSAGE AND ENUMERATION STUDY, WELLS DAM - 2013

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

August 1, 2012

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Table of Contents

List of Figures

List of Tables

ABSTRACT

In an effort to better understand Pacific lamprey (*Lampetra tridentata*) behavior at Wells Dam, Public Utility District No. 1 of Douglas County (Douglas PUD), in consultation with the Aquatic Settlement Work Group, is proposing to conduct a multi-faceted adult lamprey passage study at Wells Dam in 2013. This study is intended to collect information necessary to implement Objective 1 of the Pacific Lamprey Management Plan (PLMP) found in the Aquatic Settlement Agreement (ASA).

The goal of the study is to evaluate the effect of the Wells Hydroelectric Project (Wells Project) and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    - Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    - Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
    - Evaluate the enumeration efficiency, behavior and fish passage efficiency of the fish count station at Wells Dam using ¼ inch picketed leads and existing count windows.

Implementation of the study is consistent with requirements contained within the Wells Project PLMP. The study results are intended to support the goal of the PLMP which is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license.

1.0 INTRODUCTION

1.1 Aquatic Settlement Agreement and Pacific Lamprey Management Plan

During the relicensing process for the Wells Hydroelectric Project (Wells Project or Project), Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with federal, state and tribal relicensing participants, developed six Aquatic Resource Management Plans in support of a comprehensive Aquatic Settlement Agreement (ASA). The Pacific Lamprey Management Plan (PLMP) is one of the six Aquatic Resource Management Plans contained within the ASA that directs the implementation of Protection, Mitigation, and Enhancement measures (PMEs) for Pacific lamprey (*Lampetra tridentata*) during the term of the new Wells Project operating license.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license. Objective 1 of the PLMP is to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. Pursuant to this objective, Douglas PUD is proposing to conduct an adult active tag study to 1) collect additional information on the passage characteristics and behavior of adult lamprey migrating through the Wells Project fishways (section 4.1.6 of the PLMP); and 2) to evaluate enumeration efficiency in the vicinity of the Wells Project fishway count windows (section 4.1.3 of the PLMP) toward identifying alternatives to improve adult lamprey count accuracy.

2.0 BACKGROUND

2.1 Wells Project Pacific Lamprey Passage Studies

As part of the Wells Project relicensing, Douglas PUD conducted several adult lamprey passage studies (2001-2003, 2007, and 2008) to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream migration and behavior as it relates to fishway passage, timing, and downstream passage events through the dam.

2.1.1 2001-2003 Pacific Lamprey Radio-telemetry Study

In 2004, Douglas PUD contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). Only 18 of these tagged fish were detected upstream at Wells Dam and many of the radio tags detected were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of

150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.1.2 2007-2008 Pacific Lamprey Radio-telemetry Study

In 2007, Douglas PUD contracted with LGL Limited to conduct another active tagging study. Twenty-one lamprey were captured, radio-tagged, and released from August to October. Tags used in this study had an expected tag life of 87 days. Of the twenty-one fish, 10 were released into the tailrace and 11 were released directly into the middle fishway section of the Wells fishways. One tailrace-released fish was recaptured and re-released into the fishway, bringing total in-ladder releases to twelve. Ten of the 12 (83%) lamprey released into the middle fishway section successfully ascended, with a median upper fishway passage time of 7.9 hours. Seven of the 10 (70%) lamprey released into the tailrace were detected at the outside of a fishway entrance. Only one of these seven (14%) lamprey entered into the collection gallery and ascended the fishway with a lower fishway passage time of 6.1 hours and upper fishway passage time of 5.9 hours.

During the 2007 study, a total of 11 radio-tagged adult Pacific lamprey passed the fish counting facilities in both fishways. Nine of these fish were detected by an antenna monitoring the count window bypass area (i.e., an area in the fishway accessed through a picketed lead just downstream of the count window which allows lamprey to migrate through the fish counting facilities undetected; Figure 1), although 3 fish were detected for less than 20 seconds and probably did not completely enter the bypass area. Eight of these lamprey were not observed at the count window, and 2 fish had zero detections on the above count window antenna (LGL and Douglas PUD 2008). The results suggested that visual detections at the count windows could be significantly lower (e.g., under estimating by 73% according to these data) than the actual total number of lamprey passing the fish counting facilities.

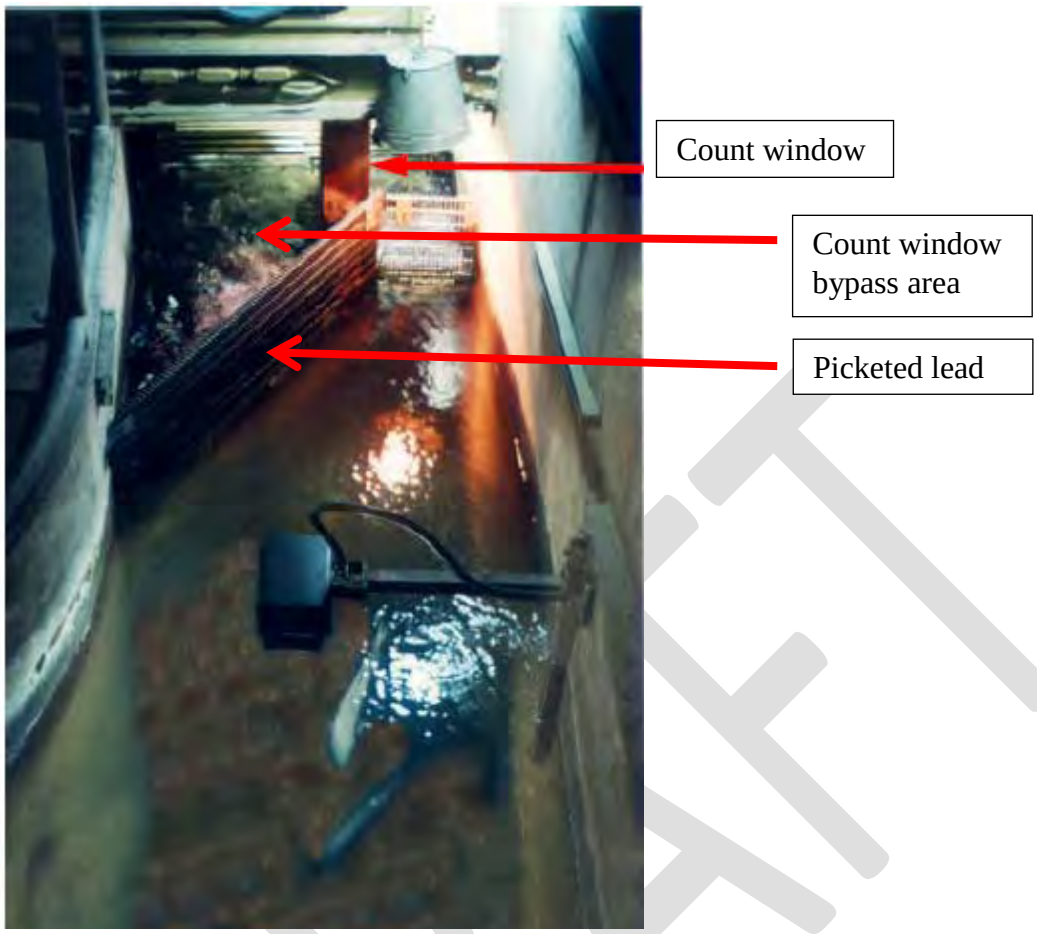

Figure 1. **Picketed lead immediately downstream of the fishway count window. Behind the picketed lead is the count window bypass area.**

In 2008, Douglas PUD conducted another adult lamprey passage study where 38 radio-tagged adult Pacific lamprey were released in the tailrace (n= 18) and fishways (n=20) of Wells Dam to continue an evaluation of behavior and passage performance, and to identify potential areas of passage impediment. In 2008, 15 lamprey approached the fishway from the tailrace, five (33%) of which entered the fishway. Movements within the collection gallery indicated that lamprey were able to move relatively unrestricted by flows. At least 11 of 19 (58%) lamprey which volitionally entered or were released in the collection gallery ascended to the lamprey trapping area in the middle fishway section. However, modifications to increase lamprey trapping efficiency effectively obstructed migration and 12 of 14 fish (86%) that encountered the lamprey traps were ultimately blocked. This artifact likely biased lower fishway passage times significantly. Upper fishway passage times of four radio-tagged lamprey that ascended past the trapping area were relatively fast (< 4 hours), except for one fish that ceased upstream movement during daylight hours. No fallbacks of fish that successfully ascended the fishway were observed for the second consecutive year. Overall, results indicate that any potential areas of impediment are restricted entirely to the entrance and lamprey trapping facility, as upper fishway passage efficiency was 100% for the second consecutive year.

During the 2008 study, of the four tagged lamprey that ascended into the upper fishway section, three bypassed the count window via the count window bypass area supporting the 2007 findings that a majority of lamprey that ascend Wells Dam may be uncounted (Robichaud et al. 2009). As concluded in the 2007 study, use of the count window bypass area appears to be an enumeration issue, rather than a passage concern (i.e., tagged fish generally move through this portion of the fishway efficiently and at above average speeds). The study recommended that further consideration should be given regarding effective monitoring of lamprey passage through the count window bypass area depending upon the importance of accurate counts at the Wells Project (LGL and Douglas PUD 2008).

The results of the 2007-2008 studies indicated that: 1) adult lamprey are having difficulty negotiating the fishway entrance; 2) lamprey passage in the fishway can be inhibited by the installation of lamprey traps on the bottom orifices within the middle section of the fishway (traps were removed in 2009); 3) lamprey are passing the middle and upper fishway sections at high rates, in a reasonable amount of time, and with negligible drop back within the ladder; and 4) a large proportion of the adult lamprey are bypassing the adult salmon counting windows (LGL and Douglas PUD 2008).

A comprehensive report was produced in February of 2009 (Robichaud et al. 2009). One of the recommendations by the researchers was to implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s) during the hours of peak lamprey activity (i.e., nighttime) and within the primary migratory period at Wells Dam (August-September).

2.1.3 2009-2010 Wells Project DIDSON Studies

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic Settlement Work Group (Aquatic SWG), prepared a plan to implement and evaluate measures to enhance entrance efficiency of adult Pacific lamprey at Wells Dam (Johnson et al. 2011). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam.

DIDSON units were deployed at Wells Dam fishway entrances during the peak of historic Pacific lamprey migration in 2009 (20 August to 24 September) and 2010 (7 August to 30 September). DIDSON was used to sample lamprey behavior and upstream passage events along the entire width of the fishway entrances and 1.3 m of vertical coverage above the sills (about 26% of the wetted vertical opening). Lamprey passage was examined relative to variable head differential treatments and entrance velocities. In 2009, three head differential treatments were tested: existing high (0.48 m; or 3.0 m/sec), moderate (0.31 m; or 2.4 m/sec) and low condition (0.15 m; or 1.8 m/sec) (Johnson et al. 2010). In 2010, only two of the 2009 treatments were used: existing high, and the moderate head differential conditions (Johnson et al. 2011). Treatments were grouped in 3-day blocks and lasted four hours each evening in 2009 (21:00 through 00:59). In 2010, the treatments were paired and lasted eight hours each evening (17:00 through 00:59). Data collected during the treatment periods were reviewed and all lamprey observations were described.

Combining both years, a total of seven lamprey observations were recorded where lamprey were observed to encounter the entrance sill heading upstream (N = 5 in 2009; and N = 2 in 2010). Five of these seven observations were in the east fishway and two were in the west fishway. Overall, five of the seven observations showed successful entry into the fishways (71%). During reduced head differential treatments, five observations were recorded with four of the five resulting in successful entry (80% efficiency). Three of three observations with the moderate head differential condition resulted in successful entry (100% entrance efficiency). During high head differential conditions, one of the two lamprey observed entered a fishway (50% entrance efficiency).

Four lamprey exhibited attach and burst behaviors (one during low (25%), two during moderate (50%) and one during high head differential conditions (25%)), all of which resulted in successful entry into the fishways. One of three lampreys that did not exhibit the former behavior successfully entered the fishway, under the moderate treatment condition. The other two lamprey that did not exhibit attach and burst behavior did not successfully enter the fishway.

Extremely low Columbia River basin lamprey runs in 2009 and 2010 resulted in few fish observed at Wells Dam (the ninth and last hydroelectric project on the Columbia River [river mile 516] with fish passage). Low sample sizes precluded statistical evaluation of these results. Nonetheless, operational modifications implemented in these two years of study suggest that lamprey entrance efficiency may be increased with lower head conditions. Pooling observations that occurred during reduced head differential treatments shows 80% (4 of 5) entrance efficiency compared to 50% (1 of 2) under the current operating condition (high condition). Study results suggest that reduced head differentials show promise in providing an environment conducive to upstream passage of lamprey.

3.0 GOALS, ASSUMPTIONS AND HYPOTHESES

3.1 Goals and Objectives

The goal of the 2013 Pacific lamprey study is to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    A. Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    B. Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*

A. Evaluate the enumeration efficiency, behavior and fish passage efficiency of the fish count station at Wells Dam using ¼ inch picketed leads and existing count windows.

3.2 Hypotheses

The following null and alternative hypotheses per each objective are as follows:

Objective 1A:

H_o: There is no difference in passage metrics (e.g., entrance efficiency,travel time, etc.) compared to other mainstem Columbia River projects.
H_{alt}: Passage metrics for lamprey differ compared to other mainstem Columbia River projects.

Objective 1B:

H_o: Flow differential has no effect on lamprey passage characteristics, with one entrance velocity treatment not providing improved entrance success than another entrance velocity treatment.
H_{alt}: Flow differential has an effect on lamprey passage characteristics, with one entrance velocity treatment providing better passage characteristics than another entrance velocity treatment.

Objective 2A:

H_o: The proportion of tagged lamprey passing the count window is similar to previous studies.
H_{alt}: The proportion of tagged lamprey passing the count window is dissimilar to previous studies.

H_o: The number of lamprey heard on antenna(s) upstream of the count window is the same as the number of tagged lamprey seen at the count window.
H_{alt}: The number of lamprey heard on antenna(s) upstream of the count window is different from the number of tagged lamprey seen at the count window.

4.0 METHODOLOGY

4.1 Fish Source

Beginning in July 2013, adult Pacific lamprey will be captured at Bonneville Dam. Weekly sampling events over a four-week period in July will be conducted with a capture goal of at least 25 fish per event[1]. In addition to fish captured at Bonneville Dam, up to twenty-five fish

[1] Actual number will be based on statistical power analysis but will be at least 125 fish. Final sample size will also need to be approved by fish managers in the lower Columbia River.

captured at Priest Rapids Dam will be utilized for the study, provided permission from Grant County PUD and approval by the Priest Rapids Fish Forum. Fish captured at Bonneville Dam will be greater than 550 g. Fish captured at Priest Rapids Dam will be greater than 450g. Using larger fish will help minimize tag burden and therefore minimize the potential for mortality and effects to behavior and swimming performance. This will allow for fish used in the study to behave and perform more similarly to untagged fish.

Collecting fish from Bonneville Dam has four primary advantages:

1. Adult lamprey counts at Wells Dam in recent years have been extremely low (i.e., ranging from 1 to 35 fish since 2006), therefore, capturing and tagging a sufficient number of fish at the Wells Project for the study is not feasible.
2. Past efforts to capture lamprey at Wells Dam have negatively biased the result of the studies as the lamprey traps were highly effective at preventing upstream ladder passage of lamprey.
3. Past lamprey trapping activities at Wells Dam have incidentally captured ESA-listed anadromous salmonid species currently covered under the Wells Habitat Conservation Plan (HCP).
4. Given the primary objective of the study (i.e., evaluation of lamprey passage behavior within the Wells fishway), acquiring fish that are within their active migration window ensures the highest probability of interaction with the Wells fishway and therefore, the greatest chances of collecting sufficient data necessary to make informed management decisions related to the future of lamprey passage activities at Wells Dam.

It is assumed that fish captured at and transported from Bonneville Dam and Priest Rapids Dam will be exhibiting upstream migratory behavior and will attempt to pass Wells Dam.
All fish captured will be transported to the Wells Fish Hatchery for a minimum 16-hour acclimation period prior to tagging. Since most fish losses from hauling stress are caused by poor water quality and improper handling (Wynne and Wurts 2011), appropriate handling and transport protocols will be developed to ensure study fish in good health are delivered to the Wells Fish Hatchery.

Only adult lamprey in healthy condition (e.g., no signs of injury, etc.) should be collected for transport. All captured fish should be immediately placed in covered hauling tanks via nets. No anesthetics will be used during trapping operations as this can produce a biological response similar to that caused by stress (Wynne and Wurts 2011).

Covered tank(s) of an appropriate volume (to transport up to 25 lamprey) will be used to avoid stressors and disease transmission related to overcrowding. Each tank will be filled with river water and water temperature and dissolved oxygen will be measured prior to transport. During transport, both temperature and dissolved oxygen will be checked hourly, levels recorded, and adjustments to equipment will be made to maintain pre-transport water quality conditions. A final evaluation of fish and water quality conditions and total transport time will be noted upon delivery to the Wells Fish Hatchery.

4.2 Tagging and Release Procedures

Tagging procedures will follow methods described in previous lamprey radio-telemetry studies conducted at Wells Dam (LGL and Douglas PUD 2008) and will consider recent advances in knowledge and understanding of fish health and condition (e.g., Cooke et al. 2011a; b). An effort will be made to minimize impacts to the biological and physiological condition of the study fish. Specific attention will be made to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

Study fish will be tagged with model NTC-4-2L Nano Tags (Lotek® Newmarket, Ontario) or an equivalent providing less than 0.5% tag burden (tag mass/fish mass) and sufficient tag life. Tags have an expected life of 162 days at a pulse rate interval (PRI) of 5.0 seconds. Tag dimensions are 16mm (length) by 4mm (height) by 6mm (width) and weight 1.10 grams in air. In addition, each fish will be given a full-duplex passive integrated transponder (PIT) tag with tag dimensions of 12mm by 2.12mm and weighing 0.1 grams. Total combined weight of both tags is 2.2 grams and a tag burden of less than 1% of body mass is proposed. Brown et al. (2006) noted that 4% is considered an acceptable burden for tagging studies, however tag burden should be minimized whenever possible.

After surgery, fish will be transferred to a covered tank with flow through river water for recovery (approximately one hour). For the purposes of the study, it is assumed that tagged fish are representative of untagged fish.

All tagged fish that have recovered from the tagging process will be transported by truck in a 113 L cooler filled with river water. An air tank and air stones will be used to maintain oxygen levels. Of the 125 tagged lamprey, 100 (twenty-five from each weekly sampling event) will be released on the right bank of the Columbia River at RM 514, 1.5 miles below Wells Dam (Figure 2). The remaining twenty-five fish (six from three weekly sampling events and seven from one weekly sampling event) will be released above the Wells fishway adult fish trap (Pool 41 in the west fishway and Pool 40 in the east fishway) in order to support count window enumeration efficiency and count window passage route study objectives (Objectives 3 and 4).

Figure 2. Release location of tagged Pacific lamprey at Columbia River RM 514.

4.3 Radio-telemetry

The movement and passage of radio-tagged lamprey (Objectives 1 and 2) will be documented by a combination of underwater and aerial antenna arrays (dipole and yagi antennas) at Wells Dam. Tag testing conducted by the contractor during installation will drive antenna location and placement.

4.3.1 Fixed-Station Telemetry Array

Fixed-station telemetry receivers and associated arrays similar to those used in past lamprey studies at Wells Dam (LGL and Douglas PUD 2008) will be deployed to monitor movements of radio-tagged lamprey at the Wells Dam fishway entrances, at select locations throughout the fishway, and at the fishway exits. Underwater dipole antennas will be used in the fishways.

Antenna arrays for tagged fish monitoring will be deployed at the following locations within the Wells Project fishways:

1. Outside fishway entrance
2. Inside fishway entrance
3. Collection gallery side gate
4. Pool 1 (collection gallery exit)
5. Pool 3 (serves as detection efficiency location for Pool 1)
6. Pool below the adult fish trap (Pool 39 in the west fishway and Pool 38 in the east fishway)
7. Below the video count window (lower portion of Pool 64 below count window)
8. Above the video count window (upper portion of Pool 64 above count window)
9. Within the count window bypass area behind the picketed lead
10. Fishway exit (Pool 72 or 73)

Fixed station telemetry arrays will also be deployed at the mouths of Methow and Okanogan rivers. Douglas PUD will analyze data provided from a station operated by any stakeholder at the mouth of the Entiat or Wenatchee rivers. PTAGIS will also be queried to determine if any of the tagged lamprey were detected on in-stream PIT arrays in the Entiat and Methow, at the request of the Aquatic SWG.

4.4 Fishway Entrance Velocities

In order to evaluate tagged entrance efficiency Pacific lamprey under reduced Wells Project fishway entrance velocities, fishway operations treatment conditions at Wells Dam will be similar to operations for the DIDSON Study conducted in 2010 (Johnson et al. 2011); two head differential treatments including the existing high condition (0.48 m), and a moderate condition (0.31 m) will be implemented. A treatment condition will occur over a 7-hour block (19:00 through 02:00) and will be changed daily (i.e., existing high condition one day and moderate condition the next day). Although the proposed fishway operations and daily hours of operation are consistent with past flow reduction studies, the proposed operating scenario for this component of the study must be reviewed and approved by the HCP Coordinating Committee. Fishway operations treatments will begin upon first release of tagged fish below Wells Dam.

4.5 Count Station Efficiency

In recent years, the efficacy of using ¼ inch bar screen rather than ½ inch bar screen as a way to improve the enumeration of lamprey passing adult fishway has been tested at PUD and federal dams (LGL et al. 2011, ACOE 2011). The use of smaller leads has resulted in no reduction in travel time and has not increased the fallback rates within the fish ladders at those dams tested (Peery et al. 2011).

During the 2012-2013 Wells Dam ladder maintenance period (typically from December through January), new ¼ inch pickets will be installed within the east and west Wells Dam fishways. This study will evaluate the behavior and performance of these pickets in guiding adult lamprey through the existing fish count stations. The data collected during this study will be compared to

prior years of study at Wells Dam to determine whether lamprey enumeration can be enhanced without negatively impacting the lamprey passage rates and times within the upper fishways.

4.6 Statistical Analyses and Reporting

4.6.1 Passage Efficiency

Telemetry data collected during the study will be managed in an appropriate database where individual antennas will be grouped into "zones" that define pivotal areas of interest, such as individual fishway entrances and exits.

Numbers of fish detected at each zone will be summarized. Each time a fish is detected in a zone, the duration of the detection event (the amount of time the fish spent in the zone) will be calculated. The operational database will also be used to map movements of fish among zones. For every combination of among-zone movements, the number of times a fish performed that movement and the amount of time it took to get from one zone to the next, will be calculated.

Passage times will be calculated from benchmark dates and times corresponding to the first and last detection of a given radio-tagged lamprey at specific locations. At Wells Dam, benchmark times for lamprey passing the Project will be:

1. first detection at the fishway entrance (outside antenna). (Note that in order to be considered a treatment fish for the study, tagged fish must be detected at this location),
2. last detection at the fishway entrance (inside antenna),
3. first detection at the ‘end of collection gallery’ zone (Pool 1),
4. first detection at the ‘adult fishway/middle fishway section’ zone (Pool 39),
5. first detection at the ‘below video count window’ zone (lower portion of Pool 64),
6. first detection at the ‘above video count window’ zone (upper portion of Pool 64),
7. first detection at the ‘count window bypass’ zone,
8. last detection at the ‘count window pass’ zone – note same as #6,
9. first detection at the fishway exit (Pool 72 or 73), and
10. last detection at the fishway exit.

From these benchmark times, passage times can be calculated for the following segments:

1. Entrance passage time – Time 1 to 2
2. Collection gallery passage time – Time 2 to 3
3. Lower fishway passage time – Time 2 to 4
4. Passage from count window to exit – Time 5 to 10
5. Upper fishway passage time – Time 4 to 10
6. Project passage time – Time 1 to 10

To evaluate use of the count window bypass area, times can be calculated for the following segments:

1. Below count window to count window bypass – Time 5 to 7

2. Residence time in count window bypass area – Time 7 to 6
3. Count window bypass to exit – Time 7 to 10

The residence and passage times and route of passage (in count window area) for each radio-tagged lamprey will be determined by working backwards through a sequence of detections. The fishway of ultimate passage and the respective passage time will be determined by identifying a sequence of detections in the ascent of a fishway, starting with detections in a fishway exit zone.

4.6.2 Entrance Efficiency

Radio-telemetry data from entrance locations (i.e., outside and inside fishway entrance arrays) will be used to evaluate entrance efficiency of the two treatment conditions for fishway operations (i.e., existing and moderate). Tagged fish will be organized into release groups (4 weekly releases). The total number of tagged lamprey detected outside fishway entrances over the course of the study will serve as the total sample size for statistical analyses. Entrance efficiency will be calculated as the total number of successful entries of fish detected outside the fishway entrances under each treatment condition (head differential). During the course of the study, successful entry will be defined as either a detection by the arrays outside the fishway entrances followed by a subsequent detection by the arrays inside the fishway entrances or a detection on the array inside of the fishway entrance. Difference in entrance efficiency between the two treatment conditions will be evaluated using statistical methods developed with assistance from the University of Washington school of Aquatic and Fisheries Sciences.

4.6.3 Enumeration Efficiency

The efficiency of enumerating lamprey using the existing counting station will be evaluated by examining observations of tagged fish via radio-telemetry detections at the "above video count window" location (upper portion of Pool 64 above count window) and comparing them to observations below the count stations (upstream weir wall in Pool 62). Enumeration efficiency will be reported as a percentage (i.e., tagged fish observed above count station/tagged fish detected below count window X 100). Given the low numbers of lamprey that have passed Wells Dam in recent years, confounding observations due to high numbers of passage events at this location during the study is not expected. Each fish ladder can be treated separately prior to grouping entrance numbers. If no significant difference is detected between the two fish ladders then the information from both ladders will be pooled by head differential treatments. Release groups will also be pooled together if statistically justified (either by low sample size or by insignificance lack of significant differences).

4.7 Schedule and Reporting

Reporting will be a collaborative effort between the contractor and the Douglas PUD contract manager for this study. The schedule for study planning and development, implementation, draft reporting, review, and final reporting are presented in Table 1 below.

Table 1. Estimated timeline for study development, implementation and reporting.

		Parties Involved			
#	Item	PUD	ASWG	Contractor	Date
1	Study Plan Development	X			July-August 2012
2	Study Plan Review Aquatic SWG	X	X		August 2012
3	Study Plan Finalized	X	X		September 2012
4	Contracting	X		X	September-November 2012
5	Telemetry Installation	X		X	December 2012-January 2013
6	Study Implementation (capture, transport, tagging, monitoring)	X		X	June-October 2013
7	Draft Interim Report to PUD			X	January 2014
8	Draft Report to Aquatic SWG	X	X		February Meeting 2014
9	Final Report Integrating Changes from Review to PUD			X	March 2014
10	Final Report to Aquatic SWG	X	X		April Meeting 2014

5.0 REFERENCES

Army Corps of Engineers (ACOE). 2011. Pacific Lamprey Passage Improvements Implementation Plan. 2010 Final Progress Report. February 23, 2011.

Brown, R. S., D. R. Geist, K. A. Deters, and A. Grassell. 2006. Effects of surgically implanted acoustic transmitters .2% of body mass on the swimming performance, survival and growth of juvenile sockeye and Chinook salmon. Journal of Fish Biology 69: 1626–1638.

Cooke, S.J., C.M. Woodley, M.B. Eppard, R.S. Brown, and J.L. Nielsen. 2011a. "Advancing the surgical implantation of electronic tags in fish: a gap analysis and research agenda based on a review of trends in intracoelomic tagging effects studies." Reviews in Fish Biology and Fisheries 21(1):127-151. doi:10.1007/s11160-010-9193-3

Cooke, S.J., G.N.Wagner, R.S. Brown, and K.A. Deters. 2011b. "Training considerations for the intracoelomic implantation of electronic tags in fish with a summary of common surgical errors." Reviews in Fish Biology and Fisheries 21(1):11-24. doi:10.1007/s11160-010-9184-4

Johnson, P.N., B. Le, and J.G. Murauskas 2010. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Johnson, P.N., B. Le, and B. Patterson. 2011. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL Limited, Public Utility District No. 1 of Douglas County (Douglas PUD). 2008. Adult Pacific Lamprey Passage and Behavior Study Aquatic Issue 6.2.1.3. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL, Cramer Fish Sciences, Blue Leaf Environmental, and Long View Associates. 2011. Assessment of Pacific Lamprey Behavior and Passage Efficiency at Priest Rapids and Wanapum Dams. Prepared for Public Utility District No. 2 of Grant County.

Loge, F., C. Caudill, D. Thompson, and C. Boggs. 2011. Video Monitoring to Determine Pacific Lamprey Ladder Escapement and Behavior at McNary and Ice Harbor Dams. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Nass, B.L., C. Sliwinski, D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Techniques, 2004. Report prepared by LGL Limited, Sidney, B.C. Canada, for Public Utility District No. 1 of Douglas County, WA.

Peery, C., B. McIlraith, D. Thompson, and F. Loge. 2011. Use of Non-Invasive Methods to Evaluate Pacific Lamprey Counts and Passage Behavior at John Day Dam – 2011. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Robichaud, D., B. Nass, and Public Utility District No. 1 of Douglas County (Douglas PUD). 2009. Adult Pacific Lamprey Passage and Behavior Study. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Wynne, F.S. and W.A. Wurts. 2011. Transportation of Warmwater Fish: Equipment and Guidelines. SRAC Publication No. 390. January 2011.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: November 13, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the October 10, 2012 Aquatic SWG Conference Call

The October Aquatic Settlement Work Group (SWG) met by conference call on Wednesday, October 10, 2012, from 10:00 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Douglas PUD will provide their draft aquatic nuisance species (ANS) educational pamphlets to the Aquatic SWG for review prior to making the pamphlets available to the general public (Item IV-2).
2. Kristi Geris will note in the Aquatic SWG October 10, 2012 meeting minutes the HCP Coordinating Committees' (including the National Marine Fisheries Service') approval of fishway modifications to improve Pacific lamprey enumeration at Wells Dam (Item IV-3).
3. The Aquatic SWG November 2012 meeting date was rescheduled to be held by conference call on Tuesday, November 13, 2012 at 10:00 am (Item V-1).

II. Summary of Decisions

1. There were no Statements of Agreement (SOAs) approved at today's meeting.

III. Agreements

1. The 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan was approved by Aquatic SWG representatives present (Item IV-3). *The HCP Coordinating Committees' conditionally approved the plan at the September 25, 2012 Coordinating Committees meeting, subject to NMFS's review of engineering plans. NMFS approved the plan by email on October 3, 2012*.

IV. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe): Mike Schiewe welcomed the Aquatic SWG members and opened the meeting (attendees are listed in Attachment A to these minutes). Schiewe reviewed the agenda and asked for additional agenda items. No additions were requested by those present.

   Kristi Geris noted that Andrew Gingerich requested the opportunity to clarify a statement he made during the September conference call regarding the Wells Dam fish bypass and water quality 2012 wrap-up. Gingerich said that the 115 percent total dissolved gas (TDG) standard he had characterized as an hourly standard is instead a 12C-high standard. Steve Lewis requested a minor revision to the Pacific Lamprey Passage Study Plan discussion, noting that it was the entire Aquatic SWG that made the recommendation, and not just the U.S. Fish and Wildlife Service (USFWS). Geris reported that all other comments and revisions received on the draft September 12, 2012 conference call minutes had been incorporated. The Aquatic SWG members present approved the September 12, 2012 conference call minutes as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **Aquatic Nuisance Species Update** (Chas Kyger): Chas Kyger presented the Douglas PUD 2012 ANS monitoring findings (Attachment B) that were distributed to the Aquatic SWG by Kristi Geris on October 9, 2012.

   Kyger said zebra and quagga mussels were sampled using plankton tows, and 12 samples were sent for analysis this week to Washington Department of Fish and Wildlife (WDFW). He noted that a few settlement substrate samples were lost due to high flows and/or continued vandalism; he also noted that three substrates were replaced with tamper-resistant hardware. Kyger reported that no zebra or quagga mussels have been found in samples collected in the Wells Project to date.

   Kyger said no formal survey was conducted for macrophytes in 2012; however, monitoring for Eurasian watermilfoil (*Myriophylulum spicatum;* EWM) was performed as part of the Wells Project Crayfish Distribution Study. Kyger said EWM was not observed to be dominant at any sample sites; however, as a pre-emptive action, on August 16, 2012, the herbicide diquat dibromide was applied at Pateros, Brewster, and Bridgeport swim areas.

   As described in the Wells Project Crayfish Distribution Study Plan, Kyger said Douglas PUD deployed crayfish traps for more than 800 hours at five locations throughout the Wells Project, resulting in zero crayfish captured. He said 19 sites and more than 23 sampling hours of active capture resulted in the capture of seven non-native northern crayfish near the mouth of the Okanogan River.

   Kyger said that two key conclusions arose from these efforts: 1) Douglas PUD traps were ineffective at capturing crayfish; and 2) two species of crayfish appear to inhabit the

Wells Project, both in low abundance. He said Douglas PUD has started opportunistic crayfish monitoring during other routine field activities, including temperature probe maintenance. Since September 2012, five native signal crayfish were captured at Brewster Bridge. Kyger said a database is being developed to track crayfish presence, species type, habitat use, and other applicable details regarding crayfish life history in the Wells Project area. Crayfish will be monitored during other fish studies and reservoir projects and this data will be added to the developed database.

Kyger said invasive species control educational pamphlets are currently being developed for distribution to the general public. He said Douglas PUD plans to make these pamphlets available at boat launches and public use areas by spring 2013.

Steve Lewis asked if the aquatic herbicide treatment was successful, and Kyger said the application was effective within about one week. Andrew Gingerich added that herbicide treatment is required under the Douglas PUD Recreation Management Plan. He said the public was notified, and appropriate permitting procedures were completed prior to application. Lewis asked how the decision was made to use herbicides to control EWM. Gingerich said that Douglas PUD discussed several potential methods for controlling EWM with the Aquatic SWG approximately one year ago when Jennifer Parson from Washington State Department of Ecology (Ecology) provided a presentation to the SWG. Methods discussed included herbicides, mechanical harvesting, and shade cloths. The application of herbicide was determined to pose the least risk given the fragment and spreading nature of harvesters and the removal of habitat using cloths. Kyger added that diquat dibromide was the recommended herbicide for treatment. Gingerich said all sites were treated on the same day, and he added that Scott Kreiter of Douglas PUD could provide further details on the decisions made regarding this matter.

Pat Irle asked if any new approaches were planned to sample crayfish in 2013. Kyger said that because trapping and active capture were both found to be ineffective, Douglas PUD plans to shift primarily to opportunistic sampling during other routine activities such as fish ladder and temperature probe maintenance. Irle suggested that during future sampling, patterns of when, where, and how crayfish are captured should be tracked. Kyger said those details will be tracked in the monitoring database. Patrick Verhey suggested returning to the mouth of the Okanogan River where crayfish were previously captured to determine if the same, or new, species are present. Kyger said additional crayfish monitoring is already planned for the mouth of the Okanogan River possibly during Douglas PUD's 2013 subyearling study activities that take place near that area.

Irle suggested that the Aquatic SWG be given the opportunity to review the draft ANS educational pamphlets before they are finalized and distributed. Gingerich confirmed that they would be made available to the Aquatic SWG for review.

3. **Pacific Lamprey Enumeration and Passage Study Update** (Andrew Gingerich)**:** Andrew Gingerich recapped that at the last Aquatic SWG meeting, Douglas PUD requested that the Aquatic SWG approve the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan at the next meeting (Attachment C). Gingerich added, however, that in an email distributed to the Aquatic SWG by Kristi Geris on September 21, 2012, Douglas PUD instead requested an email approval of the plan to ensure ample time for planning and preparation for the proposed modifications and study requirements. He said comments from USFWS and Ecology were received and incorporated into the study plan; however, no other comments or revisions were received.

   Mike Schiewe polled the Aquatic SWG for approval of the study plan, and the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan was approved by all Aquatic SWG representatives present. Schiewe added that the proposed modifications to improve Pacific lamprey enumeration at Wells Dam were introduced to the HCP Coordinating Committees last month, and the Coordinating Committees conditionally approved the plan, subject to NMFS' review of engineering plans. Schiewe said Bryan Nordlund reviewed the plans and determined that, even though the new picketed leads will have bars spaced closer together, because the bars will be narrower, the surface area of the screens will be less than that of the existing screens; therefore, the new picketed leads will cause minimal change in velocity through the counting window. Therefore, NMFS approved the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan by email on October 3, 2012. Gingerich added that, to date, three lamprey have been counted at Wells Dam; and as of the last time he checked, approximately 260 lamprey had been counted at Rocky Reach Dam, but that count may have increased since last checked.

   Steve Lewis requested that the Coordinating Committees' and NMFS' approval of the 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan be included in the meeting minutes, and Schiewe indicated that they would be incorporated.

4. **Bull Trout Letter to Postpone Study at Twisp Weir** (Andrew Gingerich): Andrew Gingerich recapped that Douglas PUD and USFWS is considering postponing the radio telemetry (RT) study at Twisp Weir in the first year of the new Federal Energy Regulatory Commission (FERC) license, and coupling the study with a more comprehensive adult passage study at Wells Dam in year 5. Gingerich recalled the path forward discussed at the September Aquatic SWG meeting for Douglas PUD and USFWS to develop a draft letter to FERC requesting delay of the Bull Trout RT Study at the Twisp Weir until 2016. He said that although the letter to FERC will be from USFWS, Aquatic SWG committee members will be copied to show the request was a vetted decision.

   Gingerich said Douglas PUD recently contacted FERC, and was told to postpone sending the letter because the new license is about to be issued. Gingerich proposed waiting

until after the new license is issued to send FERC the letter requesting postponement of the Bull Trout RT Study at the Twisp Weir. The USFWS agreed with this proposal.

5. **Douglas PUD FERC License Update** (Andrew Gingerich): Andrew Gingerich said that FERC has not publicly disclosed information on the renewal of Douglas PUD's FERC license; however, Douglas PUD's suspicion is that the license issuance is in the final stages at FERC. Gingerich said Douglas PUD hopes to hear more by the end of this month or early November.

6. **Draft Proposal and Recommendations for No Net Impact, Regional Cooperation and Recovery of Pacific Lamprey in the Mid-Upper Columbia River** (Bob Rose): Bob Rose said that Kristi Geris distributed the Draft Proposal and Recommendations for No Net Impact (NNI), Regional Cooperation, and Recovery of Pacific Lamprey in the Mid-Upper Columbia River (Attachment D) to the Aquatic SWG on October 4, 2012. Rose said that the proposal had already been introduced and discussed among the other Mid-Columbia forums and PUDs (i.e., Rocky Reach Fish Forum [RRFF], Priest Rapids Fish Forum [PRFF]; Chelan PUD and Grant PUD, respectively). Rose said he now wanted to introduce the proposal to the Aquatic SWG and Douglas PUD, and further discuss the proposal at the Aquatic SWG November meeting. He clarified that the term "NNI" is not in the Douglas PUD settlement agreement, and he is open to revising the term if preferred.

   Rose reviewed the proposal, noting that there is a preponderance of evidence throughout the Columbia River basin clearly indicating that mainstem hydroelectric projects do in fact impede or prevent adult passage past dams with a direct or indirect negative effect. Rose acknowledged that predation on juveniles may also be significant; however, he said empirical data indicate that passage at dams poses a huge impact. Rose said that within the next few months, he plans to continue introducing the concepts outlined in the proposal, and eventually plans to request that the three PUDs convene together for a coordinated discussion.

   Rose said the goal is to have regional participation in developing a plan that is suitable for immediate implementation, and that can be more fully developed in the years following initial implementation. Rose said several agencies have already submitted letters of support, and the Columbia River Inter-Tribal Fish Commission (CRITFC) is already developing a monitoring strategy to implement in 2013. Rose added that the concepts in this proposal have been discussed for about one year, and now seems to be an opportune time for this type of effort.

   Patrick Verhey said that WDFW supports the proposal and recommendations, and is looking forward to collaborating on this effort. Steve Lewis asked about a timeline for finalizing the proposal; Rose said he anticipates that by February or March 2013, the document should be fairly well defined.

Andrew Gingerich said Douglas PUD has not yet had an opportunity to discuss the document; however, an initial question is how the proposed actions fit within the Pacific Lamprey Management Plan (PLMP) and the Aquatic Settlement Agreement (ASA) in totality. Gingerich added that Douglas PUD's PLMP also proposes identifying problem areas if and where they exist and making modifications to improve lamprey passage. In addition, Gingerich noted that Douglas PUD would also coordinate on a regional level through the sharing of technical information as was intended in all management plans found within the ASA; but not that programs at other PUDs be identical to the PLMP and the ASWG processes. Gingerich said that Douglas PUD appreciates the opportunity to review the document and the enthusiasm behind the effort; and, as Rose suggested, Douglas PUD supports continuing discussion at the Aquatic SWG November meeting.

7. **WDFW Major Fishing Regulation Cycle** (Patrick Verhey): Patrick Verhey said WDFW wanted to make sure the Aquatic SWG members were aware that they have the opportunity to comment on the proposed changes to WDFW's fishing regulation cycle. Verhey specifically noted the proposals to changes to the warm-water fishing regulations above Wells Dam.

   Verhey reviewed the WDFW fishing regulations, rules, and proposals web link that was distributed to the Aquatic SWG by Kristi Geris on October 9, 2012. He noted upcoming public meetings scheduled for the evening of October 10, 2012, and October 11, 2012, at Montesano City Hall in Montesano, Washington, and at East Valley Fire Station in Yakima, Washington, respectively. Verhey said Chad Jackson asked that Aquatic SWG members contact him directly with any questions.

   Andrew Gingerich said Douglas PUD had an opportunity to review the new rules, particularly Rule Change No. 9 under the Eastern Washington and Columbia Region Freshwater category, regarding removing or modifying daily limits on non-native species. Gingerich said the rule seems to be a positive step forward in WDFW's mission to support Endangered Species Act (ESA)-listed salmon and steelhead recovery in the Columbia River Basin; and Douglas PUD is discussing developing a letter of support for this action.

V. Next Meetings

1. Mike Schiewe said that between the Thanksgiving holiday and other scheduled commitments, the HCP Hatchery Committees meeting has been rescheduled to November 14, 2012. He said it is possible to carry out both the Hatchery Committees meeting and Aquatic SWG meeting the same day; however, Schiewe asked if there was a preference to reschedule the Aquatic SWG November meeting. Aquatic SWG members present agreed to reschedule the Aquatic SWG November 2012 meeting date to Tuesday, November 13, 2012 at 10:00 am.

2. Upcoming meetings: ***November 13, 2012 (conference call); December 12, 2012 (conference call); and January 9, 2013 (conference call)***.

List of Attachments

Attachment A – List of Attendees

Attachment B – Douglas PUD 2012 ANS Monitoring Presentation

Attachment C – 2013 Wells Dam Adult Lamprey Passage and Enumeration Study Plan

Attachment D – Draft Proposal and Recommendations for NNI, Regional Cooperation, and Recovery of Pacific Lamprey in the Mid-Upper Columbia River

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Admin./ Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Jason McClellen	SWG Technical Rep.	Colville Confederated Tribes
Bob Rose	SWG Technical Rep.	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Keith Hatch	Observer	Bureau of Indian Affairs

Douglas ANS monitoring 2012

1. Zebra/Quagga Mussels
   - Monitoring/early detection

2. Macrophytes
   - Distribution update (rec/swimming areas)

3. Crayfish
   - Distribution study in Wells Project 2012

4. Information and Education
   - Provide public with info on preventing spread of ANS

Zebra & Quagga

1. Veliger plankton tows
   - 12 samples from 3 locations taken in 2012
     - Sent to WDFW for analysis

2. Settlement substrates
   - Substrates examined 4 times (10 samples total) this year with no presence of adults
   - Continued vandalism at some sites
     - Replaced 3 substrates with tamper-proof hardware

No Zebras or Quagga mussels in Wells Project to date

Macrophytes

Douglas Rec. Management Plan requires management of aquatic veg. in rec. areas: Pateros, Brewster, and Bridgeport

Eurasian Watermilfoil *(Myriophylulum spicatum)* – Aquatic nuisance species of concern in ANSMP

Photo: Bridgeport swimming area Sept 2011

- Last formal survey on Sept 30th 2011 evaluated dominance in swimming areas
  - n = 26 substrate samples following Le and Kreiter 2005
  - Results summarized in a memo dated Oct 5th 2011
  - EWM: not dominant in any of the samples. Sub-dominant in 15% of the samples
  - Herbicide (Diquat dibromide) treatment applied in 2012 at swimming areas
    - Pateros, Brewster, and Bridgeport swim areas - Aug 16, 2012

- 2012 – Monitoring during other activities
  - Crayfish study – EWM not dominant at any sample sites

Crayfish

- Northern crayfish (*Orconectes virilis)* found in the Brewster swimming area late June 2011
  - Dr. J. Olden (UW) confirmed its ID via pictures
- Baseline Crayfish Distribution Data
  - Crayfish study conducted end of August through mid September
  - 44 overnight trap sets; > 800 trap hours
  - Locations throughout Wells Project
  - No crayfish captured in traps

Wells Project July 2011- Northern Crayfish

Native Signal Crayfish (*Pacifasticus leniusculus*)

Crayfish

- Crayfish active-capture
  - Search for crayfish near shore turning rocks
  - 19 sites throughout Wells Project, >23 sampling hours
  - 7 non-native Northern crayfish captured near mouth of Okanogan River
  - Traps prove to be ineffective at capturing crayfish despite trapping in locations where crayfish were observed by active fishing
  - Two species of crayfish appear to inhabit the Wells project both in low abundance based on sampling

Crayfish

- Crayfish Monitoring
  - Crayfish captures, database will be developed and their presence, species, habitat use, and time of year will be recorded during other fish studies
  - 5 native signal crayfish captured at Brewster bridge during temperature probe maintenance (September 2012)

Invasive Species Control – Information and Education

- Inform the public on how to prevent the spread of invasive species
  - Signs at boat launches
  - Pamphlets in development
    - Make available at boat launches/public use areas (Spring 2013)

Going forward

- Continued veliger tows, and substrate samples for Z and Q mussels in 2013
- Aquatic veg. monitoring and control
- Crayfish monitoring during other activities
- Placement of educational pamphlets
- Participation in regional ANS activities and forums

ADULT LAMPREY PASSAGE AND ENUMERATION STUDY, WELLS DAM - 2013

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

September 21, 2012

Prepared by:
Long View Associates and
Douglas County Public Utility District

Prepared for:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

For copies or questions related to this study plan, contact:

Public Utility District No. 1 of Douglas County
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Table of Contents

List of Figures

List of Tables

ABSTRACT

In an effort to better understand Pacific lamprey (*Lampetra tridentata*) behavior at Wells Dam, Public Utility District No. 1 of Douglas County (Douglas PUD), in consultation with the Aquatic Settlement Work Group, is proposing to conduct a multi-faceted adult lamprey passage study at Wells Dam in 2013. This study is intended to collect information necessary to implement Objective 1 of the Pacific Lamprey Management Plan (PLMP) found in the Aquatic Settlement Agreement (ASA).

The goal of the study is to evaluate the effect of the Wells Hydroelectric Project (Wells Project) and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    - Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    - Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
    - Evaluate the enumeration efficiency, behavior and fish passage efficiency of the fish count station at Wells Dam using 11/16th inch picketed leads and existing count windows.

Implementation of the study is consistent with requirements contained within the Wells Project PLMP. The study results are intended to support the goal of the PLMP, which is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license.

1.0 INTRODUCTION

1.1 Aquatic Settlement Agreement and Pacific Lamprey Management Plan

During the relicensing process for the Wells Hydroelectric Project (Wells Project or Project), Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with federal, state and tribal relicensing participants, developed six Aquatic Resource Management Plans in support of a comprehensive Aquatic Settlement Agreement (ASA). The Pacific Lamprey Management Plan (PLMP) is one of the six Aquatic Resource Management Plans contained within the ASA that directs the implementation of Protection, Mitigation, and Enhancement measures (PMEs) for Pacific lamprey (*Lampetra tridentata*) during the term of the new Wells Project operating license.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license. Objective 1 of the PLMP is to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. Pursuant to this objective, Douglas PUD is proposing to conduct an adult active tag study to 1) collect additional information on the passage characteristics and behavior of adult lamprey migrating through the Wells Project fishways (section 4.1.6 of the PLMP); and 2) to evaluate enumeration efficiency in the vicinity of the Wells Project fishway count windows (section 4.1.3 of the PLMP) toward identifying alternatives to improve adult lamprey count accuracy.

2.0 BACKGROUND

2.1 Wells Project Pacific Lamprey Passage Studies

As part of the Wells Project relicensing, Douglas PUD conducted several adult lamprey passage studies (2001-2003, 2007, and 2008) to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream migration and behavior as it relates to fishway passage, timing, and downstream passage events through the dam.

2.1.1 2001-2003 Pacific Lamprey Radio-telemetry Study

In 2004, Douglas PUD contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). Only 18 of these tagged fish were detected upstream at Wells Dam and many of the radio tags detected were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of

150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.1.2 2007-2008 Pacific Lamprey Radio-telemetry Study

In 2007, Douglas PUD contracted with LGL Limited to conduct another active tagging study. Twenty-one lamprey were captured, radio-tagged, and released from August to October. Tags used in this study had an expected tag life of 87 days. Of the twenty-one fish, 10 were released into the tailrace and 11 were released directly into the middle fishway section of the Wells fishways. One tailrace-released fish was recaptured and re-released into the fishway, bringing total in-ladder releases to twelve. Ten of the 12 (83%) lamprey released into the middle fishway section successfully ascended, with a median upper fishway passage time of 7.9 hours. Seven of the 10 (70%) lamprey released into the tailrace were detected at the outside of a fishway entrance. Only one of these seven (14%) lamprey entered into the collection gallery and ascended the fishway with a lower fishway passage time of 6.1 hours and upper fishway passage time of 5.9 hours.

During the 2007 study, a total of 11 radio-tagged adult Pacific lamprey passed the fish counting facilities in both fishways. Nine of these fish were detected by an antenna monitoring the count window bypass area (i.e., an area in the fishway accessed through a picketed lead just downstream of the count window which allows lamprey to migrate through the fish counting facilities undetected; Figure 1), although 3 fish were detected for less than 20 seconds and probably did not completely enter the bypass area. Eight of these lamprey were not observed at the count window, and 2 fish had zero detections on the above count window antenna (LGL and Douglas PUD 2008). The results suggested that visual detections at the count windows could be significantly lower (e.g., under estimating by 73% according to these data) than the actual total number of lamprey passing the fish counting facilities.

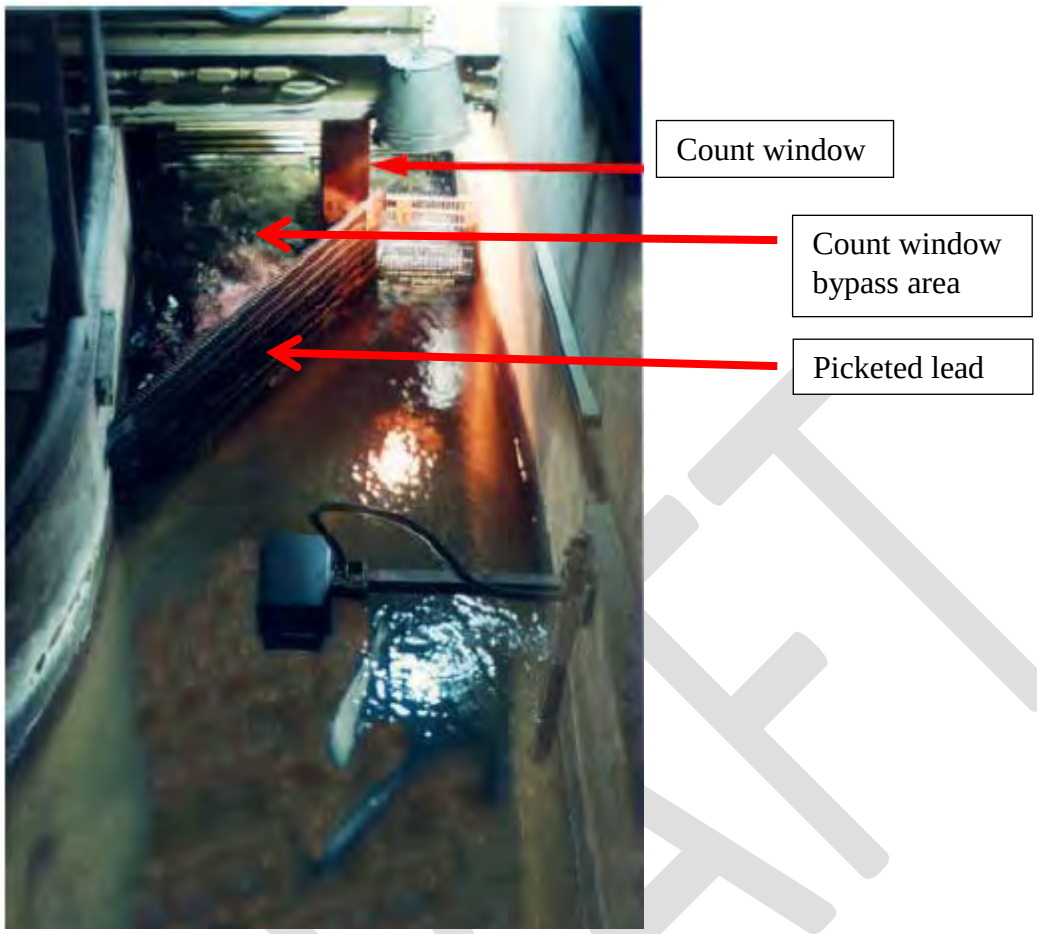

Figure 1. **Picketed lead immediately downstream of the fishway count window. Behind the picketed lead is the count window bypass area.**

In 2008, Douglas PUD conducted another adult lamprey passage study where 38 radio-tagged adult Pacific lamprey were released in the tailrace (n= 18) and fishways (n=20) of Wells Dam to continue an evaluation of behavior and passage performance, and to identify potential areas of passage impediment. In 2008, 15 lamprey approached the fishway from the tailrace, five (33%) of which entered the fishway. Movements within the collection gallery indicated that lamprey were able to move relatively unrestricted by flows. At least 11 of 19 (58%) lamprey which volitionally entered or were released in the collection gallery ascended to the lamprey trapping area in the middle fishway section. However, modifications to increase lamprey trapping efficiency effectively obstructed migration and 12 of 14 fish (86%) that encountered the lamprey traps were ultimately blocked. This artifact likely biased lower fishway passage times significantly. Upper fishway passage times of four radio-tagged lamprey that ascended past the trapping area were relatively fast (< 4 hours), except for one fish that ceased upstream movement during daylight hours. No fallbacks of fish that successfully ascended the fishway were observed for the second consecutive year. Overall, results indicate that any potential areas of impediment are restricted entirely to the entrance and lamprey trapping facility, as upper fishway passage efficiency was 100% for the second consecutive year.

During the 2008 study, of the four tagged lamprey that ascended into the upper fishway section, three bypassed the count window via the count window bypass area supporting the 2007 findings that a majority of lamprey that ascend Wells Dam may be uncounted (Robichaud et al. 2009). As concluded in the 2007 study, use of the count window bypass area appears to be an enumeration issue, rather than a passage concern (i.e., tagged fish generally move through this portion of the fishway efficiently and at above average speeds). The study recommended that further consideration should be given regarding effective monitoring of lamprey passage through the count window bypass area depending upon the importance of accurate counts at the Wells Project (LGL and Douglas PUD 2008).

The results of the 2007-2008 studies indicated that: 1) adult lamprey are having difficulty negotiating the fishway entrance; 2) lamprey passage in the fishway can be inhibited by the installation of lamprey traps on the bottom orifices within the middle section of the fishway (traps were removed in 2009); 3) lamprey are passing the middle and upper fishway sections at high rates, in a reasonable amount of time, and with negligible drop back within the ladder; and 4) a large proportion of the adult lamprey are bypassing the adult salmon counting windows (LGL and Douglas PUD 2008).

A comprehensive report was produced in February of 2009 (Robichaud et al. 2009). One of the recommendations by the researchers was to implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s) during the hours of peak lamprey activity (i.e., nighttime) and within the primary migratory period at Wells Dam (August-September).

2.1.3 2009-2010 Wells Project DIDSON Studies

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic Settlement Work Group (Aquatic SWG), prepared a plan to implement and evaluate measures to enhance entrance efficiency of adult Pacific lamprey at Wells Dam (Johnson et al. 2011). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam.

DIDSON units were deployed at Wells Dam fishway entrances during the peak of historic Pacific lamprey migration in 2009 (20 August to 24 September) and 2010 (7 August to 30 September). DIDSON was used to sample lamprey behavior and upstream passage events along the entire width of the fishway entrances and 1.3 m of vertical coverage above the sills (about 26% of the wetted vertical opening). Lamprey passage was examined relative to variable head differential treatments and entrance velocities. In 2009, three head differential treatments were tested: existing high (0.48 m; or 3.0 m/sec), moderate (0.31 m; or 2.4 m/sec) and low condition (0.15 m; or 1.8 m/sec) (Johnson et al. 2010). In 2010, only two of the 2009 treatments were used: existing high, and the moderate head differential conditions (Johnson et al. 2011). Treatments were grouped in 3-day blocks and lasted four hours each evening in 2009 (21:00 through 00:59). In 2010, the treatments were paired and lasted eight hours each evening (17:00 through 00:59). Data collected during the treatment periods were reviewed and all lamprey observations were described.

Combining both years, a total of seven lamprey observations were recorded where lamprey were observed to encounter the entrance sill heading upstream (N = 5 in 2009; and N = 2 in 2010). Five of these seven observations were in the east fishway and two were in the west fishway. Overall, five of the seven observations showed successful entry into the fishways (71%). During reduced head differential treatments, five observations were recorded with four of the five resulting in successful entry (80% efficiency). Three of three observations with the moderate head differential condition resulted in successful entry (100% entrance efficiency). During high head differential conditions, one of the two lamprey observed entered a fishway (50% entrance efficiency).

Four lamprey exhibited attach and burst behaviors (one during low (25%), two during moderate (50%) and one during high head differential conditions (25%)), all of which resulted in successful entry into the fishways. One of three lampreys that did not exhibit the former behavior successfully entered the fishway, under the moderate treatment condition. The other two lamprey that did not exhibit attach and burst behavior did not successfully enter the fishway.

Extremely low Columbia River basin lamprey runs in 2009 and 2010 resulted in few fish observed at Wells Dam (the ninth and last hydroelectric project on the Columbia River [river mile 516] with fish passage). Low sample sizes precluded statistical evaluation of these results. Nonetheless, operational modifications implemented in these two years of study suggest that lamprey entrance efficiency may be increased with lower head conditions. Pooling observations that occurred during reduced head differential treatments shows 80% (4 of 5) entrance efficiency compared to 50% (1 of 2) under the current operating condition (high condition). Study results suggest that reduced head differentials show promise in providing an environment conducive to upstream passage of lamprey.

2.1.4 2011-2012 Lamprey Operations

As a best management practice in 2011 and 2012 Douglas PUD operated the fishways with a 1.0 ft head differential during the hours 17:00 and 00:59, once five lamprey had been counted at Rocky Reach Dam and continuing through September 30. Beyond those hours, fishway collection-gallery operations should be maintained at the “normal” head differential of 1.5 feet.

3.0 GOALS, ASSUMPTIONS AND HYPOTHESES

3.1 Goals and Objectives

The goal of the 2013 Pacific lamprey study is to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*

A. Evaluate passage efficiency of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
B. Evaluate travel time of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
C. Evaluate radio-tagged adult lamprey behavior through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
D. Compare adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities to entrance efficiencies at non-reduced velocities.

2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
   A. Compare the enumeration efficiency of adult lamprey at the fish count station at Wells Dam using new, $11/16^{th}$ inch picketed leads to results of previous studies with the old picketed leads. .
   B. Compare adult lamprey behavior at the fish count station with old picketed leads to behavior at count windows with new, $11/16^{th}$ inch picketed leads.

3.2 Hypotheses

The following null and alternative hypotheses per each objective are as follows:

Objectives 1A, B and C:

H_o: There is no difference in passage metrics (i.e., passage efficiency, travel time and behavior) compared to other mainstem Columbia River projects.
H_{alt}: Passage metrics for lamprey differ compared to other mainstem Columbia River projects.

Objective 1D:

H_o: Flow differential consisting of one entrance velocity treatment has no effect on entrance success over another entrance velocity treatment.
H_{alt}: Flow differential consisting of one entrance velocity treatment has an effect on improving entrance success over another entrance velocity treatment.

Objective 2A:

H_o: The proportion of tagged lamprey passing the count window is similar to previous studies.
H_{alt}: The proportion of tagged lamprey passing the count window is dissimilar to previous studies.

H_o: The number of lamprey heard on antenna(s) upstream of the count window is the same as the number of tagged lamprey seen at the count window.
H_{alt}: The number of lamprey heard on antenna(s) upstream of the count window is different from the number of tagged lamprey seen at the count window.

4.0 METHODOLOGY

4.1 Fish Source

Beginning in July 2013, adult Pacific lamprey will be captured at Bonneville Dam. Weekly sampling events over a four-week period in July will be conducted with a capture goal of at least 25 fish per event[1]. In addition to fish captured at Bonneville Dam, up to 25 fish captured at Priest Rapids Dam will be utilized for the study, provided permission from Grant County PUD and approval by the Priest Rapids Fish Forum. Fish captured at Bonneville Dam will be greater than 550 grams (g). Fish captured at Priest Rapids Dam will be greater than 450g. Using larger fish will help minimize tag burden and therefore minimize the potential for mortality and effects to behavior and swimming performance. This will allow for fish used in the study to behave and perform more similarly to untagged fish.

Collecting fish from Bonneville Dam has four primary advantages:

1. Adult lamprey counts at Wells Dam in recent years have been extremely low (i.e., ranging from 1 to 35 fish since 2006), therefore, capturing and tagging a sufficient number of fish at the Wells Project for the study is not feasible.
2. Past efforts to capture lamprey at Wells Dam have negatively biased the result of the studies as the lamprey traps were highly effective at preventing upstream ladder passage of lamprey.
3. Past lamprey trapping activities at Wells Dam have incidentally captured ESA-listed anadromous salmonid species currently covered under the Wells Habitat Conservation Plan (HCP).
4. Given the primary objective of the study (i.e., evaluation of lamprey passage behavior within the Wells fishway), acquiring fish that are within their active migration window ensures the highest probability of interaction with the Wells fishway and therefore, the greatest chances of collecting sufficient data necessary to make informed management decisions related to the future of lamprey passage activities at Wells Dam.

It is assumed that fish captured at and transported from Bonneville Dam and Priest Rapids Dam will be exhibiting upstream migratory behavior and will attempt to pass Wells Dam.
All fish captured will be transported to the Wells Fish Hatchery for a minimum 16-hour acclimation period prior to tagging. Since most fish losses from hauling stress are caused by poor water quality and improper handling (Wynne and Wurts 2011), appropriate handling and transport protocols will be developed to ensure study fish in good health are delivered to the Wells Fish Hatchery.

Only adult lamprey in healthy condition (e.g., no signs of injury, disease, etc.) should be collected for transport. All captured fish should be immediately placed in covered hauling tanks

[1] Actual number will be based on statistical power analysis but will be at least 125 fish. Final sample size will also need to be approved by fish managers in the lower Columbia River.

via nets. No anesthetics will be used during trapping operations as this can produce a biological response similar to that caused by stress (Wynne and Wurts 2011).

Covered tank(s) of an appropriate volume (to transport up to 25 lamprey) will be used to avoid stressors and disease transmission related to overcrowding. Each tank will be filled with river water and water temperature and dissolved oxygen will be measured prior to transport. During transport, both temperature and dissolved oxygen will be checked hourly, levels recorded, and adjustments to equipment will be made to maintain pre-transport water quality conditions. A final evaluation of fish and water quality conditions and total transport time will be noted upon delivery to the Wells Fish Hatchery.

4.2 Tagging and Release Procedures

Tagging procedures will follow methods described in previous lamprey radio-telemetry studies conducted at Wells Dam (LGL and Douglas PUD 2008) and will consider recent advances in knowledge and understanding of fish health and condition (e.g., Cooke et al. 2011a; b). An effort will be made to minimize impacts to the biological and physiological condition of the study fish. Specific attention will be made to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

Study fish will be tagged with model NTC-4-2L Nano Tags (Lotek® Newmarket, Ontario) or an equivalent providing less than 0.5% tag burden (tag mass/fish mass) and sufficient tag life. Tags have an expected life of 162 days at a pulse rate interval (PRI) of 5.0 seconds. Tag dimensions are 16mm (length) by 4mm (height) by 6mm (width) and weight 1.10 grams in air. In addition, each fish will be given a full-duplex passive integrated transponder (PIT) tag with tag dimensions of 12mm by 2.12mm and weighing 0.1 grams. Total combined weight of both tags is 2.2 grams and a tag burden of less than 1% of body mass is proposed. Brown et al. (2006) noted that 4% is considered an acceptable burden for tagging studies, however tag burden should be minimized whenever possible.

After surgery, fish will be transferred to a covered tank with flow through river water for recovery (approximately one hour). For the purposes of the study, it is assumed that tagged fish are representative of untagged fish.

All tagged fish that have recovered from the tagging process will be transported by truck in a 113 L cooler filled with river water. An air tank and air stones will be used to maintain oxygen levels. Of the 125 tagged lamprey, 100 25 from each weekly sampling event) will be released on the right bank of the Columbia River at RM 514, 1.5 miles below Wells Dam (Figure 2). This location was chosen in order to maximize the number of fish that would interact with Wells dam, provide the fish were still in a “migration phase” and the distance was designed to meet balance both criteria. The remaining 25 fish (six from three weekly sampling events and seven from one weekly sampling event) will be released above the Wells fishway adult fish trap (Pool 41 in the west fishway and Pool 40 in the east fishway) in order to support count window enumeration efficiency objectives.

Figure 2. Release location of tagged Pacific lamprey at Columbia River RM 514.

4.3 Radio-telemetry

The movement and passage of radio-tagged lamprey (Objectives 1 and 2) will be documented by a combination of underwater and aerial antenna arrays (dipole and yagi antennas) at Wells Dam. Tag testing conducted by the contractor during installation will drive antenna location and placement.

4.3.1 Fixed-Station Telemetry Array

Fixed-station telemetry receivers and associated arrays similar to those used in past lamprey studies at Wells Dam (LGL and Douglas PUD 2008) will be deployed to monitor movements of radio-tagged lamprey at the Wells Dam fishway entrances, at select locations throughout the fishway, and at the fishway exits. Underwater dipole antennas will be used in the fishways.

Antenna arrays for tagged fish monitoring will be deployed at the following locations within the Wells Project fishways:

1. Outside fishway entrance
2. Inside fishway entrance
3. Collection gallery side gate
4. Pool 1 (collection gallery exit)
5. Pool 3 (serves as detection efficiency location for Pool 1)
6. Pool below the adult fish trap (Pool 39 in the west fishway and Pool 38 in the east fishway)
7. Below the video count window (lower portion of Pool 64 below count window)
8. Above the video count window (upper portion of Pool 64 above count window)
9. Within the count window bypass area behind the picketed lead
10. Fishway exit (Pool 72 or 73)

Fixed station telemetry arrays will also be deployed at the mouths of Methow and Okanogan rivers. Douglas PUD will analyze data provided from a station operated by any stakeholder at the mouth of the Entiat or Wenatchee rivers. PTAGIS will also be queried to determine if any of the tagged lamprey were detected on in-stream PIT arrays in the Entiat and Methow, at the request of the Aquatic SWG.

4.4 Fishway Entrance Velocities

In order to evaluate tagged entrance efficiency of Pacific lamprey under reduced Wells Project fishway entrance velocities, fishway operations treatment conditions at Wells Dam will be similar to operations for the DIDSON Study conducted in 2010 (Johnson et al. 2011); two head differential treatments, including the existing high condition (0.48 m) and a moderate condition (0.31 m), will be implemented. A treatment condition will occur over a 7-hour block (19:00 through 02:00) and will be changed daily (i.e., existing high condition one day and moderate condition the next day). Although the proposed fishway operations and daily hours of operation are consistent with past flow reduction studies, the proposed operating scenario for this component of the study must be reviewed and approved by the HCP Coordinating Committee. Fishway operations treatments will begin upon first release of tagged fish below Wells Dam.

4.5 Count Station Efficiency

In recent years, the efficacy of using narrower bar screen as a way to improve the enumeration of lamprey passing adult fishway has been tested at PUD and federal dams (LGL et al. 2011, ACOE 2011). The use of smaller leads has resulted in no reduction in travel time and has not increased the fallback rates within the fish ladders at those dams tested (Peery et al. 2011).

During the 2012-2013 Wells Dam ladder maintenance period (typically from December through January), new 11/16th inch pickets will be installed within the east and west Wells Dam fishways. This study will evaluate the behavior and performance of these pickets in guiding adult lamprey through the existing fish count stations. The data collected during this study will be compared to prior years of study at Wells Dam to determine whether lamprey enumeration

can be enhanced without negatively impacting the lamprey passage rates and times within the upper fishways.

4.6 Statistical Analyses and Reporting

4.6.1 Passage Efficiency and Travel Time

Telemetry data collected during the study will be managed in an appropriate database where individual antennas will be grouped into "zones" that define pivotal areas of interest, such as individual fishway entrances and exits.

Numbers of fish detected at each zone will be summarized. Each time a fish is detected in a zone, the duration of the detection event (the amount of time the fish spent in the zone) will be calculated. The operational database will also be used to map movements of fish among zones. For every combination of among-zone movements, the number of times a fish performed that movement and the amount of time it took to get from one zone to the next, will be calculated.

Passage times will be calculated from benchmark dates and times corresponding to the first and last detection of a given radio-tagged lamprey at specific locations. At Wells Dam, benchmark times for lamprey passing the Project will be as follows:

Time:

1. first detection at the fishway entrance (outside antenna). (Note that in order to be considered a treatment fish for the study, tagged fish must be detected at this location),
2. last detection at the fishway entrance (inside antenna)
3. first detection at the 'end of collection gallery' zone (Pool 1)
4. first detection at the 'adult fishway/middle fishway section' zone (Pool 39)
5. first detection at the 'below video count window' zone (lower portion of Pool 64)
6. first detection at the 'above video count window' zone (upper portion of Pool 64)
7. first detection at the 'count window bypass' zone
8. last detection at the 'count window pass' zone – note same as #6
9. first detection at the fishway exit (Pool 72 or 73)
10. last detection at the fishway exit.

From these benchmark times, passage times can be calculated for the following segments:

1. Entrance passage time – Time 1 to 2
2. Collection gallery passage time – Time 2 to 3
3. Lower fishway passage time – Time 2 to 4
4. Passage from count window to exit – Time 5 to 10
5. Upper fishway passage time – Time 4 to 10
6. Project passage time – Time 1 to 10

To evaluate use of the count window bypass area, times can be calculated for the following segments:

1. Below count window to count window bypass – Time 5 to 7
2. Residence time in count window bypass area – Time 7 to 6
3. Count window bypass to exit – Time 7 to 10

The residence and passage times and route of passage (in count window area) for each radio-tagged lamprey will be determined by working backwards through a sequence of detections. The fishway of ultimate passage and the respective passage time will be determined by identifying a sequence of detections in the ascent of a fishway, starting with detections in a fishway exit zone.

Information about passage efficiency and travel time will be compared to other hydropower projects on the Columbia River.

4.6.2 Entrance Efficiency

Radio-telemetry data from entrance locations (i.e., outside and inside fishway entrance arrays) will be used to evaluate entrance efficiency of the two treatment conditions for fishway operations (i.e., existing and moderate). Tagged fish will be organized into release groups (4 weekly releases). The total number of tagged lamprey detected outside fishway entrances over the course of the study will serve as the total sample size for statistical analyses. Entrance efficiency will be calculated as the total number of successful entries of fish detected outside the fishway entrances under each treatment condition (head differential). During the course of the study, successful entry will be defined as either a detection by the arrays outside the fishway entrances followed by a subsequent detection by the arrays inside the fishway entrances or a detection on the array inside of the fishway entrance. Difference in entrance efficiency between the two treatment conditions will be evaluated using statistical methods developed with assistance from the University of Washington school of Aquatic and Fisheries Sciences.

4.6.3 Enumeration Efficiency

The efficiency of enumerating lamprey using the existing counting station will be evaluated by examining observations of tagged fish via radio-telemetry detections at the “above video count window” location (upper portion of Pool 64 above count window) and comparing them to observations below the count stations (upstream weir wall in Pool 62). Enumeration efficiency will be reported as a percentage (i.e., tagged fish observed above count station/tagged fish detected below count window X 100). Given the low numbers of lamprey that have passed Wells Dam in recent years, confounding observations due to high numbers of passage events at this location during the study is not expected. Each fish ladder can be treated separately prior to grouping entrance numbers. If no significant difference is detected between the two fish ladders then the information from both ladders will be pooled by head differential treatments. Release groups will also be pooled together if statistically justified (either by low sample size or by insignificance lack of significant differences).

4.7 Schedule and Reporting

Reporting will be a collaborative effort between the contractor and the Douglas PUD contract manager for this study. The schedule for study planning and development, implementation, draft reporting, review, and final reporting are presented in Table 1 below.

Table 1. Estimated timeline for study development, implementation and reporting.

		Parties Involved			
#	Item	PUD	ASWG	Contractor	Date
1	Study Plan Development	X			July-August 2012
2	Study Plan Review Aquatic SWG	X	X		August 2012
3	Study Plan Finalized	X	X		September 2012
4	Contracting	X		X	September-November 2012
5	Telemetry Installation	X		X	December 2012-January 2013
6	Study Implementation (capture, transport, tagging, monitoring)	X		X	June-October 2013
7	Draft Interim Report to PUD			X	January 2014
8	Draft Report to Aquatic SWG	X	X		February Meeting 2014
9	Final Report Integrating Changes from Review to PUD			X	March 2014
10	Final Report to Aquatic SWG	X	X		April Meeting 2014

5.0 REFERENCES

Army Corps of Engineers (ACOE). 2011. Pacific Lamprey Passage Improvements Implementation Plan. 2010 Final Progress Report. February 23, 2011.

Brown, R. S., D. R. Geist, K. A. Deters, and A. Grassell. 2006. Effects of surgically implanted acoustic transmitters .2% of body mass on the swimming performance, survival and growth of juvenile sockeye and Chinook salmon. Journal of Fish Biology 69: 1626–1638.

Cooke, S.J., C.M. Woodley, M.B. Eppard, R.S. Brown, and J.L. Nielsen. 2011a. "Advancing the surgical implantation of electronic tags in fish: a gap analysis and research agenda based on a review of trends in intracoelomic tagging effects studies." Reviews in Fish Biology and Fisheries 21(1):127-151. doi:10.1007/s11160-010-9193-3

Cooke, S.J., G.N.Wagner, R.S. Brown, and K.A. Deters. 2011b. "Training considerations for the intracoelomic implantation of electronic tags in fish with a summary of common surgical errors." Reviews in Fish Biology and Fisheries 21(1):11-24. doi:10.1007/s11160-010-9184-4

Johnson, P.N., B. Le, and J.G. Murauskas 2010. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Johnson, P.N., B. Le, and B. Patterson. 2011. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL Limited, Public Utility District No. 1 of Douglas County (Douglas PUD). 2008. Adult Pacific Lamprey Passage and Behavior Study Aquatic Issue 6.2.1.3. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL, Cramer Fish Sciences, Blue Leaf Environmental, and Long View Associates. 2011. Assessment of Pacific Lamprey Behavior and Passage Efficiency at Priest Rapids and Wanapum Dams. Prepared for Public Utility District No. 2 of Grant County.

Loge, F., C. Caudill, D. Thompson, and C. Boggs. 2011. Video Monitoring to Determine Pacific Lamprey Ladder Escapement and Behavior at McNary and Ice Harbor Dams. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Nass, B.L., C. Sliwinski, D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Techniques, 2004. Report prepared by LGL Limited, Sidney, B.C. Canada, for Public Utility District No. 1 of Douglas County, WA.

Peery, C., B. McIlraith, D. Thompson, and F. Loge. 2011. Use of Non-Invasive Methods to Evaluate Pacific Lamprey Counts and Passage Behavior at John Day Dam – 2011. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Robichaud, D., B. Nass, and Public Utility District No. 1 of Douglas County (Douglas PUD). 2009. Adult Pacific Lamprey Passage and Behavior Study. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Wynne, F.S. and W.A. Wurts. 2011. Transportation of Warmwater Fish: Equipment and Guidelines. SRAC Publication No. 390. January 2011.

No Net Impact, Regional Cooperation and Recovery of Pacific Lamprey in the Mid-Upper Columbia River

DRAFT Proposal and Recommendations to the
Wells Aquatic Settlement Work Group
Rock Reach Fish Forum
Priest Rapids Fish Forum

by the Joint Fisheries Parties

Confederated Bands and Tribes of the Yakama Nation
Confederated Tribes of the Umatilla Indian Reservation
Colville Confederated Tribes
US Fish and Wildlife Service
Washington Department of Fish and Wildlife

August, 2012

Purpose: The purpose of this discussion is to provide the need and rationale for employing the "No Net Impact" (NNI) concept to Pacific lamprey as a result of the operations of the Mid-Columbia public utility projects (PUDs). Specifically, the Joint Fishery Parties (JFP, including the YN, CCT, CTUIR, USFWS and WDFW) agree that the preponderance of evidence throughout the Columbia River Basin clearly indicates that mainstem hydroelectric projects do in fact impede or prevent adult passage past these dams with a direct or indirect negative effect. This is evident in the fact that the Federal Action Agencies (Bonneville Power Administration, US Army Corps of Engineers, and Bureau of Reclamation) agreed to allocate $50,000,000 dollars primarily for adult passage improvements in the 2008 Fish Accords, and is farther evident in the fact the Mid-Columbia PUDs are themselves beginning to implement passage improvements in these Projects, therefore recognizing the impact to the migrating adult lamprey populations.

Need: It is clearly evident at both local and regional scales that Pacific lamprey populations have plummeted over the past decades, and that recovery actions are imminent and urgent. Above the Mid-Columbia Projects, local populations are essentially extirpated. From an ecologically and from a tribal harvest perspective, they are extirpated. The JFP recognizes that the Projects are not solely responsible for this cumulative effect, but they are a primary contributor to the situation and a key player in future Pacific lamprey recovery actions. The JFP advocates there is a clear connection between passage issues, Project Effects and the need for the PUDs to mitigate for these impacts to the population.

Background: Each of the PUDs contain language within their perspective Lamprey Management Plans that recognize the need to contribute to Pacific lamprey recovery. The essence of this language is captured below.

Chelan PUD Lamprey Management Plan: Section 4:
Protection, Mitigation, and Enhancement Measures.
The goal of the PLMP is to achieve No Net Impact (NNI) on Pacific lamprey by measuring ongoing Project-related impacts, if any, on Pacific lamprey; implementing appropriate and reasonable measures to reduce or eliminate such impacts; and ***implementing on-site or off-site measures*** *to address unavoidable impacts.*

Grant County PUD Lamprey Management Plan: Section 4
Protection, Mitigation, and Enhancement Measures.
The goal of the PLMP is to identify ongoing Project-related impacts on Pacific lamprey; implementing reasonable and feasible measures to reduce or eliminate such impacts; and ***implementing on-site or off-site measures to address unavoidable impacts.***

4.1 Objective 1: No Net Impact (NNI). Identify, address, and ***fully mitigate Project effects*** *to the extent reasonable and feasible.*

Douglas PUD: Lamprey Management Plan
Section 3.0: Goals and Objectives
*The goal of the PLMP is to implement measures to monitor an****d address impacts****, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:*

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;
Objective 3: Participate in the development of regional Pacific lamprey conservation activities.

The PLMP is intended to be ***compatible with other Pacific lamprey management plans*** *in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations.* ***The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies*** *and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.*

Section 1: Introduction. Paragraph 3:
The PLMP will direct implementation of measures to protect against ***and mitigate for potential Project impacts*** *on Pacific lamprey (Lampetra tridentata). To ensure active stakeholder involvement and support, Douglas developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.*

In sum, the JFP agrees there is sufficient language embedded within the Pacific Lamprey Management Plans to justify that additional (and potentially off-site) actions are not only warranted, but required within these Plans. We make the argument that even if the Projects could achieve 80-90 percent passage with little or no passage delay (which would likely be a substantial improvement over what we currently believe exists today) there would still be an impact to the migrating population and that the NNI concept was built on the foundation that all impacts would be mitigated for.

Recommendation: The JFP recommends that within each of the three Forums (ASWG, RRFF, PRFF) we establish this topic as a regular agenda item, in anticipation this discussion will require several months of considerations. We recognize the uniqueness of each of the PUDs and the need for each institution to maintain boundaries within their own FERC license, but we also recognize that each of the Plans call for regional cooperation. As a result, the JFP would ultimately like to develop and begin initiation of a "regional strategy" towards lamprey recovery in the Mid- Columbia region (Priest Rapids Dam to Okanogan River) and agree that the Mid-Columbia PUD Projects should play a role towards this end.

The JFP offers to this discussion several examples of activities that should be considered as a part of these future discussions. We do not advocate that the PUDs are solely responsible for any or all of these actions, rather, we hope to build inter-agency cooperation in a similar manner as has evolved within salmonid recovery actions. Over time, we will identify various responsibilities, and from this point we will discuss and identify the "appropriateness" of the actions as a component of overall NNI mitigation. The following actions (not intended to be comprehensive, but examples for this time) are recommended for discussion:

- contributions towards juvenile and adult supplementation / trans-location in the Upper Columbia tributaries,
- passage at Tumwater Dam - and irrigation facilities that may need enhancements,
- fixing juvenile entrainment at Dryden Dam - and other irrigation facilities,
- financial support to better establish baseline information / monitoring in preparation for restoration activities and long-term monitoring of status and trends within the tributary habitats,
- support in regional planning documents that identify specific survival standards, tagging technologies and recovery actions in which each of the PUDs can participate,
- enhanced understanding of in-reservoir adult mortality (predation? - sturgeon?),

Next Steps: The JFP will announce to the three Forums our interests and intentions at the September forum meetings. We will advocate that this be an agenda item which will require at least one hour during the October meeting. We anticipate developing an initial list of activities that could be implemented in each of the Upper Columbia Subbasins (Okanogan, Methow, Entiat, and Wenatchee) during the winter and spring months of 2013. From this short planning process, in which we will use existing salmonid subbasin restoration committees, we will discuss potential partnerships for implementation and appropriate timeframes, which will include involvement from each of the PUDs.

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: December 13, 2012

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the November 13, 2012 Aquatic SWG Conference Call

The November Aquatic Settlement Work Group (SWG) met by conference call on Tuesday, November 13, 2012, from 10:00 am to 11:30 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Andrew Gingerich will check internally to determine if flow velocity data are available for the Wells Dam counting windows areas (Item V-2).
2. Aquatic SWG members will submit questions and comments on the new Wells Hydroelectric Project Federal Energy Regulatory Commission (FERC) License to Kristi Geris by November 30, 2012; or they will submit them sooner if Douglas PUD arranges to meet with FERC at an earlier date. Geris will distribute questions and comments to the Aquatic SWG once all are received (Item V-3).

II. Summary of Decisions

1. There were no Statements of Agreement (SOAs) approved at today's meeting.

III. Agreements

1. The Aquatic SWG representatives present agreed to the proposed picketed lead modifications and count window improvements (Item V-2).

IV. Reports Finalized

1. The 2011 Douglas PUD Pikeminnow Program Annual Report was finalized and distributed to the Aquatic SWG on October 10, 2012.

V. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe): Mike Schiewe welcomed the Aquatic SWG members (attendees are listed in Attachment A) and opened the meeting. Schiewe reviewed the agenda and asked for additional agenda items. The following revisions were made to the agenda:

    - Andrew Gingerich added a discussion on the new Wells Hydroelectric Project FERC License.
    - Bob Rose added a follow-up discussion on the draft Proposal and Recommendations for No Net Impact (NNI), Regional Cooperation, and Recovery of Pacific Lamprey in the Mid-Upper Columbia River.

    Kristi Geris reported that all comments and revisions received on the draft October 10, 2012 conference call minutes had been incorporated, and that no items remained to be discussed. The Aquatic SWG members present approved the October 10, 2012 conference call minutes as revised. Geris will finalize the meeting minutes and distribute them to the Aquatic SWG.

2. **Pacific Lamprey: Picketed Lead Modification and Count Window Improvements** (Andrew Gingerich and Chas Kyger): Andrew Gingerich reviewed photos that were distributed to the Aquatic SWG by Kristi Geris on October 12, 2012. Photo 1 showed the fish ladder count window bypass area at Wells Dam (Attachment B), and Photo 2 showed the picketed lead bar screen (Attachment C). Next, Gingerich reviewed sketches of the proposed fishway modifications at Wells Dam that were distributed to the Aquatic SWG on November 13, 2012. Sketch 1 showed the changes to the ramps leading to and exiting the count windows (Attachment D), and Sketch 2 showed the replacement bar screen picketed lead (Attachment E). Gingerich said that Douglas PUD is considering completing these modifications during the Wells Dam dewatering period this December 2012 and January 2013.

    Gingerich said that the proposed count window improvements (Attachment D) are intended to improve enumeration by taking away bypass options. Chas Kyger explained that there is the potential for the lamprey to bypass the counting window through the louvered panels approaching and descending from the counting window. Kyger said that to remove this bypass option, Douglas PUD is proposing that aluminum bar grating (with the same bar spacing as the new picketed lead) be secured to the louvered panel, along with an 18-inch-wide aluminum plate, or ramp, also anchored to the existing louvers on both sides of the counting window. Kyger said that these improvements will not replace the existing infrastructure, but will be placed over the top of it; that way, if negative impacts result from the new modifications, they can easily be removed.

    Patrick Verhey asked about the amount of flow that moves through the louvers. Gingerich replied that Douglas PUD discussed this issue with Bao Le at HDR Engineering, Inc. (HDR), and that because water moves both underneath and above the louvers, they

determined that lamprey may be bypassing the counting window through the louvers, as well as through the picketed lead. Gingerich added that Grant PUD made similar modifications using the same engineering design, and that so far results are positive. Verhey asked if the orientation of the picketed lead is significant (i.e., vertical versus horizontal). Kyger replied that, currently, the picketed lead is designed to force flow in a downstream fashion, and that placing horizontal grating over the top of the picketed lead will maintain the direction of that flow.

Steve Rainey agreed that the proposed modifications offer the potential to improve enumeration. He also noted that the proposed aluminum plate may facilitate lamprey passage closer to the counting window.

Steve Lewis asked if it was assumed that lamprey approached the counting window from the bottom of the fishway. Gingerich replied that it is not certain where fish are located in the water column; however, lamprey do tend to orient to the bottom. He added that the proposed modifications should help protect bottom-oriented fish passing through the counting window area by providing suction opportunities. Lewis said that flows in the Priest Rapids Dam counting window area are fairly calm. Gingerich said that he has discussed this difference in velocity with Grant PUD and that they are unsure why flows in the counting window area at Priest Rapids Dam are lower than those at Wells Dam or if they differ. Gingerich noted that, as shown in Attachment D, the proposed aluminum plate is flush against the crowder, which does increase velocity. Rainey asked if this design should be reconsidered in order to lower velocities. Gingerich said that lowering velocity could potentially affect salmon passage, and that modifying it would require consultation with the Habitat Conservation Plan (HCP) Coordinating Committees and Bryan Nordlund. Verhey said that he thought the purpose of the crowder and proposed aluminum plate placement was to crowd fish closer to the window for improved enumeration. Rainey said that should only be an issue during periods of high turbidity, and Gingerich added that most of the time when the fish are running, turbidity is not an issue.

Gingerich said that Douglas PUD would like to move forward with the current proposed modifications and evaluate whether the modifications result in improved enumeration while still maintaining good passage efficiency. Based on the results of the evaluation, further decisions could be made about additional modifications.

Pat Irle asked if there is a way to measure velocities in the counting window area, and Gingerich replied that he believes that this has been done in the past. Gingerich said that he will check internally to determine if flow velocity data are available for the area.

Bob Rose asked how the existing cameras at the counting windows will contribute to monitoring; and Gingerich said that the cameras will help identify which portion of the lamprey are passing over the bottom plate. Rose suggested that combining these data with passage efficiency data will help determine if the modifications are effective. Rose

added that if water velocity is an issue, the length of the structure can be extended to decrease the angle. Rose asked if modeling has been performed with the proposed modifications. Gingerich said that no modeling has been performed; however, the proposed modifications are similar to those that have produced positive results at other facilities.

Rose also suggested monitoring lamprey girth at the Wells Dam counting windows for comparison to similar monitoring being conducted at Bonneville Dam. He suggested using a camera to document change in fish girth during upstream migration. Gingerich said that this idea has been discussed before for monitoring bull trout passing Wells Dam; however, depending on the proximity of the fish to the camera or window, measurements vary and there is no certainty of a true measurement. Rose acknowledged this issue, but requested that the idea still be considered.

Gingerich said that during the Wells Dam dewatering in December 2012 and January 2013, there will be opportunity for Aquatic SWG members to view the areas.

Rainey asked if Douglas PUD planned to install underwater video that monitors the plate immediately downstream of the counting window; and Gingerich replied that such an option is not being considered. Gingerich added that some data will be collected based on locations of fish at the count window.

The Aquatic SWG representatives present agreed to the proposed picketed lead modifications and count window improvements.

3. **Douglas PUD FERC License Update** (Andrew Gingerich): Andrew Gingerich first thanked members of the Aquatic SWG who have contributed to this effort. He said that FERC issued the Wells Project license order (Attachment F) on Friday, November 9, 2012. The order was distributed to the Aquatic SWG the same day. Gingerich encouraged everyone to read the license in totality, and to compile questions and comments to send to Douglas PUD. He said that Douglas PUD will have an opportunity within the next 30 days to meet with FERC to have questions answered.

   Gingerich noted that FERC had retained the authority to review and seek further clarification, and to potentially modify or reject decisions that are vetted through the Aquatic SWG, HCP Coordinating Committees, and/or HCP Hatchery Committees. Gingerich noted that this "added layer" of review will make Douglas PUD's already tight deadlines even more challenging to meet. He said that Douglas PUD plans to ask FERC for clarification on what exactly needs to be approved by FERC.

   Gingerich suggested that if Aquatic SWG members had questions on the FERC license, Douglas PUD would be willing to bring them forward at their meeting with FERC. Mike Schiewe asked if Douglas PUD knows when they plan to meet with FERC; and thus, when comments and questions on the new license will need to be compiled. Gingerich said

that it is his understanding that FERC typically arranges to meet within 30 days of license issuance; however, a specific meeting date has not yet been set. Aquatic SWG members agreed to submit questions and comments on the new FERC License to Kristi Geris by November 30, 2012; or they will submit these questions or comments sooner if Douglas PUD arranges to meet with FERC at an earlier date. Geris will distribute questions and comments to the Aquatic SWG once all are received.

Lastly, Gingerich noted that the term of the new license is 40 years, as explained in paragraph 143 of the license, which puts the Wells Project on the same schedule for renewal as the Priest Rapids Project and the Rocky Reach Project licenses (which both expire in 2052). In doing so, FERC concluded that it would be most practical to put all three projects on a license term that coincides with the expiration of the HCPs (i.e., in 2052 or in 40 years).

Steve Lewis added that the U.S. Fish and Wildlife Service (USFWS) now plans to coordinate with Douglas PUD on the draft letter to FERC requesting delay of the Bull Trout Radio Telemetry Study at the Twisp Weir. Gingerich said that once the letter is drafted, it will be distributed to the Aquatic SWG for review.

4. **Follow-up on the Draft Proposal and Recommendations for No Net Impact, Regional Cooperation, and Recovery of Pacific Lamprey in the Mid-Upper Columbia River** (Bob Rose): Bob Rose said that because most members of the Aquatic SWG had heard his presentation before, he only planned to touch on key discussion points during today's meeting. He added that he fully expects this conversation to carry on over the next several months, and does not expect decisions today.

   Rose cited Objective 3 in the Douglas PUD Pacific Lamprey Management Plan (PLMP): *Participate in the development of regional Pacific lamprey conservation activities*. Rose said that he interprets this to mean that Douglas PUD will participate in lamprey conservation and recovery activities in the mainstem Mid-Columbia, including its tributaries. Rose said he has met with other regional groups, and the plan is to develop a list of "low-hanging fruit" types of projects for the Mid-Columbia. Rose added that these projects are those that can feasibly be completed in two to three years. Rose said he anticipates that this list will become available within the next couple of months. He said that the Columbia River Inter-Tribal Fish Commission (CRITFC) has contracted HDR to develop a long-term research, management, and evaluation strategy.

   Rose noted that Douglas PUD would obtain 125 translocated adult lamprey for their passage study, and that these fish would be monitored just beyond the dam passage. He indicated that tributary use should be monitored, for spawning locations and holding periods. Rose referred back to Objective 3 in the Douglas PUD PLMP, and said that he would like Douglas PUD to participate in these regional efforts.

Andrew Gingerich said that page 14 of the Douglas PUD PLMP states clearly what regional participation means. He added that the PLMP was written to limit its scope to work to improve lamprey passage within the boundaries of the Wells Project—not outside of them. He said the way the proposal is currently written puts it largely outside the scope of the PLMP.

Patrick Verhey noted that additional information on lamprey biology needs to be collected in order to truly determine how proposed projects will impact lamprey; and added that Washington Department of Fish and Wildlife (WDFW) supports Rose's efforts and outreach. Gingerich said that Douglas PUD supports elements in the draft proposal that are also included within the Douglas PUD PLMP; however, as these elements already exist in the PLMP, he does not see the necessity for an additional document.

Steve Lewis noted ongoing discussions with other PUDs on how to address reservoir fluctuations, and he said that answers to several questions still need to be addressed. He also added that NNI is a concept that needs to be further defined and discussed. The "low-hanging fruit" types of projects need to be further defined, Lewis stated, so that Douglas PUD can discuss in which projects they may want to participate. Gingerich said that he appreciates the concern that lamprey numbers are declining, and if the proposed efforts are within the Wells Project boundaries, then Douglas PUD will be interested in participating. Rose asked how Douglas PUD anticipates finding answers without participating in a larger regional project. Gingerich said that a first step is to look at passage behavior, identify issues at the project if and where they exist, which is what Douglas PUD is already doing. Gingerich cited the upcoming passage and enumeration study as an example of this. Rose noted that many simultaneous efforts are possible with tagged fish, and suggested that Douglas PUD pursue multiple objectives whenever possible. Pat Irle asked Rose if he was suggesting that Douglas PUD monitor tagged fish from lower in the system and track them all the way up to Wells Dam; and Rose said that essentially, the answer is yes. Gingerich said that his interpretation of the NNI proposal goes beyond that to include funding, supplemental funding, and planning. He said that Douglas PUD is on board with regional coordination, and noted that Douglas PUD installed half-duplex passive integrated transponder (HD-PIT) antennae as part of their commitment to regional coordination.

Mike Schiewe recapped that it seems like Douglas PUD is willing to participate in a regional forum; however, they only want to participate in a way consistent with existing Douglas PUD plans. Gingerich said that Douglas PUD needs to operate within their FERC license and according to the PLMP to which they have agreed. Rose said that, by January or February 2013, a list of initial activities should be worked out. He said that, at that time, entities can evaluate and determine their level of participation.

V. Next Meetings

1. Upcoming meetings: ***December 12, 2012 (conference call); January 9, 2013 (conference call); and February 13, 2013 (conference call)***.

List of Attachments

Attachment A – List of Attendees

Attachment B – Photo of the fish ladder count window bypass area

Attachment C – Photo of the picketed lead bar screen

Attachment D – Sketch of the changes to the ramps leading to and exiting the count windows

Attachment E – Sketch of the replacement narrower bar screen picketed lead

Attachment F – Wells Project FERC license order

Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Rep.	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Bob Rose	SWG Technical Rep.	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Steve Rainey	Technical Support	U.S. Fish and Wildlife Service
Patrick Verhey	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology


Count Window
Crowder Retracted
Bypass Area Bar Screen Picketed Lead


18"-WIDE ALUMINUM PLATE LAMPREY RAMP SECURED TO CONCRETE WALL WITH ANCHORS AND TO EXISTING LOUVERS WITH BOLTS IN DRILLED AND TAPPED HOLES.
ALUMINUM BAR GRATING (1" X 3/16" BEARING BARS SPACED AT 11/16"). SECURE TO LOUVERED PANEL WITH GRATING CLIPS DRILLED TAPPED INTO LOUVERS. FIELD CUT TO SHAPE.


ALUMINUM BAR GRATING
(1 1/2" X 3/16" BEARING
BARS SPACED AT 11/16").
BEARING BARS SPAN
HORIZONTALLY. ALUMINUM
ANGLE AT TOP FOR HOISTING

141 FERC ¶ 62,104
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 1 of Douglas County, Washington — Project No. 2149-152

ORDER ISSUING NEW LICENSE

(November 9, 2012)

INTRODUCTION

1. On May 27, 2010, Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) filed, pursuant to sections 4(e) and 15 of the Federal Power Act (FPA),[1] an application for a new license to continue operation and maintenance of the existing Wells Hydroelectric Project No. 2149 (Wells Project or project). The project's authorized capacity being licensed is 774.25 megawatts (MW). The project is located on the Columbia River at river mile (RM) 515.6 near the cities of Pateros and Brewster in Douglas, Okanogan, and Chelan counties, Washington. The project occupies 8.60 acres of land administered by the U.S. Department of the Interior (Interior) and 6.55 acres of land administered by the U.S. Army Corps of Engineers (Corps).[2] [3]

2. As discussed below, I am issuing a new license for the project.

BACKGROUND

3. The Federal Power Commission (Commission) issued the original license for the Wells Project on July 12, 1962, and the license expired on May 31, 2012.[4] Since then, Douglas PUD has operated the project under an annual license pending the disposition of its new license application.

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[1] 16 U.S.C. §§ 797(e) and 808 (2006).

[2] The project is required to be licensed under section 23(b)(1) of the FPA, 16 U.S.C. § 817 (2006) because it occupies federal lands.

[3] In January 2010, Douglas PUD acquired the majority of Interior and Corps lands with the exception of 15.15 acres, within the project boundary and along the transmission line right-of-way, as authorized by the Omnibus Federal Land Act of 2009.

[4] Public Utility District No. 1 of Douglas County, Washington, 28 FPC 128 (1962).

4. On August 10, 2010, the Commission issued a public notice that was published in the *Federal Register* accepting the application for filing, soliciting motions to intervene and protests, indicating the application was ready for environmental analysis, and soliciting comments, final recommendations, terms and conditions, and prescriptions.[5] The notice set October 12, 2010, as the deadline for filing protests and motions to intervene, comments, final recommendations, terms and conditions, and prescriptions.

5. The U.S. Fish and Wildlife Service (FWS), U.S Department of the Interior (Interior), Washington State Department of Ecology (Washington DOE), and National Marine Fisheries Service (NMFS) filed notices of intervention.[6]

6. The Corps, Public Utility District No. 1 of Chelan County (Chelan PUD), Washington Department of Fish and Wildlife (Washington DFW), and the Confederated Tribes of the Umatilla Indian Reservation (Umatilla Tribes) filed timely motions to intervene.[7] None of the intervenors oppose the project. On October 18, 2010, Pat Kelleher filed late comments and a motion to intervene. On August 27, 2012, the Commission issued a notice granting Mr. Kelleher's late intervention.

7. Comments, recommendations, terms and conditions, and prescription were filed by NMFS, FWS, Interior, Bonneville Power Administration (BPA) and the Corps (jointly), Washington DFW, the Umatilla Tribes, and Washington DOE.

8. On April 6, 2011, Commission staff issued a draft environmental impact statement (EIS) on Douglas PUD's application to relicense the project. The cities of Pateros, Brewster, and Bridgeport, Washington; the U.S. Environmental Protection Agency (EPA); Washington DOE; the Confederated Tribes of the Colville Reservation (Colville Tribes); Washington DFW; Interior; Port of Chelan County; Douglas PUD; and NMFS filed comments on the draft EIS. On October 25, 2011, Commission staff issued a final EIS.

9. The interventions, comments, recommendations, and terms and conditions have been fully considered in determining whether, and under what conditions, to issue this license.

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[5] 75 *Fed. Reg.* 51257 (August 19, 2010).

[6] Under rule 214(a)(2) of the Commission's Rules of Practice and Procedure, these entities became parties to the proceeding upon the timely filing of their notices of intervention. 18 C.F.R. § 385.214(a)(2) (2012).

[7] Timely, unopposed motions to intervene are granted by operation of Rule 214(c)(1) of the Commission's Rules of Practice and Procedure. 18 C.F.R. §385.214 (c) (2012).

PROJECT DESCRIPTION AND OPERATION

A. Project Area

10. The Columbia River is about 1,200 miles long, 460 miles of which are in Canada and 740 miles are in the United States. It drains an area of 259,000 square miles, including a large part of Washington and Oregon, substantially all of Idaho, the western portion of Montana, and smaller areas in Nevada, Wyoming, and Utah. Beginning in the 1930s a series of major dams were constructed on the Columbia and Snake rivers for the purposes of electric power, flood control, and irrigation. Collectively, these hydropower projects, which are under both federal and non-federal ownership, are known as the Columbia river system.

11. Proceeding downstream from the Canadian-U.S. border, the first two dams on the Columbia River are Grand Coulee and Chief Joseph, at river mile (RM) 596.6 and RM 545.1, respectively. Both of these dams are federally owned and operated. The next five dams are all non-federal projects and are under Commission license: the Wells Project No. 2149 (at RM 515.6); the 866-MW Rocky Reach Project No. 2145 (at RM 473.7); the 623-MW Rock Island Project No. 943 (at RM 453.4); and the 1,893-MW Priest Rapids Project No. 2114, which includes two dams (Wanapum dam at RM 415.8 and Priest Rapids dam at RM 397.1). These seven dams are collectively called the mid-Columbia dams.

12. Downstream of the mid-Columbia dams, the Columbia River is joined by the Snake River and turns west toward the Pacific Ocean. On this stretch of the river, there are four federal dams: McNary (at RM 292.0), John Day (at RM 215.6), The Dalles (at RM 191.5), and Bonneville (at RM 146.1), all of which are federal projects. The Methow and Okanogan rivers enter the Columbia River upstream of Wells dam within Wells reservoir.

B. Project Facilities

13. The Wells Project includes a dam, reservoir, tailrace area, switchyard, transmission line, upstream and downstream fish passage facilities, a fish hatchery, and recreational facilities. The dam includes an east abutment, a central hydrocombine section, and a west abutment. The 1,030-foot-long, 160-foot-high east abutment consists of an impervious core to bedrock with a filter zone and gravel shell on each side. The 2,300-foot-long, 40-foot-high west abutment consists of an impervious core to the riverbed materials with a filter zone and gravel and rockfill shell on each side. At elevation 781 feet above mean sea level (msl), the reservoir has a surface area of 9,740 acres, a gross storage capacity of 331,200 acre-feet, and a useable storage of 97,985 acre-feet.

14. The 1,165-foot-long, 160-foot-high hydrocombine structure includes 11 spillway bays, 10 generating units, upstream and downstream fish passage facilities, and a

switchyard. The 10 generating units are identical vertical-axis Kaplan turbines with a total installed capacity of 774.25 MW. Each spillway bay is 46 feet wide, and the spill through each bay is controlled by a 66-foot-high gate that is divided into top and bottom sections.

15. The switchyard, located on top of the hydrocombine section, is connected to two single-circuit, 230-kilovolt (kV) transmission lines that extend about 41 miles to the Douglas switchyard, operated by Douglas PUD, where it interconnects with the electric grid.

16. The project's fish passage facilities include two upstream fish ladders and a downstream juvenile bypass system. One fish ladder is located at each end of the hydrocombine, and each ladder includes a pump system for providing attraction flows to the ladder entrance, a counting station, a fish trap and sorting facility, and Passive Integrated Transponder (PIT) tag[8] detection equipment. The downstream juvenile bypass system consists of fabricated steel barriers that are seasonally[9] inserted into spillway bay numbers 2, 4, 6, 8, and 10. The steel barriers are 72 feet high and block all but a 72-foot-high by 16-foot-wide vertical slot through each spillway entrance; they are designed to collapse when the spillway gates are opened more than 6 feet. The project also includes the Wells Hatchery, located on the downstream side of the west abutment of the Wells dam.

C. Project Recreation Facilities

17. The Wells Project includes 17 recreation facilities along the Wells reservoir and tailrace in the cities of Pateros, Brewster, and Bridgeport, Washington, and along the lower reaches of the Methow and Okanogan rivers. They are: (1) Wells dam overlook; (2) Starr boat launch; (3) Chicken Creek boat launch; (4) Monse Bridge boat launch; (5) Cassimer Bar fishing access; (6) Okanogan River informal boat launch and fishing site 1; (7) Okanogan River informal boat launch and fishing site 2; (8) Pateros winter boat launch; (9) Riverside Drive recreation access; (10) Peninsula Park; (11) Memorial Park; (12) Methow boat launch; (13) Columbia Cove Park; (14) Brewster waterfront trail; (15) Marina Park; (16) Carpenter Island boat launch; and (17) Methow fishing access. In addition to continuing to operate and maintain these facilities, Douglas PUD proposes to construct new visitor interpretive displays and a formal tent camping facility, expand the facilities at Marina Park, and extend the launch ramp at the Chicken Creek boat launch.

[8] PIT tags are small tags implanted in fish that transmit a unique code when they are energized by passing near a receiver antenna. Because they do not require a battery, they have a long lifespan.

[9] The downstream juvenile bypass system is typically operated from mid-April through late August.

D. Project Boundary

18. The project boundary generally follows the 781-foot-msl elevation contour line along the Wells reservoir, and encloses the project dam, powerhouse, tailrace area, transmission lines, fish passage facilities, the Wells Hatchery, and several wildlife management areas and recreational facilities. The project boundary includes about 2,664 acres of land, of which 8.60 acres are administered by BLM and 6.55 acres are administered by the Corps. Douglas PUD proposes to include all of the lands associated with its recreation facilities in the project boundary as discussed below in the Administrative Provisions section and Article 207.

E. Non-Project Facilities

19. Several existing fish and wildlife mitigation facilities are located partly or entirely outside of the current project boundary. Facilities located entirely outside of the project boundary include: the Methow Hatchery,[10] the Twisp weir, [11] and three upland units of the Wells Wildlife Area[12] (West Foster Creek, Central Ferry, and Indian Dan Canyon). The other three units of the Wells Wildlife Area (Bridgeport Bar, Okanogan, and Washburn Island) are partially included within the current Wells Project boundary.

F. Current Project Operation

20. The project is an integral part of the seven-dam mid-Columbia River hydroelectric system. Each of the seven dams is operated in accordance with the terms of the mid-

[10] The Methow Hatchery, a non-project fish hatchery owned by Douglas PUD, is located about 50 miles from the project at river mile 51 on the Methow River. The hatchery currently produces up to 550,000 spring Chinook salmon smolts as mitigation for unavoidable losses at Douglas PUD's Wells dam, Chelan PUD's Rocky Reach and Rock Island dams, and Public Utility District No. 1 of Grant County's Priest Rapids and Wanapum dams.

[11] Twisp weir is an adult salmon and steelhead broodstock collection facility that is funded by Douglas PUD and operated by Washington DFW to provide broodstock for Douglas PUD's fish hatcheries. Twisp weir is located over 40 miles from the project near river mile 7 on the Twisp River, a tributary to the Methow River.

[12] The Wells Wildlife Area was funded by Douglas PUD and developed by Washington DFW for wildlife protection, mitigation, and enhancement under the original license. Through an off-license agreement, Douglas PUD has agreed to continue to provide funds for these units and Washington DFW will continue to operate and maintain these units during the next license term.

Columbia Hourly Coordination Agreement (HCA),[13] which seeks to coordinate operations for all of the mid-Columbia projects for the best use of flows for generation and to meet fishery and other environmental resource needs.

21. Each day, the participants of the HCA provide the coordinator with an estimated schedule of desired generation from their project(s). Federal operators at the upstream Chief Joseph and Grand Coulee projects provide the coordinator with an estimate of water expected to be discharged from these two dams. The coordinator then, based on information (i.e., anticipated flows, reservoir levels, and load) provided by the HCA participants and upstream federal operators, determines an estimated operation schedule for the following day.

22. The project is also operated according to the provisions of the Pacific Northwest Coordination Agreement (PNCA), which coordinates generation and storage projects in the Columbia River System to achieve the most efficient use of water to meet the electrical loads of the region's utilities. Through the agreement's annual regulation process, the maximum firm power that can be expected from the region's system is calculated. The agreement then provides for the allocation to the parties of water on a monthly basis, optimized as if all the projects in the Columbia River System were operated by a single owner. The agreement's goals are, in order of priority: (1) meeting nonpower requirements such as flood control or environmental measures; (2) ensuring that parties to the agreement can produce their dependable capacities; (3) refilling the reservoirs at the end of the water year; and (4) producing as much non-firm power as possible. Because the Wells Project has limited storage, the project must pass in real-time most of the water it receives from the much larger upstream Grand Coulee dam and can only alter flows on an hourly basis.

23. Along with the HCA and the PNCA, the project also operates under the Hanford Reach Agreement. The Hanford Reach Agreement, filed April 19, 2004, was signed by the Public Utility District No. 1 of Grant County (Grant PUD), Chelan PUD, Douglas PUD, BPA, NMFS, Interior, Washington DFW, and the Colville Tribes, and includes coordination of project operations among the seven mid-Columbia River hydroelectric projects, including the Wells Project.

24. The project is authorized to maintain its reservoir level between elevation 771 and 781 feet msl, but recent operations have maintained levels over 774 feet msl more than

[13] The HCA was originally signed for a 1-year experimental period from July 1, 1972, to June 30, 1973. The agreement was extended numerous times, and the most recent renewal extends the term of the HCA to November 1, 2017. *See* EIS, section 2.1.3.1.

99 percent of the time. The powerhouse discharge ranges from 13,000 cubic feet per second (cfs) (one unit, minimum load) to 220,000 cfs (full hydraulic capacity).

25. Construction of the Wells Project increased the tailwater elevation at the Chief Joseph Hydroelectric Project, which reduced the hydraulic head available for its generation. Douglas PUD entered into an agreement in 1968 with the Corps to compensate the federal system for power loss due to Wells Project encroachment. The agreement was supplemented in 1982 when the Commission approved raising the elevation of Wells reservoir from elevation 779 feet msl to elevation 781 feet msl.

G. Proposed Project Operation and Environmental Measures

26. Douglas PUD proposes no change to project operation, installed or dependable capacity, or average annual generation.

27. Douglas PUD proposes to continue implementing the Wells Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP) which was approved by the Commission and incorporated into the existing license on June 21, 2004.[14] The Wells HCP is a programmatic approach developed by Douglas PUD, fisheries agencies, and tribes to reduce and mitigate the effects of the Wells Project on five Columbia River salmon and steelhead trout populations. Since 2007, Douglas PUD has met the goals of the Wells HCP[15] through a combination of juvenile fish hatchery production, predator control in the Wells reservoir, upstream and downstream fish passage facility operations, and habitat restoration projects in tributaries upstream of the project.

28. Douglas PUD also proposes to develop and implement hatchery genetic management plans for the Wells Hatchery and the non-project Methow Hatchery as included in the incidental take statement from NMFS to address the take of ESA-listed salmon and steelhead trout that may occur as a result of artificial production activities at Douglas PUD's fish hatcheries.

29. Douglas PUD proposes to implement a Wildlife and Botanical Management Plan designed to: protect and enhance rare, threatened, and endangered (RTE) wildlife species' habitat and native habitat on Wells Project lands; protect RTE botanical species from land-disturbing activities and herbicide sprays; conserve habitat for species protected by the federal ESA, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act; maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area; and control noxious weeds on project lands.

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[14] 107 FERC ¶ 61,283 (2004).

[15] *See* final EIS at 28.

30. Douglas PUD also proposes to implement an Avian Protection Plan, which includes a protocol for reporting avian mortalities in the transmission line corridor to the appropriate parties; a nest management protocol to comply with federal and state bird protection laws; a tree removal protocol requiring that any tree removal as part of transmission corridor maintenance only occur between August 31 and January 31 to protect migratory birds; and a training protocol for evaluating avian issues when performing maintenance on the transmission lines and corridor.

31. Douglas PUD proposes to implement an Historic Properties Management Plan (HPMP), that includes provisions for: coordinating and consulting with the Washington State Historic Preservation Officer (Washington SHPO), Tribal Historic Preservation Officer, Commission staff, and other parties as appropriate on the effects of the project on historic properties; education and interpretation; inadvertent discoveries of cultural materials and/or human remains; emergency situations; management standards for the monitoring and treatment of cultural resources; curation and data management; and periodic updates to accommodate environmental and regulatory changes.

32. Douglas PUD also proposes to implement a Recreation Management Plan that includes a Recreation Facility Improvement Program and a Recreation Facility Operation, Maintenance and Monitoring Program.[16] Douglas PUD would also continue to implement its land use policy that includes provisions for ensuring public access to project waters and land while protecting natural resources and complying with the terms of the license as well as other federal and state laws; prohibiting construction activities or other actions that would destroy, deface, or remove vegetation or cultural resources; issuing permits and monitoring compliance of these permits; reporting any project land conveyances to the Commission; issuing permits for docks and fences as appropriate to protect natural and cultural resources; complying with existing agreements; and developing a process by which a policy violation can be resolved.

33. Douglas PUD proposes to implement a number of other aquatic resource protection measures included in the Aquatic Settlement Agreement (Aquatic Agreement) described below.

SETTLEMENT AGREEMENT

34. Douglas PUD filed the Aquatic Agreement with its license application. Signatories to the Aquatic Agreement include: Douglas PUD, FWS, BLM, Washington DFW, Washington DOE, the Colville Tribes, and the Yakama Nation.[17] The Aquatic

[16] Douglas PUD has also entered into agreements with the cities of Pateros, Brewster, and Bridgeport, which cover operation and maintenance of recreation facilities.

[17] According to section 1.0 of the Aquatic Agreement, NMFS did not sign the agreement because its interests are satisfied by the measures included in the Wells HCP

(continued)

Agreement was publicly noticed for comments on July 7, 2010[18] and evaluated in the EIS.

35. The Aquatic Agreement includes provisions for establishing an Aquatic Settlement Work Group (Aquatic SWG) to oversee implementation and adaptive management of the specific measures contained in the Aquatic Agreement. The Aquatic Agreement also includes six proposed license articles to implement the six proposed aquatic resource management plans summarized below.

36. Proposed Article 1 requires Douglas PUD to implement the measures set forth in section 4 of the White Sturgeon Management Plan, including: developing a broodstock collection and breeding plan; implementing a juvenile stocking and evaluation program with potential participation in a mid-Columbia hatchery facility jointly funded by Douglas PUD, Chelan PUD, and Grant PUD; implementing a monitoring program to guide the stocking program; tagging and tracking a portion of the stocked sturgeon; determining the natural production potential of the Wells reservoir; compiling information on other white sturgeon supplementation and recovery programs in the Columbia River Basin; evaluating the biological benefits of implementing adult sturgeon passage measures[19] that are consistent with passage measures implemented at other mid-Columbia projects; and identifying and implementing measures to provide local education about white sturgeon; and annual reporting.

37. Proposed Article 2 requires Douglas PUD to implement the measures set forth in section 4 of the Bull Trout Management Plan, including: continuing to provide upstream and downstream passage for bull trout through existing fish passage facilities; continuing to conduct video monitoring for bull trout in the Wells dam fish ladders; conducting periodic upstream and downstream passage evaluations to document compliance with allowable levels of bull trout incidental take; evaluating upstream and downstream passage and incidental take of bull trout at the project's Wells Hatchery and off-project broodstock collection facilities associated with the Wells HCP; developing a plan to

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(which is a condition of the current license and, as discussed in this order, is also included as a condition of this license).

[18] 75 *Fed. Reg.* 40,821 (July 14, 2010).

[19] The adult sturgeon passage evaluation would be conducted by the Aquatic SWG in year 11 of the new license and every ten years thereafter, and would consist of the following: (1) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (2) the availability of reasonable and appropriate means to provide upstream passage; and (3) consensus from all other operators of the mid-Columbia hydroelectric projects to implement adult upstream passage measures.

address passage effects or exceedances of incidental take; implementing specific measures (e.g., PIT tagging and sampling) if a significant number of juvenile bull trout are observed passing Wells dam;[20] implementing modifications to upstream and downstream fish passage facilities or project operations if passage problems for bull trout are identified; evaluating bull trout stranding during periods of low reservoir elevation and implementing measures to address any associated exceedances of bull trout incidental take; monitoring activities associated with the implementation of other aquatic resource measures from the Aquatic Agreement and developing a plan to address incidental take exceedances of bull trout associated with the measures; collecting tissue samples and funding genetic analysis of sampled bull trout; participating in regional information exchanges for bull trout research and monitoring; developing an interpretive display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the upper Columbia River (UCR) and its tributaries; and annual reporting.

38. Proposed Article 3 requires Douglas PUD to implement the measures set forth in section 4 of the Pacific Lamprey Management Plan, including: continuing to operate the fish ladders and juvenile bypass facilities and conducting fish ladder salvage activities according to the criteria established in the Wells HCP; developing an operations study plan to evaluate potential operational modifications to improve upstream lamprey passage and implementing operational modifications required by the Aquatic SWG; continuing to count adult Pacific lamprey 24-hours-per-day during the adult fish ladder monitoring season (May 1 through November 15) using the most-current technology available; potentially implementing alternative measures to improve lamprey counting; conducting a literature review of upstream passage improvements for adult lamprey implemented at other Columbia and Snake River hydroelectric projects; conducting a fishway inspection and evaluating the need for implementing four specific fishway improvement measures; evaluating the effectiveness of lamprey fishway improvement measures and conducting periodic monitoring over the license term; improving adult lamprey passage until the Aquatic SWG agrees that performance is at a level similar to other mid-Columbia hydroelectric projects, or until the project complies with a regional lamprey passage standard that is being developed and adopted by the Aquatic SWG; conducting literature reviews at 5-year intervals to evaluate juvenile lamprey passage at other Columbia and Snake River hydroelectric projects; conducting a juvenile lamprey downstream passage evaluation if appropriate technology is developed during the license term to conduct such a study; implementing measures, studies, or operational modifications in consultation with the HCP Coordinating Committee[21] and the Aquatic SWG if the results of a future,

[20] A significant number is defined as greater than 10 sub-adult bull trout observed in a calendar year.

[21] The HCP Coordinating Committee is generally composed of one representative of each party to the HCP, as described in more detail in section 6 of the HCP.

potential juvenile-lamprey downstream passage evaluation indicates that Wells Project operations are adversely affecting lamprey populations above Wells dam; implementing a study to examine the presence and relative abundance of juvenile lamprey in habitat affected by the project; participating in Pacific lamprey regional work groups; and annual reporting.

39. Proposed Article 4 requires Douglas PUD to implement the measures set forth in section 4 of the Resident Fish Management Plan, including: continuing to implement the Wells HCP predator control program; conducting resident fish studies throughout the license term to determine the relative abundance of various resident fish species within Wells reservoir and to detect negative changes in resident fish populations; implementing reasonable and appropriate measures to address significant negative populations; conducting an assessment to identify the potential effects of potential changes in project operations on native resident fish, and implementing reasonable and appropriate measures in consultation with the Aquatic SWG to address potential effects; and annual reporting.

40. Proposed Article 5 requires Douglas PUD to implement the measures set forth in section 4 of the Aquatic Nuisance Species Management Plan, including: implementing best management practices (BMP) to contain aquatic nuisance species during implementation of recreation enhancement measures; monitoring for the presence of aquatic nuisance species (zebra and quagga mussels) in project waters; notifying agencies and implementing containment measures if aquatic nuisance species are detected; participating in information exchanges and regional efforts to coordinate aquatic nuisance species monitoring activities; monitoring by-catch data from implementation of other aquatic resource measures for the presence of aquatic nuisance species; implementing public outreach measures for preventing the spread of aquatic nuisance species; assessing the effects of any future changes in project operation on the proliferation of aquatic nuisance species and implementing measures to address adverse effects; and annual reporting.

41. Proposed Article 6 requires Douglas PUD to implement the measures set forth in section 4 of the Water Quality Management Plan, including: monitoring total dissolved gas, water temperature, and other water quality parameters to ensure compliance with state water quality criteria; transmitting total dissolved gas data to a web-accessible database; providing an annual report of all spill and predicted total dissolved gas levels that occur outside of the fish passage season; [22] developing and implementing a Gas

[22] The total dissolved gas report for the non-fish passage season will document total dissolved gas levels at the project during the time of year of when spill is unlikely to occur and Douglas PUD is not operating the downstream juvenile bypass system (currently October through March).

Abatement Plan annually for approval by Washington DOE; coordinating the annual Wells HCP Fish Bypass/Spill Operations Plan and Gas Abatement Plan to minimize the production of total dissolved gas during periods of spill,[23] and submitting proposed operations to the Aquatic SWG and Wells HCP Coordinating Committee for approval; preparing a total dissolved gas annual report; making water quality data available to EPA to assist in development of the Columbia River temperature total maximum daily load; notifying Washington DOE and the Aquatic SWG of instances of non-compliance with state water quality criteria; implementing future measures to address non-compliance with numeric criteria or as a result of development of the Columbia River temperature total maximum daily load; operating the project to minimize spill of hazardous substances and implementing the Spill Prevention Control and Countermeasures Plan; continuing to participate in the Columbia and Snake River Spill Response Initiative;[24] continuing to participate in regional Water Quality Team and Adaptive Management Team meetings; allowing Washington DOE staff access to the project after reasonable notice to Douglas PUD; coordinating project operations with other mid-Columbia hydroelectric projects; preparing study plans to guide implementation of the water quality monitoring program; and annual reporting.

42. In general, the Commission looks with favor on settlements in licensing cases. When parties are able to reach settlements, it can save time and money, avoid the need for protracted litigation, promote the development of positive relationships among entities who may be working together during the course of a license term, and give the Commission, as it acts on license and exemption applications, a clear sense as to the parties' views on the issues presented in each settled case.[25] However, the Commission cannot automatically accept all settlements, or all provisions of settlements. Section 10(a)(1) of the FPA[26] requires that the Commission determine that any licensed project is

[23] The Wells HCP Fish Bypass/Spill Operations Plan and Gas Abatement Plan will describe proposed project operations to minimize total dissolved gas production during the time of year when spill typically occurs and Douglas PUD is operating the downstream juvenile bypass system (currently April through August). Documentation of actual total dissolved gas levels that occur during the downstream fish passage season will be provided in the total dissolved gas annual report.

[24] The Columbia and Snake River Spill Response Initiative is a collaborative effort from local, state, and federal entities as well as members of industry to develop and address the immediate need for oil spill preparedness and response along the Columbia and Snake Rivers.

[25] *See* Settlements in Hydropower Licensing Proceedings under Part I of the Federal Power Act, 116 FERC ¶ 61,270 at p. 2-12 (2006).

[26] 16 U.S.C. § 803 (2006).

"best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)."[27]

43. Consequently, in reviewing settlements, the Commission looks not only to the wishes of the settling parties, but also at the greater public interest, and whether settlement proposals meet the comprehensive development/equal consideration standard.

44. In the EIS, staff recommended many of the measures proposed in the Aquatic Agreement, and this license includes most of the specific measures included in the six aquatic resources management plans. However, there are several measures that staff did not recommend, or recommended with modifications. The sections below discuss staff's recommended modifications to measures proposed in the Aquatic Agreement, and measures staff did not recommend but are included in this license because they are required pursuant to section 18 of the FPA, section 401 of the Clean Water Act (CWA),[28] or to be consistent with FWS' or NMFS' biological opinion incidental take statements under section 7 of the ESA.

SUMMARY OF LICENSE REQUIREMENTS

45. As summarized below, this license, which authorizes 774.25 MW of renewable energy, requires a number of measures to protect and enhance water quality, fish, wildlife, cultural, and recreation resources at the project.

46. To protect and enhance Columbia River salmon and steelhead trout populations, this license requires Douglas PUD to continue implementing the Wells HCP which includes juvenile fish hatchery production, predator control, upstream and downstream fish passage, and habitat restoration. Douglas PUD will also develop and implement a hatchery genetic management plan for the Wells Hatchery UCR steelhead program to address the take of ESA-listed salmon and steelhead trout that may occur as a result of artificial production activities at Douglas PUD's fish hatcheries.

47. To protect and enhance water quality and other fisheries resources not specifically addressed by the Wells HCP, this license requires Douglas PUD to implement the Aquatic Agreement's White Sturgeon, Bull Trout, Pacific Lamprey, Resident Fish, Aquatic Nuisance Species, and Water Quality Management Plans, described above.

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[27] 16 U.S.C. § 803(a)(1) (2006).

[28] 33 U.S.C. § 1341(a)(1) (2006).

48. To protect and enhance terrestrial resources, this license requires Douglas PUD to implement its Wildlife and Botanical Management Plan, and implement its Avian Protection Plan. To protect and enhance cultural resources, this license requires Douglas PUD to implement its HPMP to ensure that any adverse effects on historic properties as a result of project operation, maintenance, recreational, or other activities are addressed over the term of the new license, and ensure protection of cultural resources within the project boundary. Douglas PUD will also continue to implement the Douglas PUD Land Use Policy to ensure that any land management decisions and activities associated with project lands are in compliance with the HPMP. To protect and enhance recreational resources, this license requires Douglas PUD to implement its Recreation Management Plan.

WATER QUALITY CERTIFICATION

49. Under section 401(a)(1) of the Clean Water Act (CWA),[29] the Commission may not issue a license authorizing the construction or operation of a hydroelectric project unless the state water quality certifying agency either has issued water quality certification for the project or has waived certification by failing to act on a request for certification within a reasonable period of time, not to exceed one year. Section 401(d) of the CWA provides that the certification shall become a condition of any federal license that authorizes construction or operation of the project.[30]

50. On September 30, 2010, Douglas PUD applied to Washington DOE for a water quality certification for the Wells Project, which the Washington DOE received on October 1, 2010. On September 12, 2011, Douglas PUD withdrew and refiled its application. On February 27, 2012, Washington DOE issued a certification for the project that includes conditions, which are set forth in Appendix A of this order and incorporated into the license (see Ordering Paragraph D).

51. The certification includes general administrative conditions that include requirements for complying with state water quality standards and any future changes to applicable state water quality laws. The general conditions also reserve authority for Washington DOE to amend the certification; modify schedules and deadlines provided under the certification; require additional monitoring, studies, and measures; take various actions to enforce the terms of the certification; and condition or deny future proposed changes to the project or project operations that might significantly and adversely affect compliance with any applicable water quality standard.

52. With regard to the six plans in the Aquatic Settlement, the certification requires

[29] 33 U.S.C. § 1341(a)(1) (2006).

[30] 33 U.S.C. § 1341(d) (2006).

the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Resident Fish Management Plans without modification. The certification requires the implementation of the Aquatic Nuisance Species Management Plan along with four additional requirements,[31] requires several modifications and additions to the Water Quality Management Plan,[32] and requires Douglas PUD to implement and meet the requirements of the Wells HCP.

53. As discussed in the final EIS,[33] staff did not recommend several of the measures

[31] The additional measures to be implemented as part of the Aquatic Nuisance Species Management Plan include: (1) monitor for aquatic nuisance plants and non-native crayfish (in addition to the plan requirements to monitor for zebra and quagga mussels); (2) provide signage and pamphlets at project boat launches to increase public awareness of aquatic nuisance species; (3) report on any aquatic nuisance species problems; and (4) develop an Aquatic Nuisance Species Control and Prevention Plan to monitor and manage any new aquatic nuisance species detected within the project boundary and affected by the project.

[32] The additional measures to be implemented as part of the Water Quality Management Plan include: (1) achieve compliance with state total dissolved gas (TDG) standards within 10 years of license issuance; (2) monitor and report spills and TDG levels during the entire year, including both the juvenile fish passage and non-fish passage seasons, to document compliance with state TDG standards; (3) provide Washington DOE an annual TDG report by February 28 of each year following license issuance that describes the results of all activities conducted under the Gas Abatement Plan and all spill and associated TDG levels in the tailrace that occur outside of the fish passage season; (4) prepare a Water Quality Attainment Plan for Washington DOE's review and approval that provides a framework for ensuring compliance with state TDG standards within 10 years of license issuance; (5) implement operational measures to minimize spill and provide Washington DOE with the opportunity to review and condition any non-routine operational or structural changes affecting TDG levels; (6) extend the duration of the annual water temperature monitoring program by an additional 46 days from April 1 to October 31 (instead of terminating on September 15); (7) transmit hourly water temperature data to a web-accessible database; (8) provide Washington DOE an annual water temperature monitoring report by April 30 of each year following license issuance; (9) reserve authority to Washington DOE to amend the certification to include measures that may be required after EPA's approval of a Columbia River temperature total maximum daily load; (10) implement additional measures and notification procedures to minimize and control spills of hazardous substances; and (11) implement measures for water quality protection during future construction activities at the project.

[33] *See* final EIS at 223 through 231.

included in the Aquatic Agreement because, as discussed in other sections of this license, they include provisions for non-specific or future potential measures; measures that are unrelated to project effects or purposes; cost-sharing with a third-party; or measures with benefits that do no justify their cost. However, all of the certification conditions are included in this license because they are mandatory under section 401 of the CWA.

COASTAL ZONE MANAGEMENT ACT

54. Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA),[34] the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 6 months of its receipt of the applicant's certification.

55. By letter filed February 9, 2011, Washington DOE notified Douglas PUD that the project is neither within the Washington coastal zone nor within a geographic area in which Washington DOE would review licenses for consistency with the CZMA. Therefore, no consistency certification is required.

SECTION 18 FISHWAY PRESCRIPTIONS

56. Section 18 of the FPA[35] provides that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce (Commerce), as appropriate.

57. On October 6, 2010, Interior filed preliminary fishway prescriptions for salmon, steelhead, bull trout, and Pacific lamprey with its record of decision. On August 1, 2011, Interior filed modified fishway prescriptions. Interior's prescriptions are consistent with, and in most cases identical to, the fish passage measures included in the Aquatic Agreement and Wells HCP.

58. Interior's fishway prescriptions include: (1) managing the project to provide effective upstream and downstream fish passage over the full range of river flows for which the project maintains operational control; (2) providing for the construction, operation, maintenance, and effective monitoring of upstream and downstream fishways as set forth in the Wells HCP; (3) providing upstream and downstream passage for salmon, steelhead, bull trout, and Pacific lamprey through the existing fish ladders and

[34] 16 U.S.C. § 1456(c)(3)(A) (2006).

[35] 16 U.S.C. § 811 (2006).

downstream bypass system and conducting fish ladder salvage activities as set forth in the Wells HCP and Aquatic Agreement; (4) implementing upstream and downstream passage measures for bull trout to provide safe, timely, and effective passage;[36] (5) continuing to evaluate and improve upstream Pacific lamprey passage until safe, timely, and effective passage is achieved;[37] (6) continuing to count adult Pacific lamprey 24-hours-per-day during the May 1 to November 15 adult fish ladder monitoring season, using the best technology that is commercially available; (7) developing techniques for counting lamprey through all upstream passage routes at Wells dam; (8) conducting a literature review and fishway inspection to identify, prioritize, and implement measures to improve adult lamprey passage and enumeration at Wells dam; (9) developing an Operations Study Plan to evaluate potential operational modifications to improve upstream lamprey passage; (10) evaluating the need to develop plans to implement four specific fish ladder improvements (i.e., entrance efficiency, diffuser gratings, transition zones, and ladder traps/exit pools); (11) evaluating the effectiveness of lamprey fish ladder improvement measures and conducting periodic monitoring over the license term; and (12) implementing a juvenile lamprey downstream passage study if the FWS determines that substantial evidence exists at Wells dam or a dam with similar features or conditions to indicate that downstream migrating juvenile lamprey are negatively affected by Wells dam, and if adverse effects are detected, then implement measures to address adverse effects.

59. While staff agreed with some of these conditions, several of these conditions were not recommended by staff in the EIS, as discussed in other sections of this license. However, all of the conditions are included in this license because they are mandatory under section 18 of the FPA. Interior's prescriptions are attached to this order as Appendix C, and incorporated into this license by Ordering Paragraph F.

60. On October 8, 2010, NMFS (through Commerce) filed a preliminary fishway prescription for salmon and steelhead. On July 21, 2011, NMFS filed a letter stating that its preliminary prescription is final. NMFS' prescription directs Douglas PUD to carry out its obligations, in their entirety, as set forth in the Wells HCP. NMFS' prescription is attached to this order as Appendix B, and incorporated into this license by Ordering Paragraph E.

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[36] The safe, timely, and effective passage standard for bull trout is defined as survival and passage rates for adult marked fish of greater than 95 percent and greater than or equal to 90 percent, respectively, and when passage studies demonstrate that the project does not impede bull trout passage.

[37] The safe, timely, and effective passage standard for Pacific lamprey is defined as passage levels at least as high as other mid-Columbia River hydroelectric projects, until specific Pacific lamprey passage performance standards are adopted by the FWS.

61. With their prescriptions, both Interior and NMFS requested that the Commission reserve authority to modify their fishway prescriptions. Consistent with Commission policy, Article 407 of this license reserves the Commission's authority to require fishways that may be prescribed by Interior or Commerce for the Wells Project.

ESSENTIAL FISH HABITAT

62. Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act[38] requires federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH) identified under the Act. Under section 305(b)(4)(A) of the Magnuson Stevens Act, NMFS is required to provide EFH Conservation Recommendations for actions that would adversely affect EFH.[39] Under section 305(b)(4)(B) of the Act, an agency must, within 30 days after receiving recommended conservation measures from NMFS or a Regional Fishery Management Council, describe the measures proposed by the agency for avoiding, mitigating, or offsetting the effects of the agency's activity on the EFH.[40]

63. EFH is designated for various lifestages of Chinook salmon in the mainstem Columbia River and the Okanogan and Methow rivers within the project boundary. In the EIS, Commission staff determined that licensing the project with staff's recommended measures and agency mandatory conditions, would not adversely affect EFH. By letter dated April 12, 2011, Commission staff initiated EFH consultation with NMFS. NMFS included an analysis of the project's effects on Chinook salmon EFH in its March 7, 2012, biological opinion for the project. NMFS concluded that the project would adversely affect EFH, but also concluded that the terms and conditions of the biological opinion incidental take statement would address the adverse effects. Consequently, NMFS recommended that the terms and conditions be adopted as EFH Conservation Recommendations.

64. As discussed below, this license includes all of the terms and conditions contained in NMFS' biological opinion incidental take statement.

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[38] 16 U.S.C. § 1855(b)(2) (2006).

[39] 16 U.S.C. § 1855(b)(4)(A) (2006).

[40] 16 U.S.C. § 1855(b)(4)(B) (2006). The measures recommended by the Secretary of Commerce are advisory, not prescriptive. However, if the federal agency does not agree with the recommendations of the Secretary of Commerce, the agency must explain its reasons for not following the recommendations.

THREATENED AND ENDANGERED SPECIES

65. Section 7(a)(2) of the Endangered Species Act of 1973[41] requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of their designated critical habitat.

66. Four federally listed threatened and endangered species occur in the project vicinity: Columbia River bull trout, UCR spring-run Chinook salmon, UCR steelhead, and Ute ladies'-tresses. Critical habitat is designated in the project area within the Columbia and Methow rivers for UCR spring-run Chinook salmon and bull trout, and in the Columbia, Methow, and Okanogan rivers for UCR steelhead. Commission staff determined in the final EIS[42] that none of the proposed action alternatives would affect Ute ladies'-tresses. Therefore, no further action under the Endangered Species Act is required for this species.

A. NMFS

67. In the draft EIS,[43] Commission staff concluded that continued operation of the project is not likely to adversely affect UCR spring-run Chinook salmon or UCR steelhead, or designated critical habitat for either of these species. In its letter filed May 12, 2011, NMFS stated it could not concur with staff's determination for either species or their critical habitat at that time, and would like additional time to diligently analyze its determination.

68. After further analysis and review of the final EIS issued on October 25, 2011, NMFS filed a biological opinion on March 7, 2012, with its determination that the project is not likely to jeopardize the continued existence of UCR spring-run Chinook salmon or UCR steelhead, or destroy or adversely modify either of these species' designated critical habitat. NMFS also concluded that the project is not likely to adversely affect the southern resident killer whale and would have no effect on its designated critical habitat. NMFS' biological opinion includes an incidental take statement with four reasonable and prudent measures to minimize take of listed UCR spring-run Chinook salmon and UCR steelhead trout along with three terms and conditions to implement the measures.

69. The reasonable and prudent measures include: (1) minimizing incidental take from the operation of the project by requiring the licensee to adhere to all of the measures

[41] 16 U.S.C § 1536(a) (2006).

[42] *See* draft EIS at 10.

[43] *See* draft EIS at 9–10.

in the Wells HCP; (2) minimizing incidental take from the unanticipated release of hazardous substances, toxics, excessive sediments, debris, and other materials into the Columbia River and its tributaries by following the provisions of the Water Quality Management Plan; (3) minimizing incidental take from in-water and near-water construction activities by using BMPs for the proposed action to avoid or minimize adverse effects to water quality and aquatic resources; and (4) including a standard reopener clause in any license issued for the project to ensure continuing agency discretion throughout the life of the license as may be necessary to protect species listed under the ESA.

70. The terms and conditions include: (1) conducting a monitoring and reporting program to report all incidental take; (2) following and implementing all terms and conditions of the Aquatic Agreement's Water Quality Management Plan; and (3) implementing best management practices during construction activities. These reasonable and prudent measures and conditions are included in Appendix D and are made part of this license by Ordering Paragraph G. Article 15 of form L-5, the Commission's standard fish and wildlife reopener clause, addresses condition 4 of NMFS' incidental take statement reasonable and prudent measures.

B. FWS

71. In the draft EIS,[44] Commission staff concluded that continued operation of the project is not likely to adversely affect Columbia River bull trout or its designated critical habitat. In its letter filed on May 9, 2011, FWS stated that it did not concur with staff's determinations and requested a complete analysis of the project's effects on bull trout critical habitat be included in a final biological assessment[45] prior to the initiation of formal consultation. By letter dated July 19, 2011, Commission staff informed FWS that the EIS and the project record includes the best available information on the effects of the project on bull trout and its designated critical habitat, and that staff did not intend to prepare a final biological assessment. In the same letter, staff requested that FWS initiate formal consultation based on the analysis contained in the draft EIS. On August 29, 2011, Douglas PUD filed supplemental information on the effects of the project on bull trout designated critical habitat. On September 14, 2011, staff issued a letter to FWS indicating that it agreed with Douglas PUD's findings included in its supplemental

[44] *See* draft EIS at 10.

[45] Commission staff did not prepare a draft biological assessment; however, in staff's April 12, 2011 letter to the FWS requesting concurrence with the findings in the draft EIS, staff noted that Douglas PUD had prepared and filed a draft biological assessment as supplemental information to staff's analysis in the draft EIS and noted its availability in the project record.

information and again requested that FWS initiate formal consultation. On March 19, 2012, FWS filed a biological opinion with its determination that the project is not likely to jeopardize the continued existence of bull trout and is not likely to destroy or adversely modify designated bull trout critical habitat.

72. In its biological opinion, FWS included five reasonable and prudent measures to minimize the effects of anticipated incidental take of bull trout and 13 incidental take terms and conditions to implement the reasonable and prudent measures. The reasonable and prudent measures include: (1) providing adequate year-round passage conditions for all life stages of bull trout at all project facilities; (2) minimizing the effects of spillway operations and hydrographic variations to all life stages of bull trout at all project facilities; (3) minimizing the effects of the hatchery supplementation program to all life stages of bull trout; (4) minimizing the effects of the aquatic resource management plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, water quality) and the predator control program to all life stages of bull trout; and (5) designing and implementing a bull trout monitoring program to detect and quantify Wells Project impacts, including those associated with the Wells dam, Twisp weir trapping facilities, and hatchery facilities.

73. All 13 terms and conditions are either components of the Aquatic Agreement's Bull Trout Management Plan required by Washington DOE's water quality certification, or FWS' section 18 prescription, and are discussed in other sections of this license. These reasonable and prudent measures and conditions are included in Appendix E and are made part of this license by Ordering Paragraph H.

74. ESA section 7(a)(1)[46] directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. FWS' biological opinion includes four conservation recommendations for the Wells Project: (1) implementing unspecified recovery actions and restoration opportunities identified in the FWS' draft Bull Trout Recovery Plan[47] where the Wells Project activities involve or intersect recovery actions; (2) coordinating with, and contribute to, bull trout monitoring efforts in the Columbia River Basin; (3) designing and implementing an environmental education plan for bull trout; and (4) participating in information exchanges with other entities conducting bull trout research, and regional efforts to explore availability of new

[46] 16 U.S.C. § 1536(a)(1).

[47] FWS. 2002. Bull trout (*Salvelinus confluentus*) draft recovery plan. Portland, Oregon.

monitoring methods and coordination of radio tag frequencies for bull trout monitoring studies conducted at the project.

75. Of these four conservation recommendations, the first is non-specific and would be difficult or impossible to enforce, and therefore it is not included as a condition of the license. The other three conservation recommendations are included in the license because they are components of the Aquatic Agreement's Bull Trout Management Plan, which is required in whole or in part by Washington DOE's water quality certification (Appendix A), Interior's section 18 prescriptions (Appendix C), and FWS' incidental take statement terms and conditions (Appendix E) and are discussed in detail in other sections of this license.

NATIONAL HISTORIC PRESERVATION ACT

76. Under section 106 of the National Historic Preservation Act (NHPA)[48] and its implementing regulations,[49] federal agencies must take into account the effect of any proposed undertaking on properties listed or eligible for listing in the National Register of Historic Places (defined as historic properties) and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking. This generally requires the Commission to consult with the SHPO to determine whether and how a proposed action may affect historic properties and seek ways to avoid or minimize any adverse effects.

77. To satisfy these responsibilities, the Commission executed a Programmatic Agreement (PA) on March 12, 2012 with the Washington SHPO and the Colville Tribe's acting Tribal Historic Preservation Officer. The Commission also invited Douglas PUD, BLM, and U.S. Bureau of Indian Affairs to concur with the stipulations of the PA. Douglas PUD and BLM concurred. The PA requires the licensee to implement the Historic Properties Management Plan (HPMP), dated May 2010, for the term of any new license issued for this project. Execution of the PA demonstrates the Commission's compliance with section 106 of the NHPA. Article 410 requires the licensee to implement the PA and associated HPMP.

PACIFIC NORTHWEST ELECTRIC POWER PLANNING AND CONSERVATION ACT

78. In 1980, Congress enacted the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act).[50] This act created the Northwest Power

[48] 16 U.S.C. § 470 *et seq.* (2006).

[49] 36 C.F.R. Part 800 (2012).

[50] 16 U.S.C. §§ 839b *et seq.* (2006).

Planning Council (now known as the Northwest Power and Conservation Council) and directed it to develop a Columbia River Basin Fish and Wildlife Program (Program). The goals of the Program are to protect, mitigate, and enhance fish and wildlife resources affected by the development and operation of hydroelectric projects on the Columbia River and its tributaries, while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.[51] Section 4(h)(11)(A) of the Northwest Power Act, provides that federal agencies operating or regulating hydroelectric projects within the Columbia River Basin shall exercise their responsibilities to provide equitable treatment for fish and wildlife resources with other purposes for which the river system is utilized and shall take the Council's Program into account "at each relevant stage of decision-making processes to the fullest extent practicable."[52]

79. To mitigate harm to fish and wildlife resources, the Council has adopted specific provisions to be considered in the licensing or relicensing of non-federal hydropower projects (Appendix B of the Program). This license, among other things, includes: salmon, steelhead, and Pacific lamprey conservation measures (Appendix A, condition 6.5; Appendix B, article 1; Appendix C, conditions 2.3, 3.0, 5.0-5.8, 6.0; and Appendix D); resident fish species enhancement measures (Appendix A, condition 6.5; Appendix C, conditions 4.0-4.8; and Appendix E, conditions 1-13); and wildlife habitat protection (Articles 409 and Ordering Paragraph I), all of which are consistent with applicable provisions of the Program, as discussed in detail in the final EIS. As part of the Program, the Council has designated over 40,000 miles of river in the Pacific Northwest region as not being suitable for hydroelectric development ("protected area"). The project is not located within a protected area designated under Appendix B of the Program. Further, Article 408 reserves to the Commission the authority to require future alterations in project structures and operations to take into account, to the fullest extent practicable, the applicable provisions of the Program.

RECOMMENDATIONS OF FEDERAL AND STATE FISH AND WILDLIFE AGENCIES PURSUANT TO SECTION 10(j) OF THE FPA

80. Section 10(j)(1) of the FPA[53] requires the Commission, when issuing a license, to include conditions based on recommendations by federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act[54] to "adequately

[51] 16 U.S.C. § 839b(h)(5) (2006).

[52] 16 U.S.C. § 839(h)(11)(A) (2006).

[53] 16 U.S.C. § 803(j)(1) (2006).

[54] 16 U.S.C. §§ 661 *et seq*. (2006).

and equitably protect, mitigate damages to, and enhance fish and wildlife (including related spawning grounds and habitat)" affected by the project.

81. In response to the August 10, 2010 public notice that the project was ready for environmental analysis, NMFS, Washington DFW, and FWS filed a total of 54 recommendations under section 10(j).[55] Forty-three recommendations were determined to be outside the scope of section 10(j) because they are measures that: include provisions for non-specific or future potential measures; are located at off-project locations; have no nexus to project effects or purposes; are studies that could have been conducted prior to licensing; include cost sharing with a third-party; or are administrative matters. Recommendations outside of the scope of section 10(j) are discussed in the next section.

82. This license includes conditions consistent with the 11 remaining recommendations that are within the scope of section 10(j) including: continuing to implement the Wells HCP (Ordering Paragraphs D, E, and G); implementing certain provisions of the Aquatic Agreement's Water Quality Management, Bull Trout Management, Pacific Lamprey Management, White Sturgeon Management, and Aquatic Nuisance Species Management Plans (Ordering Paragraphs D, F, and H);[56] and implementing the Wildlife and Botanical Management Plan (Article 409) and Avian Protection Plan (Ordering Paragraph I).

SECTION 10(a)(1) OF THE FPA

83. Section 10(a)(1) of the FPA[57] requires that any project for which the Commission issues a license shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes. Fish and wildlife measures recommended by NMFS, Interior, and Washington DFW considered under section 10(a) rather than under section 10(j) are addressed first, followed by additional staff recommended measures.

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[55] FWS filed recommendations on October 6, 2010, and amended them on November 19, 2010. NMFS and Washington DFW filed recommendations on October 8, 2010.

[56] The specific provisions of these plans that were recommended by staff were discussed in detail in the final EIS at 230 through 239.

[57] 16 U.S.C. § 803(a)(1) (2006).

A. NMFS, Interior, and Washington DFW

84. As discussed above, NMFS, FWS, and Washington DFW filed 43 recommendations under section 10(j) that are not specific measures to protect, mitigate damages to, or enhance fish and wildlife. Consequently, these recommendations are not considered under section 10(j) of the FPA, but are considered under the broad public interest standard of section 10(a)(1). As discussed below, 40 of these recommendations filed pursuant to section 10(j) are included in the license.

85. Thirteen of these fish and wildlife agency recommendations were recommended by staff in the final EIS[58] and are included in the license including: (1) limiting the license term to no longer than the term of the Wells HCP; (2) transmitting hourly TDG data to a web-accessible database (Ordering Paragraphs D and G); (3) coordinating the annual Wells HCP Project Fish Bypass/Spill Operations Plan and Gas Abatement Plan to minimize total dissolved gas levels during periods of spill, and submit proposed operations to the Aquatic SWG and Wells HCP Coordinating Committee (Ordering Paragraphs D and G); (4) developing a Gas Abatement Plan annually and submitting it to Washington DOE by February 28 of each year (Ordering Paragraphs D and G); (5) making water quality data available to EPA to assist in development of the Columbia River temperature total maximum daily load (Ordering Paragraphs D and G); (6) allowing Washington DOE staff access to the project after reasonable notice to Douglas PUD (Ordering Paragraphs D and G); (7) coordinating project operation with other mid-Columbia hydroelectric projects after appropriate notice (Ordering Paragraphs D and G); (8) constructing a bull trout interpretive display at the Wells Dam Visitor Center (Ordering Paragraph D); (9) counting adult Pacific lamprey 24-hours-per-day during the adult fish ladder monitoring season (May 1 to November 15) (Ordering Paragraphs D and F); (10) continuing to implement Douglas PUD's Land Use Policy (Article 412); (11) implementing best management practices to contain aquatic nuisance species during modification of recreation measures (Ordering Paragraph D); (12) notifying the agencies and implement containment measures if aquatic nuisance species are detected (Ordering Paragraph D); and (13) consulting annually with FWS and the Terrestrial Resources Working Group (Terrestrial RWG)[59] when preparing annual reports for the Wildlife and Botanical Management Plan (Article 409).

86. Twenty seven of the fish and wildlife agency recommendations were not recommended by staff in the EIS, however these recommendation are required in this

[58] *See* final EIS at 235–251.

[59] Members of the Terrestrial RWG include FWS, BLM, Washington DFW, Colville Tribes, and Douglas PUD.

license under section 401 of the CWA, section 18 of the FPA, or to be consistent with the FWS or NMFS biological opinion incidental take statements under section 7 of the ESA.

87. As discussed in the final EIS,[60] staff did not recommend developing a mid-Columbia white sturgeon hatchery facility because it required cost sharing among Douglas, Chelan, and Grant PUDs (Ordering Paragraph D).

88. Staff did not recommend the following measures because they required implementing as-yet unidentified and uncertain future potential measures: (1) measures to address future instances of non-compliance with state water quality standards (Ordering Paragraphs D and G); (2) future measures from Columbia River temperature total maximum daily load development (Ordering Paragraphs D and G); (3) plans, measures, or modifications to project facilities or operations to address exceedances of bull trout passage criteria or allowable bull trout incidental take without any specific measures that would be implemented (Ordering Paragraphs D, F, and H); (4) an Operations Study Plan to evaluate and implement potential as-yet unidentified operational measures to enhance upstream lamprey passage (Ordering Paragraphs D and F); (5) proposals to use the most-current technology commercially available to count adult Pacific lamprey without identifying specific measures that would be implemented toward that end (Ordering Paragraphs D and F); (6) potential alternative measures to improve lamprey counting (Ordering Paragraphs D and F); (7) measures to improve adult lamprey passage until performance is at a level similar to other mid-Columbia hydroelectric projects, or until compliance with an as-yet unidentified standard is achieved (Ordering Paragraphs D and F); (8) a juvenile lamprey downstream passage evaluation if future appropriate technology is developed during the license term to conduct such a study, and measures if the evaluation indicates that Wells Project operations are adversely affecting lamprey populations above Wells dam (Ordering Paragraphs D and F); (9) potential adult sturgeon passage measures that are consistent with passage measures implemented at other mid-Columbia projects (Ordering Paragraph D); (10) measures to address significant negative changes to native resident fish populations (Ordering Paragraph D); (11) an assessment to identify the potential effects of future changes in project operations on native resident fish, and measures to address potential effects (Ordering Paragraph D); (12) conducting resident fish studies and implementing as-yet unidentified measures, throughout the license term, to determine the relative abundance of various resident fish species within Wells reservoir; and (13) measures to address adverse effects on aquatic resources due to future potential changes in project operations that cause an increase in the proliferation of aquatic nuisance species (Ordering Paragraph D).

[60] *See* final EIS at 243 through 259.

89. Staff did not recommend the following measures because they are too broad in scope and general in nature to effectively enforce as license conditions: (1) participating in the Columbia and Snake River Spill Response Initiative, regional Water Quality Team, and Adaptive Management Team meetings (Ordering Paragraphs D and G); (2) participating in regional information exchanges for bull trout research and monitoring (Ordering Paragraph D); and (3) participating in information exchanges and regional efforts to coordinate monitoring activities for aquatic nuisance species (Ordering Paragraph D).

90. Staff did not recommend the following measures because they are unrelated to project-specific effects or purposes in the project area: (1) collecting tissue samples and funding genetic analysis of sampled bull trout throughout the mid-Columbia River and its tributaries; (2) monitoring and studying bull trout incidental take at off-project hatcheries and broodstock collection facilities (Ordering Paragraphs D and H); (3) conducting a literature review on the effectiveness of upstream passage measures implemented at other Columbia and Snake River hydroelectric projects (Ordering Paragraphs D and F); (4) compiling information on other white sturgeon supplementation and recovery programs in the Columbia River Basin (Ordering Paragraph D); and (5) conducting literature reviews at 5-year intervals to evaluate juvenile lamprey passage at other Columbia and Snake River hydroelectric projects and participating in Pacific lamprey regional work groups to support regional conservation efforts (Ordering Paragraph D).

91. Staff did not recommend the following measures because they are administrative in nature or measures that are not needed to address project effects: (1) implementing a study to examine the presence and relative abundance of juvenile lamprey in habitat affected by the project without justification of why this information is needed or how it would be used; (2) preparing annual reports on activities related to resident fish management; (3) requiring Aquatic SWG approval of the Wells HCP Project Fish Bypass/Spill Operations Plan; (4) considering the draft reasonable and prudent measures included in the Bull Trout Management Plan; and (5) identifying appropriate white sturgeon measures as opportunities for education to local public entities.

92. Three fish and wildlife agency recommendations are not mandatory and are not included in this license. Washington DFW and FWS recommended that the Commission issue a 50 year license for the Wells Project. Licensing term is discussed in the License Term section of this order. FWS recommended that Douglas PUD use the Wells Aquatic SWG and the Terrestrial RWG as the primary forums to ensure consistency and timely coordination with the committees established by the Wells HCP. The Commission does not object to the licensee and other entities establishing work groups and forums; however, the Commission only has jurisdiction over the licensee and cannot enforce provisions against parties other than the licensee. The entities involved in the working groups and the HCP Coordinating Committee may voluntarily coordinate the implementation of the HCP, but this recommendation is not an appropriate license

requirement. FWS also recommended that Douglas PUD conduct annual coordination meetings with the Terrestrial RWG and the FWS to provide updates on the success of the mitigation measures implemented under the Wildlife and Botanical Management Plan. This recommendation would not be enforceable by the Commission since it cannot require the attendance of other parties to the meetings.

B. Other Section 10(a)(1) Recommendations

Deviations from License Requirements

93. The Aquatic Agreement's Water Quality Management Plan includes provisions to notify the Aquatic SWG and Washington DOE in the event that water quality monitoring indicates the project is causing deviations from state water quality criteria, and develop and implement plans, as directed by the Aquatic SWG, to address any project-related adverse effects on water quality. The plans may include changes to project operations or facilities, if necessary, to address adverse effects. In the event that the Aquatic SWG directs Douglas PUD to modify project operations or facilities to address deviations from state water quality criteria, the Aquatic Agreement also includes a provision for Douglas PUD to obtain Commission approval prior to implementing any substantial modifications to project facilities or operations.

94. In the final EIS, Commission staff noted that all permanent modifications to approved project facilities and operations, regardless of whether Douglas PUD considers them to be substantial, would require license amendments. Therefore, staff recommended and this license requires Douglas PUD to notify the Commission and file an application to amend the license prior to implementing any permanent long-term changes to approved project operations or facilities. However, staff also noted that some short-term or temporary modifications to approved project operations or facilities may be necessary to address water quality criteria deviations, or emergency situations or circumstances outside of the control of the licensee (e.g., flood flow conditions). Consistent with staff's recommendation, Article 403 requires Douglas PUD to notify the Commission within 48 hours of any temporary modifications to approved project operations or facilities that are necessary to protect aquatic resources or in the event of emergency situations at the project.

Bull Trout Stranding and Incidental Take Monitoring

95. The Aquatic Agreement's Bull Trout Management Plan includes provisions to implement fish stranding evaluations during periods of low reservoir elevation, and monitoring studies to document incidental take of bull trout during implementation of

other aquatic resource measures and fish hatchery activities at project and non-project facilities. All of the proposed stranding evaluations and monitoring studies are mandatory conditions. In the EIS, staff recommended that Douglas PUD conduct the stranding evaluations and all of the proposed monitoring studies that would be implemented at project facilities. However, because the proposed studies lack sufficient detail to enable Commission administration and enforcement as license conditions, staff recommended that Douglas PUD prepare and file a detailed plan and schedule for implementing the stranding evaluations and monitoring studies.[61] Consistent with staff's recommendation, Article 402 requires Douglas PUD to prepare a monitoring plan to carry out the stranding evaluations and monitoring studies to the extent that the monitoring studies address the Wells Project facilities.[62]

96. All other bull trout monitoring studies are included in Washington DOE's water quality certification (Appendix A), Interior's section 18 prescription (Appendix C), or FWS' biological opinion incidental take statement (Appendix E), and thus are a requirement of the license.

Hatchery Genetic Management Plans

97. Douglas PUD proposes to implement hatchery genetic management plans for the project's Wells Hatchery and the non-project Methow Hatchery to address the effects of Wells HCP hatchery fish production on ESA-listed salmon and steelhead. Douglas PUD filed a hatchery genetic management plan for the Methow Hatchery UCR spring Chinook program with its license application. The Wells Hatchery UCR steelhead hatchery genetic management plan is still under development and has not been filed.

98. In the final EIS,[63] staff concluded that modifications to the Wells Hatchery that may be recommended through implementation of the proposed hatchery genetic management plan could require changes to project facilities that would require Commission authorization. To provide for Commission oversight of any modifications to the project that are necessary to implement the hatchery genetic management plan, Article 404 requires Douglas PUD to complete and file the Wells Hatchery UCR steelhead hatchery genetic management plan for Commission approval within one year of license issuance.

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[61] *See* final EIS at 233.

[62] Plans for monitoring studies at non-project facilities are not required to be filed for Commission approval.

[63] *See* final EIS at 230 and A-3.

99. The Methow Hatchery UCR spring Chinook hatchery genetic management plan is not included in this license because the Methow Hatchery is a non-project facility.

Aquatic Resource Management Plan Annual Report

100. The Aquatic Agreement includes a provision to file an annual report with the Commission by May 31st of each year of the license to document all studies, measures, and activities implemented in the previous year pursuant to each of the Aquatic Agreement aquatic resources management plans. The annual report would enable the Commission to administer compliance with license requirements for implementing the aquatic resource management plans. Article 406 requires the annual report.

Aquatic Nuisance Species Management Plan

101. The Aquatic Agreement's Aquatic Nuisance Species Management Plan includes measures designed to prevent the introduction and spread of non-native aquatic species in the project area. The measures include aquatic nuisance species containment methods during construction of recreation enhancement measures, monitoring for the presence of zebra and quagga mussels, and management measures consistent with aquatic nuisance species management protocols in the event that either species is detected in the project area during the term of the license. In the final EIS,[64] staff recommended the plan; however, staff also recommended that the plan be modified to include the specific management practices to control the spread of aquatic nuisance species during construction of recreation enhancement measures, and the specific containment measures that would be implemented if zebra or quagga mussels are detected during the monitoring. Article 405 requires Douglas PUD to modify the Aquatic Nuisance Species Management Plan accordingly.

Wildlife and Botanical Management Plan

102. Douglas PUD filed a Wildlife and Botanical Management Plan with proposed measures for noxious weeds, special-status plants and wildlife, and riparian and wetland habitat. Implementing the plan would improve Douglas PUD's ability to prevent, detect, and control noxious weeds without inadvertent damage to non-target species or to herbicide-sensitive individuals; protect special-status plants; protect existing roost and perch habitat for bald eagles and ensure recruitment of suitable perch trees in the future; improve potential winter cover and forage for sharp-tailed grouse; reduce disturbance to American white pelicans that rest and forage on the reservoir; improve the condition of wetland and riparian habitat that could be used by amphibians and waterfowl at Cassimer Bar and Bridgeport Bar; and provide additional forage for waterfowl. In the final EIS,[65]

[64] *See* final EIS at 239.

[65] See final EIS at 239-241.

staff recommended the plan with additional modifications, which include annually reviewing the Washington National Heritage Program rare plant list and providing an updated list of sensitive species in the annual reports required under the Plan. Staff also recommended that Douglas PUD prepare the recommended annual reports in consultation with the Terrestrial RWG and Washington DOE because this would provide the resource agencies and the Commission a mechanism for determining if the management objectives are being achieved and if modifications to the plan are warranted. Consistent with these staff recommendations, Article 409 requires Douglas PUD to modify the Wildlife and Botanical Management Plan to incorporate staff's recommended additions, and file the plan for Commission approval prior to implementation.

Avian Protection Plan

103. Douglas PUD proposes to implement an avian protection plan for the project's transmission line to minimize the risk of avian collision and electrocution. The plan includes: installing flight diverters on the transmission line where it crosses the Columbia River, if new conductors, static wires, or aviation markers are being replaced; using light-emitting designs (if available) to improve visibility in low-light conditions; maintaining records of avian mortalities and reporting all mortalities attributed to the transmission line to FWS through the online injury/fatality reporting program; implementing a nest management protocol developed in consultation with FWS and Washington DFG; limiting conifer tree-clearing within the transmission line right-of-way to between August 31 and January 31; training utility personnel to understand avian issues, protocols, vegetation management, and compliance regulations; meeting with resource agencies to discuss management of wildlife and botanical resources in the transmission corridor; and modifying the plan only with the agreement of FWS and Washington DFW, with proposed changes to be reported to the Commission for review and approval. The Avian Protection Plan is made part of this license under Ordering Paragraph I.

Recreation Management Plan

104. Douglas PUD proposes to implement the Recreation Management Plan which includes: (1) a Recreation Facility Improvement Program with construction of a boat-in tent camping facility for non-motorized boat users in the vicinity of the Okanogan River; and (2) a Recreation Facility Operation, Maintenance and Monitoring Program. In the final EIS,[66] staff concluded that these measures would help ensure that public access and recreation needs are met for the term of the new license, enhance the aesthetic quality and the physical condition of project-related recreational facilities, and reduce recreation-related adverse effects on environmental resources. Douglas PUD has not yet determined

[66] *See* final EIS at 194–201.

a location for the boat-in tent camping facility in the vicinity of the Okanogan River. In its comments on the draft EIS, Douglas PUD requested an extension of the Commission's deadline for determining the campsite location from six months to one year from the license issuance to allow sufficient time to consult with stakeholders. Article 411 requires the licensee to implement the Recreation Management Plan and to file a supplement to the Recreation Management Plan within one year of license issuance that includes a map depicting the exact location where the proposed non-motorized campsite would be constructed.

OTHER ISSUES

A. Encroachment

105. Encroachment occurs when the tailwater elevation of a hydroelectric project is adversely impacted by the forebay elevation of another project located immediately downstream of the first. The tailwater elevation of the Corps' upstream Chief Joseph Project was increased when the Wells Project was constructed. Article 32 of the current license requires Douglas PUD to compensate the United States for tailwater elevation encroachment. Pursuant to this article, Douglas PUD and the Corps reached a compensation agreement that expired on May 31, 2012. On November 9, 2011, BPA, the Corps, and Douglas PUD filed an agreement in principle to continue to provide encroachment compensation and a request that such provision be included in the new license for the Wells Project, compensable pursuant to FPA section 10(c).[67] Accordingly, Article 203 requires Douglas PUD to compensate for this encroachment consistent with FPA section 10(c) and the principles set forth in the November 9, 2011 filing.

B. Compensation for the Confederated Tribes of the Colville Reservations

106. Section 10(e)(1) of the FPA[68] provides in pertinent part:

> when licenses are issued involving the use of . . . tribal lands embraced within Indian Reservations the Commission shall . . ., subject to the approval of the Indian Tribe having jurisdiction of such lands . . ., fix a reasonable annual charge for the use thereof.

107. On February 11, 2005, the Commission approved the Colville Settlement Agreement, which was intended to settle and resolve all claims by the Colville against Douglas PUD regarding past, present, and future section 10(e) payments for the use of

[67] 16 U.S.C. § 803(c) (2006).

[68] 16 U.S.C. § 803(e)(10) (2006).

tribal lands within the project boundary.[69] The settlement agreement covered all claims as of the effective date of the agreement for the duration of the original license and for the duration of any new license issued to Douglas PUD. The settlement agreement has three components: (1) a one time payment from Douglas PUD to the Colville; (2) a land transfer of Douglas PUD's non-project property to the Colville; and (3) Douglas PUD's ongoing responsibility to sell to the Colville a share of the project's power output. The first two components have been completed. Article 202 requires Douglas PUD to continue to sell a share of power to the Colville.

C. Canadian Entitlement

108. In 1964, the United States and Canada finalized the Columbia River Treaty, under which the two nations jointly regulate and manage the Columbia River for power and flood control. Article 38 of the current license requires Douglas PUD to make available to the federal system (i.e., BPA) for delivery to Canada, the portion of the project's power that is attributable to Canadian storage projects (i.e., headwater benefits), as determined to be due to Canadian interests under the procedures established pursuant to the treaty.[70] BPA and the Corps recommend that this provision be included in the new license. I agree. Accordingly, Article 204 of this license includes the language of Article 38 of the original license.

D. Flood Control

109. The Flood Control Act of 1936 requires the Corps and the Commission to provide for flood control for the Columbia River within the Columbia Basin. Article 34 of the current license requires the Corps' District Engineer to inform Douglas PUD of the storage space to be provided in the Wells Project reservoir to compensate for valley storage that may be expected to be lost during the ensuing flood season. The article requires Douglas PUD to provide storage space up to 500,000 acre-feet. In addition, Douglas PUD must meet certain conditions, such as reservoir drawdown and release timing, as determined by the Corps. This storage is intended for very large floods, and although extensive upstream storage development has reduced the frequency of such floods, they could still occur. BPA and the Corps recommend including this article for flood control in the new license. I agree. Article 205 requires Douglas PUD to provide

[69] 110 FERC ¶ 61,128 (2005).

[70] Douglas PUD has entered into an agreement with the BPA and the Corps that allow Douglas PUD to take advantage of improved streamflow as a result of Canadian storage as long as Douglas PUD delivers to BPA and the Corps the portion of the Canadian entitlement generated at its project. In 1998, the Commission approved this agreement, pursuant to the FPA section 22, 16 U.S.C. § 815 (2006). It expires in 2024.

this storage space.

ADMINISTRATIVE PROVISIONS

A. Annual Charges

110. The Commission collects annual charges from licensees for administration of the FPA. Article 201 provides for the collection of funds for administration of the FPA and use and occupancy of U.S. lands.

B. Exhibit F and G Drawings

111. The Commission requires licensees to file sets of approved project drawings on microfilm and in electronic file format. Articles 206 requires the filing of the approved drawings.

112. Because Douglas PUD will be modifying some of its Exhibit G drawings to include a proposed boat-in tent camping facility, a camping area near the Wells dam, and an expanded recreation area at Marina Park, Article 207 requires the filing of revised Exhibit G drawings. In addition, Sheets G-T1 through G-T5 of the Exhibit G drawings are currently labeled "Project Boundary and Location Map.", but these drawings refer to the transmission line corridor. Therefore, they must be relabeled as "Transmission Line Corridor" and renumbered from G-65 through G-69. Finally, because all of the Exhibit G drawings include the word "preliminary" above the surveyor's stamp. Article 207 requires the filing of revised Exhibit G drawings with this word removed.

C. Headwater Benefits

113. Some hydropower projects directly benefit from headwater improvements that were constructed by other licensees, the United States, or permittees. In their comments to the REA notice, BPA and the Corps recommend that we include the headwater benefits requirement in the new license. Article 208 requires Douglas PUD to reimburse such entities for these benefits if they were not previously assessed and reimbursed.

D. Use and Occupancy of Project Lands and Waters

114. Requiring a licensee to obtain prior Commission approval for every use or occupancy of project land would be unduly burdensome. Therefore, Article 413 allows the licensee to grant permission, without prior Commission approval, for the use and occupancy of project lands for such minor activities as landscape planting. Such uses must be consistent with the purposes of protecting and enhancing the scenic, recreational, and environmental values of the project.

E. Review of Final Plans and Specifications

115. Where new construction or modifications to the project are involved, the Commission requires licensees to file revised drawings of project features as built. Article 301 provides for the filing of these drawings.

F. Commission Approval of Resource Plans, Reports, Notification, and Filing of Amendments

116. In Appendices A, C, D, and E, there are certain certification conditions, fishway prescriptions, and terms and conditions of the NMFS and FWS incidental take statements that either do not require the licensee to file plans or reports with the Commission or do not provide for consultation with the appropriate agencies during plan or report development. Therefore, Article 401 requires the licensee to consult with the agencies during plan development, file reports with the Commission, file plans with the Commission for approval, and file amendment applications, as appropriate.

STATE AND FEDERAL COMPREHENSIVE PLANS

117. Section 10(a)(2)(A) of the FPA[71] requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.[72] Under section 10(a)(2)(A), federal and state agencies filed 74 comprehensive plans that address various resources in Washington. Of these, staff identified and reviewed 29 plans that are relevant to this project.[73] No conflicts were found.

APPLICANT'S PLANS AND CAPABILITIES

118. In accordance with sections 10(a)(2)(C) and 15(a) of the FPA,[74] Commission staff evaluated Douglas PUD's record as a licensee for these areas: (1) conservation efforts; (2) compliance history and ability to comply with the new license; (3) safe management, operation, and maintenance of the project; (4) ability to provide efficient and reliable electric service; (5) need for power; (6) transmission services; (7) cost effectiveness of

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[71] 16 U.S.C. § 803(a)(2)(A) (2006).

[72] Comprehensive plans for this purpose are defined at 18 C.F.R. § 2.19 (2012).

[73] The list of applicable plans can be found in section 5.5 of the final EIS.

[74] 16 U.S.C. § 803(a)(2)(C) and 808(a) (2006).

plans; and (8) actions affecting the public. I accept the staff's findings in each of the following areas.

A. Conservation Efforts

119. Section 10(a)(2)(C) of the FPA requires the Commission to consider the extent of electricity consumption efficiency improvement programs in the case of license applicants primarily engaged in the generation or sale of electric power, like Douglas PUD. Each year, Douglas PUD completes a comprehensive analysis of future load growth and the need for new resources, including customer efficiency programs, to meet its customer demand. In the most recent report, Douglas PUD proposed demand side management actions and goals to promote demand side load management practices for both residential and commercial/industrial customers. The report also showed that Douglas PUD has undertaken several programs to improve efficiency and promote energy conservation at its own plants. These programs show that Douglas PUD is making an effort to conserve electricity and has made a satisfactory good faith effort to comply with section 10(a)(2)(C) of the FPA.

B. Compliance History and Ability to Comply with the New License

120. Based on a review of Douglas PUD's compliance with the terms and conditions of the existing license, Douglas PUD's overall record of making timely filings and compliance with its license is satisfactory. Therefore, Douglas PUD has the ability to satisfy the conditions of a new license.

C. Safe Management, Operation, and Maintenance of the Project

121. Staff have reviewed Douglas PUD's management, operation, and maintenance of the Wells Project pursuant to the requirements of 18 C.F.R. Part 12 and the Commission's Engineering Guidelines. Staff concludes that there is no reason to believe that Douglas PUD cannot continue to safely manage, operate, and maintain the dam and other project works in accordance with the Commission's standards and oversight under a new license.

D. Ability to Provide Efficient and Reliable Electric Service

122. Staff have reviewed Douglas PUD's plans and its ability to operate and maintain the project in a manner most likely to provide efficient and reliable electric service. Staff's review indicates that Douglas PUD regularly inspects the project turbine generator units to ensure they continue to perform in an optimal manner, schedules maintenance to minimize effects on energy production, and since the project has been in operation, has undertaken several initiatives to ensure the project is able to operate reliably into the future. Therefore, Douglas PUD is capable of operating the project to provide efficient and reliable electric service in the future.

E. Need for Power

123. Douglas PUD serves about 18,000 retail customers in Douglas County, Washington. The Wells Project is the only generating facility owned and operated by Douglas PUD, which also has contracts to purchase power from Chelan PUD's Rocky Reach Project and the Nine Canyon Wind Project. The 774.25-MW Wells Project produces approximately 4,077,400 megawatt-hours (MWh) per year. Project power is sold under long-term contracts to four wholesale power purchasers, helping to meet the electrical power needs of consumers throughout the Pacific Northwest region.

124. Douglas PUD's 2007 Integrated Resource Plan update predicts that Douglas PUD will have adequate resources to meet its peak customer load through 2018.

125. The Wells Project is located within the Northwest subregion of the Western Electricity Coordinating Council region of the North American Electric Reliability Corporation (NERC). According to NERC's 2010 forecast, winter peak demand and annual demand requirements for the Northwest subregion are projected to grow at a rate of 1.1 percent and 1.2 percent, respectively, from 2010 through 2019.

126. Power from the Wells Project can continue to serve Douglas PUD's customers as well as meet part of the regional need for power.

F. Transmission Services

127. The project includes two 41-mile-long transmission lines that deliver project power to Douglas PUD's bulk transmission grid at the Douglas switchyard near Rocky Reach dam. Douglas PUD proposes no changes that would affect its own or other transmission services in the region. The project and project transmission lines are important elements in providing power and voltage control to local Douglas County communities and the region.

G. Cost Effectiveness of Plans

128. Douglas PUD does not propose any capacity expansion at the project and based on the available flow, staff do not expect any additional capacity to be cost-effective at this site. As discussed in this order, Douglas PUD proposes several measures and plans for the enhancement of fish and wildlife, recreation, and cultural resources at the project. Based on Douglas PUD's record as an existing licensee, staff concludes that these plans are likely to be carried out in a cost-effective manner.

H. Actions Affecting the Public

129. Douglas PUD provided extensive opportunity for public involvement in the development of its application for a new license for the Wells Project. During the previous license period, Douglas PUD provided facilities to enhance public use of project

lands and facilities and operated the project with consideration for the protection of downstream uses of the mid-Columbia River. Douglas PUD uses the project to help meet local and regional power needs.

PROJECT ECONOMICS

130. In determining whether to issue a new license for an existing hydroelectric project, the Commission considers a number of public interest factors, including the economic benefits of project power. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[75] the Commission uses current costs to compare the costs of the project and likely alternative power with no forecasts concerning potential future inflation, escalation, or deflation beyond the license issuance date. The basic purpose of the Commission's economic analysis is to provide a general estimate of the potential power benefits and the costs of a project, and of reasonable alternatives to project power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

131. In applying this analysis to the Wells Project, we have considered three options: no action alternative, Douglas PUD's proposal, and the project as licensed herein. Under the no action alternative, the project would continue to operate as it does now. The project has an installed capacity of 774.25 MW, has a dependable capacity of 715 MW, and generates an average of 4,077,400 MWh of electricity annually. The average annual project cost is about $70.4 million, or $17.25/MWh. When we multiply our estimate of average generation by the alternative power cost of $106.53/MWh,[76] staff gets a total value of the project's power of $434.4 million in 2011 dollars. To determine whether the proposed project is currently economically beneficial, staff subtracts the project's cost from the value of the project's power.[77] Therefore, the project costs $364.0 million, or $89.28/MWh, less to produce power than the likely alternative cost of power.

132. As proposed by Douglas PUD, the levelized annual cost of operating the Wells Project is $72.3 million, or $17.73/MWh. Based on the same amount of estimated average generation of 4,077,400 MWh and alternative power cost of $106.53/MWh, staff gets a total value of the project's power of $434.4 million in 2011 dollars. Therefore, in

[75] 72 FERC ¶ 61,027 (1995).

[76] The alternative power cost of $106.53 per MWh is based on information obtained from a sales contract, U.S. Energy Information Administration fuel cost data, and regional bid prices.

[77] Details of staff's economic analysis for the project as licensed herein and for various alternatives are included in the final EIS issued October 2011.

the first year of operation, the project would cost $362.1 million, or $88.80/MWh, less than the likely alternative cost of power.

133. As licensed herein with the mandatory conditions and staff measures, the levelized annual cost of operating the project would be about $72.1 million, or $17.69/MWh. Based on the same amount of estimated average generation of 4,077,400 MWh as licensed, the project would produce power valued at $434.4 million when multiplied by the $106.53/MWh value of the project's power. Therefore, in the first year of operation, project power would cost $362.2 million, or $88.84/MWh, less than the likely cost of alternative power.

134. In considering public interest factors, the Commission takes into account that hydroelectric projects offer unique operational benefits to the electric utility system (ancillary service benefits). These benefits include their ability to help maintain the stability of a power system, such as by quickly adjusting power output to respond to rapid changes in system load; and to respond rapidly to a major utility system or regional blackout by providing a source of power to help restart fossil-fuel based generating stations and put them back online.

COMPREHENSIVE DEVELOPMENT

135. Sections 4(e) and 10(a)(1) of the FPA[78] require the Commission to give equal consideration to power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The decision to license this project, and the terms and conditions included herein, reflect such consideration.

136. The EIS for the project contains background information, analysis of effects, and support for related license articles. The project will be safe if operated and maintained in accordance with the requirements of this license.

137. Based on my independent review and evaluation of the Wells Project, recommendations from the resource agencies and other stakeholders, and the no-action alternative, as documented in the final EIS, I have selected the proposed Wells Project, with the staff-recommended measures and mandatory conditions, and find that it is best adapted to a comprehensive plan for improving or developing the Columbia River.

[78] 16 U.S.C. §§ 797(e) and 803(a)(1) (2006).

138. I selected this alternative because: (1) issuance of a new license will serve to maintain a beneficial, dependable, and an inexpensive source of electric energy; (2) the required environmental measures will protect and enhance fish and wildlife resources, water quality, recreational resources, and historic properties; and (3) the 774.25 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution.

LICENSE TERM

139. Section 15(e) of the FPA[79] provides that any new license issued shall be for a term that the Commission determines to be in the public interest, but not less than 30 years or more than 50 years. Douglas PUD requested a 50-year license. Seven parties to the Aquatic Agreement and numerous other parties[80] support Douglas PUD's request for a 50-year license for the Wells Project.

140. The Commission's general policy is to establish 30-year terms for projects with little or no redevelopment, new construction, new capacity, or environmental mitigation and enhancement measures; 40-year terms for projects with a moderate amount of such activities; and 50-year terms for projects with extensive measures.[81] This license requires a moderate amount of mitigation and enhancement measures, including: continued implementation of the Wells HCP including fish passage; tributary enhancement and hatchery programs; implementation of a Wells Hatchery UCR Steelhead Hatchery Genetic Management Plan; implementation of management plans to protect and enhance water quality, bull trout, Pacific lamprey, white sturgeon, resident fish, and control aquatic nuisance species; implementation of plans that would protect and enhance wildlife and associated habitat; implementation of a plan to enhance recreation opportunities; and implementation of a plan to protect historic resources. Consequently, a license term of 40 years for the Wells Project is appropriate.

141. Douglas PUD argues the measures contained in the HCP that are carried over to the new license should be counted in favor of issuing a 50-year license. In the Commission's Rocky Reach rehearing order, the Commission explained that the HCP

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[79] 16 U.S.C. § 808(e) (2006).

[80] The following filed comments in support of a 50-year license: Congressmen Doc Hastings and David Reichert; Senators Patty Murray and Maria Cantwell; Congresswoman Cathy McMorris Rodgers; the cities of Pateros, Bridgeport, and Brewster; the Ports of Chelan and Douglas Counties; Puget Sound Energy; Avista; Public Utility District No. 1 of Okanogan County; Washington DOE; and the Douglas County Commissioners.

[81] *See Consumers Power Company*, 68 FERC ¶ 61,077, at 61,383-84 (1994).

provisions should be excluded from consideration for purposes of determining measures contained in the new license.[82] Moreover, it is the Commission's policy to coordinate to a reasonable extent the license expiration dates of projects in a river basin, in order that subsequent relicense proceedings can also be coordinated.[83] As noted above, there are three nearby licensed projects in the mid-Columbia River basin: (1) Rocky Reach Project No. 2145, (2) Rock Island Project No. 943, and (3) Priest Rapids Project No. 2114.

142. Under the FPA, we cannot issue a new license with a term of less than 30 years; therefore, we cannot coordinate this license term with that for the Rock Island Project because it expires 16 years from now in 2028.

143. In 2008 and 2009, the Commission issued new licenses for, respectively, the Priest Rapids Project and the Rocky Reach Project. Both licenses expire in 2052.[84] Both the licensees for Rocky Reach and Wells Projects are parties to HCPs that include provisions for the protection of salmon and steelhead through a combination of project survival, hatchery programs and evaluations, and habitat restoration work. These HCPs will terminate in 2052. Accordingly, choosing a license term to coincide with the expiration of the HCPs (in 2052 or in 40 years) is not only consistent with the moderate amount of mitigation and enhancement measures included in this license, but will also allow future coordination among the Columbia River Basin projects.

The Commission orders:

(A) This license is issued to Public Utility District No. 1 of Douglas County (licensee), for a period of 40 years, effective the first day of the month in which this order is issued, to operate and maintain the Wells Project. This license is subject to the terms and conditions of the Federal Power Act (FPA), which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

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[82] 127 FERC ¶ 61,152 (2009).

[83] In issuing new and subsequent licenses, the Commission will coordinate the expiration dates of licenses to the maximum extent possible, to maximize future consideration of cumulative impacts in contemporaneous proceedings at relicensing. *See* 18 C.F.R. § 2.23 (2012).

[84] 123 FERC ¶ 61,049 (2008); 126 FERC ¶ 61,138, order on reh'g, 127 FERC ¶ 61,152 (2009)

(1) All lands, to the extent of the licensee's interest in these lands, described in the project description and the project boundary discussion of this order.

(2) Project works including: (a) a 1,130-foot-long, 168-foot-wide concrete hydrocombine dam with integrated generating units, spillways, switchyard, and juvenile fish passage facilities; (b) a 2,300-foot-long, 40-foot-high earth and rock-filled west embankment; (c) a 1,030-foot-long, 160-foot-high earth and rock-filled east embankment; (d) a 29.5-mile-long reservoir with surface area of about 9,740 acres, gross storage capacity of 331,200 acre-feet, and useable storage capacity of 97,985 acre-feet at normal pool elevation of 781 feet mean sea level; (e) eleven 46-foot-wide, 65-foot-high ogee-designed spillway bays with 2 vertical lift gates; (f) five spillway bays modified to accommodate the juvenile fish bypass system; (g) 10 turbine/generating units each with a 77.425-MW generator for a total installed capacity of 774.25 MW and a maximum hydraulic capacity of 22,000 cfs at an average gross head of 73 feet; (h) two 41-mile-long, 230-kV single-circuit transmission lines running parallel to each other; (i) the Wells Hatchery; and (j) appurtenant facilities.

The project works generally described above are more specifically shown and described by those portions of Exhibits A and F shown below:

Exhibit A: The following sections of Exhibit A filed on May 27, 2010:

Section 2, pages A-4 through A-16, entitled "Project Facilities," describing the mechanical, electrical, and transmission equipment within the application for license; section 3.1, pages A-16 through A-17, entitled "Wells Hatchery;" section 4.1, pages A-19 through A-23, entitled "Recreation Facilities within the Cities of Pateros, Brewster;" and section 4.2, pages A-24 through A-27, entitled "Recreation Sites Outside the Cities."

Exhibit F: The following Exhibit F drawings filed on May 27, 2010:

Exhibit F Drawing	FERC No. 2149-	Description
Sheet F-1	1001	Hydrocombine, General Layout
Sheet F-2	1002	Hydrocombine, The Unit
Sheet F-3	1003	Hydrocombine, The Spillway
Sheet F-4	1004	Hydrocombine, The Fish Facilities
Sheet F-5	1005	Hydrocombine, The Fish Facilities
Sheet F-6	1006	Hydrocombine, Longitudinal Sections
Sheet F-7	1007	Hydrocombine, Plan View
Sheet F-8	1008	Hydrocombine, Sectional Plan – El. 776
Sheet F-9	1009	Hydrocombine, Sectional Plan – El. 764

Exhibit F Drawing	FERC No. 2149-	Description
Sheet F-10	1010	Hydrocombine, Sectional Plan – El. 752
Sheet F-11	1011	Hydrocombine, Sectional Plan – El. 736
Sheet F-12	1012	Hydrocombine, Sectional Plan – El. 720
Sheet F-13	1013	Hydrocombine, Sectional Plan – El. 705
Sheet F-14	1014	Hydrocombine, Sectional Plan – El. 686 and 666
Sheet F-15	1015	Hydrocombine, Sectional Plan – El. 634
Sheet F-16	1016	Hydrocombine Fish Facilities, Sectional Plan
Sheet F-17	1017	Dam Embankments, West Embankment
Sheet F-18	1018	Dam Embankments, East Embankment – Sheet 1 of 4
Sheet F-19	1019	Dam Embankments, East Embankment – Sheet 2 of 4
Sheet F-20	1020	Dam Embankments, East Embankment – Sheet 3 of 4
Sheet F-21	1021	Dam Embankments, East Embankment – Sheet 4 of 4
Sheet F-22	1022	Hydrocombine Fish Bypass – Flow Barrier Panels

(3) All of the structures, fixtures, equipment, and facilities used to operate or maintain the project, all portable property that may be employed in connection with the project, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) Exhibits A and F described above are approved and made part of the license.

(D) This license is subject to the conditions submitted by the Washington Department of Ecology under section 401(a)(1) of the Clean Water Act, 33 U.S.C. § 1341(a)(1) (2006), as those conditions are set forth in Appendix A to this order.

(E) This license is subject to the conditions submitted by the Secretary of the U.S. Department of Commerce under section 18 of the FPA, as those conditions are set forth in Appendix B to this order.

(F) This license is subject to the conditions submitted by the Secretary of the U.S. Department of the Interior under section 18 of the FPA, as those conditions are set forth in Appendix C to this order.

(G) This license is subject to the incidental take terms and conditions of the biological opinion submitted by the National Marine Fisheries Service on March 7, 2012, under section 7 of the Endangered Species Act, as those conditions are set forth in Appendix D to this order.

(H) This license is subject to the incidental take terms and conditions of the biological opinion submitted by the U.S. Fish and Wildlife Service on March 19, 2012, under section 7 of the Endangered Species Act, as those conditions are set forth in Appendix E to this order.

(I) The Avian Protection Plan included as Appendix E-6 of Exhibit E of the final license application filed on May 27, 2010, is approved and made a part of the license.

(J) This license is also subject to the articles set forth in Form L-5 (October, 1975), entitled "Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters and Lands of the United States," (*see* 54 F.P.C. 1832 et seq.), as reproduced at the end of this order, and the following additional articles:

Article 201. *Administrative Annual Charges*. The licensee shall pay the United States annual charges, effective the first day of the month in which the license is issued, and as determined in accordance with provisions of the Commission's regulations in effect from time to time, for the purposes of:

(a) reimbursing the United States for the cost of administration of Part I of the Federal Power Act. The authorized installed capacity for that purpose is 774.25 megawatts; and

(b) recompensing the United States for the use, occupancy, and enjoyment of 15.15 acres of its land (other than for transmission line right-of-way).

Article 202. *Compensation for the Confederated Tribes of the Colville Reservation.* Recompensing the Confederated Tribes of the Colville Reservation pursuant to the terms of the Colville Settlement Agreement and the Colville Power Sales Contract, dated August 18, 2004, between Douglas County Public Utility District No. 1 and the Confederated Tribes of the Colville Reservation, and filed with the Commission November 23, 2004, constitutes payment in full.

Article 203. *Encroachment*. With respect to compensation to the United States for the losses caused to the Chief Joseph Project by encroachment upon its tailwater by the operation of the Wells project:

(a) The licensee shall enter into an agreement with the Chief of Engineers, Department of the Army, or designated representative, to compensate the United States for encroachment on the Chief Joseph Project resulting from the operation of the Wells

Project. For Chief Joseph Units 1-16, the licensee will provide encroachment payments representing the difference in Chief Joseph generation with and without impact of the Wells Project in time and kind for the full Wells pool with updated efficiency curves. For Chief Joseph Units 17-27, the licensee will provide compensation for the excess water use between forebay elevations 779 and 781 feet mean sea level. Compensation will be based on the amount of water used by Chief Joseph Units 17-27 in excess of the hydraulic limit of the smaller units that would have been installed without the Wells Project. Encroachment compensation would not be automatically eliminated when Chief Joseph is spilling. The licensee will provide encroachment payments for water going through the turbines during instances when spill occurs at Chief Joseph, such as spilling for reserves or total dissolved gas management. The licensee will compensate the federal government for the mutually agreed incremental cost of the future unit replacements consistent with the licensee's 1963 compensation for the incremental cost of units 17-27.

(b) The licensee shall file the new encroachment agreement with the Commission for inclusion in the license.

Article 204. *Canadian Storage*. The licensee shall use the improved streamflow from Canadian storage projects for power production purposes, and make available to the federal system for delivery to Canada, or for its account, the project's share of coordinated system benefits resulting from such improved streamflows, both dependable hydroelectric capacity and average annual usable hydroelectric energy, as determined to be due to Canadian interests under the procedures established pursuant to any treaty between the United States and Canada relating to cooperative development of water resources of the Columbia River Basin.

Article 205. *Flood Control.* Each year before the beginning of flood runoff, the licensee shall gather from the District Engineer, U.S. Army Corps of Engineers, in charge of the locality, information relating to the amount of the storage space to be provided in the Wells Project reservoir to compensate approximately for valley storage that may be expected to be lost during the ensuing flood season. The licensee shall without cost to the United States provide this storage space in accordance with the following general procedures:

(a) The amount of storage space to be provided by the licensee will vary from zero acre-feet for a forecasted peak flow of 500,000 second-feet at The Dalles, Oregon, to approximately 125,000 acre-feet for a forecasted peak flow of 1,100,000 cubic feet per second at The Dalles, the forecasted flows to be as regulated by storage existing at the time of license. To the extent feasible and in order to minimize the duration of the drawdown of the Wells reservoir for valley storage replacement, the drawdown will be ordered by the District Engineer, not earlier than two weeks before the predicted date on which the observed flow at The Dalles is forecasted to equal or exceed 500,000 cubic feet per second and refill will be directed by the District Engineer generally within one week after voluntary filling of Grand Coulee Reservoir for flood control purposes is initiated.

(b) Detailed procedures for use of the valley storage replacement in the Wells reservoir will be included in a regulation manual to be prepared by the District Engineer.

Article 206. *Exhibit F Drawings*. Within 45 days of the date of issuance of the license, the licensee shall file the approved exhibit drawings in aperture card and electronic file formats.

(a) Four sets of the approved exhibit drawings shall be reproduced on silver or gelatin 35mm microfilm. All microfilm shall be mounted on type D (3-1/4" X 7-3/8") aperture cards. Prior to microfilming, the FERC Project-Drawing Number (i.e., P-2149-#### through P-2149-####) shall be shown in the margin below the title block of the approved drawing. After mounting, the FERC Drawing Number shall be typed on the upper right corner of each aperture card. Additionally, the Project Number, FERC Exhibit (i.e., F-1, etc.), Drawing Title, and date of this license shall be typed on the upper left corner of each aperture card.

Two of the sets of aperture cards along with form FERC-587 shall be filed with the Secretary of the Commission, ATTN: OEP/DHAC. The third set shall be filed with the Commission's Division of Dam Safety and Inspections Portland Regional Office.

(b) The licensee shall file two separate sets of exhibit drawings in electronic raster format with the Secretary of the Commission, ATTN: OEP/DHAC. A third set shall be filed with the Commission's Division of Dam Safety and Inspections Portland Regional Office. Exhibit F drawings must be separated from other project exhibits and identified as Critical Energy Infrastructure Information (CEII) material under 18 C.F.R. § 388.113(c) (2012). Each drawing must be a separate electronic file, and the file name shall include: FERC Project-Drawing Number, FERC Exhibit, Drawing Title, date of this license, and file extension in the following format [P-2149-####, F-1, Project Boundary, MM-DD-YYYY.TIF]. Electronic drawings shall meet the following format specification:

IMAGERY - black & white raster file
FILE TYPE – Tagged Image File Format (TIFF), CCITT Group 4
RESOLUTION – 300 dpi desired (200 dpi min)
DRAWING SIZE FORMAT – 24" X 36" (min), 28" X 40" (max)
FILE SIZE – less than 1 MB desired

Article 207. *Revised Exhibit G Drawings*. Within 90 days of the effective date of the license, the licensee shall file, for Commission approval, revised Exhibit G drawings enclosing within the project boundary all principal project works necessary for operation and maintenance of the project and identifying the location and name of each project recreation site, including:

(a) The proposed boat-in tent camping facility near the Okanogan River, the informal/rustic camping location near Wells dam, and the expanded recreation area at Marina Park.

(b) Sheets G-T1 through G-T5 renumbered as G-65 through G-69 and the description changed to "Transmission Line Corridor".

(c) All Exhibit G drawings with the word "preliminary" above the surveyor's stamp removed.

The Exhibit G drawings must comply with sections 4.39 and 4.41 of the Commission's regulations.

Article 208. *Headwater Benefits*. If the licensee's project was directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extension of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license. The benefits will be assessed in accordance with Part 11, Subpart B, of the Commission's regulations.

Article 301. *As-Built Drawings*. Within 90 days of completion of construction of the facilities directed by any article of this license (recreation facilities, etc.), the licensee shall file for Commission approval revised Exhibits A, F, and G, as applicable, to show those project facilities as built. A courtesy copy shall be filed with the Division of Dam Safety and Inspections (D2SI) Portland Regional Engineer, the Director, D2SI, and the Director, Division of Hydropower Administration and Compliance.

Article 401. *Commission Approval and Filing of Amendments*.

(a) Requirement to File Plans for Commission Approval

Various conditions of this license found in Washington Department of Ecology's (Washington DOE's) water quality certification (Appendix A), U.S. Department of the Interior's (Interior's) section 18 fishway prescriptions (Appendix C), and National Marine Fisheries Service's (NMFS') incidental take statement terms and conditions (Appendix D) require the licensee to prepare plans in consultation with other entities for approval by Washington DOE, Interior, or NMFS and implement specific measures without prior Commission approval. Each such plan shall also be submitted to the Commission for approval. These plans are listed below.

Washington DOE Certification Condition Number	**Interior Section 18 Prescription Number**	**NMFS Incidental Take Statement Term and Condition Number**	**Plan Name or Measure**	**Due Date**
6.5 (section 4.1.1 of White Sturgeon Plan)			White Sturgeon Broodstock Collection and Breeding Plan	Within one year of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Lamprey Entrance Efficiency Plan	Within one year of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder diffuser gratings	Within five years of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder transition zones	Within five years of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder traps and exit pools	Within five years of license issuance

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	NMFS Incidental Take Statement Term and Condition Number	Plan Name or Measure	Due Date
6.6(4)			Aquatic Nuisance Species Management Plan	Within one year of detection of any new aquatic nuisance species
6.7(2)(d)		2 (section 4.1.2 of Water Quality Plan)	Annual Wells HCP Project Fish Bypass/Spill Operations Plan	Within one year of license issuance
6.7(2)(a)		2 (section 4.1.3 of Water Quality Plan)	Gas Abatement Plan	By February 28 each year following license issuance
6.7(7)(a)		2 (section 4.6.1 of Water Quality Plan)	Quality Assurance Project Plans	Within one year of license issuance
6.7(2)(e)			Water Quality Attainment Plan	Within one year of license issuance
6.7(5)(a)		2 (section 4.4.1 of Water Quality Plan)	Updated Spill Prevention Control and Countermeasures Plan	Within one year of license issuance
6.8(e)			Water Quality Protection Plan for Future Construction Activities	60 days prior to the start of construction

The licensee shall include with each plan filed with the Commission documentation that the licensee developed each plan after consultation with the National Marine Fisheries Service, Washington Department of Fish and Wildlife, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management, and has received approval from Washington DOE, Interior, or NMFS as appropriate. The Commission reserves the right to make changes to any plan submitted. Upon Commission approval, the plan becomes a requirement of the license, and the licensee shall implement the plan, including any changes required by the Commission.

(b) Requirement to File Reports

Two conditions of Washington DOE's water quality certification (Appendix A) and one condition of NMFS' incidental take statement terms and conditions (Appendix D) require the licensee to file reports with other entities. These reports document compliance with requirements of this license and may have bearing on future actions. Each such report shall also be submitted to the Commission. These reports are listed in the following table:

Washington DOE Certification Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description	Due Date
6.7(2)(c)(iii)	2 (sections 4.1.1, 4.1.3 of Water Quality Plan)	Total Dissolved Gas Report, including report of all spill occurring outside of the fish passage season	By February 28 each year following license issuance
6.7(3)(b)		Temperature Report	By April 30 each year following license issuance

The licensee shall submit to the Commission documentation of any consultation, and copies of any comments and recommendations made by any consulted entity in connection with each report. The Commission reserves the right to require changes to project operations or facilities based on the information contained in the report and any other available information.

(c) Requirement to File Amendment Applications

Certain water quality certification conditions in Appendix A, section 18 fishway prescriptions in Appendix C, and incidental take statement terms and conditions for bull trout in Appendix E contemplate unspecified long-term changes to project operations,

facilities, or environmental measures for the purpose of mitigating environmental impacts. These changes may not be implemented without prior Commission authorization granted after the filing of an application to amend the license. These conditions are listed below.

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
6.5 (section 4.1.2 of White Sturgeon Plan)				Alternative measures if juvenile sturgeon stocking deadlines cannot be achieved
6.5 (section 4.4 of White Sturgeon Plan)				White sturgeon adult passage measures that are consistent with measures at other mid-Columbia projects
6.5 (sections 4.2.1, 4.4, 4.5.1, 4.6.1 of Bull Trout Plan)		6, 8		Measures to address exceedances of allowable levels of bull trout incidental take
6.5 (section 4.3 of Bull Trout Plan)	4.8	5		Modifications to upstream fishways, downstream bypass, or operations to reduce impacts to bull trout passage
	4.6	10		Measures to improve bull trout passage until compliance with the bull trout passage standard is achieved
6.5 (section 4.1.1 of Pacific Lamprey Plan)				Operational modifications to upstream fishways to benefit adult Pacific lamprey

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
	5.2			Amendments to upstream fishway operating criteria
6.5 (section 4.1.3 of Pacific Lamprey Plan)	5.5			Measures for alternate upstream passage routes or counting facilities for adult Pacific lamprey
6.5 (section 4.1.5, 4.1.6, 4.1.7 of Pacific Lamprey Plan)	5.6.2, 5.7, 5.8			Measures to improve upstream Pacific lamprey passage
6.5 (section 4.2.4 of Pacific Lamprey Plan)	6.0			Measures to address impacts on Pacific lamprey populations above Wells dam, or to improve downstream lamprey passage
6.6 (section 4.3, 4.4 of Resident Fish Plan)				Measures to address changes in resident fish populations
6.5 (section 4.3 of Aquatic Nuisance Plan)				Measures to address changes in aquatic nuisance species populations

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
6.7(3)(d), 6.7(4)			2 (section 4.1.4, 4.2.3, 4.3 of Water Quality Plan)	Measures to address non-compliance with numeric water quality criteria
6.7(3)(c)(iii)			2 (section 4.2.2 of Water Quality Plan)	Measures identified through the Columbia River temperature total maximum daily load development
6.7(3)(c)(iii)			2 (section 4.2.2 of Water Quality Plan)	Reasonable and feasible measures in the event that a Columbia River temperature total maximum daily load is not timely approved by the U.S. Environmental Protection Agency
6.7(6)(b)			2 (section 4.5.2 of Water Quality Plan)	Measures to coordinate project operations with other mid-Columbia hydroelectric project operations
6.1(7)				Additional measures if Ecology determines that there is a likelihood or probability of violations of water quality standards or state law
6.4(2)				Modifications to goals, objectives, or measures included in the Aquatic Agreement's resource management plans

Article 402. *Bull Trout Evaluations*. Within one year of license issuance, the

licensee shall file for Commission approval, a study plan and schedule for the purpose of conducting the following:

(a) the bull trout stranding evaluations described in section 4.4 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010;

(b) the bull trout incidental take monitoring studies described in section 4.5.1 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010; and

(c) the bull trout incidental take monitoring studies to be implemented at the Wells Hatchery as described in section 4.6.1 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010.

The licensee shall include with the plan, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 403. *Notification of Deviations from Operating Requirements.* Project operations may be temporarily modified if required by operating emergencies beyond the control of the licensee, or if necessary to protect water quality or aquatic resources at the project. If project operations are so modified, the licensee shall notify the Commission as soon as possible but no later than 48 hours after the incident.

Article 404. *Wells Hatchery Upper Columbia River Steelhead Hatchery Genetic Management Plan*. Within one year of license issuance, the licensee shall file for Commission approval, a Wells Hatchery Upper Columbia River Steelhead Hatchery Genetic Management Plan to address the effects of the Wells Hatchery steelhead program on Endangered Species listed salmon and steelhead.

The licensee shall include with the plan, documentation of consultation with the Wells HCP Coordinating Committee (as established in section 6 of the *Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project, FERC License No. 2149*, dated March 26, 2002), copies of comments and recommendations on the plan after it has been prepared and provided to the consulted entities, and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 405. *Aquatic Nuisance Species Management Plan*. Within six months of license issuance, the licensee shall file for Commission approval, an Aquatic Nuisance Species Management Plan that includes the following modifications to the Aquatic Settlement Agreement's Aquatic Nuisance Species Management Plan filed May 27, 2010:

(a) Section 4.1 of the plan must include specific best management practices that will be implemented to prevent the spread of aquatic nuisance species during construction of recreation enhancement measures; and

(b) Section 4.2.1 of the plan must include specific reasonable and appropriate measures that are consistent with aquatic nuisance species management protocols and will be implemented, if aquatic nuisance species are detected during monitoring activities at the project.

The licensee shall include with the updated plan, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the updated plan after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 406. *Aquatic Settlement Agreement Annual Report*. The licensee shall annually file, by May 31 of each year following license issuance, a report that documents the results of studies and the measures completed during the previous calendar year pursuant to the May 27, 2010, Aquatic Settlement Agreement's White Sturgeon Management, Bull Trout Management, Pacific Lamprey Management, Resident Fish Management, Aquatic Nuisance Species Management, and Water Quality Management Plans as required in whole or in part by Ordering Paragraph F and Appendix C, Ordering Paragraph G and Appendix D, and Ordering Paragraph H and Appendix E.

The licensee shall include with the report, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed report after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the report. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to project operations or facilities based on information contained in the report and any other available information.

Article 407. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct, operate, and maintain or provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretaries of Commerce or of the Interior pursuant to section 18 of the Federal Power Act.

Article 408. *Columbia River Basin Fish and Wildlife Program.* The Commission reserves the authority to order, upon its own motion or upon the recommendation of federal and state fish and wildlife agencies, affected Indian Tribes, or the Northwest Power and Conservation Council, alterations of project structures and operations to take into account to the fullest extent practicable the regional fish and wildlife program developed and amended pursuant to the Pacific Northwest Electric Power Planning and Conservation Act.

Article 409. *Wildlife and Botanical Management Plan*. The licensee shall implement the Wildlife and Botanical Management Plan filed May 27, 2010, as Appendix E-3 of Exhibit E of the final license application, with the following additions to section 4.7, *Consultation*:

The licensee shall annually file, by May 31 of each year following license issuance, a report that documents the results of the prior year's measures and the upcoming year's proposed measures implemented pursuant to the plan. The licensee shall include with the report an updated list of sensitive species, based upon an annual review of the Washington Natural Heritage Program rare plant list.

The licensee shall also include with the report documentation of consultation with the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, the Confederated Tribes of the Colville Reservation, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed report after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the report. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information. The Commission reserves the right to require changes to project operations or facilities based on all available information and information included in the annual reports.

Article 410. *Programmatic Agreement and Historic Properties Management Plan.* The licensee shall implement the "Programmatic Agreement Among the Federal Energy Regulatory Commission, the Washington State Historic Preservation Officer, and the Confederated Tribes of the Colville Reservation Tribal Historic Preservation Officer for Managing Historic Properties That May be Affected by a License Issuing to Douglas County Public Utilities District for the Continued Operation of the Wells Hydroelectric Project in Okanogan County, Washington (FERC Project No. 2149)" executed on March 12, 2012, and including but not limited to the Historic Properties Management Plan (HPMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Article 411. *Recreation Management Plan*. The licensee shall implement the Recreation Management Plan filed May 27, 2010, as Appendix E-5 of Exhibit E of the final license application, with the following addition to section 5.1.3, *Boat-in Tent Camping and Signage.*

Within 1 year of license issuance, the licensee shall also file, for Commission approval after consultation with the National Park Service; Washington State Parks and

Recreation Commission; Washington State Recreation and Conservation Office; Washington Department of Fish and Wildlife; Washington Department of Transportation; Washington Department of Ecology; cities of Brewster, Bridgeport, and Pateros; Port of Chelan County; Friends of Fort Okanogan; and Okanogan Historical Society; U.S. Department of the Interior; U.S. Bureau of Land Management; Okanogan and Douglas counties; the Confederated Tribes of the Colville Reservation, and U.S. Bureau of Indian Affairs, a supplement to the Recreation Management Plan included in Appendix E-5 of Exhibit E of the final license application that includes a map depicting the exact location where the proposed non-motorized campsite will be constructed. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the plan with the Commission for approval.

Article 412. *Project Land Use Policy*. Upon license issuance, the licensee shall implement the Land Use Policy included in Appendix E-13 of Exhibit E. If changes to the Land Use Policy are proposed in the future, the licensee shall develop a revised Land Use Policy or addendum in consultation with the National Marine Fisheries Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Washington Department of Ecology; Washington State Historic Preservation Officer (Washington SHPO), the Confederated Tribes of the Colville Reservation; the Confederated Tribes and Bands of the Yakama Nation; U.S. Bureau of Indian Affairs; U.S. Bureau of Land Management; National Park Service; Washington State Parks and Recreation Commission; Washington State Recreation and Conservation Office; Washington Department of Transportation; cities of Brewster, Bridgeport, and Pateros; Port of Chelan County; Friends of Fort Okanogan; Okanogan Historical Society; U.S. Department of the Interior; and Okanogan and Douglas counties, and file the revised Douglas PUD Land Use Policy or addendum for Commission approval. The Commission reserves the right to require changes to any revised Douglas PUD Land Use Policy or addendum. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the plan with the Commission for approval

Article 413. *Use and Occupancy.* (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee also shall have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for any interests that it has conveyed under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant or a conveyance made under

the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The types of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure to the satisfaction of the Commission's authorized representative that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine if the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kilovolt or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed. If no conveyance was made during the prior calendar year, the licensee shall so inform the Commission in writing no later than January 31 of each year.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the Washington State Historic Preservation Officer;

(2) before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E or if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value;

(3) the instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner

that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

(K) The licensee shall serve copies of any Commission filing required by this order on any entity specified in the order to be consulted on matters relating to that filing. Proof of service on these entities must accompany the filing with the Commission.

(L) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and section 385.713 of the Commission's regulations, 18 C.F.R. § 385.713 (2012). The filing of a request for rehearing does not operate as a stay of the effective date of this license or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Jeff C. Wright
Director
Office of Energy Projects

FORM L-5
(October 1975)

FEDERAL ENERGY REGULATORY COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR CONSTRUCTED MAJOR PROJECT AFFECTING NAVIGABLE WATERS AND LANDS OF THE UNITED STATES

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project area and project works shall be in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Article 4. The project, including its operation and maintenance and any work incidental to additions or alterations authorized by the Commission, whether or not conducted upon lands of the United States, shall be subject to the inspection and supervision of the Regional Engineer, Federal Energy Regulatory Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the

Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him such information as he may require concerning the operation and maintenance of the project, and any such alterations thereto, and shall notify him of the date upon which work with respect to any alteration will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall submit to said representative a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of any such alterations to the project. Construction of said alterations or any feature thereof shall not be initiated until the program of inspection for the alterations or any feature thereof has been approved by said representative. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights or occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. In the event the project is taken over by the United States upon the termination of the license as provided in Section 14 of the Federal Power Act, or is transferred to a new licensee or to a nonpower licensee under the provisions of Section 15 of said Act, the Licensee, its successors and assigns shall be responsible for, and shall make good any defect of title to, or of right of occupancy and use in, any of such project property that is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and shall pay and discharge, or shall assume responsibility

for payment and discharge of, all liens or encumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, That the provisions of this article are not intended to require the Licensee, for the purpose of transferring the project to the United States or to a new licensee, to acquire any different title to, or right of occupancy and use in, any of such project property than was necessary to acquire for its own purposes as the Licensee.

Article 7. The actual legitimate original cost of the project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Federal Power Act and the Commission's Rules and Regulations thereunder.

Article 8. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 9. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 10. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission any direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 11. Whenever the Licensee is directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for such part of the annual charges for interest, maintenance, and depreciation thereof as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United states, the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the cost of making the determinations pursuant to the then current regulations of the Commission under the Federal Power Act.

Article 12. The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission my prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

Article 13. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 14. In the construction or maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines and telegraph, telephone and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling or obstructing traffic or endangering life. None of the provisions of this article are intended to relieve the Licensee from any responsibility or requirement which may be imposed by any other lawful authority for avoiding or eliminating inductive interference.

Article 15. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 16. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 17. The Licensee shall construct, maintain, and operate, or shall arrange for the construction, maintenance, and operation of such reasonable recreational facilities, including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities, and utilities, giving consideration to the needs of the physically handicapped, and shall comply with such reasonable modifications of the project, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal or State agencies, after notice and opportunity for hearing.

Article 18. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and

adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 19. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 20. The Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. All clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 21. Material may be dredged or excavated from, or placed as fill in, project lands and/or waters only in the prosecution of work specifically authorized under the license; in the maintenance of the project; or after obtaining Commission approval, as appropriate. Any such material shall be removed and/or deposited in such manner as to reasonably preserve the environmental values of the project and so as not to interfere with traffic on land or water. Dredging and filling in a navigable water of the United States shall also be done to the satisfaction of the District Engineer, Department of the Army, in charge of the locality.

Article 22. Whenever the United States shall desire to construct, complete, or improve navigation facilities in connection with the project, the Licensee shall convey to the United States, free of cost, such of its lands and rights-of-way and such rights of passage through its dams or other structures, and shall permit such control of its pools, as may be required to complete and maintain such navigation facilities.

Article 23. The operation of any navigation facilities which may be constructed as a part of, or in connection with, any dam or diversion structure constituting a part of the project works shall at all times be controlled by such reasonable rules and regulations in the interest of navigation, including control of the level of the pool caused by such dam or diversion structure, as may be made from time to time by the Secretary of the Army.

Article 24. The Licensee shall furnish power free of cost to the United States for the operation and maintenance of navigation facilities in the vicinity of the project at the voltage and frequency required by such facilities and at a point adjacent thereto, whether said facilities are constructed by the Licensee or by the United States.

Article 25. The Licensee shall construct, maintain, and operate at its own expense such lights and other signals for the protection of navigation as may be directed by the Secretary of the Department in which the Coast Guard is operating.

Article 26. Timber on lands of the United States cut, used, or destroyed in the construction and maintenance of the project works, or in the clearing of said lands, shall be paid for, and the resulting slash and debris disposed of, in accordance with the requirements of the agency of the United States having jurisdiction over said lands. Payment for merchantable timber shall be at current stumpage rates, and payment for young growth timber below merchantable size shall be at current damage appraisal values. However, the agency of the United States having jurisdiction may sell or dispose of the merchantable timber to others than the Licensee: Provided, That timber so sold or disposed of shall be cut and removed from the area prior to, or without undue interference with, clearing operations of the Licensee and in coordination with the Licensee's project construction schedules. Such sale or disposal to others shall not relieve the Licensee of responsibility for the clearing and disposal of all slash and debris from project lands.

Article 27. The Licensee shall do everything reasonably within its power, and shall require its employees, contractors, and employees of contractors to do everything reasonably within their power, both independently and upon the request of officers of the agency concerned, to prevent, to make advance preparations for suppression of, and to suppress fires on the lands to be occupied or used under the license. The Licensee shall be liable for and shall pay the costs incurred by the United States in suppressing fires caused from the construction, operation, or maintenance of the project works or of the works appurtenant or accessory thereto under the license.

Article 28. The Licensee shall interpose no objection to, and shall in no way prevent, the use by the agency of the United States having jurisdiction over the lands of the United States affected, or by persons or corporations occupying lands of the United States under permit, of water for fire suppression from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license, or the use by said parties of water for sanitary and domestic purposes from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license.

Article 29. The Licensee shall be liable for injury to, or destruction of, any buildings, bridges, roads, trails, lands, or other property of the United States, occasioned by the construction, maintenance, or operation of the project works or of the works

appurtenant or accessory thereto under the license. Arrangements to meet such liability, either by compensation for such injury or destruction, or by reconstruction or repair of damaged property, or otherwise, shall be made with the appropriate department or agency of the United States.

Article 30. The Licensee shall allow any agency of the United States, without charge, to construct or permit to be constructed on, through, and across those project lands which are lands of the United States such conduits, chutes, ditches, railroads, roads, trails, telephone and power lines, and other routes or means of transportation and communication as are not inconsistent with the enjoyment of said lands by the Licensee for the purposes of the license. This license shall not be construed as conferring upon the Licensee any right of use, occupancy, or enjoyment of the lands of the United States other than for the construction, operation, and maintenance of the project as stated in the license.

Article 31. In the construction and maintenance of the project, the location and standards of roads and trails on lands of the United States and other uses of lands of the United States, including the location and condition of quarries, borrow pits, and spoil disposal areas, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Article 32. The Licensee shall make provision, or shall bear the reasonable cost, as determined by the agency of the United States affected, of making provision for avoiding inductive interference between any project transmission line or other project facility constructed, operated, or maintained under the license, and any radio installation, telephone line, or other communication facility installed or constructed before or after construction of such project transmission line or other project facility and owned, operated, or used by such agency of the United States in administering the lands under its jurisdiction.

Article 33. The Licensee shall make use of the Commission's guidelines and other recognized guidelines for treatment of transmission line rights-of-way, and shall clear such portions of transmission line rights-of-way across lands of the United States as are designated by the officer of the United States in charge of the lands; shall keep the areas so designated clear of new growth, all refuse, and inflammable material to the satisfaction of such officer; shall trim all branches of trees in contact with or liable to contact the transmission lines; shall cut and remove all dead or leaning trees which might fall in contact with the transmission lines; and shall take such other precautions against fire as may be required by such officer. No fires for the burning of waste material shall be set except with the prior written consent of the officer of the United States in charge of the lands as to time and place.

Article 34. The Licensee shall cooperate with the United States in the disposal by

the United States, under the Act of July 31, 1947, 61 Stat. 681, as amended (30 U.S.C. sec. 601, et seq.), of mineral and vegetative materials from lands of the United States occupied by the project or any part thereof: Provided, That such disposal has been authorized by the Commission and that it does not unreasonably interfere with the occupancy of such lands by the Licensee for the purposes of the license: Provided further, That in the event of disagreement, any question of unreasonable interference shall be determined by the Commission after notice and opportunity for hearing.

Article 35. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 36. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 37. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

APPENDIX A

WATER QUALITY CERTIFICATE CONDITIONS FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 ISSUED BY WASHINGTON DEPARTMENT OF ECOLOGY, ORDER NO. 8981, FEBRUARY 27, 2012

6.0 Water Quality Certification Conditions

In view of the foregoing and in accordance with Section 401 of the Clean Water Act (33 USC 1341), RCW 90.48.260 and Chapter 173-20lA, Ecology finds reasonable assurance that the operation of the Wells Project pursuant to the proposed new license will comply with state and federal water quality standards and other appropriate requirements of state law provided the following conditions are met. Implementation of the measures, the compliance schedule and adaptive management strategy contained in this Order will result in the attainment and compliance with state and federal water quality standards and other appropriate requirements of state law provided the following conditions are met. Accordingly, through this Order issued and enforceable under RCW 90.48, Ecology grants Section 401 Water Quality Certification to the Licensee, Douglas County Public Utility District No. 1 for the Wells hydroelectric project, (FERC No. 2149) subject to the following conditions. This Order will hereafter be referred to as the "Certification".

6.1 General Conditions

The Project shall comply with all water quality standards (currently codified in WAC 173-201A), ground water standards (currently codified in WAC 173-200), and sediment quality standards (currently codified in WAC 173-204) and other appropriate requirements of state law that are related to compliance with such standards.

1) In the event of changes in or amendments to the state water quality, ground water, or sediment standards changes in or amendments to the state Water Pollution Control Act (RCW 90.48) or changes in or amendments to the Federal Clean Water Act, such provisions, standards, criteria or requirements shall apply to the Project and any attendant agreements, orders, permits, to the fullest extent permitted by law.

2) Discharge of any solid or liquid waste to the waters of the State of Washington without prior approval from Ecology is prohibited.

3) Douglas PUD shall consult with Ecology before it undertakes any change to the Project or Project operations that might significantly and adversely affect compliance with any applicable water quality standard (including designated uses) or other appropriate requirement of state law. If, following such consultation, Ecology determines that such change would violate state water

quality standards or other appropriate requirements of state law, Ecology reserves the right to condition or deny such Project change. Ecology will operate in accordance with the dispute resolution process contained in the ASA [Aquatic Settlement Agreement], provided such agreement still exists and Ecology is still a party to the agreement.

4) This Certification does not exempt compliance with other statutes and codes administered by federal, state and local agencies.

5) Ecology will administer this Certification consistent with the ASA, provided such agreement still exists and Ecology is still a party to the agreement. Any provisions of this Certification that incorporate the substantive obligations of the ASA shall continue to apply even if the ASA ceases to exist, or if FERC fails to fully incorporate any provisions of the ASA in the Project license, unless otherwise ordered by Ecology. However, if a conflict or inconsistency exists or arises between this Certification and the ASA or any part thereof that is incorporated in this Certification, the terms of this Certification shall govern, unless Ecology directs otherwise.

6) Ecology retains the right to modify schedules and deadlines provided under this Certification or provisions of the Management Plans that it incorporates.

7) Ecology retains the right to require additional monitoring, studies, or measures if it determines that there is a likelihood or probability that violations of water quality standards or other appropriate requirements of state law have or may occur, or insufficient information exists to make such a determination.

8) Ecology reserves the right to amend this Certification by Administrative Order if it determines that the provisions hereof are no longer adequate to provide reasonable assurance of compliance with applicable water quality standards or other appropriate requirements of state law. Such determination shall be based upon provisions in the new FERC license or new information or changes in: (i) the construction or operation of the Project; (ii) characteristics of the water; (iii) water quality criteria or standards; (iv) Total Maximum Daily Load (TMDL) requirements; (v) effluent limitations; or (vi) other applicable requirement of state law. Amendments of this Certification shall take effect immediately upon issuance, unless otherwise provided in the order.

9) Ecology reserves the right to issue administrative orders, assess or seek penalties under state or federal law, and to initiate legal actions in any court or forum of competent jurisdiction for the purposes of enforcing the requirements of this Certification or applicable state or federal laws.

10) The conditions of this Certification should not be construed to prevent or prohibit Douglas PUD from either voluntarily or in response to legal requirements imposed by a court, the FERC, or any other body with competent jurisdiction, taking actions which will provide a greater level of protection, mitigation or enhancement of water quality or of existing or designated uses.

11) If five or more years elapse between the date that this Certification is issued and the date of issuance of the New License for the Project, this Certification shall be deemed to have been denied at such time and Douglas PUD shall send Ecology an updated 401 application that reflects then current conditions, regulations and technologies. This provision should not be construed to otherwise limit the reserved authority of Ecology to deny, amend or correct the Certification before or after the issuance of the New License.

12) All documents required under this Certification to be submitted to Ecology shall be submitted to Washington State Department of Ecology, Central Regional Office, Water Quality Program, Section Manager.

13) Copies of this Certification and associated permits, licenses, approvals and other documents shall be kept on site and made readily available for reference by Douglas PUD, its contractors and consultants, and by Ecology.

14) Douglas PUD shall allow Ecology access to inspect the Project and Project records required by this Certification for the purpose of monitoring compliance with the conditions of this Certification. Access will occur after reasonable notice, except in emergency circumstances.

15) Douglas PUD shall, upon request by Ecology, fully respond to all reasonable requests for materials to assist Ecology in making determinations under this Certification and any resulting rulemaking or other process.

16) If an action required under or pursuant to this Certification requires as a matter of federal law that the FERC approve the action before it may be undertaken, Douglas PUD shall not be considered in violation of such requirements to the extent that FERC refuses to provide such approval, provided that Douglas PUD diligently seeks such approval and so notifies Ecology.

17) The reservations contained in this Certification do not preclude or limit any right of Douglas PUD to contest the validity of any such reservation in connection with any order or any other action taken by Ecology pursuant to such reservation.

18) All information prepared or collected as a requirement of this Certification (e.g., plans, reports, monitoring results, meeting minutes, and data) shall be made available to the public on Douglas PUD's website or by another readily accessible means. Where data or quantitative analysis is involved, it shall be provided in a format that allows others to efficiently validate and analyze data and results.

19) Where this certification refers to "reasonable and feasible" actions or measures, Ecology retains the authority to ultimately determine if an action or measure qualifies as "reasonable and feasible."

20) Per RCW 90.48.422(3), Douglas PUD shall be required to mitigate or remedy a water quality violation or problem only to the extent that there is substantial evidence the project has caused such violation or problem.

21) All conditions in this Certification apply for the life of the license and any subsequent annual licenses that may be required, unless explicitly stated otherwise in this Certification or modified by a subsequent order by Ecology.

6.2 Aquatic Settlement Agreement

Douglas PUD shall operate the Project in compliance with the ASA, including the six Aquatic Resource Management Plans and their respective Goals and Objectives and Protection, Mitigation and Enhancement Measures (PMEs).

Ecology expects that the measures and processes required in this Certification will protect aquatic life as required under state law and the Clean Water Act. In the event that the ASA, or any Aquatic Resource Management Plan fails, or Ecology determines there is substantial likelihood of failure, to adequately protect, in a timely manner, existing or designated uses of water quality, Ecology reserves the right to require such changes including, but not limited to, Goals and Objectives, PMEs, or any operation or physical structures, as it determines necessary to protect these uses or water quality. In taking such actions, Ecology will operate in accordance with the dispute resolution process contained in the ASA, provided such agreement still exists and Ecology is still a party to the agreement.

For purposes of this Certification, the Goals and Objectives represent important steps toward meeting the designated uses of a water body. They serve as quantifiable goals for moving toward attaining full support of designated uses. They are not intended to serve as a surrogate for the requirement to support and protect designated uses of the waters.

Ecology reserves the right to modify the processes or decisions described herein, including timeframes. If timely progress is not made or plans or reports are not timely submitted, Ecology reserves the right to impose penalties.

1) Aquatic Settlement Work Group

The ASA requires the PUD to convene an Aquatic Settlement Work Group (ASWG) that is composed of representatives of each party to the ASA. The purpose of the ASWG is to be the primary forum for consultation and coordination among the PUD and federal, state and tribal parties in connection with implementing the ASA and its six aquatic resource management plans. Douglas PUD shall provide for the meeting space, a facilitator, etc., as described in the ASA. If consensus cannot be reached in accordance with the procedures in the ASA, or if decisions of the ASWG conflict with this Certification or state law, or if the ASWG ceases to exist, decisions shall be made by or be subject to approval by Ecology.

2) Adaptive Management

This Certification requires the use of an Adaptive Management process where necessary to meet State water quality standards through the term of the License. As used in this Certification, Adaptive Management means an iterative and rigorous process used to achieve the goals and objectives. It is intended to improve the management of aquatic resources affected by the Project in order to achieve the Goals and Objectives of the Aquatic Resource Management Plans and water quality standards as effectively and efficiently as possible.

Ecology expects the adaptive management processes contained in this Certification and in the Aquatic Resource Management Plans will be adequate to protect aquatic life as required under state law and the Clean Water Act. It is possible that during the course of the new operating license, there may be instances where the measures found in individual management plans may need to be modified. In those instances, "adaptive management" will be used to achieve the Goals and Objectives.

For purposes of this Certification, Adaptive Management involves the following steps:

a) Develop initial (or, in subsequent rounds, update) hypotheses regarding any potential Project impacts and potential protection or mitigation measures;

b) Complete studies to determine whether the hypothesized impacts are valid, and if valid, quantify the impact resulting from the Project;

c) If the hypothesized impact is validated and quantified, then the ASWG shall identify (or, in subsequent rounds, update) appropriate goals and objectives and implementing measures;

d) Develop and implement reasonable and appropriate measures to avoid,

minimize or mitigate the identified Project impacts in accordance with an established schedule;

e) Develop and implement monitoring and evaluation methodologies for determining whether the Goals and Objectives have been achieved;

f) Should the measures be successful at mitigating or minimizing Project impact(s), then periodic monitoring shall take place to confirm that such Goals and Objectives continue to be achieved;

g) Should the implemented measures fail to achieved the Goals and Objectives over a reasonable time frame, then Douglas PUD shall develop and the ASWG shall evaluate additional or revised measures, including those previously considered in the six Aquatic Resource Management Plans, and Douglas PUD shall implement any additional or revised appropriate and reasonable measures, or explain why such Goals and Objectives cannot be achieved;

h) If such Goals and Objectives have not been achieved over a reasonable time frame, then the ASWG may reevaluate and revise such Goals and Objectives.

Parts of steps (a) through (e) have already been developed as part of the Relicensing process and are included in the six Aquatic Resource Management Plans. The reference Goals and Objectives are identified in Section 3 of the Aquatic Resource Management Plans (Plans). The implementation measures are contained in Section 4 of the Plans. These Goals and Objectives and implementation measures are incorporated as part of this Certification and shall be implemented by Douglas PUD. The remaining steps shall be implemented through the course of the License, in accordance with the Plans or as determined by the ASWG and Ecology.

6.3 Anadromous Salmonids

Douglas PUD shall meet the requirements of the Wells HCP in order to protect the Plan species (spring and summer/fall Chinook, steelhead, sockeye and Coho). This involves collaboration by Douglas PUD with the responsible agencies and tribes through the Wells HCP and with members of the ASWG. However, in the event of a perceived conflict between the HCP and this Certification, it is presumed that the responsible agencies, including Ecology, shall work together to obtain a solution that best meets the needs of all species involved, in accordance with the requirements of the Clean Water Act and the Endangered Species Act.

6.4 Aquatic Resource Management Plans - General Requirements

1) Douglas PUD shall implement the Goals and Objectives as identified in Section 3 of each Plan, and all of the protection, mitigation, and enhancement measures (PMEs) that are contained in Section 4 of each Plan.

2) Each Plan includes an implementation schedule that was based on the best information available at the time the Plan was developed. As new information becomes available, the Goals and Objectives and PMEs may be adjusted through consultation with the ASWG, in accordance with Section 6.2 of this Certification.

3) Douglas PUD shall maintain current versions of the Plans on the PUD's website and they shall be made available to the public.

4) Douglas PUD shall provide a draft annual report to the ASWG summarizing the previous year's activities undertaken in accordance with each Plan. The report shall document all activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to each plan will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD shall prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

5) The final report is subject to approval by Ecology for purposes of compliance with federal and state water quality standards, including designated uses.

6.5 Bull Trout, White Sturgeon, Pacific Lamprey and Resident Fish

Douglas PUD shall implement Section 3 (Goals and Objectives) and Section 4 (PMEs) of the White Sturgeon, Bull Trout, Pacific Lamprey and Resident Fish Aquatic Resource Management Plans. Sections 3 and 4 of each of these Plans are attached hereto as Appendices A through D, respectively, and are hereby incorporated into this Certification.

6.6 Aquatic Nuisance Species (ANS)

Douglas PUD shall implement Sections 3 and 4 of the Aquatic Nuisance Species Plan. Sections 3 and 4 of this Plan are attached hereto as Appendix E and are hereby incorporated into this Certification. Additional requirements follow below:

1) Additional Monitoring Requirements. In addition to monitoring for zebra and quagga mussels, Douglas PUD shall monitor for the presence of aquatic nuisance plants (e.g., Eurasian milfoil) at public boat launches and non-native crayfish at appropriate locations within the Project area. Douglas PUD shall

monitor and report the presence of such nuisance plants and crayfish in coordination with the ASWG.

2) Education. To increase boater awareness of the dangers of spreading ANS and to educate the public regarding the methods to decrease the spread of ANS (e.g., clean the weeds off the boat and drain the live well before going to a new waterbody), Douglas PUD shall provide signage and other educational materials (e.g., pamphlets) at all boat launches, for owners of both motorized and non-motorized boats. The educational message shall be coordinated with the ASWG. Douglas PUD shall provide the pamphlets during peak boating season (May 1 – October 30) of each year. Signage shall be provided year-round.

3) Reporting. In the annual report required under section 4 of the Aquatic Nuisance Species Plan, Douglas PUD shall include information about any pending ANS problems;

4) Plan. If any new ANS are detected at levels of concern to the ASWG, and the ASWG agrees that the existence or operation of the Wells Project contributes to the introduction, spread or proliferation of the ANS, within one year following detection (and after the New License is issued), in consultation with the ASWG, Douglas PUD shall develop and begin implementation of an ANS Control and Prevention Plan (Prevention Plan) to monitor and manage invasive species within the Project boundary. The Plan shall focus on prevention by addressing the pathways for invasion of aquatic invasive flora and fauna.

6.7 Water Quality Management Plan

Douglas PUD shall implement sections 3 and 4 of the Water Quality Management Plan (WQMP), as modified below:

1) Goal and Objectives

Douglas PUD shall implement the following Goals and Objectives:

The Goal of the WQMP is to protect the quality of the surface waters affected by the Project and to ensure that Washington's water quality standards (WQS) are met.

Objective 1: Ensure that compliance with state WQS for TDG is achieved. Compliance is to be achieved within ten years of the issuance of the New License. Measures are specified to address non-attainment of standards after this time period.

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the ASWG will identify reasonable and feasible measures, which shall be implemented by Douglas PUD;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the ASWG will identify reasonable and feasible measures, which shall be implemented by Douglas PUD;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

2) Total Dissolved Gas (Objective 1)

This water quality parameter (TDG) requires a Water Quality Attainment Plan, per Section 3.0(5) above and as described in further detail in the section on Compliance, below.

Douglas PUD, in consultation with the ASWG, shall implement the following measures.

a) Gas Abatement Plan and TDG Exemption

Pursuant to WAC l73-201A-200(1)(f)(ii), and as described in Section 3.0(3) of this Certification, the TDG criteria for the Project can be adjusted to aid fish passage when the Project is operated with an approved Gas Abatement Plan (GAP).

i) Douglas PUD shall operate the Project in compliance with the GAP approved by Ecology. By February 28 of each year, Douglas PUD shall submit a GAP to Ecology for approval. Pending Ecology's approval of each subsequent GAP Douglas PUD shall continue to implement the activities identified within the previously approved plan. Douglas PUD shall submit the GAPs annually through the term of the new license unless Ecology approves a less frequent schedule or until a GAP is no longer required by Ecology.

ii) The GAP will include the Spill Operations Plan and will be accompanied by a fisheries management plan and physical and

biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

iii) It is anticipated that: (1) the TDG monitoring activities described below will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the ASA will be adequate for fish management plans, However, additional biological monitoring studies (e.g., Gas Bubble Trauma Monitoring) may be required.

b) Non-Fish Spill Season

Commencing one year after issuance of the new license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine TDG compliance with the 110% standard.

c) Monitoring and Reports

i) Douglas PUD shall maintain a TDG monitoring program at its Fixed Monitoring Station (FMS) locations in the forebay and tailrace of Wells Dam and/or at other locations as determined by Ecology, in order to monitor TDG and barometric pressure. Douglas PUD shall monitor TDG (and barometric pressure, as needed) hourly throughout the year. Data from the Wells forebay and tailrace stations shall be transmitted on a daily basis to a web-accessible database available for use by Ecology and regional fish management agencies. Douglas PUD shall maintain this monitoring program consistent with activities described in the GAP.

ii) The TDG monitoring program shall conform to the Ecology Quality Assurance Project Plan (QAPP) requirements per Section 6.7(f) of this Order and the procedures shall be at least as stringent as the quality assurance/quality control (QA/QC) calibration and monitoring procedures and protocols developed by the United States Geological Service (USGS) monitoring methodology for the Columbia River.

iii) By February 28th of each year, unless otherwise provided for in writing by Ecology, Douglas PUD shall provide an annual TDG report for Ecology's review and approval. The report shall include the results of all activities required by the GAP. In addition, the report shall describe all spills and associated TDG levels in the tailrace occurring outside the fish passage season.

d) Spill Operations

Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the GAP, using best available information to minimize the production of TDG during periods of spill. In consultation with the Wells HCP Coordinating Committee and ASWG, the spill operations plan will be reviewed and updated, as necessary.

e) Compliance Schedule.

Within one year of license issuance, Douglas PUD shall submit a Water Quality Attainment Plan (WQAP) for Ecology's review and approval. The WQAP shall include a compliance schedule to ensure compliance with water quality criteria within 10 years. The WQAP also allows time for the completion of the necessary studies or for the resolution of the issue of elevated incoming TDG through rule-making or other means. The WQAP shall be prepared in consultation with the ASWG and the HCP Coordinating Committee, and shall meet the requirements of WAC 173-201A-510(5). The WQAP shall:

i) Identify all reasonable and feasible improvements that could be used to meet TDG standards. Data on high TDG levels and flow coming into the Wells forebay and its effects on Project compliance shall be included;

ii) Contain the analytical methods that will be used to evaluate all reasonable and feasible improvements;

iii) Provide for any supplemental monitoring that is necessary to track compliance with the numeric WQS; and

iv) Include benchmarks and reporting sufficient for Ecology to track Douglas PUD's progress toward implementing this plan and achieving compliance within ten years of Ecology's approval of the plan.

v) The report of the study of reasonable and feasible improvements is due within one year of approval of the WQAP and should include the ASWG and Douglas PUD's recommendations for measures to be implemented. The report is subject to Ecology review and approval.

f) Measures to Address Non-Attainment of Standards

i) Post compliance schedule: If implementing the compliance schedule does not result in compliance with water quality standards at the time the compliance schedule expires, Douglas PUD may explore other alternative approaches available in the water quality standards, including a second compliance schedule or alternative provided in WAC 173-201A-510(5)(g).

ii) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

g) Additional Requirements

i) Minimizing Spill. The PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7QIO, as follows:

a. Minimize voluntary spill through operations, including to the extent practicable, by scheduling maintenance based on predicted flows;

b. Avoid spill by continuing to coordinate operations with upstream dams, to the extent that it reduces TDG;

c. Maximize powerhouse discharge, especially during periods of high river flows; and

d. During fish passage season, manage voluntary spill levels in real time in an effort to continue to meet TDG numeric criteria consistent with the GAP.

ii) Changes in Operation or Structure. Douglas PUD shall provide Ecology with the opportunity to review and condition any non-routine operational or structural changes affecting TDG that are not identified in this Certification. If Douglas PUD, at any point, considers modifying any of the measures identified in the spill Playbook, Douglas PUD shall immediately develop proposed alternative(s) that will produce levels of TDG equal to or less than those estimated to be produced by the measures to be replaced. These measures should be implementable in a similar timeframe and must be submitted to Ecology for review and approval prior to implementation.

iii) TDG TMDL. The Project shall be deemed in compliance with the TMDL for TDG as long as it remains in compliance with the terms

of this Certification. This Certification, including the GAPs and the WQAP, is intended to serve as the Project's portion of the Detailed Implementation Plan for the TDG TMDL.

3) Water Temperature (Objective 2)

a) Monitoring

i) Douglas PUD shall monitor water temperatures at three boundary locations of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace on an hourly basis, from April 1 to October 31.

ii) Douglas PUD shall continue to collect hourly fish ladder temperatures 24 hours a day during the upstream fish passage season (currently May 1 to November 15) at Pool No. 39 on the east ladder. Douglas PUD shall also monitor water temperatures hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

iii) Douglas PUD shall record temperature data (hourly) and transmit it on a daily basis to a web-accessible database maintained by Douglas PUD and available to Ecology, regional fish management agencies, and the public.

b) Temperature Report

Douglas PUD shall prepare an annual report of the monitoring results and analyses, in a format approved by Ecology, and submit it by April 30th of the following year.

c) Temperature TMDL Development and Implementation

i) Douglas PUD shall participate in U.S. EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the ASWG. Douglas PUD shall maintain the CE-QUAL model and temperature data from the monitoring program and make these available to EPA and other entities to assist in the development of the Columbia River temperature TMDL, upon request.

ii) When the TMDL and its implementation plan are complete and approved by EPA, Ecology anticipates that it may amend this Certification to include requirements consistent with the TMDL.

iii) If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the ASWG and other interested parties to identify reasonable and feasible measures.

iv) This plan does not exclude the option of the ASWG to consider modifying the water quality standard through a use attainability analysis or other process.

d) Measures to Address Non-Compliance

i) Douglas PUD shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the ASWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

ii) If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas PUD shall, in coordination with the ASWG and subject to approval by Ecology, take the following steps:

a. Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed;

b. After the evaluation, if Ecology determines measures are available to achieve compliance, set up a compliance schedule to attain compliance, in accordance with Section 3.0(5) (WAC 173-201A-510(5)).

c. After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

iii) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

4) Other Numeric Criteria (Objective 3)

a) Douglas PUD shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the ASWG for consideration. This includes existing or new criteria for toxic substances in water or sediments within the boundaries of the Project.

b) Ecology shall evaluate the information, and, if needed, require Douglas PUD to develop a plan to identify and address Project-related impacts, if any.

i) After the evaluation, if Ecology determines measures are available to achieve compliance, set up a compliance schedule to attain compliance, in accordance with Section 3.0(5) (WAC 173-201A-510(5)).

ii) After the evaluation, if no reasonable and feasible improvements have been identified, Douglas PUD may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

c) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

5) Spill Prevention and Control (Objective 4)

a) Spill Prevention and Control Requirements

Douglas PUD shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. Douglas PUD shall update the Project Spill Prevention Control and Countermeasures Plan (SPCC) pursuant to FERC requirements and recommendations provided by Ecology. Douglas PUD shall comply and operate the Project with the updated version(s) of the SPCC.

b) Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of the local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake Rivers.

c) Inspections

Douglas PUD shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with this section 6.7 5(d). Following inspection, Douglas PUD shall address oil and hazardous material prevention and control issues

identified by Ecology.

d) Additional Requirements - Spill Prevention and Control

i) Discharge of oil, fuel or chemicals into state waters or onto land where such contaminants could potentially drain into state waters is prohibited.

ii) Douglas PUD shall continue to provide Ecology, Central Region Office, Spills and Water Quality Programs, with copies of its most up-to-date SPCC version. Copies of the Spill Prevention Control and Countermeasures Plan (SPCC) shall be kept on site by Douglas PUD and made readily available for reference by the PUD, its contractors and consultants, and Ecology.

iii) In the event of a discharge of oil, fuel or chemicals into state waters, or onto land where such contaminants could potentially drain into state waters, containment and clean-up efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Clean-up shall include proper disposal of any spilled material and used clean-up materials.

iv) Spills into state waters, spills onto land where contaminants could potentially drain into state waters, and any other significant water quality impacts, shall be reported immediately to the Washington Emergency Management Division at 1-800-258-5990 and the National Response Center at 1-800-424-8802. Notification shall include a description of the nature and extent of the problem, any actions taken to correct the problem, plus any proposed changes in operations to prevent further problems.

6) Regional Forums (Objective 5)

a) Participation in Regional Water Quality Forums. Douglas PUD shall continue to participate in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project.

b) Project Operations. Douglas PUD may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for

exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

7) Water Quality Study Plans and Reports - General Requirements

a) Study Plans.

i) Douglas PUD shall prepare study plan(s) that include a quality assurance project plan(s) (QAPP) for each water quality parameter to be monitored in each plan. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

ii) Douglas PUD shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs. The initial QAPPs and any changes shall be submitted to the ASWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

b) Annual WQS Report.

i) Douglas PUD shall provide a draft annual report to the ASWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the requirements in this Order and as determined by the ASWG and Ecology. The report shall include any decisions, statements of agreement, evaluations, or changes made pursuant to this Order. If significant activity was not conducted in a given year, Douglas PUD may prepare a memorandum providing an explanation of the circumstances in lieu of an annual report. A summary of monitoring results and analyses of compliance with WQS numeric criteria will be included in an appendix(ces) to the annual report (these may be separate reports; e.g. for TDG and temperature).

ii) The results shall be provided in a format prescribed by Ecology. The report shall be subject to review and approval by Ecology. Ecology will use the monitoring results to track the project's progress toward meeting and remaining in compliance with state water quality standards.

6.8 Construction Activities

a) While the existing project is not a construction site, all development or mitigation projects proposed under relicensing must meet the following conditions.

b) For future construction activities requiring a separate 401 certification (e.g., those requiring an individual 404 permit from the Army Corps of Engineers), Douglas PUD shall comply with all conditions in that additional 401 certification.

c) All water quality criteria as specified in WAC 173-201A apply to any construction work needed to implement development or mitigation projects required under the new FERC license.

d) Unless otherwise stated in another Section 401 certification (see above), the turbidity criteria (WAC 173-201A) may be modified to allow a temporary mixing zone during and immediately after in-water or shoreline construction activities that disturb in-place sediments. A temporary turbidity mixing zone is subject to the constraints of WAC 173-201A, and is authorized only after the activity has received all other necessary local and state permits and approvals and after the implementation of appropriate best management practices (BMPs) to avoid or minimize disturbance of in-place sediments and exceedances of the turbidity criterion. The temporary turbidity mixing zone for waters with flows greater than 100 cubic feet per second (cfs) at the time of construction is 300 feet downstream of the activity causing the turbidity exceedances.

e) For all other future construction activities, a water quality protection plan (WQPP) shall be prepared and implemented for each project involving work in or near water. The WQPP shall include:

i) A copy of the Hydraulic Project Approval (HPA) per Chapter 77.55.021 RCW for the project;

ii) A description of all Best Management Practices (BMPs) to be employed for in and near-water work;

iii) A plan for sampling and monitoring during construction;

iv) A plan for implementing mitigation measures should a water quality violation occur; and

v) A written procedure for reporting any water quality violations to Ecology.

f) Douglas PUD shall submit each WQPP to Ecology for review and written approval prior to starting work.

7.0 Penalties and Appeal

Any person who fails to comply with any provision of this Certification shall be liable for criminal and civil penalties as provided under state and/or federal law.

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this Final Order:

File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

Serve a copy of your appeal and this Order on Ecology in paper form by mail or in person (see addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

APPENDIX B

U.S. DEPARTMENT OF COMMERCE, NATIONAL MARINE FISHERIES SERVICE FISHWAY PRESCRIPTION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED JULY 21, 2011

Article 1. Prescription for Incorporating the Anadromous Fish Agreement and Habitat Conservation Plan into the Project License

For the protection, mitigation of damages to, and the enhancement of fishery resources the licensee shall carry out its obligations, in their entirety, as set forth in the Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project No. 2149 filed with the Commission on November 24, 2003, and as approved by the Commission at 107 FERC ¶61,280 and ¶61,281.

APPENDIX C

U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE FISHWAY PRESCRIPTION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED AUGUST 1, 2011

1.0 Reservation of Authority to Prescribe Fishways

Authority is reserved for the Department of the Interior (Department) to prescribe the evaluation, construction, operation, and maintenance of fishways at the Wells Hydroelectric Project, Project No. 2149, as appropriate, including measures to determine, ensure, or improve the effectiveness of such fishways, pursuant to Section 18 of the Federal Power Act, as amended. This reservation includes, but is not limited to, authority to prescribe fishways for spring, summer, and fall Chinook salmon, sockeye salmon, coho salmon, steelhead, bull trout, Pacific lamprey, white sturgeon, and any other fish to be managed, enhanced, protected, or restored to the mid-Columbia River during the term of the license. Pursuant to Section 9.5.2 of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (Wells AFA/HCP), such reserved fish passage authority may be exercised for Plan Species (spring, summer and fall Chinook salmon, sockeye salmon, coho salmon, and steelhead) only in the event that the Wells AFA/HCP is terminated.

2.0 General Prescriptions for Fishways

The following general prescriptions for fishways apply to the operation and maintenance of both upstream and downstream fishways at the Wells Hydroelectric Project, subject to the provisions of Section 9.5.2 of the Wells AFA/HCP and in accordance with the Wells Hydroelectric Project Aquatic Settlement Agreement (Aquatic SA), including the Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), and the White Sturgeon Management Plan (WSMP), and are prescribed to ensure the effectiveness of the fishways pursuant to Section 1701(b) of the National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008):

2.1 The Department reserves the authority to modify, replace or amend these prescriptions for fishways at any time before license issuance, as well as any time during the term of the license, after review of new substantial evidence in support of a change to the fishway prescription.

2.2 The U.S. Fish and Wildlife Service (FWS), pursuant to the authorities of the Department, retains the right to review and approve all documents (e.g., plans, specifications, measures, study designs, reports) developed pursuant to this Prescription prior to construction and implementation of any required measure. These approvals will be provided by the Regional

Director, FWS, Portland, OR. To facilitate this review and approval process, correspondence between the Director and the Licensee will occur through:

Assistant Project Leader
U.S. Fish and Wildlife Service
Central Washington Field Office
215 Melody Lane, Suite 119
Wenatchee, WA 98801

2.3 The Licensee shall manage the Wells Hydroelectric Project and all its associated features, including the dam, spillways, powerhouse, and reservoir, to provide effective upstream and downstream fish passage over the full range of river flows for which the project maintains operational control. The Licensee shall manage the Project's upstream and downstream fish passage facilities subject to the provisions in this Prescription and in accordance with the Licensee's AFA/HCP Adult Fish Passage Plan and Bypass Operations Plan, and with the Wells Hydroelectric Project Aquatic SA, including the BTMP, PLMP, and the WSMP.

3.0 Upstream and Downstream Fishways and Salmon and Steelhead (Appendix E-1) (Plan Species): To provide for the safe, timely, and effective upstream and downstream passage of fish at the Wells Project, the Licensee shall provide for the construction, operation, maintenance, and effectiveness monitoring of upstream and downstream fishways for Plan Species as set forth in the Wells AFA/HCP, filed with the FERC on November 24, 2003, and as approved by the Federal Energy Regulatory Commission (FERC) in 2004 at 107 FERC ¶61,280 and ¶61,281.

4.0 Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout (Article 2) (*BTMP Section 4.1.1*): The Licensee shall provide upstream passage for bull trout through the existing upstream fishways and downstream passage for bull trout through the existing downstream bypass system consistent with the AFA/HCP and Aquatic SA. Both upstream fishway facilities (located on the west and east shores) shall be operational year round with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Operation of the downstream passage facilities for bull trout shall be consistent with bypass operations for Plan Species identified in the Wells AFA/HCP.

4.1 Bull Trout Passage Performance Standard: The Licensee shall implement the upstream and downstream measures contained in the Wells Hydroelectric Project BTMP to provide safe, timely, and effective upstream

and downstream passage for adult and sub-adult bull trout at the Wells Hydroelectric Project. "Safe, timely and effective" passage shall be achieved when the Licensee has demonstrated that the survival and passage success rates for adult marked fish are greater than 95% and greater than or equal to 90%, respectively, and when passage studies demonstrate that the fishway facilities at Wells Dam do not impede the passage of bull trout. To ensure that safe, timely and effective passage at Wells Dam is maintained during the term of the new license, the Licensee shall implement the following bull trout upstream and downstream measures consistent with the BTMP.

4.2 Upstream Fishway Counts *(BTMP Section 4.1.2)*: The Licensee shall continue to conduct video monitoring in the Wells Dam fishways from May 1 through November 15 to count and provide information on the population size of upstream moving bull trout.

4.3 Sub-Adult Bull Trout Monitoring *(BTMP Section 4.2.3)*: If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Licensee shall, in consultation with the FWS, and the Wells Aquatic Settlement Agreement Work Group (Aquatic SWG), implement reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, the Licensee may modify counting activities, and shall continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity shall occur the following year of first observation of sub-adult bull trout (>10 per calendar year), in consultation with the FWS and the Aquatic SWG.

4.4 Upstream Fishway Operations Criteria *(BTMP Section 4.1.3)*: The Licensee shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP and this Prescription.

4.5 Bypass Operations Criteria *(BTMP Section 4.1.4):* The Licensee shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP and this Prescription.

4.6 Bull Trout Upstream and Downstream Passage Evaluation *(BTMP Section 4.2.1)*: The Licensee shall periodically monitor upstream and downstream passage of bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every 10 years thereafter during the new license term, the Licensee shall conduct a 1-year monitoring

study to verify continued compliance with the bull trout passage performance standard (Section 4.1 of this Prescription). These monitoring studies shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the monitoring results demonstrate continued compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then no additional actions are needed. If the monitoring results demonstrate that the Licensee is no longer in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the monitoring study will be replicated to confirm the results. If the results after 2 years of monitoring demonstrate that the Licensee is no longer in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the Licensee shall, pursuant to Section 4.8 of this Prescription, develop and implement additional measures to improve bull trout passage until compliance with the bull trout passage performance standard (Section 4.1 of this Prescription) is achieved. If the bull trout counts at Wells Dam increase more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders, bypass, or hydrocombine, then the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the Wells HCP Coordinating Committee (WCC), shall conduct a 1-year, follow-up monitoring study to verify continued compliance with the bull trout performance standard (Section 4.1 of this Prescription).

4.7 Adult Bull Trout Passage Evaluation at Brood Stock Collection Facilities (*BTMP Section 4.2.2*): The Licensee shall, beginning in year 1 of the new license, conduct a 1-year radio-telemetry evaluation to assess upstream and downstream passage of adult bull trout at the adult salmon and steelhead brood stock collection facilities associated with the Wells AFA/HCP, including but not limited to, the Twisp weir adult collection facility. The Licensee shall capture and tag up to 10 adult, migratory bull trout (>400mm) per assessment per year and use fixed receiver stations upstream and downstream of the collection facilities. Assessments shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the evaluation demonstrates that the Licensee is not in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the evaluation will be replicated to confirm the results. If the results after 2 years of evaluation demonstrate that the Licensee is not in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the Licensee shall develop, implement, and evaluate additional measures, in consultation with the FWS, WCC and the Aquatic SWG, until the FWS determines that the bull trout passage performance standard has been

achieved. At such time as the FWS determines the bull trout passage performance standard has been achieved, the implementation of this Condition shall be integrated into the 1-year telemetry monitoring program that is to be conducted every 10 years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.6 above.

4.8 Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified *(BTMP Section 4.3)*: If monitoring (Section 4.6 of this Prescription) identifies upstream or downstream passage problems for bull trout, the Licensee shall, in consultation with the FWS, WCC and the Aquatic SWG, identify, design, implement, and evaluate reasonable and feasible measures to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage. Study protocols and radio-telemetry assessment methodologies prescribed above in Sections 4.6 and 4.7 of this Prescription, shall be used to evaluate the effectiveness of any additional measures implemented to reduce the identified impacts to bull trout passage. Upon completion of the evaluation, the FWS and the National Marine Fisheries Service (NMFS), in consultation with the Aquatic SWG, and the WCC, will determine whether the proposed measure should be made permanent, removed, or modified.

5.0 Upstream Passage of Pacific Lamprey (Article 3): The Licensee shall implement the upstream passage measures contained in the Wells Hydroelectric Project PLMP to provide upstream passage for Pacific lamprey at the Wells Dam. Specifically, the Licensee shall implement the Pacific lamprey upstream passage measures identified in the PLMP consistent with the following:

5.1 Upstream Passage Performance Standard: The Licensee shall, in consultation with the FWS, the Aquatic SWG, and the U.S Bureau of Indian Affairs (BIA), continue to evaluate upstream Pacific lamprey passage until safe, timely and effective passage has been achieved. This "safe, timely and effective" standard will be achieved when the Licensee has demonstrated that lamprey passage is at levels at least as high as other mid-Columbia River PUD hydroelectric projects, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, until specific Pacific lamprey passage performance standards have been adopted by the FWS. At such time, the Licensee shall demonstrate compliance with the new standards.

5.1.1 Steady Progress *(PLMP Section 4.1.5)*: The Licensee shall exhibit steady progress, as agreed to by the FWS, in consultation with the Aquatic SWG and the BIA, towards achieving this Upstream Passage Performance Standard (Section 5.1 of this Prescription). Once compliance is achieved, the Licensee shall only be required to implement activities pursuant to Section 5.8, Periodic Monitoring.

5.2 Upstream Fishway Operations *(PLMP Section 4.1.1)*: The Licensee shall operate the existing upstream fishways at Wells Dam in accordance with the operation criteria for anadromous salmonids, bull trout, and Pacific lamprey as outlined in the Wells AFA/HCP and the Wells Aquatic SA, as approved and/or amended by the FWS and the NMFS in consultation with the WCC, the Aquatic SWG, and the BIA.

5.3 Salvage Activities During Ladder Maintenance Dewatering *(PLMP Section 4.1.2)*: The Licensee shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the Wells AFA/HCP. All Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the Wells AFA/HCP. Any adult lamprey that are captured during salvage activities shall be released upstream of Wells Dam, unless otherwise determined by the FWS, in consultation with the Aquatic SWG, and the BIA. The Licensee shall ensure the FWS, Aquatic SWG, and the BIA are made aware of salvage activities, and the Licensee shall also provide a summary of salvage activities in the Wells Aquatic SA annual report.

5.4 Upstream Fishway Counts for Pacific Lamprey *(PLMP Section 4.1.3)*: The Licensee shall continue to conduct annual fish passage monitoring in the Wells Dam adult fishways using the best technology commercially available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1 – November 15).

5.5 Lamprey Counts *(PLMP Section 4.1.3)*: Based upon information collected from the evaluations of fishway measures prescribed in Section 5.6 below, the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop techniques for enumerating lamprey through all upstream passage routes at Wells Dam. Potential measures to improve counting accuracy may include the development of a correction factor based upon data collected during passage evaluations (PLMP Sections 4.1.6 and 4.1.7) or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

5.6 Fishway Measures to Improve Upstream Passage for Adult Pacific Lamprey *(PLMP Section 4.1.1, Section 4.1.4, and Section 4.1.5)*: The Licensee shall, in consultation with the FWS, WCC, the Aquatic SWG, and the BIA, implement and evaluate the measures contained in Sections 4.1.1, 4.1.4, and 4.1.5 of the PLMP to achieve safe, timely and effective passage of Pacific lamprey. Measures to improve upstream passage for adult Pacific lamprey shall include the following components:

5.6.1 Upstream Passage Improvement Literature Review *(PLMP Section 4.1.4 and 4.1.5)*: The Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, adult fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

5.6.2 Implementation of Adult Fishway Measures *(PLMP Section 4.1.5)*: The Licensee shall, in consultation with the FWS, the WCC, the Aquatic SWG and the BIA, identify, design, implement, and evaluate operational and/or structural measures as needed to achieve and maintain safe, timely and effective passage for Pacific lamprey during the new license term. Passage measures will be designed to improve passage performance for Pacific lamprey through the Wells Dam adult fishways without negatively impacting the passage performance of adult anadromous salmonids. Each measure implemented shall be evaluated by the Licensee to determine its effect on adult Pacific lamprey. All evaluations shall be designed in consultation with the FWS, the Aquatic SWG, and the BIA. Upon completion of any specific evaluation, the FWS and the NMFS, in consultation with the WCC, the Aquatic SWG and the BIA, will determine whether the proposed measure should be made permanent, removed, or modified. The specific components of these operational and structural passage measures and their schedules for implementation shall include the following:

- Adult Fishway Inspection (*PLMP Section 4.1.5)*: Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall conduct an adult fishway inspection with the FWS, the Aquatic SWG, the BIA, and regional lamprey passage experts to identify,

prioritize, and implement measures to improve adult lamprey passage and enumeration at Wells Dam. Additional inspections will be conducted by the Licensee at the request of the FWS, the Aquatic SWG, and the BIA consistent with winter dewatering operations.

- Operations Study Plan *(PLMP Section 4.1.1)*: Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the WCC, the Aquatic SWG and the BIA, the Licensee shall develop an Operations Study Plan (OS Plan) that specifically identifies operational measures to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey measures on salmon.

- Entrance Efficiency (*PLMP Section 4.1.5*): Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance measures intended to increase lamprey passage into the adult fishway without significantly impacting the passage of adult salmonids.

- Diffuser Gratings *(PLMP Section 4.1.5)*: Within 5 years of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that diffuser gratings within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If diffuser gratings do adversely affect passage, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, the Licensee shall develop a plan and schedule acceptable to the FWS for modifying the gratings as needed to address impacts.

- Transition Zones *(PLMP Section 4.1.5)*: Within 5 years of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that transition zones within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If transition zones do adversely affect passage, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, the Licensee shall develop a plan and schedule acceptable to the FWS for addressing the impacts.

- Ladder Traps and Exit Pools *(PLMP Section 4.1.5):* Within 5 years of license issuance or as soon as practicable following consultation

with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that lamprey ladder traps and exit pools within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If ladder traps and/or exit pools do adversely affect passage, the Licensee shall, in consultation with FWS, the Aquatic SWG, and the BIA, develop a plan and schedule acceptable to the FWS for addressing the impacts.

5.7 Adult Pacific Lamprey Upstream Passage Evaluation *(PLMP Section 4.1.6)*: Within 5 years of license issuance or within 1 year of implementing all measures identified in Section 5.6 (whichever comes first), the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, conduct a 1-year study to verify the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If results demonstrate that passage rates at Wells Dam are below the Upstream Passage Performance Standard (Section 5.1 of this Prescription), the Licensee, shall, in consultation with the FWS, the WCC, the Aquatic SWG, and the BIA, design, evaluate and implement additional measures to improve upstream Pacific lamprey passage. The Licensee shall continue to design, evaluate and implement measures, in consultation with the FWS, the Aquatic SWG, and the BIA, until the Upstream Passage Performance Standard (Section 5.1 of this Prescription) is achieved.

5.8 Periodic Monitoring *(PLMP Section 4.1.7)*: Once adult Pacific lamprey standards have been achieved, the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, periodically monitor adult Pacific lamprey passage performance through Wells Dam adult fishways to verify continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription). Specifically, every 10 years after compliance has been achieved, or as determined necessary by the FWS in consultation with the Aquatic SWG, and the BIA, the Licensee shall implement a 1-year study to demonstrate continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription). If study results demonstrate continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription) then no additional actions are needed. If the results demonstrate that the Licensee is no longer in compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription), then the upstream passage study will be replicated to confirm the results. If the results after 2 years of study demonstrate that the Licensee is no longer in compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription), the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop and implement additional measures to improve upstream

Pacific lamprey passage consistent with Sections 5.6 and 5.7 of this Prescription.

6.0 Downstream Passage of Juvenile Pacific Lamprey (Article 3) *(PLMP Section 4.2.4)*: At such time as the FWS, in consultation with the Aquatic SWG , and the BIA, determines that substantial evidence exists either at Wells Dam or at a dam with similar features or conditions (e.g., turbines, spillways, and bypass) to Wells, indicating that downstream migrating juvenile lamprey may be negatively impacted at Wells Dam, then the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop a downstream juvenile lamprey passage study. The study shall determine whether a negative impact exists at Wells Dam, and if present, quantify the impact. Upon approval of the FWS, the Licensee shall implement the study.

If statistically valid study results indicate that Wells Dam has a substantive negative impact on downstream migrating juvenile lamprey, then the Licensee, in consultation with FWS, the WCC the Aquatic SWG, and the BIA, shall identify and implement regionally accepted measures (e.g., operational or structural changes, translocation, artificial production, habitat enhancement) to address such impacts. If operational or structural changes are needed to improve passage survival of juvenile lamprey, then those changes shall be coordinated with the WCC prior to development and implementation.

APPENDIX D

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS INCLUDED IN THE NATIONAL MARINE FISHERIES SERVICE'S BIOLOGICAL OPINION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED MARCH 7, 2012

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

The following RPMs are necessary and appropriate to minimize the effect of anticipated incidental take of UCR spring-run Chinook salmon and UCR steelhead. FERC must require the licensee to minimize incidental take as follows:

1. Minimize incidental take from the operation of the project by requiring the licensee to adhere to all the measures in the Anadromous Fish Agreement and Wells Habitat Conservation Plan as approved and adopted by the Commission in 2004 and incorporated into the proposed license.

2. Minimize incidental take from the unanticipated release of hazardous substances, toxics, excessive sediment, debris, and other materials into the Columbia River and its tributaries, the fish passage and rearing facilities by following provisions of the Water Quality Management Plan.

3. Minimize incidental take from in-water and near-water construction activities by using BMPs for the proposed action to avoid or minimize adverse effects to water quality and aquatic resources.

4. FERC shall include the standard license reopener clause in any license issued for this project to ensure continuing agency discretion throughout the life of the license as may be necessary to protect species listed under the ESA.

To be exempt from the prohibitions of Section 9 of the ESA, FERC must ensure that Douglas PUD fully carries out the conservation measures in the new license to be issued by FERC. FERC must include in the license the following terms and conditions that carry out the RPMs listed above. Partial compliance with these terms and conditions may result in more take than anticipated, and invalidate this take exemption. These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, FERC or its Licensee must undertake the following:

1. Require the Licensee to monitor fish populations and habitat and passage as described in the provisions of the Anadromous Fish Agreement and Wells Habitat Conservation Plan that relate to Upper Columbia River Spring Chinook and Upper Columbia River steelhead (including, but not limited to fish passage, fish supplementation, aquatic habitat conditions [e.g., flows and habitat restoration], construction, monitoring, and fish sampling) for this project. The Licensee must report all incidental take that occurs during these activities to NMFS. The Licensee must report the results of monitoring fish and fish passage and water quality annually to NMFS. This may be concurrent with the Project annual reports to FERC and shall be provided to NMFS by March 31 for take, which occurred in the prior calendar year. Listed fish must be handled with extreme care and kept in water, with adequate circulation, to the maximum extent possible during sampling and monitoring. When a mix of species are captured or collected, ESA-listed fish must be processed first, to the extent possible, to minimize stress. Listed fish must be transferred using a sanctuary net (which holds water during transfer) whenever practical to prevent the added stress of being dewatered. Require the Licensee to monitor juvenile and adult mortality to ensure that incidental take levels are not exceeded. The Licensee must develop the monitoring measures in conjunction with NMFS, and receive our approval of the monitoring plan.

   Incidental take should be reported to:

   National Marine Fisheries Service
   Hydropower Division, FERC and Water Diversions
   Attention: Keith Kirkendall, Branch Chief
   1201 NE Lloyd Blvd., Suite 1100
   Portland, OR 97232

To carry out RPM #2, FERC or its Licensee must undertake the following:

1. Follow and implement all terms and conditions of the Wells project Aquatic Settlement Agreement Water Quality Management Plan.

To carry out RPM #3, FERC or its Licensee must undertake the following:

1. Require the Licensee to use best management practices in all construction work, including adhering to certain timing restrictions. Spill control equipment must be on site and in quantities sufficient to effectively contain and recover accidental release of chemicals. Project personnel must be familiar with spill control equipment operation and procedures prior to the initiation of work. Instream work shall be conducted according to BMPs, consistent with WDFW's Hydraulic Code (RCW 77-55) by conforming to a Hydraulic Project Approval (WAC 220-110) obtained from WDFW. In the event that the regulations are significantly modified or repealed

during the license term, the terms in effect in 2011 shall continue in force for the term of the license to protect fish and their habitat.

APPENDIX E

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS INCLUDED IN THE U.S. FISH AND WILDLIFE SERVICE'S BIOLOGICAL OPINION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED MARCH 19, 2012

Reasonable and Prudent Measures

Reasonable and prudent measures (RPMs) are non-discretionary measures designed to minimize impacts on specific individuals or habitats affected by the proposed action, and require only minor changes to the project. The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of the bull trout.

RPM 1. FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for all life stages of bull trout at all Project facilities.

RPM 2. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of spillway operations and hydrographic variation to all life stages of bull trout at all Project facilities.

RPM 3. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

RPM 4. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program to all life stages of bull trout.

RPM 5. FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Wells Hydroelectric Project impacts, including those associated with the Wells Dam, Twisp Weir trapping facilities, and hatchery facilities. This information will allow the Service to determine whether authorized take levels are exceeded.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agency must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and also outline required reporting and monitoring requirements. *These terms and conditions are non-discretionary.* All plans called for in these terms and conditions shall be provided to the Service upon completion.

To implement RPM 1: FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for bull trout at all Project facilities.

1. Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout *(BTMP Section* 4.1.1): FERC shall require Douglas PUD, in coordination with the Service, to provide upstream passage for bull trout through the existing upstream fishways and downstream passage for bull trout through the existing downstream bypass system consistent with the AFA/HCP and Aquatic SA. Both upstream fishway facilities (located on the west and east shores) shall be operational year round with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Operation of the downstream passage facilities for bull trout shall be consistent with bypass operations for Plan Species identified in the Wells AFA/HCP.

2. Bull Trout Passage Performance Standard: FERC shall require Douglas PUD, in coordination with the Service, to implement the upstream and downstream measures contained in the Wells Hydroelectric Project BTMP to provide safe, timely, and effective upstream and downstream passage for adult and sub-adult bull trout at the Wells Hydroelectric Project. "Safe, timely and effective" passage shall be achieved when Douglas PUD has demonstrated that the survival and passage success rates for adult marked fish are greater than 95% and greater than or equal to 90%, respectively, and when passage studies demonstrate that the fishway facilities at Wells Dam do not impede the passage of bull trout. To ensure that safe, timely and effective passage at Wells Dam is maintained during the term of the new license, Douglas PUD shall implement the bull trout upstream and downstream measures consistent with the BTMP.

3. Upstream Fishway Operations Criteria *(BTMP Section 4.1.3*): FERC shall require Douglas PUD, in coordination with the Service, to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP.

4. Bypass Operations Criteria *(BTMP Section* 4.1.4): FERC shall require Douglas PUD, in coordination with the Service, to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP.

5. Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified *(BTMP Section 4.3)*: FERC shall require Douglas PUD, in coordination with the Service, to identify, design, implement, and evaluate reasonable and feasible measures to modify the upstream fishway, downstream bypass, or operations to reduce the identified incidental take of bull trout if monitoring (Term and Condition #10) identifies upstream or downstream passage problems for bull trout, in consultation with the Service, WCC and the Aquatic SWG. Study protocols and radio-telemetry assessment methodologies prescribed above in Term and Condition #10 and #11, shall be used to evaluate the effectiveness of any additional measures implemented to reduce the incidental take of bull trout. Upon completion of the evaluation, the Service and the National Marine Fisheries Service (NMFS), in consultation with the Aquatic SWG, and the WCC, will determine whether the proposed measure should be made permanent, removed, or modified.

To implement RPM 2: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of hydrographic variation to all life stages of bull trout at all Project facilities.

6. Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation *(BTMP Section* 4.4): FERC shall require Douglas PUD, in coordination with the Service, to continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' MSL). If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas, in consultation with the Aquatic SWG, to address the impact.

To implement RPM 3: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

7. Bull Trout Monitoring During Hatchery Activities *(BTMP 4.6.1)*: FERC shall require Douglas PUD, in coordination with the Service, to monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and subadult bull trout resulting from incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas. If the incidental take

of bull trout is exceeded due to Douglas's hatchery actions then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 4: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of implementing the Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program to all life stages of bull trout.

8. Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout *(BTMP Section 4.5.1)*: FERC shall require Douglas PUD, in coordination with the Service, to monitor activities associated with the implementation of other Aquatic Resource Management Plans for white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 5: FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Wells Hydroelectric Project impacts, including those associated with the Wells Dam, Twisp Weir trapping facilities, and hatchery facilities. This information will allow the Service to determine whether authorized take levels are exceeded.

9. Upstream Fishway Counts *(BTMP Section 4.1.2)*: FERC shall require Douglas PUD, in coordination with the Service, to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving bull trout.

10. Adult Bull Trout Upstream and Downstream Passage Evaluation *(BTMP Section 4.2.1)*: FERC shall require Douglas PUD, in coordination with the Service, to periodically monitor incidental take of bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas PUD shall conduct a 1 year monitoring study to verify continued compliance with the bull trout passage

performance standard (Term and Condition #2). These monitoring studies shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the monitoring results demonstrate continued compliance with the bull trout passage performance standard (Term and Condition #2), then no additional actions are needed. If the monitoring results demonstrate that Douglas PUD is no longer in compliance with the bull trout passage performance standard (Term and Condition #2), then the monitoring study will be replicated to confirm the results. If the results after two years of monitoring demonstrate that Douglas PUD is no longer in compliance with the bull trout passage performance standard (Term and Condition #2), then Douglas PUD shall, pursuant to Term and Condition #5, develop and implement additional measures to improve bull trout passage until compliance with the bull trout passage performance standard (Term and Condition #2) is achieved. If the bull trout counts at Wells Dam increase more than twice the existing 5-year average or if there is a significant change in the operation of the fish ladders, bypass, or hydrocombine, then Douglas PUD shall, in consultation with the Service, the Aquatic SWG, and the Wells HCP Coordinating Committee (WCC), shall conduct a 1 year, follow-up monitoring study to verify continued compliance with the bull trout performance standard (Term and Condition #2). Although the BTMP specifies to Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

11. Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities *(BTMP Section (4.2.2)*: FERC shall require Douglas PUD, in coordination with the Service, beginning in year one of the new license, to conduct a one-year radio-telemetry evaluation to assess incidental take of adult bull trout at the adult salmon and steelhead brood stock collection facilities associated with the Wells AFA/HCP, including but not limited to, the Twisp weir adult collection facility. Douglas PUD shall capture and tag up to 10 adult, migratory bull trout (>400mm) per assessment per year and use fixed receiver stations upstream and downstream of the collection facilities. Assessments shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the evaluation demonstrates that Douglas PUD is not in compliance with the bull trout passage performance standard (Term and Condition #2), then the evaluation will be replicated to confirm the results. If the results after two years of evaluation demonstrate that Douglas PUD is not in compliance with the bull trout passage performance standard (Term and Condition #2), then Douglas PUD shall develop, implement, and evaluate additional measures, in consultation with the Service, WCC and the Aquatic SWG, until the Service determines that the bull trout passage performance standard has been achieved. At such time as the Service determines the bull trout passage performance standard has been achieved, the implementation of this measure shall be integrated into the 1 year telemetry monitoring program that

is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Term and Condition #10 above. Although the BTMP specifies to Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

12. Sub-Adult Bull Trout Monitoring *(BTMP Section 4.2.3)*: FERC shall require Douglas PUD, if at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), in consultation with the Service, and the Wells Aquatic SWG, implement reasonable and appropriate methods for monitoring sub-adult bull trout. Although the BTMP states that >10 sub-adults per calendar year as the threshold, new information leads the Service to conclude that 31 sub-adults per calendar year is a more appropriate threshold. Specifically, Douglas PUD may modify counting activities, and shall continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity shall occur the following year of first observation of sub-adult bull trout (>10 per calendar year), in consultation with the Service and the Aquatic SWG.

13. Funding Collection of Tissue Samples and Genetic Analysis *(BTMP Section 4.5.2)*: FERC shall require Douglas PUD, in coordination with the Service, to collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Any sub-adult bull trout collected during these activities will also be incorporated into the bull trout genetic analysis. Beginning in year 1 of the new license, Douglas will collect up to 10 adult bull trout tissue samples from the Twisp River brood stock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the off-Project bull trout radio-telemetry monitoring study. This term and condition is consistent with other section 10(a)(l)(a) permits that involve handling of bull trout. The analysis will provide valuable information on the conservation status and genetic relationships between bull trout populations in the Columbia basin. This information will be used to determine the local populations impacted by Project operations, and when used in conjunction with other data such as movement data and redd counts, the resiliency of local populations impacted by the proposed action may be determined. Samples will be submitted to the Service (Central Washington Field Office in Wenatchee, Washington).

Reporting Requirements

In order to monitor the impacts of incidental take, Douglas PUD shall prepare an annual report describing the progress of implementing the proposed relicensing and its impact on the bull trout. The report, which shall be submitted to the Service (Central Washington Field Office) annually on or before April 15th, shall list and describe the work that was completed and the number of bull trout, if any, observed and/or incidentally taken (i.e., injured or killed) during the course of implementing the Project.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be immediately made to the nearest Service Law Enforcement Office (Redmond, Washington; telephone 425-883-8122) and reported to the Service's Central Washington Field Office (509-665-3508). Care should be taken in handling sick or injured specimens to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species and preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Service Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take described above is exceeded, such additional take represents new information requiring reinitiation of consultation (assuming the Commission retains discretion or control over the action) and review of the RPMs provided. Douglas PUD must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

Document Content(s)

Final Conference Call Minutes

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: January 17, 2013

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Minutes of the December 13, 2012 Aquatic SWG Conference Call

The December Aquatic Settlement Work Group (SWG) met by conference call on Thursday, November 13, 2012, from 10:00 am to 11:00 am. Attendees are listed in Attachment A of these meeting minutes.

I. Summary of Action Items

1. Steve Lewis and Patrick Verhey will contact Kristi Geris by the end of the day (i.e., December 13, 2012) with comments and revisions to the draft November 13, 2012 Aquatic SWG conference call minutes (Item V-1).
2. Andrew Gingerich will provide Douglas PUD's draft 2013 Action Plan to Kristi Geris for distribution to the Aquatic SWG before the January 9, 2013 Aquatic SWG meeting (Item V-3).
3. Andrew Gingerich will contact Tracy Hillman to coordinate scheduling of the Rocky Reach Fish Forum, Priest Rapids Fish Forum, and Aquatic SWG January 2013 meeting dates (Item V-7).
4. Andrew Gingerich will look into arranging a conference room at Wells Dam for the January 9, 2013 Aquatic SWG meeting (Item VI-1).
5. The Aquatic SWG January 9, 2013 meeting is tentatively scheduled to be in person at Wells Dam. (Note: January 9, 2013 has been confirmed as the next meeting of the Aquatic SWG) (Item VI-1).

II. Summary of Decisions

1. There were no Statements of Agreement (SOAs) approved at today's meeting.

III. Agreements

1. There were no agreements discussed at today's meeting.

IV. Reports Finalized

1. No reports have been finalized since the last Aquatic SWG meeting.

V. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** (Mike Schiewe): Mike Schiewe welcomed the Aquatic SWG members (attendees are listed in Attachment A) and opened the meeting. Schiewe reviewed the agenda and asked for additional agenda items. Andrew Gingerich added a summary review of the Douglas PUD 2011 Pikeminnow Program Annual Report to be presented by Chas Kyger, and also added that he plans to request an in-person meeting for the Aquatic SWG January 9, 2013 meeting.

   Kristi Geris reported that all comments and revisions received on the draft November 13, 2012 conference call minutes had been incorporated, and that no items remained to be discussed.

   Steve Lewis asked Gingerich about the use of infrared (IR) cameras that was at one time discussed for the Pacific lamprey modifications. Gingerich said that a few months ago, Douglas PUD changed from using IR cameras to instead, excluding fish from bypass locations and performing visual counts with existing cameras. He said fish can be observed through the count window to see it they are using the plate or free swimming through this area, so the IR cameras are unnecessary. Gingerich said that Douglas PUD plans to evaluate data collected this season (2013), and that based on those data, they will re-evaluate the need to install IR cameras next year. He added that Wells Dam has some camera capability because the count window is filmed all day, every day. Gingerich noted that Geris distributed an email prior to the meeting that contained the Wells Dam lamprey passage improvements engineering specifications (Attachment B). The Aquatic SWG would like to reserve the use of IR cameras in the future to assess fishway modifications for lamprey.

   Steve Lewis and Patrick Verhey requested additional time to review the November Aquatic SWG meeting minutes and said that they will contact Geris by the end of the day with any requested revisions to the draft minutes. The Aquatic SWG members present approved the November 13, 2012 conference call minutes as revised, assuming that no significant changes are received from Lewis and Verhey. (Note: Lewis and Verhey had no additional comments or revisions to the draft minutes and Geris distributed the finalized meeting minutes to the Aquatic SWG on December 13, 2012.)

2. **Postponed: Draft letter to Federal Energy Regulatory Commission requesting delay of the Bull Trout Radio Telemetry Study at the Twisp Weir** (Andrew Gingerich): Andrew Gingerich reminded the Aquatic SWG that Douglas PUD and United States Fish and Wildlife (USFWS) had planned to develop a draft letter to the Federal Energy Regulatory Commission (FERC) requesting delay of the Bull Trout Radio Telemetry (RT) Study at the Twisp Weir until 2016. He explained that Douglas PUD recently submitted a request for

a re-hearing on their new license to FERC, and recommended that they postpone submittal of the letter. Gingerich said that he wanted to let the Aquatic SWG know that the letter is still on the table, and that at some point within the next 12 months, will have the Aquatic SWG review and approve the letter as previously discussed. Gingerich said that the letter to FERC will be included in the Douglas PUD 2013 Action Plan.

Mike Schiewe asked whether a request for a re-hearing restarts the license clock. Gingerich said it did not and said that Douglas PUD is required to operate the license as issued while the request for re-hearing is pending. He added that all year-one requirements taking place in the next 12 months will move forward with no change due to the re-hearing. Patrick Verhey asked if Douglas PUD knows how long FERC will take to review the request for re-hearing. Gingerich said that Douglas PUD does not know; however, he said that Shane Bickford estimated that it will likely take on the order of months, but FERC has not indicated a response time. He added that FERC assigns a compliance officer to each project, and that Douglas PUD has not yet been assigned one.

3. **Douglas PUD draft 2013 Action Plan development** (Andrew Gingerich): Andrew Gingerich said that Douglas PUD is developing a draft 2013 Action Plan that outlines Douglas PUD's planned work during the coming year, including year one requirements of the new license and anticipated accomplishments. He added that the plan is typically distributed in January of each year. Gingerich said that after internal review and prior to the January 9, 2013 Aquatic SWG meeting, he will provide the draft 2013 Action Plan to Kristi Geris for distribution to the Aquatic SWG.

4. **Sturgeon modification** (Andrew Gingerich): Andrew Gingerich said that Douglas PUD has been developing plans for a modernization of Wells Hatchery to accommodate updates for all hatchery programs, including the rearing of juvenile white sturgeon. He said one of the highest priorities is to complete the sturgeon modifications because the Yakama Nation (YN) and Colville Confederated Tribes (CCT) will be delivering fertilized eggs and larvae to the hatchery in June 2013. Gingerich said that Douglas PUD is close to awarding a bid to a contractor who will make the modifications.

   Gingerich said that Douglas PUD is also close to securing professional service agreements with the YN and CCT for their gamete collection program and larval collection program, respectively. Mike Schiewe asked at what time larval will be delivered, and Gingerich replied that this will occur around June 15, 2013. Gingerich added that historically, timing of larval availability is dependent on flows and temperatures; and that larval delivery is slightly later than direct gamete take. He also added that there is a lot to accomplish before that time, but that he is confident Douglas PUD is in good shape to meet the schedule.

5. **FERC comments review** (Andrew Gingerich): Andrew Gingerich reported that Douglas PUD did not receive any comments on the new FERC license from the Aquatic SWG. Patrick Verhey said that Washington Department of Fish and Wildlife (WDFW) had convened an internal meeting to discuss whether or not to file a request for re-hearing; however, they decided not to because most of WDFW's concerns were already covered in Douglas PUD's request (e.g., the duration of the license and incorporation of the HCP agreements). Gingerich said that FERC's online library can be accessed by anyone in the public to review the complete list of issues raised in Douglas PUD's request for a re-hearing.

   Although not a formal agenda item for today's meeting, Gingerich updated the Aquatic SWG that Douglas PUD is continuing to work on the implementation of the lamprey passage study in 2013 and is implementing the agreed to operational changes. He said that because the study will take place in year one of the new FERC license, there are a number of administrative requirements that now must be met. For example, he noted that page 28, paragraph 94 of the license states that all permanent modifications to project facilities will require license amendments; and, that page 48, article 401 states that Douglas PUD is required to file a study plan with FERC. Gingerich also noted that page 50, article 401(c) stipulates that long-term changes to project operations or facilities may not be implemented without prior FERC authorization that is granted after the filing of an application to amend the license; which Gingerich noted would apply to the proposed head differential changes and change in count station modifications for lamprey, both of which are planned to facilitate the year one passage and enumeration study.

   Gingerich said that this means that Douglas PUD needs to put together a package of information for FERC describing and showing the vetting process for the request lamprey study and related operational and structural modifications that the Aquatic SWG has developed and approved. He suggested requesting letters of support from each stakeholder represented in the Aquatic SWG, and suggested that alternatively, Douglas PUD could draft a letter that the Aquatic SWG can all sign. Gingerich added that any requirement in a Douglas PUD management plan that is not explicit will require an amendment request; which adds a layer to the implementation process.

   Pat Irle said that Washington Department of Ecology (Ecology) is supportive of either drafting a letter or signing a joint letter. She added that because Douglas PUD has a better idea of what FERC wants, it would be more efficient for Douglas PUD to draft a letter that the Aquatic SWG can all sign. Gingerich said that Douglas PUD would gladly draft the letter. He then asked the group how they felt about Douglas PUD drafting a letter that each stakeholder would put on their respective agency letterhead. Gingerich said to start Douglas PUD will draft a single letter for review. He suggested that Mike Schiewe submit the final letter to FERC with each stakeholder listed at the bottom of the

letter and also copied on the email. Schiewe suggested that the easiest method of transmittal would be if each agency uses the same letter to send to FERC on their respective agency letterhead.

Verhey asked for clarification of why a standard Aquatic SWG vote wouldn't be sufficient for FERC; and he further inquired why there was a need for letters? Schiewe noted that this is a good point to consider, and that the group may not want to set a precedent for a more cumbersome process then necessary. Gingerich said that Douglas PUD discussed this possibility and decided that because this project started well before issuance of the license, this instance is unique and may require a stronger case than usual to show FERC that this project has been thoroughly vetted among the group. He added that future cases will likely require something lighter. Verhey said that if this is a strong concern, then WDFW is open to reviewing a letter drafted by Douglas PUD.

Gingerich said that he and Chas Kyger will work on putting together a package that would go to FERC. He said once the package is compiled, Douglas PUD will draft a letter for the Aquatic SWG to review. He added that everyone will have the opportunity to review and modify it, if necessary. Gingerich said that he is envisioning three objectives to include in the letter: 1) modifications to the fishway to improve passage; 2) modified grading to address enumeration and bypass through the louvers; and 3) support of the study as already vetted. Gingerich said Douglas PUD plans to compile information straight from the record and emails to develop the package.

6. **Douglas PUD 2011 Pikeminnow Program Annual Report** (Chas Kyger): Chas Kyger said that the Douglas PUD Final 2011 Pikeminnow Program Annual Report was distributed to the Aquatic SWG on October 10, 2012. He summarized that removal efforts were conducted from April 7, 2011, to November 11, 2011, and that a total of 16,302 northern pikeminnow were captured. He said that river flows were high, and that the overall catch-per-unit effort (CPUE) equaled 3.1 pikeminnow per hour. Kyger added that CPUE was broken down by location (Wells Tailrace and Wells Reservoir) and that compared to past years, the 2011 CPUE declined largely due to the magnitude and duration of the spring freshet and the resultant spill at Wells Dam. He said that for example, the Wells Dam tailrace catch has historically been among the highest; however, in 2011, it was one of the lower catches. He said that peak spawning time in 2011 was later than in other years, and that it was observed from July 16, 2012, to July 31, 2012. He said that typically, peak spawning occurs in late June to early July. Kyger suggested that this later spawning time was also likely due to high flows and lower temperatures. Kyger also noted the Douglas PUD speculates that decreased CPUE throughout the Wells Project may be attributed to over ten years of pikeminnow removal and therefore a reduction in population size.

Kyger said that the digestive tracts of a subsample of the total capture were sampled, and that about half were empty and only 6 percent had identifiable salmonids as stomach contents. He added that the highest level of salmonid stomach contents was observed during smolt migration. Kyger said that the incidental catch included peamouth, sucker spp., chiselmouth, and burbot. He also reported that no salmonid species were captured during sampling. Patrick Verhey asked if any Pacific lamprey were found in the stomach contents, and Kyger replied that only one was identified. He added that the crews are becoming more experienced at identifying lamprey in stomach contents and he anticipates that these data will improve over the years.

Andrew Gingerich said that pikeminnow removal is a requirement of the HCP, and that it is also a resident fish issue. He added that Douglas PUD has been collecting these data for more than a decade.

VI. Next Meetings

1. **In-person/Wells Dam fish ladder tour Aquatic SWG January meeting** (Andrew Gingerich): Andrew Gingerich suggested an in-person, Aquatic SWG January 2013 meeting to take the opportunity for a site visit to the Wells Dam fish ladder. He suggested meeting the morning of January 9, 2013, for the monthly Aquatic SWG meeting and then taking a tour of the fish ladder in the afternoon. Gingerich said that the first fish ladder was taken out of service in early December 2012, and will be out until around January 17, 2013; at which time, the second ladder will be shut down. Gingerich said that a lot of maintenance and study preparation is happening in 2013 and therefore the dewater period will be a busy one this year. He said that Douglas PUD typically likes providing the Aquatic SWG with an opportunity each year to visit Wells Dam.

   Mike Schiewe suggested convening the Aquatic SWG meeting at Wells Dam. Gingerich said that he will look into arranging a conference room at Wells Dam for the January 2013 meeting. He also said that he will contact Tracy Hillman to coordinate scheduling of the Rocky Reach Fish Forum, Priest Rapids Fish Forum, and Aquatic SWG January 2013 meeting dates.

   The Aquatic SWG January 9, 2013 meeting is scheduled to be in person, tentatively at Wells Dam. (Note the January 9, 2012 meeting date has been confirmed.)

2. **CCT changes** (Mike Schiewe): Mike Schiewe notified the Aquatic SWG that there have been personnel changes in the CCT Natural Resource Group; Paul Friedlander is now the acting Director of the group.

3. Upcoming meetings: ***January 9, 2013 (in-person); February 13, 2013 (conference call); and March 13, 2013 (conference call)***.

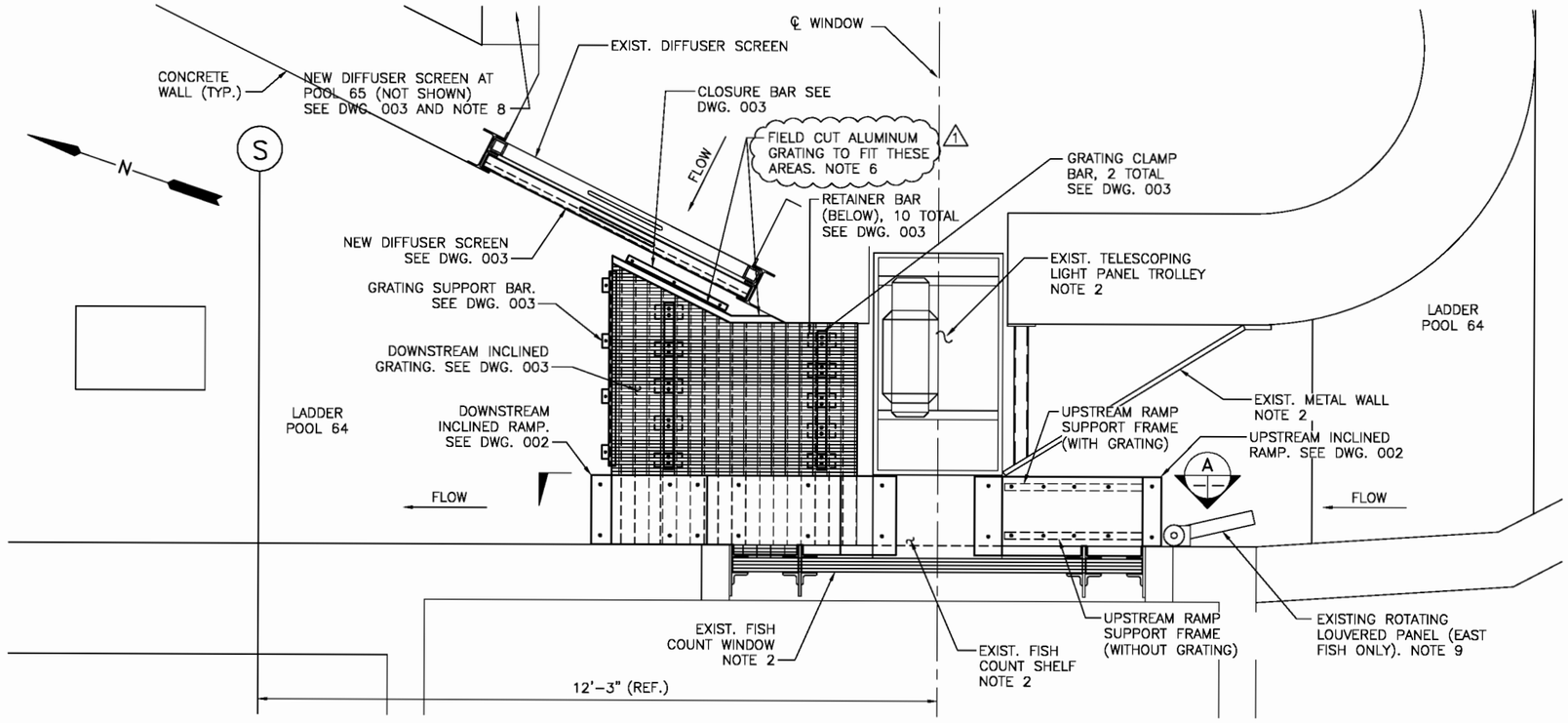
List of Attachments

Attachment A – List of Attendees

Attachment B – Wells Dam lamprey passage improvements engineering specifications

Attachment A
List of Attendees

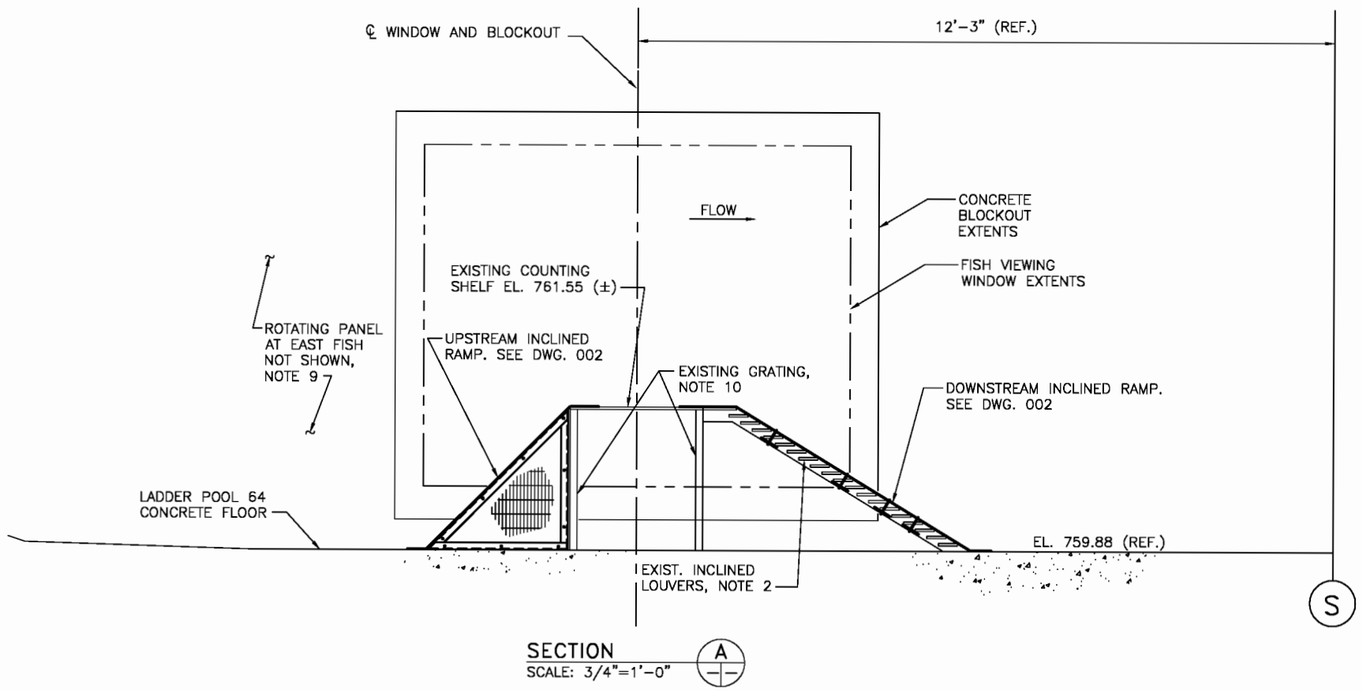
Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Representative	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Steve Lewis	SWG Technical Representative	U.S. Fish and Wildlife Service
Patrick Verhey	SWG Technical Representative	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Representative	Washington State Department of Ecology



PLAN

EAST FISH FACILITIES (WEST FISH OPP. HAND AND SIMILAR)

500 250 0 1 2
Scale in mm Scale in Feet



SECTION A
SCALE: 3/4"=1'-0"

NOTES:

1. THESE DRAWINGS WERE DEVELOPED FOR THE DISTRICT FOR FABRICATION AND INSTALLATION OF THE MODIFICATIONS TO BE MADE AT THE EAST AND WEST FISH FACILITIES FISH COUNTING WINDOWS TO IMPROVE LAMPREY PASSAGE CAPABILITIES AND PREVENT FISH AND LAMPREY FROM ACCESSING UNWANTED AREAS BY LIMITING OPENING SIZES TO 1/2" OR LESS IN THE LEAST DIMENSION.
2. AS-BUILT DRAWINGS DO NOT EXIST FOR THE LOUVERED RAMP OR FISH COUNTING SHELF. CONSEQUENTLY, INFORMATION PRESENTED ON THESE DRAWINGS ABOUT THESE FABRICATIONS IS LIMITED. ALSO, ACCESS TO THE FACILITIES WAS LIMITED DURING DESIGN DEVELOPMENT WITH MUCH OF THE AREA FULLY OR PARTIALLY SUBMERGED DURING SITE VISITS.
3. ITEMS TO BE FABRICATED IN CONJUNCTION WITH THIS PROJECT WILL REQUIRE FIELD MEASURING AND CUTTING IN ORDER TO FIT IN THE PROJECT AREA AND MEET THE GAP TOLERANCES OF 1/2" MAXIMUM GAP IN THE LEAST DIMENSION.
4. ALL STEEL SHAPES SHALL BE 304 STAINLESS UNLESS OTHERWISE NOTED. ALL STEEL WELDING SHALL CONFORM TO THE REQUIREMENTS OF AWS D1.1.
5. ALL ALUMINUM SHALL BE ALLOY 6063 UNLESS OTHERWISE NOTED. ALL ALUMINUM WELDING SHALL CONFORM TO THE REQUIREMENTS OF AWS D1.2.
6. ATTACH SMALL GRATING PIECES TO EXISTING GRATING USING COMPATIBLE GRATING CLIPS. GAPS AROUND GRATING TO BE 1/2" OR LESS IN THE LEAST DIMENSION.
7. (NOT USED) — 1
8. INSTALL NEW SCREEN AT POOL 65 IN THE OUTER GUIDE SLOT. EXISTING SCREEN TO REMAIN IN PLACE.
9. REMOVAL OF THE ROTATING LOUVERED PANEL MAY BE REQ'D TO ALLOW INSTALLATION OF THE UPSTREAM RAMP.
10. TEMPORARY REMOVAL OF EXISTING VERTICAL GRATING MAY BE REQ'D TO ALLOW ACCESS FOR INSTALLATION OF NEW COMPONENTS.

NO	DATE	REVISION	BY	CHK	JOB ENG	ENG PROJ	ENG
1	12/12/12	REVISED GALV. GRATING TO ALUM. GRATING	LN	RGW	RGW		
0	11/19/2012	RELEASED FOR CONSTRUCTION	LN	RGW	RGW		

Public Utility District No. 1 of Douglas County

WELLS HYDROELECTRIC PROJECT
COLUMBIA RIVER

LAMPREY PASSAGE IMPROVEMENTS
EAST AND WEST FISH FACILITIES
PLAN AND SECTION

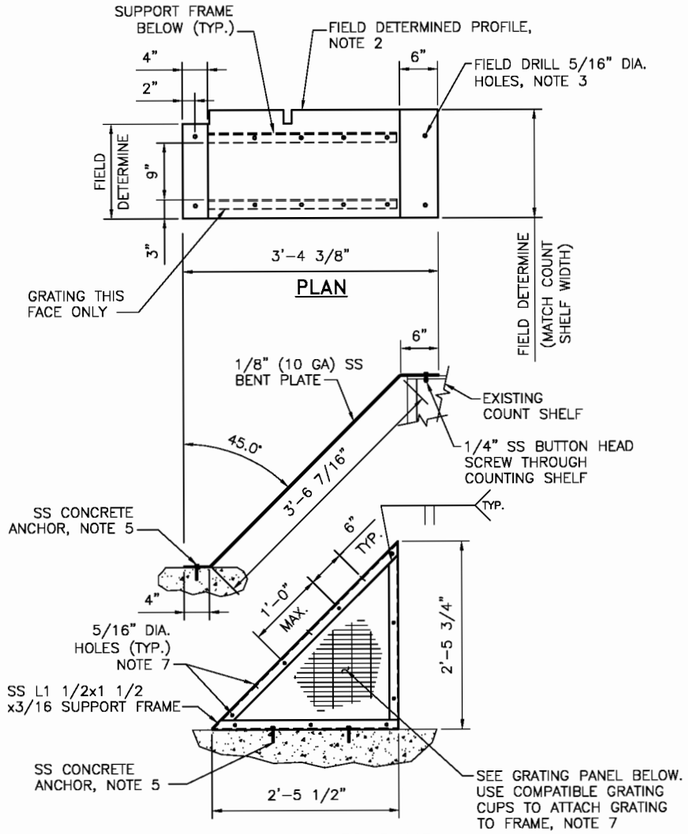
DESIGNED: ATH | DRAWN: ATH | CHECKED: RGW | DATE: 10/2012 | REVISON: 1

JACOBS

DRAWING NUMBER: X643-06-6100-DS-001

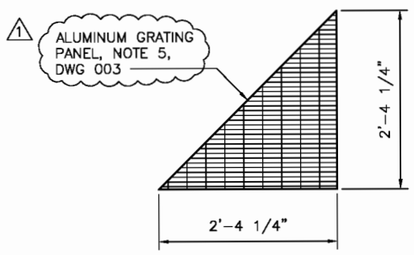
SCALE: 3/4"=1'-0" | SHT. 1 OF 3

ROLF G. WIELICK STATE OF WASHINGTON 28970 REGISTERED PROFESSIONAL ENGINEER



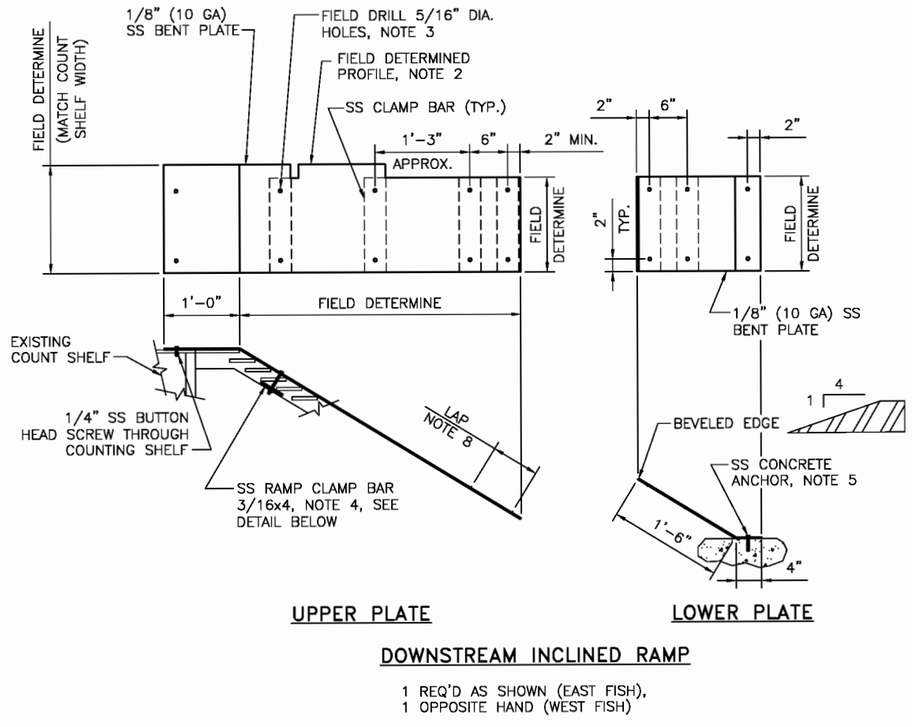
UPSTREAM INCLINED RAMP

2 FRAMES REQ'D AS SHOWN (EAST FISH)
2 FRAMES OPPOSITE HAND (WEST FISH)



UPSTREAM INCLINED RAMP GRATING PANEL

NOTE: GRATING PANEL ONLY REQ'D FOR SUPPORT FRAME FURTHEST FROM VIEWING WINDOW.
1 REQ'D (EAST FISH)
1 REQ'D (WEST FISH)

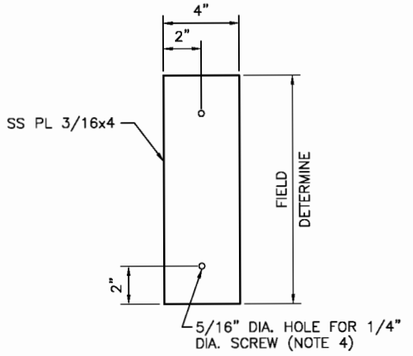


UPPER PLATE

LOWER PLATE

DOWNSTREAM INCLINED RAMP

1 REQ'D AS SHOWN (EAST FISH),
1 OPPOSITE HAND (WEST FISH)



SS RAMP CLAMP BAR

4 REQ'D (EAST FISH)
4 REQ'D (WEST FISH)

NOTES:

1. SEE DRAWING 001 FOR GENERAL NOTES.
2. RAMP PLATES WILL NEED TO BE FIELD CUT TO ENSURE A TIGHT FIT (LESS THAN 1/2 INCH GAP) AROUND EXISTING VIEWING WINDOW MULLIONS.
3. HOLES SHALL BE FIELD DRILLED THROUGH RAMP PLATES AND EXISTING LOUVERS.
4. AFFIX RAMP PLATE TO LOUVERED RAMP USING A DOUBLE NUTTED 1/4"x4" SS (18-8) BUTTON HEAD SCREW (McMASTER-CARR #92949A558).
5. CONCRETE ANCHORS SHALL BE 1/4"x2 1/4" HILTI KWIK-BOLT 3 STAINLESS STEEL EXPANSION ANCHORS.
6. (1) (NOT USED)
7. DRILL HOLES FOR ATTACHING GRATING IN ONLY ONE OF THE TWO FRAMES. HOLE LOCATIONS TO BE OPTIMIZED TO ALLOW INSTALLATION OF GRATING CLIPS THROUGH GRATING OPENINGS.
8. THE LOWER RAMP PLATE LAPS OVER THE UPPER PLATE TO ALLOW FIELD ADJUSTMENT. ALTERNATIVELY, THE RAMP CAN BE MADE IN ONE PIECE BUT WILL REQUIRE FIELD MEASUREMENT FOR LENGTH.

NO	DATE	REVISION	BY	CHK	JOB ENG	ENG PROJ	ENG
1	12/12/12	REVISED GALV. GRATING TO ALUM. GRATING	LN	RGW	RGW		
0	11/19/2012	RELEASED FOR CONSTRUCTION	LN	RGW	RGW		

ROLIE G. WIBLICK STATE OF WASHINGTON 20330 REGISTERED PROFESSIONAL ENGINEER

500 250 0 1 2
Scale in mm | Scale in Feet

Public Utility District No. 1 of Douglas County

WELLS HYDROELECTRIC PROJECT
COLUMBIA RIVER

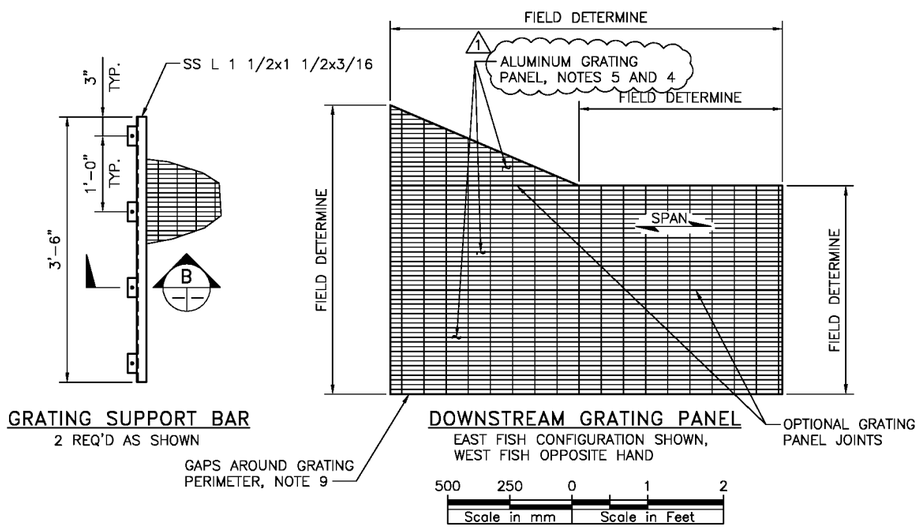
LAMPREY PASSAGE IMPROVEMENTS
LAMPREY RAMPS
DETAILS

DESIGNED: ATH | DRAWN: ATH | CHECKED: RGW | DATE: 10/2012 | REVISION: 1

JACOBS

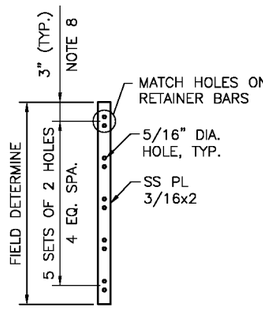
DRAWING NUMBER: X643-06-6100-DS-002

SCALE: 1" = 1'-0" | SHT. 2 OF 3

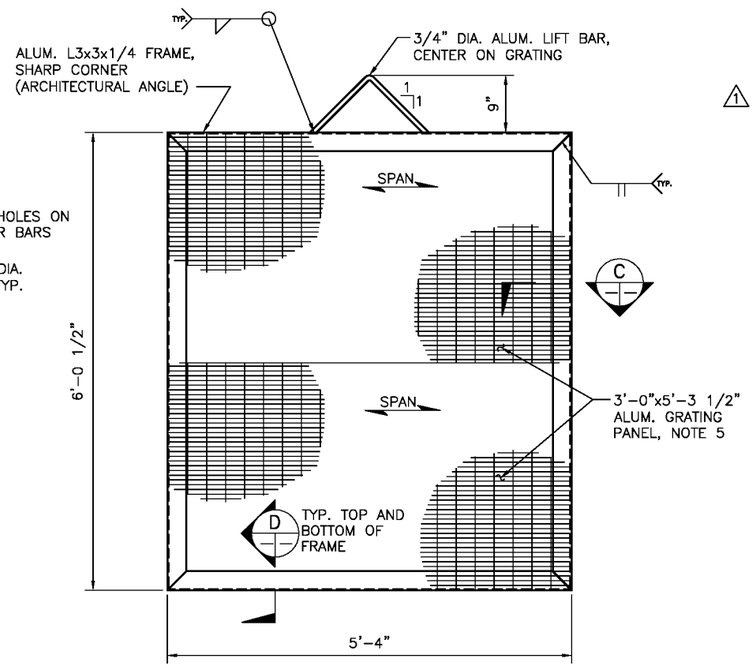


GRATING SUPPORT BAR
2 REQ'D AS SHOWN

DOWNSTREAM GRATING PANEL
EAST FISH CONFIGURATION SHOWN, WEST FISH OPPOSITE HAND



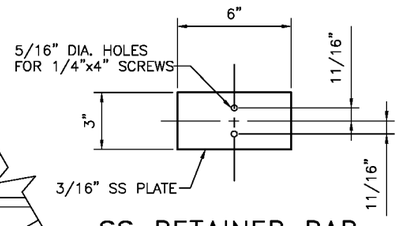
SS CLAMP BAR
2 REQ'D (EAST FISH)
2 REQ'D (WEST FISH)



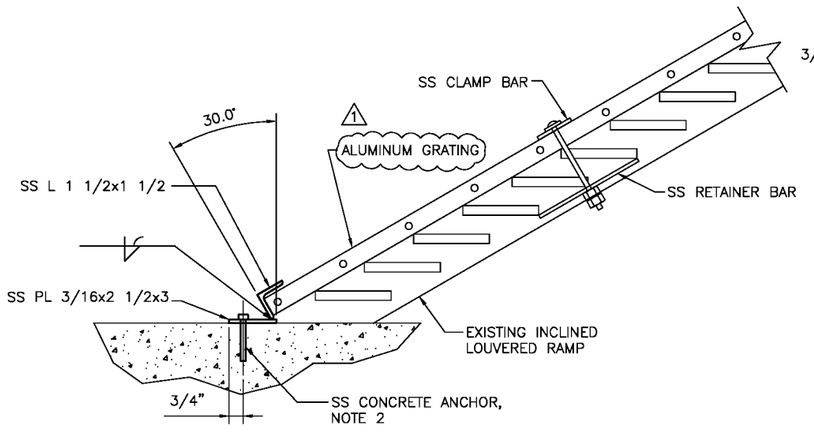
NEW DIFFUSER SCREEN
2 REQ'D (EAST FISH)
2 REQ'D (WEST FISH)

NOTES:

1. SEE DRAWING 001 FOR GENERAL NOTES.
2. CONCRETE ANCHORS SHALL BE 1/4"x2 1/4" HILTI KWIK-BOLT 3 STAINLESS STEEL EXPANSION ANCHORS.
3. (1) (NOT USED)
4. AFFIX GRATING PANELS TO LOUVERED RAMP USING CLAMP BAR AND RETAINER BARS AND DOUBLE NUTTED 1/4"x4" SS (18-8) BUTTON HEAD SCREWS (McMASTER-CARR #92949A558).
5. ALUMINUM GRATING SHALL BE 1"x3/16" RECTANGULAR BAR GRATING, 11/16" BAR SPACING, SWAGE-LOCKED CLOSE-MESH CONSTRUCTION (CUT FROM NW GRATING PART NO. 11-4-43 SR).
6. WELD EVERY FOURTH ALUM. GRATING BAR TO FISH SCREEN FRAME. CUT 1" FROM ENDS OF THE THREE BARS BETWEEN WELDED BARS.
7. CLOSURE BAR BOLTED TO CONCRETE TO ALLOW ATTACHMENT OF NEW FIELD-CUT (ALUMINUM) GRATING PANELS (NOTE 5) (1) ON SIDE OF LOUVERED RAMP. ATTACH GRATING TO CLOSURE BAR USING COMPATIBLE GRATING CLIPS.
8. ADJUST DIMENSION SO THAT HOLES PASS TROUGH GRATING OPENINGS.
9. MAXIMUM GAPS AROUND GRATING TO NEW AND EXISTING FABRICATIONS TO BE 1/2" OR LESS IN THE LEAST DIMENSION.



SS RETAINER BAR



SECTION B
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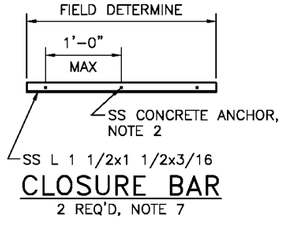
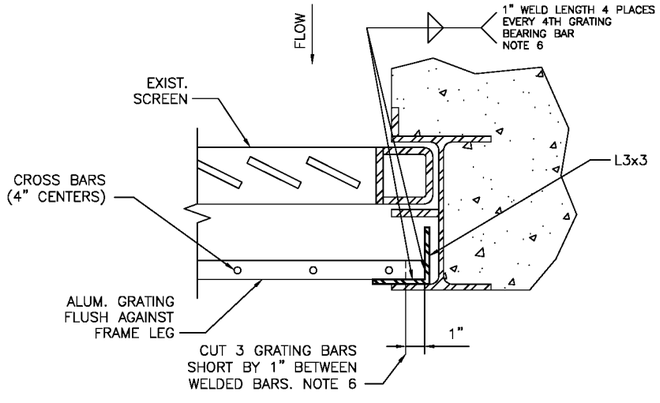


CLOSURE BAR
2 REQ'D, NOTE 7



SECTION C
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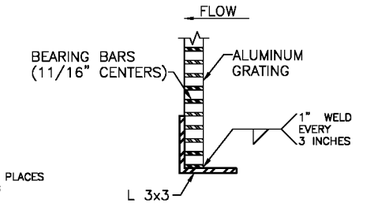

SECTION D
3"=1'-0"

NO	DATE	REVISION	BY	CHK	JOB ENG	ENG PROJ	ENG
1	12/12/12	REVISED GALV. GRATING TO ALUM. GRATING	LN	RGW	RGW		
0	11/19/2012	RELEASED FOR CONSTRUCTION	LN	RGW	RGW		

Public Utility District No. 1 of Douglas County

WELLS HYDROELECTRIC PROJECT
COLUMBIA RIVER

LAMPREY PASSAGE IMPROVEMENTS GRATING PANEL AND FISH SCREEN DETAILS

DESIGNED:	ATH	DRAWN:	ATH	CHECKED:	RGW	DATE:	10/2012	REVISON:	1

JACOBS

DRAWING NUMBER: X643-06-6100-DS-003

SCALE: AS SHOWN | SHT. 3 OF 3

ROLF C. WIBLICK STATE OF WASHINGTON 29510 REGISTERED PROFESSIONAL ENGINEER

APPENDIX B
LIST OF AQUATIC SETTLEMENT WORK GROUP MEMBERS

Aquatic Settlement Work Group Members

Signatory Parties

Organization	Policy Representative	Technical Representative
Douglas PUD	Shane Bickford	Beau Patterson (Jan-Feb) Andrew Gingerich (Mar-Dec)
Yakama Nation	Paul Ward	Steve Parker
U.S. Fish and Wildlife	Jessi Gonzales	Steve Lewis
U.S. Bureau of Land Management	Karen Kelleher (Jan-Feb) Mike Phillips (Feb-Apr) Linda Coates (May-Dec)	Karen Kelleher (Jan-Feb) Mike Phillips (Feb-Apr) Linda Coates (May-Dec)
Washington State Department of Ecology	John Merz (Jan-Feb) Charlie McKinney (Mar-Dec)	Pat Irle
Washington Department of Fish and Wildlife	Patrick Verhey (Jan-Mar) Jeff Korth (Mar-May) Dennis Beich (Jun-Dec)	Bob Jateff (Jan-Feb) Patrick Verhey (Mar-Dec)
Colville Confederated Tribes	Joe Peone	Bill Towey

Aquatic Settlement Work Group Members

Technical Support

Organization	Representative	Expertise
US Fish and Wildlife Service	Mark Nelson	Bull Trout, Lamprey
US Fish and Wildlife Service	RD Nelle	Bull Trout, Lamprey
Washington Department of Fish and Wildlife	Molly Hallock	Lamprey
Washington Department of Fish and Wildlife	Brad James	Sturgeon
Washington Department of Fish and Wildlife	Chad Jackson	Fisheries
Douglas PUD	Bao Le	Lamprey, Water Quality, ANS
Colville Confederated Tribes	Kirk Truscott	Fisheries
Colville Confederated Tribes	Brett Nine	Sturgeon
Colville Confederated Tribes	Matt Howell	Sturgeon
Yakama Nation	Patrick Luke	Lamprey
Yakama Nation	Bob Rose	Fisheries

APPENDIX C
FEDERAL ENERGY REGULATORY COMMISSION LICENSE WELLS PROJECT NO. 2149-52

141 FERC ¶ 62,104
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 1 of Douglas County, Washington — Project No. 2149-152

ORDER ISSUING NEW LICENSE

(November 9, 2012)

INTRODUCTION

1. On May 27, 2010, Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) filed, pursuant to sections 4(e) and 15 of the Federal Power Act (FPA),[1] an application for a new license to continue operation and maintenance of the existing Wells Hydroelectric Project No. 2149 (Wells Project or project). The project's authorized capacity being licensed is 774.25 megawatts (MW). The project is located on the Columbia River at river mile (RM) 515.6 near the cities of Pateros and Brewster in Douglas, Okanogan, and Chelan counties, Washington. The project occupies 8.60 acres of land administered by the U.S. Department of the Interior (Interior) and 6.55 acres of land administered by the U.S. Army Corps of Engineers (Corps).[2] [3]

2. As discussed below, I am issuing a new license for the project.

BACKGROUND

3. The Federal Power Commission (Commission) issued the original license for the Wells Project on July 12, 1962, and the license expired on May 31, 2012.[4] Since then, Douglas PUD has operated the project under an annual license pending the disposition of its new license application.

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[1] 16 U.S.C. §§ 797(e) and 808 (2006).

[2] The project is required to be licensed under section 23(b)(1) of the FPA, 16 U.S.C. § 817 (2006) because it occupies federal lands.

[3] In January 2010, Douglas PUD acquired the majority of Interior and Corps lands with the exception of 15.15 acres, within the project boundary and along the transmission line right-of-way, as authorized by the Omnibus Federal Land Act of 2009.

[4] Public Utility District No. 1 of Douglas County, Washington, 28 FPC 128 (1962).

4. On August 10, 2010, the Commission issued a public notice that was published in the *Federal Register* accepting the application for filing, soliciting motions to intervene and protests, indicating the application was ready for environmental analysis, and soliciting comments, final recommendations, terms and conditions, and prescriptions.[5] The notice set October 12, 2010, as the deadline for filing protests and motions to intervene, comments, final recommendations, terms and conditions, and prescriptions.

5. The U.S. Fish and Wildlife Service (FWS), U.S Department of the Interior (Interior), Washington State Department of Ecology (Washington DOE), and National Marine Fisheries Service (NMFS) filed notices of intervention.[6]

6. The Corps, Public Utility District No. 1 of Chelan County (Chelan PUD), Washington Department of Fish and Wildlife (Washington DFW), and the Confederated Tribes of the Umatilla Indian Reservation (Umatilla Tribes) filed timely motions to intervene.[7] None of the intervenors oppose the project. On October 18, 2010, Pat Kelleher filed late comments and a motion to intervene. On August 27, 2012, the Commission issued a notice granting Mr. Kelleher's late intervention.

7. Comments, recommendations, terms and conditions, and prescription were filed by NMFS, FWS, Interior, Bonneville Power Administration (BPA) and the Corps (jointly), Washington DFW, the Umatilla Tribes, and Washington DOE.

8. On April 6, 2011, Commission staff issued a draft environmental impact statement (EIS) on Douglas PUD's application to relicense the project. The cities of Pateros, Brewster, and Bridgeport, Washington; the U.S. Environmental Protection Agency (EPA); Washington DOE; the Confederated Tribes of the Colville Reservation (Colville Tribes); Washington DFW; Interior; Port of Chelan County; Douglas PUD; and NMFS filed comments on the draft EIS. On October 25, 2011, Commission staff issued a final EIS.

9. The interventions, comments, recommendations, and terms and conditions have been fully considered in determining whether, and under what conditions, to issue this license.

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[5] 75 *Fed. Reg.* 51257 (August 19, 2010).

[6] Under rule 214(a)(2) of the Commission's Rules of Practice and Procedure, these entities became parties to the proceeding upon the timely filing of their notices of intervention. 18 C.F.R. § 385.214(a)(2) (2012).

[7] Timely, unopposed motions to intervene are granted by operation of Rule 214(c)(1) of the Commission's Rules of Practice and Procedure. 18 C.F.R. §385.214 (c) (2012).

PROJECT DESCRIPTION AND OPERATION

A. Project Area

10. The Columbia River is about 1,200 miles long, 460 miles of which are in Canada and 740 miles are in the United States. It drains an area of 259,000 square miles, including a large part of Washington and Oregon, substantially all of Idaho, the western portion of Montana, and smaller areas in Nevada, Wyoming, and Utah. Beginning in the 1930s a series of major dams were constructed on the Columbia and Snake rivers for the purposes of electric power, flood control, and irrigation. Collectively, these hydropower projects, which are under both federal and non-federal ownership, are known as the Columbia river system.

11. Proceeding downstream from the Canadian-U.S. border, the first two dams on the Columbia River are Grand Coulee and Chief Joseph, at river mile (RM) 596.6 and RM 545.1, respectively. Both of these dams are federally owned and operated. The next five dams are all non-federal projects and are under Commission license: the Wells Project No. 2149 (at RM 515.6); the 866-MW Rocky Reach Project No. 2145 (at RM 473.7); the 623-MW Rock Island Project No. 943 (at RM 453.4); and the 1,893-MW Priest Rapids Project No. 2114, which includes two dams (Wanapum dam at RM 415.8 and Priest Rapids dam at RM 397.1). These seven dams are collectively called the mid-Columbia dams.

12. Downstream of the mid-Columbia dams, the Columbia River is joined by the Snake River and turns west toward the Pacific Ocean. On this stretch of the river, there are four federal dams: McNary (at RM 292.0), John Day (at RM 215.6), The Dalles (at RM 191.5), and Bonneville (at RM 146.1), all of which are federal projects. The Methow and Okanogan rivers enter the Columbia River upstream of Wells dam within Wells reservoir.

B. Project Facilities

13. The Wells Project includes a dam, reservoir, tailrace area, switchyard, transmission line, upstream and downstream fish passage facilities, a fish hatchery, and recreational facilities. The dam includes an east abutment, a central hydrocombine section, and a west abutment. The 1,030-foot-long, 160-foot-high east abutment consists of an impervious core to bedrock with a filter zone and gravel shell on each side. The 2,300-foot-long, 40-foot-high west abutment consists of an impervious core to the riverbed materials with a filter zone and gravel and rockfill shell on each side. At elevation 781 feet above mean sea level (msl), the reservoir has a surface area of 9,740 acres, a gross storage capacity of 331,200 acre-feet, and a useable storage of 97,985 acre-feet.

14. The 1,165-foot-long, 160-foot-high hydrocombine structure includes 11 spillway bays, 10 generating units, upstream and downstream fish passage facilities, and a

switchyard. The 10 generating units are identical vertical-axis Kaplan turbines with a total installed capacity of 774.25 MW. Each spillway bay is 46 feet wide, and the spill through each bay is controlled by a 66-foot-high gate that is divided into top and bottom sections.

15. The switchyard, located on top of the hydrocombine section, is connected to two single-circuit, 230-kilovolt (kV) transmission lines that extend about 41 miles to the Douglas switchyard, operated by Douglas PUD, where it interconnects with the electric grid.

16. The project's fish passage facilities include two upstream fish ladders and a downstream juvenile bypass system. One fish ladder is located at each end of the hydrocombine, and each ladder includes a pump system for providing attraction flows to the ladder entrance, a counting station, a fish trap and sorting facility, and Passive Integrated Transponder (PIT) tag[8] detection equipment. The downstream juvenile bypass system consists of fabricated steel barriers that are seasonally[9] inserted into spillway bay numbers 2, 4, 6, 8, and 10. The steel barriers are 72 feet high and block all but a 72-foot-high by 16-foot-wide vertical slot through each spillway entrance; they are designed to collapse when the spillway gates are opened more than 6 feet. The project also includes the Wells Hatchery, located on the downstream side of the west abutment of the Wells dam.

C. Project Recreation Facilities

17. The Wells Project includes 17 recreation facilities along the Wells reservoir and tailrace in the cities of Pateros, Brewster, and Bridgeport, Washington, and along the lower reaches of the Methow and Okanogan rivers. They are: (1) Wells dam overlook; (2) Starr boat launch; (3) Chicken Creek boat launch; (4) Monse Bridge boat launch; (5) Cassimer Bar fishing access; (6) Okanogan River informal boat launch and fishing site 1; (7) Okanogan River informal boat launch and fishing site 2; (8) Pateros winter boat launch; (9) Riverside Drive recreation access; (10) Peninsula Park; (11) Memorial Park; (12) Methow boat launch; (13) Columbia Cove Park; (14) Brewster waterfront trail; (15) Marina Park; (16) Carpenter Island boat launch; and (17) Methow fishing access. In addition to continuing to operate and maintain these facilities, Douglas PUD proposes to construct new visitor interpretive displays and a formal tent camping facility, expand the facilities at Marina Park, and extend the launch ramp at the Chicken Creek boat launch.

[8] PIT tags are small tags implanted in fish that transmit a unique code when they are energized by passing near a receiver antenna. Because they do not require a battery, they have a long lifespan.

[9] The downstream juvenile bypass system is typically operated from mid-April through late August.

D. Project Boundary

18. The project boundary generally follows the 781-foot-msl elevation contour line along the Wells reservoir, and encloses the project dam, powerhouse, tailrace area, transmission lines, fish passage facilities, the Wells Hatchery, and several wildlife management areas and recreational facilities. The project boundary includes about 2,664 acres of land, of which 8.60 acres are administered by BLM and 6.55 acres are administered by the Corps. Douglas PUD proposes to include all of the lands associated with its recreation facilities in the project boundary as discussed below in the Administrative Provisions section and Article 207.

E. Non-Project Facilities

19. Several existing fish and wildlife mitigation facilities are located partly or entirely outside of the current project boundary. Facilities located entirely outside of the project boundary include: the Methow Hatchery,[10] the Twisp weir, [11] and three upland units of the Wells Wildlife Area[12] (West Foster Creek, Central Ferry, and Indian Dan Canyon). The other three units of the Wells Wildlife Area (Bridgeport Bar, Okanogan, and Washburn Island) are partially included within the current Wells Project boundary.

F. Current Project Operation

20. The project is an integral part of the seven-dam mid-Columbia River hydroelectric system. Each of the seven dams is operated in accordance with the terms of the mid-

[10] The Methow Hatchery, a non-project fish hatchery owned by Douglas PUD, is located about 50 miles from the project at river mile 51 on the Methow River. The hatchery currently produces up to 550,000 spring Chinook salmon smolts as mitigation for unavoidable losses at Douglas PUD's Wells dam, Chelan PUD's Rocky Reach and Rock Island dams, and Public Utility District No. 1 of Grant County's Priest Rapids and Wanapum dams.

[11] Twisp weir is an adult salmon and steelhead broodstock collection facility that is funded by Douglas PUD and operated by Washington DFW to provide broodstock for Douglas PUD's fish hatcheries. Twisp weir is located over 40 miles from the project near river mile 7 on the Twisp River, a tributary to the Methow River.

[12] The Wells Wildlife Area was funded by Douglas PUD and developed by Washington DFW for wildlife protection, mitigation, and enhancement under the original license. Through an off-license agreement, Douglas PUD has agreed to continue to provide funds for these units and Washington DFW will continue to operate and maintain these units during the next license term.

Columbia Hourly Coordination Agreement (HCA),[13] which seeks to coordinate operations for all of the mid-Columbia projects for the best use of flows for generation and to meet fishery and other environmental resource needs.

21. Each day, the participants of the HCA provide the coordinator with an estimated schedule of desired generation from their project(s). Federal operators at the upstream Chief Joseph and Grand Coulee projects provide the coordinator with an estimate of water expected to be discharged from these two dams. The coordinator then, based on information (i.e., anticipated flows, reservoir levels, and load) provided by the HCA participants and upstream federal operators, determines an estimated operation schedule for the following day.

22. The project is also operated according to the provisions of the Pacific Northwest Coordination Agreement (PNCA), which coordinates generation and storage projects in the Columbia River System to achieve the most efficient use of water to meet the electrical loads of the region's utilities. Through the agreement's annual regulation process, the maximum firm power that can be expected from the region's system is calculated. The agreement then provides for the allocation to the parties of water on a monthly basis, optimized as if all the projects in the Columbia River System were operated by a single owner. The agreement's goals are, in order of priority: (1) meeting nonpower requirements such as flood control or environmental measures; (2) ensuring that parties to the agreement can produce their dependable capacities; (3) refilling the reservoirs at the end of the water year; and (4) producing as much non-firm power as possible. Because the Wells Project has limited storage, the project must pass in real-time most of the water it receives from the much larger upstream Grand Coulee dam and can only alter flows on an hourly basis.

23. Along with the HCA and the PNCA, the project also operates under the Hanford Reach Agreement. The Hanford Reach Agreement, filed April 19, 2004, was signed by the Public Utility District No. 1 of Grant County (Grant PUD), Chelan PUD, Douglas PUD, BPA, NMFS, Interior, Washington DFW, and the Colville Tribes, and includes coordination of project operations among the seven mid-Columbia River hydroelectric projects, including the Wells Project.

24. The project is authorized to maintain its reservoir level between elevation 771 and 781 feet msl, but recent operations have maintained levels over 774 feet msl more than

[13] The HCA was originally signed for a 1-year experimental period from July 1, 1972, to June 30, 1973. The agreement was extended numerous times, and the most recent renewal extends the term of the HCA to November 1, 2017. *See* EIS, section 2.1.3.1.

99 percent of the time. The powerhouse discharge ranges from 13,000 cubic feet per second (cfs) (one unit, minimum load) to 220,000 cfs (full hydraulic capacity).

25. Construction of the Wells Project increased the tailwater elevation at the Chief Joseph Hydroelectric Project, which reduced the hydraulic head available for its generation. Douglas PUD entered into an agreement in 1968 with the Corps to compensate the federal system for power loss due to Wells Project encroachment. The agreement was supplemented in 1982 when the Commission approved raising the elevation of Wells reservoir from elevation 779 feet msl to elevation 781 feet msl.

G. Proposed Project Operation and Environmental Measures

26. Douglas PUD proposes no change to project operation, installed or dependable capacity, or average annual generation.

27. Douglas PUD proposes to continue implementing the Wells Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP) which was approved by the Commission and incorporated into the existing license on June 21, 2004.[14] The Wells HCP is a programmatic approach developed by Douglas PUD, fisheries agencies, and tribes to reduce and mitigate the effects of the Wells Project on five Columbia River salmon and steelhead trout populations. Since 2007, Douglas PUD has met the goals of the Wells HCP[15] through a combination of juvenile fish hatchery production, predator control in the Wells reservoir, upstream and downstream fish passage facility operations, and habitat restoration projects in tributaries upstream of the project.

28. Douglas PUD also proposes to develop and implement hatchery genetic management plans for the Wells Hatchery and the non-project Methow Hatchery as included in the incidental take statement from NMFS to address the take of ESA-listed salmon and steelhead trout that may occur as a result of artificial production activities at Douglas PUD's fish hatcheries.

29. Douglas PUD proposes to implement a Wildlife and Botanical Management Plan designed to: protect and enhance rare, threatened, and endangered (RTE) wildlife species' habitat and native habitat on Wells Project lands; protect RTE botanical species from land-disturbing activities and herbicide sprays; conserve habitat for species protected by the federal ESA, Bald and Golden Eagle Protection Act, and Migratory Bird Treaty Act; maintain productive wildlife habitat on the Cassimer Bar Wildlife Management Area; and control noxious weeds on project lands.

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[14] 107 FERC ¶ 61,283 (2004).

[15] *See* final EIS at 28.

30. Douglas PUD also proposes to implement an Avian Protection Plan, which includes a protocol for reporting avian mortalities in the transmission line corridor to the appropriate parties; a nest management protocol to comply with federal and state bird protection laws; a tree removal protocol requiring that any tree removal as part of transmission corridor maintenance only occur between August 31 and January 31 to protect migratory birds; and a training protocol for evaluating avian issues when performing maintenance on the transmission lines and corridor.

31. Douglas PUD proposes to implement an Historic Properties Management Plan (HPMP), that includes provisions for: coordinating and consulting with the Washington State Historic Preservation Officer (Washington SHPO), Tribal Historic Preservation Officer, Commission staff, and other parties as appropriate on the effects of the project on historic properties; education and interpretation; inadvertent discoveries of cultural materials and/or human remains; emergency situations; management standards for the monitoring and treatment of cultural resources; curation and data management; and periodic updates to accommodate environmental and regulatory changes.

32. Douglas PUD also proposes to implement a Recreation Management Plan that includes a Recreation Facility Improvement Program and a Recreation Facility Operation, Maintenance and Monitoring Program.[16] Douglas PUD would also continue to implement its land use policy that includes provisions for ensuring public access to project waters and land while protecting natural resources and complying with the terms of the license as well as other federal and state laws; prohibiting construction activities or other actions that would destroy, deface, or remove vegetation or cultural resources; issuing permits and monitoring compliance of these permits; reporting any project land conveyances to the Commission; issuing permits for docks and fences as appropriate to protect natural and cultural resources; complying with existing agreements; and developing a process by which a policy violation can be resolved.

33. Douglas PUD proposes to implement a number of other aquatic resource protection measures included in the Aquatic Settlement Agreement (Aquatic Agreement) described below.

SETTLEMENT AGREEMENT

34. Douglas PUD filed the Aquatic Agreement with its license application. Signatories to the Aquatic Agreement include: Douglas PUD, FWS, BLM, Washington DFW, Washington DOE, the Colville Tribes, and the Yakama Nation.[17] The Aquatic

[16] Douglas PUD has also entered into agreements with the cities of Pateros, Brewster, and Bridgeport, which cover operation and maintenance of recreation facilities.

[17] According to section 1.0 of the Aquatic Agreement, NMFS did not sign the agreement because its interests are satisfied by the measures included in the Wells HCP

(continued)

Agreement was publicly noticed for comments on July 7, 2010[18] and evaluated in the EIS.

35. The Aquatic Agreement includes provisions for establishing an Aquatic Settlement Work Group (Aquatic SWG) to oversee implementation and adaptive management of the specific measures contained in the Aquatic Agreement. The Aquatic Agreement also includes six proposed license articles to implement the six proposed aquatic resource management plans summarized below.

36. Proposed Article 1 requires Douglas PUD to implement the measures set forth in section 4 of the White Sturgeon Management Plan, including: developing a broodstock collection and breeding plan; implementing a juvenile stocking and evaluation program with potential participation in a mid-Columbia hatchery facility jointly funded by Douglas PUD, Chelan PUD, and Grant PUD; implementing a monitoring program to guide the stocking program; tagging and tracking a portion of the stocked sturgeon; determining the natural production potential of the Wells reservoir; compiling information on other white sturgeon supplementation and recovery programs in the Columbia River Basin; evaluating the biological benefits of implementing adult sturgeon passage measures[19] that are consistent with passage measures implemented at other mid-Columbia projects; and identifying and implementing measures to provide local education about white sturgeon; and annual reporting.

37. Proposed Article 2 requires Douglas PUD to implement the measures set forth in section 4 of the Bull Trout Management Plan, including: continuing to provide upstream and downstream passage for bull trout through existing fish passage facilities; continuing to conduct video monitoring for bull trout in the Wells dam fish ladders; conducting periodic upstream and downstream passage evaluations to document compliance with allowable levels of bull trout incidental take; evaluating upstream and downstream passage and incidental take of bull trout at the project's Wells Hatchery and off-project broodstock collection facilities associated with the Wells HCP; developing a plan to

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(which is a condition of the current license and, as discussed in this order, is also included as a condition of this license).

[18] 75 *Fed. Reg.* 40,821 (July 14, 2010).

[19] The adult sturgeon passage evaluation would be conducted by the Aquatic SWG in year 11 of the new license and every ten years thereafter, and would consist of the following: (1) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (2) the availability of reasonable and appropriate means to provide upstream passage; and (3) consensus from all other operators of the mid-Columbia hydroelectric projects to implement adult upstream passage measures.

address passage effects or exceedances of incidental take; implementing specific measures (e.g., PIT tagging and sampling) if a significant number of juvenile bull trout are observed passing Wells dam;[20] implementing modifications to upstream and downstream fish passage facilities or project operations if passage problems for bull trout are identified; evaluating bull trout stranding during periods of low reservoir elevation and implementing measures to address any associated exceedances of bull trout incidental take; monitoring activities associated with the implementation of other aquatic resource measures from the Aquatic Agreement and developing a plan to address incidental take exceedances of bull trout associated with the measures; collecting tissue samples and funding genetic analysis of sampled bull trout; participating in regional information exchanges for bull trout research and monitoring; developing an interpretive display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the upper Columbia River (UCR) and its tributaries; and annual reporting.

38. Proposed Article 3 requires Douglas PUD to implement the measures set forth in section 4 of the Pacific Lamprey Management Plan, including: continuing to operate the fish ladders and juvenile bypass facilities and conducting fish ladder salvage activities according to the criteria established in the Wells HCP; developing an operations study plan to evaluate potential operational modifications to improve upstream lamprey passage and implementing operational modifications required by the Aquatic SWG; continuing to count adult Pacific lamprey 24-hours-per-day during the adult fish ladder monitoring season (May 1 through November 15) using the most-current technology available; potentially implementing alternative measures to improve lamprey counting; conducting a literature review of upstream passage improvements for adult lamprey implemented at other Columbia and Snake River hydroelectric projects; conducting a fishway inspection and evaluating the need for implementing four specific fishway improvement measures; evaluating the effectiveness of lamprey fishway improvement measures and conducting periodic monitoring over the license term; improving adult lamprey passage until the Aquatic SWG agrees that performance is at a level similar to other mid-Columbia hydroelectric projects, or until the project complies with a regional lamprey passage standard that is being developed and adopted by the Aquatic SWG; conducting literature reviews at 5-year intervals to evaluate juvenile lamprey passage at other Columbia and Snake River hydroelectric projects; conducting a juvenile lamprey downstream passage evaluation if appropriate technology is developed during the license term to conduct such a study; implementing measures, studies, or operational modifications in consultation with the HCP Coordinating Committee[21] and the Aquatic SWG if the results of a future,

[20] A significant number is defined as greater than 10 sub-adult bull trout observed in a calendar year.

[21] The HCP Coordinating Committee is generally composed of one representative of each party to the HCP, as described in more detail in section 6 of the HCP.

potential juvenile-lamprey downstream passage evaluation indicates that Wells Project operations are adversely affecting lamprey populations above Wells dam; implementing a study to examine the presence and relative abundance of juvenile lamprey in habitat affected by the project; participating in Pacific lamprey regional work groups; and annual reporting.

39. Proposed Article 4 requires Douglas PUD to implement the measures set forth in section 4 of the Resident Fish Management Plan, including: continuing to implement the Wells HCP predator control program; conducting resident fish studies throughout the license term to determine the relative abundance of various resident fish species within Wells reservoir and to detect negative changes in resident fish populations; implementing reasonable and appropriate measures to address significant negative populations; conducting an assessment to identify the potential effects of potential changes in project operations on native resident fish, and implementing reasonable and appropriate measures in consultation with the Aquatic SWG to address potential effects; and annual reporting.

40. Proposed Article 5 requires Douglas PUD to implement the measures set forth in section 4 of the Aquatic Nuisance Species Management Plan, including: implementing best management practices (BMP) to contain aquatic nuisance species during implementation of recreation enhancement measures; monitoring for the presence of aquatic nuisance species (zebra and quagga mussels) in project waters; notifying agencies and implementing containment measures if aquatic nuisance species are detected; participating in information exchanges and regional efforts to coordinate aquatic nuisance species monitoring activities; monitoring by-catch data from implementation of other aquatic resource measures for the presence of aquatic nuisance species; implementing public outreach measures for preventing the spread of aquatic nuisance species; assessing the effects of any future changes in project operation on the proliferation of aquatic nuisance species and implementing measures to address adverse effects; and annual reporting.

41. Proposed Article 6 requires Douglas PUD to implement the measures set forth in section 4 of the Water Quality Management Plan, including: monitoring total dissolved gas, water temperature, and other water quality parameters to ensure compliance with state water quality criteria; transmitting total dissolved gas data to a web-accessible database; providing an annual report of all spill and predicted total dissolved gas levels that occur outside of the fish passage season; [22] developing and implementing a Gas

[22] The total dissolved gas report for the non-fish passage season will document total dissolved gas levels at the project during the time of year of when spill is unlikely to occur and Douglas PUD is not operating the downstream juvenile bypass system (currently October through March).

Abatement Plan annually for approval by Washington DOE; coordinating the annual Wells HCP Fish Bypass/Spill Operations Plan and Gas Abatement Plan to minimize the production of total dissolved gas during periods of spill,[23] and submitting proposed operations to the Aquatic SWG and Wells HCP Coordinating Committee for approval; preparing a total dissolved gas annual report; making water quality data available to EPA to assist in development of the Columbia River temperature total maximum daily load; notifying Washington DOE and the Aquatic SWG of instances of non-compliance with state water quality criteria; implementing future measures to address non-compliance with numeric criteria or as a result of development of the Columbia River temperature total maximum daily load; operating the project to minimize spill of hazardous substances and implementing the Spill Prevention Control and Countermeasures Plan; continuing to participate in the Columbia and Snake River Spill Response Initiative;[24] continuing to participate in regional Water Quality Team and Adaptive Management Team meetings; allowing Washington DOE staff access to the project after reasonable notice to Douglas PUD; coordinating project operations with other mid-Columbia hydroelectric projects; preparing study plans to guide implementation of the water quality monitoring program; and annual reporting.

42. In general, the Commission looks with favor on settlements in licensing cases. When parties are able to reach settlements, it can save time and money, avoid the need for protracted litigation, promote the development of positive relationships among entities who may be working together during the course of a license term, and give the Commission, as it acts on license and exemption applications, a clear sense as to the parties' views on the issues presented in each settled case.[25] However, the Commission cannot automatically accept all settlements, or all provisions of settlements. Section 10(a)(1) of the FPA[26] requires that the Commission determine that any licensed project is

[23] The Wells HCP Fish Bypass/Spill Operations Plan and Gas Abatement Plan will describe proposed project operations to minimize total dissolved gas production during the time of year when spill typically occurs and Douglas PUD is operating the downstream juvenile bypass system (currently April through August). Documentation of actual total dissolved gas levels that occur during the downstream fish passage season will be provided in the total dissolved gas annual report.

[24] The Columbia and Snake River Spill Response Initiative is a collaborative effort from local, state, and federal entities as well as members of industry to develop and address the immediate need for oil spill preparedness and response along the Columbia and Snake Rivers.

[25] *See* Settlements in Hydropower Licensing Proceedings under Part I of the Federal Power Act, 116 FERC ¶ 61,270 at p. 2-12 (2006).

[26] 16 U.S.C. § 803 (2006).

"best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce, for the improvement and utilization of waterpower development, for the adequate protection, mitigation, and enhancement of fish and wildlife (including related spawning grounds and habitat), and for other beneficial public uses, including irrigation, flood control, water supply, and recreational and other purposes referred to in section 4(e)."[27]

43. Consequently, in reviewing settlements, the Commission looks not only to the wishes of the settling parties, but also at the greater public interest, and whether settlement proposals meet the comprehensive development/equal consideration standard.

44. In the EIS, staff recommended many of the measures proposed in the Aquatic Agreement, and this license includes most of the specific measures included in the six aquatic resources management plans. However, there are several measures that staff did not recommend, or recommended with modifications. The sections below discuss staff's recommended modifications to measures proposed in the Aquatic Agreement, and measures staff did not recommend but are included in this license because they are required pursuant to section 18 of the FPA, section 401 of the Clean Water Act (CWA),[28] or to be consistent with FWS' or NMFS' biological opinion incidental take statements under section 7 of the ESA.

SUMMARY OF LICENSE REQUIREMENTS

45. As summarized below, this license, which authorizes 774.25 MW of renewable energy, requires a number of measures to protect and enhance water quality, fish, wildlife, cultural, and recreation resources at the project.

46. To protect and enhance Columbia River salmon and steelhead trout populations, this license requires Douglas PUD to continue implementing the Wells HCP which includes juvenile fish hatchery production, predator control, upstream and downstream fish passage, and habitat restoration. Douglas PUD will also develop and implement a hatchery genetic management plan for the Wells Hatchery UCR steelhead program to address the take of ESA-listed salmon and steelhead trout that may occur as a result of artificial production activities at Douglas PUD's fish hatcheries.

47. To protect and enhance water quality and other fisheries resources not specifically addressed by the Wells HCP, this license requires Douglas PUD to implement the Aquatic Agreement's White Sturgeon, Bull Trout, Pacific Lamprey, Resident Fish, Aquatic Nuisance Species, and Water Quality Management Plans, described above.

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[27] 16 U.S.C. § 803(a)(1) (2006).

[28] 33 U.S.C. § 1341(a)(1) (2006).

48. To protect and enhance terrestrial resources, this license requires Douglas PUD to implement its Wildlife and Botanical Management Plan, and implement its Avian Protection Plan. To protect and enhance cultural resources, this license requires Douglas PUD to implement its HPMP to ensure that any adverse effects on historic properties as a result of project operation, maintenance, recreational, or other activities are addressed over the term of the new license, and ensure protection of cultural resources within the project boundary. Douglas PUD will also continue to implement the Douglas PUD Land Use Policy to ensure that any land management decisions and activities associated with project lands are in compliance with the HPMP. To protect and enhance recreational resources, this license requires Douglas PUD to implement its Recreation Management Plan.

WATER QUALITY CERTIFICATION

49. Under section 401(a)(1) of the Clean Water Act (CWA),[29] the Commission may not issue a license authorizing the construction or operation of a hydroelectric project unless the state water quality certifying agency either has issued water quality certification for the project or has waived certification by failing to act on a request for certification within a reasonable period of time, not to exceed one year. Section 401(d) of the CWA provides that the certification shall become a condition of any federal license that authorizes construction or operation of the project.[30]

50. On September 30, 2010, Douglas PUD applied to Washington DOE for a water quality certification for the Wells Project, which the Washington DOE received on October 1, 2010. On September 12, 2011, Douglas PUD withdrew and refiled its application. On February 27, 2012, Washington DOE issued a certification for the project that includes conditions, which are set forth in Appendix A of this order and incorporated into the license (see Ordering Paragraph D).

51. The certification includes general administrative conditions that include requirements for complying with state water quality standards and any future changes to applicable state water quality laws. The general conditions also reserve authority for Washington DOE to amend the certification; modify schedules and deadlines provided under the certification; require additional monitoring, studies, and measures; take various actions to enforce the terms of the certification; and condition or deny future proposed changes to the project or project operations that might significantly and adversely affect compliance with any applicable water quality standard.

52. With regard to the six plans in the Aquatic Settlement, the certification requires

[29] 33 U.S.C. § 1341(a)(1) (2006).

[30] 33 U.S.C. § 1341(d) (2006).

the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Resident Fish Management Plans without modification. The certification requires the implementation of the Aquatic Nuisance Species Management Plan along with four additional requirements,[31] requires several modifications and additions to the Water Quality Management Plan,[32] and requires Douglas PUD to implement and meet the requirements of the Wells HCP.

53. As discussed in the final EIS,[33] staff did not recommend several of the measures

[31] The additional measures to be implemented as part of the Aquatic Nuisance Species Management Plan include: (1) monitor for aquatic nuisance plants and non-native crayfish (in addition to the plan requirements to monitor for zebra and quagga mussels); (2) provide signage and pamphlets at project boat launches to increase public awareness of aquatic nuisance species; (3) report on any aquatic nuisance species problems; and (4) develop an Aquatic Nuisance Species Control and Prevention Plan to monitor and manage any new aquatic nuisance species detected within the project boundary and affected by the project.

[32] The additional measures to be implemented as part of the Water Quality Management Plan include: (1) achieve compliance with state total dissolved gas (TDG) standards within 10 years of license issuance; (2) monitor and report spills and TDG levels during the entire year, including both the juvenile fish passage and non-fish passage seasons, to document compliance with state TDG standards; (3) provide Washington DOE an annual TDG report by February 28 of each year following license issuance that describes the results of all activities conducted under the Gas Abatement Plan and all spill and associated TDG levels in the tailrace that occur outside of the fish passage season; (4) prepare a Water Quality Attainment Plan for Washington DOE's review and approval that provides a framework for ensuring compliance with state TDG standards within 10 years of license issuance; (5) implement operational measures to minimize spill and provide Washington DOE with the opportunity to review and condition any non-routine operational or structural changes affecting TDG levels; (6) extend the duration of the annual water temperature monitoring program by an additional 46 days from April 1 to October 31 (instead of terminating on September 15); (7) transmit hourly water temperature data to a web-accessible database; (8) provide Washington DOE an annual water temperature monitoring report by April 30 of each year following license issuance; (9) reserve authority to Washington DOE to amend the certification to include measures that may be required after EPA's approval of a Columbia River temperature total maximum daily load; (10) implement additional measures and notification procedures to minimize and control spills of hazardous substances; and (11) implement measures for water quality protection during future construction activities at the project.

[33] *See* final EIS at 223 through 231.

included in the Aquatic Agreement because, as discussed in other sections of this license, they include provisions for non-specific or future potential measures; measures that are unrelated to project effects or purposes; cost-sharing with a third-party; or measures with benefits that do no justify their cost. However, all of the certification conditions are included in this license because they are mandatory under section 401 of the CWA.

COASTAL ZONE MANAGEMENT ACT

54. Under section 307(c)(3)(A) of the Coastal Zone Management Act (CZMA),[34] the Commission cannot issue a license for a project within or affecting a state's coastal zone unless the state CZMA agency concurs with the license applicant's certification of consistency with the state's CZMA program, or the agency's concurrence is conclusively presumed by its failure to act within 6 months of its receipt of the applicant's certification.

55. By letter filed February 9, 2011, Washington DOE notified Douglas PUD that the project is neither within the Washington coastal zone nor within a geographic area in which Washington DOE would review licenses for consistency with the CZMA. Therefore, no consistency certification is required.

SECTION 18 FISHWAY PRESCRIPTIONS

56. Section 18 of the FPA[35] provides that the Commission shall require the construction, maintenance, and operation by a licensee of such fishways as may be prescribed by the Secretary of the Interior or the Secretary of Commerce (Commerce), as appropriate.

57. On October 6, 2010, Interior filed preliminary fishway prescriptions for salmon, steelhead, bull trout, and Pacific lamprey with its record of decision. On August 1, 2011, Interior filed modified fishway prescriptions. Interior's prescriptions are consistent with, and in most cases identical to, the fish passage measures included in the Aquatic Agreement and Wells HCP.

58. Interior's fishway prescriptions include: (1) managing the project to provide effective upstream and downstream fish passage over the full range of river flows for which the project maintains operational control; (2) providing for the construction, operation, maintenance, and effective monitoring of upstream and downstream fishways as set forth in the Wells HCP; (3) providing upstream and downstream passage for salmon, steelhead, bull trout, and Pacific lamprey through the existing fish ladders and

[34] 16 U.S.C. § 1456(c)(3)(A) (2006).

[35] 16 U.S.C. § 811 (2006).

downstream bypass system and conducting fish ladder salvage activities as set forth in the Wells HCP and Aquatic Agreement; (4) implementing upstream and downstream passage measures for bull trout to provide safe, timely, and effective passage;[36] (5) continuing to evaluate and improve upstream Pacific lamprey passage until safe, timely, and effective passage is achieved;[37] (6) continuing to count adult Pacific lamprey 24-hours-per-day during the May 1 to November 15 adult fish ladder monitoring season, using the best technology that is commercially available; (7) developing techniques for counting lamprey through all upstream passage routes at Wells dam; (8) conducting a literature review and fishway inspection to identify, prioritize, and implement measures to improve adult lamprey passage and enumeration at Wells dam; (9) developing an Operations Study Plan to evaluate potential operational modifications to improve upstream lamprey passage; (10) evaluating the need to develop plans to implement four specific fish ladder improvements (i.e., entrance efficiency, diffuser gratings, transition zones, and ladder traps/exit pools); (11) evaluating the effectiveness of lamprey fish ladder improvement measures and conducting periodic monitoring over the license term; and (12) implementing a juvenile lamprey downstream passage study if the FWS determines that substantial evidence exists at Wells dam or a dam with similar features or conditions to indicate that downstream migrating juvenile lamprey are negatively affected by Wells dam, and if adverse effects are detected, then implement measures to address adverse effects.

59. While staff agreed with some of these conditions, several of these conditions were not recommended by staff in the EIS, as discussed in other sections of this license. However, all of the conditions are included in this license because they are mandatory under section 18 of the FPA. Interior's prescriptions are attached to this order as Appendix C, and incorporated into this license by Ordering Paragraph F.

60. On October 8, 2010, NMFS (through Commerce) filed a preliminary fishway prescription for salmon and steelhead. On July 21, 2011, NMFS filed a letter stating that its preliminary prescription is final. NMFS' prescription directs Douglas PUD to carry out its obligations, in their entirety, as set forth in the Wells HCP. NMFS' prescription is attached to this order as Appendix B, and incorporated into this license by Ordering Paragraph E.

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[36] The safe, timely, and effective passage standard for bull trout is defined as survival and passage rates for adult marked fish of greater than 95 percent and greater than or equal to 90 percent, respectively, and when passage studies demonstrate that the project does not impede bull trout passage.

[37] The safe, timely, and effective passage standard for Pacific lamprey is defined as passage levels at least as high as other mid-Columbia River hydroelectric projects, until specific Pacific lamprey passage performance standards are adopted by the FWS.

61. With their prescriptions, both Interior and NMFS requested that the Commission reserve authority to modify their fishway prescriptions. Consistent with Commission policy, Article 407 of this license reserves the Commission's authority to require fishways that may be prescribed by Interior or Commerce for the Wells Project.

ESSENTIAL FISH HABITAT

62. Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act[38] requires federal agencies to consult with the Secretary of Commerce regarding any action or proposed action authorized, funded, or undertaken by the agency that may adversely affect Essential Fish Habitat (EFH) identified under the Act. Under section 305(b)(4)(A) of the Magnuson Stevens Act, NMFS is required to provide EFH Conservation Recommendations for actions that would adversely affect EFH.[39] Under section 305(b)(4)(B) of the Act, an agency must, within 30 days after receiving recommended conservation measures from NMFS or a Regional Fishery Management Council, describe the measures proposed by the agency for avoiding, mitigating, or offsetting the effects of the agency's activity on the EFH.[40]

63. EFH is designated for various lifestages of Chinook salmon in the mainstem Columbia River and the Okanogan and Methow rivers within the project boundary. In the EIS, Commission staff determined that licensing the project with staff's recommended measures and agency mandatory conditions, would not adversely affect EFH. By letter dated April 12, 2011, Commission staff initiated EFH consultation with NMFS. NMFS included an analysis of the project's effects on Chinook salmon EFH in its March 7, 2012, biological opinion for the project. NMFS concluded that the project would adversely affect EFH, but also concluded that the terms and conditions of the biological opinion incidental take statement would address the adverse effects. Consequently, NMFS recommended that the terms and conditions be adopted as EFH Conservation Recommendations.

64. As discussed below, this license includes all of the terms and conditions contained in NMFS' biological opinion incidental take statement.

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[38] 16 U.S.C. § 1855(b)(2) (2006).

[39] 16 U.S.C. § 1855(b)(4)(A) (2006).

[40] 16 U.S.C. § 1855(b)(4)(B) (2006). The measures recommended by the Secretary of Commerce are advisory, not prescriptive. However, if the federal agency does not agree with the recommendations of the Secretary of Commerce, the agency must explain its reasons for not following the recommendations.

THREATENED AND ENDANGERED SPECIES

65. Section 7(a)(2) of the Endangered Species Act of 1973[41] requires federal agencies to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of their designated critical habitat.

66. Four federally listed threatened and endangered species occur in the project vicinity: Columbia River bull trout, UCR spring-run Chinook salmon, UCR steelhead, and Ute ladies'-tresses. Critical habitat is designated in the project area within the Columbia and Methow rivers for UCR spring-run Chinook salmon and bull trout, and in the Columbia, Methow, and Okanogan rivers for UCR steelhead. Commission staff determined in the final EIS[42] that none of the proposed action alternatives would affect Ute ladies'-tresses. Therefore, no further action under the Endangered Species Act is required for this species.

A. NMFS

67. In the draft EIS,[43] Commission staff concluded that continued operation of the project is not likely to adversely affect UCR spring-run Chinook salmon or UCR steelhead, or designated critical habitat for either of these species. In its letter filed May 12, 2011, NMFS stated it could not concur with staff's determination for either species or their critical habitat at that time, and would like additional time to diligently analyze its determination.

68. After further analysis and review of the final EIS issued on October 25, 2011, NMFS filed a biological opinion on March 7, 2012, with its determination that the project is not likely to jeopardize the continued existence of UCR spring-run Chinook salmon or UCR steelhead, or destroy or adversely modify either of these species' designated critical habitat. NMFS also concluded that the project is not likely to adversely affect the southern resident killer whale and would have no effect on its designated critical habitat. NMFS' biological opinion includes an incidental take statement with four reasonable and prudent measures to minimize take of listed UCR spring-run Chinook salmon and UCR steelhead trout along with three terms and conditions to implement the measures.

69. The reasonable and prudent measures include: (1) minimizing incidental take from the operation of the project by requiring the licensee to adhere to all of the measures

[41] 16 U.S.C § 1536(a) (2006).

[42] *See* draft EIS at 10.

[43] *See* draft EIS at 9–10.

in the Wells HCP; (2) minimizing incidental take from the unanticipated release of hazardous substances, toxics, excessive sediments, debris, and other materials into the Columbia River and its tributaries by following the provisions of the Water Quality Management Plan; (3) minimizing incidental take from in-water and near-water construction activities by using BMPs for the proposed action to avoid or minimize adverse effects to water quality and aquatic resources; and (4) including a standard reopener clause in any license issued for the project to ensure continuing agency discretion throughout the life of the license as may be necessary to protect species listed under the ESA.

70. The terms and conditions include: (1) conducting a monitoring and reporting program to report all incidental take; (2) following and implementing all terms and conditions of the Aquatic Agreement's Water Quality Management Plan; and (3) implementing best management practices during construction activities. These reasonable and prudent measures and conditions are included in Appendix D and are made part of this license by Ordering Paragraph G. Article 15 of form L-5, the Commission's standard fish and wildlife reopener clause, addresses condition 4 of NMFS' incidental take statement reasonable and prudent measures.

B. FWS

71. In the draft EIS,[44] Commission staff concluded that continued operation of the project is not likely to adversely affect Columbia River bull trout or its designated critical habitat. In its letter filed on May 9, 2011, FWS stated that it did not concur with staff's determinations and requested a complete analysis of the project's effects on bull trout critical habitat be included in a final biological assessment[45] prior to the initiation of formal consultation. By letter dated July 19, 2011, Commission staff informed FWS that the EIS and the project record includes the best available information on the effects of the project on bull trout and its designated critical habitat, and that staff did not intend to prepare a final biological assessment. In the same letter, staff requested that FWS initiate formal consultation based on the analysis contained in the draft EIS. On August 29, 2011, Douglas PUD filed supplemental information on the effects of the project on bull trout designated critical habitat. On September 14, 2011, staff issued a letter to FWS indicating that it agreed with Douglas PUD's findings included in its supplemental

[44] *See* draft EIS at 10.

[45] Commission staff did not prepare a draft biological assessment; however, in staff's April 12, 2011 letter to the FWS requesting concurrence with the findings in the draft EIS, staff noted that Douglas PUD had prepared and filed a draft biological assessment as supplemental information to staff's analysis in the draft EIS and noted its availability in the project record.

information and again requested that FWS initiate formal consultation. On March 19, 2012, FWS filed a biological opinion with its determination that the project is not likely to jeopardize the continued existence of bull trout and is not likely to destroy or adversely modify designated bull trout critical habitat.

72. In its biological opinion, FWS included five reasonable and prudent measures to minimize the effects of anticipated incidental take of bull trout and 13 incidental take terms and conditions to implement the reasonable and prudent measures. The reasonable and prudent measures include: (1) providing adequate year-round passage conditions for all life stages of bull trout at all project facilities; (2) minimizing the effects of spillway operations and hydrographic variations to all life stages of bull trout at all project facilities; (3) minimizing the effects of the hatchery supplementation program to all life stages of bull trout; (4) minimizing the effects of the aquatic resource management plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, water quality) and the predator control program to all life stages of bull trout; and (5) designing and implementing a bull trout monitoring program to detect and quantify Wells Project impacts, including those associated with the Wells dam, Twisp weir trapping facilities, and hatchery facilities.

73. All 13 terms and conditions are either components of the Aquatic Agreement's Bull Trout Management Plan required by Washington DOE's water quality certification, or FWS' section 18 prescription, and are discussed in other sections of this license. These reasonable and prudent measures and conditions are included in Appendix E and are made part of this license by Ordering Paragraph H.

74. ESA section 7(a)(1)[46] directs federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or to develop information. FWS' biological opinion includes four conservation recommendations for the Wells Project: (1) implementing unspecified recovery actions and restoration opportunities identified in the FWS' draft Bull Trout Recovery Plan[47] where the Wells Project activities involve or intersect recovery actions; (2) coordinating with, and contribute to, bull trout monitoring efforts in the Columbia River Basin; (3) designing and implementing an environmental education plan for bull trout; and (4) participating in information exchanges with other entities conducting bull trout research, and regional efforts to explore availability of new

[46] 16 U.S.C. § 1536(a)(1).

[47] FWS. 2002. Bull trout (*Salvelinus confluentus*) draft recovery plan. Portland, Oregon.

monitoring methods and coordination of radio tag frequencies for bull trout monitoring studies conducted at the project.

75. Of these four conservation recommendations, the first is non-specific and would be difficult or impossible to enforce, and therefore it is not included as a condition of the license. The other three conservation recommendations are included in the license because they are components of the Aquatic Agreement's Bull Trout Management Plan, which is required in whole or in part by Washington DOE's water quality certification (Appendix A), Interior's section 18 prescriptions (Appendix C), and FWS' incidental take statement terms and conditions (Appendix E) and are discussed in detail in other sections of this license.

NATIONAL HISTORIC PRESERVATION ACT

76. Under section 106 of the National Historic Preservation Act (NHPA)[48] and its implementing regulations,[49] federal agencies must take into account the effect of any proposed undertaking on properties listed or eligible for listing in the National Register of Historic Places (defined as historic properties) and afford the Advisory Council on Historic Preservation a reasonable opportunity to comment on the undertaking. This generally requires the Commission to consult with the SHPO to determine whether and how a proposed action may affect historic properties and seek ways to avoid or minimize any adverse effects.

77. To satisfy these responsibilities, the Commission executed a Programmatic Agreement (PA) on March 12, 2012 with the Washington SHPO and the Colville Tribe's acting Tribal Historic Preservation Officer. The Commission also invited Douglas PUD, BLM, and U.S. Bureau of Indian Affairs to concur with the stipulations of the PA. Douglas PUD and BLM concurred. The PA requires the licensee to implement the Historic Properties Management Plan (HPMP), dated May 2010, for the term of any new license issued for this project. Execution of the PA demonstrates the Commission's compliance with section 106 of the NHPA. Article 410 requires the licensee to implement the PA and associated HPMP.

PACIFIC NORTHWEST ELECTRIC POWER PLANNING AND CONSERVATION ACT

78. In 1980, Congress enacted the Pacific Northwest Electric Power Planning and Conservation Act (Northwest Power Act).[50] This act created the Northwest Power

[48] 16 U.S.C. § 470 *et seq.* (2006).

[49] 36 C.F.R. Part 800 (2012).

[50] 16 U.S.C. §§ 839b *et seq.* (2006).

Planning Council (now known as the Northwest Power and Conservation Council) and directed it to develop a Columbia River Basin Fish and Wildlife Program (Program). The goals of the Program are to protect, mitigate, and enhance fish and wildlife resources affected by the development and operation of hydroelectric projects on the Columbia River and its tributaries, while assuring the Pacific Northwest an adequate, efficient, economical, and reliable power supply.[51] Section 4(h)(11)(A) of the Northwest Power Act, provides that federal agencies operating or regulating hydroelectric projects within the Columbia River Basin shall exercise their responsibilities to provide equitable treatment for fish and wildlife resources with other purposes for which the river system is utilized and shall take the Council's Program into account "at each relevant stage of decision-making processes to the fullest extent practicable."[52]

79. To mitigate harm to fish and wildlife resources, the Council has adopted specific provisions to be considered in the licensing or relicensing of non-federal hydropower projects (Appendix B of the Program). This license, among other things, includes: salmon, steelhead, and Pacific lamprey conservation measures (Appendix A, condition 6.5; Appendix B, article 1; Appendix C, conditions 2.3, 3.0, 5.0-5.8, 6.0; and Appendix D); resident fish species enhancement measures (Appendix A, condition 6.5; Appendix C, conditions 4.0-4.8; and Appendix E, conditions 1-13); and wildlife habitat protection (Articles 409 and Ordering Paragraph I), all of which are consistent with applicable provisions of the Program, as discussed in detail in the final EIS. As part of the Program, the Council has designated over 40,000 miles of river in the Pacific Northwest region as not being suitable for hydroelectric development ("protected area"). The project is not located within a protected area designated under Appendix B of the Program. Further, Article 408 reserves to the Commission the authority to require future alterations in project structures and operations to take into account, to the fullest extent practicable, the applicable provisions of the Program.

RECOMMENDATIONS OF FEDERAL AND STATE FISH AND WILDLIFE AGENCIES PURSUANT TO SECTION 10(j) OF THE FPA

80. Section 10(j)(1) of the FPA[53] requires the Commission, when issuing a license, to include conditions based on recommendations by federal and state fish and wildlife agencies submitted pursuant to the Fish and Wildlife Coordination Act[54] to "adequately

[51] 16 U.S.C. § 839b(h)(5) (2006).

[52] 16 U.S.C. § 839(h)(11)(A) (2006).

[53] 16 U.S.C. § 803(j)(1) (2006).

[54] 16 U.S.C. §§ 661 *et seq*. (2006).

and equitably protect, mitigate damages to, and enhance fish and wildlife (including related spawning grounds and habitat)" affected by the project.

81. In response to the August 10, 2010 public notice that the project was ready for environmental analysis, NMFS, Washington DFW, and FWS filed a total of 54 recommendations under section 10(j).[55] Forty-three recommendations were determined to be outside the scope of section 10(j) because they are measures that: include provisions for non-specific or future potential measures; are located at off-project locations; have no nexus to project effects or purposes; are studies that could have been conducted prior to licensing; include cost sharing with a third-party; or are administrative matters. Recommendations outside of the scope of section 10(j) are discussed in the next section.

82. This license includes conditions consistent with the 11 remaining recommendations that are within the scope of section 10(j) including: continuing to implement the Wells HCP (Ordering Paragraphs D, E, and G); implementing certain provisions of the Aquatic Agreement's Water Quality Management, Bull Trout Management, Pacific Lamprey Management, White Sturgeon Management, and Aquatic Nuisance Species Management Plans (Ordering Paragraphs D, F, and H);[56] and implementing the Wildlife and Botanical Management Plan (Article 409) and Avian Protection Plan (Ordering Paragraph I).

SECTION 10(a)(1) OF THE FPA

83. Section 10(a)(1) of the FPA[57] requires that any project for which the Commission issues a license shall be best adapted to a comprehensive plan for improving or developing a waterway or waterways for the use or benefit of interstate or foreign commerce; for the improvement and utilization of waterpower development; for the adequate protection, mitigation, and enhancement of fish and wildlife; and for other beneficial public uses, including irrigation, flood control, water supply, recreation, and other purposes. Fish and wildlife measures recommended by NMFS, Interior, and Washington DFW considered under section 10(a) rather than under section 10(j) are addressed first, followed by additional staff recommended measures.

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[55] FWS filed recommendations on October 6, 2010, and amended them on November 19, 2010. NMFS and Washington DFW filed recommendations on October 8, 2010.

[56] The specific provisions of these plans that were recommended by staff were discussed in detail in the final EIS at 230 through 239.

[57] 16 U.S.C. § 803(a)(1) (2006).

A. NMFS, Interior, and Washington DFW

84. As discussed above, NMFS, FWS, and Washington DFW filed 43 recommendations under section 10(j) that are not specific measures to protect, mitigate damages to, or enhance fish and wildlife. Consequently, these recommendations are not considered under section 10(j) of the FPA, but are considered under the broad public interest standard of section 10(a)(1). As discussed below, 40 of these recommendations filed pursuant to section 10(j) are included in the license.

85. Thirteen of these fish and wildlife agency recommendations were recommended by staff in the final EIS[58] and are included in the license including: (1) limiting the license term to no longer than the term of the Wells HCP; (2) transmitting hourly TDG data to a web-accessible database (Ordering Paragraphs D and G); (3) coordinating the annual Wells HCP Project Fish Bypass/Spill Operations Plan and Gas Abatement Plan to minimize total dissolved gas levels during periods of spill, and submit proposed operations to the Aquatic SWG and Wells HCP Coordinating Committee (Ordering Paragraphs D and G); (4) developing a Gas Abatement Plan annually and submitting it to Washington DOE by February 28 of each year (Ordering Paragraphs D and G); (5) making water quality data available to EPA to assist in development of the Columbia River temperature total maximum daily load (Ordering Paragraphs D and G); (6) allowing Washington DOE staff access to the project after reasonable notice to Douglas PUD (Ordering Paragraphs D and G); (7) coordinating project operation with other mid-Columbia hydroelectric projects after appropriate notice (Ordering Paragraphs D and G); (8) constructing a bull trout interpretive display at the Wells Dam Visitor Center (Ordering Paragraph D); (9) counting adult Pacific lamprey 24-hours-per-day during the adult fish ladder monitoring season (May 1 to November 15) (Ordering Paragraphs D and F); (10) continuing to implement Douglas PUD's Land Use Policy (Article 412); (11) implementing best management practices to contain aquatic nuisance species during modification of recreation measures (Ordering Paragraph D); (12) notifying the agencies and implement containment measures if aquatic nuisance species are detected (Ordering Paragraph D); and (13) consulting annually with FWS and the Terrestrial Resources Working Group (Terrestrial RWG)[59] when preparing annual reports for the Wildlife and Botanical Management Plan (Article 409).

86. Twenty seven of the fish and wildlife agency recommendations were not recommended by staff in the EIS, however these recommendation are required in this

[58] *See* final EIS at 235–251.

[59] Members of the Terrestrial RWG include FWS, BLM, Washington DFW, Colville Tribes, and Douglas PUD.

license under section 401 of the CWA, section 18 of the FPA, or to be consistent with the FWS or NMFS biological opinion incidental take statements under section 7 of the ESA.

87. As discussed in the final EIS,[60] staff did not recommend developing a mid-Columbia white sturgeon hatchery facility because it required cost sharing among Douglas, Chelan, and Grant PUDs (Ordering Paragraph D).

88. Staff did not recommend the following measures because they required implementing as-yet unidentified and uncertain future potential measures: (1) measures to address future instances of non-compliance with state water quality standards (Ordering Paragraphs D and G); (2) future measures from Columbia River temperature total maximum daily load development (Ordering Paragraphs D and G); (3) plans, measures, or modifications to project facilities or operations to address exceedances of bull trout passage criteria or allowable bull trout incidental take without any specific measures that would be implemented (Ordering Paragraphs D, F, and H); (4) an Operations Study Plan to evaluate and implement potential as-yet unidentified operational measures to enhance upstream lamprey passage (Ordering Paragraphs D and F); (5) proposals to use the most-current technology commercially available to count adult Pacific lamprey without identifying specific measures that would be implemented toward that end (Ordering Paragraphs D and F); (6) potential alternative measures to improve lamprey counting (Ordering Paragraphs D and F); (7) measures to improve adult lamprey passage until performance is at a level similar to other mid-Columbia hydroelectric projects, or until compliance with an as-yet unidentified standard is achieved (Ordering Paragraphs D and F); (8) a juvenile lamprey downstream passage evaluation if future appropriate technology is developed during the license term to conduct such a study, and measures if the evaluation indicates that Wells Project operations are adversely affecting lamprey populations above Wells dam (Ordering Paragraphs D and F); (9) potential adult sturgeon passage measures that are consistent with passage measures implemented at other mid-Columbia projects (Ordering Paragraph D); (10) measures to address significant negative changes to native resident fish populations (Ordering Paragraph D); (11) an assessment to identify the potential effects of future changes in project operations on native resident fish, and measures to address potential effects (Ordering Paragraph D); (12) conducting resident fish studies and implementing as-yet unidentified measures, throughout the license term, to determine the relative abundance of various resident fish species within Wells reservoir; and (13) measures to address adverse effects on aquatic resources due to future potential changes in project operations that cause an increase in the proliferation of aquatic nuisance species (Ordering Paragraph D).

[60] *See* final EIS at 243 through 259.

89. Staff did not recommend the following measures because they are too broad in scope and general in nature to effectively enforce as license conditions: (1) participating in the Columbia and Snake River Spill Response Initiative, regional Water Quality Team, and Adaptive Management Team meetings (Ordering Paragraphs D and G); (2) participating in regional information exchanges for bull trout research and monitoring (Ordering Paragraph D); and (3) participating in information exchanges and regional efforts to coordinate monitoring activities for aquatic nuisance species (Ordering Paragraph D).

90. Staff did not recommend the following measures because they are unrelated to project-specific effects or purposes in the project area: (1) collecting tissue samples and funding genetic analysis of sampled bull trout throughout the mid-Columbia River and its tributaries; (2) monitoring and studying bull trout incidental take at off-project hatcheries and broodstock collection facilities (Ordering Paragraphs D and H); (3) conducting a literature review on the effectiveness of upstream passage measures implemented at other Columbia and Snake River hydroelectric projects (Ordering Paragraphs D and F); (4) compiling information on other white sturgeon supplementation and recovery programs in the Columbia River Basin (Ordering Paragraph D); and (5) conducting literature reviews at 5-year intervals to evaluate juvenile lamprey passage at other Columbia and Snake River hydroelectric projects and participating in Pacific lamprey regional work groups to support regional conservation efforts (Ordering Paragraph D).

91. Staff did not recommend the following measures because they are administrative in nature or measures that are not needed to address project effects: (1) implementing a study to examine the presence and relative abundance of juvenile lamprey in habitat affected by the project without justification of why this information is needed or how it would be used; (2) preparing annual reports on activities related to resident fish management; (3) requiring Aquatic SWG approval of the Wells HCP Project Fish Bypass/Spill Operations Plan; (4) considering the draft reasonable and prudent measures included in the Bull Trout Management Plan; and (5) identifying appropriate white sturgeon measures as opportunities for education to local public entities.

92. Three fish and wildlife agency recommendations are not mandatory and are not included in this license. Washington DFW and FWS recommended that the Commission issue a 50 year license for the Wells Project. Licensing term is discussed in the License Term section of this order. FWS recommended that Douglas PUD use the Wells Aquatic SWG and the Terrestrial RWG as the primary forums to ensure consistency and timely coordination with the committees established by the Wells HCP. The Commission does not object to the licensee and other entities establishing work groups and forums; however, the Commission only has jurisdiction over the licensee and cannot enforce provisions against parties other than the licensee. The entities involved in the working groups and the HCP Coordinating Committee may voluntarily coordinate the implementation of the HCP, but this recommendation is not an appropriate license

requirement. FWS also recommended that Douglas PUD conduct annual coordination meetings with the Terrestrial RWG and the FWS to provide updates on the success of the mitigation measures implemented under the Wildlife and Botanical Management Plan. This recommendation would not be enforceable by the Commission since it cannot require the attendance of other parties to the meetings.

B. Other Section 10(a)(1) Recommendations

Deviations from License Requirements

93. The Aquatic Agreement's Water Quality Management Plan includes provisions to notify the Aquatic SWG and Washington DOE in the event that water quality monitoring indicates the project is causing deviations from state water quality criteria, and develop and implement plans, as directed by the Aquatic SWG, to address any project-related adverse effects on water quality. The plans may include changes to project operations or facilities, if necessary, to address adverse effects. In the event that the Aquatic SWG directs Douglas PUD to modify project operations or facilities to address deviations from state water quality criteria, the Aquatic Agreement also includes a provision for Douglas PUD to obtain Commission approval prior to implementing any substantial modifications to project facilities or operations.

94. In the final EIS, Commission staff noted that all permanent modifications to approved project facilities and operations, regardless of whether Douglas PUD considers them to be substantial, would require license amendments. Therefore, staff recommended and this license requires Douglas PUD to notify the Commission and file an application to amend the license prior to implementing any permanent long-term changes to approved project operations or facilities. However, staff also noted that some short-term or temporary modifications to approved project operations or facilities may be necessary to address water quality criteria deviations, or emergency situations or circumstances outside of the control of the licensee (e.g., flood flow conditions). Consistent with staff's recommendation, Article 403 requires Douglas PUD to notify the Commission within 48 hours of any temporary modifications to approved project operations or facilities that are necessary to protect aquatic resources or in the event of emergency situations at the project.

Bull Trout Stranding and Incidental Take Monitoring

95. The Aquatic Agreement's Bull Trout Management Plan includes provisions to implement fish stranding evaluations during periods of low reservoir elevation, and monitoring studies to document incidental take of bull trout during implementation of

other aquatic resource measures and fish hatchery activities at project and non-project facilities. All of the proposed stranding evaluations and monitoring studies are mandatory conditions. In the EIS, staff recommended that Douglas PUD conduct the stranding evaluations and all of the proposed monitoring studies that would be implemented at project facilities. However, because the proposed studies lack sufficient detail to enable Commission administration and enforcement as license conditions, staff recommended that Douglas PUD prepare and file a detailed plan and schedule for implementing the stranding evaluations and monitoring studies.[61] Consistent with staff's recommendation, Article 402 requires Douglas PUD to prepare a monitoring plan to carry out the stranding evaluations and monitoring studies to the extent that the monitoring studies address the Wells Project facilities.[62]

96. All other bull trout monitoring studies are included in Washington DOE's water quality certification (Appendix A), Interior's section 18 prescription (Appendix C), or FWS' biological opinion incidental take statement (Appendix E), and thus are a requirement of the license.

Hatchery Genetic Management Plans

97. Douglas PUD proposes to implement hatchery genetic management plans for the project's Wells Hatchery and the non-project Methow Hatchery to address the effects of Wells HCP hatchery fish production on ESA-listed salmon and steelhead. Douglas PUD filed a hatchery genetic management plan for the Methow Hatchery UCR spring Chinook program with its license application. The Wells Hatchery UCR steelhead hatchery genetic management plan is still under development and has not been filed.

98. In the final EIS,[63] staff concluded that modifications to the Wells Hatchery that may be recommended through implementation of the proposed hatchery genetic management plan could require changes to project facilities that would require Commission authorization. To provide for Commission oversight of any modifications to the project that are necessary to implement the hatchery genetic management plan, Article 404 requires Douglas PUD to complete and file the Wells Hatchery UCR steelhead hatchery genetic management plan for Commission approval within one year of license issuance.

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[61] *See* final EIS at 233.

[62] Plans for monitoring studies at non-project facilities are not required to be filed for Commission approval.

[63] *See* final EIS at 230 and A-3.

99. The Methow Hatchery UCR spring Chinook hatchery genetic management plan is not included in this license because the Methow Hatchery is a non-project facility.

Aquatic Resource Management Plan Annual Report

100. The Aquatic Agreement includes a provision to file an annual report with the Commission by May 31st of each year of the license to document all studies, measures, and activities implemented in the previous year pursuant to each of the Aquatic Agreement aquatic resources management plans. The annual report would enable the Commission to administer compliance with license requirements for implementing the aquatic resource management plans. Article 406 requires the annual report.

Aquatic Nuisance Species Management Plan

101. The Aquatic Agreement's Aquatic Nuisance Species Management Plan includes measures designed to prevent the introduction and spread of non-native aquatic species in the project area. The measures include aquatic nuisance species containment methods during construction of recreation enhancement measures, monitoring for the presence of zebra and quagga mussels, and management measures consistent with aquatic nuisance species management protocols in the event that either species is detected in the project area during the term of the license. In the final EIS,[64] staff recommended the plan; however, staff also recommended that the plan be modified to include the specific management practices to control the spread of aquatic nuisance species during construction of recreation enhancement measures, and the specific containment measures that would be implemented if zebra or quagga mussels are detected during the monitoring. Article 405 requires Douglas PUD to modify the Aquatic Nuisance Species Management Plan accordingly.

Wildlife and Botanical Management Plan

102. Douglas PUD filed a Wildlife and Botanical Management Plan with proposed measures for noxious weeds, special-status plants and wildlife, and riparian and wetland habitat. Implementing the plan would improve Douglas PUD's ability to prevent, detect, and control noxious weeds without inadvertent damage to non-target species or to herbicide-sensitive individuals; protect special-status plants; protect existing roost and perch habitat for bald eagles and ensure recruitment of suitable perch trees in the future; improve potential winter cover and forage for sharp-tailed grouse; reduce disturbance to American white pelicans that rest and forage on the reservoir; improve the condition of wetland and riparian habitat that could be used by amphibians and waterfowl at Cassimer Bar and Bridgeport Bar; and provide additional forage for waterfowl. In the final EIS,[65]

[64] *See* final EIS at 239.

[65] See final EIS at 239-241.

staff recommended the plan with additional modifications, which include annually reviewing the Washington National Heritage Program rare plant list and providing an updated list of sensitive species in the annual reports required under the Plan. Staff also recommended that Douglas PUD prepare the recommended annual reports in consultation with the Terrestrial RWG and Washington DOE because this would provide the resource agencies and the Commission a mechanism for determining if the management objectives are being achieved and if modifications to the plan are warranted. Consistent with these staff recommendations, Article 409 requires Douglas PUD to modify the Wildlife and Botanical Management Plan to incorporate staff's recommended additions, and file the plan for Commission approval prior to implementation.

Avian Protection Plan

103. Douglas PUD proposes to implement an avian protection plan for the project's transmission line to minimize the risk of avian collision and electrocution. The plan includes: installing flight diverters on the transmission line where it crosses the Columbia River, if new conductors, static wires, or aviation markers are being replaced; using light-emitting designs (if available) to improve visibility in low-light conditions; maintaining records of avian mortalities and reporting all mortalities attributed to the transmission line to FWS through the online injury/fatality reporting program; implementing a nest management protocol developed in consultation with FWS and Washington DFG; limiting conifer tree-clearing within the transmission line right-of-way to between August 31 and January 31; training utility personnel to understand avian issues, protocols, vegetation management, and compliance regulations; meeting with resource agencies to discuss management of wildlife and botanical resources in the transmission corridor; and modifying the plan only with the agreement of FWS and Washington DFW, with proposed changes to be reported to the Commission for review and approval. The Avian Protection Plan is made part of this license under Ordering Paragraph I.

Recreation Management Plan

104. Douglas PUD proposes to implement the Recreation Management Plan which includes: (1) a Recreation Facility Improvement Program with construction of a boat-in tent camping facility for non-motorized boat users in the vicinity of the Okanogan River; and (2) a Recreation Facility Operation, Maintenance and Monitoring Program. In the final EIS,[66] staff concluded that these measures would help ensure that public access and recreation needs are met for the term of the new license, enhance the aesthetic quality and the physical condition of project-related recreational facilities, and reduce recreation-related adverse effects on environmental resources. Douglas PUD has not yet determined

[66] *See* final EIS at 194–201.

a location for the boat-in tent camping facility in the vicinity of the Okanogan River. In its comments on the draft EIS, Douglas PUD requested an extension of the Commission's deadline for determining the campsite location from six months to one year from the license issuance to allow sufficient time to consult with stakeholders. Article 411 requires the licensee to implement the Recreation Management Plan and to file a supplement to the Recreation Management Plan within one year of license issuance that includes a map depicting the exact location where the proposed non-motorized campsite would be constructed.

OTHER ISSUES

A. Encroachment

105. Encroachment occurs when the tailwater elevation of a hydroelectric project is adversely impacted by the forebay elevation of another project located immediately downstream of the first. The tailwater elevation of the Corps' upstream Chief Joseph Project was increased when the Wells Project was constructed. Article 32 of the current license requires Douglas PUD to compensate the United States for tailwater elevation encroachment. Pursuant to this article, Douglas PUD and the Corps reached a compensation agreement that expired on May 31, 2012. On November 9, 2011, BPA, the Corps, and Douglas PUD filed an agreement in principle to continue to provide encroachment compensation and a request that such provision be included in the new license for the Wells Project, compensable pursuant to FPA section 10(c).[67] Accordingly, Article 203 requires Douglas PUD to compensate for this encroachment consistent with FPA section 10(c) and the principles set forth in the November 9, 2011 filing.

B. Compensation for the Confederated Tribes of the Colville Reservations

106. Section 10(e)(1) of the FPA[68] provides in pertinent part:

> when licenses are issued involving the use of . . . tribal lands embraced within Indian Reservations the Commission shall . . ., subject to the approval of the Indian Tribe having jurisdiction of such lands . . ., fix a reasonable annual charge for the use thereof.

107. On February 11, 2005, the Commission approved the Colville Settlement Agreement, which was intended to settle and resolve all claims by the Colville against Douglas PUD regarding past, present, and future section 10(e) payments for the use of

[67] 16 U.S.C. § 803(c) (2006).

[68] 16 U.S.C. § 803(e)(10) (2006).

tribal lands within the project boundary.[69] The settlement agreement covered all claims as of the effective date of the agreement for the duration of the original license and for the duration of any new license issued to Douglas PUD. The settlement agreement has three components: (1) a one time payment from Douglas PUD to the Colville; (2) a land transfer of Douglas PUD's non-project property to the Colville; and (3) Douglas PUD's ongoing responsibility to sell to the Colville a share of the project's power output. The first two components have been completed. Article 202 requires Douglas PUD to continue to sell a share of power to the Colville.

C. Canadian Entitlement

108. In 1964, the United States and Canada finalized the Columbia River Treaty, under which the two nations jointly regulate and manage the Columbia River for power and flood control. Article 38 of the current license requires Douglas PUD to make available to the federal system (i.e., BPA) for delivery to Canada, the portion of the project's power that is attributable to Canadian storage projects (i.e., headwater benefits), as determined to be due to Canadian interests under the procedures established pursuant to the treaty.[70] BPA and the Corps recommend that this provision be included in the new license. I agree. Accordingly, Article 204 of this license includes the language of Article 38 of the original license.

D. Flood Control

109. The Flood Control Act of 1936 requires the Corps and the Commission to provide for flood control for the Columbia River within the Columbia Basin. Article 34 of the current license requires the Corps' District Engineer to inform Douglas PUD of the storage space to be provided in the Wells Project reservoir to compensate for valley storage that may be expected to be lost during the ensuing flood season. The article requires Douglas PUD to provide storage space up to 500,000 acre-feet. In addition, Douglas PUD must meet certain conditions, such as reservoir drawdown and release timing, as determined by the Corps. This storage is intended for very large floods, and although extensive upstream storage development has reduced the frequency of such floods, they could still occur. BPA and the Corps recommend including this article for flood control in the new license. I agree. Article 205 requires Douglas PUD to provide

[69] 110 FERC ¶ 61,128 (2005).

[70] Douglas PUD has entered into an agreement with the BPA and the Corps that allow Douglas PUD to take advantage of improved streamflow as a result of Canadian storage as long as Douglas PUD delivers to BPA and the Corps the portion of the Canadian entitlement generated at its project. In 1998, the Commission approved this agreement, pursuant to the FPA section 22, 16 U.S.C. § 815 (2006). It expires in 2024.

this storage space.

ADMINISTRATIVE PROVISIONS

A. Annual Charges

110. The Commission collects annual charges from licensees for administration of the FPA. Article 201 provides for the collection of funds for administration of the FPA and use and occupancy of U.S. lands.

B. Exhibit F and G Drawings

111. The Commission requires licensees to file sets of approved project drawings on microfilm and in electronic file format. Articles 206 requires the filing of the approved drawings.

112. Because Douglas PUD will be modifying some of its Exhibit G drawings to include a proposed boat-in tent camping facility, a camping area near the Wells dam, and an expanded recreation area at Marina Park, Article 207 requires the filing of revised Exhibit G drawings. In addition, Sheets G-T1 through G-T5 of the Exhibit G drawings are currently labeled "Project Boundary and Location Map.", but these drawings refer to the transmission line corridor. Therefore, they must be relabeled as "Transmission Line Corridor" and renumbered from G-65 through G-69. Finally, because all of the Exhibit G drawings include the word "preliminary" above the surveyor's stamp. Article 207 requires the filing of revised Exhibit G drawings with this word removed.

C. Headwater Benefits

113. Some hydropower projects directly benefit from headwater improvements that were constructed by other licensees, the United States, or permittees. In their comments to the REA notice, BPA and the Corps recommend that we include the headwater benefits requirement in the new license. Article 208 requires Douglas PUD to reimburse such entities for these benefits if they were not previously assessed and reimbursed.

D. Use and Occupancy of Project Lands and Waters

114. Requiring a licensee to obtain prior Commission approval for every use or occupancy of project land would be unduly burdensome. Therefore, Article 413 allows the licensee to grant permission, without prior Commission approval, for the use and occupancy of project lands for such minor activities as landscape planting. Such uses must be consistent with the purposes of protecting and enhancing the scenic, recreational, and environmental values of the project.

E. Review of Final Plans and Specifications

115. Where new construction or modifications to the project are involved, the Commission requires licensees to file revised drawings of project features as built. Article 301 provides for the filing of these drawings.

F. Commission Approval of Resource Plans, Reports, Notification, and Filing of Amendments

116. In Appendices A, C, D, and E, there are certain certification conditions, fishway prescriptions, and terms and conditions of the NMFS and FWS incidental take statements that either do not require the licensee to file plans or reports with the Commission or do not provide for consultation with the appropriate agencies during plan or report development. Therefore, Article 401 requires the licensee to consult with the agencies during plan development, file reports with the Commission, file plans with the Commission for approval, and file amendment applications, as appropriate.

STATE AND FEDERAL COMPREHENSIVE PLANS

117. Section 10(a)(2)(A) of the FPA[71] requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, or conserving a waterway or waterways affected by the project.[72] Under section 10(a)(2)(A), federal and state agencies filed 74 comprehensive plans that address various resources in Washington. Of these, staff identified and reviewed 29 plans that are relevant to this project.[73] No conflicts were found.

APPLICANT'S PLANS AND CAPABILITIES

118. In accordance with sections 10(a)(2)(C) and 15(a) of the FPA,[74] Commission staff evaluated Douglas PUD's record as a licensee for these areas: (1) conservation efforts; (2) compliance history and ability to comply with the new license; (3) safe management, operation, and maintenance of the project; (4) ability to provide efficient and reliable electric service; (5) need for power; (6) transmission services; (7) cost effectiveness of

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[71] 16 U.S.C. § 803(a)(2)(A) (2006).

[72] Comprehensive plans for this purpose are defined at 18 C.F.R. § 2.19 (2012).

[73] The list of applicable plans can be found in section 5.5 of the final EIS.

[74] 16 U.S.C. § 803(a)(2)(C) and 808(a) (2006).

plans; and (8) actions affecting the public. I accept the staff's findings in each of the following areas.

A. Conservation Efforts

119. Section 10(a)(2)(C) of the FPA requires the Commission to consider the extent of electricity consumption efficiency improvement programs in the case of license applicants primarily engaged in the generation or sale of electric power, like Douglas PUD. Each year, Douglas PUD completes a comprehensive analysis of future load growth and the need for new resources, including customer efficiency programs, to meet its customer demand. In the most recent report, Douglas PUD proposed demand side management actions and goals to promote demand side load management practices for both residential and commercial/industrial customers. The report also showed that Douglas PUD has undertaken several programs to improve efficiency and promote energy conservation at its own plants. These programs show that Douglas PUD is making an effort to conserve electricity and has made a satisfactory good faith effort to comply with section 10(a)(2)(C) of the FPA.

B. Compliance History and Ability to Comply with the New License

120. Based on a review of Douglas PUD's compliance with the terms and conditions of the existing license, Douglas PUD's overall record of making timely filings and compliance with its license is satisfactory. Therefore, Douglas PUD has the ability to satisfy the conditions of a new license.

C. Safe Management, Operation, and Maintenance of the Project

121. Staff have reviewed Douglas PUD's management, operation, and maintenance of the Wells Project pursuant to the requirements of 18 C.F.R. Part 12 and the Commission's Engineering Guidelines. Staff concludes that there is no reason to believe that Douglas PUD cannot continue to safely manage, operate, and maintain the dam and other project works in accordance with the Commission's standards and oversight under a new license.

D. Ability to Provide Efficient and Reliable Electric Service

122. Staff have reviewed Douglas PUD's plans and its ability to operate and maintain the project in a manner most likely to provide efficient and reliable electric service. Staff's review indicates that Douglas PUD regularly inspects the project turbine generator units to ensure they continue to perform in an optimal manner, schedules maintenance to minimize effects on energy production, and since the project has been in operation, has undertaken several initiatives to ensure the project is able to operate reliably into the future. Therefore, Douglas PUD is capable of operating the project to provide efficient and reliable electric service in the future.

E. Need for Power

123. Douglas PUD serves about 18,000 retail customers in Douglas County, Washington. The Wells Project is the only generating facility owned and operated by Douglas PUD, which also has contracts to purchase power from Chelan PUD's Rocky Reach Project and the Nine Canyon Wind Project. The 774.25-MW Wells Project produces approximately 4,077,400 megawatt-hours (MWh) per year. Project power is sold under long-term contracts to four wholesale power purchasers, helping to meet the electrical power needs of consumers throughout the Pacific Northwest region.

124. Douglas PUD's 2007 Integrated Resource Plan update predicts that Douglas PUD will have adequate resources to meet its peak customer load through 2018.

125. The Wells Project is located within the Northwest subregion of the Western Electricity Coordinating Council region of the North American Electric Reliability Corporation (NERC). According to NERC's 2010 forecast, winter peak demand and annual demand requirements for the Northwest subregion are projected to grow at a rate of 1.1 percent and 1.2 percent, respectively, from 2010 through 2019.

126. Power from the Wells Project can continue to serve Douglas PUD's customers as well as meet part of the regional need for power.

F. Transmission Services

127. The project includes two 41-mile-long transmission lines that deliver project power to Douglas PUD's bulk transmission grid at the Douglas switchyard near Rocky Reach dam. Douglas PUD proposes no changes that would affect its own or other transmission services in the region. The project and project transmission lines are important elements in providing power and voltage control to local Douglas County communities and the region.

G. Cost Effectiveness of Plans

128. Douglas PUD does not propose any capacity expansion at the project and based on the available flow, staff do not expect any additional capacity to be cost-effective at this site. As discussed in this order, Douglas PUD proposes several measures and plans for the enhancement of fish and wildlife, recreation, and cultural resources at the project. Based on Douglas PUD's record as an existing licensee, staff concludes that these plans are likely to be carried out in a cost-effective manner.

H. Actions Affecting the Public

129. Douglas PUD provided extensive opportunity for public involvement in the development of its application for a new license for the Wells Project. During the previous license period, Douglas PUD provided facilities to enhance public use of project

lands and facilities and operated the project with consideration for the protection of downstream uses of the mid-Columbia River. Douglas PUD uses the project to help meet local and regional power needs.

PROJECT ECONOMICS

130. In determining whether to issue a new license for an existing hydroelectric project, the Commission considers a number of public interest factors, including the economic benefits of project power. Under the Commission's approach to evaluating the economics of hydropower projects, as articulated in *Mead Corp.*,[75] the Commission uses current costs to compare the costs of the project and likely alternative power with no forecasts concerning potential future inflation, escalation, or deflation beyond the license issuance date. The basic purpose of the Commission's economic analysis is to provide a general estimate of the potential power benefits and the costs of a project, and of reasonable alternatives to project power. The estimate helps to support an informed decision concerning what is in the public interest with respect to a proposed license.

131. In applying this analysis to the Wells Project, we have considered three options: no action alternative, Douglas PUD's proposal, and the project as licensed herein. Under the no action alternative, the project would continue to operate as it does now. The project has an installed capacity of 774.25 MW, has a dependable capacity of 715 MW, and generates an average of 4,077,400 MWh of electricity annually. The average annual project cost is about $70.4 million, or $17.25/MWh. When we multiply our estimate of average generation by the alternative power cost of $106.53/MWh,[76] staff gets a total value of the project's power of $434.4 million in 2011 dollars. To determine whether the proposed project is currently economically beneficial, staff subtracts the project's cost from the value of the project's power.[77] Therefore, the project costs $364.0 million, or $89.28/MWh, less to produce power than the likely alternative cost of power.

132. As proposed by Douglas PUD, the levelized annual cost of operating the Wells Project is $72.3 million, or $17.73/MWh. Based on the same amount of estimated average generation of 4,077,400 MWh and alternative power cost of $106.53/MWh, staff gets a total value of the project's power of $434.4 million in 2011 dollars. Therefore, in

[75] 72 FERC ¶ 61,027 (1995).

[76] The alternative power cost of $106.53 per MWh is based on information obtained from a sales contract, U.S. Energy Information Administration fuel cost data, and regional bid prices.

[77] Details of staff's economic analysis for the project as licensed herein and for various alternatives are included in the final EIS issued October 2011.

the first year of operation, the project would cost $362.1 million, or $88.80/MWh, less than the likely alternative cost of power.

133. As licensed herein with the mandatory conditions and staff measures, the levelized annual cost of operating the project would be about $72.1 million, or $17.69/MWh. Based on the same amount of estimated average generation of 4,077,400 MWh as licensed, the project would produce power valued at $434.4 million when multiplied by the $106.53/MWh value of the project's power. Therefore, in the first year of operation, project power would cost $362.2 million, or $88.84/MWh, less than the likely cost of alternative power.

134. In considering public interest factors, the Commission takes into account that hydroelectric projects offer unique operational benefits to the electric utility system (ancillary service benefits). These benefits include their ability to help maintain the stability of a power system, such as by quickly adjusting power output to respond to rapid changes in system load; and to respond rapidly to a major utility system or regional blackout by providing a source of power to help restart fossil-fuel based generating stations and put them back online.

COMPREHENSIVE DEVELOPMENT

135. Sections 4(e) and 10(a)(1) of the FPA[78] require the Commission to give equal consideration to power development purposes and to the purposes of energy conservation; the protection, mitigation of damage to, and enhancement of fish and wildlife; the protection of recreational opportunities; and the preservation of other aspects of environmental quality. Any license issued shall be such as in the Commission's judgment will be best adapted to a comprehensive plan for improving or developing a waterway or waterways for all beneficial public uses. The decision to license this project, and the terms and conditions included herein, reflect such consideration.

136. The EIS for the project contains background information, analysis of effects, and support for related license articles. The project will be safe if operated and maintained in accordance with the requirements of this license.

137. Based on my independent review and evaluation of the Wells Project, recommendations from the resource agencies and other stakeholders, and the no-action alternative, as documented in the final EIS, I have selected the proposed Wells Project, with the staff-recommended measures and mandatory conditions, and find that it is best adapted to a comprehensive plan for improving or developing the Columbia River.

[78] 16 U.S.C. §§ 797(e) and 803(a)(1) (2006).

138. I selected this alternative because: (1) issuance of a new license will serve to maintain a beneficial, dependable, and an inexpensive source of electric energy; (2) the required environmental measures will protect and enhance fish and wildlife resources, water quality, recreational resources, and historic properties; and (3) the 774.25 MW of electric capacity comes from a renewable resource that does not contribute to atmospheric pollution.

LICENSE TERM

139. Section 15(e) of the FPA[79] provides that any new license issued shall be for a term that the Commission determines to be in the public interest, but not less than 30 years or more than 50 years. Douglas PUD requested a 50-year license. Seven parties to the Aquatic Agreement and numerous other parties[80] support Douglas PUD's request for a 50-year license for the Wells Project.

140. The Commission's general policy is to establish 30-year terms for projects with little or no redevelopment, new construction, new capacity, or environmental mitigation and enhancement measures; 40-year terms for projects with a moderate amount of such activities; and 50-year terms for projects with extensive measures.[81] This license requires a moderate amount of mitigation and enhancement measures, including: continued implementation of the Wells HCP including fish passage; tributary enhancement and hatchery programs; implementation of a Wells Hatchery UCR Steelhead Hatchery Genetic Management Plan; implementation of management plans to protect and enhance water quality, bull trout, Pacific lamprey, white sturgeon, resident fish, and control aquatic nuisance species; implementation of plans that would protect and enhance wildlife and associated habitat; implementation of a plan to enhance recreation opportunities; and implementation of a plan to protect historic resources. Consequently, a license term of 40 years for the Wells Project is appropriate.

141. Douglas PUD argues the measures contained in the HCP that are carried over to the new license should be counted in favor of issuing a 50-year license. In the Commission's Rocky Reach rehearing order, the Commission explained that the HCP

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[79] 16 U.S.C. § 808(e) (2006).

[80] The following filed comments in support of a 50-year license: Congressmen Doc Hastings and David Reichert; Senators Patty Murray and Maria Cantwell; Congresswoman Cathy McMorris Rodgers; the cities of Pateros, Bridgeport, and Brewster; the Ports of Chelan and Douglas Counties; Puget Sound Energy; Avista; Public Utility District No. 1 of Okanogan County; Washington DOE; and the Douglas County Commissioners.

[81] *See Consumers Power Company*, 68 FERC ¶ 61,077, at 61,383-84 (1994).

provisions should be excluded from consideration for purposes of determining measures contained in the new license.[82] Moreover, it is the Commission's policy to coordinate to a reasonable extent the license expiration dates of projects in a river basin, in order that subsequent relicense proceedings can also be coordinated.[83] As noted above, there are three nearby licensed projects in the mid-Columbia River basin: (1) Rocky Reach Project No. 2145, (2) Rock Island Project No. 943, and (3) Priest Rapids Project No. 2114.

142. Under the FPA, we cannot issue a new license with a term of less than 30 years; therefore, we cannot coordinate this license term with that for the Rock Island Project because it expires 16 years from now in 2028.

143. In 2008 and 2009, the Commission issued new licenses for, respectively, the Priest Rapids Project and the Rocky Reach Project. Both licenses expire in 2052.[84] Both the licensees for Rocky Reach and Wells Projects are parties to HCPs that include provisions for the protection of salmon and steelhead through a combination of project survival, hatchery programs and evaluations, and habitat restoration work. These HCPs will terminate in 2052. Accordingly, choosing a license term to coincide with the expiration of the HCPs (in 2052 or in 40 years) is not only consistent with the moderate amount of mitigation and enhancement measures included in this license, but will also allow future coordination among the Columbia River Basin projects.

The Commission orders:

(A) This license is issued to Public Utility District No. 1 of Douglas County (licensee), for a period of 40 years, effective the first day of the month in which this order is issued, to operate and maintain the Wells Project. This license is subject to the terms and conditions of the Federal Power Act (FPA), which is incorporated by reference as part of this license, and subject to the regulations the Commission issues under the provisions of the FPA.

(B) The project consists of:

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[82] 127 FERC ¶ 61,152 (2009).

[83] In issuing new and subsequent licenses, the Commission will coordinate the expiration dates of licenses to the maximum extent possible, to maximize future consideration of cumulative impacts in contemporaneous proceedings at relicensing. *See* 18 C.F.R. § 2.23 (2012).

[84] 123 FERC ¶ 61,049 (2008); 126 FERC ¶ 61,138, order on reh'g, 127 FERC ¶ 61,152 (2009)

(1) All lands, to the extent of the licensee's interest in these lands, described in the project description and the project boundary discussion of this order.

(2) Project works including: (a) a 1,130-foot-long, 168-foot-wide concrete hydrocombine dam with integrated generating units, spillways, switchyard, and juvenile fish passage facilities; (b) a 2,300-foot-long, 40-foot-high earth and rock-filled west embankment; (c) a 1,030-foot-long, 160-foot-high earth and rock-filled east embankment; (d) a 29.5-mile-long reservoir with surface area of about 9,740 acres, gross storage capacity of 331,200 acre-feet, and useable storage capacity of 97,985 acre-feet at normal pool elevation of 781 feet mean sea level; (e) eleven 46-foot-wide, 65-foot-high ogee-designed spillway bays with 2 vertical lift gates; (f) five spillway bays modified to accommodate the juvenile fish bypass system; (g) 10 turbine/generating units each with a 77.425-MW generator for a total installed capacity of 774.25 MW and a maximum hydraulic capacity of 22,000 cfs at an average gross head of 73 feet; (h) two 41-mile-long, 230-kV single-circuit transmission lines running parallel to each other; (i) the Wells Hatchery; and (j) appurtenant facilities.

The project works generally described above are more specifically shown and described by those portions of Exhibits A and F shown below:

Exhibit A: The following sections of Exhibit A filed on May 27, 2010:

Section 2, pages A-4 through A-16, entitled "Project Facilities," describing the mechanical, electrical, and transmission equipment within the application for license; section 3.1, pages A-16 through A-17, entitled "Wells Hatchery;" section 4.1, pages A-19 through A-23, entitled "Recreation Facilities within the Cities of Pateros, Brewster;" and section 4.2, pages A-24 through A-27, entitled "Recreation Sites Outside the Cities."

Exhibit F: The following Exhibit F drawings filed on May 27, 2010:

Exhibit F Drawing	FERC No. 2149-	Description
Sheet F-1	1001	Hydrocombine, General Layout
Sheet F-2	1002	Hydrocombine, The Unit
Sheet F-3	1003	Hydrocombine, The Spillway
Sheet F-4	1004	Hydrocombine, The Fish Facilities
Sheet F-5	1005	Hydrocombine, The Fish Facilities
Sheet F-6	1006	Hydrocombine, Longitudinal Sections
Sheet F-7	1007	Hydrocombine, Plan View
Sheet F-8	1008	Hydrocombine, Sectional Plan – El. 776
Sheet F-9	1009	Hydrocombine, Sectional Plan – El. 764

Exhibit F Drawing	FERC No. 2149-	Description
Sheet F-10	1010	Hydrocombine, Sectional Plan – El. 752
Sheet F-11	1011	Hydrocombine, Sectional Plan – El. 736
Sheet F-12	1012	Hydrocombine, Sectional Plan – El. 720
Sheet F-13	1013	Hydrocombine, Sectional Plan – El. 705
Sheet F-14	1014	Hydrocombine, Sectional Plan – El. 686 and 666
Sheet F-15	1015	Hydrocombine, Sectional Plan – El. 634
Sheet F-16	1016	Hydrocombine Fish Facilities, Sectional Plan
Sheet F-17	1017	Dam Embankments, West Embankment
Sheet F-18	1018	Dam Embankments, East Embankment – Sheet 1 of 4
Sheet F-19	1019	Dam Embankments, East Embankment – Sheet 2 of 4
Sheet F-20	1020	Dam Embankments, East Embankment – Sheet 3 of 4
Sheet F-21	1021	Dam Embankments, East Embankment – Sheet 4 of 4
Sheet F-22	1022	Hydrocombine Fish Bypass – Flow Barrier Panels

(3) All of the structures, fixtures, equipment, and facilities used to operate or maintain the project, all portable property that may be employed in connection with the project, and all riparian or other rights that are necessary or appropriate in the operation or maintenance of the project.

(C) Exhibits A and F described above are approved and made part of the license.

(D) This license is subject to the conditions submitted by the Washington Department of Ecology under section 401(a)(1) of the Clean Water Act, 33 U.S.C. § 1341(a)(1) (2006), as those conditions are set forth in Appendix A to this order.

(E) This license is subject to the conditions submitted by the Secretary of the U.S. Department of Commerce under section 18 of the FPA, as those conditions are set forth in Appendix B to this order.

(F) This license is subject to the conditions submitted by the Secretary of the U.S. Department of the Interior under section 18 of the FPA, as those conditions are set forth in Appendix C to this order.

(G) This license is subject to the incidental take terms and conditions of the biological opinion submitted by the National Marine Fisheries Service on March 7, 2012, under section 7 of the Endangered Species Act, as those conditions are set forth in Appendix D to this order.

(H) This license is subject to the incidental take terms and conditions of the biological opinion submitted by the U.S. Fish and Wildlife Service on March 19, 2012, under section 7 of the Endangered Species Act, as those conditions are set forth in Appendix E to this order.

(I) The Avian Protection Plan included as Appendix E-6 of Exhibit E of the final license application filed on May 27, 2010, is approved and made a part of the license.

(J) This license is also subject to the articles set forth in Form L-5 (October, 1975), entitled "Terms and Conditions of License for Constructed Major Project Affecting Navigable Waters and Lands of the United States," (*see* 54 F.P.C. 1832 et seq.), as reproduced at the end of this order, and the following additional articles:

Article 201. *Administrative Annual Charges*. The licensee shall pay the United States annual charges, effective the first day of the month in which the license is issued, and as determined in accordance with provisions of the Commission's regulations in effect from time to time, for the purposes of:

(a) reimbursing the United States for the cost of administration of Part I of the Federal Power Act. The authorized installed capacity for that purpose is 774.25 megawatts; and

(b) recompensing the United States for the use, occupancy, and enjoyment of 15.15 acres of its land (other than for transmission line right-of-way).

Article 202. *Compensation for the Confederated Tribes of the Colville Reservation.* Recompensing the Confederated Tribes of the Colville Reservation pursuant to the terms of the Colville Settlement Agreement and the Colville Power Sales Contract, dated August 18, 2004, between Douglas County Public Utility District No. 1 and the Confederated Tribes of the Colville Reservation, and filed with the Commission November 23, 2004, constitutes payment in full.

Article 203. *Encroachment*. With respect to compensation to the United States for the losses caused to the Chief Joseph Project by encroachment upon its tailwater by the operation of the Wells project:

(a) The licensee shall enter into an agreement with the Chief of Engineers, Department of the Army, or designated representative, to compensate the United States for encroachment on the Chief Joseph Project resulting from the operation of the Wells

Project. For Chief Joseph Units 1-16, the licensee will provide encroachment payments representing the difference in Chief Joseph generation with and without impact of the Wells Project in time and kind for the full Wells pool with updated efficiency curves. For Chief Joseph Units 17-27, the licensee will provide compensation for the excess water use between forebay elevations 779 and 781 feet mean sea level. Compensation will be based on the amount of water used by Chief Joseph Units 17-27 in excess of the hydraulic limit of the smaller units that would have been installed without the Wells Project. Encroachment compensation would not be automatically eliminated when Chief Joseph is spilling. The licensee will provide encroachment payments for water going through the turbines during instances when spill occurs at Chief Joseph, such as spilling for reserves or total dissolved gas management. The licensee will compensate the federal government for the mutually agreed incremental cost of the future unit replacements consistent with the licensee's 1963 compensation for the incremental cost of units 17-27.

(b) The licensee shall file the new encroachment agreement with the Commission for inclusion in the license.

Article 204. *Canadian Storage*. The licensee shall use the improved streamflow from Canadian storage projects for power production purposes, and make available to the federal system for delivery to Canada, or for its account, the project's share of coordinated system benefits resulting from such improved streamflows, both dependable hydroelectric capacity and average annual usable hydroelectric energy, as determined to be due to Canadian interests under the procedures established pursuant to any treaty between the United States and Canada relating to cooperative development of water resources of the Columbia River Basin.

Article 205. *Flood Control.* Each year before the beginning of flood runoff, the licensee shall gather from the District Engineer, U.S. Army Corps of Engineers, in charge of the locality, information relating to the amount of the storage space to be provided in the Wells Project reservoir to compensate approximately for valley storage that may be expected to be lost during the ensuing flood season. The licensee shall without cost to the United States provide this storage space in accordance with the following general procedures:

(a) The amount of storage space to be provided by the licensee will vary from zero acre-feet for a forecasted peak flow of 500,000 second-feet at The Dalles, Oregon, to approximately 125,000 acre-feet for a forecasted peak flow of 1,100,000 cubic feet per second at The Dalles, the forecasted flows to be as regulated by storage existing at the time of license. To the extent feasible and in order to minimize the duration of the drawdown of the Wells reservoir for valley storage replacement, the drawdown will be ordered by the District Engineer, not earlier than two weeks before the predicted date on which the observed flow at The Dalles is forecasted to equal or exceed 500,000 cubic feet per second and refill will be directed by the District Engineer generally within one week after voluntary filling of Grand Coulee Reservoir for flood control purposes is initiated.

(b) Detailed procedures for use of the valley storage replacement in the Wells reservoir will be included in a regulation manual to be prepared by the District Engineer.

Article 206. *Exhibit F Drawings*. Within 45 days of the date of issuance of the license, the licensee shall file the approved exhibit drawings in aperture card and electronic file formats.

(a) Four sets of the approved exhibit drawings shall be reproduced on silver or gelatin 35mm microfilm. All microfilm shall be mounted on type D (3-1/4" X 7-3/8") aperture cards. Prior to microfilming, the FERC Project-Drawing Number (i.e., P-2149-#### through P-2149-####) shall be shown in the margin below the title block of the approved drawing. After mounting, the FERC Drawing Number shall be typed on the upper right corner of each aperture card. Additionally, the Project Number, FERC Exhibit (i.e., F-1, etc.), Drawing Title, and date of this license shall be typed on the upper left corner of each aperture card.

Two of the sets of aperture cards along with form FERC-587 shall be filed with the Secretary of the Commission, ATTN: OEP/DHAC. The third set shall be filed with the Commission's Division of Dam Safety and Inspections Portland Regional Office.

(b) The licensee shall file two separate sets of exhibit drawings in electronic raster format with the Secretary of the Commission, ATTN: OEP/DHAC. A third set shall be filed with the Commission's Division of Dam Safety and Inspections Portland Regional Office. Exhibit F drawings must be separated from other project exhibits and identified as Critical Energy Infrastructure Information (CEII) material under 18 C.F.R. § 388.113(c) (2012). Each drawing must be a separate electronic file, and the file name shall include: FERC Project-Drawing Number, FERC Exhibit, Drawing Title, date of this license, and file extension in the following format [P-2149-####, F-1, Project Boundary, MM-DD-YYYY.TIF]. Electronic drawings shall meet the following format specification:

IMAGERY - black & white raster file
FILE TYPE – Tagged Image File Format (TIFF), CCITT Group 4
RESOLUTION – 300 dpi desired (200 dpi min)
DRAWING SIZE FORMAT – 24" X 36" (min), 28" X 40" (max)
FILE SIZE – less than 1 MB desired

Article 207. *Revised Exhibit G Drawings*. Within 90 days of the effective date of the license, the licensee shall file, for Commission approval, revised Exhibit G drawings enclosing within the project boundary all principal project works necessary for operation and maintenance of the project and identifying the location and name of each project recreation site, including:

(a) The proposed boat-in tent camping facility near the Okanogan River, the informal/rustic camping location near Wells dam, and the expanded recreation area at Marina Park.

(b) Sheets G-T1 through G-T5 renumbered as G-65 through G-69 and the description changed to "Transmission Line Corridor".

(c) All Exhibit G drawings with the word "preliminary" above the surveyor's stamp removed.

The Exhibit G drawings must comply with sections 4.39 and 4.41 of the Commission's regulations.

Article 208. *Headwater Benefits*. If the licensee's project was directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement during the term of the original license (including extension of that term by annual licenses), and if those headwater benefits were not previously assessed and reimbursed to the owner of the headwater improvement, the licensee shall reimburse the owner of the headwater improvement for those benefits, at such time as they are assessed, in the same manner as for benefits received during the term of this new license. The benefits will be assessed in accordance with Part 11, Subpart B, of the Commission's regulations.

Article 301. *As-Built Drawings*. Within 90 days of completion of construction of the facilities directed by any article of this license (recreation facilities, etc.), the licensee shall file for Commission approval revised Exhibits A, F, and G, as applicable, to show those project facilities as built. A courtesy copy shall be filed with the Division of Dam Safety and Inspections (D2SI) Portland Regional Engineer, the Director, D2SI, and the Director, Division of Hydropower Administration and Compliance.

Article 401. *Commission Approval and Filing of Amendments*.

(a) Requirement to File Plans for Commission Approval

Various conditions of this license found in Washington Department of Ecology's (Washington DOE's) water quality certification (Appendix A), U.S. Department of the Interior's (Interior's) section 18 fishway prescriptions (Appendix C), and National Marine Fisheries Service's (NMFS') incidental take statement terms and conditions (Appendix D) require the licensee to prepare plans in consultation with other entities for approval by Washington DOE, Interior, or NMFS and implement specific measures without prior Commission approval. Each such plan shall also be submitted to the Commission for approval. These plans are listed below.

Washington DOE Certification Condition Number	**Interior Section 18 Prescription Number**	**NMFS Incidental Take Statement Term and Condition Number**	**Plan Name or Measure**	**Due Date**
6.5 (section 4.1.1 of White Sturgeon Plan)			White Sturgeon Broodstock Collection and Breeding Plan	Within one year of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Lamprey Entrance Efficiency Plan	Within one year of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder diffuser gratings	Within five years of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder transition zones	Within five years of license issuance
6.5 (section 4.1.5 of Pacific Lamprey Plan)	5.6.2		Plan and schedule for fish ladder traps and exit pools	Within five years of license issuance

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	NMFS Incidental Take Statement Term and Condition Number	Plan Name or Measure	Due Date
6.6(4)			Aquatic Nuisance Species Management Plan	Within one year of detection of any new aquatic nuisance species
6.7(2)(d)		2 (section 4.1.2 of Water Quality Plan)	Annual Wells HCP Project Fish Bypass/Spill Operations Plan	Within one year of license issuance
6.7(2)(a)		2 (section 4.1.3 of Water Quality Plan)	Gas Abatement Plan	By February 28 each year following license issuance
6.7(7)(a)		2 (section 4.6.1 of Water Quality Plan)	Quality Assurance Project Plans	Within one year of license issuance
6.7(2)(e)			Water Quality Attainment Plan	Within one year of license issuance
6.7(5)(a)		2 (section 4.4.1 of Water Quality Plan)	Updated Spill Prevention Control and Countermeasures Plan	Within one year of license issuance
6.8(e)			Water Quality Protection Plan for Future Construction Activities	60 days prior to the start of construction

The licensee shall include with each plan filed with the Commission documentation that the licensee developed each plan after consultation with the National Marine Fisheries Service, Washington Department of Fish and Wildlife, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management, and has received approval from Washington DOE, Interior, or NMFS as appropriate. The Commission reserves the right to make changes to any plan submitted. Upon Commission approval, the plan becomes a requirement of the license, and the licensee shall implement the plan, including any changes required by the Commission.

(b) Requirement to File Reports

Two conditions of Washington DOE's water quality certification (Appendix A) and one condition of NMFS' incidental take statement terms and conditions (Appendix D) require the licensee to file reports with other entities. These reports document compliance with requirements of this license and may have bearing on future actions. Each such report shall also be submitted to the Commission. These reports are listed in the following table:

Washington DOE Certification Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description	Due Date
6.7(2)(c)(iii)	2 (sections 4.1.1, 4.1.3 of Water Quality Plan)	Total Dissolved Gas Report, including report of all spill occurring outside of the fish passage season	By February 28 each year following license issuance
6.7(3)(b)		Temperature Report	By April 30 each year following license issuance

The licensee shall submit to the Commission documentation of any consultation, and copies of any comments and recommendations made by any consulted entity in connection with each report. The Commission reserves the right to require changes to project operations or facilities based on the information contained in the report and any other available information.

(c) Requirement to File Amendment Applications

Certain water quality certification conditions in Appendix A, section 18 fishway prescriptions in Appendix C, and incidental take statement terms and conditions for bull trout in Appendix E contemplate unspecified long-term changes to project operations,

facilities, or environmental measures for the purpose of mitigating environmental impacts. These changes may not be implemented without prior Commission authorization granted after the filing of an application to amend the license. These conditions are listed below.

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
6.5 (section 4.1.2 of White Sturgeon Plan)				Alternative measures if juvenile sturgeon stocking deadlines cannot be achieved
6.5 (section 4.4 of White Sturgeon Plan)				White sturgeon adult passage measures that are consistent with measures at other mid-Columbia projects
6.5 (sections 4.2.1, 4.4, 4.5.1, 4.6.1 of Bull Trout Plan)		6, 8		Measures to address exceedances of allowable levels of bull trout incidental take
6.5 (section 4.3 of Bull Trout Plan)	4.8	5		Modifications to upstream fishways, downstream bypass, or operations to reduce impacts to bull trout passage
	4.6	10		Measures to improve bull trout passage until compliance with the bull trout passage standard is achieved
6.5 (section 4.1.1 of Pacific Lamprey Plan)				Operational modifications to upstream fishways to benefit adult Pacific lamprey

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
	5.2			Amendments to upstream fishway operating criteria
6.5 (section 4.1.3 of Pacific Lamprey Plan)	5.5			Measures for alternate upstream passage routes or counting facilities for adult Pacific lamprey
6.5 (section 4.1.5, 4.1.6, 4.1.7 of Pacific Lamprey Plan)	5.6.2, 5.7, 5.8			Measures to improve upstream Pacific lamprey passage
6.5 (section 4.2.4 of Pacific Lamprey Plan)	6.0			Measures to address impacts on Pacific lamprey populations above Wells dam, or to improve downstream lamprey passage
6.6 (section 4.3, 4.4 of Resident Fish Plan)				Measures to address changes in resident fish populations
6.5 (section 4.3 of Aquatic Nuisance Plan)				Measures to address changes in aquatic nuisance species populations

Washington DOE Certification Condition Number	Interior Section 18 Prescription Number	FWS Incidental Take Statement Term and Condition Number	NMFS Incidental Take Statement Term and Condition Number	Description
6.7(3)(d), 6.7(4)			2 (section 4.1.4, 4.2.3, 4.3 of Water Quality Plan)	Measures to address non-compliance with numeric water quality criteria
6.7(3)(c)(iii)			2 (section 4.2.2 of Water Quality Plan)	Measures identified through the Columbia River temperature total maximum daily load development
6.7(3)(c)(iii)			2 (section 4.2.2 of Water Quality Plan)	Reasonable and feasible measures in the event that a Columbia River temperature total maximum daily load is not timely approved by the U.S. Environmental Protection Agency
6.7(6)(b)			2 (section 4.5.2 of Water Quality Plan)	Measures to coordinate project operations with other mid-Columbia hydroelectric project operations
6.1(7)				Additional measures if Ecology determines that there is a likelihood or probability of violations of water quality standards or state law
6.4(2)				Modifications to goals, objectives, or measures included in the Aquatic Agreement's resource management plans

Article 402. *Bull Trout Evaluations*. Within one year of license issuance, the

licensee shall file for Commission approval, a study plan and schedule for the purpose of conducting the following:

(a) the bull trout stranding evaluations described in section 4.4 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010;

(b) the bull trout incidental take monitoring studies described in section 4.5.1 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010; and

(c) the bull trout incidental take monitoring studies to be implemented at the Wells Hatchery as described in section 4.6.1 of the Aquatic Settlement Agreement's Bull Trout Management Plan, filed May 27, 2010.

The licensee shall include with the plan, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed plan after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 403. *Notification of Deviations from Operating Requirements.* Project operations may be temporarily modified if required by operating emergencies beyond the control of the licensee, or if necessary to protect water quality or aquatic resources at the project. If project operations are so modified, the licensee shall notify the Commission as soon as possible but no later than 48 hours after the incident.

Article 404. *Wells Hatchery Upper Columbia River Steelhead Hatchery Genetic Management Plan*. Within one year of license issuance, the licensee shall file for Commission approval, a Wells Hatchery Upper Columbia River Steelhead Hatchery Genetic Management Plan to address the effects of the Wells Hatchery steelhead program on Endangered Species listed salmon and steelhead.

The licensee shall include with the plan, documentation of consultation with the Wells HCP Coordinating Committee (as established in section 6 of the *Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project, FERC License No. 2149*, dated March 26, 2002), copies of comments and recommendations on the plan after it has been prepared and provided to the consulted entities, and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 405. *Aquatic Nuisance Species Management Plan*. Within six months of license issuance, the licensee shall file for Commission approval, an Aquatic Nuisance Species Management Plan that includes the following modifications to the Aquatic Settlement Agreement's Aquatic Nuisance Species Management Plan filed May 27, 2010:

(a) Section 4.1 of the plan must include specific best management practices that will be implemented to prevent the spread of aquatic nuisance species during construction of recreation enhancement measures; and

(b) Section 4.2.1 of the plan must include specific reasonable and appropriate measures that are consistent with aquatic nuisance species management protocols and will be implemented, if aquatic nuisance species are detected during monitoring activities at the project.

The licensee shall include with the updated plan, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the updated plan after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the plan. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the plan with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to the plan. Implementation of the plan shall not begin until the plan is approved by the Commission. Upon Commission approval, the licensee shall implement the plan, including any changes required by the Commission.

Article 406. *Aquatic Settlement Agreement Annual Report*. The licensee shall annually file, by May 31 of each year following license issuance, a report that documents the results of studies and the measures completed during the previous calendar year pursuant to the May 27, 2010, Aquatic Settlement Agreement's White Sturgeon Management, Bull Trout Management, Pacific Lamprey Management, Resident Fish Management, Aquatic Nuisance Species Management, and Water Quality Management Plans as required in whole or in part by Ordering Paragraph F and Appendix C, Ordering Paragraph G and Appendix D, and Ordering Paragraph H and Appendix E.

The licensee shall include with the report, documentation of consultation with the National Marine Fisheries Service, U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, U.S. Bureau of Indian Affairs, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed report after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the report. The licensee shall allow a minimum of 30 days for the consulted entities to comment and to make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information.

The Commission reserves the right to require changes to project operations or facilities based on information contained in the report and any other available information.

Article 407. *Reservation of Authority to Prescribe Fishways.* Authority is reserved to the Commission to require the licensee to construct, operate, and maintain or provide for the construction, operation, and maintenance of such fishways as may be prescribed by the Secretaries of Commerce or of the Interior pursuant to section 18 of the Federal Power Act.

Article 408. *Columbia River Basin Fish and Wildlife Program.* The Commission reserves the authority to order, upon its own motion or upon the recommendation of federal and state fish and wildlife agencies, affected Indian Tribes, or the Northwest Power and Conservation Council, alterations of project structures and operations to take into account to the fullest extent practicable the regional fish and wildlife program developed and amended pursuant to the Pacific Northwest Electric Power Planning and Conservation Act.

Article 409. *Wildlife and Botanical Management Plan*. The licensee shall implement the Wildlife and Botanical Management Plan filed May 27, 2010, as Appendix E-3 of Exhibit E of the final license application, with the following additions to section 4.7, *Consultation*:

The licensee shall annually file, by May 31 of each year following license issuance, a report that documents the results of the prior year's measures and the upcoming year's proposed measures implemented pursuant to the plan. The licensee shall include with the report an updated list of sensitive species, based upon an annual review of the Washington Natural Heritage Program rare plant list.

The licensee shall also include with the report documentation of consultation with the U.S. Fish and Wildlife Service, Washington Department of Fish and Wildlife, Washington Department of Ecology, the Confederated Tribes of the Colville Reservation, and U.S. Bureau of Land Management; copies of comments and recommendations on the completed report after it has been prepared and provided to the consulted entities; and specific descriptions of how the consulted entities' comments are accommodated by the report. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the report with the Commission. If the licensee does not adopt a recommendation, the filing shall include the licensee's reasons based on project-specific information. The Commission reserves the right to require changes to project operations or facilities based on all available information and information included in the annual reports.

Article 410. *Programmatic Agreement and Historic Properties Management Plan.* The licensee shall implement the "Programmatic Agreement Among the Federal Energy Regulatory Commission, the Washington State Historic Preservation Officer, and the Confederated Tribes of the Colville Reservation Tribal Historic Preservation Officer for Managing Historic Properties That May be Affected by a License Issuing to Douglas County Public Utilities District for the Continued Operation of the Wells Hydroelectric Project in Okanogan County, Washington (FERC Project No. 2149)" executed on March 12, 2012, and including but not limited to the Historic Properties Management Plan (HPMP) for the project. In the event that the Programmatic Agreement is terminated, the licensee shall continue to implement the provisions of its approved HPMP. The Commission reserves the authority to require changes to the HPMP at any time during the term of the license.

Article 411. *Recreation Management Plan*. The licensee shall implement the Recreation Management Plan filed May 27, 2010, as Appendix E-5 of Exhibit E of the final license application, with the following addition to section 5.1.3, *Boat-in Tent Camping and Signage.*

Within 1 year of license issuance, the licensee shall also file, for Commission approval after consultation with the National Park Service; Washington State Parks and

Recreation Commission; Washington State Recreation and Conservation Office; Washington Department of Fish and Wildlife; Washington Department of Transportation; Washington Department of Ecology; cities of Brewster, Bridgeport, and Pateros; Port of Chelan County; Friends of Fort Okanogan; and Okanogan Historical Society; U.S. Department of the Interior; U.S. Bureau of Land Management; Okanogan and Douglas counties; the Confederated Tribes of the Colville Reservation, and U.S. Bureau of Indian Affairs, a supplement to the Recreation Management Plan included in Appendix E-5 of Exhibit E of the final license application that includes a map depicting the exact location where the proposed non-motorized campsite will be constructed. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the plan with the Commission for approval.

Article 412. *Project Land Use Policy*. Upon license issuance, the licensee shall implement the Land Use Policy included in Appendix E-13 of Exhibit E. If changes to the Land Use Policy are proposed in the future, the licensee shall develop a revised Land Use Policy or addendum in consultation with the National Marine Fisheries Service; U.S. Fish and Wildlife Service; Washington Department of Fish and Wildlife; Washington Department of Ecology; Washington State Historic Preservation Officer (Washington SHPO), the Confederated Tribes of the Colville Reservation; the Confederated Tribes and Bands of the Yakama Nation; U.S. Bureau of Indian Affairs; U.S. Bureau of Land Management; National Park Service; Washington State Parks and Recreation Commission; Washington State Recreation and Conservation Office; Washington Department of Transportation; cities of Brewster, Bridgeport, and Pateros; Port of Chelan County; Friends of Fort Okanogan; Okanogan Historical Society; U.S. Department of the Interior; and Okanogan and Douglas counties, and file the revised Douglas PUD Land Use Policy or addendum for Commission approval. The Commission reserves the right to require changes to any revised Douglas PUD Land Use Policy or addendum. The licensee shall allow a minimum of 30 days for the consulted entities to comment and make recommendations before filing the plan with the Commission for approval

Article 413. *Use and Occupancy.* (a) In accordance with the provisions of this article, the licensee shall have the authority to grant permission for certain types of use and occupancy of project lands and waters and to convey certain interests in project lands and waters for certain types of use and occupancy, without prior Commission approval. The licensee may exercise the authority only if the proposed use and occupancy is consistent with the purposes of protecting and enhancing the scenic, recreational, and other environmental values of the project. For those purposes, the licensee also shall have continuing responsibility to supervise and control the use and occupancies for which it grants permission, and to monitor the use of, and ensure compliance with the covenants of the instrument of conveyance for any interests that it has conveyed under this article. If a permitted use and occupancy violates any condition of this article or any other condition imposed by the licensee for protection and enhancement of the project's scenic, recreational, or other environmental values, or if a covenant or a conveyance made under

the authority of this article is violated, the licensee shall take any lawful action necessary to correct the violation. For a permitted use or occupancy, that action includes, if necessary, canceling the permission to use and occupy the project lands and waters and requiring the removal of any non-complying structures and facilities.

(b) The types of use and occupancy of project lands and waters for which the licensee may grant permission without prior Commission approval are: (1) landscape plantings; (2) non-commercial piers, landings, boat docks, or similar structures and facilities that can accommodate no more than 10 watercraft at a time and where said facility is intended to serve single-family type dwellings; (3) embankments, bulkheads, retaining walls, or similar structures for erosion control to protect the existing shoreline; and (4) food plots and other wildlife enhancement. To the extent feasible and desirable to protect and enhance the project's scenic, recreational, and other environmental values, the licensee shall require multiple use and occupancy of facilities for access to project lands or waters. The licensee shall also ensure to the satisfaction of the Commission's authorized representative that the use and occupancies for which it grants permission are maintained in good repair and comply with applicable state and local health and safety requirements. Before granting permission for construction of bulkheads or retaining walls, the licensee shall: (1) inspect the site of the proposed construction, (2) consider whether the planting of vegetation or the use of riprap would be adequate to control erosion at the site, and (3) determine if the proposed construction is needed and would not change the basic contour of the impoundment shoreline. To implement this paragraph (b), the licensee may, among other things, establish a program for issuing permits for the specified types of use and occupancy of project lands and waters, which may be subject to the payment of a reasonable fee to cover the licensee's costs of administering the permit program. The Commission reserves the right to require the licensee to file a description of its standards, guidelines, and procedures for implementing this paragraph (b) and require modification of those standards, guidelines, or procedures.

(c) The licensee may convey easements or rights-of-way across, or leases of project lands for: (1) replacement, expansion, realignment, or maintenance of bridges or roads where all necessary state and federal approvals have been obtained; (2) storm drains and water mains; (3) sewers that do not discharge into project waters; (4) minor access roads; (5) telephone, gas, and electric utility distribution lines; (6) non-project overhead electric transmission lines that do not require erection of support structures within the project boundary; (7) submarine, overhead, or underground major telephone distribution cables or major electric distribution lines (69 kilovolt or less); and (8) water intake or pumping facilities that do not extract more than one million gallons per day from a project impoundment. No later than January 31 of each year, the licensee shall file three copies of a report briefly describing for each conveyance made under this paragraph (c) during the prior calendar year, the type of interest conveyed, the location of the lands subject to the conveyance, and the nature of the use for which the interest was conveyed. If no conveyance was made during the prior calendar year, the licensee shall so inform the Commission in writing no later than January 31 of each year.

(d) The licensee may convey fee title to, easements or rights-of-way across, or leases of project lands for: (1) construction of new bridges or roads for which all necessary state and federal approvals have been obtained; (2) sewer or effluent lines that discharge into project waters for which all necessary federal and state water quality certification or permits have been obtained; (3) other pipelines that cross project lands or waters but do not discharge into project waters; (4) non-project overhead electric transmission lines that require erection of support structures within the project boundary for which all necessary federal and state approvals have been obtained; (5) private or public marinas that can accommodate no more than 10 watercraft at a time and are located at least one-half mile (measured over project waters) from any other private or public marina; (6) recreational development consistent with an approved report on recreational resources of an Exhibit E; and (7) other uses, if: (i) the amount of land conveyed for a particular use is five acres or less; (ii) all of the land conveyed is located at least 75 feet, measured horizontally, from project waters at normal surface elevation; and (iii) no more than 50 total acres of project lands for each project development are conveyed under this clause (d)(7) in any calendar year. At least 60 days before conveying any interest in project lands under this paragraph (d), the licensee must file a letter with the Commission stating its intent to convey the interest and briefly describing the type of interest and location of the lands to be conveyed (a marked Exhibit G map may be used), the nature of the proposed use, the identity of any federal or state agency official consulted, and any federal or state approvals required for the proposed use. Unless the Commission's authorized representative, within 45 days from the filing date, requires the licensee to file an application for prior approval, the licensee may convey the intended interest at the end of that period.

(e) The following additional conditions apply to any intended conveyance under paragraph (c) or (d) of this article:

(1) before conveying the interest, the licensee shall consult with federal and state fish and wildlife or recreation agencies, as appropriate, and the Washington State Historic Preservation Officer;

(2) before conveying the interest, the licensee shall determine that the proposed use of the lands to be conveyed is not inconsistent with any approved report on recreational resources of an Exhibit E or if the project does not have an approved report on recreational resources, that the lands to be conveyed do not have recreational value;

(3) the instrument of conveyance must include the following covenants running with the land: (i) the use of the lands conveyed shall not endanger health, create a nuisance, or otherwise be incompatible with overall project recreational use; (ii) the grantee shall take all reasonable precautions to ensure that the construction, operation, and maintenance of structures or facilities on the conveyed lands will occur in a manner

that will protect the scenic, recreational, and environmental values of the project; and (iii) the grantee shall not unduly restrict public access to project waters.

(4) The Commission reserves the right to require the licensee to take reasonable remedial action to correct any violation of the terms and conditions of this article, for the protection and enhancement of the project's scenic, recreational, and other environmental values.

(f) The conveyance of an interest in project lands under this article does not in itself change the project boundaries. The project boundaries may be changed to exclude land conveyed under this article only upon approval of revised Exhibit G drawings (project boundary maps) reflecting exclusion of that land. Lands conveyed under this article will be excluded from the project only upon a determination that the lands are not necessary for project purposes, such as operation and maintenance, flowage, recreation, public access, protection of environmental resources, and shoreline control, including shoreline aesthetic values. Absent extraordinary circumstances, proposals to exclude lands conveyed under this article from the project shall be consolidated for consideration when revised Exhibit G drawings would be filed for approval for other purposes.

(g) The authority granted to the licensee under this article shall not apply to any part of the public lands and reservations of the United States included within the project boundary.

(K) The licensee shall serve copies of any Commission filing required by this order on any entity specified in the order to be consulted on matters relating to that filing. Proof of service on these entities must accompany the filing with the Commission.

(L) This order constitutes final agency action. Any party may file a request for rehearing of this order within 30 days from the date of its issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and section 385.713 of the Commission's regulations, 18 C.F.R. § 385.713 (2012). The filing of a request for rehearing does not operate as a stay of the effective date of this license or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Jeff C. Wright
Director
Office of Energy Projects

FORM L-5
(October 1975)

FEDERAL ENERGY REGULATORY COMMISSION

TERMS AND CONDITIONS OF LICENSE FOR CONSTRUCTED MAJOR PROJECT AFFECTING NAVIGABLE WATERS AND LANDS OF THE UNITED STATES

Article 1. The entire project, as described in this order of the Commission, shall be subject to all of the provisions, terms, and conditions of the license.

Article 2. No substantial change shall be made in the maps, plans, specifications, and statements described and designated as exhibits and approved by the Commission in its order as a part of the license until such change shall have been approved by the Commission: Provided, however, That if the Licensee or the Commission deems it necessary or desirable that said approved exhibits, or any of them, be changed, there shall be submitted to the Commission for approval a revised, or additional exhibit or exhibits covering the proposed changes which, upon approval by the Commission, shall become a part of the license and shall supersede, in whole or in part, such exhibit or exhibits theretofore made a part of the license as may be specified by the Commission.

Article 3. The project area and project works shall be in substantial conformity with the approved exhibits referred to in Article 2 herein or as changed in accordance with the provisions of said article. Except when emergency shall require for the protection of navigation, life, health, or property, there shall not be made without prior approval of the Commission any substantial alteration or addition not in conformity with the approved plans to any dam or other project works under the license or any substantial use of project lands and waters not authorized herein; and any emergency alteration, addition, or use so made shall thereafter be subject to such modification and change as the Commission may direct. Minor changes in project works, or in uses of project lands and waters, or divergence from such approved exhibits may be made if such changes will not result in a decrease in efficiency, in a material increase in cost, in an adverse environmental impact, or in impairment of the general scheme of development; but any of such minor changes made without the prior approval of the Commission, which in its judgment have produced or will produce any of such results, shall be subject to such alteration as the Commission may direct.

Article 4. The project, including its operation and maintenance and any work incidental to additions or alterations authorized by the Commission, whether or not conducted upon lands of the United States, shall be subject to the inspection and supervision of the Regional Engineer, Federal Energy Regulatory Commission, in the region wherein the project is located, or of such other officer or agent as the Commission may designate, who shall be the authorized representative of the

Commission for such purposes. The Licensee shall cooperate fully with said representative and shall furnish him such information as he may require concerning the operation and maintenance of the project, and any such alterations thereto, and shall notify him of the date upon which work with respect to any alteration will begin, as far in advance thereof as said representative may reasonably specify, and shall notify him promptly in writing of any suspension of work for a period of more than one week, and of its resumption and completion. The Licensee shall submit to said representative a detailed program of inspection by the Licensee that will provide for an adequate and qualified inspection force for construction of any such alterations to the project. Construction of said alterations or any feature thereof shall not be initiated until the program of inspection for the alterations or any feature thereof has been approved by said representative. The Licensee shall allow said representative and other officers or employees of the United States, showing proper credentials, free and unrestricted access to, through, and across the project lands and project works in the performance of their official duties. The Licensee shall comply with such rules and regulations of general or special applicability as the Commission may prescribe from time to time for the protection of life, health, or property.

Article 5. The Licensee, within five years from the date of issuance of the license, shall acquire title in fee or the right to use in perpetuity all lands, other than lands of the United States, necessary or appropriate for the construction maintenance, and operation of the project. The Licensee or its successors and assigns shall, during the period of the license, retain the possession of all project property covered by the license as issued or as later amended, including the project area, the project works, and all franchises, easements, water rights, and rights or occupancy and use; and none of such properties shall be voluntarily sold, leased, transferred, abandoned, or otherwise disposed of without the prior written approval of the Commission, except that the Licensee may lease or otherwise dispose of interests in project lands or property without specific written approval of the Commission pursuant to the then current regulations of the Commission. The provisions of this article are not intended to prevent the abandonment or the retirement from service of structures, equipment, or other project works in connection with replacements thereof when they become obsolete, inadequate, or inefficient for further service due to wear and tear; and mortgage or trust deeds or judicial sales made thereunder, or tax sales, shall not be deemed voluntary transfers within the meaning of this article.

Article 6. In the event the project is taken over by the United States upon the termination of the license as provided in Section 14 of the Federal Power Act, or is transferred to a new licensee or to a nonpower licensee under the provisions of Section 15 of said Act, the Licensee, its successors and assigns shall be responsible for, and shall make good any defect of title to, or of right of occupancy and use in, any of such project property that is necessary or appropriate or valuable and serviceable in the maintenance and operation of the project, and shall pay and discharge, or shall assume responsibility

for payment and discharge of, all liens or encumbrances upon the project or project property created by the Licensee or created or incurred after the issuance of the license: Provided, That the provisions of this article are not intended to require the Licensee, for the purpose of transferring the project to the United States or to a new licensee, to acquire any different title to, or right of occupancy and use in, any of such project property than was necessary to acquire for its own purposes as the Licensee.

Article 7. The actual legitimate original cost of the project, and of any addition thereto or betterment thereof, shall be determined by the Commission in accordance with the Federal Power Act and the Commission's Rules and Regulations thereunder.

Article 8. The Licensee shall install and thereafter maintain gages and stream-gaging stations for the purpose of determining the stage and flow of the stream or streams on which the project is located, the amount of water held in and withdrawn from storage, and the effective head on the turbines; shall provide for the required reading of such gages and for the adequate rating of such stations; and shall install and maintain standard meters adequate for the determination of the amount of electric energy generated by the project works. The number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, shall at all times be satisfactory to the Commission or its authorized representative. The Commission reserves the right, after notice and opportunity for hearing, to require such alterations in the number, character, and location of gages, meters, or other measuring devices, and the method of operation thereof, as are necessary to secure adequate determinations. The installation of gages, the rating of said stream or streams, and the determination of the flow thereof, shall be under the supervision of, or in cooperation with, the District Engineer of the United States Geological Survey having charge of stream-gaging operations in the region of the project, and the Licensee shall advance to the United States Geological Survey the amount of funds estimated to be necessary for such supervision, or cooperation for such periods as may mutually agreed upon. The Licensee shall keep accurate and sufficient records of the foregoing determinations to the satisfaction of the Commission, and shall make return of such records annually at such time and in such form as the Commission may prescribe.

Article 9. The Licensee shall, after notice and opportunity for hearing, install additional capacity or make other changes in the project as directed by the Commission, to the extent that it is economically sound and in the public interest to do so.

Article 10. The Licensee shall, after notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with such other projects or power systems and in such manner as the Commission any direct in the interest of power and other beneficial public uses of water resources, and on such conditions concerning the equitable sharing of benefits by the Licensee as the Commission may order.

Article 11. Whenever the Licensee is directly benefited by the construction work of another licensee, a permittee, or the United States on a storage reservoir or other headwater improvement, the Licensee shall reimburse the owner of the headwater improvement for such part of the annual charges for interest, maintenance, and depreciation thereof as the Commission shall determine to be equitable, and shall pay to the United States the cost of making such determination as fixed by the Commission. For benefits provided by a storage reservoir or other headwater improvement of the United states, the Licensee shall pay to the Commission the amounts for which it is billed from time to time for such headwater benefits and for the cost of making the determinations pursuant to the then current regulations of the Commission under the Federal Power Act.

Article 12. The United States specifically retains and safeguards the right to use water in such amount, to be determined by the Secretary of the Army, as may be necessary for the purposes of navigation on the navigable waterway affected; and the operations of the Licensee, so far as they affect the use, storage and discharge from storage of waters affected by the license, shall at all times be controlled by such reasonable rules and regulations as the Secretary of the Army may prescribe in the interest of navigation, and as the Commission my prescribe for the protection of life, health, and property, and in the interest of the fullest practicable conservation and utilization of such waters for power purposes and for other beneficial public uses, including recreational purposes, and the Licensee shall release water from the project reservoir at such rate in cubic feet per second, or such volume in acre-feet per specified period of time, as the Secretary of the Army may prescribe in the interest of navigation, or as the Commission may prescribe for the other purposes hereinbefore mentioned.

Article 13. On the application of any person, association, corporation, Federal agency, State or municipality, the Licensee shall permit such reasonable use of its reservoir or other project properties, including works, lands and water rights, or parts thereof, as may be ordered by the Commission, after notice and opportunity for hearing, in the interests of comprehensive development of the waterway or waterways involved and the conservation and utilization of the water resources of the region for water supply or for the purposes of steam-electric, irrigation, industrial, municipal or similar uses. The Licensee shall receive reasonable compensation for use of its reservoir or other project properties or parts thereof for such purposes, to include at least full reimbursement for any damages or expenses which the joint use causes the Licensee to incur. Any such compensation shall be fixed by the Commission either by approval of an agreement between the Licensee and the party or parties benefiting or after notice and opportunity for hearing. Applications shall contain information in sufficient detail to afford a full understanding of the proposed use, including satisfactory evidence that the applicant possesses necessary water rights pursuant to applicable State law, or a showing of cause why such evidence cannot concurrently be submitted, and a statement as to the relationship of the proposed use to any State or municipal plans or orders which may have been adopted with respect to the use of such waters.

Article 14. In the construction or maintenance of the project works, the Licensee shall place and maintain suitable structures and devices to reduce to a reasonable degree the liability of contact between its transmission lines and telegraph, telephone and other signal wires or power transmission lines constructed prior to its transmission lines and not owned by the Licensee, and shall also place and maintain suitable structures and devices to reduce to a reasonable degree the liability of any structures or wires falling or obstructing traffic or endangering life. None of the provisions of this article are intended to relieve the Licensee from any responsibility or requirement which may be imposed by any other lawful authority for avoiding or eliminating inductive interference.

Article 15. The Licensee shall, for the conservation and development of fish and wildlife resources, construct, maintain, and operate, or arrange for the construction, maintenance, and operation of such reasonable facilities, and comply with such reasonable modifications of the project structures and operation, as may be ordered by the Commission upon its own motion or upon the recommendation of the Secretary of the Interior or the fish and wildlife agency or agencies of any State in which the project or a part thereof is located, after notice and opportunity for hearing.

Article 16. Whenever the United States shall desire, in connection with the project, to construct fish and wildlife facilities or to improve the existing fish and wildlife facilities at its own expense, the Licensee shall permit the United States or its designated agency to use, free of cost, such of the Licensee's lands and interests in lands, reservoirs, waterways and project works as may be reasonably required to complete such facilities or such improvements thereof. In addition, after notice and opportunity for hearing, the Licensee shall modify the project operation as may be reasonably prescribed by the Commission in order to permit the maintenance and operation of the fish and wildlife facilities constructed or improved by the United States under the provisions of this article. This article shall not be interpreted to place any obligation on the United States to construct or improve fish and wildlife facilities or to relieve the Licensee of any obligation under this license.

Article 17. The Licensee shall construct, maintain, and operate, or shall arrange for the construction, maintenance, and operation of such reasonable recreational facilities, including modifications thereto, such as access roads, wharves, launching ramps, beaches, picnic and camping areas, sanitary facilities, and utilities, giving consideration to the needs of the physically handicapped, and shall comply with such reasonable modifications of the project, as may be prescribed hereafter by the Commission during the term of this license upon its own motion or upon the recommendation of the Secretary of the Interior or other interested Federal or State agencies, after notice and opportunity for hearing.

Article 18. So far as is consistent with proper operation of the project, the Licensee shall allow the public free access, to a reasonable extent, to project waters and

adjacent project lands owned by the Licensee for the purpose of full public utilization of such lands and waters for navigation and for outdoor recreational purposes, including fishing and hunting: Provided, That the Licensee may reserve from public access such portions of the project waters, adjacent lands, and project facilities as may be necessary for the protection of life, health, and property.

Article 19. In the construction, maintenance, or operation of the project, the Licensee shall be responsible for, and shall take reasonable measures to prevent, soil erosion on lands adjacent to streams or other waters, stream sedimentation, and any form of water or air pollution. The Commission, upon request or upon its own motion, may order the Licensee to take such measures as the Commission finds to be necessary for these purposes, after notice and opportunity for hearing.

Article 20. The Licensee shall clear and keep clear to an adequate width lands along open conduits and shall dispose of all temporary structures, unused timber, brush, refuse, or other material unnecessary for the purposes of the project which results from the clearing of lands or from the maintenance or alteration of the project works. In addition, all trees along the periphery of project reservoirs which may die during operations of the project shall be removed. All clearing of the lands and disposal of the unnecessary material shall be done with due diligence and to the satisfaction of the authorized representative of the Commission and in accordance with appropriate Federal, State, and local statutes and regulations.

Article 21. Material may be dredged or excavated from, or placed as fill in, project lands and/or waters only in the prosecution of work specifically authorized under the license; in the maintenance of the project; or after obtaining Commission approval, as appropriate. Any such material shall be removed and/or deposited in such manner as to reasonably preserve the environmental values of the project and so as not to interfere with traffic on land or water. Dredging and filling in a navigable water of the United States shall also be done to the satisfaction of the District Engineer, Department of the Army, in charge of the locality.

Article 22. Whenever the United States shall desire to construct, complete, or improve navigation facilities in connection with the project, the Licensee shall convey to the United States, free of cost, such of its lands and rights-of-way and such rights of passage through its dams or other structures, and shall permit such control of its pools, as may be required to complete and maintain such navigation facilities.

Article 23. The operation of any navigation facilities which may be constructed as a part of, or in connection with, any dam or diversion structure constituting a part of the project works shall at all times be controlled by such reasonable rules and regulations in the interest of navigation, including control of the level of the pool caused by such dam or diversion structure, as may be made from time to time by the Secretary of the Army.

Article 24. The Licensee shall furnish power free of cost to the United States for the operation and maintenance of navigation facilities in the vicinity of the project at the voltage and frequency required by such facilities and at a point adjacent thereto, whether said facilities are constructed by the Licensee or by the United States.

Article 25. The Licensee shall construct, maintain, and operate at its own expense such lights and other signals for the protection of navigation as may be directed by the Secretary of the Department in which the Coast Guard is operating.

Article 26. Timber on lands of the United States cut, used, or destroyed in the construction and maintenance of the project works, or in the clearing of said lands, shall be paid for, and the resulting slash and debris disposed of, in accordance with the requirements of the agency of the United States having jurisdiction over said lands. Payment for merchantable timber shall be at current stumpage rates, and payment for young growth timber below merchantable size shall be at current damage appraisal values. However, the agency of the United States having jurisdiction may sell or dispose of the merchantable timber to others than the Licensee: Provided, That timber so sold or disposed of shall be cut and removed from the area prior to, or without undue interference with, clearing operations of the Licensee and in coordination with the Licensee's project construction schedules. Such sale or disposal to others shall not relieve the Licensee of responsibility for the clearing and disposal of all slash and debris from project lands.

Article 27. The Licensee shall do everything reasonably within its power, and shall require its employees, contractors, and employees of contractors to do everything reasonably within their power, both independently and upon the request of officers of the agency concerned, to prevent, to make advance preparations for suppression of, and to suppress fires on the lands to be occupied or used under the license. The Licensee shall be liable for and shall pay the costs incurred by the United States in suppressing fires caused from the construction, operation, or maintenance of the project works or of the works appurtenant or accessory thereto under the license.

Article 28. The Licensee shall interpose no objection to, and shall in no way prevent, the use by the agency of the United States having jurisdiction over the lands of the United States affected, or by persons or corporations occupying lands of the United States under permit, of water for fire suppression from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license, or the use by said parties of water for sanitary and domestic purposes from any stream, conduit, or body of water, natural or artificial, used by the Licensee in the operation of the project works covered by the license.

Article 29. The Licensee shall be liable for injury to, or destruction of, any buildings, bridges, roads, trails, lands, or other property of the United States, occasioned by the construction, maintenance, or operation of the project works or of the works

appurtenant or accessory thereto under the license. Arrangements to meet such liability, either by compensation for such injury or destruction, or by reconstruction or repair of damaged property, or otherwise, shall be made with the appropriate department or agency of the United States.

Article 30. The Licensee shall allow any agency of the United States, without charge, to construct or permit to be constructed on, through, and across those project lands which are lands of the United States such conduits, chutes, ditches, railroads, roads, trails, telephone and power lines, and other routes or means of transportation and communication as are not inconsistent with the enjoyment of said lands by the Licensee for the purposes of the license. This license shall not be construed as conferring upon the Licensee any right of use, occupancy, or enjoyment of the lands of the United States other than for the construction, operation, and maintenance of the project as stated in the license.

Article 31. In the construction and maintenance of the project, the location and standards of roads and trails on lands of the United States and other uses of lands of the United States, including the location and condition of quarries, borrow pits, and spoil disposal areas, shall be subject to the approval of the department or agency of the United States having supervision over the lands involved.

Article 32. The Licensee shall make provision, or shall bear the reasonable cost, as determined by the agency of the United States affected, of making provision for avoiding inductive interference between any project transmission line or other project facility constructed, operated, or maintained under the license, and any radio installation, telephone line, or other communication facility installed or constructed before or after construction of such project transmission line or other project facility and owned, operated, or used by such agency of the United States in administering the lands under its jurisdiction.

Article 33. The Licensee shall make use of the Commission's guidelines and other recognized guidelines for treatment of transmission line rights-of-way, and shall clear such portions of transmission line rights-of-way across lands of the United States as are designated by the officer of the United States in charge of the lands; shall keep the areas so designated clear of new growth, all refuse, and inflammable material to the satisfaction of such officer; shall trim all branches of trees in contact with or liable to contact the transmission lines; shall cut and remove all dead or leaning trees which might fall in contact with the transmission lines; and shall take such other precautions against fire as may be required by such officer. No fires for the burning of waste material shall be set except with the prior written consent of the officer of the United States in charge of the lands as to time and place.

Article 34. The Licensee shall cooperate with the United States in the disposal by

the United States, under the Act of July 31, 1947, 61 Stat. 681, as amended (30 U.S.C. sec. 601, et seq.), of mineral and vegetative materials from lands of the United States occupied by the project or any part thereof: Provided, That such disposal has been authorized by the Commission and that it does not unreasonably interfere with the occupancy of such lands by the Licensee for the purposes of the license: Provided further, That in the event of disagreement, any question of unreasonable interference shall be determined by the Commission after notice and opportunity for hearing.

Article 35. If the Licensee shall cause or suffer essential project property to be removed or destroyed or to become unfit for use, without adequate replacement, or shall abandon or discontinue good faith operation of the project or refuse or neglect to comply with the terms of the license and the lawful orders of the Commission mailed to the record address of the Licensee or its agent, the Commission will deem it to be the intent of the Licensee to surrender the license. The Commission, after notice and opportunity for hearing, may require the Licensee to remove any or all structures, equipment and power lines within the project boundary and to take any such other action necessary to restore the project waters, lands, and facilities remaining within the project boundary to a condition satisfactory to the United States agency having jurisdiction over its lands or the Commission's authorized representative, as appropriate, or to provide for the continued operation and maintenance of nonpower facilities and fulfill such other obligations under the license as the Commission may prescribe. In addition, the Commission in its discretion, after notice and opportunity for hearing, may also agree to the surrender of the license when the Commission, for the reasons recited herein, deems it to be the intent of the Licensee to surrender the license.

Article 36. The right of the Licensee and of its successors and assigns to use or occupy waters over which the United States has jurisdiction, or lands of the United States under the license, for the purpose of maintaining the project works or otherwise, shall absolutely cease at the end of the license period, unless the Licensee has obtained a new license pursuant to the then existing laws and regulations, or an annual license under the terms and conditions of this license.

Article 37. The terms and conditions expressly set forth in the license shall not be construed as impairing any terms and conditions of the Federal Power Act which are not expressly set forth herein.

APPENDIX A

WATER QUALITY CERTIFICATE CONDITIONS FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 ISSUED BY WASHINGTON DEPARTMENT OF ECOLOGY, ORDER NO. 8981, FEBRUARY 27, 2012

6.0 Water Quality Certification Conditions

In view of the foregoing and in accordance with Section 401 of the Clean Water Act (33 USC 1341), RCW 90.48.260 and Chapter 173-20lA, Ecology finds reasonable assurance that the operation of the Wells Project pursuant to the proposed new license will comply with state and federal water quality standards and other appropriate requirements of state law provided the following conditions are met. Implementation of the measures, the compliance schedule and adaptive management strategy contained in this Order will result in the attainment and compliance with state and federal water quality standards and other appropriate requirements of state law provided the following conditions are met. Accordingly, through this Order issued and enforceable under RCW 90.48, Ecology grants Section 401 Water Quality Certification to the Licensee, Douglas County Public Utility District No. 1 for the Wells hydroelectric project, (FERC No. 2149) subject to the following conditions. This Order will hereafter be referred to as the "Certification".

6.1 General Conditions

The Project shall comply with all water quality standards (currently codified in WAC 173-201A), ground water standards (currently codified in WAC 173-200), and sediment quality standards (currently codified in WAC 173-204) and other appropriate requirements of state law that are related to compliance with such standards.

1) In the event of changes in or amendments to the state water quality, ground water, or sediment standards changes in or amendments to the state Water Pollution Control Act (RCW 90.48) or changes in or amendments to the Federal Clean Water Act, such provisions, standards, criteria or requirements shall apply to the Project and any attendant agreements, orders, permits, to the fullest extent permitted by law.

2) Discharge of any solid or liquid waste to the waters of the State of Washington without prior approval from Ecology is prohibited.

3) Douglas PUD shall consult with Ecology before it undertakes any change to the Project or Project operations that might significantly and adversely affect compliance with any applicable water quality standard (including designated uses) or other appropriate requirement of state law. If, following such consultation, Ecology determines that such change would violate state water

quality standards or other appropriate requirements of state law, Ecology reserves the right to condition or deny such Project change. Ecology will operate in accordance with the dispute resolution process contained in the ASA [Aquatic Settlement Agreement], provided such agreement still exists and Ecology is still a party to the agreement.

4) This Certification does not exempt compliance with other statutes and codes administered by federal, state and local agencies.

5) Ecology will administer this Certification consistent with the ASA, provided such agreement still exists and Ecology is still a party to the agreement. Any provisions of this Certification that incorporate the substantive obligations of the ASA shall continue to apply even if the ASA ceases to exist, or if FERC fails to fully incorporate any provisions of the ASA in the Project license, unless otherwise ordered by Ecology. However, if a conflict or inconsistency exists or arises between this Certification and the ASA or any part thereof that is incorporated in this Certification, the terms of this Certification shall govern, unless Ecology directs otherwise.

6) Ecology retains the right to modify schedules and deadlines provided under this Certification or provisions of the Management Plans that it incorporates.

7) Ecology retains the right to require additional monitoring, studies, or measures if it determines that there is a likelihood or probability that violations of water quality standards or other appropriate requirements of state law have or may occur, or insufficient information exists to make such a determination.

8) Ecology reserves the right to amend this Certification by Administrative Order if it determines that the provisions hereof are no longer adequate to provide reasonable assurance of compliance with applicable water quality standards or other appropriate requirements of state law. Such determination shall be based upon provisions in the new FERC license or new information or changes in: (i) the construction or operation of the Project; (ii) characteristics of the water; (iii) water quality criteria or standards; (iv) Total Maximum Daily Load (TMDL) requirements; (v) effluent limitations; or (vi) other applicable requirement of state law. Amendments of this Certification shall take effect immediately upon issuance, unless otherwise provided in the order.

9) Ecology reserves the right to issue administrative orders, assess or seek penalties under state or federal law, and to initiate legal actions in any court or forum of competent jurisdiction for the purposes of enforcing the requirements of this Certification or applicable state or federal laws.

10) The conditions of this Certification should not be construed to prevent or prohibit Douglas PUD from either voluntarily or in response to legal requirements imposed by a court, the FERC, or any other body with competent jurisdiction, taking actions which will provide a greater level of protection, mitigation or enhancement of water quality or of existing or designated uses.

11) If five or more years elapse between the date that this Certification is issued and the date of issuance of the New License for the Project, this Certification shall be deemed to have been denied at such time and Douglas PUD shall send Ecology an updated 401 application that reflects then current conditions, regulations and technologies. This provision should not be construed to otherwise limit the reserved authority of Ecology to deny, amend or correct the Certification before or after the issuance of the New License.

12) All documents required under this Certification to be submitted to Ecology shall be submitted to Washington State Department of Ecology, Central Regional Office, Water Quality Program, Section Manager.

13) Copies of this Certification and associated permits, licenses, approvals and other documents shall be kept on site and made readily available for reference by Douglas PUD, its contractors and consultants, and by Ecology.

14) Douglas PUD shall allow Ecology access to inspect the Project and Project records required by this Certification for the purpose of monitoring compliance with the conditions of this Certification. Access will occur after reasonable notice, except in emergency circumstances.

15) Douglas PUD shall, upon request by Ecology, fully respond to all reasonable requests for materials to assist Ecology in making determinations under this Certification and any resulting rulemaking or other process.

16) If an action required under or pursuant to this Certification requires as a matter of federal law that the FERC approve the action before it may be undertaken, Douglas PUD shall not be considered in violation of such requirements to the extent that FERC refuses to provide such approval, provided that Douglas PUD diligently seeks such approval and so notifies Ecology.

17) The reservations contained in this Certification do not preclude or limit any right of Douglas PUD to contest the validity of any such reservation in connection with any order or any other action taken by Ecology pursuant to such reservation.

18) All information prepared or collected as a requirement of this Certification (e.g., plans, reports, monitoring results, meeting minutes, and data) shall be made available to the public on Douglas PUD's website or by another readily accessible means. Where data or quantitative analysis is involved, it shall be provided in a format that allows others to efficiently validate and analyze data and results.

19) Where this certification refers to "reasonable and feasible" actions or measures, Ecology retains the authority to ultimately determine if an action or measure qualifies as "reasonable and feasible."

20) Per RCW 90.48.422(3), Douglas PUD shall be required to mitigate or remedy a water quality violation or problem only to the extent that there is substantial evidence the project has caused such violation or problem.

21) All conditions in this Certification apply for the life of the license and any subsequent annual licenses that may be required, unless explicitly stated otherwise in this Certification or modified by a subsequent order by Ecology.

6.2 Aquatic Settlement Agreement

Douglas PUD shall operate the Project in compliance with the ASA, including the six Aquatic Resource Management Plans and their respective Goals and Objectives and Protection, Mitigation and Enhancement Measures (PMEs).

Ecology expects that the measures and processes required in this Certification will protect aquatic life as required under state law and the Clean Water Act. In the event that the ASA, or any Aquatic Resource Management Plan fails, or Ecology determines there is substantial likelihood of failure, to adequately protect, in a timely manner, existing or designated uses of water quality, Ecology reserves the right to require such changes including, but not limited to, Goals and Objectives, PMEs, or any operation or physical structures, as it determines necessary to protect these uses or water quality. In taking such actions, Ecology will operate in accordance with the dispute resolution process contained in the ASA, provided such agreement still exists and Ecology is still a party to the agreement.

For purposes of this Certification, the Goals and Objectives represent important steps toward meeting the designated uses of a water body. They serve as quantifiable goals for moving toward attaining full support of designated uses. They are not intended to serve as a surrogate for the requirement to support and protect designated uses of the waters.

Ecology reserves the right to modify the processes or decisions described herein, including timeframes. If timely progress is not made or plans or reports are not timely submitted, Ecology reserves the right to impose penalties.

1) Aquatic Settlement Work Group

The ASA requires the PUD to convene an Aquatic Settlement Work Group (ASWG) that is composed of representatives of each party to the ASA. The purpose of the ASWG is to be the primary forum for consultation and coordination among the PUD and federal, state and tribal parties in connection with implementing the ASA and its six aquatic resource management plans. Douglas PUD shall provide for the meeting space, a facilitator, etc., as described in the ASA. If consensus cannot be reached in accordance with the procedures in the ASA, or if decisions of the ASWG conflict with this Certification or state law, or if the ASWG ceases to exist, decisions shall be made by or be subject to approval by Ecology.

2) Adaptive Management

This Certification requires the use of an Adaptive Management process where necessary to meet State water quality standards through the term of the License. As used in this Certification, Adaptive Management means an iterative and rigorous process used to achieve the goals and objectives. It is intended to improve the management of aquatic resources affected by the Project in order to achieve the Goals and Objectives of the Aquatic Resource Management Plans and water quality standards as effectively and efficiently as possible.

Ecology expects the adaptive management processes contained in this Certification and in the Aquatic Resource Management Plans will be adequate to protect aquatic life as required under state law and the Clean Water Act. It is possible that during the course of the new operating license, there may be instances where the measures found in individual management plans may need to be modified. In those instances, "adaptive management" will be used to achieve the Goals and Objectives.

For purposes of this Certification, Adaptive Management involves the following steps:

a) Develop initial (or, in subsequent rounds, update) hypotheses regarding any potential Project impacts and potential protection or mitigation measures;

b) Complete studies to determine whether the hypothesized impacts are valid, and if valid, quantify the impact resulting from the Project;

c) If the hypothesized impact is validated and quantified, then the ASWG shall identify (or, in subsequent rounds, update) appropriate goals and objectives and implementing measures;

d) Develop and implement reasonable and appropriate measures to avoid,

minimize or mitigate the identified Project impacts in accordance with an established schedule;

e) Develop and implement monitoring and evaluation methodologies for determining whether the Goals and Objectives have been achieved;

f) Should the measures be successful at mitigating or minimizing Project impact(s), then periodic monitoring shall take place to confirm that such Goals and Objectives continue to be achieved;

g) Should the implemented measures fail to achieved the Goals and Objectives over a reasonable time frame, then Douglas PUD shall develop and the ASWG shall evaluate additional or revised measures, including those previously considered in the six Aquatic Resource Management Plans, and Douglas PUD shall implement any additional or revised appropriate and reasonable measures, or explain why such Goals and Objectives cannot be achieved;

h) If such Goals and Objectives have not been achieved over a reasonable time frame, then the ASWG may reevaluate and revise such Goals and Objectives.

Parts of steps (a) through (e) have already been developed as part of the Relicensing process and are included in the six Aquatic Resource Management Plans. The reference Goals and Objectives are identified in Section 3 of the Aquatic Resource Management Plans (Plans). The implementation measures are contained in Section 4 of the Plans. These Goals and Objectives and implementation measures are incorporated as part of this Certification and shall be implemented by Douglas PUD. The remaining steps shall be implemented through the course of the License, in accordance with the Plans or as determined by the ASWG and Ecology.

6.3 Anadromous Salmonids

Douglas PUD shall meet the requirements of the Wells HCP in order to protect the Plan species (spring and summer/fall Chinook, steelhead, sockeye and Coho). This involves collaboration by Douglas PUD with the responsible agencies and tribes through the Wells HCP and with members of the ASWG. However, in the event of a perceived conflict between the HCP and this Certification, it is presumed that the responsible agencies, including Ecology, shall work together to obtain a solution that best meets the needs of all species involved, in accordance with the requirements of the Clean Water Act and the Endangered Species Act.

6.4 Aquatic Resource Management Plans - General Requirements

1) Douglas PUD shall implement the Goals and Objectives as identified in Section 3 of each Plan, and all of the protection, mitigation, and enhancement measures (PMEs) that are contained in Section 4 of each Plan.

2) Each Plan includes an implementation schedule that was based on the best information available at the time the Plan was developed. As new information becomes available, the Goals and Objectives and PMEs may be adjusted through consultation with the ASWG, in accordance with Section 6.2 of this Certification.

3) Douglas PUD shall maintain current versions of the Plans on the PUD's website and they shall be made available to the public.

4) Douglas PUD shall provide a draft annual report to the ASWG summarizing the previous year's activities undertaken in accordance with each Plan. The report shall document all activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to each plan will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD shall prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

5) The final report is subject to approval by Ecology for purposes of compliance with federal and state water quality standards, including designated uses.

6.5 Bull Trout, White Sturgeon, Pacific Lamprey and Resident Fish

Douglas PUD shall implement Section 3 (Goals and Objectives) and Section 4 (PMEs) of the White Sturgeon, Bull Trout, Pacific Lamprey and Resident Fish Aquatic Resource Management Plans. Sections 3 and 4 of each of these Plans are attached hereto as Appendices A through D, respectively, and are hereby incorporated into this Certification.

6.6 Aquatic Nuisance Species (ANS)

Douglas PUD shall implement Sections 3 and 4 of the Aquatic Nuisance Species Plan. Sections 3 and 4 of this Plan are attached hereto as Appendix E and are hereby incorporated into this Certification. Additional requirements follow below:

1) Additional Monitoring Requirements. In addition to monitoring for zebra and quagga mussels, Douglas PUD shall monitor for the presence of aquatic nuisance plants (e.g., Eurasian milfoil) at public boat launches and non-native crayfish at appropriate locations within the Project area. Douglas PUD shall

monitor and report the presence of such nuisance plants and crayfish in coordination with the ASWG.

2) Education. To increase boater awareness of the dangers of spreading ANS and to educate the public regarding the methods to decrease the spread of ANS (e.g., clean the weeds off the boat and drain the live well before going to a new waterbody), Douglas PUD shall provide signage and other educational materials (e.g., pamphlets) at all boat launches, for owners of both motorized and non-motorized boats. The educational message shall be coordinated with the ASWG. Douglas PUD shall provide the pamphlets during peak boating season (May 1 – October 30) of each year. Signage shall be provided year-round.

3) Reporting. In the annual report required under section 4 of the Aquatic Nuisance Species Plan, Douglas PUD shall include information about any pending ANS problems;

4) Plan. If any new ANS are detected at levels of concern to the ASWG, and the ASWG agrees that the existence or operation of the Wells Project contributes to the introduction, spread or proliferation of the ANS, within one year following detection (and after the New License is issued), in consultation with the ASWG, Douglas PUD shall develop and begin implementation of an ANS Control and Prevention Plan (Prevention Plan) to monitor and manage invasive species within the Project boundary. The Plan shall focus on prevention by addressing the pathways for invasion of aquatic invasive flora and fauna.

6.7 Water Quality Management Plan

Douglas PUD shall implement sections 3 and 4 of the Water Quality Management Plan (WQMP), as modified below:

1) Goal and Objectives

Douglas PUD shall implement the following Goals and Objectives:

The Goal of the WQMP is to protect the quality of the surface waters affected by the Project and to ensure that Washington's water quality standards (WQS) are met.

Objective 1: Ensure that compliance with state WQS for TDG is achieved. Compliance is to be achieved within ten years of the issuance of the New License. Measures are specified to address non-attainment of standards after this time period.

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the ASWG will identify reasonable and feasible measures, which shall be implemented by Douglas PUD;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the ASWG will identify reasonable and feasible measures, which shall be implemented by Douglas PUD;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

2) Total Dissolved Gas (Objective 1)

This water quality parameter (TDG) requires a Water Quality Attainment Plan, per Section 3.0(5) above and as described in further detail in the section on Compliance, below.

Douglas PUD, in consultation with the ASWG, shall implement the following measures.

a) Gas Abatement Plan and TDG Exemption

Pursuant to WAC l73-201A-200(1)(f)(ii), and as described in Section 3.0(3) of this Certification, the TDG criteria for the Project can be adjusted to aid fish passage when the Project is operated with an approved Gas Abatement Plan (GAP).

i) Douglas PUD shall operate the Project in compliance with the GAP approved by Ecology. By February 28 of each year, Douglas PUD shall submit a GAP to Ecology for approval. Pending Ecology's approval of each subsequent GAP Douglas PUD shall continue to implement the activities identified within the previously approved plan. Douglas PUD shall submit the GAPs annually through the term of the new license unless Ecology approves a less frequent schedule or until a GAP is no longer required by Ecology.

ii) The GAP will include the Spill Operations Plan and will be accompanied by a fisheries management plan and physical and

biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

iii) It is anticipated that: (1) the TDG monitoring activities described below will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the ASA will be adequate for fish management plans, However, additional biological monitoring studies (e.g., Gas Bubble Trauma Monitoring) may be required.

b) Non-Fish Spill Season

Commencing one year after issuance of the new license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine TDG compliance with the 110% standard.

c) Monitoring and Reports

i) Douglas PUD shall maintain a TDG monitoring program at its Fixed Monitoring Station (FMS) locations in the forebay and tailrace of Wells Dam and/or at other locations as determined by Ecology, in order to monitor TDG and barometric pressure. Douglas PUD shall monitor TDG (and barometric pressure, as needed) hourly throughout the year. Data from the Wells forebay and tailrace stations shall be transmitted on a daily basis to a web-accessible database available for use by Ecology and regional fish management agencies. Douglas PUD shall maintain this monitoring program consistent with activities described in the GAP.

ii) The TDG monitoring program shall conform to the Ecology Quality Assurance Project Plan (QAPP) requirements per Section 6.7(f) of this Order and the procedures shall be at least as stringent as the quality assurance/quality control (QA/QC) calibration and monitoring procedures and protocols developed by the United States Geological Service (USGS) monitoring methodology for the Columbia River.

iii) By February 28th of each year, unless otherwise provided for in writing by Ecology, Douglas PUD shall provide an annual TDG report for Ecology's review and approval. The report shall include the results of all activities required by the GAP. In addition, the report shall describe all spills and associated TDG levels in the tailrace occurring outside the fish passage season.

d) Spill Operations

Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the GAP, using best available information to minimize the production of TDG during periods of spill. In consultation with the Wells HCP Coordinating Committee and ASWG, the spill operations plan will be reviewed and updated, as necessary.

e) Compliance Schedule.

Within one year of license issuance, Douglas PUD shall submit a Water Quality Attainment Plan (WQAP) for Ecology's review and approval. The WQAP shall include a compliance schedule to ensure compliance with water quality criteria within 10 years. The WQAP also allows time for the completion of the necessary studies or for the resolution of the issue of elevated incoming TDG through rule-making or other means. The WQAP shall be prepared in consultation with the ASWG and the HCP Coordinating Committee, and shall meet the requirements of WAC 173-201A-510(5). The WQAP shall:

i) Identify all reasonable and feasible improvements that could be used to meet TDG standards. Data on high TDG levels and flow coming into the Wells forebay and its effects on Project compliance shall be included;

ii) Contain the analytical methods that will be used to evaluate all reasonable and feasible improvements;

iii) Provide for any supplemental monitoring that is necessary to track compliance with the numeric WQS; and

iv) Include benchmarks and reporting sufficient for Ecology to track Douglas PUD's progress toward implementing this plan and achieving compliance within ten years of Ecology's approval of the plan.

v) The report of the study of reasonable and feasible improvements is due within one year of approval of the WQAP and should include the ASWG and Douglas PUD's recommendations for measures to be implemented. The report is subject to Ecology review and approval.

f) Measures to Address Non-Attainment of Standards

i) Post compliance schedule: If implementing the compliance schedule does not result in compliance with water quality standards at the time the compliance schedule expires, Douglas PUD may explore other alternative approaches available in the water quality standards, including a second compliance schedule or alternative provided in WAC 173-201A-510(5)(g).

ii) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

g) Additional Requirements

i) Minimizing Spill. The PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7QIO, as follows:

a. Minimize voluntary spill through operations, including to the extent practicable, by scheduling maintenance based on predicted flows;

b. Avoid spill by continuing to coordinate operations with upstream dams, to the extent that it reduces TDG;

c. Maximize powerhouse discharge, especially during periods of high river flows; and

d. During fish passage season, manage voluntary spill levels in real time in an effort to continue to meet TDG numeric criteria consistent with the GAP.

ii) Changes in Operation or Structure. Douglas PUD shall provide Ecology with the opportunity to review and condition any non-routine operational or structural changes affecting TDG that are not identified in this Certification. If Douglas PUD, at any point, considers modifying any of the measures identified in the spill Playbook, Douglas PUD shall immediately develop proposed alternative(s) that will produce levels of TDG equal to or less than those estimated to be produced by the measures to be replaced. These measures should be implementable in a similar timeframe and must be submitted to Ecology for review and approval prior to implementation.

iii) TDG TMDL. The Project shall be deemed in compliance with the TMDL for TDG as long as it remains in compliance with the terms

of this Certification. This Certification, including the GAPs and the WQAP, is intended to serve as the Project's portion of the Detailed Implementation Plan for the TDG TMDL.

3) Water Temperature (Objective 2)

a) Monitoring

i) Douglas PUD shall monitor water temperatures at three boundary locations of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace on an hourly basis, from April 1 to October 31.

ii) Douglas PUD shall continue to collect hourly fish ladder temperatures 24 hours a day during the upstream fish passage season (currently May 1 to November 15) at Pool No. 39 on the east ladder. Douglas PUD shall also monitor water temperatures hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

iii) Douglas PUD shall record temperature data (hourly) and transmit it on a daily basis to a web-accessible database maintained by Douglas PUD and available to Ecology, regional fish management agencies, and the public.

b) Temperature Report

Douglas PUD shall prepare an annual report of the monitoring results and analyses, in a format approved by Ecology, and submit it by April 30th of the following year.

c) Temperature TMDL Development and Implementation

i) Douglas PUD shall participate in U.S. EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the ASWG. Douglas PUD shall maintain the CE-QUAL model and temperature data from the monitoring program and make these available to EPA and other entities to assist in the development of the Columbia River temperature TMDL, upon request.

ii) When the TMDL and its implementation plan are complete and approved by EPA, Ecology anticipates that it may amend this Certification to include requirements consistent with the TMDL.

iii) If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the ASWG and other interested parties to identify reasonable and feasible measures.

iv) This plan does not exclude the option of the ASWG to consider modifying the water quality standard through a use attainability analysis or other process.

d) Measures to Address Non-Compliance

i) Douglas PUD shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the ASWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

ii) If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas PUD shall, in coordination with the ASWG and subject to approval by Ecology, take the following steps:

a. Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed;

b. After the evaluation, if Ecology determines measures are available to achieve compliance, set up a compliance schedule to attain compliance, in accordance with Section 3.0(5) (WAC 173-201A-510(5)).

c. After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

iii) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

4) Other Numeric Criteria (Objective 3)

a) Douglas PUD shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the ASWG for consideration. This includes existing or new criteria for toxic substances in water or sediments within the boundaries of the Project.

b) Ecology shall evaluate the information, and, if needed, require Douglas PUD to develop a plan to identify and address Project-related impacts, if any.

i) After the evaluation, if Ecology determines measures are available to achieve compliance, set up a compliance schedule to attain compliance, in accordance with Section 3.0(5) (WAC 173-201A-510(5)).

ii) After the evaluation, if no reasonable and feasible improvements have been identified, Douglas PUD may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

c) Ecology reserves the right to require additional measures and use all available compliance tools as appropriate.

5) Spill Prevention and Control (Objective 4)

a) Spill Prevention and Control Requirements

Douglas PUD shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. Douglas PUD shall update the Project Spill Prevention Control and Countermeasures Plan (SPCC) pursuant to FERC requirements and recommendations provided by Ecology. Douglas PUD shall comply and operate the Project with the updated version(s) of the SPCC.

b) Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of the local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake Rivers.

c) Inspections

Douglas PUD shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of assessing Spill Prevention and Control measures and compliance with this section 6.7 5(d). Following inspection, Douglas PUD shall address oil and hazardous material prevention and control issues

identified by Ecology.

d) Additional Requirements - Spill Prevention and Control

i) Discharge of oil, fuel or chemicals into state waters or onto land where such contaminants could potentially drain into state waters is prohibited.

ii) Douglas PUD shall continue to provide Ecology, Central Region Office, Spills and Water Quality Programs, with copies of its most up-to-date SPCC version. Copies of the Spill Prevention Control and Countermeasures Plan (SPCC) shall be kept on site by Douglas PUD and made readily available for reference by the PUD, its contractors and consultants, and Ecology.

iii) In the event of a discharge of oil, fuel or chemicals into state waters, or onto land where such contaminants could potentially drain into state waters, containment and clean-up efforts shall begin immediately and be completed as soon as possible, taking precedence over normal work. Clean-up shall include proper disposal of any spilled material and used clean-up materials.

iv) Spills into state waters, spills onto land where contaminants could potentially drain into state waters, and any other significant water quality impacts, shall be reported immediately to the Washington Emergency Management Division at 1-800-258-5990 and the National Response Center at 1-800-424-8802. Notification shall include a description of the nature and extent of the problem, any actions taken to correct the problem, plus any proposed changes in operations to prevent further problems.

6) Regional Forums (Objective 5)

a) Participation in Regional Water Quality Forums. Douglas PUD shall continue to participate in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project.

b) Project Operations. Douglas PUD may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for

exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

7) Water Quality Study Plans and Reports - General Requirements

a) Study Plans.

i) Douglas PUD shall prepare study plan(s) that include a quality assurance project plan(s) (QAPP) for each water quality parameter to be monitored in each plan. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

ii) Douglas PUD shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs. The initial QAPPs and any changes shall be submitted to the ASWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

b) Annual WQS Report.

i) Douglas PUD shall provide a draft annual report to the ASWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the requirements in this Order and as determined by the ASWG and Ecology. The report shall include any decisions, statements of agreement, evaluations, or changes made pursuant to this Order. If significant activity was not conducted in a given year, Douglas PUD may prepare a memorandum providing an explanation of the circumstances in lieu of an annual report. A summary of monitoring results and analyses of compliance with WQS numeric criteria will be included in an appendix(ces) to the annual report (these may be separate reports; e.g. for TDG and temperature).

ii) The results shall be provided in a format prescribed by Ecology. The report shall be subject to review and approval by Ecology. Ecology will use the monitoring results to track the project's progress toward meeting and remaining in compliance with state water quality standards.

6.8 Construction Activities

a) While the existing project is not a construction site, all development or mitigation projects proposed under relicensing must meet the following conditions.

b) For future construction activities requiring a separate 401 certification (e.g., those requiring an individual 404 permit from the Army Corps of Engineers), Douglas PUD shall comply with all conditions in that additional 401 certification.

c) All water quality criteria as specified in WAC 173-201A apply to any construction work needed to implement development or mitigation projects required under the new FERC license.

d) Unless otherwise stated in another Section 401 certification (see above), the turbidity criteria (WAC 173-201A) may be modified to allow a temporary mixing zone during and immediately after in-water or shoreline construction activities that disturb in-place sediments. A temporary turbidity mixing zone is subject to the constraints of WAC 173-201A, and is authorized only after the activity has received all other necessary local and state permits and approvals and after the implementation of appropriate best management practices (BMPs) to avoid or minimize disturbance of in-place sediments and exceedances of the turbidity criterion. The temporary turbidity mixing zone for waters with flows greater than 100 cubic feet per second (cfs) at the time of construction is 300 feet downstream of the activity causing the turbidity exceedances.

e) For all other future construction activities, a water quality protection plan (WQPP) shall be prepared and implemented for each project involving work in or near water. The WQPP shall include:

i) A copy of the Hydraulic Project Approval (HPA) per Chapter 77.55.021 RCW for the project;

ii) A description of all Best Management Practices (BMPs) to be employed for in and near-water work;

iii) A plan for sampling and monitoring during construction;

iv) A plan for implementing mitigation measures should a water quality violation occur; and

v) A written procedure for reporting any water quality violations to Ecology.

f) Douglas PUD shall submit each WQPP to Ecology for review and written approval prior to starting work.

7.0 Penalties and Appeal

Any person who fails to comply with any provision of this Certification shall be liable for criminal and civil penalties as provided under state and/or federal law.

You have a right to appeal this Order to the Pollution Control Hearing Board (PCHB) within 30 days of the date of receipt of this Order. The appeal process is governed by Chapter 43.21B RCW and Chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2).

To appeal you must do the following within 30 days of the date of receipt of this Final Order:

File your appeal and a copy of this Order with the PCHB (see addresses below). Filing means actual receipt by the PCHB during regular business hours.

Serve a copy of your appeal and this Order on Ecology in paper form by mail or in person (see addresses below.) E-mail is not accepted.

You must also comply with other applicable requirements in Chapter 43.21B RCW and Chapter 371-08 WAC.

APPENDIX B

U.S. DEPARTMENT OF COMMERCE, NATIONAL MARINE FISHERIES SERVICE FISHWAY PRESCRIPTION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED JULY 21, 2011

Article 1. Prescription for Incorporating the Anadromous Fish Agreement and Habitat Conservation Plan into the Project License

For the protection, mitigation of damages to, and the enhancement of fishery resources the licensee shall carry out its obligations, in their entirety, as set forth in the Anadromous Fish Agreement and Habitat Conservation Plan for the Wells Hydroelectric Project No. 2149 filed with the Commission on November 24, 2003, and as approved by the Commission at 107 FERC ¶61,280 and ¶61,281.

APPENDIX C

U.S. DEPARTMENT OF INTERIOR, FISH AND WILDLIFE SERVICE FISHWAY PRESCRIPTION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED AUGUST 1, 2011

1.0 Reservation of Authority to Prescribe Fishways

Authority is reserved for the Department of the Interior (Department) to prescribe the evaluation, construction, operation, and maintenance of fishways at the Wells Hydroelectric Project, Project No. 2149, as appropriate, including measures to determine, ensure, or improve the effectiveness of such fishways, pursuant to Section 18 of the Federal Power Act, as amended. This reservation includes, but is not limited to, authority to prescribe fishways for spring, summer, and fall Chinook salmon, sockeye salmon, coho salmon, steelhead, bull trout, Pacific lamprey, white sturgeon, and any other fish to be managed, enhanced, protected, or restored to the mid-Columbia River during the term of the license. Pursuant to Section 9.5.2 of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (Wells AFA/HCP), such reserved fish passage authority may be exercised for Plan Species (spring, summer and fall Chinook salmon, sockeye salmon, coho salmon, and steelhead) only in the event that the Wells AFA/HCP is terminated.

2.0 General Prescriptions for Fishways

The following general prescriptions for fishways apply to the operation and maintenance of both upstream and downstream fishways at the Wells Hydroelectric Project, subject to the provisions of Section 9.5.2 of the Wells AFA/HCP and in accordance with the Wells Hydroelectric Project Aquatic Settlement Agreement (Aquatic SA), including the Bull Trout Management Plan (BTMP), Pacific Lamprey Management Plan (PLMP), and the White Sturgeon Management Plan (WSMP), and are prescribed to ensure the effectiveness of the fishways pursuant to Section 1701(b) of the National Energy Policy Act (P.L. 102-486, Title XVII, 106 Stat. 3008):

2.1 The Department reserves the authority to modify, replace or amend these prescriptions for fishways at any time before license issuance, as well as any time during the term of the license, after review of new substantial evidence in support of a change to the fishway prescription.

2.2 The U.S. Fish and Wildlife Service (FWS), pursuant to the authorities of the Department, retains the right to review and approve all documents (e.g., plans, specifications, measures, study designs, reports) developed pursuant to this Prescription prior to construction and implementation of any required measure. These approvals will be provided by the Regional

Director, FWS, Portland, OR. To facilitate this review and approval process, correspondence between the Director and the Licensee will occur through:

Assistant Project Leader
U.S. Fish and Wildlife Service
Central Washington Field Office
215 Melody Lane, Suite 119
Wenatchee, WA 98801

2.3 The Licensee shall manage the Wells Hydroelectric Project and all its associated features, including the dam, spillways, powerhouse, and reservoir, to provide effective upstream and downstream fish passage over the full range of river flows for which the project maintains operational control. The Licensee shall manage the Project's upstream and downstream fish passage facilities subject to the provisions in this Prescription and in accordance with the Licensee's AFA/HCP Adult Fish Passage Plan and Bypass Operations Plan, and with the Wells Hydroelectric Project Aquatic SA, including the BTMP, PLMP, and the WSMP.

3.0 Upstream and Downstream Fishways and Salmon and Steelhead (Appendix E-1) (Plan Species): To provide for the safe, timely, and effective upstream and downstream passage of fish at the Wells Project, the Licensee shall provide for the construction, operation, maintenance, and effectiveness monitoring of upstream and downstream fishways for Plan Species as set forth in the Wells AFA/HCP, filed with the FERC on November 24, 2003, and as approved by the Federal Energy Regulatory Commission (FERC) in 2004 at 107 FERC ¶61,280 and ¶61,281.

4.0 Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout (Article 2) (*BTMP Section 4.1.1*): The Licensee shall provide upstream passage for bull trout through the existing upstream fishways and downstream passage for bull trout through the existing downstream bypass system consistent with the AFA/HCP and Aquatic SA. Both upstream fishway facilities (located on the west and east shores) shall be operational year round with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Operation of the downstream passage facilities for bull trout shall be consistent with bypass operations for Plan Species identified in the Wells AFA/HCP.

4.1 Bull Trout Passage Performance Standard: The Licensee shall implement the upstream and downstream measures contained in the Wells Hydroelectric Project BTMP to provide safe, timely, and effective upstream

and downstream passage for adult and sub-adult bull trout at the Wells Hydroelectric Project. "Safe, timely and effective" passage shall be achieved when the Licensee has demonstrated that the survival and passage success rates for adult marked fish are greater than 95% and greater than or equal to 90%, respectively, and when passage studies demonstrate that the fishway facilities at Wells Dam do not impede the passage of bull trout. To ensure that safe, timely and effective passage at Wells Dam is maintained during the term of the new license, the Licensee shall implement the following bull trout upstream and downstream measures consistent with the BTMP.

4.2 Upstream Fishway Counts *(BTMP Section 4.1.2)*: The Licensee shall continue to conduct video monitoring in the Wells Dam fishways from May 1 through November 15 to count and provide information on the population size of upstream moving bull trout.

4.3 Sub-Adult Bull Trout Monitoring *(BTMP Section 4.2.3)*: If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Licensee shall, in consultation with the FWS, and the Wells Aquatic Settlement Agreement Work Group (Aquatic SWG), implement reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, the Licensee may modify counting activities, and shall continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity shall occur the following year of first observation of sub-adult bull trout (>10 per calendar year), in consultation with the FWS and the Aquatic SWG.

4.4 Upstream Fishway Operations Criteria *(BTMP Section 4.1.3)*: The Licensee shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP and this Prescription.

4.5 Bypass Operations Criteria *(BTMP Section 4.1.4):* The Licensee shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP and this Prescription.

4.6 Bull Trout Upstream and Downstream Passage Evaluation *(BTMP Section 4.2.1)*: The Licensee shall periodically monitor upstream and downstream passage of bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every 10 years thereafter during the new license term, the Licensee shall conduct a 1-year monitoring

study to verify continued compliance with the bull trout passage performance standard (Section 4.1 of this Prescription). These monitoring studies shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the monitoring results demonstrate continued compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then no additional actions are needed. If the monitoring results demonstrate that the Licensee is no longer in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the monitoring study will be replicated to confirm the results. If the results after 2 years of monitoring demonstrate that the Licensee is no longer in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the Licensee shall, pursuant to Section 4.8 of this Prescription, develop and implement additional measures to improve bull trout passage until compliance with the bull trout passage performance standard (Section 4.1 of this Prescription) is achieved. If the bull trout counts at Wells Dam increase more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders, bypass, or hydrocombine, then the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the Wells HCP Coordinating Committee (WCC), shall conduct a 1-year, follow-up monitoring study to verify continued compliance with the bull trout performance standard (Section 4.1 of this Prescription).

4.7 Adult Bull Trout Passage Evaluation at Brood Stock Collection Facilities (*BTMP Section 4.2.2*): The Licensee shall, beginning in year 1 of the new license, conduct a 1-year radio-telemetry evaluation to assess upstream and downstream passage of adult bull trout at the adult salmon and steelhead brood stock collection facilities associated with the Wells AFA/HCP, including but not limited to, the Twisp weir adult collection facility. The Licensee shall capture and tag up to 10 adult, migratory bull trout (>400mm) per assessment per year and use fixed receiver stations upstream and downstream of the collection facilities. Assessments shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the evaluation demonstrates that the Licensee is not in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the evaluation will be replicated to confirm the results. If the results after 2 years of evaluation demonstrate that the Licensee is not in compliance with the bull trout passage performance standard (Section 4.1 of this Prescription), then the Licensee shall develop, implement, and evaluate additional measures, in consultation with the FWS, WCC and the Aquatic SWG, until the FWS determines that the bull trout passage performance standard has been

achieved. At such time as the FWS determines the bull trout passage performance standard has been achieved, the implementation of this Condition shall be integrated into the 1-year telemetry monitoring program that is to be conducted every 10 years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.6 above.

4.8 Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified *(BTMP Section 4.3)*: If monitoring (Section 4.6 of this Prescription) identifies upstream or downstream passage problems for bull trout, the Licensee shall, in consultation with the FWS, WCC and the Aquatic SWG, identify, design, implement, and evaluate reasonable and feasible measures to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage. Study protocols and radio-telemetry assessment methodologies prescribed above in Sections 4.6 and 4.7 of this Prescription, shall be used to evaluate the effectiveness of any additional measures implemented to reduce the identified impacts to bull trout passage. Upon completion of the evaluation, the FWS and the National Marine Fisheries Service (NMFS), in consultation with the Aquatic SWG, and the WCC, will determine whether the proposed measure should be made permanent, removed, or modified.

5.0 Upstream Passage of Pacific Lamprey (Article 3): The Licensee shall implement the upstream passage measures contained in the Wells Hydroelectric Project PLMP to provide upstream passage for Pacific lamprey at the Wells Dam. Specifically, the Licensee shall implement the Pacific lamprey upstream passage measures identified in the PLMP consistent with the following:

5.1 Upstream Passage Performance Standard: The Licensee shall, in consultation with the FWS, the Aquatic SWG, and the U.S Bureau of Indian Affairs (BIA), continue to evaluate upstream Pacific lamprey passage until safe, timely and effective passage has been achieved. This "safe, timely and effective" standard will be achieved when the Licensee has demonstrated that lamprey passage is at levels at least as high as other mid-Columbia River PUD hydroelectric projects, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, until specific Pacific lamprey passage performance standards have been adopted by the FWS. At such time, the Licensee shall demonstrate compliance with the new standards.

5.1.1 Steady Progress *(PLMP Section 4.1.5)*: The Licensee shall exhibit steady progress, as agreed to by the FWS, in consultation with the Aquatic SWG and the BIA, towards achieving this Upstream Passage Performance Standard (Section 5.1 of this Prescription). Once compliance is achieved, the Licensee shall only be required to implement activities pursuant to Section 5.8, Periodic Monitoring.

5.2 Upstream Fishway Operations *(PLMP Section 4.1.1)*: The Licensee shall operate the existing upstream fishways at Wells Dam in accordance with the operation criteria for anadromous salmonids, bull trout, and Pacific lamprey as outlined in the Wells AFA/HCP and the Wells Aquatic SA, as approved and/or amended by the FWS and the NMFS in consultation with the WCC, the Aquatic SWG, and the BIA.

5.3 Salvage Activities During Ladder Maintenance Dewatering *(PLMP Section 4.1.2)*: The Licensee shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the Wells AFA/HCP. All Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the Wells AFA/HCP. Any adult lamprey that are captured during salvage activities shall be released upstream of Wells Dam, unless otherwise determined by the FWS, in consultation with the Aquatic SWG, and the BIA. The Licensee shall ensure the FWS, Aquatic SWG, and the BIA are made aware of salvage activities, and the Licensee shall also provide a summary of salvage activities in the Wells Aquatic SA annual report.

5.4 Upstream Fishway Counts for Pacific Lamprey *(PLMP Section 4.1.3)*: The Licensee shall continue to conduct annual fish passage monitoring in the Wells Dam adult fishways using the best technology commercially available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1 – November 15).

5.5 Lamprey Counts *(PLMP Section 4.1.3)*: Based upon information collected from the evaluations of fishway measures prescribed in Section 5.6 below, the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop techniques for enumerating lamprey through all upstream passage routes at Wells Dam. Potential measures to improve counting accuracy may include the development of a correction factor based upon data collected during passage evaluations (PLMP Sections 4.1.6 and 4.1.7) or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

5.6 Fishway Measures to Improve Upstream Passage for Adult Pacific Lamprey *(PLMP Section 4.1.1, Section 4.1.4, and Section 4.1.5)*: The Licensee shall, in consultation with the FWS, WCC, the Aquatic SWG, and the BIA, implement and evaluate the measures contained in Sections 4.1.1, 4.1.4, and 4.1.5 of the PLMP to achieve safe, timely and effective passage of Pacific lamprey. Measures to improve upstream passage for adult Pacific lamprey shall include the following components:

5.6.1 Upstream Passage Improvement Literature Review *(PLMP Section 4.1.4 and 4.1.5)*: The Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, adult fishway operational changes, etc.) implemented at other Columbia and Snake river hydroelectric facilities. The literature review will be conducted to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

5.6.2 Implementation of Adult Fishway Measures *(PLMP Section 4.1.5)*: The Licensee shall, in consultation with the FWS, the WCC, the Aquatic SWG and the BIA, identify, design, implement, and evaluate operational and/or structural measures as needed to achieve and maintain safe, timely and effective passage for Pacific lamprey during the new license term. Passage measures will be designed to improve passage performance for Pacific lamprey through the Wells Dam adult fishways without negatively impacting the passage performance of adult anadromous salmonids. Each measure implemented shall be evaluated by the Licensee to determine its effect on adult Pacific lamprey. All evaluations shall be designed in consultation with the FWS, the Aquatic SWG, and the BIA. Upon completion of any specific evaluation, the FWS and the NMFS, in consultation with the WCC, the Aquatic SWG and the BIA, will determine whether the proposed measure should be made permanent, removed, or modified. The specific components of these operational and structural passage measures and their schedules for implementation shall include the following:

- Adult Fishway Inspection (*PLMP Section 4.1.5)*: Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall conduct an adult fishway inspection with the FWS, the Aquatic SWG, the BIA, and regional lamprey passage experts to identify,

prioritize, and implement measures to improve adult lamprey passage and enumeration at Wells Dam. Additional inspections will be conducted by the Licensee at the request of the FWS, the Aquatic SWG, and the BIA consistent with winter dewatering operations.

- Operations Study Plan *(PLMP Section 4.1.1)*: Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the WCC, the Aquatic SWG and the BIA, the Licensee shall develop an Operations Study Plan (OS Plan) that specifically identifies operational measures to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey measures on salmon.

- Entrance Efficiency (*PLMP Section 4.1.5*): Within 1 year of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance measures intended to increase lamprey passage into the adult fishway without significantly impacting the passage of adult salmonids.

- Diffuser Gratings *(PLMP Section 4.1.5)*: Within 5 years of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that diffuser gratings within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If diffuser gratings do adversely affect passage, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, the Licensee shall develop a plan and schedule acceptable to the FWS for modifying the gratings as needed to address impacts.

- Transition Zones *(PLMP Section 4.1.5)*: Within 5 years of license issuance or as soon as practicable following consultation with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that transition zones within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If transition zones do adversely affect passage, as determined by the FWS, in consultation with the Aquatic SWG and the BIA, the Licensee shall develop a plan and schedule acceptable to the FWS for addressing the impacts.

- Ladder Traps and Exit Pools *(PLMP Section 4.1.5):* Within 5 years of license issuance or as soon as practicable following consultation

with the FWS, the Aquatic SWG, and the BIA, the Licensee shall demonstrate that lamprey ladder traps and exit pools within the adult fishways at Wells Dam do not adversely affect passage of adult Pacific lamprey. If ladder traps and/or exit pools do adversely affect passage, the Licensee shall, in consultation with FWS, the Aquatic SWG, and the BIA, develop a plan and schedule acceptable to the FWS for addressing the impacts.

5.7 Adult Pacific Lamprey Upstream Passage Evaluation *(PLMP Section 4.1.6)*: Within 5 years of license issuance or within 1 year of implementing all measures identified in Section 5.6 (whichever comes first), the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, conduct a 1-year study to verify the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If results demonstrate that passage rates at Wells Dam are below the Upstream Passage Performance Standard (Section 5.1 of this Prescription), the Licensee, shall, in consultation with the FWS, the WCC, the Aquatic SWG, and the BIA, design, evaluate and implement additional measures to improve upstream Pacific lamprey passage. The Licensee shall continue to design, evaluate and implement measures, in consultation with the FWS, the Aquatic SWG, and the BIA, until the Upstream Passage Performance Standard (Section 5.1 of this Prescription) is achieved.

5.8 Periodic Monitoring *(PLMP Section 4.1.7)*: Once adult Pacific lamprey standards have been achieved, the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, periodically monitor adult Pacific lamprey passage performance through Wells Dam adult fishways to verify continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription). Specifically, every 10 years after compliance has been achieved, or as determined necessary by the FWS in consultation with the Aquatic SWG, and the BIA, the Licensee shall implement a 1-year study to demonstrate continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription). If study results demonstrate continued compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription) then no additional actions are needed. If the results demonstrate that the Licensee is no longer in compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription), then the upstream passage study will be replicated to confirm the results. If the results after 2 years of study demonstrate that the Licensee is no longer in compliance with the Upstream Passage Performance Standard (Section 5.1 of this Prescription), the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop and implement additional measures to improve upstream

Pacific lamprey passage consistent with Sections 5.6 and 5.7 of this Prescription.

6.0 Downstream Passage of Juvenile Pacific Lamprey (Article 3) *(PLMP Section 4.2.4)*: At such time as the FWS, in consultation with the Aquatic SWG , and the BIA, determines that substantial evidence exists either at Wells Dam or at a dam with similar features or conditions (e.g., turbines, spillways, and bypass) to Wells, indicating that downstream migrating juvenile lamprey may be negatively impacted at Wells Dam, then the Licensee shall, in consultation with the FWS, the Aquatic SWG, and the BIA, develop a downstream juvenile lamprey passage study. The study shall determine whether a negative impact exists at Wells Dam, and if present, quantify the impact. Upon approval of the FWS, the Licensee shall implement the study.

If statistically valid study results indicate that Wells Dam has a substantive negative impact on downstream migrating juvenile lamprey, then the Licensee, in consultation with FWS, the WCC the Aquatic SWG, and the BIA, shall identify and implement regionally accepted measures (e.g., operational or structural changes, translocation, artificial production, habitat enhancement) to address such impacts. If operational or structural changes are needed to improve passage survival of juvenile lamprey, then those changes shall be coordinated with the WCC prior to development and implementation.

APPENDIX D

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS INCLUDED IN THE NATIONAL MARINE FISHERIES SERVICE'S BIOLOGICAL OPINION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED MARCH 7, 2012

2.8.3 Reasonable and Prudent Measures and Terms and Conditions

"Reasonable and prudent measures" are nondiscretionary measures to minimize the amount or extent of incidental take (50 CFR 402.02). "Terms and conditions" implement the reasonable and prudent measures (50 CFR 402.14). These must be carried out for the exemption in section 7(o)(2) to apply.

The following RPMs are necessary and appropriate to minimize the effect of anticipated incidental take of UCR spring-run Chinook salmon and UCR steelhead. FERC must require the licensee to minimize incidental take as follows:

1. Minimize incidental take from the operation of the project by requiring the licensee to adhere to all the measures in the Anadromous Fish Agreement and Wells Habitat Conservation Plan as approved and adopted by the Commission in 2004 and incorporated into the proposed license.

2. Minimize incidental take from the unanticipated release of hazardous substances, toxics, excessive sediment, debris, and other materials into the Columbia River and its tributaries, the fish passage and rearing facilities by following provisions of the Water Quality Management Plan.

3. Minimize incidental take from in-water and near-water construction activities by using BMPs for the proposed action to avoid or minimize adverse effects to water quality and aquatic resources.

4. FERC shall include the standard license reopener clause in any license issued for this project to ensure continuing agency discretion throughout the life of the license as may be necessary to protect species listed under the ESA.

To be exempt from the prohibitions of Section 9 of the ESA, FERC must ensure that Douglas PUD fully carries out the conservation measures in the new license to be issued by FERC. FERC must include in the license the following terms and conditions that carry out the RPMs listed above. Partial compliance with these terms and conditions may result in more take than anticipated, and invalidate this take exemption. These terms and conditions constitute no more than a minor change to the proposed action because they are consistent with the basic design of the proposed action.

To carry out RPM #1, FERC or its Licensee must undertake the following:

1. Require the Licensee to monitor fish populations and habitat and passage as described in the provisions of the Anadromous Fish Agreement and Wells Habitat Conservation Plan that relate to Upper Columbia River Spring Chinook and Upper Columbia River steelhead (including, but not limited to fish passage, fish supplementation, aquatic habitat conditions [e.g., flows and habitat restoration], construction, monitoring, and fish sampling) for this project. The Licensee must report all incidental take that occurs during these activities to NMFS. The Licensee must report the results of monitoring fish and fish passage and water quality annually to NMFS. This may be concurrent with the Project annual reports to FERC and shall be provided to NMFS by March 31 for take, which occurred in the prior calendar year. Listed fish must be handled with extreme care and kept in water, with adequate circulation, to the maximum extent possible during sampling and monitoring. When a mix of species are captured or collected, ESA-listed fish must be processed first, to the extent possible, to minimize stress. Listed fish must be transferred using a sanctuary net (which holds water during transfer) whenever practical to prevent the added stress of being dewatered. Require the Licensee to monitor juvenile and adult mortality to ensure that incidental take levels are not exceeded. The Licensee must develop the monitoring measures in conjunction with NMFS, and receive our approval of the monitoring plan.

   Incidental take should be reported to:

   National Marine Fisheries Service
   Hydropower Division, FERC and Water Diversions
   Attention: Keith Kirkendall, Branch Chief
   1201 NE Lloyd Blvd., Suite 1100
   Portland, OR 97232

To carry out RPM #2, FERC or its Licensee must undertake the following:

1. Follow and implement all terms and conditions of the Wells project Aquatic Settlement Agreement Water Quality Management Plan.

To carry out RPM #3, FERC or its Licensee must undertake the following:

1. Require the Licensee to use best management practices in all construction work, including adhering to certain timing restrictions. Spill control equipment must be on site and in quantities sufficient to effectively contain and recover accidental release of chemicals. Project personnel must be familiar with spill control equipment operation and procedures prior to the initiation of work. Instream work shall be conducted according to BMPs, consistent with WDFW's Hydraulic Code (RCW 77-55) by conforming to a Hydraulic Project Approval (WAC 220-110) obtained from WDFW. In the event that the regulations are significantly modified or repealed

during the license term, the terms in effect in 2011 shall continue in force for the term of the license to protect fish and their habitat.

APPENDIX E

REASONABLE AND PRUDENT MEASURES AND TERMS AND CONDITIONS INCLUDED IN THE U.S. FISH AND WILDLIFE SERVICE'S BIOLOGICAL OPINION FOR THE WELLS HYDROELECTRIC PROJECT NO. 2149 FILED MARCH 19, 2012

Reasonable and Prudent Measures

Reasonable and prudent measures (RPMs) are non-discretionary measures designed to minimize impacts on specific individuals or habitats affected by the proposed action, and require only minor changes to the project. The Service believes that the following reasonable and prudent measures are necessary and appropriate to minimize take of the bull trout.

RPM 1. FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for all life stages of bull trout at all Project facilities.

RPM 2. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of spillway operations and hydrographic variation to all life stages of bull trout at all Project facilities.

RPM 3. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

RPM 4. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program to all life stages of bull trout.

RPM 5. FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Wells Hydroelectric Project impacts, including those associated with the Wells Dam, Twisp Weir trapping facilities, and hatchery facilities. This information will allow the Service to determine whether authorized take levels are exceeded.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the Act, the action agency must comply with the following terms and conditions, which implement the reasonable and prudent measures described above and also outline required reporting and monitoring requirements. *These terms and conditions are non-discretionary.* All plans called for in these terms and conditions shall be provided to the Service upon completion.

To implement RPM 1: FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for bull trout at all Project facilities.

1. Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout *(BTMP Section* 4.1.1): FERC shall require Douglas PUD, in coordination with the Service, to provide upstream passage for bull trout through the existing upstream fishways and downstream passage for bull trout through the existing downstream bypass system consistent with the AFA/HCP and Aquatic SA. Both upstream fishway facilities (located on the west and east shores) shall be operational year round with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Operation of the downstream passage facilities for bull trout shall be consistent with bypass operations for Plan Species identified in the Wells AFA/HCP.

2. Bull Trout Passage Performance Standard: FERC shall require Douglas PUD, in coordination with the Service, to implement the upstream and downstream measures contained in the Wells Hydroelectric Project BTMP to provide safe, timely, and effective upstream and downstream passage for adult and sub-adult bull trout at the Wells Hydroelectric Project. "Safe, timely and effective" passage shall be achieved when Douglas PUD has demonstrated that the survival and passage success rates for adult marked fish are greater than 95% and greater than or equal to 90%, respectively, and when passage studies demonstrate that the fishway facilities at Wells Dam do not impede the passage of bull trout. To ensure that safe, timely and effective passage at Wells Dam is maintained during the term of the new license, Douglas PUD shall implement the bull trout upstream and downstream measures consistent with the BTMP.

3. Upstream Fishway Operations Criteria *(BTMP Section 4.1.3*): FERC shall require Douglas PUD, in coordination with the Service, to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP.

4. Bypass Operations Criteria *(BTMP Section* 4.1.4): FERC shall require Douglas PUD, in coordination with the Service, to operate the bypass system at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP.

5. Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified *(BTMP Section 4.3)*: FERC shall require Douglas PUD, in coordination with the Service, to identify, design, implement, and evaluate reasonable and feasible measures to modify the upstream fishway, downstream bypass, or operations to reduce the identified incidental take of bull trout if monitoring (Term and Condition #10) identifies upstream or downstream passage problems for bull trout, in consultation with the Service, WCC and the Aquatic SWG. Study protocols and radio-telemetry assessment methodologies prescribed above in Term and Condition #10 and #11, shall be used to evaluate the effectiveness of any additional measures implemented to reduce the incidental take of bull trout. Upon completion of the evaluation, the Service and the National Marine Fisheries Service (NMFS), in consultation with the Aquatic SWG, and the WCC, will determine whether the proposed measure should be made permanent, removed, or modified.

To implement RPM 2: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of hydrographic variation to all life stages of bull trout at all Project facilities.

6. Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation *(BTMP Section* 4.4): FERC shall require Douglas PUD, in coordination with the Service, to continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' MSL). If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas, in consultation with the Aquatic SWG, to address the impact.

To implement RPM 3: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

7. Bull Trout Monitoring During Hatchery Activities *(BTMP 4.6.1)*: FERC shall require Douglas PUD, in coordination with the Service, to monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and subadult bull trout resulting from incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas. If the incidental take

of bull trout is exceeded due to Douglas's hatchery actions then Douglas will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 4: FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of implementing the Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and the Predator Control Program to all life stages of bull trout.

8. Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout *(BTMP Section 4.5.1)*: FERC shall require Douglas PUD, in coordination with the Service, to monitor activities associated with the implementation of other Aquatic Resource Management Plans for white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

To implement RPM 5: FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Wells Hydroelectric Project impacts, including those associated with the Wells Dam, Twisp Weir trapping facilities, and hatchery facilities. This information will allow the Service to determine whether authorized take levels are exceeded.

9. Upstream Fishway Counts *(BTMP Section 4.1.2)*: FERC shall require Douglas PUD, in coordination with the Service, to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving bull trout.

10. Adult Bull Trout Upstream and Downstream Passage Evaluation *(BTMP Section 4.2.1)*: FERC shall require Douglas PUD, in coordination with the Service, to periodically monitor incidental take of bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every ten years thereafter during the new license term, Douglas PUD shall conduct a 1 year monitoring study to verify continued compliance with the bull trout passage

performance standard (Term and Condition #2). These monitoring studies shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the monitoring results demonstrate continued compliance with the bull trout passage performance standard (Term and Condition #2), then no additional actions are needed. If the monitoring results demonstrate that Douglas PUD is no longer in compliance with the bull trout passage performance standard (Term and Condition #2), then the monitoring study will be replicated to confirm the results. If the results after two years of monitoring demonstrate that Douglas PUD is no longer in compliance with the bull trout passage performance standard (Term and Condition #2), then Douglas PUD shall, pursuant to Term and Condition #5, develop and implement additional measures to improve bull trout passage until compliance with the bull trout passage performance standard (Term and Condition #2) is achieved. If the bull trout counts at Wells Dam increase more than twice the existing 5-year average or if there is a significant change in the operation of the fish ladders, bypass, or hydrocombine, then Douglas PUD shall, in consultation with the Service, the Aquatic SWG, and the Wells HCP Coordinating Committee (WCC), shall conduct a 1 year, follow-up monitoring study to verify continued compliance with the bull trout performance standard (Term and Condition #2). Although the BTMP specifies to Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

11. Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities *(BTMP Section (4.2.2)*: FERC shall require Douglas PUD, in coordination with the Service, beginning in year one of the new license, to conduct a one-year radio-telemetry evaluation to assess incidental take of adult bull trout at the adult salmon and steelhead brood stock collection facilities associated with the Wells AFA/HCP, including but not limited to, the Twisp weir adult collection facility. Douglas PUD shall capture and tag up to 10 adult, migratory bull trout (>400mm) per assessment per year and use fixed receiver stations upstream and downstream of the collection facilities. Assessments shall employ the same study protocols and radio-telemetry assessment methodologies used at Wells Dam in 2006 and 2007. If the evaluation demonstrates that Douglas PUD is not in compliance with the bull trout passage performance standard (Term and Condition #2), then the evaluation will be replicated to confirm the results. If the results after two years of evaluation demonstrate that Douglas PUD is not in compliance with the bull trout passage performance standard (Term and Condition #2), then Douglas PUD shall develop, implement, and evaluate additional measures, in consultation with the Service, WCC and the Aquatic SWG, until the Service determines that the bull trout passage performance standard has been achieved. At such time as the Service determines the bull trout passage performance standard has been achieved, the implementation of this measure shall be integrated into the 1 year telemetry monitoring program that

is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Term and Condition #10 above. Although the BTMP specifies to Douglas PUD to utilize radio-telemetry as the recommended monitoring method, the Service concludes that future monitoring technologies may be utilized in the implementation of this term and condition.

12. Sub-Adult Bull Trout Monitoring *(BTMP Section 4.2.3)*: FERC shall require Douglas PUD, if at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), in consultation with the Service, and the Wells Aquatic SWG, implement reasonable and appropriate methods for monitoring sub-adult bull trout. Although the BTMP states that >10 sub-adults per calendar year as the threshold, new information leads the Service to conclude that 31 sub-adults per calendar year is a more appropriate threshold. Specifically, Douglas PUD may modify counting activities, and shall continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity shall occur the following year of first observation of sub-adult bull trout (>10 per calendar year), in consultation with the Service and the Aquatic SWG.

13. Funding Collection of Tissue Samples and Genetic Analysis *(BTMP Section 4.5.2)*: FERC shall require Douglas PUD, in coordination with the Service, to collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Any sub-adult bull trout collected during these activities will also be incorporated into the bull trout genetic analysis. Beginning in year 1 of the new license, Douglas will collect up to 10 adult bull trout tissue samples from the Twisp River brood stock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the off-Project bull trout radio-telemetry monitoring study. This term and condition is consistent with other section 10(a)(l)(a) permits that involve handling of bull trout. The analysis will provide valuable information on the conservation status and genetic relationships between bull trout populations in the Columbia basin. This information will be used to determine the local populations impacted by Project operations, and when used in conjunction with other data such as movement data and redd counts, the resiliency of local populations impacted by the proposed action may be determined. Samples will be submitted to the Service (Central Washington Field Office in Wenatchee, Washington).

Reporting Requirements

In order to monitor the impacts of incidental take, Douglas PUD shall prepare an annual report describing the progress of implementing the proposed relicensing and its impact on the bull trout. The report, which shall be submitted to the Service (Central Washington Field Office) annually on or before April 15th, shall list and describe the work that was completed and the number of bull trout, if any, observed and/or incidentally taken (i.e., injured or killed) during the course of implementing the Project.

Upon locating a dead, injured, or sick endangered or threatened species specimen, initial notification must be immediately made to the nearest Service Law Enforcement Office (Redmond, Washington; telephone 425-883-8122) and reported to the Service's Central Washington Field Office (509-665-3508). Care should be taken in handling sick or injured specimens to ensure effective treatment and care, and in handling dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured endangered species and preservation of biological materials from a dead animal, the finder has the responsibility to carry out instructions provided by Service Law Enforcement to ensure that evidence intrinsic to the specimen is not unnecessarily disturbed.

The RPMs, with their implementing terms and conditions, are designed to minimize the impact of incidental take that might otherwise result from the proposed action. If, during the course of the action, the level of incidental take described above is exceeded, such additional take represents new information requiring reinitiation of consultation (assuming the Commission retains discretion or control over the action) and review of the RPMs provided. Douglas PUD must immediately provide an explanation of the causes of the taking and review with the Service the need for possible modification of the RPMs.

Document Content(s)

APPENDIX D
2012 AQUATIC SETTLEMENT AGREEMENT ACTION PLAN

2012 AQUATIC SETTLEMENT AGREEMENT ACTION PLAN

1. **White Sturgeon Management Plan**
    a. Broodstock collection and breeding plan discussions……..... Ongoing 2012
    b. Wells hatchery design and development for offspring …….Aug-Oct 2012
2. **Bull Trout Management Plan**
    a. Annual monitoring and management plan draft……February 2012
    b. Report deadline (FERC)……... March 31 2012
    c. 2013 Adult passage at the Twisp weir study plan development . Throughout 2012
    d. 2013 Adult passage at the Twisp weir study plan review…… Throughout 2012
    e. PIT tag and release incidental captures at the Weir……. May-Aug 2012
    f. Bull trout recovery planning coordination.…….. Throughout 2012
    g. Bull trout ID and counts at Wells Dam…..…….. Throughout 2012
3. **Pacific Lamprey Management Plan**
    a. Lamprey HD installation west ladder pool 19……..... Jan 2012
    b. Lamprey IR video monitoring feasibility…….. Feb-Dec 2012
    c. Lamprey HD installation east and west ladder …….. . Dec 2012-Jan 2013
    d. Salvage activities during ladder dewatering…….. Dec 2012-Jan 2013
    e. Translocation study plan development……...Nov-Dec 2012
    f. Regional coordination and participation……... Throughout 2012
4. **Resident Fish Management Plan**
    a. Pikeminnow 2011 annual report draft to CC and ASWG……..... April 2012
    b. Pikeminnow control……. April - August 2012
    c. Incidental capture enumeration during subyearling collection……June - July 2012
5. **Aquatic Nuisance Species Management Plan**
    a. Dreissenid mussels surveillance:……..... April – October 2012
    b. Northern crayfish surveillance study plan development…… April 2012
    c. Northern crayfish surveillance ASWG approval…… May 2012
    d. Northern crayfish surveillance:……..... June – October 2012
    e. Crayfish report...……. November 2012
    f. ANS monitoring during other activities and projects …….. Summer/fall 2012
6. **Water Quality Management Plan**
    a. WELW site upgrades…….…….. April-Dec 2012
    b. TDG monitoring…….……April-December 2012
    c. Gas bubble trauma monitoring (adult and juvenile)……. .. April-July 2012
    d. Gas abatement plan, report and TDG exception:
    Gas abatement plan draft…….……... February 28, 2012

Gas abatement plan final……..….. April 1, 2012
Gas abatement report draft……... October 31, 2012
Gas abatement report final…….. February 28, 2012

e. Temperature monitoring…..…… Throughout 2012
f. Water temperature system bid…….…….. ……Aug 2012
g. Spill prevention and control requirements……... Throughout 2012
h. Participation in CSR spill response initiative, SPCC and EPA's TMDL.…... 2012
i. Inspections…… TBD
j. Water Quality Attainment Plan development ……throughout 2012
k. Water Temperature Monitoring Plan and Quality Assurance Plan.. Nov-Dec 2012

7. Aquatic Settlement Work Group

a. Meetings ……..Monthly
b. 2011 annual report draft…… February 2012
c. 2011 annual report final…….. April 2012
d. Twisp Weir tour and ladder tours…….. April & Dec-Jan. 2012-13

APPENDIX E
2012 GAS ABATEMENT PLAN

2012 TOTAL DISSOLVED GAS ABATEMENT PLAN

WELLS HYDROELECTRIC PROJECT

Prepared by:

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April 2012

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Table of Contents

List of Figures

List of Tables

List of Appendices

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Executive Summary

Under the Water Quality Standards (WQS) Chapter 173-201A of the Washington Administrative Code (WAC) criteria developed by the Washington Department of Ecology (Ecology), Total Dissolved Gas (TDG) measurements shall not exceed 110 percent at any point of measurement in any state water body. The standards state that a dam operator is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency flood (7Q10). In addition to allowances for natural flood flows, the TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with an Ecology-approved gas abatement plan. On a per-application basis, Ecology has approved a TDG adjustment to allow spill for juvenile fish passage past Columbia and Snake River dams (WAC 173-201A-200(1)(f)(ii)).

On the Columbia and Snake rivers there are three separate standards for the fish passage related TDG adjustment. TDG shall not exceed 125 percent in the tailrace of a dam, as measured in any one-hour period. 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 hourly readings in any one day (24-hour period). The increased levels of spill, resulting in elevated TDG levels, are intended to allow increased fish passage without causing more harm to fish populations than what would be caused by turbine fish passage. This TDG adjustment provided by Ecology is based on a risk analysis study conducted by the National Marine Fisheries Service (NMFS) (NMFS 2000).

The goal of the Wells Total Dissolved Gas Abatement Plan (GAP) is to implement a long-term strategy to achieve compliance with the Washington State WQS criteria for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project) while continuing to provide safe passage for downstream migrating juvenile salmonids. Public Utility District No. 1 of Douglas County (Douglas PUD), which owns and operates the Wells Project, is submitting this GAP to Ecology for approval as required for receipt of a TDG adjustment to aid fish passage at Wells Dam.

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1.0 Introduction and Background

The Wells Hydroelectric Project Gas Abatement Plan (GAP) provides details on operational and structural measures to be implemented in 2012 by Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) at Wells Dam under the Federal Energy Regulatory Commission (FERC) license for Project No. 2149. These measures are intended to result in compliance with the modified Washington State water quality standards (WQS) for total dissolved gas (TDG) allowed under the TDG adjustment, provided incoming water to the Project is in compliance and flows are below the seven-day, 10-year-frequency flood levels (7Q10: 246 kcfs).

The goal of the GAP is to implement a long-term strategy to achieve compliance with the Washington State WQS for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project or Project), while continuing to provide safe passage for downstream migrating juvenile salmonids via the Juvenile Bypass System (JBS). Douglas PUD is the owner and operator of the Wells Project and is submitting this GAP to the Washington Department of Ecology (Ecology) for approval as required for receipt of a TDG adjustment for fish passage.

Since 2003, Ecology has approved GAPs and issued a TDG adjustment for the Wells Project. Since 2008, Douglas PUD has submitted GAPs for the fish passage season annually. The most recent GAP was approved by Ecology in 2011 (Appendix 1).

This GAP contains three sets of information. Section 1.0 summarizes the background information related to regulatory and project specific TDG information at the Wells Project. Proposed Wells Project operations and activities related to TDG management are contained in Sections 2.0 and 3.0. Section 4.0 provides a summary of compliance and physical monitoring plans, quality assurance and quality control procedures, and reporting.

1.1 Project Description

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE); and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The spillway consists of eleven spill gates that are capable of spilling a total of 1,180 kcfs (thousand cubic feet per second). The crest of the spillway is approximately five and a half feet above normal tailwater elevation and two feet below tailwater elevation when plant discharge is 219 kcfs. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a dam top elevation of 795 feet above

mean sea level (msl). The JBS was developed by Douglas PUD and uses a barrier system to modify the intake velocities on all even numbered spillways (2, 4, 6, 8 and 10). The Wells Project is considered a "run-of-the-river" project due to its relatively limited storage capacity.

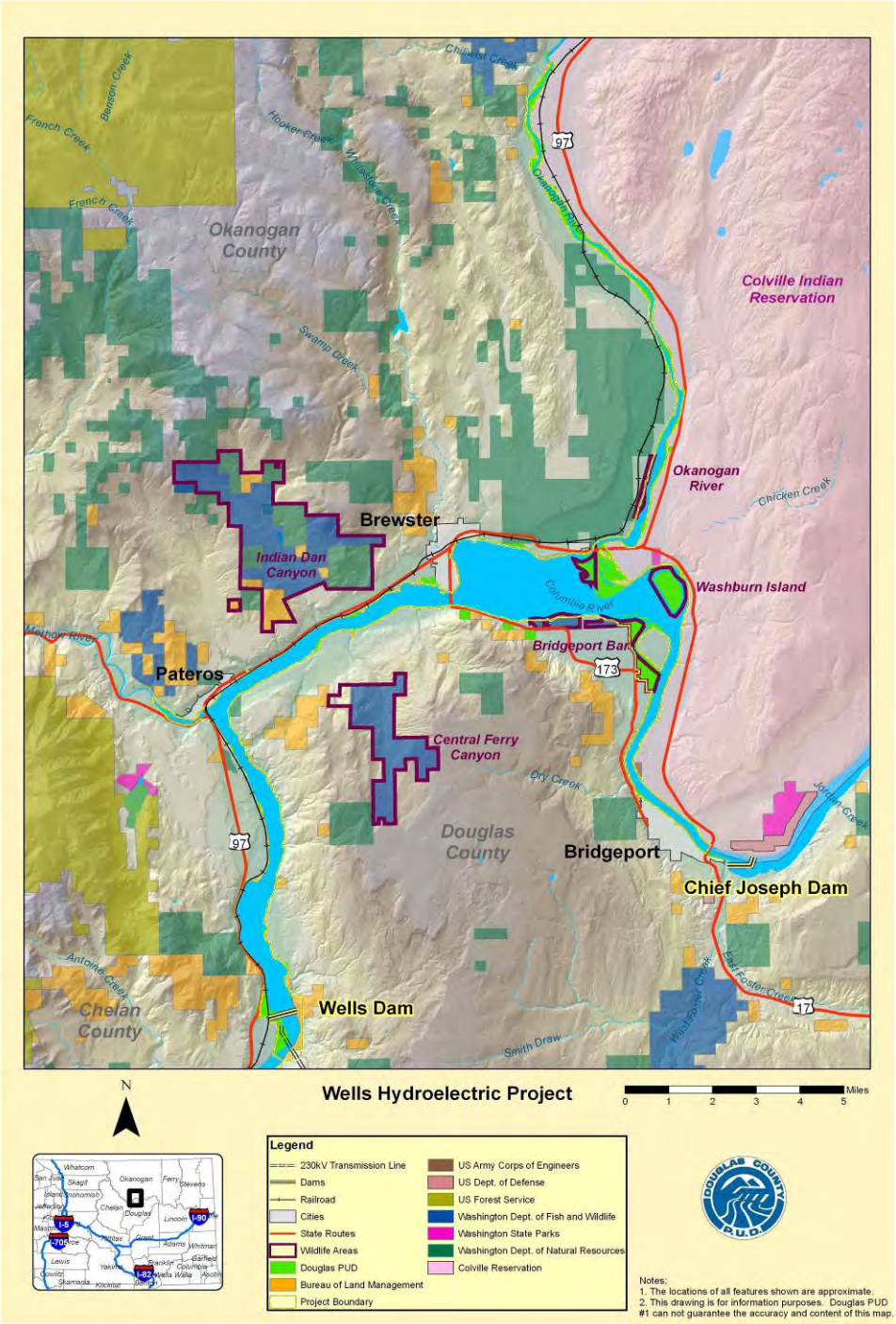

Figure 1. Map of the Wells Hydroelectric Project in Central Washington.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet.

1.2 Regulatory Framework

The WQS of the Washington Administrative Code (WAC) define standards for the surface waters of Washington State.

Under the WQS, TDG shall not exceed 110 percent at any point of measurement in any state water body. However, the standards exempt dam operators from this TDG standard when the river flow exceeds the 7Q10 flow. The 7Q10 flow is the highest calculated flow of a running seven consecutive day average, using the daily average flows that may be seen in a 10-year period. The 7Q10 total river flow for the Wells Project was computed using the hydrologic record from 1974 through 1998, coupled with a statistical analysis to develop the number from 1930 through 1998. These methods follow the United States Geological Survey (USGS) Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" and determined that the 7Q10 flow at Wells Dam is 246,000 cfs (Ecology et. al. 2004).

In addition to allowances for natural flood flows, 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, an interim adjustment to the TDG standard (110 percent) to allow spill for juvenile fish passage past dams on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). This adjustment comprises three separate standards to be met by dam operators. TDG shall not exceed 125 percent in any one-hour period in the tailrace of a dam. 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 hourly readings in any 24-hour period (12C High). The increased levels of spill resulting in elevated TDG levels are authorized by Ecology to allow salmonid smolts a non-turbine downstream passage route that is less harmful to fish populations than caused by turbine fish passage. This TDG exemption provided by Ecology is based on a risk analysis study conducted by the National Marine Fisheries Service (NMFS) (NMFS 2000).

A significant portion of the Wells Reservoir occupies lands within the boundaries of the Colville Indian Reservation. Wells Project operations do not affect TDG levels in tribal waters, where the Colville Tribes' TDG standard is a maximum of 110 percent, year-round, at all locations. This TDG standard is also the U.S. Environmental Protection Agency's (EPA) standard for all tribal waters on the Columbia River, from the Canadian border to the Snake River confluence. TDG levels on the Colville Reservation portion of the mainstem Columbia River within Wells Reservoir result from the operations of upstream dams but in particular, the USACE's Chief Joseph Dam (located immediately upstream).

1.2.1 7Q10

The 7Q10 flood flow at the Wells Project is 246 kcfs. The Project is not required to comply with state WQS for TDG when project flows exceed this value.

1.2.2 Fish Spill Season

Although not defined in state regulations, the fish spill season is determined by fish management agencies when necessary to aid downstream juvenile salmonid fish passage over the dams as an alternative to passage through the Project turbines. The fish spill season is generally April to end of August, but may vary from year to year. During non-fish spill, Douglas PUD will make every effort to remain in compliance with the 110 percent standard. During fish spill, Douglas PUD will make every effort not to exceed an average of 120 percent as measured in the tailrace of the dam. TDG at the Wells Project also must not exceed an average of 115 percent as measured in the forebay of the next downstream dam (Rocky Reach). These averages are calculated using the twelve (12) highest consecutive hourly readings in any 24-hour period. In addition, there is a maximum one-hour average of 125 percent, relative to atmospheric pressure, during fish spill season. Nothing in these special conditions allows an impact to existing and characteristic uses.

1.2.3 Incoming TDG Levels

During the fish spill season, TDG concentrations in the Wells Project forebay are primarily determined by the USACE's upstream water management activities at Chief Joseph Dam.

Since the completion of spill deflectors at Chief Joseph Dam in 2008, there has been a significant increase in the amount of spill at the Chief Joseph Project resulting from Federal Columbia River Power System (FCRPS)-wide operations. This recent increase in the amount of spill at Chief Joseph Dam has resulted in a dramatic increase in the volume of water entering the Wells Project area that is supersaturated with TDG. This mass influx of supersaturated water has resulted in significantly higher TDG concentrations observed in the forebay of Wells Dam.

Despite the absence of fish passage at Chief Joseph Dam, the USACE has operated under the assumption that the fish passage TDG adjustment approved by Ecology applies to all FCRPS dams, rather than the eight dams with fish passage in the lower Snake and Columbia rivers. Douglas PUD does not believe that the fish passage adjustment is authorized for Chief Joseph Dam by Ecology, and that the USACE is out of compliance with Washington State WQS, as well as the EPA TDG standard and the Colville Tribe's TDG standard, whenever TDG in the Chief Joseph Dam tailrace exceeds 110 percent.

The USACE has significantly revamped their 2012 proposed spill priority list for the FCRPS in recognition of the 110 percent TDG standard for joint operations of Grand Coulee and Chief Joseph Dams. Douglas PUD strongly supports their proposed 2012 spill priority as it will reduce the future frequency and duration of Wells Dam receiving water above the TDG criteria, in comparison to spill priorities implemented during 2009, 2010 and 2011.

1.2.4 TMDL

In June 2004, a total maximum daily load (TMDL) was jointly established for the Mid-Columbia River and Lake Roosevelt by Ecology, the Spokane Tribe of Indians, and EPA (Ecology et al. 2004). EPA's issuance covers all waters above Grand Coulee Dam and all tribal waters; EPA's TMDL covers all tribal waters of the Colville Confederated Tribes, including the right bank of the Columbia River from Chief Joseph Dam downstream to the Okanogan River confluence. Ecology's issuance covers all state waters downstream from Grand Coulee Dam to the Snake River confluence.

A summary implementation strategy prepared by Ecology and the Spokane Tribe of Indians describes proposed measures that could be used to reduce TDG levels in the Columbia River. Short-term actions primarily focus on meeting Endangered Species Act (ESA) requirements, while long-term goals address both ESA and TMDL requirements (Ecology et. al., 2004). Many of the recommended TMDL actions are currently being addressed by Douglas PUD through the implementation of Habitat Conservation Plan (HCP) activities for anadromous salmon, the Bull Trout Monitoring and Management Plan resulting from consultation with the U.S. Fish and Wildlife Service, and requirements described in current and past GAPs.

The Wells Project occupies waters both upstream and downstream of the Okanogan River. In waters upstream of the Okanogan River, the TMDL does not provide an exemption for fish passage spills (except as a temporary waiver or special condition as part of the short-term compliance period, as described in the Implementation Plan, Appendix A of the TMDL). Downstream of the Okanogan River, allocations are provided based on both the 110 percent criteria and the criteria established for fish passage in the Washington State WQS. Any allocations or exemptions for fish passage downstream of the Okanogan River may be used only after approval of a gas abatement plan (Ecology et al. 2004).

1.2.5 Additional 401 Certification Requirements

On May 27, 2010 Douglas PUD filed an application for a new license with the FERC for the Wells Project. On September 30, 2010, Ecology received an application for a 401 Certification from Douglas PUD, requested pursuant to the provisions of 33 USC §1341 (§401 of the Clean Water Act). On September 12, 2011, Douglas PUD withdrew its request and reapplied. On February 27, 2012, Ecology concluded that the Wells Project, as conditioned by its 401 Certification/Order No. 8981, would comply with all applicable provisions of 33 USC 1311, 1312, 1313, 1316, 1317 and appropriate requirements of Washington State law. The 401 Certification conditions that are relevant to the GAP and the abatement of TDG under the TDG adjustment are as follows:

- Douglas PUD shall consult with Ecology before it undertakes any change to the Project or Project operations that might significantly and adversely affect compliance with any applicable water quality standard (including designated uses) or other appropriate requirement of state law.
- Copies of the Wells Project 401 Certification and associated permits, licenses, approvals and other documents shall be kept on site and made readily available for reference by Douglas PUD, its contractors and consultants, and by Ecology.

- Douglas PUD shall allow Ecology access to inspect the Project and Project records required under the 401 Certification for the purpose of monitoring compliance with conditions of the 401 Certification. Access will occur after reasonable notice, except in emergency circumstances.

- Douglas PUD shall, upon request by Ecology, fully respond to all reasonable requests for materials to assist Ecology in making determinations under the 401 Certification and any resulting rulemaking or other process.

- Douglas PUD shall operate the Wells Project in compliance with a GAP approved by Ecology. By February 28 of each year, Douglas PUD shall submit a GAP to Ecology for approval. Pending Ecology's approval of each subsequent GAP, Douglas PUD shall continue to implement the activities identified within the previously approved plan.

- The GAP will include the Spill Operations Plan and will be accompanied by a fisheries management plan (section 2.2.1) and physical (section 4.1.1) and biological (section 2.2.2) monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

- Commencing one year after issuance of a new FERC license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine TDG compliance with the 110 percent standard (see section 4.1.1). The non-fish spill season is defined as the times of the year that are not considered the fish spill season (generally April to end of August).

- If Douglas PUD, at any point, considers modifying any of the measures identified in the spill playbook, they will immediately develop proposed alternative(s) that will produce levels of TDG equal to or less than those estimated to be produced by the measures to be replaced. These measures should be implementable in a similar timeframe and must be submitted to Ecology for review and approval prior to implementation.

- The Project shall be deemed in compliance with the TMDL for TDG as long as it remains in compliance with the terms of the 401 Certification. The certification, including the GAPs and the Water Quality Attainment Plan (section 2.2.4), is intended to serve as the Project's portion of the Detailed Implementation Plan for the TDG TMDL.

1.3 History of Operations and Compliance

1.3.1 Flows

Flow from the Columbia River originates in the headwaters of the Canadian Rockies and picks up snow melt from tributary streams as it travels over 1,243 miles before emptying into the Pacific Ocean. There are 85,300 square miles of drainage area above Wells Dam. The natural hydrograph had low flows in November through January with high flows in May through July. Storage dams on the Columbia River and its tributaries upstream of the Wells Project in the U.S. and Canada capture spring and summer high flows to hold for release in the fall and winter months. Table 1 presents information on Columbia River

flow, as measured at Wells Dam from 2002 to2011, and shows that the current hydrograph of the Columbia River is controlled by upstream storage and release regimes. Juvenile anadromous salmonid migration occurs within a regime of reduced high flows during the spring migration period.

In general, the hydropower system and reservoir operations in the Columbia River are coordinated through a set of complex agreements and policies that are designed to optimize the benefits and minimize the adverse effects of project operations. The Wells Project operates within the constraints of the Pacific Northwest Coordination Agreement, Canadian Treaty, Canadian Entitlement Agreement, Hourly Coordination Agreement, the Hanford Reach Fall Chinook Protection Program and the FERC regulatory and license requirements.

Table 1. Average monthly flows (kcfs) at Wells Dam, by month (2002-2011).

	Month											
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2002	91.0	91.9	66.1	116.9	135.0	205.6	176.5	115.1	73.9	79.4	96.7	93.3
2003	75.7	69.9	82.2	106.7	130.7	137.6	106.2	96.4	64.0	74.6	87.7	105.5
2004	96.2	80.5	70.0	87.3	114.2	132.3	101.5	95.7	75.7	79.3	90.9	112.0
2005	102.0	104.4	94.9	85.4	122.1	130.8	136.8	107.9	67.6	78.5	90.9	91.8
2006	101.2	104.5	87.3	148.4	165.3	195.1	127.9	103.9	66.3	66.3	77.1	90.8
2007	114.5	85.3	120.3	154.7	159.2	152.0	133.0	113.1	60.0	64.4	80.2	86.8
2008	104.0	88.6	82.4	90.3	158.7	206.8	135.3	86.5	60.7	63.0	75.2	94.2
2009	107.8	80.2	71.5	111.0	122.7	146.6	103.1	74.5	53.5	58.1	80.1	101.8
2010	71.1	72.1	65.2	70.7	112.2	173.0	119.9	83.6	53.8	67.7	85.8	86.2
2011	114.9	136.6	124.1	145.7	206.0	259.0	206.6	139.9	73.8	74.9	89.9	98.2
All	97.8	91.4	86.4	111.7	142.6	173.9	134.7	101.7	64.9	70.6	85.0	96.1

1.3.2 Spill Operations

1.3.2.1 General Operation

The Hourly Coordination Agreement is intended to integrate power operations for the seven dams from Grand Coulee to Priest Rapids. "Coordinated generation" is assigned to meet daily load requirements via Central Control in Ephrata, WA. Automatic control logic is used to maintain pre-set reservoir levels to meet load requirements and minimize involuntary spill. These pre-set reservoir levels are maintained at each project via management of a positive or negative "bias". Positive or negative bias assigns a project more or less generation based on its reservoir elevation at a given time and thus, maximizes system benefits and minimizes involuntary spill.

1.3.2.2 Spill for Fish

Wells Dam is a hydrocombine design where the spillway is situated directly above the generating units. Research at Wells Dam in the mid-1980s showed that a modest amount of spill effectively guided a high percentage of the downstream migrating juvenile salmonids through the JBS. The operation of the Wells JBS utilizes the five even-numbered spillways. These spillways have been modified with constricting barriers to improve the attraction flow while using modest levels of water. These spillways

are used to provide a non-turbine passage route for downstream migrating juvenile salmonids from April through August. Normal operation of the JBS uses 10 kcfs. During periods of extreme high flow, one or more of the JBS barriers will be removed to provide adequate spill capacity to respond to an emergency plant load rejection. Spill barriers may also be removed to minimize TDG production during high spill events, or when flood flows are forecast.

Typically, the JBS will use approximately 6 to 8 percent of the total river flow for fish guidance. Between the years 1997 and 2004, the volume of water dedicated to JBS operations has ranged from 1.5 to 3.2 million acre-feet annually. The operation of the JBS adds a small amount of TDG (0 – 2 percent) while meeting a very high level of fish guidance and protection. This high level of fish protection at Wells Dam has met the approval of the fisheries agencies and tribes and is vital to meeting the survival performance standards contained within the FERC-approved HCP with NMFS. The Wells Project JBS is the most efficient bypass system on the mainstem Columbia River. The bypass system on average collects and safely passes 92.0 percent of the spring migrating salmonids (yearling Chinook, steelhead and sockeye) and 96.2 percent of the summer migrating subyearling Chinook (Skalski et al. 1996) (Table 2).

Table 2. Wells Hydroelectric Project Juvenile Bypass System Efficiency.

Species	% JBS Passage
Yearling (spring) Chinook	92.0
Steelhead	92.0
Sockeye	92.0
Subyearling (summer/fall) Chinook	96.2

The JBS is used to protect downstream migrating juvenile salmonids. Fish bypass operations at Wells Dam falls into two seasons, Spring Bypass and Summer Bypass. For 21 years, the status of the fish migration for both spring and summer periods was monitored by an array of hydroacoustic sensors placed in the forebay of Wells Dam. The operation period for the juvenile bypass begins in April and ends in August; actual start and stop dates are set by the HCP Coordinating Committee, and are based on long-term monitoring to bracket the run timing of greater than 95 percent of both the spring and summer migrants. Up to ten million juvenile salmonids migrate past Wells Dam each year.

1.3.2.3 Flows in Excess of Hydraulic Capacity

The Wells Project is a “run-of-the river” project with a relatively small storage capacity. River flows in excess of the ten-turbine hydraulic capacity must be passed over the spillways.

The forebay elevation at Wells Dam is maintained between 781.0 and 771.0 msl. The Wells Project has a hydraulic generating capacity of approximately 220 kcfs (ASL 2007) and a spillway capacity of 1,180 kcfs. Data for Columbia River flows for eighty-five years at Priest Rapids yielded a peak daily average discharge of 690 kcfs on June 12, 1948 (USGS web page for historical flows at Priest Rapids on the

Columbia River, http://waterdata.usgs.gov/wa/nwis/dv/?site_no=12472800). The hydraulic capacity of Wells Dam is well within the range of recorded flow data.

1.3.2.4 Flow in Excess of Power Demand

Spill may occur at flows less than the Wells Project hydraulic capacity when the volume of water is greater than the amount required to meet electric power system loads. This may occur during temperate weather conditions and when power demand is low or when non-power constraints on river control results in water being moved through the Mid-Columbia at a different time of day than the power is required (i.e. off-peak periods). Hourly coordination (Section 3.2) between hydroelectric projects on the river was established to minimize this situation for spill. Spill in excess of power demand provides benefit to migration juvenile salmonids. Fish that pass through the spillway survive at a higher rate relative to passage through a turbine and the turbulence in the tailrace generated by spill in excess of power demand increases tailrace velocity and reduces tailrace egress times. The reductions in tailrace egress time and increases in water turbulence and velocity reduce predation in the Wells tailrace.

1.3.2.5 Gas Abatement Spill

Gas Abatement Spill is used to manage TDG levels throughout the Columbia River Basin. The Technical Management Team (including NMFS, USACE, and Bonneville Power Administration [BPA]) implements and manages this spill. Gas Abatement Spill is requested from dam operators from a section of the river where gas levels are high. A trade of power generation for spill is made between operators, providing power generation in the river with high TDG and trading an equivalent amount of spill from a project where TDG is lower. Historically, the Wells Project has accommodated requests to provide Gas Abatement Spill. However, in an effort to limit TDG generated at the Wells Project, Douglas PUD has adopted a policy of not accepting Gas Abatement Spill at Wells Dam.

1.3.2.6 Other Spill

Other spill includes spill as a result of maintenance or plant load rejection. A load rejection occurs when the generating plant is forced off-line by an electrical fault, which trips breakers and shuts off generation. At a run-of-the-river hydroelectric dam, if water cannot flow through operating turbines, then the river flow that was producing power has to be spilled until turbine operation can be restored. These events are extremely rare, and would account for approximately 10 minutes in every ten years.

Maintenance spill is utilized for any activity that requires spill to assess the routine operation of individual spillways and turbine units. These activities include checking gate operation, and all other maintenance that would require spill. The FERC requires that all spillway gates be operated once per year. To control TDG levels associated with maintenance spill, Douglas PUD limits, to the extent practical, maintenance spill during the spill season.

1.3.3 Compliance Activities in Previous Year

1.3.3.1 Operational

Since the Wells Project is a "run-of-the river" project with a relatively small storage capacity, river flows in excess of the ten-turbine hydraulic capacity must be passed over the spillways. Outside of system coordination and gas abatement spill (Douglas PUD has adopted a policy of not accepting the latter), minimization of involuntary spill has primarily focused on minimizing TDG production dynamics of water spilled based upon a reconfiguration of spillway operations. The 2009 Wells Project GAP (Le and Murauskas, 2009) introduced the latest numerical model developed by the University of Iowa's IIHR-Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the Wells Dam tailrace and further identify operational configurations that would minimize TDG production at the Project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG adjustment criteria during the passage season with flows up to 7Q10 levels provided the forebay TDG levels are below 115 percent. Compliance was achieved through the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through other spillbays in a defined pattern and volume. These preferred operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season with success. Overall, no exceedances were observed in either the Wells Dam tailrace or the Rocky Reach forebay in 2009.

In 2010, the concepts from the 2009 Spill Playbook were integrated into the 2010 Wells Project Spill Playbook given their effectiveness in maintaining levels below TDG criteria during the previous year. High Columbia River flows in June, which exceeded the preceding 15-year average flow, resulted in several exceedances of the hourly (125 percent maximum) and 12C-High (120 percent) TDG limits in the Wells Dam tailrace, and Rocky Reach forebay (115 percent). In response, Douglas PUD implemented an in-season analysis of the 2010 Spill Playbook and determined that full implementation of the recommendations from IIHR Engineering Laboratory would require the removal of the juvenile fish bypass system flow barriers in one spillbay. Following the in-season analysis and consultation with the HCP Coordinating Committee, changes were made to the 2010 Spill Playbook that allowed for the removal of the juvenile fish bypass system barriers in spillbay 6. Specifically, the Spill Playbook was modified to state that when spill levels approach the 53 kcfs threshold, the JBS barriers in spillbay 6 would be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay. When spill exceeded 53 kcfs, excess spill would be directed through spillbays 6 and 7 rather than through spillbays 5 and 7. This operational configuration resulted in a more compact spill pattern that reduced the air-water interface surface area between spillway flows and the subsequent potential for lateral mixing and air entrainment.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011

with additional minor modifications. Following approval of the 2011 GAP by Ecology, the 2011 Spill Playbook was implemented.

1.3.3.2 Structural

No structural modifications were implemented (none were scheduled) during the 2011 monitoring season, other than the removal of the JBS barriers, if needed, to accommodate high spill volumes in accordance with the Spill playbook.

1.3.3.3 Biological Monitoring

NMFS has shown that Gas Bubble Trauma (GBT) is low if the level of TDG can be managed to below 120 percent (NMFS 2000). They recommend that "the biological monitoring components will include smolt monitoring at selected smolt monitoring locations and daily data collection and reporting only when TDG exceeds 125 percent for an extended period of time." The 2011 Wells Project GAP has included the NMFS recommendation to sample for GBT in juvenile salmon when TDG levels exceed 125 percent saturation (NMFS 2000). In 2011, the 125 percent standard was exceeded on numerous occasions. As a result, Douglas PUD conducted GBT sampling of juvenile salmonids at the Rocky Reach juvenile fish bypass, and in addition, sampled adult spring Chinook at the Wells fish ladder traps. Biological monitoring was initiated on May 21 and continued daily as TDG levels above and below Wells Dam remained above thresholds, which require monitoring. Daily observations continued until May 30, 2011 when Ecology (Pat Irle, Pers. Comm.) approved a three day/week sampling schedule when TDG levels are sustained above 125 percent. Douglas PUD continued to monitor TDG conditions and biological responses into late July.

Biological sampling indicated that GBT expression in juvenile salmonids examined at Rocky Reach was variable, and appeared to track TDG concentrations reasonably well. GBT expression was confounded by species specific sensitivities to levels of TDG coupled with changes to the species run composition during the spill season. Juvenile salmonids expressed varied amount of GBT by species. Coho expressed the highest incidence of GBT with steelhead and yearling Chinook expressing intermediate GBT and sockeye and subyearling Chinook appearing to be the most resilient to high TDG concentrations. Throughout the season, adult spring Chinook sampled at Wells Dam appeared to have little symptoms of GBT, even when TDG was above 130 percent in the Wells tailrace.

The Wells Dam 2011 GBT Biological Monitoring Report (Gingerich and Patterson 2012) has been provided to Ecology (Andrew Gingerich, Pers. Comm.).

1.3.4 Compliance Success in Previous Year (2011)

TDG river flows in 2011 were much higher than the trailing 16-year average at the Wells Project (Table 3); 145 percent of the 16-year average for the entire season. Flows in 2011 were the third-highest on record since Wells Dam was constructed. The maximum hourly flow observed during the spill season was 327.8 kcfs on June 5 and flows frequently exceeded the 7Q10 value of 246.0 kcfs. The average monthly flow for all of June exceeded the 7Q10 value for the Wells Project.

Table 3. Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2011 compared to the previous 16-year average (1995-2010), by month.

Month	1995-2010 Mean	2011 Mean	Percent Difference from 16-Year Average
April	113.9	145.7	+27.9%
May	143.5	206.0	+43.6%
June	167.1	259.0	+55.0%
July	129.8	206.6	+59.2%
August	105.5	139.9	+32.6%
All	132.0	191.4	+45.0%

High flows in excess of power demand, and incoming water out of compliance with the TDG standards, resulted in elevated TDG for much of the spill season. Hourly spill exceeded the JBS spill volume almost continuously from May 11 to July 20, 2011. On June 5 forced spill reached 185.5 kcfs, the maximum hourly value for the 2011 season. These high spill events in June were attributed to both flow volumes in excess of the Project's hydraulic capacity, and flows in excess of the power system needs and/or transmission system capacity. Spill volume across the April-August spill season was over 300 percent of the preceding 16-year average (Table 4).

Table 4. Average monthly spill (kcfs) during the TDG monitoring season at the Wells Project in 2011 compared to the 16-year average (1995-2010), by month.

	1995-2010		2011	
Month	**Mean**	**Std Dev**	**Mean**	**Std Dev**
April	14.0	13.1	10.0	0.2
May	18.8	23.8	54.0	47.1
June	30.5	38.8	112.3	26.0
July	11.8	12.0	50.8	29.2
August	7.7	4.5	10.8	2.1
Spill Season	17.0	24.1	51.8	46.9

As a result of these high spill volumes, TDG exceeded the fish passage exception levels from mid-May, through late July. Of the 137 days during the spill season, there were 34 instances (24.8 percent of the monitoring period) where daily average flows at the Wells Project exceeded the 7Q10 value. During the 2011 monitoring season, the TDG criterion for the forebay of Wells Dam was exceeded 75 of 137 days (55.0 percent). If days where the Wells forebay exceedances are not excluded from compliance analysis except when TDG levels in the Wells tailrace are equal to or less than incoming forebay TDG levels, compliance with the tailrace criterion (120 percent) would have been 70 percent (72/103 days). Hourly TDG measurements during the 2011 monitoring period (April 12-August 26) ranged from 102.0 percent

to 129.9 percent in the forebay of Wells Dam, from 104.1 percent to 138.8 percent in the tailrace of Wells Dam[1], and from 103.8 percent to 135.4% in the forebay of Rocky Reach Dam (Table 5).

Table 5. Hourly sampling events (n) and resulting TDG (percent saturation) at the forebay of Rocky Reach Dam, the forebay of Wells Dam (WEL), and the tailrace of Wells Dam (WELW) by month, 2011.

	Wells Dam Forebay				Wells Dam Tailrace				Rocky Reach Dam Forebay			
Month	n	Min	Mean	Max	n	Min	Mean	Max	n	Min	Mean	Max
April	447	102.0	104.6	108.9	448	104.1	106.8	111.2	453	103.8	106.6	109.2
May	716	105.2	114.2	127.1	717	106.8	118.9	138.8	744	105.2	117.0	134.5
June	718	114.5	122.3	129.9	656	117.2	130.3	138.4	720	110.4	128.0	135.4
July	741	113.4	116.4	119.8	741	113.2	122.0	131.0	744	105.1	119.5	127.6
August	608	108.2	111.9	116.0	608	109.6	113.1	125.0	624	108.9	111.9	115.8

Despite extended periods of high flows, incoming TDG and spill, the Wells Project attained a high percentage of compliance when periods of flows in excess of 7Q10, and periods when incoming water to the Project exceeded TDG criteria, are removed from the analysis. Average compliance with all three standards (125% hourly and 120% 12C-High in the Wells tailrace, 115% 12C-High in the Rocky Reach forebay) averaged 96.0% during the 2011 fish passage season. These encouraging results support the continued implementation of the 2011 Spill Playbook in 2012 during the fish passage season.

2.0 Proposed Operations and Activities

2.1 Operational Spill

2.1.1 Minimizing Involuntary Spill

Based on the Wells Project'simproved TDG performance as a result of 2011 operations associated with implementation of the Wells Project Spill Playbook, similar operating principles will be implemented for the 2012 fish passage season.

As discussed in Section 1.3.3.1 above, high Columbia River flows in 2011 resulted from high flood flows and subsequent forced spill. Often, incoming water in the forebay was already above tailrace compliance levels. However, operations following the 2011 Spill Playbook, when forebay inflows were below 115 percent TDG adjustment criterion and below 7Q10 flows, resulted in high compliance rates. The 2012 Spill Playbook is proposing to shift concentrated spill away from spillway 7 to spillway 5. Spillway 5 was selected because spill through this bay can be more reliably supported by discharge from

[1] On June 11, from 0900-2000, values as high as 150.3 percent were reported, which at the time caused considerable alarm. By 2100 June 11, the WELW sensor was nonfunctioning. Subsequent investigation indicated a debris mobilization event had damaged the deployment conduit and sensor. These high readings were judged to be spurious and a result of damage to the probe, confirmed by the lack of a corresponding spike in TDG values downstream in the Rocky Reach forebay.

adjacent turbine units. The turbine discharge from Units 4 and 5 are expected to further enhance the surface jet being spilled through spillway 5. The updated Spill Playbook for 2012 is attached as Appendix 2.

In addition to minimizing involuntary spill through the implementation of the Spill Playbook, Douglas PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7Q10 as follows:

- Minimize voluntary spill through operations including to the extent practicable, by scheduling maintenance based on predicted flows;
- Avoid spill by continuing to coordinate operations with upstream dams, to the extent that it reduces TDG;
- Maximize powerhouse discharge, especially during periods of high river flows; and
- During fish passage season, manage voluntary spill levels in real time in an effort to continue to meet TDG numeric criteria.

2.2 Implementation

2.2.1 Fisheries Management Plans

Juvenile salmon and steelhead survival studies conducted at the Wells Project in accordance with the HCP have shown that the operation of the Wells Project, of which the JBS is an integral part, provides an effective means for outmigrating salmon and steelhead to pass through the Wells Project with a high rate of survival (Bickford et al. 2001, Bickford et al. 2011) (Table 6). The Wells JBS is the most efficient juvenile fish bypass system on the mainstem Columbia River (Skalski et al. 1996). The Wells Anadromous Fish Agreement and HCP (Douglas PUD 2002) is the Wells Project's fisheries management plan for anadromous salmonids, and directs operations of the Wells JBS to achieve the No Net Impact (NNI) standard for HCP Plan Species. The Aquatic Resource Management Plans (for white sturgeon, bull trout, Pacific lamprey, resident fish, water quality, and aquatic nuisance species) in the Wells Project's Aquatic Settlement Agreement (developed in support of the pending Wells Project operating license) are the fisheries management plans for all other aquatic life designated uses.

Table 6. 1998 -2000, 2010 Wells Hydroelectric Project Juvenile Survival Study Results.

Species	% Project Survival
Yearling Chinook (2010)	96.4
Yearling Chinook and Steelhead (1998, 1999	96.2

In spring 2010, Douglas PUD conducted a survival verification study with yearling Chinook salmon, a required 10-year follow-up study to confirm whether the Wells Project continues to achieve survival standards of the Wells Anadromous Fish Agreement and HCP. Approximately 80,000 Passive Integrated Transponder (PIT)-tagged yearling summer Chinook were released over a 30 day period in 15 replicates. The study determined that juvenile Chinook survival from the mouth of the Okanogan and Methow rivers averaged 96.4 percent over the 15 replicate releases of study fish (Table 6). This result confirms conclusions from the three previous years of study and documents that juvenile fish survival through the Wells Project continues to exceed the 93 percent Juvenile Project Survival Standard required by the HCP (Bickford et al. 2011).

The current phase designations (status of salmon and steelhead species reaching final survival determination) for the HCP Plan Species are summarized in Table 7. Specific details regarding survival study design, implementation, analysis, and reporting are available in annual summary reports prepared and approved by the Wells HCP Coordinating Committee.

Table 7. Wells Hydroelectric Project Habitat Conservation Plan Species Phase Designations.

Species	Phase Designation
Yearling (spring) Chinook	Phase III[2] – Standards Achieved (22-Feb-05)
Steelhead	Phase III – Standards Achieved (22-Feb-05)
Sockeye	Phase III – Additional Juvenile Studies (22-Feb-05)
Subyearling (summer/fall) Chinook	Phase III – Additional Juvenile Studies (22-Feb-05)
Coho	Phase III – Additional Juvenile Studies (27-Dec-06)

In 2012, Douglas PUD shall continue to operate Wells Dam adult fishways and the JBS in accordance with HCP operations criteria to protect aquatic life designated uses. Furthermore, all fish collection (hatchery broodstock and/or evaluation activities) or assessment activities that occur at Wells Dam will require approval by Douglas PUD and the HCP Coordinating Committee to ensure that such activities protect aquatic life designated uses.

Douglas PUD shall continue to operate the Wells Project in a coordinated manner toward reducing forebay fluctuations and maintaining relatively stable reservoir conditions that are beneficial to multiple designated uses (aquatic life, recreation, and aesthetics). Coordinated operations reduce spill, thus reducing the potential for exceedances of the TDG numeric criteria and impacts to aquatic life associated with TDG.

2.2.2 Biological Monitoring

As in past years, if hourly TDG levels exceed 125 percent in the tailrace of Wells Dam, Douglas PUD will conduct adult and juvenile salmonid GBT sampling. Douglas PUD will work with the Washington Department of Fish and Wildlife hatchery programs to monitor the occurrence of GBT on adult

[2] Phase III = Dam survival >95 percent or project survival >93 percent or combined juvenile and adult survival >91 percent (Standard Achieved).

broodstock collected for hatchery needs. Adult broodstock collection occurs at the adult trapping facilities in the Wells fishways. Upon collection of broodstock, hatchery staff will inoculate each fish, place a marking identification tag on them and look for any fin markings or unusual injuries. It is expected that adult broodstock sampled for GBT will consist of spring Chinook since they are the species migrating through the Wells Project during fish spill periods where high TDG is a concern.

The JBS at Wells Dam does not have facilities to allow for juvenile fish sampling and observation. To address GBT sampling for juvenile anadromous salmonids if hourly TDG levels exceed 125 percent in the tailrace of Wells Dam, Douglas PUD will request biological sampling of migrating juveniles for symptoms of GBT at the Rocky Reach juvenile bypass sampling facility. Target species for juvenile GBT sampling will consist of coho, sockeye, and yearling and subyearling Chinook. If flood flows above 7Q10 persist for extended timeframes (more than one week), sampling effort will be reduced to 3 days per week.

2.2.3 Water Quality Forums

Douglas PUD is currently involved in the Water Quality Team meetings held in Portland, Oregon. The purpose of the Water Quality Team is to address regional water quality issues. This forum allows regional coordination for monitoring, measuring, and evaluating water quality in the Columbia River Basin. Douglas PUD will continue its involvement in the Water Quality Team meetings for further coordination with other regional members.

Douglas PUD is also currently involved in the Transboundary Gas Group that meets annually to coordinate and discuss cross border dissolved gas issues in Canada and the U.S. Douglas PUD will continue its involvement with the Transboundary Gas Group.

In 2011, Douglas PUD actively participated in regional water quality forums with Ecology, Washington Department of Fish and Wildlife, Tribal Agencies, the U.S. Fish and Wildlife Service, NMFS, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). These meetings, ranging from the Transboundary Gas Group to meetings with the USACE to individual telephone and email information exchange, allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia River Basin. Douglas PUD is proposing to continue its involvement in such forums to further improve coordination with other regional water quality managers.

2.2.4 Water Quality Attainment Plan

Within one year of new FERC license issuance, Douglas PUD shall submit a Water Quality Attainment Plan (WQAP) to Ecology for review and approval. After Ecology approval, Douglas PUD shall submit the WQAP to FERC for approval prior to implementation. The WQAP shall include a compliance schedule to ensure compliance with TDG criteria within 10 years. The WQAP will also allow time for the completion of the necessary studies or for the resolution of the issue of elevated incoming TDG from upstream projects through rule-making or other means. The WQAP shall be prepared in consultation with the Aquatic Settlement Work Group (Aquatic SWG) and the HCP Coordinating Committee and shall meet the requirements of WAC 173-201A-510(5). The WQAP shall:

- Identify all reasonable and feasible improvements that could be used to meet TDG criteria. Data on high TDG levels and flow coming into the Wells forebay and its effects on Project compliance shall be included;
- Contain the analytical methods that will be used to evaluate all reasonable and feasible improvements;
- Provide for any supplemental monitoring that is necessary to track compliance with the numeric WQS; and
- Include benchmarks and reporting sufficient for Ecology to track Douglas PUD's progress toward implementing this plan and achieving compliance within ten years of Ecology's approval of the plan.

If implementing the compliance schedule does not result in compliance with TDG criteria at the time the compliance schedule expires, Douglas PUD may explore other alternative approaches available in the water quality standards, including a second compliance schedule or alternatives provided in WAC 173-201A-510(5)(g).

3.0 Structural Activities

No structural modifications related to spill are scheduled to occur at the Wells Project in 2012. As in 2011, high flow volume and spill may require JBS barrier removal per this GAP (see Appendix 2: 2012 Spill Playbook).

4.0 Compliance and Physical Monitoring

4.1 Monitoring Locations

4.1.1 TDG

TDG monitoring has been implemented in the Wells Dam forebay since 1984. Douglas PUD began monitoring TDG levels in the Wells Dam tailrace in 1997 by collecting data from a boat and drifting through the tailrace at four points across the width of the river. During the transect monitoring, no TDG "hot spots" were detected; the river appeared completely mixed horizontally. A fixed TDG monitoring station was established in 1998. The placement of the fixed monitoring station was determined based upon the 1997 work and was further verified as collecting data representative of river conditions during a 2006 TDG assessment at Wells Dam (EES et. al. 2007). Results of the 2008-2009 TDG numerical modeling activities conducted by University of Iowa/IIHR also confirmed that the tailrace monitoring station is located at a site representative of the mixed river flow, particularly during higher flows. Furthermore, locations of both forebay and tailrace sensors had to be protected to avoid sensor/data loss and damage and for safe accessibility during extreme high flows. The current locations of both the forebay and tailrace monitors took these criteria into consideration.

TDG monitoring at the Wells Project typically commences on April 1 and continues until September 15 annually. This monitoring period will encompass the operation of the Wells JBS as well as when river flows are at their highest and when a majority of spill occurs. Throughout this period, data from both forebay and tailrace sensors are transmitted by radio transmitters to a master radio at Wells Dam. This system is checked at the beginning of the season for communication between the probes and transmitters by technicians at Wells Dam. TDG data are sent and logged at the Douglas PUD Headquarters' building in 15-minute intervals. Information on barometric pressure, water temperature and river gas pressure is sent to the USACE on the hour over the Internet. The four data points (15 minute) within an hour are used in compiling hourly TDG values, the 24-hour TDG average and the 12C-High readings in a day (24-hour period).

In 2012, Douglas PUD intends to install redundant TDG sensors in the tailrace location. Should the primary sensor fail data gaps can be filled from the second sensor. Installation timeframe will be contingent upon regulatory agencies' approvals for in-water work and modification of the shoreline within the ordinary high water mark. Hourly TDG data transmissions to the USACE of Wells forebay and tailrace station data will be expanded to cover the year-round monitoring requirement (i.e., both the fish spill and non-fish spill seasons) within one year of new FERC license issuance.

4.1.2 Water Temperature

In addition to the collection of TDG data (described above), Douglas PUD has also been monitoring water temperatures at the TDG stations in the forebay and tailrace of Wells Dam, at various locations around the Wells Reservoir and in the Wells Dam fish ladders year round since 2005. These additional temperature data are collected using Onset tidbit temperature loggers. Historically, loggers have been deployed at five mainstem Columbia River locations and at one site on the upper Methow and Okanogan rivers within the Project boundary. Each quarter (every 3 months), loggers are retrieved for data download, the probes calibrated and tested for quality control purposes.

Within one year of new FERC license issuance, Douglas PUD shall monitor water temperatures at TDG monitoring locations and other Project locations with equipment capable of the daily transmission of hourly data to a web-accessible database maintained by Douglas PUD and available to Ecology, regional fish management agencies, and the public.

4.2 Quality Assurance

4.2.1 TDG

As part of the Douglas PUD's Quality Assurance/Quality Control (QA/QC) program, Douglas PUD's water quality consultant will visit the TDG sensor sites monthly for maintenance and calibration of TDG instruments. Calibration follows criteria established by the USACE, with the exception of monthly rather than bi-weekly calibration of sensors. A spare probe will be available and field-ready in the event that a probe needs to be removed from the field for repairs.

The consultant will inspect instruments during the monthly site visits and TDG data will be monitored weekly by Douglas PUD personnel. If, upon inspection of instruments or data, it is deemed that repairs are needed, they will be promptly made. Occasionally during the monthly sensor calibration, an error

may develop with the data communication. These problems are handled immediately by technicians located at Wells Dam. Generally, the radio transmitters at each fixed station will run the entire season without any problems.

Douglas PUD intends to collect quality, usable data for each day over the 168-day (April 1 – September 15) monitoring season. As part of the quality assurance process, data anomalies will be removed. This would include data within a 2-hour window of probe calibration and any recording errors that result from communication problems. Data errors will prompt a technician or water quality specialist or consultant site visit, to inspect the instrument and repair or replace, if necessary.

4.2.2 Water Temperature

QA/QC measures will be accomplished through maintenance and calibration visits of temperature monitoring equipment. As part of the QA/QC process, data will be reviewed and anomalies will be identified and removed from the data set prior to posting to the web-accessible database.

4.3 Reporting

Upon approval of the Wells GAP and issuance of a Wells Project TDG adjustment, Douglas PUD shall submit an annual report to Ecology no later than February 28 subsequent to each year that the TDG adjustment is approved. The annual report will summarize all GAP activities conducted for the prior year (i.e., annual report filed February 28, 2013 will be for all GAP activities conducted in 2012) as required by Ecology.

5.0 Conclusions

Pending approval by Ecology, implementation of the measures identified within the 2012 GAP are intended to serve as a long-term strategy to maintain compliance with the Washington State WQS for TDG in the Columbia River at the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids.

6.0 Literature Cited

ASL Environmental Sciences (ASL). 2007. Turbine Discharge Measurements by Acoustic Scintillation Flow Meter at Units 1 and 2, Wells Hydroelectric Project, Pateros, Washington, August 2006. Prepared by ASL Environmental Sciences Inc. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Bickford, S. A., J. R. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells Hydroelectric Facility, 2000.

Bickford, S.A., T. Kahler, R. Townsend, J.R. Skalski, R. Richmond, S. McCutcheon and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010 draft.

Douglas PUD. 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

EES Consulting, Carroll, J., ENSR, and Parametrix. 2007. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project. FERC No. 2149. Prepared by EES Consulting, Joe Carroll, ENSR, and Parametrix. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Gingerich, A. and B. Patterson. 2012. Douglas PUD Gas Bubble Trauma Biological Monitoring 2011, Wells Hydroelectric Project, FERC NO. 2149.

Le, B. and J. Murauskas. 2009. Total Dissolved Gas Abatement Plan. Wells Hydroelectric Project. April 2009. Prepared for Washington Department of Ecology, Yakima, Washington, 98902-3452.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Skalski, J. R., G. E. Johnson, C. M. Sullivan, E. Kudera and M. W. Erho. 1996. Statistical Evaluation of Turbine Bypass Efficiency at Wells Dam on the Columbia River, Washington. Canadian Journal of Fisheries and Aquatic Science. Volume 53, No. 10, 1996. Pages 2188-2198.

Washington Department of Ecology, Spokane Tribe of Indians and U.S. Environmental Protection Agency. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt: Submittal Report. Accessed online December 7, 2010 at: http://www.ecy.wa.gov/biblio/0403002.html

7.0 Appendices

Appendix 1. Approval letter from Pat Irle on Gas Abatement Plan for 2011.

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
15 W Yakima Ave, Ste 200 • Yakima, WA 98902-3452 • (509) 575-2490

March 31, 2011

Beau Patterson
Douglas County PUD No. 1
1151 Valley Mall Boulevard
East Wenatchee, WA 98802

RE: Wells Hydropower Project No. 2149
2011 Total Dissolved Gas Abatement Plan

Dear Beau:

The 2011 Total Dissolved Gas Abatement Plan for Wells Dam is hereby approved for the 2011 fish spill season, in accordance with WAC 173-201A- 200(1)(f)(ii).

Two minor comments:

1) The next annual draft Gas Abatement Plan (for 2012) should be submitted to Ecology by February 28th, 2012, at the latest, so that we can prepare comments and Douglas County Public Utility District can address those comments by April 1st , 2012, the date that fish spill is expected to begin.

2) We need to discuss procedures for monitoring and reporting compliance with the 110% standard during non-fish spill season.

Thanks for your continuing high quality work.

Sincerely,

Pat Irle
Hydropower Projects Manager

Appendix 2. Wells Hydroelectric Project Spill Playbook, 2012.

Memorandum

To: Ken Pflueger, Mike Bruno, Arlen Simon, Hank LuBean, Tom Kahler, Brian Hicks
From: Beau Patterson, Shane Bickford
Date: March 27, 2012
Subject: 2012 Wells Dam Spill Playbook

The 2011 Wells Dam Spill Playbook was based on the TDG production dynamics modeling conducted by the University of Iowa's IIHR-Hydroscience and Engineering Hydraulic Research Laboratories in 2009, and subsequent adaptive refinements implemented in 2010 mid-season and following that spill season. The two-phase flow computational fluid dynamics (CFD) model is used to predict hydrodynamics of TDG distribution within the tailrace of Wells Dam and further identify operational configurations that minimize TDG production at the project.

There is potential for conflicts to exist between these spill pattern instructions, and the spill barrier removal requirements of the Emergency Action Plan, based on weekly flood flow projections for the peak runoff period. Spill barriers should be removed when criteria are reached under either plan; barriers should be reinstalled when consistent with both plans.

Despite operational and environmental challenges during the 2011 spill season, when Wells Project flows were below the 7Q-10 flood flows (246 kcfs) and forebay TDG levels were less than 115%, Douglas PUD's average compliance rate for all three TDG waiver standards was 97.5%. Based on this high compliance rate under challenging conditions, recommendations for 2012 operations for TDG management are to again implement the measures contained within the 2011 Gas Abatement Plan and Spill Playbook. Operational prescriptions are described for the following scenarios.

No Forced Spill

The Wells Dam JBS should be operated continuously throughout the juvenile salmon outmigration (April 9 to August 19 for 2012). The standard Wells HCP operating criteria, as described in Section 4.3.1 of the Wells HCP, will apply to the 2012 operating season. The operating criteria includes requirements that at least one bypass bay be operated during the entire JSB season, requires that no turbine is operated without an adjacent bypass bay being open and requires that all five bypass bays be operated continuously for 24 hours when the Chief Joseph Dam uncoordinated discharge estimate for that day is 140 kcfs or greater. The Wells JBS is normally operated with 1.7 kcfs passed through S2 and S10, and 2.2 kcfs through S4, S6, and S8. Figure 1 (below) assumes that the Chief Joseph Dam uncoordinated discharge estimate is greater than 140 kcfs or sufficient turbines units are operating that all five bypass bays are open .

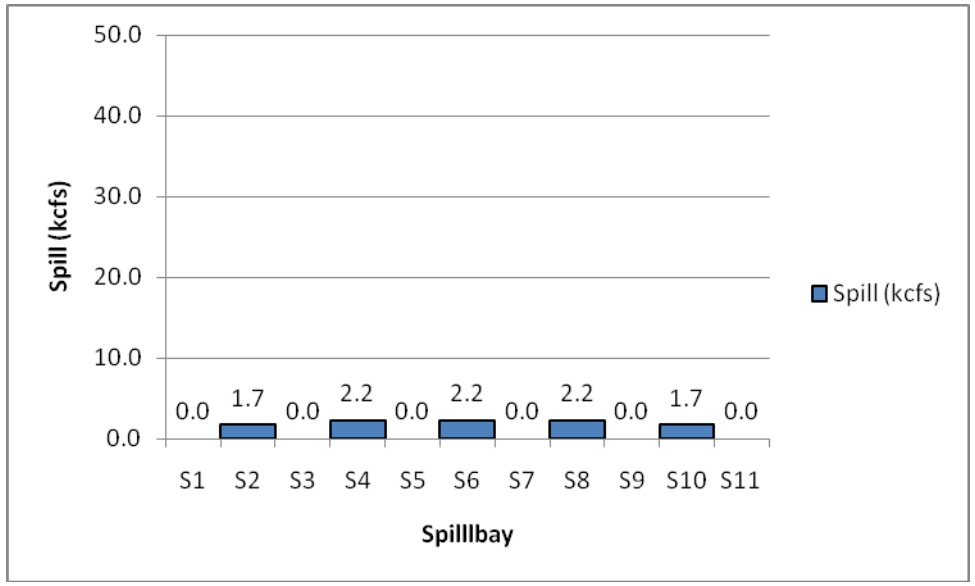

Figure 1. Operational configuration under no forced spill (JBS only).

I. Total Spill ≤ 53.0 kcfs, JBS barriers in place

As forced spill increases, Project Operators should allocate all spill through *S5* until the maximum capacity is reached through that spillbay (~43.0 kcfs). Note that *S5* spill requires support of generation flows from units 4 and 5 to minimize TDG production. This, along with the already established JBS spill (10.0 kcfs) would equal 53.0 kcfs (Figure 2). Over 90% of the spill events over the past decade could have been handled under this configuration.

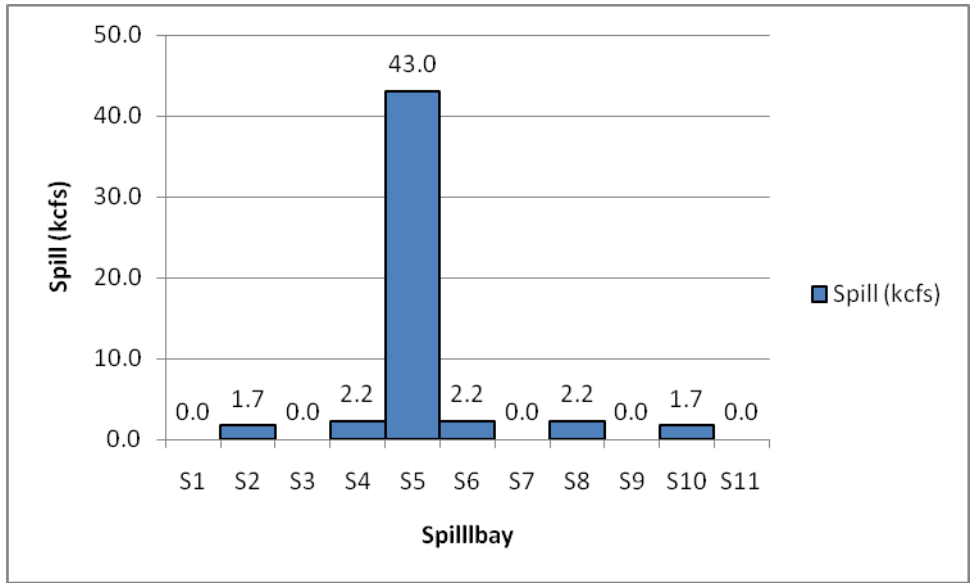

Figure 2. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

II. JBS Barrier Removal Criteria

When either of the following occurs, remove the JBS barrier in *S6*:

Spill in *S5* reaches 30 kcfs and total spill is expected to exceed 40kcfs for more than 8 hours, *or* total spill is expected to exceed 53 kcfs. After the JBS barrier is removed from *S6* and when flow through S5 is at least 30kcfs, shift 15 kcfs to *S6* (Figure 3). It is best to have generating units 4, 5, and 6 operating to support this spill configuration. Once at least 15 kcfs is being spilled through *S6*, spill can be allocated to *S5* until 43.0 kcfs is reached.

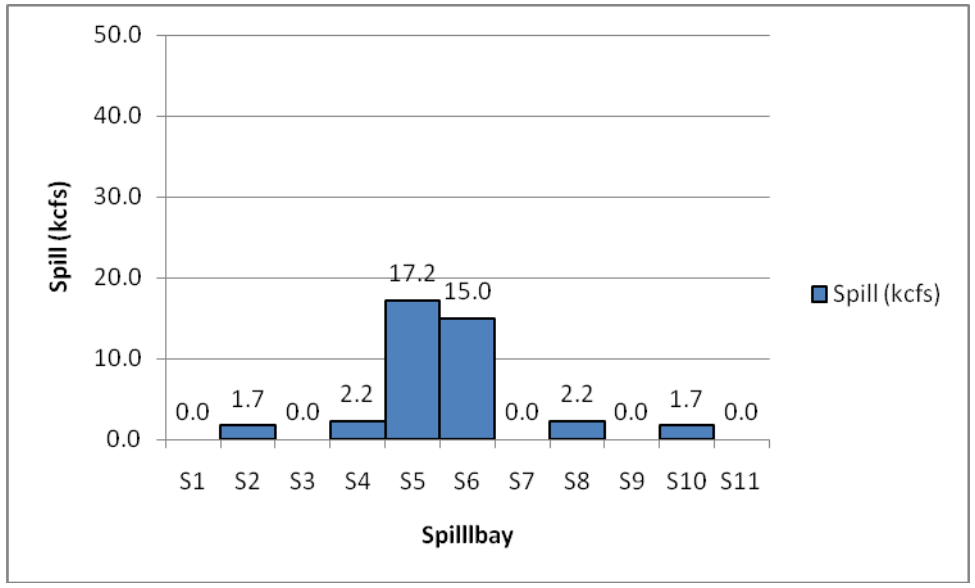

Figure 3. Operational configuration once spill reaches 30 kcfs in S5 and is expected to be above 40 kcfs for more than 8 hours (JBS removed). Shift sufficient spill from S5 to maintain a minimum of 15 kcfs spill at S6. Note that the 15.0 kcfs includes the existing 2.2 kcfs JBS flow.

III. Short duration decreases in Forced Spill (<53.0 kcfs) and JBS Barriers in *S6* Removed

If after removal of JBS barrier in *S6*, total spill drops below 53 kcfs (between 10-53 kcfs), and is expected to stay in this range for only a short period (4 days or less), direct spill through *S6* up to 15 kcfs (total spill < 22.9 kcfs). When total spill exceeds 22.8 kcfs, direct the remainder of spill through *S5*.

IV. Forced Spill (> 53.0 kcfs) and JBS Barriers in *S6* Removed

After *S5* reaches 43.0 kcfs, additional spill should be allocated to *S6* (*S6* is already spilling at least 15.0 kcfs need to fully engage the submerged spillway lip below the ogee). As flow increases, spill should continually increase through *S6* until paired with *S5* (e.g., 43.0 kcfs through *S5* and 26.0 kcfs through *S6*) (Figure 4). Eventually, *S6* will reach 43.0 kcfs (93.8 kcfs, Figure 4).

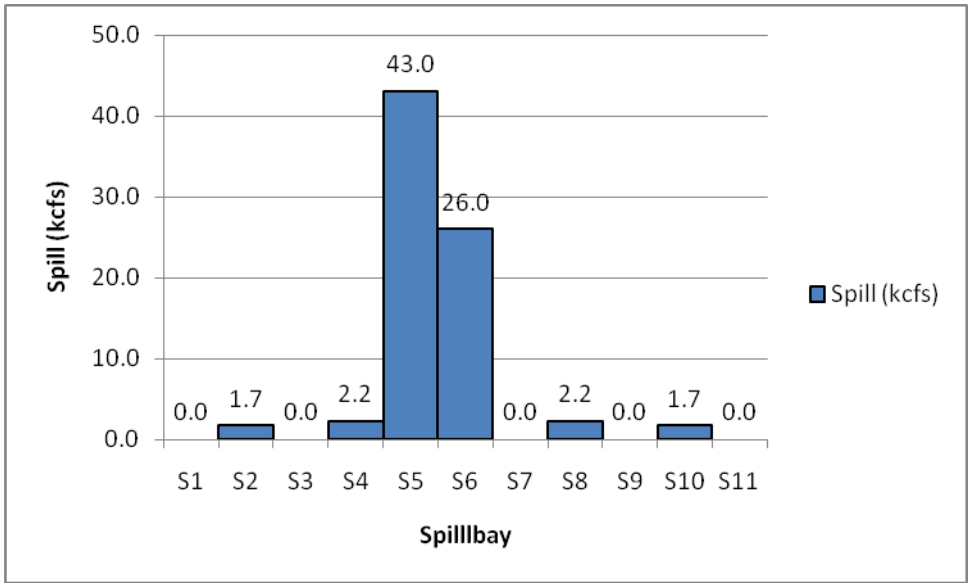

Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS flow, with removal of JBS barriers in *S6*). In this instance spill has reached the 43.0 kcfs maximum in S5 and additional spill is being allocated to S6 (26.0 kcfs).

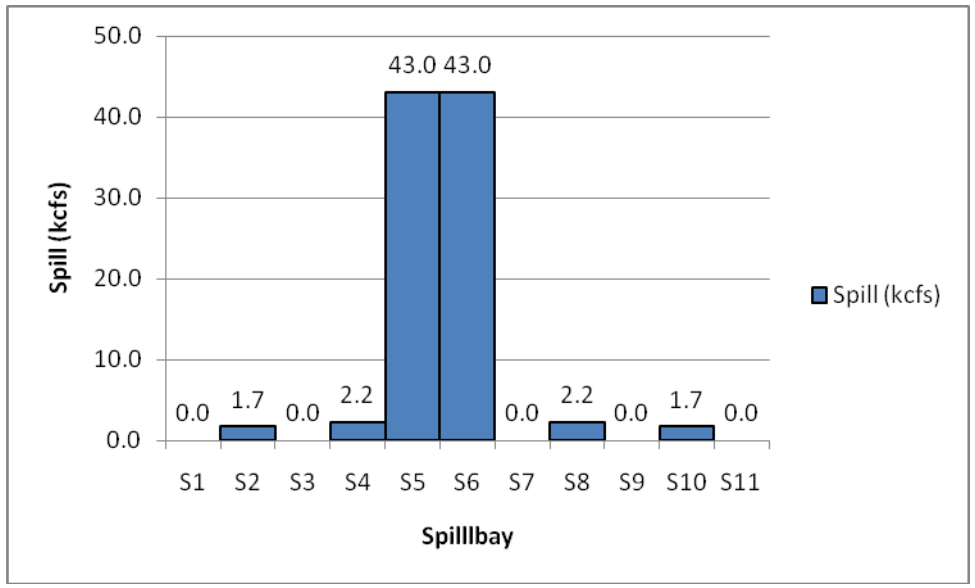

Figure 5. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (93.8 kcfs of spill), S6 has been fully allocated and 43.0 kcfs is now allocated through both *S5* and *S6*.

V. Forced Spill (> 93.8 kcfs) and JBS Barriers in *S6* Removed

After both *S5* and *S6* reach 43.0 kcfs, spill can also be allocated to *S7*. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through *S6* should be relocated to *S7* (Figure 6). As flow increases, spill can be continually increased through *S7* until paired with *S6* (30.0 kcfs through S6 and S7, while S5 continues at 43.0 kcfs). After this point, both *S6* and *S7* can be increased until all three spillbays have reached 43.0 kcfs (136.8 kcfs of spill, Figure 7).

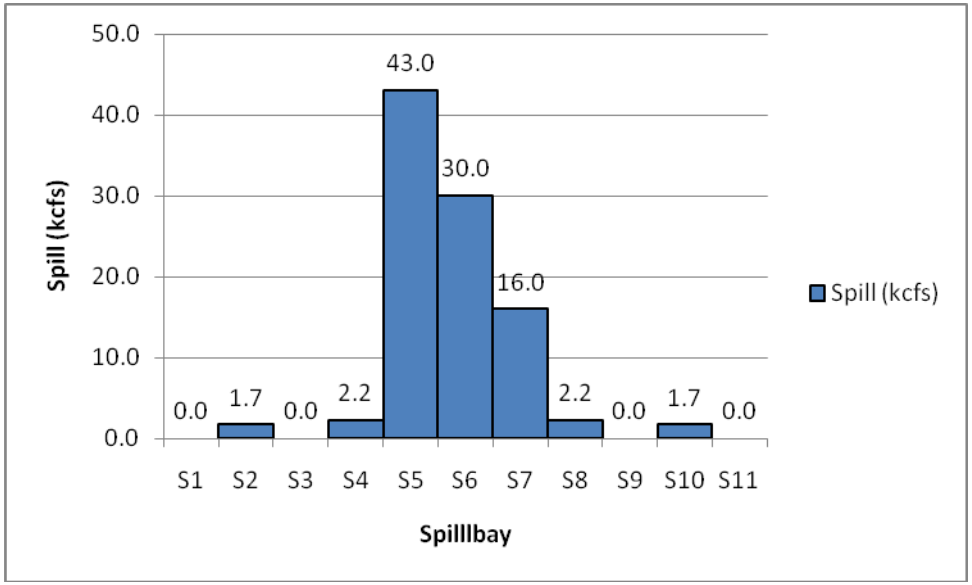

Figure 6. Operational configuration under forced spill > 96.0 kcfs. In this instance (96.8 kcfs of total spill), spill from *S6* is relocated to *S7* to maintain concentrated flow with *S5*. A spill of 16.0 kcfs is maintained in *S7* as to engage the submerged spillway lip.

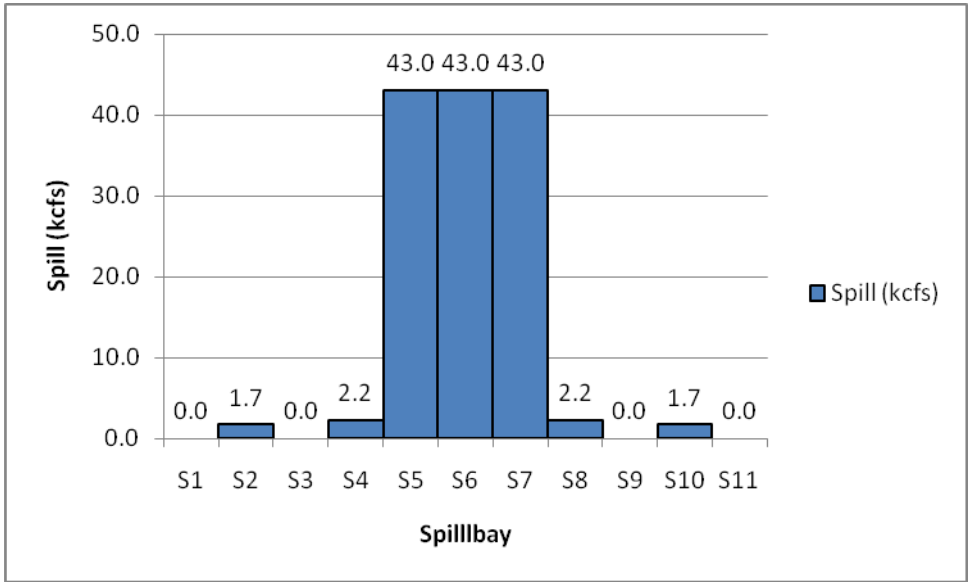

Figure 7. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in *S6*). In this instance (136.8 kcfs of total spill), 43.0 kcfs is allocated through *S5*, *S6*, and *S7*.

VI. Forced Spill (> 136.8 kcfs)

Forced spill exceeding 136.8 kcfs rarely occurs (less than 0.5%). If these conditions arise and total river flow exceeds 246.0 kcfs, then 7Q-10 conditions are occurring and Wells Dam is exempt from the TDG standards. Under this situation, Project Operators may perform any combination of operations to ensure that flood waters are safely passed. Also, at this point, JBS barriers will likely be removed allowing additional flexibility to spill up to 43 kcfs each through *S2*, *S4*, *S6*, and *S8*. Project Operators may pass spill through *S3* in a similar fashion to operations mentioned above (starting at a minimum of 15.0 kcfs to ensure that spillway lips are engaged).

VII. JBS Re-Installment Criteria

Once spills of less than 40.0 kcfs are predicted for at least four days, JBS barriers should be re-installed in *S6*.

I. Spill Lookup Table

Operation	Total Spill	Spillbay Number										
		S1 -	*S2* JBS	***S3***	*S4* JBS	***S5***	*S6* JBS	***S7***	*S8* JBS	***S9***	*S10* JBS	*S11* -
I. No Forced Spill	10.0	0.0	1.7	0.0	2.2	0.0	2.2	0.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), min.	11.0	0.0	1.7	0.0	2.2	1.0	2.2	0.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), max.	53.0	0.0	1.7	0.0	2.2	43.0	2.2	0.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs, *S6* JBS out), min.	54.0	0.0	1.7	0.0	2.2	31.2	15.0	0.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs, *S6* JBS out), max.	93.8	0.0	1.7	0.0	2.2	43.0	43.0	0.0	2.2	0.0	1.7	0.0
IV. Spill (> 93.8 kcfs, *S6* JBS out), min.	96.8	0.0	1.7	0.0	2.2	43.0	38.8	15.0	2.2	0.0	1.7	0.0
IV. Spill (> 93.8 kcfs, *S6* JBS out), max.	136.8	0.0	1.7	0.0	2.2	43.0	43.0	43.0	2.2	0.0	1.7	0.0
V. Spill (>137.0 kcfs), min.	137.0	0.0	1.7	15.0	2.2	43.0	43.0	28.2	2.2	0.0	1.7	0.0
V. Total Flow (>246 kcfs), max.	-	*Operators may adjust as needed.* *TDG exemption in place when total river flows exceed 246.0 kcfs.*										

Notes: (1) No spill through *S1* and *S11* as to minimize interference with fish ladders. (2) Even-numbered spillbays are designated as the Juvenile Bypass System (JBS). (3) Primary spillbays for forced spill are *S5*, *S6*, *S7*, *S3*, and *S9* (in that order).

APPENDIX F
AQUATIC SETTLEMENT WORK GROUP 2012 STUDY REPORTS

- 2011 Bull Trout Monitoring and Management Plan Annual Report
- 2012 Assessment of Salmonid Passage Responses to Different Flow Velocities at Wells Dam Fishway Entrance
- 2012 Wells Project Total Dissolved Gas Abatement Plan (GAP) Annual Report
- 2012 Wells Project Crayfish Distribution Study
- 2013 Adult Lamprey Passage and Enumeration Study, Wells Dam

Commissioners:
T. JAMES DAVIS
LYNN M. HEMINGER
RONALD E. SKAGEN

General Manager:
WILLIAM C. DOBBINS

Public Utility District No. 1 of Douglas County

1151 Valley Mall Parkway • East Wenatchee, Washington 98802-4497 • 509/884-7191 • FAX 509/884-0553 • www.douglaspud.org

Via Electronic Filing

March 28, 2012

Honorable Kimberly D. Bose
Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington DC 20426

Subject: Wells Hydroelectric Project No. 2149
Wells Bull Trout Monitoring and Management Plan – Annual Report

Dear Secretary:

In accordance with Article 62 of the Federal Energy Regulatory Commission (Commission) license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits the 2011 Annual Report associated with the implementation of the Wells Bull Trout Monitoring and Management Plan (Bull Trout Plan).

On June 21, 2004, the Commission issued orders amending the license for the Wells Project in order to implement the terms of the Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP). The United States Fish and Wildlife Service (USFWS) issued a biological opinion (BO) pursuant to Section 7 of the Endangered Species Act (ESA) to assess the effects of the HCP on ESA listed bull trout and other listed species under the jurisdiction of the USFWS. The BO included reasonable and prudent measures (RPMs) and associated terms and conditions for implementing the RPMs for bull trout. The Commission order approving the Wells HCP added Article 61, 62 and 63 to the Wells Project license.

Article 61 of the license required Douglas PUD to file with the Commission a Bull Trout Plan for monitoring take associated with the operations of the Wells Project. Article 61 further required that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation).

Following consultation with the USFWS, NMFS, WDFW, Colville Confederated Tribes, and the Yakama Nation, Douglas PUD filed the Bull Trout Plan with the Commission on February 28, 2005. The Bull Trout Plan was approved by the Commission on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the Commission an annual report describing the activities required by the Bull Trout Plan.

Article 63 of the license reserves the Commission's authority to require Douglas PUD to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan.

Consistent with Article 62 of the license, please find enclosed Douglas PUD's Annual Bull Trout Report for activities that took place between January 01, 2011 and December 31, 2011. This report is simultaneously being provided to the USFWS and the parties to the Wells HCP and the Aquatic Settlement Agreement.

If you have any questions related to the 2011 Annual Bull Trout Report, please feel free to contact me at (509) 881-2208 or sbickford@dcpud.org.

Sincerely,

Shane Bickford
Supervisor of Natural Resources

Enclosure: (1) 2011 Bull Trout Annual Report. Wells Hydroelectric Project FERC Project No. 2149. March 2012.

Copy: Steve Lewis, USFWS
Walt Davis, FERC, Portland, with 1 copy
James Hastreiter, FERC, Portland, with 1 copy
Erich Gaedeke, FERC, Portland with 1 copy
Mike Schiewe, Coordinator – HCP Coordinating Committee
Wells HCP Coordinating Committee – Members List
Wells Aquatic Settlement Work Group – Members List
Brad Hawkins, Douglas PUD

BULL TROUT MONITORING AND MANAGEMENT PLAN
2011 ANNUAL REPORT

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

March 28, 2012

Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

For copies of this Annual Report, contact:

Public Utility District No. 1 of Douglas County
Attention: Natural Resources
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4497
Phone: (509) 884-7191

Table of Contents

List of Tables

List of Figures

EXECUTIVE SUMMARY

The goal of the Wells Hydroelectric Project (Wells Project) Bull Trout Monitoring and Management Plan (Bull Trout Plan) is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout (*Salvelinus confluentus*) associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan was prepared and is implemented to meet monitoring requirements stipulated in a U.S. Fish and Wildlife Service (USFWS) Biological Opinion (USFWS 2004) regarding implementation of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP). The USFWS Biological Opinion monitoring requirements were also incorporated by the Federal Energy Regulatory Commission (FERC) into the existing Wells Project license in 2004. The Bull Trout Plan was developed in collaboration with the USFWS, National Marine Fisheries Service (NMFS), Washington Department of Fish and Wildlife (WDFW), the Colville Confederated Tribes, and the Yakama Nation, and was approved by the FERC. The Bull Trout Plan has four objectives, addressed by carrying out various field study components from 2004 to 2008 at the Wells Project.

In accordance with Article 62 of the FERC license for the Wells Project, Public Utility District No. 1 of Douglas County (Douglas PUD) is required to prepare and file with the Commission an annual report describing the activities required by the Bull Trout Plan. In December 2008, Douglas PUD filed with the FERC, a final comprehensive report summarizing the results of all activities conducted under the Bull Trout Plan between January 2005 and July 2008.

In a letter to the FERC on December 29, 2008, Douglas PUD requested that the 2008 annual report filing (due March 31, 2009) be eliminated and instead include all remaining 2008 activities (August to December 2008) within the 2009 annual report that was filed with the FERC on March 31, 2010. In a letter dated February 3, 2009 the FERC approved Douglas PUD's request. The 2009 annual report was submitted in March of 2010, and included both the results of those additional activities conducted in 2008 that were not included in the Bull Trout Plan 2005-2008 Final Report (LGL and Douglas PUD, 2008) and the ongoing Bull Trout Plan activities that were conducted in 2009. In March 2011, the 2010 annual was submitted to FERC.

The enclosed annual report is a comprehensive summary of the bull trout research, monitoring and evaluation (M&E) efforts that took place during calendar year 2011.

Four adult bull trout were incidentally captured at Wells Dam during Chinook brood collection activities in the spring of 2011. All of these fish were PIT-tagged and subsequently released back into the fishways to continue their upstream migration. One of these fish was later detected at the Twisp River PIT tag interrogation location on October 12, 2011. Another fish PIT-tagged at Wells was released and detected at the Gold Creek interrogation station on September 28, 2011. The other two adult bull trout tagged at Wells Dam in 2011 have not been detected to date. This outcome is not surprising given the low detection probabilities for the riverine PIT-tag detection arrays, especially during the spring freshet.

One of the five fish PIT-tagged at Wells in 2010, during brood collection activities, was detected in the Twisp River on July 5th and again in the lower Methow River on October 4th of 2010. In

2011, this fish was detected at Rocky Reach and then at Wells Dam in early and mid-July, respectively. Together, this fish appeared to make a spawning migration to the Twisp River in 2010, exited the Methow in the fall of 2010, successfully passed downstream through Wells and Rocky Reach between October 2010 and July 2011, followed by successful accents at both of these projects in July 2011.

Thirty-six adult bull trout (>440 mm) were captured by the PUD's contractor at the Twisp Weir in 2011. Twenty-six of these fish did not have a PIT tag and were given one. Seven of these 36 fish were fish captured and tagged in 2010 and 3 were fish captured twice in 2011. DNA samples were taken from adults captured at the Twisp River Weir in 2010 and 2011. These DNA samples will be passed along to the USFWS for future micro satellite analysis.

Bull trout behavior within the Methow Basin during 2011 remained similar to previous years; however, fewer PIT-tag detections were recorded in the spring of 2011 due to a protracted spring freshet that damaged many of the PIT-tag detection arrays and significantly reduced the detection efficiencies the few remaining interrogation sites. Similarly, bull trout encounters at the Twisp Weir were also down in 2011 when compared to prior years. The historically high flows in 2011 prevented the weir from being operated for almost two months because river flows exceeded the operational tolerance of the weir. As in past years, adult bull trout were detected migrating upstream into the Twisp River in the spring (May and June). After spawning in August and September, a consistent downstream migration was exhibited by adults moving out of the Twisp River and into the lower Methow and Wells reservoir.

Counts of bull trout passing Wells Dam in 2011 remained similar to counts collected during 2008 through 2010, but showed a slight increase in observations. Adult bull trout counts at the Wells Project were 43, 43, 44 and 66 respectively for the years 2008 through 2011. Off-season fishway video monitoring continues to indicate that bull trout are not passing Wells Dam during January to April. In late December 2011 two bull trout were salvaged in the east fish ladder during maintenance activities. During 2011, 97% (64 of 66) of the bull trout passing through Wells Dam fish ladders did so during the months of May through July, with the last observation in early November 2011. This timing is consistent with past years, and indicates bull trout passage at the dam is largely a seasonal migration independent of Project operations.

To date, no sub-adult bull trout have been observed in Wells Dam fishways. After reviewing video of the 66 bull trout that were observed in the fish ladders in 2011, all of these fish were classified as adults. These fish had an average estimated total length of 21 inches and ranged from 15-28 inches (380-710 mm). In August 2011 a Methow Core Area (MCA), PIT tagged (2010) sub-adult bull trout was detected at the Rocky Reach bypass facility and was therefore moving downstream. This fish was 170 mm (7 inches) when tagged in August 2010, suggesting that it may have been a sub-adult at the time it passed Wells Dam (sometime before August 29th 2011). To date, over 100 sub-adult bull trout have been PIT tagged in the MCA by Douglas PUD contractors. The 2011 detection would be the first confirmed MCA sub-adult observed at a mid-Columbia project. This preliminary data suggests that sub-adults in the MCA stay close to their natal habitats relative to adult conspecifics.

Incidental captures of sub-adult bull trout by Douglas PUD's hatchery monitoring and evaluation screw traps were consistent with previous years. Twenty-one sub-adult bull trout were captured in the Twisp River (six year average = 20.1). Two sub-adult bull trout were captured in the Methow River screw trap (six year average = 1.8). DNA samples were taken from all of these fish. Alex Repp (WDFW, Biologist) is the current custodian of these samples. DNA samples from previous years are being held by the WDFW and the USFWS for future analyses. Additional incidental captures of sub-adult bull trout took place by Douglas PUD contractors conducting hook and line, backpack electroshocking and netting for residual steelhead in the Methow Basin. A total of 14 bull trout were incidentally captured with this gear in 2011. All of these fish were subsequently PIT-tagged and released unharmed (Charlie Snow, pers. comm.). Tag codes for all PIT-tagged fish were uploaded to the PTAGIS database.

Douglas PUD biologists conducted a bull trout stranding survey in the Wells project on June 10th 2011, following operations at the project that lowered the reservoir below 773 feet above mean sea level (MSL). No bull trout were observed during this sampling. Past stranding and entrapment surveys have indicated that infrequent Project operations that result in lowering of the reservoir have not impacted adult or sub-adult bull trout in the Wells Project.

In accordance with Article 63 of the Wells Dam operating license, Douglas PUD continued participation in the development of a bull trout recovery plan with regional USFWS authorities. This participation included attending June 29th 2011 and August 29th 2011 recovery planning meetings and data sharing at the request of the USFWS. Douglas PUD will participate in the review of the Bull Trout Recovery Plan following its release in the spring of 2012.

In early 2011 the USFWS initiated an ESA Section 7 consultation on the proposed relicensing of the Wells Project. This consultation was concluded on March 16th 2012 when the USFWS issued a final Biological Opinion and Incidental Take Statement for the relicensing of the Wells Project. Douglas PUD provided the USFWS with biological data and information related to this consultation

1.0 INTRODUCTION

In August 1993, Douglas, Chelan, and Grant Public Utility Districts (collectively, "mid-Columbia PUDs") initiated discussions to develop a long-term, comprehensive program for managing fish and wildlife that inhabit the mid-Columbia River basin (the portion of the Columbia River from the tailrace of Chief Joseph Dam to the confluence of the Yakima and Columbia rivers). After an extensive review, the negotiating parties determined that the best basin-wide approach would be to develop an agreement for anadromous salmonids, specifically: spring and summer/fall Chinook salmon (*Oncorhynchus tshawytscha*); sockeye salmon (*O. nerka*); coho salmon (*O. kisutch*); and steelhead (*O. mykiss*) (collectively, "Plan Species") which are under the jurisdiction of the National Marine Fisheries Service (NMFS).

On July 30, 1998, Public Utility District No. 1 of Douglas County (Douglas PUD) submitted an unexecuted form of an Application for Approval of the Wells Project Anadromous Fish Agreement and Habitat Conservation Plan (Wells HCP) to the Federal Energy Regulatory Commission (FERC) and NMFS. To expedite the FERC's completion of formal consultation, Douglas PUD prepared a biological evaluation of the effects of implementing the Wells HCP on listed species under the jurisdiction of the U.S. Fish and Wildlife Service (USFWS).

In a letter to the FERC, the USFWS requested consultation under Section 7 of the Endangered Species Act (ESA) regarding the effects of hydroelectric project operations on bull trout in the Columbia River (letter from M. Miller, USFWS, to M. Robinson, FERC, dated January 10, 2000). The request for consultation was based on observations of bull trout in the study area. In its reply to the USFWS, the FERC noted that there was virtually no information on bull trout in the mainstem Columbia River. To begin to address this information gap, an initial radio-telemetry study of bull trout in the mid-Columbia basin was requested by USFWS in 2000 and implemented from 2001 to 2004 by Douglas, Chelan, and Grant PUDs (BioAnalysts, Inc. 2004).

On November 24, 2003, Douglas PUD filed an application with the FERC for approval of the executed Wells HCP. The 2003 application for approval replaced the 1998 application with the executed form of the Wells HCP. On December 10, 2003, the USFWS received a request from the FERC for formal Section 7 ESA consultation to determine whether the proposed incorporation of the Wells HCP into the FERC license for Wells Hydroelectric Project (Wells Project) operations was likely to jeopardize the continued existence of the Columbia River ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request, the USFWS issued a Biological Opinion (BO) pursuant to Section 7 of the ESA to assess the effects of implementing the HCP on bull trout and other listed species under the jurisdiction of the USFWS. The BO included an Incidental Take Statement outlining reasonable and prudent measures (RPMs) and associated terms and conditions to monitor and limit bull trout take at the Wells Project. On June 21, 2004, the FERC issued orders amending the license for the Wells Project to implement the terms of the Wells HCP. The FERC incorporated the USFWS bull trout RPMs and terms and conditions into the existing Wells Project license, which are detailed in license articles 61, 62, and 63.

Article 61 of the license requires Douglas PUD to file with the FERC a Bull Trout Plan for implementing the USFWS bull trout RPMs and terms and conditions, which were designed to

monitor and limit bull trout take associated with Wells Project operations. Article 61 further requires that Douglas PUD prepare the Bull Trout Plan in consultation with the USFWS, NMFS, Washington Department of Fish and Wildlife (WDFW), and interested Indian Tribes (Colville Confederated Tribes and the Yakama Nation). Following consultation with these stakeholders, on February 28, 2005, Douglas PUD filed with the FERC the "*Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008"* (Douglas PUD 2004), which is referred to as the "Bull Trout Plan" in this document. The Bull Trout Plan was approved by the FERC on April 19, 2005.

Article 62 of the license requires Douglas PUD to prepare and file with the FERC an annual report of the status of activities required by the Bull Trout Plan. On March 26, 2008, Douglas PUD with approval from USFWS filed a request for an extension of time to submit the 2007 annual bull trout monitoring report and to consolidate the 2007 annual report with the final bull trout monitoring report, required to be filed with the FERC by December 31, 2008. On April 16, 2008, the FERC issued an order granting this request and per the order, Douglas PUD filed with the FERC a 2005-2008 final monitoring report that summarized all data collected to meet the Bull Trout Plan objectives outlined in the USFWS bull trout RPMs and terms and conditions, and the Wells Project license articles 61 and 62.

The next reporting deadline associated with the Bull Trout Plan was March 31, 2009 (2008 Annual Report). However, because the 2005-2008 final report contained bull trout monitoring activities for most of 2008, Douglas PUD requested and was granted permission, via the FERC's April 16, 2008 letter to Douglas PUD, to eliminate the March 2009 filing of the 2008 Annual Report and instead include all remaining 2008 activities within the 2009 annual report**.** The former document was submitted in March of 2010, which summarized the results of those additional activities conducted in 2008 that were not completed in time for inclusion into the Bull Trout Plan 2005-2008 Final Report (LGL and Douglas PUD 2008) and the ongoing Bull Trout Plan activities that were conducted in 2009. In March of 2011 the 2010 annual report was submitted to the FERC. The following document serves as the 2011 annual report (filed with the FERC in March 2012). As in previous years the 2011 report is a comprehensive summary of all the bull trout research over the last 11 years, but is focused largely on the monitoring and evaluation efforts conducted during 2011.

Article 63 was a reservation of authority by the FERC to require the licensee to carry out specified measures for the purpose of participating in the development and implementation of a bull trout recovery plan. The USFWS continued bull trout recovery planning in 2011. In response to compliance with article 63 of the Wells Project license, Douglas PUD has and will continue to participate in the development of future recovery planning documents for bull trout.

Over the last five years Douglas PUD has worked closely with stakeholders to relicense Well Dam. As part of this process the FERC requested ESA consultation from the USFWS on the Wells Project relicensing application, which included a series of new aquatic, wildlife, avian, botanical, historic property and recreation management plans, in addition to the plans already contained within the Wells HCP. In 2011 the USFWS initiated an ESA Section 7 consultation, requested by the FERC, as part of the relicensing of the Wells Project

2.0 GOALS AND OBJECTIVES

The goal of the Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout from Wells Project operations and facilities. The Bull Trout Plan was intended to be an adaptive approach, where strategies for meeting the goals and objectives may be negotiated under a collaborative effort with stakeholders based on new information and ongoing monitoring results. The plan was designed specifically to: (1) address ongoing project-related impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS Draft Bull Trout Recovery Plan; and (3) monitor and minimize the extent of any incidental take of bull trout consistent with Section 7 of the ESA.

The Bull Trout Plan has four main objectives: (1) identify potential project-related impacts on upstream and downstream passage of *adult* bull trout through the Wells Dam and reservoir and implement appropriate measures to monitor any incidental take of bull trout; (2) assess project-related impacts on upstream and downstream passage of *sub-adult* bull trout; (3) investigate the potential for bull trout entrapment or stranding in off-channel or backwater areas of Wells Reservoir; and (4) identify the core areas and local populations, as defined in the USFWS Draft Bull Trout Recovery Plan, for the bull trout that utilize the Wells Project Area.

Activities designed to support some objectives in the Bull Trout Plan were only intended to be conducted in the early phases of plan implementation (i.e., radio-tagging of bull trout at Wells Dam between 2005-2008 and comprehensive incidental take calculation for monitoring years 2001-2004 and 2005-2008). The results of these activities can be found in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD 2008) and are considered completed tasks with the filing of that final report. For the purposes of continued annual reporting per Article 62, only ongoing Bull Trout Plan activities are reported herein.

Below is a brief summary of the Bull Trout Plan objectives. A more detailed strategic framework to implement each objective is summarized in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD 2008).

2.1 Objective 1 - Adult Bull Trout Passage Monitoring

Strategy 1-1: Implement an adult bull trout telemetry program to monitor adult upstream and downstream passage in the Wells Project Area and implement appropriate measures to monitor any incidental take of bull trout.

Strategy 1-2: Analyze passage results and operational data to determine if correlations exist between passage times and passage events and project operations.

Strategy 1-3: Determine off-season adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period 2004-2005. Per request by the USFWS, off-season fishway monitoring for adult bull trout passage has continued to date.

Strategy 1-4: Should upstream or downstream passage problems be identified, pursue the feasibility of options to modify upstream passage facilities or operations that reduce the impact to bull trout passage.

2.2 Objective 2 - Sub-adult Bull Trout Passage Monitoring

Strategy 2-1: The stakeholders agree at this time[1] that because of the inability to collect a sufficient sample size of sub-adult bull trout, it is not feasible to assess sub-adult passage at Wells. However, when encountered at the Wells Project, or in tributary traps, sub-adult bull trout will be PIT-tagged.

Strategy 2-2: Determine off-season sub-adult bull trout passage through the adult fishway (numbers and times of year) at Wells for an experimental period from 2004 to 2005. Per request by the USFWS, off-season fishway monitoring for sub-adult bull trout passage has continued to date.

2.3 Objective 3 - Bull Trout Entrapment and Stranding Evaluation

Strategy 3-1: Evaluate Wells inflow patterns, reservoir elevations, and backwater curves to determine if stranding or entrapment of bull trout may occur.

2.4 Objective 4 - Identification of Core Area and Local Populations of Bull Trout that Utilize the Wells Project Area

Strategy 4-1: Gather genetic samples from radio-tagged and PIT-tagged bull trout for comparison to baseline genetic samples from local populations and core areas.

Strategy 4-2: Work cooperatively with other agencies to obtain locations of radio-tagged fish outside the Project area.

3.0 STUDY AREA

3.1 Wells Bull Trout Plan Study Area

The study area for this report included all waters within the Wells Project, including the lower Okanogan and Methow rivers, the Wells Reservoir, Wells Dam, and Wells Tailrace, downstream to the "Gateway" location set at approximately 3 miles downstream from Wells Dam. Additional monitoring also took place at downstream hydroelectric projects and other accessible reaches of the mid-Columbia Basin including the Methow, Wenatchee, Entiat, and Okanogan rivers. PIT tagging activities also occurred in the Methow and Twisp rivers.

[1] At the time that the Bull Trout Plan was prepared in 2004.

3.2 General Description of the Wells Hydroelectric Project Area

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington. Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (COE), and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, located approximately 8 miles upstream from the Wells Project at the mouth of the Methow River.

The Wells Project is the chief generating resource for Douglas PUD. It includes 10 generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a crest elevation of 795 feet mean sea level (msl) in height.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5 miles up the Methow River and approximately 15.5 miles up the Okanogan River. The normal maximum surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at elevation of 781 feet msl. The normal maximum water surface elevation of the reservoir is 781 feet msl (Figure 3.2-1).

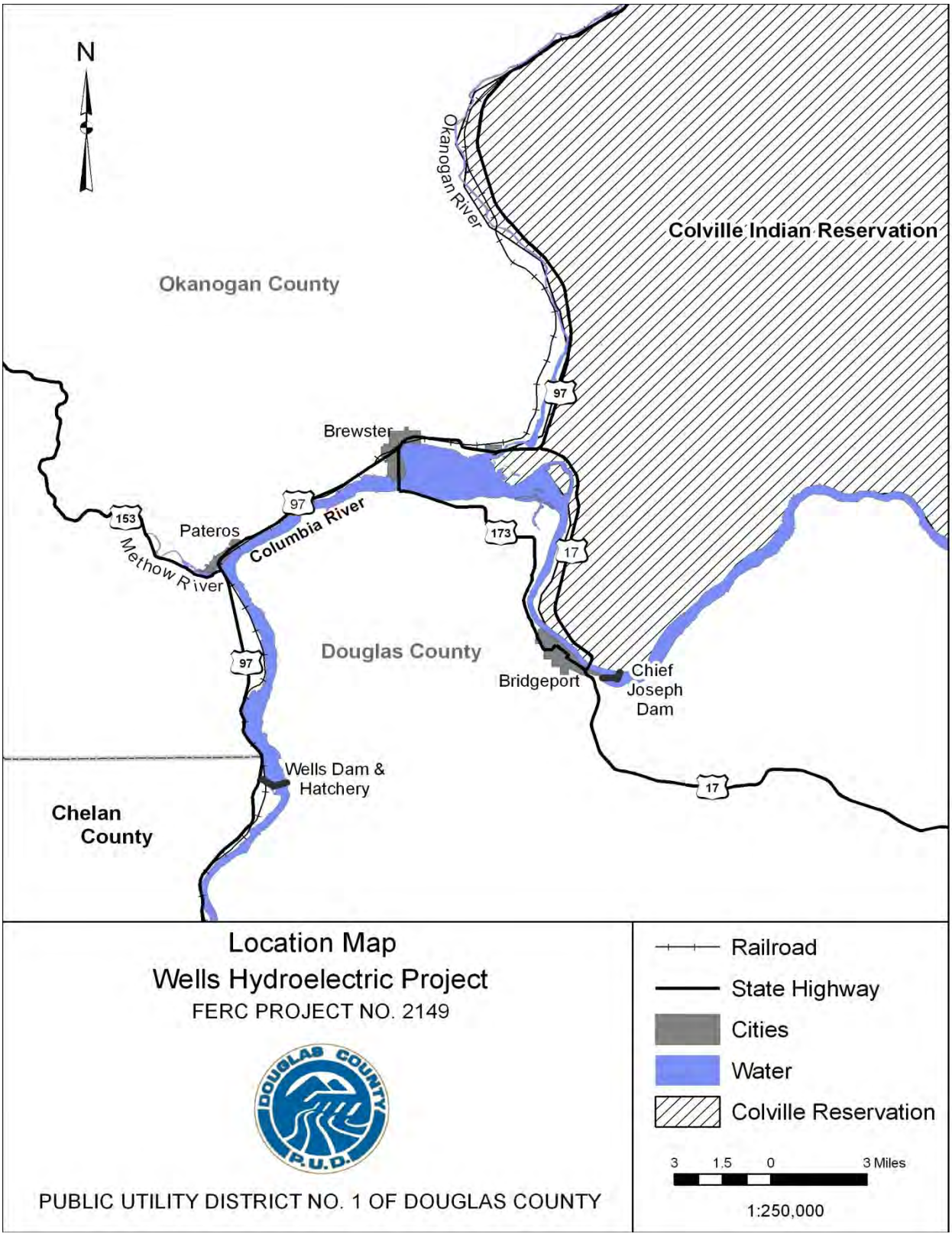

Figure 3.2-1 Location map of the Wells Project.

4.0 BACKGROUND AND EXISTING INFORMATION

4.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and East to Western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the Mackenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Over part of their range, bull trout are sympatric with Dolly Varden; most notably in British Columbia and a small portion of the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat (USFWS et al. 2000), and stream/population connectivity. Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats (Rieman and McIntyre 1995), and should not be expected to occupy all available habitats at the same time (Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993), although each form is not present everywhere. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Mongillo 1993; Kraemer 1994; McPhail and Baxter 1996; Volk 2000). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives. Sexually mature resident bull trout are often much smaller at maturation than sexually mature adults of other life histories (McPhail and Baxter 1996).

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes, but it is unknown if this emigration is a result of density dependent effects from limited stream rearing habitat, or if these young-of-the-year actually survive in the lake environment (Riehle et al. 1997). Juvenile bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover (Sexauer and James 1993) with maximum summer water temperatures generally less than 16ºC (Dunham et al. 2003) and areas with cold hyporheic zones or groundwater upwellings (Baxter and Hauer 2000).

4.2 Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the ESA (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). The USFWS anticipates releasing a recovery planning document in the spring of 2012 (Judy Neibauer, Personal Communication, February 8, 2012). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004, the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995). After legal challenge, the designation was expanded and new critical habitat was proposed throughout the range of bull trout in January 14, 2010 (75 FR 2270), including all of the Wells Project waters except the Okanogan River.

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain “threatened” status for the species, and determine if multiple distinct population segments exist within the Columbia River that merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and

recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit[2] and the USFWS has identified the Wenatchee, Entiat, and Methow rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area may function as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwintering, migration, and foraging habitats. The Wenatchee Core Area has populations using lake and riverine habitat (both the Wenatchee and Columbia rivers) for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent a regularly interacting reproductive unit. Sixteen local populations have been identified in the Wenatchee (6), Entiat (2), and Methow (8) core areas (USFWS 2002). However, little genetic information currently existed at the end of 2011, which identifies local populations by genetic means. As part of Douglas PUD's Bull Trout Monitoring and Management Plan, Douglas PUD has provided the USFWS with genetic samples to facilitate this process.

4.3 2001-2004 Mid-Columbia Bull Trout Radio-telemetry Study

Bull trout have been counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the behavior, migratory characteristics and habitat use of bull trout in the mid-Columbia River. Therefore, to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio-telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio-telemetry (Figure 4.3-1) to address the information deficit. The number of bull trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

From 2001 to 2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams, radio-tagged, and monitored through 2004. Multiple-telemetry techniques were used to assess the movement and behavior of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the project, identify passage times and

[2] Note that while the USFWS refers to the area encompassing the Wells Project as the Upper Columbia Recovery Unit for bull trout, the section of the Columbia River from Chief Joseph Dam to the confluence of the Yakima and Columbia rivers is often termed the "mid-Columbia" for other purposes, and is the term used in this document when referring to the reach.

determine their direction of travel (i.e., upstream/downstream). In addition to these systems, a number of additional telemetry systems were deployed to address specific questions posed by the USFWS and Douglas PUD. At Wells Dam, several additional systems were installed to identify whether tagged bull trout could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually during the study period from 2001-2004, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial telemetry surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). English et al. (1998, 2001) provide a detailed description of the telemetry systems at each of the dams and within the tributaries.

Successful bull trout upstream and downstream passage was observed at the Wells Project. In addition, no bull trout injury or mortality was observed associated with the Wells Project. Radio-tagged bull trout that migrated upstream past Wells Dam used the Methow River subbasin during the bull trout spawning period. Key findings of the 2001 to 2004 study are used in this document to assess the 6-year average take analysis as stipulated in the Bull Trout Plan (Objective 1, Strategy 1-1) and are summarized in the results section of this document.

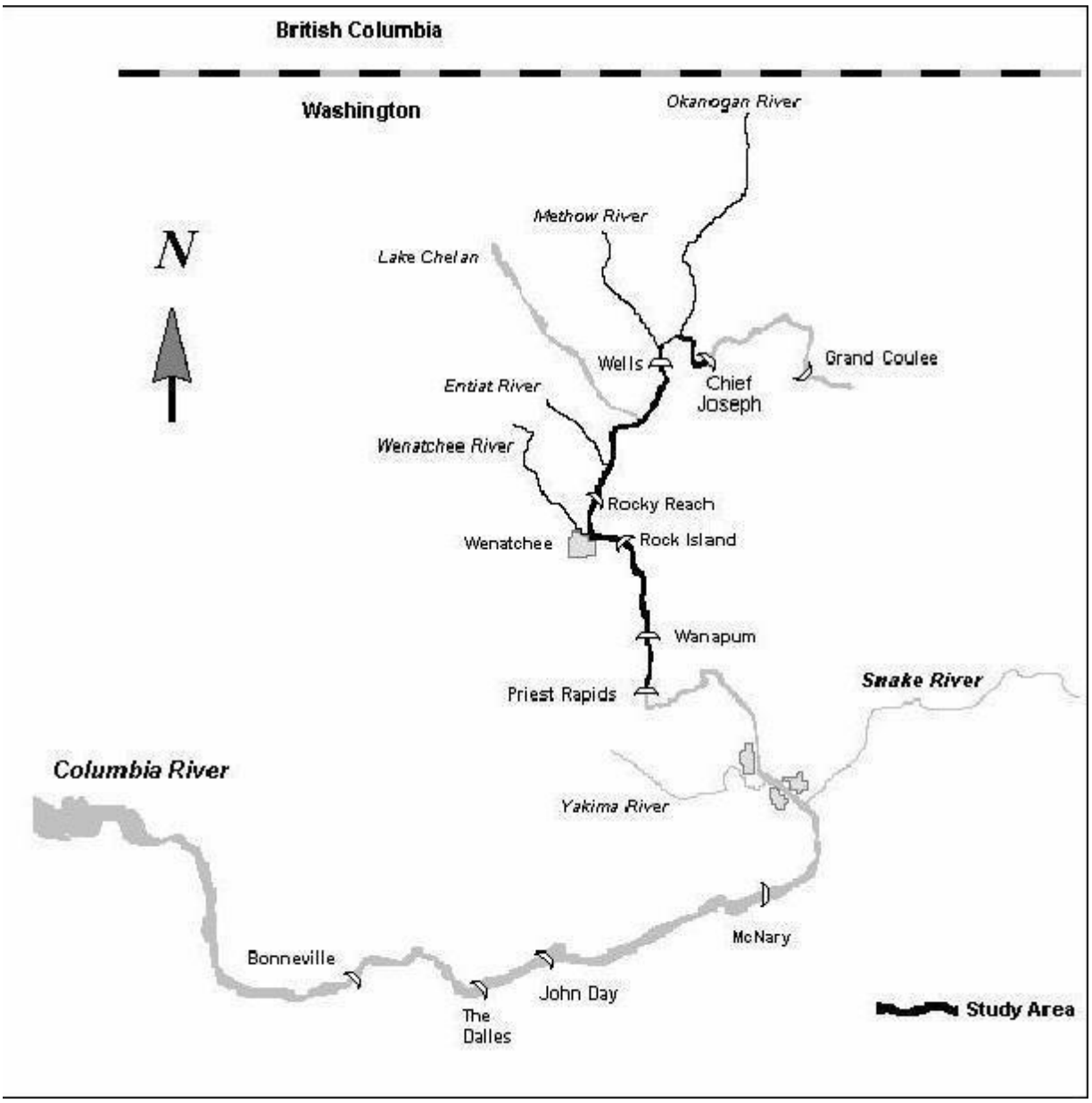

Figure 4.3-1 Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2004).

4.4 2005-2008 Bull Trout Monitoring and Management Plan Activities

The goal of the Wells Project Bull Trout Plan is to identify, develop, and implement measures to monitor and address potential project-related impacts on bull trout associated with the operations of the Wells Project and associated facilities (Douglas PUD 2004). The Bull Trout Plan has four objectives, addressed by implementing various field study components from 2004 to 2008 at the Wells Project.

The first objective was to identify potential project-related impacts on upstream and downstream passage of adult bull trout (fish ≥ 400 mm in length) through Wells Dam and reservoir, and implement appropriate measures to monitor any incidental take of adult bull trout. To meet the first objective, radio-telemetry was used to monitor upstream and downstream passage, and off-season video counting was done in the Wells Project fishways during the winter. Between 2005 and 2008, 26 adult bull trout were trapped at Wells Dam and radio-tagged. Concurrent with the implementation of the Bull Trout Plan, the USFWS and Chelan PUD radio-tagged and released 136 adult bull trout at other mid-Columbia River basin locations including the Methow River, and Rock Island and Rocky Reach dams (50 USFWS tags 2006-2008, 86 Chelan PUD tags 2005-2007).

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

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

Project operations did not appear to influence the movements of adult bull trout. Instead, adult bull trout passage events appeared to be more closely associated with water temperature, photoperiod and time of year with rather predictable patterns of upstream and downstream

movement (LGL and Douglas PUD 2007; 2008). Because no take (injury or mortality) was observed during the study, there was no need to investigate how Project operations affected take at Wells Dam.

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

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

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

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

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

In summary, no mortality or injury was observed for bull trout (adult and sub-adult) passing through or interacting with the operations of the Wells Project during the take monitoring studies conducted between 2001 and 2008. No incidental take of bull trout was observed at the Wells Project, and the Wells Project is presumed to be within the incidental take levels authorized by the USFWS Biological Opinion Incidental Take Statement (USFWS 2004).

5.0 2011 BULL TROUT MONITORING AND MANAGEMENT PLAN ACTIONS

A more detailed description of the methodologies used to implement each Bull Trout Plan objective-strategy in 2011 can be found in the Bull Trout Plan 2005-2008 Final Monitoring Report (LGL and Douglas PUD 2008). These methodologies were developed from the objectives first outlined in the *Wells Hydroelectric Project Bull Trout Monitoring and Management Plan 2004-2008* (Douglas PUD 2004).

6.0 RESULTS

6.1 Strategy 1-1: Adult bull trout telemetry program

6.1.1 Bull trout tagged by Douglas PUD

As previously reported, an evaluation of station receiver data for the period of August 2008 to December 2009 at Wells Dam, Wells Dam Tailrace, the "Gateway" location (approximately 3 miles downstream from Wells Dam), and at stations located at the Methow and Okanogan river mouths yielded no additional detection data. During the latter half of 2008, bull trout would have already entered the Methow River to access spawning and overwintering habitat located outside of the Wells Project Area. By 2009, most of the tags activated in earlier years expired and were unavailable in providing additional data. A complete description of bull trout radio-telemetry findings can be found in (LGL and Douglas PUD 2008).

No additional radio-telemetry was conducted in 2011. Douglas PUD will implement a radio-telemetry study using adult bull trout captured in the Twisp River Weir in year one of the new FERC license. In 2016 additional radio-telemetry efforts will be carried out at Wells Dam in consultations with the Aquatic Settlement Work Group and the USFWS. These and other bull trout measures are part of the Aquatic Settlement Agreement prepared during the Integrated License Process for Wells Dam.

6.1.2 PIT tagging efforts and interrogations

Thirty-six adult bull trout (>440 mm) were incidentally captured at the Twisp River Weir in 2011. These captures are approximately 60% fewer bull trout that were captured at the weir in 2010 and is a result of high flows in June that made the weir inoperable. Migrating bull trout would have been able to pass the weir without capture during these flows. Twenty-six of the 2011 captures had not been previously PIT tagged. Untagged adults were anesthetized, measured, and given a PIT tag prior to release. Seven of these 36 fish were captured and tagged in 2010 and 3 were captured twice in 2011.

Out of the 26 adult bull trout PIT-tagged at the Twisp Weir in 2011, 14 were subsequently detected on instream PIT-tag arrays within the Methow Basin in 2011. Ninety-three percent of these detections occurred at the TWR (lower Twisp River) location during a time when bull trout have been observed exiting the Twisp River following spawning in the upper reaches of this river (Table 6.1.2-1). These results are consistent with previous years of monitoring.

Ninety one adult bull trout were incidentally captured at the Twisp River Weir in 2010. Eighty seven of these fish were given new PIT tags, while 4 of them were recaptures. These adult bull trout contribute to a novel dataset tagged within the Twisp River or MCA. Sixty nine percent of these adults have since been detected at various locations following release in 2010. Because of the complexity of these in-stream behaviors, movements associated with spawning have been summarized in Table 6.1.2-1. In this summary two assumptions were made: 1) drop back was assumed when a fish was detected at any site downstream of the weir after August of the tagging year and 2) spawning was assumed when a fish was detected post tagging at TWR during the months of September and October, which is associated with downstream movement following spawning. Together, important limitations exist with passive tags, however behaviors appear to be tied to pre- and post-spawning behaviors and bull trout seeking overwintering habitats.

Table 6.1.2-1 Summary of adult bull trout incidentally captures at the Twisp Weir in 2010 and 2011 and their PIT tag detections as of December 31 2011.

Description	2010	2011
Number tagged	87	26
Number detected post release	60	14
Percent detected post release	69%	54%
Spawned in 2010	18	NA
Spawned in 2011	1	13
Spawned in both 2010 and 2011	24	NA
Dropped back after tagging and spawned in 2010 only	0	NA
Dropped back after tagging and spawned in 2011 only	4	0
Dropped back after tagging and spawned in 2010 and 2011	3	NA
Dropped back after tagging (not observed spawning)	8	0
Overwinter detection or upstream movement only	2	1
Percent of bull trout assumed spawned in same tag year*	**75%** (45/60)	**93%** (13/14)

* assumes that an equal number of spawning fish and drop back fish went undetected.
Note. drop back was assumed when a fish was detected at a downstream location after tagging between June and August of tag year.
Note. spawning was assumed when a fish was detected post tagging at TWR during the months of September and October, which is associated with downstream movement following spawning.

During spring Chinook broodstock collection activities, five and four adult bull trout were incidentally captured and tagged at Wells Dam in 2010 and 2011, respectively. One of the 2011 fish was later detected at the Twisp River PIT tag interrogation location on October 12, 2011 and another was detected at the Gold Creek interrogation station on September 28, 2011. The other two adult bull trout tagged at Wells Dam in 2011 have not been detected to date. Of the five fish tagged at Wells in 2010, one was detected in 2011. Following release at Wells Dam in 2010, this fish was detected in the Twisp River on July 5th and, subsequently, in the lower Methow River near the Columbia on October 4th of 2010. In 2011, this fish was detected at Rocky Reach and Wells Dam in early and mid-July respectively, suggesting that this fish made successful downstream passages at Wells and Rocky Reach Dams, followed by successful accents at these projects during a typical upstream passage period. Previous radio-telemetry data is consistent with the behavior, timing, and successful dam passage displayed by this PIT-tagged adult.

Table 6.1.3-1summarizes the number of bull trout tagged in the MCA and at Wells Dam since 2005. These captures and tagging efforts are a result of incidental captures of bull trout during anadromous salmonid M&E and broodstock collection efforts. Together, Douglas PUD has funded the successful capture, tagging and release of 373 sub-adult and adult bull trout since 2005, 137 of which have since been detected passing at least one in-stream PIT tag array (Table 6.1.3-2).

6.1.3 Movement and Behavior within the Methow Basin

Detections within the Methow Basin occurred predominately during the late summer, fall and winter of 2011. Unusually high flows in the spring and early summer reduced detection efficiency and physically destroyed many detection arrays within the MCA. Ninety two unique fish were observed on at least one PIT tag interrogation station in the Methow Basin during 2010, 85 of which were PIT-tagged under Douglas PUD's M&E funding in the MCA. Twenty nine unique fish were observed on an MCA in-stream array in 2011. All but one of these fish were tagged by Douglas PUD's M&E staff (the other was tagged by the Yakama Nation Fisheries staff). Consistent with 2011 it appears that the majority of detections were a result of fish making downstream movements towards and, presumably, into the lower Methow River or Columbia River since approximately 70% of these detections occurred between September and December 2011. Information regarding station outages can be found on the PTAGIS website (http://www.ptagis.org/ptagis/index.jsp).

Table 6.1.3-1 Incidental captures of bull trout during M&E activities from 2005-2011. All fish were given PIT tags and data was uploaded to PTAGIS.

	Location								
Tag Year	Twisp River Weir	Twisp River Screw Trap	Methow River Screw Trap	Methow hook and line, dipnet, or shock	Twisp hook and line, dipnet, or shock	Chewuch hook and line, dipnet, or shock	Wells Dam	Total	Length (mean; range [mm])
2005	0	16	0	0	0	0	0	16	162; 106-196
2006	0	20	0	0	0	0	0	20	200; 121-287
2007	0	10	4	0	0	0	0	14	188; 146-244
2008	0	27	1	41	1	1	0	71	228; 82-330
2009	0	21	6	1	0	0	0	28	162; 118-227
2010	87	27	0	18	15	0	5	152	473; 118-790
2011	26	21	2	4	10	5	4	72	354; 141-720
Grand total								373	

Note: Presence of adults tagged at the Twisp Weir in 2010 and 2011 highlight the influence of capture method and location on mean fish size.

Table 6.1.3-2 Number of bull trout since detected in the Methow Core Area or Wells Action Area 2005-2011.

Tag year	Numbers tagged	Since detected	Percent detected	Number detected at Wells	Number detected at LMR
2005	16	0	0%	0	0
2006	20	0	0%	0	0
2007	14	2	14%	0	0
2008	71	10	14%	0	2
2009	28	12	43%	1	2
2010	152	84	55%	2	20
2011	72	29	40%	NA	3
Grand total	373	137	37%	3	27

Note. LMR is the lower Methow River interrogation location, approximately a mile upstream of the Methow and Columbia River Confluence. Detections at this location are often associated with upstream movements in the spring and early summer, downstream movements in the fall (September-October), or overwintering from November to May.

Together, three general trends exist for behavior of bull trout in the Methow River Basin:

1) Bull trout enter the Methow Basin in spring and early summer. They move quickly up river, presumably, to foraging and find spawning locations. The lack of upstream migration data, relative to downstream data in the fall is indicative of high flow river conditions, debris damaging PIT tag arrays and lower detection efficiencies during these

seasonal conditions. However, radio-telemetry data confirms that upstream movements do take place in the spring and summer.

2) The most obvious location for spawning occurs in the Twisp River above the Twisp River Weir detection location, since the majority of the fish were detected at the Twisp River Weir in the late summer and early fall.
3) Both adult and sub-adult bull trout appear to make directed downstream movements into the lower Methow and the Wells Project after spawning and prior to the onset of winter. However, adults and sub-adults have been detected in higher reaches of the Methow River during the winter periods, suggesting that over wintering locations are not exclusive to the Columbia and lower Methow Rivers.

6.2 Strategy 1-2: Correlations between passage events and Project operations

Results from the 2005-2008 radio-telemetry effort indicated bull trout movement was determined by seasonal conditions rather than project operations.

Observations of bull trout at Wells Dam in 2011 remained similar to observations from previous years. Adult bull trout fishway counts at the Wells Project were 43, 43, 44, and 66 respectively for the past four years. Over the last ten years, 2001 had the largest count at Wells Dam fishways at 107. The 2011 count is highly comparable to the eleven year average of just under 66 bull trout counted in Wells Dam fishways annually.

Adult bull trout begin seasonal usage of the Wells Dam fishways reliably in early to mid-May, with the >98% of fishway use occurring from May through the end of July. The seasonal end to Wells Dam fishway use by bull trout has been less predictable, occurring sometime between July and November over the last decade. 2011 was the first year that a bull trout was observed in the Wells Dam fish ladder in December. To date, no bull trout have been observed in Wells Dam fish ladders from January to April (Figure 6.2-1).

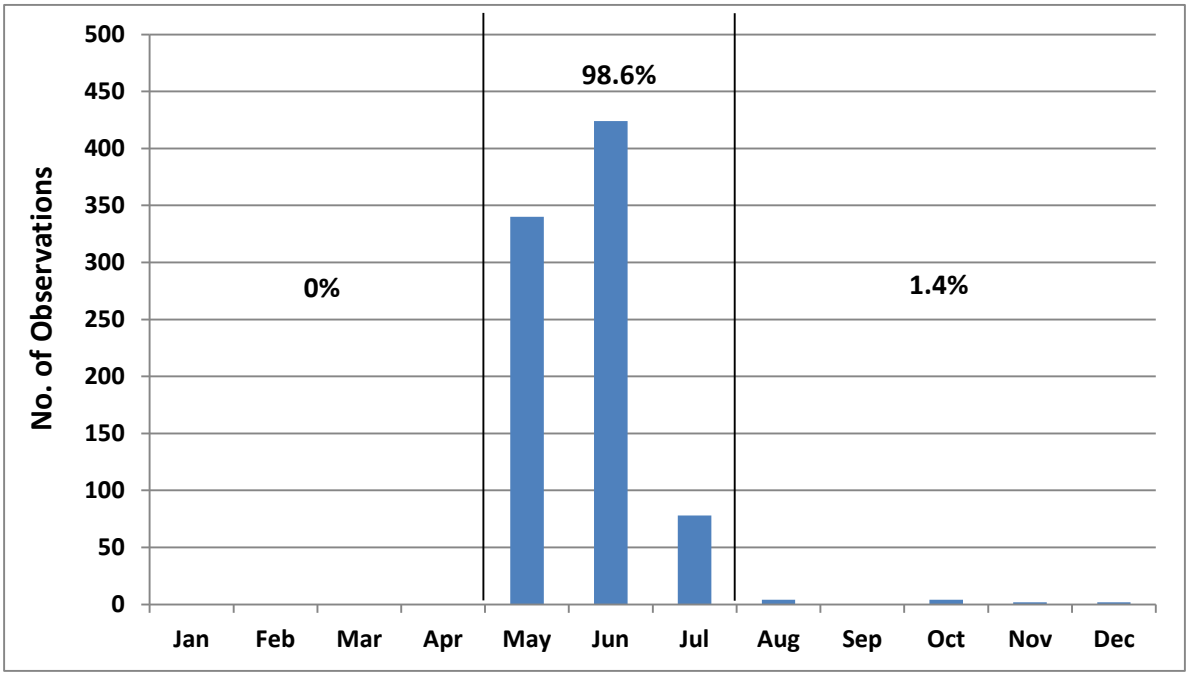

Figure 6.2-1 Seasonal distribution of bull trout observations at Wells Dam for the years 1998-2011.

6.3 Strategy 1-3: Off-season fishway passage of adult bull trout

Off-season video monitoring of both Wells Dam fishways continued for the 2010-2011 winter period (November 16 - April 30). Consistent with prior years of off-season video monitoring, no adult bull trout were observed using the fishways during the winter. However, during annual fish ladder dewatering activities, two bull trout were observed in the east fish ladder in 2011 (December). In 2011, 64 of 66 (97%) counted bull trout at Wells Dam fish ladders passed during the months of May through July. Consistent with observations from several years of year-round fishway counts, adult bull trout passage through Wells Dam primarily occurs in May through July each year (Figure 6.2-1).

6.4 Strategy 1-4: Modifications to passage facilities or operations

There have been no passage issues identified that limit upstream or downstream passage of adult bull trout at Wells Dam. Therefore, there is no need for modifications to current passage facilities or operations.

6.5 Strategy 2-1: Sub-adult PIT tagging program

Douglas PUD passively collected information from all PIT-tagged fish, including bull trout, as they passed through the fishways at Wells Dam. Douglas PUD also scanned all bull trout incidentally captured at rotary screw traps and adult brood collection facilities. The information

collected at the dam and in the tributaries was posted on the PTAGIS website, which is operated and maintained by the Pacific States Marine Fisheries Commission.

Consistent with previous years, no sub-adult bull trout were observed or detected at Wells Dam. Douglas PUD continues to provide support to WDFW for PIT tagging bull trout incidentally collected at both on-site and off-site smolt collection facilities (Table 6.5-1). Tag information for all tagged fish was posted on the PTAGIS website (http://www.ptagis.org/ptagis/index.jsp). Despite tagging over 150 sub-adult bull trout in the Methow action area since 2005 only one Methow origin tagged sub-adult bull trout has been detected in the mainstem Columbia. In May of 2011, a sub-adult bull trout that was tagged in August of 2010 at the Twisp River screw trap, was detected at the Rocky Reach juvenile bypass facility. Therefore, this fish successfully passed downstream through Wells Dam. No sub-adults have been detected in Wells Dam fish ladders to date. Together, over 155 sub-adult bull trout have been PIT-tagged in the MCA as a result of Douglas PUD funding, including more than 20 in 2011.

Within the Methow Basin there are 15 separate PIT tag interrogations facilities, making it one of the most extensive PIT tag interrogation networks in the Columbia Basin. Of the bull trout that have been PIT-tagged by WDFW, using Douglas PUD tags, numerous within basin detections have occurred. Within the Methow, tagged sub-adult bull trout have been observed in the lower Methow, middle Methow, Chewuch, Beaver, Gold, Wolf and Eightmile Creek, Twisp River and the lower Methow detection locations. In summary, the majority of bull trout detections in the Methow River Basin occurred between July and November at the MRT and the TWR interrogation locations. Previous Radio-telemetry data suggests that the majority of bull trout tagged at Wells Dam are destined for spawning reaches in the Twisp River. Other spawning locations included the Lost River and Gold Creek (LGL and Douglas PUD 2008).

6.6 Strategy 2-2: Off-season fishway passage of sub-adult bull trout

Similar to off-season video monitoring of adult bull trout (Section 6.3), off-season video monitoring of the Wells Dam fishways for sub-adult bull trout continued for the winter periods (November 16 - April 30). During these monitoring periods, no sub-adult bull trout were observed utilizing the fishways. To date, no sub-adult bull trout have been observed using Wells Dam fishways at any time during the year.

6.7 Strategy 3-1: Inflow patterns, reservoir elevations, and backwater curves

On November 5, 2008, Douglas PUD conducted several stranding surveys intended to document whether or not bull trout are stranded in the Wells Reservoir during lower than normal reservoir surface elevation operations (surface elevation at or below 773 feet MSL). The survey locations were selected based upon an analysis of detailed bathymetric maps produced in 2005 combined with Wells Reservoir hydraulic information. This effort identified several locations where stranding of sub-adult bull trout could potentially occur. Six total potential stranding locations were identified. These locations were the Methow River mouth, the Okanogan River mouth, the Kirk Islands, the shallow water habitat in the Columbia River directly across from the mouth of the Okanogan River, Schluneger Flats and the off-channel areas of the Bridgeport Bar Islands.

Boat and foot surveys were conducted and included a combination of shoreline transects and inspection of isolated sanctuary pools. Similar to previous bull trout stranding surveys, no bull trout were observed during the 2008 survey which suggests that bull trout are able to avoid stranding and entrapment areas in the event of a Wells Reservoir drawdown. During 2009 and 2010, no stranding surveys were conducted as low water events did not take place. On June 10, 2011 Douglas PUD biologists conducted a stranding survey using similar methods as in 2008. This survey was initiated since Wells Project operations reduced reservoir depth to below 773 feet MSL. During this survey no bull trout were encountered and only a few sculpin (*Cottus* sp.) and three-spine stickleback (*Gasterosteus aculeatus*) were observed (less than 10 of each species). Imagines from this survey are included in Figure 6.7-1.

Figure 6.7-1 Low reservoir conditions on June 10, 2011 and Douglas PUD biologists conducting a stranding survey.

6.8 Strategy 4-1: Genetic sampling program

In 2011, 10 and 2 DNA samples were taken from juvenile bull trout in the Twisp River smolt trap and Methow River smolt trap respectively (operated by WDFW). Total DNA samples taken from sub-adults since 2008 are summarized in Table 6.8-1. All samples are currently in the care of WDFW or the USFWS. Genetic analysis results are not yet available, but are anticipated to be provided by USFWS in the future and when available will be included in future reports.

Table 6.8-1 Sub-adult bull trout PIT-tagged in the Methow Basin, 2008-2010 (data from C. Snow, WDFW).

Year	Collection/tag site	# PIT-tagged/ # captured	# DNA sampled
2008*	Methow River trap	0/0*	0*
2008*	Twisp River trap	13/14*	0*
2009	Methow River trap	6/6	5
2009	Twisp River trap	21/21	10
2010	Methow River trap	0/0	0
2010	Twisp River trap	29/29	10
2011	Methow River trap	2/2	2
2011	Twisp River trap	21/21	21

*August to December only: In early 2008 16 sub-adults were captured in the Twisp River trap and 10 DNA samples were taken from these fish. To see 2005-2008 data table similar to above, refer to LGL and Douglas PUD (2008).

6.9 Strategy 4-2: Participation in information exchanges and regional efforts

Douglas PUD continues to coordinate with regional tribal, state, and federal agencies, to promote the exchange of bull trout information and to ensure that local and regional bull trout monitoring efforts are coordinated in the Upper Columbia River. In 2011, Douglas PUD biologists attended June 29th and August 29th meetings to contribute to the recovery planning.

7.0 CONCLUSIONS

Six years of tagging results and eight years of monitoring results, as reported in the Bull Trout Plan 2005-2008 Final Report, demonstrate no project-related impacts to adult or sub-adult bull trout from passage through the Wells Project, nor by stranding/entrapment due to lowering of the reservoir elevation. Using the original eight years of data, Douglas PUD has also determined there are no apparent correlations between project operations and downstream passage events, and that there is no upstream movement of adult or sub-adult bull trout through the Wells Dam fishways during the November 16 through April 30 timeframe. Bull trout captured and tagged at Wells Dam were radio-tracked to the Methow and Entiat Core Areas during spawning periods, and have also demonstrated movement between these systems by successfully passing upstream and downstream through Wells Dam. PIT tag data concurs with radio-telemetry survival estimates (100%), since adult bull trout PIT-tagged in the MCA and at Wells have been detected at Wells in subsequent years following tagging.

Additional tagging and monitoring has taken place since 2008 including tagging and monitoring in 2009, 2010 and 2011. These studies support the conclusions reported for the first eight years of take monitoring at Wells Dam. In particular, the results of the 2011 implementation of the Bull Trout Plan remain consistent with the previous 10 years of monitoring and evaluation. Radio-telemetry and PIT tag data suggest that bull trout passage at Wells Dam is independent of project operations and instead associated with seasonal movement patterns such as spawning migrations during May through July. To date, no sub-adult bull trout have been observed in Wells Dam fishways. Data collected from the Methow River basin smolt collection operations indicate that sub-adult bull trout are present near the confluence of the Methow and Columbia River. However, only one of more than 155 sub-adults PIT-tagged in the MCA has since been detected in the mainstem Columbia below Wells Dam.

In 2011, thirty six adult bull trout were captured at the Twisp River Weir during salmonid broodstock operations. Twenty six of these fish did not have a PIT tag and were subsequently given one prior to release. Seven of the 36 adult bull trout were recaptures from 2010 PIT-tagging at the weir. Newly tagged fish in 2011 add to the unique dataset of already PIT-tagged bull trout in the MCA. Movements of these adult fish appear to be closely related to spawning migration movements (pre and post-spawning) and those related to overwintering.

In 2011, genetic samples were taken from 12 sub-adult bull trout during the implementation of off-site smolt collection activities and provided to the USFWS for future genetic analysis. To date, low-water project operations appear to have no stranding effect on adult or sub-adult bull trout. In addition to coordinating monitoring efforts and information exchanges of project specific bull trout data, Douglas PUD continues to participate in regional activities that support bull trout conservation and recovery.

8.0 REFERENCES

Baxter, C. V., and F. R. Hauer. 2000. Geomorphology, hyporheic exchange, and the selection of spawning habitat by bull trout (Salvelinus confluentus). Canadian Journal of Aquatic Science. 57:1470-1481.

BioAnalysts, Inc. 2004. Movement of bull trout within the Mid-Columbia River and tributaries, 2001-2004. Report prepared by BioAnalysts for Public Utility District No.1 of Chelan County, Public Utility District No.1 of Douglas County, and Public Utility District No.2 of Grant County.

Brewin P. A. and M. K. Brewin. 1997. Distribution maps for bull trout in Alberta. Pages 206-216 in: Mackay, W.C., M. D. Brewin and M. Monita, editors. Friends of the Bull Trout Conference Proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Calgary, Alberta, Canada.

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley) from the American Northwest. California Fish and Game 64:139-174.

Douglas PUD (Public Utility District No. 1 of Douglas County). 2004. Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008. Prepared by Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Dunham, J., B. Rieman, and G. Chandler. 2003. Influences of temperature and environmental variables on the distribution of bull trout within streams at the southern margin of its range. North American Journal of Fisheries Management, 23:894–904.

English, K. K., T. C. Nelson, C. Sliwinski, and J. R. Stevenson. 1998. Assessment of passage facilities for adult sockeye, Chinook, and steelhead at Rock Island and Rocky Reach dams on the mid-Columbia River in 1997. Report to Public Utility District No. 1 of Chelan County, Wenatchee, WA.

English, K. K., C. Sliwinski, B. Nass, and J. R. Stevenson. 2001. Assessment of passage facilities for adult steelhead at Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells dams on the mid-Columbia River in 1999. Report to Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Kraemer, C. 1994. Some observations on the life history and behavior of the native char, Dolly Varden (Salvelinus malma) and bull trout (Salvelinus confluentus) of the North Puget Sound Region. Washington Department of Wildlife. Draft.

LGL and Douglas PUD. 2008. Wells bull trout monitoring and management plan 2005-2008 final report. Report to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL and Douglas PUD. 2007. Wells Hydroelectric Project No. 2149 2006 Annual Report - Wells Bull Trout Monitoring and Management Plan. Report to Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

McPhail, J. D. and J. S. Baxter. 1996. A review of bull trout (*Salvelinus confluentus*) life history and habitat use in relation to compensation and improvement opportunities. Fisheries management report no. 104. University of British Columbia. Vancouver, B.C.

Mongillo, P. E. 1993. The distribution and status of bull trout/Dolly Varden in Washington State. Washington Department of Wildlife. Fisheries Management Division, Report 93- 22. Olympia, Washington. 45 pp.

Pleyte, Kay A., S. D. Duncan, and R. B. Phillips. 1992. Evolutionary relationships of the fish genus Salvelinus inferred from DNA sequences of the first internal transcribed spacer (ITS 1) of ribosomal DNA. Molecular Phylogenetics and Evolution, 1(3): 223-230.

Riehle, M. W. Weber, A. M. Stuart, S. L. Thiesfeld and D. E. Ratliff. 1997. Progress report of the multi-agency study of bull trout in the Metolius River system, Oregon. In Friends of the Bull Trout Conference Proceedings. Bull Trout Task Force. Calgary, (Alberta). Pages 137-144.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S. Forest Service, Intermountain Research Station. General Technical Report INT-302.

Rieman, B. E., and J. D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions of American Fisheries Society. Vol. 124 (3): 285-296.

Rieman, B. E., D. C. Lee and R. F. Thurow. 1997. Distribution, status and likely future trends of bull trout within the Columbia River and Klamath Basins. North American Journal of Fisheries Management. 17(4): 1111-1125.

Sexauer, H. M. and P. W. James. 1993. A survey of the habitat use by juvenile and prespawning adult bull trout, Salvelinus confluentus, in four streams in the Wenatchee National Forest. Ellensburg, WA, Central Washington University.

U.S. Fish and Wildlife Service, National Marine Fisheries Service, Plum Creek Timber Company, Inc., and CH2M Hill. 2000. Final Environmental Impact Statement and Native Fish Habitat Conservation Plan – Proposed Permit for Taking of Federally Listed Native Fish Species on Plum Creek Timber Company, Inc. Lands. September, 2000.

U.S. Fish and Wildlife Service. 2002. Chapter 22, Upper Columbia Recovery Unit, Washington. 113 p. In: U.S. Fish and Wildlife Service. Bull Trout (*Salvelinus confluentus*) Draft Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2004. Biological Opinion and Conference Opinion for the License Amendment to incorporate the Rocky Reach, Rock Island and Wells Anadromous Fish Agreement and Habitat Conservation Plans. Federal Energy Regulatory Commission (FERC). FWS Reference Number: 04-W0203. U.S. Fish and Wildlife Service, Central Washington Field Office, Wenatchee.

U.S. Fish and Wildlife Service. 2008a. News Release: Status Review of Bull Trout Completed. Contacts T. Koch and J. Jewett. Portland, OR.

U.S. Fish and Wildlife Service. 2008b. Bull Trout (*Salvelinus confluentus*). 5-Year Review: Summary and Evaluation. Portland, OR.

Volk, E. C. 2000. Using otolith strontium to infer migratory histories of bull trout and Dolly Varden from several Washington State rivers. Submitted to Olympic National Park in fulfillment of Contract #2550041. Washington Department of Fish and Wildlife, Olympia.

Assessment of Salmonid Passage Responses to Different Flow Velocities at Wells Dam Fishway Entrance

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1.0 Introduction

In 2009 and 2010, different head differentials were tested at the entrances to the Wells Dam fishways to assess whether there was an effect of the resultant differences in entrance velocities on the passage of Pacific lamprey. Concurrently, passage of salmonids was also monitored to assess whether a reduction in water velocity that might be beneficial to lamprey would have a detrimental effect on salmonid use of the fishway. This report examines the possible effects of changes in fishway entrance water velocity on the passage counts of Chinook salmon, steelhead, coho, and sockeye salmon.

2.0 Methods

Generalized linear models (GLM) (McCullagh and Nelder 1989) were used to analyze the salmonid count data (Appendix A). The fitted model was a two-way classification for a randomized block design. Quasi-likelihood methods were used and the test of treatment effects was based on an *F*-test using the ratio of the treatment mean deviance to that of the error mean deviance. Pairwise treatment comparisons were based on a *t*-test adjusted for the overdispersion (i.e., scale parameter [SP] = error mean deviance).

Treatment means $\bar{x}_i$ were calculated based on the arithmetic average of the replicate values across *n* blocks,

$$\bar{x}_i = \frac{\sum_{j=1}^{n} x_{ij}}{n},$$

with associated variance calculated as

$$\text{Var}\ \bar{x} = \frac{\bar{x}\ \text{SP}}{n}.$$

In 2009, three different treatment levels were considered. Salmonid passage was examined relative to variable head differential treatments: existing high condition (0.46 m), moderate condition (0.31 m) and low condition (0.15 m), which results respectively in relatively high, moderate, and low water velocities at the fishway entrances. The treatments occurred during 4-hour blocks (i.e., 2100 – 0059) each day. However, because of differences in transit time of various salmonids at fishways, observations times were accordingly adjusted (Table 1). In some instances, alternative observation times were used because exact transit times were unknown. It is important when viewing the test results not to consider these alternative observation windows as independent tests. Instead, a significant result among any of the alternative observation windows should be considered as evidence of a treatment effect for a particular species. In 2010, only the moderate condition (0.31 m) and existing high condition (0.46 m) were tested using a randomized block design.

Table 1. Alternative observation time windows used in assessing passage effects on salmonids.

Year	Observation window	Salmonid Species			
		Chinook	Steelhead	Sockeye	Coho
2009	9 PM – 1 AM	X	X	X	X
	10 PM – 2 AM	X			X
	3 AM – 7 AM		X	X	X
2010	6 PM – 2 AM	X			X
	11 PM – 7 AM		X	X	X

In performing the analyses, test blocks with zero counts were excluded from the analyses to avoid artificially underdispersing the data. Typically, this occurred in the later test blocks of sockeye as the run diminished and the early blocks of coho as the run increased (Appendix B) but not once fish were arriving consistently.

A meta-analysis was used to combine the test results across years. Only treatment levels 0.31 m and 0.46 m were tested both years. The meta-analysis was used to test whether salmonid passage was significantly lower at the 0.31 m level compared to the 0.46 m test level. Using the individual *P*-values for the one-tailed test each year (P_i), an overall *P*-value was calculated where

$$P = P\left(\chi_4^2 \geq -2\sum_{i=1}^{2} \ln P_i\right).$$

Separate meta-analyses were performed for each species. Statistical significance in this report refers to *P*-values < 0.05.

3.0 Results

Analyses of deviance were performed on seven combinations of data in 2009 and five species × windows combinations in 2010 (Appendix C). In two instances, count data were inadequate (i.e., all zeros) for analyzing coho responses to the velocity treatments (Table 2). Results are presented by species.

3.1 Chinook Salmon

The two alternative window analyses in 2009 and the one analysis in 2010 were all nonsignificant (*P* > 0.05) (Table 2). Pairwise treatment comparisons in 2009 all were nonsignificant (Table 3). Therefore, no significant evidence exists that suggests Chinook salmon passage was affected by the three different entrance water velocities. Comparison of treatment means shows little relationship between increased entrance velocity and fish passage (Table 4).

3.2 Steelhead

Test results were significant in 2009 for steelhead but not in 2010 (Table 2). Closer examination reveals passage at 0.15 m was lower than at 0.46 m in 2009, and was near significantly different from passage at 0.31 m (Table 3). Pairwise comparisons between 0.31 m and 0.46 m were not significantly different in either year. Comparison of treatment means indicates 0.15 m had a detrimental effect on steelhead passage, while passage at 0.31 m and 0.41 m was comparable (Table 4).

3.3 Sockeye Salmon

No significant effects were found during the 2009 trials for sockeye (Tables 2, 3). A near significant difference was found in 2010 (Table 2), but with the 0.31 m treatment having higher passage than the standard 0.46 m (Table 4).

3.4 Coho Salmon

No significant differences in coho passage were found in either the 2009 or 2010 trials. Data patterns nevertheless suggest the possibility of increased passage as velocities increased (Table 4).

Table 2. *P*-values from analyses of deviance *F*-tests of treatment effects on salmonid passage at Wells Dam, 2009–2010. Results reported by species, window of observation, and year.

	Chinook salmon	Steelhead	Sockeye salmon	Coho salmon
2009				
9 PM – 1 AM	0.3220	0.0258	0.4131	N/A
10 PM – 2 AM	0.8463			N/A
3 AM – 7 AM		0.5202	0.4788	0.4455
2010				
6 PM – 2 AM	0.2304			0.1421
11 PM – 7 AM		0.2760	0.0631	0.4221

Table 3. *P*-values for pairwise comparison of treatment effects on salmonid passage. Results reported by species, window of observation, and year. Two-tailed tests of significance were performed.

		Treatment level tested		
Year	Testing period	0.15 vs. 0.31	0.15 vs. 0.46	0.31 vs. 0.46
		Chinook		
2009	9 PM – 1 AM	0.8630	0.2262	0.1718
2009	10 PM – 2 AM	0.8556	0.5759	0.7041
2010	6 PM – 2 AM			0.2304
		Steelhead		
2009	9 PM – 1 AM	0.0614	0.0101	0.3660
2009	3 AM – 7 AM	0.3428	0.9435	0.3093
2010	11 PM – 7 AM			0.2760
		Sockeye		
2009	9 PM – 1 AM	0.2030	0.5410	0.4720
2009	3 AM – 7 AM	0.7991	0.2683	0.3735
2010	11 PM – 7 AM			0.0631
		Coho		
2009	3 AM – 7 AM	0.6023	0.2836	0.4691
2010	6 PM – 2 AM			0.1421
2010	11 PM – 7 AM			0.4221

Table 4. Mean and standard error of counts of species passage for different treatment levels. Horizontal lines connecting treatments indicate treatments that are not significantly different (α = 0.05) using two-tailed tests. Standard errors in parentheses.

		Treatment level tested		
Year	Testing period	0.15 m	0.31 m	0.46 m
		Chinook		
2009	9 PM – 1 AM	3.6364 (0.7267)	3.8182 (0.7446)	2.4545 (0.5970)
2009	10 PM – 2 AM	3.2727 (0.7074)	3.0909 (0.6874)	2.7273 (0.6457)
2010	6 PM – 2 AM		20.4444 (2.9532)	23.3333 (3.2289)
		Steelhead		
2009	9 PM – 1 AM	7.3636 (1.5245)	12.3636 (1.9754)	15.0909 (2.1824)
2009	3 AM – 7 AM	40.1818 (4.4625)	34.2727 (4.1214)	40.6364 (4.4877)
2010	11 PM – 7 AM		22.3704 (1.6245)	25.0000 (1.7173)
		Sockeye		
2009	9 PM – 1 AM	0.8889 (0.2842)	0.4444 (0.2010)	0.6667 (0.2462)
2009	3 AM – 7 AM	0.7778 (0.3338)	0.6667 (0.3091)	0.3333 (0.2185)
2010	11 PM – 7 AM		3.1111 (0.5806)	1.7222 (0.4320)
		Coho		
2009	3 AM – 7 AM	0.3333 (0.3340)	0.6667 (0.4723)	1.3333 (0.6680)
2010	6 PM – 2 AM		0.5000 (0.2938)	1.5000 (0.5088)
2010	11 PM – 7 AM		1.2500 (0.5480)	2.0000 (0.6932)

4.0 Meta-Analysis Across Years

Only treatment levels 0.31 m and 0.46 m were tested in both 2009 and 2010. A meta-analysis was used to combine the two years of test results and produce an overall *P*-value. The hypotheses tested were

$$H_o: \mu_{0.31} \geq \mu_{0.46}$$
vs.
$$H_a: \mu_{0.31} < \mu_{0.46}.$$

The meta-analysis tests whether there was a significant reduction in passage under the 0.31 m test condition compared to the standard operating level of 0.46 m. The meta-analysis was nonsignificant for all species ($P > 0.05$); however, steelhead ($P = 0.1066$) and coho salmon ($P = 0.0780$) were close to being significant with the higher velocity having higher fish passage (Table 5).

5.0 Discussion

Sockeye salmon demonstrated no significant effects of entrance velocity on passage rates. In fact, observed entrance rates were typically higher at the 0.31 m condition than the 0.46 standard condition (Table 4). There was also no evidence that reduced velocities had any effect on Chinook salmon passage rates (Table 4).

Steelhead showed consistent but nonsignificant differences in passage rates between 0.31 m and 0.46 m test conditions, with the higher velocities having the slightly higher passage rate (Table 4). The meta-analysis, combining the 2009 and 2010 results, was nonsignificant at $P = 0.1066$. Coho salmon also showed a consistent but nonsignificant difference in passage rates between the 0.31 m and 0.46 m test conditions (Table 4). The meta-analysis across years was nonsignificant at $P = 0.0780$.

Finally, the analyses were sensitive to the timing of the window of observations. A significant result among any of the alternative observation windows was considered a significant finding in this report. This is based on the assumption that inappropriate windows of observations will be outside the zone of treatment effects and reflect the null hypothesis of no difference by default.

6.0 Literature Cited

McCullagh, P., and Nelder, J. A., (1989), *Generalised Linear Models* (Second ed.), London, United Kingdom: Chapman & Hall.

Table 5. Meta-analysis combining the results of the 2009 and 2010 trials. *P*-values for the one-tailed tests of passage at 0.31 m being less than passage at 0.46 m.

Species	Year	Passage 0.31 m – 0.46 m *P*-value
Chinook salmon	2009	0.9066
	2010	0.1152
	Combined	0.3404
Steelhead	2009	0.1607
	2010	0.1380
	Combined	0.1066
Sockeye salmon	2009	0.8133
	2010	0.9685
	Combined	0.9797
Coho salmon	2009	0.0711
	2010	0.2111
	Combined	0.0780

Appendix A

Salmonid count data used in the subsequent tests of entrance velocity effects in fishway passage

Year: 2009		Chinook		Steelhead		Sockeye		Coho		
Block	Treatment	9PM_to_1AM	10PM_to_2AM	9PM_to_1AM	3AM_to_7AM	9PM_to_1AM	3AM_to_7AM	9PM_to_1AM	10PM_to_2AM	3AM_to_7AM
1	0.31	3	2	3	6	2	0	0	0	0
1	0.46	3	2	2	11	2	2	0	0	0
1	0.15	1	1	0	26	7	3	0	0	0
2	0.31	2	2	1	5	0	2	0	0	0
2	0.46	2	2	4	10	0	0	0	0	0
2	0.15	5	3	7	18	0	0	0	0	0
3	0.46	4	4	2	32	2	0	0	0	0
3	0.31	2	2	5	20	1	1	0	0	0
3	0.15	4	2	7	26	0	0	0	0	0
4	0.15	5	5	6	83	0	2	0	0	0
4	0.46	3	3	20	68	0	1	0	0	0
4	0.31	2	2	3	32	0	1	0	0	0
5	0.15	4	3	10	21	0	1	0	0	0
5	0.31	6	4	20	49	0	0	0	0	0
5	0.46	4	5	11	37	0	0	0	0	0
6	0.15	8	10	13	59	0	0	0	0	0
6	0.31	6	6	32	34	1	1	0	0	0
6	0.46	3	2	29	38	0	0	0	0	0
7	0.31	11	9	27	89	0	0	0	0	0
7	0.46	0	1	44	130	1	0	0	0	0
7	0.15	5	4	3	69	1	1	0	0	0
8	0.31	5	4	14	53	0	0	0	0	0
8	0.46	2	3	9	42	0	0	0	0	0
8	0.15	3	3	3	20	0	0	0	0	0
9	0.15	0	0	13	57	0	0	0	0	0
9	0.31	4	1	15	38	0	1	1	0	0
9	0.46	4	6	20	31	1	0	0	0	2
10	0.15	3	3	10	34	0	0	0	0	1
10	0.46	1	0	10	23	0	0	0	0	1
10	0.31	1	2	11	26	0	0	0	0	1
11	0.46	1	2	15	25	0	0	0	0	1
11	0.15	2	2	9	29	0	0	0	0	0

11	0.31	0	0	5	25	0	0	0	0	1

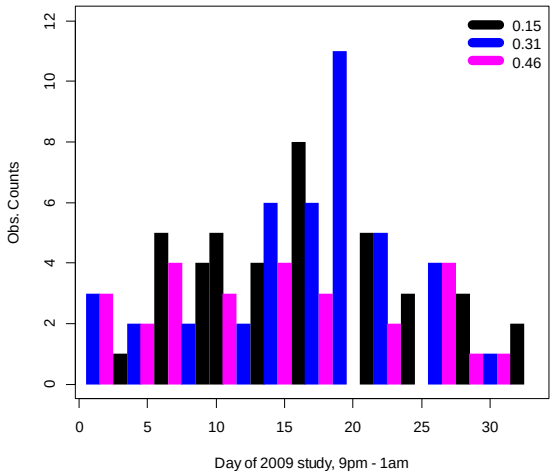
Year: 2010		Chinook	Steelhead	Sockeye	Coho	
Block	Treatment	6PM_to_2AM	11PM_to_7AM	11PM_to_7AM	6PM_to_2AM	11PM_to_7AM
0.31	1	30	4	20	0	0
0.46	1	13	13	8	0	0
0.31	2	33	3	14	0	0
0.46	2	31	13	2	0	0
0.46	3	29	7	7	0	0
0.31	3	21	4	6	0	0
0.31	4	13	3	1	0	0
0.46	4	21	4	3	0	0
0.31	5	6	4	3	0	0
0.46	5	52	28	1	0	0
0.31	6	32	34	5	0	0
0.46	6	32	17	0	0	0
0.46	7	18	10	3	0	0
0.31	7	16	10	0	0	0
0.31	8	12	9	3	0	0
0.46	8	13	19	2	0	0
0.46	9	8	11	1	0	0
0.31	9	13	21	1	0	0
0.31	10	18	14	0	0	0
0.46	10	27	9	1	0	0
0.31	11	33	7	1	0	0
0.46	11	15	3	0	0	0
0.31	12	9	10	1	0	0
0.46	12	95	15	0	0	0
0.31	13	52	33	0	0	0
0.46	13	53	14	0	0	0
0.31	14	19	15	1	0	0
0.46	14	32	23	0	0	0
0.31	15	32	19	0	0	0
0.46	15	16	12	1	1	0
0.31	16	30	22	0	0	0
0.46	16	45	20	0	0	0
0.46	17	102	19	1	0	0
0.31	17	29	26	0	0	0
0.46	18	26	20	1	0	0
0.31	18	55	25	0	0	0
0.31	19	35	46	0	0	0
0.46	19	49	44	0	0	0
0.31	20	43	31	0	0	0
0.46	20	34	43	0	0	1
0.31	21	55	56	0	0	0
0.46	21	32	67	0	0	0
0.46	22	39	40	0	0	0
0.31	22	41	36	0	0	1
0.31	23	20	54	0	0	0
0.46	23	19	57	0	3	5
0.46	24	19	73	0	1	1
0.31	24	29	34	0	0	0
0.31	25	36	22	0	0	1
0.46	25	16	38	0	0	2
0.46	26	31	27	0	3	5
0.31	26	19	38	0	1	2
0.31	27	11	24	0	2	6
0.46	27	20	29	0	1	2

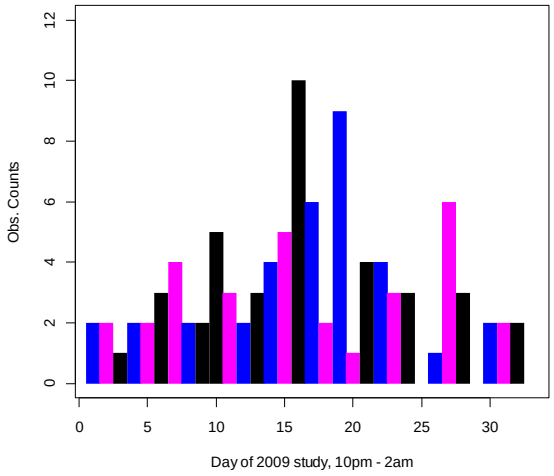
Appendix B

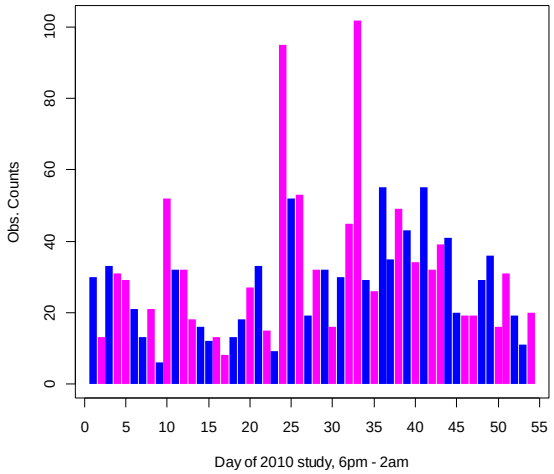
Bar charts of passage counts by test condition over time

Chinook Salmon

Histograms of Chinook salmon counts by trials

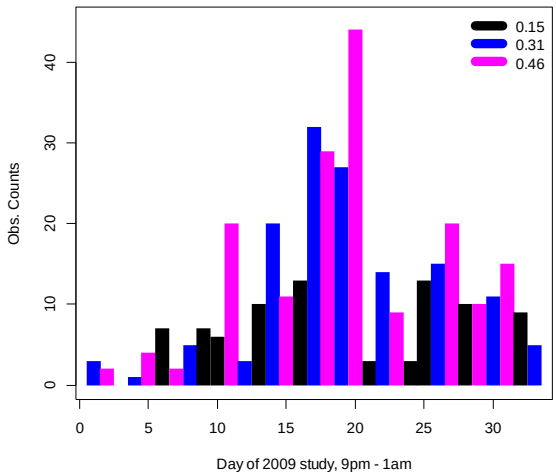


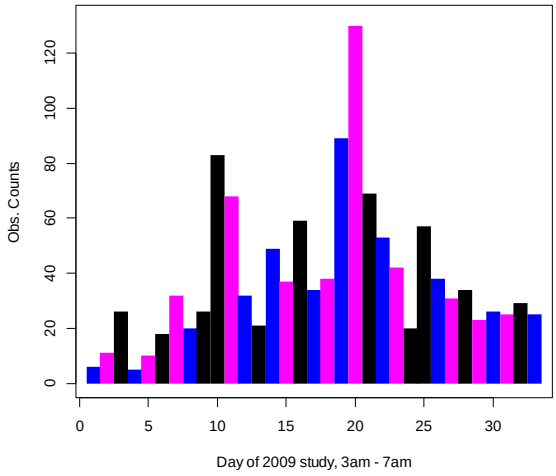


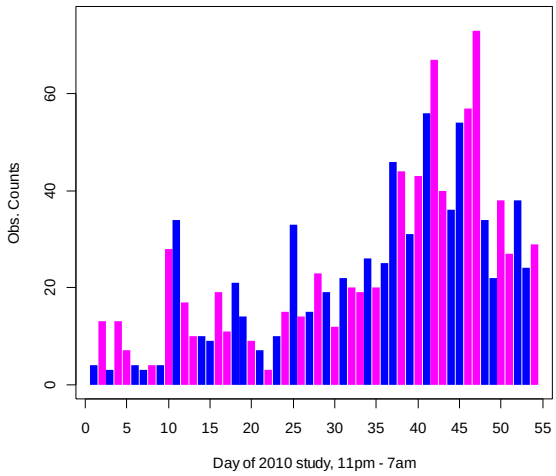


Steelhead

Histograms of steelhead counts by trials

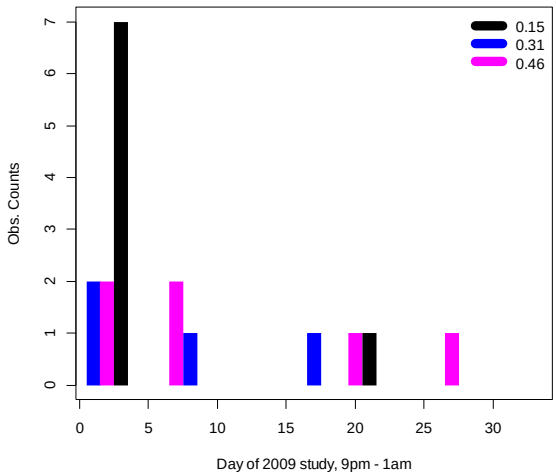


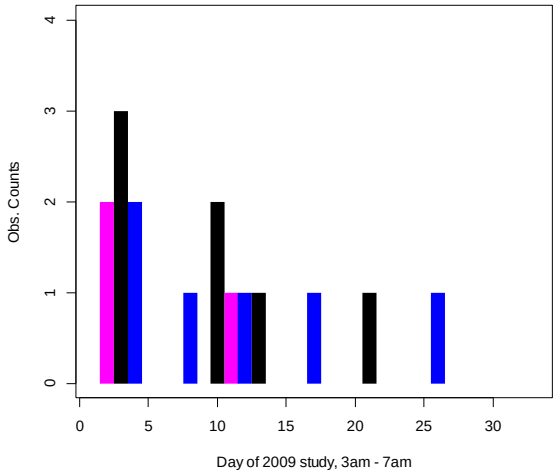


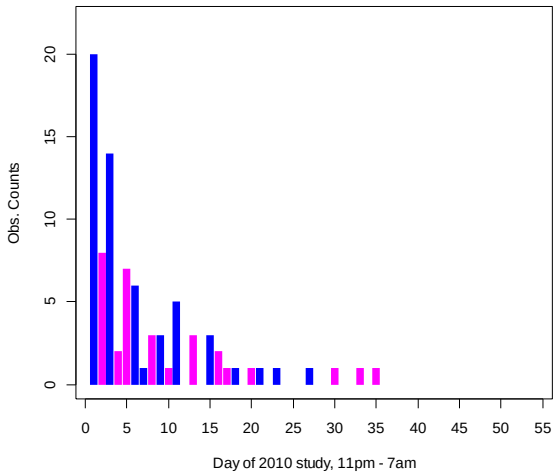


Sockeye Salmon

Histograms of sockeye salmon counts by trials

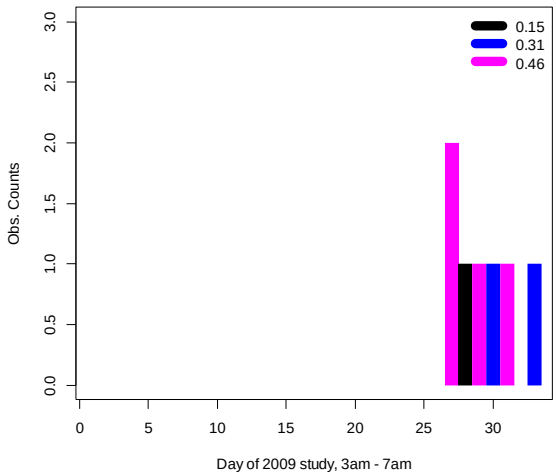


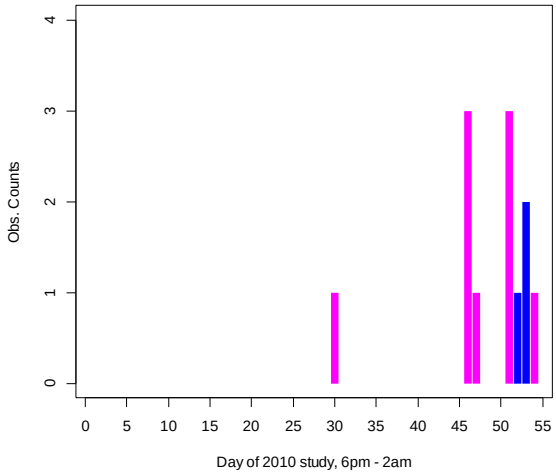


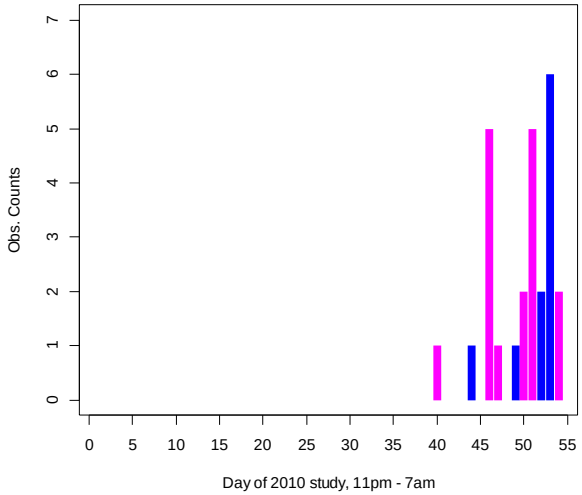


Coho

Histograms of coho salmon counts by trials







Appendix C

Analyses of deviance tables used in testing for differences in salmonid passage under different entrance velocities

Table C1. Analyses of deviance tables for Chinook salmon.

2009: 9 PM – 1 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	32	55.6570			
Block	10	19.8780	1.9878	1.2445	0.3234
Treatment	2	3.8334	1.9167	1.2000	0.3220
Error	20	31.9455	1.5973		

2009: 10 PM – 2 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	32	53.4701			
Block	10	19.2688	1.9269	1.1458	0.3793
Treatment	2	0.5661	0.2831	0.1683	0.8463
Error	20	33.6352	1.6818		

2010: 6 PM – 2 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	53	528.0919			
Block	26	292.3798	11.2454	1.3124	0.2466
Treatment	1	12.9238	12.9238	1.5082	0.2304
Error	26	222.7883	8.5688		

Table C2. Analyses of deviance tables for steelhead.

2009: 9 PM – 1 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	32	253.4061			
Block	10	153.3047	15.3305	4.4157	0.0023
Treatment	2	30.6650	15.3325	4.4163	0.0258
Error	20	69.4364	3.4718		

2009: 3 AM – 7 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	32	513.9085			
Block	10	397.5123	39.7512	7.2917	0.0001
Treatment	2	7.3647	3.6824	0.6755	0.5202
Error	20	109.0315	5.4516		

2010: 11 PM – 7 AM

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	53	625.1908			
Block	26	538.4348	20.7090	6.5018	< 0.0001
Treatment	1	3.9434	3.9434	1.2381	0.2760
Error	26	82.8127	3.1851		

Table C3. Analyses of deviance tables for sockeye salmon.

2009: 9 PM – 1 AM (Blocks 1-9)

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	26	50.1573			
Block	8	37.1647	4.6456	6.3893	0.0008
Treatment	2	1.3592	0.6796	0.9347	0.4131
Error	16	11.6334	0.7271		

2009: 3 AM – 7 AM (Blocks 1-9)

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	26	31.6534			
Block	8	11.5457	1.4432	1.2591	0.3295
Treatment	2	1.7683	0.8841	0.7714	0.4788
Error	16	18.3394	1.1462		

2010: 11 PM – 7 AM (Blocks 1-18)

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	35	170.2084			
Block	17	131.6054	7.7415	4.2024	0.0025
Treatment	1	7.2862	7.2862	3.9552	0.0631
Error	17	31.3168	1.8422		

Table C4. Analyses of deviance tables for coho salmon.

2009: 9 PM – 1 AM Only 1 fish observed (during a 0.31 Treatment period).
2009: 10 PM – 2 AM No fish observed.

2009: 3 AM – 7 AM (Blocks 9, 10, 11 only (starting day 25))

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	8	6.2910			
Block	2	0.2747	0.1373	0.1368	0.8760
Treatment	2	2.0008	1.0004	0.9965	0.4455
Error	4	4.0155	1.0039		

2010: 6 PM – 2 AM (Blocks 15,23-27 only)

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	11	15.9559			
Block	5	7.6382	1.5276	1.4750	0.3401
Treatment	1	3.1395	3.1395	3.0314	0.1421
Error	4	5.1783	1.0357		

2010: 11 PM – 7 AM (Blocks 20-27 only (starting day 39))

	Df	Deviance	Mean Dev.	F	P(> F)
$Total_c$	15	36.7612			
Block	7	21.9098	3.1300	1.6285	0.2678
Treatment	1	1.3972	1.3972	0.7269	0.4221
Error	7	13.4543	1.9220		

Wells Hydroelectric Project
Total Dissolved Gas Abatement Plan

2012 Annual Report

Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4331

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December 31, 2012

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TABLE OF CONTENTS

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LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

1 INTRODUCTION

The 2012 Wells Hydroelectric Project Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on April 6, 2012 (Appendix 1 and Appendix 2). The GAP and its associated measures are intended to meet state water quality standards for total dissolved gas (TDG). This annual report concludes the 2012 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Hydroelectric Project (Wells Project) in 2012.

1.1 Project Description

The Wells Project is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD) and is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Public Utility District No. 1 of Chelan County. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. The hydrocombine is 1,130 feet long, 168 feet wide and has a top of dam elevation of 795 feet above mean sea level (msl). Upstream fish passage facilities are located on both sides of the hydrocombine.

The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends 1.5 miles up the Methow River and 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet msl.

1.2 Fixed Monitoring Site Locations

Fixed monitoring stations for TDG are located above and below Wells Dam. The forebay station (WEL) is located midway across the deck of Wells Dam (47° 56’ 50.28” N, 119° 51’ 54.78” W). The tailrace station (WELW) is located on the left bank of the Columbia River 2.6 miles downstream of Wells Dam (47° 54’ 46.86” N, 119° 53’ 45.66” W). Hach® HYDROLAB MiniSonde instruments equipped with TDG and temperature probes are deployed approximately 15 feet below normal surface water elevation and are calibrated monthly (example in Appendix 3). Data from both stations are automatically transmitted by radio to Wells Dam, stored, and forwarded to the USACE. Weather data are recorded by Global Water, Inc. instrumentation, including an electronic barometer located on the deck of Wells Dam at 810 feet elevation.

Figure 1. Location of the Wells Project.

1.3 Regulatory Framework

Washington Administrative Code (WAC) Chapter 173-201A identifies the Water Quality Standards (WQS) for surface waters in Washington State. The WQS state that TDG measurements shall not exceed 110% saturation at any point of measurement in any state water body. The WQS provide for two exceptions to this rule: (1) during natural flood flows, and (2) for spill over dams to increase survival of downstream migrating juvenile salmon.

Natural flood flows are identified by periods in which river flow volume exceeds the highest seven consecutive day average observed during a ten-year period, called the 7Q-10 flow. The 7Q-10 flow for the Wells Project is 246,000 cubic feet per second (cfs), based on the hydrologic records from 1930 to 1998 and the USGS Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Pickett et al. 2004). When river flow volume exceeds 7Q-10 flows, the WQS permits exceedances of the 110% TDG saturation standard.

Ecology may also approve an exception to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; provided that spill aids in the survival of fish. The TDG exception is considered by Ecology on a per-application basis and must be accompanied by an approved GAP (WAC 173-201A-200(1) (f) (ii)). On the Columbia and Snake rivers, the TDG exception for fish passage has three standards during the fish passage (spill) season: (1) TDG shall not exceed 125% saturation in the tailrace of the project as measured in any one-hour period; (2) TDG shall not exceed 120% saturation in the tailrace of the project based on the average of the twelve highest consecutive hourly readings in any

one day (12C-High[1]); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings in any one day.

1.4 2012 Gas Abatement Plan Approach

1.4.1 Operational

Based on the success of 2009 and 2010 operations associated with implementation of the Wells Project Spill Playbook (Spill Playbook), those operations were implemented again in 2011 and 2012 with minor modification as described below.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Additional recommendations for 2011 and 2012 operations, from a TDG management perspective, included:

1. Minimize spill.
2. Forced Spill (≤ 53.0 kcfs). Switch the priority for forced spill less than 53.0 kcfs from spillbay 7 to spillbay 5. Units 4 and 5 should be operated to support spill from spillbay 5.
3. If spill exceeds 53.0 kcfs, or is predicted to exceed 40.0 kcfs for more than 8 hours, remove the Juvenile Bypass System (JBS) barriers in spillbay 6.
4. When spill exceeds 30.0 kcfs in spillbay 5 and JBS barriers have been removed in spillbay 6, shift at least 15.0 kcfs from spillbay 5 to spillbay 6 (i.e., 27.2 kcfs and 15.0 kcfs through spillbays 5 and 6, respectively). Support spill through spillbays 5 and 6 by operating units 4, 5 and 6.
5. Reinstall the JBS barriers if total spill is predicted to remain below 40.0 kcfs for more than four days.

Modifications were based on previous adaptive operational results, model predictions, and operational contingencies for unplanned unit outages.

Despite operational and environmental challenges during the 2011 spill season, when Wells Project flows were below the 7Q-10 flood flows (246 kcfs) and forebay TDG levels were less than 115%, Douglas PUD had very high compliance values for all three standards. Based on this high compliance rate under challenging conditions, the 2012 Gas Abatement Plan and Spill Playbook contained few additional measures when compared to the 2011 Gas Abatement Plan and Spill Playbook. The 2012 Spill Playbook is attached as Appendix 4.

[1] Ecology currently uses the methodology described in Appendix 5 for determining 12C-High TDG values in the tailrace and forebay of Columbia Basin hydroelectric projects.

During the 2012 flood flow periods, the Wells Project was an 8 unit plant. This is highly unusual for Wells Dam and was largely attributed to our turbine contractors' inability to properly reassemble the turbine in Unit 7. In addition to this prolonged unit outage, an unplanned mechanical breakdown of unit 6 also took place during the peak of the spring runoff. Further, bi-annual maintenance occurred during May and August when flows typically accommodate this maintenance. However, during 2012, high flows occurred even in the months of May and August when units 1, 2 and 3 were serviced. During these service and breakdown periods Wells Dam had a generating hydraulic capacity of approximately 160 kcfs (versus 180 kcfs for a 9 unit plant).

1.4.2 Structural

No permanent structural modifications were proposed or conducted in the 2012 monitoring season.

1.4.3 Consultation

Douglas PUD will continue to direct all correspondence related to compliance with the TDG standards to the Hydropower Projects Manager, Department of Ecology, Central Region Office, Water Quality Program, 15 W. Yakima Avenue, Suite 200, Yakima, Washington 98902.

2 OPERATIONS

2.1 Description of Fish-Spill Season Flow

The 2012 Fish Spill Season occurred April 9th (0:00 hrs) through August 19th (12:00 hrs) at Wells Dam. As required, TDG data were monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil). Historical data is also available for download at this website. Data from 1969 to 2011 (42 years) show that average monthly flows between April and August range from 51.9 to 348.7 kcfs at the Wells Project. During this time period, flows tend to be highest in June (mean 164.5 kcfs), and lowest in August (104.6, Table 1). Flows at the run-of-river Wells Project are determined by upstream storage releases at the Grand Coulee Hydroelectric Project, with less than 5% of the flow provided by tributaries flowing into the Wells Project.

Table 1. Monthly total river discharge (kcfs) from the Wells Project (April-August), 1969-2011.

Month	April	May	June	July	August
Mean Monthly Average (kcfs)	115.6	149.4	164.5	132.2	104.6
Minimum Monthly Average (kcfs)	51.9	55.2	73.7	53.4	63.9
Maximum Monthly Average (kcfs)	184.9	262.6	348.7	221.9	181.3

Columbia River flows at Wells Dam in 2012 were the 3rd-highest on record for the months of April through August (next to 1972 and 1997). Over 42-year historical record, only 1972 (218.8 kcfs) and 1997 (207.7 kcfs) had higher average monthly flows than the 2012 spill season (207.3 kcfs). Average monthly river flow at the Wells Project was 41.6-92.0% higher than the 42-year average for the April through August fish spill season (Figure 2). The average flow during the 2012 fish spill season was 56% (74 kcfs) higher than the previous 42-year average (Table 2). Flows for all months during the spill season were higher than the monthly 42-year average. The maximum hourly flow observed during the spill season was 314.2 kcfs on June 25 and flows frequently exceeded the 7Q-10 value of 246.0 kcfs by 68 kcfs. The average monthly flow for all of July was 253.8 kcfs. This value also exceeded the 7Q-10 value for the Wells Project. Of the 133 days during the Wells fish spill season, there were 56 days (42% of the monitoring period) where one or more hourly values were above 7Q-10 flows at the Wells Project, including a 38-day uninterrupted stretch from June 19 to July 26th.

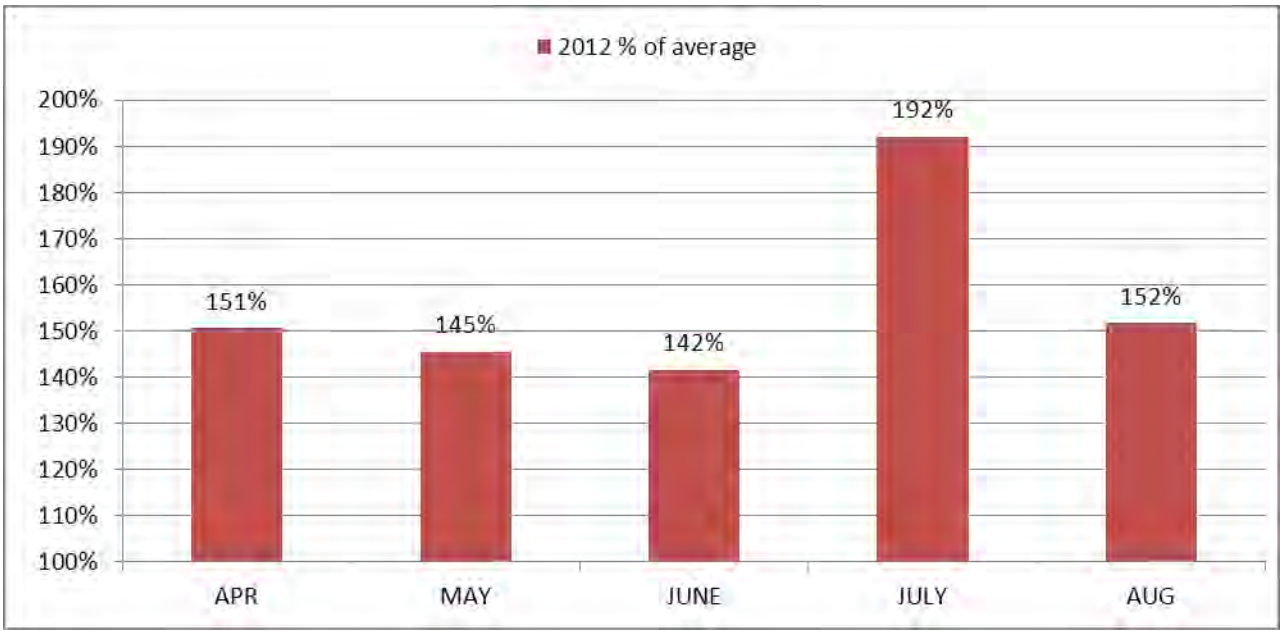

Figure 2. **Increase in 2012 flows compared to average monthly flows (1969-2011) during the fish spill season, where 100% would be average montly volume.**

Table 2. **Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the previous 42-year average (1969-2011), by month.**

Month	1969-2011 Mean	2012 Mean	Percent Difference from 42-year Average
April	115.6	174.1	+151%
May	149.4	217.2	+145%
June	164.5	232.9	+142%
July	132.2	253.8	+192%
August	104.6	158.7	+152%

All	133.3	207.34	+156%

2.2 Fish Spill Program

Wells Dam is a hydrocombine, where the spillbays are located directly above the turbine water passages. Research at Wells Dam in the mid-1980s demonstrated that a modest amount of spill could be used to effectively guide a high proportion of the downstream migrating juvenile salmon away from the turbines and into a surface oriented bypass system. A JBS was subsequently developed at Wells in the late 1980s. The Wells Dam JBS was engineered based on biological research and hydraulic modeling, and utilizes constricting flow barriers deployed in five of the eleven spillbays to effectively attract and safely guide fish through the project. The Wells Project JBS has since proven to be the most efficient system on the mainstem Columbia River, providing high levels of fish protection that has met approval of fisheries agencies and tribes (Skalski et al. 1996). The survival performance measures contained within the Federal Energy Regulatory Commission (FERC) approved Anadromous Fish Agreement and Habitat Conservation Plan (HCP) have been consistently exceeded, with a three-year survival average of 96.2% for juvenile steelhead and Chinook salmon (Bickford et al. 2001). The results from a fourth year of survival study at Wells Dam in 2010 (Bickford et al. 2011) confirmed past study results by documenting that survival through the entire Wells Project is in excess of 96.4% for juvenile spring migrating anadromous fish (see Section 3.1.2 below).

2.3 Fish Spill Quantities and Duration

The Wells Dam JBS uses up to 2,200 cfs per spillbay, though one or more of the flow barriers may be removed to provide adequate spill capacity to respond to plant load rejection. Under normal conditions, however, the JBS will use roughly six to eight percent of the total river flow for fish guidance. The increased spill has a small influence on TDG production (~0-2%) while providing a safe, non-turbine passage route for over 92% of the spring and 96% of the summer migrating juvenile salmonids. The JBS was operated on a fixed schedule between April 12th and August 26th from 2003 to 2011. The HCP Coordinating Committee (HCP CC) retains annual operating oversight that includes the potential to operate the JBS as early as April 1st and as late as August 31st to ensure that 95% of the spring and summer migration of juvenile salmonids is provided a safe, non-turbine passage route past Wells Dam. In early 2012, prior to the start of the 2012 spill season, Douglas PUD evaluated past performance of the Wells Dam JBS operating dates relative to observed annual run timing (at the Rocky Reach Bypass) for both spring and summer migrants. With that data, a request was made to and granted by the HCP CC to revise operating dates in 2012 to start April 9th and end August 19th. These dates were therefore used in 2012 to operate fish passage spill for migrating juvenile salmonids.

Average monthly spill (calculated from daily averages) at the Wells Project in 2012 was higher than the previous 17-year average. Average spill volume ranged from 12.5 kcfs at the end of the fish spill season in August to 84.4 kcfs in July (Table 3). On June 29Th forced spill reached a maximum hourly value of 167.5 kcfs when more than 312 kcfs of water was passing Wells Dam. These high spill events were attributed to both flow volumes in excess of the Project's hydraulic capacity, and flows in excess of the power system needs and/or transmission system capacity.

Table 3. Average monthly spill (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the 16-year average (1995-2011), by month.

	1995-2011		2012	
Month	**Mean**	**Std Dev**	**Mean**	**Std Dev**
April	10.9	7.0	20.6	13.7
May	21.9	20.7	59.0	18.6
June	36.4	39.6	65.4	41.9
July	15.1	11.2	84.4	28.4
August	7.9	2.1	12.5	9.4
Spill Season	18.4	16.1	48.4	37.0

3 IMPLEMENTATION RESULTS

3.1 Fisheries Management

3.1.1 Fish Passage Efficiencies

No fish passage efficiency studies were conducted at the Wells Project in 2012. However, three years of bypass efficiency studies have shown the Wells Dam JBS to be the most efficient juvenile salmonid collection system in the Columbia River with fish passage efficiencies up to 92% for spring migrants and up to 96% for summer migrants (comprised of steelhead, spring Chinook, and sockeye salmon, and summer/fall Chinook salmon, respectively; Skalski et al. 1996).

3.1.2 Survival Studies

No survival studies were conducted at the Wells Project in 2012. In preparation for future subyearling Chinook run-timing and behavior studies, Douglas PUD proceeded with year two of a pilot study to: evaluate the feasibility of capturing wild subyearling Chinook using seining techniques; identify capture locations; and determine whether it is possible to capture enough subyearlings to confidently evaluate migration behavior and timing. Over 19,000 wild subyearling Chinook salmon were beach seined from the reservoir and tagged in the Project area during these efforts.

These juvenile salmon were outfitted with a Passive Integrated Transponder (PIT) tag that allows them to be detected at downstream hydroelectric projects. In subsequent years Douglas PUD expects to estimate survival of these fish when migrating past Wells Dam using similar techniques, toward the goal of demonstrating steady progress in complying with the HCP passage survival standards for subyearling summer/fall Chinook. To date, over 2,800 of these fish have been observed at lower river projects including Rocky Reach, McNary, John Day, and Bonneville Dam.

In spring 2010, Douglas PUD conducted a survival verification study with yearling Chinook salmon, a required 10-year follow-up study to confirm whether the Wells Project continues to achieve survival standards of the Wells HCP. Approximately 80,000 PIT-tagged yearling summer Chinook were released

over a 30 day period in 15 replicates. Study results indicated that juvenile Chinook survival from the mouth of the Okanogan and Methow rivers averaged 96.4% over the 15 replicate releases of study fish, and confirms the results from the three previous years of study documenting that fish survival through the Wells Project continues to easily exceed the 93% Juvenile Project Survival Standard required by the HCP (Bickford et al. 2011).

3.2 Biological Monitoring

In 2012, Columbia River flows at Wells Dam were the 3rd highest on record with total river flow past Wells Dam during the months of April through August almost twice the long-term historic average. Over 42 years of operation, only 1972 (218.8 kcfs) and 1997 (207.7 kcfs) had higher average monthly flows than 2012 (207.3 kcfs). As a result of high flows, high volumes of forced spill throughout the mid-Columbia system resulted in prolonged, elevated TDG levels.

The 2012 Wells Project GAP includes the National Marine Fisheries Service (NMFS) recommendation to sample for Gas Bubble Trauma (GBT) in juvenile salmon when hourly tailrace TDG levels exceed 125% saturation (NMFS 2000).

In response to elevated TDG levels in the tailrace and as required by the 2012 Wells Project GAP, biological monitoring was initiated by Douglas PUD on May 3rd and continued on days subsequent to 125% TDG exceedances below Wells Dam. On June 29th Douglas PUD switched to a three day a week sampling effort since TDG in the tailrace was sustained for 8 days as was discussed with Ecology (Pat Irle, Pers. Comm.). Douglas PUD continued to monitor TDG conditions and biological responses until July 25th, when TDG concentrations in the tailrace fell below 125%.

Over the course of the biological monitoring period five juvenile anadromous fish species were examined, including spring and summer Chinook, steelhead, sockeye and coho. Douglas PUD biologists sampled juveniles on 24 days over a three month span (May 3 to July 25). An average of 23 ±18 (standard deviation) juveniles were sampled on each of these days, across a TDG range of 118.1-130.6% (daily mean; Rocky Reach forebay). In total, staff examined 562 juvenile fish across this TDG spectrum, with only 7 of them showing signs of GBT expression. In addition, Douglas PUD staff and Washington Department of Fish and Wildlife (WDFW) examined over 800 adult salmon captured at Wells Dam fish ladders during broodstock collection activities with none showing signs of GBT despite sampling fish when TDG was in excess of 125% in the Wells tailrace (Gingerich and Patterson 2011).

Overall, GBT expression in juvenile salmonids examined at Rocky Reach was very mild with only 1.25% of all fish showing signs of mild GBT expression. Similarly to 2011, coho appeared to be the most susceptible to a given concentration of TDG relative to other species (Gingerich and Patterson 2011).

3.3 Water Quality Forums

Douglas PUD has actively participated in regional water quality forums with Ecology, WDFW, NMFS, Tribal Agencies, the US Fish and Wildlife Service, the USACE, and other mid-Columbia PUDs (i.e., Grant and Chelan counties). Specific forums include the Trans-boundary Gas Group, Columbia Basin meetings

with Ecology, and the Sovereign Technical Team Water Quality Work Group. These meetings allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia Basin and support ongoing Upper Columbia River Treaty review analyses that will provide a foundation for Treaty negotiations between Canada and the U.S. Douglas PUD will continue its involvement in water quality meetings for further coordination with other regional water quality managers.

3.4 Physical Monitoring

3.4.1 Overview

TDG monitoring at the Wells Project has occurred since 1984 when forebay stations were first established. TDG monitoring in the tailrace of Wells Dam began in 1997 by actively collecting data at four points across the width of the river. Based on these data, the location for a fixed monitoring station was established in 1998. Subsequent analysis verified that both monitoring station locations are appropriate and representative of the river conditions, particularly during high flows (EES et al. 2007; Politano et al. 2009). TDG monitoring at the Wells Project currently encompasses the fish passage season and a majority of all forced spill, beginning April 9th and continuing until August 19th. As part of Douglas PUD's Quality Assurance/Quality Control (QA/QC) measures, the TDG sensors are serviced monthly for maintenance and calibration. Data is collected at 15-minute intervals at the Wells Project over the entire fish spill season (typically April 1st – August 31st but may be adjusted per HCP consultation. See section 2.3 above).

3.4.2 Data Evaluation and Analyses

Hourly TDG monitoring data were retrieved from the USACE, Northwest Division for three monitoring locations: the forebay of Wells Dam (WEL), tailrace of Wells Dam (WELW), and forebay of Rocky Reach Dam (RRH). The data were partitioned to include only readings obtained during the fish spill season (April 9th to August 19th). Data were stratified by monitoring site, ascending date, and ascending time. The Ecology-approved 12C-High method was used to obtain TDG measurements for comparison to numeric criteria and evaluation of compliance.

During the 2012 monitoring season, the TDG criterion for the forebay of Wells Dam was exceeded 125 of 133 days (94.0) when using the water quality standard of 110%. When using the 115% fish waiver standard exceedances occurred on 62 of 133 days or 46.6% of the time (Figure 3). Figure 3 below depicts the incoming water as a 12-C high, where the bottom dashed line is the 110% standard and 115% is the inapplicable fish passage waiver criteria. Only on 8 days of the 133-day fish spill season (6.0%) did Wells Dam receive water in compliance with the 110% water quality standard.

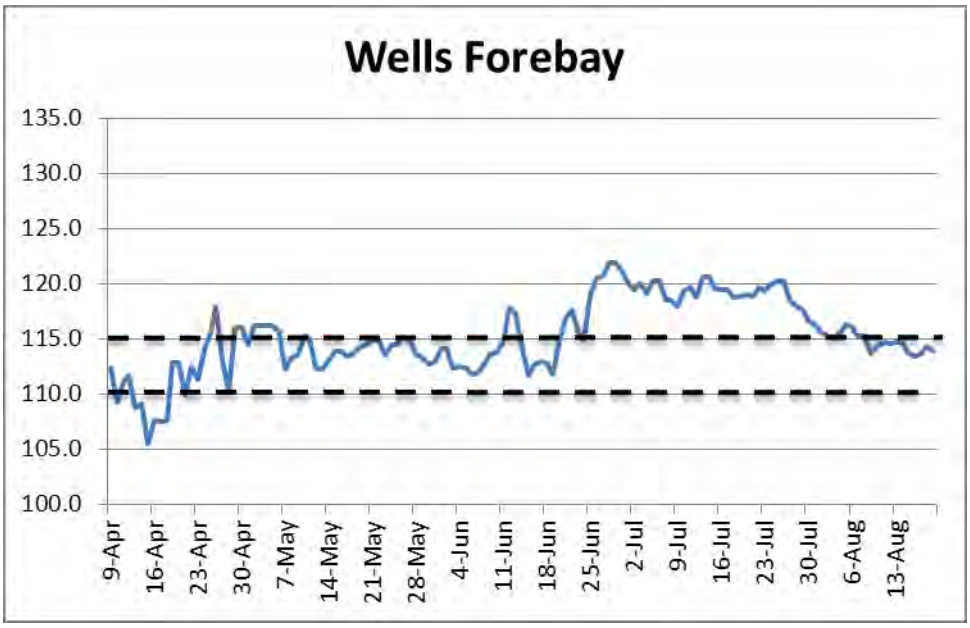

Figure 3. 12-C High TDG concentration in the Wells Forebay during 133 fish spill days in 2012.

Flood control spill started early and remained high throughout most of the fish passage season at Wells Dam. As a result of these high flows, high volumes of forced spill resulted in prolonged, elevated levels of TDG throughout the Columbia River system. The primary source of elevated TDG entering the mid-Columbia has been the operation of federal projects upstream of Wells Dam; primarily Chief Joseph and Grand Coulee dams. Although spill deflectors at the Chief Joseph Dam strip some dissolved gas from Grand Coulee flows, TDG levels in the Wells Dam forebay were consistently above the 110% and 115% forebay compliance criteria in 2012. At Grand Coulee Dam, spill operations produced TDG levels above 115% beginning in early April. TDG levels in the Grand Coulee Dam tailrace remained high and peaked over 120% in June. Concentrations remained above 115% until the end of July (Figure 4). TDG concentrations in the Chief Joseph tailrace were similar to those observed at Grand Coulee where the 110% TDG standard was rarely achieved.

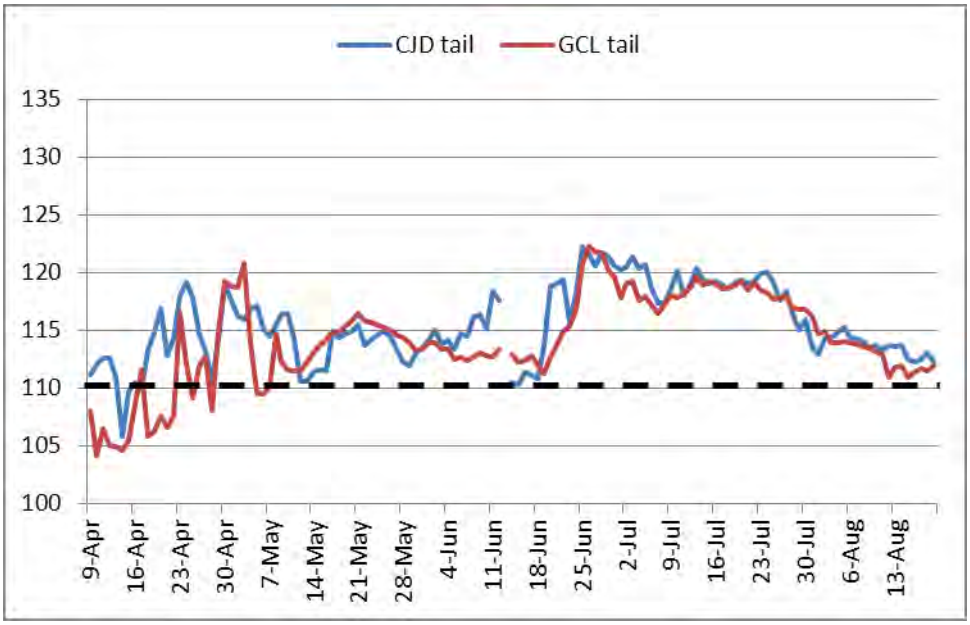

Figure 4. **TDG concentration in the tailrace of Grand Coulee (GCL tail) and Chief Joesph (CJD tail) dams during the 2012 fish spill season. The solid line represents the applicable 110% state water quality standard.**

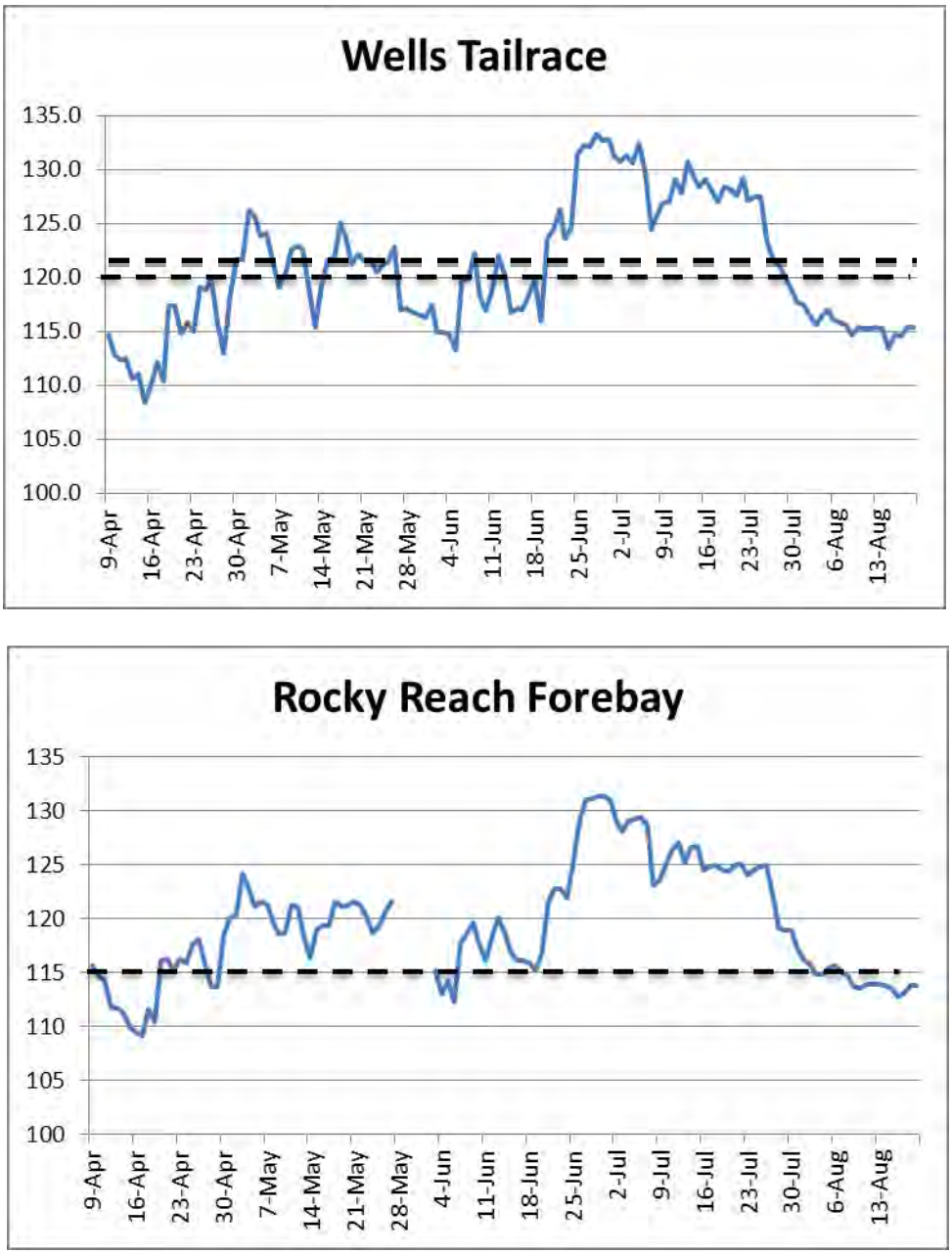

Figure 5. **Daily 12-C High TDG measurements (percent saturation) from Wells Dam tailrace (WELW) and Rocky Reach Dam forebay (RRH) during the 2012 monitoring season. Reference lines are at the 120% and 115% compliance marks. Note that the sensor maintained by Chelan PUD in the Rocky Reach forebay failed on May 28th and was inoperable until June 1st.**

As described in the 2012 GAP there are three compliance criteria for the 2012 fish passage waiver that must be met in association with the operation of the Wells Project: 1) average TDG in the tailrace cannot exceed 125% for one hour or 2) 120% for 12 continuous hours (12C-High); and 3) TDG in the downstream Rocky Reach forebay cannot exceed 115% 12C-High. These compliance criteria are waived when flows exceed the 7Q-10 flow (246 kcfs) or when incoming water is out of compliance (>115% TDG 12C-High) in the Wells Dam forebay and Wells Dam doesn't further increase TDG in the noncompliant water it is receiving. The Wells Dam compliance performance for the 2012 fish spill season are found in table 4, and are specifically summarized below in text.

Table 4. Wells Dam compliance performance for the 2012 fish spill season.

	Compliance	
	Days with 7Q10 flows removed[1]	**Considering 7Q10 flows**
Wells Tailrace 125% hourly standard		
Days out of compliance	2	2
Spill/bypass season	77	133
DCPUD Percent compliant	**97%**	**98%**
Wells Tailrace 120% 12C-High standard		
Days out of compliance	14	14
Spill/bypass season	77	133
DCPUD Percent compliant	**82%**	**89%**
Rocky Reach Forebay 115% 12C-High standard		
Days out of compliance	44	44
Spill/bypass season	77	127[2]
DCPUD Percent compliant	**43%**	**65%**

[1]Days during 2012 fish spill season with flows exceeding 246.0 kcfs (56 days) have been removed from the analysis. The compliance analysis does not factor incoming TDG that was routinely out of compliance via federal projects above Wells Dam.
[2]Five days removed from analysis because of sensor failure.

Wells Tailrace 125% hourly standard

In the Wells Dam tailrace, the hourly average TDG value exceeded 125% for 752 hours on 41 of 133 days during the spill season. On 39 of the 41 days when TDG values exceeded 125%, flows at the Wells Project exceeded the 7Q-10 flows. As a result, Wells was out of compliance with the 125% TDG standard on 2 days out of 133 days (98% compliant). On the remaining 2 days when flows were less than 246 kcfs, TDG in the Wells forebay exceeded 110% on both days and 115% on one of the two days. Once 7Q-10 days were removed from the analysis compliance fell 1% to 97% (Table 4).

Wells Tailrace 120% 12C-High standard

There were a total of 65 days during the 133 day fish spill season where the 120% 12C- High threshold was exceeded (Figure 5). On 51 of those 65 days, flows at the Wells Project exceeded the 7Q-10 value.

Therefore, Wells Dam was 89% compliant with the 120% 12C-High standard for TDG. On all 14 of the non-compliant days, Wells Dam received water from the federal system that was above the state standard of 110% and on five of those days forebay water was at or above 115%. Once 7Q-10 days were removed from the analysis compliance fell 7% to 82% (Table 4).

Rocky Reach Forebay 115% 12C-High standard

The 12C-High TDG value in the Rocky Reach forebay exceeded 115% on 98 of 127 days (five days were removed from this analysis since in late May the Rocky Reach forebay probe failed; Figure 5). Of the 99 days when the standard was exceeded in the Rocky Reach forebay, daily average flows exceeded 7Q-10 on 56 days. Therefore, Wells Dam was 65% compliant with the 115% 12C-High standard for TDG. Of the remaining 44 days, Wells forebay exceeded 115% TDG on 17 days and exceeded 110% on the remaining 24 days. Once 7Q-10 days were removed from the analysis compliance fell to 43% (Table 4).

Compliance Summary

At the Wells Project, average compliance was exceptionally high, given that it was the 3rd highest fish spill flow season on record, and Wells Dam had reduced turbine capacity related to unscheduled maintenance on Unit 6 and the continued unscheduled delay in rebuilding Unit 7. Finally, the compliance criteria averages would have been at or near 100% if incoming TDG violations from Chief Joseph Dam were factored into the compliance analyses (See table 5).

Table 5. TDG Concentration of Water Received at Wells Dam during 2012 fish spill season (133 days).

	TDG standard	Number of days in compliance in a 133 day season	Days in Compliance with TDG Standards (%)
USACE compliance	110%	8	6%
	115%	71	53%

3.5 Non-fish Bypass Season

During the non-fish passage period (January 1 to April 1 and August 31 to December 31), TDG is not currently collected at the Wells forebay and tailrace fixed monitoring stations. Non-spill flows at Wells Dam (through the turbine units and fishways) generate little to no additional dissolved gas. Spill outside the fish passage adjustment period is uncommon, but was higher in 2012 than most years since the federal system decided to draft Grand Coulee Dam aggressively in March of 2012. Starting in April 2013 Douglas County PUD will begin montoring year round and subsquent TDG annual reports will include compliance performance during non-fish bypass season.

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Operational

In 2012, high spring and early summer river flows throughout the Columbia River basin resulted in flows at Wells Dam that were the 3rd highest on record for the month of April through August (since 1969). Spill at the Wells Project started early, and was almost 1.5-2.0 times the long term historical average (1969-2011). In the months of May, June and July, average monthly discharge was above 215 kcfs. In addition, from June 19th to July 26th hourly values greater than 246.0 kcfs occurred every day (Table 2); a threshold above which the Wells Project is not required to meet with Washington State WQS for TDG. During spill season, there were a total of 36 days (27.1%) when daily average flows at Wells Dam were above 7Q-10 flood flows. In addition, 56 days (42.1%) had one or more hourly values above 246 kcfs. As a result of high flows, increased spill volumes throughout the mid-Columbia system resulted in prolonged, elevated levels of TDG. Similar to 2011, the operation of Grand Coulee Dam, coupled with historical and sustained high flows from April through the beginning of August were the primary sources of elevated TDG entering Wells Dam and the mid-Columbia system (Figure 2 & 6).

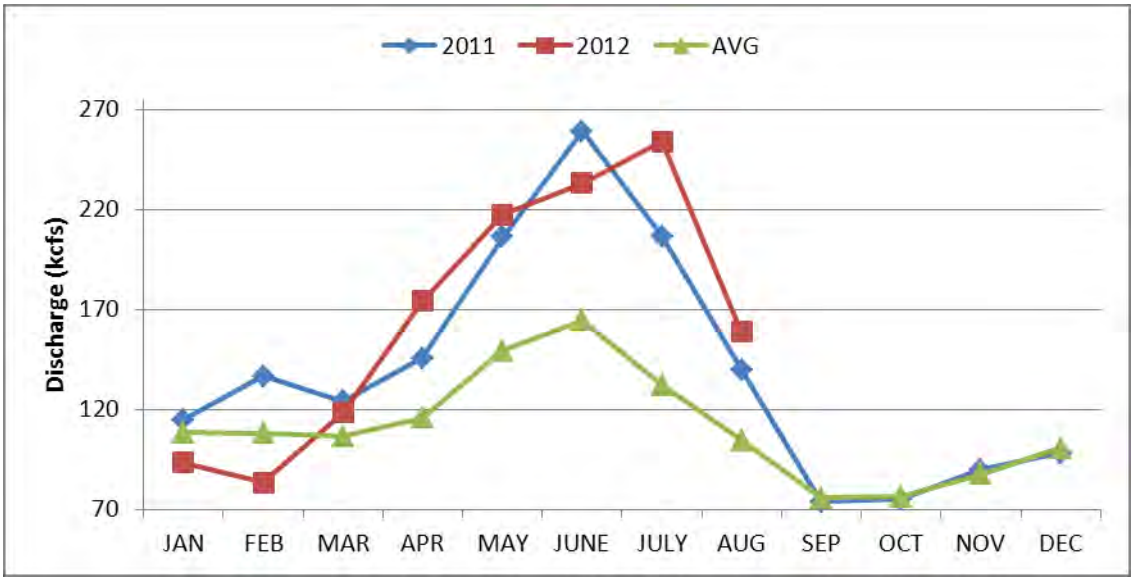

Figure 6. **Average discharge past Wells Dam in the years 2011, 2012 compared to the 42 year average.**

At Grand Coulee Dam, spill operations produced TDG levels between 110-125% between late April and early August. Although spill onto deflectors at the downstream Chief Joseph Dam (the next downstream facility) strips some dissolved gases from Grand Coulee flows, TDG levels in the Wells Dam forebay remained consistently above the 110 forebay compliance criteria. During the spill season, incoming waters to Wells Dam were above the 110% TDG waiver criteria a total of 125 out of 133 days (94.0%). In addition, incoming waters to Wells Dam were above 115% on 62 out of 133 days (46.6%). Washington

State WQS require TDG compliance at Wells Dam even when the dam is receiving water out-of-compliance. This standard skewed performance metrics at Wells Dam since no violations below Wells Dam occurred when incoming water was compliant.

Since the completion of spill deflectors at Chief Joseph Dam in 2008, there has been a shift in federal spill operations to upstream facilities resulting in a significant increase in the amount of spill at Grand Coulee and Chief Joseph dams. This recent increase in the amount of spill has resulted in a dramatic increase in the volume of water that is supersaturated with TDG entering the mid-Columbia system. However, TDG performance was marginally lower at Chief Joseph in 2012 than they were in 2011. The mass influx of supersaturated water has resulted in significantly higher TDG concentrations observed in the forebay of Wells Dam and throughout the mid-Columbia River reach.

Douglas PUD implemented the Ecology-approved GAP during the entire 2012 spill season utilizing the lessons learned during previous years of spill evaluation at the Wells Project. The 2012 Spill Playbook was an important element in managing TDG at Wells during the fish passage season. At the Wells Project, TDG compliance was exceptionally high, given that 2012 had the 3rd highest fish spill season flows on record (April-August; see Figure 6), and Wells had reduced turbine capacity related to unscheduled maintenance on Unit 6 and the prolonged rebuild of Unit 7. Finally, the compliance average would be at or near 100% for Wells Dam if incoming TDG violations from Chief Joseph could have been eliminated.

4.2 Structural

No permanent structural modifications were proposed or conducted in the 2012 monitoring season. Removal of the bypass barrier structures in Spillway 4, 6 and 8 was implemented consistent with the 2012 Spill Playbook.

5 CONCLUSIONS

With the operation of spill deflectors at Chief Joseph Dam in recent years and shifting spill operations by the USACE to this facility and Grand Coulee Dam upstream, there has been an increasing trend of flows with higher levels of TDG entering the Wells Project. FCRPS (Federal Columbia River Power System) spill priorities coupled with two years of 1.5-2.0 times average runoff during the fish spill season have reduced compliance results. In 2012, large volumes of spill at Grand Coulee Dam resulted in a high frequency of flows with TDG levels out-of-compliance entering the Wells Project. Additionally, there were numerous days when flows at Wells Dam were above the 7Q-10 flood flow. In consideration of these conditions, Douglas PUD, through the implementation of its Spill Playbook, achieved high compliance with the TDG waiver standards. If Chief Joseph Dam could attain the non-fish passage WQS criteria of 110%, then the Wells Project would be able to fully comply with the WQS standard. Regardless of these observations, TDG performance at Wells Dam was exceptional in 2012 given the extreme levels of flow recorded and number of turbine units unavailable during the fish passage spill season. These results support the continued implementation of the Spill Playbook to manage TDG production through operational means, and indicate future operational performance should result in

even higher rates of TDG standards compliance in years under more normal 95% unit availability, more normal river flows and with federal compliance of the non-fish passage WQS (110%).

6 REFERENCES

Bickford, S. A., J. R. Skalski, R. Townsend, S. McCutcheon, R. Richmond, R. Frith and R. Fechhelm. 2001. Project survival estimates for yearling summer steelhead migrating through the Wells Hydroelectric Facility, 2000.

Bickford, S. A., T. Kahler, R. Townsend, J. R. Skalski, R. Richmond, S. McCutcheon and R. Fechhelm. 2011. Project survival estimates for yearling Chinook migrating through the Wells Hydroelectric Project, 2010 (2010 spring migrant survival verification study).

EES Consulting, Carroll, J., ENSR, and Parametrix. 2007. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project. FERC No. 2149. Prepared by EES Consulting, Joe Carroll, ENSR, and Parametrix. Environmental Protection Agency (EPA). 1976. Quality Criteria for Water. PB-263943.

Gingerich, A., and B. Patterson. 2011. Douglas PUD Gas Bubble Trauma Biological Monitoring. 2011. Wells Hydroelectric Project. FERC No. 2149. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

Patterson B., and A. Gingerich. 2011. Memorandum to Pat Irle, Washington Department of Ecology re: Evaluation of TDG at Wells Dam, 2011 mid-season analysis. August 17, 2011.

Pickett, P., H. Rueda, M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Submittal Report. Washington Department of Ecology, Olympia, WA. U.S. Environmental Protection Agency, Portland, OR. June 2004. Publication No. 04-03-002.

Politano, M., A. Arenas Amado and L. Weber. 2009. An Investigation into the Total Dissolved Gas Dynamics of the Wells Project (Total Dissolved Gas Evaluation). Report prepared by IIHR-Hydroscience & Engineering, University of Iowa, Iowa City, Iowa.

Skalski, J. R., G.E. Johnson, C.M. Sullivan, E. Kudera, and M.W. Erho. 1996. Statistical evaluation of turbine bypass efficiency at Wells Dam on the Columbia River, Washington. Canadian Journal of Fisheries and Aquatic Sciences 53:2188-2198.

APPENDICES

Appendix 1. Wells Project 2012 Gas Abatement Plan

Appendix 2. Letter of 2012 GAP approval from Washington Department of Ecology

Andrew Gingerich

From: Irle, Pat (ECY) <PIRL461@ECY.WA.GOV>
Sent: Friday, April 06, 2012 3:51 PM
To: Beau Patterson
Cc: McKinney, Charlie (ECY); Andrew Gingerich; Shane Bickford
Subject: GAP for 2012

Hi, Beau –

It looks like your GAP has addressed our comments. As noted in those comments, a QAPP is still needed to fully describe the QA/QC procedures used to monitor TDG. We would like to see the QAPP completed and approved by Ecology before the start of the next (2013) fish spill season.

Thanks again for your work.

Pat Irle, MA, LG
Hydropower Projects Manager
Department of Ecology
Washington State
(509) 454-7864

Appendix 3. Example Hach® HYDROLAB MiniSonde calibration report from the 2012 monitoring season

Appendix 4. Wells Project 2012 Spill Playbook

WELLS PROJECT CRAYFISH DISTRIBUTION STUDY

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

August 6, 2012

Prepared by:
Chas Kyger and Andrew Gingerich (Douglas County Public Utility District)

Prepared for:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

1.0 INTRODUCTION

1.1 Aquatic Nuisance Species Management Plan and Clean Water Act Section 401 Certification

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). In addition, the ANSMP implementation supports requirements outlined in the recently issued Wells Project 401 Certification issued by the Washington Department of Ecology, in support of the Clean Water Act (DOE 2012).

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species in Project waters. Douglas County Public Utility District (DCPUD), in collaboration with the Aquatic SWG, has agreed to implement several protection, mitigation and enhancement measures (PMEs) in support of the ANSMP. In addition to the PMEs listed in the ANSMP, the Washington State Department of Ecology Section 401 Water Quality Certification for the Wells Hydroelectric Project includes an additional requirement to monitor non-native crayfish at appropriate locations within the Project area. In fulfillment of this requirement, and in an effort to describe the distribution of native and non-native crayfish in the Project, Douglas is proposing to conduct a crayfish distribution study in 2012.

2.0 BACKGROUND

Crayfishes of North America have received increased attention from fisheries biologists over recent decades, including their distribution in the Pacific Northwest (Larson and Olden 2011). The effects of non-native crayfish on biotic and abiotic processes within the Columbia Basin are not well known. Importantly however, crayfish are an important prey item for many species of native fish. Despite the presence of state regulations against the distribution and use of certain species of crayfish within Washington state, enforcement of these rules is complicated by an inability of the general public and enforcement personnel to identify the differences between native and non-native crayfish (Johnson et al. 2009). The proliferation of a non-native crayfish could be harmful to biota found within the Wells Project including the potential to reduce the abundance of native crayfish. Because of the potential for negative impacts on the ecosystem, biologist, researchers and regulators have placed an increasing emphasis on the collection of baseline crayfish abundance and relative distribution data. This plan serves to improve the baseline understanding that two species of crayfish currently inhabit the waters found within the Wells Project.

2.1 Crayfish in the Wells Project

In late 2010, Douglas conducted an exploratory crayfish sampling effort in the Wells Reservoir using methods described in the Crayfish Survey Protocol and Identification Guide for Washington (Olden and Larson 2010). Sampling occurred over a two day period with one overnight sample. No native signal crayfish (*Pacifastacus leniusculus*) or non-native Northern crayfish (*Orconectes virilis*) were captured during this pilot effort.

During seining activities in June 2011 near the Brewster swimming area, Douglas County PUD biologists captured a large crayfish with unusual morphological indicators. After careful examination and a series of pictures the crayfish was released. After providing the photos to Dr. Julian Olden (University of Washington) she confirmed that the unusual specimen collected near Brewster was a Northern, or Virile crayfish. Larson and Olden (2011) have similarly confirmed the presence of Virile crayfish in waters adjacent to the Wells Project including the Chelan, Methow and other upper Columbia River tributaries .

During January 2012, 14 crayfish were recovered in the west fishway of Wells dam. All of these crayfish were identified as Washington's native Signal crayfish. To date, no known specimens of the red swamp crayfish (*Procambarus clarkii*), rusty crayfish (*Orconectes rusticus*), or any other species have been intercepted in the Wells Project Area. However, these species have been found in other Pacific Northwest waterbodies.

Proposed sampling in 2012, per the requirements of the 2012 401 water quality certification, is aimed at collecting baseline information on the relative abundance and distribution of all species of crayfish within the Wells Project.

3.0 GOALS AND OBJECTIVES

The goal of the 2012 crayfish distribution analysis is to describe the distribution and relative abundance of crayfish in the Wells Project.

Specific objectives of the study include:

1. *Determine the presence/absence of Northern crayfish at multiple sites throughout the Project.*

2. *Compare relative abundance of Northern crayfish and signal crayfish at multiple sites throughout the Project.*

3. *Determine the type of habitats in the Project with the greatest occurrence and abundance of Northern crayfish.*

4. *Determine the presence and absence of other species of non-native crayfish within the Wells Project.*

4.0 METHODOLOGY

4.1 Sampling Methods

Sampling methods will follow guidelines described in the Crayfish Survey Protocol and Identification Guide for Washington (Olden and Larson 2010). Modified Gee minnow traps with 1.5 to 2 inch openings will be deployed to capture crayfish. Traps will be baited and attached to anchors to ensure contact with to bottom. Each trap will also be attached by rope to a numbered buoy for trap identification and retrieval.

Sampling will take place over a three week period in late August to early September. A sampling occasion will consist of an overnight trap set with retrieval the following morning. At least two sampling occasions will occur each week. Up to 20 traps will be deployed during each sampling occasion resulting in as many as 120 trap sets over the three week study. Traps will be set in 5 identified sampling areas within the Wells Project. Trap set locations within sample areas will be stratified by habitat type; two traps will be placed in open areas, and two traps will be placed in areas with aquatic macrophytes. Depending on characteristics of individual sampling areas, individual trap set locations will be chosen to represent a range of water depths and current velocities in each area. Using this strategy we will aim to represent all habitat types found within the Wells Project.

During retrieval of traps, site location will be recorded via map and handheld GPS. Sample site characteristics will also be recorded including: depth, water temperature, macrophyte type (if present), and qualitative measures of substrate size (sand, gravel, cobble, boulder) and current velocity (low, moderate, high). Captured crayfish will be identified to species and sex will be determined. Non-native crayfish species will be retained and destroyed. Non-target fish species captured incidentally will be identified, measured, and recorded. All native crayfish and non-target fish taxa will be released at the location of capture.

4.1.1 Sample Areas

The Project will be divided into five sample areas with each area sampled equally. The five sample areas will be:

1. Chief Joseph Tailrace – The area between the Chief Joseph tailrace and Washburn Island.
2. Bridgeport Bar – The area between Washburn Pond and Brewster Bridge launch.
3. Okanogan River – The area near and within the mouth of the Okanogon River.
4. Brewster-Pateros – The area between Brewster and Pateros.
5. Wells forebay – The area from Pateros to Wells Dam.

These sample areas were chosen to encompass the encompass all of the eco-regions found within the project. Within these areas, sampling will focus on areas where vectors for non-native crayfish introduction are most concentrated and suitable crayfish habitat is present.

4.2 Data Analyses

4.2.1 Crayfish Distribution and Abundance (Objective 1 and 2)

Raw data from trapping along with sample site locations will be used to produce a map of the distribution of both native and non-native crayfish species in the Project area. In addition to presence and absence data, the total catches of each species will also be displayed along with the proportion of catch of non-native/native crayfish captured and each site. If sufficient data are available, a one-way ANOVA will be used to compare mean native and non-native crayfish abundance among sample areas. Results will be summarized and shared with the ASWG. Results will be used to inform future activities associated with the implementation of the Aquatic Nuisance Species Management Plan for the Wells Project.

4.2.2 Crayfish Habitat Use (Objective 3)

Site characteristics collected during sampling will be used to examine relationships between habitat attributes and native and non-native crayfish presence and abundance. Catch data will be grouped by site habitat characteristics and mean crayfish presence and abundance will be compared using statistical methods which may include t-test, ANOVA, and linear regression depending on the type of variable examined and the data available. Habitat attributes of particular interest include presence of macrophytes, bottom substrate, and water temperature. Habitat preference data for Northern crayfish will be informative for determining areas in the Project that may be currently inhabited or have the greatest risk of colonization in the future.

5.0 REFERENCES

DOE (Washington Department of Ecology), 2012. Wells Hydroelectric Project (FERC No. 2149) 401 Certification/Order No. 8981. Issued February 27, 2012.

Johnson, B.M., R. Arlinghaus, and P.J. Martinez. 2009. Are we doing all we can to stem the tide of illegal fish stocking? Fisheries 34(8):390-394.

Larson, E.R., and J.D. Olden. 2011. The state of crayfish in the Pacific Northwest. Fisheries:36(2)60-73.

Olden, J.D. and E.R. Larson. 2010. Crayfish survey protocol and identification guide for Washington. School of Aquatic and Fisheries Sciences, University of Washington.

ADULT LAMPREY PASSAGE AND ENUMERATION STUDY, WELLS DAM - 2013

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

September 21, 2012

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Table of Contents

List of Figures

List of Tables

ABSTRACT

In an effort to better understand Pacific lamprey (*Lampetra tridentata*) behavior at Wells Dam, Public Utility District No. 1 of Douglas County (Douglas PUD), in consultation with the Aquatic Settlement Work Group, is proposing to conduct a multi-faceted adult lamprey passage study at Wells Dam in 2013. This study is intended to collect information necessary to implement Objective 1 of the Pacific Lamprey Management Plan (PLMP) found in the Aquatic Settlement Agreement (ASA).

The goal of the study is to evaluate the effect of the Wells Hydroelectric Project (Wells Project) and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*
    - Evaluate passage behavior and success of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
    - Evaluate adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities.
2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
    - Evaluate the enumeration efficiency, behavior and fish passage efficiency of the fish count station at Wells Dam using 11/16th inch picketed leads and existing count windows.

Implementation of the study is consistent with requirements contained within the Wells Project PLMP. The study results are intended to support the goal of the PLMP, which is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license.

1.0 INTRODUCTION

1.1 Aquatic Settlement Agreement and Pacific Lamprey Management Plan

During the relicensing process for the Wells Hydroelectric Project (Wells Project or Project), Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with federal, state and tribal relicensing participants, developed six Aquatic Resource Management Plans in support of a comprehensive Aquatic Settlement Agreement (ASA). The Pacific Lamprey Management Plan (PLMP) is one of the six Aquatic Resource Management Plans contained within the ASA that directs the implementation of Protection, Mitigation, and Enhancement measures (PMEs) for Pacific lamprey (*Lampetra tridentata*) during the term of the new Wells Project operating license.

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Wells Project during the term of the new license. Objective 1 of the PLMP is to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. Pursuant to this objective, Douglas PUD is proposing to conduct an adult active tag study to 1) collect additional information on the passage characteristics and behavior of adult lamprey migrating through the Wells Project fishways (section 4.1.6 of the PLMP); and 2) to evaluate enumeration efficiency in the vicinity of the Wells Project fishway count windows (section 4.1.3 of the PLMP) toward identifying alternatives to improve adult lamprey count accuracy.

2.0 BACKGROUND

2.1 Wells Project Pacific Lamprey Passage Studies

As part of the Wells Project relicensing, Douglas PUD conducted several adult lamprey passage studies (2001-2003, 2007, and 2008) to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream migration and behavior as it relates to fishway passage, timing, and downstream passage events through the dam.

2.1.1 2001-2003 Pacific Lamprey Radio-telemetry Study

In 2004, Douglas PUD contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). Only 18 of these tagged fish were detected upstream at Wells Dam and many of the radio tags detected were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of

150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project Passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project Passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.1.2 2007-2008 Pacific Lamprey Radio-telemetry Study

In 2007, Douglas PUD contracted with LGL Limited to conduct another active tagging study. Twenty-one lamprey were captured, radio-tagged, and released from August to October. Tags used in this study had an expected tag life of 87 days. Of the twenty-one fish, 10 were released into the tailrace and 11 were released directly into the middle fishway section of the Wells fishways. One tailrace-released fish was recaptured and re-released into the fishway, bringing total in-ladder releases to twelve. Ten of the 12 (83%) lamprey released into the middle fishway section successfully ascended, with a median upper fishway passage time of 7.9 hours. Seven of the 10 (70%) lamprey released into the tailrace were detected at the outside of a fishway entrance. Only one of these seven (14%) lamprey entered into the collection gallery and ascended the fishway with a lower fishway passage time of 6.1 hours and upper fishway passage time of 5.9 hours.

During the 2007 study, a total of 11 radio-tagged adult Pacific lamprey passed the fish counting facilities in both fishways. Nine of these fish were detected by an antenna monitoring the count window bypass area (i.e., an area in the fishway accessed through a picketed lead just downstream of the count window which allows lamprey to migrate through the fish counting facilities undetected; Figure 1), although 3 fish were detected for less than 20 seconds and probably did not completely enter the bypass area. Eight of these lamprey were not observed at the count window, and 2 fish had zero detections on the above count window antenna (LGL and Douglas PUD 2008). The results suggested that visual detections at the count windows could be significantly lower (e.g., under estimating by 73% according to these data) than the actual total number of lamprey passing the fish counting facilities.

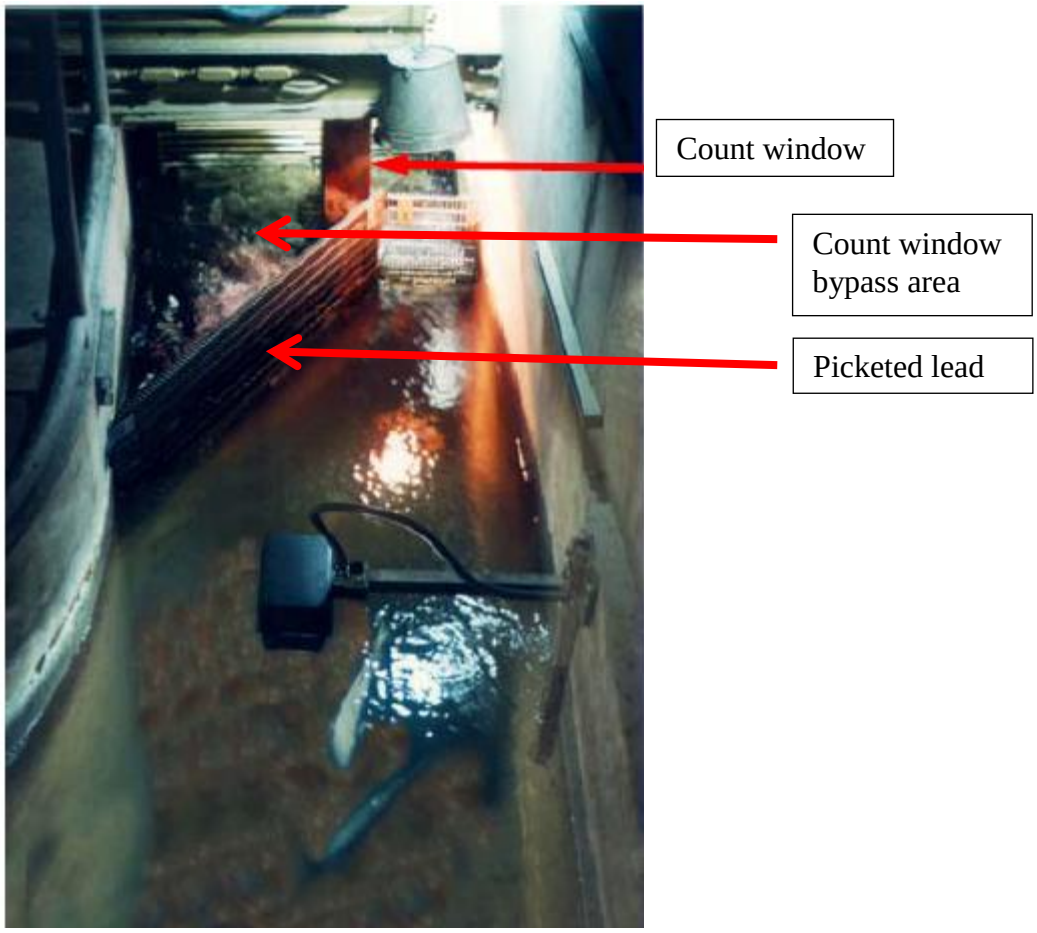

Figure 1. **Picketed lead immediately downstream of the fishway count window. Behind the picketed lead is the count window bypass area.**

In 2008, Douglas PUD conducted another adult lamprey passage study where 38 radio-tagged adult Pacific lamprey were released in the tailrace (n= 18) and fishways (n=20) of Wells Dam to continue an evaluation of behavior and passage performance, and to identify potential areas of passage impediment. In 2008, 15 lamprey approached the fishway from the tailrace, five (33%) of which entered the fishway. Movements within the collection gallery indicated that lamprey were able to move relatively unrestricted by flows. At least 11 of 19 (58%) lamprey which volitionally entered or were released in the collection gallery ascended to the lamprey trapping area in the middle fishway section. However, modifications to increase lamprey trapping efficiency effectively obstructed migration and 12 of 14 fish (86%) that encountered the lamprey traps were ultimately blocked. This artifact likely biased lower fishway passage times significantly. Upper fishway passage times of four radio-tagged lamprey that ascended past the trapping area were relatively fast (< 4 hours), except for one fish that ceased upstream movement during daylight hours. No fallbacks of fish that successfully ascended the fishway were observed for the second consecutive year. Overall, results indicate that any potential areas of impediment are restricted entirely to the entrance and lamprey trapping facility, as upper fishway passage efficiency was 100% for the second consecutive year.

During the 2008 study, of the four tagged lamprey that ascended into the upper fishway section, three bypassed the count window via the count window bypass area supporting the 2007 findings that a majority of lamprey that ascend Wells Dam may be uncounted (Robichaud et al. 2009). As concluded in the 2007 study, use of the count window bypass area appears to be an enumeration issue, rather than a passage concern (i.e., tagged fish generally move through this portion of the fishway efficiently and at above average speeds). The study recommended that further consideration should be given regarding effective monitoring of lamprey passage through the count window bypass area depending upon the importance of accurate counts at the Wells Project (LGL and Douglas PUD 2008).

The results of the 2007-2008 studies indicated that: 1) adult lamprey are having difficulty negotiating the fishway entrance; 2) lamprey passage in the fishway can be inhibited by the installation of lamprey traps on the bottom orifices within the middle section of the fishway (traps were removed in 2009); 3) lamprey are passing the middle and upper fishway sections at high rates, in a reasonable amount of time, and with negligible drop back within the ladder; and 4) a large proportion of the adult lamprey are bypassing the adult salmon counting windows (LGL and Douglas PUD 2008).

A comprehensive report was produced in February of 2009 (Robichaud et al. 2009). One of the recommendations by the researchers was to implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s) during the hours of peak lamprey activity (i.e., nighttime) and within the primary migratory period at Wells Dam (August-September).

2.1.3 2009-2010 Wells Project DIDSON Studies

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic Settlement Work Group (Aquatic SWG), prepared a plan to implement and evaluate measures to enhance entrance efficiency of adult Pacific lamprey at Wells Dam (Johnson et al. 2011). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam.

DIDSON units were deployed at Wells Dam fishway entrances during the peak of historic Pacific lamprey migration in 2009 (20 August to 24 September) and 2010 (7 August to 30 September). DIDSON was used to sample lamprey behavior and upstream passage events along the entire width of the fishway entrances and 1.3 m of vertical coverage above the sills (about 26% of the wetted vertical opening). Lamprey passage was examined relative to variable head differential treatments and entrance velocities. In 2009, three head differential treatments were tested: existing high (0.48 m; or 3.0 m/sec), moderate (0.31 m; or 2.4 m/sec) and low condition (0.15 m; or 1.8 m/sec) (Johnson et al. 2010). In 2010, only two of the 2009 treatments were used: existing high, and the moderate head differential conditions (Johnson et al. 2011). Treatments were grouped in 3-day blocks and lasted four hours each evening in 2009 (21:00 through 00:59). In 2010, the treatments were paired and lasted eight hours each evening (17:00 through 00:59). Data collected during the treatment periods were reviewed and all lamprey observations were described.

Combining both years, a total of seven lamprey observations were recorded where lamprey were observed to encounter the entrance sill heading upstream (N = 5 in 2009; and N = 2 in 2010). Five of these seven observations were in the east fishway and two were in the west fishway. Overall, five of the seven observations showed successful entry into the fishways (71%). During reduced head differential treatments, five observations were recorded with four of the five resulting in successful entry (80% efficiency). Three of three observations with the moderate head differential condition resulted in successful entry (100% entrance efficiency). During high head differential conditions, one of the two lamprey observed entered a fishway (50% entrance efficiency).

Four lamprey exhibited attach and burst behaviors (one during low (25%), two during moderate (50%) and one during high head differential conditions (25%)), all of which resulted in successful entry into the fishways. One of three lampreys that did not exhibit the former behavior successfully entered the fishway, under the moderate treatment condition. The other two lamprey that did not exhibit attach and burst behavior did not successfully enter the fishway.

Extremely low Columbia River basin lamprey runs in 2009 and 2010 resulted in few fish observed at Wells Dam (the ninth and last hydroelectric project on the Columbia River [river mile 516] with fish passage). Low sample sizes precluded statistical evaluation of these results. Nonetheless, operational modifications implemented in these two years of study suggest that lamprey entrance efficiency may be increased with lower head conditions. Pooling observations that occurred during reduced head differential treatments shows 80% (4 of 5) entrance efficiency compared to 50% (1 of 2) under the current operating condition (high condition). Study results suggest that reduced head differentials show promise in providing an environment conducive to upstream passage of lamprey.

2.1.4 2011-2012 Lamprey Operations

As a best management practice in 2011 and 2012 Douglas PUD operated the fishways with a 1.0 ft head differential during the hours 17:00 and 00:59, once five lamprey had been counted at Rocky Reach Dam and continuing through September 30. Beyond those hours, fishway collection-gallery operations should be maintained at the “normal” head differential of 1.5 feet.

3.0 GOALS, ASSUMPTIONS AND HYPOTHESES

3.1 Goals and Objectives

The goal of the 2013 Pacific lamprey study is to evaluate the effect of the Wells Project and its operations on adult Pacific lamprey upstream passage behavior and enumeration in the Wells Project fishways.

Specific objectives of the study include:

1. *Adult Pacific Lamprey Upstream Passage Evaluation (PLMP section 4.1.6).*

A. Evaluate passage efficiency of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
B. Evaluate travel time of radio-tagged adult Pacific lamprey through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
C. Evaluate radio-tagged adult lamprey behavior through Wells Dam fishways; with an emphasis in the lower fishway section (i.e., fishway entrance and collection gallery).
D. Compare adult Pacific lamprey entrance efficiency under reduced Wells Project fishway entrance velocities to entrance efficiencies at non-reduced velocities.

2. *Upstream Fishway Counts and Alternative Passage Routes (PLMP section 4.1.3)*
   A. Compare the enumeration efficiency of adult lamprey at the fish count station at Wells Dam using new, $11/16^{th}$ inch picketed leads to results of previous studies with the old picketed leads. .
   B. Compare adult lamprey behavior at the fish count station with old picketed leads to behavior at count windows with new, $11/16^{th}$ inch picketed leads.

3.2 Hypotheses

The following null and alternative hypotheses per each objective are as follows:

Objectives 1A, B and C:

H_o: There is no difference in passage metrics (i.e., passage efficiency, travel time and behavior) compared to other mainstem Columbia River projects.
H_{alt}: Passage metrics for lamprey differ compared to other mainstem Columbia River projects.

Objective 1D:

H_o: Flow differential consisting of one entrance velocity treatment has no effect on entrance success over another entrance velocity treatment.
H_{alt}: Flow differential consisting of one entrance velocity treatment has an effect on improving entrance success over another entrance velocity treatment.

Objective 2A:

H_o: The proportion of tagged lamprey passing the count window is similar to previous studies.
H_{alt}: The proportion of tagged lamprey passing the count window is dissimilar to previous studies.

H_o: The number of lamprey heard on antenna(s) upstream of the count window is the same as the number of tagged lamprey seen at the count window.
H_{alt}: The number of lamprey heard on antenna(s) upstream of the count window is different from the number of tagged lamprey seen at the count window.

4.0 METHODOLOGY

4.1 Fish Source

Beginning in July 2013, adult Pacific lamprey will be captured at Bonneville Dam. Weekly sampling events over a four-week period in July will be conducted with a capture goal of at least 25 fish per event[1]. In addition to fish captured at Bonneville Dam, up to 25 fish captured at Priest Rapids Dam will be utilized for the study, provided permission from Grant County PUD and approval by the Priest Rapids Fish Forum. Fish captured at Bonneville Dam will be greater than 550 grams (g). Fish captured at Priest Rapids Dam will be greater than 450g. Using larger fish will help minimize tag burden and therefore minimize the potential for mortality and effects to behavior and swimming performance. This will allow for fish used in the study to behave and perform more similarly to untagged fish.

Collecting fish from Bonneville Dam has four primary advantages:

1. Adult lamprey counts at Wells Dam in recent years have been extremely low (i.e., ranging from 1 to 35 fish since 2006), therefore, capturing and tagging a sufficient number of fish at the Wells Project for the study is not feasible.
2. Past efforts to capture lamprey at Wells Dam have negatively biased the result of the studies as the lamprey traps were highly effective at preventing upstream ladder passage of lamprey.
3. Past lamprey trapping activities at Wells Dam have incidentally captured ESA-listed anadromous salmonid species currently covered under the Wells Habitat Conservation Plan (HCP).
4. Given the primary objective of the study (i.e., evaluation of lamprey passage behavior within the Wells fishway), acquiring fish that are within their active migration window ensures the highest probability of interaction with the Wells fishway and therefore, the greatest chances of collecting sufficient data necessary to make informed management decisions related to the future of lamprey passage activities at Wells Dam.

It is assumed that fish captured at and transported from Bonneville Dam and Priest Rapids Dam will be exhibiting upstream migratory behavior and will attempt to pass Wells Dam.
All fish captured will be transported to the Wells Fish Hatchery for a minimum 16-hour acclimation period prior to tagging. Since most fish losses from hauling stress are caused by poor water quality and improper handling (Wynne and Wurts 2011), appropriate handling and transport protocols will be developed to ensure study fish in good health are delivered to the Wells Fish Hatchery.

Only adult lamprey in healthy condition (e.g., no signs of injury, disease, etc.) should be collected for transport. All captured fish should be immediately placed in covered hauling tanks

[1] Actual number will be based on statistical power analysis but will be at least 125 fish. Final sample size will also need to be approved by fish managers in the lower Columbia River.

via nets. No anesthetics will be used during trapping operations as this can produce a biological response similar to that caused by stress (Wynne and Wurts 2011).

Covered tank(s) of an appropriate volume (to transport up to 25 lamprey) will be used to avoid stressors and disease transmission related to overcrowding. Each tank will be filled with river water and water temperature and dissolved oxygen will be measured prior to transport. During transport, both temperature and dissolved oxygen will be checked hourly, levels recorded, and adjustments to equipment will be made to maintain pre-transport water quality conditions. A final evaluation of fish and water quality conditions and total transport time will be noted upon delivery to the Wells Fish Hatchery.

4.2 Tagging and Release Procedures

Tagging procedures will follow methods described in previous lamprey radio-telemetry studies conducted at Wells Dam (LGL and Douglas PUD 2008) and will consider recent advances in knowledge and understanding of fish health and condition (e.g., Cooke et al. 2011a; b). An effort will be made to minimize impacts to the biological and physiological condition of the study fish. Specific attention will be made to minimize incision length, possibility of infection, handling time, water temperature stressors, and air exposure.

Study fish will be tagged with model NTC-4-2L Nano Tags (Lotek® Newmarket, Ontario) or an equivalent providing less than 0.5% tag burden (tag mass/fish mass) and sufficient tag life. Tags have an expected life of 162 days at a pulse rate interval (PRI) of 5.0 seconds. Tag dimensions are 16mm (length) by 4mm (height) by 6mm (width) and weight 1.10 grams in air. In addition, each fish will be given a full-duplex passive integrated transponder (PIT) tag with tag dimensions of 12mm by 2.12mm and weighing 0.1 grams. Total combined weight of both tags is 2.2 grams and a tag burden of less than 1% of body mass is proposed. Brown et al. (2006) noted that 4% is considered an acceptable burden for tagging studies, however tag burden should be minimized whenever possible.

After surgery, fish will be transferred to a covered tank with flow through river water for recovery (approximately one hour). For the purposes of the study, it is assumed that tagged fish are representative of untagged fish.

All tagged fish that have recovered from the tagging process will be transported by truck in a 113 L cooler filled with river water. An air tank and air stones will be used to maintain oxygen levels. Of the 125 tagged lamprey, 100 25 from each weekly sampling event) will be released on the right bank of the Columbia River at RM 514, 1.5 miles below Wells Dam (Figure 2). This location was chosen in order to maximize the number of fish that would interact with Wells dam, provide the fish were still in a “migration phase” and the distance was designed to meet balance both criteria. The remaining 25 fish (six from three weekly sampling events and seven from one weekly sampling event) will be released above the Wells fishway adult fish trap (Pool 41 in the west fishway and Pool 40 in the east fishway) in order to support count window enumeration efficiency objectives.

Figure 2. Release location of tagged Pacific lamprey at Columbia River RM 514.

4.3 Radio-telemetry

The movement and passage of radio-tagged lamprey (Objectives 1 and 2) will be documented by a combination of underwater and aerial antenna arrays (dipole and yagi antennas) at Wells Dam. Tag testing conducted by the contractor during installation will drive antenna location and placement.

4.3.1 Fixed-Station Telemetry Array

Fixed-station telemetry receivers and associated arrays similar to those used in past lamprey studies at Wells Dam (LGL and Douglas PUD 2008) will be deployed to monitor movements of radio-tagged lamprey at the Wells Dam fishway entrances, at select locations throughout the fishway, and at the fishway exits. Underwater dipole antennas will be used in the fishways.

Antenna arrays for tagged fish monitoring will be deployed at the following locations within the Wells Project fishways:

1. Outside fishway entrance
2. Inside fishway entrance
3. Collection gallery side gate
4. Pool 1 (collection gallery exit)
5. Pool 3 (serves as detection efficiency location for Pool 1)
6. Pool below the adult fish trap (Pool 39 in the west fishway and Pool 38 in the east fishway)
7. Below the video count window (lower portion of Pool 64 below count window)
8. Above the video count window (upper portion of Pool 64 above count window)
9. Within the count window bypass area behind the picketed lead
10. Fishway exit (Pool 72 or 73)

Fixed station telemetry arrays will also be deployed at the mouths of Methow and Okanogan rivers. Douglas PUD will analyze data provided from a station operated by any stakeholder at the mouth of the Entiat or Wenatchee rivers. PTAGIS will also be queried to determine if any of the tagged lamprey were detected on in-stream PIT arrays in the Entiat and Methow, at the request of the Aquatic SWG.

4.4 Fishway Entrance Velocities

In order to evaluate tagged entrance efficiency of Pacific lamprey under reduced Wells Project fishway entrance velocities, fishway operations treatment conditions at Wells Dam will be similar to operations for the DIDSON Study conducted in 2010 (Johnson et al. 2011); two head differential treatments, including the existing high condition (0.48 m) and a moderate condition (0.31 m), will be implemented. A treatment condition will occur over a 7-hour block (19:00 through 02:00) and will be changed daily (i.e., existing high condition one day and moderate condition the next day). Although the proposed fishway operations and daily hours of operation are consistent with past flow reduction studies, the proposed operating scenario for this component of the study must be reviewed and approved by the HCP Coordinating Committee. Fishway operations treatments will begin upon first release of tagged fish below Wells Dam.

4.5 Count Station Efficiency

In recent years, the efficacy of using narrower bar screen as a way to improve the enumeration of lamprey passing adult fishway has been tested at PUD and federal dams (LGL et al. 2011, ACOE 2011). The use of smaller leads has resulted in no reduction in travel time and has not increased the fallback rates within the fish ladders at those dams tested (Peery et al. 2011).

During the 2012-2013 Wells Dam ladder maintenance period (typically from December through January), new 11/16th inch pickets will be installed within the east and west Wells Dam fishways. This study will evaluate the behavior and performance of these pickets in guiding adult lamprey through the existing fish count stations. The data collected during this study will be compared to prior years of study at Wells Dam to determine whether lamprey enumeration

can be enhanced without negatively impacting the lamprey passage rates and times within the upper fishways.

4.6 Statistical Analyses and Reporting

4.6.1 Passage Efficiency and Travel Time

Telemetry data collected during the study will be managed in an appropriate database where individual antennas will be grouped into "zones" that define pivotal areas of interest, such as individual fishway entrances and exits.

Numbers of fish detected at each zone will be summarized. Each time a fish is detected in a zone, the duration of the detection event (the amount of time the fish spent in the zone) will be calculated. The operational database will also be used to map movements of fish among zones. For every combination of among-zone movements, the number of times a fish performed that movement and the amount of time it took to get from one zone to the next, will be calculated.

Passage times will be calculated from benchmark dates and times corresponding to the first and last detection of a given radio-tagged lamprey at specific locations. At Wells Dam, benchmark times for lamprey passing the Project will be as follows:

Time:

1. first detection at the fishway entrance (outside antenna). (Note that in order to be considered a treatment fish for the study, tagged fish must be detected at this location),
2. last detection at the fishway entrance (inside antenna)
3. first detection at the ‘end of collection gallery’ zone (Pool 1)
4. first detection at the ‘adult fishway/middle fishway section’ zone (Pool 39)
5. first detection at the ‘below video count window’ zone (lower portion of Pool 64)
6. first detection at the ‘above video count window’ zone (upper portion of Pool 64)
7. first detection at the ‘count window bypass’ zone
8. last detection at the ‘count window pass’ zone – note same as #6
9. first detection at the fishway exit (Pool 72 or 73)
10. last detection at the fishway exit.

From these benchmark times, passage times can be calculated for the following segments:

1. Entrance passage time – Time 1 to 2
2. Collection gallery passage time – Time 2 to 3
3. Lower fishway passage time – Time 2 to 4
4. Passage from count window to exit – Time 5 to 10
5. Upper fishway passage time – Time 4 to 10
6. Project passage time – Time 1 to 10

To evaluate use of the count window bypass area, times can be calculated for the following segments:

1. Below count window to count window bypass – Time 5 to 7
2. Residence time in count window bypass area – Time 7 to 6
3. Count window bypass to exit – Time 7 to 10

The residence and passage times and route of passage (in count window area) for each radio-tagged lamprey will be determined by working backwards through a sequence of detections. The fishway of ultimate passage and the respective passage time will be determined by identifying a sequence of detections in the ascent of a fishway, starting with detections in a fishway exit zone.

Information about passage efficiency and travel time will be compared to other hydropower projects on the Columbia River.

4.6.2 Entrance Efficiency

Radio-telemetry data from entrance locations (i.e., outside and inside fishway entrance arrays) will be used to evaluate entrance efficiency of the two treatment conditions for fishway operations (i.e., existing and moderate). Tagged fish will be organized into release groups (4 weekly releases). The total number of tagged lamprey detected outside fishway entrances over the course of the study will serve as the total sample size for statistical analyses. Entrance efficiency will be calculated as the total number of successful entries of fish detected outside the fishway entrances under each treatment condition (head differential). During the course of the study, successful entry will be defined as either a detection by the arrays outside the fishway entrances followed by a subsequent detection by the arrays inside the fishway entrances or a detection on the array inside of the fishway entrance. Difference in entrance efficiency between the two treatment conditions will be evaluated using statistical methods developed with assistance from the University of Washington school of Aquatic and Fisheries Sciences.

4.6.3 Enumeration Efficiency

The efficiency of enumerating lamprey using the existing counting station will be evaluated by examining observations of tagged fish via radio-telemetry detections at the "above video count window" location (upper portion of Pool 64 above count window) and comparing them to observations below the count stations (upstream weir wall in Pool 62). Enumeration efficiency will be reported as a percentage (i.e., tagged fish observed above count station/tagged fish detected below count window X 100). Given the low numbers of lamprey that have passed Wells Dam in recent years, confounding observations due to high numbers of passage events at this location during the study is not expected. Each fish ladder can be treated separately prior to grouping entrance numbers. If no significant difference is detected between the two fish ladders then the information from both ladders will be pooled by head differential treatments. Release groups will also be pooled together if statistically justified (either by low sample size or by insignificance lack of significant differences).

4.7 Schedule and Reporting

Reporting will be a collaborative effort between the contractor and the Douglas PUD contract manager for this study. The schedule for study planning and development, implementation, draft reporting, review, and final reporting are presented in Table 1 below.

Table 1. Estimated timeline for study development, implementation and reporting.

		Parties Involved			
#	Item	PUD	ASWG	Contractor	Date
1	Study Plan Development	X			July-August 2012
2	Study Plan Review Aquatic SWG	X	X		August 2012
3	Study Plan Finalized	X	X		September 2012
4	Contracting	X		X	September-November 2012
5	Telemetry Installation	X		X	December 2012-January 2013
6	Study Implementation (capture, transport, tagging, monitoring)	X		X	June-October 2013
7	Draft Interim Report to PUD			X	January 2014
8	Draft Report to Aquatic SWG	X	X		February Meeting 2014
9	Final Report Integrating Changes from Review to PUD			X	March 2014
10	Final Report to Aquatic SWG	X	X		April Meeting 2014

5.0 REFERENCES

Army Corps of Engineers (ACOE). 2011. Pacific Lamprey Passage Improvements Implementation Plan. 2010 Final Progress Report. February 23, 2011.

Brown, R. S., D. R. Geist, K. A. Deters, and A. Grassell. 2006. Effects of surgically implanted acoustic transmitters .2% of body mass on the swimming performance, survival and growth of juvenile sockeye and Chinook salmon. Journal of Fish Biology 69: 1626–1638.

Cooke, S.J., C.M. Woodley, M.B. Eppard, R.S. Brown, and J.L. Nielsen. 2011a. "Advancing the surgical implantation of electronic tags in fish: a gap analysis and research agenda based on a review of trends in intracoelomic tagging effects studies." Reviews in Fish Biology and Fisheries 21(1):127-151. doi:10.1007/s11160-010-9193-3

Cooke, S.J., G.N.Wagner, R.S. Brown, and K.A. Deters. 2011b. "Training considerations for the intracoelomic implantation of electronic tags in fish with a summary of common surgical errors." Reviews in Fish Biology and Fisheries 21(1):11-24. doi:10.1007/s11160-010-9184-4

Johnson, P.N., B. Le, and J.G. Murauskas 2010. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Johnson, P.N., B. Le, and B. Patterson. 2011. Assessment of Adult Pacific Lamprey Response to Velocity Reductions at Wells Dam Fishway Entrances. Wells Hydroelectric Project. FERC No. 2149. June 2011. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL Limited, Public Utility District No. 1 of Douglas County (Douglas PUD). 2008. Adult Pacific Lamprey Passage and Behavior Study Aquatic Issue 6.2.1.3. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

LGL, Cramer Fish Sciences, Blue Leaf Environmental, and Long View Associates. 2011. Assessment of Pacific Lamprey Behavior and Passage Efficiency at Priest Rapids and Wanapum Dams. Prepared for Public Utility District No. 2 of Grant County.

Loge, F., C. Caudill, D. Thompson, and C. Boggs. 2011. Video Monitoring to Determine Pacific Lamprey Ladder Escapement and Behavior at McNary and Ice Harbor Dams. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Nass, B.L., C. Sliwinski, D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Techniques, 2004. Report prepared by LGL Limited, Sidney, B.C. Canada, for Public Utility District No. 1 of Douglas County, WA.

Peery, C., B. McIlraith, D. Thompson, and F. Loge. 2011. Use of Non-Invasive Methods to Evaluate Pacific Lamprey Counts and Passage Behavior at John Day Dam – 2011. Presentation at the 2011 Anadromous Fish Evaluation Program. Walla Walla, WA.

Robichaud, D., B. Nass, and Public Utility District No. 1 of Douglas County (Douglas PUD). 2009. Adult Pacific Lamprey Passage and Behavior Study. Wells Hydroelectric Project. FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Wynne, F.S. and W.A. Wurts. 2011. Transportation of Warmwater Fish: Equipment and Guidelines. SRAC Publication No. 390. January 2011.

APPENDIX B: AQUATIC SETTLEMENT AGREEMENT
2012 MANAGEMENT PLAN REPORTS

2012 ANNUAL REPORT

WHITE STURGEON MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license. On November 9, 2012 the Federal Energy Regulatory Commission (FERC) issued a new Operating License for the Wells Project. The license requires the implementation of the WSMP over the course of a fourth year period.

The goal of the WSMP is to increase the white sturgeon (*Acipenser transmontanus*) population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the information available as of December 2006, the Aquatic Settlement Work Group (Aquatic SWG) determined that an assessment of Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Project. Therefore, the Aquatic SWG concluded that resource measures related to white sturgeon should focus on population protection and enhancement by means of supplementation as an initial step in order to increase the number of fish within the Wells Reservoir. In addition to the initial supplementation activities, implementation of a monitoring and evaluation program shall be conducted to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, longer-term supplementation strategy. All objectives were developed in order to meet the WSMP goal. The PMEs presented within the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment. Public Utility District No. 1 of Douglas County (Douglas PUD), in consultation with the Aquatic SWG has developed a larval collection and direct gamete take program to implement in years 1-4 of the Wells Operating License. In June 2013, both larval and fertilized eggs will be collected and transported to Wells Hatchery where juveniles will be reared for up to one year. These fish will be released in the Wells Project in 2014 towards meeting this objective.

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program. Monitoring of naturally produced and hatchery produced juvenile and adult sturgeon will be initiated in 2015. During 2013 Douglas PUD will work with the Aquatic SWG to develop the details of the Index Monitoring Program in concert with the Marked Fish Tracking Program as part of the overall Sturgeon Monitoring and Evaluation Program.

Monitoring of release sturgeon will take place in 2015. During 2013 Douglas PUD will work with the Aquatic SWG to develop the Objective 2 Monitoring and Evaluation Program. Monitoring design will be designed around the number of fish release, fish size and program goals.

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities. Natural reproduction evaluations may be coupled with the active tagging studies being implemented under Objective 2 Index Monitoring Program. In 2013 and 2014, Douglas PUD will work with the Aquatic SWG to develop a strategy for monitoring natural reproduction in the Wells Project.

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results. Phase II goals will be addressed following the completion of Phase I in 2022

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage. Phase II goals, including longer term indexing and evaluating the feasibility and biological merit of adult passage measures will be addressed one year after the completion of Phase I (2023).

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities. Education opportunities will be discussed with the Aquatic SWG in 2013 and 2014. Potential opportunities include inviting elementary school children to attend a Wells Hatchery tour and to participate in the juvenile sturgeon release events in years 2014-2017. In addition, during the development of the new visitor center at Wells Dam, white sturgeon educational material will be provided consistent with requirements of the WSMP.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

The WSMP will be updated in 2013 to reflect additional requirements that have been added by the final Clean Water Act Section 401 Water Quality Certification and the new project license issued by the FERC. The 2013 annual report on the implementation of the WSMP will include all of the sturgeon related activities that took place from the issuance of the new license in November 2012 to the end of December 2013. The 2013 annual report will also specifically address the implementation of the new sturgeon related measures found exclusively in the FERC license.

1.0 INTRODUCTION

The White Sturgeon Management Plan (WSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license (Issued November 9, 2012).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The WSMP will direct implementation of measures to protect against and mitigate for potential Project impacts on white sturgeon (*Acipenser transmontanus*). To ensure active stakeholder involvement and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of white sturgeon in the Wells Hydroelectric Project (Project). This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for white sturgeon during the term of the new license.

In addition to the requirements found within the WSMP, the new Federal Energy Regulatory Commission (FERC) license added several additional sturgeon related requirements associated with the continued operation of the Wells Project. Implementation of all of the WSMP related measures will be reported to the various agencies and tribes within the annual report for the WSMP.

2.0 BACKGROUND

2.1 White Sturgeon Biology

White sturgeon are the largest of all North American freshwater fish. They are found in marine waters and freshwaters of rivers along the Pacific coast from Monterey, California to Cook Inlet in northwestern Alaska (Wydoski and Whitney 2003). Significant populations of the Pacific coast appear to be restricted to three locations: the Sacramento, Fraser, and Columbia rivers (Lane 1991). White sturgeon are distributed throughout the U.S. portion of the Columbia River

and in many of its larger tributaries. Historically, white sturgeon migrated throughout the mainstem Columbia River from the estuary to the headwaters, although passage was probably limited at times by large rapids and falls (Brannon and Setter 1992).

White sturgeon are long-lived fish, with fin ray analysis documenting fish over 100 years in age (Beamesderfer et al. 1995). This anadromous species has been reported to reach a length of 20 feet and a weight of 1,800 pounds (Wydoski and Whitney 2003). In the Columbia River, white sturgeon spawn in the spring between April and July. Only a small percentage of adult white sturgeon in the Columbia River spawn in a given year. Intervals between spawning have been estimated to be between 3 and 11 years. White sturgeon deposit eggs through broadcast spawning at water temperatures between 10 and 18°C. Mature white sturgeon commonly produce between 100,000 and 300,000 eggs, but larger fish may produce up to 3 million eggs (Wydoski and Whitney 2003). Spawning and egg incubation in the Columbia River occur in the swiftest water available (2.6-9.2 feet per second) at depths between 13.1 and 65.6 feet over cobble, boulder, and bedrock substrates (Wydoski and Whitney 2003). In mainstem Columbia River reservoirs, spawning occurred within 5 miles downstream of the mainstem dams. Eggs hatch in approximately 7 days at 15°C.

Columbia River white sturgeon are reported to have declined in numbers because of numerous factors, including obstruction of migration by mainstem hydroelectric dams, altered stream flows, altered hydrologic regimes, altered temperature regimes, reduced spawning habitat, and over harvest (van der Leeuw et al. 2006; Wydoski and Whitney 2003). Variations in population characteristics also have been attributed to differences in exploitation rates and recruitment success, access to marine food resources, and suitability of hydrologic conditions and available habitats (Devore et al. 1995). During the 1800s, prior to construction of mainstem hydroelectric dams on the Columbia River, white sturgeon were in great demand for their caviar and smoked flesh. In 1892, during the peak of commercial harvest activities, approximately 2.5 million kilograms of white sturgeon were harvested (Wydoski and Whitney 2003). Regulations of the white sturgeon fishery began with a 4-foot minimum size limit established in 1899. Several regulations were established from 1899 to 2000 to manage the fishery in the lower Columbia River, although, effective recovery efforts did not begin until spawners were protected in the 1950s (Wydoski and Whitney 2003).

Beginning in the 1930s, with the construction of Rock Island, Grand Coulee, and Bonneville dams, migration was disrupted because white sturgeon generally do not pass upstream through fishways that were built for salmon, although they do pass downstream through dams (Lepla et al. 2001). Construction of hydroelectric projects in the mid-Columbia River Basin, such as Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells has also affected the upstream movement of white sturgeon. Current populations in the Columbia River basin can be divided into three groups: fish below the Bonneville Dam, with access to the ocean; fish isolated functionally, but not genetically, between dams; and fish in several large tributaries. However, the population dynamics and factors regulating production of white sturgeon within isolated populations in the mid-Columbia River reservoirs such as the Rocky Reach and Wells reservoirs are not well understood.

2.2 White Sturgeon Management and Recovery Efforts

Management programs to protect and restore white sturgeon in the Kootenai River and the upper Columbia River are on-going and have provided a relevant framework for the development of a white sturgeon management plan in the Wells Reservoir. The Kootenai and upper Columbia sturgeon recovery efforts have also provided a good technical framework for implementing a sturgeon management plan. The strategies and activities outlined in these aforementioned management programs have provided important information, which has been used to develop an effective WSMP.

2.2.1 Kootenai River White Sturgeon Recovery

In the early 1990s following concerns that white sturgeon populations were decreasing due to near total recruitment failure, a detailed monitoring program was instituted by the Idaho Department of Fish and Game (IDFG) to provide more information on white sturgeon species status in the Kootenai River system. In 1994, the USFWS listed the Kootenai stock of white sturgeon as an endangered species, which introduced a higher level of management and control by various authorities in the drainage and region. A Recovery Team was established to provide technical direction regarding hatchery supplementation efforts. A final Kootenai White Sturgeon Recovery Plan was signed by the USFWS in 1999.

Kootenai white sturgeon recovery efforts consist of a multi-faceted approach aimed at improving survival at various life history stages. Coordinated flow releases during spring are a major habitat restoration focus designed to increase natural recruitment, although currently it is difficult to assess the relationship between flows and recruitment success (USFWS 1999). Directed stocking programs, which address genetic concerns, stocking rates, and fish size at release, have also been implemented to boost juvenile sturgeon in the Kootenai system. The Kootenai Tribe of Idaho in collaboration with the Kootenay Trout Hatchery (KTH) in Canada are primarily responsible for producing high-quality juvenile white sturgeon for the directed stocking program. Information collected from annual monitoring activities, which assess survival, growth rates, and natural spawning success, allow for an adaptive management approach with regards to the stocking program.

2.2.2 Upper Columbia River White Sturgeon Recovery

In 2002, a bi-national Recovery Team, termed the Upper Columbia White Sturgeon Recovery Initiative (UCWSRI) finalized the Upper Columbia White Sturgeon Recovery Plan in response to concerns that the transboundary white sturgeon population residing between Hugh L. Keenleyside Dam and Grand Coulee Dam consists of an aging and declining population with extremely limited recruitment. The Recovery Team, consisting of technical representatives from Federal, Provincial, and State resource management agencies and from Canadian and U.S. tribes, directs the recovery program.

Due to near total recruitment failure over the past two decades, a decision was made early in the recovery planning process to move immediately to development of a hatchery program to produce juvenile sturgeon for stocking (UCWSRI 2002). The breeding plan (Kincaid 1993) developed for the Kootenai sturgeon program was used as a model for the upper Columbia

sturgeon. Rearing of all fish for the stocking program occurs at the KTH. Similar to the Kootenai recovery strategy, a juvenile index monitoring program to assess growth, survival, health, distribution, and relative abundance of released juveniles shall provide information essential to monitoring the upper Columbia sturgeon population and the success of the hatchery stocking program.

2.2.3 Rocky Reach White Sturgeon Management Plan

The relicensing process for the Rocky Reach Hydroelectric Project brought fisheries agencies, tribes, and interested parties together in a Natural Resources Working Group (Rocky Reach Fish Forum or RRFF) that provided an opportunity for comprehensive review of current and future management priorities for fish resources potentially impacted by ongoing Project operations (Chelan PUD 2005). In 2004 and 2005, RRFF members collaborated on the development of goals and objectives to manage the white sturgeon population within the Rocky Reach Project boundary under the new license. Based upon the information collected from white sturgeon field studies implemented by Chelan PUD in 2001 and 2002, a white sturgeon management plan was developed to promote population growth of sturgeon to a level commensurate with the available habitat. The Rocky Reach management plan measures include the implementation of a white sturgeon supplementation program, a monitoring program to determine population characteristics, and tracking surveys to determine movements and to assess potential spawning locations.

Following the issuance of Rocky Reach Dam's operating license from the FERC Chelan PUD implemented the first year of broodstock collection in 2010. Few viable adults were obtained despite many adults being captured. Offspring from 1x2 cross and captive brood fish were released into the Rocky Reach Reservoir, for an approximate 2011 release of 6,500 fish. In 2011, viable broodstock capture increased, however offspring produced showed signs of White Sturgeon Iridovirus which prevented the release of very many fish in 2012. Approximately 130 fish were released into the Rocky Reach Project in 2012. In 2012, broodstock collection resulted in two spawning groups that contained multiple males and it is expected that 6,500 fish will be released in 2013.

2.2.4 Priest Rapids Project White Sturgeon Management Plan

As part of the Priest Rapids Project relicensing, white sturgeon populations were investigated in the Priest Rapids and Wanapum reservoirs from 1999 to 2003. Results of the study have assisted in identifying a framework for the future development and implementation of a Priest Rapids Project White Sturgeon Management Plan. Biological objectives associated with this management plan consist of increasing white sturgeon populations to a level commensurate with available habitat through a supplementation program and the implementation of a monitoring program to determine population characteristics such as natural recruitment, spawning, rearing, growth, survival, and rates of emigration.

Following the issuance of the Priest Rapids Dam license Order and the issuance of a Clean Water Act Section 401 Water Quality Certification (401 Certification) via the Washing Department of Ecology, Grant PUD has begun implementing white sturgeon stocking objectives. Similar to Chelan PUD, Grant PUD has participated in three years of juvenile sturgeon releases above

Priest Rapids and Wanapum Dams. Release numbers and broodstock collection for this effort is coordinated through the Priest Rapids Fish Forum (PRFF), but have targeted approximately 6,500 fish per year.

2.3 Project White Sturgeon Study

Since little information existed on the status of white sturgeon populations in the mid-Columbia, Chelan, Grant, and Douglas PUDs each initiated studies of white sturgeon to support their current or upcoming relicensing processes. The information gathered from these studies was intended to provide basic white sturgeon life history information, distribution, and current population sizes in the mid-Columbia River Basin. Additionally, study results provided the foundation for the development of appropriate management goals and objectives.

From 2001-2003, Douglas PUD implemented a study to examine the white sturgeon population within the Project. Prior to the implementation of this study, little information on white sturgeon was available for the Wells Reservoir. WDFW catch record card returns for 1993 and 1994 indicate that legal size white sturgeon were present in the Wells Reservoir (Brad James, WDFW, pers. comm.). Additionally, information from previous studies in reservoirs upstream and downstream supported the existence of a population. The primary objectives of the study were to provide basic information on the population abundance, age structure, size, and growth of Project white sturgeon; analyze movements of white sturgeon within the Reservoir; and compare the data collected during this study with data collected during assessments at other projects (Jerald 2007).

During the summers of 2001 and 2002, setlines were deployed in the Wells Reservoir. Sturgeon captured on setlines were measured, marked with passive integrated transponder (PIT) tags and with scute markings. Additionally, a select number of captured fish were fitted with radio-transmitters to track movements and had pectoral fin rays removed for age analysis using standard methodologies (Beamesderfer et al. 1989).

Setline sampling took place over a two-year timeframe with a total of 129 setlines deployed and retrieved from throughout the reservoir. In total, 13 white sturgeon were captured during the 2-year study with the majority of the fish being captured in the Columbia River within five miles of the mouth of the Okanogan River. Twelve of the captured fish were PIT tagged. Subsequently, five recapture events were recorded for a total of 18 capture events during the mark-recapture period (one fish was recaptured twice). Population abundance was estimated to be 31.35±17.51. The 95% confidence interval for sturgeon abundance was calculated to be CI ($13<N<218$). The results of the mark-recapture portion of the study indicated that the sturgeon population in the Wells Reservoir is small with a point estimate of 31 fish over 50 cm in length (Skalski and Townsend 2005).

The length of the 13 fish captured during the study ranged from 60-202 cm. Two of the fish were classified as juveniles (<90 cm fork length) while 11 were classified as sub-adults or adults. It is important to note that the capture methodology was not designed to provide accurate sampling of fish under 50 cm. Captured sturgeon ranged in age from 6 to 30 years old (based on 11 fish) demonstrating that all of these fish recruited to the Wells Reservoir after Wells Dam was

completed in 1967 with strong year class recruitment between the years 1972 and 1978 and again between 1988 and 1996. The presence of fish within these age classes suggests that successful recruitment within or to the Wells Reservoir is occurring either through (1) spawning within the Wells Reservoir and/or (2) immigration into the Wells Reservoir from populations upstream. Two white sturgeon were captured in 2001 and subsequently recaptured in 2002 to provide limited growth rate information. One juvenile fish was measured at 65 cm (fork length) on July 11, 2001. The fish was again captured on September 26, 2002 and measured 87 cm. This represented a growth rate of 22 cm in 14 months, or 18.9 cm/year. One adult fish was captured on August 9, 2001 measuring 197 cm (fork length). The fish was subsequently captured on September 6, 2002 and measured 199 cm representing a 2 cm growth rate over approximately 13 months, or 1.85 cm/year (Jerald 2007). In October 2006, this fish was found dead along the shoreline of the Columbia River adjacent to the mouth of the Okanogan River. At that time, biologists measured the fish at 228.5 cm representing a 29.5 cm increase in length over a four year period or an average of 7.4 cm of growth per year.

A total of six white sturgeon were fitted with radio-tags and monitored throughout the study period using mobile and fixed telemetry. Telemetry data along with setline capture data verify that white sturgeon congregate in the Columbia River near the Okanogan River confluence during the summer, fall, and winter months with none of the six fish being detected downstream from Brewster river mile (RM 530) or upstream of Park Island (RM 538). Very little movement of tagged sturgeon was observed during winter months. In the spring of 2002, one of the five mature fish radio-tagged made an upstream migration into the Okanogan River and two different radio-tagged mature sized sturgeon made movements into the Okanogan River during 2003.

In general, the results of the white sturgeon study in the Wells Reservoir were similar to the results of a study conducted in the neighboring Rocky Reach Reservoir in 2001-2002 (Chelan PUD 2005). Results indicate that the Wells Reservoir adult sturgeon population is estimated from 13-217 fish. These results are similar to the Rocky Reach assessment which estimated numbers of sturgeon from 50-115 fish. Both studies captured similar numbers of sturgeon using similar amounts of effort and similar capture techniques (Rocky Reach=18 sturgeon, Wells=13 sturgeon). Radio-telemetry data from both studies suggest that very little activity occurs during the overwintering period. Wells Reservoir sturgeon ranged in age from 6 to 30 years old while Rocky Reach sturgeon ranged in age from 7 to 50 years old. Both studies suggest that some recruitment into each population is occurring given the presence of juvenile fish in their respective reservoirs (Chelan PUD 2005; Jerald 2007).

3.0 GOAL AND OBJECTIVES

The goal of the WSMP is to increase the white sturgeon population in the Wells Reservoir to a level that can be supported by the available habitat and characterized by a diverse age structure consisting of multiple cohorts (juvenile and adult). In addition, the WSMP is intended to support spawning, rearing and migration as identified by the aquatic life designated use under WAC 173-201A in the Washington state water quality standards. Based upon the available information, the Aquatic SWG agreed that a rigorous and reliable assessment of ongoing Project effects on white sturgeon was not practical given sturgeon life history characteristics and the limited number of fish estimated to exist in the Wells Reservoir. Therefore, the Aquatic SWG concluded that

efforts should focus, initially, on supplementation efforts to increase the population within the Wells Reservoir in order to address Project effects. Once the population numbers have been increased to a level that can be studied, as determined by the Aquatic SWG, Douglas PUD shall implement a monitoring and evaluation program to accurately assess natural recruitment, juvenile habitat use, emigration rates, carrying capacity, and the potential for natural reproduction so as to inform the scope of a future, long-term supplementation strategy. The PMEs of the WSMP are designed to meet the following objectives:

Objective 1: Supplement the white sturgeon population in order to address Project effects, including impediments to migration and associated bottlenecks in spawning and recruitment;

Objective 2: Determine the effectiveness of the supplementation activities through a monitoring and evaluation program;

Objective 3: Determine the potential for natural reproduction in the Wells Reservoir in order to appropriately inform the scope of future supplementation activities;

Objective 4: Adaptively manage the supplementation program as warranted by the monitoring results and in consultation with the Aquatic SWG;

Objective 5: Evaluate whether there is biological merit to providing safe and efficient adult upstream passage;

Objective 6: Identify white sturgeon educational opportunities that coincide with WSMP activities.

This WSMP is intended to be compatible with other white sturgeon management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies and recovery goals of federal, state and tribal natural resource management agencies. The WSMP is not intended to be a harvest management plan and does not create or supersede jurisdiction over fisheries management decisions made by the responsible fishery agencies and tribes. However, the WSMP activities are expected to ultimately support appropriate and reasonable harvest opportunities consistent with the goals of the responsible fishery agencies and tribes and designated use for harvest under WAC 173-201A identified in the Washington state water quality standards. Should the responsible fishery agencies and tribes determine that there is an ongoing harvestable surplus of sturgeon in the Wells Reservoir, then this indicates significant progress toward achievement of the goals and objectives of this plan.

The schedule for implementation of specific measures within the WSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goal and objectives described in Section 3.0 of the WBMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures. The program shall be implemented in two phases. Phase I of the PMEs shall be implemented during the first ten years of the new license and consist of supplementation, monitoring and evaluation activities. Results of Phase I PMEs will be used to inform the scope of continued PMEs during Phase II, which shall be implemented for the remainder of the new license.

Douglas PUD, in consultation with the Aquatic SWG, shall initiate implementation of the following PMEs during the 50-year license term:

Phase I (Years 1-10)

- Development of a Broodstock Collection and Breeding Plan (Year 1 and updated as determined by the Aquatic SWG, See Section 4.1.1);
- Broodstock Collection (Years 1-4 and other years TBD by the Aquatic SWG, see Section 4.1.1);
- Juvenile Stocking (Years 2-5 and other years TBD by the Aquatic SWG, see Section 4.1.2);
- Index Monitoring Program (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.1);
- Marked Fish Tracking (Years 3-5 and 2 more years prior to Year 10 TBD by the Aquatic SWG, see Section 4.2.2);
- Natural Reproduction Assessments (5 annual assessments over the license term, see Section 4.2.3)[*];

[*] Natural reproduction assessments can be implemented over the term of the license (Phase I and Phase II) as determined by the Aquatic SWG.

Phase II (Years 11-50)

- Long-term juvenile stocking (stocking rate and frequency TBD by Aquatic SWG in Years 11-50, see Section 4.4.1);
- Supplementation Program Review (Years 11-50 TBD by the Aquatic SWG, see Section 4.4.2);
- Long-term Index Monitoring Program (Year 12 and once every 3-5 years thereafter TBD by the Aquatic SWG, see Section 4.4.3);
- Adult Passage Evaluation (Year 11 and once every 10 years thereafter, see Section 4.4)

As determined by the Aquatic SWG, appropriate educational opportunities coinciding with implementation of WSMP activities (Section 4.5) will be made available during the entire license term.

The following sections describe, in detail, the components, timing of implementation, and decision-making process of the PMEs to be conducted during Phase I and II of the white sturgeon management program.

4.1 Phase I Supplementation Program (Objective 1)

4.1.1 Broodstock Collection and Breeding Plan

Due to the low numbers of sturgeon indicated by the 2001-2003 white sturgeon study and the need to increase genetic variation, there is a low probability that broodstock from only the Wells Reservoir can be utilized as the basis for supplementation activities. Consequently, other sources of fish must be considered in addition to capturing fish from Wells Reservoir to increase the white sturgeon population. Within one year of issuance of the new license Douglas PUD shall prepare and implement a Broodstock Collection and Breeding Plan, in consultation with the Aquatic SWG, which considers such factors as genetics and questions of imprinting, and are consistent with the goal and objectives of the WSMP and includes the level of detail provided in other existing white sturgeon breeding plans.

Following is a prioritized list[1] of juvenile fish source options that shall be incorporated into a Broodstock Collection and Breeding Plan:

- Broodstock collected from the Wells Reservoir;
- Broodstock collected from nearby reservoirs (Priest Rapids, Wanapum, Rocky Reach, Rock Island);
- Broodstock collected from McNary Reservoir;
- Juvenile production from the Lake Roosevelt white sturgeon recovery effort;
- Broodstock collected from below Bonneville Dam in the lower Columbia River;
- Juveniles purchased from a commercial facility.

A white sturgeon supplementation program may include, but may not be limited to, the following implementation options (Not listed in a priority order):

- Build new or retrofit existing Douglas PUD funded hatchery facilities to accommodate white sturgeon broodstock, egg incubation, and juvenile rearing;
- Development of a mid-Columbia hatchery facility funded by the three PUDs (Douglas, Chelan, and Grant) to accommodate various phases of white sturgeon supplementation; broodstock, egg incubation, and juvenile rearing;
- Direct release into the Wells Reservoir of juveniles produced via appropriate Breeding Plan criteria and reared at a commercial facility;
- Direct release into the Wells Reservoir juveniles or adults trapped and hauled from the lower Columbia River.

[1] Although the original WSMP included a prioritized list, since the development of the WSMP the Aquatic SWG has approved the White Sturgeon Brood Stock Collection and Breeding Plan (field with the FERC on February 14 2012) and a sturgeon collection location Statement of Agreement developed and approved in the Aquatic SWG on March 20th 2012. Collectively, these two documents approve all capture locations found in the WSMP and remove the prioritization found in the WSMP.

The initial source of broodstock shall be determined within the first year of issuance of the new license. Collection of broodstock shall occur consistent with the broodstock collection plan in years 1-4 of the new license. Any additional years during the Phase I program (first ten years of the new license) in which broodstock collection shall occur in order to facilitate additional juvenile stocking into the Wells Reservoir (Section 4.1.2) will be determined by the Aquatic SWG. The intent of broodstock collection is to use their progeny, if feasible, for future white sturgeon stocking activities in the Wells Reservoir. The broodstock collection plan shall be updated annually, or as otherwise recommended by Douglas PUD in consultation with the ASWG, to incorporate new and appropriate information.

4.1.1.1 Progress Towards Objective 1 in 2012 – Broodstock Collection and Breeding Plan

In September 2011 the Aquatic SWG completed and approved the Wells White Sturgeon Broodstock and Breeding Plan ahead of schedule (Sturgeon Plan). The Sturgeon Plan was filed with the FERC in February 2013. The Sturgeon Plan will be implemented in 2013.

At the end of 2011, Douglas PUD advertised and issued an Aquatic SWG approved Request for Proposals to obtain juvenile sturgeon or gametes in 2012 to begin early implementation of the sturgeon stocking efforts in the Wells Project. Two proposals were received and brought to the Aquatic SWG for consideration. Douglas PUD presented the proposals to the group with the intention of funding one of the proposals, provided the Aquatic SWG could arrive at unanimous decision. After thorough discussion unanimous approval could not be obtained and early implementation juvenile collection or gamete collection was put on hold.

In early 2012, Douglas PUD presented an SOA to the Aquatic SWG that involved Douglas PUD funding both of the two proposals received. One of the proposals was for the collection of wild spawned sturgeon larvae from reservoirs throughout the upper and middle Columbia River and the second proposal focused on the collection of broodstock for the artificial spawning of sturgeon at the Marion Drain Hatchery facility. After review and revision by the Aquatic SWG a final SOA supporting a dual-faceted sturgeon collection program was approved in June of 2012. In the spring and early summer of 2013 the Colville Tribes will collect naturally spawned larval sturgeon using drift nets and the Yakama Nation will collect broodstock for hatchery fertilization at Marion Drain. Both sources of fish will be transported to Wells Hatchery within days of collection.

In 2012, Douglas PUD modified the Wells Hatchery to facilitate the rearing of juvenile sturgeon. The hatchery upgrades included the installation of new 12 - 3’ x 5’ circular Combi- tanks, with heated well water as a rearing water source. The circular tanks were installed in two separate bio-secure configurations that allow Douglas PUD to rear both groups of juvenile sturgeon independently. The wild caught larvae fish will be reared in separate tanks from the artificially collected eggs provided by the Marion Drain program.

4.1.2 Juvenile White Sturgeon Stocking

Within two years following issuance of the new license, Douglas PUD shall release up to 5,000 yearling white sturgeon into the Wells Reservoir annually for four consecutive years (20,000 fish total). Additional years and numbers of juvenile sturgeon to be stocked during Phase I will be determined by the Aquatic SWG and will not exceed 15,000 juvenile sturgeon (total of 35,000 juvenile sturgeon during Phase I). In consultation with the Aquatic SWG, yearling fish for release shall be acquired through one or more of the sources listed in priority order in Section 4.1.1 above, or through other measures identified by the Aquatic SWG. If juvenile sturgeon stocking deadlines cannot be achieved, the Aquatic SWG will determine alternative implementation measures that will be undertaken by Douglas PUD (see Table 4.7-1, footnote 2).

Douglas PUD shall ensure that all hatchery-reared juvenile white sturgeon released into the Wells Reservoir are marked with PIT tags and year-specific scute marks for monitoring purposes described in Section 4.2 of this plan. In order to allow for tracking of juvenile white sturgeon emigration described under Section 4.2.2, Douglas PUD shall ensure that up to one percent (or a maximum of 50) of the juvenile white sturgeon released into the Wells Reservoir are large enough to allow implantation of an active tag prior to release. In addition, following the third year of supplementation (unless the Aquatic SWG determines more analysis is required), the Aquatic SWG may elect to release juveniles at an earlier or later life stage for the fourth year in order to compare success of fish released at varying life stages. For example, the Aquatic SWG may elect to have a proportion of the hatchery-reared juveniles released at differing size intervals (with the minimum size being that which permits PIT tagging), in order to monitor potential differences in survival and growth during future indexing periods.

4.1.2.1 Progress Towards Objective 1 in 2012 – Juvenile White Sturgeon Stocking

Rearing of juvenile fish from both the larval and egg collection program will take place for up to 12 months at the Wells Hatchery with the intention of rearing fish to approximately 250 mm fork length. Douglas PUD plans on planting up to 5,000 juvenile sturgeon in the summer of 2014 depending on the source and number of fish successfully collected and reared. All of these fish will be PIT-tagged and scute marked according to the marking plan described in Section 4.2 of the WSMP. Up to one percent (or 50) of the juvenile fish liberated into the Wells Reservoir will be tagged with active transmitters to facilitate the collection of data for the Phase I monitoring and evaluation program.

4.2 Phase I Monitoring and Evaluation Program (Objective 2)

Douglas PUD shall conduct a monitoring and evaluation program within the Wells Reservoir for the purpose of assessing the effectiveness of the supplementation activities described in Section 4.1 and outlined in Table 4.7-1. Monitoring shall include both an Index Monitoring Program (Section 4.2.1) and a Marked Fish Tracking Program (Section 4.2.2). Both of these studies will be used to collect life history and population dynamics information including rates of fish movements into and out of the Wells Reservoir and habitat use. Douglas PUD shall also obtain updated information, when available, on other white sturgeon recovery programs (e.g., Upper Columbia River, Kootenai River, mid-Columbia PUDs), in order to improve the monitoring and evaluation program and refine its implementation. The results of this information will also inform supplementation, monitoring and evaluation activities during implementation of Phase II of the WSMP.

4.2.1 Index Monitoring Program

Within three years following issuance of the New License, Douglas PUD shall initiate a three-year index monitoring program (Years 3-5) for juvenile and adult sturgeon in the Wells Reservoir to determine age-class structure, survival rates, abundance, density, condition factor, growth rates, and to identify distribution and habitat selection of juvenile sturgeon. The indexing methods shall include using gillnets, set lines or other appropriate recapture methods for juveniles and adults.

As a component of the Phase I indexing program, Douglas PUD shall capture and implant active tags in a portion of the juvenile and sexually mature adult sturgeon population found in the Wells Reservoir. This tagging effort shall be used to augment broodstock collection (Section 4.1.1), population level information and juvenile habitat use (Section 4.2.2) and natural reproduction potential (Section 4.2.3).

After the initial three-year indexing period (Years 3-5), Douglas PUD shall conduct an additional two years of index monitoring in Phase I as determined by the Aquatic SWG. After year 9, an additional year of index monitoring would take place in year 12 and then every three to five years over the term of the new license (Phase II) to assess age-class structure, survival rates, abundance, condition factor, growth rates; identify distribution and habitat selection of juvenile sturgeon; and to inform the supplementation program strategy (see Table 4.7-1).

Frequency (every 3, 4 or 5 years) of implementation of a long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG. Phase II index monitoring activities will not consist of implantation of active tags in captured individuals.

4.2.1.1 Progress Towards Objective 2 in 2012 – Index Monitoring Program

Monitoring of naturally produced and hatchery produced juvenile and adult sturgeon will be initiated in 2015. During 2013 Douglas PUD will work with the Aquatic SWG to develop the details of the Index Monitoring Program in concert with the Marked Fish Tracking Program as part of the overall Sturgeon Monitoring and Evaluation Program.

4.2.2 Marked Fish Tracking Program

Beginning in year three of the new license and continuing for three years (Years 3-5), Douglas PUD shall conduct tracking surveys of the juvenile white sturgeon that were released with active tags as part of supplementation activities. This will require one percent of each of the annual classes of juvenile sturgeon (up to a maximum of 50 fish each year) released in years 2, 3, 4, and 5 to be reared large enough to implant an active tag for tracking purposes (See Table 4.7-1). The purpose of tracking active-tagged fish is to determine juvenile white sturgeon emigration rates out of the Wells Reservoir and habitat use within the Wells Reservoir.

Douglas PUD shall repeat the tracking survey for two additional years during Phase I (see Table 4.7-1). The additional two years of surveys shall track: 1) active tags implanted in a percentage of juvenile fish from previous years of supplementation activities (dependent upon tag life) and

2) any juvenile and adult fish implanted with active tags during the last indexing period preceding the survey. Subsequent Phase I surveys are likely to coincide with the additional Phase I index monitoring and juvenile stocking activities.

4.2.2.1 Progress Towards Objective 2 in 2012 – Monitoring and Evaluation Program

Monitoring of release sturgeon will take place in 2015. During 2013 Douglas PUD will work with the Aquatic SWG to develop the Objective 2 Monitoring and Evaluation Program. Monitoring design will be designed around the number of fish release, fish size and program goals.

4.2.3 Determining Natural Reproduction Potential (Objective 3)

In years where environmental conditions are appropriate, Douglas PUD shall track sexually mature adult sturgeon that were captured and implanted with active tags under Section 4.2.1 for the purpose of identifying potential spawning locations and determining natural reproduction potential. Appropriate environmental conditions may be determined by examining the following factors: water quality and quantity (i.e., flow, temperature, and turbidity), the presence of reproductively viable adults during index monitoring activities, and the status of maturity for supplemented fish. In years in which sexually mature adult sturgeon are tagged under Section 4.2.1, Douglas PUD may also utilize egg collection mats in combination with tracking in areas of the Wells Reservoir for the purpose of identifying potential spawning locations and activity. Five surveys of natural reproduction using adult tracking and/or egg mat placement shall occur over the term of the new license. Several of these surveys are intended to be implemented during the latter part of the license in order to examine the natural reproductive potential of supplemented fish recruiting to sexually maturity. These activities will support the aquatic life designated use for spawning under WAC 173-201A in the Washington state water quality standards.

4.2.3.1 Progress Towards Objective 3 in 2012 – Determining Natural Reproduction Potential

Natural reproduction evaluations may be coupled with the active tagging studies being implemented under Objective 2the Index Monitoring Program. In 2013 and 2014, Douglas PUD will work with the Aquatic SWG to develop a strategy for monitoring natural reproduction in the Wells Project.

4.3 Phase II Supplementation and Monitoring Program (Objectives 2 and 4)

The information collected through activities described in Section 4.1-4.3 will provide insight into the population dynamics, habitat availability, and limiting factors that affect the natural population structure of white sturgeon within the Wells Reservoir. This information will inform supplementation, monitoring and evaluation activities during implementation of Phase II supplementation and monitoring activities in the WSMP for the duration of the new license term after year 10.

4.3.1 Long-Term Juvenile White Sturgeon Stocking

The number and frequency of yearlings released in Phase II of the white sturgeon supplementation program will range from 0 to 5,000 fish. Stocking rates shall be based on the results of the Phase I Monitoring and Evaluation Program (Section 4.2) and determination of carrying capacity (Section 4.3) and shall be consistent with the goal and objectives of the WSMP. The Phase II stocking rates can also be adjusted as determined by the Aquatic SWG (also see Table 4.7-1, footnotes 2 and 3).

4.3.1.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program

Phase II goals will be addressed following the completion of Phase I in 2022.

4.3.2 Supplementation Program Review

Douglas PUD shall compile information on other white sturgeon supplementation programs in the Columbia River Basin in order to assess whether the white sturgeon supplementation program being implemented at the Project is: (i) consistent and comparable with the technology and methods being implemented by other supplementation programs in the region; (ii) reasonable in cost and effective to implement at the Project; and (iii) consistent with the supplementation program goals and objectives. The supplementation program review will be conducted annually in coordination with the development of the annual report (Section 4.6).

4.3.2.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program

Phase II goals will be addressed following the completion of Phase I in 2022.

4.3.3 Long-term Index Monitoring Program

Beginning in Year Twelve of the new license and every 3 to 5 years thereafter for the duration of the new license, Douglas PUD shall continue to conduct a Phase II Index Monitoring Study for juvenile and adult sturgeon in the Wells Reservoir. This program will be used to monitor age-class structure, survival rates, abundance, condition factor, growth rates, identify distribution and habitat selection of juvenile sturgeon, and may continue to support broodstock collection activities. The indexing methods will include using gillnets or other appropriate recapture methods for juveniles and set lines for adults and will not consist of actively tracking fish. Frequency (every 3, 4, or 5 years) of implementation of long-term index monitoring activities (after year 12) will be determined by the Aquatic SWG.

4.3.3.1 Progress Towards Objectives 2 and 4 - Phase II Supplementation and Monitoring Program

Phase II goals will be addressed following the completion of Phase I in 2022.

4.4 Evaluation and Implementation of Adult Passage Measures (Objective5)

In Year Eleven of the new license and every 10 years thereafter for the duration of the new license unless otherwise determined by the Aquatic SWG, the Aquatic SWG shall evaluate the biological merit to providing upstream passage for adult white sturgeon. The assessment of biological merit shall be determined by: (i) evaluating information gathered from monitoring and evaluation activities and determining whether there is significant biological benefit and need for upstream passage; (ii) the availability of reasonable and appropriate means to provide upstream passage; and (iii) consensus from all other operators of the mid-Columbia projects to implement adult upstream passage measures[1]. If all three criteria above are met, Douglas PUD, in consultation with the Aquatic SWG shall develop adult passage measures that are consistent with measures being implemented by other mid-Columbia project operators.

4.4.1 Progress Towards Objective 5 - Phase II Evaluation and Implementation of Adult Passage Measures

Phase two goals, including longer term indexing and evaluating the feasibility and biological merit of adult passage measures will be addressed one year after the completion of Phase I (2023).

4.5 Educational Opportunities Coinciding with WSMP Activities (Objective 6)

Douglas PUD, in consultation with the Aquatic SWG, shall identify appropriate WSMP activities as opportunities for education to local public entities such as schools, cities, fishing and recreation groups, and other interested local groups. WSMP activities that may be appropriate for public participation are hatchery tours, release of hatchery juveniles, and tagging of juveniles prior to release.

4.5.1 Progress Towards Objective 6 – Educational Opportunities Coinciding with WSMP Activities

Education opportunities will be discussed with the Aquatic SWG in 2013 and 2014. Potential opportunities include inviting elementary school children to attend a Wells Hatchery tour and to participate in the juvenile sturgeon release events in years 2014-2017. In addition, during the development of the new visitor center at Wells Dam, White sturgeon educational material will be provided consistent with requirements of the WSMP.

[1] The intent is to provide connectivity to the Hanford Reach white sturgeon population.

4.6 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the WSMP. The report will document all white sturgeon activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this WSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.6.1 Progress Towards Meeting Annual Reporting Requirements

Consistent with the reporting requirements in Article 406 of the FERC License for the Wells Project, the 401 Certification, and the Aquatic Settlement Agreement WSMP, the WSMP Annual Report will be updated annually in consultation with the Aquatic SWG. Each year the WSMP Annual Report will be provided to the Aquatic SWG for review and then filed with the FERC on or prior to May 31st. The report will include a summary of the annual progress made towards the implantation of the WSMP and focus on the previous year's developments.

4.7 Implementation Schedule

Table 4.7-1 outlines the estimated long-term schedule of the activities described in Sections 4.1-4.4 of the WSMP.

Table 4.7-1 Project White Sturgeon Implementation Schedule

New License Year	Broodstock Plan and Collection[1]	Release Fish into Wells Reservoir[2]	Index Monitoring[3]	Tracking Marked Fish[4]	Natural Production Assessment[5]	Adult Passage Evaluation
PHASE I						
1	X				TBD	
2	X	X				
3	X	X	X	X	TBD	
4	X	X	X	X		
5	TBD	X	X	X		
6	TBD	TBD			TBD	
7	TBD	TBD	TBD	TBD		
8	TBD	TBD				
9	TBD	TBD	TBD	TBD		
10	TBD	TBD			TBD	
PHASE II[6]						
11	Level and frequency TBD	Level and frequency TBD				X[7]
12			X			
13-50			TBD		TBD	Every ten years after Year 11

[1]Douglas PUD broodstock plan shall be completed within one year following this issuance of the new license. Broodstock collection activities will occur at a minimum in years 1-4 during the new license term. Additional years, during Phase I, will be determined by the Aquatic SWG. In Year 11 (Phase II), level and frequency of activity will be determined by the Aquatic SWG and will be based upon the level of long-term supplementation identified from monitoring results.

[2]No more than a total of 35,000 fish will be stocked in Phase I (Years 1-10). The Phase II supplementation program will be determined by the Aquatic SWG and consistent with the goal of the WSMP.

[3] Results of the index monitoring activities will be used to determine the scope of future supplementation activities. Index monitoring activities from year 12 through the remainder of the new license term will occur at a frequency of 3-5 years as determined by the Aquatic SWG.

[4] Active-tagged juvenile and adult sturgeon will be tracked to assess emigration, habitat use, and potential spawning locations. This activity will occur in years 3, 4, and 5. Two additional years will be determined by the Aquatic SWG but will likely be consistent with years in which index monitoring activities are implemented.

[5] Tracking of reproductively viable adult sturgeon in combination with deployment of egg collection mats to identify natural production in the Wells Reservoir during 5 separate years over the term of the new license based on flow conditions or other data as determined by the Aquatic SWG.

[6] Phase II activities will consist only of broodstock plan and collection, stocking activities, index monitoring, and potentially natural reproduction assessments for the remainder of the new license.

[7] Adult Passage Evaluations will occur in Year 11 and every 10 years thereafter for the term of the new license.

5.0 REFERENCES

Beamesderfer, R.C., J.C. Elliot, and C.A. Foster. 1989. Report A. Pages 5-52. In: A.A. Nigro [editor]. Status and habitat requirements of white sturgeon populations in the Columbia River downstream from McNary Dam. Annual Progress Report. Prepared for the U.S. Department of Energy, Bonneville Power Administration, Portland, OR.

Beamesderfer, R.C., T.A. Rien, and A.A. Nigro. 1995. Differences in the dynamics and potential production of impounded and unimpounded white sturgeon populations in the lower Columbia River. Transactions of the American Fisheries Society 124: 857-872.

Brannon, E. and A. Setter. 1992. Movements of white sturgeon in Roosevelt Lake. Final Report (1988-1991) to Bonneville Power Administration, Portland Or. Project No. 89-45:35 p.

Devore, J.D., B.W. James, C.A. Tracy, and D.A. Hale. 1995. Dynamics and potential production of white sturgeon in the unimpounded lower Columbia River: Transactions of the American Fisheries Society, v. 124, Issue 6, p. 845-856.

Jerald, T. 2007. White Sturgeon (Acipenser transmontanus) Population Assessment in Wells Reservoir. MSc Thesis. Central Washington University, Ellensburg, WA.

Kincaid, H.L. 1993. Breeding plan to preserve the genetic variability of the Kootenai River white sturgeon. Report prepared for the Bonneville Power Administration Contract No. DE-A179-93B002886.

Lane, E.D. 1991. Status of white sturgeon, Acipenser transmontanus, in Canada. Canadian Field-Nat. 105:161-68.

Lepla, K., J.A. Chandler, and P. Bates. 2001. Status of Snake River white sturgeon associated with the Hells Canyon complex. Idaho Power Technical Report Appendix E.3.1-6 Chapter 1. 24 pp.

van der Leeuw, B.K., M.J. Parsley, C.D. Wright, and E.E. Kofoot. 2006. Validation of critical assumption of the riparian habitat hypothesis for white sturgeon: U.S. Geological Survey Scientific Investigation Report 2006-5225, 20 p.

Public Utility District No. 1 of Chelan County (Chelan PUD). 2005. Rocky Reach White Sturgeon Management Plan. Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Skalski, J.R. and R.L. Townsend. 2005. Analysis of the Douglas County Public Utility District #1 Sturgeon Mark-Recapture Study. Columbia Basin Research. School of Aquatic and Fishery Sciences, University of Washington, Seattle, WA.

Upper Columbia White Sturgeon Recovery Initiative (UCWSRI). 2002. Upper Columbia White Sturgeon Recovery Plan. November 28, 2002. 90 pp.

U.S. Fish and Wildlife Service (USFWS). 1999. Recovery Plan for the White Sturgeon (Acipenser transmontanus): Kootenai River Population. U.S. Fish and Wildlife Service, Portland, Oregon. 96 pp. plus appendices.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. American Fisheries Society. University of Washington Press.

2012 ANNUAL REPORT

BULL TROUT MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

The goal of the BTMP is to identify, monitor, and address impacts, if any, on bull trout (*Salvelinus confluentus*) resulting from the Project in a manner consistent with the United States Fish and Wildlife Service (USFWS) Bull Trout Recovery Plan and the terms of the Section 7 Incidental Take Statement (ITS). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout Section 7 Biological Opinion (BO) in association with the Federal Energy Regulatory Commission's (FERC) approval of the HCP. The PMEs presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP. In 2012 Public Utility District No. 1 of Douglas County (Douglas PUD) maintained safe, efficient and timely passage through the downstream juvenile fish bypass system and upstream adult fishway passage structures for bull trout and conducted video monitoring of the Wells Dam fishway viewing windows during fish passage season. Douglas PUD continued to operate the juvenile fish bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP.

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage. Douglas PUD will implement the year 5 Passage Evaluation Study in 2017 or earlier if the 5-year average adult bull trout count of 60 fish increases more than two times (120 or more bull trout counted in a single year). No significant changes in the operation of the fish ladders or hydrocombine have been implemented or are proposed that would trigger the implementation of bull trout passage evaluation. During 2012 Douglas PUD in consultation with the Aquatic Settlement Work Group (Aquatic SWG) developed a study plan to assess incidental take of bull trout at the Twisp River Weir broodstock collection facility. After discussions with the Aquatic SWG and specifically with the USFWS, the parties including the USFWS signatories agreed that Douglas PUD should postpone the Off-Project Passage Evaluation until year five (2017) of the new license when the Bull Trout Passage and Enumeration Study is scheduled to take place at Wells Dam. During 2012, one sub-adult bull trout was collected during winter maintenance related fish salvage activities in one of the adult fishways. No new sub-adult related monitoring activities were implemented or are proposed; fewer than 10 sub-adult bull trout have been observed at Wells in a single calendar year.

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate the effectiveness of these measures. No new adverse impacts to bull trout were identified in 2012.

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations. Stranding surveys were not conducted in 2012 since reservoir elevation did not fall below 773' Mean Sea Level (MSL).

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP. Genetic samples were collected for all of the bull trout captured at the Twisp Weir in 2012. Samples will be analyzed if requested by the Aquatic SWG. Genetic samples will be taken at Wells Dam in year ten of the new license.

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout. In 2012, the number of bull trout encountered during hatchery operation activities was comparable to previous years. Hatchery actions in 2012 were very similar to other years where broodstock are collected at Wells Dam and the Twisp Weir traps.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The BTMP will be updated in 2013 to reflect additional requirements that have been added by the final 401 Certification, the 2012 Endangered Species Act Section 7 consultation for bull trout associated with the relicensing of the Wells Project and the new project license issued by the FERC. Implementation of all bull trout related measures implemented during the first full year of the FERC license will be reported within the 2013 BTMP Annual Report.

1.0 INTRODUCTION

The Bull Trout Management Plan (BTMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The BTMP will direct implementation of measures to mitigate project impacts, if any, on bull trout (*Salvelinus confluentus*). To ensure active stakeholder participation and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan to direct the long-term management of bull trout in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and defines the relevant PMEs (Section 4) for bull trout during the term of the new license.

Additionally, this management plan is intended to continue implementation activities aimed at protecting bull trout in a manner consistent with measures specified in the original Wells Bull Trout Monitoring and Management Plan (WBTMMP) (Douglas 2004). The 2004 WBTMMP was developed in consultation with the USFWS, as required by the USFWS Bull Trout Biological Opinion (BO) in association with the implementation of the HCP.

In addition to the requirements found within the BTMP, the Endangered Species Act (ESA) Section 7 consultation for the relicensing of the Wells Project and the new Federal Energy Regulatory Commission (FERC) license has added several additional bull trout related requirements associated with the continued operation of the Wells Project. The 2013 annual report on the implementation of the BTMP will include all of the bull trout related activities that took place from the issuance of the new license in November 2012 to the end of December 2013 and will also include any bull trout related compliance reports or plans filed with the Aquatic SWG, USFWS and the FERC during calendar year 2013.

2.0 BACKGROUND

2.1 Bull Trout Biology

Bull trout are native to northwestern North America, historically occupying a large geographic range extending from California north into the Yukon and Northwest Territories of Canada, and east to western Montana and Alberta (Cavender 1978). They are generally found in interior drainages, but also occur on the Pacific Coast in Puget Sound and in the large drainages of British Columbia.

Bull trout currently occur in lakes, rivers and tributaries in Washington, Montana, Idaho, Oregon (including the Klamath River basin), Nevada, two Canadian Provinces (British Columbia and Alberta), and several cross-boundary drainages in extreme southeast Alaska. East of the Continental Divide, bull trout are found in the headwaters of the Saskatchewan River in Alberta, and the McKenzie River system in Alberta and British Columbia (Cavender 1978; McPhail and Baxter 1996; Brewin and Brewin 1997). The remaining distribution of bull trout is highly fragmented.

Bull trout are a member of the char group within the family Salmonidae. Bull trout closely resemble Dolly Varden (*Salvelinus malma*), a related species. Genetic analyses indicate, however, that bull trout are more closely related to an Asian char (*Salvelinus leucomaenis*) than to Dolly Varden (Pleyte et al. 1992). Bull trout are sympatric with Dolly Varden over part of their range, most notably in British Columbia and the Coastal-Puget Sound region of Washington State.

Bull trout are believed to have more specific habitat requirements than other salmonids (Rieman and McIntyre 1993). Growth, survival, and long-term persistence are dependent upon habitat characteristics such as clean, cold, connected, and complex instream habitat, a stable substrate with a low percentage of fine sediments, high channel stability, and stream/population connectivity (USFWS et al. 2000). Stream temperature and substrate type, in particular, are critical factors for the sustained long-term persistence of bull trout. Spawning is often associated with the coldest, cleanest, and most complex stream reaches within basins. However, bull trout may exhibit a patchy distribution, even in pristine habitats, and should not be expected to occupy all available habitats at the same time (Rieman and McIntyre 1995; Rieman et al. 1997).

Bull trout exhibit four distinct life history types: resident, fluvial, adfluvial, and anadromous. The fluvial, adfluvial, and resident forms exist throughout the range of the bull trout (Rieman and McIntyre 1993). These forms spend their entire life in freshwater. The anadromous life history form is currently known only to occur in the Coastal-Puget Sound region within the coterminous United States (Volk 2000; Kraemer 1994; Mongillo 1993). Multiple life history types may be expressed in the same population, and this diversity of life history types is considered important to the stability and viability of bull trout populations (Rieman and McIntyre 1993).

The majority of growth and maturation for anadromous bull trout occurs in estuarine and marine waters, adfluvial bull trout in lakes or reservoirs, and fluvial bull trout in large river systems.

Resident bull trout populations are generally found in small headwater streams where fish remain their entire lives.

For migratory life history types, juveniles tend to rear in tributary streams for 1 to 4 years before migrating downstream into a larger river, lake, or estuary and/or nearshore marine area to mature (Rieman and McIntyre 1993). In some lake systems, age 0+ fish (less than 1 year old) may migrate directly to lakes (Riehle et al. 1997). Juvenile and adult bull trout in streams frequently inhabit side channels, stream margins and pools with suitable cover and areas with cold hyporheic zones or groundwater upwellings (Sexauer and James 1993; Baxter and Hauer 2000).

2.2 Species Status

On June 10, 1998, the USFWS listed bull trout within the Columbia River basin as threatened under the Endangered Species Act (ESA) (FR 63(111)). Later (November 1, 1999), the USFWS listed bull trout within the coterminous United States as threatened under the ESA (FR 64(210)). The USFWS identified habitat degradation, fragmentation, and alterations associated with dewatering, road construction and maintenance, mining, and grazing; blockage of migratory corridors by dams or other diversion structures; poor water quality; incidental angler harvest; entrainment into diversion channels; and introduced non-native species as major factors affecting the distribution and abundance of bull trout. They noted that dams (and natural barriers) have isolated population segments resulting in a loss of genetic exchange among these segments (FR 63(111)). The USFWS believes many populations are now isolated and disjunct. In October 2002, the USFWS completed the first draft of a bull trout recovery plan intended to provide information and guidance that will lead to recovery of the species, including its habitat (USFWS 2002). Threatened bull trout population segments are widely distributed over a large area and because population segments were subject to listing at different times, the USFWS adopted a two-tiered approach to develop the draft recovery plan for bull trout (USFWS 2002). In November 2002, the USFWS published in the federal register a proposed rule for the designation of critical habitat for the Klamath River and Columbia River distinct population segments of bull trout (67 FR 71235). In October 2004 the USFWS published a final rule in the Federal Register designating critical habitat for the Klamath River and Columbia River populations of bull trout (69 FR 59995).

In April 2008, the USFWS completed the 5-year status review for Columbia River bull trout with two recommendations: maintain "threatened" status for the species, and determine if multiple distinct population segments exist within the Columbia River and merit protection under the ESA. The recommendations intend to facilitate analysis of project effects over more specific and biologically appropriate areas, ultimately allowing a greater focus of regulatory protection and recovery resources (USFWS 2008a). The review also identified specific issues that limit the overall ability to accurately and quantitatively evaluate the current status of bull trout. Seven recommendations were made to improve future evaluation and management decisions, all of which are largely based on improvement and standardization of monitoring and evaluation techniques, better delineation and agreement of core areas and Recovery Units, and multi-agency cooperation and management (USFWS 2008b).

The Wells Project is situated within the Upper Columbia River Recovery Unit and the USFWS has identified the Wenatchee, Entiat, and Methow Rivers as its core areas. A core area represents the closest approximation of a biologically functioning unit for bull trout. A core area functions as a metapopulation for bull trout. Not all core areas are equal and each has specific functions that are unique. For example, the Entiat Core Area depends heavily on the mainstem Columbia River to provide overwinter, migration, and forage habitats. The Wenatchee Core Area has populations using lake and riverine (both the Wenatchee and Columbia Rivers) habitat for overwintering, migration, and foraging. Within a core area, many local populations may exist. A local population is assumed to be the smallest group of fish that is known to represent an interacting reproductive unit. Nineteen local populations have been identified in the Wenatchee (7), Entiat (2) and Methow (10) core areas (USFWS 2002).

2.3 Project Bull Trout Studies

2.3.1 2001-2003 Project Bull Trout Study

Listed Columbia River bull trout have been observed and counted at Wells Dam since 1998. In 2000, due to the potential for operations at mid-Columbia dams to affect the movement and survival of bull trout, the USFWS requested that the three mid-Columbia PUDs (Douglas, Chelan, and Grant PUDs) evaluate the movement and status of bull trout in their respective project areas. At that time, little was known about the life-history characteristics (e.g., movements, distribution, habitat use, etc.) of bull trout in the mid-Columbia River. Therefore, in order to assess the operational effects of hydroelectric projects on bull trout within the mid-Columbia, a three PUD coordinated radio-telemetry study was implemented beginning in 2001. The goal of the study was to monitor the movements and migration patterns of adult bull trout in the mid-Columbia River using radio-telemetry (Figure 2.3-1). The number of trout to be collected and tagged at each dam (Rock Island, Rocky Reach, and Wells) was based on the proportion of fish that migrated past those dams in 2000.

From 2001-2003, bull trout were collected from the Wells, Rocky Reach, and Rock Island dams and radio-tagged. Multiple-telemetry techniques were used to assess the movement of tagged bull trout within the study area. At Wells Dam, a combination of aerial and underwater antennas was deployed. The primary purpose for this system was to document the presence of bull trout at the Project, identify passage times and determine their direction of travel (upstream/downstream). In addition to these systems, a number of telemetry systems were deployed to address specific questions posed by the USFWS and Douglas PUD. At Wells Dam, several additional systems were installed to identify tagged bull trout that could enter, ascend, and exit specific gates and fish ladders. All possible access points to the adult fish ladders and the exits were monitored individually in 2001, 2002, and 2003, allowing the route of passage to be determined as well as the ability to establish the exact time of entrance and exit from the ladder system. English et al. (1998; 2001) provides a detailed description of the telemetry systems at each of the dams and within the tributaries.

To assess bull trout movements into and out of the Wells Reservoir, fixed-telemetry monitoring sites were established at the mouth of the Methow and Okanogan rivers and periodic aerial surveys were conducted on the reservoir and throughout both watersheds (English et al. 1998, 2001). Key findings of the multi-year study are as follows:

- Total upstream fishway counts (May 1st to November 15th) at Wells Dam from 2000 to 2003 were 90, 107, 76, and 53 bull trout, respectively.
- Adult bull trout migrate upstream through Wells Dam from May through November. Peak movement occurs in May and June with 94, 95, 92, and 89 percent of adult bull trout being detected during these months at Wells Dam for years 2000-2003, respectively.
- Tagged migratory adult bull trout successfully move both upstream and downstream past the Project (radio-telemetry). From the 79 bull trout radio-tagged in 2001 and 2002 at Rock Island, Rocky Reach, and Wells, five bull trout passed downstream through Wells Dam with no documented mortality. Twelve downstream passage events occurred at Rocky Reach (4) and Rock Island (8) through turbines from 2001 to 2003. None of the 17 (5 Wells, 4 Rocky Reach and 8 Rock Island) observed downstream passage events resulted in observed mortality of bull trout.
- Between 2001 and 2003, a total of 10 (2 tagged at Rock Island, 4 Rocky Reach, 4 Wells), 11 (4 Wells, 5 Rocky Reach, 2 from 2001), and 1 (1 Wells) tagged bull trout were detected moving upstream of the Project, respectively.
- Median tailrace times (tailrace detection to ladder entrance detection) during the telemetry study at Wells in 2001-2003 were 1.53, 7.84, and 1.00 days, respectively. Median travel times (tailrace detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 8.87, 7.60, and 1.16 days, respectively. Median ladder passage times (entrance detection to ladder exit detection) during the telemetry study at Wells in 2001-2003 were 5.70, 0.23, and 0.16 days, respectively.
- Adult bull trout migrating upstream of Wells Dam appear to be destined for the Methow River. Between 2001 and 2003, no bull trout selected the Okanogan system (one trout moved into the Okanogan, but left shortly thereafter and moved into the Methow system).
- Median travel time from Wells Dam (detection at ladder exit) to first detection in the Methow River in 2001-2003 was 0.40, 2.78, and 1.09 days, respectively.
- All tributary entrance events (fixed station detections) into the Methow River by bull trout (28 total events, 2001-2003) occurred before June 27. An additional two bull trout, not detected by the tributary fixed station systems, were detected in the Methow River via 2002 aerial surveys. Bull trout in the Methow system selected two primary areas, the mainstem Methow River and the Twisp River.
- To date, 30% (9/30) of bull trout that entered the Methow River have been detected leaving the system. Tributary exit dates were recorded for 78% (7/9) of these emigrating bull trout and 86% (6/7) of bull trout with a recorded exit date left the Methow River system between October and December.
- Bull trout migrating upstream through Wells Dam in 2001 were 5 year old (n=2, mean fork length=55.6cm) and 6 year old (n=6, mean fork length= 54.6cm) fish as determined by scales.

- 92% (11/12) and 53% (8/15) of tagged bull trout detected in the vicinity of Wells Dam entered the Wells Hatchery Outfall in 2001 and 2002, respectively. It is possible that the bull trout frequented the outfall in search of prey. Typical operation at the hatchery is to volitionally release yearling chinook smolts between April 15 and 30, and subyearling chinook smolts in early June. Given that bull trout feed opportunistically (Goetz 1989), it is likely that the tagged bull trout were taking advantage of the large concentration of juvenile salmonids within the hatchery outfall system.

2.3.2 2005-2008 Project Bull Trout Study

On December 10, 2003, the USFWS received a request from the FERC for formal consultation to determine whether the proposed incorporation of the HCP into the FERC license for operation of the Project was likely to jeopardize the continued existence of the Columbia River distinct population segment (DPS) of ESA-listed bull trout, or destroy or adversely modify proposed bull trout critical habitat. In response to the FERC request and based upon the results of the 2001-2003 study, which suggested that continued operations are not likely to jeopardize bull trout, the USFWS filed the BO and Incidental Take Statement (ITS) with FERC. On June 21, 2004, FERC issued an order incorporating the HCP and the terms and conditions of the ITS into the FERC license for the Project.

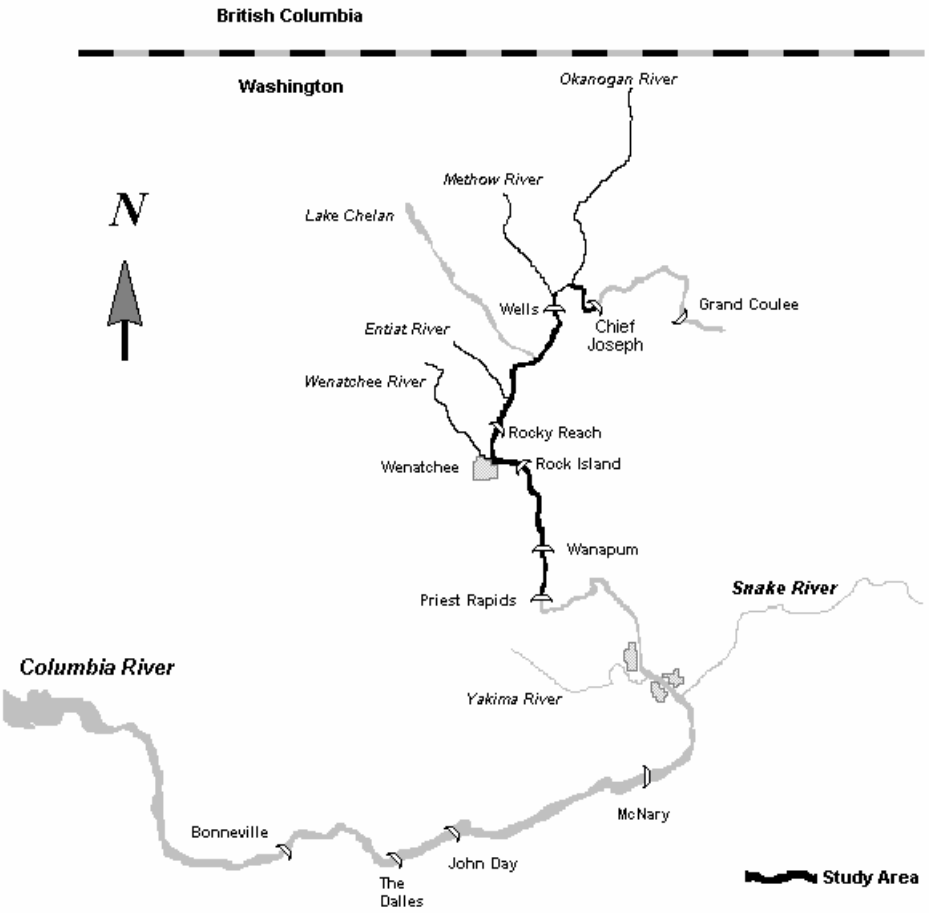

Figure 2.3-1 **Study area for assessing migration patterns of bull trout in the mid-Columbia River (2001-2003). Fixed radio-telemetry sites monitored the movement of bull trout near Priest Rapids, Wanapum, Rock Island, Rocky Reach and Wells dams. Fixed sites placed in the Wenatchee, Entiat, Methow and Okanogan rivers monitored time of entry and exodus of bull trout in large tributaries of the mid-Columbia River.**

In 2004, Douglas in consultation with the USFWS and as required under the HCP BO, developed the WBTMMP. The goal of the WBTMMP is to continue monitoring and evaluating bull trout in the Project to quantify and address, to the extent feasible, potential Project impacts on bull trout. Implementation of WBTMMP measures specifically include: (1) address ongoing Project impacts through the life of the existing operating license; (2) provide consistency with recovery actions as outlined in the USFWS bull trout recovery plan; and (3) monitor and minimize the extent of incidental take of bull trout, if any, consistent with Section 7 of the ESA. WBTMMP implementation started in 2005 and continued through the spring of 2008. Objectives of the plan include identifying Project impacts, if any, on upstream and downstream passage of adult and sub-adult bull trout through Wells Dam, investigating the potential for sub-adult entrapment or stranding in off-channel or backwater areas of Wells Reservoir, and identifying the Core Areas and Local Populations, as defined in the USFWS Bull Trout Recovery Plan, of bull trout that utilize the Project.

To address Project impacts, if any, on upstream and downstream passage of adult bull trout, Douglas PUD captured and radio-tagged 6, 10, and 10 adult bull trout at Wells Dam in 2005, 2006, and 2007, respectively (LGL and Douglas PUD, 2008). In 2005, all six fish traveled upstream into the Methow River and no downstream passage events were recorded. Travel time from release (after tagging) until entrance into the Methow River ranged from 7 hours to 12 days. In 2006, in addition to the 10 adult bull trout radio-tagged at Wells Dam, the USFWS radio-tagged 13 bull trout in the Methow River Core Area and Public Utility District No.1 of Chelan County (Chelan PUD) released 29 tagged bull trout from Rocky Reach and Rock Island dams. In total, 13 downstream passage events and 8 upstream passage events were recorded at Wells Dam in 2006. There were no observed instances of bull trout mortality resulting from these passage events. In 2007, 10 bull trout were tagged at Wells Dam, the USFWS tagged 5 bull trout in the Methow River Core Area, and Chelan PUD released 19 tagged bull trout from Rocky Reach and Rock Island dams. In total, 1 downstream passage event and 3 upstream passage events were recorded at Wells Dam in 2007. Similar to 2006, no instances of bull trout mortality were observed resulting from these passage events. From 2005 to 2008 (all radio-tagged fish combined), 25 downstream passage events and 52 upstream passage events by 40 individual bull trout were recorded at Wells Dam with no observances of bull trout injury or mortality (LGL and Douglas PUD, 2008). From 2005-2007, no adult or sub-adult bull trout were observed utilizing Wells Dam fishways during the winter monitoring period (typically November 16 to April 30). Monitoring of radio-tagged adult bull trout ended in June 2008.

To address potential project-related impacts on sub-adult bull trout, fish were opportunistically tagged with passive integrated transponder (PIT) tags when encountered during standard fish sampling operations at Wells Dam or during off-Project tributary smolt trapping activities. In 2005, 2006, 2007, and 2008 a total of 16, 20, 14, and 17 sub-adult bull trout were PIT-tagged during tributary smolt sampling activities, respectively. No sub-adult bull trout were observed during Wells Dam fish sampling operations or by the adult PIT-tag detection system in the fishways. Over the 2005-2008 period, no sub-adult bull trout were observed utilizing Wells Dam fishways during the winter period.

In 2005, Douglas PUD collected high resolution bathymetric information of Project waters to address the potential for entrapment or stranding of bull trout in off-channel or backwater areas of the Wells Reservoir. This data combined with Wells inflow patterns, reservoir elevations, and backwater curves would allow Douglas PUD to begin identifying entrapment or stranding areas. In 2006, a field survey of potential bull trout stranding sites using bathymetric and operations information was conducted during a period of low reservoir elevation associated with the Methow River flood control program. Following a complete survey of the project, no stranded bull trout (sub-adult or adult) were found during the 2006 low water event. In 2007, reservoir conditions were not sufficiently low to warranted further field investigations.

In support of identifying the local populations and core areas of bull trout utilizing the Project area, Douglas PUD funded the collection of genetic samples from 22, 20, and 24 bull trout in 2005, 2006 and 2007, respectively. In 2005, 6 samples were collected at Wells Dam and 16 were collected at off-Project operations (Methow and Twisp river screw traps). In 2006, 10 samples were collected at Wells Dam and 10 samples were collected at off-Project operations. In 2007, 10 samples were collected at Wells Dam and 14 samples were collected at off-Project operations. All genetic samples were provided to the USFWS.

3.0 GOALS AND OBJECTIVES

The goal of the BTMP is to identify, monitor and address impacts, if any, on bull trout resulting from the Project in a manner consistent with the USFWS Bull Trout Recovery Plan and the terms of the Section 7 ITS (See Section 4.7). This BTMP is intended to continue the implementation of management activities to protect bull trout during the new license term in a manner consistent with the original WBTMMP (Douglas 2004). The 2004 WBTMMP was developed in coordination with the USFWS, as required by the USFWS Bull Trout BO in association with the HCP. The PMEs presented within the BTMP are designed to meet the following objectives:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP;

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage;

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures;

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (similar to WBTMMP);

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis. Should bull trout be delisted, the Aquatic SWG will re-evaluate the needs and objectives of the BTMP;

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

This BTMP is intended to be compatible with other bull trout management plans and the Upper Columbia Salmon Recovery Plan (UCSRP) in the Columbia River mainstem. Furthermore, this management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the BTMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goals and objectives described in Section 3.0 of the BTMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures.

4.1 Operate the Upstream Fishways and Downstream Bypass Systems in a Manner Consistent with the HCP (Objective 1)

4.1.1 Provide Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout

Douglas PUD will continue to provide upstream passage for adult bull trout through the existing upstream fishways and downstream passage of adult and sub-adult bull trout through the existing downstream bypass system. Both upstream fishway facilities (located on the west and east shores) are operational year around with maintenance occurring on each fishway at different times during the winter to ensure that one upstream fishway is always operational. Maintenance activities on Wells fishways occur during the winter when bull trout have not been observed passing Wells Dam. Operation of the downstream passage facilities for bull trout will be consistent with bypass operations for Plan Species identified in the HCP. Currently the bypass system is operated from April 12 through August 26 of each year. This operating period is consistent with the period of high bull trout and anadromous fish presence at the Project.

4.1.1.1 Progress Towards Meeting Objective 1 in 2012- Provide Upstream and Downstream Passage for Adult and Sub-Adult Bull Trout

Consistent with the BTMP and the Wells HCP, Douglas PUD maintained safe, efficient and timely passage through the downstream juvenile fish bypass system and upstream adult fishway passage structures for bull trout. Winter maintenance occurred in the adult fishway structures in January 2012 and December 2012. At least one of the adult fishways was in operation at all times during the winter maintenance period (December – February) and both adult fishways were in operation for the remainder of the year (March – November). Juvenile Fish Bypass operations were implemented consistent with the HCP Coordinating Committee approved Bypass Operations Plan for 2012. The dates of operation included initiation on April 9th at 000 hours with the bypass system operated continuously until midnight on August 19th. The 2012 dates of operation for the juvenile fish bypass system were developed in consultation with the Wells HCP Coordinating Committee and are the result of species run-timing estimates developed by the University of Washington, Columbia Basin Research that were reviewed, approved and adopted by the HCP Coordinating Committee and implemented by Douglas PUD prior to the beginning of the 2012 bypass season.

4.1.2 Upstream Fishway Counts

Douglas PUD shall continue to conduct video monitoring in the Wells Dam fishways from May 1st through November 15th to count and provide information on the population size of upstream moving bull trout.

4.1.2.1 Progress Towards Meeting Objective 1in 2012- Upstream Fishway Counts

Seventy four bull trout were counted at Wells Dam fish ladder viewing windows in 2012. Counts at Wells represent a 14% increase in the 12 year average count of 65. Eighty nine percent (89%) of the passage occurred during the months of May and June, which is consistent with the 12 year average of eighty eight percent (88%) of bull trout passage occurring during these months. Bull trout passing Wells Dam in May and June are primarily destined to spawn in the Methow Basin and in particular the upper reaches of the Twisp River. Only three of the 74 bull trout counted at Wells Dam passed the project after July 26th.

4.1.3 Upstream Fishway Operations Criteria

Douglas PUD shall continue to operate the upstream fishway at Wells Dam in accordance with criteria outlined in the HCP.

4.1.3.1 Progress Towards Meeting Objective 1 in 2012- Upstream Fishway Operations Criteria

Consistent with the BTMP and the Wells HCP, Douglas PUD continued to operate the two upstream fishways at Wells Dam in accordance with upstream fishway criteria found in the HCP and as approved by the Wells HCP Coordinating Committee.

4.1.4 Bypass Operations Criteria

Douglas PUD shall continue to operate the bypass system at Wells Dam in accordance with criteria outlined in the HCP.

4.1.4.1 Progress Towards Meeting Objective 1 in 2012- Bypass Operations Criteria

Consistent with the BTMP and the HCP, Douglas PUD continued to operate the juvenile fish bypass system at Wells Dam in accordance with criteria outlined in the Wells HCP and as approved by the HCP Coordinating Committee.

4.2 Identify Any Adverse Project-related Impacts on Adult and Sub-adult Bull Trout Passage (Objective 2)

4.2.1 Adult Bull Trout Upstream and Downstream Passage Evaluation

Douglas PUD shall continue to monitor upstream and downstream passage and incidental take of adult bull trout through Wells Dam and in the Wells Reservoir through the implementation of a radio-telemetry study. Specifically, in years 5 and 10 of the new license, and continuing every

ten years thereafter during the new license term, Douglas PUD will conduct a one-year monitoring program to determine whether Douglas PUD remains in compliance with the ITS. The same study protocols used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2007) will be employed for these monitoring studies.

If the adult bull trout counts at Wells Dam increases more than two times the existing 5-year average or if there is a significant change in the operation of the fish ladders or hydrocombine, then the Aquatic SWG will determine whether additional years of take monitoring are needed beyond those identified in this section of the BTMP. If the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to exceedance of the allowable level of incidental take.

4.2.1.1 Progress Towards Meeting Objective 2 in 2012- Adult Bull Trout Upstream and Downstream Passage Evaluation

Douglas PUD will implement the year 5 Passage Evaluation Study in 2017 or earlier if the 5-year average adult bull trout count of 60 fish increases more than two times (120 or more bull trout counted in a single year). At the time that the Aquatic Settlement Agreement was signed the five year average count of bull trout at Wells Dam was 60 fish. In 2012 the number of observed fish was 74.

No significant changes in the operation of the fish ladders or hydrocombine have been implemented or are proposed that would trigger the early implementation of bull trout passage evaluation.

4.2.2 Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities

Douglas PUD shall assess upstream and downstream passage and incidental take of adult, migratory bull trout at off-Project (outside of the Project boundary) adult salmon and steelhead broodstock collection facilities associated with the Wells HCP. Specifically, beginning in year one of the new license, Douglas PUD will conduct a one-year radio-telemetry study to assess passage and incidental take at off-Project adult collection facilities (i.e., Twisp weir). Douglas PUD will capture and tag up to 10 adult, migratory bull trout (>400mm) at adult collection facilities and use fixed receiver stations upstream and downstream of collection facilities to examine upstream and downstream passage characteristics and incidental take. Study protocols that have been used during past radio-telemetry assessments at Wells Dam (LGL and Douglas PUD 2008) will be employed for this assessment.

If negative impacts to passage associated with Off-Project collection facilities are observed or the authorized incidental take level is exceeded during any one-year period, Douglas PUD will conduct another monitoring study in the succeeding year. If negative impacts to passage continue to be observed or the authorized incidental take level is exceeded in this second year, Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to passage impacts or the exceedance of the allowable level of incidental take.

After year one of the new license, the implementation of this sub-objective will be integrated into the one-year telemetry monitoring program that is to be conducted every ten years (beginning in year 10 of the new license) at Wells Dam as identified in Section 4.2.1. In year 10 of the new license and every 10 years thereafter, bull trout will be captured and tagged only at Wells Dam (Section 4.2.1) since data show that bull trout passing Wells Dam are migrating back into the Methow River watershed (LGL and Douglas PUD 2008). Through the continued deployment of fixed station monitoring at off-Project adult salmon and steelhead broodstock collection facilities, these tagged bull trout will continue to provide passage and take information in support of this sub-objective throughout the term of the new license.

4.2.2.1 Progress Towards Meeting Objective 2 in 2012- Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities

During 2012 Douglas PUD in consultation with the Aquatic SWG developed a study plan to assess incidental take of bull trout at the Twisp River Weir broodstock collection facility. After discussions with the Aquatic SWG and specifically with the USFWS, the parties including the USFWS signatories agreed that Douglas PUD should postpone the Off-Project Passage Evaluation until year five (2017) of the new license when the Bull Trout Passage and Enumeration Study is scheduled to take place at Wells Dam. Combining the studies would provide a more comprehensive study and potentially require less study fish than two independent studies, thereby limiting the overall impact or take associated with these studies on the bull trout population in the Methow Basin. In 2013 Douglas PUD and the Aquatic SWG will submit a letter to the FERC recommending that the Bull Trout Off-Project Collection Facility Passage Evaluation be delayed until 2017.

4.2.3 Sub-Adult Bull Trout Monitoring

While an objective of the BTMP is to identify potential Project impacts on upstream and downstream passage of sub-adult bull trout, Aquatic SWG members (including the USFWS) agree that it is not feasible to assess sub-adult passage because sub-adult bull trout have not been observed at Wells Dam. During the previous six years of bull trout data collection at Wells Dam (BioAnalyst Inc. 2004; LGL and Douglas PUD 2008), sub-adult bull trout have not been documented passing Wells Dam (based upon fishway video counts and bull trout trapping for radio-telemetry). However, it is expected that through the increased monitoring associated with the implementation of the BTMP that there may be additional encounters with sub-adult bull trout. If at any time during the new license term, sub-adult bull trout are observed passing Wells Dam in significant numbers (>10 per calendar year), the Aquatic SWG will recommend reasonable and appropriate methods for monitoring sub-adult bull trout. Specifically, Douglas PUD may modify counting activities, continue to provide PIT tags and equipment, and facilitate training to enable fish sampling entities to PIT tag sub-adult bull trout when these fish are collected incidentally during certain fish sampling operations. This activity will occur the following year of first observation of sub-adult bull trout (>10 per calendar year) and subsequently as recommended by the Aquatic SWG.

4.2.3.1 Progress Towards Meeting Objective 2 in 2012- Sub-Adult Bull Trout Monitoring

On November 10th, 2012, one sub-adult bull trout was observed at Wells Dam during window counts. The sub-adult bull trout collected from the ladder was estimated to be 12 inches or 305 mm. This is the first ever observation of a sub-adult bull trout at Wells Dam. No new sub-adult related monitoring activities were implemented or are proposed; fewer than 10 sub-adult bull trout have been observed at Wells in a single calendar year.

4.3 Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull Trout are Identified (Objective 3)

Douglas PUD shall continue to operate the upstream fishway and downstream bypass at Wells Dam in accordance with the HCP. However, if upstream or downstream passage problems for bull trout are identified (as agreed to by the USFWS and Douglas PUD), Douglas PUD will identify and implement, in consultation with the Aquatic SWG and HCP Coordinating Committee, reasonable and appropriate options to modify the upstream fishway, downstream bypass, or operations to reduce the identified impacts to bull trout passage.

4.3.1 Progress Towards Meeting Objective 3 in 2012- Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull trout are Identified

No new adverse impacts to bull trout were identified in 2012. As a result, Douglas PUD is not proposing to implement any new upstream fishway or downstream bypass measures to reduce new impacts to bull trout.

4.4 Investigate Entrapment or Stranding of Bull Trout during Periods of Low Reservoir Elevation (Objective 4)

During the implementation of the WBTMMP from 2004-2008, Douglas PUD, through the use of high resolution bathymetric information, hydraulic and elevation data, and backwater curves, identified potential bull trout entrapment and stranding areas in the Wells Reservoir. Although no stranded bull trout were observed in these areas during the implementation of the WBTMMP, Douglas PUD will continue to investigate potential entrapment or stranding areas for bull trout through periodic monitoring when periods of low reservoir elevation expose identified sites. During the first five years of the new license, Douglas PUD will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773' MSL). If no incidences of bull trout stranding are observed during the first five years of study, additional assessment will take place every fifth year during the remainder of the license term, unless waived by the Aquatic SWG. If bull trout entrapment and stranding result in take in exceedance of the authorized incidental take level, then reasonable and appropriate measures will be implemented by Douglas PUD, in consultation with the Aquatic SWG, to address the impact.

4.4.1 Progress Towards Meeting Objective 4 in 2012- Implement Reasonable and Appropriate Measures to Modify the Upstream Fishway and Downstream Bypass if Adverse Impacts on Bull trout are Identified

Stranding surveys were not conducted in 2012 since reservoir elevation did not fall below 773' MSL. Article 402 of the new FERC license requires Douglas PUD, in consultation with the Aquatic SWG and NMFS, to develop and file for approval by the FERC, a Bull Trout Stranding Survey Plan. This plan is required to be filed with the FERC by the end of October 2013.

4.5 Participate in the Development and Implementation of the USFWS Bull Trout Recovery Plan (Objective 5)

4.5.1 Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout

Douglas PUD will monitor activities associated with the implementation of other Aquatic Resource Management Plans (white sturgeon, Pacific lamprey, resident fish, aquatic nuisance species, and water quality) and Predator Control Program that may result in the incidental capture and take of bull trout. If the incidental take of bull trout is exceeded due to the implementation of other Aquatic Resource Management Plan activities, then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take. If the incidental take of bull trout is exceeded due to the implementation of the Predator Control Program, then Douglas PUD will develop a plan, in consultation with the HCP Coordinating Committee and the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

4.5.1.1 Progress Towards Meeting Objective 5 in 2012 - Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout

Two activities had the potential to encounter bull trout in 2012, the subyearling life history study and pikeminnow removal. The subyearling life history study is an HCP study focused on the life history and behavior of juvenile Chinook salmon in the Upper Columbia River and principally within the Wells Project. Juvenile subyearling Chinook are collected with beach seines in June and July of 2012 within the Wells Project. Although many non-target taxa were collected, no bull trout were encountered.

The HCP required predator control program, principally Douglas PUD's pikeminnow control program, did not encounter any bull trout in 2012. The pikeminnow control program uses setlines to capture pikeminnow in deep water areas of the Wells Project, over the programs existence (more than fifteen years) no bull trout have been encountered.

4.5.2 Funding Collection of Tissue Samples and Genetic Analysis

Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, Douglas PUD will, if recommended by the Aquatic SWG, collect up to 10 adult bull trout tissue samples in the Wells Dam fishway facilities over a period of one year and fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the bull trout radio-telemetry monitoring study. Samples will be submitted to the USFWS Central Washington Field Office in Wenatchee, Washington. Any sub-adult bull

trout collected during these activities will also be incorporated into the bull trout genetic analysis.

Beginning in year one of the new license, Douglas PUD will collect up to 10 adult bull trout tissue samples from the Twisp River broodstock collection facility over a period of one year and will fund their genetic analysis. Genetic tissue collection will take place concurrent with the implementation of the Off-Project bull trout radio-telemetry monitoring study.

4.5.2.1 Progress Towards Meeting Objective 5 in 2012 - Funding Collection of Tissue Samples and Genetic Analysis

Genetic samples were collected for all of the bull trout captured at the Twisp Weir in 2012. Samples will be analyzed if requested by the Aquatic SWG. Genetic samples will be taken at Wells Dam in year ten of the new license.

4.5.3 Information Exchange and Regional Monitoring Efforts

Douglas PUD will continue to participate in information exchanges with other entities conducting bull trout research and regional efforts to explore availability of new monitoring methods and coordination of radio-tag frequencies for bull trout monitoring studies in the Project.

Douglas PUD will make available an informational and educational display at the Wells Dam Visitor Center to promote the conservation and recovery of bull trout in the Upper Columbia River and associated tributary streams.

4.5.3.1 Progress Towards Meeting Objective 5 in 2012 - Information Exchange and Regional Monitoring Efforts

Douglas PUD participated in bull trout recovery planning meetings held by the USFWS in 2012. These meetings focused on recovery planning and genetic assignment development in the Methow, Entiat and Wenatchee river basins. In addition, information was shared with regional partners via PTAGIS, a regional PIT tag database. All PIT tag data was made publicly available through this website.

4.6 Identify Any Adverse Impacts of Project-related Hatchery Operations on Adult and Sub-adult Bull Trout (Objective 6)

4.6.1 Bull Trout Monitoring During Hatchery Activities

During the term of the new license, Douglas PUD shall monitor hatchery actions (e.g., salmon trapping, sturgeon brood stocking and capture activities) that may encounter adult and sub-adult bull trout for incidental capture and take. Actions to be monitored shall be associated with the Wells Hatchery, the Methow Hatchery, and any future facilities directly funded by Douglas PUD.

If the incidental take of bull trout is exceeded due to Douglas PUD's hatchery actions then Douglas PUD will develop a plan, in consultation with the Aquatic SWG, to address the identified factors contributing to the exceedance of the allowable level of incidental take.

4.6.1.1 Progress Towards Meeting Objective 6 in 2012 - Bull Trout Monitoring During Hatchery Activities

In 2012, the number of bull trout encountered during hatchery operation activities was comparable to previous years. Hatchery actions in 2012 were very similar to other years where broodstock are collected at Wells Dam and the Twisp Weir traps. In addition, the Twisp Weir is used to control the ratio of natural origin and hatchery steelhead and spring Chinook spawning in the upper reaches of the Twisp River. Screw traps used during HCP related smolt monitoring and evaluation activities in the Methow River Basin often encounter juvenile bull trout. All of these trapping activities are conducted by Douglas PUD's lead hatchery contractor the Washington State Department of Fish and Wildlife.

During trapping activities in 2012, sixty-nine and two adult bull trout were incidentally captured at the Twisp Weir and at Wells Dam, respectively. All of these bull trout were given a PIT tag if they did not carry an existing tag. All captured fish were released in good condition, with no lethal take observed. Captured bull trout at both facilities are within allowable take limits. Seventeen sub-adult bull trout were captured at the Twisp River screw trap and none were encountered at the Methow River screw trap at McFarland (Carlton, WA). All bull trout captured at the Twisp screw trap were given PIT tags and released in good condition. No lethal take was observed. Take limits at screw trap facilities operated by Douglas PUD and its contractors were within allowable limits in 2012.

Article 402 of the FERC license for the Wells Project requires Douglas PUD to develop, in consultation with the Aquatic SWG and the NMFS, a study plan to monitor incidental take associated with the implementation of activities at the Wells Hatchery. Douglas PUD is planning to file this study plan with the FERC for approval by the end of October 2013.

4.7 USFWS Section 7 Consultation

The PMEs contained within the BTMP were specifically developed, in consultation with the USFWS, to address potential Reasonable and Prudent Measures (RPMs) for the Project relicensing and associated section 7 consultation. All of the USFWS's potential RPMs for the Wells Project can be found in Appendix A. Each of these RPMs has been cross referenced with the specific supporting objective and PME (Sections 4.1 - 4.6) found within the BTMP. The purpose of Appendix A is to provide consistency with Douglas PUD's Aquatic Settlement Agreement and the USFWS' subsequent section 7 consultation on the relicensing of the Wells Project.

4.7.1.1 Progress Towards Meeting Objective 5 in 2012 - USFWS Section 7 Consultation

On March 16th 2012, the USFWS issued a bull trout BO related to the relicensing of the Wells Project. The BO contained various RMPs and the terms and conditions (T&Cs). These RPM's and T&Cs can be found within Appendix E of the FERC license for the Wells Project and they

are entirely consistent and cross referenced with the measures found in the BTMP, and more specifically with the measures reported within this report (2012 BTMP annual report).

4.8 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the BTMP. The report will document all bull trout activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this BTMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.8.1.1 Progress Towards Meeting Annual Reporting Requirements

In addition to the reporting requirements found within the Aquatic Settlement Agreement requiring the submission of annual reports for all six of the management plans including the BTMP, Article 406 of the FERC license for the Wells Project also requires Douglas PUD to submit annual reports detailing the implementation of each of the six Aquatic Settlement Agreement management plans.

In addition to the bull trout reporting requirements above, one addition bull trout reporting requirement can be found in the bull trout BO (Appendix E of the FERC license). The bull trout BO requires Douglas PUD to submit an annual take report to the Central Regional Office of the USFWS on or before April 15th of each year of the new license.

Because the measures required by the BO are entirely consistent with the measures found in the Aquatic Settlement Agreement's BTMP and because the reporting requirements for the BTMP, bull trout BO and Article 406 are consistent, the 2012 BTMP Annual Report (this report) will be used to satisfy all three of the bull trout annual reporting requirements.

5.0 REFERENCES

Baxter, C. V. and F. R. Hauer. 2000. Geomorphology, hyporheic exchange, and the selection of spawning habitat by bull trout (*Salvelinus confluentus*). Canadian Journal of Aquatic Science. 57:1470-1481.

BioAnalysts, Inc. 2004. Movement of Bull Trout within the Mid-Columbia River and Tributaries, 2001-2004. Prepared by BioAnalysts, Inc., Eagle Rock, Idaho for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 1 of Grant County, Ephrata, WA.

Brewin, P. A. and M. K. Brewin. 1997. Distribution maps for bull trout in Alberta. Pages 206-216 in: Mackay, W.C., M. D. Brewin and M. Monita, editors. Friends of the Bull Trout Conference Proceedings. Bull Trout Task Force (Alberta), c/o Trout Unlimited Calgary, Alberta, Canada

Cavender, T. M. 1978. Taxonomy and distribution of the bull trout, Salvelinus confluentus (Suckley) from the American Northwest. California Fish and Game 64:139-174.

Douglas (Public Utility District No. 1 of Douglas County). 2004. Wells Hydroelectric Project Bull Trout Monitoring and Management Plan, 2004-2008. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

English, K. K., T. C. Nelson, C. Sliwinski, and J. R. Stevenson. 1998. Assessment of passage facilities for adult sockeye, chinook, and steelhead at Rock Island and Rocky Reach dams on the mid-Columbia River in 1997. Report to Public Utility District No. 1 of Chelan County, Wenatchee, WA.

English, K. K., C. Sliwinski, B. Nass, and J. R. Stevenson. 2001. Assessment of passage facilities for adult steelhead at Priest Rapids, Wanapum, Rock Island, Rocky Reach, and Wells dams on the mid-Columbia River in 1999. Report to Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Goetz, F. 1989. Biology of Bull Trout, *Salvelinus Confluentus*: a Literature Review, USDA Forest Service, Willamette National Forest. Eugene. OR.

Kraemer, C. 1994. Some observations on the life history and behavior of the native char, Dolly Varden (Salvelinus malma) and bull trout (Salvelinus confluentus) of the North Puget Sound Region. Washington Department of Wildlife. Draft.

LGL and Douglas PUD. 2007. Wells bull trout monitoring and management plan, 2006 Annual Report. Wells Hydroelectric Project FERC No. 2149.

LGL and Douglas PUD. 2008. Bull trout monitoring and management plan, 2005-2008 final report. Wells Hydroelectric Project FERC No. 21.49. Prepared for Public Utilities District No. 1 of Douglas County. East Wenatchee, Washington.

McPhail, J. D. and J. S. Baxter. 1996. A review of bull trout (Salvelinus confluentus) life history and habitat use in relation to compensation and improvement opportunities. Fisheries management report no. 104. University of British Columbia. Vancouver, B.C.

Mongillo, P. E. 1993. The distribution and status of bull trout/Dolly Varden in Washington State. Washington Department of Wildlife. Fisheries Management Division, Report 93- 22. Olympia, Washington. 45 pp.

Pleyte, Kay A., S. D. Duncan, and R. B. Phillips. 1992. Evolutionary relationships of the fish genus Salvelinus inferred from DNA sequences of the first internal transcribed spacer (ITS 1) of ribosomal DNA. Molecular Phylogenetics and Evolution, 1(3): 223-230.

Riehle, M. W. Weber, A. M. Stuart, S. L. Thiesfeld and D. E. Ratliff. 1997. Progress report of the multi-agency study of bull trout in the Metolius River system, Oregon. In Friends of the Bull Trout Conference Proceedings. Bull Trout Task Force. Calgary, (Alberta). Pages 137-144.

Rieman, B. E., and J. D. McIntyre. 1993. Demographic and habitat requirements for conservation of bull trout. U.S. Forest Service, Intermountain Research Station. General Technical Report INT-302.

Rieman, B. E., and J. D. McIntyre. 1995. Occurrence of bull trout in naturally fragmented habitat patches of varied size. Transactions of American Fisheries Society. Vol. 124 (3): 285-296.

Rieman, B. E., D. C. Lee and R. F. Thurow. 1997. Distribution, status and likely future trends of bull trout within the Columbia River and Klamath Basins. North American Journal of Fisheries Management. 17(4): 1111-1125.

Sexauer, H. M. and P. W. James. 1993. A survey of the habitat use by juvenile and prespawning adult bull trout, Salvelinus confluentus, in four streams in the Wenatchee National Forest. Ellensburg, WA, Central Washington University.

U.S. Fish and Wildlife Service, National Marine Fisheries Service, Plum Creek Timber Company, Inc., and CH2M Hill. 2000. Final Environmental Impact Statement and Native Fish Habitat Conservation Plan – Proposed Permit for Taking of Federally Listed Native Fish Species on Plum Creek Timber Company, Inc. Lands. September, 2000.

U.S. Fish and Wildlife Service. 2002. Chapter 22, Upper Columbia Recovery Unit, Washington. 113 p. In: U.S. Fish and Wildlife Service. Bull Trout (Salvelinus confluentus) Draft Recovery Plan. Portland, Oregon.

U.S. Fish and Wildlife Service. 2008a. News Release: Status Review of Bull Trout Completed. Contacts T. Koch and J. Jewett. Portland, OR.

U.S. Fish and Wildlife Service. 2008b. Bull Trout (*Salvelinus confluentus*). 5-Year Review: Summary and Evaluation. Portland, OR.

Volk, E. C. 2000. Using otolith strontium to infer migratory histories of bull trout and Dolly Varden from several Washington State rivers. Submitted to Olympic National Park in fulfillment of Contract #2550041. Washington Department of Fish and Wildlife, Olympia.

APPENDIX A

CROSS REFERENCED UNITED STATES FISH AND WILDLIFE SERVICE (USFWS) REASONABLE AND PRUDENT MEASURES (RPMS) WITH WELLS BULL TROUT MANAGEMENT PLAN (BTMP) OBJECTIVES AND SUPPORTING PROTECTION, MITIGATION AND ENHANCEMENT MEASURES (PMES)

FWS RPM 1: FERC shall require Douglas PUD, in coordination with the Service, to provide adequate year-round passage conditions for all life history stages of bull trout at all Project facilities.

Associated BTMP Objectives and PMEs:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).

PME: Upstream Fishway Counts (Section 4.1.2).

PME: Upstream Fishway Operations Criteria (Section 4.1.3).

PME: Bypass Operations Criteria (Section 4.1.4).

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

PME: Adult Bull Trout Upstream and Downstream Passage Evaluation (Section 4.2.1).

PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).

PME: Sub-Adult Bull Trout Monitoring (Section 4.2.3).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures.

FWS RPM 2. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effect of spillway operations and hydrographic variation to all life history stages of bull trout at all Project facilities.

Associated BTMP Objectives and PMEs:

Objective 1: Operate the upstream fishways and downstream bypass systems in a manner consistent with the HCP (Section 4.1).

PME: Provide Upstream and downstream Passages for Adult and Sub-Adult Bull Trout (Section 4.1.1).

PME: Upstream Fishway Operations Criteria (Section 4.1.3).

PME: Bypass Operations Criteria (Section 4.1.4).

Objective 3: Implement reasonable and appropriate options to modify upstream fishway, downstream bypass, or operations if adverse impacts on bull trout are identified and evaluate effectiveness of these measures (Section 4.3).

Objective 4: Periodically monitor for bull trout entrapment or stranding during low Wells Reservoir elevations (Section 4.4).

FWS RPM 3. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the Hatchery Supplementation Program to all life stages of bull trout.

Associated BTMP Objectives and PMEs:

Objective 2: Identify any adverse Project-related impacts on adult and sub-adult bull trout passage (Section 4.2).

PME: Adult Bull Trout Passage Evaluation at Off-Project Collection Facilities (Section 4.2.2).

Objective 6: Identify any adverse impacts of Project-related hatchery operations on adult and sub-adult bull trout.

PME: Bull Trout Monitoring During Hatchery Activities (Section 4.6.1).

FWS RPM 4. FERC shall require Douglas PUD, in coordination with the Service, to minimize the effects of the other Aquatic Resource Management Plans and Predator Control Program to all life stages of bull trout.

Associated BTMP Objectives and PMEs:

Objective 5: Participate in the development and implementation of the USFWS Bull Trout Recovery Plan, including information exchange and genetic analysis (Section 4.5).

PME: Monitor other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout (Section 4.5.1).

FWS RPM 5. FERC shall require Douglas PUD, in coordination with the Service, to design and implement a bull trout monitoring program that will adequately detect and quantify Project impacts. This information will reduce uncertainty regarding Project impacts over the life of the project and shall be used to modify Project operations to the extent practicable to further minimize the manner or extent of take.

Associated BTMP Objectives and PMEs:

Refer to Wells Bull Trout Management Plan in its entirety.

Additional PMEs Proposed in the BTMP (not listed above):

PME: Funding Collection of Tissue Samples and Genetic Analysis (Section 4.5.2).
PME: Information Exchange and Regional Monitoring Efforts (section 4.5.3).

2012 ANNUAL REPORT

PACIFIC LAMPREY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey (*Lampetra tridentata*) resulting from the Project during the term of the new license. Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with the Aquatic Settlement Work Group (Aquatic SWG), has agreed to implement several Pacific lamprey PMEs in support of the PLMP. This report summarizes actions carried out in 2012 that are associated with the PMEs presented within the ANSMP which are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. In 2012, Douglas PUD carried out several activities associated with PMEs under objective 1 of the PLMP. Douglas PUD maintained safe, efficient and timely passage through the upstream adult fishway passage structures for all native fish species including Pacific lamprey and monitored fish passage 24 hours a day during fish passage season. The Wells Dam adult fishway collection galleries were operated at a reduced head differential each night during the peak of lamprey migration to enhance lamprey passage. During the fish ladder maintenance period in 2012, Douglas PUD implemented the practices and procedures in the Adult Ladder Dewatering Plan to minimize the presence of lamprey and other fish and to safely place any stranded fish back into the Columbia River. Douglas PUD also developed an adult Pacific lamprey passage study in 2012 that is scheduled for completion in 2013.

Objective 2: Identify and address any Project-related impacts on downstream passage and survival and rearing of juvenile Pacific lamprey. In 2012, to improve downstream passage and survival of juvenile fish, Douglas PUD operated the downstream bypass system at Wells Dam from April 9th to August 19th. During dewatering of the Wells Dam fishways for maintenance in 2012, Douglas PUD conducted salvage operations to salvage and release any stranded juvenile lamprey.

Objective 3: Participate in the development of regional Pacific lamprey conservation activities. In 2012, Douglas PUD representatives attended and participated in regional coordination and information exchange related to Pacific lamprey.

The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with

other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

In addition to the requirements found within the PLMP, the new FERC license for the Wells Project added several additional lamprey passage measures. The 2013 annual report on the implementation of the PLMP will include all of the lamprey related activities implemented at the Wells Project from the issuance of the new license in November 2012 to the end of December 2013 and will also include any Pacific lamprey- related reports filed with the Aquatic SWG and the Federal Energy Regulatory Commission during calendar year 2013.

1.0 INTRODUCTION

The Pacific Lamprey Management Plan (PLMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The PLMP will direct implementation of measures to protect against and mitigate for potential Project impacts on Pacific lamprey (*Lampetra tridentata*). To ensure active stakeholder involvement and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of Pacific lamprey in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies the goal and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for Pacific lamprey during the term of the new license.

In addition to the requirements found within the PLMP, the new Federal Energy Regulatory Commission (FERC) license has added several additional lamprey related requirements associated with the continued operation of the Wells Project. The 2013 annual report on the implementation of the PLMP will include all of the Pacific lamprey related activities that took place from the issuance of the new license in November 2012 to the end of December 2013 and will also include any lamprey related reports and plans filed with the Aquatic SWG and the FERC during calendar year 2013.

2.0 BACKGROUND

2.1 Pacific Lamprey Biology

Pacific lamprey are present in most tributaries of the Columbia River and in the mainstem Columbia River during their migration stages. They have cultural, utilitarian and ecological significance in the basin, because Native Americans have historically harvested them for subsistence, ceremonial and medicinal purposes (Close et al. 2002). As an anadromous species, they also play an important role in the food web by contributing marine-derived nutrients to the basin and may act as a predatory buffer for juvenile salmon and steelhead. Little specific information is available on the life history or status of lamprey in the mid-Columbia River watersheds. They are known to occur in the Methow, Wenatchee and Entiat rivers (NMFS 2002) and recently have been captured during juvenile salmon and steelhead trapping operations in the Okanogan River.

In general, adults are parasitic on fish in the Pacific Ocean while ammocoetes (larvae) are filter feeders that inhabit the fine silt deposits in backwaters and quiet eddies of streams (Wydoski and Whitney 2003). Adults generally spawn in low-gradient stream reaches in the tail areas of pools and in riffles, over gravel substrates (Jackson et al. 1997). Adults die after spawning. After hatching, the ammocoetes burrow into soft substrate for an extended larval period filtering particulate matter from the water column (Meeuwig et al. 2002). The ammocoetes undergo a metamorphosis into macrophthalmia (outmigrating juvenile lamprey) between 3 and 7 years after hatching, and then migrate from their parent streams to the ocean (Close et al. 2002). Adults typically spend 1-4 years in the ocean before returning to freshwater tributaries to spawn.

Pacific lamprey populations of the Columbia River have generally declined in abundance over the last 40 years according to counts at dams on the lower Columbia and Snake rivers (Close et al. 2002). Starke and Dalen (1995) reported that adult lamprey counts at Bonneville Dam regularly exceeded 100,000 fish in the 1960s and more recently have ranged between 20,000 and 120,000 for the period 2000-2004 (DART - www.cqs.washington.edu/dart/adult.html).

In the mid-Columbia River Basin, adult lamprey count data at hydroelectric projects varies by site but is generally available for all projects since 1998 (with the exception of Wanapum Dam where data is only available for 2007). As is expected, the general trend for mid-Columbia River counts is relatively consistent with observations at Bonneville Dam from year to year (i.e., relatively high count years at Bonneville result in relatively high count years in the mid-Columbia River). It is important to note that the daily and seasonal time periods as well as the counting protocols may differ at each project. These differences may affect data reliability and need to be considered when examining and comparing these data. Table 2.1-1 provides a summary of adult lamprey passage data for mid-Columbia River hydroelectric facilities.

Table 2.1-1. Minimum, maximum, and average counts for adult Pacific lamprey at mid-Columbia River hydroelectric projects from 1998 to 2007.

	Priest Rapids	Wanapum*	Rock Island	Rocky Reach	Wells
Min	1,130	4,771	559	303	21
Max	6,593	4,771	5,074	2,583	1,417
Average	3,016	4,771	2,157	952	326

* Wanapum Dam counts are only available for 2007.

Close et al. (1995, 2002) identified several factors that may account for the decline in lamprey counts in the Columbia River Basin. This includes reduction in suitable spawning and rearing habitat from flow regulation and channelization and pollution, reductions of prey in the ocean, and juvenile and adult passage problems at dams. Mesa et al. (2003) found that adult Pacific lamprey had a mean critical swimming speed of approximately 85 cm/s which suggests that they may have difficulty negotiating fishways with high current velocities that were designed for salmon and steelhead passage.

The study of adult Pacific lamprey migration patterns past dams and through reservoirs in the lower Columbia River has provided the first data sets on lamprey passage timing, travel times, and passage success at hydroelectric projects (Vella et al. 2001; Ocker et al. 2001; Moser et al. 2002a; Moser et al. 2002b). These studies have shown that approximately 90% of the radio-tagged lamprey released downstream of Bonneville Dam migrated back to the tailrace below Bonneville Dam; however, less than 50% of the lamprey which encountered a fishway entrance actually passed through the ladder exit at the dam (Nass et al. 2005).

Similar collection and passage efficiency results were observed at Rocky Reach, Wanapum, and Priest Rapids dams during tagging studies conducted at those projects (Nass et al. 2003; Stevenson et al. 2005).

Of the 125 radio-tagged lampreys released approximately 7 kilometers downstream of Rocky Reach Dam, 93.6% were detected at the project, and of those fish, 94.0% entered the fishway. Of the fish that entered the Rocky Reach fishway, 55.5% exited the ladder (Stevenson et al. 2005).

During studies at Wanapum and Priest Rapids dams, a total of 51 and 74 lamprey were radio-tagged and released downstream of Priest Rapid Dam in 2001 and 2002, respectively. Over the two years of study, the proportion of fish that approached the fishway that exited the ladders was 30% and 70% at Priest Rapids and 100% and 51% at Wanapum Dam in 2001 and 2002, respectively (Nass et al. 2003).

Two recent reviews of Pacific lamprey (Hillman and Miller 2000; Golder Associates Ltd. 2003) in the mid-Columbia River have indicated that little specific information is available regarding their population status (Stevenson et al. 2005).

2.2 Status of Pacific Lamprey

In January 2003, the USFWS received a petition from 11 environmental groups seeking the listing of four lamprey species (Pacific lamprey, river lamprey, western brook lamprey, and Kern brook lamprey). The petition cited population declines and said lamprey are threatened by artificial barriers to upstream and downstream migration, de-watering and habitat degradation among other threats. In response to the petition, the USFWS conducted an initial review to determine whether an emergency listing was warranted and decided in March 2003 that such a situation did not exist.

In an agreement stemming from a lawsuit filed by the petitioners in response to the initial finding, the USFWS committed to the issuance of a 90-day finding on the petition by December 20, 2004. Again, the USFWS announced that the petition seeking a listing of the four lamprey species did not contain enough information to warrant further review and the agency was not going to place the lamprey species on the Endangered Species list. For Pacific lamprey, the petitioners provided information showing a drop in range and numbers, but did not provide information describing how the regional portion of the species' petitioned range, or any smaller portion, is appropriate for listing under the Endangered Species Act (ESA). The agency did however decide it will continue to work with others on efforts to gather information related to the conservation of lamprey and their habitats.

2.3 Monitoring and Studies of Outmigrating Juvenile Lamprey (Macrophthalmia)

Little information in the mid-Columbia River Basin exists with regard to the outmigration timing and abundance of juvenile Pacific lamprey. Upstream of the Project, recent juvenile salmonid trapping operations by WDFW and the Colville Tribe have provided preliminary information on the presence of juvenile lamprey outmigrants in both the Methow and Okanogan rivers. This information represents incidental captures of juvenile lamprey, and may not be reflective of actual abundance or population trends. In the Okanogan River, information is available for 2006 and 2007 where 220 and 24 juvenile lamprey were observed, respectively, during spring trapping operations. In the Methow River watershed, information is available for two sites; the Twisp and Methow rivers. At the Twisp River site, no juvenile lamprey have been observed since data has been collected (2005). At the Methow River site, for the years 2004-2007, 89, 84, 831, and 37 juvenile lamprey were observed, respectively, in trapping operations that typically last from April to November with peaks generally occurring in the spring. Data collection from these activities is likely to continue and provide information on juvenile Pacific lamprey as they begin their outmigration through the Columbia River hydrosystem towards the Pacific Ocean.

Although there is a growing body of information on adult Pacific lamprey and their interactions at hydroelectric projects, relatively little information exists describing the effects of hydroelectric plant operations on macrophthalmia. Recent juvenile lamprey studies at hydroelectric projects have addressed testing for lamprey macrophthalmia survival through juvenile bypass facilities (Bleich and Moursund 2006), impingement at intake diversion screens (Moursund et al. 2000 and 2003), validation of existing screening criteria (Ostrand 2005), and responses of juvenile Pacific lamprey to simulated turbine passage environments (Moursund et al. 2001; INL 2006).

Results of other studies targeting predaceous birds and fish suggest that juvenile lamprey may compose a significant proportion of the diets of these predators (Poe et al. 1991; Merrell 1959).

A review of the recent body of work addressing juvenile lamprey at hydroelectric facilities concludes that there is a current lack of methods and tools to effectively quantify the level of survival for juvenile lamprey migrating through hydroelectric facilities. Furthermore, no studies exist that assign a level of survival attributed to a project's operations. This is due to the lack of miniaturized active tag technologies to overcome two study limitations. Macrophthalmia are relatively small in size and unique in body shape and they tend to migrate low in the water column resulting in the rapid attenuation of active tag signal strength. In an effort to develop a tagging protocol, the Bonneville Power Administration (BPA) funded Oregon State University (OSU) to identify and develop tag technologies for lamprey macrophthalmia. Recent reports on this developmental effort have concluded that the smallest currently available radio-tag was still too large for implantation in the body cavity of a juvenile lamprey (Schreck et al. 2000). Additionally, external application was not effective as animals removed tags within the first week and fish performance was affected. This report also concluded that internal implantation of Passive Integrated Transponder (PIT) tags was the most viable option for tagging juvenile lamprey although this method included severe limitations such as the limited range of detection systems and the ability to tag only the largest outmigrating juvenile lamprey (Schreck et al. 2000).

2.4 Project Adult Pacific Lamprey Counts and Passage Timing

Returning adult Pacific lamprey have been counted at Wells Dam since 1998. Between the years of 1998 and 2007, the number of lamprey passing Wells Dam annually has averaged 326 fish and ranged from 21 fish in 2006 to 1,417 fish in 2003 (Table 2.4-1). In addition to the overriding condition that Pacific lamprey numbers are declining in the Columbia River system, the relatively small number of adult lamprey observed at Wells Dam may be attributed to fact that the Project is the last of nine passable dams on the mainstem Columbia River and the fact that the Project is over 500 miles upstream from the Pacific Ocean and the bioenergetic expenditure for a relatively poor swimming species such as Pacific lamprey is likely great.

Adult lamprey pass Wells Dam from early July until late November with peak passage times between mid-August and late October (Figures 2.4-1 and 2.4-2). In all years since counting was initiated, Pacific lamprey counts at the east fish ladder were greater than at the west fish ladder except for 2007. It is important to note that historically, counting protocols were designed to assess adult salmonids and did not necessarily conform to lamprey migration behavior (Moser and Close 2003). Traditional counting times for salmon did not coincide with lamprey passage activity which occurs primarily at night; the erratic swimming behavior of adult lamprey also makes them inherently difficult to count (Moser and Close 2003). Beamish (1980) also noted that lamprey overwinter in freshwater for one year prior to spawning. Consequently, lamprey counted in one year may actually have entered the system in the previous year (Moser and Close 2003) which confounds annual returns back into the Columbia River Basin. In addition to salmonid-specific counting protocols, adult fishway facilities have been constructed specifically for passage of salmonids. Recent research has identified areas such as picketed lead structures downstream of fish count windows that adult lamprey may access to bypass count stations and

avoid being enumerated (LGL 2008). It is unknown to what degree lamprey behavior and methodological and structural concerns are reflected in Columbia River lamprey passage data. However, it is important to consider such caveats when examining historic lamprey count data at Columbia River dams including Wells Dam.

Table 2.4-1 Adult Pacific lamprey counts at Wells Dam for east and west fish ladders, 1998-2007.

	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
East	174	47	96	153	226	724	263	151	13	17
West	169	26	59	106	117	694	140	64	8	18
Total	343	73	155	259	343	1418	403	215	21	35

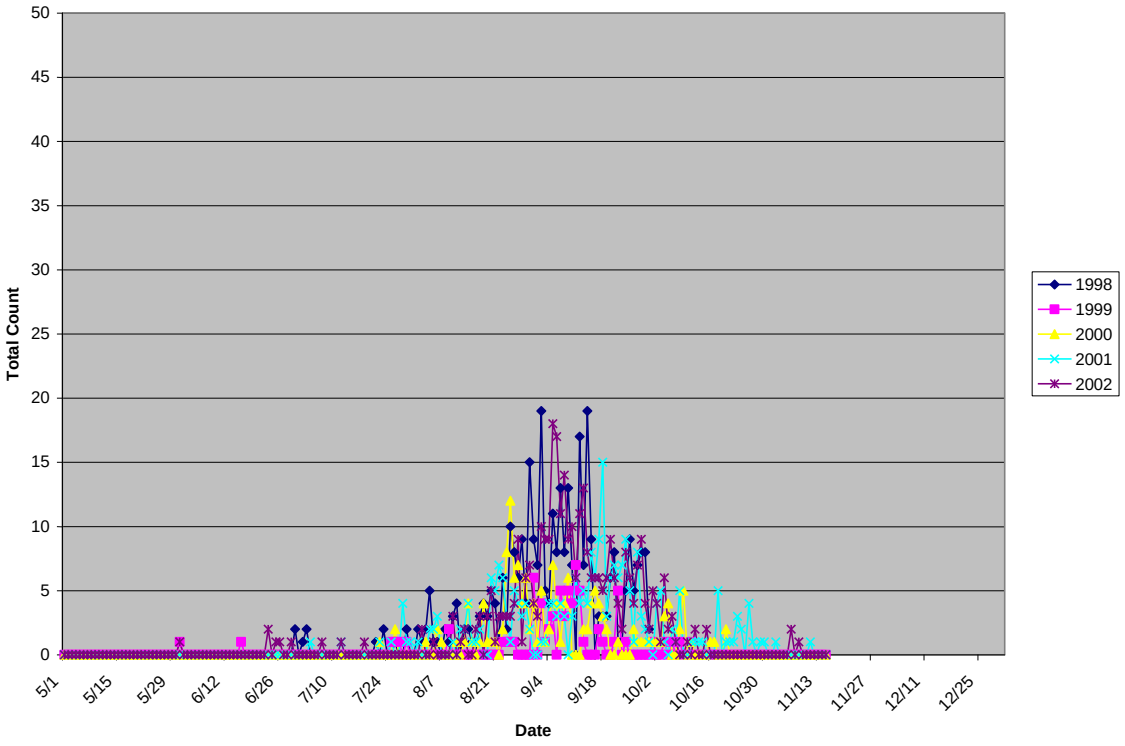

Figure 2.4-1 Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 1998-2002.

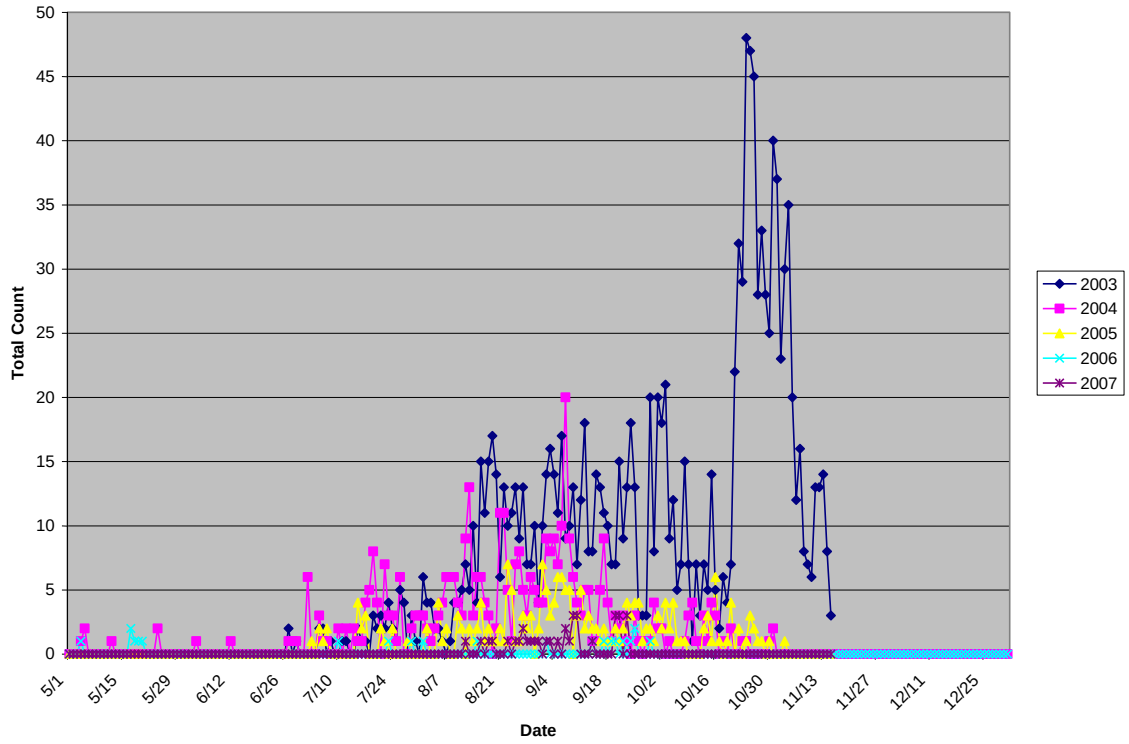

Figure 2.4-2 Daily counts of adult Pacific lamprey at Wells Dam during the fish counting season, 2003-2007.

2.5 Project Pacific Lamprey Studies

Until recently, relatively little information was available on Pacific lamprey in the mid-Columbia River Basin. However, with increased interest in the species coupled with a petition for listing under the ESA (Section 2.2), Douglas PUD has initiated studies to address Pacific lamprey passage and migratory behavior in the Project consistent with currently available technology.

2.5.1 2001-2003 Project Pacific Lamprey Study

In 2004, Douglas PUD contracted with LGL Limited to conduct a lamprey radio-telemetry study at Wells Dam in coordination with Chelan PUD, which was conducting a similar study at Rocky Reach Dam. A total of 150 lamprey were radio-tagged and released at or below Rocky Reach Dam. The radio tags used in this study had an expected operational life of 45 days (Nass et al. 2005). It is important to note that as a result of the lamprey release site being located over 50 miles downstream of Wells Dam, the value of the study results for the Project was limited by the relatively small numbers of tagged fish detected upstream at Wells (n=18) and the fact that many of the radio tags detected at Wells Dam were within days of exceeding their expected battery life.

The 2004 study at Wells Dam was implemented through a combination of fixed-station monitoring at the dam and fixed-stations at tributary mouths. Collectively, these monitoring sites were used to determine migration and passage characteristics of lamprey entering the

Project Area. Of the 150 adult lamprey released at or below Rocky Reach in 2004, 18 (12% of 150) were detected in the Wells Dam tailrace, and ten (56% of 18) of these were observed at an entrance to the fishways at Wells Dam. A total of 3 radio-tagged lamprey passed Wells Dam prior to expiration of the tags, resulting in a Fishway Efficiency estimate of 30% (3 of 10) for the study period. A single lamprey was detected upstream of Wells Dam at the mouth of the Methow River (Nass et al. 2005).

For lamprey that passed the dam, the majority (92%) of Project passage time was spent in the tailrace. Median time required to pass through the fishway was 0.3 d and accounted for 8% of the Project passage time (Nass et al. 2005).

Although the 2004 study at Wells Dam provided preliminary passage and behavioral information for migrating adult lamprey, the limited observations due to the small sample size (n=18) were insufficient in addressing the objectives of the 2004 study.

2.5.2 2007-2008 Project Pacific Lamprey Study

In 2007, Douglas PUD contracted with LGL Limited to conduct a second lamprey radio-telemetry study at Wells Dam. The study was scheduled to occur from early August through November and utilized tags that had 87 days of battery life. A total of 21 adult lamprey were tagged and released for the purpose of this study. However, due to very low adult lamprey returns to Wells Dam in 2007 (n=35) and low trapping efficiency, only 6 adult Pacific lamprey were captured at Wells Dam during trapping activities (August 14 to October 3). Therefore, 15 additional adult lamprey were collected at Rocky Reach Dam, transported to Wells Dam, tagged and released. The project was continued in 2008 to obtain additional information.

A comprehensive report was produced in February of 2009 containing the results from the two-year radio-telemetry behavior studies (Robichaud et al. 2009). Results indicated that the "greatest impediment to successful passage of adult lamprey at Wells Dam appears to be the conditions at the fishway entrance, probably related to water velocities that limit swimming and attachment capabilities." An equally significant impediment to successful passage of adult lamprey at Wells Dam in 2008 was the installation of perforated plates on the floor of the weir orifices in an effort to increase trapping efficiency. Robichaud et al. further recommended the following:

- Implement a reduction in fishway head differential to reduce entrance velocities to levels within the swimming capabilities of Pacific lamprey (0.8 to 2.1 m/s). These proposed flow reductions should be restricted to hours of peak lamprey activity (i.e., nighttime) and within their primary migratory period at Wells Dam (August-September).
- Remove perforated plates from orifice floors at the current trapping locations and discontinue trapping efforts at Wells Dam.
- Consider using monitoring tools that are less intrusive, do not require the collection of fish from the ladders at Wells Dam, and minimize the surgical implantation of tags in fish that are nearing their physiological limits.

2.5.3 2009-2010 Pacific Lamprey Ladder Modification Study

In response to Robichaud et al. (2009), Douglas PUD, in consultation with the Aquatic Settlement Work Group (Aquatic SWG), prepared a plan to implement and evaluate measures to enhance entrance efficiency of adult Pacific lamprey at Wells Dam (Johnson et al. 2011). These measures, originally scheduled for year two after license issuance (2013), were designed to determine whether temporary velocity reductions at the fishway entrances would enhance the attraction and relative entrance success of adult lamprey at Wells Dam.

DIDSON units were deployed at Wells Dam fishway entrances during the peak of historic Pacific lamprey migration in 2009 (20 August to 24 September) and 2010 (7 August to 30 September). DIDSON was used to sample lamprey behavior and upstream passage events along the entire width of the fishway entrances and 1.3 m of vertical coverage above the sills (about 26% of the wetted vertical opening). Lamprey passage was examined relative to variable head differential treatments and entrance velocities. In 2009, three head differential treatments were tested: existing high (0.48 m; or 3.0 m/sec), moderate (0.31 m; or 2.4 m/sec) and low condition (0.15 m; or 1.8 m/sec) (Johnson et al. 2010). In 2010, only two of the 2009 treatments were used: existing high, and the moderate head differential conditions (Johnson et al. 2011). Treatments were grouped in 3-day blocks and lasted four hours each evening in 2009 (21:00 through 00:59). In 2010, the treatments were paired and lasted eight hours each evening (17:00 through 00:59). Data collected during the treatment periods were reviewed and all lamprey observations were described.

Combining both years, a total of seven lamprey observations were recorded where lamprey were observed to encounter the entrance sill heading upstream (N = 5 in 2009; and N = 2 in 2010). Five of these seven observations were in the east fishway and two were in the west fishway. Overall, five of the seven observations showed successful entry into the fishways (71%). During reduced head differential treatments, five observations were recorded with four of the five resulting in successful entry (80% efficiency). Three of three observations with the moderate head differential condition resulted in successful entry (100% entrance efficiency). During high head differential conditions, one of the two lamprey observed entered a fishway (50% entrance efficiency).

Four lamprey exhibited attach and burst behaviors (one during low (25%), two during moderate (50%) and one during high head differential conditions (25%)), all of which resulted in successful entry into the fishways. One of three lampreys that did not exhibit the former behavior successfully entered the fishway, under the moderate treatment condition. The other two lamprey that did not exhibit attach and burst behavior did not successfully enter the fishway.

Extremely low Columbia River basin lamprey runs in 2009 and 2010 resulted in few fish observed at Wells Dam (the ninth and last hydroelectric project on the Columbia River [river mile 516] with fish passage). Low sample sizes precluded statistical evaluation of these results. Nonetheless, operational modifications implemented in these two years of study suggest that lamprey entrance efficiency may be increased with lower head conditions. Pooling observations that occurred during reduced head differential treatments shows 80% (4 of 5) entrance efficiency compared to 50% (1 of 2) under the current operating condition (high condition). Study results

suggest that reduced head differentials show promise in providing an environment conducive to upstream passage of lamprey.

2.5.4 2011-2012 Lamprey Operations

As a best management practice in 2011 and 2012 Douglas PUD operated the fishways with a 1.0 ft head differential during the hours 17:00 and 00:59, once five lamprey had been counted at Rocky Reach Dam and continuing through September 30. Beyond those hours, fishway collection-gallery operations should be maintained at the "normal" head differential of 1.5 feet.

3.0 GOALS AND OBJECTIVES

The goal of the PLMP is to implement measures to monitor and address impacts, if any, on Pacific lamprey resulting from the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several Pacific lamprey PMEs in support of the PLMP. The PMEs presented within the PLMP are designed to meet the following objectives:

Objective 1: Identify and address any adverse Project-related impacts on passage of adult Pacific lamprey;

Objective 2: Identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific lamprey;

Objective 3: Participate in the development of regional Pacific lamprey conservation activities. The PLMP is intended to be compatible with other Pacific lamprey management plans in the Columbia River mainstem. Furthermore, the PLMP is intended to be supportive of the HCP, the critical research needs identified by the Columbia River Basin Technical Working Group, the Resident Fish Management Plan, Bull Trout Management Plan, and White Sturgeon Management Plan by continuing to monitor and address ongoing impacts, if any, on Pacific lamprey resulting from Project operations. The PLMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under Washington state water quality standards found at WAC 173-201A.

The schedule for implementation of specific measures within the PLMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

Douglas PUD, in consultation with the Aquatic SWG, will implement PMEs for Pacific lamprey in the Project consistent with the goals and objectives identified in Section 3.0 of the PLMP. Douglas PUD, in consultation with the Aquatic Settlement Work Group and the HCP

Coordinating Committee has initiated the implementation of the following Pacific lamprey related measures.

4.1 Adult Pacific Lamprey Passage (Objective 1)

4.1.1 Upstream Fishway Operations Criteria

Douglas PUD shall operate the upstream fishways at Wells Dam in accordance with criteria outlined in the HCP. Based upon information collected from activities conducted in Sections 4.1.3 - 4.1.7, Douglas PUD, in consultation with the Aquatic SWG and the HCP Coordinating Committee, may evaluate various operational and structural modifications to the upstream fishways (e.g., reduction in fishway flows at night) for the benefit of Pacific lamprey passing upstream through Wells Dam during the new license term. If requested, the Aquatic SWG shall develop an Operations Study Plan (OS Plan) that specifically identifies all operational modifications to be evaluated, the proposed monitoring strategy, implementation timeline and criteria for success. The plan shall include a component to evaluate the effects of lamprey modifications on salmon. Upon completion of the evaluation, the Aquatic SWG, in consultation with the HCP Coordinating Committee, will determine whether the proposed modifications should be made permanent, removed, or modified.

4.1.1.1 Progress Towards Objective 1 in 2012 – Upstream Fishway Operations Criteria

Consistent with the PLMP and the Wells HCP, Douglas PUD maintained safe, efficient and timely passage through the upstream adult fishway passage structures for all native fish species including Pacific lamprey. The specific operating criteria for the adult fishways can be found in the Wells HCP. Per these requirements, at least one of the adult fishways was in operation at all times of the year including during the winter maintenance period (December – February) and with both adult fishways in operation for the remainder of the year (March – November).

Based on the results of previous studies, the Aquatic SWG and HCP Coordinating Committee once again approved the temporary operation of the adult fishway collection galleries at a 1.0-foot head differential each night during the peak of the 2012 lamprey migration. The normal operating head differential is 1.5 feet. This temporary fishway operating criteria was approved and employed as a best management practice with the intent to enhance lamprey fishway-entrance efficiency until a conclusive study can be conducted that identifies the best collection gallery operating criteria that is consistent for all species including salmon, steelhead, bull trout and lamprey.

Operation of the fishway collection at reduced head differential nightly, from 17:00 to 00:59, commenced August 6th 2012, following the cumulative passage of 5 lamprey at Rocky Reach Dam and ended September 30th 2012. Similar temporary fishway operating criteria will be adopted in 2013 in support of a large scale lamprey radio telemetry study focused on identifying the best collection gallery operating criteria to enhance Pacific lamprey entrance efficiency.

4.1.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to implement the Adult Fish Passage Plan and associated Adult Ladder Dewatering Plan as required by the HCP. These plans include practices and procedures utilized during fishway dewatering operations to minimize fish presence in the fish ladders and then once dewatered directs Douglas PUD staff to remove stranded fish and safely place them back into the Columbia River. All fish species, including Pacific lamprey that are encountered during dewatering operations are salvaged consistent with the protocol identified in the HCP. Any adult lamprey that are captured during salvage activities will be released upstream of Wells Dam, unless otherwise determined by the Aquatic SWG. Douglas PUD will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas will provide a summary of salvage activities in the annual report.

4.1.2.1 Progress Toward Objective 1 in 2012 – Salvage Activities During Ladder Maintenance Dewatering

During the fish ladder maintenance period in 2012, Douglas PUD implemented the practices and procedures in the Adult Ladder Dewatering Plan to minimize the presence of lamprey and other fish and to safely place any stranded fish back into the Columbia River. During the 2012 salvage activities in both fishways no adult lamprey were encountered.

4.1.3 Upstream Fishway Counts and Alternative Passage Routes

Douglas PUD shall continue to conduct annual adult fish passage monitoring in the Wells Dam fishways using the most current technology available, to count and provide information on upstream migrating adult Pacific lamprey 24-hours per day during the adult fishway monitoring season (May 1- November 15). Based upon information collected from activities conducted in Sections 4.1.6 - 4.1.7, Douglas PUD, in consultation with the Aquatic SWG, may choose to address the use of alternative upstream passage routes around Wells Dam fishway counting stations by adult Pacific lamprey. Potential measures to improve counting accuracy, following consultation and approval of the Aquatic SWG, may include, but may not be limited to, the development of a correction factor based upon data collected during passage evaluations (Sections 4.1.6 and 4.1.7) or utilization of an alternative passage route as a counting facility for adult Pacific lamprey.

4.1.3.1 Progress Towards Objective 1 in 2012 – Upstream Fishway Counts and Alternative Passage Routes

During 2012, Douglas PUD monitored adult fish passage, including Pacific lamprey, 24-hours a day during the fishway monitoring season. Three adult lamprey were enumerated at Wells Dam in 2012 (one on August 28 and two on September 9).

In addition, Douglas PUD, in consultation with the Aquatic SWG, developed the 2013 Adult Pacific Lamprey Passage and Enumeration Study Plan. The study is designed to evaluate measures implemented to improve adult Pacific lamprey passage and enumeration, which include the installation of temporary modifications to the fish count station area to improve passage and counting efficiency and temporary changes in fishway operations to enhance lamprey passage at the collection gallery entrances. The results from the 2013 Adult Pacific Lamprey Passage and Enumeration Study will be used to evaluate the performance of these

temporary modifications to the fish count station and entrance operating criteria. Should these temporary changes be determined to enhance passage and count station efficiency, then these actions will be made permanent following approval from the Wells HCP Coordinating Committee, the Aquatic SWG, and the FERC.

4.1.4 Upstream Passage Improvement Literature Review

If additional passage improvement measures are deemed necessary by the Aquatic SWG, then within six months after this determination, Douglas PUD, in consultation with the Aquatic SWG, shall complete a literature review on the effectiveness of upstream passage measures (i.e., lamprey passage systems, plating over diffuser grating, modifications to orifices, rounding sharp edges, fishway operational changes, etc.) implemented at other Columbia and Snake rivers hydroelectric facilities. The literature review will be conducted in support of activities identified in Section 4.1.5 to help in the selection of reasonable measures that may be implemented to improve adult lamprey passage at Wells Dam.

4.1.4.1 Progress Towards Objective 1 in 2012 – Upstream Passage Improvement Literature Review

Following a fishway tour and a summary of the modifications underway in December 2012, the Aquatic SWG did not deem additional passage improvement measures necessary in 2012, therefore no upstream passage improvement literature review was conducted. The value of conducting a literature review will be discussed in the fall of 2013 following the completion of the 2013 Adult Pacific Lamprey Passage and Enumeration Study.

4.1.5 Fishway Modifications to Improve Upstream Passage

If additional passage improvement measures are deemed necessary by the Aquatic SWG, based upon the results of studies conducted at Wells Dam, then within one year or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify, design and implement any reasonable upstream passage modifications (structural and/or operational). Passage measures will be designed to improve passage performance by providing safe, effective, and volitional passage for Pacific lamprey through the Wells Dam fishways without negatively impacting the passage performance of adult anadromous salmonids. The following components shall be included in these passage measures:

- Fishway Inspection: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall conduct a fishway inspection with the Aquatic SWG and regional lamprey passage experts to identify and prioritize measures to improve adult lamprey passage and enumeration at Wells Dam. Additional ladder inspections will be conducted at the request of the Aquatic SWG, consistent with winter ladder dewatering operations.
- Entrance Efficiency: Within one year of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall develop a Lamprey Entrance Efficiency Plan (LEE Plan) for evaluating operational and physical ladder entrance modifications intended to create an environment at the fishway entrances that are conducive to adult lamprey passage without significantly impacting

the passage of adult salmonids. These improvements shall be evaluated until compliance, as described below, is attained.

- Diffuser Gratings: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, diffuser gratings within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Transition Zones: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, transition zones within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.
- Ladder Traps and Exit Pools: Within five years of license issuance or as soon as practicable following consultation with the Aquatic SWG, Douglas PUD shall identify and address, if needed, lamprey ladder traps and exit pools within fishways at Wells Dam that adversely affect passage of adult Pacific lamprey.

Douglas PUD shall exhibit steady progress, as agreed to by the Aquatic SWG, towards improving adult lamprey passage until performance at Wells Dam is determined to be similar to other mid-Columbia River hydroelectric dams, or until scientifically rigorous standards and evaluation techniques are established by the Lamprey Technical Workgroup, or its successor, and adopted regionally. The Aquatic SWG will then evaluate, and if applicable and appropriate, adopt these standards for use at Wells Dam. If compliance is achieved, Douglas PUD shall only be required to implement activities pursuant to Section 4.1.7 (Periodic Monitoring) for adult Pacific lamprey passage.

4.1.5.1 Progress Towards Objective 1 in 2012 – Fishway Modifications to Improve Upstream Passage

In 2012, Douglas PUD, in consultation with the Aquatic SWG and Wells HCP Coordinating Committee, developed the Adult Pacific Passage and Enumeration Study Plan. The study, scheduled for the summer of 2013, is designed to evaluate the effects of structural and operational modifications to the Wells Dam fishways on adult Pacific lamprey entrance efficiency and enumeration. Results of the study will be used to evaluate the effectiveness of temporary count station features added to the ladders in 2012, prior to license issuance, temporary modifications to the fishway operating criteria was intended to improve upstream passage of lamprey.

During December 2012, the Aquatic SWG was invited to participate in a fishway tour at Wells Dam. Participating signatories included the USFWS and the WDFW. In 2013 Douglas PUD will again provide a fishway tour and inspection period for all members of the Aquatic SWG. In addition, Douglas PUD plans to develop an Entrance Efficiency Plan in 2013. Per the requirements in the PLMP and Article 401 of the FERC license, the Entrance Efficiency Plan will be developed in consultation with the Aquatic SWG and the HCP Coordinating Committee. It is also possible that these committees will propose postponing the development of the Entrance Efficiency Plan until the results from the Adult Pacific Lamprey Passage and Enumeration Study are available.

4.1.6 Adult Pacific Lamprey Upstream Passage Evaluation

Should upstream passage measures be implemented under Section 4.1.5, then within one year following the implementation of such measures, Douglas PUD, in consultation with the Aquatic SWG, shall conduct a one-year study to monitor the effectiveness of such measures on upstream passage performance of adult Pacific lamprey through Wells Dam. If monitoring results indicate that passage rates at Wells Dam are not similar to passage rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement additional measures to improve upstream Pacific lamprey passage. Measures described in Sections 4.1.5 and 4.1.6 may be repeated, as necessary, until adult passage through Wells Dam is similar to passage rates at other mid-Columbia River hydroelectric dams or within standards as described in Section 4.1.5.

4.1.6.1 Progress Towards Objective 1 in 2012 – Adult Pacific Lamprey Upstream Passage Evaluation

Following the implementation of the recommended upstream passage improvement measures in 2012, the Aquatic SWG and Wells HCP Coordinating Committee approved an Adult Pacific Lamprey Passage and Enumeration Study Plan. This study will fulfill the requirements of this section of the PLMP. Preliminary results from the study are expected to be available in late 2013 to early 2014 with the results of the study included in the 2013 PLMP Annual Report.

4.1.7 Periodic Monitoring

Once adult Pacific lamprey upstream passage rates at Wells Dam are similar to rates at other mid-Columbia River dams or within standards as described in Section 4.1.5, Douglas PUD, in consultation with the Aquatic SWG, shall periodically monitor adult Pacific lamprey passage performance through Wells Dam fishways to verify the effectiveness of passage improvement measures. Specifically, every ten years after compliance has been achieved, or as determined by the Aquatic SWG, Douglas PUD shall implement a one-year study to verify the effectiveness of the adult fish ladders with respect to adult lamprey passage. If results of the monitoring program confirm the effectiveness of adult lamprey passage measures and the results indicate that passage rates are still in compliance, then no additional measures are needed. If the results indicate that adult upstream passage rates are out of compliance, then the upstream passage study will be replicated to confirm the results. If the results after two years of study both indicate that passage rates have not been maintained, Douglas PUD, in consultation with the Aquatic SWG, shall develop and implement measures to improve upstream Pacific lamprey passage, if any (see Section 4.1.5).

4.1.7.1 Progress Towards Objective 1 in 2012 – Periodic Monitoring

Periodic monitoring will take place following the evaluation and adoption of final fishway configurations and operating criteria.

4.2 Juvenile Pacific Lamprey Downstream Passage and Survival and Rearing (Objective 2)

4.2.1 Downstream Bypass Operations Criteria

Douglas PUD is required to operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the HCP.

4.2.1.1 Progress Towards Objective 2 in 2012 – Downstream Bypass Operations Criteria

In 2012, Douglas PUD operated the downstream bypass system at Wells Dam in accordance with the criteria outlined in the Wells HCP. Juvenile Fish Bypass operations were implemented consistent with the HCP Coordinating Committee approved Bypass Operations Plan for 2012. The dates of operation included initiation on April 9th at 000 hours with the bypass system operated continuously until midnight on August 19th. The 2012 dates of operation for the juvenile fish bypass system were developed in consultation with the Wells HCP Coordinating Committee and are the result of species run-timing estimates developed by the University of Washington, Columbia Basin Research that were reviewed, approved and adopted by the HCP Coordinating Committee and implemented by Douglas PUD prior to the beginning of the 2012 bypass season.

4.2.2 Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD shall continue to conduct salvage activities as required by the HCP's Adult Fish Passage Plan during fishway dewatering operations. All fish species, including Pacific lamprey that are encountered during dewatering operations shall be salvaged consistent with the protocol identified in the HCP. Any juvenile Pacific lamprey that are captured during salvage activities will be released downstream of Wells Dam. Douglas PUD will coordinate salvage activities with the Aquatic SWG and allow for member participation. Douglas PUD will provide a summary of salvage activities in the annual report.

4.2.2.1 Progress Towards Objective 2 in 2012 – Salvage Activities During Ladder Maintenance Dewatering

Douglas PUD conducted salvage activities during dewatering of the Wells Dam east fishway on December 4 and December 5, 2012. During salvage operations three juvenile lamprey were captured in the fishway collection gallery during dewatering. All three juvenile lamprey were released into the Columbia River unharmed.

4.2.3 Juvenile Pacific Lamprey Passage and Survival Literature Review

Beginning in year five and every five years thereafter during the new license, Douglas PUD, in consultation with the Aquatic SWG, shall conduct a literature review to summarize available technical information related to juvenile lamprey passage and survival through Columbia and

Snake rivers hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4.

4.2.3.1 Progress Towards Objective 2 in 2012 – Juvenile Pacific Lamprey Passage and Survival Literature Review

A literature review of technical information related to juvenile lamprey passage and survival through Columbia and Snake rivers hydroelectric facilities is scheduled for year 5 (2017) of the new license.

4.2.4 Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation

Based upon the current state of the science regarding tag technology and methodologies for Pacific lamprey macrophthalmia (Section 2.3), coupled with the challenges of obtaining macrophthalmia in sufficient numbers within the Project to meet sample size requirements for a statistically rigorous study, a juvenile downstream passage and survival evaluation is not feasible at this time.

During the term of the new license, if tag technology and methodologies are developed and field tested and a sufficient source of macrophthalmia in or upstream of the Project are identified to ensure that a field study will yield statistically rigorous and unbiased results, Douglas PUD, in consultation with the Aquatic SWG, shall implement a one-year juvenile Pacific lamprey downstream passage and survival study.

If statistically valid study results indicate that Project operations have a significant negative impact on the Pacific lamprey population above the Wells Dam, Douglas PUD, in consultation with the Aquatic SWG, shall identify and implement scientifically rigorous and regionally accepted measures (e.g., translocation, artificial production or habitat enhancement), if any, or additional studies to address such impacts. If operational changes are needed to improve passage survival of juvenile lamprey migrants, then those changes need to be coordinate with the HCP Coordinating Committee.

4.2.4.1 Progress Towards Objective 2 in 2012 – Juvenile Pacific Lamprey Downstream Passage and Survival Evaluation

Currently no tag technologies and methodologies exist for use to study downstream passage and survival of juvenile Pacific lamprey. Current limitations include but are not limited to, tag burden and tag retention, detection efficiencies, fish source, tag life, and the unpredictability of juvenile lamprey migration.

4.2.5 Juvenile Pacific Lamprey Habitat Evaluation

Within three years of the effective date of the new license, Douglas PUD shall implement a one-year study to examine presence and relative abundance of juvenile Pacific lamprey in habitat areas within the Project that may be affected by Project operations. As part of this measure,

Douglas PUD shall identify areas of potential juvenile Pacific lamprey habitat for future evaluation. Sampling of these areas will assess presence/absence and relative abundance. Any sampling methodologies used in support of this activity will require coordination with the HCP Coordinating Committee and regulatory approval of the federal and state agencies.

4.2.5.1 Progress Towards Objective 2 in 2012 – Juvenile Pacific Lamprey Habitat Evaluation

No juvenile Pacific lamprey habitat evaluation took place in 2012. This evaluation is scheduled within three years of the license effective date and therefore will take place in 2015.

4.3 Participate in Regional Pacific Lamprey Conservation Activities (Objective 3)

4.3.1 Regional Lamprey Working Groups

Douglas shall participate in Pacific lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the USFWS Lamprey Conservation Initiative). Activities may include but are not limited to information exchanges with other entities, meeting attendance, and coordination of Douglas PUD's Pacific lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities may also include conducting PLMP research within the Project, and sharing that information with other entities.

4.3.1.1 Progress Towards Objective 3 in 2012 – Regional Lamprey Working Groups

In 2012, Douglas PUD representatives attended and participated in regional coordination and information exchange related to Pacific lamprey including: Juvenile Pacific Lamprey Seminar on August 1 (Wenatchee, WA), the Pacific Lamprey Technical Work Group on November 28 (Portland, OR), and the Army Corps of Engineers Anadromous Fish Evaluation on November 27 to November 29 (Portland, OR).

4.3.2 Reporting

Douglas PUD will provide an annual report to the Aquatic SWG summarizing the previous year's activities and proposed activities for the following year undertaken in accordance with the PLMP. The report will document all Pacific lamprey activities conducted within the Project and describe activities proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this PLMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.3.3 Progress Towards Annual Reporting Requirements

In addition to the reporting requirements found within the Aquatic Settlement Agreement requiring the submission of annual reports for all six of the management plans including the PLMP, Article 406 of the FERC license for the Wells Project also requires Douglas PUD to

submit annual reports detailing the implementation of each of the six Aquatic Settlement Agreement management plans.

Consistent with Article 406 of the FERC License for the Wells Project, the Wells Dam Water Quality 401 Certification, and the PLMP, this report (PLMP Annual Report) will be updated annually in consultation of the Aquatic SWG. Each year the PLMP Annual Report will be filed on or prior to May 31st. The report will include a summary of the progress made towards the implementation of the PLMP and additional lamprey related measures found within the FERC license.

5.0 REFERENCES

Beamish, R.J. 1980. Adult biology of the river lamprey (Lampetra ayersi) and the Pacific lamprey (Lampetra tridentata) from the Pacific coast of Canada. Canadian Journal of Fisheries and Aquatic Sciences 37: 1906-1923.

Bleich, M.D., and R.A. Moursund. 2006. PIT Tag Evaluation of Juvenile Bypass System at the McNary Dam for Passage of Juvenile Pacific Lamprey (Lampetra tridentata), 2005. Prepared for the U.S. Army Corps of Engineers. Prepared by Battelle-Pacific NW Division, Richland, WA.

Close, D., M. Fitzpatrick, and H. Li. 2002. The ecological and cultural importance of a species at risk of extinction, Pacific Lamprey. North American Journal of Fisheries Management, July.

Close, D., M. Fitzpatrick, H. Li, B. Parker, D. Hatch, and G. James. 1995. Status report of the Pacific Lamprey (Lampetra tridentata) in the Columbia River basin. Project No. 94-026, Contract No. 95BI39067. Report to the U.S. Department of Energy, Bonneville Power Administration, Portland, Oregon. USA.

Golder Associates Ltd. 2003. Review of Pacific Lamprey in the Rocky Reach Project Area. Internal Draft. Report to Chelan County Public Utility District, Wenatchee, WA.

Hillman, T. and M. Miller. 2000. Status of Pacific lamprey in the mid-Columbia region. BioAnalysts, Inc. Report to Chelan County Public Utility District, Wenatchee, WA.

INL (Idaho National Laboratory). 2006. Responses of Juvenile Pacific Lamprey to Turbine Passage. Idaho National Laboratory. Advanced Turbine Systems at: http://hydropower.inl.gov/turbines/index.shtml (last accessed 4/18/07).

Jackson, A.D., D.R. Hatch, B.L. Parker, M.S. Fizpatrick, D.A. Close, and H. Li. 1997. Pacific lamprey research and restoration annual report 1997. Prepared for the Bonneville Power

LGL (LGL Limited) and DCPUD. 2008. Adult Pacific Lamprey Passage Evaluation. Wells Hydroelectric Project. No. 2149. Prepared by LGL Limited, Ellensburg, WA. Prepared for Public Utility District No.1 of Douglas County, East Wenatchee, WA.

Meeuwig, M.H., J.M. Bayer, J.G. Seelye, and R.A. Reiche. 2002. Identification of larval Pacific lampreys (Lampetra tridentata), river lampreys (L. ayresi), and western brook lamprey (L. richardsoni) and thermal requirements of early life history stages of lampreys. Report by U.S. Geologic Survey, Western Fisheries Resources Division, Columbia River Research Laboratory for the Bonneville Power Administration, Portland, Oregon. Project No. 2000-029.

Merrell, T.R. 1959. Gull food habits on the Columbia River. Fish Commission of Oregon Research Briefs 7(1):82.

Mesa, M.G., J.M. Bayer and J.G. Seelye. 2003. Swimming performance and physiological responses to exhaustive exercise in radio-tagged and untagged Pacific lampreys. Transactions of the American Fisheries Society 132: 483 - 492.

Moser, M., A. Matter, L. Stuehrenberg, and T. Bjornn. 2002a. Use of an extensive radio receiver network to document Pacific Lamprey (Lampetra tridentata) entrance efficiency at fishways in the Lower Columbia River, USA. Hydrobiologia 483: 45-53.

Moser, M., P. Ocker, L. Stuehrenberg, and T. Bjornn. 2002b. Passage efficiency of adult Pacific Lampreys at hydropower dams on the Lower Columbia River, USA. Trans. Am. Fish. Soc. 131:956-965.

Moser, M. and D. Close. 2003. Assessing Pacific lamprey status in the Columbia River Basin. Northwest Science. Vol. 77, No.2.

Moursund, R.A., D. D. Dauble, and D. Belch. 2000. Effects of John Day Dam Bypass Screens and Project Operations on the Behavior and Survival of Juvenile Pacific Lamprey (*Lampreta tridentata*). Prepared by Pacific Northwest National Laboratory for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon.

Moursund, R.A., R. P. Mueller, T. M. Degerman, and D. D. Dauble. 2001. Effects of Dam Passage on Juvenile Pacific Lamprey (Lampetra tridentata). Prepared by Pacific Northwest National Laboratory for the U.S. Army Corps of Engineers, Portland District, Portland, Oregon. Contract DE-AC06-76RL01830.

Moursund, R. A., D. D. Dauble, and M. J. Langeslay. 2003. Turbine Intake Diversion Screens: Investigating Effects on Pacific Lamprey. Hydro Review.

Murauskas, J.G. and P.N. Johnson. 2009. Assessment of adult Pacific lamprey behavior in response to temporary velocity reductions at fishway entrances. Study plan prepared for the Aquatic Settlement Work Group, Wells Hydroelectric Project FERC No. 2149, with technical support from J. Skalski, R. Wielick, D. Allison, M. Hallock, and B. Le. East Wenatchee, Washington.

Nass, B.L., C. Sliwinski, K.K. English, L. Porto, and L. Hildebrand. 2003. Assessment of adult lamprey migratory behavior at Wanapum and Priest Rapids Dams using radio-telemetry techniques, 2001-2002. Report prepared by LGL Limited, Sidney, BC, Canada, for Public Utility District No. 2 of Grant County, Ephrata, WA

Nass, B.L., C. Sliwinski, D. Robichaud. 2005. Assessment of Adult Pacific Lamprey Migratory Behavior at Wells Dam Using Radio-telemetry Technicques, 2004. Report prepared by LGL Limited, Sidney, B.C., Canada for Public Utility District No. 1 of Douglas County, WA.

NMFS (National Marine Fisheries Service). 2002. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and

Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

Ocker, A., L. Stuehrenberg, M. Moser, A. Matter, J. Vella, B. Sandford, T. Bjornn, and K. Tolotti. 2001. Monitoring adult Pacific Lamprey (Lampetra tridentata) migration behavior in the lower Columbia River using radio-telemetry, 1998-1999. NMFS report of research to USACE, Portland District, Portland, OR.

Ostrand, K.G. 2005. Validation of Existing Screening Criteria for Lamprey Macrophthalmia.United States Fish and Wildlife Service: Abernathy Fish Technology Center, Longview, WA.

Poe, T.P., H.C. Hansel, S.Vigg, D.E. Palmer, and L.A. Prendergast. 1991. Feeding of predaceous fishes on out-migrating juvenile salmonids in John Day Reservoir, Columbia River. Transactions of the American Fisheries Society 120:405-420.

Robichaud, D., B. Nass, and J.G. Murauskas. 2009. Adult Pacific lamprey passage and behavior study (adult lamprey passage study). Wells Hydroelectric Project, FERC No. 2140. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Schreck, C., S. Heppell, and D. Lerner. 2000. Determination of Passage of Juvenile Lamprey: Development of a Tagging Protocol. Oregon Cooperative Fish and Wildlife Research Unit, Biological Resources Division-U.S. Geological Survey, Oregon State University.

Starke, G. and J. Dalen. 1995. Pacific Lamprey (Lampetra tridentata) passage patterns past Bonneville Dam and incidental observations of lamprey at the Portland District Columbia River dams in 1993. U.S. Army Corps of Engineers, Cascade Locks, Oregon. USA.

Stevenson, J.R., P. Westhagen, D. Snyder, J. Skalski, and A. Giorgi. 2005. Evaluation of Adult Pacific Lamprey Passage at Rocky Reach Dam Using Radio-telemetry Techniques, 2004. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, WA.

Vella, J., L. Stuehrenberg, M. Moser, and T. Bjornn. 2001. Migration patterns of Pacific Lamprey (Lampetra tridentata) in the lower Columbia River, 1997. NMFS report of research to USACE, Portland District, Portland, OR.

Wydoski, R. and R. Whitney. 2003. Inland fishes of Washington, 2nd edition. American Fisheries Society, Bethesda, Maryland in association with the University of Washington Press.

2012 ANNUAL REPORT

RESIDENT FISH MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with the Aquatic Settlement Work Group, has agreed to implement several resident fish PMEs in support of the RFMP. This report summarizes actions carried out in 2012 that are associated with the PMEs presented within the RFMP which are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Douglas PUD's Land Use Policy. In 2012, Douglas PUD continued to implement the HCP Predator Control Programs and the Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities. The resident fish assemblage study is scheduled for 2014.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD. Actions under objective 3 are contingent upon the findings of the resident fish assemblage study in 2014.

Objective 4: In response to proposed major changes in Wells Dam operations requiring FERC approval, Douglas PUD will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement

reasonable and appropriate measures to address any effects on social, economic, and culturally important native species. No major changes in Project operations occurred in 2012.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. The RFMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

Implementation of all of the RFMP related measures during the first full year of the FERC license will be reported within the 2013 annual report for the RFMP.

1.0 INTRODUCTION

The Resident Fish Management Plan (RFMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The RFMP will direct implementation of measures to protect and enhance native resident fish populations in the Wells Reservoir. To ensure active stakeholder involvement and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management of native resident fish populations in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for native resident fish during the term of the new license.

The 2013 annual report on the implementation of the RFMP will include all of the native resident fish related activities implemented during the first full year of the new FERC license.

2.0 BACKGROUND

2.1 Resident Fish Species

The resident fish assemblage present in the Wells Reservoir is composed of a diverse community of native and introduced, warm and coldwater, and recreational and non-recreational fish species. Since the construction of Wells Dam several studies have either directly (McGee 1979; Beak 1999) or indirectly (Dell et al. 1975; Burley and Poe 1994) addressed the resident fish assemblage in the Wells Reservoir.

2.1.1 Project Resident Fish Assessments

In assessing the occurrence of gas bubble disease in fish in the mid-Columbia River reservoirs, Dell et al. (1975) observed that the most abundant resident fish species in the Wells Reservoir were northern pikeminnow (*Ptychocheilus oregonensis*), stickleback (*Gasterosteus spp.*), and suckers (*Catostomus* spp.). They also determined that mountain whitefish (*Prosopium williamsoni*) and pumpkinseed (*Lepomis gibbosus*) were the most abundant resident game fish, although these two species accounted for less than two percent of the total 32,289 fish sampled. Overall, 27 species of resident and migratory fish were identified in the study area (Table 2.1-1).

In 1993, a one-year study was conducted to determine the relative predation by northern pikeminnow on outmigrating juvenile salmonids and to develop relative predation indices for each of the five mid-Columbia River reservoirs. During the study, incidental catch (species captured other than northern pikeminnow) was high with over 25 fish species recorded and catch dominated by Catostomidae (suckers) (Burley and Poe 1994).

Table 2.1-1 Native and non-native resident fish species that have been documented in the Wells Reservoir from past resident fish assessments, monitoring efforts, and miscellaneous studies (Dell et al. 1975; McGee 1979; Burley and Poe 1994; Beak 1999; NMFS 2002; BioAnalyst, Inc. 2004).

Native Species	Non-Native Species
White sturgeon *Acipenser transmontanus*[*]	Carp *Cyprinus carpio*
Chiselmouth *Acrocheilus alutaceus*	Black bullhead *Ictalurus melas*
Longnose sucker *Catostomus catostomus*	Brown bullhead *Ictalurus nebulosus*
Bridgelip sucker *Catostomus columbianus*	Pumpkinseed *Lepomis gibbosus*
Largescale sucker *Catostomus macrocheilus*	Bluegill *Lepomis macrochirus*
Lake whitefish *Coregonus clupeaformis*	Smallmouth bass *Micropterus dolomieu*
Prickly sculpin *Cottus asper*	Largemouth bass *Micropterus salmoides*
Threespine stickleback *Gasterosteus aculeatus*	Yellow Perch *Perca flavescens*
Burbot *Lota lota*	Black crappie *Pomoxis nigromaculatus*
Peamouth *Mylocheilus caurinus*	Walleye *Stizostedion vitreum*
Rainbow trout *Oncorhynchus mykiss*	Tench *Tinca tinca*
Mountain whitefish *Prosopium williamsoni*	
Northern pikeminnow *Ptychocheilus oregonensis*	
Redside shiner *Richardsonius balteatus*	
Dace Rhinichthys spp.	
Bull Trout *Salvelinus confluentus*[*]	

[*] Individual management plans for both white sturgeon and bull trout have been developed and as such, they are not addressed in this Resident Fish Management Plan.

McGee (1979) noted that chiselmouth (*Acrocheilus alutaceus*), redside shiners (*Richardsonius balteatus*), and largescale suckers (*Catostomus macrocheilus*) were the most abundant non-game fish captured during Wells Reservoir surveys while pumpkinseed were the most abundant game fish caught. Similar sampling design and methodology to the 1974 study (Dell et al. 1975) were employed in order to ensure that results of the study were comparable with past observations. In total, 2,480 fish were collected during the study using live traps, beach seines and angling.

Twenty of the 27 known species previously trapped in other mid-Columbia reservoirs (Dell et al. 1975) were captured in the Wells Reservoir during the study.

In 1998, Douglas PUD conducted an updated Wells Reservoir resident fish assessment (Beak 1999). Again, an effort was made to implement a sampling design similar to the two previous studies (1974 and 1979) so as to be consistent and allow comparisons with past results. In total, 22 species of fish were identified with 5,657 fish captured using beach seines and 716 fish observed via diving transects. Beak (1999) reported suckers as the most abundant resident fish captured in beach seining sampling in the Wells study area. These species represented 41 percent of the beach seining catch and 46 percent of the underwater dive survey count. Other abundant species in the beach seine catch were bluegill (*Lepomis macrochirus*) (32 percent), northern pikeminnow (10 percent), peamouth (*Mylocheilus caurinus*) (6 percent), and carp (*Cyprinus carpio*) (5 percent). Fifteen other species represented the remaining 7 percent of the total catch of 3,783 fish. Table 2.1-2 ranks the relative abundance of dominant fish species captured in the 1974, 1979, and 1998 Project studies and how species abundance has shifted over time.

Table 2.1-2 Ranking of relative abundance of dominant fish species in the 1974, 1979, and 1998 Wells Reservoir resident fish assessments (Beak 1999).

Species	1974	1979	1998
Largescale sucker *Catostomus macrocheilus*	1	4	1
Redside Shiner *Richardsonius balteatus*	3	3	3
Northern Pikeminnow *Ptychocheilus oregonensis*	2	5	4
Bluegill *Lepomis macrochirus*	16	0	2
Pumpkinseed *Lepomis gibbosus*	11	2	18
Chiselmouth *Acrocheilus alutaceus*	4	1	10

2.1.2 Recreational Fish Species

Kokanee

Landlocked sockeye (*Oncorhynchus nerka*), known as kokanee are a native fish which occur in several lakes in the mid and upper Columbia basins including Lake Wenatchee, Lake Chelan, Lake Osoyoos, and Lake Roosevelt. Although previous resident fish assessments have not detected the presence of this fish species in the Project, anecdotal information exists indicating that low numbers of kokanee may be present in the Project. These fish likely originate from Lake Roosevelt, above Grand Coulee Dam, and during periods of high spring flow are displaced downstream through Grand Coulee and Chief Joseph dams and into the Wells Reservoir.

Largemouth Bass

Largemouth bass (*Micropterus salmoides*) were widely introduced in Washington in the late 1800s (Wydoski and Whitney 2003). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002). They prefer clear water habitat with mud and sand substrates, which is best suited for aquatic vegetation production (Wydoski and Whitney 2003). Little is known about the

populations in the Wells Reservoir as they are infrequently captured (Beak 1999; Duke 2001; Burley and Poe 1994).

Mountain Whitefish

Mountain whitefish are assumed to occur in all small-order tributaries to the Methow, Okanogan, Wenatchee and Entiat rivers, and in connecting larger lake systems. They are also believed to occur in the mainstem reservoirs, although their behavior patterns are not known. They mostly inhabit riffles in summer and large pools in winter (Wydoski and Whitney 2003). Spawning typically occurs from October through December, generally in riffles, but also on gravel shoals of lake shores. Mountain whitefish feed primarily on instar forms of benthic aquatic insects, although they also occasionally eat crayfish, freshwater shrimp, leeches, fish eggs and small fish. In lakes, they feed extensively on zooplankton, particularly cladocerans. There is evidence that mountain whitefish still spawn in the lower reaches of some tributaries (NMFS 2002). Mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Dam tailrace (Zook 1983).

Northern Pikeminnow

Northern pikeminnow are a slow-growing, long-lived predator native to the Columbia River basin. In summer, adult northern pikeminnow prefer shallow, low velocity areas in cool lakes or rivers. During the winter, they use deeper water and pools (Scott and Crossman 1973). Spawning occurs during the summer, in shallow water areas with gravel substrate. They tend to concentrate in tailrace areas downstream of mainstem dams during the juvenile salmonid migration period, holding in relatively slow-moving water areas (less than about 3 feet per second) near passage routes (NMFS 2002). Due to their large numbers and distribution throughout the Columbia River basin, northern pikeminnow are considered to pose the greatest predation threat to migrating juvenile anadromous salmonids (NMFS 2002).

Resident Rainbow Trout

Rainbow trout (*Oncorhynchus mykiss*) are an inland (remains in freshwater) form of steelhead. However, some rainbow trout remain in freshwater for most of their life but undergo a physiological change to a smolt and migrate to the ocean late in life. In addition to the potential for rainbow trout to become anadromous, the progeny of steelhead are believed to have the potential to become resident rainbow (Peven 1990). Inland rainbow and juvenile steelhead are not distinguishable from each other until the steelhead undergo smoltification. The mid-Columbia River tributaries contain a mixture of resident rainbow and ocean-migrating steelhead. Resident rainbow trout are likely present in low numbers in the Wells Reservoir. During the 1998 resident fish assessment, rainbow trout consisted of 0.05 percent of the relative catch (Beak 1999).

Smallmouth Bass

Smallmouth bass (*Micropterus dolomieu*) are a non-native game fish that have inhabited the mid-Columbia River reach since at least the 1940s. They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their

recreational importance (WDFW 2002). Preferred habitat for this species includes rocky shoals, banks, or gravel bars. Adult smallmouth bass in the mid-Columbia River are most abundant around the deltas of warmer tributary rivers. In the Wells Reservoir, smallmouth bass are typically found in the lower Okanogan River and the confluence of the Okanogan and Columbia rivers (Beak 1999). They are also abundant in areas upstream of the mid-Columbia River.

Smallmouth bass were the second most abundant predator species captured in the mid-Columbia River during predator assessment sampling conducted in 1994. They were most frequently captured from forebay sampling sites (Burley and Poe 1994). Similar relative abundance estimates of smallmouth bass were observed in recent sampling programs in other mid-Columbia River reservoirs (Beak 1999; Duke 2001). They are a significant fish predator species in the Columbia River, and prey on juvenile salmonids. In the 1994 predator assessment, fish composed 87 percent of the smallmouth bass diet, with salmonids consisting of 11 percent of the prey fish.

Walleye

Walleye (*Stizostedion vitreum*) are a cool-water, piscivorous game fish believed to have moved downstream into the mid-Columbia River reach from a population established for recreational fishing in Lake Roosevelt in the late 1950s (Zook 1983). They were the least abundant predator species captured in the mid-Columbia River in 1994 (Burley and Poe 1994). They are listed as a priority species in Washington State because of their vulnerability to habitat loss or degradation and their recreational importance (WDFW 2002).

Walleye occur throughout the mainstem reservoirs but are not typically found in the tributaries. Although suitable spawning habitat appears to be plentiful in the mid-Columbia River, peak summer temperatures in this section of river are suboptimal and appear to restrict the recruitment of subyearling walleye to the yearling age class (Zook 1983). Recruitment of walleye into the mid-Columbia River reservoirs is suspected to result from the entrainment of young fish through Grand Coulee Dam during spring run-off (Zook 1983).

2.1.3 Other Resident Species

Resident, non-recreational species make up the bulk of the standing crop of fish in the Wells Reservoir. Many of these species are native to the Wells Reservoir, including burbot (*Lota lota*), chiselmouth, peamouth chub, redside shiner, largescale sucker, bridgelip sucker (*C. columbianus*), longnose sucker (*C. catostomus*), lake whitefish (*Coregonus clupeaformis*), Prickly sculpin (*Cottus asper*), threespine stickleback (*Gasterosteus aculeatus*), and dace species (*Rhinichthys spp.)*(See Table 2.1-1). Currently, no management actions or active fisheries for these species occur.

2.2 Resident Fish Habitat

2.2.1 Spawning habitat

Objectives of past resident fish studies (McGee 1979; Zook 1983; Beak 1999) did not specifically address spawning habitat but rather focused on species diversity, relative abundance and spatial distribution. Therefore, little information exists about the location and availability of spawning habitat for resident fish species in Project waters. It is likely that some resident fish species (cyprinids, catostomids, cottids) that spend their entire lives in Project waters utilize areas of the Wells Reservoir, tailrace, and lower tributaries (Methow and Okanogan rivers) to reproduce while other resident species, although present in the Wells Reservoir, utilize areas outside of the Project Boundary. Zook (1983) in his review of resident fish in the Wells Reservoir, hypothesized that some resident species such as mountain whitefish, rainbow trout, and walleye, although present, may not be successfully reproducing. Zook's review (1983) suggests that resident rainbow trout are primarily a product of residualism of hatchery-produced steelhead and that mountain whitefish appear to use the Wells Reservoir principally as a migration route between spawning areas in the Methow River and the Wells Tailrace. The report also suggests that walleye populations in the Wells Reservoir are recruited from the Lake Roosevelt population that was introduced in the late 1950s. The report also states that although spawning habitat appears to be available, evidence of successful reproduction has not been observed (Zook 1983).

Northern pikeminnow control efforts have been implemented at the Wells Reservoir starting in 1995. Part of these efforts included the identification of known spawning locations through the use of radio-telemetry. Based upon results of this study, northern pikeminnow spawning habitat is located in the Wells Reservoir near Park Island, near river mile (RM) 1.5 on the Methow River and in the Wells tailrace immediately downstream of the east bank fish ladder (Bickford and Skillingstad 2000).

2.2.2 Rearing habitat

Past resident fish surveys (McGee 1979; Beak 1999) observed significant spatial trends in species distribution within the Wells Reservoir. Both McGee (1979) and Beak (1999) noted that in general, spiny ray species (centrarchids) were most abundant between RM 530 and RM 540 and in the lower Okanogan River portion of the Project. This unique area of the Wells Reservoir is shallow and broad with slower water velocities, finer substrate, warmer water temperatures, and higher turbidity (Beak 1999) and is conducive to rearing spiny ray fish species while excluding more streamlined fish that prefer fast flowing water. Both surveys also found that the more streamlined resident fish species, such as chiselmouth and redside shiner (cyprinids), were most abundant downstream of RM 530 where water velocities increased, turbidity decreased, and the amount of shallow littoral habitat decreased. Other resident fish such as various sucker species and white sturgeon are most likely distributed throughout the Wells Reservoir but reside and feed at depths near the river bottom. Migratory, cold water species such as bull trout and whitefish spawn outside of the Wells Reservoir and it is likely that the majority of juvenile fish of these species rear in tributary habitats. Sub-adult bull trout, however, have been observed passing over other mid-Columbia River dams and recent studies suggest that bull trout forage for resident species present in the Wells Reservoir (BioAnalysts Inc. 2004).

2.3 Management Activities Affecting Resident Fish

2.3.1 Habitat Conservation Plan's Predator Control Program

Section 4.3.3 of the Wells HCP includes the requirement that Douglas PUD implement a northern pikeminnow and piscivorous bird harassment and control program to reduce the level of predation upon anadromous salmonids in the mid-Columbia Basin. The northern pikeminnow removal program includes a northern pikeminnow control program, participation in fishing derbies and tournaments and the use of long-line fishing equipment. These efforts are designed to provide an immediate and substantial reduction in the predator populations present within the waters of the Project.

Since efforts were first initiated in 1995, Douglas PUD's northern pikeminnow removal program has captured over 134,000 northern pikeminnow (1995-2006). The continual harvest of northern pikeminnow from these waters will provide additional decreases in predator abundance. Yearly removal efforts will also keep the northern pikeminnow population in a manageable state.

The other component of the predator control program is the implementation of control measures for piscivorous birds. The focus of Douglas PUD's piscivorous bird control program is not removal but hazing and access deterrents. Hazing includes propane cannons, pyrotechnics and the physical presence of hazing staff. Access deterrents include steel wires across the hatchery ponds and tailrace, fencing and covers for hatchery ponds, and electric fencing. When hazing and access deterrents fail, options for removal are also implemented by the US Department of Agriculture (DOA) Animal Control staff hired to conduct the hazing programs.

Although the intent of the predator control program is for the protection of anadromous salmonids, reductions in aquatic and terrestrial predator abundance within the Reservoir may benefit many native resident fish species.

2.3.2 Project Shoreline Management and Land Use Policy

Douglas PUD owns approximately 89 miles of shoreline in fee title and addresses shoreline management issues through the implementation of a strict Land Use Policy that requires formal approval of all land use activities that take place within the Project Boundary. Applications to permit activities such as construction of boat docks, piers, and landscaping are reviewed and considered for approval by Douglas PUD after all required regulatory permits are acquired by the applicant. Additionally, when making land use or related permit decisions on Douglas PUD owned lands that affect habitat within the Project Boundary, Douglas PUD is required by Section 5 of the HCP to notify and consider comments from the HCP signatory parties (Douglas 2002). Shoreline management activities directly related to Project land use benefit resident fish, juvenile anadromous fish, and aquatic invertebrates and plants by minimizing impact in littoral areas within the Project Boundary.

3.0 GOALS AND OBJECTIVES

The goal of the RFMP is to protect and enhance native resident fish populations and habitat in the Project during the term of the new license. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several resident fish PMEs in support of the RFMP. The PMEs presented within the RFMP are designed to meet the following objectives:

Objective 1: Continue to provide additional benefits to resident fishery resources in the Project as a result of continued implementation of the HCP, Predator Control Programs and Doulas PUD's Land Use Policy.

Objective 2: In year 2 and every 10 years thereafter during the new license term, Douglas PUD will conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Project. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species (ANS) Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir. The results of this study may be used to inform the implementation activities of the other Wells aquatic resource management (ANS, bull trout, Pacific lamprey, and white sturgeon) plans and HCP predator control activities.

Objective 3: If any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through implementation of other aquatic resource management plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

Objective 4: In response to proposed major changes at Wells Dam requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, on Project habitat functionally related to spawning, rearing, and migration of native resident fish, in order to make informed management decisions towards the success of the RFMP. Douglas PUD will implement reasonable and appropriate measures to address any effects on social, economic, and culturally important native species.

This RFMP is intended to be compatible with other resident fish management plans in the Columbia River mainstem. Furthermore, the RFMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, and White Sturgeon Management Plan by continuing to monitor changes, if necessary, in the resident fish assemblage within the Project. This management plan is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies and supportive of designated uses for aquatic life under WAC 173-201A, the Washington state water quality standards.

The schedule for implementation of specific measures within the RFMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goal and objectives described in Section 3.0 of the RFMP, Douglas PUD, in consultation with the Aquatic SWG has initiated the implementation of the following measures.

4.1 Implementation Of Programs that Benefit Resident Fish (Objective 1)

4.1.1 HCP Predator Control Programs

Douglas PUD shall continue to conduct annual predator control activities for northern pikeminnow and avian predators as outlined in the HCP (Douglas 2002). Although implementation of this program is targeted at reducing predation on anadromous species covered by the HCP, it is also anticipated to have direct benefits for resident fish species.

4.1.1.1 Progress Towards Objective 1 in 2012 – Implementation of Programs that Benefit Resident Fish

Douglas PUD implemented predator control activities for northern pikeminnow in 2012. The pikeminnow control program resulted in the removal of 12,596 pikeminnow from the Wells Project. A total of 5,426 non-target fish were incidentally captured and released representing 34.1% of the overall catch. Incidental encounters of resident fish consisted of nine taxa: 3,203 burbot, 724 peamouth, 603 sucker spp., 528 chiselmouth, 161 sculpin spp., 142 pikeminnow / chiselmouth hybrids, 72 white sturgeon (*Acipenser transmontanus*), 47 redside shiner, and 18 brown bullhead catfish (*Ameiurus nebulosus*). All non-target fish were released alive.

4.1.2 Project Shoreline Management and Land Use Policy

Douglas PUD shall continue to implement the Douglas Land Use Policy which requires approval of all land use activities that take place within the Project Boundary. All permit activities such as construction of boat docks, piers, and landscaping within Project Boundary will be subject to review and approval by Douglas PUD only after the applicant has received all other required regulatory permits, in addition to consideration by the HCP signatory parties and permit review by state and federal action agencies. The intent of the review and approval process captured in the Land Use Policy is to protect aquatic habitats and aquatic species that may be affected by proposed land use activities within the Project.

4.1.2.1 Progress Towards Objective 1 in 2012 – Project Shoreline Management and Land Use Policy

Douglas PUD continued to implement the Land Use Policy in 2012 per Article 412 of the new FERC license for the Wells Project.

4.2 Monitoring the Resident Fish Assemblage within the Wells Reservoir (Objective 2)

Douglas PUD shall conduct a resident fish study to determine the relative abundance of the various resident fish species found within the Wells Reservoir. This assessment shall occur in year 2 and every 10 years thereafter during the term of the new license. The study objectives will focus on (1) identifying whether there have been major shifts in the resident fish populations resulting from the implementation of the White Sturgeon, Bull Trout, Pacific Lamprey, and Aquatic Nuisance Species Management Plans, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

In order to maintain comparative assemblage information over time to inform Project resident fish status and trends, methodology for monitoring activities shall remain consistent with the methods described in Beak (1999). Information collected from these monitoring activities may be used to inform the implementation activities of the other Wells aquatic resource management plans and the HCP predator control activities.

4.2.1 Progress Towards Objective 2 in 2012 – Monitor Resident Fish Assemblage within the Wells Reservoir

Monitoring of the resident fish assemblage in the Wells Reservoir is scheduled for 2014. The study plan for this study will be developed by Douglas PUD and will be approved by the Aquatic SWG prior to implementation in 2014.

4.3 Actions to Address Major Shifts in Native Resident Fish Assemblage (Objective 3)

Based upon information collected during the resident fish status and trends monitoring (Section 4.2), if any statistically significant negative changes to native resident fish populations of social, economic, and cultural importance are identified, and are not caused by and cannot be addressed through the implementation of other Aquatic Resource Management Plans or activities (white sturgeon, Pacific lamprey, bull trout, ANS, HCP, predator control), reasonable and appropriate implementation measures to address negative changes, if any, will be undertaken by Douglas PUD.

4.3.1 Progress Towards Objective 3 in 2012 – Actions to Address Major Shifts in Native Resident Fish Assemblage

Implementation of actions under Objective 3 are contingent upon the findings of the resident fish assemblage study scheduled for 2014.

4.4 Monitoring in Response to Proposed Changes in Project Operations (Objective 4)

If at any time during the new license term, future changes in Wells Dam operations are proposed that require FERC approval and the Aquatic SWG concludes that either reservoir or tailrace habitat within Project Boundary may be affected with regards to spawning, rearing, and migration (aquatic life designated uses) of native resident fish, an assessment will be implemented to identify potential effects, if any, in order to make informed license decisions. If the results of the assessment identify adverse effects to native resident fish species of social, economic and cultural importance, attributable to such changes in Project operations, then Douglas PUD will consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.

4.4.1 Progress Towards Objective 4 in 2012 – Monitoring in Response to Proposed Changes in Project Operations

No changes in Project operations occurred in 2012 or are proposed for 2013 that would trigger the need for a resident fish impact assessment.

4.5 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the RFMP. The report will document all native resident fish activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this RFMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas PUD will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.5.1 Progress Towards Annual Reporting Requirements

Consistent with the reporting requirements found in Article 406 of the FERC License for the Wells Project, 401 Certification, and the Aquatic Settlement Agreement RFMP, the RFMP Annual Report will be updated annually with the assistance of the Aquatic SWG. Each year the RFMP Annual Report will be filed on or prior to May 31st. The report will include a summary of the annual progress made towards the implementation of the RFMP and focus on the previous year's developments.

5.0 REFERENCES

Beak Consultants, Inc. and Rensel Associates. 1999. Assessment of resident fish in Lake Pateros, Washington. Final Report. Prepared for Public Utility District No. 1 of Douglas County. Beak Consultants, Inc. in cooperation with Rensel Associates. Arlington, Washington.

Bickford, S. and T. Skilingstad. 2000. Movements of Northern Squawfish in the reservoir, forebay, and tailrace of the Wells Hydroelectric Project, mid-Columbia River, Washington. Public Utility District No. 1 Douglas County, East Wenatchee, Washington.

BioAnalysts, Inc. 2004. Movement of Bull Trout within the mid-Columbia River and tributaries, 2001-2004. Prepared for Public Utility District No. 1 of Chelan County, Wenatchee, WA, Public Utility District No. 1 of Douglas County, East Wenatchee, WA, and Public Utility District No. 2 of Grant County, Ephrata, WA.

Burley, C.C. and T.P. Poe. 1994. Significance of predation in the Columbia River from Priest Rapids dam to Chief Joseph dam, predator consumption indexing. Contract 430-486. Prepared for PUD No 1 of Chelan County, PUD No. 1 of Douglas County, and PUD No. 2 of Grant County.

Dell, M.B., Erho, M.W., and B.D. Leman. 1975. Occurrence of Gas Bubble Disease Symptoms On Fish In Mid-Columbia River Reservoirs. Public Utility District of Grant County, Ephrata, WA, Public Utility District of Douglas County, East Wenatchee, WA, Public Utility District of Chelan County, Wenatchee, WA.

Douglas (Public Utility District No. 1 of Douglas County). 2002. Wells Hydroelectric Project Anadromous Fish Agreement and Habitat Conservation Plan. Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Duke. 2001. Rocky Reach fish presence and habitat use survey. Report prepared for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

McGee, J.A. 1979. Fisheries Survey of Wells Reservoir. Public Utility District of Douglas County, East Wenatchee, Washington.

NMFS. 2002. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

Peven, C.M. 1990. The life history of naturally produced steelhead trout from the mid-Columbia River basin. M.S. Thesis, University of Washington, Seattle, Washington.

Scott, W.B. and E.J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Ottawa, Canada.

WDFW (Washington Department of Fish and Wildlife). 2002. Species of concern in Washington State. Available at: http://www.wa.gov/wdfw/diversity/soc/soc.htm.

Wydoski, R.S. and R.R. Whitney. 2003. Inland Fishes of Washington. Second Edition. American Fisheries Society. University of Washington Press.

Zook, W.J. 1983. Resident fisheries of Wells Pool: A Review. Prepared for Public Utility District No. 1 of Douglas County. Fulton Fisheries Advisors. 61 pgs.

2012 ANNUAL REPORT

AQUATIC NUISANCE SPECIES MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification for the Wells Hydroelectric Project (Project).

The goal of the ANSMP is to prevent the introduction and/or spread of aquatic nuisance species (ANS) in Project waters. Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with the Aquatic Settlement Work Group (Aquatic SWG), has agreed to implement several PMEs in support of the ANSMP. This report summarizes actions carried out in 2012 that are associated with the PMEs presented within the ANSMP which are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil (*Myriophyllum spicatum*) proliferation during in-water (i.e., construction, maintenance, and recreation improvements) improvement activities in the Project. In 2012, no in-water construction took place. Modifications to the best management practices contained in the current ANSMP, required by Article 405 of the new Federal Energy Regulatory Commission (FERC) license issued in November 2012, began in December 2012.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities, and conducting education outreach within the Project. In 2012, Douglas PUD participated in coordination with regional and state efforts to prevent the introduction and spread of ANS which continued during zebra and quagga mussel monitoring and the 2012 Well Project Crayfish Distribution Study. By-catch monitoring also occurred during the sub-yearling Chinook life-history study and the Northern pikeminnow removal program. In 2012, signage designed to inform and educate the public about ANS was maintained year-round at all public boat launch facilities in the Wells Project. In addition, development of educational pamphlets for placement at public use facilities in May 2013 began in 2012.

Objective 3: In response to proposed changes in the Project requiring FERC approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of ANS in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects. No significant changes in Project operations occurred in 2012.

1.0 INTRODUCTION

The Aquatic Nuisance Species Management Plan (ANSMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

To ensure active stakeholder participation and support, the Public Utility District No. 1 of Douglas County (Douglas PUD) developed all of the resource management plans in close coordination with agency and tribal natural resource managers (Aquatic Settlement Work Group or Aquatic SWG). During the development of this plan, the Aquatic SWG focused on developing management priorities for resources potentially impacted by Project operations. Entities invited to participate in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Indian Nation (Yakama Nation), and Douglas PUD.

The ANSMP will direct implementation of measures to prevent the introduction and/or spread of aquatic nuisance species (ANS) in Project waters. To ensure active stakeholder participation and support, Douglas PUD developed this plan, along with the other aquatic management plans, in close coordination with the members of the Aquatic SWG.

The Aquatic SWG agrees on the need to develop a plan for the long-term management and prevention of ANS in the Project. This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant PMEs (Section 4) for ANS during the term of the new license.

2.0 BACKGROUND

Nonnative aquatic species may be released or "introduced" into an aquatic environment intentionally or unintentionally. Most often, such species are unable to adapt to their new environments and do not form self-sustaining populations (ANSC 2001). However, if such a species is able to adapt, become established, and thrive, it has the potential to threaten the diversity or abundance of native species and aquatic habitats and may even affect economic resources and human health.

RCW 77.60.130 defines the term ANS as a "nonnative aquatic plant or animal species that threatens the diversity or abundance of native species, the ecological stability of infested waters, or commercial, agricultural, or recreational activities dependent on such waters" (RCW 2007). Since few natural controls exist in their new habitat, ANS may spread rapidly, damaging

recreational opportunities, lowering property values, clogging waterways, impacting irrigation and power generation, destroying native plant and animal habitat, and sometimes destroying or endangering native species (ANSC 2001).

2.1 Aquatic Nuisance Species of Concern

2.1.1 Eurasian Watermilfoil (*Myriophyllum spicatum)*

Eurasian watermilfoil (EWM) is an aquatic plant native to Europe, Asia, northern Africa, and Greenland. It was once commonly sold as an aquarium plant (Ecology 2007). EWM may have been introduced to the North American continent at Chesapeake Bay in the 1880's, although evidence shows that the first collection was made from a pond in the District of Columbia during the fall of 1942. By 1985, EWM had been found in 33 states, the District of Columbia, and the Canadian provinces of British Columbia, Ontario, and Quebec (Ecology 2007). The first documented occurrence of EWM in the State of Washington was in 1965. The source of introduction was most likely from sources in Canada and despite an effort to stop its spread, EWM infestations in Lake Osoyoos, British Columbia spread down through the Okanogan Lakes and into the Okanogan River and the Columbia River in 1974 (Duke 2001).

EWM is extremely adaptable with the ability to thrive in a variety of environmental conditions. It grows in still to flowing waters, can tolerate salinities of up to 15 parts per thousand, grows rooted in water depths from 1 to 10 meters, and can survive under ice (Ecology 2007). Relative to other submersed plants, EWM requires high light, has a high photosynthetic rate, and can grow over a broad temperature range (Ecology 2007). EWM exhibits an annual pattern of growth. In the spring, shoots begin to grow rapidly as water temperatures approach 15 degrees centigrade. When they near the surface, shoots branch profusely, forming a dense canopy (Ecology 2007). Typically, plants flower upon reaching the surface and die back to the root crowns, which sprout again in the spring.

Although EWM can potentially spread by both sexual and vegetative means, vegetative spread is considered the major method of reproduction. During the growing season, the plant undergoes autofragmentation. The plant fragments often develop roots at the nodes before separation from the parent plants. Fragments are also produced by wind and wave action, control harvest activity and boating activities, with each plant fragment having the potential to develop into a new plant (Ecology 2007).

EWM is classified as a class B noxious weed by the Washington State Noxious Weed Control Board (WNWCB 2007). Class B noxious weeds are nonnative plants whose distribution is limited to portions of Washington State. Additionally, EWM has been identified as a nuisance species in the Washington State Aquatic Nuisance Species Management Plan (ANSC 2001). EWM can adversely impact aquatic ecosystems by forming dense canopies that often shade out native vegetation. Monospecific stands of EWM affect aquatic habitat, water quality, can impact power generation and irrigation, and interfere with recreational activities. In Washington, private and government sources spend about $1,000,000 per year on EWM control (Ecology 2007).

2.1.2 Zebra Mussel (*Dreissena polymorpha*) and Quagga Mussel (*Dreissena rostriformis bugensis*)

Zebra and quagga mussels are freshwater, bivalve mollusks that typically have a dark and white (zebra-like) pattern on their shells. They are native to Eurasia and were both introduced into the Great Lakes as a result of ballast water discharge from transoceanic ships that were carrying veligers, juveniles, or adult mussels (USGS 2007). Zebra mussels first invaded North America in the mid-1980s and quagga mussels invaded a few years later in 1989 (USFWS 2007). These two species are closely related with subtle morphological differences. More research is needed on North American quagga mussels to assess ecological differences between the two species, but the practical implications of both species are essentially identical (USFWS 2007). The North American distribution of these species has been concentrated in the Great Lakes region of the U.S. with the zebra mussel distribution also spanning farther into the southern U.S. (Figure 2.1-1). Despite recent measures to prevent their westward expansion, quagga mussels were discovered in the Lake Mead Recreation Area. Populations have subsequently been found throughout the Boulder Basin of Lake Mead (Figure 2.1-1) and in more than a dozen reservoirs serving Southern California (Pam Meacham, pers. comm.).

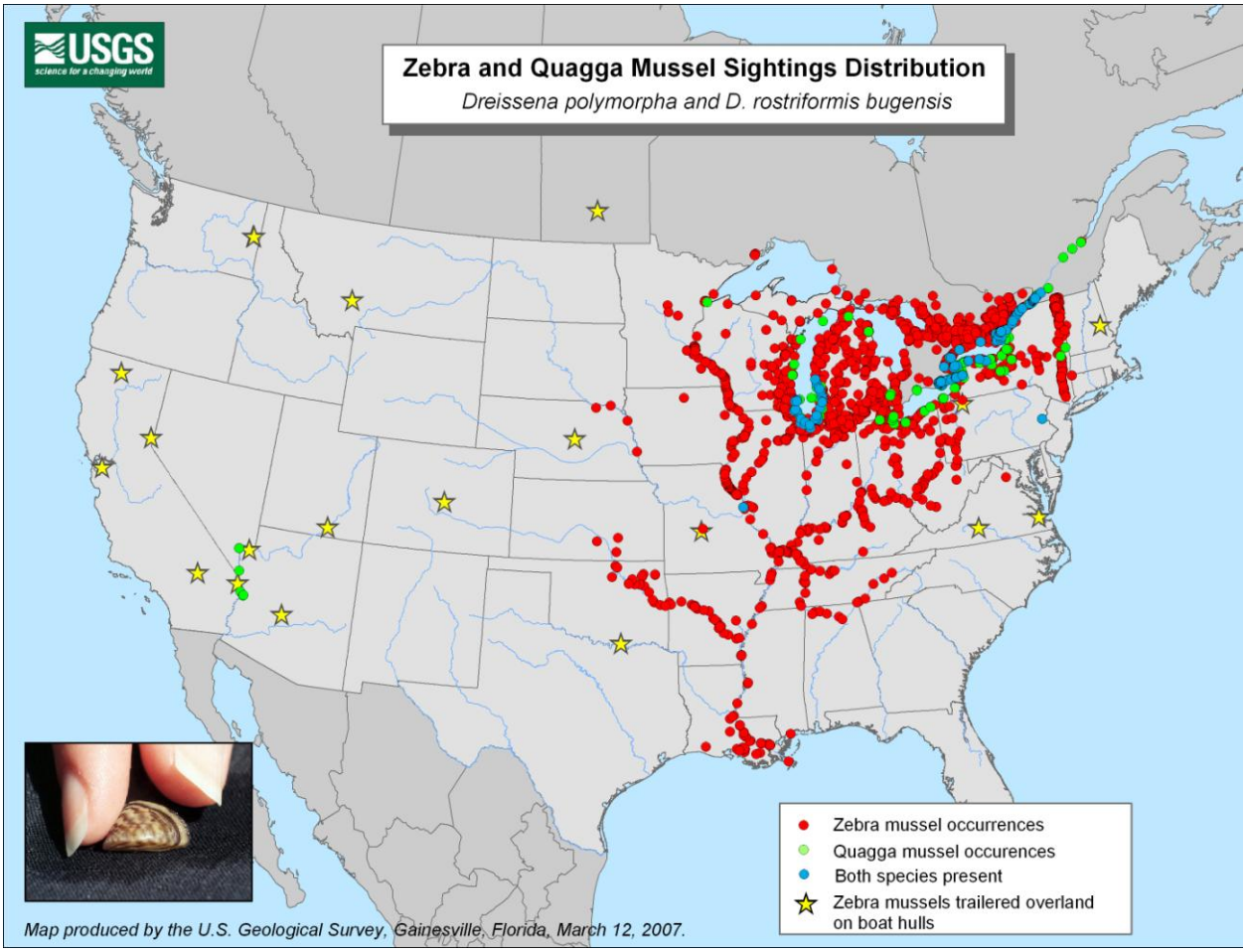

Figure 2.1-1 Zebra and Quagga Mussel Sightings Distribution Map (USGS 2007).

Zebra and quagga mussel size varies from microscopic to two inches long. Typical lifespan is up to 5 years. Both species may spawn year around if conditions are favorable. Peak spawning typically occurs in spring and fall. *Dreissena* are dioecious (either male or female) with external fertilization. Both species are prolific reproducers. Fecundity is high with a few individuals having the capability of producing millions of eggs and sperm (USFWS 2007). After fertilization, pelagic microscopic larvae, or veligers, develop within a few days and these veligers soon acquire minute bivalve shells. Free-swimming veligers drift with currents for three to four weeks until suitable substrate for settling is located. Adults attach to hard surfaces via byssal threads, but can detach and move to new habitat. Both species can tolerate a wide range of water temperatures (1-30°C), low velocities (<2 m/sec), and prefer hard surfaces for attachment although quagga mussels can live in soft sediments (USFWS 2007). Zebra mussels are typically found just below the surface to about 12 meters and quagga mussels are typically found at any depth where oxygen is available (USFWS 2007).

Zebra mussels have caused major ecological and economic problems since their arrival in North America, and quagga mussels pose many of the same threats. Both species are prolific filter feeders, removing substantial amounts of phytoplankton and suspended particulate from the water thus impacting aquatic ecosystems by potentially altering food webs (USGS 2007). *Dreissena's* ability to rapidly colonize hard surfaces causes serious economic problems. These major bio-fouling organisms can clog water intake structures such as pipes and screens, therefore reducing capabilities for power and water treatment plants. Recreation-based industries and activities have also been heavily impacted; docks, breakwalls, buoys, boats, and beaches have all been heavily colonized (USGS 2007). Zebra mussel densities have been reported to be over 700,000 individuals per square meter in some facilities in the Great Lakes area. Each year, the economic impact to the U.S. and Canada is approximately $140 million in damage and control costs (Sea Grant 2007).

2.2 Project Information

Past aquatic studies contributing information to aquatic nuisance species of concern, discussed above, consisted of an aquatic macrophyte species composition and mapping survey (Lê and Kreiter 2005) and a macroinvertebrate assessment and rare, threatened, and endangered (RTE) species survey (Bioanalysts 2006). Results of these studies and other Project aquatic studies indicate that the aquatic ecosystem within the Project is composed of a diverse community of flora and fauna consisting of varied aquatic taxa such as plankton, macroinvertebrates (insects, snails and bivalves), fish, and plants. Although nonnative species are present within Project waters, the aquatic community is characterized by a native species dominated assemblage. It is important to note the varying degree to which a nonnative species can be characterized as a "nuisance" species. The many factors that determine a nonnative species' magnitude of infestation and impact are complex and not always well understood.

2.2.1 Aquatic Macrophytes

Some information exists on aquatic macrophyte communities in the mid-Columbia River system. Vegetation mapping in and around the Rocky Reach Reservoir (River Miles (RM) 473.6 to 515.5) identified 979 acres of aquatic macrophytes (Duke 2001) out of a total surface area of 8,167 acres (Duke 2001). Nonnative EWM represented 34 percent of the biomass samples

collected from within the Rocky Reach Reservoir (Duke 2001). In the Priest Rapids and Wanapum reservoirs, the composition of EWM in the aquatic macrophyte community was higher at 42 percent of littoral plant biomass (Normandeau et al. 2000).

In August and September 2005, Douglas PUD conducted an aquatic macrophyte study in the Wells Reservoir. Sixty-one transects totaling 369 sample points were completed during the 2005 study (Lê and Kreiter 2005). Depths of up to 30 feet were sampled and sampling points along transects were completed at intervals of 5 feet or less. A total of nine aquatic plant species were documented (Table 2.2-1). Table 2.2-1 presents the percentage of samples in which each of the identified aquatic species was categorized as the dominant species (consisting of >60 percent of the sample composition). The two most dominant species in samples collected were common waterweed (*Elodea canadensis*) and leafy pondweed (*Potamogeton foliosus*) at 24.7 percent and 16.7 percent, respectively. Both of these species are native. EWM was dominant in only 6.3 percent of samples (Table 2.2-1). Samples with no plants (absent) consisted of 41.7 percent of all samples taken. This observation supports the concept that macrophyte communities maintain a patchy distribution.

Table 2.2-1 Aquatic macrophyte species identified and the frequency at which each of the species was considered the dominant species (consisting of >60 percent of the total sample) in a given sample during the Macrophyte Identification and Distribution Study, 2005 (Lê and Kreiter 2005).

Scientific Name	Common Name	Percentage of samples in which dominant
Chara spp.	Muskgrass	.003% (1/396)
Elodea canadensis	Common waterweed	24.7% (98/396)
Myriophyllum spicatum	Eurasian watermilfoil	6.3% (25/396)
Potamogeton crispus	Curly leaf pondweed	4.3% (17/396)
Potamogeton foliosus	Leafy pondweed	16.7% (66/396)
Potamogeton nodosus	American pondweed	1.3% (5/396)
Potamogeton pectinatus	Sago pondweed	0.8% (3/396)
Potamogeton zosteriformis	Flat-stemmed or eelgrass pondweed	2.3% (9/396)
Absent		41.7% (165/396)

Although EWM is present in the Project, the 2005 study indicated that it is not a dominant component of the Project aquatic plant community. During the Project study, EWM was often sub-dominant to several native species in samples collected. These contrasting observations between the Wells Reservoir and downstream reservoirs (Rocky Reach, Priest Rapids, and

Wanapum) where EWM was found to be the most abundant species are not clearly understood. One possible explanation may be that EWM, which is a species that can proliferate from plant fragments (Ecology 2001), has increased its ability to colonize due to potentially higher levels of disturbance in the downstream reservoirs as compared to the Wells Reservoir. The Rocky Reach Reservoir serves a larger population base, maintains an EWM removal program at recreational sites, and has higher levels of recreational use and development as compared to the Wells Reservoir. It is possible that these activities directly and indirectly re-mobilize EWM plant fragments and increase the potential for colonization in the Rocky Reach Reservoir as well as in downstream reservoirs (Lê and Kreiter 2005).

2.2.2 Aquatic Macroinvertebrates

In September and October 2005, Douglas PUD conducted an aquatic invertebrate inventory and an assessment of the presence of RTE aquatic invertebrates within the Wells Reservoir. The overall objective of the study was to document the distribution, habitat associations and qualitative abundance of the current aquatic invertebrate (e.g., clams, snails and insects) assemblage in the Wells Reservoir.

Samples were collected within representative habitats throughout the Wells Reservoir using an air lift suction device, Ponar grabs and colonization baskets. A total of 17 sites were sampled. In addition to the varied aquatic insects and worms found during the survey, approximately 20 species of freshwater mollusks were identified during the inventory from dredge samples (Table 2.3-1). Within the Methow, Okanogan and Columbia portions of the Wells Reservoir, 13, 11, and nine species of mollusks were present, respectively. Of the 20 species, 10 gastropods (snails) and 10 bivalves (clams, mussels) were identified. The gastropods included nine native species and one nonnative species (Big-ear radix, *Radix auricularia*). Similarly, the bivalves also included nine native species and one nonnative species (Asian clam, *Corbicula fluminea*) (BioAnalysts, Inc. 2006). The 2005 macroinvertebrate assessment did not discover the presence of any zebra mussels or quagga mussels within the Project.

2.2.3 Project Aquatic Nuisance Species Monitoring

In 2006, Douglas PUD, in coordination with the Aquatic Nuisance Species Division of WDFW, began monitoring for zebra mussels and quagga mussels in Project waters. Activities consisted of monthly plankton tows to target mussel veligers at sites downstream of boat launches within the Wells Reservoir. Sampling activities were conducted during the summer and early fall when recreational boating activity is at a peak. Sampling protocols were provided by WDFW. All samples were sent back to WDFW for analysis. To date, none of the samples collected within the Project have contained any signs of zebra or quagga mussel presence.

In 2007, Douglas PUD, in coordination with the Center for Lakes and Reservoirs at Portland State University, installed a permanent substrate sampler in the Wells Dam forebay to monitor for zebra and quagga mussel colonization within the Project. Douglas PUD staff checks the substrate sampler monthly throughout the year as specified by the monitoring protocol. To date, no signs of zebra or quagga mussel presence have been detected. Both of these monitoring activities are ongoing.

Table 2.2-2 Mollusks collected from sampling stations on the Methow, Okanogan, and Columbia rivers during the 2005 Project Aquatic Macroinvertebrate Inventory.

Location	Common Name	Taxon
Methow River	Western pearlshell	*Margaritinopsis falcata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Western lake fingernail clam	*Musculium raymondi*
	Shortface lanx	*Fisherola nuttalli*
	Ashy pebblesnail	*Fluminicola fuscus*
	Western floater	*Anodonta kennerlyi*
	Ubiquitous peaclam	*Pisidium casertanum*
	Big-ear radix*	*Radix auricularia*
	Golden fossaria	*Fossaria obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Ash gyro	*Gyraulus parvus*
		Corbicula sp.
Okanogan River	Western ridgemussel	*Gonidea angulata*
	Striate fingernail clam	*Sphaerium striatinum*
	Ridgebeak peaclam	*Pisidium compressum*
	Ubiquitous peaclam	*Pisidium casertanum*
	Asian clam*	*Corbicula fluminea*
	Ashy pebblesnail	*Fluminicola fuscus*
	Fragile ancylid	*Ferrissia californica*
	Ash gyro	*Gyraulus parvus*
	Western lake fingernail clam	*Musculium raymondi*
		Physella sp.
		Anodonta sp.
Columbia River	Western floater	*Anodonta kennnerlyi*
	Asian clam*	*Corbicula fluminea*
	Ridgebeak peaclam	*Pisidium compressum*
	Three ridge valvata	*Valvata tricarinata*
	Rocky Mountain physa	*Physella propinqua propinqua*
	Ash gyro	*Gyraulus parvus*
	Golden fossaria	*Fossaria (F.) obrussa*
	Prairie fossaria	*Fossaria (Bakerilymnaea) bulimoides*
	Big-ear radix*	*Radix auricularia*

*Nonnative taxon.

3.0 GOAL AND OBJECTIVES

The goal of the ANSMP is to prevent the introduction and/or spread of ANS in Project waters. Douglas PUD, in collaboration with the Aquatic SWG, has agreed to implement several PMEs in support of the ANSMP. The PMEs presented within the ANSMP are designed to meet the following objectives:

Objective 1: Implement best management practices to prevent Eurasian watermilfoil proliferation during in-water (i.e., construction, maintenance and recreation improvements) improvement activities in the Project.

Objective 2: Continue participation in regional and state efforts to prevent the introduction and spread of aquatic nuisance species. Activities include continued monitoring for the presence of ANS, monitoring bycatch data collected during other aquatic management plan activities and conducting education outreach within the Project.

Objective 3: In response to proposed changes in the Project requiring Federal Energy Regulatory Commission (FERC) approval, the Aquatic SWG will assess the potential effects, if any, with respect to the introduction or proliferation of aquatic nuisance species in the Project to inform management decisions to support success of the ANSMP and will implement reasonable and appropriate measures to address any potential effects.

The ANSMP is intended to be compatible with other ANS management plans in the Columbia River mainstem. Furthermore, this management plan is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Water Quality Management Plan by continuing to prevent the introduction and/or spread of ANS in Project waters. The ANSMP is intended to be not inconsistent with other management strategies of federal, state, and tribal natural resource management agencies.

The schedule for implementation of specific measures within the ANSMP is based on the best information available at the time the Plan was developed. As new information becomes available, implementation of each activity may be adjusted through consultation with the Aquatic SWG.

4.0 PROTECTION, MITIGATION AND ENHANCEMENT MEASURES

In order to fulfill the goals and objectives described in the new FERC license, 401 Certification and Section 3.0 of the ANSMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures.

4.1 Implement Best Management Practices During Recreational Improvement Activities (Objective 1)

If at any time during the new license term, Douglas PUD is required to construct, improve or maintain recreation access at boat launches and swim areas and the removal or disturbance of aquatic macrophtye beds that contain Eurasian watermilfoil may potentially occur, Douglas PUD will implement containment efforts utilizing best management practices agreed to by the Aquatic SWG during such activities.

4.1.1 Progress Towards Objective 1 in 2012 – Implement Best Management Practices During Recreational Improvement Activities

The new license for the Wells Project was issued on November 9, 2012. Between the issuance of the license and the end of the 2012 calendar year (December 31st) Douglas PUD did not implement any new recreation improvements in the Wells Project that required the use of Best Management Practices.

Toward meeting the requirement to file an updated ANSMP by May 2013, Douglas PUD has been working closely with the parties to the Aquatic Settlement Work Group and the National Marine Fisheries Service to develop a revised ANSMP that adheres to the requirements of Article 405 of the new FERC License.

The new ANSMP is currently being updated to include: 1) specific best management practices that will be implemented to prevent the spread of aquatic nuisance species during construction of recreation enhancement measures and 2) specific reasonable and appropriate measures that are consistent with aquatic nuisance species management protocols and will be implemented if ANS are detected during monitoring activities at the project. The revised ANSMP is being developed in consultation with the Aquatic SWG and will be filed with the FERC for approval prior to May 31, 2013.

4.2 Participation in Regional and State ANS Efforts (Objective 2)

4.2.1 Coordination with Regional and State Entities

Douglas PUD shall continue to coordinate with regional and state entities to implement activities in Project waters to monitor for the presence of ANS, specifically zebra and quagga mussels. Activities covered by this objective will consist of monitoring for the presence of zebra and quagga mussels as is identified in Section 2.2.3. If ANS are detected during monitoring activities, Douglas PUD will immediately notify the appropriate regional and state agencies and assist in the implementation of reasonable and appropriate measures to address the ANS presence as is consistent with ANS Management protocols.

Douglas PUD shall participate in information exchanges and regional efforts to coordinate monitoring activities.

4.2.1.1 Progress Towards Objective 2 in 2012 – Coordination with Regional and State ANS Efforts

Similar to in previous years, Douglas PUD closely coordinated zebra and quagga mussel monitoring with WDFW during 2012. Sampling took place during the spring summer and fall months when water temperatures are conducive to vileger production. Collected samples were sent to WDFW for analysis. All samples came back negative for the presence of invasive mussels.

Douglas PUD also developed and conducted a study of the distribution of non-native northern crayfish in the Wells Project. Results of the study were shared with the Aquatic ASWG. In August and September, approximately 700 hours of trapping effort was carried out in areas throughout the Wells Project. Traps failed to capture any crayfish. Physical searching commenced following unsuccessful trapping, with both native, Signal (*Pacifastacus leniusculus*), and non-native, Northern (*Orconectes virilis*) crayfish being found. However both species were found in low abundance throughout the Wells Project and the two species did not co-inhabit the same locations. In an effort to gain more information on the crayfish population in the Wells Reservoir, Douglas PUD has developed a database where incidental captures of crayfish during other fisheries activities will be recorded.

4.2.2 Monitor Bycatch from other Project Aquatic Resource Management Activities

Douglas PUD shall monitor bycatch data collected from ongoing Project aquatic resource management activities for aquatic nuisance species presence to support regional and state efforts and the ANSMP. Such ongoing activities may consist of broodstock collection activities at Wells Dam and in associated Project tributaries, the northern pikeminnow removal program, water quality monitoring and any other aquatic resource activities related to implementation of Aquatic Resource Management Plans for bull trout, Pacific lamprey, white sturgeon, and resident fish.

4.2.2.1 Progress Towards Objective 2 in 2012 – Monitor Bycatch from other Project Aquatic Resource Management Activities

Douglas PUD monitored bycatch for aquatic nuisance species during aquatic resource management activities in 2012. Specific activities in which monitoring of bycatch occurred included: the subyearling Chinook life-history study, northern pikeminnow removal program, temperature station monitoring, and the crayfish distribution study. In addition, a database for tracking the presence of non-native crayfish encountered during other management activities was established in 2012.

Bycatch results were presented in respective reports for each activity. Briefly, non-native bycatch during all activities was consistent with previous resident fish sampling with no new non-natives found. Bycatch was dominated by, Triploid Rainbow Trout (*O. mykiss*), Common Carp (*Cyprinus carpio*), Suckers (*Catostomus sp*.), Tench (*T. tinca*), Smallmouth bass (*Micropterus dolomieu*), Chiselmouth (*Acrocheilus alutaceus*), White fish (*Prosopium sp*.),. Species composition was function of depth of collection and water temperature.

4.2.3 ANS Information and Education

Douglas PUD shall make information regarding the effects of ANS introductions and the importance of prevention available to the public. Such outreach activities may consist of posting signage at Project recreation areas and boat launches.

Douglas PUD shall also provide literature produced by appropriate state entities (Ecology and WDFW) for distribution at the visitor centers of local communities of the Project (Pateros, Brewster, Bridgeport) including Wells Dam.

4.2.3.1 Progress Towards Objective 2 in 2012 – ANS Information and Education

In 2012, Douglas PUD maintained ANS signage year-round at all public boat launch facilities in the Wells Project. Signs included information about preventing the spread of ANS. Douglas PUD also began developing literature in the form of brochures and fact sheets on ANS prevention measures and the risks of ANS introductions. This information will be made available to the public by May 2013 at public use facilities and visitor centers.

4.3 Monitor and Address ANS Effects to Aquatic Communities During Changes in Project Operations (Objective 3)

If at any time during the new license term, future changes in Project operations requiring FERC approval are proposed and the Aquatic SWG concludes that such proposed operations may encourage the introduction or proliferation of aquatic nuisance species within the Project, the Aquatic SWG will assess the potential effects, if any, in order to make informed management decisions.

If the assessment identifies adverse effects to Aquatic Resources due to aquatic nuisance species attributable to changes in Project operations, Douglas PUD shall consult with the Aquatic SWG to select and implement reasonable and appropriate PMEs to address the identified adverse effect(s).

4.3.1 Progress Towards Objective 3 in 2012 - Monitor and Address ANS Effects to Aquatic Communities During Changes in Project Operations

No significant changes in Project operations occurred in 2012.

4.4 Reporting

Douglas PUD will provide a draft annual report to the Aquatic SWG summarizing the previous year's activities undertaken in accordance with the ANSMP. The report will document all ANS activities conducted within the Project. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this ANSMP will be included in the annual report. If significant activity was not conducted in a given year, Douglas will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

4.4.1 Progress Towards Annual Reporting Requirements

Consistent with Article 406 of the new FERC License for Wells Dam, the Wells Dam 401 Certification, and the ANSMP, this annual ANSMP report will be updated annually with the assistance of the Aquatic SWG. Each year the report will be provided to the members for a 30 days review prior to May 31st. The report will include a summary of the progress made towards the implementation of the ANSMP and focus on the previous year's developments.

5.0 REFERENCES

ANSC (Aquatic Nuisance Species Committee). 2001. Washington State Aquatic Nuisance Species Management Plan. Edited by Pamala Meacham, Washington Department of Fish and Wildlife (WDFW). Published by WDFW.

BioAnalyst, Inc. 2006. Aquatic Macroinvertebrate Inventory and RTE Assessment. Wells Hydroelectric Project, FERC No. 2149. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Duke. 2001. Rocky Reach fish presence and habitat use survey. Report prepared for the Public Utility District No. 1 of Chelan County, Wenatchee, Washington.

Ecology (Washington State Department of Ecology). 2001. An Aquatic Plant Identification Manual for Washington's Freshwater Plants. Washington State Department of Ecology, June 2001, Publication 01-10-032.

Ecology (Washington State Department of Ecology). 2007. Non-native Freshwater Plants: Eurasian Watermilfoil. Available at: http://www.ecy.wa.gov/programs/wq/plants/weeds/milfoil.html (Accessed August 2007).

Lê, B. and S. Kreiter. 2005. Aquatic Macrophyte Identification and Distribution Study. Wells Hydroelectric Project, FERC NO. 2149. Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Normandeau Associates, Inc. 2000. An Evaluation of Water Quality and Limnology for the Priest Rapids Project Area. Report prepared for Public Utility District No. 2 of Grant County. Normandeau Associates, Inc. in cooperation with Washington State University and the Idaho Department of Fish and Wildlife.

RCW (Revised Code of Washington). 2007. Washington State Legislature. http://apps.leg.wa.gov/RCW/default.aspx?cite=77.60.130 (Accessed August 2007).

Sea Grant (Sea Grant Pennsylvania). 2007. Zebra Mussel and Quagga Mussel. Available at: http://seagrant.psu.edu/publications/fs/zebraquagga2007.pdf (Accessed August 2007).

USFWS (United States Fish and Wildlife Service). 2007. Western Quagga Mussels: Background Information. U.S. Fish and Wildlife Service.

USGS (United States Geological Survey). 2007. Dreissena Species FAQs, A Closer Look. Available at: http://cars.er.usgs.gov/Nonindigenous_Species/Zebra_mussel_FAQs/Dreissena_FAQs/dreissena_faqs.html (Accessed August 2007).

WNWCB (Washington State Noxious Weed Control Board). 2007. Washington State Noxious Weed List. Available at: http://www.nwcb.wa.gov/weed_list/weed_list.htm (Accessed August 2007).

2012 ANNUAL REPORT

WATER QUALITY MANAGEMENT PLAN

WELLS HYDROELECTRIC PROJECT

FERC PROJECT NO. 2149

April 2013

Prepared by:
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

EXECUTIVE SUMMARY

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans (Plans) contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six Aquatic Resource Management Plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license and, together with the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP), will function as the Water Quality Attainment Plan (WQAP) in support of the Clean Water Act Section 401 Water Quality Certification (401 Certification) for the Wells Hydroelectric Project (Project).

The goal of the WQMP is to protect the quality of the surface waters affected by the Wells Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Public Utility District No. 1 of Douglas County (Douglas PUD), in collaboration with the Aquatic Settlement Work Group (Aquatic SWG), has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State Water Quality Standards (WQS), Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for Total dissolved Gas (TDG)[1]. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD. In April 2012 Washington Department of Ecology (Ecology) approved Douglas PUD's Gas Abatement Plan (GAP) and issued a fish passage TDG adjustment waiver for the 2012 spill season. The final 2012 GAP requires Douglas PUD to monitor TDG in the forebay and tailrace of Wells Dam throughout the entire fish passage season (April 19th – August 19th). Hourly forebay and tailrace TDG values were reported on the U.S. Army Corps of Engineers Water Management Division webpage and the Columbia River Data Access Real Time webpage, consistent with regional fish management agencies. The GAP also included a biological monitoring plan, which involved the collection of adult salmonids at Wells Dam and juvenile salmonids at Rocky Reach Dam when TDG at Wells Dam exceeded 125% in the tailrace during any hour. In 2012, over 500 juvenile and 800 adult salmon were assessed for signs of Gas Bubble Trauma (GBT) when TDG values were above 125%. During the 2012 water year, Ecology was updated regularly when flows were exceptionally high and when TDG standards exceeded those required by the fish passage TDG exemption. In addition, Douglas PUD provided Ecology with weekly TDG and water reports.

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas

[1] During the 2011 spill season Wells Dam had measurable TDG exceedances, which fell above water quality standards. As such, during the issuance of the Wells 401 Certification and as part of the relicensing of the Wells Project, Ecology requires that compliance with state WQS for TDG is achieved at the Wells Project. Compliance is to be achieved within ten years of the issuance of the New License and approved Water Quality Attainment Plan.

PUD. Water temperature monitoring in 2012 was consistent with the requirements listed in the WQMP and 401 Certification.

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD. In 2012 samples of floating algae were taken and sent to King County laboratories. Toxicity levels were such that the Washington Department of Ecology recommended posting information at recreational sites designed to prevent people and pets from coming in contact with floating algae mats.

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin. Consistent with the WQMP, 401 Certification, Operating License, during calendar year 2012, Douglas PUD participated in regional forums lead by the Washington Department of Ecology, the Sovereign Technical Team, and U. S. Army Corps of Engineers and other managers. In addition, the Wells Project was operated in a manner to minimize spill and TDG production consistent with the developed Spill Playbook and Gas Abatement Plan.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including Total Maximum Daily Loads (TMDL). Furthermore, the WQMP is intended to be supportive of the Habitat Conservation Plan (HCP), Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

The 2013 annual report on the implementation of the WQMP will include all of the water quality compliance related activities implemented from the issuance of the new license in November 2012 to the end of December 2013 and will include all of the new water quality related compliance reports and plans added into the new license by the 401 Certification.

1.0 INTRODUCTION

The Water Quality Management Plan (WQMP) is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement). Collectively, these six plans are critical to direct implementation of Protection, Mitigation, and Enhancement measures (PMEs) during the term of the new license (issued November 9, 2012).

During the development of this plan, the Aquatic Settlement Work Group (Aquatic SWG) focused on management priorities for resources potentially impacted by Wells Hydroelectric Project (Project) operations. Entities that participated in the Aquatic SWG include the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), Bureau of Land Management (BLM), Bureau of Indian Affairs (BIA), Washington Department of Ecology (Ecology), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (Colville), the Confederated Tribes and Bands of the Yakama Nation (Yakama Nation), and Douglas PUD.

The Washington State Water Quality Standards (WQS) found at WAC 173-201A include designated uses (recreation, agriculture, domestic and industrial use, and habitat for aquatic life) and supporting numeric criteria. The WQMP is intended to address only the numeric criteria of the WQS. Aquatic life uses of the Project identified by the WQS shall be addressed by the five other Aquatic Resource Management Plans within the Agreement and by the measures implemented in the Wells Anadromous fish Agreement and Habitat Conservation Plan (HCP).

This management plan summarizes the relevant resource issues and background (Section 2), identifies goals and objectives of the plan (Section 3), and describes the relevant measures (Section 4) to maintain compliance with the numeric criteria of state WQS during the term of the new license.

The WQMP will be updated in 2013 to reflect additional requirements that have been added by the final Clean Water Act (CWA) Section 401 Water Quality Certification (401 Certification) and the new project license issued by the Federal Energy Regulatory Commission (FERC). The 2013 annual report on the implementation of the WQMP will include all of the water quality related activities that took place from the issuance of the new license in November 2012 to the end of December 2013. The 2013 annual report will also specifically address the implementation of the new water quality related measures found exclusively in the FERC license.

2.0 BACKGROUND

Section 401 of the Clean Water Act (33 USC Chapter 26 § 1341 *et seq.*) requires that applicants for a hydroelectric project license from the FERC provide FERC with a 401 Certification that provides reasonable assurance that the Project will comply with applicable WQS and any other appropriate requirements of state law. In Washington State, Ecology is responsible for issuing 401 Certifications. The 401 Certification for the Wells Project was issued on February 27th 2012.

2.1 Water Quality Standards

Congress passed the CWA in 1972, and designated the U.S. Environmental Protection Agency (EPA) as the administering federal agency. This federal law requires that a state's water quality standards protect the surface waters of the U.S. for beneficial or designated uses, such as recreation, agriculture, domestic and industrial use, and habitat for aquatic life. Any state WQS, or amendments to these standards, do not become effective under the CWA until they have been approved by EPA.

Ecology is responsible for the protection and restoration of Washington State's waters. Ecology establishes WQS that set limits on pollution in lakes, rivers, and marine waters in order to protect water quality and specified designated uses of such water bodies. These standards are found in WAC 173-201A.

2.1.1 Water Quality Standards for the Project

The Project includes the mainstem Columbia River above Wells Dam, one mile of the mainstem Columbia River below Wells Dam, the Methow River (up to river mile [RM] 1.5) and the Okanogan River (up to RM 15.5).

Under the 2006 WQS, the Project includes designated uses for spawning/rearing (aquatic life), primary contact recreation, and all types of water supply and miscellaneous uses. Numeric criteria to support the protection of these designated uses consist of various physical, chemical, and biological parameters including total dissolved gas (TDG), temperature, dissolved oxygen (DO), pH, turbidity, and toxins.

Unless stated otherwise in the subsections below, WQS criteria discussed in subsections 2.1.1.1 to 2.1.1.6 apply to all waters within the Project.

2.1.1.1 Total Dissolved Gas

TDG is measured as a percent saturation. Based upon criteria developed by Ecology, TDG measurements shall not exceed 110% at any point of measurement in any state water body. The WQS state that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency (7Q10) flood. The 7Q10 flow is the highest value of a running seven consecutive day average using the daily average flows that may be seen in a 10-year period. The 7Q10 total river flow for the Project was computed by Ecology (Pickett et al 2004) using the hydrologic record from 1974 through 1998 and a statistical analysis to develop the number from 1930 through 1998. The U.S. Geological Survey Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" was followed. The resulting 7Q10 flow at Wells Dam is 246,000 cubic feet per second (cfs).

In addition to allowances for TDG standard exceedances during natural flood flows in excess of 7Q10, the TDG criteria may be adjusted to accommodate spill to facilitate fish passage over hydroelectric dams when consistent with an Ecology-approved Gas Abatement Plan (GAP). Ecology has approved on a per application basis, an interim exemption to the TDG standard (110%) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-

201A-200(1)(f)(ii)). Dams in the Columbia and Snake rivers may be granted such an exemption. The GAP must be accompanied by fisheries management, physical, and biological monitoring plans (173-201A-200(1)(f)(ii)).

Columbia and Snake River TDG Exemption

On the Columbia and Snake rivers, three conditions apply to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125% as measured in any one-hour period during spillage for fish passage. Second, TDG shall not exceed 120% in the tailrace of a dam, as an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure. Third, TDG shall not exceed 115% in the forebay of the next dam downstream, also based on an average of the 12 highest consecutive hourly readings in any one day (24-hour period), relative to atmospheric pressure.

The increased levels of spill resulting in elevated TDG levels are intended to allow increased fish passage without causing more harm to fish populations than caused by turbine passage. The TDG exemption provided by Ecology is based on a risk analysis study conducted by the National Marine Fisheries Service (NMFS; NMFS 2000).

2.1.1.2 Temperature

Temperature is measured by the 7-day average of the daily maximum temperatures (7-DADMax). The 7-DADMax for any individual day is calculated by averaging that day's daily maximum temperature with the daily maximum temperatures of the three days prior and the three days after that date (WAC 173-201A-020).

Under the WQS, the 7-DADMax temperature within the Columbia, Methow, and Okanogan river portions of the Project shall not exceed 17.5°C (63.5°F) (WAC 173-201A-602 and 173-201A-200(1)(c)). Additionally, the WQS contains additional supplemental temperature requirements for the Project portion of the Methow River (see Methow River Supplemental Requirements section below). When a water body's temperature is warmer than 17.5°C (or within 0.3°C (0.54°F) of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the 7-DADMax temperature of that water body to increase more than 0.3°C (0.54°F).

When the background condition of the water is cooler than 17.5°C, the allowable rate of warming up to, but not exceeding, the numeric criteria from human actions is restricted as follows:

(A) Incremental temperature increases resulting from individual point source activities must not, at any time, exceed 28/(T+7) as measured at the edge of a mixing zone boundary (where "T" represents the background temperature as measured at a point or points unaffected by the discharge and representative of the highest ambient water temperature in the vicinity of the discharge).

(B) Incremental temperature increases resulting from the combined effect of all non-point source activities in the water body must not, at any time, exceed 2.8°C (5.04°F).

Temperatures are not to exceed the criteria at a probability frequency of more than once every ten years on average. Temperature measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:
(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

The following guidelines on preventing acute lethality and barriers to migration of salmonids are also used in determinations of compliance with the narrative requirements for use protection established in WAC 173-201A (e.g., WAC 173-201A-310(1), 173-201A-400(4), and 173-201A-410 (1)(c)). The following site-level considerations do not, however, override the temperature criteria established for waters in WAC 173-201A-200(1)(c) or WAC 173-201A-602:

(A) Moderately acclimated (16-20°C, or 60.8-68.0°F) adult and juvenile salmonids will generally be protected from acute lethality by discrete human actions maintaining the 7-DADMax temperature at or below 22°C (71.6°F) and the 1-day maximum (1-DMax) temperature at or below 23°C (73.4°F).

(B) Lethality to developing fish embryos can be expected to occur at a 1-DMax temperature greater than 17.5°C (63.5°F).

(C) To protect aquatic organisms, discharge plume temperatures must be maintained such that fish could not be entrained (based on plume time of travel) for more than two seconds at temperatures above 33°C (91.4°F) to avoid creating areas that will cause near instantaneous lethality.

(D) Barriers to adult salmonid migration are assumed to exist any time the 1-DMax temperature is greater than 22°C (71.6°F) and the adjacent downstream water temperatures are 3°C (5.4°F) or cooler.

Methow River Supplemental Requirements

Ecology has identified water bodies, or portions thereof, which require special protection for spawning and incubation in accordance with Ecology publication 06-10-038. This publication indicates where and when the following criteria are to be applied to protect the reproduction of native char, salmon, and trout. Water temperatures are not to exceed 13°C from October 1 to June 15 in the lower Methow River including the portion within the Project boundary (up to RM 1.5).

2.1.1.3 Dissolved Oxygen

DO criteria are measured in milligrams per liter (mg/L). Under the WQS, DO measurements shall not be under the 1-day minimum of 8.0 mg/L. 1-day minimum is defined as the lowest DO reached on any given day. When a waterbody's DO is lower than the 8.0 mg/L criteria (or within 0.2 mg/L of the criteria) and that condition is due to natural conditions, then human actions considered cumulatively may not cause the DO of that water body to decrease more than 0.2

mg/L. Concentrations of DO are not to fall below 8.0 mg/L at a probability frequency of more than once every ten years on average.

DO measurements should be taken to represent the dominant aquatic habitat of the monitoring site. This typically means samples should:

(A) Be taken from well mixed portions of rivers and streams.

(B) Not be taken from shallow stagnant backwater areas, within isolated thermal refuges, at the surface, or at the water's edge.

2.1.1.4 pH

pH is defined as the negative logarithm of the hydrogen ion concentration. Under the WQS, pH measurements shall be in the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.

2.1.1.5 Turbidity

Turbidity is measured in nephelometric turbidity units (NTUs). Turbidity shall not exceed 5 NTU over background when the background is 50 NTU or less; or a 10% increase in turbidity when the background turbidity is more than 50 NTU.

2.1.1.6 Toxins

Toxic substances shall not be introduced above natural background levels in waters of the state which have the potential either singularly or cumulatively to adversely affect characteristic water uses, cause acute or chronic toxicity to the most sensitive biota dependent upon those waters, or adversely affect public health, as determined by Ecology.

Ecology shall employ or require chemical testing, acute and chronic toxicity testing, and biological assessments, as appropriate, to evaluate compliance with WAC 173-201-240 and to ensure that aquatic communities and the existing and characteristic beneficial uses of waters are being fully protected.

Within the Project Area, specifically within the Project portion of the Okanogan River, two toxic substances are of concern: Dichloro-Diphenyl-Trichloroethane (DDT) and Polychlorinated Biphenyls (PCBs). DDT is a synthetic organochlorine insecticide that was frequently used in agriculture prior to being banned in 1972. PCBs are an organic compound that were used as coolants and insulating fluids for transformers, and capacitors. PCBs are classified as persistent organic pollutants and production was banned in the 1970s due to its high level of toxicity.

Toxic substances criteria identified in the WQS for these two substances are as follow:

(A) In freshwater, DDT (and metabolites) shall not exceed 1.1 µg/L as an instantaneous concentration at any time. Exceedance of the criteria is defined as an acute condition. DDT (and

metabolites) shall not exceed 0.001 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

(B) In freshwater, PCBs shall not exceed 2.0 µg/L as a 24-hour average. Exceedance of the criteria is defined as an acute condition. PCBs shall not exceed 0.01 µg/L as a 24-hour average. Exceedance of the criteria is defined as a chronic condition.

2.1.2 305(b) Report, 303(d) List and Total Maximum Daily Loads

Every two years, the EPA, as specified in section 305(b) of the CWA, requires Ecology to compile an assessment of the state's water bodies. Data collected from the water quality assessment are used to develop a 305(b) report. The report evaluates and assigns each water body into five categories based upon the Ecology's evaluation of the water quality parameters collected from within each water body.

Category 1 states that a water body is in compliance with the State WQS for the parameter of interest.
Category 2 states a water body of concern.
Category 3 signifies that insufficient data are available to make an assessment.
Categories 4a-4c indicates an impaired water body that does not require a Total Maximum Daily Load (TMDL) for one of three reasons:

- Category 4a indicates a water body with a finalized TMDL.
- Category 4b indicates a water body with a Pollution Control Program.
- Category 4c indicates a water body impaired by a non-pollutant (e.g., low water flow, stream channelization, and dams).

Category 5 represents all water bodies within the state that are considered impaired and require a Water Quality Implementation Plan (WQIP) (formerly TMDL). The 303(d) list consists of only water bodies with Category 5 listings.

Information presented below in subsections 2.1.2.1 to 2.1.2.6 are based upon the Draft 2008 Water Quality Assessment and candidate 303(d) list that has been finalized by Ecology and submitted to the EPA for approval.

2.1.2.1 Total Dissolved Gas

The reach of the Columbia River within the Project is on the state's 1998 303(d) list for TDG impairment (Category 5 listing). In 2004, Ecology developed a TDG TMDL (which was approved by EPA) for the mid-Columbia River and as such, this reach of the Columbia River, which includes the Project, is no longer on the 303(d) list for TDG (Category 4a).

Neither the reach of the Methow River within the Project (RM 1.5) nor the reach of the Okanogan River within the Project (RM 15.5) are listed on the 2008 303(d) list for TDG.

2.1.2.2 Temperature

The reach of the Columbia River within the Project is on the state's 2004 303(d) list for temperature impairment. The EPA has developed a draft temperature TMDL for the mainstem

Columbia River, including that portion of the Columbia River contained within the Project. It is anticipated that the EPA will issue the final temperature TMDL for the Columbia River at some future date. The TMDL will address the water temperature effects of dams and other human actions, including model analyses and load allocations for mainstem hydroelectric projects including Wells Dam.

The reach of the Methow River within the Project (RM 1.5) is not on the 2008 303(d) list for temperature.

The reach of the Okanogan River within the Project (RM 15.5) is not on the 2008 303(d) list for temperature. However, reaches of the Okanogan River upstream of the Wells Project boundary are listed on the 2008 303(d) list for temperature.

2.1.2.3 DO

No part of the Project area is on the 2008 303(d) list for DO.

2.1.2.4 pH

No part of the Project area is on the 2008 303(d) list for pH.

2.1.2.5 Turbidity

No part of the Project area is on the 2008 303(d) list for turbidity.

2.1.2.6 Toxins

Neither the reach of the Columbia River within the Project nor the reach of the Methow River within the Project (RM 1.5) is on the 2008 303(d) list for toxins.

The reach of the Okanogan River within the Project (RM 15.5) is not listed on the 2008 303(d) list for toxins. In 1998, Ecology put the portion of the Okanogan River within Project boundary on the 303(d) list for 4, 4'-DDE, 4,4'-DDD, PCB-1254, and PCB 1260 concentrations above standards in edible carp tissue (Ecology 1998). In 2004, Ecology completed the Lower Okanogan River DDT and PCB TMDL (which was approved by EPA).

2.2 Project Water Quality Monitoring Results

2.2.1 Total Dissolved Gas

TDG supersaturation is a condition that occurs in water when atmospheric gasses are forced into solution at pressures that exceed the pressure of the overlying atmosphere. Water containing more than 100% TDG is in a supersaturated condition. Water may become supersaturated through natural or dam-related processes that increase the amount of air dissolved in water. Supersaturated water in the Columbia River may result from the spilling of water at Columbia River dams. The occurrence of TDG supersaturation in the Columbia River system is well

documented and has been linked to mortalities and migration delays of salmon and steelhead (Beiningen and Ebel 1970; Ebel et al. 1975).

At Wells Dam, Douglas PUD has monitored TDG for compliance with state and federal water quality regulations since 1998 and more recently in support of its GAP and TDG exemption issued by Ecology for juvenile fish passage (Le 2008). Douglas PUD is required to monitor TDG in the Wells Dam forebay and tailrace area (on the Columbia River, near RM 515.6). Douglas PUD uses Rocky Reach forebay TDG data collected by Chelan County PUD for downstream forebay monitoring compliance data.

A TDG study conducted in 2006 indicated that the current location of the TDG compliance monitoring stations are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam (EES Consulting et al. 2007). Detailed information regarding the study is provided in Section 2.3.1.2.

Since 2003, Douglas PUD has operated the Project during the juvenile fish passage season (April – August) in accordance with an Ecology-approved GAP and associated TDG exemption. TDG monitoring at Wells Dam is facilitated through the deployment of Hydrolab Minisonde probes in the center of the Wells forebay and approximately 3 miles downstream of Wells Dam. TDG data are logged every fifteen minutes, averaged (4 in an hour) and transmitted on the hour. Probes are serviced and checked monthly for accuracy and calibrated if necessary.

Levels of TDG at Wells Dam and the Rocky Reach Dam forebay that result in exceedances of the numeric criteria are most likely to occur during April through August as a result of high flows caused by either rapid snow melt or federal flow augmentation intended to aid downstream juvenile salmonid passage. Douglas PUD monitors for TDG at Wells Dam between April 1 and September 15 annually to coincide with this observation. Chelan County PUD monitors for TDG at Rocky Reach Dam between April 1 and August 31. High TDG values at both Wells Dam and Rocky Reach Dam resulting in exceedances are often associated with various factors including high spring flows, unit outages, and upstream Federal Columbia River Power System operations, including federal flow augmentation, resulting in water entering the Project with relatively high TDG levels. During these time periods, river conditions in the mid-Columbia River system are conducive to exceedances of the TDG criteria.

In past years, Wells forebay monitoring data show that on average TDG values at this location frequently exceed 115%, especially during the high flow years of 2011 and 2012. For example, in July of 2012 nearly twice as much water passed the Wells Project than the previous forty two year average for the month of July. In general, Wells Dam adds relatively small amounts of TDG through the use of spill intended to aid in the passage of juvenile salmonids (0-2%). However, similar to other hydroelectric facilities on the Columbia River system, probabilities for exceedances are more likely during late spring periods of high river flow and low electrical demand or during high flow years such as 2011 and 2012. Table 2.2-1 contains historic average, minimum and maximum flow values associated with the Wells Project. Over the last ten years Wells Dam has demonstrated high compliance with TDG requirements. Specific TDG performance during the 2012 spill season is contained in the 2012 GAP report filed with the FERC in February 2013.

Table 2.2-1 Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the previous 42-year average (1969-2011), by month.

Month	1969-2011 Mean	2012 Mean	Percent Difference from 42-year Average
April	115.6	174.1	+151%
May	149.4	217.2	+145%
June	164.5	232.9	+142%
July	132.2	253.8	+192%
August	104.6	158.7	+152%
All	133.3	207.34	+156%

2.2.2 Temperature

Beginning in 2001, an extensive water temperature monitoring effort was initiated by Douglas PUD in order to better understand the temperature dynamics throughout the Wells Reservoir. Temperature data was collected by Douglas PUD at four locations in the Columbia River (RM 544.5, RM 535.3, RM 530.0, and RM 515.6) and at one site each on the Okanogan (RM 10.5) and Methow (RM 1.4) rivers. Data collected by Douglas PUD were collected hourly using Onset tidbit temperature loggers. Monitoring start and end dates varied from year to year but generally began in the early spring and ended in late fall. Quality assurance and control measures were implemented prior to deploying and upon retrieving temperature loggers to ensure that data collected were accurate. Due to sensor loss or sensor malfunction in some years, the availability of data at some of these monitoring locations is sporadic.

In general, 7-DAD Max temperature data indicate that the portion of the Columbia River upstream of and within the Project generally warms to above 17.5°C (WQS numeric criteria) in mid-July and drops below the numeric criteria by early October (Figure 2.2-1). Water temperatures in the Methow River upstream of the Project warm to above 17.5°C in mid-July and drop below the numeric criteria by September (Figure 2.2-2), while trends in the Okanogan River (upstream of the Project) indicate warming above 17.5°C from early June with cooling by late September (Figure 2.2-3). Maximum water temperatures typically occur in late summer (August) with temperatures below Chief Joseph Dam, the Methow River (RM 1.4), and the Okanogan River (RM 10.5) reaching 20.0°C, 22.5°C, and 27.0°C, respectively. It is important to note that these data are representative of water temperatures as they flow into the Project. In 2006, Douglas PUD expanded the Project temperature monitoring season to cover the entire year and implemented a more frequent downloading schedule. Douglas PUD also added additional monitoring stations at the mouths of the Okanogan (RM 0.5) and Methow (RM 0.1) rivers. These have been used to model temperature and allocate the effects of Project operations on water temperatures at Wells Dam and within the Wells Reservoir as they relate to compliance with the WQS numeric criteria for temperature.

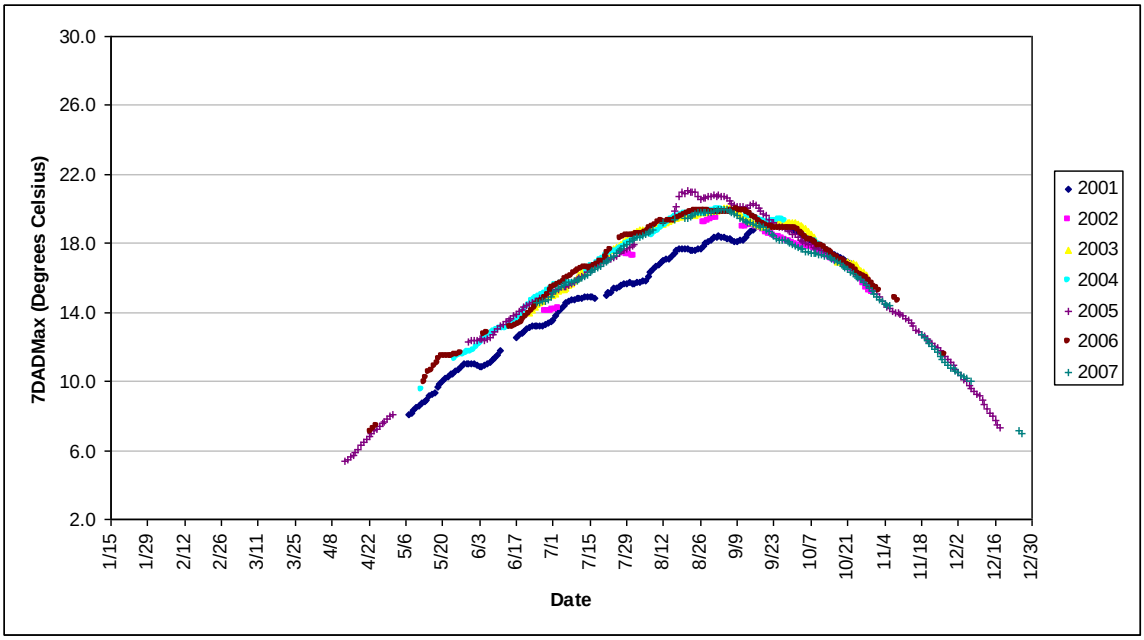

Figure 2.2-1 **7-DAD Max water temperature collected in the tailrace of Chief Joseph Dam (RM 544) using Onset temperature loggers for years 2001-2007.**

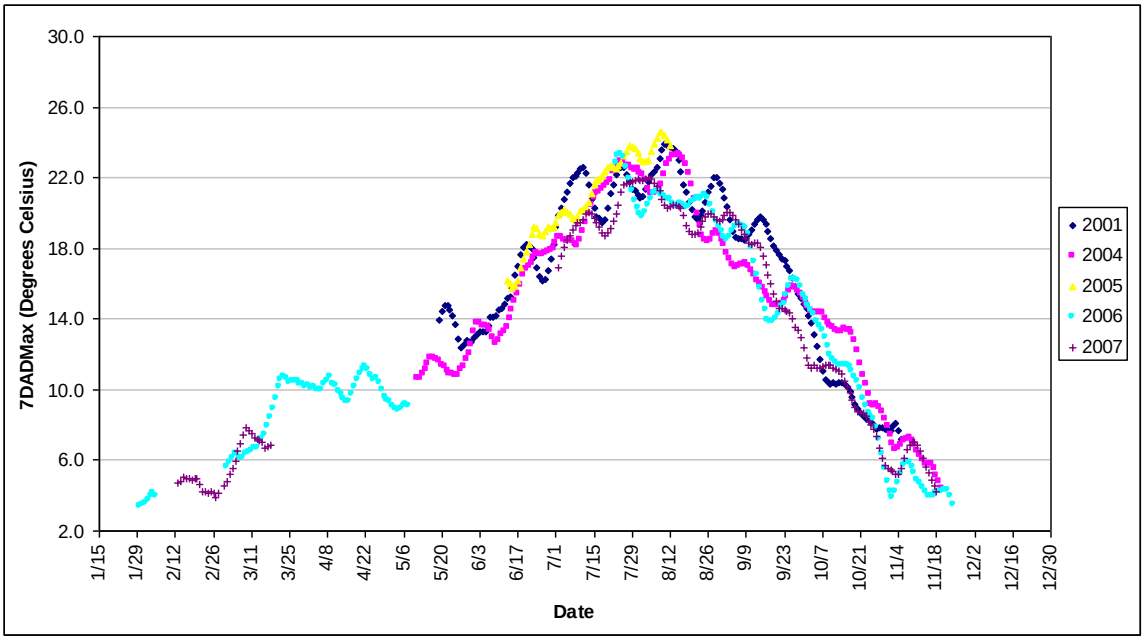

Figure 2.2-2 **7-DADMax water temperature collected in the Methow River upstream from the influence of Wells Dam (RM 1.4) using Onset temperature loggers for years 2001-2007. Data were unavailable in 2002 and 2003.**

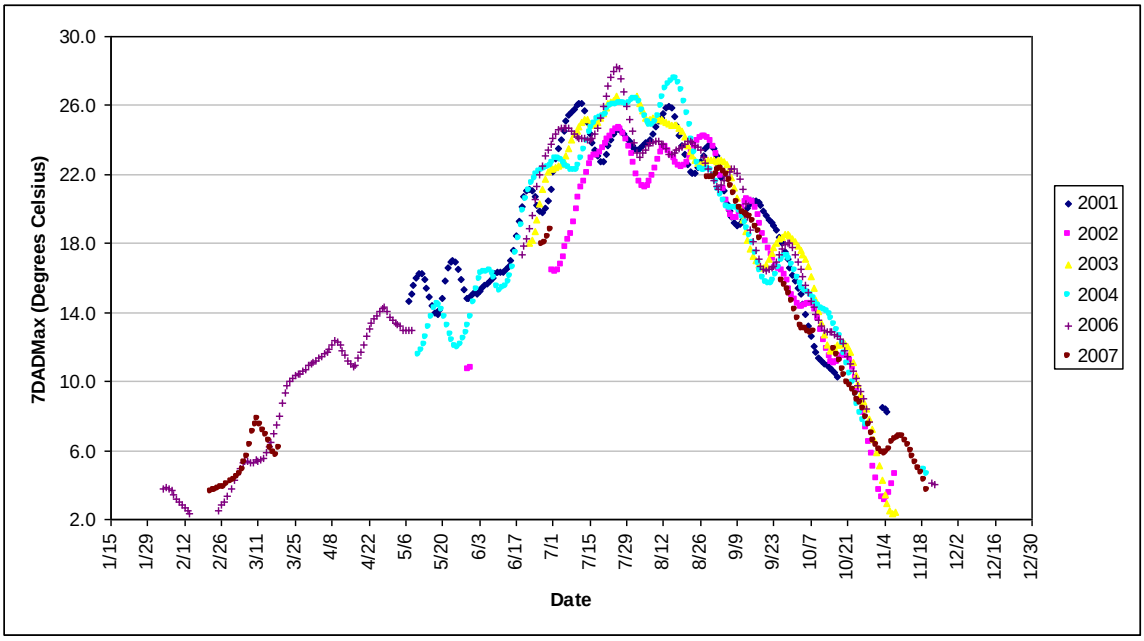

Figure 2.2-3 **7-DADMax water temperature collected in the Okanogan River (RM 10.5) using Onset temperature loggers for years 2001-2007.**

2.2.2.1 Wells Dam Fish Ladder Temperature Monitoring

Wells Dam has two fish ladders, one at each end of the dam. The two fish ladders are conventional staircase type fish ladders with 73 pools. The water source for the upper pools is the Wells Dam forebay. The flow through the upper 17 pools varies from 44 cfs at full reservoir to approximately 31 cfs at maximum reservoir drawdown. The lower 56 pools discharge a constant 48 cfs of water. To maintain the flow at 48 cfs in the lower ladder pools, supplementary water (auxiliary water supply) is introduced into Pool No. 56 through a pipeline from the reservoir. Pools are numbered in order from the bottom (near the collection gallery and entrance) to the top (exit to the Wells Dam forebay). The ladders are enclosed.

According to the HCP Biological Opinion (BO) issued by NMFS, all entities that use the fish trapping facilities at Wells Dam are required to discontinue trapping operations when fish ladder water temperatures exceed 68.0º F (20.6°C). In 2001 and 2003, Douglas PUD added supplemental temperature recording equipment at Pool 39 near the broodstock collection facilities in the east fishway at Wells Dam to ensure compliance with requirements in the NMFS BO. In 2001, hourly data indicated that water temperatures at this location in the east fish ladder did not exceed 68.0ºF (20.6°C) at any time during the monitoring period (Figure 2.2-4), which ran from late July to early December. In 2003, data were recorded every two hours and exceedances of greater than 68.0ºF (20.6°C) were observed on three hourly occasions (Figure 2.2-5).

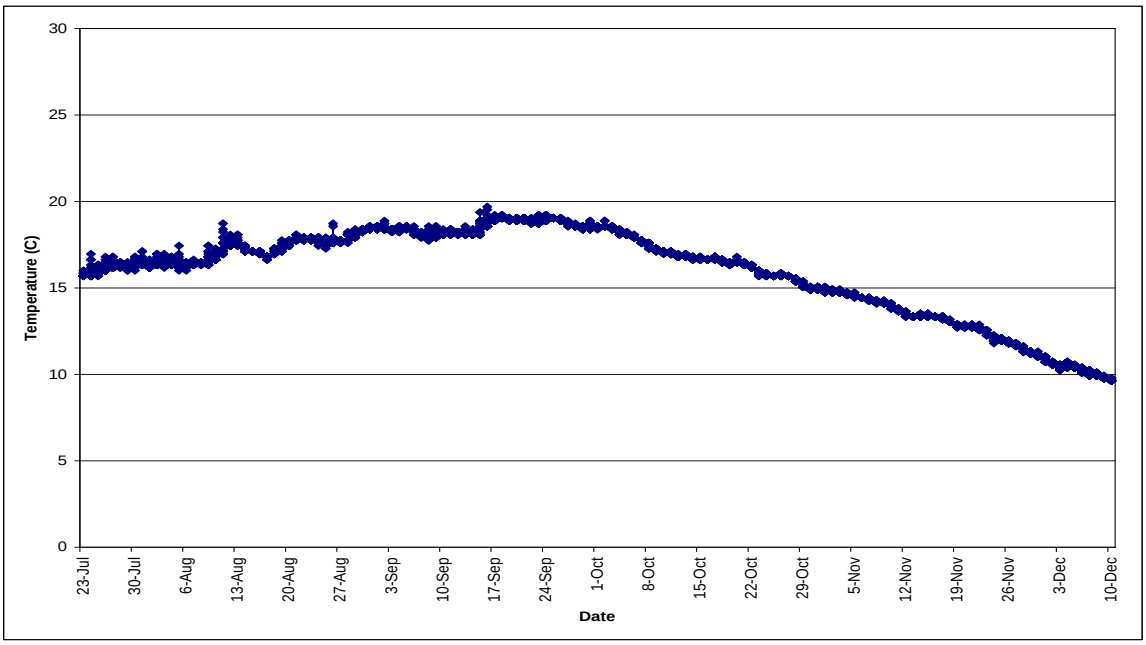

Figure 2.2-4 Hourly water temperatures collected at the Wells Dam east fish ladder trap during 2001.

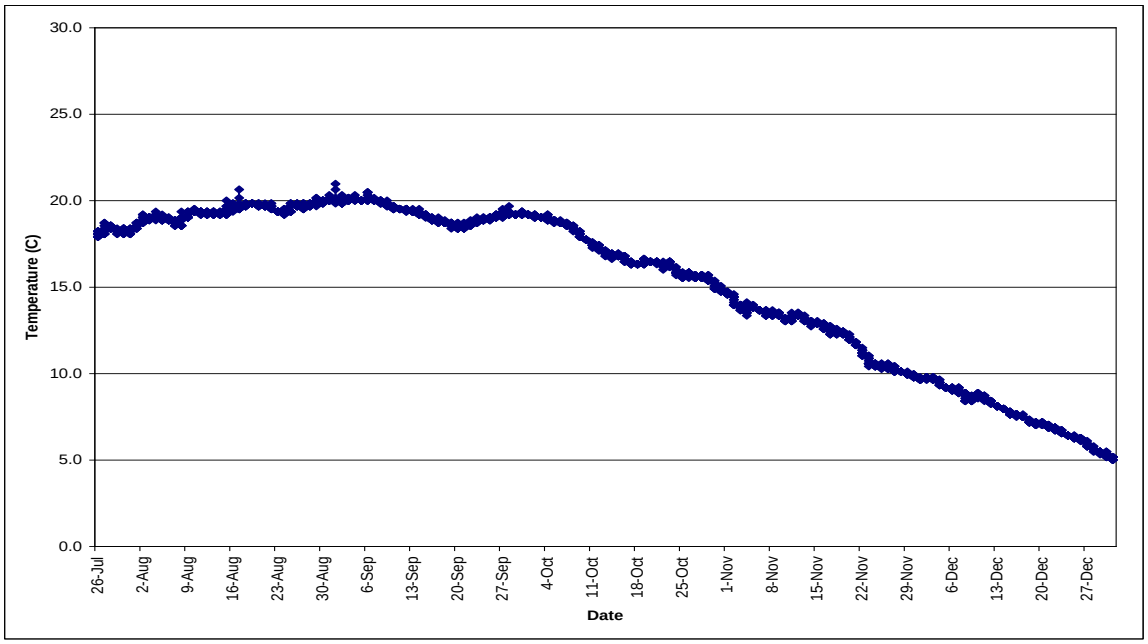

Figure 2.2-5 Water temperatures collected every two hours at the Wells Dam east fish ladder trap during 2003.

2.2.3 DO, pH, and Turbidity

2.2.3.1 DO and pH

In 2005, Douglas PUD added sensors to its existing forebay TDG monitoring equipment (Hydrolab Minisonde) in order to collect preliminary information on pH and DO within the Project to monitor these parameters during the late summer when probabilities of exceedance are highest. In 2006, Douglas PUD expanded the monitoring period to include the entire late summer period. In 2007, Douglas PUD further expanded the monitoring period to begin in July and end in early December (Figure 2.2-6 and 2.2-7). The monitoring data indicate that values for these parameters are generally in compliance with the WQS numeric criteria at this site. pH values are consistently within the range of 6.5 to 8.5 as specified by the numeric criteria. During August and September periods of this study, there were periodic excursions of DO below the numeric criteria of 8.0 mg/L. Probable causes are likely due to the physiological processes of aquatic plants; however, these exceedances do not appear to be the dominant trend.

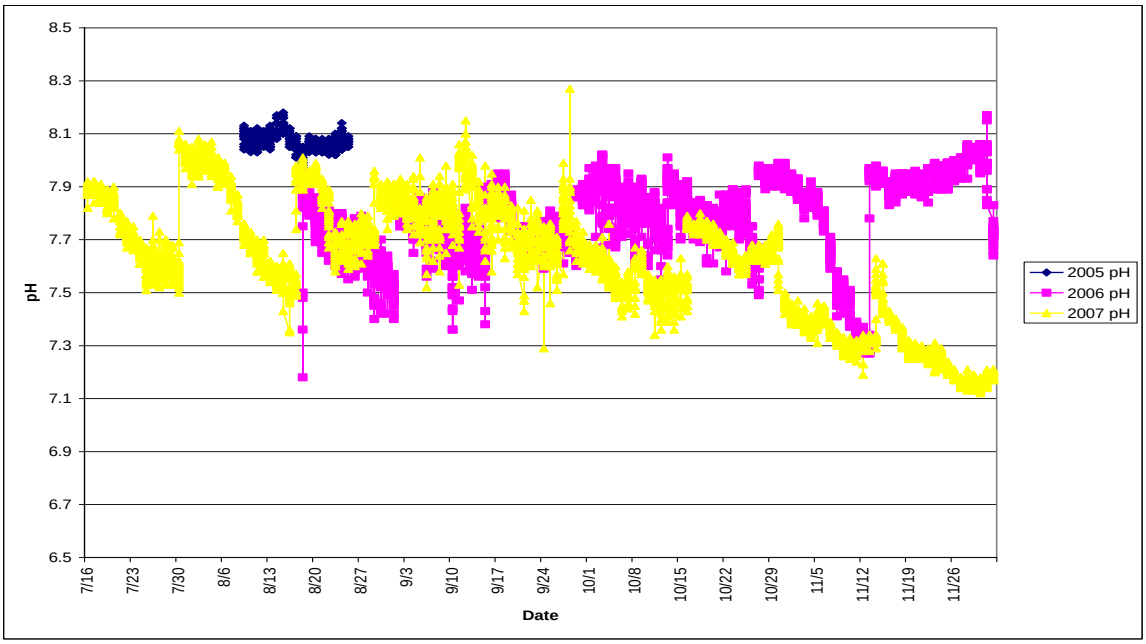

Figure 2.2-6 **pH measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.**

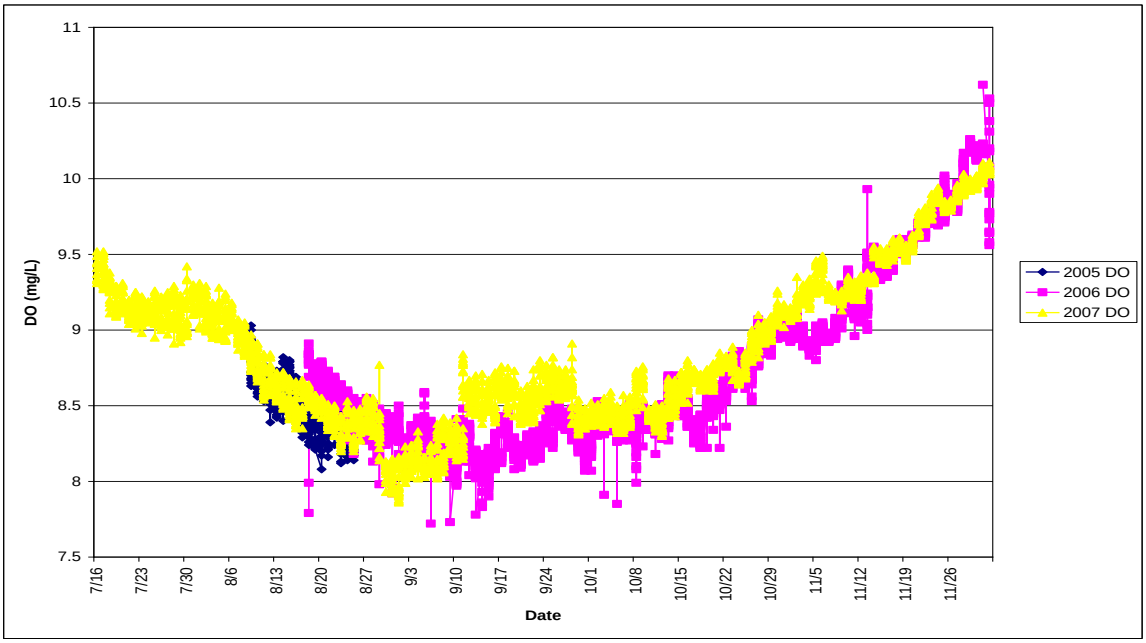

Figure 2.2-7 **DO measurements collected at the Wells Forebay TDG monitoring station (Hydrolab MiniSonde), 2005-2007.**

2.2.3.2 Turbidity

At Wells Dam, Secchi disk readings are taken daily during the adult fish passage assessment period of May 1 to November 15 to examine turbidity. A standard Secchi disk is lowered into the forebay on the west side of Wells Dam near the exit to the west fishway. Measurements are recorded in meters of visibility and records have been made since the early 1970s; however, continuous, reliable information adhering to a standard protocol has been collected since 1998. General trends of Secchi disk data suggest relatively lower periods of visibility (0.6 meters to 1.2 meters) during the spring and early summer. These relatively low periods of visibility are highly correlated with high flows during the spring runoff period. As the high flow period subsides, Secchi disk values increase to between 3.4 and 4.6 meters for the remainder of the monitoring period. In 2008, Douglas PUD installed a fixed turbidity sensor near the east fishway exit in the Wells forebay and collected turbidity data in the Wells Dam forebay.

2.3 Project Water Quality Studies

2.3.1 Total Dissolved Gas

Each year from 2003-2008, Douglas PUD implemented spill testing activities to examine the relationship between water spilled over the dam and the production of TDG. These results were subsequently used by IIHR-Hydroscience and Engineering of University of Iowa to develop and calibrate an unsteady state three-dimensional (3D), two-phase flow computational fluid dynamics (CFD) tool to predict the hydrodynamics of gas saturation and TDG distribution within the Wells tailrace. These tools were then used to reliably predict TDG production at Wells Dam and establish how preferred operating conditions and spillway configurations can be used as methods to manage TDG within WQS numeric criteria (Politano et al. 2009b).

2.3.1.1 Project TDG Assessments 2003-2005

In 2003 and 2004, Douglas PUD hired Columbia Basin Environmental (CBE) to determine the effectiveness of the tailwater sensor relative to the tailwater cross section profile for TDG and better define the relationship between spillway releases and TDG production (CBE 2003, 2004). CBE deployed TDG sensors along two transects. Based on the results of these studies, the tailwater station provided an accurate record of daily average TDG values in the Wells Dam tailrace. The studies also showed that at times, gas levels from some turbine flows were being affected by spill.

In spring 2005, Douglas PUD contracted with CBE to implement a TDG study at Wells Dam designed to measure TDG pressures resulting from various spill patterns at the dam (CBE 2006). An array of water quality data loggers was installed in the Wells Dam tailwater for a period of two weeks between May 23, 2005 and June 6, 2005. The Wells Dam powerhouse and spillway were operated through a predetermined range of operational scenarios that varied both total flow and shape of the spillway discharge. A total of eight configurations were tested including flat spill patterns (near equal distribution of spill across the entire spillway), crowned spill patterns (spill is concentrated towards the center of the spillway) and spill over loaded and unloaded units (Table 2.3-1).

Table 2.3-1 Test matrix for 2005 Wells Dam TDG Production Dynamics Study.

Test	Description
1A	Spill over load, east spill/east generation
1B	Spill over unloaded units, east spill/west generation
1C	Spill over unloaded units, west spill/east generation
1D	Spill over load, west spill/west generation
2A	Crowned spill, modest flow
2B	Dentated spill, modest flow
2C	Crowned spill, high flow
2D	Flat spill, high flow

Results from the study indicated that spill from the west side of the spillway resulted in consistently higher TDG saturations than similar spill from the east side. All Dentated spill patterns and flat spill patterns at high river flow yielded higher TDG saturations than crowned spill for similar total discharges. The results of this study also indicated that TDG levels of powerhouse flows may have been influenced by spill.

2.3.1.2 EES Consulting 2006 Project TDG Production Dynamics Study

In 2006, Douglas PUD continued TDG assessments at the Project by examining the best spillway configurations and project operations to minimize the production of TDG. Douglas PUD hired a team of hydraulic and TDG experts from the Pacific Northwest to help design a monitoring program for a study that would examine various operational scenarios and their respective TDG production dynamics.

Thirteen sensors were placed along three transects at 1,000, 2,500, and 15,000 feet below Wells Dam. There were also three sensors placed across the forebay, one being the fixed monitoring station midway across the face of the dam and two more a distance of 300 feet from the dam. The sensors were programmed to collect data in 15-minute intervals for both TDG and water temperature. Each test required the operations of the dam to maintain static flows through the powerhouse and spillway for at least a three-hour period. While there were 30 scheduled spill events, there were an additional 50 events where the power house and spillway conditions were held constant for a minimum three-hour period. These "incidental" events provided an opportunity to collect additional TDG data on a variety of Project operations that met study criteria and are included in the results of the 2006 TDG Abatement Study. Spill amounts ranged from 5.2 to 52% of project flow; the volume of spill ranged from 2.2 to 124.7 kcfs and the total discharge ranged from16.4 to 254.0 kcfs. There were six tests that were done at flows that exceeded the Wells Dam 7Q10 flows of 246 kcfs.

Results of the study indicated that two operational scenarios, spread spill and concentrated spill, produced the lowest levels of TDG. The EES Consulting team recommended continued testing of operational measures to ameliorate TDG production at Wells Dam (EES Consulting et al. 2007). The 2006 study confirmed that the current locations of the forebay and tailwater TDG compliance monitoring station are appropriate in providing representative TDG production information both longitudinally and laterally downstream of Wells Dam.

2.3.1.3 IIHR-Hydroscience and Engineering TDG Modeling

A study was initiated with the University of Iowa IIHR-Hydroscience and Engineering in 2007 to develop a numerical model capable of predicting the hydrodynamics and TDG concentrations in the tailrace of the Wells Project. The purpose of the model was to assist in the understanding of the underlying dynamics of TDG production allowing an accurate evaluation of the effectiveness of various spill configurations and plant operations in reducing TDG at Wells Dam. The modeling efforts were divided into three phases. Phase I was a developmental stage for calibration and validation. The results from Phase I were successful and the model was proven to provide a reliable predictor of tailrace TDG and therefore a useful tool to identify Project operations that can minimize TDG concentrations downstream of Wells Dam (Politano et al. 2008). Phase II was a series of model runs using varying spill configurations based on typical 7Q10 events observed over the past decade. The final model run, referred to as Scenario-9, showed that preferred operating conditions and spillway configurations are able to reduce tailrace TDG to levels within Washington State WQS (< 120%) during a 7Q10 flow (Politano et al. 2009a).

Phase III included a final series of model runs aimed at gaining further reductions in tailrace TDG by reconfiguring the spillway operations used to achieve the tailrace standard in Phase II (Scenario-9). In addition to gaining additional reductions in TDG, IIHR-Hydroscience and Engineering ran a "Standard Compliance Comparison" scenario. The Standard Compliance Comparison scenario included a forebay TDG of 115%, along with 9 of 10 units operating at full capacity (i.e., 90% of total powerhouse capacity), to provide results comparable to downstream hydroelectric project TDG evaluations. The Phase III report also demonstrated compliance with two other requirements of the state WQS: (1) the ability to meet 115% in the forebay of Rocky Reach Dam during fish spill; and (2) the ability to maintain 110% in the tailrace during non-fish spill periods (Politano et al. 2009b).

2.3.1.4 Project TDG Playbooks

Since 2007, spill playbooks have been developed annually for operators at Wells Dam. The original spill playbook in 2007 focused on a range of operations to evaluate TDG production along with potential operational constraints. The subsequent playbooks evolved to the current 2012 format that simply focuses on strategies that have been identified to effectively manage TDG production in the tailrace of Wells Dam.

Since the Wells Project is a "run-of-the river" project with a relatively small storage capacity, river flows in excess of the ten-turbine hydraulic capacity must be passed over the spillways. Outside of system coordination and gas abatement spill (Douglas PUD has adopted a policy of not accepting the latter), minimization of involuntary spill has primarily focused on minimizing TDG production dynamics of water spilled based upon a reconfiguration of spillway operations. The 2009 Wells Project GAP (Lê and Murauskas, 2009) introduced the latest numerical model developed by the University of Iowa's IIHR-Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the Wells Dam tailrace and further identify operational configurations that would minimize TDG production at the Project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG adjustment

criteria during the passage season with flows up to 7Q-10 levels provided the forebay TDG levels are below 115%. Compliance was achieved through the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through adjacent odd numbered spillbays in a defined pattern and volume. These preferred operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season with success. Overall, no exceedances were observed in either the Wells Dam tailrace or the Rocky Reach forebay in 2009.

In 2010, the concepts from the 2009 Spill Playbook were integrated into the 2010 Wells Project Spill Playbook given their effectiveness in maintaining levels below TDG criteria during the previous year. High Columbia River flows in June, which exceeded the preceding 15-year average flow, resulted in several exceedances of the hourly (125% maximum) and 12C-High (120%) TDG limits in the Wells Dam tailrace, and Rocky Reach forebay (115%). In response, Douglas PUD implemented an in-season analysis of the 2010 Spill Playbook and determined that full implementation of the recommendations from IIHR Engineering Laboratory would require the removal of the juvenile fish bypass system flow barriers in one even numbered spillbay. Following the in-season analysis and consultation with the HCP Coordinating Committee, changes were made to the 2010 Spill Playbook that allowed for the removal of the juvenile fish bypass system barriers in spillbay 6. Specifically, the Spill Playbook was modified to state that when spill levels approach the 53 kcfs threshold, the JBS barriers in spillbay 6 would be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay. When spill exceeded 53 kcfs, excess spill would be directed through spillbays 6 and 7 rather than through spillbays 5 and 7. This operational configuration resulted in a more compact spill pattern that reduced the air-water interface surface area between spillway flows and the subsequent potential for lateral mixing and air entrainment.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Following approval of the 2011 GAP by Ecology, the 2011 Spill Playbook was implemented. Only minor changes were made to the 2012 spill playbook as a result of high compliance during the 2011 spill season.

In December of 2012 the final GAP report was completed for the 2012 spill season. After analysis it was determined that the 2012 spill season had the third highest average monthly flows since 1969 (April- August). In addition incoming flows were reliably above 115%. Despite these conditions Wells Dam demonstrated high compliance with all standards aside from the Rocky Reach 115% 12C-high forebay standard since incoming flows to Wells were above 115% greater than 50% of the spill season days. Given these unique conditions, and high compliance performance in 2011 no changes were suggested for the 2012 spill playbook.

In summary, the resulting 2012 spill strategies are based on four basic principles:

- Spill operations concentrated through a single spillbay (as opposed to spread through several spillbays) reduce TDG production and increase degasification at the tailwater surface.
- Discharge from spillbays (denoted S hereafter) located near the middle of the dam (e.g., S7) prevent water with high TDG from attaching to the shoreline.
- Forced spill exceeding Juvenile Bypass System (JBS) flows of 2.2 kcfs must be increased to ≥ 15 kcfs to ensure that the submerged spillway lip below the ogee is engaged. The resulting force creates flows that are surface oriented, ultimately promoting degasification at the tailwater surface.
- Operations of spillbays should change with expected incoming flows, which include the removal and reinstallation of bypass barriers. Active management of the spillbays and bypass barriers should improve TDG performance.

The above principles are used as a guideline for Project operators to spill at a range of outflows to ensure the future compliance with the Washington State WQS for TDG.

2.3.2 EES Consulting 2006 Project Limnology

In 2005, Douglas PUD implemented a study to collect baseline limnological information for waters within the Project (EES Consulting 2006). The objectives of this study were to further document existing water quality conditions within the Project and to collect information to fill water quality data gaps identified by Douglas PUD to support the water quality certification process administered by Ecology. A total of nine sampling sites, consisting of 5 mainstem sites, 2 tributaries and 2 littoral habitats, were selected to represent the spatial variability within the Project (Table 2.3-2). The year-long study began in May 2005 and investigated various water quality parameters at each of the nine sampling sites. Sampling included physical, chemical and biological water quality characteristics. A total of 22 water quality characteristics were sampled. All procedures used for the purpose of collecting, preserving and analyzing samples followed established EPA 40 CFR 136 protocol.

Table 2.3-2 Water quality sampling sites for the 2005-2006 Project Limnological Investigation.

Site	Description
1	Downstream of Chief Joseph Dam (at Hwy 17 bridge)
2	Columbia River just downstream of the Brewster Bridge
3	Bridgeport Bar littoral site
4	Columbia River downstream of Pateros where the thalweg approaches maximum depth in the lower Wells Reservoir
5	Okanogan River upstream of confluence with Columbia River
6	Methow River upstream of confluence with Columbia River
7	Lower Wells Reservoir/Starr Boat Launch littoral site
8	Wells Forebay
9	Wells Tailrace

Results from the limnological investigation showed that the Project is characterized by low to moderately low levels for nutrients, slightly basic pH (range 7.5–8.5), well-oxygenated water and

low turbidity with moderately low algae growth. Average Secchi depth for the Wells Reservoir varied minimally during May through August with only a slight increase as the season progressed (study average per site range 4.1 meters to 4.5 meters). Secchi depth (transparency) increased to a seasonal peak in September of 6.25 meters before slightly decreasing in October to a mean depth of 5.3 meters. Transparency increased downstream at the Brewster Bridge and Wells Forebay relative to the head of the reservoir at the Chief Joseph Dam tailrace for all months.

Turbidity in the Columbia River showed little seasonal variation with an annual average of 0.98 NTU and a variation of 0.38 NTU in September, 2005 (Wells Forebay site) to 3.81 NTU in February, 2006 (Brewster Bridge site). Longitudinal variation in turbidity was also minimal; sampling did not occur within the mixing zone plume of the Okanogan River. Turbidity in the Okanogan River was consistently higher than the Columbia River. Turbidity in the Methow River was higher than in the Columbia River in May (due to sediment load) and in August due to phytoplankton growth. The only turbidity reading over 5.0 NTU was in the Methow River during May where turbidity was 5.6 NTU.

Under the EES Consulting limnology study, water temperature in the Wells Reservoir is primarily governed by the temperature of inflowing water at Chief Joseph Dam with little warming occurring as water traverses the Wells Reservoir's length. Similar to the Wells hourly temperature monitoring data (Section 2.2.2), results of the study indicate that the Project waters remained unstratified throughout the entire study period and was vertically homogeneous for DO. Figure 2.3-1 shows a vertical water profile of the Project. Low respiration rates at depth, a lack of vertical stratification and short water retention times resulted in homogeneous DO levels at all depths within the Project.

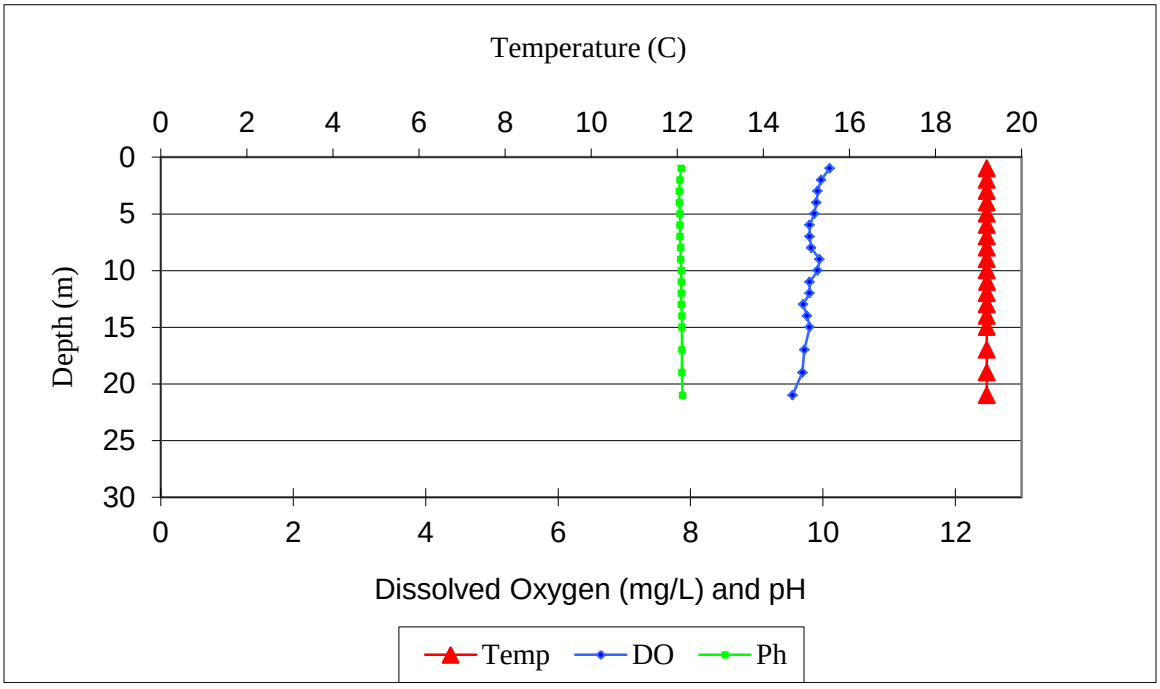

Figure 2.3-1 Vertical water quality profile of the Project forebay from sampling date August 17, 2005.

DO levels at one meter depth increased from upriver to downriver; the average difference (May through October) was 1.07 mg/L. The difference was more pronounced during May through August. The difference in September and October was 0.3 mg/L, which is at the limit of instrument reliability. Upstream to downstream differences in surface DO were negligible for the February 2006 sampling event. Littoral DO was similar or slightly higher than pelagic DO for surface waters. DO saturation levels were equal to or greater than 100% for all sites and all depths in all months except October when DO percent saturation for surface waters ranged from 110% to 91% saturation. The lower saturation levels in October may be due to reduced primary productivity while water temperatures were still relatively warm. All DO readings were above 8.0 mg/L and in compliance with the WQS numeric criteria.

Nitrogen and phosphorus are the two primary macronutrients needed for plant growth. Silica is important for diatomaceous phytoplankton. Ammonia (Nitrogen) levels were near or below detection levels for pelagic and littoral Columbia River Project waters as well as the Okanogan River for May through August and in February. Ammonia levels were only slightly higher in September and October. Ammonia peaked in the Methow River in August. Nitrates/Nitrites (Nitrogen) for Columbia River Project waters were higher in May before leveling off during the summer and fall. Nitrates/Nitrites were significantly higher at all sites for the February sample than any other month. Nitrates within littoral waters were lower than pelagic waters except in February when levels were similar. Nitrates/Nitrites in both the Okanogan and Methow rivers showed an increasing trend during the growing season. Total nitrogen levels for Columbia River pelagic and littoral waters were similar and relatively constant with the exception of significantly higher levels at most sites during February.

Orthophosphorus peaked for all stations in July. Orthophosphorus levels for pelagic and littoral waters were similar in all months except July when littoral orthophosphorus concentrations were significantly higher than observed for pelagic areas. Orthophosphorus levels in the Methow and Okanogan rivers were higher than in the Columbia River. Orthophosphorus was partially depleted in the Okanogan River but not in the Methow River at the time of the August sampling. Total phosphorus was slightly higher in littoral waters than in pelagic areas. Wave disturbance to bottom sediments may be a factor for this difference. Total phosphorus levels in pelagic surface waters ranged from below detection limits to 30.8 ug/L. Total phosphorus was higher for the Okanogan River than elsewhere, which is likely due to the higher sediment load. Total phosphorus for all stations peaked in July before gradually declining throughout the rest of the growing season.

The range in Nitrogen to Phosphorus (N:P) ratios for the Project waters was 2.5 to 30.8. The average Total Nitrogen to Total Phosphorus (TN:TP) ratio in the Project waters was 13.7 for the photic zone and averaged 14.8 for samples from all depths. These values are within the suggested literature ranges for phosphorus limitation. The N:P ratios peaked in July with pelagic and littoral waters showing similar trends. A decreasing N:P ratio through the major part of the algae growing season is typical of moderate to low nutrient waters as algae assimilate available nutrients. The N:P ratios were higher in the tributary rivers relative to the Columbia River. The N:P ratios are an indicator but not an absolute confirmation of factors limiting productivity.

Moderate to low chlorophyll *a* concentrations (range 0.5 *u*g/L to 5.8 *u*g/L) occurred throughout the sample period with peaks in July and October for the Project waters. Concentrations were lowest in August and also had the least variability among sites for the August sampling event. Pelagic and littoral waters were similar for chlorophyll *a* concentrations in most months except October when littoral waters reported twice as high *c*hlorophyll *a* levels.

Phytoplankton were dominated by diatoms for all months at all sites sampled with Chryptophyta (small unicellular flagellates) being second dominant based on biovolume. Diatoms and Chryptophyta are both considered a good food source for the rest of the aquatic food web. Diatoms comprised 75% to 84% of the total phytoplankton biomass for the Project sites. Chlorophytes (green algae) were sub-dominant in the tailrace but only a minor component elsewhere. Total phytoplankton biomass was relatively low for all Project sample sites; total biomass was generally less than 200,000 um^3/ml. Biomass peaked in July and August for pelagic areas of the Project waters and minor peaks occurred in October for littoral sites. The timing of peaks varied among all stations. Cyanophyta (blue-green algae) were only recorded in the Project sites for the July sample at Brewster Bridge where they comprised 16% of the total biomass; however, the biomass of Cyanophytes were comprised of relatively few but very large multicellular units. Cyanophytes also were recorded in the Wells Tailrace (4.7% biomass) in July. Diatoms dominated phytoplankton in the Methow River where peak biomass occurred in August (1,455,158 um^3/ml). This peak is much higher than biomass observed anywhere else in the Project. Biomass levels in the Okanogan River were only slightly higher than in the Columbia River for most months with minor peaks occurring in May and October. Cyanophytes were a small proportion of the August biomass sample for the Okanogan River.

Diatoms also dominated periphyton. Seasonal lows occurred in July for all sites except Bridgeport shallows where the trend was decreasing periphyton biovolume as the season progressed.

Zooplankton density for pelagic waters was greatest in July (6,080/m^3) and lowest (1,289/m^3) in August. Copepods dominated the zooplankton population. Zooplankton densities in the tributary river mouths peaked in May. Although rotifers were present in all months, their density dropped to very low levels after May. Cladocera were the third most prevalent group with a minor peak occurring in July for this group.

Trophic Status Index (TSI) developed by Carlson (1977, 1996) and modified for nitrogen by Kratzer and Brezonik (1981) is an indication of the productivity of a lake based on Secchi depth, TP, TN and chlorophyll *a* concentrations for summer months (June through September). Project waters are classified as oligo-mesotrophic based on a mean TSI score of 36.5 with 40 to 50 being the range for mesotrophic classification (EES 2006).

2.3.3 Okanogan River Sediment Loading Analysis

In 2006, Douglas PUD, at Ecology's request, conducted an analysis to assess sediment accumulation within the Project portion of the Okanogan River (lower 15.5 miles). The request was based upon concerns that Project operations might be contributing to the accumulation of DDT and PCB-laden sediment that could impact aquatic life designated use. Douglas PUD contracted with Erlandsen and Associates to collect bathymetric information at nine transects

(RM 0.8, 1.3, 2.7, 4.9, 8.2, 10.5, 14.4, 16.6, and 19.0) within and above the Project portion of the Okanogan River. Bathymetric data of these same nine transects were collected previously by the Bechtel Corporation in 1997. A comparison of the bathymetric data for all nine transects between 1997 and 2006 indicated that sediment is not accumulating in the Project portion of the Okanogan River. It was concluded that with regard to sediment loading, the Okanogan River is exhibiting natural riverine processes and is not affected by Project operations. Douglas PUD presented the results of the information to Ecology and the issue has been resolved.

2.3.4 Temperature, Dissolved Oxygen, pH, and Turbidity

2.3.4.1 Water Temperature Modeling

To assess compliance with the State temperature standards, two 2D laterally-averaged temperature models (using CE-QUAL-W2) were developed that represent existing (or "with Project") conditions and "without Project" conditions of the Wells Project including the Columbia River from the Chief Joseph Dam tailrace to Wells Dam, the lowest 15.5 miles of the Okanogan River, and the lowest 1.5 miles of the Methow River. The results were processed to develop daily values of the 7-DADMax, and then compared for the two conditions (West Consultants, Inc. 2008).

The model analyses demonstrated that "with Project" temperatures in the Columbia, Okanogan and Methow rivers do not increase more than 0.3^{o}C compared to ambient ("without Project") conditions anywhere in the reservoir, and that the Project complies with state water quality standards for temperature. The analyses also show that backwater from the Wells Project can reduce the very high summer temperatures observed in the lower Okanogan and Methow rivers. The intrusion of Columbia River water into the lowest 1-2 miles of the Okanogan River and lowest 1.5 miles of the Methow River can significantly decrease the temperature of warm summer inflows from upstream, and can also moderate the cold winter temperatures by 1-3^{o}C, reducing the extent and length of freezing.

2.3.4.2 Dissolved Oxygen, pH, and Turbidity

A study to collect additional DO, pH, and turbidity data from within the Wells Project was proposed by the Aquatic Resource Work Group in 2007. The goal of this study was to obtain required DO, pH, and turbidity information for the Wells Dam forebay and lower Okanogan River, both above and within the Wells Project boundary. The information gathered from these monitoring efforts demonstrated that the Project, as proposed to be operated under the new license, will meet the numeric criteria for WQS (Parametrix, Inc. 2009).

DO measurements demonstrated that the Okanogan River and the forebay of Wells Dam were in compliance with WQS. Project effects on DO concentrations in the Okanogan River were not evident as incoming water quality closely resembled that of the inundated portions of the Okanogan River. Changes in background minimum DO levels at Malott (above Project boundary) have a strong and significant linear relationship ($P < 0.0001$) with minimum values recorded within Project boundaries at both Monse and the Highway 97 Bridge. These results indicate that there is no statistically significant difference between minimum DO measurements collected above the Project and within the Project. DO concentrations in the forebay of Wells

Dam remained well above the minimum numeric water quality criterion, excluding an instrument-related malfunction observed in early October (Parametrix, Inc. 2009).

Only on one occasion did pH within the Project exceed background measurements, but only by 0.06 units, well within the water quality allowance for human caused conditions. These results indicate that pH measurements within the Project boundary are well within the numeric criteria for WQS (Parametrix, Inc. 2009).

It is not clear what effect, if any, the Wells Project may have had on turbidity. Elevated turbidity values appeared to coincide with snowmelt and precipitation causing increased river flow. Turbidity levels in the Okanogan River above the Project (at Malott) were inconsistent with readings collected at both Monse (5 of 122 comparable days, or 4%) and Highway 97 (8 of 165 comparable days, or 5%), suggesting that such events are not widespread or persistent within the Wells Project (Parametrix, Inc. 2009). In 2009, Douglas PUD contracted Columbia Basin Environmental to continue monitoring turbidity for an additional year. Results from the 2009 field season indicate that turbidity decreases from the background monitoring location (Malott, RM 17.0), to both Monse (RM 5.0) and the Highway 97 Bridge (RM 1.3). No exceedances were observed and the data showed that the Wells Project is in compliance with the Washington State water quality standards for turbidity (DCPUD and CBE 2009).

2.3.5 Summary of Compliance with WQS

Based on the Initial and Updated Study Reports the Aquatic SWG was able to determine that waters within the Wells Project currently meet state numeric criteria of WQS as defined in Chapter 173-201A WAC. The following table presents supporting studies, by standard:

Standard	Studies	Result(s)	Continued Monitoring
TDG	Politano et al. 2008, 2009a, 2009b.	Compliance met under preferred operating conditions and standard compliance scenario.	Yes
Temperature	West Consultants, Inc. 2008	Compliance met, zero exceedances. Potential future TMDL.	Yes
DO	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
pH	Parametrix, Inc. 2009	Compliance met, zero exceedances	No
Turbidity	Parametrix, Inc. 2009; DCPUD and CBE 2009.	Compliance met, zero exceedances	No

3.0 GOAL AND OBJECTIVES

The goal of the WQMP is to protect the quality of the surface waters affected by the Project with regard to the numeric criteria. Studies conducted during the relicensing process have found water quality within the Wells Project to be within compliance. Douglas PUD, in collaboration

with the Aquatic SWG, has agreed to implement measures in support of the WQMP. Reasonable and feasible measures will be implemented in order to maintain compliance with the numeric criteria of the Washington State WQS, Chapter 173-201A WAC. The measures presented within the WQMP (Section 4.0) are designed to meet the following objectives:

Objective 1: Maintain compliance with state WQS for TDG. If non-compliance is observed, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;

Objective 2: Maintain compliance with state WQS for water temperature. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;

Objective 3: Maintain compliance with state WQS for other numeric criteria. If information becomes available that suggests non-compliance is occurring or likely to occur, the Aquatic SWG will identify reasonable and feasible measures, which will be implemented by Douglas PUD;

Objective 4: Operate the Project in a manner that will avoid, or where not feasible to avoid, minimize, spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill; and

Objective 5: Participate in regional forums tasked with improving water quality conditions and protecting designated uses in the Columbia River basin.

The WQMP is intended to be compatible with other water quality management plans in the Columbia River mainstem, including TMDLs. Furthermore, the WQMP is intended to be supportive of the HCP, Bull Trout Management Plan, Pacific Lamprey Management Plan, Resident Fish Management Plan, White Sturgeon Management Plan, and Aquatic Nuisance Species Management Plan through the protection of designated uses (WAC 173-201A-600) in Project waters. The WQMP is intended to be not inconsistent with other management strategies of federal, state and tribal natural resource management agencies.

The schedule for implementation of specific measures within the WQMP is based on the best information available at the time the plan was developed. As new information becomes available, the measures proposed in the WQMP may be adjusted through consultation with the Aquatic SWG.

4.0 WATER QUALITY MEASURES

In order to fulfill the goals and objectives described in Section 3.0 of the WQMP, Douglas PUD, in consultation with the Aquatic SWG, has initiated the implementation of the following measures.

4.1 TDG Compliance (Objective 1)

4.1.1 Monitoring

Douglas PUD shall continue to maintain fixed monitoring stations in the forebay and tailrace area of Wells Dam to monitor TDG and barometric pressure. TDG will be monitored hourly during the fish spill season each year. Data from the Wells forebay and tailrace stations will be transmitted on a daily basis to the applicable web-accessible database used by Ecology and regional fish management agencies. Douglas PUD shall maintain this monitoring program consistent with activities described in the then-current Wells GAP (Section 4.1.3).

Douglas PUD shall provide an annual report of all spill (and predicted TDG levels in the tailrace) occurring outside the fish passage season (currently October 1 to March 15).

4.1.1.1 Progress Towards Meeting Objective 1 in 2012 - Monitoring

In February 2012 Ecology issued a 401 Certification for Wells Dam, consistent with Federal Power Act Requirement for licensing non-federal hydro-projects. Requirements in the 401 Certification are consistent with the WQMP. In November 2012 the FERC issued a new license for the Wells Project. Requirements in the license are consistent with the 401 Certification and the WQMP.

In April 2012 Ecology approved Douglas PUD's GAP and issued a fish passage TDG adjustment waiver for the 2012 spill season. The final 2012 GAP requires Douglas PUD to monitor TDG in the forebay and tailrace of Wells Dam throughout the entire fish passage season (April 19th to – August 19th). Hourly forebay and tailrace TDG values were reported on the U.S. Army Corps of Engineers Water Management Division webpage and the Columbia River Data Access Real Time webpage, consistent with regional fish management agencies. Flows at Wells Dam were the third highest during the spill season on record. Douglas PUD provided Ecology and the Aquatic SWG in-season reports on water quality. Following the completion of the spill season, and consistent with requirements, Douglas PUD prepared a 2012 GAP/TDG report. The GAP report was approved by Ecology and the ASWG and filed with the FERC in February 2013, consistent with FERC license requirements. The Ecology and the FERC approved the 2012 GAP prior to the April 9th initiation of juvenile fish bypass operations and forced spill for fish.

As required by the Wells 401 Certification Douglas PUD will also collect TDG data outside of the fish spill/bypass season. Data will be collected in the same manner as collected during the spill season and will be consistent with an approved Quality Assurance Project Plan approved by the Aquatic SWG and Washington State Department of Ecology. Douglas PUD will start collecting the data following the completion of the 2013 spill season in August 2013, which is consistent with the license requirement deadline. Data collected outside of bypass season will be used to determine compliance with the 110% water quality standard.

4.1.2 Spill Operations

Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the Aquatic SWG and the GAP, using best

available information to minimize the production of TDG during periods of spill. All operations identified within the plan shall require the approval of the Wells HCP Coordinating Committee and the Aquatic SWG in order to ensure that spill operations are aimed at protecting designated uses and complying with the WQS numeric criteria for TDG in the Columbia River at the Project. In consultation with the Wells HCP Coordinating Committee and Aquatic SWG, the spill operations plan will be reviewed and updated, as necessary.

4.1.2.1 Progress Towards Meeting Objective 1 in 2012 - Spill Operations

In early 2013 Douglas PUD developed a 2013 GAP concomitantly with the 2013 Spill and Bypass Operations Plan and coordinated the review of these two documents with the HCP Coordinating Committee. Both plans will be filed with the FERC after approved by Ecology, the NMFS and theUSFWS. In late March 2013, the FERC approved the Juvenile Fish Bypass Plan and the Gas Abatement Plan and Spillway Play Book for 2013,

4.1.3 Project Gas Abatement Plan and TDG Exemption

Pending Ecology's approval of each subsequent GAP (which provides for the TDG exemption), Douglas PUD shall continue to implement the activities identified within the previously-approved plan. Douglas PUD shall submit the GAP to Ecology by February 28th of each year, or on a less frequent basis, as documented by Ecology in writing. Douglas PUD shall submit the GAPs through the term of the new license or until no longer required by Ecology.

The GAP will include the Spill Operations Plan (Section 4.1.2) and will be accompanied by a fisheries management plan and physical and biological monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.

It is anticipated that: (1) the TDG monitoring activities described in Section 4.1.1 will be adequate for the physical monitoring plan requirement; and (2) the Wells HCP and Aquatic Resource Management Plans in the Aquatic Settlement Agreement with respect to fish passage will be adequate for fish management plans, for the purposes of the GAP. Additional biological monitoring studies for purposes of Gas Bubble Trauma Monitoring may be required.

Douglas PUD shall provide an annual TDG report as required by the Ecology-approved GAP.

4.1.3.1 Progress Towards Meeting Objective 1 in 2012 - Project Gas Abatement Plan and TDG Exemption

In 2012, Douglas PUD implemented the Aquatic SWG and Ecology approved 2012 GAP. The GAP was submitted to Ecology prior to February 28th and was approved by Ecology in early April 2012. The 2012 GAP included Douglas PUD's Spill Playbook for 2012 (Playbook), which serves as the Spill Operations Plan identified above. The Playbook is consistent with methods used at Wells to minimize the production of TDG during differing flow regimes up to 246.0 kcfs of river flow. Additional details of spill and TDG performance were provided in the 2012 GAP report filed with Ecology and the FERC in February 2013 and as approved by the FERC in late March 2013.

The GAP also included a biological monitoring plan, which involved the collection of adult salmonids at Wells Dam and juvenile salmonids at Rocky Reach Dam when TDG at Wells Dam exceeded 125% in the tailrace during any hour. In 2012, over 500 juvenile and 800 adult salmon were assessed for signs of GBT when TDG values were above 125%. No adult salmon showed GBT expression even when TDG values were above 125%. Less than 2% of all juvenile salmon examined in 2012 showed signs of GBT expression and in all cases the symptoms were mild. Additional details of GBT expression were provided in the 2012 GAP report filed with Ecology and the FERC in February 2013.

4.1.4 Measures to Address Non-Compliance

Douglas PUD shall report all occurrences of non-compliance with TDG numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration.

If the Project is found to be consistently out of compliance with TDG at any time during the new license term, Douglas PUD shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.1.4.1 Progress Towards Meeting Objective 1 in 2012 - Measures to Address Non-Compliance

During the 2012 water year, Ecology was updated regularly when flows were exceptionally high and when TDG standards exceeded those required by the fish passage TDG exemption. In addition, Douglas PUD provided Ecology with weekly TDG and water reports.

Douglas PUD expects that both (A) and (B) above will be addressed through the development of a Quality Assurance Project Plan (QAPP) for TDG and water temperature and a Water Quality Attainment Plan (WQAP in early 2013). These two plans are additional requirements found in the 401 Certification and the FERC issued license. The plans are specifically designed to determine if the Wells Project is in compliance for TDG and what measures will be used to improve or address compliance concerns. Both plans are scheduled to be completed by no later than the end of October 2013.

4.2 Water Temperature Compliance (Objective 2)

4.2.1 Monitoring

Douglas PUD shall continue to monitor temperature at the Wells Dam forebay and tailrace in conjunction with its TDG monitoring program (currently April 1-September 15). Temperature data from the TDG monitoring program will be recorded hourly and reported daily to regional

databases. Water temperatures shall also be monitored at all boundary conditions of the Project (Methow River RM 1.5, Okanogan River RM 10.5, and Columbia River RM 544.5) and in the Well Dam forebay and tailrace as required by the Aquatic SWG.

Douglas PUD shall continue to collect hourly fish ladder temperatures 24 hours a day during the fish passage season (May 1 to November 15) at Pool No. 39 on the east ladder. Water temperatures shall also be monitored hourly in the auxiliary water supply system and near the east shore of the Wells Dam forebay (bottom, middle, and surface depths) during this same time period.

4.2.1.1 Progress Towards Meeting Objective 2 in 2012 - Monitoring

Water temperature monitoring in 2012 was consistent with the requirements above. In 2013 Douglas PUD will move to year round monitoring of TDG in the forebay and tailrace at Wells Dam. Per the requirements of the new license and 401 Certification, several new water temperature stations will be installed throughout the reservoir and will be accessible via a remote wireless connection. All water quality data will be transmitted hourly and provided on a public website. Additional information on monitoring will be contained within the QAPP. Monitoring will be consistent with the WQMP, the Wells Project 401 Certification and the Wells Dam Operating License issued by the FERC.

4.2.2 Temperature TMDL Development and Implementation

Douglas PUD shall participate in EPA Region 10's water temperature TMDL development for the U.S. portion of the Columbia River, in coordination with the Parties of the Aquatic SWG. Temperature data from the monitoring program at Wells Dam (Section 4.2.1) and software and results of the CE-QUAL-W2 model will be made available to EPA and other entities to assist in the development of the Columbia River temperature TMDL.

Where the measures identified in the TMDL are more protective than other measures in this plan, provisions of the temperature TMDL and implementation plans relevant to the Project and its operations, including specified time frames for implementing improvement measures, shall be implemented at the Project.

If a TMDL is not timely approved by EPA, Ecology may establish an allocation. In this case, Ecology will work with the Aquatic SWG and other interested parties to identify reasonable and feasible measures.

This plan does not exclude the option of the Aquatic SWG to consider modifying the water quality standard through a use attainability analysis or other process.

4.2.2.1 Progress Towards Meeting Objective 2 in 2012 - Temperature TMDL Development and Implementation

No TMDL planning took place in 2012. When the EPA's TMDL development occurs, Douglas PUD will participate.

On a related note, Douglas PUD provided the United States Army Corps of Engineers with the CE-QUAL-W2 data and model for the Wells Project. This model output was used to inform the Columbia River Treaty Sovereign Technical Team.

4.2.3 Measures to Address Non-Compliance

Douglas PUD shall report information indicative of non-compliance with water temperature immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. Such information may include changes in Project operations likely to increase water temperature or observations inconsistent with related environmental parameters.

If the Project is found to be consistently out of compliance with water temperature at any time during the new license term, Douglas PUD shall, in coordination with the Aquatic SWG, take the following steps:

(A) Evaluate alternative Project operations or any new reasonable and feasible technologies that have been developed; and

(B) After the evaluation, if no new reasonable and feasible improvements have been identified, propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.2.3.1 Progress Towards Meeting Objective 2 in 2012 - Measures to Address Non-Compliance

No issues of non-compliance with the state's water temperature standards were observed during 2012. As a result, no new measures are proposed to address non-compliance of the water temperature standards.

4.3 Compliance with Other Numeric Criteria (Objective 3)

Douglas PUD shall report information indicative of non-compliance with other numeric criteria immediately to Ecology for regulatory discretion and to the Aquatic SWG for consideration. This includes existing or developed criteria for toxic substances in water or sediments within Project Boundaries. The Aquatic SWG shall evaluate the information, and, if needed, require Douglas PUD to develop a plan to identify and address Project-related impacts, if any.

After the evaluation, if no reasonable and feasible improvements have been identified, Douglas PUD may propose an alternative to achieve compliance with the standards, such as site-specific criteria, a use attainability analysis, or a water quality offset.

4.3.1.1 Progress Towards Meeting Objective 3 in 2012 - Compliance with Other Numeric Criteria

In 2012 samples of floating cyanobacteria algae were taken and sent to King County laboratories. Toxicity levels for microcystins and anotoxin-a were such that the Washington Department of Ecology recommended posting information at recreational sites designed to prevent people and pets from coming in contact with floating algae mats (Hardy 2008). As such, information was posted at all boat launches and swimming areas around the Wells Project. Following weekly sampling and a reduction of toxicity the posted information was removed several weeks after the initial incident was reported and confirmed. Douglas PUD will monitoring the prevalence of cyanobacteria in 2013 and share additional findings with Ecology and the Aquatic SWG in subsequent summer seasons.

4.4 Spill Prevention and Control (Objective 4)

4.4.1 Spill Prevention and Control Requirements

Douglas PUD shall operate the Project in a manner that will minimize spill of hazardous materials and implement effective countermeasures in the event of a hazardous materials spill. The Project Spill Prevention Control and Countermeasures Plan (SPCC) will be updated pursuant to FERC requirements and recommendations as provided by Ecology. Douglas PUD shall comply with the updated version(s) of the SPCC.

4.4.1.1 Progress Towards Meeting Objective 4 in 2012 - Spill Prevention and Control Requirements

The Wells Project is operated in strict compliance with the Spill Prevention and Control requires of the WQMP, 401 Certification and the FERC license. No spills of toxic or hazardous materials were identified during the 2012 reporting period.

4.4.2 Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD shall continue participation in the Columbia and Snake River Spill Response Initiative (CSR-SRI). The CSR-SRI is a collaborative effort made up of local, state, and federal oil spill response community as well as members of industry and was developed to address the immediate need for oil spill preparedness and response in the area along the Columbia and Snake rivers. In addition to participation in the CSR-SRI, Douglas PUD shall continue to operate the Project in accordance with its SPCC (Jacobs 2007).

4.4.2.1 Progress Towards Meeting Objective 4 in 2012 - Participation in the Columbia and Snake River Spill Response Initiative

Douglas PUD has been an active participant in the Snake-Columbia Spill Response Initiative toward the minimization of TDG throughout the Columbia and Snake rivers. The project continues to be operated in a manner that is consistent with the SPCC (2007).

4.4.3 Inspections

For the term or the new license, Douglas PUD shall, upon reasonable notice, allow Ecology staff or representatives access to inspect the Project, including inside the dam, for the purpose of

assessing Spill Prevention and Control measures and compliance with Section 4.4.1. Following inspection, Douglas PUD shall address oil and hazardous material prevention and control issues identified by Ecology.

4.4.3.1 Progress Towards Meeting Objective 4 in 2012 - Inspections

Ecology's oil spill inspection team visited Wells Dam in late 2012 toward the development of a coordinated sampling process.

4.5 Regional Forums (Objective 5)

4.5.1 Participation in Regional Water Quality Forums

Douglas PUD shall continue its participation in both the Water Quality Team and Adaptive Management Team meetings to address regional water quality issues, including sharing the results from monitoring, measuring, and evaluating water quality in the Wells Project. However, Douglas PUD will not advocate for any water quality measures in regional forums without consulting with the Aquatic SWG.

4.5.1.1 Progress Towards Meeting Objective 5 in 2012 - Participation in Regional Water Quality Forums

Consistent with the WQMP, 401 Certification, Operating License, during calendar year 2012, Douglas PUD participated in regional forums lead by the Washington Department of Ecology, the Sovereign Technical Team, and U. S. Army Corps of Engineers and other managers. Examples included the Washington Department of Ecology's TDG and spill priority meeting in Seattle in the spring 2012, and the U.S. Army Corps of Engineers annual TDG monitoring meeting in Portland, Oregon in the fall of 2012. Douglas PUD will continue to participate in regional forums in 2013.

4.5.2 Project Operations

Douglas PUD may, following notice and opportunity for hearing, coordinate the operation of the project, electrically and hydraulically, with other mid-Columbia hydroelectric operations to the extent practicable. Coordinated operations are intended to reduce spill, increase generating efficiencies and thereby reduce the potential for exceedances of the TDG numeric criteria. These coordinated operations should be beneficial to TDG compliance and Aquatic Resources.

4.5.2.1 Progress Towards Meeting Objective 5 in 2012 - Project Operations

Douglas PUD continued implementation of the Hourly Coordination Agreement in 2012, consistent with the WQMP, 401 Certification, and FERC Operating License.

4.6 Reporting

Douglas PUD shall provide a draft annual report to the Aquatic SWG summarizing the previous year's water quality activities and activities proposed for the coming year, in accordance with the

WQMP and as determined by the Aquatic SWG. The report will include any decisions, statements of agreement, evaluations, or changes made pursuant to this WQMP. If significant activity was not conducted in a given year, Douglas PUD may prepare a memorandum providing an explanation of the circumstances in lieu of the annual report. A summary of monitoring results, any analyses and compliance with the WQS numeric criteria will be included in an appendix to the annual report.

4.6.1 Progress Towards Meeting Annual Reporting Requirements

In addition to the reporting requirements found within the Aquatic Settlement Agreement requiring the submission of annual reports for all six of the management plans including the WQMP, Article 406 of the FERC license for the Wells Project also requires Douglas PUD to submit annual reports detailing the implementation of each of the six Aquatic Settlement Agreement management plans. This report is intended to satisfy those reporting requirements associated with the new license for the Wells Project.

4.6.2 Study Plans

Douglas PUD shall prepare study plan(s) that include QAPP(s) for each parameter to be monitored. The QAPPs shall follow the Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies (July 2004 Ecology Publication Number 04-03-030) or its successor. The QAPPs shall contain, at a minimum, a list of parameter(s) to be monitored, a map of sampling locations, and descriptions of the purpose of the monitoring, sampling frequency, sampling procedures and equipment, analytical methods, quality control procedures, data handling and data assessment procedures and reporting protocols.

Douglas PUD shall review and update the QAPPs annually based on a yearly review of data and data quality. Ecology may also require future revisions to the QAPP based on monitoring results, regulatory changes, changes in Project operations, and/or the requirements of TMDLs.

The initial QAPPs and any changes shall be submitted to the Aquatic SWG for review and are subject to approval by Ecology. Implementation of the monitoring program shall begin upon Ecology's written approval of the QAPP, unless otherwise provided by Ecology.

4.6.2.1 Progress Towards Meeting Objective 5 in 2012 - Study Plans

As discussed above, Douglas PUD has been working with Ecology on the development of a plan for the accurate monitoring necessary to inform the QAPP for water temperature and TDG. In the event that Aquatic SWG identifies additional measures to be monitored, Douglas PUD will prepare a QAPP in consultation with the Aquatic SWG to provide quality data and assess compliance with standards.

5.0 REFERENCES

Beiningen, K.T. and W.J. Ebel. 1970. Effect of John Day Dam on dissolved nitrogen concentrations and salmon in the Columbia River, 1968. In: Chapman, D., C. Peven, A. Giorgi, T. Hillman, and F. Utter. 1995. Status of spring Chinook salmon in the mid-Columbia Region. Don Chapman Consultants, Inc., Boise, Idaho.

Carlson, R.E. 1977. A trophic state index for lakes. Limnology and Oceanography. 22:361-369.

Carlson, R.E. and J. Simpson. 1996. A coordinators guide to volunteer lake monitoring methods. North American Lake Management Society. 96 pp.

CBE (Columbia Basin Environmental). 2003. Wells Dam Spillway Total Dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

CBE. 2004. Wells Dam Spillway Total Dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

CBE. 2006. Wells Dam Spillway total dissolved Gas Evaluation. Final Report. Prepared by Columbia Basin Environmental, The Dalles, Oregon for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

DCPUD and CBE. 2009. 2009 Turbidity Monitoring on the Okanogan River. Data collected by Columbia Basin Environmental for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

Ebel, W.J., H.L. Raymond, G.E. Monan, W.E. Farr, and G.K. Tanonaka. 1975. Effect of atmospheric gas supersaturation caused by dams on salmon and steelhead trout of the Snake and Columbia Rivers. National Marine Fisheries Services, Seattle, Washington.

Ecology (Washington Department of Ecology). 1998. Water Quality Data Summary. Ambient monitoring data [online]. Available at: http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html. (Accessed February 2008)

Ecology (Washington Department of Ecology). 2004. Lower Okanogan River Basin DDT and PCBs Total Maximum Daily Load (TMDL). Submittal Report. Prepared by Mark Peterschmidt. Washington State Department of Ecology, Water Quality Programs. Publication No. 04-10-043.

EES Consulting, Inc. 2006. Comprehensive Limnological Investigation. Wells Hydroelectric Project FERC No. 2149. Prepared by EES Consulting, Bellingham, WA for Public Utility District No. 1 of Douglas County, East Wenatchee, Washington.

EES Consulting, Carroll, J., ENSR, and Parametrix. 2007. Total Dissolved Gas Production Dynamics Study. Wells Hydroelectric Project. FERC No. 2149. Prepared by EES Consulting, Joe Carroll, ENSR, and Parametrix. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Hardy, J. 2008 Washington State Recreational Guidance for Microcystins (Provisional) and Anatoxin-a (Interim/Provisional) Final Report. Washington Department of Health. Olympia Washington.

Jacobs Engineering. 2007. Wells Hydroelectric Project: Spill Prevention Control and Countermeasure (SPCC) Plan. Prepared by Jacobs Engineering, Bellevue, WA. Prepared for Public Utility District No. 1 of Douglas County, East Wenatchee, WA.

Kratzer, C.R, and P.L. Brezonik. 1981. A Carlson-type trophic state index for nitrogen in Florida lakes. Water Resources Bulletin 17(4) 713-715.

Le, B. 2008. Total Dissolved Gas Abatement Plan. Wells Hydroelectric Project. Prepared by Public Utility District No. 1of Douglas County, East Wenatchee, WA. Prepared for Washington Department of Ecology, Yakima, WA, 98902-3452.

Lê, B. and J. Murauskas. 2009. Total Dissolved Gas Abatement Plan. Wells Hydroelectric Project. April 2009. Prepared for Washington Department of Ecology, Yakima, Washington, 98902-3452.

National Marine Fisheries Service (NMFS). 2000. Endangered Species Act – Section 7 Consultation: Biological Opinion. Consultation on Remand for Operation of the Columbia River Power System and 19 Bureau of Reclamation Projects in the Columbia Basin. F/NWR/2004/00727. November 30, 2005. Pages 5-6, 5-7, 5-53, 10-9, and Appendix E: Risk Analysis.

NMFS. 2002. Anadromous Fish Agreements and Habitat Conservation Plans: Final Environmental Impact Statement for the Wells, Rocky Reach, and Rock Island Hydroelectric Projects. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service, Northwest Region, Portland, Oregon. December 2002.

Parametrix, Inc. 2009. Continued monitoring of DO, pH, and turbidity in the Wells forebay and lower Okanogan River (DO, pH, and Turbidity Study). Wells Hydroelectric Project, FERC No. 2149. Initial Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Pickett, P., H. Rueda, M. Herold. 2004. Total Maximum Daily Load for Total Dissolved Gas in the Mid-Columbia River and Lake Roosevelt. Submittal Report. Washington Department of Ecology, Olympia, WA. U.S. Environmental Protection Agency, Portland, OR. June 2004. Publication No. 04-03-002.

Politano, M., A. Arenas Amado, and L. Weber. 2008. An investigation into the total dissolved gas dynamics of the Wells Project (Total Dissolved Gas Investigation): Wells Hydroelectric Project, FERC No. 2149. Initial Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Politano, M., A. Arenas Amado, and L. Weber. 2009a. An investigation into the total dissolved gas dynamics of the Wells Project (Total Dissolved Gas Investigation): Wells Hydroelectric Project, FERC No. 2149. Updated Study Report required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

Politano, M., A. Arenas Amado, and D. Hay. 2009b. Total dissolved gas modeling and compliance evaluation for the Wells Hydroelectric Project. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

West Consultants, Inc. 2008. Development of a water temperature model relating Project operations to compliance with the Washington State and EPA water quality standards (Water Temperature Study). Wells Hydroelectric Project, FERC No. 2149. Initial Study Report Required by FERC. Prepared for Public Utility District No. 1 of Douglas County. East Wenatchee, WA.

APPEMDIX C: PRE-FILING CONSULTATION RECORD FOR THE ANNUAL REPORT CALENDAR YEAR 2012 ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT & 2012 MANAGEMENT PLAN REPORTS

REQUEST FOR APPROVAL FOR THE 2012 AQUATIC SWG ANNUAL REPORT FROM THE AQUATIC SETTLEMENT WORK GROUP

Andrew Gingerich

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Wednesday, April 10, 2013 1:38 PM
To: Bob Rose; Jason McLellan; Pat Irle (pirl461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); 'Steve Lewis'; Andrew Gingerich
Cc: Emily Pizzichemi; Bao Le; Beau Patterson; Bill Towey (bill.towey@colvilletribes.com); Bob Jateff (jatefrjj@dfw.wa.gov); 'Brad James'; 'Bret Nine'; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chas Kyger; Chris Sheridan; 'Donella Miller'; Jeff Korth (korthjwk@dfw.wa.gov); 'Jessi Gonzales'; Joe Peone (joe.peone@colvilletribes.com); kirk.truscott@colvilletribes.com; Kristi Geris; Mary Mayo; Mike Schiewe; Molly Hallock (hallomh@dfw.wa.gov); 'Patrick Luke'; Paul Ward (ward@yakama.com); Shane Bickford; 'Steve Parker (parker@yakama.com)'; Steve Rainey
Subject: FW: Aquatic SWG: Draft 2012 Aquatic SWG Annual Report for review
Attachments: 2012_Draft_Aquatic_SWG_Annual_Report_14Mar2013_for ASWG review.doc

Hi Aquatic SWG: this is a reminder to please submit comments and/or your formal approval of the draft 2012 Aquatic SWG Annual Report to Andrew Gingerich no later than Monday, April 15, 2013. Instructions to access the appendices that are saved on the ftp site are below.

Thanks!
Kristi ☺

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com

From: Kristi Geris
Sent: Thursday, March 14, 2013 4:56 PM
To: 'Andrew Gingerich (andrewg@dcpud.org)'; 'Bao Le'; 'Beau Patterson (bpatterson@dcpud.org)'; 'Bill Towey (bill.towey@colvilletribes.com)'; 'Bob Jateff (jatefrjj@dfw.wa.gov)'; 'Bob Rose'; 'Brad James'; 'Bret Nine'; 'Chad Jackson'; 'Charlie McKinney (cmck461@ecy.wa.gov)'; 'Chas Kyger'; 'Chris Sheridan'; 'Donella Miller'; 'Jason McLellan'; 'Jeff Korth (korthjwk@dfw.wa.gov)'; 'Jessi Gonzales'; 'Joe Peone (joe.peone@colvilletribes.com)'; 'kirk.truscott@colvilletribes.com'; 'Mary Mayo'; 'Mike Schiewe (mschiewe@anchorqea.com)'; 'Molly Hallock (hallomh@dfw.wa.gov)'; 'Pat Irle (pirl461@ecy.wa.gov)'; 'Patrick Luke'; 'Patrick Verhey (Patrick.Verhey@dfw.wa.gov)'; 'Paul Ward (ward@yakama.com)'; 'Shane Bickford (sbickford@dcpud.org)'; 'Steve Lewis'; 'Steve Parker (parker@yakama.com)'; 'Steve Rainey'
Cc: Emily Pizzichemi
Subject: Aquatic SWG: Draft 2012 Aquatic SWG Annual Report for review

Hi Aquatic SWG: please find attached the Draft 2012 Aquatic SWG Annual Report for a 30-day review. The appendices are available for download from an ftp site (due to size) in the folder: Draft 2012 Aquatic Settlement Agreement Annual Report (the draft report is also saved here). Let me know if you have any problems accessing the site. Instructions are below.

Comments are due no later than Monday, April 15, 2013.

Thanks!
Kristi ☺

Instructions:

To gain access to this FTP folder, please use the following procedure:
* From your Windows XP desktop, Select **Start ->Run** or for Windows 7, Select **Start-> and click in the Search box**
* **Cut and Paste** the following line in the "***Open***" field and then Select "***OK***": (Please note that the following line is not a URL or hotlink)

%systemroot%/explorer ftp:// 090280-02.01%40090280-02.01:d0uglas@ftp.anchorqea.com/

You should now be logged into the FTP account; a window will be generated for you to upload your file(s) into.
(Copy & paste your files into or from the window).

To perform a "**manual login"** from a Microsoft Explorer window, select the link below:
ftp://ftp.anchorqea.com

This will launch a "Log on as" window.
Username: **090280-02.01@090280-02.01** (this refers to the particular FTP user account @ the FTP project name)
Password: **d0uglas (the 0 is a zero)**

Kristi Geris
Scientist

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Please consider the environment before printing this email.

REQUEST FOR APPROVAL FOR THE 2012 AQUATIC SWG MANAGEMENT PLAN REPORTS FROM THE AQUATIC SETTLEMENT WORK GROUP

Andrew Gingerich

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Friday, April 12, 2013 3:57 PM
To: Andrew Gingerich; Bao Le; Beau Patterson; Bill Towey (bill.towey@colvilletribes.com); Bob Jateff (jatefrjj@dfw.wa.gov); Bob Rose; 'Brad James'; 'Bret Nine'; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chas Kyger; Chris Sheridan; 'Donella Miller'; Jason McLellan; Jeff Korth (korthjwk@dfw.wa.gov); 'Jessi Gonzales'; Joe Peone (joe.peone@colvilletribes.com); kirk.truscott@colvilletribes.com; Kristi Geris; Mary Mayo; Mike Schiewe; Molly Hallock (hallomh@dfw.wa.gov); Pat Irle (pirl461@ecy.wa.gov); 'Patrick Luke'; Patrick Verhey (Patrick.Verhey@dfw.wa.gov); Paul Ward (ward@yakama.com); Shane Bickford; 'Steve Lewis'; 'Steve Parker (parker@yakama.com)'; Steve Rainey
Cc: Emily Pizzichemi
Subject: FW: Annual ASWG Management Plan Reports
Attachments: 2013_04_12 Douglas - 2012 RFMP Annual Report.pdf; 2013_04_12 Douglas - 2012 WQMP Annual Report.pdf; 2013_04_12 Douglas - 2012 WSMP Annual Report.pdf; 2013_04_12 Douglas - 2012 ANSMP Annual Report.pdf; 2013_04_12 Douglas - 2012 BTMP Annual Report.pdf; 2013_04_12 Douglas - 2012 PLMP Annual Report.pdf

Hi Aquatic SWG: please see the email below from Andrew and the attached Annual ASWG Management Plan Reports. These draft reports are out for review with comments due to Andrew prior to the Aquatic SWG May 8, 2013 conference call, at which time Douglas PUD will request formal approval of the reports.

Thanks! Happy reading!
Kristi ☺

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Friday, April 12, 2013 3:43 PM
To: Kristi Geris
Cc: Shane Bickford; Chas Kyger
Subject: Annual ASWG Management Plan Reports

Kristi, please distribute the below email and attachments.

As promised, Douglas PUD has completed the annual reports for each Management Plan found within the Aquatic Settlement Agreement.

The reports are setup to be consistent with each Management Plan. Specifically, within Section 4 (PME's) and below each objective we have listed "progress towards meeting objective x". The language in these sections should be consistent with what we have discussed and worked on as a group over the last few months.

As we discussed on the call this past Wednesday, Douglas PUD is asking the ASWG for comments prior to the May 8th ASWG conference call. During that call we would like to have these reports approved so that we can file them with the FERC prior to the May 31st deadline.

Please let me know if you have any questions.

Thanks all.

Andrew

Andrew Gingerich
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REVIEW FROM NMFS FOR THE 2012 AQUATIC SWG ANNUAL REPORT AND 2012 AQUATIC SWG MANAGEMENT PLAN REPORTS

Andrew Gingerich

From: Keith Kirkendall - NOAA Federal <keith.kirkendall@noaa.gov>
Sent: Thursday, April 18, 2013 8:39 AM
To: Bryan Nordlund - NOAA Federal
Cc: Andrew Gingerich; Tom Kahler; Chas Kyger; Shane Bickford
Subject: Re: ASWG Annual Report

Follow Up Flag: Follow up
Flag Status: Completed

Seeing how my in-basket has been overwhelmed by the mere volume of all these reports and I too was wondering what NMFS's role was enlight of the the HCP; I do agree with Bryan's proposed plan for managing our participation

thanks keith

On Thu, Apr 18, 2013 at 8:13 AM, Bryan Nordlund - NOAA Federal <bryan.nordlund@noaa.gov> wrote:
Andrew - well, at first blush my plan was to be a trooper and plow through the documents to weed out any potential wrongs being done to HCP Plan Species by actions of the ASWG. However, it is just too much for me to provide meaningful comment on. There would be too much catch-up and explaining things to me to be worth the time and effort on either your end or my end, especially since much of it is outside NMFS jurisdiction and interests.

I believe Tom has been pretty good about pointing out to the HCP CC areas where the ASWG has plans that might affect anadromous fish - the lamprey passage study for example. So long as I have the opportunity to weigh in with my opinions and thoughts regarding ASWG plans brought before the HCP CC, NMFS interests will be addressed. I also assume that any unlikely take of Plan Species that results from the implementation of ASWG plans will be reported to NMFS by DPUD, and this will provide NMFS the opportunity to comment on revising future plans if necessary.

I will take a look at the water quality report and provide any comments/questions I may have. Other than that, I believe NMFS interests to be adequately covered within the bounds of the Wells HCP, assuming DPUD remains vigilant about identifying future actions proposed from the ASWG that may affect anadromous fish.

Thanks for the opportunity to review these reports. I'll put the water quality report in my queue for review, but will waive my review of the others. I have cc'd my supervisor in the event he has other ideas.

Bryan Nordlund

On Wed, Apr 17, 2013 at 1:56 PM, Andrew Gingerich <andrewg@dcpud.org> wrote:

Bryan. First, thanks for looking at the BMPs and Aquatic Nuisance Species stuff. Second, the attachments aren't meant to overwhelm you so bear with me a second.

Unfortunately our FERC requirements seem to be plentiful. For example, we have annual reports for each management plan within the Aquatic Settlement Agreement (there are six: Aquatic Nuisance Species, White

Sturgeon, Bull Trout, Water Quality, Resident Fish, Pacific Lamprey). These are in addition to the Annual Report that Tom Kahler cited below in a previous email. These 6 reports are straightforward and include summaries of our progress on implementing each Management Plan under the new license. One could argue after reading between the lines in our new Operating License, specifically license article 406 (p. 56), that we should provide the NMFS a chance to review them each along with the annual Aquatic Settlement Work Group Report that Tom attached below in a previous email (I have attached it again in this email). Admittedly, there are some redundancies between the reports but they are all required. All of these reports are due to the FERC by May 31st.

Based on Tom's previous email below, and the knowledge that we have an addition six management plan reports for you or someone at the NMFS to review (all are attached)… what seems like a logical path forward? The license is not specific on who at the NMFS should review these documents. To me, the requirement to consult the NMFS on these reports seems peculiar since the NMFS elected to not participate in the Aquatic Settlement process, citing that the NFMS' concerns are met through the implementation and processes of the HCP. Nevertheless, the license requires that we consult the NMFS on much of this stuff. Following this consultation we need to file reports with the FERC and concomitantly file the consultation record or approval from the various agencies, including the NMFS in this case.

One option would be to make note of receipt of these reports and return to me an email verifying that the NMFS does not have comments on these reports since they fall outside of the actions contained in the HCP. Or, we could track down the person in the NMFS that is anxious to review these items?

Feel free to call me to discuss. Or respond via email.

I appreciate your help with this stuff Bryan.

Andrew

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Senior Aquatic Resource Biologist

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1151 Valley Mall Parkway
East Wenatchee, Washington 98802

From: Tom Kahler
Sent: Thursday, April 11, 2013 4:38 PM
To: 'Bryan Nordlund (bryan.nordlund@noaa.gov)'
Cc: Andrew Gingerich; Chas Kyger
Subject: ASWG Annual Report

Hi Bryan,

To follow up with my phone message to you a few minutes ago…. I'm worried that I'll soon become your worst nightmare, because I seem to have an endless list of orphan reports from our Aquatic Settlement Work Group that the new license requires us to "consult" with NMFS on before submitting to FERC. FERC does not specify to whom within NMFS we should send this, so I'm running it by you first hoping you'll know just the right person (you're welcome to do it yourself). As with the GAP, we need someone at NMFS to review and comment (as desired) on this report. Likewise, as with the GAP, an email or letter from you or someone else at NMFS providing comments or indicating that you have no comments would suffice. Please call me or Andrew (509 881-2323) to discuss as necessary, and let us know who we should provide this to within your organization as you deem appropriate. We need to file this with FERC by the end of May.

Thanks again,

Tom

Tom Kahler

Fisheries Biologist

P.U.D. No. 1 of Douglas County

1151 Valley Mall Parkway

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tkahler@dcpud.org

APPROVAL FROM YAKAMA NATION FOR THE 2012 AQUATIC SWG ANNUAL REPORT AND THE 2012 AQUATIC SWG MANAGEMENT PLAN REPORTS

Andrew Gingerich

From: Bob Rose <rosb@yakamafish-nsn.gov>
Sent: Thursday, May 09, 2013 7:26 AM
To: Mike Schiewe
Cc: Andrew Gingerich
Subject: Re: Wells ASWG

Hi Andrew, Mike.
I've reviewed each of the documents listed below and I do approve that the ASWG accept these as Final.
Thanks for the reminder.
My apologies for not being able to attend yesterday.
Best Regards,
B Rose

1. Approval of the 2012 Annual Report
2. Approval of the Settlement Agreement Management Plan Annual Reports
3. Approval of QAPP for Water Temperature and TDG Monitoring.

On Wed, May 8, 2013 at 8:15 AM, Mike Schiewe <mschiewe@anchorqea.com> wrote:

Bob – There are three decision items on the agenda

1. Approval of the 2012 Annual Report
2. Approval of the Settlement Agreement Management Plan Annual Reports
3. Approval of QAPP for Water Temperature and TDG Monitoring.

Do you have any comments, questions? Are you ready to approve?

Thanks, Mike

From: Bob Rose [mailto:rosb@yakamafish-nsn.gov]
Sent: Monday, May 06, 2013 8:27 AM
To: Andrew Gingerich; Mike Schiewe
Subject: Wells ASWG

Hi Andrew - Mike, I hope you are refreshed and roaring to go for another week!

So, just looking at my schedule - I will need to be in Tacoma Wednesday with the Tacoma Power folks going over the Annual Review for that proceeding. So will not be in on the call.

However Mike - I'm going to go through the two decision documents asap and will get back to you with a vote for these two items. So hopefully I'll not hang up progress on those items.

I don't think I have much to add to the discussion, as I've visited recently with Andrew about a couple of these things. I am around via phone if I can help out with anything.
Best to both,

--
Bob Rose
Yakama Nation
Fisheries Resource Management Program
509-945-0141

--
Bob Rose
Yakama Nation
Fisheries Resource Management Program
509-945-0141

NMFS APPROVAL OF THE 2013 QUALITY ASSURANCE PROJECT PLAN

Andrew Gingerich

From: Bryan Nordlund - NOAA Federal <bryan.nordlund@noaa.gov>
Sent: Wednesday, May 08, 2013 10:29 AM
To: Andrew Gingerich
Cc: Chas Kyger; Tom Kahler; Shane Bickford
Subject: Re: Left one more out

Follow Up Flag: Follow up
Flag Status: Flagged

Andrew - This morning, I read (actually, I think I re-read) the Water Temperature and TDG QAPP plan for Wells Dam. It wasn't checked off of my "tasks" list - possibly an error, since the text sounded familiar.

In any event, the 2013 QAPP for Wells Dam looks good to me. No comments and consider this NMFS approval (or added approval, if I had sent this approval previously).

Thanks,
Bryan

On Wed, Apr 17, 2013 at 2:56 PM, Andrew Gingerich <andrewg@dcpud.org> wrote:

Bryan, I left one out!

Here is item number seven that we need to show NMFS consultation. This is a plan on how we plan to collect TDG and water temperature data in the Wells Project in a robust manner that will help us determine Wells' ability to meet the WA state water quality standards. This review actually falls under article 41 and page 48 of the new Wells License.

Let me know if you have time and we can chat briefly on the phone about all these plans and reports.

Thanks again.

Andrew

Andrew Gingerich
Senior Aquatic Resource Biologist

Douglas County Public Utility District

AQUATIC SETTLEMENT WORK GROUP APPROVAL OF THE 2012 AQUATIC SWG ANNUAL REPORT AND THE 2012 AQUATIC SWG MANAGEMENT PLAN REPORTS

Final Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: May 9, 2013

From: Michael Schiewe, Chair (Anchor QEA)

Re: Final Action Items of the May 8, 2013, Aquatic SWG Conference Call

Below is a summary of Action Items from the Aquatic SWG meeting held by conference call from 10:00 am to 11:30 am on Wednesday, May 8, 2013. These action items include the following:

I. Summary of Action Items

1. Pat Irle (Washington State Department of Ecology) will provide additional comments or approval of Aquatic Settlement Work Group 2012 Annual Report to Mike Schiewe via email (*Approval was confirmed via email dated May 9, 2013)* (Item II).
2. Irle will provide additional comments or approval of the Water Quality Management Plan 2013 Annual Report to Schiewe via email *(Approval was confirmed via email dated May 9, 2013) (*Item III).
3. Andrew Gingerich will talk with Scott Kreiter (Douglas PUD Lands Department) about method of application of aquatic herbicide in public swimming areas, and report back to Aquatic SWG representatives at the June 12, 2013 meeting (Item IIX).
4. Steve Lewis will send the Twisp Weir Bull Trout Study deferral request letter to Emily Pizzichemi for distribution to the Aquatic SWG. Aquatic SWG representatives will submit comments and/or their formal approval to Gingerich no later than June 5, 2013 (Item IX).
5. Chas Kyger will provide additional details on the Lamprey Passage and Enumeration Study, including release locations, during the June 5, 2013 meeting (Item X).

II. Summary of Decisions

1. There were no Statements of Agreement (SOAs) approved at today's meeting.

III. Agreements

1. Aquatic SWG representatives present approved Douglas PUD's Aquatic Settlement Work Group 2012 Annual Report *(Bob Rose and Pat Irle provided email confirmation of approval on May 9, 2013)* (Item II).

2. Aquatic SWG representatives present approved Douglas PUD's Aquatic Settlement Agreement Management Plan Annual Reports (six total) *(Bob Rose and Pat Irle provided email confirmation of approval on May 9, 2013)* (Item III). Approval required the inclusion of a reference to the Wells Aquatic Settlement Agreement White Sturgeon Collection Plan SOA (approved March 20, 2013) in the prioritization list on page 11, section 4.4.1 of the White Sturgeon Management Plan Report.

3. Aquatic SWG representatives present approved the 2013 Draft Quality Assurance Project Plan for Water Temperature and Total Dissolved Gas Monitoring (*Bob Rose provided email confirmation of approval on May 9, 2013)* (Item IX).

IV. Reports Finalized

1. No reports have been finalized since the last Aquatic SWG meeting.

WASHINGTON DEPARTMENT OF ECOLOGY APPROVAL OF THE 2012 AQUATIC SWG ANNUAL REPORT AND THE 2012 AQUATIC SWG MANAGEMENT PLAN REPORTS

Andrew Gingerich

From: Irle, Pat (ECY) <PIRL461@ECY.WA.GOV>
Sent: Tuesday, May 21, 2013 2:48 PM
To: Andrew Gingerich
Subject: RE: Formal approval of various documents

Follow Up Flag: Follow up
Flag Status: Flagged

Hi, Andrew – This is an e-mail to formally approve the items listed in your e-mail below.
Thanks for all the good work!
Pat Irle
WA Dept of Ecology
Hydropower Projects Manager

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Thursday, May 09, 2013 3:25 PM
To: Irle, Pat (ECY)
Subject: Formal approval of various documents

Pat Anchor sent me your approval of the various documents discussed at the ASWG meeting yesterday. I think it would be helpful to have a direct email from you for the FERC filings for each of the documents we discussed and reviewed over the last few weeks.

Could you respond to me via a reply of this message to note that you formally approve these three items:

1. Aquatic Settlement Agreement Annual Report (distributed by Anchor QEA)
2. All six management plans annual reports
3. The QAPP for water temperature and TDG monitoring

Thanks!

Andrew Gingerich
Senior Aquatic Resource Biologist
Douglas County Public Utility District
andrewg@dcpud.org
509-881-2323 (work)
509-884-0553 (fax)
1151 Valley Mall Parkway
East Wenatchee, Washington 98802

Andrew Gingerich

From: Irle, Pat (ECY) <PIRL461@ECY.WA.GOV>
Sent: Tuesday, May 21, 2013 2:47 PM
To: Andrew Gingerich
Cc: Chas Kyger; Shane Bickford
Subject: RE: Wells WQMP Annual Report

Follow Up Flag: Follow up
Flag Status: Flagged

All good points. Sounds good. Thanks for your consideration and revisions.

The "approval" email follows immediately.

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Tuesday, May 21, 2013 2:37 PM
To: Irle, Pat (ECY)
Cc: Chas Kyger; Shane Bickford
Subject: RE: Wells WQMP Annual Report

Pat below I have offered up some revisions to address comments. Please find them in red and italics.

If these revisions and actions seem appropriate I will make them to include in the final submission and report.

As you know, once you think the management plans, Aquatic SWG report and QAPP look good I will seek a formal email from Ecology (yourself) that notes your approval of the following:

1. The 6 Aquatic Settlement Agreement Management Plan Reports
2. The Anchor QEA developed Aquatic SWG/SA report
3. The Quality Assurance Project Plan for monitoring TDG and water temperature.

Douglas needs to file the first two by the end of the month. We are hoping to file them this week. In an ideal world I would also file he QAPP this month. I have approval from the other ASWG members and the NMFS to file these documents so the pressure is on! ;)

Thanks…let me know what you think of the below.
Andrew
509-881-2323

From: Irle, Pat (ECY) [mailto:PIRL461@ECY.WA.GOV]
Sent: Tuesday, May 21, 2013 11:51 AM
To: Andrew Gingerich
Subject: Wells WQMP Annual Report

Hi, Andrew – these are my thought on the WQMP Annual Report. You may have comments on these. Feel free to call/e-mail.
I now turn to the other plans (which I expect to have even fewer comments on.)

Major comment on the WQMP annual report:

On Page 1,Objective 1 states that the project is in compliance with TDG. However, according to the 401 certification, that the project currently doesn't always meet the numeric criteria. (per 401, page 17: "Objective 1: Ensure that compliance with state WQS for TDG is achieved. Compliance is to be achieved within ten years of the issuance of the New License. Measures are specified to address non-attainment of standards after this time period.") Is there some way to clarify this (or footnote it)?

Yes I agree. Our hope was to avoid changing the Management Plan Text and only add what we have done in the reporting sections of these management plans. However, your comment needs to be addressed. I suggest we footnote the section and at the bottom of the page include this reference "During the 2011 spill season Wells Dam had measurable TDG exceedances, which fell above Water Quality Standard limits. As such, during the issuance of the Wells 401 Certification and as part of the relicensing of the Wells Project, Ecology requires that compliance with state WQS for TDG is achieved at the Wells Project. Compliance is to be achieved within ten years of the issuance of the New License and approved Water Quality Attainment Plan."

Minor Comments
Can you include the citations for the following (on pp 6-7)?

a) "well mixed" etc.
b) Moderately acclimated adult and juvenile, etc.

Refer to the preceding paragraph that cites "WAC 173-201A" or find it here http://apps.leg.wa.gov/wac/default.aspx?cite=173-201A-200 . This section (entire page) is a cut and paste from the WAC. I'm not sure we need to reference it again. Additionally, this section is part of the WQMP and I'd prefer not to change it if you think it is acceptable as is.

Can you include the Okanogan Supplemental Temperature Requirements? (page 6)

Within the Wells Project only the Methow River has supplemental temperature requirements (those in addition to the normal WAC WQ standards). The Okanogan, to my knowledge, has none. Additionally, Again, I'd prefer to not change this section since it verbatim from the WQMP.

4.1.1.1 (page 28): could you include in this section the information about new year-round monitoring for TDG.

Yes. That's a great idea. How about I add, "As required by the Wells 401 Certification Douglas PUD will also collect TDG data outside of the fish spill/bypass season. Data will be collected in the same manner as collected during the spill season and will be consistent with an approved Quality Assurance Project Plan approved by the Aquatic SWG and Washington Department of Ecology. Douglas PUD will start collecting the data following the completion of the 2013 spill season in August 2013, which is consistent with the license requirement deadline. Data collected outside of bypass season will be used to determine compliance with the 110% water quality standard."

Even more minor comments:

You may want to clarify that the DO standard of 8.0 is for these waterbodies (not all waterbodies.) (page 6)

If you're happy with not clarifying I won't change this section since it's verbatim with the WQMP. I don't want to change the management plan language if it's not completely necessary.

4.3.1.1 (page 32) – regarding floating algal mats. Can you identify the type of algae and whether it is native or nonnative?

Yes. This is a reporting section that is easy to change. Cyanobacteria is ubiquitous in North American and beyond, I'm not sure I have ever seen it classified as nonnative or native. Instead would it be simply acceptable to add a little more detail here? See the bold and suggested additions below:

"In 2012 samples of floating ***cyanobacteria*** *algae were taken and sent to King County laboratories. Toxicity levels for* ***microcystins and anotoxin-a*** *were such that the Washington Department of Ecology recommended posting information at recreational sites designed to prevent people and pets from coming in contact with floating algae mats* ***(Hardy 2008)****. As such, information was posted at all boat launches and swimming areas around the Wells Project. Following weekly sampling and a reduction of toxicity the posted information was removed several weeks after the initial incident was reported and confirmed.* ***Douglas PUD will monitoring the prevalence of cyanobacteria in 2013 and share additional findings with Ecology and the Aquatic SWG in subsequent summer seasons."*** *Also I will add the following reference to the ref list:*

Hardy, J. 2008 Washington State Recreational Guidance for Microcystins (Provisional) and Anatoxin-a (Interim/Provisional) Final Report. Washington Department of Health. Olympia Washington.

Document Content(s)