



ANNUAL REPORT CALENDAR YEAR 2010 ACTIVITIES UNDER THE AQUATIC SETTLEMENT AGREEMENT WELLS HYDROELECTRIC PROJECT FERC LICENSE NO. 2149

Prepared for

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

Prepared by

Anchor QEA, LLC
1423 Third Avenue, Suite 300
Seattle, Washington 98101

April 2011

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1 INTRODUCTION

The Wells Hydroelectric Project (Wells Project) is owned and operated by Public Utility District 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 it 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 second annual report to be developed for activities accomplished under the Agreement, covering the period from January 1, 2010, to December 31, 2010.

The Agreement is intended to resolve all remaining 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 Original Operating License, the Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for the Wells Hydroelectric Project (HCP 2002), or other related agreements. The Original Operating License for the Wells Project will expire May 31, 2012. This Agreement is the culmination of 3 years of collaborative discussions with stakeholders related to relicensing that began in March 2006.

On December 18, 2009, Douglas PUD filed with the FERC the Draft License Application (DLA) for the New Operating License, which included this Agreement. A Final License Application (FLA) was filed with the 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.

The six Aquatic Resource Management Plans contained in attachments B through G of the Agreement¹, together with the 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 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” will be used to achieve the biological goals and objectives.

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 compiles all relevant materials associated with Agreement activities during the year. The subsequent sections of this chapter describe activities implemented during 2010 toward implementing the Agreement and Aquatic Resource Management Plans.

2.1 2010 Aquatic Settlement Agreement Decisions, Agreements, and Milestones

Decisions, agreements, and milestones made by the Aquatic Settlement Work Group (Aquatic SWG) during 2010 and related to the Agreement are shown in Table 1 and reflected in the Aquatic SWG meeting minutes (Appendix A).

¹ Attachment B: White Sturgeon Management Plan; Attachment C: Bull Trout Management Plan; Attachment D: Pacific Lamprey Management Plan; Attachment E: Resident Fish Management Plan; Attachment F: Aquatic Nuisance Species Management Plan; and Attachment G: Water Quality Management Plan

Table 1
2010 Summary of Decisions, Agreements, and Milestones – Aquatic SWG

Aquatic SWG Decisions, Agreements, and Milestones	Meeting Date
The Aquatic SWG agreed to implement a Pacific Lamprey dual-frequency identification sonar (DIDSON) Passage Study in 2010.	March 10
The Aquatic SWG agreed to develop a White Sturgeon Broodstock Collection Plan.	March 10
The Aquatic SWG agreed to provide the Bureau of Indian Affairs (BIA) with final Aquatic SWG agendas and meeting minutes.	June 9
The Aquatic SWG agreed to Douglas PUD's request to work through the Aquatic SWG to implement ongoing Aquatic Nuisance Species (ANS) programs, including approving any new monitoring proposals.	June 9
The Aquatic SWG approved the White Sturgeon Broodstock Collection and Breeding Plan final agreement.	October 13

2.1.1 *Development of White Sturgeon Broodstock Collection and Breeding Plan*

In March 2010, the Aquatic SWG agreed to develop a white sturgeon broodstock collection and rearing protocol (Broodstock Protocols). The Broodstock Protocols will be based on the Wells Project White Sturgeon Management Plan. A preliminary draft Broodstock Protocols document was provided to the Aquatic SWG for comment in August 2010. In October, the Broodstock Protocols were approved by the Aquatic SWG. The protocols will continue to be adaptively managed to allow for incorporation of changes approved by the Aquatic SWG in the future.

2.1.2 *White Sturgeon Supplementation Request for Proposals*

The Aquatic SWG worked with Douglas PUD to develop a draft Request for Proposals (RFP) for support implementing the Wells Project White Sturgeon Management Plan. The Wells Project White Sturgeon Management Plan will be implemented in the first year following approval of the Wells Project New Operating License. The stocking of juvenile sturgeon will begin in Year 2 of the new license. The current license expires May 31, 2012. In November 2010, the Aquatic SWG agreed to postpone further discussion of the RFP until early 2011. In early 2011, discussion among stakeholders is expected to result in additional information regarding white sturgeon broodstock collection strategies associated with similar programs being implemented by Chelan Public Utility District (PUD) and Grant PUD.

2.1.3 *Discussion on Establishing Regional Sturgeon and Lamprey Technical Working Groups*

In October 2010, the YN suggested that the Aquatic SWG consider participating in proposed regional technical working groups for white sturgeon and lamprey. In December, the YN presented a draft proposal to the Aquatic SWG for establishing these regional technical working groups. The Aquatic SWG agreed to consider the proposal in 2011.

2.1.4 *Coordination with the Upper Columbia Cooperative Milfoil Group*

In June 2010, Douglas PUD contacted the Upper Columbia Cooperative Milfoil Group (Milfoil Group) regarding potential coordination of Douglas PUD Aquatic Nuisance Species (ANS) activities. Because the Milfoil Group is currently focused on mapping activities, and because Douglas PUD has already mapped milfoil in the project area, Douglas PUD, with Aquatic SWG concurrence, chose not to become a formal member of the Milfoil Group. However, Douglas PUD agreed to periodically attend Milfoil Group meetings and to continue to review Milfoil Group activities.

2.2 Completed Studies 2010

2.2.1 *2010 Adult Lamprey Passage Study*

Douglas PUD continued their investigation of lamprey passage at Wells Dam in 2010 for a second year. As in 2009, fish passage at the fishway entrances was monitored using DIDSON technology. The 2010 study was designed to evaluate two entrance conditions (1.0- and 1.5-foot head differential), and it expanded the duration of monitoring and the hours of sampling per day as compared to the 2009 study (55 days for 8 hours per day in 2010, compared to 35 days for 4 hours per day in 2009; representing a 214% increase in monitoring effort). Both the Wells HCP Coordinating Committee and Aquatic SWG reviewed and approved the lamprey entrance study proposal developed by Douglas PUD. The results of the 2010 lamprey research and a draft study report will be presented to the Aquatic SWG in early 2011.

2.2.2 2010 Total Dissolved Gas Monitoring

On April 9, 2010, Ecology approved Douglas PUD's 2010 Gas Abatement Plan (GAP). In December 2010, Douglas PUD reported results of measures implemented in 2010 to meet state water quality standards for total dissolved gas (TDG) during spill operations at the Wells Project. High Columbia River flows in June (greater than 15-year average flow) necessitated an in-season adjustment to spill operations at the Project, which had been approved by the HCP Coordinating Committees. As a result, no exceedances of the tailrace TDG criteria were observed after the changes were implemented on July 1. Douglas PUD will continue monitoring TDG on an annual basis, providing annual reports of data as required by the Ecology-approved GAP. Douglas submitted the draft 2011 GAP to Ecology on February, 28, 2011, and is currently awaiting review and comments.

2.2.3 2010 Bull Trout Monitoring and Management Plan (BTMMP)

Bull trout monitoring and management efforts continued in 2010. These efforts included coordination with regional groups, Passive Integrated Transponder (PIT) tagging at Wells Dam and off-site locations in the Methow Tributaries (coordinated effort with WDFW), and on- and off-season counts of bull trout at Wells Dam. An annual report of these activities will be provided to the Aquatic SWG in April 2011.

2.2.4 ANS Monitoring

The Aquatic SWG approved plans to implement ANS monitoring efforts. These efforts are consistent with proposed requirements contained in the Aquatic Nuisance Species Monitoring Plan (ANSMP) for the new FERC license. Although these are not currently required activities, Douglas PUD began early implementation of these projects, as approved by the Aquatic SWG in June 2010. Douglas PUD will continue to implement ANS surveillance for *Dreissenid* mussels and northern crayfish in 2011. Neither of these taxa were found in the Wells Project during 2010 monitoring.

2.3 Planned Monitoring 2011

Douglas PUD will continue annual monitoring of TDG at the Wells Project as required by the Ecology-approved GAP. The monitoring is expected to begin in April and continue through August 2011.

In early March 2011, a water velocity test was conducted at Wells Dam's west fishway. This testing put specific emphasis on water velocities that lamprey would encounter under certain operational conditions at this fish ladder, and was an HCP Coordinating Committee condition for approval of the 2010 DIDSON study implementation.

Continued support and implementation of the BTMMP and ANS efforts will occur in 2011. Information regarding these programs will be provided to the Aquatic SWG as they occur. An annual report for the BTMMP will be submitted to the FERC and the Aquatic SWG in early 2012, which will summarize activities and results from 2011.

Douglas PUD will be in communication with its partners to evaluate whether or not to install half-duplex (HD) PIT tag detection arrays for lamprey during the 2011/2012 winter maintenance period. These efforts would be done in consultation with the U.S. Army Corps of Engineers (USACE) and their tagging plans for future adult Pacific lamprey migration years, and would be specifically directed at examining lamprey movement and behavior.

Douglas PUD is considering an additional lamprey study (DIDSON, radio, acoustics, or other) despite 2 years of low returns and observations of lamprey at Wells Dam. A study may be implemented provided run sizes are appropriate. Discussion on this topic will be coordinated with the USACE and the Aquatic SWG.

3 AGREEMENT ADMINISTRATION

This section lists events of note that occurred in 2010 related to the administration of the Agreement, and lists reports published in 2010 that relate to the Aquatic SWG.

3.1 HCP Coordination

In early 2010, Douglas PUD provided the HCP Coordinating Committees with an overview of the proposed 2010 Pacific Lamprey Passage DIDSON Study for comment and consideration. In June 2010, Douglas PUD staff discussed the draft study plan with the Coordinating Committees and received approval to proceed. This approval was contingent upon Douglas PUD agreeing to conduct direct velocity measurements at the fishway entrances under normal and reduced velocity operating conditions. The HCP Coordinating

Committee agreed that these measurements could be conducted after the 2010 Lamprey Passage DIDSON Study. Direct velocity measurements will be completed on March 2, 2011, toward fulfillment of this request from the HCP Coordinating Committee.

3.2 Aquatic Settlement Work Group Members

A designated technical representative and a separate designated policy representative for each Party make up the Aquatic SWG 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 2010

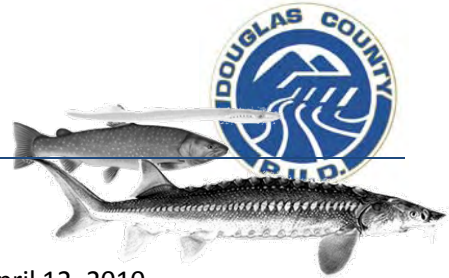
The following reports were finalized and approved by the Aquatic SWG in 2010 (Appendix C):

- 2009 Assessment of Adult Pacific Lamprey Passage
- 2010 Total Dissolved Gas Abatement Annual Report

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

Final Call Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: April 12, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of January 13, 2010 Aquatic SWG Conference Call

I. Summary of Decisions

1. There were no decision items at this meeting.

II. Summary of Action Items

1. Josh Murauskas will send the Annual Total Dissolved Gas (TDG) Report to the Aquatic Settlement Work Group (SWG) as an informational item (Item III-1).
2. Josh Murauskas will send video clips showing lamprey behavior at the Wells fish ladder entrances taken during the 2009 lamprey research project (Item III-3).

III. Summary of Discussions

1. **Update on Total Dissolved Gas Annual Report** – Josh Murauskas said that the Department of Ecology and Douglas PUD has worked with the other Mid-Columbia PUDs to develop a new format for the Annual TDG Report. This year, there were no exceedances in TDG attributable to Wells Dam operations. In recent years, there have been multiple exceedances in the Wells forebay due to water quality coming from Chief Joseph Dam. This is a result of the shift in generation to Grand Coulee Dam and spill to Chief Joseph Dam. New “flip lips” were installed at Chief Joseph Dam last year as a means to allow increased spill, which could ultimately result in an increased frequency of out-of-compliance waters entering the Wells Project. Douglas PUD is not held responsible for these exceedances. Mr. Murauskas will distribute this report to the Aquatic SWG.
2. **Notice on PUD White Sturgeon Programs** – Bob Rose updated the group that the Yakama Nation (YN) has begun to work with Washington Department of Fish and Wildlife (WDFW) and Grant and Chelan PUDs on coordinating regional white sturgeon hatchery and future program needs. He also said that there is an opportunity for Douglas PUD to be involved in early implementation of requirements in the Wells Hydroelectric Project White Sturgeon Management Plan. Shane Bickford noted that the implementation schedule in the Settlement Agreement does not include putting

sturgeon in the Wells reservoir until 2013, following the development of a hatchery program, and only after consultation with U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS). Steve Lewis indicated that ESA consultation will be required prior to implementation of the Wells sturgeon stocking plan. Mr. Rose said that he brings this discussion to the Aquatic SWG in order to get them involved and keep them updated on the development of these plans.

3. **Update on 2009 Pacific Lamprey Study** – Josh Murauskas said that data from the 2009 Pacific Lamprey Study have been compiled and the report is under development. Josh indicated that because the Columbia River lamprey run was so small last year that the sample size at Wells Dam was lower than expected, statistical inferences will be unachievable; however, several distinct patterns of movement were observed.. Shane Bickford noted that an additional year of study would be necessary in order to achieve scientifically rigorous conclusions. Mr. Bickford said that some initial ideas for a second season of study include elimination of the lowest operating condition (0.5-foot head differential) and focus on testing the 1- and 1.5-foot differential. He suggested that the Aquatic SWG might also want to consider expanding the time of year for study, as well as increase the hours of sampling. Preliminary results show that nighttime operational reductions may have a positive effect on lamprey entrance efficiency and no negative impacts on upstream adult salmon passage. Results from the 2009 lamprey study will be available prior to and presented at the next in-person meeting in March. Prior to that meeting, Mr. Murauskas will send video clips showing lamprey behavior at the Wells fish ladder entrances taken during the 2009 lamprey research project. The group suggested the possibility of adopting a 1 or 1.5 head differential as a longterm solution to improving lamprey passage at the Project.
4. **Wells Integrated Licensing Process Schedule** – Shane Bickford noted that stakeholders were notified yesterday of the schedule for the Wells Integrated Licensing Process (ILP). Comments on the final license application are due on March 18. Douglas PUD will submit final Hatchery Genetic Management Plans (HGMPs) to NMFS in early March and to FERC on May 28. In July, the Federal Energy Regulatory Commission (FERC) will issue their REA notice for National Environmental Policy Act (NEPA) review. In August, Douglas PUD will submit an application for 401 Certification to Washington State Department of Ecology (Ecology). Between January and March of 2011, FERC will issue its environmental assessment, which then triggers the Endangered Species Act (ESA) consultation. The FERC license is expected to be issued by May 2012.

IV. Next Meetings

1. Upcoming meetings: *Conference call on February 10 (if necessary); in-person meeting on March 10 at Douglas PUD.*

List of Attachments

Attachment A – List of Attendees

Attachment A List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Ali Wick	Administrative	Anchor QEA, LLC
Keith Hatch	Observer	Bureau of Indian Affairs
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Kirk Truscott	CCT Technical	Colville Confederated Tribes
Josh Murauskas	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Bob Rose	SWG Technical Rep.	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Patrick Verhey	SWG Policy Alternate	Washington Department of Fish and Wildlife
Chad Jackson	WDFW Technical	Washington Department of Fish and Wildlife
Molly Hallock	WDFW Technical	Washington Department of Fish and Wildlife
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife

From: [Ali Wick](#)
To: [Bob Rose](#)
Cc: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; Brad James; Chad Jackson; Donella Miller; korthjwk@DFW.WA.GOV; [Jessi Gonzales](#); [Joe Kelly](#); joe.peone@colvilletribes.com; [Jon Merz](#); [Josh Murauskas](#); [Karen Kelleher](#); [Kirk Truscott](#); [Mary Mayo](#); [Mike Schiewe](#); [Molly Hallock](#); [Pat Irle](#); [Patrick Luke](#); [Patrick Verhey](#); [Paul Ward](#); [Shane Bickford](#); [Steve Lewis](#); parker@yakama.com; [Tony Eldred](#)
Subject: Aq SWG call 2/10 - cancelled
Date: Tuesday, February 09, 2010 1:59:00 PM

Hi all - I did just receive confirmation from Bob Rose today that we are okay to cancel, so you may remove tomorrow's call from your calendars.

Stay tuned for information on the Aq SWG in-person March meeting.

-Ali

Ali Wick
ANCHOR QEA, LLC
awick@anchorqea.com
1423 Third Avenue, Suite 300
Seattle, WA 98101
Front Desk 206.287.9130
Direct Line 206.903.3333
Fax 206.287.9131
Cell 206.779.9425

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www.anchorqea.com

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-----Original Message-----

From: Bob Rose [<mailto:brose@yakama.com>]
Sent: Monday, February 08, 2010 1:52 PM
To: Ali Wick
Cc: bill.towey@colvilletribes.com; JATEFRJJ@DFW.WA.GOV; Brad James; Chad Jackson; Donella Miller; korthjwk@DFW.WA.GOV; [Jessi Gonzales](#); [Joe Kelly](#); joe.peone@colvilletribes.com; [Jon Merz](#); [Josh Murauskas](#); [Karen Kelleher](#); [Kirk Truscott](#); [Mary Mayo](#); [Mike Schiewe](#); [Molly Hallock](#); [Pat Irle](#); [Patrick Luke](#); [Patrick Verhey](#); [Paul Ward](#); [Shane Bickford](#); [Steve Lewis](#); parker@yakama.com; [Tony Eldred](#)
Subject: Re: Aq SWG call 2/10 - propose to cancel

Thanks Ali -
Can we hold this thought.
Not sure we-YN- want to cancel the meeting at this time.
Will reply back first thing tomorrow morning.
Thanks

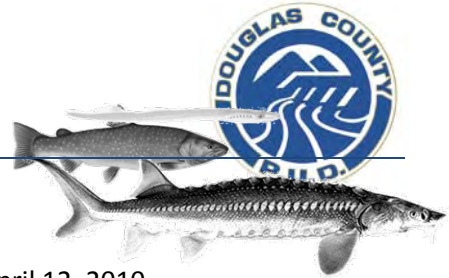
Ali Wick wrote:

>
> Hello AQ SWG Members – Following my last email requesting agenda items
> for Wednesday's planned call, I have not received notice of any
> existing issues to discuss during the call. Therefore we propose to

> cancel the call and meet in-person in March.
>
> Please weigh in now if you propose otherwise.
>
> -Ali
>
> *Ali Wick*
>
> *ANCHOR QEA, LLC*
> awick@anchorage.com <<mailto:awick@anchorage.com>>
> 1423 Third Avenue, Suite 300
> Seattle, WA 98101
> Front Desk 206.287.9130
> Direct Line 206.903.3333
> Fax 206.287.9131
> Cell 206.779.9425
>
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> *www.anchorage.com
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>

Final Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: April 12, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of March 10, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. Continue the DIDSON Study in 2010, with study modifications intended to increase coverage, and thus sample size.
2. Draft a broodstock plan for sturgeon. After review, the Aquatic SWG will solicit responses to begin the decision process for implementation.

II. Summary of Action Items

1. Josh Murauskas will draft sturgeon broodstock collection protocols for Aquatic Settlement Work Group (SWG) review by July 2010 (Item II-2).
2. Josh Murauskas will prepare a one-page description of the proposed 2010 lamprey study plan to review with the HCP Coordinating Committees and get their approval prior to June 2010 (Item II-3).
3. Josh Murauskas will distribute to the Aquatic SWG the 2009 Lamprey Passage Study Results memo, his PowerPoint presentation, and any short DIDSON clips from the study that are small enough to be emailed (Item II-3).

III. Summary of Discussions

1. **Welcome/Meeting Minute Review** – Mike Schiewe opened the meeting. The revised January 13, 2010, meeting minutes were approved as final.
2. **Sturgeon** – Shane Bickford gave an overview of the current discussions and negotiations regarding the sturgeon hatchery programs that the three PUDs (Douglas, Chelan, and Grant) are responsible for implementing. Both Chelan PUD and Grant PUD are required to implement their programs in the next two years; Douglas PUD is required to implement their stocking program in year 2 of the new license. Required numbers of juvenile sturgeon to be released annually are 5,000 fish for Douglas PUD; 10,000 fish for Grant PUD; and 6,500 fish for Chelan PUD. Mr. Bickford noted that Grant PUD is considering establishing a sturgeon rearing capability at Priest Rapids Hatchery and that

the Yakama Nation (YN) is pursuing expanded use of its facility at Marion Drain. Mr. Bickford indicated that Douglas PUD has had preliminary discussions with the YN about their Marion Drain program and with Grant PUD about their Priest Rapids facility. Bret Nine asked what other options are available—Mr. Bickford said that he is aware of several established or proposed rearing operations/facilities, including Wells Hatchery, Priest Rapids, Marian Drain, Cranebrook, and Columbia Basin. He noted that Douglas PUD will be remodeling the Wells Hatchery facility as part of the new license, so one option will be whether there is enough capacity at Wells Dam for Douglas PUD to fulfill its sturgeon requirement there. Bill Towey suggested that Douglas PUD put together a table that lays out the sturgeon program objectives and then lists all the hatchery options and relevant information about each one, thus giving the Aquatic SWG an all-inclusive look at the possibilities. It was decided that such a table could be populated by soliciting responses to an RFP. The group agreed that the first step is for Douglas PUD to draft a sturgeon broodstock collection and rearing protocol that could be used in preparation of an RFP. The protocol would be based on the previously approved Sturgeon Management Plan. Douglas PUD agreed to prepare a draft protocol document for Aquatic SWG review in July 2010.

3. **2009 Lamprey Passage Study Results** – Josh Murauskas presented results of the 2009 Adult Lamprey Passage Study. As background, he noted that there was a substantial increase in abundance of adult lampreys returning to the Columbia River from 1997-2003 and then a large decrease from 2003-present. Prior to 1997, there were large fluctuations in returns, but there was inconsistent monitoring and reporting during this period. Mr. Murauskas noted that lamprey tend to be smaller and leaner by the time they reach Wells Dam, and that recent studies show poor effectiveness of radio-telemetry tags on fish of this size. Another complication is that at the time of year that the lamprey runs reach Wells Dam—they are showing up just as water temperatures starts dropping off, which can lead to fish deciding to stop and overwinter, making it hard to find fish still in active migration. Lastly, the proportion of adult lampreys passing Bonneville Dam that ultimately arrive at Wells Dam has averaged less than 1% over the past decade, leading to difficulty with obtaining adequate numbers of fish for studies. These inherent difficulties with trapping and radio-telemetry led the SWG to consider alternative technologies that are unobtrusive, un-biased, and less detrimental to the migrating population.

For the 2009 study, Dual-frequency Identification Sonar (DIDSON) was used to monitor lamprey passage at the Wells Dam fishway entrances under three conditions: 1.5-foot, 1.0-foot, and 0.5-foot head differential. In general, the low numbers of returning lampreys to the Columbia River (Bonneville Dam count was 8,400), and a concomitantly very low number of lamprey arriving at Wells Dam resulted in few observations and limited the ability to statistically evaluate the results. Results were that under the high-flow condition (1.5-foot), 1 of 2 lampreys successfully passed the dam; under the

moderate (1.0-foot) condition, 1 of 1 lamprey was successful; and under the low (0.5-foot) condition, 1 of 2 lampreys were successful (for a combined 66% entrance efficiency under reduced conditions). Lamprey passing under the high-flow condition struggled and spent a considerably longer amount of time to negotiate the entrance compared to those passing under the moderate- and low-flow conditions.

The SWG discussed and agreed to continue to conduct a DIDSON study, with some modifications to the study design to enhance coverage, and thus increase sample size. These included testing at two head differentials (1.0 ft and 1.5 ft.), instead of the three tested in 2009, and potentially increasing the sample size through expanded/changed spatial and temporal DIDSON coverage at the fishway entrances. Mr. Murauskas agreed to prepare a one-page description of a proposed 2010 lamprey study plan to review with the HCP Coordinating Committees (HCP-CC) and get their approval prior to June 2010. The HCP-CC will evaluate the study design to ensure minimal impacts to salmon and steelhead passage. Once the HCP-CC approves, then a revised study plan will be reviewed and approved by the Aquatic SWG. Mr. Murauskas agreed to distribute to the Aquatic SWG by email the 2009 Lamprey Passage Study Results memo, his PowerPoint presentation, and any short DIDSON clips from the study that are small enough to be emailed.

4. **Relicensing Offer of Settlement to FERC** – Shane Bickford explained that Douglas PUD is sending in its final license application to the Federal Energy Regulatory Commission (FERC) at the end of May, and the Aquatic Settlement is an important element of that application. Douglas PUD has put together a summary page and a joint approval page for signatures of officials of state and federal agencies, and tribes that are signatories of the Settlement Agreement. Mr. Bickford will be sending these around to the legal departments of the Aquatic SWG agencies to make sure that it's written in a way they approve, and then the goal is to have signatures from everyone by early May.
5. **Aquatic SWG Annual Report Schedule** – SWG review 3/15 – 4/15

IV. Next Meetings

1. Upcoming meetings: *Conference calls on April 14 and May 12 (if necessary); in-person meeting on June 9 at Douglas PUD (with the possibly of moving the in-person meeting to July).*

List of Attachments

Attachment A – List of Attendees

Attachment A List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Virginia See	Administrative	Anchor QEA, LLC
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Bret Nine	CCT Technical	Colville Confederated Tribes
Josh Murauskas	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Patrick Luke	YN Technical	Yakama Nation
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Molly Hallock	WDFW Technical	Washington Department of Fish and Wildlife
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife
Beau Patterson	Observer	Douglas PUD

From: [Ali Wick](#)
To: [Bao Le](#); [Beau Patterson](#); [Bill Towey \(bill.towey@colvilletribes.com\)](#); [Bob Jateff \(JATEFRJJ@DFW.WA.GOV\)](#); [Bob Rose \(brose@yakama.com\)](#); [Brad James](#); [Bret Nine](#); [Chad Jackson](#); [Donella Miller](#); [Jeff Korth \(korthjwk@dfw.wa.gov\)](#); [Jessi Gonzales](#); [Joe Kelly](#); [Joe Peone \(joe.peone@colvilletribes.com\)](#); [Jon Merz](#); ["Josh Murauskas"](#); [Karen Kelleher](#); [Kirk Truscott](#); [Mary Mayo](#); [Mike Schiewe](#); [Molly Hallock](#); [Pat Irle](#); [Patrick Luke](#); [Patrick Verhey](#); [Paul Ward](#); ["Shane Bickford"](#); [Steve Lewis](#); [Steve Parker \(parker@yakama.com\)](#); [Tony Eldred](#)
Subject: Aq SWG: No mtg this Weds; final 1/13 and 3/10 mins
Date: Monday, April 12, 2010 11:55:00 AM
Attachments: [2010_01_13_FINAL Aquatic SWG Call minutes.doc](#)
[2010_03_10_FINAL Aquatic SWG Mins.doc](#)

Hello Aq SWG: Per the below email, we have not received any comments from folks asking for discussions for a next Aq SWG meeting; therefore, we will defer until next month.

Also, attached are the final 3/10 and 1/13 meeting minutes. The 1/13 minutes were approved at the 3/10 meeting; the 3/10 revised minutes were sent out for last check, and there have been no comments to the revised minutes, and so these are now final.

Best,

-Ali

Ali Wick

ANCHOR QEA, LLC

awick@anchorqea.com

1423 Third Avenue, Suite 300

Seattle, WA 98101

Front Desk 206.287.9130

Direct Line 206.903.3333

Fax 206.287.9131

Cell 206.779.9425

ANCHOR QEA, LLC

www.anchorqea.com

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From: Ali Wick

Sent: Tuesday, April 06, 2010 10:03 AM

To: 'Bao Le'; 'Beau Patterson'; 'Bill Towey (bill.towey@colvilletribes.com)'; 'Bob Jateff (JATEFRJJ@DFW.WA.GOV)'; 'Bob Rose (brose@yakama.com)'; 'Brad James'; 'Bret Nine'; 'Chad Jackson'; 'Donella Miller'; 'Jeff Korth (korthjwk@dfw.wa.gov)'; 'Jessi Gonzales'; 'Joe Kelly'; 'Joe Peone (joe.peone@colvilletribes.com)'; 'Jon Merz'; 'Josh Murauskas'; 'Karen Kelleher'; 'Kirk Truscott'; 'Mary Mayo'; 'Mike Schiewe'; 'Molly Hallock'; 'Pat Irle'; 'Patrick Luke'; 'Patrick Verhey'; 'Paul Ward'; 'Shane Bickford'; 'Steve Lewis'; 'Steve Parker (parker@yakama.com)'; 'Tony Eldred'

Subject: Aq SWG: Revised 3/10 minutes; final request for meeting items?

Hi Aq SWG: Attached please find the revised 3/10 minutes for your review. There were only edits from DPUD this time.

Please let me know by this Friday COB if you have items you'd like to discuss on our scheduled call next week; otherwise, we will defer our call to next month.

Thank you!,

-Ali

Ali Wick

ANCHOR QEA, LLC

awick@anchoragea.com

1423 Third Avenue, Suite 300

Seattle, WA 98101

Front Desk 206.287.9130

Direct Line 206.903.3333

Fax 206.287.9131

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From: [Ali Wick](#)
To: [Bao Le](#); [Beau Patterson](#); [Bill Towey \(bill.towey@colvilletribes.com\)](#); [Bob Jateff \(JATEFRJJ@DFW.WA.GOV\)](#); [Bob Rose \(brose@yakama.com\)](#); [Brad James](#); [Bret Nine](#); [Chad Jackson](#); [Donella Miller](#); [Jeff Korth \(korthjwk@dfw.wa.gov\)](#); [Jessi Gonzales](#); [Joe Kelly](#); [Joe Peone \(joe.peone@colvilletribes.com\)](#); [Jon Merz](#); [Karen Kelleher](#); [Kirk Truscott](#); [Mary Mayo](#); [Mike Schiewe](#); [Molly Hallock](#); [Pat Irle](#); [Patrick Luke](#); [Patrick Verhey](#); [Paul Ward](#); ["Shane Bickford"](#); [Steve Lewis](#); [Steve Parker \(parker@yakama.com\)](#); [Tony Eldred](#)
Subject: Aq SWG: No call/meeting on 5/12
Date: Monday, May 10, 2010 2:31:00 PM

Hello Aq SWG: Per the below email, we have not received any notes from folks asking for discussions for an Aq SWG meeting this week. Therefore, we will defer until next month, when we are scheduled for an in-person meeting on June 9.

Best,
-Ali

Ali Wick

ANCHOR QEA, LLC

awick@anchorqea.com

1423 Third Avenue, Suite 300

Seattle, WA 98101

Front Desk 206.287.9130

Direct Line 206.903.3333

Fax 206.287.9131

Cell 206.779.9425

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From: Ali Wick
Sent: Tuesday, May 04, 2010 4:12 PM
To: 'Bao Le'; 'Beau Patterson'; Bill Towey (bill.towey@colvilletribes.com); 'Bob Jateff (JATEFRJJ@DFW.WA.GOV)'; Bob Rose (brose@yakama.com); 'Brad James'; 'Bret Nine'; 'Chad Jackson'; 'Donella Miller'; 'Jeff Korth (korthjwk@dfw.wa.gov)'; 'Jessi Gonzales'; 'Joe Kelly'; Joe Peone (joe.peone@colvilletribes.com); 'Jon Merz'; 'Karen Kelleher'; 'Kirk Truscott'; 'Mary Mayo'; Mike Schiewe; 'Molly Hallock'; 'Pat Irle'; 'Patrick Luke'; 'Patrick Verhey'; 'Paul Ward'; 'Shane Bickford'; 'Steve Lewis'; Steve Parker (parker@yakama.com); 'Tony Eldred'
Subject: Aq SWG: Call/meeting on 5/12?

Hi Aq SWG: Just checking in to verify whether there are topics that would indicate we'd need to have our call next Wednesday, 5/12. If so, please let me know by EOD this Friday so that we can notify everyone. Thank you!

-Ali

Ali Wick

ANCHOR QEA, LLC

awick@anchoragea.com

1423 Third Avenue, Suite 300

Seattle, WA 98101

Front Desk 206.287.9130

Direct Line 206.903.3333

Fax 206.287.9131

Cell 206.779.9425

ANCHOR QEA, LLC

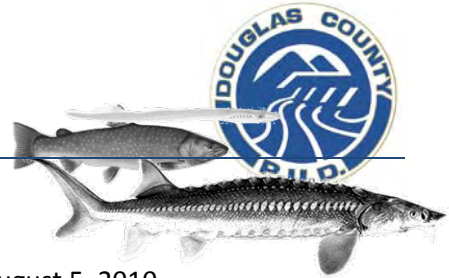
www.anchorqea.com

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Final Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: August 5, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of June 9, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. The Aquatic Settlement Work Group (Aquatic SWG) Chair will continue to provide Bureau of Indian Affairs (BIA) with final Aquatic SWG agendas and meeting minutes; U.S. Fish and Wildlife (USFWS) will provide other documents at their discretion (Item III-5).

II. Summary of Action Items

1. Beau Patterson will contact the Upper Columbia Cooperative Milfoil Group regarding potential coordination of Douglas PUD Aquatic Nuisance Species activities, and he will report back to the Aquatic SWG (Item III-2).
2. Steve Lewis will check on the availability of a USFWS-owned Dual-frequency Identification Sonar (DIDSON) unit for use in lamprey research at Wells Dam this year (Item III-3).

III. Summary of Discussions

1. **Welcome** – Mike Schiewe welcomed Aquatic SWG members and opened the meeting.
2. **Proposed Early Implementation of Ongoing Aquatic Nuisance Species Monitoring Efforts** – Beau Patterson introduced this item, describing several aquatic nuisance species monitoring programs that Douglas PUD is conducting within the Wells Project boundary. In describing the programs, Patterson clarified that Douglas PUD's Aquatic Nuisance Species (ANS) Management Plan (a component of the Settlement Agreement) will not be formally implemented until the new license is approved. In the meantime, Patterson asked whether the Aquatic SWG would be supportive of Douglas PUD working through the Aquatic SWG to implement the ongoing programs and approve any new monitoring. The Aquatic SWG agreed that they would be supportive of this approach, and Patterson confirmed that all ANS monitoring efforts would be vetted through the Aquatic SWG now, and also once the ANS Management Plan is in effect. These efforts currently include three programs:

- Sampling in the Wells Dam forebay for zebra and quagga mussels (in cooperation with Portland State University)
- Seasonal tow netting for veligers of zebra and quagga mussels, to include vertical and horizontal tows (this would be an expansion of the current Douglas PUD tow netting effort)
- Monitoring of three substrate samplers at three city boat launches (Douglas PUD will be taking over Washington Department of Fish and Wildlife's [WDFW's] seasonal sampling efforts in Brewster, Pateros, and Bridgeport)

Pat Irle asked about Eurasian watermilfoil (milfoil) monitoring associated with the Wells Project; she indicated that she had recently learned that there was a Mid-Columbia meeting to discuss milfoil science and management. She asked about Douglas PUD's current program and policy regarding milfoil. Shane Bickford summarized that aquatic plant coverage in the Wells Reservoir is about 90 percent native species, and that Douglas PUD's approach has been to avoid disturbing the substrate in order to limit milfoil spread. He mentioned that Douglas PUD has best management practices (BMPs) for milfoil in Douglas PUD-owned recreation areas in its Recreation Management Plan. Beau Patterson agreed to contact the Upper Columbia Cooperative Milfoil Group and update the Aquatic SWG on their program and activities.

3. **Proposed 2010 DIDSON Lamprey Entrance Efficiency Study Modifications** – Beau Patterson introduced this topic. He said that pending approval by the Wells Habitat Conservation Plan Coordinating Committee (HCP-CC) on June 22, Douglas PUD plans to test two entrance conditions (1.0 and 1.5 head differential) and expand DIDSON monitoring of lamprey passage to up to 55 days for up to 8 hours per day. The purpose of these changes is to increase the sample size. He wanted to vet these changes with the Aquatic SWG before presenting them to the HCP-CC. The draft study plan was approved for discussion with the HCP-CC.

Steve Lewis asked whether Douglas PUD could use an additional DIDSON unit to expand entrance coverage if a USFWS-owned unit was available. Douglas PUD indicated that they could install the additional unit if it was available by mid July. Lewis agreed to check on the availability of the unit and coordinate with Beau Patterson.

4. **Update on License Application and Settlement** – Shane Bickford updated the Aquatic SWG that the final license application was filed with the Federal Energy Regulatory Commission (FERC) on May 27. Douglas PUD also submitted the Offer of Settlement on this same date, requesting that the license and the management plans be included in the license as measures. He thanked the Aquatic SWG for their coordination in signing the Offer of Settlement document in time for the filing. The Tendering Notice for the final license application was issued by FERC on June 2. The Tendering Notice contains FERC's tentative dates for issuing the notice indicating that the application is ready for

environmental analysis, also known as the NREA Document. Douglas PUD is now waiting for FERC to issue the NREA Document. Douglas PUD is now working on the 401 application and anticipates providing a draft of that document to the Washington State Department of Ecology (Ecology) in early July.

5. **Document Sharing** – Jessi Gonzales and Steve Lewis asked which Aquatic SWG documents were currently being shared with BIA and by whom. Ali Wick confirmed that as previously agreed to by the Aquatic SWG, she provides final meeting minutes and final agendas to BIA prior to meetings. There was some discussion about the protocol for this, and Mike Schiewe said that sending final minutes and agendas is what the Aquatic SWG has agreed to previously. Jessi Gonzales confirmed that as part of USFWS/BIA federal agency coordination, the USFWS will be responsible for sharing other documents with the BIA, as needed.
6. **Broodstock Protocol** – Shane Bickford updated the Aquatic SWG that Douglas PUD is working on broodstock collection protocols consistent with the Sturgeon Management Plan. He indicated that implementation of the program would likely involve an RFP (request for proposals) in the coming months. This work will be kicked off in July.

IV. Next Meetings

1. Upcoming meetings: *In-person meeting on July 14; calls on August 11, September 8, and October 13.*

List of Attachments

Attachment A – List of Attendees

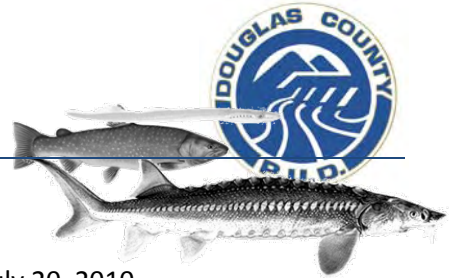
Attachment A

List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Ali Wick	Administrative	Anchor QEA, LLC
Keith Hatch	Observer	Bureau of Indian Affairs
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Beau Patterson	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Pat Irle	SWG Technical Rep.	Ecology
Bao Le	Consulting	Longview Consulting
Jessi Gonzales	SWG Policy Rep.	U.S. Fish and Wildlife Service
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Molly Hallock	WDFW Technical	Washington Department of Fish and Wildlife
Tony Eldred	SWG Policy Rep.	Washington Department of Fish and Wildlife

Final Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: July 20, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of July 14, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. There were no decisions items at this meeting.

II. Summary of Action Items

1. Jessi Gonzalez will provide to Ali Wick for distribution a copy of the U.S. Fish and Wildlife Service (USFWS) report on contaminant uptake by rainbow trout and sturgeon (Item III-2).
2. Beau Patterson will provide baseline sediment contaminant data to Jessi Gonzales (Item III-2).
3. Beau Patterson will review past lamprey passage data and will provide the Aquatic Settlement Work Group (Aquatic SWG) with an email suggesting criteria that could be used for making a determination as to whether to go forward with a lamprey passage study in 2010 (Item III-3).
4. Beau Patterson will send the Upper Columbia Cooperative Milfoil Group meeting minutes to Ali Wick for distribution to the Aquatic SWG (Item III-4).
5. Jessi Gonzales will provide the USFWS review of the Wells Invasive Species Control Management Plan to Ali Wick for distribution (Item III-4).
6. Steve Lewis will circulate the draft Section 18 prescriptions to the Aquatic SWG by email before the next Aquatic SWG meeting (Item III-5).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** – Mike Schiewe welcomed Aquatic SWG members and opened the meeting. Agenda item III-6 (Changes at FERC with Project Management) was added to the agenda by Beau Patterson. No comments were provided on the June 16, 2010 meeting minutes. The meeting minutes were approved as final and will be posted on the ftp site.

2. **Draft White Sturgeon Broodstock Protocol** – Beau Patterson gave an update on the status of the draft white sturgeon broodstock protocols. In March 2010, Larry Hildebrand of Golder Associates was engaged to develop a draft broodstock protocol. The draft document is not complete enough to present to the Aquatic SWG for review and discussion at this time. Douglas PUD intends to have a draft ready to distribute to the Aquatic SWG by email prior to the next Aquatic SWG meeting in August. Patterson explained that the protocol will prioritize collecting local broodstock (Wells Reservoir). However, if adequate numbers of broodstock cannot be collected in the Wells Reservoir, the next priority will be to collect broodstock regionally, and then from the Columbia River Basin generally. Patterson said that currently there is no evidence that there are genetic differences among the Columbia River white sturgeon populations, with the exception of the Kalispell population. Genetic research being conducted at University of California at Davis may shed new light on the genetic status of Columbia River populations.

Jessi Gonzales explained that the USFWS has expressed concern to the U.S. Bureau of Reclamation (BOR) about the potential uptake of contaminants by sturgeon exposed to contaminated sediments transported downstream as a result of water releases from Lake Roosevelt. The USFWS is of the opinion that this is a legitimate concern and will be asking BOR to address the concern. Gonzales stated that the USFWS has recently completed a study comparing contaminant uptake by sturgeon and rainbow trout. The study concluded that rainbow trout bioaccumulated selected metals to a greater extent than did sturgeon. Consequently, it was concluded that rainbow trout are not an appropriate surrogate of contaminant uptake for white sturgeon. Gonzales will provide a copy of the report to Ali Wick for distribution to the Aquatic SWG.

Gonzales indicated that the USFWS is preparing recommendations to submit to BOR regarding monitoring of contaminated sediment transported downstream as a result of Lake Roosevelt water releases. They will recommend monitoring of contaminant uptake in downstream Columbia River white sturgeon populations and that monitoring be conducted in a coordinated fashion with downstream hydroelectric project owners, the USFWS, and fisheries parties. Patterson indicated that Douglas PUD would be interested in what the USFWS recommends but would defer to agency experts regarding appropriate sampling protocols. Gonzales asked about any sediment sampling in the Wells Project area by Douglas PUD. Patterson responded that they had conducted baseline sampling in the portion of the Okanogan River affected by backwatering from the Wells Reservoir. Patterson will provide the baseline sediment sampling data to Gonzales. Mike Schiewe said that the U.S. Environmental Protection Agency (EPA) had sampled sediments and fish in the Snake and lower Columbia rivers and has a staff person, Burt Shepard, working on contaminants in Lake Roosevelt.

3. **DIDSON Lamprey Study Update** – Steve Lewis confirmed that the USFWS Dual-frequency Identification Sonar (DIDSON) camera is in use on one of their own projects and not available for use at Wells Dam. Beau Patterson briefed the Aquatic SWG on Douglas PUD's presentation of the 2010 DIDSON Lamprey Study proposal to the HCP Coordinating Committees. Douglas PUD explained to the Coordinating Committees that for the 2010 study they had eliminating the low-head differential operation as a sampling condition. Bryan Nordlund still expressed concerns regarding possible impacts to salmon passage. Patterson informed the Aquatic SWG that the DIDSON unit would be installed July 20 and the study is planned for an August 7 start. The DIDSON cameras will be run continuously during the study period. At NOAA's request, Douglas PUD will collect direct fishway entrance velocities rather than relying on modeled velocities. Patterson stated that although the Coordinating Committees approved the study proposal with revisions, NOAA indicated their expectation of the need for additional monitoring of effects of any proposed operational or structural changes on salmon and steelhead passage.

Patterson updated the Aquatic SWG on the low numbers of adult lamprey migrating in the Columbia River this year: 2,490 over Bonneville Dam; 25 over Priest Rapids Dam; 2 over Rock Island Dam; and no lamprey counted at Rocky Reach and Wells dams as of July 19, 2010. Based on last year's run-timing, the run is just past the mid-point this year. Patterson asked for the Aquatic SWG's thoughts on delaying this year's study if lamprey numbers are extremely low at Wells Dam. He explained that it might be easier to get approval to fund an additional study next year in lieu of this year's study, rather than to get additional funding for a third year of study. Mike Schiewe asked for triggers that could be used to determine whether or not to continue the study this year or to cancel the study. Patterson suggested using the number of lamprey over Priest Rapids Dam as a trigger. Bao Le mentioned problems with the low numbers of lamprey available for tagging to meet monitoring needs at the Grant PUD Project and at the U.S. Army Corps of Engineers (Corps) projects downstream. Le stated that the lamprey count at Wells Dam is typically about one-third the count at Rocky Reach Dam. Patterson said he will look at past lamprey passage data, and by next week, he will summarize these data in an email to the Aquatic SWG. The email will also include suggested criteria that could be used for making a determination as to whether to go forward with a lamprey passage study in 2010.

Keith Hatch stated he would prefer the study go forward regardless of the number of lamprey that might attempt to pass Wells Dam, noting there is benefit in gathering whatever data may become available this year. Lewis stated he also thinks there is value in collecting lamprey passage data at Wells Dam this year even if sample sizes are extremely low. Patterson stated he does not anticipate halting this year's study if at least one member desires to go forward.

4. **Update on Upper Columbia Cooperative Milfoil Group** – Beau Patterson provided an update on the meeting of the Upper Columbia Cooperative Milfoil Group. Gordon Brett, Douglas PUD's lands supervisor, attended the meeting and spoke with the meeting facilitator. The group proponents are the Chelan and Okanogan County Weed Control Boards. They are exploring forming a cooperative weed board for the area from Grant County north to the Canadian border. The weed boards are looking for opportunities to share information and costs, and to fund milfoil control efforts. Douglas PUD has decided it will not sign on as an Upper Columbia Cooperative Milfoil Group member at this time. Douglas PUD has already mapped milfoil occurrences in the Project Area and does not want to take on additional milfoil aquatic mapping efforts. Most Upper Columbia Cooperative Milfoil Group participants are working on addressing milfoil mapping needs. Patterson said they had just recently learned that a Washington State Department of Ecology (Ecology) staff person was looking at milfoil at the mouth of the Okanogan River in reply to complaints of milfoil in this area. Ecology found mostly native milfoil species, some Eurasian milfoil, and some hybrids. Douglas PUD feels it has a good milfoil control program in place geared towards avoiding manipulation and maintaining the status quo. Patterson will send the Upper Columbia Cooperative Milfoil Group meeting minutes to Ali Wick for distribution to the Aquatic SWG.

Pat Irle asked that Douglas PUD continue to stay active in milfoil control. Patterson explained the public education and signage efforts Douglas PUD has in place now and said they will share their knowledge of milfoil control and program activities with the Upper Columbia Cooperative Milfoil Group. Douglas PUD will continue to receive meeting minutes from the Upper Columbia Cooperative Milfoil Group, will periodically attend the meetings, and will report back on the meeting activities periodically.

Jessi Gonzales asked about opportunities to make changes to the Wells Invasive Species Control Management Plan. Mike Schiewe emphasized that the Aquatic SWG is the forum for making changes to management plan actions consistent with the adaptive management element of the Wells Project Settlement Agreement. Gonzales stated that the USFWS office in Olympia is reviewing the management plan and may have comments. She will provide the review to Wick for distribution to the Aquatic SWG when she receives it. Gonzales also said the USFWS is researching the issue of felt-bottomed waders as a vector for spreading invasive species. She will distribute the draft recommendations to Douglas PUD and Ecology when they are ready for review.

5. **Update on Notice of Settlement and Comment Period** – Beau Patterson said the Federal Energy Regulatory Commission (FERC) formally noticed the Settlement Agreement on July 27, which triggers a 30-day comment period ending on August 27. The Aquatic SWG discussed when it is necessary to file a notice of intervention. Patterson stated it is not necessary to file a notice of intervention if you have mandatory authority or are a signatory to the Settlement Agreement. Jessi Gonzales asked Keith Hatch if Bureau of Indian Affairs (BIA) would file comments. Hatch said he did not know.

Patterson said FERC did not request filings of notice of interventions when they noticed the Settlement Agreement. Normally the notice of Ready for Environmental Analysis (REA) requires a filing of notice of intervention.

Steve Lewis said Douglas PUD and the USFWS are still working on the Section 18 prescriptions. He will circulate the draft Section 18 prescriptions by email before the next Aquatic SWG meeting, but if the Aquatic SWG wants to discuss prior to that time, then a conference call can be scheduled.

6. **Changes at FERC with Project Management** – Beau Patterson informed the Aquatic SWG that the FERC Wells Project Manager, Bob Easton, has been reassigned. The FERC fisheries biologist assigned to the project, Nick Jayjack, has also been reassigned. Kim Nguyen is the new project manager. The FERC Northwest Region does not currently have a fisheries biologist. FERC has said they do not anticipate an REA notice before the end of August given these changes in personnel. Douglas PUD will continue to monitor the FERC schedule for the Wells Project relicensing.
7. **Bull trout critical habitat** – Jessi Gonzales asked whether Douglas PUD’s bull trout biological opinion addressed bull trout critical habitat using the bull trout matrix of effects. Beau Patterson stated that the biological opinion had already been revised in consultation with USFWS staff to address critical habitat.

IV. Next Meetings

1. Upcoming meetings: *Calls on August 11, September 8, and October 13.*

List of Attachments

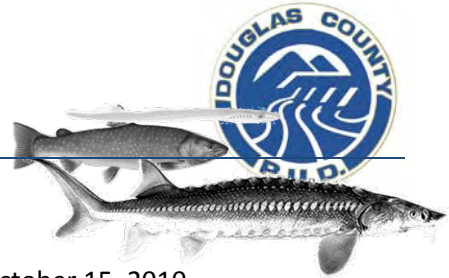
Attachment A – List of Attendees

Attachment A List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Carmen Andonaegui	Administrative	Anchor QEA, LLC
Keith Hatch (by phone)	Observer	Bureau of Indian Affairs
Beau Patterson	SWG Technical Rep.	Douglas PUD
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Bao Le	Consulting	Longview Consulting
Jessi Gonzales	SWG Policy Rep.	U.S. Fish and Wildlife Service
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service

FINAL Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: October 15, 2010

From: Michael Schiewe (Anchor QEA)

re: FINAL Minutes of August 11, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. There were no decisions items at this meeting.

II. Summary of Action Items

1. Aquatic Settlement Workgroup (Aquatic SWG) members will send comments on the Draft White Sturgeon Broodstock Protocols to Beau Patterson no later than September 10, and copy all Aquatic SWG members (Item III-2).
2. Aquatic SWG members will call Steve Lewis, if necessary, to discuss questions or concerns on the Section 18 Fishway Prescriptions and provide comments on the Prescriptions to Lewis no later than August 25 (Item III-3).
3. Steve Lewis will contact Bob Rose to make sure he is aware of the need for comments on the draft Section 18 Fishway Prescriptions (Item III-3).
4. Carmen Andonaegui will set up a conference call for August 25 at 10:00 am to discuss comments on the Section 18 Fishway Prescriptions, if needed (Item III-3).
5. Mike Schiewe will coordinate with Steve Lewis prior to August 25 to confirm or cancel the meeting to discuss Section 18 Fishway Prescriptions. He will notify the workgroup as to whether the August 25 meeting is needed (Item III-3).
6. Molly Hallock will send Shane Bickford the email regarding the number of lamprey that will be passive integrated transponder tagged (PIT-tagged) as part of the lamprey passage study at Bonneville Dam (Item III-4).
7. Shane Bickford, within the next week, will send out to the Aquatic SWG an updated Federal Energy Regulatory Commission (FERC) schedule for the Wells Project Relicensing (Item III-5).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** – Mike Schiewe welcomed Aquatic SWG members and opened the meeting. Agenda Item III-4 (Relicensing Update) was added to the agenda by Shane Bickford. Schiewe asked for a vote on approval of the July 14, 2010 meeting minutes. Comments on the July 14 meeting minutes were provided by Beau Patterson by email on August 9. One revision was made by the Aquatic SWG during today's meeting. The meeting minutes were approved as revised, and Ali Wick will finalize the revised meeting minutes and distribute them to the Aquatic SWG.
2. **Draft White Sturgeon Broodstock Protocols** – Beau Patterson opened the discussion by stating that the draft White Sturgeon Broodstock Protocols (Protocols) would be used in the development of a Request for Proposal to implement the white sturgeon artificial propagation program identified in the White Sturgeon Management Plan. As a next step, Patterson indicated that he would like Aquatic SWG review and comments so that the Protocols could be revised and subject to approval at a future Aquatic SWG meeting. The Aquatic SWG agreed to a 30-day review period, with comments due to Patterson no later than September 10, 2010. Pat Irle asked about potential concerns from Columbia River Inter-Tribal Fish Commission (CRITFC) regarding the Protocols. Mike Schiewe noted that the Yakama Nation (YN) is a member of CRITFC and a signatory to the Wells Aquatic Settlement Agreement, and hence could coordinate as appropriate. Responding to a question, Patterson confirmed that the version of the draft Protocols intended for review is the version distributed by email on August 3, 2010. Schiewe asked that comments on the Protocols be sent to Patterson and copied to Aquatic SWG members. Patterson stated that he anticipates a second round of comments following revisions that are made based on the comments due on September 10. Patterson confirmed that the Protocols are intended to meet Douglas PUD's license obligation for addressing white sturgeon activities.
3. **Section 18 Fishway Prescriptions** – Steve Lewis explained that the U.S. Fish and Wildlife Service (USFWS) has developed draft Section 18 Fishway Prescriptions (Prescriptions) for passage of salmonids and lamprey at the Wells Project. The Prescriptions are a U.S. Department of the Interior product and have been approved by Douglas PUD, USFWS, and the Bureau of Indian Affairs (BIA). Lewis stated that his goal for this meeting was to provide a brief overview of the draft Prescriptions and address any immediate questions. Lewis opened the discussion by stating that the draft Prescriptions were consistent with the Wells Aquatic Settlement management plans and are intended to ensure that safe, timely, and efficient fish passage is met at the Wells Project. Shane Bickford thanked USFWS for making sure the Prescriptions are consistent with the bull trout and lamprey management plans and also meet Section 18 requirements.

Lewis explained that he would like to get a sense of the Aquatic SWG's comfort level with the draft and would like approval of the Prescriptions as soon as possible. He reiterated that the draft has already been approved by BIA. Brett Nine said Bill Towey will need to review and provide comments on the draft. Pat Irle said she would like time to review the Prescriptions in more detail but before that, had some general questions. Irle asked how passage for sturgeon in the future might be addressed since it is not addressed in the draft Prescriptions now. Lewis explained that there is a reservation in the Prescriptions to allow the USFWS to coordinate with Douglas PUD 20 to 30 years into the future, to consider fish passage needs for sturgeon if necessary. Currently, supplementation is considered to be the appropriate action for addressing sturgeon population needs, given their very low numbers. Bickford explained that all the sturgeon life history stages can be accommodated within the Project itself without fish passage. Therefore, passage may not be necessary to allow for the establishment of a productive sturgeon population within the Wells Reservoir. Irle asked whether approval of the BIA includes approval by the YN. Lewis clarified that BIA approval, as an agency under the U.S. Department of Interior, did not necessarily constitute approval by any tribes in particular.

Bickford noted that the USFWS will be under a tight timeline to obtain approval of the Prescriptions as a result of FERC's August 10 notice of Ready for Environmental Analysis (REA). The USFWS will need to submit the Prescriptions by the REA comment deadline (60-day review), including internal and legal review. Irle said she needed additional time to coordinate with WDFW on comments. Tony Eldred said he has not yet reviewed the Prescriptions and cannot comment at this time. Lewis agreed to contact Bob Rose, who was unable to attend today's meeting, to make sure the YN was aware of the need for comments on the draft Prescriptions. Irle asked that a meeting date be set aside as a place holder to discuss comments on the Prescriptions, if needed. Mike Schiewe set a conference call meeting date for August 25 at 10:00 am, and Carmen Andonaegui will set up a conference call for the meeting. Schiewe will coordinate with Lewis prior to August 25 to confirm or cancel the meeting as appropriate, and will notify the workgroup.

4. **Lamprey Studies** – Beau Patterson reminded the Aquatic SWG of the three-page memo on lamprey passage timing and conversion rates that was distributed to the Aquatic SWG after the last meeting. He stated that the tightest correlation between passage at downstream dams and returns to Wells Dam was with Bonneville Dam counts. Counts from lamprey passage structures are included in the Fish Passage Center (FPC) counts. These FPC counts are added into the DART window counts totals on a weekly basis. The total lamprey passage count at Bonneville Dam is just over 8,000 and tapering off. In 2000, there was a bimodal run with a second late peak, but it appears the bulk of this year's return is reaching Priest Rapids Dam with counts still building or just peaked, suggesting a low return year rather than a bimodal run.

Patterson stated that the Dual-frequency Identification Sonar (DIDSON) study started as planned on Saturday, July 31. No lamprey have been counted passing the dam since the start of the study; however, one lamprey was counted passing the dam on July 26. Based on passage counts at Bonneville Dam, conversion rates to passage at Wells Dam indicate this year could be 2 to 3 times better than last year's run over Wells Dam. Patterson estimated that based on the run at Bonneville, up to 100 fishway entrance attempts may be seen at Wells, with the low end of his estimate at about 18 entrance attempts.

Responding to a question from Tony Eldred, Patterson said the one lamprey that passed through the Wells fishway did so at a 1.5-foot operating head. Shane Bickford explained that only about one-quarter of the lamprey that pass the dam go by the fish count windows. The other three-quarters of the lamprey pass through the picketed lead and are not seen. Douglas PUD has 3 years of lamprey passage data estimating a 75 percent passage rate through the picketed lead. Molly Hallock said Washington Department of Fish and Wildlife (WDFW) and Douglas PUD are hoping to develop a correction factor for lamprey passage counted at the windows. Steve Lewis mentioned that installing a low light in the picketed lead is also being considered to allow counts. Bickford stated that Douglas PUD is developing plans to improve lamprey counts at the Wells Project. Eldred asked if Douglas PUD had an estimate of the run size at Wells Dam this year. Patterson responded that based on a 10,000 to 11,000 lamprey passage count at Bonneville and the estimated conversion rate, he estimates a count of 60 lamprey at Wells with an actual passage of about 240, based on the estimated 25/75 percent passage split between the count window and the picketed lead passage routes.

Bickford asked Hallock how many lamprey were being half-duplex (HD) PIT-tagged at Bonneville. Hallock replied that she did not know and that Mary Mosher (National Marine Fisheries Service [NMFS]) and Chris Caudill (University of Idaho) are heading up the study. Hallock will send Bickford an email she received that summarizes how many lamprey will be tagged; she thought it was about 1 percent of the estimated run. Bickford noted that about 1 percent of run being tagged equates to about 6 adults making it to Wells Dam, which has limited value for evaluating passage at the Project. Lewis asked about the logistics of installing a low level light in the picketed lead. Bickford responded that it would require dewatering the fishway to install any camera and light and that the installation would need to be designed to not interfere with the functioning of the picketed lead. Eldred asked which fish ladder was most used by lamprey for passage. Bickford and Bao Le thought highest passage was through the east ladder. Patterson and Bickford said the split between passage at the ladders was about 80/20 percent. Any improvements would focus first on the ladder with the highest passage.

5. **Relicensing Update** – Shane Bickford updated the Aquatic SWG on the Wells Project licensing schedule since the Final License Application (FLA) was filed on May 28, 2010.

He stated there were no challenges to the Aquatic Settlement and the docket is now closed. On August 10, FERC issued a Notice of Acceptance (NOA) of the FLA and a notice of REA. The REA will include the HCP, the Aquatic Settlement Agreement, and all the management plans. Within 60 days, all FLA comments and Interventions are due, including Section 18 Preliminary Terms and Conditions and Prescriptions and 10(a) and 10(j) Recommendations. Douglas PUD intends to file a final 401 Water Quality Permit application on September 30, 2010. Public comments on the draft 401 certification will occur during August 2011. Bickford will provide an updated FERC licensing schedule for the Wells Project to the Aquatic SWG within the next week.

IV. Next Meetings

1. Upcoming meetings: *Conference call on September 8 and in-person meeting on October 13.*

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
Beau Patterson	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Tony Eldred	SWG Technical Rep.	Washington Department of Fish and Wildlife
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Bao Le	Consulting	Longview Consulting
Brett Nine	SWG Technical Rep.	Colville Confederated Tribes
Molly Hollock	SWG Technical Rep.	Washington Department of Fish and Wildlife
Chad Jackson	SWG Technical Rep.	Washington Department of Fish and Wildlife
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service

From: [Carmen Andonaegui](#)
To: [Beau Patterson \(bpatterson@dcpud.org\)](#); [Bill Towey \(bill.towey@colvilletribes.com\)](#); [ble@longviewassociates.com](#); [Bob Jateff \(jatefrji@dfw.wa.gov\)](#); [Bob Rose \(brose@yakama.com\)](#); "Brad James"; "Bret Nine"; "Chad Jackson"; "Donella Miller"; [Jeff Korth \(korthjwk@dfw.wa.gov\)](#); "Jessi Gonzales"; [Joe Kelly \(j1kelly@or.blm.gov\)](#); [Joe Peone \(joe.peone@colvilletribes.com\)](#); "Jon Merz"; "Karen Kelleher"; [kirk.truscott@colvilletribes.com](#); "Mary Mayo"; [Mike Schiewe \(mschiewe@anchoragea.com\)](#); [Molly Hallock \(hallomh@dfw.wa.gov\)](#); [Pat Irlle \(pir461@ecy.wa.gov\)](#); "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)"; "Tony Eldred"
Subject: Aquatic SWG: 9/8 meeting cancelled
Date: Friday, September 03, 2010 7:49:26 PM

Hi Aquatic SWG: The September Aquatic SWG conference call has been cancelled due to a lack of agenda items and a lack of action items to carry forward from our last meeting.

The next planned meeting is October 13th, in-person, at the Douglas PUD Building in East Wenatchee.

-Carmen

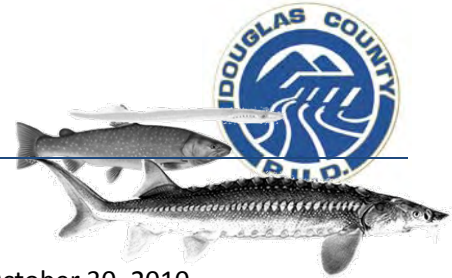
Carmen Andonaegui
ANCHOR QEA, LLC

candonaegui@anchoragea.com
23 S. Wenatchee Avenue, Suite 120
Wenatchee, WA 98801
T 509.888.0240
C 509.881-0198
F 509.888.2211

www.anchoragea.com

Final Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: October 30, 2010

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of October 13, 2010 Aquatic SWG Meeting

I. Summary of Decisions

1. The Aquatic Settlement Workgroup (Aquatic SWG) agreed to continue discussion on the White Sturgeon RFP after December 2010 (Item III-3).

II. Summary of Action Items

1. There were no action items from this meeting.

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** – Mike Schiewe welcomed Aquatic SWG members and opened the meeting. Agenda Item 4 (Regional Technical Sturgeon and Lamprey Working Groups) was added to the agenda by Bob Rose. Schiewe asked for approval of the August 11, 2010 meeting minutes and the August 24, 2010 conference call minutes. Comments on the August 11 and August 25 minutes were provided by Pat Irle. The meeting minutes were approved as revised. Carmen Andonaegui will finalize the revised meeting minutes and distribute them to the Aquatic SWG.
2. **White Sturgeon Broodstock Collection and Breeding Plan** – Beau Patterson provided a second version of the White Sturgeon Broodstock Collection and Breeding Plan (Plan) to the Aquatic SWG on September 21, 2010. He received comments from Washington Department of Fish and Wildlife (WDFW) and the Colville Confederated Tribes (CCT). Comments expressed general agreement with the Plan, with the exception of prioritization of broodstock sources. WDFW and CCT recommended the list of potential sources not be prioritized. Patterson revised the draft Plan to reflect the comments. Patterson emphasized that Douglas PUD does not have a preference regarding broodstock sources, except with regard to costs; and would prefer a consensus recommendation from the Aquatic SWG. Jeff Korth expressed his appreciation for the flexibility incorporated into the Plan and his support for the Plan. Bob Rose expressed his interest in seeing a Plan element that allowed for an adaptive approach to selecting broodstock sources.

Korth recommended adding “broodstock collection” to broodstock source option #4 on page 10. Rose recommended adding to broodstock source option #3, “and lower Columbia Reservoirs”. Patterson made the recommended revisions to the Plan. Patterson said the Plan will remain “draft” to allow for changes approved by the Aquatic SWG in the future.

3. **White Sturgeon Supplementation RFP Timeline** – Beau Patterson explained that the draft White Sturgeon Program RFP was an early draft, and that quite a bit of detail was still needed before finalizing. Douglas PUD will continue developing the RFP, with input from the Aquatic SWG, from an upcoming Mid-Columbia PUD white sturgeon supplementation meeting requested by the Washington Department of Fish and Wildlife (WDFW) and the Yakama Nation (YN), and from an anticipated technical work group meeting similar to the 2009 Boardman meeting; an updated draft will be on the Aquatic SWG Meeting agenda in January 2011. Implementation of the Management Plan will occur in the first year following approval of a new Wells Project operating license. The current license expires May 31, 2012. Douglas PUD anticipates a new license as early as late 2011, which will be effective in June 2012 following expiration of the current operating license. Patterson said Douglas PUD will likely begin implementation of new license measures when the new operating license is received. The Aquatic SWG agreed to postpone discussion on the RFP until at least January 2011.
4. **Discussion on Establishing Regional Sturgeon and Lamprey Technical Working Group** – Bob Rose introduced this topic, explaining the potential advantages of establishing regional white sturgeon and Pacific lamprey technical working groups. He explained how establishing species-specific technical groups might lead to greater coordination of efforts among the three programs supported by the PUDs, and also reduce the need for as many meetings. He suggested that with regional technical working groups, project-specific issues could be addressed by co-managers in a coordinated manner three or four times per year rather than at monthly meetings. The focus would be specifically related to lamprey and sturgeon. Mike Schiewe suggested that Rose prepare a proposal for establishing regional technical working groups. The proposal should, at a minimum, include participants, scope of issues that will be addressed, and assurances that PUD FERC obligations can be met with the regional technical working group. Rose suggested that the regional technical working groups’ scopes would be broader than the scope of the Settlement Agreement Parties and that co-managers take lead on sturgeon and lamprey issues. Rose stated he intends to put a proposal out for consideration for a more detailed discussion during the November and December Aquatic SWG meetings.

Rose indicated that a technical working group for white sturgeon would likely limit its focus to three issues: broodstock, release location and strategy, and monitoring and evaluation. Schiewe asked about meeting FERC compliance obligations associated with

a new license and how a regional plan might be formalized in an operating license. Patterson responded that Douglas PUD's Wells Project license application includes proposed license articles to implement aquatic resource management plans. The consensus based, adaptive management construct of the aquatic resource management plans allows flexibility. Rose explained that the goal of a regional technical working group would be to provide joint recommendations by the fisheries managers to the PUDs or to the Aquatic SWG for approval. Rose explained that the CCT, YN, and WDFW are working to develop a regional plan to address broodstock release and Research, Monitoring and Evaluation (RM&E). Rose emphasized that members of the Aquatic SWG would be invited to participate in the development of the regional plan.

V. Next Meetings

1. Upcoming meetings: *Conference calls on November 10 and December 8. January 12, an in-person meeting at Douglas PUD. Next meeting will include a discussion of proposed regional technical workgroups.*

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
Beau Patterson	SWG Technical Rep.	Douglas PUD
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Brett Nine	Technical Resource	Colville Confederated Tribes
Keith Hatch (on phone)	Observer	BIA
Jeff Korth (on phone)	Alternate	Washington Department of Fish and Wildlife
Bob Rose	SWG Technical Rep.	Yakama Nation

From: [Carmen Andonaegui](#)
To: [Beau Patterson \(bpatterson@dcpud.org\)](#); [Bill Towey \(bill.towey@colvilletribes.com\)](#); [ble@longviewassociates.com](#); [Bob Jateff \(jatefrjj@dfw.wa.gov\)](#); [Bob Rose \(brose@yakama.com\)](#); "Brad James"; "Bret Nine"; "Chad Jackson"; "Donella Miller"; [Jeff Korth \(korthjwk@dfw.wa.gov\)](#); "Jessi Gonzales"; [Joe Kelly \(j1kelly@or.blm.gov\)](#); [Joe Peone \(joe.peone@colvilletribes.com\)](#); "Jon Merz"; "Karen Kelleher"; [kirk.truscott@colvilletribes.com](#); "Mary Mayo"; [Mike Schiewe \(mschiewe@anchorqea.com\)](#); [Molly Hallock \(hallomh@dfw.wa.gov\)](#); [Pat Irlle \(pir461@ecy.wa.gov\)](#); "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)"; "Tony Eldred"
Cc: [Bob Dach \(Robert.dach@bia.gov\)](#); [Keith Hatch \(Keith.Hatch@bia.gov\)](#)
Subject: ASWG: November ASWG mtg cancelled
Date: Saturday, October 30, 2010 6:14:34 PM

Hi ASWG: The November ASWG meeting has been cancelled due to a lack of agenda items. The next meeting is for a conference call and is scheduled for December 8.

Carmen

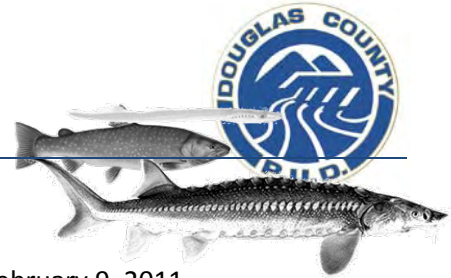
Carmen Andonaegui
ANCHOR QEA, LLC

candonaegui@anchorqea.com
23 S. Wenatchee Avenue, Suite 120
Wenatchee, WA 98801
T 509.888.0240
C 509.881-0198
F 509.888.2211

www.anchorqea.com

Final Meeting Minutes

Aquatic Settlement Work Group



To: Aquatic SWG Parties

Date: February 9, 2011

From: Michael Schiewe (Anchor QEA)

re: Final Minutes of December 8, 2010 Aquatic SWG Conference Call

I. Summary of Decisions

1. There were no decision items at this meeting.

II. Summary of Action Items

1. Bob Rose will revise the 3-PUD Forum Workgroups Proposal and this issue be revisited at the Aquatic SWG meeting on January 12 (Item III-2).

III. Summary of Discussions

1. **Welcome, Agenda Review, and Meeting Minutes Review** – Mike Schiewe welcomed Aquatic SWG members and opened the meeting. Schiewe asked for approval of the revised October 13, 2010 meeting minutes. Schiewe noted that the Next Meetings section of the October 13, 2010 meeting minutes contained an error, and that the January meeting is scheduled for January 12, 2011. Beau Patterson requested that wording in the Summary of Decisions section be changed to read that the white sturgeon topic will be continued “after December 2010” rather than “in January 2011.” The meeting minutes were approved as revised. Carmen Andonaegui will finalize the revised meeting minutes and distribute them to the Aquatic SWG.
2. **3-PUD Forum-Workgroups Proposal** – Bob Rose introduced his proposal (see Attachment B). He indicated that the proposal had been discussed at the Rocky Reach (Chelan PUD) and Priest Rapids (Grant PUD) Fish Forums, and that they had agreed to meet on February 2, 2011, for further discussions; Rose indicated he hoped that the Douglas PUD Aquatic SWG would be able to join on that day as well. Pat Irle recapped the discussion of this topic at the recent Rocky Reach Fish Forum meeting; she stated that the Washington State Department of Ecology supports the idea of having a consolidated Fish Forum meeting such as Rose proposed and recommended that this combined Fish Forum/Aquatic SWG meeting occur, at least initially, on a monthly basis. Rose stated that the second part of the proposal was that technical workgroups meet on a monthly basis to focus on technical topics or species’ plans that are not typically covered in detail in the Fish Forum/Aquatic SWG meetings. The proposal is for three

meeting dates per month (one a lamprey technical workgroup, one a sturgeon technical workgroup, and one a combined Fish Forum/Aquatic SWG meeting). Bill Towey expressed support for this idea. Molly Hallock asked Rose if this would really reduce the number of meetings for him; he said he thought that it would and that it would make the meetings more efficient. Patrick Verhey supported the proposal and the idea that combining the various forum meetings into a single day could increase efficiencies and meeting attendance. He also mentioned that we should see how it works and use adaptive management to address any potential emerging issues related to the proposal.

Beau Patterson said that Douglas PUD is not opposed to trying the proposed meeting date arrangements in early 2011 but that they have reservations. He expressed concern that the proposed types and frequencies of meetings have changed over time since combined meetings were first discussed in October 2010. Patterson said he understood the efficiencies the proposed framework would create for the regional approach to managing lamprey and sturgeon that co-managers would like to use. However, he said there are three aspects to the proposal that concern Douglas PUD: 1) the proposal represents an increase in the number of meetings for Douglas PUD staff; 2) Douglas PUD's application for Federal Energy Regulatory Commission (FERC) relicensing has been submitted, along with the Aquatic Settlement Agreement, and the application is being processed—the Aquatic Settlement Agreement already contains a framework for implementing Aquatic Settlement Agreement work plans, and once the license is issued, Douglas PUD will abide by the license articles issued by FERC, which may not allow for Rose's proposed format to be implemented; and 3) Douglas PUD is hesitant about opening the Aquatic SWG process to entities who are not signatories to the Aquatic Settlement Agreement. For example, Douglas PUD has reservations about bringing in unique parties from the Chelan PUD and Grant PUD Fish Forums (e.g., Park Service, Alcoa, Grant and Chelan PUDs, BIA). Patterson stated that Douglas PUD will maintain an open mind regarding the proposal and that they are willing to try the meeting arrangements. However, Patterson said the Aquatic SWG meetings will need to continue in parallel with the proposal meeting structure, at least in the beginning.

Jeff Osborne mentioned that Chelan PUD had similar concerns to those raised by Patterson. One possibility mentioned at the Fish Forum meeting yesterday was that on the day of a combined Fish Forum/Aquatic SWG meeting, each entity (Priest Rapids Fish Forum, Rocky Reach Fish Forum, and Wells Aquatic SWG) would have set periods of time during which they would still meet as a formal entity; then there would be set time-slots during the day for coordinated meeting topics. This arrangement would satisfy the needs of those entities required for regional coordination, but still meet the conditions of each of the Project licenses. Rose concurred that Osborne's explanation was as he had envisioned it.

Schiewe suggested that as a next step, Rose add more specificity to the proposal to

include the explanation and details discussed today. Rose said that the goal is to get the proposed meeting schedule started in January and February but to remain flexible as far as meeting frequency, with the ability to change the pattern over time depending on what works best. Patterson reiterated that despite Douglas PUD's reservations, they are willing to initially go down a parallel path and will certainly participate in the Sturgeon Technical Workgroup meeting on December 16 and the proposed February 2, 2011, consolidated Fish Forum meeting as well. Shane Bickford said he shared Patterson's reservations and in particular had many questions about how these meetings would generate the required products (e.g., meeting minutes, annual reports) that Douglas PUD is responsible for producing as agreed to in its Aquatic Settlement Agreement.

Rose reiterated that the purpose of the proposal is to eliminate the need to go to three separate PUD technical workgroup meetings with the same technical information, when the information could be discussed and settled during one day-long, consolidated meeting. Irle stated that the purpose of the technical workgroup meetings would be for collaboration and information-sharing on technologies, new methods, and new findings about focus species, and that the technical workgroups would not have decision-making authority. The two PUD Fish Forums and the Aquatic SWG would all try to meet on the same day of the month.

Towey asked who would set the meetings up and provide the structure and coordination amongst the entities who would be involved. Irle said that there had been discussion at yesterday's Chelan PUD Fish Forum meeting that WDFW and the Yakama Nation would take the lead organizing and coordinating the White Sturgeon and Lamprey Technical Workgroups, with Jeff Korth (WDFW) and Bob Rose chairing the groups. For the Fish Forum/Aquatic SWG meeting days, meeting locations could be rotated among the PUDs. The PUDs could then decide who would facilitate the meeting, maybe rotating facilitation among the PUDs as well.

Schiewe reiterated that a logical next step was for Rose to add the details discussed at today's meeting to a revised proposal. Rose agreed to revise the proposal, and Schiewe indicated that the issue will be revisited at the Aquatic SWG meeting on January 12. Douglas PUD agreed to plan to attend the proposed February 2 combined Fish Forum meeting. Irle requested that Rose distribute the proposal to the Aquatic SWG prior to the January 12 meeting to allow time for review.

3. **USFWS FPA 10(j) Recommendations – Wells Project** – Beau Patterson introduced this item. He stated that FERC shared the revised draft 10(j) recommendations from the Department of the Interior with Douglas PUD. Some of these Section 10(j) recommendations filed by the Department of the Interior with FERC were inconsistent with the wording in the draft Aquatic Settlement Agreement. Douglas PUD worked with the U.S. Fish and Wildlife Service (USFWS) and they ultimately agreed on amendments to several of the 10(j) recommendations (see Attachment C), using the wording in the

draft Aquatic Settlement Agreement. In response to a question from Steve Lewis, Douglas PUD clarified that on November 23, 2010, Douglas PUD filed with FERC their responses to comments from Aquatic Settlement Agreement reviewers, which included a response to the Department of the Interior's comments regarding these 10(j) recommendations.

V. Next Meetings

1. Upcoming meetings: *January 12, an in-person meeting at Douglas PUD. February 9 and March 9 will be conference calls.*

List of Attachments

Attachment A – List of Attendees

Attachment B – Draft Proposal for Streamlining Mid-Columbia PUD Forum and Workgroup Processes

Attachment C – Letter Regarding Amended Comments, Recommendations, Terms and Conditions, and Prescriptions – Review of Notice of Application Ready for Environmental Analysis, Soliciting Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions for the Wells Hydroelectric Project, Project No. 2149-152, Chelan and Douglas Counties, Washington (ER 10/686)

Attachment A List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Virginia See	Administrative	Anchor QEA, LLC
Beau Patterson	SWG Technical Rep.	Douglas PUD
Shane Bickford	SWG Policy Rep.	Douglas PUD
Pat Irle	SWG Technical Rep.	Washington State Department of Ecology
Patrick Verhey	SWG Technical Rep/Alternate	Washington Department of Fish and Wildlife
Molly Hallock	Technical Resource	Washington Department of Fish and Wildlife
Jeff Osborne*	Observer	Chelan PUD
Steve Lewis	SWG Technical Rep.	U.S. Fish and Wildlife Service
Bob Rose	SWG Technical Rep.	Yakama Nation
Bill Towey	SWG Technical Rep.	Colville Confederated Tribes
Brett Nine	Technical Resource	Colville Confederated Tribes

* Attended for Item 2 only.

Draft Proposal
to the
Priest Rapids Fish Forum
Rocky Reach Fish Forum
Wells Aquatic Settlement Work Group

Streamlining Mid-Columbia PUD Forum and Workgroup Processes

Introduction: As is currently the case, there are three Mid-Columbia PUD Forum-Workgroup processes, meeting on a monthly basis to address fishery and water quality concerns associated with Settlement Agreements, FERC Licenses / Relicensing and State DOE 401 Certifications. This is a total of 36 separate meetings annually.

For most participants, there is a considerable amount of time and money invested in traveling to these various meetings. And, as is often the case, there are a wide variety of topics addressed in each of these meetings. Some participants are not primarily responsible for various meeting topics resulting in considerable time spent waiting for the topic(s) of their particular interest and/or responsibility.

Over the past year, the current situation has been necessary, as each of the PUD technical Forums-Workgroups have needed to "get their houses in order" so to speak. However, it seems apparent that the general working relationships have now been established. Now, there are many technical considerations specific to implementation of the various Management Plans that go well beyond the technical capacities and/or interests of some Forum-Workgroup members and require considerable focused time to work through the details. Also, both WDFW and Yakama Nation representatives have identified a need to address management of both White Sturgeon and Pacific lamprey issues in a more regional context. It is time to consider a different framework that produces better results for the resources and provides greater efficiency and cost savings for Parties to the three Settlement Agreements.

Proposal: The Yakama Nation representative to the Wells Aquatic Work Group, Rocky Reach Fish Forum and Priest Rapids Fish Forum proposes to 1) abandon the existing Forum-Workgroup monthly meeting schedule for each of the three PUDs and 2) hold regularly scheduled quarterly meetings in which all three Forum-Workgroups meet on the same day for approximately 3 hours per meeting. These quarterly meetings are intended to satisfy both FERC and DOE 401 obligations. Meeting locations can rotate to various locations and implementation of these quarterly meetings does not preclude the possibility of additional scheduled meetings called for by either Forum-Workgroup, as needed and agreed to by the relevant Parties.

As is often the case, Pacific lamprey and White sturgeon discussions often dominate the meeting agendas. Given the heightened interests and complexity in implementing the Management Plans for these two species, the Yakama Nation also recommends that an individual Technical Subcommittee be established within each of the Forum-Workgroups and directed to work together, functioning as one body within a Mid-Columbia regional context. One committee would be established for sturgeon, another for lamprey. These Technical Subcommittees would also meet monthly, on regularly scheduled days. All existing Forum-Workgroup Parties would be encouraged to participate and time would be allocated for each of the three PUD processes. From these meetings, technical recommendations for future implementation of activities, specific to each of the PUDs interests, would be provided to the relevant Forum-Workgroup, presumably during the Mid-C quarterly meetings. Topics, other than sturgeon and lamprey, may also be subject to a specific Technical Subcommittee, this is probably not necessary.

Discussion: The Yakama Nation representative recognizes the challenges associated with this proposal. Clearly, details for meeting facilitation remain to be considered. Also, it is likely that formal changes will need to be made for meeting protocols. And, it is difficult to gage if Quarterly meetings will be able to provide ample time to allow decisions to be made in a timely manner. Recognizing these challenges, we are still faced with a growingly inefficient regional business model. We need also to recognize that in many recent cases, most technical work that has brought advancement in implementation for both lamprey and sturgeon has been completed outside of, then later approved during the Forum-Workgroup meetings. So our current technical discussions seem to naturally be trending towards the proposed model. In addition, our current Forum-Workgroup meetings seem to have fewer participants by the month. (It should be noted, there is nothing magic about Quarterly meetings - if we choose to hold Forum-Workgroup meetings every other month, that in itself is considerable improvement.)

Next Steps: With respect to the proposed Forum-Workgroup meetings, I believe the first step is to get an initial read from the Forum-Workgroup members if they are generally favorable or opposed to this proposal. Without irreconcilable opposition, a sub-group could meet and work out details, such as facilitation, protocol and proposed meeting dates/locations. If we are able to successfully make it this far, we would then select a date for the first meeting, hopefully in late winter. I will also recommend that we try this - or a similar alternative approach for a minimum three meetings. If we need to re-adjust, we will at that time.

With respect to the technical subcommittee meetings, I recommend these continue to be announced to the Workgroup-Forum members. Both WDFW and YN representatives will strive to encourage integration of all three PUD representatives to foster a greater regional approach. Establishing a regularly scheduled meeting date for regional technical discussions for both sturgeon and lamprey will, in itself, provide greater efficiency and benefit for the natural resources.



United States Department of the Interior

OFFICE OF THE SECRETARY
Office of Environmental Policy and Compliance
620 SW Main Street, Suite 201
Portland, Oregon 97205-3026



9043.1

IN REPLY REFER TO:

ER10/686

Electronically Filed

November 19, 2010

Honorable Kimberly D. Bose, Secretary
Federal Energy Regulatory Commission
888 First Street, NE
Washington, D.C. 20426

Subject: **AMENDED COMMENTS, RECOMMENDATIONS, TERMS AND CONDITIONS, AND PRESCRIPTIONS** - Review of Notice of Application Ready for Environmental Analysis, Soliciting Comments, Recommendations, Preliminary Terms and Conditions, and Preliminary Fishway Prescriptions for the Wells Hydroelectric Project, Project No. 2149-152, Chelan and Douglas Counties, Washington (ER 10/686)

Dear Ms. Bose:

On October 6, 2010, the Department of the Interior (Department) filed its comments and preliminary recommendations, terms and conditions, and prescriptions for the subject project pursuant to sections 10(a), 10(j), and 18 of the Federal Power Act (FPA). Those comments were intended to be materially consistent with the provisions of the *Wells Aquatic Settlement Agreement* (Settlement Agreement) filed with the Commission on May 27, 2010.

On October 8, 2010, the Public Utility District No. 1 of Douglas County (Douglas PUD) notified the Department that 10(j) Recommendation No. 1 was inconsistent with the Settlement Agreement because it recommended a license term of 42 years or less. Subsequently, the Department, through the U.S. Fish and Wildlife Service (Service), met with Douglas PUD on October 15, 2010, where additional concerns regarding the Department's filing were raised, and, in particular, material conflicts between the terms of the Settlement Agreement and 10(j) Recommendations Nos. 4, 5, 6, 7, 8, 9, and 10 were identified.

With this letter, we are amending 10(j) Recommendations Nos. 1, 4, 5, 6, 7, 8, 9, and 10. The Department recognizes that Douglas PUD has additional concerns and we will continue to work with them directly, as well as through the ongoing licensing process, i.e., Douglas PUD's filing of reply comments, to resolve those concerns.

AMENDED 10(j) RECOMMENDATION NO. 1

The Service agrees that the disputed language is inconsistent with the Settlement Agreement. Section 5 of the Settlement Agreement requires the settlement parties to support a 50-year term for the new operating license. Therefore, the Service wishes to submit a correction to the wording of 10(j) recommendation No. 1 to better conform to the wording in the proposed license articles contained in the Settlement Agreement. Accordingly, 10(j) Recommendation No. 1 is hereby corrected to read as follows:

10(j) Recommendation No. 1: Duration of the New License:

For the conservation, development, and mitigation of damages to fish and wildlife resources, the term of the new license should be 50 years in accordance with the Wells Aquatic Settlement Agreement.

Justification

The Wells AFA/HCP is intended to constitute a comprehensive and long term adaptive management plan for spring and summer/fall Chinook salmon, sockeye salmon, coho salmon and steelhead (Plan Species) and their habitat as affected by the Wells Hydroelectric Project. Included in this goal was the need to establish appropriate protections for salmon and steelhead listed as endangered or threatened under the ESA. The Wells AFA/HCP is a comprehensive plan for fish passage, hatchery compensation and tributary conservation, and endangered species issues for Plan Species at the Project. No Net Impact (NNI) has been attained for all Plan Species identified in the Wells AFA/HCP, and attainment can reasonably be expected to continue for the duration of the new license term, given the applicant's proposal to continue implementation of the AFA/HCP measures as part of the new license.

Prior to issuance, the Wells AFA/HCP was reviewed under section 7 of the ESA and NOAA Fisheries issued a biological opinion to cover the incidental take of listed fish for the implementation of the Wells AFA/HCP at the Wells Project. Likewise, the Service issued a biological opinion to cover incidental take of bull trout for implementation of the Wells AFA/HCP. The Service will also complete a biological opinion for the relicensing of the Project which is anticipated to permit incidental take of bull trout for 50 years.

The Wells ASA includes six management plans for water quality, bull trout, Pacific lamprey, white sturgeon, resident fish and aquatic nuisance species (Aquatic Resources), and is intended to establish the applicant's obligations for the protection, mitigation and enhancement of Aquatic Resources affected by Project operations for a period of 50 years under the new license.

The Wells ASA, together with the Wells AFA/HCP, address the project related impacts for spring and summer/fall Chinook salmon, sockeye salmon, coho salmon, and steelhead, in addition to bull trout, Pacific lamprey, resident fish, white sturgeon, water quality and aquatic nuisance species for 50 years. The

Service anticipates participating in the adaptive management of listed species throughout the license period, as agreed to in the settlement agreements. Therefore, the Service supports a 50-year license term for the Project.

AMENDED 10(j) RECOMMENDATION NO. 4

Douglas PUD believes 10(j) Recommendation No. 4 inaccurately describes the proposed measures contained within the Bull Trout Management Plan (BTMP) and that the deletion of incidental take and the insertion of injury/mortality in sections a), b), c), e) and f) of the recommendation is a material alteration of their obligations under the Settlement Agreement. The Service did not intend the wording of this recommendation to be materially inconsistent with the Settlement Agreement. The Service altered the language contained in the BTMP to better align the recommendation with the purpose and intent of section 10(j) of the FPA. That alteration did not nor was it intended to change the obligations and measures that Douglas PUD agreed to implement under the BTMP. The implementation of the BTMP is intended to provide protection to bull trout during the subsequent license term regardless of the listing status of this fish species. Nevertheless, the Service has agreed to amend 10(j) Recommendation No. 4 to avoid any future misunderstandings regarding bull trout management at the Project. Accordingly, 10(j) Recommendation No. 4 is hereby amended to read as follows:

10(j) Recommendation No. 4: Bull Trout Management Plan

For the conservation, development, and mitigation of damages to fish and wildlife resources, the Licensee shall, in consultation with the Wells Aquatic SWG, implement the Bull Trout Management Plan (BTMP) according to the requirements of the Wells Aquatic Settlement Agreement. Where implementation of the BTMP might affect salmon and steelhead, the Licensee shall be responsible for coordinating these actions with NOAA Fisheries and the Wells HCP Coordinating Committee. The BTMP shall be implemented to direct the improvement, if needed, of adult upstream passage and juvenile downstream passage through the Project. The BTMP shall include the development of telemetry studies to monitor the movement, behavior, and passage of adults through the Project's existing fishways and reservoir. The BTMP shall also include an assessment of fishway modifications should fishway modifications be made to improve the passage of bull trout and monitor incidental take of bull trout under the ESA at the Project. The BTMP includes the following measures to be implemented by the Licensee for the conservation and development of bull trout:

- a. Investigate Entrapment or Stranding of Bull Trout During Periods of Low Reservoir Elevation (BTMP Section 4.4): The Licensee shall 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, the Licensee will implement up to five bull trout entrapment/stranding assessments during periods of low reservoir elevation (below 773 ft. 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 the Licensee, in consultation with the Aquatic SWG, to address the impact.

b. **Monitoring Other Aquatic Resource Management Plan Activities and Predator Control Program for Incidental Capture and Take of Bull Trout (BTMP Section 4.5.1):** The Licensee 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 the Licensee 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 the Licensee 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.

c. **Funding Collection of Tissues Samples and Genetic Analysis (BTMP Section 4.5.2):** Beginning in year 10 of the new license, and continuing every 10 years thereafter for the term of the new license, the Licensee 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 Service's 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, the Licensee shall 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 shall take place concurrent with the implementation of the Off-Project bull trout radio-telemetry monitoring study.

d. **Information Exchange and Regional Monitoring Efforts (BTMP Section 4.5.3):** The Licensee 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.

The Licensee 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.

e. Bull Trout Monitoring During Hatchery Activities (BTMP Section 4.6.1): During the term of the new license, the Licensee 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 the Licensee.

If the incidental take of bull trout is exceeded due to the Licensee's hatchery actions then the Licensee shall 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.

f. USFWS Section 7 Consultation (BTMP Section 4.7): The PMEs contained within the BTMP were specifically developed, in consultation with the Service, to address potential Reasonable and Prudent Measures (RPMs) for the Project relicensing and associated section 7 consultation. All the FWS's potential RPMs for the Wells Project can be found in Appendix A of the BTMP. 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 Licensee's Aquatic Settlement Agreement and the Service's subsequent section 7 consultation on the relicensing of the Wells Project.

g. Reporting (BTMP Section 4.8): The Licensee shall 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 and changes proposed for the following year. Furthermore, any decisions, statements of agreement, evaluations, or changes made pursuant to this BTMP shall be included in the annual report. If significant activity was not conducted in a given year, the Licensee shall prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

Justification

The Service concurs with the applicant's proposed comprehensive BTMP (Douglas PUD 2010). The BTMP is intended to be an adaptive management plan, where strategies for meeting the goals and objectives shall be revised collaboratively with relicensing stakeholders. New bull trout information, input from regional scientific experts, the best techniques, and the evaluation/monitoring results will be used to achieve identified BTMP goals. The

protection, mitigation, and enhancement measures described in the BTMP will be used to achieve consistency with the Service's Bull Trout Recovery Plan and establish the measures necessary to minimize the effect of any incidental take of bull trout during the term of the new license.

Bull trout in the mid-Columbia River Basin have more specific habitat requirements than most other salmonids. Habitat components that influence bull trout distribution and abundance include water temperature, cover, and channel stability; substrate for spawning and rearing; and migratory corridors. Bull trout are found in colder streams and require colder water than most other salmonids for incubation, juvenile rearing, and spawning. Spawning and rearing areas are often associated with cold-water springs, groundwater infiltration, and/or the coldest streams in a watershed. Throughout their lives, bull trout require complex forms of cover, including large woody debris, undercut banks, boulders, and pools. Alterations in channel form and reductions in channel stability result in habitat degradation and reduced survival of bull trout eggs and juveniles. Channel alterations may reduce the abundance and quality of side channels, stream margins, and pools, which are areas bull trout frequently inhabit. For spawning and early rearing bull trout require loose, clean gravel relatively free of fine sediments. Because bull trout have a relatively long incubation and development period within spawning gravel (greater than 200 days), the transport of bedload in unstable channels may kill young bull trout.

Bull trout use migratory corridors such as the mid-Columbia River to move back and forth from spawning and rearing habitats to foraging and overwintering habitats. Different habitats provide bull trout the opportunity to exploit diverse resources, and migratory corridors allow local populations to connect, which increases the potential for gene flow and rebuilding of local populations (USFWS 2002b).

Declines in bull trout distribution and abundance are the result of the combined effects of habitat degradation and fragmentation; the blockage of migratory corridors; poor water quality; angler harvest and poaching; entrainment into diversion channels and dams; and the introduction of non-native species. Specific land and water management activities that continue to depress bull trout populations and degrade habitat include hydroelectric dams and other diversion structures, forest management practices, livestock grazing, agriculture, road construction and maintenance, mining, and urban and rural development. Implementation of the applicant's project-specific BTMP will minimize take of bull trout at the Project and greatly assist the recovery of bull trout within the mid-Columbia River Basin.

AMENDED 10(j) RECOMMENDATION NO. 5

Douglas PUD believes 10(j) recommendation No. 5 incorrectly inserts involvement of outside entities into this recommendation, which have not signed the Settlement Agreement. Douglas PUD also notes that the Pacific Lamprey Management Plan inherent to this recommendation has been completed and filed with the Commission. They further believe that the insertion of other entities into this recommendation is a violation of or is materially inconsistent with the Settlement Agreement. It is also our understanding that there is no definition of what constitutes a “violation” or a “material inconsistency” within the confines of the Settlement Agreement.

It was not the intention of the Service to create roles or rights for non-signing parties, such as NOAA-Fisheries and BIA, or a new forum, but rather to create a means for communication and coordination between entities with specific fish management authorities. While the Service agrees that the Pacific Lamprey Management Plan has been completed by Douglas PUD, there is no guarantee that it will be fully adopted by the Commission and implemented into the new license. Subsequently, the Service and Douglas PUD have worked together to develop amended language that meets the Service’s intent. Based upon these discussions, 10(j) Recommendation No. 5 is hereby amended to read as follows:

10(j) Recommendation No. 5: Pacific Lamprey Management Plan

For the conservation, development, and mitigation of damages to fish and wildlife resources, the Licensee shall, in consultation with the Aquatic SWG, implement the *Pacific Lamprey Management Plan* (PLMP) according to the requirements of the *Aquatic Settlement Agreement*. The PLMP shall be implemented to improve adult upstream passage and juvenile downstream passage of Pacific lamprey through the Project. The PLMP shall include the development of studies to monitor the movement, behavior, and passage of adults through the Project’s existing fishways and reservoir. The PLMP shall include assessments of fishway modifications made to improve the passage of adult lamprey at other hydroelectric developments in the Columbia River Basin for potential implementation at the Wells Project. The PLMP shall also include the following measures to be implemented by the Licensee for the conservation and development of Pacific lamprey:

- a. Downstream Bypass Operations Criteria (PLMP Section 4.2.1): The Licensee shall operate the downstream bypass system at Wells Dam in accordance with criteria outlined in the Wells AFA/HCP.
- b. Salvage Activities During Ladder Maintenance Dewatering (PLMP Section 4.2.2): The Licensee shall continue to conduct salvage activities as required by the Wells AFA/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 using protocols identified in the Wells AFA/HCP. Any juvenile Pacific lamprey that are captured during salvage activities will be released

unharmful downstream of Wells Dam. The Licensee shall coordinate salvage activities with the Aquatic SWG and allow for member participation. The Licensee shall provide a summary of salvage activities in the annual report.

- c. Juvenile Pacific Lamprey Passage and Survival Literature Review (PLMP Section 4.2.3): Beginning in year five and every five years thereafter during the new license, the Licensee, 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 river hydroelectric facilities. This information will be used to assess the feasibility of conducting activities identified in Section 4.2.4 of the PLMP.
- d. Juvenile Pacific Lamprey Habitat Evaluation (PLMP Section 4.2.5): Within three years of the effective date of the new license, the Licensee 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, the Licensee 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 Habitat Conservation Plan Coordinating Committee and regulatory approval of the federal and state agencies.
- e. Regional Lamprey Working Groups (PLMP Section 4.3.1): The Licensee shall participate in Pacific lamprey work groups in order to support regional conservation efforts (e.g., the Pacific Lamprey Technical Work Group and the Service's Lamprey Conservation Initiative). Activities may include, but are not limited to, information exchanges with other entities, meeting attendance, and coordination of the Licensee's Pacific lamprey activities with other entities conducting lamprey research in the mid-Columbia River. Activities shall also include conducting PLMP research within the Project, and sharing that information with other entities.

Justification

To address the Project's effects on Pacific lamprey, the applicant proposes to implement the Wells Comprehensive Pacific Lamprey Management Plan (PLMP) (Douglas PUD 2010). 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. To achieve this goal, the PLMP includes measures to: (1) identify and address any adverse Project-related impacts on passage of adult Pacific lamprey; (2) identify and address any Project-related impacts on downstream passage and survival, and rearing of juvenile Pacific lamprey; and (3) participate in the development of regional Pacific lamprey conservation activities. Specific measures to be implemented include conducting

accurate adult lamprey passage counts; fishway modifications to improve upstream passage; upstream passage evaluations; juvenile downstream passage and survival evaluation; determining juvenile lamprey presence/absence and relative abundance in the project area; supporting regional lamprey conservation efforts through lamprey research and information exchanges; and implementing the Wells AFA/HCP. The PLMP is intended to be an adaptive management approach by which specific actions are implemented to mitigate ongoing negative impacts on Pacific lamprey passage. Actions may be adjusted through collaborative efforts of the Aquatic SWG, based on new information and ongoing monitoring results. The plan is also intended to be consistent with other management plans in the mid-Columbia region.

The Service concurs with the applicant's proposed protection, mitigation, and enhancement measures for Pacific lamprey. However, the specific details for some of the proposed measures related to the safe, timely, and effective passage of Pacific lamprey are not fully defined at this time and other parts of the proposed Pacific Lamprey Management Plan lack specificity. There is an absence of specific milestones in the plan regarding the upstream and downstream passage of Pacific lamprey; however, measures have been drafted using the available science for the Project and ensure that steady progress is made towards improving lamprey passage and reducing lamprey mortality. The Service provides further specificity regarding these milestones in its fishway prescription for this Project to expedite steady progress towards the development of the information needed to minimize project impacts on adult and juvenile Pacific lamprey. These prescribed measures are important because there is significant regional concern regarding lamprey populations in the Columbia River Basin.

In 1993, the Oregon Department of Fish and Wildlife designated Pacific lamprey at risk of being listed as threatened or endangered. The Service designated Pacific lamprey as a Category 2 candidate species under the ESA in 1994. The Northwest Power and Conservation Council's 1994 Fish and Wildlife Program acknowledged the apparent decline of Pacific lamprey and requested a status report to identify research needs. The Columbia River Treaty Tribes have repeatedly voiced concern about the decline of Pacific lamprey, a culturally important species. In January of 2003, four species of lamprey were petitioned for listing under the ESA. As part of the Aquatic Settlement Agreement developed during the relicensing of the Project, the applicant was required to develop its PLMP to identify and address the Project's effects on this important species. The information developed through the implementation of the PLMP will guide the applicant and resource managers in the development and implementation of suitable facilities, structural modifications, and/or changes to Project operations to minimize or eliminate ongoing negative impacts on Pacific lamprey.

AMENDED 10(j) RECOMMENDATION NO. 6

Douglas PUD believes 10(j) recommendation No. 6 incorrectly inserts involvement of outside entities into this recommendation, which have not signed the Settlement Agreement. Douglas PUD also notes that the White Sturgeon Management Plan inherent to this recommendation has been completed and filed with the Commission. They further believe that the insertion of other entities into this recommendation is a violation of or is materially inconsistent with the Settlement Agreement. It is also our understanding that there is no definition of what constitutes a “violation” or a “material inconsistency” within the confines of the Settlement Agreement.

It was not the intention of the Service to create roles or rights for non-signing parties, such as NOAA-Fisheries and BIA, or a new forum, but rather to create a means for communication and coordination between entities with specific fish management authorities. While the Service agrees that the White Sturgeon Management Plan has been completed by Douglas PUD, there is no guarantee that it will be fully adopted by the Commission and implemented into the new license. Subsequently, the Service and Douglas PUD have worked together to develop amended language that meets the Service’s intent. Accordingly, 10(j) Recommendation No. 6 is hereby amended to read as follows:

10(j) Recommendation No. 6: White Sturgeon Management Plan

Within one year of license issuance, the Licensee shall, for the conservation, development, and mitigation of damages to fish and wildlife resources, implement the WSMP for the Project. 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 create a diverse age structure in the population that consists of multiple cohorts (adults and juvenile age classes). The WSMP includes the following measures to be implemented in Phase I and Phase II of the plan:

- a. Phase 1 (Years 1-10):
 - Development of a Brood Stock Collection and Breeding Plan (Year 1 and updated as determined by the Aquatic SWG)(*WSMP Section 4.1.1*);
 - Brood Stock Collection (Years 1-4 and other years to be determined by the Aquatic SWG)(*WSMP Section 4.1.1*);
 - Juvenile Stocking (Years 2-5 and other years to be determined by the Aquatic SWG)(*WSMP Section 4.1.2*);
 - Index Monitoring Program implementation (Years 3-5 and 2 more years prior to Year 10 to be determined by the Aquatic SWG)(*WSMP Section 4.2.1*);
 - Marked Fish Tracking (Years 3-5 and 2 more years prior to Year 10 to be determined by the Aquatic SWG)(*WSMP Section 4.2.2*);
 - Natural Reproduction Assessments (5 annual assessments over the license term) (*WSMP 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;

- b. Phase II (Years 11-50):
 - Long-term juvenile stocking (Stocking rate and frequency to be determined by Aquatic SWG in Years 11-50)(*WSMP Section 4.4.1*);
 - Supplementation Program Review (Years 11-50 to be determined by the Aquatic SWG)(*WSMP Section 4.4.2*);
 - Long-term Index Monitoring Program (Year 12 and once every 3-5 years thereafter to be determined by the Aquatic SWG)(*WSMP Section 4.4.3*);
 - Adult Passage Evaluation (Year 11 and once every 10 years thereafter)(*WSMP Section 4.4*)

Justification

The current status of the mid-Columbia River white sturgeon population requires immediate action to create a viable population. The ongoing decline of the mid-Columbia population likely began with repeated recruitment failure several decades ago. The population decline has only been recently recognized and there is concern that extirpation may occur before effective actions to arrest the decline can be implemented. The applicant's proposed protection, mitigation, and enhancement measures for white sturgeon include an augmentation program to enhance white sturgeon populations through the use of hatchery fish or other measures to achieve specific population goals; a monitoring and evaluation program to evaluate the effectiveness of the plan and augmentation program, and to adjust population targets; and provisions for coordination with other mid-Columbia River regional sturgeon planning groups. The Service concurs with these measures. These measures are consistent with other regional plans developed to arrest the decline of the white sturgeon in the Columbia River Basin (Upper Columbia White Sturgeon Recovery Initiative 2002). The augmentation/supplementation of white sturgeon in the Wells reservoir will help to offset some of the Project's continuing effects on the natural recruitment of this popular sport fish, as well as improve recreational fishing opportunity within the reservoir and tribal use of white sturgeon.

AMENDED 10(j) RECOMMENDATION NO. 10

The Service's 10(j) Recommendation No. 10 recommended that the Licensee create a forum of State and Federal resource agencies and Tribes to ensure consistency and timely coordination between the implementation of the Wells AFA/HCP and the environmental measures incorporated into the new license for the protection, mitigation and enhancement of non-Plan species. Douglas PUD believes that this recommendation directly conflicts with the terms of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) and the Settlement Agreement, and the rights of the parties to the HCP, the Settlement Agreement, and the Terrestrial Resource Work Group as proposed in the Final License Application (FLA).

It was not the intention of the Service to create roles or rights for non-signing parties or a new forum, but rather to create a means for communication and coordination among the different committees and work groups so that the actions of one, i.e., the implementation of measures and

management plans, would not create unintended consequences for the others. Subsequently, the Service and Douglas PUD have worked together to develop amended language that meets the Service's intent. Douglas PUD will be responsible for coordination and implementation of studies and associated management plans as set forth in the new license by working directly with the established work groups and committees, as they have under the current license. Accordingly, 10(j) Recommendation No. 10 is hereby amended to read as follows:

10(j) Recommendation No. 10: Coordination of the Wells Aquatic Settlement Work Group (Aquatic SWG) and Terrestrial Work Group (TWG) with the Wells AFA/HCP Committee

The Licensee shall, for the conservation, development, and mitigation of damages to fish and wildlife resources, use the Wells Aquatic SWG and the TWG as the primary forums to ensure consistency and timely coordination with the committees established by the Wells AFA/HCP. Coordination between these three entities will be important during the implementation of the environmental measures incorporated into the new license for the protection, mitigation, and enhancement of aquatic resources, terrestrial resources and Plan Species. The Licensee will be responsible for coordination and implementation of studies and associated management plans set forth in the new license by working directly with these work groups and committees. Consistent with the Wells Aquatic Settlement Agreement and Wells AFA/HCP, the work groups and committees shall function to: (1) promote information exchange; (2) review the applicant's choice of specific implementation and monitoring measures and approve their selection; (3) periodically adjust the applicant's PM&Es, as needed to meet the goals and objectives established in the resource management plans; (4) adjust schedules and dates for performance; and (5) determine when the goals and objectives have been achieved and the PM&Es adequately implemented.

Justification

Work group and Wells AFA/HCP committee coordination will be an essential element in the successful implementation of measures for aquatic resources (i.e., bull trout, Pacific lamprey, white sturgeon, resident fish, water quality and aquatic nuisance species); Plan Species under the Wells AFA/HCP; and terrestrial resources under the applicant's Terrestrial Resources Management Plan. This coordination will ensure that the implementation of environmental measures for the benefit of Plan Species is consistent with the implementation of environmental measures for aquatic resources. Coordination regarding the applicant's obligations to implement measures associated with terrestrial resources at the Project will also be ensured for the duration of the new license, through existing agreements.

Specifically, the Wells AFA/HCP is the major plan for implementing the applicant's proposed salmon and steelhead PM&E measures. Coordinating the implementation of survival standards for salmon and steelhead with the PM&E measures for aquatic resources will require a major effort by the settlement parties (Licensee, federal and state resource agencies and tribes), and will need to be

carefully planned and executed to be successful. The complexity of the Wells AFA/HCP and measures designed for aquatic resources will necessitate effective and committed involvement of the settlement parties to coordinate changing management philosophies, new technologies, and compliance with changing policies. Coordination and participation by the settlement parties will provide guidance, special expertise, and information exchange through the term of the next license, to effectively implement the Wells AFA/HCP.

AMENDED 10(j) RECOMMENDATION NO. 7

The amended recommendations above alleviate many of the concerns identified by Douglas PUD for 10(j) recommendation No. 7. In order to provide consistency with the amendments outlined in the above recommendations, the Service has agreed to amend 10(j) Recommendation No. 7 to avoid any future misunderstandings. Accordingly, 10(j) Recommendation No. 7 is hereby amended to read as follows:

10(j) Recommendation No. 7: Resident Fish Management Plan

Within one year of license issuance, the Licensee shall, for the conservation, development, and mitigation of damages to fish and wildlife resources, fund and implement its comprehensive Resident Fish Management Plan (RFMP) in accordance with the Aquatic Settlement Agreement. The RFMP shall be implemented in consultation with the Aquatic SWG. 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. The RFMP shall include the following measures:

- a. HCP Predator Control Program (RFMP Section 4.1, sub-section 4.1.1): The Licensee shall continue to conduct annual predator control activities for northern pikeminnow and avian predators as outlined in the Wells AFA/HCP (Douglas PUD 2002).
- b. Project Shoreline Management and Land Use Policy (RFMP Section 4.1, sub-section 4.1.2): The Licensee 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 the Project Boundary shall be subject to review and approval by the Licensee, only after the permit applicant has received all other required regulatory permits. In addition, proposed permits must receive consideration by the Wells AFA/HCP signatory parties and be reviewed by state and federal action agencies.
- c. Monitoring the Resident Fish Assemblage within the Wells Reservoir (Objective 2) (RFMP Section 4.2): The Licensee 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 the Wells AFA/HCP Predator Control Program, and (2) collecting information on resident predator fish populations found within the Wells Reservoir.

To maintain comparative assemblage information over time and 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 Wells AFA/HCP predator control activities.

- d. Actions to Address Major Shifts in Native Resident Fish Assemblage (Objective 3)(RFMP Section 4.3): 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 the Licensee.
- e. Monitoring in Response to Proposed Changes in Project Operations (Objective 4)(RFMP Section 4.4): 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 the Licensee shall consult with the Aquatic SWG to select and implement reasonable and appropriate measures to address such effects.
- f. Reporting (RFMP Section 4.5): The Licensee shall 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 will prepare a memorandum providing an explanation of the circumstances in lieu of the annual report.

Justification

The applicant has documented numerous species of resident fish which reside in the project area (Douglas PUD 2010; Exhibit E). Species abundance and composition of these resident fish have been relatively constant over time. However, to continue the monitoring and management of resident fish and associated impacts resulting from the continued operation of the Project, the applicant has developed the RFMP as part of the ASA. In conjunction with the Wells AFA/HCP, the ASA was developed in collaboration with federal, state, and tribal entities to address all of the aquatic resource issues related to the relicensing of the Project, including impacts on resident fish.

The applicant identifies in its FLA that the Project may have an adverse effect on resident fish (Douglas PUD 2010, Exhibit E). The planned implementation of the RFMP, during the term of the new license, is expected to fully address any measureable adverse effects on resident fish. The applicant notes in its FLA that reservoir fluctuations resulting from the Project may have an effect on resident fish and benthic macroinvertebrates (Douglas PUD 2010, Exhibit E). Effects of the applicant's northern pikeminnow removal program associated with the Wells AFA/HCP may also have an effect on native resident fish. Although implementation of this program is targeted at reducing predation on anadromous fish species covered by the Wells AFA/HCP, it is also anticipated to have direct benefits to resident fish in the project area. Accordingly, the implementation of the RFMP will minimize the effect of future project operations on resident fish resources and ensure that the benefits of those measures are sustained for the duration of the new license term.

AMENDED 10(j) RECOMMENDATION NO. 8

The amended recommendations above alleviate many of the concerns identified by Douglas PUD for 10(j) recommendation No. 8. In order to provide consistency with the amendments outlined in the above recommendations, the Service has agreed to amend 10(j) Recommendation No. 8 to avoid any future misunderstandings. Accordingly, 10(j) Recommendation No. 8 is hereby amended to read as follows:

10(j) Recommendation No. 8: Wildlife and Botanical Management Plan

Within one year of license issuance, the Licensee shall, for the conservation, development, and mitigation of damages to fish and wildlife resources, fund and implement its comprehensive Wildlife and Botanical Management Plan (WBMP). The WBMP shall be implemented in consultation with the U.S. Fish and Wildlife Service (Service) and the Terrestrial Work Group (TWG). The goal of the WBMP is to protect, maintain and enhance wildlife and habitat on Project lands commensurate with ongoing effects of operating the Project. The WBMP is also

intended to guide wildlife management activities and to protect rare, threatened and endangered wildlife and plant species on Project lands during the term of the new license for the Project. The WBMP includes goals, objectives, and procedures for the management of RTE wildlife and botanical species' habitats, noxious weeds, bald eagle habitat (perching and nesting structures), and wildlife monitoring on project lands, other lands adjacent to the reservoir, and on lands that may be purchased to meet mitigation objectives. The WBMP shall be tiered to any Commission-approved Recreation Resources Management Plan so that goals and objectives of both plans are integrated and not in conflict. The plan shall be updated in consultation with the resource agencies referenced herein. Lastly, the Licensee shall provide annual progress reports and conduct annual coordination meetings with the resource agencies referenced herein to provide updates on the success of the mitigation measures implemented under the WBMP. The meetings shall be initiated, coordinated, and documented by the Licensee.

Justification

The primary goal of the Licensee's WBMP is to protect, maintain and enhance wildlife and habitat on Project lands commensurate with ongoing effects of operating the Project. Secondary goals are to restore or improve ecological quality and diversity, to restore or increase habitat for key indicator species, and to provide for public use. The Service concurs with the goals of the proposed WBMP.

The WBMP was also developed in consultation with state and federal agencies. The WBMP will guide implementation of resource protection measures for wildlife and botanical resources during the term of the new license, including maintenance and enhancement of wildlife and habitat, protection for RTE wildlife and plant species, maintaining the Cassimer Bar Wildlife Management Area, and control of noxious weeds in the Project Boundary. The wildlife and botanical protection measures will enhance recreational opportunities in the Project area, including fishing, hunting, and wildlife viewing.

The applicant has also developed the *230 kV Transmission Line Avian Protection Plan (APP)*, to protect resident and migrant birds that could potentially interact with the Wells 230 kV transmission lines. The APP is intended to protect both avian migrants interacting with the transmission lines crossing the Columbia River and birds nesting or perching on the transmission line structures.

AMENDED 10(j) RECOMMENDATION NO. 9

The amended recommendations above alleviate many of the concerns identified by Douglas PUD for 10(j) recommendation No. 9. In order to provide consistency with the amendments outlined in the above recommendations, the Service has agreed to amend 10(j) Recommendation No. 9 to avoid any future misunderstandings. Accordingly, 10(j) Recommendation No. 9 is hereby amended to read as follows:

10(j) Recommendation No. 9: Avian Protection Plan

For the conservation, development, and mitigation of damages to fish and wildlife resources, the Licensee shall implement its 230 kV Transmission Line Avian Protection Plan (APP). The APP shall be implemented in consultation with the U.S. Fish and Wildlife Service (Service) and the Terrestrial Work Group (TWG). The goal of the APP is to protect resident and migrant birds that interact with the Wells 230kV transmission lines. The APP includes the following measures:

- a. Bird Flight Diverters (APP Section 5.2.1): Bird flight diverters shall be installed on the Wells transmission line river crossing in the event that the transmission line is reconductored, or if the static wire or aviation markers are replaced. The bird flight diverters shall be spaced between the aerial marker balls to increase visibility of the shield wire.
- b. Record Keeping (APP Section 5.3): The Licensee shall maintain records of all avian mortalities detected on the 230 kV transmission line right-of-way. The Licensee shall report all avian mortalities caused by the Wells 230 kV transmission lines to the Service through the online USFWS Bird Fatality/Injury Reporting Program (<https://birdreport.fws.gov>).
- c. Nest Management (APP Section 6.1): The Licensee shall implement a nest management protocol that includes: (1) all nest management will be performed in compliance with federal and state laws; (2) the Licensee's Wildlife Biologist shall be consulted before any nest is removed and will secure permits from the Service and WDFW, if necessary, before nest removal proceeds; and (3) active nests shall not be removed from the Wells 230 kV transmission line between February 1 and August 31 without prior approval from the Service and WDFW.
- d. Tree Removal (APP Section 6.2.1): To protect nesting birds, the Licensee shall only perform tree clearing on the transmission line corridor between August 31 and January 31. Clearing of the conifer trees on the transmission line corridor is anticipated to happen once every ten years beginning in 2018.
- e. Training (APP Section 7.0): The Licensee shall train all appropriate utility personnel to understand avian issues on the Wells 230 kV transmission lines. This training shall include background information,

protocols/procedures by which employees are required to report an avian mortality, implement a nest removal action, disposal of carcasses, perform vegetation management and comply with applicable regulations and the consequences of non-compliance.

- f. Consultation (APP Section 8.0): The Licensee shall meet with resource agencies or tribes, when requested, to discuss management of wildlife and botanical species on the transmission line corridor. All changes to the APP must be agreed to by the WDFW, Service, and the Licensee. Any agreed-upon changes to the APP will be reported to Commission for review and approval.

Justification

Utility poles and transmission line structures can benefit raptors by providing perch and /or nesting structures in areas where few natural perches or nest sites are available. These same structures can pose a threat to raptors and migratory birds through electrocution and collision with conductors and lines. Avian electrocutions and collisions with power lines have been documented nearly as long as utilities have provided power to the public and industry (APLIC 2006, 1996, and 1994; APLIC and USFWS 2005). Since the 1970s, utilities, the Service, and the National Audubon Society have worked together to document avian mortalities and to develop methods to reduce electrocutions and line collisions. In 2005, the Avian Power Line Interaction Committee and the Service jointly published *Avian Protection Plan Guidelines* to assist utilities in developing voluntary APPs. Therefore, the applicant has proposed to implement its APP to minimize any impacts of the Project on resident and migrant birds for the duration of the new license term.

The Department appreciates the opportunity to file these amended recommendations. If you have any questions regarding these amendments or require additional information, please contact me at (503) 326-2489.

Sincerely,



Preston A. Sleeper
Regional Environmental Officer

cc: Service List

UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 1 of Douglas County)	FERC Project No. 2149-152
)	
Notice of Application Ready for Environmental)	
Analysis, Soliciting Comments, Recommendations,)	
Preliminary Terms and Conditions, and Preliminary)	
Fishway Prescriptions for the Wells)	
Hydroelectric Project)	

Certificate of Service

I hereby certify that I have this day caused the foregoing document to be served upon each person designated on the official service list compiled by the Secretary in this proceeding.
Dated on this 19th day of November, 2010.



Preston Sleeper
Regional Environmental Officer
U.S. Department of the Interior
620 SW Main Street, Suite 201
Portland, Oregon 97205
(503) 326-2489

APPENDIX B
LIST OF AQUATIC SETTLEMENT WORK
GROUP MEMBERS

Aquatic Settlement Work Group Members

Signatory Parties

Organization	Policy Representative	Work Group Representative
Douglas PUD	Shane Bickford	Beau Patterson
Yakama Nation	Paul Ward	Steve Parker
U.S. Fish and Wildlife	Jessi Gonzales	Steve Lewis
U.S. Bureau of Land Management	Karen Kelleher	Vacant
Washington State Department of Ecology	John Merz	Pat Irle
Washington Department of Fish and Wildlife	Tony Eldred	Bob Jateff
Colville Confederated Tribes	Joe Peone	Bill Towey

Technical Support

Organization	Representative	Expertise
Washington Department of Fish and Wildlife	Molly Hallock	Lamprey
Washington Department of Fish and Wildlife	Chad Jackson	Fisheries
Longview Associates for Douglas PUD	Bao Le	Lamprey
Colville Confederated Tribes	Kirk Truscott	Fisheries
Colville Confederated Tribes	Bret Nine	Sturgeon
Yakama Nation	Patrick Luke	Lamprey

APPENDIX C

AQUATIC SETTLEMENT WORK GROUP

2010 STUDY REPORTS

List of 2010 study reports identified in Section 2.2 to be included in the final annual report:

- 2009 Assessment of Adult Pacific Lamprey Passage
- 2010 Total Dissolved Gas Abatement Annual Report

**ASSESSMENT OF ADULT PACIFIC LAMPREY RESPONSE TO
VELOCITY REDUCTIONS AT WELLS DAM FISHWAY ENTRANCES
(2009 DIDSON Study Report)**

WELLS HYDROELECTRIC PROJECT

FERC NO. 2149

June 2010

Prepared by:

P.N. Johnson
LGL Limited
Stevenson, Washington

And

B. Le
Long View Associates
Portland, Oregon

And

J.G. Murauskas
Public Utility District No. 1 of Douglas County
East Wenatchee, Washington

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ABSTRACT

Researchers conducting studies at hydroelectric projects on the Columbia River have suggested that high velocity conditions at fishway entrances designed to attract salmonids may be an obstacle for adult lampreys during their upstream migration. Previous studies indicate that operational modifications that create lowered velocities at fishway entrances may result in increased fishway entrance efficiency for lamprey. To test this theory at Wells Dam, Dual-frequency Identification Sonar (DIDSON) was used to passively assess adult Pacific lamprey passage behavior in response to operational modifications at the Wells Dam fishway entrances in 2009.

DIDSON units were deployed during the peak migration period (20 August to 24 September) at Wells Dam to sample 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: existing high condition (0.46 m; or 3.0 m/sec), moderate condition (0.31 m; or 2.4 m/sec), and low condition (0.15 m; or 1.8 m/sec). Treatments lasted four hours each evening (21:00 through 00:59) and were scheduled in a randomized block design to allow for at least ten separate days for each treatment. Data collected during the treatment periods were reviewed and all lamprey observations were described.

Eleven behavioral sequences of adult lampreys were observed near the fishway entrances, including eight in the west fishway and three in the east fishway. Six of these lampreys were first observed upstream of the sill and therefore did not provide information on fishway approach and entrance behavior. The remaining five lampreys were observed approaching the fishway entrances from downstream; of these, three were able to complete entry. Of these three, two occurred under reduced treatment levels (lower velocities). The two failed attempts occurred during both low and high treatment periods. DIDSON footage documented a lamprey swimming freely through the entrance under a reduced operational condition. Observations where fish used burst and attach movements (one of which lingered for an extended period of time) occurred during both a high and low treatment period.

The diminutive lamprey run in 2009 resulted in few fish observed at Wells Dam, precluding statistically significant evaluation of these results. Nonetheless, operational modifications implemented in 2009 suggest strong potential for increasing entrance efficiency. Pooling observations that occurred during reduced velocity treatments shows a 67% (2 of 3) entrance efficiency compared to 50% (1 of 2) under normal conditions. Despite the low sample size, these results are encouraging and continued investigation is recommended.

These results suggest that: (1) some lampreys demonstrate exploratory behavior, in addition to rejections associated with fishway entrance velocities; (2) spatial and temporal DIDSON coverage (vertical coverage and diel timing, respectively) under the 2009 configuration did not capture all entrance events; (3) reduced head differentials show promise in providing an environment conducive to upstream passage of lampreys; and (4) these operations do not negatively influence passage of adult salmon.

Despite the low sample size of lampreys available in 2009, DIDSON was an effective non-invasive technique for assessing behaviors in the fishway entrances. It remains to be determined to what degree improved entrance efficiency may be attributed to entrance velocity reductions, lack of radio-tagging effects, and possibly a synergistic interaction between both variables. Advantages of DIDSON over other lamprey sampling methods are discussed as are recommendations for improving lamprey passage assessment at Wells Dam in future years.

This study was initiated under early implementation of measures identified in the Wells Pacific Lamprey Management Plan (PLMP) to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. The PLMP is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement) developed in support of the Wells Hydroelectric Project (Project) Integrated Licensing Process. Similar to all management plans under the Agreement, the PLMP was developed in close coordination with agency and tribal natural resource managers to direct implementation of measures to protect against and mitigate for potential Project impacts to aquatic resources during the term of the new license.

1.0 INTRODUCTION

The Pacific lamprey (*Entosphenus tridentatus*) is an anadromous member of the jawless fish family (Petromyzontidae) that inhabits marine and freshwater systems from southern California to the Aleutian Islands in Alaska. Historically, Pacific lampreys were widely distributed throughout Washington State and served as an important ecological and cultural resource to the region (Close et al. 2002). Construction of hydroelectric and irrigation projects without fish passage facilities and the development of elaborate fishways specifically designed for salmon and steelhead in the Columbia River Basin (Basin), has limited the ability of migrating adult lampreys to reach upstream spawning locations, presumably contributing to Basin-wide population declines observed since 2004 (Close et al. 2002; Robichaud et al. 2009).

Research to better understand adult lamprey passage behavior was initiated at Wells Dam in 2004 (Nass et al. 2005). Subsequent investigations of lamprey behavior and passage efficiency took place in 2007 and 2008 (LGL and Douglas PUD 2008; Robichaud et al. 2009). The 2007-2008 studies identified the following:

- Entrance efficiencies ranged from 14% in 2007 to 33% in 2008, for a two-year average of 27%.
- Lower fishway passage efficiency was 33% over both years although 2008 trapping operations that resulted in complete exclusion of passage in the middle portion of the fishway may have significantly biased these results.
- Upper fishway passage efficiency was 100% and passage times were relatively fast (median passage times = 6.7 h) indicating that little or no passage impediments exist in this portion of the Wells fishways.
- A majority of lamprey may be uncounted at Wells Dam as 73% (11/15) of radio-tagged lamprey ascending the upper fishway bypassed the adult counting stations.
- No fallbacks were observed over all study years including in 2004.
- Due to low sample sizes, only two unobstructed complete passage events were recorded (31.5 h and 32.7 h). These passage times are excellent compared to studies at other Columbia Basin dams where median passage times reported were up to 7.6 days (Keefer et al., 2008).
- Overall, results indicate that potential passage impediments are restricted to the entrance and lower fishway.

Despite high passage rates and passage efficiency through the upper portions of Wells Project fishways, radio-tagged adult lampreys exhibit difficulty negotiating fishway entrances at Wells Dam. This impediment has been attributed to the hydraulic conditions at fishway entrances caused by the head differential between the fishway collection gallery and tailrace. The standard head differential at Wells Dam fishways is 0.48 m (1.5 ft) \pm 0.06 m (0.2 ft). Average velocities (~3.0 m/s) currently experienced in the fishway entrances at Wells Dam are well above the known swimming capability of adult lampreys (Robichaud et al. 2009). Swimming performance of adult lampreys has been reported at 0.9 m/s (sustained swimming) to 2.1 m/s (burst speeds) (Mesa et al. 2003; Daigle et al. 2005). High velocity conditions are typical of fishway entrances in dams throughout the Basin, and have been identified as a key area for improving passage efficiency of adult lampreys through hydroelectric projects.

Radio-telemetry (RT) has been the most widely used technology to assess adult lamprey behavior in the Basin over the last two decades. Although results from RT studies have been useful in identifying passage impediments, recent studies utilizing increased sample sizes and advances in tag technology indicate that the base assumption of RT – that tagged fish are representative of untagged fish – has been consistently violated. Moser et al. (2007) found that there was a significant long-term effect of tagging on lamprey performance and that effects are perhaps more prevalent than the literature suggests. Keefer et al. (2009) also identified issues with RT when 63% of PIT tagged lampreys were found to ascend The Dalles Dam fishway from the top of Bonneville Dam fishways compared to 25% of RT-tagged fish.

Both Moser et al. (2007) and Keefer et al. (2009) found that negative effects of RT tag implantation were particularly evident in smaller lampreys, with passage success often positively correlated with fish size. Thus, tag effects are predictably greater at upstream locations where lampreys have expended more bioenergetic reserves than those sampled downstream and are therefore typically smaller in size. For example, fish used in RT studies at Wells Dam have been as small as 54 cm total length (TL) and 0.27 kg, 29.9% and 55.9% smaller, respectively, than mean values reported at Bonneville Dam (river km 235) in 2001 and 2002 studies. Even more importantly, the girth of lampreys radio-tagged in 2007 and 2008 at Wells Dam averaged 10.2 cm (9.0-12.0 cm), compared to a majority of fish tagged at Bonneville Dam in the 12.5 to 14.9 cm girth range (Moser et al. 2005; Robichaud et al. 2009).

Given the significant negative effects of RT on adult lampreys, combined with the small size and low numbers of fish typically observed at Wells Dam, alternative techniques to monitor lamprey behavior were required. Dual-frequency Identification Sonar (DIDSON) was identified as a promising alternative technology, due to the ability to estimate lamprey entrance efficiencies in a completely non-invasive manner. This is in direct contrast with other sampling methods that require trapping, handling, and invasive surgery of all individuals involved in the study. The use of DIDSON further improves the scientific rigor of researching lamprey behavior by capturing individuals in their natural state and potentially allowing collection of a greater sample size.

The goal of this study was to identify fishway operations that could be used long-term to improve the hydraulic conditions for entry of adult lampreys into the fishways at Wells Dam, without impacting passage of anadromous salmonids. This study and the results are, to our knowledge, the first of its kind in which passive, non-invasive procedures are used to assess passage metrics of lampreys at a hydroelectric project.

This study was initiated under early implementation of measures identified in the Wells Pacific Lamprey Management Plan (PLMP) to identify and address any adverse Project-related impacts on passage of adult Pacific lamprey. The PLMP is one of six Aquatic Resource Management Plans contained within the Aquatic Settlement Agreement (Agreement) developed in support of the Wells Hydroelectric Project (Project) Integrated Licensing Process. Similar to all management plans under the Agreement, the PLMP was developed in close coordination with agency and tribal natural resource managers to direct implementation of measures to protect against and mitigate for potential Project impacts to aquatic resources during the term of the new license.

2.0 MATERIALS AND METHODS

2.1 DIDSON

DIDSON is a multi-beam sonar system capable of capturing near-video quality streaming images of fish moving through its 29° x 12° field-of-view (Belcher et al. 2001). DIDSON was designed to bridge the gap between existing sonar which can detect acoustic targets at long ranges but cannot record the shape or size of targets, and video technologies which can record fish in clear water at close range but are limited at low light levels or when turbidity is high. DIDSON has high resolution and a fast frame rate that allows it to substitute for optical systems, and is superior to optical systems in turbid water and dark conditions. It has been demonstrated to be effective for monitoring movement and behavior of fish in passageways at hydroelectric facilities (e.g., Ploskey et al. 2005; Johnson et al. 2006).

Two DIDSON units were deployed inside the east and west fish ladder entrances at Wells Dam on 20 August. Aluminum mounting assemblies were used to fasten the units to the walls adjacent to the entrances. The units were placed 6.1 m from the entrances at the elevation of the entrance sill of each fishway and aimed to allow complete horizontal coverage of the sill, a distance of about 2.4 m. This orientation permitted 1.3 m of vertical coverage above sill elevation, which equates to about 26% vertical coverage of the water column at each entrance.

2.2 Fishway Operations

Head differential treatments at Wells Dam in 2009 were paired across fish ladders and randomized in eleven three-day blocks. There were three alternative treatments, including the existing high condition (0.46 m), moderate condition (0.31 m), and low condition (0.15 m). These head differentials create average calculated water velocities of approximately 3.0, 2.4, and 1.8 m/s, respectively (note that a velocity gradient is present, with the lowest values occurring at the boundaries). Negotiations with the HCP-Coordinating Committee and analysis of passage data from past RT studies and fishway counts of both steelhead and adult lampreys indicated that treatments occurring during 4-hour blocks (21:00 through 00:59) each evening would provide the highest probability of increasing lamprey sampling events while minimizing any potential impacts to anadromous salmonid passage. Blocked treatments began on 21 August and ended on 23 September. One-day unblocked treatments occurred 20-21 August and 23-24 September (Table 1).

2.3 Data Collection

Each DIDSON system consisted of the sonar head, 46 m DIDSON cable, DIDSON topside switch box, Toshiba laptop computer, Ethernet cable and 1 GB external hard drives. The laptops were loaded with DIDSON software version 5.23, which was used to set data collection parameters and operate the sonar. GoToMyPC software was loaded on each laptop to allow for remote monitoring of the systems to insure functionality and avoid the need for constant monitoring by technicians. All topside electronics were housed in hard plastic lockable cabinets located on the tailrace deck.

All DIDSON data were collected using the high frequency mode (1.8 MHz). This setting uses the maximum of 96 beams resulting in high-resolution data collection. Data were collected at 10 frames per second using a 5 m-long window length with the window starting at 3.33 m from the sonar heads. Data were collected in successive 10-minute files and ported directly to external hard drives. External hard drives were exchanged at least every three days and data were archived to additional external hard drives.

The DIDSON unit in the west fish ladder operated continuously for 35 days between 20 August (12:20 for west side and 16:40 for east side) and 24 September (12:50). An operating malfunction occurred in the east fish ladder DIDSON unit caused by a dead battery on the CPU board 12 days into the study (2 September). Immediately following the determination that a new unit was needed, the manufacturer shipped the soonest available DIDSON. The unit was received and dive team deployed on 12 September to exchange DIDSON units. Normal data collection was resumed at 13:40 the same day.

2.4 Data Processing

Data were processed to determine the presence and behavior of lamprey observed in the DIDSON field-of-view (FOV). Treatment schedules and window counts were ignored to avoid any bias while reviewing data. Data files collected during the treatment periods (21:00 through 00:59) were processed by reviewing the files with the DIDSON playback software. The software has controls allowing for pausing and viewing data in forward and reverse at different speeds. Each data file was initially reviewed at 30 frames per second (3 times the rate in which data were collected). When a lamprey was thought to be observed, the review speed was slowed down to 10 frames per second and reviewed again to determine whether the target in question was a lamprey. Criteria used for separating lamprey from salmonids and other fish included observance of serpentine swimming behavior and the absence of linearity to the body shape.

For each lamprey observed, the following variables were noted: entrance location, date, time of initial and final observance in the FOV, whether the fish encountered and approached the sill heading upstream, and fate. Fate refers to whether the lamprey was observed to enter the fishway gallery, approached the sill but did not enter the gallery, or exited the gallery. Based on swimming behaviors observed, each detected lamprey seen to exit the gallery was classified as to whether their movement appeared to be volitional or non-volitional. Volitional and non-volitional movements were classified based on fish orientation (head or tail first) and any indication of struggle to maintain or change position. Other information regarding lamprey activities such as lateral movements and range from DIDSON were also noted.

For dates in which lamprey were observed in the DIDSON FOV but not seen entering the fish ladders, additional data were processed to determine whether these fish may have entered the ladders prior to 21:00 hour. In these instances, data collected from 19:00 through 20:59 were reviewed in the manner described above.

3.0 RESULTS

A total of 11 lamprey observations were recorded during the study period, including eight in the west ladder and three in the east ladder (Table 1). Lamprey activity was most frequent at the west ladder on 20 August when three fish were observed during the 21:00 hour. East ladder activity was highest on 18 September when two fish were observed.

Table 1. Lamprey behaviors observed using DIDSON at Wells Dam in 2009. “Duration in FOV” refers to amount of time (in minutes and seconds) each lamprey was present in the DIDSON field-of-view. “Interaction with Sill” indicates whether the lamprey approached the sill heading upstream. Fate depicts whether the lamprey was observed to enter the fish ladder gallery (entry), approached the sill but did not enter the gallery (no entry or reentry), or exited the gallery (exit). Treatment denotes the head differential condition associated with each observation. Shading highlights each fish that encountered the sill heading upstream.

Entrance Location	Treatment	Entrance & Fish Designation	Date	Initial Time	Duration in FOV	Interaction with Sill?	Fate
West	Low	W1	20-Aug	21:42:17	00:05	No	Entry
West	Low	W2	20-Aug	21:49:22	00:18	Yes	Exit/No Reentry
West	Low	W3	20-Aug	21:57:24	02:25	Yes	Entry
West	Mod	W4	21-Aug	23:08:26	00:02	No	Exit
West	Mod	W5	22-Aug	0:52:09	00:04	Yes	Entry
West	Low	W6	23-Aug	22:02:04	00:14	No	Exit
West	Low	W7	26-Aug	23:15:25	00:05	No	Exit
West	High	W8	4-Sep	22:58:23	00:04	No	Exit
East	Low	E1	15-Sep	0:11:16	00:02	No	Exit
East	High	E2	18-Sep	21:35:31	00:09	Yes	No Entry
East	High	E3	18-Sep	22:19:47	10:44	Yes	Entry

Only the lampreys observed to encounter the sill heading upstream were used to evaluate the effectiveness of the fishway entrance velocity reductions. Six fish were excluded from the analysis because they did not experience the entrance sill during the treatment conditions.

Five lampreys were observed approaching the entrance sill heading upstream during the study. Three of these fish were observed successfully entering the fishway, with entries occurring during each of the three treatments conditions. Two of the three fish that successfully negotiated the fishway entrances attached to the sill prior to entry. One of the three fish was able to free swim into the entrance indicating that velocities associated with the moderate treatment may potentially complement the swimming performance of lamprey at Wells Dam. The attachment behavior occurred under both low and high treatment levels, though the manner and time in which fish remained attached differed (0:02:25 and 0:10:44, respectively). The two lampreys that approached but did not complete entry were observed during the low and high head differential treatments.

3.1 Detailed Observations of Lamprey Behaviors

The following detailed descriptions of lamprey behaviors include only those fish that were observed to interact with the sill since only these were fish used in the analysis for evaluating entrance efficiency relative to treatment condition.

- W2 – Low Treatment. Initially observed in the gallery about 2 m from the sill moving downstream swimming laterally to the flow; passed over the sill and exited the gallery leaving the sample volume. This fish (assuming it is the same fish) reappeared near the upstream edge on the east side of the sill a couple seconds later before drifting down near the downstream edge of the sill where it appeared to struggle to keep its position which suggests non-volitional movement. This fish then exited the sample volume at maximum range heading downstream.
- W3 – Low Treatment. Initially observed attaching itself to the downstream edge on the west side of the sill where it stayed for over two minutes. This fish detached itself and passed upstream over the sill and into the gallery. It exited the sample volume about 0.25 m upstream of the sill.
- W5 – Moderate Treatment. Initially observed outside the gallery about 1 m from the sill swimming upstream. This fish moved slightly westward before passing over the sill and entering the gallery. It exited the sample volume about 2.5 m from the sill.
- E2 – High Treatment. Initially observed over the sill near the east edge swimming erratically, suggesting non-volitional movement. It maintained position over the sill for a short while before moving downstream and exiting the sample volume at maximum range.
- E3 – High Treatment. Initially observed attached to the top near the center of the sill where it stayed for over 10 minutes. It detached from the sill and moved slightly to the west where it reattached itself briefly, detaching again and moving slightly to the east before swimming upstream over the sill and into the gallery. This fish exited the sample volume about 1 m upstream of the sill.

4.0 DISCUSSION

4.1 Benefits of DIDSON and Limitations of Radio Telemetry

DIDSON is an effective tool for assessing lamprey passage through a confined area (e.g., a fishway entrance) in terms of efficiency, coverage, and reliability. DIDSON data were retrieved over 17 visits to both the east and west fishways, resulting in 11 observations of adult lampreys – roughly two lampreys for every three site visits. Despite the processing time needed to review the DIDSON footage (~ 1.5 hours per sampling date), the passive sampling method proved to be relatively efficient. This conclusion is even more evident when considering that the adult lamprey counts throughout the Columbia River Basin were at record lows in 2009 and data were only collected from DIDSON units over four hours per evening. In comparison, the first year of RT research at Wells Dam with onsite lamprey trapping required daily visits over a 10-week period. Only six adult lampreys were captured, with a total bycatch of 493 other fishes. Analyses later indicated that trapping efficiency for adult lampreys may have been as low as ~10% (LGL and Douglas PUD 2008) and that the presence of the traps and associated floor

exclusion grating induced significant delay and drop back within the ladder thereby influencing the outcome of the 2008 study.

The biological benefits of DIDSON sampling are particularly evident at Wells Dam. Recent research has indicated that laboratory studies often cited to justify the use of RT technology for lamprey research (e.g., Close et al. 2003; Mesa et al. 2003) did not identify the significance of surgical implantation on lamprey swimming performance in field applications. Keefer et al. (2008) found that overall passage efficiency at Bonneville Dam was 22% for radio-tagged lamprey (n = 298), compared to 52% for HD PIT-tagged fish (n = 610). Keefer et al. (2009) also identified issues with RT when 63% of PIT-tagged lampreys were found to ascend The Dalles Dam fishway from last detections at the top of Bonneville Dam fishways, compared to 25% of RT-tagged fish. Moser et al. (2007) found that radio-tagged lampreys at lower Columbia dams had approach times and passage success rates that were significantly related to percent tag mass (relative to lamprey mass) and percent tag girth (relative to lamprey diameter). Based on results of their relatively large field study (> 800 fish), Moser et al. (2007) concluded that “the effect of prolonged swimming with relatively large transmitters may have resulted in eventual abandonment of migration or even death...” At Wells Dam, at least 24% of radio-tagged lampreys in 2008 displayed either a lack of movement (potentially tag shed or mortality) or an absence of detections (indicating uncharacteristic movement out of the study area or tag failure). The high proportion of uncharacteristic detection histories suggests that handling and surgical tagging had a considerable effect on lamprey swimming performance. After censoring these fish from the study, radio-tagged lamprey released in the tailrace had an entrance efficiency of 27% at Wells Dam (N=22) over two years of study (2007 and 2008).

Distance upstream, as related to fish bioenergetics, and seasonality are two additional factors that also confound results of active telemetry and limit comparisons to results reported in previous studies at downriver dams. For example, the research conducted at Lower Columbia River dams that led to the establishment of the ‘~ 50% passage standard’ of adult lamprey selectively tagged only the largest adult lamprey collected from the traps at Bonneville Dam. Moser et al. (2005) reported “due to the abundance of lamprey in 2002, we selected the largest fish to minimize tag effects.” The fish used for these studies had a mean weight from 590 g (males) to 627 g (females), and roughly 50% of all tagged fish had girths ≥ 12.5 cm. In comparison, lamprey tagged at Wells Dam in 2007 and 2008 averaged 369 g (range 270-560 g) and 10.2 cm in girth (range 9-12 cm). Though researchers are currently exploring the relationship between bioenergetics and passage success in lamprey (Ho et al. 2008), a positive correlation between fish size and swimming performance has already been identified (Moser et al. 2007).

The use of DIDSON technology to sample lamprey behavior has avoided potentially biased or negative results associated with sampling fish exposed to trapping, handling, chemical immobilization, surgery, and tag implantation. Although DIDSON sampling is often limited in the inability to distinguish among similar species, Pacific lampreys are readily identifiable since they are the only fish present at Wells Dam with their diagnostic shape and swimming behavior. The ability to sample individual fish behaviors in their natural environment through unobtrusive sampling provides researchers with a better understanding of naturally-occurring adult lamprey behavior. Further, the relatively small numbers of lampreys that typically reach the tailrace of

Wells Dam underscores the importance of non-invasive procedures to ensure that sexually mature individuals remain viable for the upcoming spawning season.

4.2 DIDSON Limitations

DIDSON cannot be used to determine the fate of individual fish since unique identifiers cannot be detected with this technology. The inability to identify individual fish also has ramifications for comparing lamprey passage efficiency results based on DIDSON to studies involving RT. Typically, passage metrics are calculated in RT studies based on individual fish passing the dam (i.e., the number of failed attempts by an individual fish prior to successful passage is not factored into the metric calculation; Robichaud et al. 2009). Since individual fish cannot be identified with DIDSON, entrance efficiency would be calculated based on the ratio of successful entrances to total attempted entrances (successful + failed). This is an important distinction to make clear in order to avoid false comparisons among different methods of calculating passage metrics.

4.3 Behavioral Observations

Observations of lamprey entrance behaviors included free-swimming into the fishway (n=2) and attachment to the sill prior to successful entry into the fishway (n=2). Of the free swimming lampreys detected, one (W5) was seen to pass over the sill while entering the fishway (during a moderate treatment period) and the other (W1) first appeared in the FOV upstream of the sill (during a low treatment period).

The two lampreys observed to attach to the sill prior to entering the fishway exhibited varying behaviors. W3 attached itself to the downstream edge of the sill during a low treatment period and remained there for about 2.5 minutes, whereas E3 attached itself to the top of the sill during a high treatment period and remained there for almost 11 minutes. W3 was seen to enter the fishway immediately after detachment while E3 was shown to detach and reattach to the top of the sill before detaching a second time and entering the fishway. It is uncertain whether these differing behaviors are related to treatment condition, but it is reasonable to assume that E3 stayed attached longer than W3 as a result of the higher velocity conditions it encountered as compared to W3. Both fish entered successfully, but during high velocity conditions more effort was clearly necessary as evidenced by the attachment duration and occurrence of multiple attachments. With reduced velocities, W3 entered after a single, short-duration attachment and W5 did not need to burst and attach to enter the fishway.

The two fish that encountered the sill but did not enter the fishways both exhibited difficulty maintaining position, and non-volitional movement downstream. During reduced velocity conditions, W2 appeared to struggle negotiating the flow near the upstream edge of the sill before heading downstream. During high velocity conditions, E2 showed erratic swimming movements over the sill before heading downstream into the tailrace. Presumably, because these fish were above the elevation of the sill, they could not attach to it.

The prevailing thinking has been that adult lampreys exhibit demersal swimming behavior during their migration, encounter fishway structures near the bottom and move up along the face

of the dam near fishway openings that they sense based on flow fields (Moser et al. 2002a). The results from this study suggest that lamprey may potentially enter fishways at higher elevations particularly when the velocities have been reduced and there is less of a need for burst and attach behavior. Furthermore, even lamprey entering during velocity conditions resulting from low velocity treatments may use attachment behavior, perhaps for purposes of re-orientation to weaker flow fields prior to entry.

4.4 Comparison to Other Studies

Previous studies at Wells Dam using RT with limited sample sizes reported low estimates of lamprey entrance efficiency. For 2004, Nass et al. (2005) reported an estimated entrance efficiency of 30% based on fish tagged and released downstream at Rocky Reach Dam. Studies conducted in 2007 and 2008 at Wells Dam reported an average entrance efficiency over both years of 27% (6 entered of 22 that approached) (LGL and Douglas PUD 2008; Robichaud et al. 2009). Although speculative due to low sample sizes and behavioral/physiological concerns inherent in RT methods, these results provide minimum estimates of lamprey entrance efficiency during high velocity conditions at Wells Dam.

In 2009 at Wells Dam, one of two lampreys detected to encounter the sill during normal (high-velocity; 3.0 m/sec) treatments was observed to enter the fishway; an estimated 50% entrance efficiency during normal conditions. With reduced velocity treatments (low and moderate conditions combined; i.e., 1.8 and 2.4 m/sec) two of three lamprey observed to encounter the sill entered the fishway (67% entrance efficiency). Despite the small sample size, these results show strong potential for increasing entrance efficiency through operational modifications at Wells Dam. It is difficult to contrast the 2009 results to the previous studies since the data used to calculate the metric differ between RT and DIDSON methods (as discussed above). Nonetheless the 67% estimate for entrance efficiency during reduced velocity treatments shows improvement over what has been previously reported at Wells using RT methods (Nass 2005; LGL and Douglas PUD 2008; Robichaud et al. 2009). The encouraging results warrant further investigation examining the potential for improving lamprey entrance efficiency through velocity reduction testing.

High flow velocities at fishway entrances in the Columbia River designed to attract adult salmonids are thought to impede upstream passage of Pacific lampreys (Moser et al. 2002a; 2005; Daigle et al. 2005). Water velocities > 1.2 m/sec in an experimental fishway were shown to deter lampreys (Keefer et al. 2008). The notion that high water velocities obstruct lamprey passage at hydropower projects has led to field studies designed to evaluate the effect of lowered velocities at fishway entrances for improving lamprey passage. Moser (2002b) assessed effects of nighttime flow reductions at fishways in the spillway at Bonneville Dam and found no significant differences in the number of successful lamprey entries during high (2.4 m/sec) and low (1.2 m/sec) velocity conditions. Using RT in 2007, Johnson et al. (2009) demonstrated that lamprey entrance efficiency (the number that successfully entered of those that approached an entrance) increased during low velocity compared to high velocity treatments (26% and 2% for low and high velocity conditions, respectively) at Bonneville Dam's Powerhouse 2 (PH2) north entrance. At the south entrance of PH2, entrance efficiencies were 32% during low and 24% during high velocity treatments. Johnson et al. (2009) suggested that the repeated entry attempts

and/or lamprey attaching to the face of the dam for prolonged periods of time during high velocity treatments indicated that lamprey had difficulty entering the fishway during this condition. Their results also indicated a likely tradeoff between fishway attraction and entrance efficiency; more lamprey were attracted to the entrances during high compared to low velocity conditions but disproportionately fewer passed during high flow treatments. Caudill et al. (2009) evaluated the effects of reduced nighttime velocities at Bonneville Dam PH2 in 2009 and reported that entrance efficiencies for radio-tagged lamprey were significantly higher during low velocity treatments (34%) than during control treatments (24%). Boggs et al. (2009) conducted an evaluation of nighttime flow reductions at McNary Dam in 2009; preliminary analysis to date shows that no significant difference between test and control treatments was detected for lampreys approaching the fishway.

It is important to note that results from downriver studies may not be directly comparable to results from work conducted at Wells Dam since the studies on the lower Columbia River rely on tagging more robust, better-conditioned lampreys earlier in the migration season as compared to the smaller, weaker fish that migrate higher up in the Basin in the late summer and fall.

4.5 Study Limitations

The major hindrance in the 2009 flow reduction evaluation was the low numbers of lamprey available to be monitored at Wells Dam. Lamprey abundance based on window counts at Bonneville Dam was historically low in 2009 (8,622, or 18% of the average counts over the last 10 years); only 9 lampreys (28% of the ten year average) were counted at Wells Dam in 2009 (Dart Website 2010).

Eleven lampreys were observed with DIDSON monitoring, only five of which interacted with the sill and could be used to analyze velocity reduction treatment effects related to entrance efficiency. Because of the small sample size, effects of treatments on lamprey passage could not be assessed conclusively.

4.6 Effects on Anadromous Salmonid Passage

Measures to enhance adult lamprey passage at Wells Dam cannot compromise anadromous salmonids passage efficiencies. During study hours 393 steelhead, 110 Chinook, 18 sockeye, and 2 coho salmon observed at the count window. These observations accounted for 1.5%, 0.2%, < 0.1%, and < 0.1% of the annual run for each species, respectively. Steelhead observations were most frequent, and ranged from 0 to 44 fish during the four-hour daily treatment period. Interestingly, more steelhead were observed during reduced head differential; however, differences among treatment levels were statistically indistinguishable (Kruskal-Wallis Rank Sums, $P = 0.24$). Chinook observations were less frequent, and also statistically indistinguishable among treatment levels ($P = 0.78$). Coho and sockeye observations were practically negligible, but statistically indistinguishable among treatment levels. It does not appear, based on this initial study effort, that nocturnal velocity reductions had any effect on passage of salmon and steelhead.

4.7 Recommendations

Despite low sample size, the 2009 study demonstrated the effectiveness of DIDSON sampling for assessing lamprey entrance efficiencies. To improve our understanding of the dynamics of lamprey fishway entrance efficiencies, we offer the following recommendations:

1. Conduct additional lamprey entrance investigations at Wells Dam: lamprey abundance was very low in 2009 and as a result of low sample size, lamprey entrance efficiencies relative to velocity reduction treatments could not be assessed. The study should be repeated until sufficient observations are obtained to allow rigorous statistical analysis.
2. Increase treatment duration: to help bolster sample size in future studies, it may be beneficial to increase the treatment duration to include additional hours for analysis of treatment effects. Instead of limiting the treatment duration to four hour periods as was done in 2009, consideration should be given to increasing treatment periods to six or eight hour periods. Provided that extending treatment periods does not deter salmonid passage, this option enhances the ability to detect additional lamprey.
3. Eliminate the low treatment condition: to further increase statistical power it is recommended that the low velocity treatment be eliminated. During the low velocity operation only one fish was observed to enter the fishway after encountering the sill. This may be attributed to the relatively slow entrance velocities that are observed during this operation. Velocities may be too slow to adequately attract sufficient adult lamprey to the entrance thereby making statistical inferences about this operation difficult. By eliminating one of the three treatments, the effective sample size of the remaining two treatments (high and medium) will increase. Further, operations for passage of adult salmon are unlikely to be affected by the medium treatment condition during nighttime hours while concerns exist about continuing the low treatment condition due to the resultant lack of attraction water and any potential impacts on anadromous salmonids. The two downstream neighboring projects (Rocky Reach Dam and Rock Island Dam) currently utilize 1.0' of head differential (medium condition) at their fishway entrances.
4. Increase vertical coverage upstream of the entrances: the DIDSON deployment in 2009 allowed for 1.3 m of vertical coverage above the sill, or about 26% of the wetted entrance area. Sample coverage along the vertical plane could be doubled if a similar deployment as was used in 2009 is employed with an additional DIDSON mounted above the original one in each fishway. This would result in more than 50% coverage of the entire wetted entrance area. Increased vertical coverage would allow for testing the hypothesis that lamprey may be entering the fishway higher in the water column and not encountering the sill during reduced velocity treatments.
5. Continue to assess potential effects on salmonid passage: it does not appear that velocity reduction treatments negatively affected salmonid passage based on this initial study. However, it is important to continue to monitor and evaluate potential

effects of nocturnal fishway entrance head differential treatments on anadromous salmonid passage.

6. Characterize fishway entrance velocities: to date fishway entrance velocities at Wells Dam have been estimated based on flow field models; flows at the entrances have never been directly measured. To characterize flow field dynamics during normal and reduced velocity treatments, we recommend deploying an Acoustic Doppler Current Profiler (ADCP) to measure velocity conditions at the fishway entrances. Results from ADCP sampling will allow for a better understanding of adult lamprey passage relative to accurate estimates of flow velocities at the entrances.

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Wells Hydroelectric Project Total Dissolved Gas Abatement Plan

2010 Annual Report



Prepared by:

Bao Le
Long View Associates
Portland, OR

And

Beau Patterson
Public Utility District No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802-4331

Prepared for:

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

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1 INTRODUCTION

The 2010 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on April 9th, 2010 (Appendix 1 and Appendix 2) and was amended by Douglas PUD and Ecology on July 1, 2010. The Wells Project GAP and its associated measures are intended to meet state water quality standards for total dissolved gas (TDG). This annual report concludes the 2010 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2010.

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. Upstream fish passage facilities are located on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a top of dam elevation of 795 feet above mean sea level (msl).

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.

1.1 Fixed Monitoring Site Locations

Two fixed monitoring stations for total dissolved gas (TDG) are located at Wells Dam, including a forebay and tailrace station. 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 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.

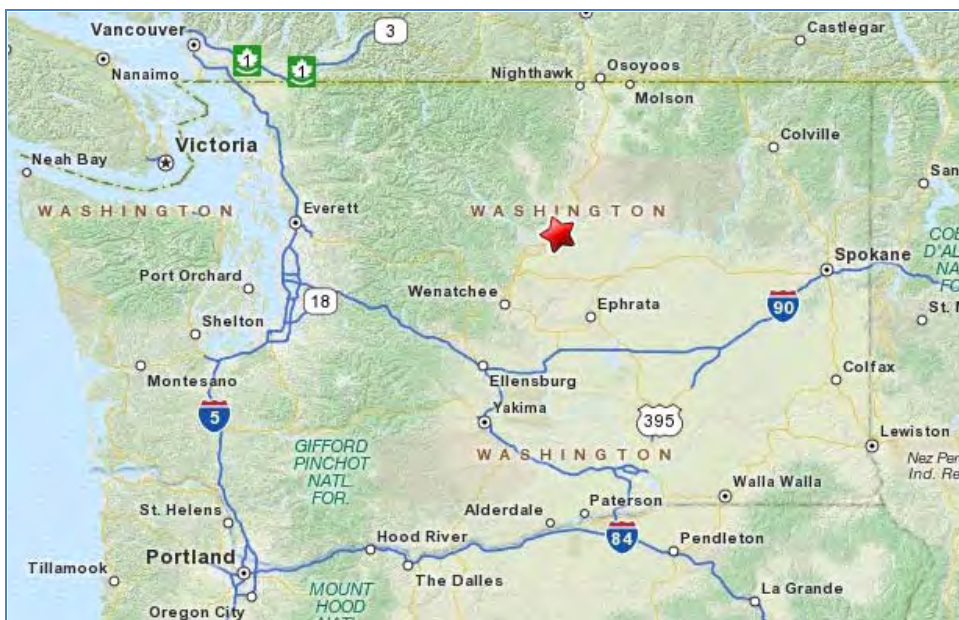


Figure 1. Location of the Wells Project.

1.2 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) spill over hydroelectric projects to increase survival of downstream migrating juvenile salmon.

Natural flood flows are identified by periods in which river flow volume exceeds the seven day, 10-year frequency flood stage (7Q-10). The 7Q-10 value is defined as the highest average river flow volume observed during seven consecutive days throughout a ten-year period. 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, WQS permit exceedance of the 110% TDG saturation standard.

Ecology may also waive the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon. The interim TDG waiver 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 waiver 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-High¹); and, (3) TDG shall not exceed 115% saturation in the forebay

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.

of the next downstream project based on the average of the twelve highest consecutive hourly readings in any one day.

1.3 2010 Gas Abatement Plan Requirements

1.3.1 Operational

The Wells Project 2009 GAP introduced the latest numerical model developed by the University of Iowa's IIHR-Hydrosience and Engineering Hydraulic Research Laboratories (IIHR Engineering). The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the tailrace of Wells Dam and further identify operational configurations that would minimize TDG production at the project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG fish spill waiver standards during the passage season with flows up to 7Q-10 levels (246,000 cfs; Politano et al. 2009). IIHR Engineering identified the most benign spillway operation at the Wells Project was the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through other spillbays in a defined pattern (Politano et al. 2009). These preferred TDG operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook (Appendix 4a) implemented for the first time during the 2009 fish passage (spill) season as part of the GAP.

In 2010, the 2009 Wells Project Spill Playbook (Appendix 4a) was implemented again given its effectiveness in maintaining levels below TDG criteria 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 2009 Spill Playbook and determined that full implementation of the recommendation from IIHR Engineering would require the removal of the juvenile fish bypass system flow barriers. Following the in-season analysis and consultation with the HCP Coordinating Committee, changes were made to the 2010 spill Playbook (Appendix 4b) that allowed for the removal of the juvenile fish bypass system barriers. Specifically, the Playbook was modified to state that when spill levels approach the 53 kcfs threshold, the Juvenile Bypass System 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 resulting 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.

Other operational requirements of the 2010 GAP included:

1. The "fish spill" season identified as the period between April 1st and August 31st, with "non-fish spill" season occurring from September 1st to March 31st, unless otherwise specified in writing by Ecology.

2. General TDG Abatement Measures to maintain compliance with TDG criteria, consistent with the juvenile salmon passage and survival standards set forth in the Anadromous Fish Agreement and Habitat Conservation Plan (HCP), are as follows:
 - a. Minimize voluntary spill;
 - b. Manage voluntary spill in real-time to meet TDG numeric criteria;
 - c. Minimize spill, to the extent practicable, by scheduling maintenance based on predicted flows.
3. Provide an annual Gas Abatement Plan report to Ecology no later than December 31st of the same year, including:
 - a. Daily flow, spill and TDG levels;
 - b. Summary of exceedances and what was done to correct the exceedance(s);
 - c. Results of any applicable fish passage efficiency or survival studies conducted under requirements of the HCP Agreement;
 - d. Revised GAP to reflect any changes, new information or technologies. Draft GAPs shall be submitted to Ecology for review and approval by February 28th of the year to be implemented (e.g., February 28th, 2011 for the 2011 spill season).

Douglas PUD will direct all correspondence to the Hydropower Projects Manager, Department of Ecology, Central Region Office, Water Quality Program, 15 W. Yakima Avenue, Suite 200, Yakima, Washington 98902.

1.3.2 Structural

No permanent structural modifications were proposed or conducted in the 2010 monitoring season. Removal of the bypass barrier structures in Spillway 6 was implemented consistent with the in-season revision to the Spill Playbook.

2 OPERATIONS

2.1 Description of Fish-Spill Season Flow

The 2010 Fish Spill Season was April 12th through August 26th at Wells Dam. As required, TDG data is monitored during this period and transmitted to the US Army Corps of Engineers, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil). Historical data is available for download. Data from 1995 to 2010 (16 years) show that average monthly flows between April and August range from 53.4 to 300.3 thousand cfs (kcfs) at the Wells Project. During this time period, flows tend to be greater and more variable in June (mean 167.1 kcfs, SD±50.75), and lowest and least variable in August (105.5 kcfs, SD ±22.88, Table 1).

Table 1. Monthly total river discharge (kcfs) from the Wells Project (April-August), 1995-2010.

Month	April	May	June	July	August
Mean Monthly Average (kcfs)	113.9	143.5	167.1	129.8	105.5
Minimum Monthly Average (kcfs)	62.9	55.2	84.5	53.4	70.4
Maximum Monthly Average (kcfs)	177.4	251.9	300.3	182.8	152.1
Standard Deviation (kcfs)	±35.98	±42.79	±50.75	±33.33	±22.88

Average monthly river flow at the Wells Project in 2010 was approximately 15% lower than the 16-year average (Table 2). June flows were higher than the 16-year average, while other spill season average monthly river flows at the Wells Project were considerably lower than the 16-year average. The maximum hourly flows observed (268.6 kcfs in June) exceeded the 7Q-10 value of 246.0 kcfs. There were ten instances where hourly flows at the Wells Project exceeded the 7Q-10 value, occurring June 21st-24th.

Table 2. Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2010 compared to the previous 15-year average (1995-2009), by month.

Month	1995-2009	2010
	Mean	Mean
April	113.9	70.7
May	143.5	112.2
June	167.1	173.0
July	129.8	119.9
August	105.5	83.6
All	132.0	111.9

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 Juvenile Fish Bypass System (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 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 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.

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 negligible 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 migration of juvenile salmonids. The JBS has been operated on a fixed schedule between April 12th and August 26th since 2003 but the HCP Coordinating Committee 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 over Wells Dam.

Average spill at the Wells Project in 2010 was lower than the previous 15-year average. Average monthly spill ranged from 6.1 kcfs in April to 24 kcfs in June (Table 3). On numerous occasions between June 9 and July 2, 2010 hourly spill exceeded the approximate JBS flows. On June 17th forced spill reached the maximum hourly value for the 2010 season, 113.8 kcfs. 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.

Table 3. Average hourly spill (kcfs) during the TDG monitoring season at the Wells Project in 2010 compared to the 15-year average (1995-2009), by month.

Month	1995-2009		2010	
	Mean	Std Dev	Mean	Std Dev
April	10.3	16.3	6.1	2.4
May	19.5	27.1	8.0	2.3
June	31.0	42.8	24.0	20.7
July	11.9	15.2	9.2	6.2
August	6.8	7.2	6.5	2.5
All Year	7.3	19.8	3.3	4.5

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 2010. 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, Chinook, and sockeye salmon, and Chinook salmon, respectively; Skalski et al. 1996).

3.1.2 Survival Studies

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 Habitat Conservation Plan. Approximately 80,000 PIT-tagged yearling summer Chinook were released over a 30 day period in 15 replicates. The draft report determined that juvenile Chinook survival from the mouth of the Okanogan and Methow rivers averaged 96.4% over the 15 replicate releases of study fish. This result confirms the results from the three previous years of study and documents that fish survival through the Wells Project continues to exceed the 93% Juvenile Project Survival Standard required by the Habitat Conservation Plan (Bickford et al., 2010 draft). A final report will be available in early 2011.

3.2 Biological Monitoring

The 2010 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 2010, no hourly TDG readings at Wells Dam forebay or in the forebay of Rocky Reach Dam exceeded 125% saturation. In the Wells Dam tailrace, there were five instances where hourly TDG exceeded 125% saturation during the 2010 TDG monitoring season. Two observations occurred on June 17th (127.0%, 129.9%), one on June 22nd (125.3%), and two on June 29th (126.1%, 126.3%). There was no GBT monitoring following the June 17th event. On June 24th at 0800, Douglas PUD staff conducted GBT monitoring at Rocky Reach Dam in response to the June 22nd exceedance. Relatively few juvenile salmonid outmigrants were moving through the mid-Columbia River at this time. In total, four Chinook and 13 sockeye juveniles were sampled from the Rocky Reach bypass 0800-0900. No signs of GBT were observed. On the morning of June 30th, Chelan PUD staff conducted GBT sampling on behalf of Douglas PUD, in response to the June 29th exceedances. Three sockeye and 18 Chinook were examined with no sign of GBT observed.

3.3 Water Quality Forums

Douglas PUD has actively participated in regional water quality forums with Ecology, Washington Department of Fish and Wildlife, NMFS, Tribal Agencies, the US Fish and Wildlife Service, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). These meetings, ranging from the Trans-

boundary Gas Group to Columbia Basin meetings with the USACE, allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia Basin. Douglas PUD will continue its involvement in the Water Quality Team 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 1st and continuing until September 15th. 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.

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 12st to August 26th). Data were stratified by monitoring site, ascending date, and ascending time. The Ecology-approved 12C-High method (Appendix 5) was used to obtain TDG measurements for comparison to numeric criteria and evaluation of compliance.

Average monthly TDG measurements during the 2010 monitoring period (April 12-August 26) ranged from 104.4% to 111.9% in the forebay of Wells Dam, from 105.9% to 113.5% in the tailrace of Wells Dam, and from 106.1% to 112.2% in the forebay of Rocky Reach Dam. Maximum monthly values were observed in June at all three monitoring locations, whereas minimum monthly values varied by month among the monitoring location (Table 4).

Table 4. 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, 2010.

Month	Wells Dam Forebay				Wells Dam Tailrace				Rocky Reach Dam Forebay			
	n	Min	Mean	Max	n	Min	Mean	Max	n	Min	Mean	Max
April	277	102.6	106.0	109.3	456	94.7	106.2	110.5	456	104.4	107.7	110.5
May	744	101.6	104.4	107.0	744	102.8	105.9	109.1	744	103.6	106.1	109.1
June	720	103.5	109.1	114.8	720	104.9	112.5	129.9	720	98.6	111.4	121.8
July	733	108.4	111.9	114.8	744	109.9	113.5	119.9	744	101.9	112.2	116.6
August	621	103.9	109.2	113.2	624	104.7	110.6	114.7	624	103.9	109.6	112.5

Monthly average 12C-High TDG saturation measurements in 2010 during the monitoring period ranged from 105% to 113% in the forebay of Wells Dam, from 107% to 115% in the tailrace of Wells Dam, and from 107% to 113% in the forebay of Rocky Reach Dam. Maximum values were observed in June and July, and minimum values were observed in April and May and again in August (Table 5).

Table 5. Descriptive statistics of daily 12-C High TDG measurements (percent saturation) from Wells Dam forebay (WEL) and tailrace (WELW) and the forebay from Rocky Reach Dam (RRH) during the 2010 monitoring season.

Month	Wells Dam Forebay				Wells Dam Tailrace				Rocky Reach Forebay			
	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev	Min	Max	Mean	Std Dev
April	104.0	108.0	107.0	1.4	95.0	110.0	107.0	1.3	106.0	110.0	108.0	1.3
May	103.0	107.0	105.0	0.9	105.0	108.0	107.0	0.9	105.0	109.0	107.0	1.1
June	105.0	114.0	110.0	3.1	107.0	123.0	114.0	5.1	106.0	121.0	113.0	4.5
July	111.0	114.0	113.0	1.0	112.0	118.0	115.0	1.2	111.0	116.0	113.0	1.2
August	106.0	113.0	110.0	1.7	107.0	114.0	112.0	1.9	105.0	113.0	110.0	1.8
All	106.0	111.0	109.0	1.6	105.0	115.0	111.0	2.1	107.0	114.0	110.0	2.0

During the 2010 monitoring season, the TDG criterion for the forebay of Wells Dam was not exceeded by operations at the Chief Joseph Dam. The TDG TMDL load allocation for Chief Joseph Dam during Phase 1 (2004-2010) allowed Chief Joseph Dam operators the criteria of the fish passage adjustment (Ecology et al. 2004). On ten occasions, between June 11th and July 27th, 12C-High values reached 113-114% at various flow conditions; however, on none of these occasions did the 12-C High value exceed the 115% criterion.

In the Wells Dam tailrace, the TDG criterion of 120% was exceeded on 4 occasions; June 22nd, June 24th, June 26th, and June 29th. Wells Dam tailrace 12C-High TDG values, which ranged from 120.5% to 123.2%, occurred during flow conditions ranging from 188.5 kcfs to 268.6 kcfs, the latter being above the 7Q-10 value for Wells Dam of 246.0 kcfs. In the forebay of Rocky Reach Dam, the 115% 12C-HighTDG criterion was exceeded on eight occasions; June 22nd-June 25th, June 27th-June 30th, and July 2nd. 12C-High values ranged from 115.6% to 120.9%. Exceedances occurred during flow conditions ranging from 169.6 kcfs to 257.9 kcfs. With the exception of these exceedances, which occurred in association with high river flow volumes between June 17 and July 2 which sometimes were above the 7Q10 flow, the Wells Project was in compliance with TDG Water Quality Standards.

The TDG TMDL identified a positive, linear relationship from 2002 FMS data, between the increase in Wells Dam tailrace % TDG saturation and volume of spill, described by the equation $y = 0.1295x$, $R^2 = 0.921$, where y is the absolute increase in tailrace % saturation, and x is the volume of spill in kcfs (Ecology et al. 2004). This same relationship was characterized by a lower independent coefficient in 2010, $y = 0.1144x$, indicating spill operations implemented in 2010 produced 11.6% less TDG per volume of spill compared to 2002 operations.

Regression analyses of hourly TDG values indicate that incoming waters to the forebay at Rocky Reach Dam during fish spill in 2010 have a strong and statistically significant positive relationship to TDG values in the forebay of Wells Dam. The strongest relationship was found between Wells forebay TDG and the Rocky Reach forebay TDG 15 hours later; suggesting average water particle transport time between the projects during 2010 fish spill was 15 hours (Figure 2). Throughout the fish spill season, average TDG in the Rocky Reach forebay was 1.2% higher than observed in the Wells forebay. TDG production in the Wells tailrace is a linear function of volume of spill at Wells Dam; the very tight correlation of Wells forebay TDG with Rocky Reach forebay TDG, regardless of Wells Dam spill, indicates TDG downstream from Chief Joseph Dam to Rocky Reach Reservoir is primarily a function of the mass loading of TDG due to the recent increased proportion of spill at Chief Joseph Dam. The seasonal patterns of TDG at the forebay of Wells Dam (WEL) and downstream (WELW and RRH) monitoring locations is shown in Figure 3.

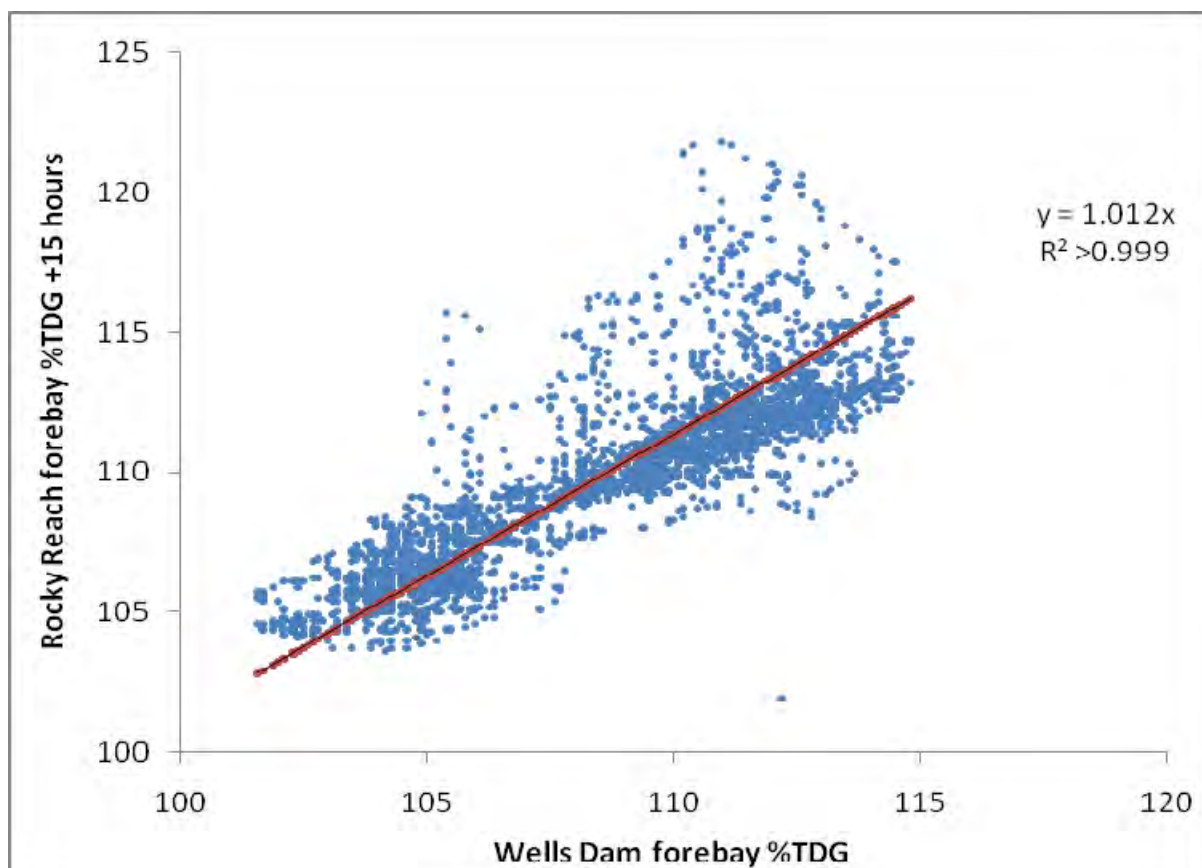


Figure 2. Linear regression demonstrating the relationship between % TDG of water above Wells Dam and subsequent downstream % TDG in the Rocky Reach Dam forebay.

During the non-fish passage period (January 1 to April 11 and August 27 to December 31), TDG is not usually measured at the Wells forebay and tailrace fixed monitoring stations. Studies have demonstrated that non-spill flows at Wells Dam (through the turbine units and fishways) generates little

to no additional dissolved gas. Spill outside the fish passage adjustment period is rare: during the non-fish passage period, spill occurred during just 7 hourly periods, with a range of spill volumes from 500 to 8,000 cfs. Three of seven hours occurred in August during the week following the fish passage adjustment period, prior to tailrace TDG sensors being removed; spill ranged from 900 to 8,000 cfs during these events, and tailrace TDG levels ranged from 104% to 108%. During the period when sensors were removed, there were four hourly periods with spill ranging from 500 to 2,600 kcfs. Spill of this magnitude would not result in any exceedances of the TDG standard at Wells Dam, with predicted TDG increases in the 0-1% range.

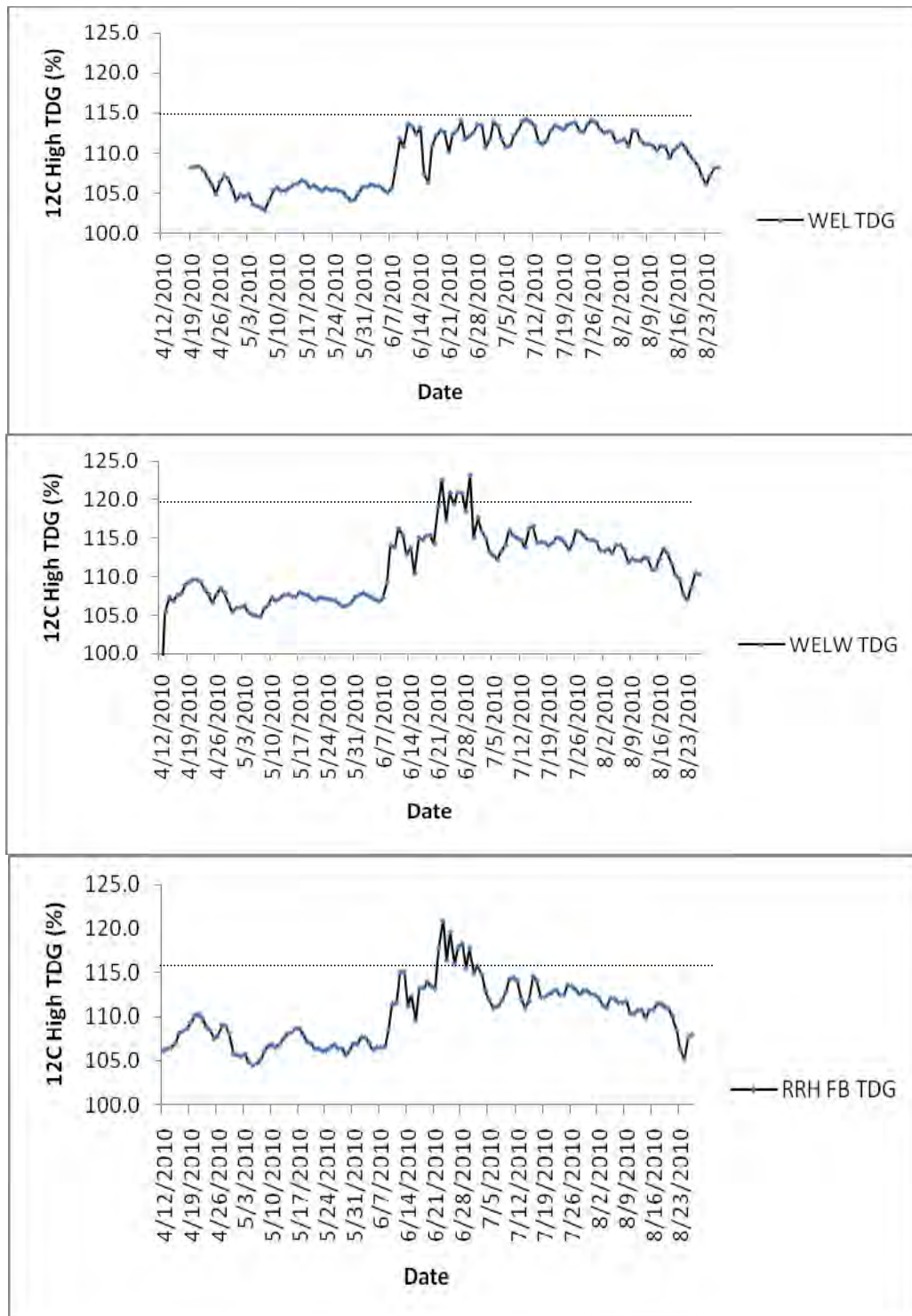


Figure 3. Daily 12-C High TDG measurements (percent saturation) from Wells Dam forebay (WEL) and tailrace (WELW) and the forebay from Rocky Reach Dam (RRH) during the 2010 monitoring season. Reference lines are at the 120% and 115% compliance marks.

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Operational

River flows in 2010 were indicative of a low water year with the notable exception of late June, when several heavy rain events created high flows and elevated TDG values in the Snake and lower Columbia River. In expectation of a drought year, the Bonneville Power Administration (BPA) had reduced discharge from Grand Coulee in May and early June and filled Grand Coulee one month earlier than normal. The subsequent heavy rain events in June, subsequent to filling Grand Coulee, resulted in unexpectedly high discharges and in addition required some drafting of Grand Coulee Reservoir. These unexpectedly elevated flows created significant challenges for the operations of the Federal Columbia River Power System (FCRPS) (BPA 2010).

In addition to accommodating high flows while meeting load requirements and Clean Water Act and Endangered Species Act requirements, Federal operators and BPA are also tasked with integrating the regions remarkable growth in wind power projects (approximately 6,000 megawatts connected to the Columbia River Basin transmission grid) resulting from renewable portfolio standards in Washington, Oregon, and California. This rapid increase in wind power requires balancing reserves to wind generators, which now consumes a significant portion of the operational flexibility of the FCRPS. In June, during the heavy rain events, wind power fluctuated between zero and almost full output as storms blew through the region. Loads remained fairly flat and low due to cool weather. Variable generation from wind, relatively low demands for electricity, and reduced operational flexibility of the system combined to create higher levels of involuntary spill at all of the federal and non-federal dams.

As part of the FCRPS Gas Abatement Plan, involuntary spill is spread incrementally across all federally owned projects to prevent excessively high total dissolved gas levels at those projects. While not part of the criteria adjustment allowed for the eight mainstem federal projects with fish passage, the Gas Abatement Plan includes spill at Grand Coulee and Chief Joseph dams as operational measures to manage TDG levels below federal projects in the Columbia River that result from involuntary spill. During Phase 1 of the TDG TMDL (Ecology et al. 2004), installation and testing of flow deflectors at Chief Joseph Dam increased allowable spill from 20 kcfs to 100 kcfs (BPA 2010).

The intent of the spill deflectors at Chief Joseph Dam was to further reduce TDG production in the Upper Columbia River, in addition to the reduction in TDG production reductions that results from shifting spill away from Grand Coulee and to Chief Joseph under the by joint operations of these two dams. The dramatic increase in spill volumes at Chief Joseph Dam under the last year of Phase 1 of the TDG TMDL, coupled with the BPA's operations for integration of wind generation, resulted in less production of TDG below Grand Coulee and the federal projects with fish passage than would have occurred otherwise. Unfortunately, the integrated operations of the FCRPS to reduce TDG system-wide below federal projects, has come at the expense of increased TDG, and in particular an increase in the mass volume of water supersaturated with TDG, in the Wells Reservoir. This increase in spill operations at Chief Joseph Dam, and resulting increased mass loading of incoming waters with TDG, caused the majority of exceedances at Wells Dam in 2010.

In 2011, Chief Joseph Dam should begin to operate under Phase 2 of the TDG TMDL, as operational and structural changes to meet compliance with a ΔP load allocation of 73 mm Hg have been completed. Compliance with the Chief Joseph Dam TDG load allocation will greatly facilitate future compliance with the TDG WQS at Wells Dam and in the downstream Rocky Reach Dam forebay, as well as at other downstream projects. Operations under Phase 2 of the TDG TMDL will greatly reduce the exposure of ESA-listed salmonids and other aquatic life to elevated TDG in the Upper Columbia River.

4.2 Structural

No permanent structural modifications were proposed or conducted in the 2010 monitoring season. Removal of the bypass barrier structures in Spillway 6 was implemented consistent with the in-season revision to the Spill Playbook.

5 CONCLUSIONS

Although 2010 was a relatively low water year, it was unique given the relatively short high-water period that occurred in June due to storm events which caused high precipitation in the Columbia River basin. Coupled with variable wind generation and its impacts on FCRPS operational flexibility and low electricity demand due to cool weather, relatively higher levels of involuntary spills occurred at projects upstream of Wells Dam. This resulted in a number of observed exceedances of the 125% hourly and 12C-High daily values both in the Wells Dam tailrace and Rocky Reach forebay in the month of June. In response to these exceedances, Douglas PUD implemented in-season changes to its spill operations at the project resulting in improved TDG performance with no observed exceedances of the tailrace TDG criteria after the changes were implemented on July 1st.

At Wells Dam, river flows in June were approximately 4% higher than the 16-year average. June was the only month in 2010 where monthly flows were greater than the 16-year average. During the latter half of June, incoming flows to Wells Dam were often above 200 kcfs and on nine occasions, hourly flows exceeded the 7Q-10 value of 246 kcfs. Incoming TDG levels during this time period consistently ranged between 110-114% as Chief Joseph Dam spilled higher volumes of water. The outage of Unit 7 for generator rebuild at Wells Dam resulted in less generating capacity and the need to spill additional water. Outage of Unit 7 likely also contributed to higher TDG by not supporting the surface jet for spill discharged from spillbay 7. These factors, combined with minimal load requirements, high flow volumes and relatively high incoming TDG resulted in the several observed exceedances of the 125% hourly criterion (3 exceedances) and 12C-High 120% criterion (4 exceedances) in the Wells Dam tailrace, and the 12C-High 115% criterion in the Rocky Reach Forebay (8 exceedances) despite implementation of the Spill Playbook.

In response to the observed exceedances, Douglas PUD implemented in-season changes to the 2010 Spill Playbook. Specifically, the amended Spill Playbook states that when spill levels are expected to reach the 53 kcfs threshold, the Juvenile Bypass System barriers in spillbay 6 should be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay (the previous threshold for removal was 96 kcfs). After July 1st, when spill approached the 53 kcfs

criteria, the bypass barriers were removed and the excess spill was directed through spillbays 6 and 7 rather than through spillbays 5 and 7 (Appendix 4b) resulting 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. After implementation of changes to the spill playbook on July 1st, 8 additional events of high incoming TDG were observed (>113%) at Wells Dam with incoming TDG greater than 110% occurring regularly. Although flows were generally decreasing, no exceedances in the Wells Dam tailrace or the Rocky Reach forebay were observed. The improvement in TDG performance at Wells Dam in July and August was likely due not only to the changes implemented in spill operations at Wells Dam, but also to the changing environmental conditions that impact river flow, temperatures, load, and resulting spill from upstream projects.

Despite high levels of involuntary spill and an increasing frequency of waters with relatively higher TDG levels entering the Wells Project, 94-97% compliance with the TDG criteria is confirmation that implementation and adaptive management, as appropriate, of the Wells Project Spill Playbook is providing a useful means to meet WQS within the Wells Project, and has resulted in reductions in TDG production on a per volume spilled basis. When Chief Joseph Dam is operated in compliance with the Phase 2 TDG TMDL criteria in future years, it is anticipated that this will greatly facilitate compliance with the Washington state TDG criteria at the Wells Project.

6 REFERENCES

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APPENDICES

Appendix 1. Wells Project 2010 Gas Abatement Plan

2010 TOTAL DISSOLVED GAS ABATEMENT PLAN

WELLS HYDROELECTRIC PROJECT

Prepared by:

Bao Le
Long View Associates
Portland, Oregon

And

Beau Patterson
Public Utilities District No. 1 of Douglas County
East Wenatchee, Washington

Prepared for:

Pat Irle
Hydropower Projects Manager
Washington Department of Ecology
Yakima, Washington 98902-3452

April 2010

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Executive Summary

Under the Water Quality Standards (WQS) Chapter 173-201A of the Washington Administrative Code (WAC) criteria developed by 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 an operator of a dam 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. Ecology has approved, on a per-application basis, an interim waiver to the TDG standard (110 percent) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)).

On the Columbia and Snake rivers there are three separate standards with regard to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125 percent as measured in any one-hour period. Further, TDG shall not exceed 120 percent in the tailrace of a dam and shall not exceed 115 percent in the forebay of the next dam downstream as measured as an average of the 12 highest consecutive 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 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).

The goal of the Wells Total Dissolved Gas Abatement Plan (Gas Abatement Plan) is to implement a long-term strategy to achieve compliance with the Washington state water quality standard for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project) while continuing to provide safe passage for downstream migrating juvenile salmonids. Douglas PUD, which owns and operates the Wells Project, is submitting this Gas Abatement Plan to Washington Department of Ecology (Ecology) for approval as required for receipt of a TDG exemption at Wells Dam.

This Gas Abatement Plan summarizes the background information related to regulatory and project specific TDG information at the Wells Project (Section 1.0), discusses proposed Wells Project operations and activities related to TDG management (Section 2.0 and 3.0), and provides a summary of compliance and physical monitoring plans, the development of Quality Assurance Project Plans (QAPP), and reporting (Section 4.0).

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1.0 Introduction and Background

The Wells Hydroelectric Project Gas Abatement Plan (Gas Abatement Plan) provides details on operation and structural measures to be implemented in 2010 by Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) at Wells Dam under 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 exemption.

The goal of the Gas Abatement Plan is to implement a long-term strategy to achieve compliance with the Washington state water quality standard for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project) while continuing to provide safe passage for downstream migrating juvenile salmonids. Douglas PUD, which owns and operates the Wells Project, is submitting this Gas Abatement Plan to Washington Department of Ecology (Ecology) for approval as required for receipt of a TDG exemption at Wells Dam.

In the past, Ecology has approved Gas Abatement Plans and issued a TDG exemption at Wells Dam. Douglas PUD submitted a Gas Abatement Plan that was approved on March 27, 2003 for one year. In 2004, an extension was granted by Ecology. On March 31, 2005, Ecology approved Douglas PUD's 2005 Gas Abatement Plan allowing a TDG exemption in support of fish passage through February 2008. In 2008 and 2009, Douglas PUD again submitted Gas Abatement Plans for the fish passage seasons which were approved by Ecology (Appendix 1).

This Gas Abatement Plan summarizes the background information related to regulatory and project specific TDG information at the Wells Project (Section 1.0), discusses proposed Wells Project operations and activities related to TDG management (Section 2.0 and 3.0), and provides a summary of compliance and physical monitoring plans, the development of Quality Assurance Project Plans (QAPP), and reporting (Section 4.0).

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 is comprised of eleven spill gates that are capable of spilling a total of 1,180 kcfs. The crest of the spillways 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 top of dam elevation of 795 feet above mean sea level (msl). The system 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.

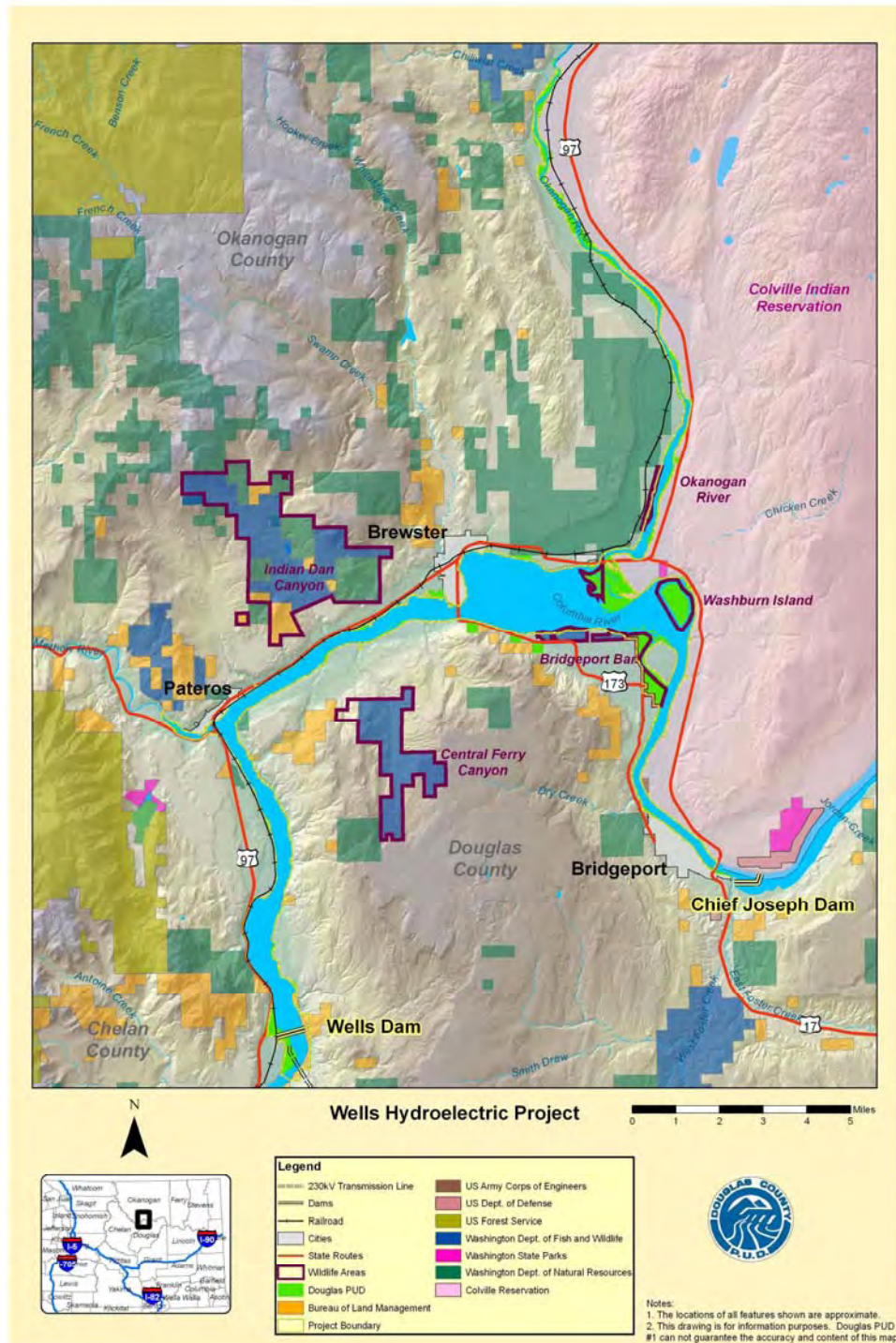


Figure 1. Map of the Wells Hydroelectric Project in Central Washington.

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 address 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. The standards allow that an operator of a dam is not held to the TDG standards when the river flow exceeds the seven-day, 10-year-frequency flood (7Q10). 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 Wells Project was computed using the hydrologic record from 1974 through 1998 and a statistical analysis to develop the number from 1930 through 1998. The United States Geological Survey (USGS) Bulletin 17B, “Guidelines for Determining Flood Flow Frequency” was followed. The resulting 7Q10 flow at Wells Dam is 246,000 cfs (Pickett 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 waiver to the TDG standard (110 percent) to allow spill for juvenile fish passage on the Columbia and Snake rivers (WAC 173-201A-200(1)(f)(ii)). On the Columbia and Snake rivers there are three separate standards with regard to the TDG exemption. First, in the tailrace of a dam, TDG shall not exceed 125 percent as measured in any one-hour period. Further, TDG shall not exceed 120 percent in the tailrace of a dam and shall not exceed 115 percent in the forebay of the next dam downstream as measured as an average of the 12 highest consecutive 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 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).

1.2.1 7Q10

The 7Q10 for this project is 246 kcfs. The Project will not be expected to comply with state water quality standards for TDG for incoming flows exceeding this value.

1.2.2 Fish Spill Season

At this time, for purposes of compliance with the WQS for TDG, the “fish spill” season is assumed to occur from April 1 through August 31; and “non-fish spill” season occurs from September 1 to March 31. During non-fish spill, the PUD will make every effort to remain in compliance with the 110 percent standards. During fish spill, the PUD will make every effort not to exceed an average of 120 percent as

measured in the tailrace of the dam. The Project also must not exceed an average of 115 percent as measured in the forebay of the next downstream dam. These averages are based on 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 spillage for fish passage. Nothing in these special conditions allows an impact to existing and characteristic uses.

1.2.3 Incoming TDG Levels

Per the TDG exemption criteria, TDG shall not exceed 115 percent in the forebay of the next dam downstream dam as measured as an average of the 12 highest consecutive hourly readings in any one day (24-hour period). During the juvenile fish passage season, TDG concentrations in the Wells Project forebay are primarily determined by the upstream water management activities of Chief Joseph Dam. In June 2000, the USACE recommended installation of flow deflectors at Chief Joseph Dam combined with the “joint operation” of Chief Joseph Dam with Grand Coulee Dam in order to provide the greatest benefit of TDG reduction in the Mid-Columbia River. Since the completion of spill deflectors at Chief Joseph Dam in 2008 and a disproportionate amount of spill from the project resulting from joint operations, relatively higher TDG concentrations are expected in the forebay of Wells Dam.

1.2.4 TMDL

In June 2004, a total maximum daily load (TMDL) report was submitted for the Mid-Columbia River and Lake Roosevelt based on a listing of the area by Washington State on its federal Clean Water Act 303(d) list due to TDG levels exceeding state water quality standards. A summary implementation strategy prepared by Ecology and the Spokane Tribe describe 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 (Pickett et. al., 2004). Many of the actions recommended by the TMDL are currently being addressed by Douglas PUD through the implementation of Habitat Conservation Plan 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 Gas Abatement Plans. A status review of the TDG TMDL is planned for 2010. Due to an increase in interest in the TDG requirements, an advisory group consisting of representatives from tribes, federal and state agencies and others, have been convened to evaluate appropriate points of compliance for this TMDL. This group is called the Adaptive Management Team (AMT).

1.3 *History of Operations and Compliance*

1.3.1 Flows

The Columbia Basin in eastern Oregon, Washington and British Columbia has climate that is best described as desert. 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. The natural hydrograph had low flows in November through January with high flows in May through July. Storage dams in the U.S. and Canada on the Columbia River and its tributaries

upstream of the Wells project capture spring and summer high flows to hold for release in the fall and winter months. There are 85,300 square miles of drainage area above Wells Dam. Table 1 presents information on Columbia River flow as measured at Wells Dam in 2009 and over the past 10 years and shows the current hydrograph of the Columbia River as controlled by upstream storage and release regimes. Because the Wells Project operates in run-of-river mode with very limited active storage, juvenile anadromous salmonid migration occurs within a regime of reduced 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 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 Federal Energy Regulatory Commission (FERC) regulatory and license requirements.

Table 1. Average monthly flows (kcfs) at Wells Dam, by month (2000-2009).

Year	Month											
	1	2	3	4	5	6	7	8	9	10	11	12
2000	145.5	116.0	101.3	146.0	149.7	121.0	118.6	109.1	83.1	73.9	93.1	104.4
2001	96.5	88.2	73.8	62.9	55.2	84.5	53.4	70.3	62.5	56.1	70.9	79.1
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
All	110.1	104.7	99.5	116.8	145.6	166.7	130.4	106.9	74.3	75.8	88.2	106.9

1.3.2 Spill Operations

1.3.2.1 General Operation

Under the Hourly Coordination Agreement, power operations for the seven dams from Grand Coulee to Priest Rapids are coordinated to meet daily load requirements through the assignment of "coordinated generation" through Central Control hosted at the Public Utility District No. 2 of Grant County (Grant PUD). Automatic control logic is used to maintain pre-set reservoir levels in order to meet load requirements and minimize involuntary spill. These pre-set reservoir levels are maintained at each project through management of a positive or negative "bias" which assigns a project more or less generation depending on whether the reservoir elevation should be increased or decreased in order to maximize system benefits and minimize involuntary spill.

1.3.2.2 Spill for Fish

Wells Dam is a hydrocombine-designed dam where the spillway is situated directly above the powerhouse. Research at Wells Dam in the mid-1980s showed that a modest amount of spill would effectively guide a high percentage of the downstream migrating juvenile salmonids through the Juvenile Bypass System (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 2.2 kcfs per spillway. During periods of extreme high flow, one or more of the JBS barriers may be removed to provide adequate spill capacity to respond to a plant load rejection.

Typically, the JBS will use approximately 6 to 8 percent of the total river flow for fish guidance. The operation of the JBS adds a negligible level 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 Habitat Conservation Plan (HCP) with NMFS. The Wells Project fish bypass system is the most efficient 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 Efficiency.

Species	% JBS Passage
Yearling (spring) Chinook	92.0
Steelhead	92.0
Sockeye	92.0
Subyearling (summer/fall) Chinook	96.2

The JBS is utilized for protection of 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. Starting in 2003, the operation of the juvenile bypass for the Wells HCP was set with fixed dates that were established based on 21 years of hydroacoustic and fyke net data. The dates for bypass operation are from April 12 through August 26. These dates bracket greater than 95% of both the spring and summer migrants. Annually, there have been as many as ten million juvenile salmonids that have migrated past Wells Dam.

Between the years 1997 and 2004, the volume of water dedicated to the JBS has ranged from 1.5 to 3.2 million acre-feet. Operation of the JBS adds a small amount of dissolved gas (0 to 2 percent) to the river while meeting a very high level of fish guidance and protection. Ecology has authorized an exemption to

the total dissolved gas standard for fish protection on the Columbia and Snake rivers. Operation of the Wells Project JBS does not produce TDG at levels that exceed the Ecology TDG exemption.

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 hydraulic capacity of the ten turbines must be passed over the spillways.

The forebay elevation at Wells Dam is set 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 690,000 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 recent historical 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 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. Hourly coordination (Section 3.2) between hydroelectric projects on the river was established to minimize this situation for spill.

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, U.S. Army Corps of Engineers, and Bonneville Power Administration) 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 was low. Historically, the Wells Project has accommodated requests to provide Gas Abatement Spill. 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 the 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

The Wells Project is a “run-of-the river” project with a relatively small storage capacity. River flows in excess of the hydraulic capacity of the ten turbines 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 Wells Project 2009 Gas Abatement Plan (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 tailrace of Wells Dam and further identify operational configurations that would minimize TDG production at the project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG fish spill waiver standards during the passage season with flows up to 7Q-10 levels (246,000 cfs; Pickett et. al. 2004). 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. 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.

River flows in 2009 were below average compared to the trailing 10-year average at the Wells Project (Table 3). Flow in 2009 was most similar to 2003-2005, and 2008. These low flow years typically begin with average flows around 100 kcfs in April, gradually increasing to 130-150 kcfs in May and June, and tapering off to below 70 kcfs in September. TDG values for low flow years are slightly lower than, but generally indistinguishable from, the 10-year average. These below average river flow years with available TDG measurements will be used comparatively in discussion, given their similarities to the 2009 monitoring season (Table 4).

From a compliance perspective, two differences are noticeable between current and past low flow years: (1) the higher frequency of out of compliance days at the Wells Forebay, resulting from operations at Chief Joseph Dam; and, (2) the evident improvement of TDG management in the Wells Tailrace through implementation of the 2009 Wells Project Spill Playbook.

Exceedances of TDG numeric criteria of water leaving Chief Joseph Dam increased from 0.2 percent in 2003, 2004, and 2005 (1 of 549 days) to 15.1 percent in 2008 and 2009 (48 of 318 days). This represents a greater than 7,500 percent increase in the frequency of exceedances in the forebay at Wells Dam during low flow years, caused by recent changes in spill and generation management at the upstream

Chief Joseph and Grand Coulee dams. Extensive spill testing, installation of tailrace flow deflectors, and the exchange of spill for generation with Grand Coulee Dam are all likely contributing factors in this dramatic increase in TDG exceedances for water entering the Wells Project (personal communication, K. Easthouse, USACE).

Despite the lack of fish passing Chief Joseph Dam, the USACE has obtained TDG waivers for fish passage in recent years. Unlike typical TDG waivers, operators at Chief Joseph Dam have been allowed a year-round exemption from WQS for TDG (personal communication, R. Turner, USACE). This has allowed increased spill at Chief Joseph Dam and waters with increased TDG levels entering the Wells Project, resulting in TDG exceedances in the forebays of both Wells and Rocky Reach dams.

Despite the additional complicating factor of incoming waters with higher concentrations of TDG in recent years, operations at the Wells Project have improved the management of TDG at downstream compliance stations. During 2009, zero exceedances occurred in the tailrace of Wells Dam (0 of 183 days). During the last four low flow years (2003-2005, and 2008), 97.5 percent of days were in compliance (18 of 714 days). The reduction of exceedances to 0 percent in the tailrace of Wells Dam was likely a result of environmental circumstances in combination with improved operations in the Wells Project. Similarly, compliance in the downstream forebay of Rocky Reach Dam was achieved 100 percent of the time during the 2009 monitoring season. During the last four low flow years, only 93.6 percent of days were in compliance (47 of 685).

Table 3. 2009 river flows compared to 10-yr average flows (in kcfs). Spring is defined as April 12 – June 30. Summer is defined as July 1 – August 26.

Season	10 Year (2000-2009) Average Flows (kcfs)	2009 Average Flows	% of 10 Year Average (%)
Spring	131.2	127.0	96.8
Summer	108.2	89.0	82.3

Table 4. Average hourly flow (kcfs) and TDG (percent saturation) during the fish spill season at the Wells Project (including tailrace and forebay) 2000-2009, by month. Years of similar river flow volume to 2009 are shaded for comparison.

YR	April		May		June		July		August		All	
	Flow	TDG	Flow	TDG	Flow	TDG	Flow	TDG	Flow	TDG	Flow	TDG
2000	146	108	150	110	121	112	119	111	109	110	121	109
2001	63	107	55	109	85	107	53	110	70	107	65	107
2002	117	108	135	110	206	119	177	119	115	112	137	112
2003	107	106	131	109	138	112	106	112	96	108	107	109
2004	87	108	114	109	132	109	101	111	96	109	101	109
2005	85	107	122	109	131	111	137	111	108	108	109	108
2006	148	108	165	115	195	120	128	115	104	109	134	113
2007	155	109	159	112	152	112	133	112	113	108	129	110
2008	90	106	159	111	207	119	135	113	86	111	123	111
2009	111	107	123	110	147	113	103	114	75	110	102	110
All	117	107	146	110	167	114	130	113	107	109	124	110

1.3.3.2 Structural

No structural modifications were proposed or conducted in the 2009 monitoring season.

1.3.4 Compliance Success in Previous Year (2009)

1.3.4.1 TDG

No hourly TDG measurements were recorded above 125 percent saturation, and the 12C-High daily values did not surpass 120 percent on any given day in the tailrace of Wells Dam. The 12C-High values at the forebay of Rocky Reach Dam did not surpass 115 percent on any given day when incoming waters from Chief Joseph Dam were in compliance (12C-High < 115 percent in the forebay of Wells Dam) (Table 5). Although 2009 was a relatively low flow year compared to the past 10 years, management of TDG levels in the Wells Project showed substantial improvements over similar years of river flow. The improvement of TDG management, despite an increasing frequency of TDG exceedances in water entering the Wells Project, is confirmation that the newly implemented 2009 Wells Project Spill Playbook is providing a useful means to meet WQS within the Wells Project.

Table 5. Summary of Spill and TDG Compliance in 2009. Spring is defined as April 12 – June 30. Summer is defined as July 1 – August 26.

Season	Average Daily % Spill	Average Daily Spill Volume (kcfs)	Wells Tailrace TDG Compliance (%)	Rocky Reach Forebay TDG Compliance (%)
Spring	6.8	134.4	100	100
Summer	7.8	90.6	100	100

2.0 Proposed Operations and Activities

2.1 *Operational Spill*

2.1.1 Minimizing Involuntary Spill

Based on the success of last year's operations associated with implementation of the Wells Project Spill Playbook, those operations will be followed again this year. The 2009 playbook is attached as Appendix 2.

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)(Table 6). The Wells Anadromous Fish Agreement and Habitat Conservation Plan (Douglas PUD 2002) is the Wells Project's fisheries management plan for anadromous salmonids, and directs operations of the Wells JBS in order to achieve the NNI standard for HCP Plan Species. The Wells JBS is the most efficient juvenile fish bypass system on the mainstem Columbia River (Skalski et al. 1996).

Table 6. 1998 -2000 Wells Hydroelectric Project Juvenile Survival Study Results.

Species	% Project Survival
Yearling (spring) Chinook	96.2
Steelhead	96.2

The HCP requires juvenile project survival studies to be repeated at Wells Dam in 2010. Final results of those studies may suggest the use of additional passage tools including the use of voluntary spill if necessary to reach survival goals of the HCP. 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 ¹ – 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 2010, 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 potentials for exceedances of the TDG numeric criteria and impacts to aquatic life associated with TDG.

2.2.2 Biological Monitoring

Douglas PUD will work with the Washington Department of Fish and Wildlife hatchery programs to monitor the occurrence of Gas Bubble Trauma (GBT) on adult broodstock collected for hatchery needs. Upon collection of brood, hatchery staff will inoculate each fish, place a marking identification tag on them and look for any fin markings or unusual injuries. NMFS has shown that 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.” Thus, biological sampling at Wells Dam of adult broodstock will only occur when hourly TDG levels in the mid-Columbia exceed 125 percent.

At most hydroelectric projects on the Columbia River, a juvenile migrant sampling station is incorporated into the JBS. This allows for the external observation of fish for signs of GBT. The signs of GBT are bubbles under the skin of the fish along the fin rays and near the eye sockets. While juvenile migrants are the choice fish for sampling when inspecting for GBT, the JBS at Wells Dam does not have facilities incorporated to allow for juvenile fish sampling and observation. As in past years, 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 juvenile sampling facility at Rocky Reach Dam.

¹ Phase III = Dam survival >95% or project survival >93% or combined juvenile and adult survival >91% (Standard Achieved).

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 meetings is to address regional water quality issues. This forum allows regional coordination for monitoring, measuring, and evaluating water quality in the Columbia 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 2009, 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, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). These meetings, ranging from the Transboundary Gas Group to Columbia Basin meetings with the USACE, allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia Basin. Douglas PUD will continue its involvement in such forums to further improve coordination with other regional water quality managers as detailed in section 5.1.2.

3.0 Structural Activities

No structural modifications related to spill are scheduled to occur at the Wells Project in 2010.

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 being conducted by University of Iowa/IIHR have also confirmed that the tailrace monitoring station is located at a site representative of the river, 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 commenced on April 1 and will continue until September 15 annually. This monitoring period will encompass the operation of the Wells JBS as well as the time period river flows are at their highest and when a majority of forced spill occurs. Throughout this period, data from both forebay and tailrace sensors are transmitted by slave 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. Total dissolved gas 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 U.S. Army Corps of Engineers 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 twelve maximum hour TDG averages.

4.1.2 Water Temperature

Douglas PUD has been monitoring water temperatures throughout the Wells Reservoir and in the Wells Dam tailrace year round since 2005. Temperature monitoring locations are provided in Table 8. Temperature monitoring through the reservoir and the inundated portions of tributary streams will be performed with Onset® Tidbit thermographs.

Table 8. List of Wells Reservoir and tributary temperature monitoring stations.

River	Side/Mile	Location
Columbia	Left / 515.6	Wells Forebay*
Columbia	Left / 530	Near Brewster
Columbia	Left / 535.3	Brewster Flats
Columbia	Left / 544.5	Chief Joseph Tailrace
Columbia	Left/515.5	Wells Dam Tailrace
Columbia	Right/515.5	Wells Dam Tailrace
Methow	Right / 2.8	Near Pateros
Okanogan	Center / 10.5	Near Monse
Methow	Center/0.4	Mouth of Methow
Okanogan	Center/1.3	Mouth of Okanogan

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 both 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. 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 site visit, to inspect the instrument and repair or replace if necessary.

4.2.2 Water Temperature

QA/QC measures will be accomplished through calibration of thermographs at the beginning and end of a period of sensor deployment. As part of the QA/QC process, data anomalies will be identified and removed from the data set. Sensors will be deemed unreliable if calibration against a Bureau of Standard accuracy thermometer shows a variance of $\pm 0.2^{\circ}\text{C}$. Thermographs will be swapped out quarterly (every three months) with recently tested sensors to avoid data loss.

4.3 Reporting

Upon approval of the Wells Gas Abatement Plan and issuance of a Wells Project TDG exemption, Douglas PUD shall submit an annual report describing the results of all monitoring activities described within this Gas Abatement Plan. The report will be submitted to Ecology no later than December 31 of each year that the TDG exemption is active. The report will summarize all Gas Abatement Plan activities conducted for the year in which it is submitted as required by Ecology.

5.0 Conclusions

Pending approval by Ecology, implementation of the measures identified within the 2010 Gas Abatement Plan are intended to serve as a long-term strategy to maintain compliance with the Washington state water quality standard 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.
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- 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.
- 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.

7.0 Appendices

Appendix 1. Letter from Pat Irle on Gas Abatement Plan for 2009.



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

15 W Yakima Ave, Ste 200 • Yakima, WA 98902-3452 • (509) 575-2490

June 4, 2009

Josh Murauskas
Douglas County PUD No. 1
1151 Valley Mall Boulevard
East Wenatchee, WA 98802

RE: Wells Hydropower Project No. 2149
2008 Annual Gas Abatement Report and
2009 Gas Abatement Plan

Dear Josh Murauskas:

The 2009 Gas Abatement Plan for the Wells Dam is hereby approved for the 2009 fish spill season.

The results presented in the 2008 Gas Abatement Report and in other studies Douglas Public Utility District (PUD) has done over the recent months as part of the re-licensing effort are truly appreciated.

As we discussed recently, it would be helpful if the mid-Columbia PUDs could meet with Ecology to coordinate on format and content of the Gas Abatement Plans (GAPs) and Gas Abatement reports.

Following are comments on the 2008 ("annual") Gas Abatement Report. We expect these problems will be addressed in the draft and final Gas Abatement reports for the 2009 fish spill season. We would like to meet with the PUD to discuss the content of the draft report shortly after we receive it.

I. General Comments

We really appreciate the inclusion of the "2009 Playbook" as part of the GAP. This provides very useful information.

NOTED
JUN 05 2009
MEH



The 2008 GAP required that the following be included in the (annual) Gas Abatement Report (see Section 5.3 h):

- i. Flow and TDG levels, on a daily basis, with purpose of spill (e.g., fish spill, turbine down time.)
- ii. Summary of exceedances and what was done to correct the exceedances.
- iii. Results of the fish passage efficiency (FPE) studies and survival per the Habitat Conservation Plan (HCP).

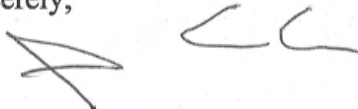
It is very important that this information be included in the next (2009) Annual Gas Abatement Report. Note that the purpose of spill is to be provided for each day.

II. More Specific

- 1) Table 4.0-1 could be made more useful to help determine: a) compliance with state water quality standards; b) impacts of incoming flows on compliance; and/or c) impacts of operation on compliance.
- 2) Section 4.2.4, last sentence, says the PUD "has adopted a policy of not accepting in [sic] Gas Abatement Spill at Wells Dam". What does this mean? Did you mean "not any"? Or something else?
- 3) Please describe the locations of "WELW" (page 13) and "WEL" (page 15).
- 4) Need section in Chapter 4 that describes the 2008 fish management activities and any results or comments provided by the PUD at the water quality meetings.
- 5) It seems more appropriate to put the discussion of the historical TDG monitoring in the forebay (page 15, first paragraph) in Section 4, "History of Operations and TDG Compliance Monitoring".
- 6) Where are the adult broodstock collected (page 16)?

Please let me know if you have any questions or suggestions.

Sincerely,



Pat Irle
Hydropower Projects Manager
Water Quality Program

Appendix 2. Wells Hydroelectric Project Spill Playbook, 2010.

Memorandum

To: Ken Pflueger, Mike Bruno, Dub Simmons, Arlen Simon, Hank Lubean
From: Joshua Murauskas, Shane Bickford, Duncan Hay (Oakwood Consultants)
Date: April 21, 2009
Subject: Wells Dam Spill Playbook, 2009

Douglas PUD has conducted several modeling assessments aimed at gaining a better understanding of the effect of spill operations on the production, transport and mixing of TDG in the Wells Dam tailrace.

Results indicate that:

1. Concentrated spill operations (as opposed to spread) reduce TDG production and increase degasification at the tailwater surface.
2. 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.
3. 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 will create flows that are surface oriented, ultimately promoting degasification at the tailwater surface.

The attached Spill Strategy is based on these principles and the preferred operating conditions will help achieve compliance with the Washington State water quality standards. Further details are provided in the *Wells Hydroelectric Project Updated Study Report* Document submitted to the FERC on April 15th, 2009.

I. No Forced Spill

The Wells Dam JBS (even numbered spillbays, 10.0 kcfs total) should be operated continuously throughout the juvenile salmon outmigration (normally April 12 to August 26). 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).

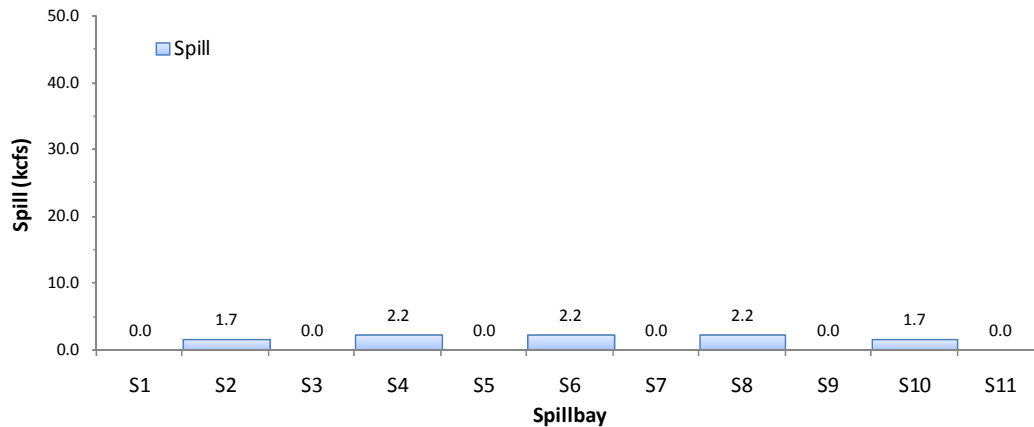


Figure 1. Operational configuration under no forced spill (JBS only).

II. Forced Spill (≤ 53.0 kcfs)

As forced spill increases, Project Operators should allocate all spill through *S7* until the maximum capacity is reached through that spillbay (~43.0 kcfs). 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.

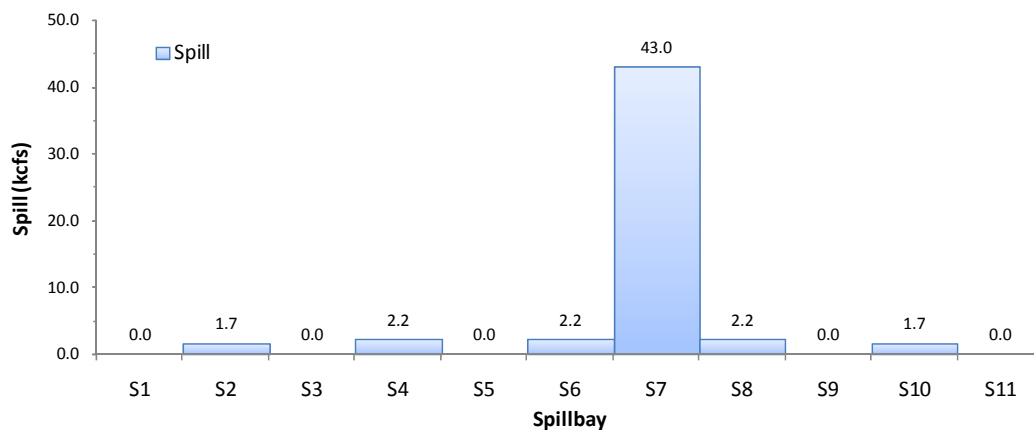


Figure 2. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

III. Forced Spill (> 53.0 kcfs)

After S7 reaches 43.0 kcfs, spill should be allocated to S5. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S7 must be relocated to S5 (Figure 3). As flow increases, spill should continually increase through S5 until paired with S7 (e.g., 28.0 kcfs through S5 and S7). After this point (66.0 kcfs), both S5 and S7 can be increased until both spillbays have reached 43.0 kcfs (96.0 kcfs, Figure 4).

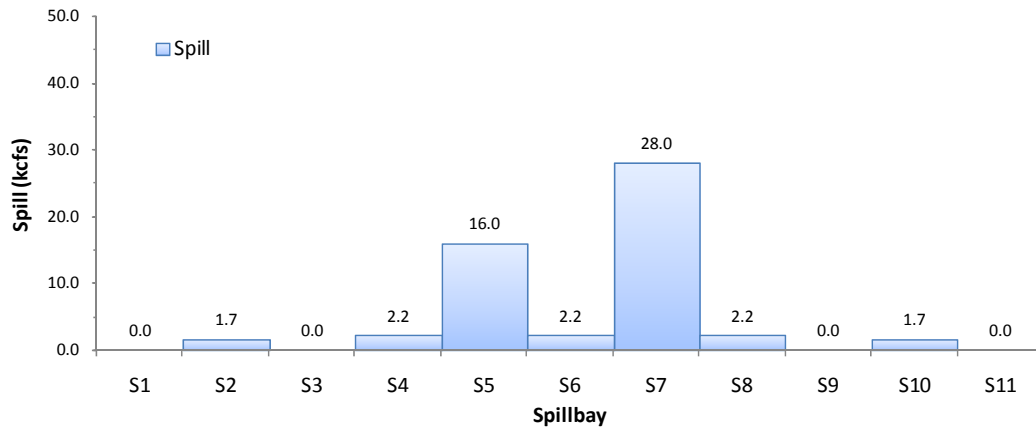


Figure 3. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (54.0 kcfs of total spill), 16.0 kcfs is allocated through S5 in order to engage the submerged spillway lip.

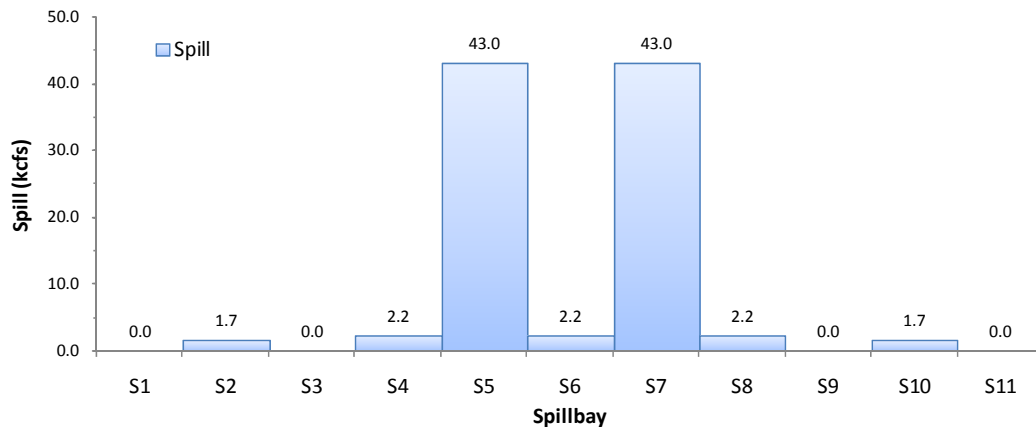


Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (96.0 kcfs of spill), 43.0 kcfs is allocated through both S5 and S7.

IV. Forced Spill (> 96.0 kcfs)

After both S5 and S7 reach 43.0 kcfs, spill should be allocated to S9. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S5 should be relocated to S9 (Figure 5). As flow increases, spill can be continually increased through S5 until paired with S9 (28.0 kcfs through S5 and S9, while S7 continues at 43.0 kcfs). After this point, both S5 and S7 can be increased until both spillbays have reached 43.0 kcfs, equal to discharge through S7 (139.0 kcfs, Figure 6).

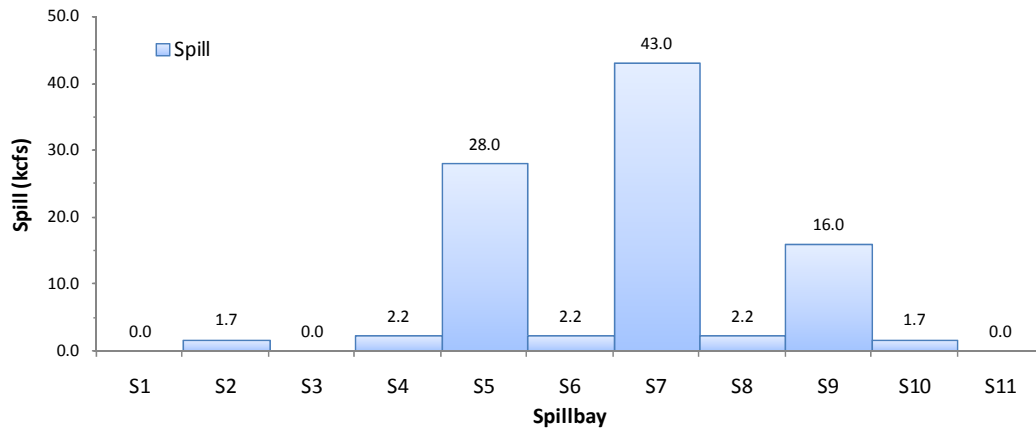


Figure 5. Operational configuration under forced spill > 96.0 kcfs (including JBS). In this instance (97.0 kcfs of total spill), 16.0 kcfs is allocated through S9 in order to engage the submerged spillway lip.

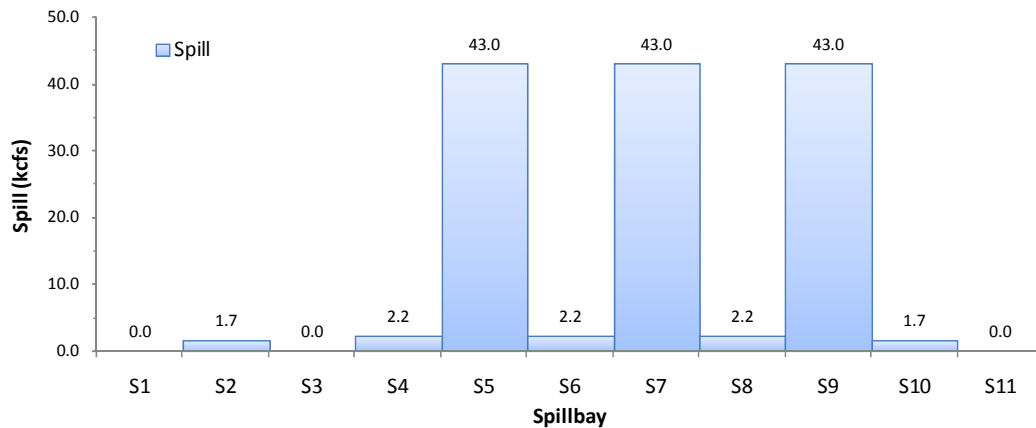


Figure 6. Operational configuration under forced spill > 96.0 kcfs (including JBS). In this instance (139.0 kcfs of total spill), 43.0 kcfs is allocated through S5, S7, and S9.

V. Forced Spill (> 96.0 kcfs) and JBS Barriers in S6 Removed

After both S5 and S7 reach 43.0 kcfs, spill can also be allocated to S6, provide the JBS barrier has been removed. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S5 (or S9 if scenario IV is in play) should be relocated to S6 (Figure 7). As flow increases, spill can be continually increased through S5 until paired with S6 (30.0 kcfs through S5 and S6, while S7 continues at 43.0 kcfs). After this point, both S5 and S6 can be increased until all three spillbays have reached 43.0 kcfs(136.8 kcfs of spill, Figure 8).

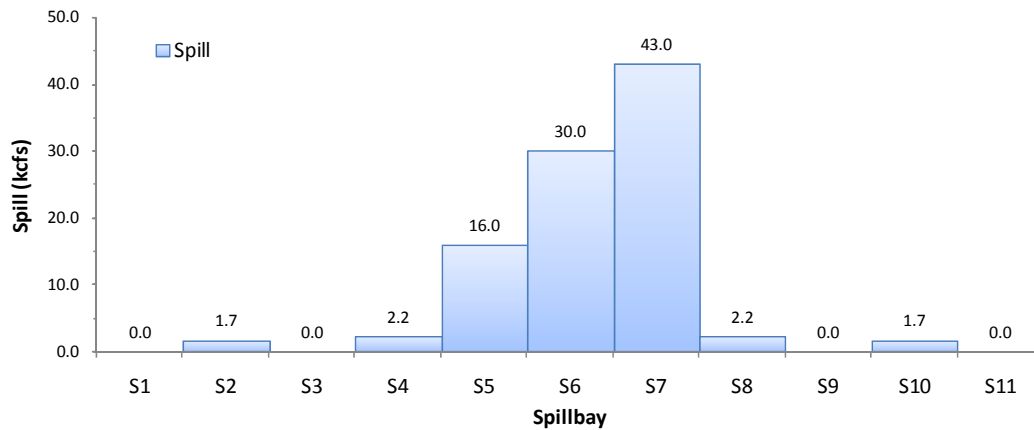


Figure 7. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in S6). In this instance (96.8 kcfs of total spill), spill from S5 is relocated to S6 to maintain concentrated flow with S7. A spill of 16.0 kcfs is maintained in S5 as to engage the spillway lip below the ogee.

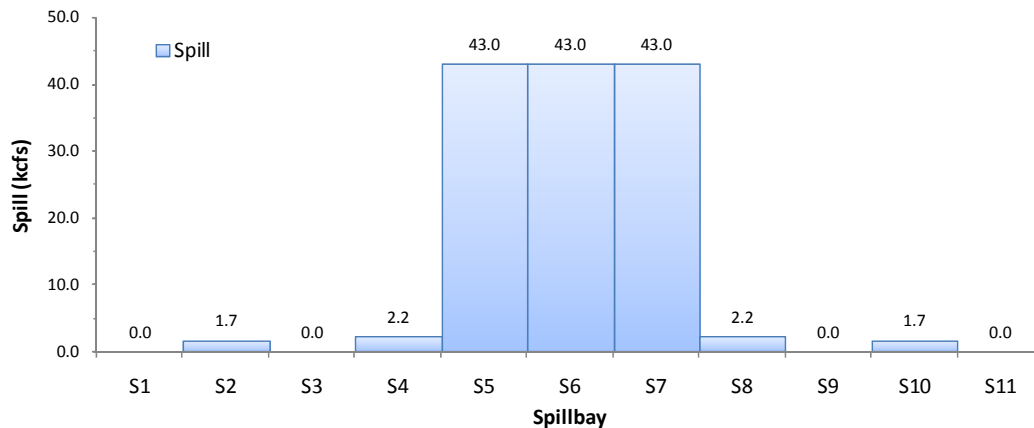


Figure 8. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in S6). In this instance (136.8 kcfs of total spill), 43.0 kcfs is allocated through S5, S7, and S9.

VI. Forced Spill (> 139.0 kcfs)

Forced spill exceeding 139.0 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 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).

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.	20.0	0.0	1.7	0.0	2.2	0.0	2.2	10.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), max.	53.0	0.0	1.7	0.0	2.2	0.0	2.2	43.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs), min.	54.0	0.0	1.7	0.0	2.2	16.0	2.2	28.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs), max.	96.0	0.0	1.7	0.0	2.2	43.0	2.2	43.0	2.2	0.0	1.7	0.0
IV. Spill (> 96.0 kcfs), min.	97.0	0.0	1.7	0.0	2.2	28.0	2.2	43.0	2.2	16.0	1.7	0.0
IV. Spill (> 96.0 kcfs), max.	139.0	0.0	1.7	0.0	2.2	43.0	2.2	43.0	2.2	43.0	1.7	0.0
V. Spill (> 96.0 kcfs, S6 JBS out), min.	96.8	0.0	1.7	0.0	2.2	16.0	30.0	43.0	2.2	0.0	1.7	0.0
V. Spill (> 96.0 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 (> 139.0 kcfs), min.	140.0	0.0	1.7	16.0	2.2	43.0	2.2	43.0	2.2	28.0	1.7	0.0
V. Spill (> 139.0 kcfs), max.	-	<p><i>Operators may adjust as needed.</i></p> <p><i>TDG exemption in place when total river flows exceed 246.0 kcfs.</i></p>										

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 S7, S5, S9, and S3 (in that order).

Appendix 2. Letter of 2010 GAP approval from Washington Department of Ecology



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY

15 W Yakima Ave, Ste 200 • Yakima, WA 98902-3452 • (509) 575-2490

April 9, 2010

Beau Patterson
Douglas County PUD No. 1
1151 Valley Mall Boulevard
East Wenatchee, WA 98802

RE: Wells Hydropower Project No. 2149
2010 Total Dissolved Gas Abatement Plan

Dear Beau -

The 2010 Total Dissolved Gas Abatement Plan for Wells Dam is hereby approved for the 2010 fish spill season, in accordance with WAC 173-201A- 200(1)(f)(ii).

Two minor comments:

- 1) The draft Gas Abatement Plan report for this year should be submitted to Washington State Department of Ecology (Ecology) by October 31, 2010.
- 2) The next annual draft Gas Abatement Plan (for 2011) should be submitted to Ecology by February 28th, 2011, at the latest, so that we can prepare comments and Douglas County Public Utility District can address those comments by April 1st, 2011, the date that fish spill is expected to begin.

Thanks for your high quality work.

Sincerely,

Pat Irle
Hydropower Projects Manager
Water Quality Program



Appendix 3. Example Hach® HYDROLAB MiniSonde calibration report from the 2010 monitoring season



Calibration Report

Client: Public Utility District No. 1 of Douglas County

Date: 26-Jul-10 **Site:** WEL
Arrival Time: 10:10
Departure Time: 10:45

Calibration Type: Field

Date: 26-Jul-10 **Time:** 10:20

BP Station:
735.7 mmHg

	Std	Initial	Final
Temperature	17.85	17.8	N / C
TDG 100%	735.7	737	N / C
TDG 113%	835.7	836	N / C
TDG 126%	935.7	936	N / C
TDG 139%	1035.7	1037	N / C
TDG membrane ID	DPUD-10-01		
Integrity Check	Pass		

Comments:



Calibration Report

Client: Public Utility District No. 1 of Douglas County

Date: 26-Jul-10 **Site:** WELW
Arrival Time: 11:15
Departure Time: 11:55

Calibration Type: Field

Date: 26-Jul-10 **Time:** 11:35

BP Station:
736 mmHg

	Std	Initial	Final
Temperature	19.3	19.2	N / C
TDG 100%	736	737	N / C
TDG 113%	836	837	N / C
TDG 126%	936	937	N / C
TDG 139%	1036	1037	N / C
TDG membrane ID	DPUD-10-02		
Integrity Check	Pass		

Comments:

Appendix 4a. Wells Project 2010 Spill Playbook

Memorandum

To: Ken Pflueger, Mike Bruno, Dub Simmons, Arlen Simon, Hank Lubean
From: Shane Bickford, Beau Patterson, Duncan Hay (Oakwood Consultants)
Date: June 11, 2010
Subject: Wells Dam Spill Playbook, 2009-2010

Douglas PUD has conducted several modeling assessments aimed at gaining a better understanding of the effect of spill operations on the production, transport and mixing of TDG in the Wells Dam tailrace.

Results indicate that:

1. Concentrated spill operations (as opposed to spread) reduce TDG production and increase degasification at the tailwater surface.
2. 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.
3. 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 will create flows that are surface oriented, ultimately promoting degasification at the tailwater surface.

The attached Spill Strategy is based on these principles and the preferred operating conditions will help achieve compliance with the Washington State water quality standards. Further details are provided in the *Wells Hydroelectric Project Updated Study Report* Document submitted to the FERC on April 15th, 2009 and in the 2010 Gas Abatement Plan submitted and approved by Ecology in April 2010.

I. No Forced Spill

The Wells Dam JBS (even numbered spillbays, 10.0 kcfs total) should be operated continuously throughout the juvenile salmon outmigration (normally April 12 to August 26). 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).

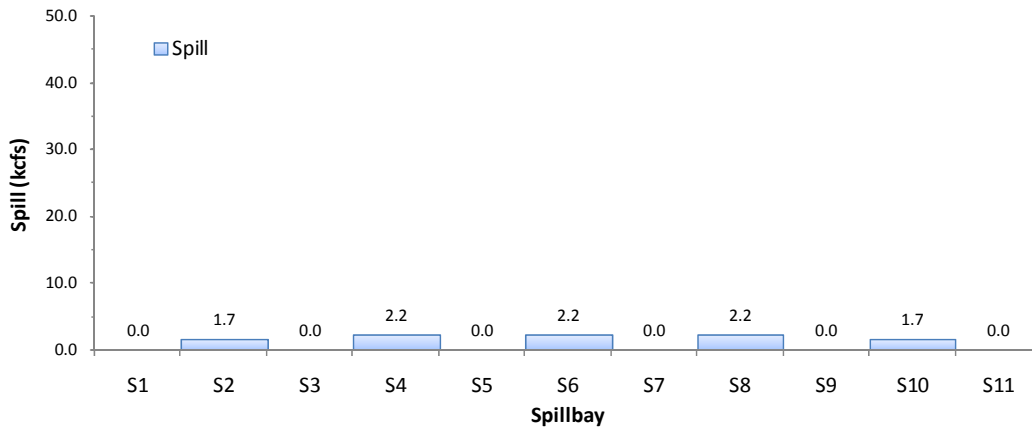


Figure 1. Operational configuration under no forced spill (JBS only).

II. Forced Spill (≤ 53.0 kcfs)

As forced spill increases, Project Operators should allocate all spill through *S7* until the maximum capacity is reached through that spillbay (~43.0 kcfs). 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.

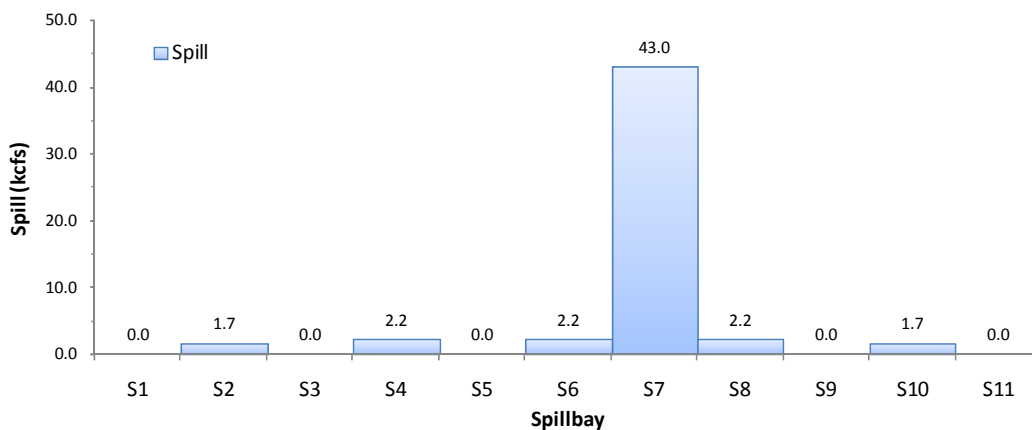


Figure 2. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

III. Forced Spill (> 53.0 kcfs)

After S7 reaches 43.0 kcfs, spill should be allocated to S5. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S7 must be relocated to S5 (Figure 3). As flow increases, spill should continually increase through S5 until paired with S7 (e.g., 28.0 kcfs through S5 and S7). After this point (66.0 kcfs), both S5 and S7 can be increased until both spillbays have reached 43.0 kcfs (96.0 kcfs, Figure 4).

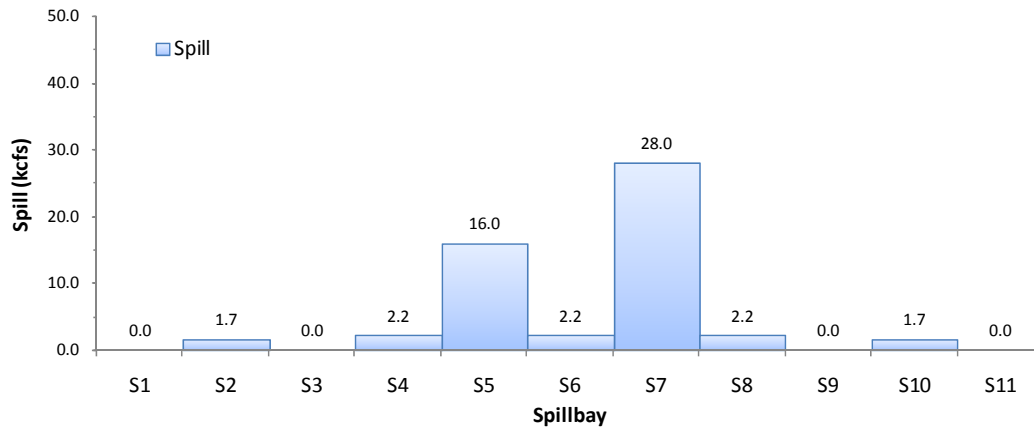


Figure 3. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (54.0 kcfs of total spill), 16.0 kcfs is allocated through S5 in order to engage the submerged spillway lip.

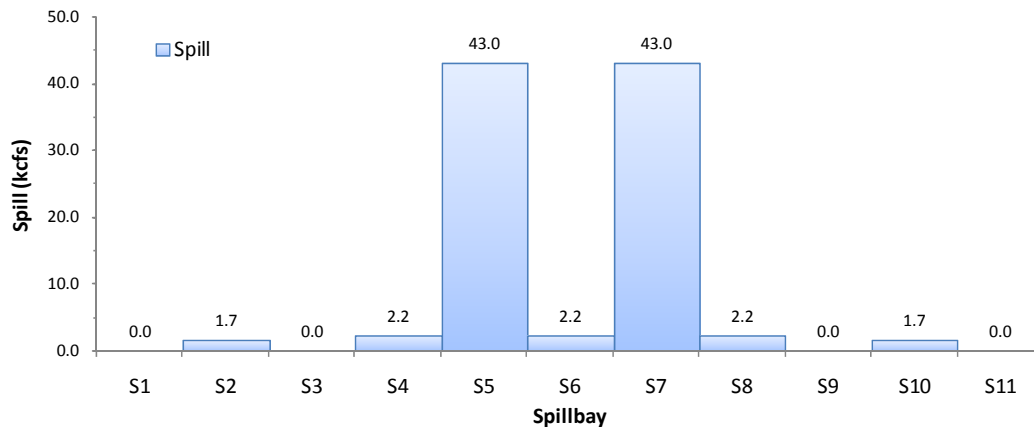


Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (96.0 kcfs of spill), 43.0 kcfs is allocated through both S5 and S7.

IV. Forced Spill (> 96.0 kcfs)

After both S5 and S7 reach 43.0 kcfs, spill should be allocated to S9. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S5 should be relocated to S9 (Figure 5). As flow increases, spill can be continually increased through S5 until paired with S9 (28.0 kcfs through S5 and S9, while S7 continues at 43.0 kcfs). After this point, both S5 and S7 can be increased until both spillbays have reached 43.0 kcfs, equal to discharge through S7 (139.0 kcfs, Figure 6).

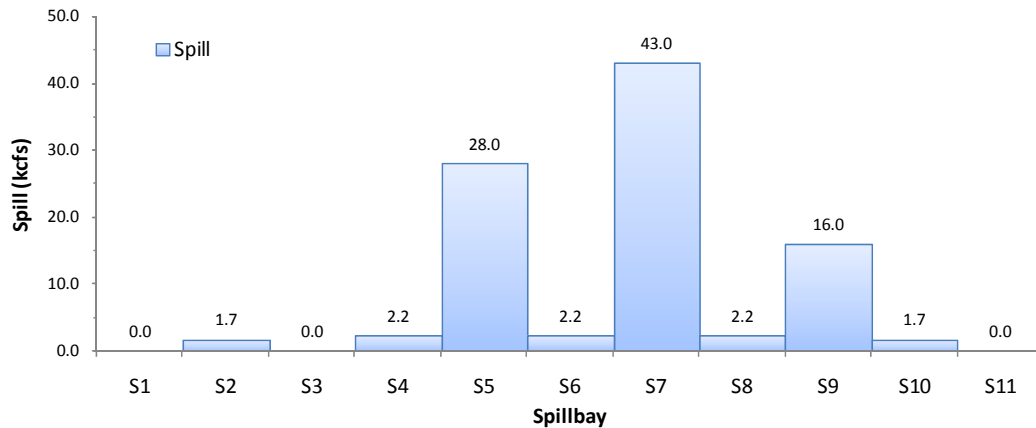


Figure 5. Operational configuration under forced spill > 96.0 kcfs (including JBS). In this instance (97.0 kcfs of total spill), 16.0 kcfs is allocated through S9 in order to engage the submerged spillway lip.

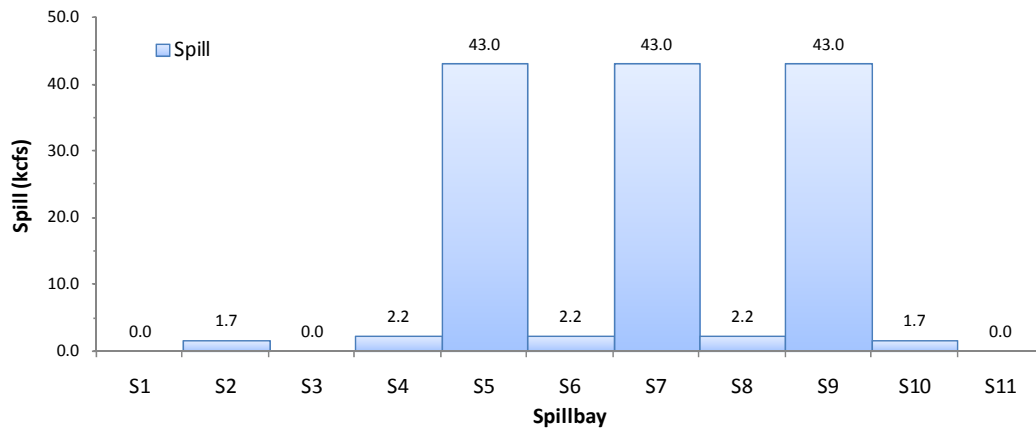


Figure 6. Operational configuration under forced spill > 96.0 kcfs (including JBS). In this instance (139.0 kcfs of total spill), 43.0 kcfs is allocated through S5, S7, and S9.

V. Forced Spill (> 96.0 kcfs) and JBS Barriers in S6 Removed

After both S5 and S7 reach 43.0 kcfs, spill can also be allocated to S6, provide the JBS barrier has been removed. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S5 (or S9 if scenario IV is in play) should be relocated to S6 (Figure 7). As flow increases, spill can be continually increased through S5 until paired with S6 (30.0 kcfs through S5 and S6, while S7 continues at 43.0 kcfs). After this point, both S5 and S6 can be increased until all three spillbays have reached 43.0 kcfs(136.8 kcfs of spill, Figure 8).

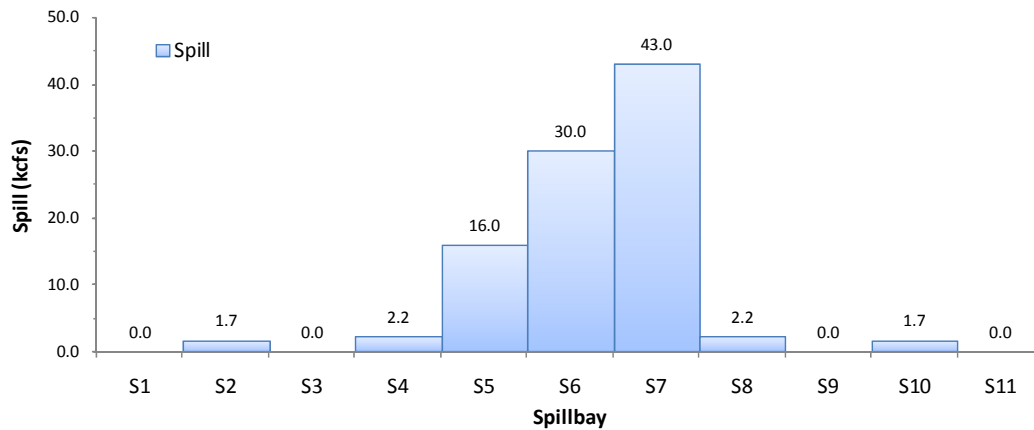


Figure 7. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in S6). In this instance (96.8 kcfs of total spill), spill from S5 is relocated to S6 to maintain concentrated flow with S7. A spill of 16.0 kcfs is maintained in S5 as to engage the spillway lip below the ogee.

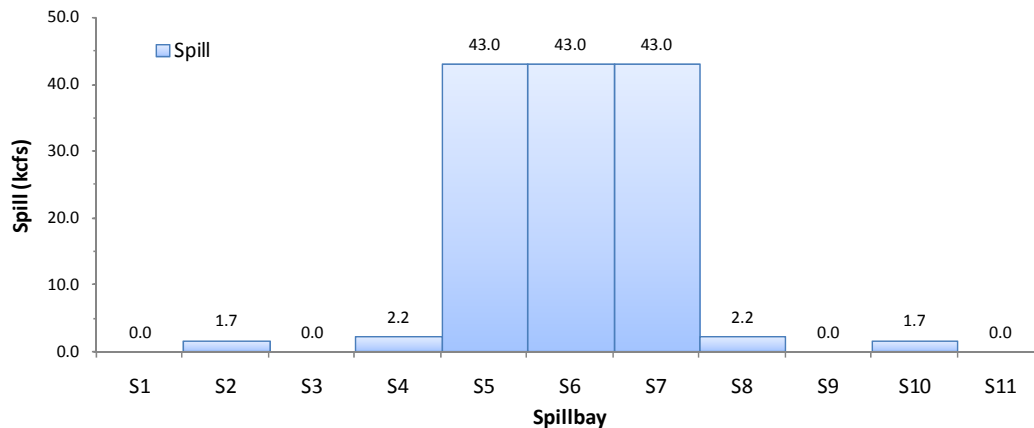


Figure 8. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in S6). In this instance (136.8 kcfs of total spill), 43.0 kcfs is allocated through S5, S7, and S9.

VI. Forced Spill (> 139.0 kcfs)

Forced spill exceeding 139.0 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 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).

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.	20.0	0.0	1.7	0.0	2.2	0.0	2.2	10.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), max.	53.0	0.0	1.7	0.0	2.2	0.0	2.2	43.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs), min.	54.0	0.0	1.7	0.0	2.2	16.0	2.2	28.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs), max.	96.0	0.0	1.7	0.0	2.2	43.0	2.2	43.0	2.2	0.0	1.7	0.0
IV. Spill (> 96.0 kcfs), min.	97.0	0.0	1.7	0.0	2.2	28.0	2.2	43.0	2.2	16.0	1.7	0.0
IV. Spill (> 96.0 kcfs), max.	139.0	0.0	1.7	0.0	2.2	43.0	2.2	43.0	2.2	43.0	1.7	0.0
V. Spill (> 96.0 kcfs, S6 JBS out), min.	96.8	0.0	1.7	0.0	2.2	16.0	30.0	43.0	2.2	0.0	1.7	0.0
V. Spill (> 96.0 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 (> 139.0 kcfs), min.	140.0	0.0	1.7	16.0	2.2	43.0	2.2	43.0	2.2	28.0	1.7	0.0
V. Spill (> 139.0 kcfs), max.	-	<p><i>Operators may adjust as needed.</i></p> <p><i>TDG exemption in place when total river flows exceed 246.0 kcfs.</i></p>										

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 S7, S5, S9, and S3 (in that order).

Appendix 4b. Wells Project 2010 Spill Playbook, 2010 Mid-season Revision

Memorandum

To: Ken Pflueger, Mike Bruno, Dub Simmons, Arlen Simon, Hank Lubean, Tom Kahler
From: Beau Patterson, Shane Bickford
Date: July 1, 2010
Subject: Wells Dam Spill Playbook, 2010 mid-season revision

On June 11, Shane provided the 2010 Wells Dam Spill Playbook. Since then, we have had a few exceedances of hourly (125% max) and 12C-High (120% max) TDG concentrations in the tailrace, and more prolonged exceedances in the Rocky Reach forebay (115% max). These are likely due to a complex interaction of record cool temperatures, very high seasonal precipitation, unusual operations of the upstream dams, and dentated spill patterns at Wells when spill exceeds 53kcfs. As a result, we are changing the 2010 spill playbook to improve compliance with state and federal water quality standards for TDG.

These changes are included in the accompanying 2010 Spill Playbook, which replaces the June 11 version. Items of note:

When spill levels are expected to reach the 53 kcfs threshold, the District should remove the Juvenile Bypass System barriers in spillbay 6 in order remain in compliance with the TDG standards in the Wells tailrace and Rocky Reach forebay. There is no change in spill operations for spill less than 53 kcfs, except the JBS barrier in spillbay 6 has been removed to allow for quick response to spill requirements in excess of that amount. When spill exceeds 53 kcfs, excess spill is directed through spillbays 6 and 7 rather than through spillbays 5 and 7.

Please contact Shane or Beau if there are any questions. If spill is projected to no longer exceed 53kcfs for the remainder of the fish spill season, the spillbay 6 JBS barrier should be reinstalled. Anything you can do to maximize flow through the turbines, and minimize forced spill in excess of the JBS spill, will improve the gas situation.

Thank you for your patience and understanding as we try to determine how to best manage TDG at Wells Dam.

I. No Forced Spill

The Wells Dam JBS (even numbered spillbays, 10.0 kcfs total) should be operated continuously throughout the juvenile salmon outmigration (normally April 12 to August 26). 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).

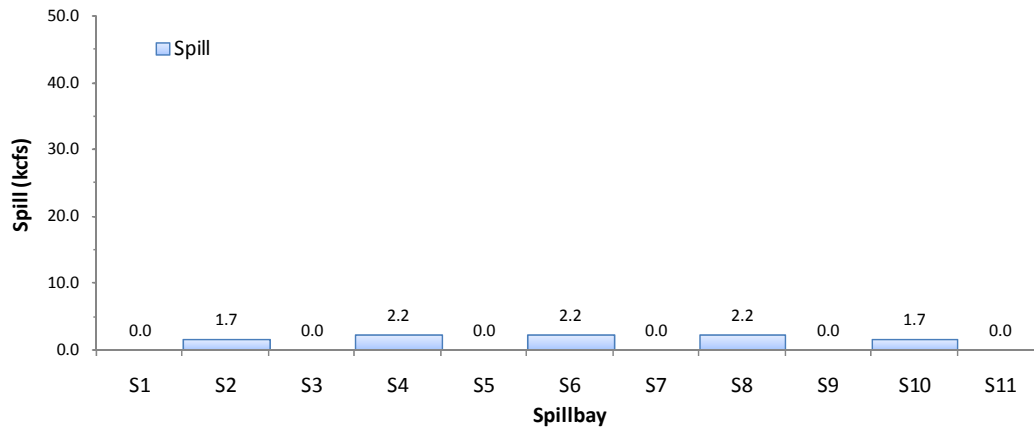


Figure 1. Operational configuration under no forced spill (JBS only).

II. Forced Spill (≤ 53.0 kcfs)

As forced spill increases, Project Operators should allocate all spill through *S7* until the maximum capacity is reached through that spillbay (~43.0 kcfs). 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.

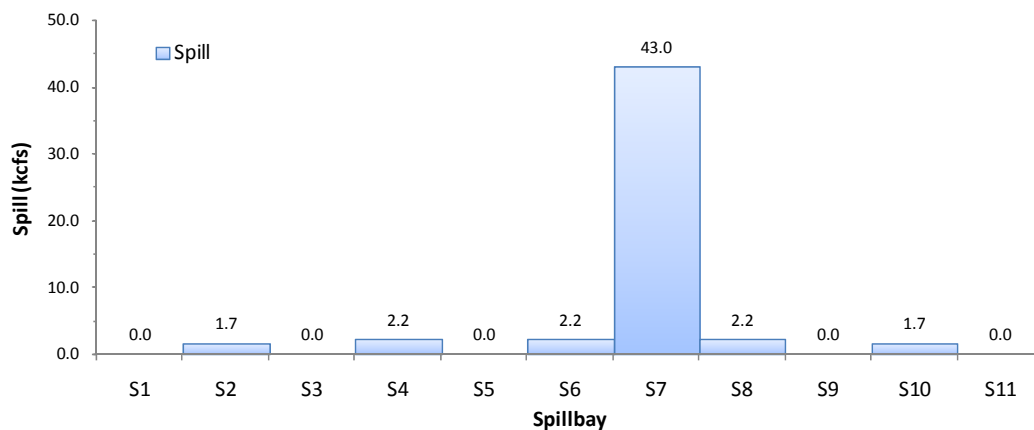


Figure 2. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

III. Forced Spill (> 53.0 kcfs) and JBS Barriers in S6 Removed

After S7 reaches 43.0 kcfs, spill should be allocated to S6, following the required removal of the JBS barriers in S6. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through S7 must be relocated to S6 (Figure 3). As flow increases, spill should continually increase through S6 until paired with S7 (e.g., 28.0 kcfs through S6 and S7). After this point (63.8 kcfs), both S6 and S7 can be increased until both spillbays have reached 43.0 kcfs (93.8 kcfs, Figure 4).

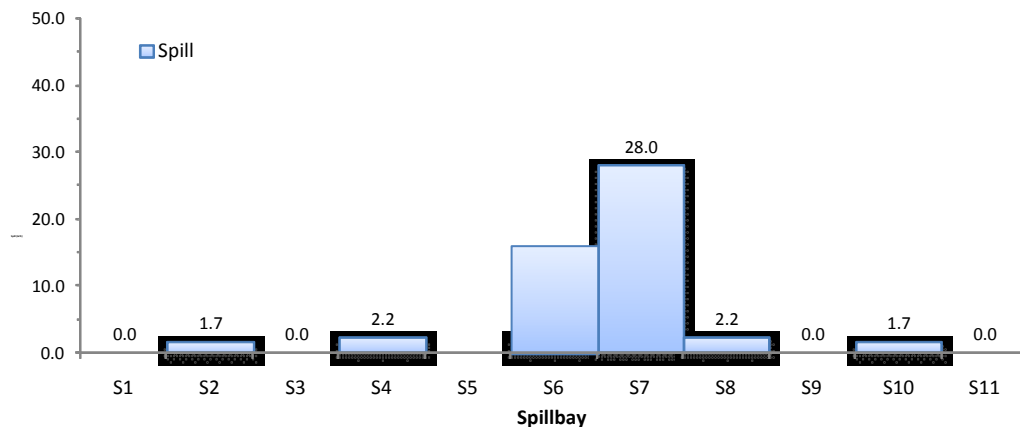


Figure 3. Operational configuration under forced spill > 53.0 kcfs (including JBS flow, with removal of JBS barriers in S6). In this instance (54.0 kcfs of total spill), 18.2 kcfs is allocated through S6 in order to engage the submerged spillway lip.

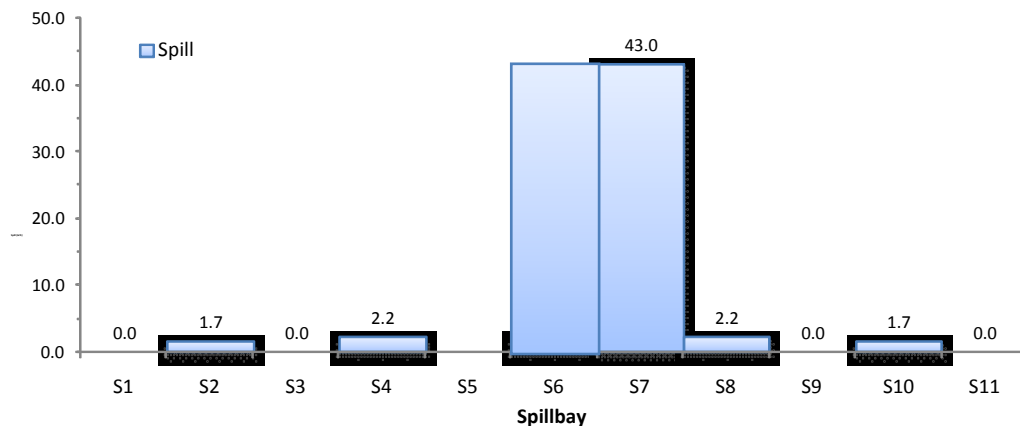


Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (93.8 kcfs of spill), 43.0 kcfs is allocated through both S6 and S7.

IV. Forced Spill (> 93.8 kcfs)

After both S6 and S7 reach 43.0 kcfs, spill can also be allocated to S5. 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 S5 (Figure 7). As flow increases, spill can be continually increased through S5 until paired with S6 (30.0 kcfs through S5 and S6, while S7 continues at 43.0 kcfs). After this point, both S5 and S6 can be increased until all three spillbays have reached 43.0 kcfs(136.8 kcfs of spill, Figure 8).

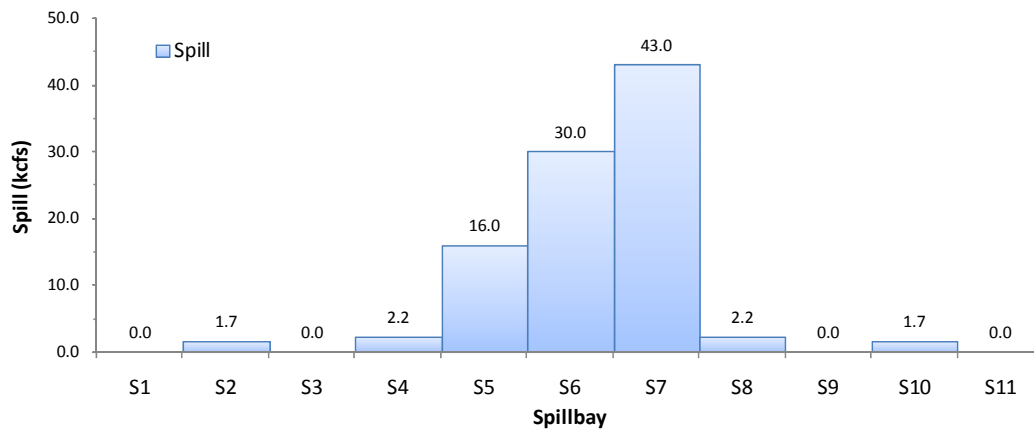


Figure 5. Operational configuration under forced spill > 96.0 kcfs. In this instance (96.8 kcfs of total spill), spill from S5 is relocated to S6 to maintain concentrated flow with S7. A spill of 16.0 kcfs is maintained in S5 as to engage the spillway lip below the ogee.

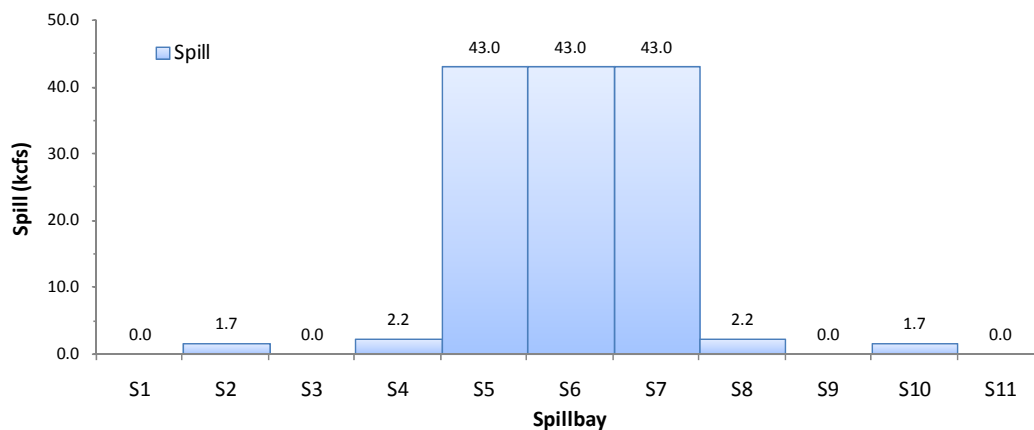


Figure 6. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in S6). In this instance (136.8 kcfs of total spill), 43.0 kcfs is allocated through S5, S6, and S7.

V. 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 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).

I. Spill Lookup Table

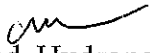
Operation	Total Spill	Spillbay Number										
		S1 -	S2 JBS	S3	S4 JBS	S5	S6 JBS	S7	S8 JBS	S9	S10 JBS	S11 -
I. No Forced Spill	10.0	0.0	1.7	0.0	2.2	0.0	2.2	0.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), min.	11.0	0.0	1.7	0.0	2.2	0.0	2.2	1.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), max.	53.0	0.0	1.7	0.0	2.2	0.0	2.2	43.0	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	0.0	15.0	31.2	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	0.0	43.0	43.0	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	15.0	38.8	43.0	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	28.2	43	43.0	2.2	0.0	1.7	0.0
V. Spill (> 137.0 kcfs), max.	-	<p><i>Operators may adjust as needed.</i></p> <p><i>TDG exemption in place when total river flows exceed 246.0 kcfs.</i></p>										

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 S7, S6, S5, S9, and S3 (in that order).

Appendix 5. Letter from Washington Department of Ecology describing 12C-High TDG calculation

April 2, 2008

TO: Columbia and Snake River Dam Spill Operators

FROM: Chris Maynard,  Hydropower Coordinator, Washington State Department of Ecology

RE: Method for averaging 12 consecutive daily average high IDG readings in any one day

I have been asked to clarify how Ecology expects operators to measure TDG during fish passage spill on the Columbia and Snake Rivers.

Washington's previous 1997 total dissolved gas (TDG) Water Quality Standards (WQS) for fish spill on the Snake and Columbia Rivers required TDG measurements to be taken at least hourly and the 12 highest measurements averaged over the course of a day. A day was assumed to be a 24 hours period although the start and end time were never clearly defined. The operators averaged measurements and reported based on a calendar day, starting at 12:a.m. and ending at 12 am. The term 'day' did not need to be defined because averaging any high TDG from midnight to midnight captured all high IDG readings. Often the high readings for tailraces would occur during the early hours after midnight and in the evening hours with a period of lower readings in between during the day. This is because fish spill often occurs more at night.

The revised 2006 Washington WQS require measuring the average of the 12 highest *consecutive* hours in any one day. This is because at 120% TDG or less, studies have shown that aquatic organisms experience the most TDG harm from consecutive exposure, not intermittent exposure throughout a 24 hour period. High TDG and corresponding spills tend to occur during consecutive blocks of time. Measuring midnight to midnight breaks up the consecutive period of nightly high TDG.

Beginning during the 2008 spill season, the operators should use the following method to average and report the 12 consecutive hourly high TDG reading in a day:

Method: Use a rolling average to measure 12 consecutive hours. The highest 12 hour average in 24 hours is reported on the calendar day (ending at midnight) of the final measurement.

- The first averaging period of each calendar day begins with the first hourly measurement at 1:00 a.m. This hour is averaged with the previous day's last 11 hourly measurements.
- Each subsequent hourly measure is averaged with the previous 11 hours until there are 24 averages for the day.
- From the 24 hour averages, the highest average is reported for the calendar day.
- Round 12 hour average to nearest whole number.

Rationale for the rolling average: The standards say "in any one day", but a day need not be a calendar day. Defining a day as starting at a set hour (like midnight) and ending 24 hours later leaves only twelve 12-hour blocks to average within 24 hours. If a period ends at midnight, night spill TDG measurements would be cut off during the middle of the night and the consecutive readings of the highest spill period would not be averaged since the period from 12 midnight on would not be counted with the previous day. So a rolling 12-hour average makes the most sense. This method best captures consecutive hours of high IDG not only below dams that spill at night, but also for dams that vary their hours of spill from nighttime. It also captures consecutive forebay reading which measure IDG from the upstream dam hours later.

The accompanying table shows an example of how the TDG should be tracked and averaged as a rolling average. It shows what hours will be reported for a day: the highlighted green and blue hours are those that are averaged each hour to report as May 19th. The first period evaluated for May 19th reporting begins with the first hour's measurements of the day. Since the previous 12 hour measurements are needed for a consecutive average, eleven of those hours (in the first highlighted column) will necessarily occur on May 18th. The next hour's measurement is then evaluated with the eleven hours previous, and so on through the day until the last measurement at midnight. There are now twenty-four averaging periods, and the highest average (ending at 2: a.m. May 19th) is chosen to report for May 19th.

Cc: Agnes Lut, ODEQ
Margaret Filardo, FPC
WQT
Pat Irle, Ecology
Marcie Mangold, Ecology