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Via Electronic Filing

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

February 22, 2018

Subject: Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2017 Annual Report – License Article 401 (b)

Dear Secretary Bose:

Pursuant to Article 401(b) of the Federal Energy Regulatory Commission (FERC) license for the Wells Hydroelectric Project (Wells Project), the Public Utility District No. 1 of Douglas County (Douglas PUD) hereby submits the final Total Dissolved Gas Abatement Plan Annual Report (TDG Report) for calendar year 2017. Article 401(b) requires Douglas PUD to file an annual TDG Report with the FERC by February 28th during each year of the new license.

The final 2017 TDG Report is attached as Appendix A to this letter. A draft version of this 2017 TDG report was distributed to the Washington State Department of Ecology (Ecology) and all of the other parties to the Aquatic Settlement Agreement (ASA) including the United States Fish and Wildlife Service (USFWS), U.S. Bureau of Land Management (BLM), Washington State Department of Fish and Wildlife (WDFW), the Confederated Tribes of the Colville Reservation (CCT) and the Confederated Tribes and the Bands of the Yakama Nation (YN). No comments were received during the 30 day comment period. Following review, all parties present during the February 14, 2018 Aquatic SWG conference call approved the 2017 TDG Report. The pre-filing consultation record supporting the review and approval of the 2017 TDG Report can be found in Appendix B.

The enclosed 2017 TDG Report is consistent with (1) the Water Quality Management Plan that is contained within the ASA, (2) Condition 6.7(2)(c)(iii) of Ecology's Clean Water Act section 401 Water Quality Certification (401 Certification), and (3) the National Marine Fisheries Service Endangered Species Act Incidental Take Statement (ITS) Reasonable and Prudent Measure No. 2 for the Wells Project.

If you have any questions or require further information regarding the enclosed report, please feel free to contact Andrew Gingerich at (509) 881-2323, andrewg@dcpud.org.

Sincerely,

Shane Bickford
Natural Resources Supervisor

Enclosure:

1) Appendix A – Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2017 Annual Report

2) Appendix B – Pre-filing consultation record for the Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2017 Annual Report

Cc: Breean Zimmerman – Ecology, Union Gap
Scott Carlon – NMFS, Portland
Wells Aquatic Settlement Work Group
Tom Kahler – Douglas PUD
Andrew Gingerich – Douglas PUD

APPENDIX A

WELLS HYDROELECTRIC PROJECT TOTAL DISSOLVED GAS ABATEMENT PLAN 2017 ANNUAL REPORT

Wells Hydroelectric Project
Total Dissolved Gas Abatement Plan

2017 Annual Report

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

Prepared for:

Washington Department of Ecology
1250 West Alder Street
Union Gap, WA 98903-0009

And

Aquatic Settlement Work Group

January 2018

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1 INTRODUCTION

The 2017 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on February 3, 2017 and subsequently approved by the Federal Energy Regulatory Commission (FERC) on April 13, 2017. The GAP and its associated measures represent a long-term strategy to achieve compliance with the Washington State Water Quality Standard (WQS) criteria for total dissolved gas (TDG) in the Columbia River at the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids. This annual report concludes the 2017 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2017. In addition, this report contains TDG performance for the Wells Project during the 2017 fish passage season, and TDG performance outside of the fish passage season. Data summarized in this report includes monitoring from January 1, 2017 to December 31, 2017.

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 of Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. The hydrocombine is 1,130 feet long, 168 feet wide and has a top of dam elevation of 795 feet above mean sea level (msl). Upstream fish passage facilities are located on both sides of the hydrocombine.

The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends 1.5 miles up the Methow River and 15.5 miles up the Okanogan River. The surface area of the reservoir is 9,740 acres with a gross storage capacity of 331,200 acre-feet and usable storage of 97,985 acre-feet at the normal maximum water surface elevation of 781 feet msl.

1.2 Fixed Monitoring Site Locations

Fixed monitoring stations (FMS) for TDG are located above and below Wells Dam. The forebay station (WEL) is located midway across the deck of Wells Dam (47° 56’ 50.28” N, 119° 51’ 54.78” W). The tailrace station (WELW) is located on the left bank of the Columbia River 2.6 miles downstream of Wells Dam (47° 54’ 46.86” N, 119° 53’ 45.66” W). In the spring of 2014, Douglas PUD installed a third FMS at Washburn Island (WSBW; 48° 5' 17.15" N, 119°40' 33.82" W), located approximately 7 miles

downstream of Chief Joseph Dam. Hach® or Hydrotech HYDROLAB MiniSonde (MS5) instruments equipped with TDG and temperature probes are deployed approximately 15 feet below normal surface water elevation and are calibrated monthly. Data from the three stations are automatically transmitted by radio to Wells Dam, stored, forwarded to the USACE, and posted to the Douglas PUD public webpage (www.douglaspud.org). Weather data are recorded by Global Water, Inc. instrumentation, including an electronic barometer located on the deck of Wells Dam at 810 feet elevation. All three FMS are geographically represented by yellow pins in Figure 1.

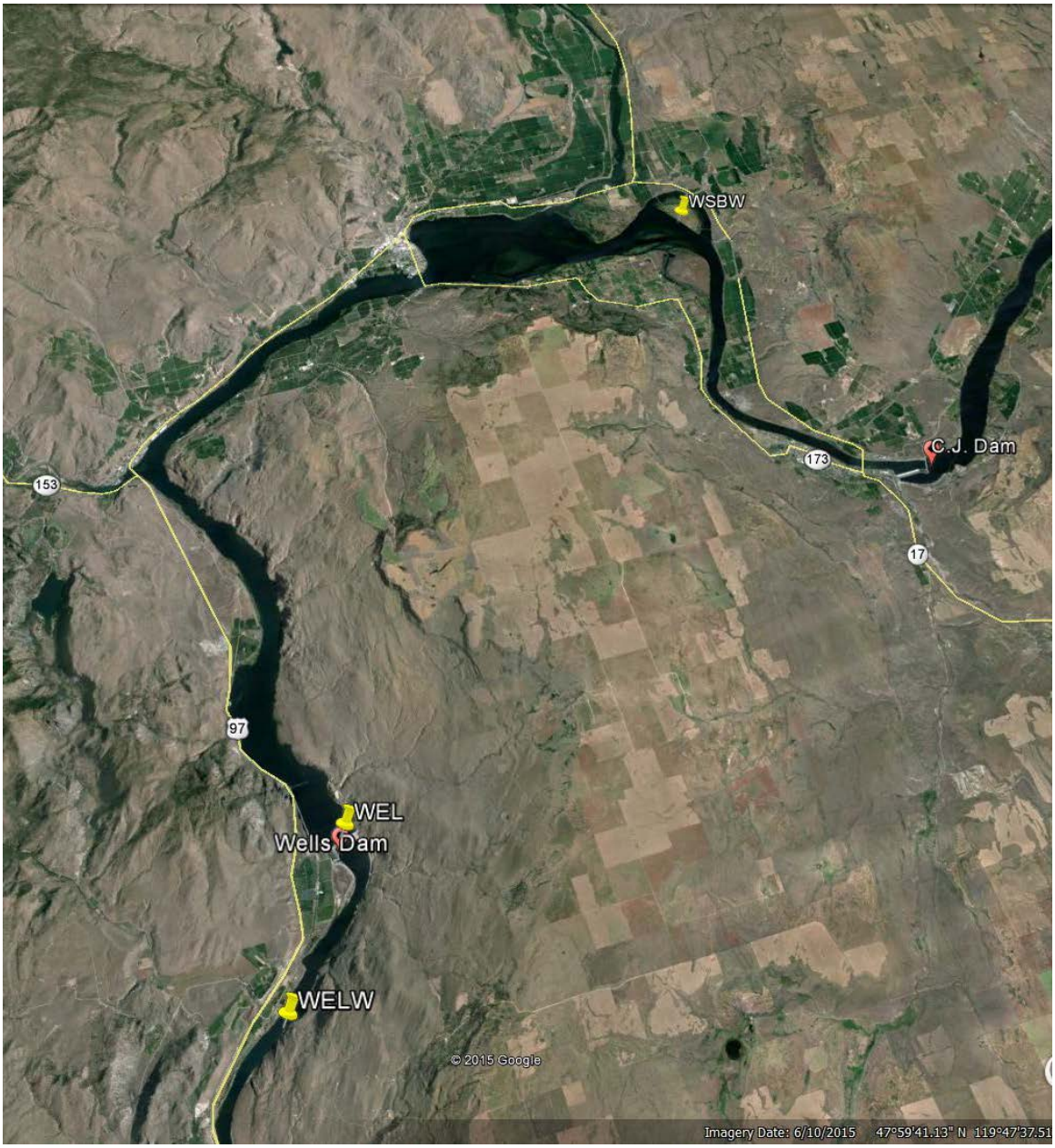

Figure 1. TDG fixed monitoring stations (yellow pins) above and below the Wells Project

1.3 Regulatory Framework

Washington Administrative Code (WAC) Chapter 173-201A identifies the WQS for surface waters in Washington State. Per the WQS, TDG measurements shall not exceed 110% saturation at any point of measurement in any state water body. The WQS provides for two exceptions to this rule: (1) for spill over dams to increase survival of downstream migrating juvenile salmon; and (2) during natural flood flows.

Ecology may approve an adjustment to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; provided that spill aids in the survival of migratory fish. The TDG adjustment is considered by Ecology on a per-application basis and must be accompanied by an approved GAP and biological monitoring plan (WAC 173-201A-200(1) (f) (ii)). On the Columbia and Snake rivers, the TDG exception for fish passage has three standards during the fish passage 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 (12C-High); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings. Natural flood flows are identified by periods in which river flow volume exceeds the highest seven consecutive day average observed during a ten-year period, called the 7Q-10 flow. The 7Q-10 flow for the Wells Project is 246,000 cubic feet per second (cfs), based on the hydrologic records from 1930 to 1998 and the USGS Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Pickett et al. 2004). When river flow volume exceeds 7Q-10 flows, the WQS established in the WAC do not apply.

1.4 2016 Gas Abatement Plan Approach

1.4.1 Operational

Based on the success of 2009 and 2010 operations associated with implementation of the Wells Project Spill Playbook (Spill Playbook), those operations were implemented between 2011 and 2017 with minor modification as described below.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Additional recommendations for 2011-2017 operations, from a TDG management perspective, included:

1. Minimize spill.
2. Forced Spill (≤ 53.0 kcfs). Switch the priority for forced spill less than 53 kcfs from spillbay 7 to spillbay 5 during the rebuild of turbine unit 7. Turbine units 4 and 5 were operational and should be operated to support spill from spillbay 5.

3. If spill exceeds 53 kcfs, or is predicted to exceed 40 kcfs for more than 8 hours, remove the Juvenile Bypass System (JBS) barriers in spillbay 6.

4. When spill exceeds 30 kcfs in spillbay 5 and JBS barriers have been removed in spillbay 6, shift at least 15.0 kcfs from spillbay 5 to spillbay 6 (i.e., 27.2 kcfs and 15.0 kcfs through spillbays 5 and 6, respectively). Support spill through spillbays 5 and 6 by operating turbine units 4, 5 and 6.

5. Reinstall the JBS barriers if total spill is predicted to remain below 40 kcfs for more than four days.

Modifications were based on previous adaptive operational results, model predictions, and operational contingencies, including the prolonged rebuild of turbine unit 7 at Wells Dam. In 2017, the GAP recommended moving spill back to the spillbays above turbine unit 7 when forced spill exceeded 53 kcfs, since turbine unit 7 was returned to commercial operation and deemed sufficiently reliable to be operating throughout the 2017 juvenile fish bypass season. Using these modifications, Wells Dam has demonstrated high TDG compliance with the WAC and WQS.

1.4.2 Structural

No permanent structural modifications were proposed or conducted in the 2017 monitoring season. High flows in the first part of the bypass period required several removals and installations of bypass barriers at Wells Dam in 2017. Bypass barrier 2 was installed and prior to the onset of the bypass season in April and remained installed through termination in August. Bypass barrier 4 followed the same schedule as bypass barrier 2 however it was removed on 7/5 to remove trash racks on unit 4 and reinstalled on 7/12 (to accommodate unit 4 maintenance). Bypass barrier 6 was not installed until April 25 because spill conditions met removal criteria at the beginning of the bypass period. Bypass barrier 6 was removed again on 5/6 due to high involuntary spill, and returned to service on 7/3 for the remainder of the bypass period. Like bypass barrier 6, bypass barrier 8 was installed on 4/19 because spill conditions met removal criteria at the beginning of the bypass period. Bypass barrier 10 was installed on 4/10. Barriers 8 and 10 remained in service for the balance of the bypass period once installed. Removal and reinstallation of the JBS barriers follows the requirements of the FERC approved Spill Playbook, Bypass Operating Plan and Wells Dam Emergency Action Plan (EAP).

1.4.3 Consultation

In early 2016 Ecology designated a new 401 Certification and Hydro-project Manager for the Wells Project. In previous years, Douglas PUD directed all correspondence related to TDG compliance to Ecology's Hydropower Projects Manager located in the Central Region Office (Yakima, Washington 98902). Beginning with the 2016 Annual Report, Douglas PUD has since directed all correspondence related to TDG compliance to the Hydropower Projects Manager in Union Gap, Washington (98903). In addition, Douglas PUD annually consults with the Aquatic Settlement Work Group (Aquatic SWG) and HCP Coordinating Committee (HCP CC) for specific TDG and WQS documents per Douglas PUD's Wells Project 401 Water Quality Certification (401 Certification) and FERC license requirements.

2 OPERATIONS

2.1 Description of Fish-Passage Season Flow

The Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) required Douglas PUD to provide juvenile fish bypass passage opportunities for greater than 95% of the downstream migrating juvenile fish covered by the HCP (Plan Species). The HCP defined juvenile fish passage season starts April 1st and runs through August 31st of each year. Douglas PUD annually reviews fish passage statistics and uses that information to tune operations during subsequent years toward ensuring that greater than 95% of the juvenile outmigration is afforded a non-turbine passage route around Wells Dam. Based upon prior year information, the juvenile fish bypass was started on April 9 (0:00 hrs) and ended at midnight on August 19th. As required, TDG performance was monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil) and made available on Douglas PUD's public webpage (http://douglaspud.org/wells-project/total-dissolved-gas-and-temperature-monitoring). Historical data continues to be available for download at both of these websites.

Data from 1969 to 2017 show that average monthly flows between April and August ranged from 105.7 to 163.7 kcfs at the Wells Project (Table 1; Figure 2). During this time period, flows tend to be greater in June and lowest in August. Flows at the run-of-river Wells Project are determined by upstream storage releases at the Grand Coulee Hydroelectric Project, with typically less than 10% of the total river flow provided by the two rivers that flow into the Columbia River within the Wells Project (Okanogan and Methow Rivers).

Table 1. Monthly average river discharge (kcfs) from the Wells Project, 1969-2017.

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Mean
2017	125.5	118.3	157.6	**203.8**	230.9	200.5	122.8	93.6	73.5	56.8	73.6	95.5	129.4
Average since 1969	108.8	107.8	107.7	119.3	151.3	163.7	134.4	105.7	75.1	75.3	87.7	101.2	111.3
Minimum since 1969	67.4	69.9	56	51.9	55.2	73.7	53.4	63.9	53.5	56	63.8	72.6	
Maximum since 1969	159.2	180.7	193.9	**203.8**	262.6	348.7	253.8	181.3	123	108.9	110	149	
10YR mean (2006-2017)	106.7	98.4	105.3	134.9	165.6	180.4	146.8	107.1	66.6	66.6	85.7	100	113.7

Average monthly flows in 2017 set an average monthly flow record since 1969 with an average of 203.8 kcfs in flow past Wells Dam during the month (Bold values Table 1). Observed flows in April 2017 were 1.7 times higher than average flows recorded in the month since 1969 (203.8 kcfs vs 119.3 average since 1969). 2017 flows during the months of March, April, and May were generally much higher than average historical averages (Figure 2). Specifically, during the months of March, April, and May, flows were 1.46, 1.71, and 1.53 times higher than historical averages during these spring months in 2017. Starting in late June flows retuned to near average for the balance of the year (Figure 2).

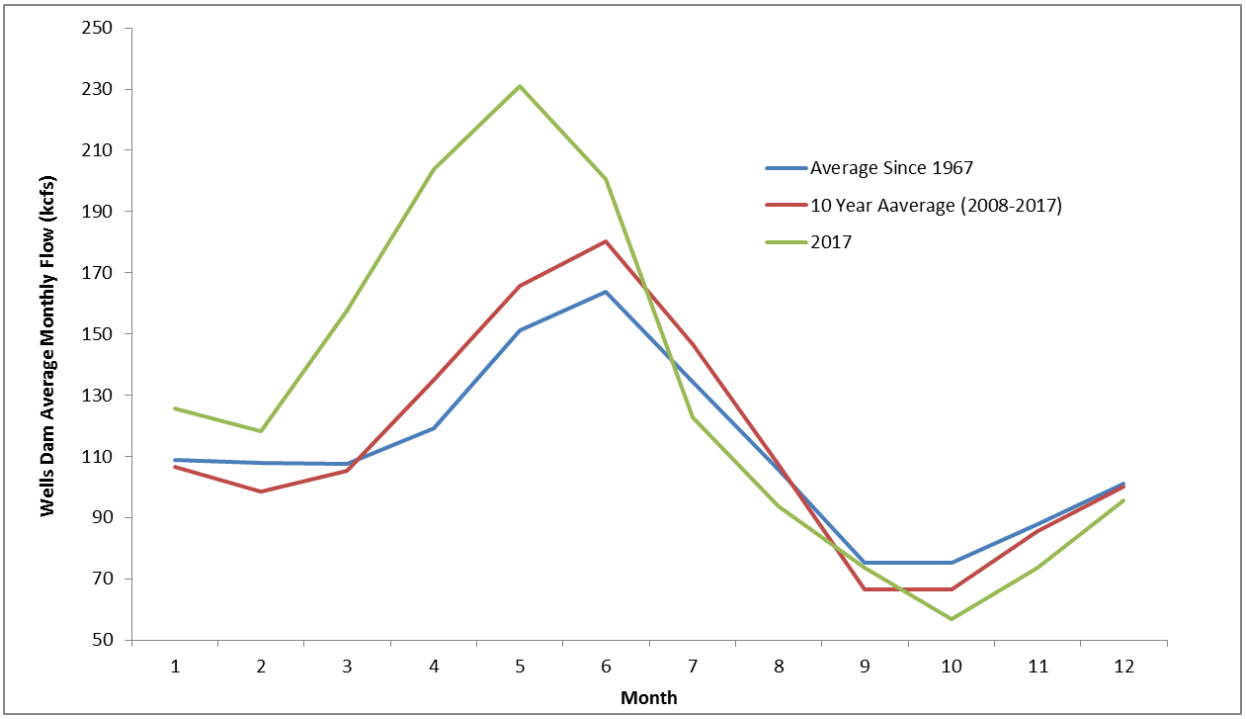

Figure 2. 2017 monthly flows compared to historic normal and averages.

2.2 Fish Bypass Program

Wells Dam is a hydrocombine, where the spillbays are located directly above the turbine water passages. Research at Wells Dam in the mid-1980s demonstrated that a modest amount of spill could be used to effectively guide a high proportion of the downstream migrating juvenile salmon away from the turbines and into a surface oriented bypass system. A JBS was subsequently developed at Wells in the late 1980s. The Wells Dam JBS was engineered based on biological research and hydraulic modeling, and utilizes constricting flow barriers deployed in five of the eleven spillbays to effectively attract and safely guide fish through the project. The Wells Project JBS has since proven to be the most efficient system on the mainstem Columbia River, providing high levels of fish protection and survival that has met approval from various fisheries agencies and tribes (Skalski et al. 1996). The passage and survival performance measures contained within the FERC approved HCP have been consistently exceeded, with a three-year survival average of 96.2% for juvenile steelhead and Chinook salmon (Bickford et al. 2001).

The results from a fourth year of survival study at Wells Dam in 2010 (Bickford et al. 2011) confirmed past study results by documenting that survival through the entire Wells Project is in excess of 96.4% for juvenile spring migrating anadromous fish (see Section 3.1.2 below).

2.3 Fish Bypass Spill Quantities and Duration

The Wells Dam JBS uses up to 2,200 cfs of water for each of the five bypass/spillbays. Under normal conditions, the JBS will use roughly five to eight percent of the total river flow for fish guidance. The increased spill has a small influence on TDG production (~0-2%) while providing a safe and highly effective, non-turbine passage route for over 92% of the spring and 96% of the summer migrating juvenile salmonids. The HCP defined juvenile fish migration period runs from April 1st to August 31st of each year. From 2003 to 2011 the HCP CC directed the District to operate the JBS on a fixed schedule between April 12 and August 26 in an effort to provide a non-turbine passage route for at least 95% of the spring and summer migration of juvenile salmonids. The HCP CC retains annual operating oversight that includes the potential to operate the JBS as early as April 1 and as late as August 31 to ensure that 95% of the spring and summer migration of juvenile salmonids are provided a safe, non-turbine passage route over Wells Dam. Any spill that occurs between April 1st and August 31st is deemed to have a beneficial effect on migrating juvenile salmonids.

In 2012, Douglas PUD evaluated past performance of the Wells Dam JBS operating dates relative to observed annual run timing (at the Rocky Reach Bypass) for both spring and summer migrants. With that data, a request was made to and granted by the HCP CC to revise the bypass operating dates in 2012 to start April 9 and end August 19. These dates were therefore used in 2012-2017 to operate the fish bypass system for migrating juvenile salmonids. Juvenile anadromous salmonids that pass Wells Dam before and after the bypass system is shut down for the year benefit from spill at the Project and therefore Douglas PUD annually develops a GAP and conducts biological and physical monitoring in order to obtain an Ecology approved TDG adjustment for the entire juvenile salmonid migration period (April 1st to August 31st).

3 IMPLEMENTATION RESULTS

3.1 Fisheries Management

3.1.1 Fish Passage Efficiencies

No new fish passage efficiency studies were conducted at the Wells Project in 2017. However, three years of bypass efficiency studies have shown the Wells Dam JBS to be the most efficient juvenile salmonid collection system in the Columbia River with fish passage efficiencies up to 92% for spring migrants and up to 96% for summer migrants (comprised of steelhead, spring Chinook, and sockeye salmon, and summer/fall Chinook salmon, respectively; Skalski et al. 1996).

3.1.2 Survival Studies

No survival studies were conducted at the Wells Project in 2017.

3.2 Biological Monitoring

The 2017 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 2017, biological monitoring occurred at the Rocky Reach JBS on 16 days: April 4-7, 11-14, May 8, 11, 12, 18, 19, 22, 23 and June 12. Although some 125% hourly exceedances took place in the month of March, the Rocky Reach JBS was not operational during this period. GBT was most prevalent at the end of May on the 22nd, and occurred on the heels of many days where average TDG values in the Wells Tailrace were above 125%. Whereas, when average TDG values were below 125% in the preceding day to the sample, GBT was low or not observed. In addition if TDG values were above 125% for only a short period of time (a few hours or less) the prevalence of GBT in fish sampled at Rocky Reach JBS on the subsequent day was low to non-existent (Table 2). Ten of the 13 fish (77%) showing signs of GBT in 2017 were coho. A total of 495 fish were examined for GBT in 2017 (Table 2).

Table 2. Gas Bubble Trauma (GBT) Sampling at Rocky Reach Juvenile Bypass System in 2017.

Date	Max Hourly TDG (%)	Daily Average TDG (%)	Sample Date	Number of Fish Sampled	Number of Fish showing some level of GBT	Percent of fish sampled showing signs of GBT
3-Apr	126.4	122.4	4-Apr	15	0	0%
4-Apr	126.0	123.0	5-Apr	8	0	0%
5-Apr	125.3	123.0	6-Apr	8	0	0%
6-Apr	127.1	123.6	7-Apr	7	0	0%
10-Apr	127.9	123.8	11-Apr	12	3	25%
11-Apr	129.2	127.4	12-Apr	30	1	3%
12-Apr	128.9	126.4	13-Apr	71	0	0%
13-Apr	129.2	125.7	14-Apr	36	0	0%
7-May	128.5	119.7	8-May	37	0	0%
10-May	129.5	123.7	11-May	48	0	0%
11-May	128.6	124.4	12-May	46	0	0%
17-May	128.8	126.3	18-May	41	0	0%
18-May	128.9	126.6	19-May	53	0	0%
21-May	127.0	124.3	22-May	20	6	30%
22-May	126.6	123.8	23-May	41	3	7%
11-Jun	123.9	122.8	12-Jun	22	0	0%
Total				495	13	

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 U.S. Fish and Wildlife Service, the USACE,

and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). Specific forums include the Trans-boundary Gas Group, Columbia Basin meetings with Ecology, and the Sovereign Technical Team Water Quality Work Group. These meetings allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia Basin and support ongoing Upper Columbia Treaty review analyses that will provide a foundation for Treaty negotiations between Canada and the U.S. Douglas PUD will continue its involvement in water quality meetings for further coordination with other regional water quality managers towards meeting TDG standards.

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 FMS was established in 1998. Subsequent analysis verified that both monitoring station locations are appropriate and representative of mixed river condition, particularly during high flows (EES et al. 2007; Politano et al. 2009). TDG monitoring at the Wells Project currently occurs year round as required by Douglas PUD's 401 Certification. As required by Douglas PUD's Quality Assurance Project Plan for TDG, FMS sensors are serviced and calibrated at least once per month or sooner if calibration issues are observed on the devices.

In 2014, an additional reservoir monitoring station was installed at Washburn Island (RM 537.5) to collect TDG data representative of water quality entering the Wells Project from Chief Joseph Dam. The current Chief Joseph Dam tailwater station (CHQW) minisonde TDG sensor is deployed along the right bank of the Columbia River, 0.75 miles downstream from the dam. The river right location of the USACE TDG sensor precludes it from collecting bulk flow data, and instead the sensor monitors spillbay water disproportionally. Under some conditions, water coming from Chief Joseph Dam spillbays is of lower TDG concentration than the powerhouse. For example, when the Chief Joseph Dam forebay has high concentrations of TDG (e.g. greater than 120 %) as a result of high spill volumes from Grand Coulee Dam and limited degassing through Rufus Woods Reservoir, water sent through the spillbays at Chief Joseph Dam may actually be stripped of gas via the spill deflectors. However, powerhouse TDG concentrations are essentially identical to those in the forebay and can be missed by the CHQW sensor since powerhouse flows orient to river left rather than river right where the TDG sensor resides. As a result of the CHQW location and the orientation of spill and powerhouse flows, bulk flows leaving the federal system and entering into the Wells Project are not accurately monitored. The Washburn Island location installed and operated by Douglas PUD allows water quality managers and the Aquatic SWG Parties to:

1) Better understand TDG degassing in the Wells Project and expected TDG saturation in the Wells forebay.

2) Assure data quality at the Wells forebay TDG sensor since Washburn Island TDG values should correlate predictably with Wells forebay TDG values. Based on the comparison of the sensors at these

two locations, technicians can ensure reliable data collection by scheduling sensor servicing when data appears to be erroneous.

3) More accurately assess TDG production from the federal power system upstream of Wells Dam, which may support improved management towards minimizing TDG production in the Columbia River.

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 passage season (April 1 to August 31). Data were stratified by monitoring site, ascending date, and ascending time. The Ecology-approved 12C-High method was used to obtain TDG measurements for comparison to numeric criteria and evaluation of compliance.

3.5 TDG Compliance

Outside of the fish passage season the TDG criterion in the Wells tailrace is 110% (January – March and September – December). Additionally, there were three compliance criteria for the 2016 fish passage adjustment that must be met in association with operation at the Wells Project as described in the 2016 GAP:

1) Average TDG in the tailrace cannot exceed 125% for one hour or

2) 120% for 12 continuous hours (12C-High), and

3) TDG in the downstream Rocky Reach forebay cannot exceed 115% (12C-High).

These compliance criteria are waived when flows exceed the 7Q-10 value for the Wells Project (246 kcfs). For more information refer to WAC 173-201A-200.

3.5.1 Non-Fish Passage Season Compliance (Wells Tailrace 110%)

Per the Douglas PUD FERC Operating License and 401 Certification, in August 2013 Douglas PUD started colleting TDG data during the non-fish passage season. Non-spill flows at Wells Dam (through the turbine units and fishways) generate little to no additional dissolved gas. Spill outside the fish passage adjustment period is uncommon. However, beginning in March 2017 seasonally abnormal flows were observed at Wells Dam. Beginning on March 18, 2017 incoming TDG values were above 110%, by March 21, 2017 Wells forebay TDG values were above 115% and stayed above this value through April 1, 2017 (start of the bypass season). As such, beginning on March 21, 2017 Wells tailrace TDG values were above 110% through the start of the bypass season when TDG standards changed to facilitate passage efficiency through the Wells Dam Bypass. Following the completion of the bypass period in 2017, no values were recorded in the Wells Dam tailrace that were at or above 110% (Table 3).

3.5.2 Fish Passage Season Compliance

Wells Tailrace 125% hourly standard

There were 27 days that had observed hourly averages of 125% or greater in the Wells Dam tailrace during the 2017 bypass period. However, 10 of those days occurred during a 14 day period when flows at Wells Dam averaged 246.3 kcfs (May 7 to May 22) and therefore were removed from exceedances (above 7Q10). As such, 17 days had hourly averages that were over 125% in the Wells Dam tailrace (Table 3). In all of these 17 days, incoming TDG ranged between 114-125% and when calculated as 12C-High values. Currently, there is no exemption for TDG violations when incoming water is out of compliance.

Wells Tailrace 120% 12C-High standard

There were 51 days that had observed 12C-high values of 120% or greater in the Wells Dam tailrace during the 2017 bypass period. However, 12 of those days occurred during a 16 day period when flows at Wells Dam averaged 246.3 kcfs (May 7 to May 22) and therefore were removed from exceedances (above 7Q10). As such, 39 days had observed 12C-high values at or above 120% in the Wells Dam tailrace. In all of these 39 days, incoming TDG ranged between 114-125% and when calculated as 12C-High values. Currently, there is no exemption for TDG violations when incoming water is out of compliance.

Rocky Reach Forebay 115% 12C-High standard

There were 89 days that had observed 12C-high values of 115% or greater in the Rocky Reach forebay during the 2017 bypass period. However, 16 of those days occurred during a 16 day period when flows at Wells Dam averaged 246.3 kcfs (May 7 to May 22) and therefore were removed from exceedances (above 7Q10). As such, 73 days had observed 12C-high values at or above 115% in the Rocky Reach forebay. In all of these 73 days, incoming TDG ranged between 112-125% and when calculated as 12C-High values. Currently, there is no exemption for TDG violations when incoming water is out of compliance.

3.5.3 Yearly TDG Compliance Summary

The following table summarizes TDG compliance at the Well Project for the entire 2017 season.

Table 3. 2017 TDG compliance summary.

	Compliance
Wells Tailrace 125% hourly standard	
Days out of compliance	17*
Fish passage season	153
DCPUD compliance	**89%**
Wells Tailrace 120% 12C-High standard	
Days out of compliance	39*
Fish passage season	153
DCPUD compliance	**75%**
Rocky Reach Forebay 115% 12C-High standard	
Days out of compliance	73*
Fish passage season	153
DCPUD compliance	**52%**
Wells Tailrace 110% (Non-fish passage season standard)	
Days out of compliance	13*
Fish passage season	213
DCPUD compliance	**94%**

*Incoming TDG was always above 110% and almost always above 115% as calculated as a 12C-High average. Many days during the non-bypass and bypass period showed Wells Dam forebay TDG values even above 120% as calculated as a 12C-High average (Figure 3). Nevertheless, incoming conditions were not factored into compliance statistics above.

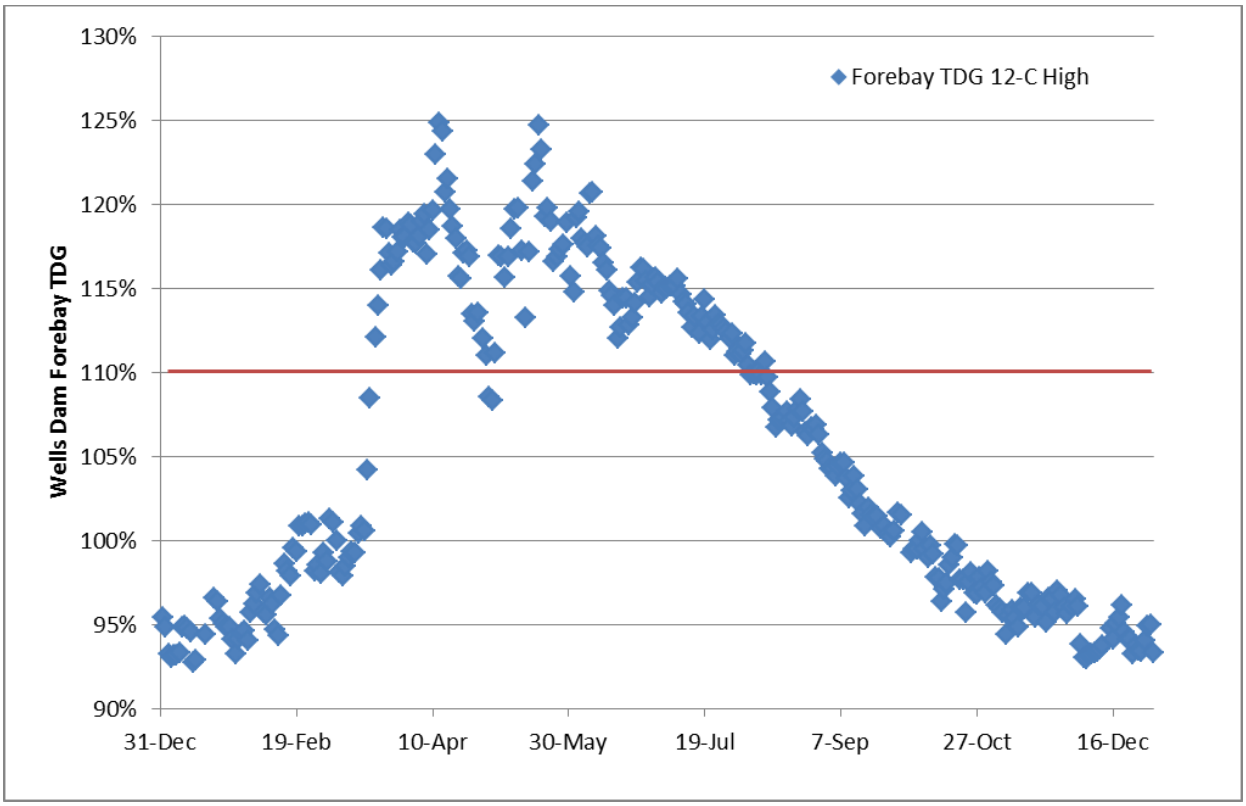

Figure 3. **12C-High values in the Wells Dam forebay during 2017. Results show that incoming TDG was out of compliance in late March through mid August of 2017.**

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Water Quality Attainment Plan Activities

As required by the Wells Project 401 Certification, Douglas PUD developed a Water Quality Attainment Plan (WQAP). The WQAP was approved by Ecology and the FERC in 2013. The WQAP provides a detailed strategy for achieving compliance with the TDG state WQS within a required ten-year timeframe (i.e., compliance schedule). The compliance schedule outlines a step-wise approach toward meeting compliance with the TDG WQS. In 2017 (Year 4), the WQAP called for continued adaptive management and implementation of the Spill Playbook, biological monitoring (i.e., GBT monitoring in biota, as needed), and the identification of key Project operating parameters towards developing a database that would house fine scale operation data. Future year's data would be used to identify fine scale operations that might improve TDG compliance.

In the spring of 2016 Douglas PUD reviewed Wells Project Operations data collection with Wells Dam Hydro Operations staff and the Information Systems Department. The objective of this analysis was to conduct a comprehensive evaluation of both operational and structural data collection towards ultimately improving compliance with the TDG WQS criteria. A fine scale spill data collection database was completed in 2017. Adaptive management and implementation of the Spill Playbook and biological

monitoring (i.e., GBT monitoring in biota, as needed) continued in 2017. Finally, in 2017 technicians installed spill gate flow sensors that automatically send spill gate openness data to Douglas County PUD's SCADA (supervisory control and data acquisition) system. This data is expected to help inform TDG production in subsequent years towards refining the spill playbook.

4.2 Operational

Flows at Wells Dam were well above normal in the month of March through May and near normal during the balance of the season (Figures 2 & 4). High spring flows due to a wet and snowy February, drum gate maintenance at Grand Coulee, low load requests to BPA, and normally scheduled bi-annual mainteance combined to contribute to high TDG production above and below Wells during the early spring season of 2017. Despite these constraints Wells Dam performed remarkably well by putting a minimum generation on all available units at Wells Dam and forcing Project participants to take all available generation. Maximizing generation and putting as much water through available units minimizes involuntary spill and therefore reduces the production of TDG. In most cases TDG values below Wells were within 1-4% of incoming TDG (Figure 5).

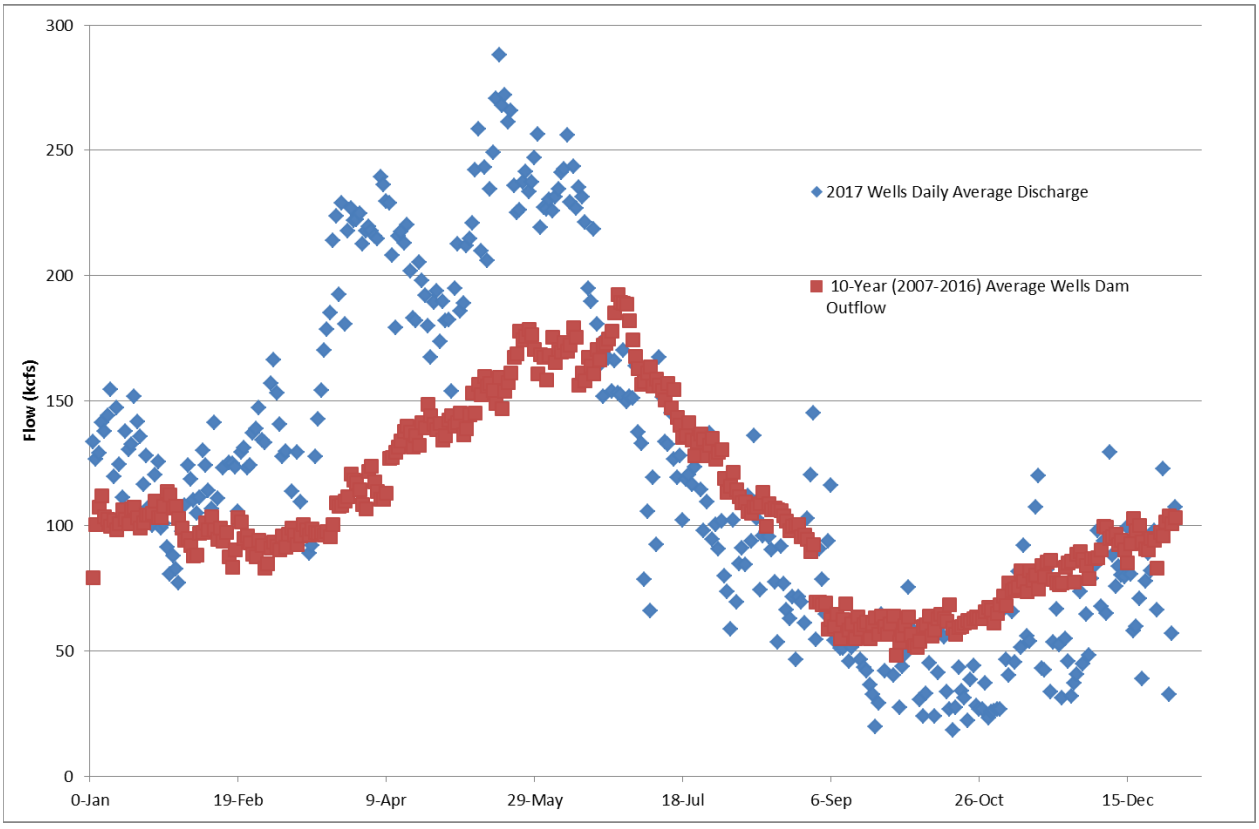

Figure 4. Average Daily flows at Wells Dam during 2017 relative to the ten year average.

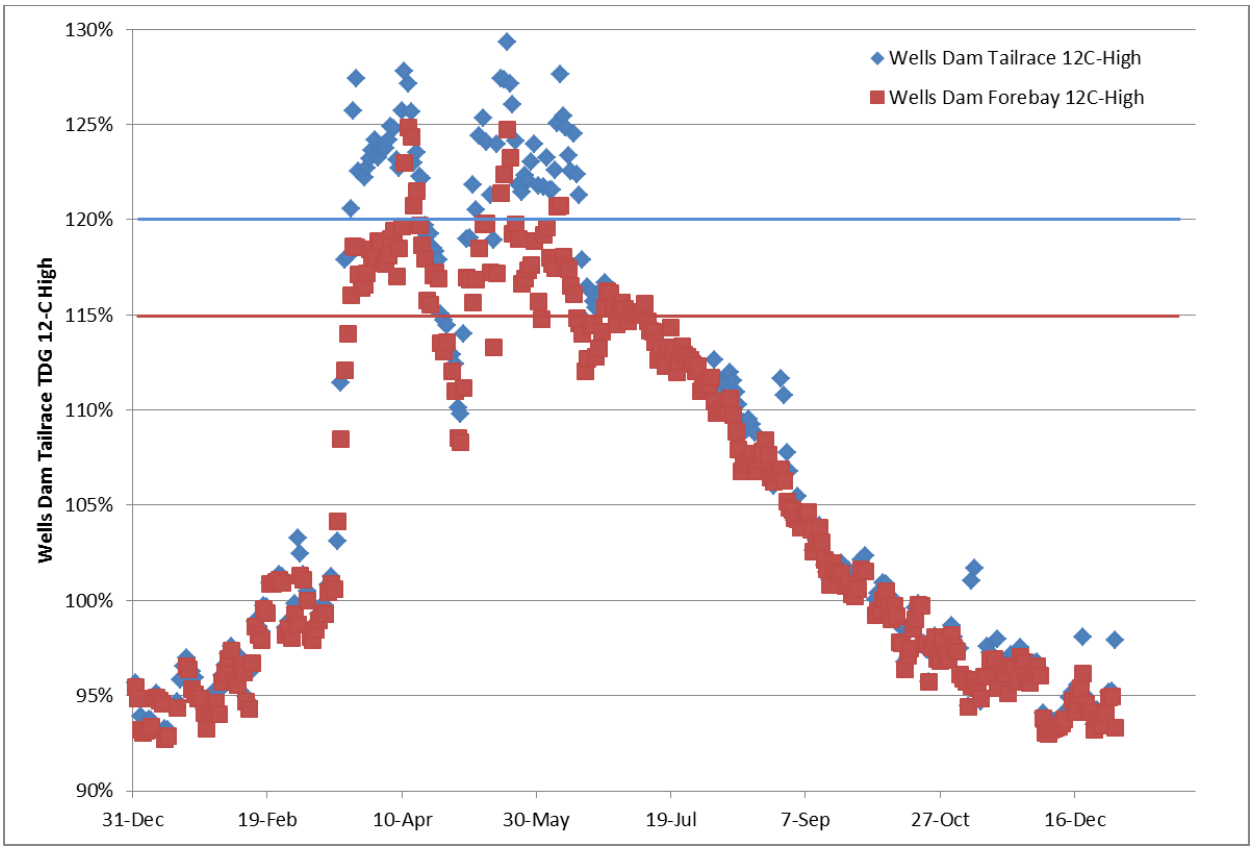

Figure 5. Comparison of Wells Dam forebay and tailrace during 2017.

Douglas PUD implemented the Ecology and FERC approved 2017 GAP during the entire 2017 fish passage season utilizing the lessons learned during previous years of spill study at the Wells Project. The 2017 Spill Playbook was an important element in managing TDG at Wells Dam during the fish passage season.

4.3 Structural

No permanent structural modifications were proposed or completed during the 2017 monitoring season.

5 CONCLUSIONS

TDG performance at Wells Dam during the 2017 season was good considering the operational and snowpack challenges in the spring and the record setting flows in April 2017. Results support the continued implementation of the Spill Playbook to manage TDG production through operational means, and suggest future operational performance should result in even higher rates of TDG standards compliance. Douglas PUD will put an emphasis on testing the Spill Playbook in years where ten units are

available 95% of the time (normal reliability). The ongoing turbine rebuild project currently only uses 9 out of 10 units while operating during the peak hydrograph. This reduces the amount of water that can be passed through the powerhouse by approximately 15-20 kcfs and therefore makes compliance more challenging since this water must be spilled. Despite this challenge Douglas PUD has maintained high TDG compliance with WQS. Douglas PUD will work closely with Ecology towards meeting year round TDG standards in subsequent years.

6 REFERENCES

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APPENDIX B

PRE-FILING CONSULTATION RECORD FOR THE WELLS HYDROELECTRIC PROJECT TOTAL DISSOLVED GAS ABATEMENT PLAN 2017 ANNUAL REPORT

NOTICE TO AQUATIC SETTLEMENT WORK GROUP TO REVIEW THE TOTAL DISSOLVED GAS ABATEMENT PLAN 2017 ANNUAL REVIEW

From:	Kristi Geris
To:	Andrew Gingerich; Bob Rose; Chas Kyger; Donella Miller (mild@yakamafish-nsn.gov); Jason McLellan; John Ferguson; Kristi Geris; Mark Peterschmidt (mape461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); Ralph Lampman (lamr@yakamafish-nsn.gov); Sean Goudy (gous@yakamafish-nsn.gov); "Steve Lewis"; Zimmerman, Breean (ECY)
Cc:	Shane Bickford; Tom Kahler; Keith Hatch (Keith.Hatch@bia.gov); Chris Sheridan (csherida@blm.gov)
Subject:	FW: Draft 2017 Wells TDG GAP Report and Draft 2018 Wells GAP/BOP for ASWG review
Date:	Tuesday, January 16, 2018 5:00:35 PM
Attachments:	2018_01_16 Douglas - Draft 2018 Wells Dam GAP and BOP.DOC 2018_01_16 Douglas - Draft 2017 Wells Dam TDG GAP Annual Report.docx

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Hi Aquatic SWG: please see the email below from Andrew and the attached Draft 2017 Wells Dam TDG GAP Report and Draft 2018 Wells Dam GAP/BOP, which are available for review with edits and comments due to Andrew no later than **COB Monday, February 12, 2018**.

The attached documents are also available for download from the Aquatic SWG Extranet Site, under: Documents > All by Mtg Date > 2/14/2018 (instructions below). Thanks! –kristi

Instructions:

To gain access to the Aquatic SWG Extranet Homepage, please use the following procedure:

* Visit: https://extranet.dcpud.net/sites/nr/aswg/
* Login using “Forms Authentication” (for non-Douglas PUD employees)

You should now be at the Aquatic SWG homepage.

If you encounter problems, or need a login username and password to access the site: Please feel free to contact me, Andrew Gingerich, or Julene McGregor [jmcgregor@dcpud.org; (509) 881-2236] and we will gladly assist you with questions or issues.

Kristi Geris

ANCHOR QEA, LLC
kgeris@anchorqea.com
C 360.220.3988

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Tuesday, January 16, 2018 4:48 PM
To: Kristi Geris <kgeris@anchorqea.com>
Cc: 'Zimmerman, Breean (ECY)' <bzim461@ECY.WA.GOV>; Tom Kahler <tomk@dcpud.org>; John Ferguson <jferguson@anchorqea.com>; Shane Bickford <ShaneB@dcpud.org>; Chas Kyger <chask@dcpud.org>
Subject: TDG GAP Annual Report for 2017

Hi Kristi, as I promised the Aquatic SWG during our meeting at Wells Dam last week:

Please distribute to the technical reps within the Aquatic SWG. Please also make sure that we include BIA, and BLM on the cc list.

Every year at this time Douglas PUD provides two documents to the Aquatic SWG for review, comment, and eventual approval. The first summarizes TDG compliance during the previous year

(2017). The second document discusses the methods that are expected to be used in order to provide safe and effective passage of juvenile salmonids, meet TDG standards under Chapter 173-201A-200 of the WAC, and operate Wells Dam safely (2018 Gas Abatement Plan and Bypass Operating Plan). The second of these two documents get reviewed concurrently with the HCP CC per our 401 Certification and FERC license requirements. Specifically, these two documents are:

1. 2017 Annual TDG (GAP) Report
2. 2018 Gas Abatement Plan and Bypass Operating Plan

The second document is also required in order to obtain an Ecology's approved TDG adjustment during the 2018 bypass season. This adjustment facilitates high survival of downstream migrating fish during peak downstream migration. Both documents are attached for committee review and consideration. Douglas PUD is hoping to receive comments no later than COB Feb 12th . That will give Douglas PUD a day to update/make changes before seeking approval from the Aquatic SWG at the February 14th, 2018 Aquatic SWG call. Both of these documents are due to the FERC by Feb 28th every year.

I appreciate the review and consideration. Please let me know if you have questions.

Respectfully,

Andrew Gingerich
Senior Aquatic Resource Biologist
Public Utility No. 1 of Douglas County
1151 Valley Mall Parkway
East Wenatchee, WA 98802
Office: (509) 881-2323

FINAL AQUATIC SETTLEMENT WORK GROUP ACTION ITEMS SHOWING APPROVAL OF TOTAL DISSOLVED GAS ABATEMENT PLAN 2017 ANNUAL REPORT

FINAL

Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties

Date: February 15, 2018

From: John Ferguson, Chair (Anchor QEA, LLC)

Re: Final Action Items of the February 14, 2018 Aquatic SWG Conference Call

Below is a summary of Action Items from the Aquatic Settlement Work Group (SWG) meeting that was held by conference call on Wednesday, February 14, 2018, from 10:00 a.m. to 12:00 p.m. Attendees are listed in Attachment A. These action items include the following:

I. Summary of Action Items

1. Douglas PUD will develop a draft Statement of Agreement (SOA) describing how Douglas PUD will support Pacific Lamprey translocation efforts in future years (tentatively expected following finalization of the technical memorandum, *Temporary Fishway "Lamprey Operations": 2017 Pacific Lamprey Migration at Wells Dam*, and an acoustic telemetry Pacific Lamprey approach report being drafted by Douglas PUD in coordination with LGL Limited; Item VI-1).
2. Steve Lewis will contact Tim Culbertson (Secretary-Manager for Columbia Basin Hydropower) regarding how water managers coordinate and manage forced spill and total dissolved gas (TDG) at Mid-Columbia hydroelectric projects, outside of the former Mid-Columbia Hourly Coordination Agreement (Item VI-4).
3. Douglas PUD will discuss how forced spill and TDG are coordinated and managed at Wells Dam, outside of the former Mid-Columbia Hourly Coordination Agreement, during a future Aquatic SWG meeting (Item VI-4).
4. Douglas PUD will incorporate 2017 Pacific Lamprey run data into the *2017 Pacific Lamprey Management Plan Annual Report* (Item VI-6).
5. Ralph Lampman (Yakama Nation [YN]) will provide a summary of questions from the Wells Dam fishway tour on January 10, 2018, for discussion during the Aquatic SWG conference call on March 14, 2018 (Item VI-8). *(Note: Lampman provided these questions to Kristi Geris on February 14, 2018, which Geris distributed to the Aquatic SWG that same day.)*
6. The Aquatic SWG meeting on March 14, 2018, will be held by conference call (Item VII-3).

II. Summary of Decisions

1. Aquatic SWG members present approved the technical memorandum, *Temporary Fishway "Lamprey Operations": 2017 Pacific Lamprey Migration at Wells Dam* (Item VI-2).
2. Aquatic SWG members present approved the *Wells Hydroelectric Project Total Dissolved Gas Abatement Plan 2017 Annual Report*, with the YN abstaining (Item VI-3).
3. Aquatic SWG members present approved the *2018 Total Dissolved Gas Abatement Plan* and *Wells Bypass Operating Plan*, with the YN and U.S. Fish and Wildlife Service (USFWS) abstaining (Item VI-5).

III. Agreements

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

IV. Review Items

1. The draft *2018 Aquatic Settlement Agreement and Workgroup Action Plan* was distributed to the Aquatic SWG by Kristi Geris on December 18, 2017. This document is currently under review (Item VI-7).

V. Documents Finalized

1. There are no documents that have been recently finalized.

Attachment A – List of Attendees

Name	Role	Organization
John Ferguson	Aquatic SWG Chairman	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	Aquatic SWG Technical Representative	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Breean Zimmerman	Aquatic SWG Technical Representative	Washington State Department of Ecology
Steve Lewis	Aquatic SWG Technical Representative	U.S. Fish and Wildlife Service
Patrick Verhey	Aquatic SWG Technical Representative	Washington Department of Fish and Wildlife
Bob Rose	Aquatic SWG Technical Representative	Yakama Nation
Ralph Lampman	Technical Support	Yakama Nation
Tyler Beals	Technical Support	Yakama Nation