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Public Utility District No. 1 of Douglas County

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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 25, 2014

Subject: Wells Hydroelectric Project No. 2149
2013 Total Dissolved Gas Report – License Article 401 (b)

Dear Secretary Bose:

Pursuant to Article 401(b) of the new 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 Report (TDG Report) for calendar year 2013. Article 401(b) requires Douglas PUD to file an annual TDG Report with the Federal Energy Regulatory Commission (FERC) by February 28th during each year of the new license.

The final 2013 TDG Report is attached as Appendix A to this letter and was reviewed and approved by 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).

The enclosed 2013 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. The pre-filing consultation record supporting the review and approval of the 2013 TDG Report can be found in Appendix B.

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Please note that the 2013 TDG Report only contains data collected during the 2013 fish passage season (April – August) and the non-fish passage season (September - December) as required by the Wells Project License. Section 6.7(2)(b) of the 401 Certification and the monitoring requirements found within the final 2013 Gas Abatement Plan both require Douglas PUD to begin reporting spills and monitoring TDG levels during the non-fish spill season commencing one year after issuance of the new license (November 2013). As such, next year's TDG report will be the first annual report that will contain complete year round monitoring results as required by the 401 Certification (January – March & September – December).

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 – 2013 Total Dissolved Gas Report – Wells Project
2) Appendix B – Pre-filing consultation record for the 2013 TDG Report

Copy:
Mr. Charlie McKinney – Ecology, Yakima
Mr. Keith Kirkendall – NMFS, Portland
Wells Aquatic Settlement Work Group
Mr. Tom Kahler – Douglas PUD
Mr. Andrew Gingerich – Douglas PUD

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Appendix A: 2013 Total Dissolved Gas Report - Wells Project

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Wells Hydroelectric Project
Total Dissolved Gas Abatement Plan

2013 Annual Report

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

January 2013

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1 INTRODUCTION

The 2013 Wells Hydroelectric Project (Wells Project) Gas Abatement Plan (GAP) was approved by the Washington State Department of Ecology (Ecology) on February 12, 2013 (Appendix 1 and Appendix 2). Section 6.7 2) d) of the Clean Water Act section 401 Water Quality Certification for the Wells Project required Douglas PUD to coordinate the annual HCP Bypass Operations Plan (BOP) and the GAP. On March 25th, 2013 the coordinated GAP and BOP was approved by the FERC (Appendix 3).

The FERC and Ecology approved GAP and its associated measures are intended to meet state water quality standards for total dissolved gas (TDG). This annual report concludes the 2013 monitoring season and describes the background, operations, and results of GAP implementation at the Wells Project in 2013. This report also includes the final report containing the results of implementing the BOP at the Wells Project in 2013 (Appendix 4). In addition, this report contains TDG performance for the Wells Project following the completion of the 2013 spill season (April 9th to August 19th), towards measuring year round TDG performance. Data summarized in this report includes monitoring from April 9, 2013 to December 31, 2013.

1.1 Project Description

The Wells Project is owned and operated by Public Utility District No. 1 of Douglas County (Douglas PUD) and is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE), and 42 miles upstream from the Rocky Reach Hydroelectric Project, owned and operated by Public Utility District No. 1 of Chelan County. The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

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

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

1.2 Fixed Monitoring Site Locations

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Fixed monitoring stations for TDG are located above and below Wells Dam. The forebay station (WEL) is located midway across the deck of Wells Dam (47° 56' 50.28" N, 119° 51' 54.78" W). The tailrace station (WELW) is located on the left bank of the Columbia River 2.6 miles downstream of Wells Dam (47° 54' 46.86" N, 119° 53' 45.66" W). Hach® HYDROLAB MiniSonde instruments equipped with TDG and temperature probes are deployed approximately 15 feet below normal surface water elevation and are calibrated monthly. Data from both stations are automatically transmitted by radio to Wells Dam, stored, and forwarded to the USACE. Weather data are recorded by Global Water, Inc. instrumentation, including an electronic barometer located on the deck of Wells Dam at 810 feet elevation.

Figure 1. Location of the Wells Project.

1.3 Regulatory Framework

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

Natural flood flows are identified by periods in which river flow volume exceeds the highest seven consecutive day average observed during a ten-year period (7Q-10 flow). The 7Q-10 flow for the Wells Project is 246,000 cubic feet per second (cfs), based on the hydrologic records from 1930 to 1998 and the USGS Bulletin 17B, "Guidelines for Determining Flood Flow Frequency" (Pickett et al. 2004). When river flow volume exceeds 7Q-10 flows, the WQS permits exceedances of the 110% TDG criteria.

Ecology may also approve an exemption to the 110% upper criterion for TDG saturation during the outmigration of juvenile salmon; provided that spill aids in the survival of fish. The TDG exemption is

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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 exemption for fish passage has three standards during the fish passage (spill) season: (1) TDG shall not exceed 125% saturation in the tailrace of the project as measured in any one-hour period; (2) TDG shall not exceed 120% saturation in the tailrace of the project based on the average of the twelve highest consecutive hourly readings in any one day (12C-High); and, (3) TDG shall not exceed 115% saturation in the forebay of the next downstream project based on the average of the twelve highest consecutive hourly readings in any one day.

1.4 2013 Gas Abatement Plan Approach

1.4.1 Operational

Based on the success of 2009 and 2010 operations associated with implementation of the Wells Project Spill Playbook (Spill Playbook), those operations were implemented again between 2011 and 2013 with minor modification based upon an additional technical analysis of the 2010 Spill Playbook in February of 2011. Additional recommendations 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. Units 4 and 5 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 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 unit 7.

1.4.2 Structural

No permanent structural modifications were proposed or conducted during the 2013 monitoring season. Structural changes sometimes include removing spill bypass barriers to improved TDG performance and are required under emergency flow conditions that are consistent with Douglas' Emergency Action Plan and Spill Playbook. Bypass barriers are used to encourage migrating smolts to use bypass spill bays rather than sound and use turbine passage routes. However, under some extreme conditions barriers need to be removed to allow operators to manage high flows.

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1.4.3 Consultation

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

2 OPERATIONS

2.1 Description of Fish-Spill Season Flow

The 2013 fish spill season occurred April 9th (0:00 hrs) through August 19th (12:00 hrs) at Wells Dam pursuant to the HCP Coordinating Committee approved 2013 BOP. As required, TDG data were monitored during this period and transmitted to the USACE, Northwest Division on a real-time basis (www.nwd-wc.usace.army.mil). In addition, Douglas PUD's operating license requires that TDG data be reported on Douglas PUD's public webpage. As such, TDG data is available in real-time at dcpud.org. Historical data is also available for download at both of these websites.

Data from 1969 to 2013 show that average monthly river flows at Wells Dam between April and August range from 51.9 (historic monthly minimum; Table 1) to 348.7 kcfs (historic monthly maximum; Table 1) at the Wells Project. During this time period, flows tend to be greater in June (mean 164.7 kcfs), and lowest in August (105.9, Table 1). 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 flow provided by tributaries flowing into the Wells Project.

Table 1. Average monthly river flows (kcfs) at Wells Dam, 1969-2013.

	Month											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	132.3	91.3	73.5	149.5	178.7	172.4	159.0	114.1	68.4	70.7	86.1	
10-yr average (2004-2013)	103.7	92.7	90.8	121.7	155.7	180.1	147.7	107.8	65.9	68.7	84.2	98.1
Average since 1969	108.7	107.8	105.7	116.4	150.1	164.7	135.5	105.9	75.7	76.0	87.7	101.4
Minimum since 1969	67.4	69.9	56.0	51.9	55.2	73.7	53.4	63.9	53.5	56.0	63.8	72.6
Max since 1969	159.2	180.7	193.9	184.9	262.6	348.7	253.8	181.3	123.0	108.9	110.0	149.0

Columbia River flows at Wells Dam in 2013 were above average in all fish spill season months and ranged between 5 - 28% higher when compared to historic average monthly flows (1969-2013; Figure 2). The average flow during the 2013 fish spill season was 8.2-33.1 kcfs higher than the historic average (Table 2). The maximum hourly flow observed during the spill season was 242 kcfs on June 28, which is only slightly below the 7Q-10 value at Wells Dam of 246 kcfs.

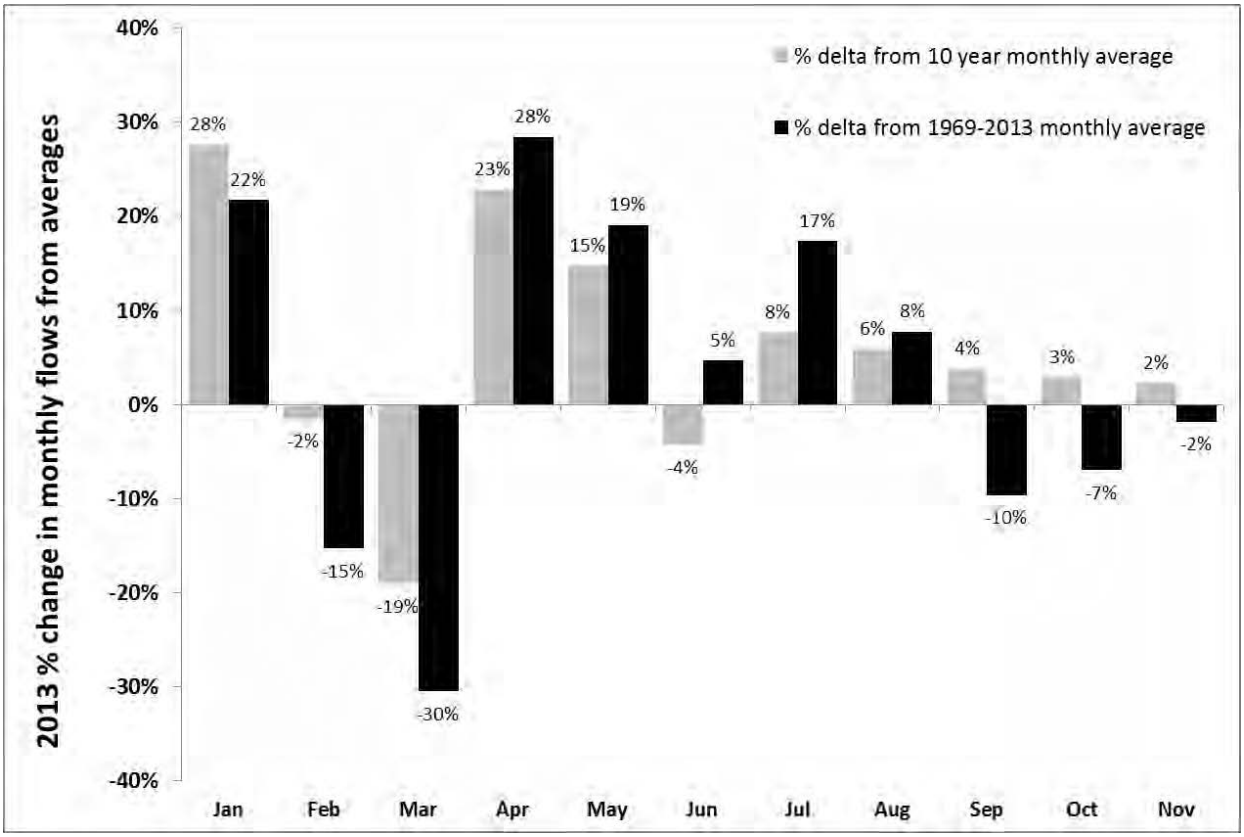

Figure 2. Percent change in 2013 average monthly flows from historic monthly averages at Wells Dam.

Table 2. Average monthly river flow (kcfs) at Wells Dam in 2013 compared to the previous historic average monthly river flow (1969-2013).

	Month											
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2013	132.3	91.3	73.5	149.5	178.7	172.4	159.0	114.1	68.4	70.7	86.1	
Average since 1969	108.7	107.8	105.7	116.4	150.1	164.7	135.5	105.9	75.7	76.0	87.7	101.4
2013 difference from 1969 - 2013 average	23.6	-16.5	-32.2	33.1	28.6	7.7	23.5	8.2	-7.3	-5.3	-1.6	

2.2 Fish Spill Program

Wells Dam is a hydrocombine, where the spillbays are located directly above the turbine water passages. Research at Wells Dam in the mid-1980s demonstrated that a modest amount of spill could be used to effectively guide a high proportion of the downstream migrating juvenile salmon away from the turbines and into a surface oriented bypass system. A JBS was subsequently developed at Wells Dam in the late 1980s. The Wells Dam JBS was engineered based on biological research and hydraulic modeling, and utilizes constricting flow barriers deployed in five of the eleven spillbays to effectively

attract and safely guide fish through the project. The Wells Project JBS has since proven to be the most efficient system on the mainstem Columbia River, providing high levels of fish protection that has met approval of fisheries agencies and tribes (Skalski et al. 1996). The survival performance measures contained within the Federal Energy Regulatory Commission (FERC) approved Anadromous Fish Agreement and Habitat Conservation Plan (HCP) have been consistently exceeded, with a three-year survival average of 96.2% for juvenile steelhead and Chinook salmon (Bickford et al. 2001). The results from a fourth year of survival study at Wells Dam in 2010 (Bickford et al. 2011) confirmed past study results by documenting that survival through the entire Wells Project is in excess of 96.4% for juvenile spring migrating anadromous fish (see Section 3.1.2 below).

2.3 Fish Spill Quantities and Duration

The Wells Dam JBS uses up to 2,200 cfs per spillbay, though one or more of the flow barriers may be removed to provide adequate spill capacity to respond to plant load rejection. Under normal conditions, however, the JBS will use roughly six to eight percent of the total river flow for fish guidance. The increased spill has a small influence on TDG production (~0-2%) while providing a safe, non-turbine passage route for over 92% of the spring and 96% of the summer migrating juvenile salmonids. The JBS was operated on a fixed schedule between April 12th and August 26th from 2003 to 2011. The HCP Coordinating Committee (HCP CC) retains annual operating oversight that includes the potential to operate the JBS as early as April 1st and as late as August 31st to ensure that 95% of the spring and summer migration of juvenile salmonids is provided a safe, non-turbine passage route past Wells Dam. In 2013, Douglas PUD evaluated past performance of the Wells Dam JBS operating dates relative to observed annual run timing (at the Rocky Reach Bypass) for both spring and summer migrants. With that data, a request was made to and granted by the HCP CC to revise operating dates in 2013 to start April 9th and end August 19th. These dates were therefore used in 2013 to operate fish passage spill for migrating juvenile salmonids.

Spill volumes at Wells Dam in 2013 were high in early April, late May, and late June/early July (Figure 3). Large spill volumes in June and July are not uncharacteristic and are associated with snow-melt and run-off in the upper-Columbia River. However, large spill volumes of flow in April and May are not typical.

Early flows in April were human induced and specifically tied to drafting at Grand Coulee Dam for flood control operations prior to the anticipated large volume of run-off north of the Canadian- United States border. However, the level and intensity of these flows were not expected and operators at Wells Dam were challenged to find sufficient off-peak load to maintain full utilization of the powerhouse. Specifically on April 8th and 11th coordination between the federal and non-federal system was incomplete and the federal dams upstream of Wells Dam discharged unexpectedly large volumes of water little or no notification. Specifically, on the morning of April 11th the uncoordinated operation between the federal and noon-federal system resulted in the highest hourly spill volume of the year at 117.3 kcfs.

In late May, Grand Coulee Dam drafted in anticipation of high levels of recreational use on Lake Roosevelt over the Memorial Day Weekend. These short, large volume, drafting exercises make

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management of water at Wells Dam challenging given its run-of-the-river nature and the lack of storage capacity (Grand Coulee Dam has more than 56 times the storage capacity of Wells Dam). High flows in April complicate operations at Wells Dam, since weather is often mild and load demands are limited. In addition, spring winds enhance the use of wind power and reduce the need for hydroelectric generation. Collectively, the spill pattern at Wells Dam in 2013 was unusual compared to the 10-year average (Figure 3).

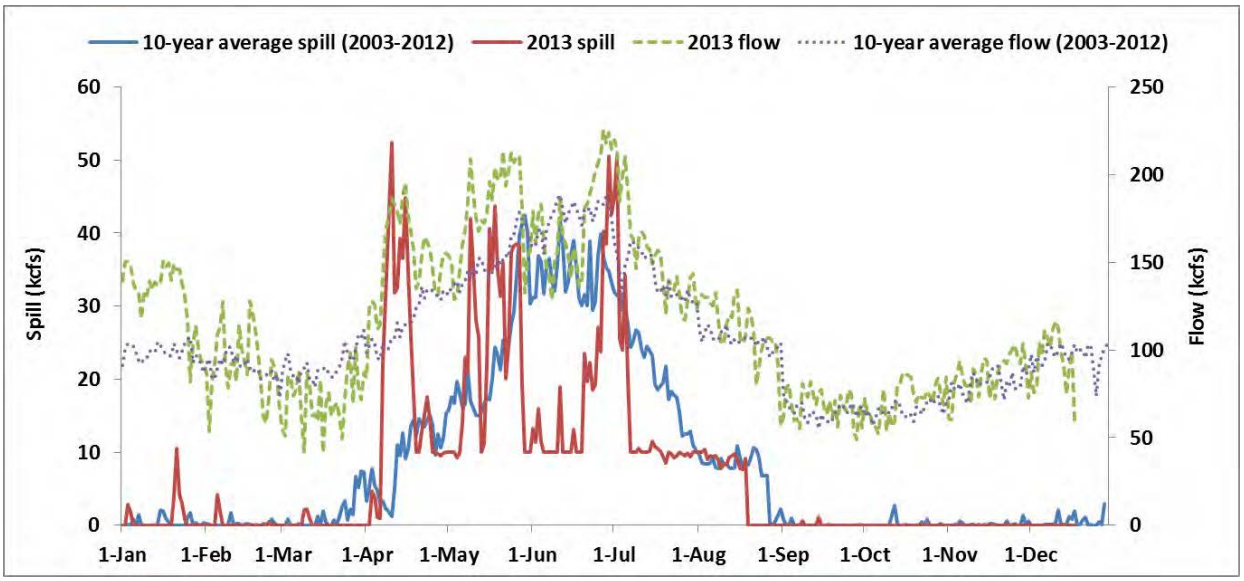

Figure 3. Historic and 2013 spill and flow profile at Wells Dam.

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 2013. 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 2013. In preparation for future subyearling Chinook run-timing and behavior studies, Douglas PUD proceeded with year three of a pilot study to: evaluate the feasibility of capturing wild subyearling Chinook using seining techniques; identify capture locations; and determine whether it is possible to capture enough subyearlings to confidently evaluate

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migration behavior and timing. Over 17,000 wild subyearling Chinook salmon were beach seined from the reservoir and tagged in the Wells Project area during these efforts.

These juvenile salmon were outfitted with a Passive Integrated Transponder (PIT) tag that allows them to be detected at downstream hydroelectric projects. In subsequent years, Douglas PUD expects to estimate survival of these fish when migrating past Wells Dam using similar techniques, toward the goal of demonstrating steady progress in complying with the HCP passage survival standards for subyearling summer/fall Chinook.

In spring 2010, Douglas PUD conducted a survival verification study with yearling Chinook salmon, a required 10-year follow-up study to confirm whether the Wells Project continues to achieve survival standards of the Wells HCP. Approximately 80,000 PIT-tagged yearling summer Chinook were released over a 30 day period in 15 replicates. Study results indicated that juvenile Chinook survival from the mouth of the Okanogan and Methow rivers averaged 96.4% over the 15 replicate releases of study fish, and confirms the results from the three previous years of study documenting that fish survival through the Wells Project continues to easily exceed the 93% Juvenile Project Survival Standard required by the HCP (Bickford et al., 2011).

3.2 Biological Monitoring

The 2013 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 2013, one short excursion above the 125% standard occurred during the fish spill season (April 11th). On April 12th, per the requirements of the Ecology approved GAP, Douglas PUD biologist sampled juvenile fish at the Rocky Reach bypass sampler. Less than 10 fish were sampled over a two-hour period since the number of fish traveling though the sampler that early in the fish migration season was very low. None of the fish sampled showed signs of GBT.

3.3 Water Quality Forums

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

3.4 Physical Monitoring

3.4.1 Overview

TDG monitoring at the Wells Project has occurred since 1984 when forebay stations were first established. TDG monitoring in the tailrace of Wells Dam began in 1997 by actively collecting data at four points across the width of the river. Based on these data, the location for a fixed monitoring station was established in 1998. Subsequent analysis verified that both monitoring station locations are appropriate and representative of the river conditions, particularly during high flows (EES et al. 2007; Politano et al. 2009). TDG monitoring at the Wells Project in 2013 encompassed the entire fish passage season and accounted for all of the spill events including the operation of the juvenile fish bypass system that started operation on April 9th and ended at midnight on August 19th. As part of Douglas PUD's Ecology-approved 2013 Wells Project TDG Quality Assurance Project Plan, the TDG sensors are serviced monthly for maintenance and calibration. Data was collected at 15-minute intervals at the Wells Project over the entire fish spill season (April 1st – August 31st) and starting on September 1st of this year, Douglas PUD began collecting TDG data at 15-minute interval throughout the non-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). 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 evaluate compliance.

3.5 Compliance

At Wells Dam, there are three compliance criteria for the 2013 fish passage TDG exemption that must be met in association with operation at the Wells Project as described in the 2013 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 10-year flood flow volume (7Q-10 = 246 kcfs).

3.5.1 Compliance: Fish Spill Season

Wells Tailrace 125% hourly standard

Two days in April had short duration spill episode at Wells Dam that resulted in 125% exceedences. As described in section 2.3, these violations were a result of poor communication between the federal and

non-federal hydro operators rather than issues associated with incoming TDG or 7-Q10 events. As such, compliance with the 125% standard during 2013 was over 98.7%.

Wells Tailrace 120% 12C-High standard

During 2013, Wells Dam met the 120% compliance standard 100% of the time (Table 3).

Rocky Reach Forebay 115% 12C-High standard

The 12C-High TDG value in the Rocky Reach forebay exceeded 115% on 14 of 133 days (Table 3). Thirteen out of 14 of these days occurred in late June and early July when high flows from Canadian snow melt were observed (See daily TDG summary in the Wells tailrace in Figure 4 for perspective). The remaining day occurred in May when Lake Roosevelt was drafting in anticipation of the Memorial Day weekend recreation activities. Non-compliance was observed on May 12th,June 23rd-25th, 29th-30th and July 1st-8th. During June and July, Wells Dam had 9 out of 10 turbine units available due to prolonged unit maintenance on unit 7.

During the 2013 spill season, no incoming 12C-High values greater than 115% were observed in the Wells Forebay. However, almost 50% of the hourly TDG values in the Wells Forebay (1,524 hourly values of a total of 3,192 spill season hours) had values above 110 %. Incoming TDG produced at Chief Joseph Dam was the source for the elevated levels of TDG in the forebay of Wells Dam.

Table 3. 2013 TDG Compliance Summary.

	Compliance
Wells Tailrace 125% hourly standard	
Days out of compliance	2
Spill/bypass season	133
DCPUD Percent compliance	**98.7%**
Wells Tailrace 120% 12C-High standard	
Days out of compliance	0
Spill/bypass season	133
DCPUD Percent compliance	**100%**
Rocky Reach Forebay 115% 12C-High standard	
Days out of compliance	14
Spill/bypass season	133
DCPUD Percent compliance	**89.47%**

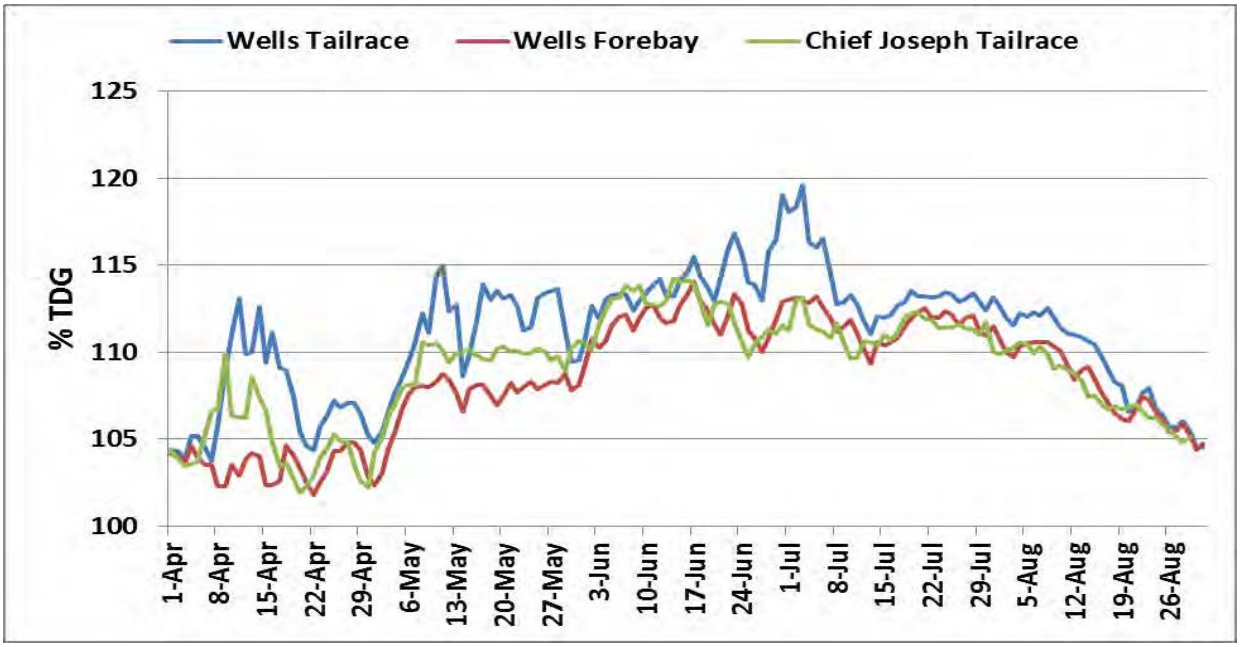

Figure 4. Daily TDG averages above and below Wells Dam during the 2013 fish spill season.

3.5.2 Compliance: Non-Fish Spill Season

Douglas PUD's FERC License and 401 Certification requires TDG monitoring to evaluate compliance with the TDG numeric criteria(110%) outside of the fish bypass season (i.e., year round). In September 2013, Douglas PUD started collecting TDG data during the non-fish bypass period (in general, January 1 to April 1 and August 31 to December 31 but exact dates may vary each year). Non-spill flows at Wells Dam (through the turbine units and fishways) generate little to no additional TDG. Spill outside the fish passage TDG exemption period is uncommon. During the 2013 non-fish bypass season, (no instantaneous exceedances of the 110% TDG numeric criteria occurred (Figure 5).

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Figure 5. Mean daily TDG at Wells Dam outside of fish bypass season.

4 DISCUSSION OF GAS ABATEMENT MEASURES

4.1 Operational

Flows at Wells Dam were above normal in 2013 during the fish bypass season. Specifically, flows in April and May were 20% higher than average as a result of short periods of drafting at Grand Coulee Dam for recreation at and high spring inflows to Lake Roosevelt. Despite this, Wells Dam demonstrated high performance with nine out of ten turbine units available during the reporting period. In addition, incoming TDG was above 110% at Well Dam during almost half of the total spill period hours as a direct result of operations at Chief Joseph Dam. If incoming TDG had remained in compliance with the Confederated Tribe of the Colville Reservation and Environmental Protection Agency TDG standard of 110% for the Chief Joseph tailrace, Wells Dam would have been 100% in compliance with WAC standards in 2013.

Since the completion of spill deflectors at Chief Joseph Dam in 2008, there has been a shift in federal spill operations to upstream facilities resulting in a significant increase in the amount of spill at Grand Coulee and Chief Joseph dams. This recent increase in the amount of spill has resulted in a dramatic increase in the volume of TDG supersaturated water entering the mid-Columbia system. The mass influx of supersaturated water has resulted in significantly higher TDG concentrations observed in the Wells Dam Forebay.

Douglas PUD implemented the Ecology-approved GAP during the entire 2013 spill season utilizing the lessons learned during previous years of spill study at the Wells Project. The 2013 Spill Playbook was an important element in managing TDG at Wells Dam during the fish passage season. At the Wells Project, TDG compliance was exceptionally high, despite flows in 2013 being above average, incoming TDG levels constantly above the 110% standard, and reduced generation capacity related to rebuild of Unit 7 at Wells Dam.

4.2 Structural

No permanent structural modifications were proposed or conducted in the 2012 monitoring season. In 2013, Douglas PUD removed bypass barriers from Spillway 6 on May 23rd and reinstalled them on May 30th; then removed them again on July 1st and reinstalled them on July 11th. The removal and reinstallation of the bypass barrier was consistent with requirements identified in the Spill Playbook, Bypass Operating Plan and Wells Dam Emergency Action Plan and significantly improved the ability of Wells Dam to remain compliant with the 2013 fish passage TDG exemption.

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5 CONCLUSIONS

With the operation of spill deflectors at Chief Joseph Dam in recent years and shifting spill operations by the USACE to this Project, there has been an increasing trend of flows with higher levels of TDG entering Wells Project waters. FCRPS (Federal Columbia River Power System) spill priorities coupled with above average runoff during the fish spill season have tested the ability of the Wells Project to comply with applicable TDG standards. In consideration of these conditions, Douglas PUD, through the implementation of its Spill Playbook, achieved high compliance with the TDG exemption standards. If Chief Joseph Dam could comply with the non-fish passage WQS criteria of 110% (note that the Colville and EPA standards in the Chief Joseph Dam tailrace are also 110%), then the Wells Project would be able to fully comply with the TDG standard. Regardless of these observations, TDG performance at Wells Dam was very high with one of three compliance metrics met 100% of the time. These 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. In addition, Douglas PUD is hoping to build upon a more refined operational database that may inform spill playbooks and improve TDG management though the implementation of the WQAP. Douglas PUD will put an emphasis on testing the Spill Playbook in years where ten units are available 95% of the time (normal reliability).

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APPENDICES

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Appendix 1. Wells Project 2013 Gas Abatement Plan and Spill Playbook

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TOTAL DISSOLVED GAS ABATEMENT PLAN

WELLS HYDROELECTRIC PROJECT

(FERC Project No. 2149)

Prepared by:

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

February 1, 2013

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Executive Summary

Washington State Water Quality Standards (WQS) are defined in Washington Administrative Code (WAC) Chapter 173-201A, and are administered by the Washington Department of Ecology. Compliance with the total dissolved gas (TDG) standard requires that TDG not exceed 110 percent at any point of measurement in any state water body. A dam operator is not held to the TDG standards when the river flow exceeds the seven-day, 10-year frequency flood (7Q-10). In addition to allowances for natural flood flows, the TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with an Ecology-approved gas abatement plan. On a per-application basis, Ecology has approved a TDG adjustment to allow spill for juvenile fish passage past Columbia and Snake River dams (WAC 173-201A-200(1)(f)(ii)).

On the Columbia and Snake rivers there are three separate standards for the fish passage TDG adjustment: 1) TDG shall not exceed 125 percent in the tailrace of a dam, as measured in any one-hour period, 2) TDG shall not exceed 120 percent in the tailrace of a dam and 3) shall not exceed 115 percent in the forebay of the next dam downstream. Compliance with the latter two standards is determined using an average of the 12 highest consecutive hourly readings in any 24-hour period. The increased levels of spill, resulting in elevated TDG levels, are intended to allow increased fish passage with less harm to fish populations than what would be caused by turbine fish passage. This TDG adjustment provided by Ecology is based on a risk analysis study conducted by the National Marine Fisheries Service (NMFS) (NMFS 2000).

The goal of the Wells Total Dissolved Gas Abatement Plan (GAP) is to implement a long-term strategy to achieve compliance with the Washington State WQS criteria for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project) while continuing to provide safe passage for downstream migrating juvenile salmonids. Public Utility District No. 1 of Douglas County (Douglas PUD), which owns and operates the Wells Project, is submitting this GAP to Ecology as required for receipt of a TDG adjustment to aid fish passage at Wells Dam.

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1.0 Introduction and Background

The Wells Hydroelectric Project Gas Abatement Plan (GAP) provides details on operational and structural measures to be implemented by Public Utility District No. 1 of Douglas County, Washington (Douglas PUD) at Wells Dam under the Federal Energy Regulatory Commission (FERC) license for Project No. 2149. These measures are intended to result in compliance with the modified Washington State water quality standards (WQS) for total dissolved gas (TDG) allowed under the TDG adjustment, provided incoming water to the Project is in compliance and flows are below the seven-day, 10-year frequency flood levels (7Q-10: 246 kcfs).

The goal of the GAP is to implement a long-term strategy to achieve compliance with the Washington State WQS for TDG in the Columbia River at the Wells Hydroelectric Project (Wells Project or Project), while continuing to provide safe passage for downstream migrating juvenile salmonids via the Juvenile Bypass System (JBS). Douglas PUD is the owner and operator of the Wells Project and is submitting this GAP to the Washington Department of Ecology (Ecology) for approval as required for receipt of a TDG adjustment for fish passage.

Since 2003, Ecology has approved GAPs and issued a TDG adjustment for the Wells Project. The most recent GAP was approved by Ecology in 2012

This GAP contains three sets of information. Section 1.0 summarizes the background information related to regulatory and project-specific TDG information at the Wells Project. Proposed Wells Project operations and activities related to TDG management are contained in Sections 2.0 and 3.0. Section 4.0 provides a summary of compliance and physical monitoring plans, quality assurance and quality control procedures, and reporting.

1.1 Project Description

The Wells Project is located at river mile (RM) 515.6 on the Columbia River in the State of Washington (Figure 1). Wells Dam is located approximately 30 river miles downstream from the Chief Joseph Hydroelectric Project, owned and operated by the United States Army Corps of Engineers (USACE); and 42 miles upstream from the Rocky Reach Hydroelectric Project owned and operated by Public Utility District No. 1 of Chelan County (Chelan PUD). The nearest town is Pateros, Washington, which is located approximately 8 miles upstream from the Wells Dam.

The Wells Project is the chief generating resource for Douglas PUD. It includes ten generating units with a nameplate rating of 774,300 kW and a peaking capacity of approximately 840,000 kW. The spillway consists of eleven spill gates that are capable of spilling a total of 1,180 thousand cubic feet per second (kcfs). The crest of the spillway is approximately five and a half feet above normal tailwater elevation and two feet below tailwater elevation when plant discharge is 219 kcfs. The design of the Wells Project is unique in that the generating units, spillways, switchyard, and fish passage facilities were combined into a single structure referred to as the hydrocombine. Fish passage facilities reside on both sides of the hydrocombine, which is 1,130 feet long, 168 feet wide, with a dam top elevation of 795 feet above mean sea level (msl). The Juvenile Bypass System (JBS) was developed by Douglas PUD and uses a

barrier system to modify the intake velocities on all even numbered spillways (2, 4, 6, 8 and 10). The Wells Project is considered a "run-of-the-river" project due to its relatively limited storage capacity.

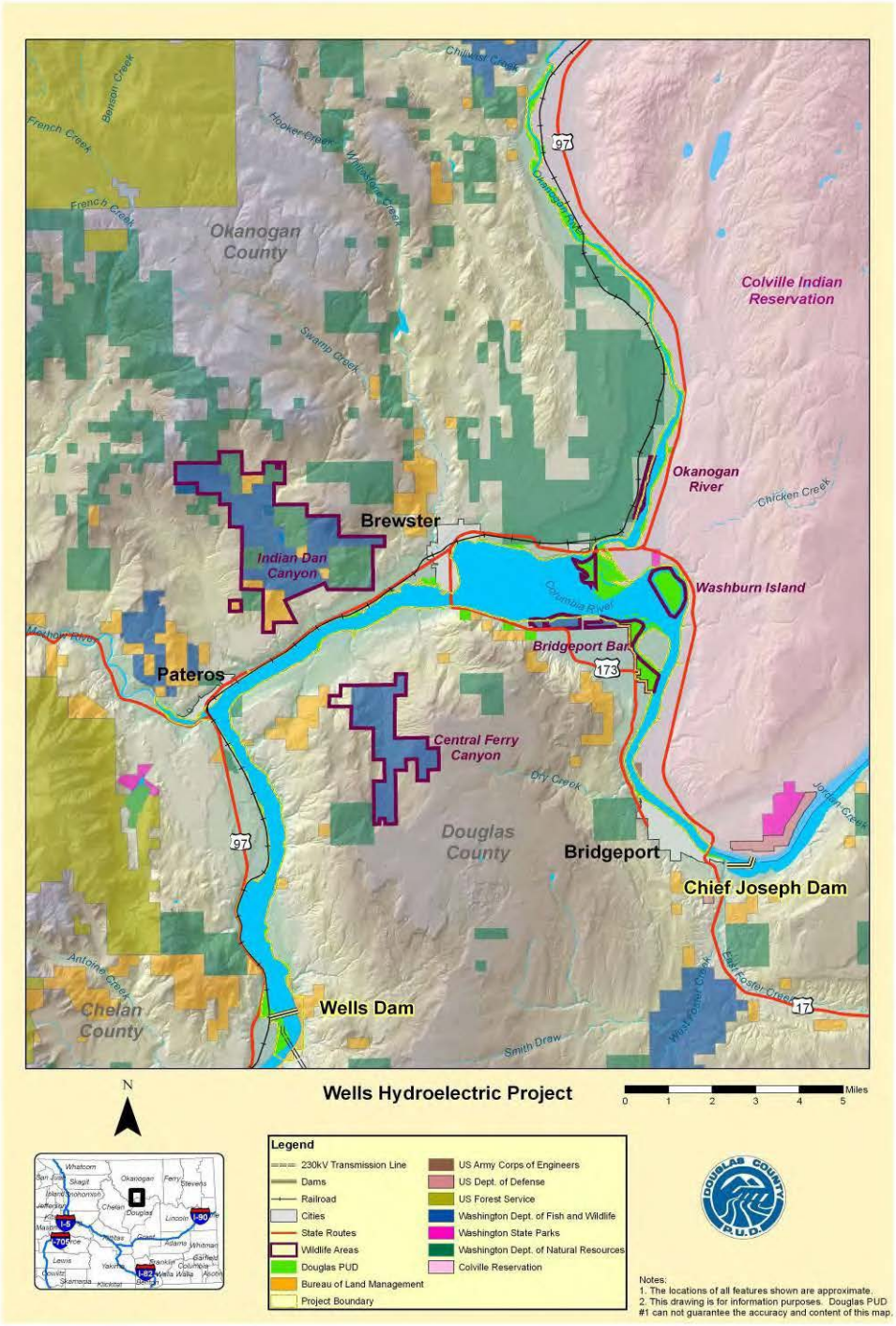

Figure 1. Map of the Wells Hydroelectric Project in Central Washington.

The Wells Reservoir is approximately 30 miles long. The Methow and Okanogan rivers are tributaries of the Columbia River within the Wells Reservoir. The Wells Project boundary extends approximately 1.5

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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

Article 401(a) of the FERC license for the Wells Project requires that the GAP be developed in consultation with the National Marine Fisheries Service (NMFS), [United States Fish and Wildlife Service (USFWS)], Washington State Department of Fish and Wildlife, [Washington State Department of Ecology (Ecology)], Confederated Tribes of the Colville Reservation, Confederated Tribes and Bands of the Yakama Nation, United States Bureau of Land Management, and United States Bureau of Indian Affairs. The GAP must then be approved by NMFS and Interior before being submitted to Ecology and the Aquatic Settlement Work Group for approval. Once approved by the Aquatic Settlement Work Group and in particular Ecology, then the GAP is to be filed with the FERC for approval.

WAC Chapter 173-201A defines standards for the surface waters of Washington State. Section 200(1)(f) defines the WQS for TDG, and subsection ii defines the TDG criteria adjustment for fish passage.

Under the WQS, TDG shall not exceed 110 percent at any point of measurement in any state water body. However, the standards exempt dam operators from this TDG standard when the river flow exceeds the 7Q-10 flow. The 7Q-10 flow is the highest calculated flow of a running seven consecutive day average, using the daily average flows that may be seen in a 10-year period. The 7Q-10 total river flow for the Wells Project was computed using the hydrologic record from 1974 through 1998, coupled with a statistical analysis to develop the number from 1930 through 1998. These methods follow the United States Geological Survey (USGS) Bulletin 17B, “Guidelines for Determining Flood Flow Frequency” and determined that the 7Q-10 flow at Wells Dam is 246,000 cfs (Ecology et. al. 2004).

In addition to allowances for natural flood flows, the TDG criteria may be adjusted to aid fish passage over hydroelectric dams when consistent with an Ecology-approved gas abatement plan. This plan must be accompanied by fisheries management and physical and biological monitoring plans. Ecology may approve, on a per application basis, an interim adjustment to the TDG standard (110 percent) to allow spill for juvenile fish passage past dams on the Columbia and Snake rivers. Ecology-approved fish-passage adjustments comprise three separate standards to be met by dam operators: 1)TDG shall not exceed 125 percent in any one-hour period in the tailrace of a dam,2) TDG shall not exceed 120 percent in the tailrace of a dam and 3) shall not exceed 115 percent in the forebay of the next dam downstream, with compliance criteria 2 and 3 measured as an average of the 12 highest consecutive hourly readings in any 24-hour period (12C High). The increased levels of spill resulting in elevated TDG levels are authorized by Ecology to allow salmonid smolts a non-turbine downstream passage route that is less harmful to fish populations than turbine fish passage. This TDG adjustment provided by Ecology is based on a risk analysis study conducted by the National Marine Fisheries Service (NMFS) (NMFS 2000).

A significant portion of the Wells Reservoir occupies lands within the boundaries of the Colville Indian Reservation. Wells Project operations do not affect TDG levels in tribal waters, where the Colville Tribes’ TDG standard is a maximum of 110 percent, year-round, at all locations. This TDG standard is also the

U.S. Environmental Protection Agency's (EPA) standard for all tribal waters on the Columbia River, from the Canadian border to the Snake River confluence. TDG levels on the Colville Reservation portion of the mainstem Columbia River within Wells Reservoir result from the operations of upstream federal dams but in particular, the USACE's Chief Joseph Dam (located immediately upstream of Wells Dam) and the US Bureau of Reclamation's Grand Coulee Dam (located immediately upstream of Chief Joseph Dam).

1.2.1 7Q-10 Flood Flows

The 7Q-10 flood flow at the Wells Project is 246.0 kcfs. The Project is not required to comply with state WQS for TDG when project flows exceed this value.

1.2.2 Fish Spill Season

Although not defined in state regulations, the fish spill season at Wells Dam is determined by the Habitat Conservation Plan (HCP) Coordinating Committee and is intended to aid downstream juvenile salmonid fish passage over Wells Dam as an alternative to passage through the Project turbines. The fish spill season is generally April to end of August, but may vary from year to year. During non-fish spill, Douglas PUD will make every effort to remain in compliance with the 110 percent standard. During the fish spill season, Douglas PUD will make every effort not to exceed an average of 120 percent as measured in the tailrace of the dam. TDG at the Wells Project also must not exceed an average of 115 percent as measured in the forebay of the next downstream dam (Rocky Reach). These averages are calculated using the twelve (12) highest consecutive hourly readings in any 24-hour period. In addition, there is a maximum one-hour average of 125 percent, relative to atmospheric pressure, during fish spill season. Nothing in these special conditions allows an impact to existing and characteristic uses.

1.2.3 Incoming TDG Levels

During the fish spill season, TDG concentrations in the Wells Project forebay are primarily determined by the USACE's upstream water management activities at Chief Joseph Dam and the Bureau of Reclamation's activities at Grand Coulee Dam.

Since the completion of spill deflectors at Chief Joseph Dam in 2008, there has been a significant increase in the amount of spill at the Chief Joseph Project resulting from Federal Columbia River Power System (FCRPS)-wide operations. Recent increases in the amount of spill at Chief Joseph Dam have resulted in a dramatic rise in the volume of supersaturated water entering the Wells Project. For example, in 2012 Wells Dam received non-compliant water (>110%) on 125 days of the 133 days fish spill season. This mass influx of supersaturated water has resulted in significantly higher TDG concentrations observed in the forebay of Wells Dam that often exceeds TDG values of 115%.

Despite the absence of fish passage at Chief Joseph Dam, the USACE has operated under the assumption that the fish passage TDG adjustment approved by Ecology applies to all FCRPS dams, rather than the eight dams with fish passage in the lower Snake and Columbia rivers. Chief Joseph and Grand Coulee dams do not currently have upstream or downstream fish passage and subsequently do not have Ecology approved fish passage adjustment for spilling water above the 110% statewide uniform TDG

standard. As a result, both the USACE and the Bureau of Reclamation are out of compliance with Washington State WQS, as well as the EPA TDG standard and the Colville Tribe's TDG standard, whenever TDG in the Chief Joseph dam or Grand Coulee dam tailraces exceeds 110 percent.

In 2012 the USACE revamped their proposed spill priority list for the FCRPS in recognition of the 110 percent TDG standard for joint operations of Grand Coulee and Chief Joseph Dams. Douglas PUD strongly supported the USACE's proposed 2012 spill priority as it was expected to reduce the future frequency and duration of non-compliant water entering the Wells Reservoir. Despite the spill priority modification in 2012, Douglas PUD consistently received non-compliant water from the upstream federal hydro-system above 110% on all but 8 days of the 133 day spill season. In addition Wells received water containing TDG over the 115% (12C-High) standard for more than 50% of the spill season days in 2012.

1.2.4 Total Maximum Daily Load

In June 2004, a total maximum daily load (TMDL) for TDG was jointly established for the Mid-Columbia River and Lake Roosevelt by Ecology, the Spokane Tribe of Indians, and EPA (Ecology et al. 2004). EPA's issuance covers all waters above Grand Coulee Dam and all tribal waters; EPA's TMDL covers all tribal waters of the Colville Confederated Tribes, including the right bank of the Columbia River from Chief Joseph Dam downstream to the Okanogan River confluence. Ecology's issuance covers all state waters downstream from Grand Coulee Dam to the Snake River confluence.

A summary implementation strategy prepared by Ecology and the Spokane Tribe of Indians describes proposed measures that could be used to reduce TDG levels in the Columbia River. Short-term actions primarily focus on meeting Endangered Species Act (ESA) requirements, while long-term goals address both ESA and TMDL requirements (Ecology et. al., 2004). Many of the recommended TMDL actions are currently being addressed by Douglas PUD through the implementation of the Wells Anadromous Fish Agreement and Habitat Conservation Plan (HCP) for anadromous salmon, the Bull Trout Management Plan resulting from consultation with the U.S. Fish and Wildlife Service, and requirements described in current and past GAPs.

The Wells Project occupies waters both upstream and downstream of the Okanogan River. In waters upstream of the Okanogan River, the TMDL does not provide an exemption for fish passage spills (except as a temporary waiver or special condition as part of the short-term compliance period, as described in the Implementation Plan, Appendix A of the TMDL). Downstream of the Okanogan River, allocations are provided based on both the 110 percent criteria and the criteria established for fish passage in the Washington State WQS. Any adjustment for fish passage downstream of the Okanogan River requires an Ecology-approved Gas Abatement Plan or GAP (Ecology et al. 2004).

1.2.5 Additional 401 Certification Requirements

On May 27, 2010 Douglas PUD filed an application for a new license with the FERC for the Wells Project. On September 30, 2010, Ecology received an application for a 401 Certification from Douglas PUD, requested pursuant to the provisions of 33 USC §1341 (§401 of the Clean Water Act). On September 12, 2011, Douglas PUD withdrew its request and reapplied. On February 27, 2012, Ecology concluded that

the Wells Project, as conditioned by its 401 Certification/Order No. 8981, would comply with all applicable provisions of 33 USC 1311, 1312, 1313, 1316, 1317 and appropriate requirements of Washington State law. The 401 Certification general conditions that are relevant to the GAP and the abatement of TDG under the TDG adjustment are as follows:

- Douglas PUD shall consult with Ecology before it undertakes any change to the Project or Project operations that might significantly and adversely affect compliance with any applicable water quality standard (including designated uses) or other appropriate requirement of state law.
- Copies of the Wells Project 401 Certification and associated permits, licenses, approvals and other documents shall be kept on site and made readily available for reference by Douglas PUD, its contractors and consultants, and by Ecology.
- Douglas PUD shall allow Ecology access to inspect the Project and Project records required under the 401 Certification for the purpose of monitoring compliance with conditions of the 401 Certification. Access will occur after reasonable notice, except in emergency circumstances.
- Douglas PUD shall, upon request by Ecology, fully respond to all reasonable requests for materials to assist Ecology in making determinations under the 401 Certification and any resulting rulemaking or other process.
- Douglas PUD shall operate the Wells Project in compliance with a GAP approved by Ecology. By February 28 of each year, Douglas PUD shall submit a GAP to Ecology for approval. Pending Ecology's approval of each subsequent GAP, Douglas PUD shall continue to implement the activities identified within the previously approved plan.
- The GAP will include the Spill Operations Plan and will be accompanied by a fisheries management plan (section 2.2.1) and physical (section 4.1.1) and biological (section 2.2.2) monitoring plans. The GAP shall include information on any new or improved technologies to aid in the reduction in TDG.
- Commencing one year after issuance of a new FERC license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine TDG compliance with the 110 percent standard (see section 4.1.1). The non-fish spill season is defined as the times of the year that are not considered the fish spill season (generally April to end of August).
- If Douglas PUD, at any point, considers modifying any of the measures identified in the spill playbook, they will immediately develop proposed alternative(s) that will produce levels of TDG equal to or less than those estimated to be produced by the measures to be replaced. These measures should be implementable in a similar timeframe and must be submitted to Ecology for review and approval prior to implementation.
- The Project shall be deemed in compliance with the TMDL for TDG as long as it remains in compliance with the terms of the 401 Certification. The certification, including the GAPs and the

Water Quality Attainment Plan (section 2.2.4), is intended to serve as the Project's portion of the Detailed Implementation Plan for the TDG TMDL.

The 401 Certification also contains specific conditions that are relevant to the GAP and the abatement of TDG under the TDG adjustment are as follows:

- Commencing one year after issuance of the new license, Douglas PUD shall monitor and report spills and TDG during non-fish spill season to determine compliance with the 110% standard.
- Douglas PUD shall maintain a TDG monitoring program at its Fixed Monitoring Locations in the forebay and tailrace of Wells Dam and/or at other locations as determined by Ecology, in order to monitor TDG and barometric pressure. Douglas PUD shall monitor TDG hourly throughout the year.
- The TDG monitoring program shall conform to the Ecology Quality Assurance Project Plan (QAPP) requirements per Section 6.7 (f) of the [license] order and the procedures shall be at least as stringent as the quality assurance/quality control calibration and monitoring procedures developed by the USGS for the Columbia River.
- Douglas PUD shall provide an annual TDG report to Ecology for review and approval by February 28th of each year.
- Within one year of issuance of the new license, Douglas PUD shall coordinate the annual HCP Project Fish Bypass/Spill Operations Plan with the GAP, using best available information to minimize the production of TDG. This coordination shall be accomplished in consultation with the Wells HCP Coordinating Committee and the aquatic SWG.
- Within one year of license issuance, Douglas PUD shall submit a Water Quality Attainment Plan for Ecology to review and approve. The plan shall include a compliance schedule to ensure compliance with the water quality criteria with 10 years.
- Douglas PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7Q10 by minimizing voluntary spill through operations, including scheduling maintenance based upon predicted flows, avoiding spill by coordinating operations with updstream dams to the extent that it reduces TDG, maximize power house discharge, especially during periods of high river flows, and manage voluntary spill in real time in an effort to continue to meet TDG numeric criteria consistent with the GAP.

1.2.6 Additional Requirements of the FERC Operating License

Article 401(a) of the FERC operating license for P-2149 requires that the Gas Abatement Plan be filed with the Commission for approval following the approval of the GAP by NMFS, USFWS and Ecology. Article 401(b) requires the TDG report be submitted to the Commission by February 28th of each year.

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Article 401(c) requires Commission authorization of an application to amend the license, prior to the implementation of measures to address non-compliance with numeric water quality criteria.

1.3 History of Operations and Compliance

1.3.1 Historical Flows

Flow from the Columbia River originates in the headwaters of the Canadian Rockies and picks up snow melt from tributary streams as it travels over 1,243 miles before emptying into the Pacific Ocean. There are 85,300 square miles of drainage area above Wells Dam. The natural hydrograph had low flows in November through January with high flows in May through July. Storage dams on the Columbia River and its tributaries upstream of the Wells Project in the U.S. and Canada capture spring and summer high flows to hold for release in the fall and winter months. Table 1 presents information on Columbia River flow, as measured at Wells Dam from 2002 to 2012, and shows that the current hydrograph of the Columbia River is controlled by upstream, federally managed storage and release regimes. Juvenile anadromous salmonid migration occurs within a regime of reduced high flows during the spring migration period.

In general, the hydropower system and reservoir operations in the Columbia River are coordinated through a set of complex agreements and policies that are designed to optimize the benefits and minimize the adverse effects of project operations. The Wells Project operates within the constraints of the Pacific Northwest Coordination Agreement, Canadian Treaty, Canadian Entitlement Agreement, Hourly Coordination Agreement, the Hanford Reach Fall Chinook Protection Program and the FERC regulatory and license requirements.

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Table 1. Average monthly flows (kcfs) at Wells Dam, by month (2002-2012).

	Month											
Year	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
2002	91	91.9	66.1	116.9	135	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	74.6	87.7	105.5
2004	96.2	80.5	70	87.3	114.2	132.3	101.5	95.7	75.7	79.3	90.9	112
2005	102	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	133	113.1	60	64.4	80.2	86.8
2008	104	88.6	82.4	90.3	158.7	206.8	135.3	86.5	60.7	63	75.2	94.2
2009	107.8	80.2	71.5	111	122.7	146.6	103.1	74.5	53.5	58.1	80.1	101.8
2010	71.1	72.1	65.2	70.7	112.2	173	119.9	83.6	53.8	67.7	85.8	86.2
2011	114.9	136.6	124.1	145.7	206	259	206.6	139.9	73.8	74.9	89.9	98.2
2012	93.4	83.5	118.4	174.1	217.2	232.9	253.8	158.6	79.5	64	88.4	NA
All	97.4	90.7	89.3	117.4	149.4	179.2	145.5	106.8	66.3	70.0	85.7	96.1

1.3.2 Spill Operations

1.3.2.1 General Operation

The Hourly Coordination Agreement is intended to integrate power operations for the seven dams from Grand Coulee to Priest Rapids. "Coordinated generation" is assigned to meet daily load requirements via Central Control in Ephrata, WA. Automatic control logic is used to maintain pre-set reservoir levels to meet load requirements and minimize involuntary spill. These pre-set reservoir levels are maintained at each project via management of a positive or negative "bias". Positive or negative bias assigns a project more or less generation based on its reservoir elevation at a given time and thus, maximizes system benefits and minimizes involuntary spill.

1.3.2.2 Spill for Fish

Wells Dam is a hydrocombine design where the spillway is situated directly above the generating units. Research at Wells Dam in the mid-1980s showed that a modest amount of spill effectively guided 92.0-96.2% of the spring and summer downstream migrating juvenile salmonids through the JBS (Skalski et al. 1996; Table 2). The operation of the Wells JBS utilizes the five even-numbered spillways. These spillways have been modified with constricting barriers to improve the attraction flow while using modest levels of water. These spillways are used to provide a non-turbine passage route for downstream migrating juvenile salmonids from April through August. Normal operation of the JBS uses 10 kcfs. During periods of extreme high flow, one or more of the JBS barriers will be removed to provide adequate spill capacity to respond to an emergency plant load rejection. Spill barriers may also be removed to minimize TDG production during high spill events, or when flood flows are forecast. Bypass gates are opened when adjacent turbines are operating.

Typically, the JBS will use approximately 6 to 8 percent of the total river flow for fish guidance. Between the years 1997 and 2004, the volume of water dedicated to JBS operations has ranged from 1.5 to 3.2 million acre-feet annually. The operation of the JBS adds a small amount of TDG (up to 2 percent) while meeting a very high level of fish guidance and protection. This high level of fish protection at Wells Dam has met the approval of the fisheries agencies and tribes and is vital to meeting the survival performance standards contained within the FERC-approved HCP. The Wells Project JBS is the most efficient bypass system on the mainstem Columbia River.

Table 2. Wells Hydroelectric Project Juvenile Bypass System Efficiency.

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

The JBS is used to protect downstream migrating juvenile salmonids. Fish bypass operations at Wells Dam falls into two seasons, Spring Bypass and Summer Bypass. For 21 years, the status of the fish migration for both spring and summer periods was monitored by an array of hydroacoustic sensors placed in the forebay of Wells Dam. The operation period for the juvenile bypass begins in April and ends in August; actual start and stop dates are set by the HCP Coordinating Committee, and are based on long-term monitoring to bracket the run timing of greater than 95 percent of both the spring and summer migrants. Up to thirteen million juvenile salmonids migrate past Wells Dam each year.

1.3.2.3 Flows in Excess of Hydraulic Capacity

The Wells Project is a “run-of-the river” project with a relatively small storage capacity (~98,000 acre ft). By comparison, Grand Coulee Dam, two projects upstream of Wells Dam, has 58 times the storage capacity of the Wells Reservoir. River flows in excess of the ten-turbine hydraulic capacity (219 kcfs) at Wells Dam must be passed over the spillways.

The forebay elevation at Wells Dam is maintained between 781.0 and 771.0 msl. The Wells Project has a hydraulic generating capacity of 219 kcfs (ASL 2007) and a spillway capacity of 1,180 kcfs. In recent years however the Wells project has had less than 200 kcfs plant capacity due to ongoing generator and turbine rebuild and upgrade projects. Data for Columbia River flows for eighty-five years at Priest Rapids yielded a peak daily average discharge of 690 kcfs on June 12, 1948 (USGS web page for historical flows at Priest Rapids on the Columbia River, http://waterdata.usgs.gov/wa/nwis/dv/?site_no=12472800). Therefore, the hydraulic capacity of Wells Dam is well within the range of recorded flow data.

1.3.2.4 Flow in Excess of Power Demand

Spill may occur at flows less than the Wells Project hydraulic capacity when the volume of water is greater than the amount required to meet electric power system loads. This may occur during temperate weather conditions and when power demand is low or when non-power constraints on river

control results in water being moved through the Mid-Columbia at a different time of day than the power is required (i.e. off-peak periods). Hourly coordination (Section 3.2) between hydroelectric projects on the river was established to maximize generation by minimizing spill. Spill in excess of power demand provides benefit to migration juvenile salmonids. Fish that pass through the spillway survive at a higher rate relative to passage through a turbine and the turbulence in the tailrace generated by spill in excess of power demand increases tailrace velocity and reduces tailrace egress times. The reductions in tailrace egress time and increases in water turbulence and velocity reduce predation in the Wells tailrace.

1.3.2.5 Gas Abatement Spill

Gas Abatement Spill is used to manage TDG levels throughout the Columbia River Basin. The Technical Management Team (including NMFS, USACE, and Bonneville Power Administration [BPA]) implements and manages this spill. Gas Abatement Spill is requested from dam operators at other projects in the Columbia and Snake Rivers where gas levels are high. A trade of power generation for spill is made between operators, providing power generation in the river with high TDG and trading an equivalent amount of spill from a project where TDG is lower. Historically, the Wells Project has accommodated requests to provide Gas Abatement Spill. However, in an effort to limit TDG generated at the Wells Project, Douglas PUD has adopted a policy of not accepting Gas Abatement Spill at Wells Dam.

1.3.2.6 Other Spill

Other spill includes spill as a result of maintenance or plant load rejection. A load rejection occurs when the generating plant is forced off-line by an electrical fault, which trips breakers and shuts off generation. At a run-of-the-river hydroelectric dam, if water cannot flow through operating turbines, then the river flow that was producing power has to be spilled until turbine operation can be restored. These events are extremely rare, and would account for approximately 10 minutes in every ten years.

Maintenance spill is utilized for any activity that requires spill to assess the routine operation of individual spillways and turbine units. These activities include checking gate operation, conducting index and generator load testing and all other maintenance activities that would require spill to pass water. 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 period of peak flow .

1.3.3 Compliance Activities in Previous Year

1.3.3.1 Operational

Since the Wells Project is a “run-of-the river” project with a relatively small storage capacity, river flows in excess of the ten-turbine hydraulic capacity must be passed over the spillways. Outside of system coordination and gas abatement spill (Douglas PUD has adopted a policy of not accepting the latter), minimization of involuntary spill has primarily focused on minimizing TDG production dynamics of water spilled based upon a reconfiguration of spillway operations. The 2009 Wells Project GAP (Le and Murauskas, 2009) introduced the latest numerical model developed by the University of Iowa’s IIHR-

Hydroscience and Engineering Hydraulic Research Laboratories. The two-phase flow computational fluid dynamics tool was used to predict hydrodynamics of TDG distribution within the Wells Dam tailrace and further identify operational configurations that would minimize TDG production at the Project. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet the TDG adjustment criteria during the passage season with flows up to 7Q-10 levels provided the forebay TDG levels are below 115 percent. Compliance was achieved through the use of a concentrated spill pattern through Spillbay No. 7 and surplus flow volume through adjacent odd numbered spillbays in a defined pattern and volume. These preferred operating conditions create surface-oriented flows by engaging submerged spillway lips below the ogee, thus increasing degasification at the tailrace surface, decreasing supersaturation at depth, and preventing high-TDG waters from bank attachment. These principles were the basis of the 2009 Wells Project Spill Playbook and were fully implemented for the first time during the 2009 fish passage (spill) season with success. Overall, no exceedances were observed in either the Wells Dam tailrace or the Rocky Reach forebay in 2009.

In 2010, the concepts from the 2009 Spill Playbook were integrated into the 2010 Wells Project Spill Playbook given their effectiveness in maintaining levels below TDG criteria during the previous year. High Columbia River flows in June, which exceeded the preceding 15-year average flow, resulted in several exceedances of the hourly (125 percent maximum) and 12C-High (120 percent) TDG limits in the Wells Dam tailrace, and Rocky Reach forebay (115 percent). In response, Douglas PUD implemented an in-season analysis of the 2010 Spill Playbook and determined that full implementation of the recommendations from IIHR Engineering Laboratory would require the removal of the juvenile fish bypass system flow barriers in one even numbered spillbay. Following the in-season analysis and consultation with the HCP Coordinating Committee, changes were made to the 2010 Spill Playbook that allowed for the removal of the juvenile fish bypass system barriers in spillbay 6. Specifically, the Spill Playbook was modified to state that when spill levels approach the 53 kcfs threshold, the JBS barriers in spillbay 6 would be removed in order to remain in compliance with the TDG criteria in the Wells Dam tailrace and Rocky Reach Dam forebay. When spill exceeded 53 kcfs, excess spill would be directed through spillbays 6 and 7 rather than through spillbays 5 and 7. This operational configuration resulted in a more compact spill pattern that reduced the air-water interface surface area between spillway flows and the subsequent potential for lateral mixing and air entrainment.

In February 2011, Douglas PUD conducted an additional technical analysis of the 2010 Spill Playbook (after in-season changes) and confirmed that continued implementation would be appropriate for 2011 with additional minor modifications. Following approval of the 2011 GAP by Ecology, the 2011 Spill Playbook was implemented. Only minor changes were made to the 2012 spill playbook as a result of high compliance during the 2011 spill season.

In December of 2012 the final GAP report was completed for the 2012 spill season. After analysis it was determined that the 2012 spill season had the 3rd highest average monthly flows since 1969 (April-August). In addition incoming flows were reliably above 115%. Despite these conditions Wells Dam demonstrated high compliance with all standards aside from the Rocky Reach 115% 12C-high forebay standard since incoming flows to Wells were above 115% greater than 50% of the spill season days.

Given these unique conditions, and high compliance performance in 2011 and 2012, no changes are suggested for the 2013 spill playbook.

1.3.3.2 Structural

No structural modifications were implemented (none were scheduled) during the 2012 monitoring season, other than the removal of the JBS barriers, if needed, to accommodate high spill volumes in accordance with the Spill playbook. No structural modifications are planned for the 2013 spill season.

1.3.3.3 Biological Monitoring

NMFS has shown that Gas Bubble Trauma (GBT) is low if the level of TDG can be managed to below 120 percent (NMFS 2000). They recommend that "the biological monitoring components will include smolt monitoring at selected smolt monitoring locations and daily data collection and reporting only when TDG exceeds 125 percent for an extended period of time." The 2012 Wells Project GAP has included the NMFS recommendation to sample for GBT in juvenile salmon when TDG levels exceed 125 percent saturation (NMFS 2000). In 2012, the 125 percent standard was exceeded on numerous occasions, but almost always when flows at Wells Dam were above 7Q-10 flood flows (246.0 kcfs). Regardless of 7Q-10 conditions, Douglas PUD conducted GBT sampling of juvenile salmonids at the Rocky Reach juvenile fish bypass, and in addition, sampled adult salmon at the Wells fish ladder traps. Over 800 adult salmon were collected and sampled from Wells Dam fish ladders, with none showing signs of GBT expression in 2012. Juvenile biological monitoring was initiated on May 3 and continued on days subsequent to 125% exceedences, which require monitoring. Daily monitoring continued until June 29, 2012, after which a three day/week sampling schedule was implemented due to TDG levels being sustained above 125 percent. Douglas PUD continued to monitor TDG conditions and biological responses until July 25, 2012.

Biological sampling indicated that GBT expression in juvenile salmonids examined at Rocky Reach averaged 1.25% for all 24 days of sampling, with a maximum daily occurrence of <6% of the fish examined. In all cases, GBT expression was mild with only a few cases of moderate expression (score of 1 or 2 on the 1-4 expression score scale). GBT expression peaked in late June and early July when the highest TDG values were observed in the Wells and Rocky Reach forebays. GBT expression was confounded by species specific sensitivities to levels of TDG coupled with changes to the species run composition during the spill season. Juvenile salmonids expressed varied amount of GBT by species. Coho expressed the highest incidence of GBT with steelhead and yearling Chinook expressing intermediate GBT and sockeye and subyearling Chinook appearing to be the most resilient to high TDG concentrations. Throughout the season, adult spring Chinook sampled at Wells Dam appeared to have few symptoms of GBT, even when TDG was above 130 percent in the Wells tailrace.

1.3.4 Compliance Success in Previous Year (2012)

TDG river flows in 2012 were much higher than historic flows at the Wells Project (Table 3); 156 percent of the 42-year average for the entire spill season. Flows in 2012 were the third-highest on record since Wells Dam was constructed (1997 and 1972 were slightly higher). The maximum hourly flow observed during the spill season was 314 kcfs on June 25 and flows frequently exceeded the 7Q-10 value of 246.0

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kcfs. The average monthly flow from mid-June to the end of July exceeded the 7Q-10 value for the Wells Project in 2012.

Table 3. Average monthly river flow volume (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the previous 42-year average (1969-2011), by month.

Month	1969-2011 Mean	2012 Mean	Percent Difference from 42-year Average
April	115.6	174.1	+151%
May	149.4	217.2	+145%
June	164.5	232.9	+142%
July	132.2	253.8	+192%
August	104.6	158.7	+152%
All	133.3	207.34	+156%

High flows and incoming water out of compliance with the TDG standards, resulted in elevated TDG. On June 29 forced spill reached 167.5 kcfs, the maximum hourly value for the 2012 season (total outflow was 312.8 during the same hour). These high spill events were attributed to both flow volumes in excess of the Project's hydraulic capacity, and flows in excess of the power system needs and/or transmission system capacity. Spill volume across the April-August spill season was over 260 percent of the preceding 17-year average (Table 4).

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Table 4. Average monthly spill (kcfs) during the TDG monitoring season at the Wells Project in 2012 compared to the 17-year average (1995-2011), by month.

	1995-2011		2012	
Month	**Mean**	**Std Dev**	**Mean**	**Std Dev**
April	10.9	7.0	20.6	13.7
May	21.9	20.7	59.0	18.6
June	36.4	39.6	65.4	41.9
July	15.1	11.2	84.4	28.4
August	7.9	2.1	12.5	9.4
Spill Season	18.4	16.1	48.4	37.0

As a result of these high spill volumes and the reception of non-compliant upstream water from the federal hydro-system, TDG exceeded the fish passage exception levels in early May, through early August. Of the 133 days during the spill season, there were 56 days when one or more hours had flows at Wells Dam above the 7Q-10 value. During the 2012 monitoring season, the TDG criterion for the forebay of Wells Dam was exceeded on all but 8 days (94.0 % of the spill season). If days where the Wells forebay exceedances are not excluded from compliance analysis except when TDG levels in the Wells tailrace are equal to or less than incoming forebay TDG levels, compliance for all three standards range from 49-98%. The 2012 compliance summary is reported in table 5.

Table 5. 2012 compliance summary.

	Compliance	
	Days with 7Q-10 flows removed	**Considering 7Q-10 flows**
Wells Tailrace 125% hourly standard		
Days out of compliance	2	2
Spill/bypass season	77	133
DCPUD Percent compliance	**97%**	**98%**
Wells Tailrace 120% 12C-High standard		
Days out of compliance	14	14
Spill/bypass season	77	133
DCPUD Percent compliance	**82%**	**89%**
Rocky Reach Forebay 115% 12C-High standard		
Days out of compliance	39	39
Spill/bypass season	77	127*
DCPUD Percent compliance	**49%**	**69%**

* Six days where the Rocky Reach forebay sensor failed has been removed from the analysis.

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Despite extended periods of high flows, incoming TDG and spill, unit 7 rebuild, the Wells Project attained a high percentage of compliance when periods of flows in excess of 7Q-10, and periods when incoming water to the Project exceeded TDG criteria, are removed from the analysis. These encouraging results support the continued implementation of the 2012 Spill Playbook in 2013 during the fish passage season.

2.0 Proposed Operations and Activities

2.1 Operational Spill

2.1.1 Minimizing Involuntary Spill

Based on the Wells Project'simproved TDG performance as a result of 2012 operations associated with implementation of the Wells Project Spill Playbook, similar operating principles will be implemented for the 2013 fish passage season.

As discussed in Section 1.3.3.1 above, high Columbia River flows in 2012 resulted from high flood flows and subsequent forced spill. Often, incoming water in the forebay was already above tailrace compliance levels. However, operations following the 2012 Spill Playbook, when forebay inflows were below 115 percent TDG adjustment criterion and below 7Q-10 flows, resulted in high rates of compliance. Similarly to 2012, the 2013 Spill Playbook is proposing to shift concentrated spill away from spillway 7 to spillway 5. Spillway 5 was selected because spill through this bay can be more reliably supported by discharge from adjacent turbine units. The turbine discharge from Units 4 and 5 are expected to further enhance the surface jet being spilled through spillway 5. The updated Spill Playbook for 2012 is attached as Appendix 1.

In addition to minimizing involuntary spill through the implementation of the Spill Playbook, Douglas PUD shall manage spill toward meeting water quality criteria for TDG during all flows below 7Q-10 as follows:

- Minimize voluntary spill through operations including to the extent practicable, by scheduling maintenance based on predicted flows;
- Avoid spill by continuing to coordinate operations with upstream dams, to the extent that it reduces TDG;
- Maximize powerhouse discharge, especially during periods of high river flows; and
- During fish passage season, manage voluntary spill levels in real time in an effort to continue to meet TDG numeric criteria.

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2.2 Implementation

2.2.1 Fisheries Management Plans

Juvenile salmon and steelhead survival studies conducted at the Wells Project in accordance with the HCP have shown that the operation of the Wells Project, of which the JBS is an integral part, provides an effective means for outmigrating salmon and steelhead to pass through the Wells Project with a high rate of survival (Bickford et al. 2001, Bickford et al. 2011) (Table 6). The Wells JBS is the most efficient juvenile fish bypass system on the mainstem Columbia River (Skalski et al. 1996). The Wells Anadromous Fish Agreement and HCP (Douglas PUD 2002) is the Wells Project's fisheries management plan for anadromous salmonids, and directs operations of the Wells JBS to achieve the No Net Impact (NNI) standard for HCP Plan Species. The Aquatic Resource Management Plans (for white sturgeon, bull trout, Pacific lamprey, resident fish, water quality, and aquatic nuisance species) in the Wells Project's Aquatic Settlement Agreement (developed in support of the pending Wells Project operating license) are the fisheries management plans for all other aquatic life designated uses.

Table 6. 1998 -2000, 2010 Wells Hydroelectric Project Juvenile Survival Study Results.

Species	% Project Survival
Yearling Chinook (2010)	96.4
Yearling Chinook and Steelhead (1998, 1999)	96.2

In spring 2010, Douglas PUD conducted a survival verification study with yearling Chinook salmon, a required 10-year follow-up study to confirm whether the Wells Project continues to achieve survival standards of the Wells Anadromous Fish Agreement and HCP. Approximately 80,000 Passive Integrated Transponder (PIT)-tagged yearling summer Chinook were released over a 30 day period in 15 replicates. The study determined that juvenile Chinook survival from the mouth of the Okanogan and Methow rivers averaged 96.4 percent over the 15 replicate releases of study fish (Table 6). This result confirms conclusions from the three previous years of study and documents that juvenile fish survival through the Wells Project continues to exceed the 93 percent Juvenile Project Survival Standard required by the HCP (Bickford et al. 2011).

The current phase designations (status of salmon and steelhead species reaching final survival determination) for the HCP Plan Species are summarized in Table 7. Specific details regarding survival study design, implementation, analysis, and reporting are available in annual summary reports prepared and approved by the Wells HCP Coordinating Committee.

Table 7. Wells Hydroelectric Project Habitat Conservation Plan Species Phase Designations.

Species	Phase Designation
Yearling (spring) Chinook	Phase III[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 2013, Douglas PUD shall continue to operate Wells Dam adult fishways and the JBS in accordance with HCP operations criteria to protect aquatic life designated uses. Furthermore, all fish collection (hatchery broodstock and/or evaluation activities) or assessment activities that occur at Wells Dam will require approval by Douglas PUD and the HCP Coordinating Committee to ensure that such activities protect aquatic life designated uses.

Douglas PUD shall continue to operate the Wells Project in a coordinated manner toward reducing forebay fluctuations and maintaining relatively stable reservoir conditions that are beneficial to multiple designated uses (aquatic life, recreation, and aesthetics). Coordinated operations reduce spill, thus reducing the potential for exceedances of the TDG numeric criteria and impacts to aquatic life associated with TDG.

2.2.2 Biological Monitoring

As in past years, if hourly TDG levels exceed 125 percent in the tailrace of Wells Dam, Douglas PUD will conduct adult and juvenile salmonid GBT sampling. Douglas PUD will work with the Washington Department of Fish and Wildlife hatchery programs to monitor the occurrence of GBT on adult salmon collected in the Wells Dam and Wells Hatchery fishways. Upon collection of broodstock, hatchery staff will inoculate each fish, place a marking identification tag on them and look for any fin markings or unusual injuries. It is expected that adult broodstock sampled for GBT will consist of spring and summer Chinook and sockeye since they are the species migrating through the Wells Project during fish spill periods where high TDG is a concern, however all encountered salmonids including steelhead and bull trout will be examined.

The JBS at Wells Dam does not have facilities to allow for juvenile fish sampling and observation. To address GBT sampling for juvenile anadromous salmonids if hourly TDG levels exceed 125 percent in the tailrace of Wells Dam, Douglas PUD will request biological sampling of migrating juveniles for symptoms of GBT at the Rocky Reach juvenile bypass sampling facility on the day subsequent to the exceedence. Target species for juvenile GBT sampling will consist of coho, sockeye, and yearling and subyearling Chinook and steelhead. If flood flows above 7Q-10 persist for extended timeframes (more than one

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

week), sampling effort will be reduced to 3 days per week. Proposed biological monitoring for 2013 is consistent with 2012 sampling measures.

2.2.3 Water Quality Forums

Douglas PUD is currently involved in the Water Quality Team meetings held in Portland, Oregon. The purpose of the Water Quality Team is to address regional water quality issues. This forum allows regional coordination for monitoring, measuring, and evaluating water quality in the Columbia River Basin. Douglas PUD will continue its involvement in the Water Quality Team meetings for further coordination with other regional members.

Douglas PUD is also currently involved in the Transboundary Gas Group that meets annually to coordinate and discuss cross border dissolved gas issues in Canada and the U.S. Douglas PUD will continue its involvement with the Transboundary Gas Group.

In 2012, Douglas PUD actively participated in regional water quality forums with Ecology, Washington Department of Fish and Wildlife, Tribal Agencies, the U.S. Fish and Wildlife Service, NMFS, the USACE, and other Mid-Columbia PUDs (i.e., Grant and Chelan counties). These meetings, ranging from the Transboundary Gas Group to meetings with the USACE to individual telephone and email information exchange, allow for regional coordination for monitoring, measuring, and evaluating water quality in the Columbia River Basin. Douglas PUD is proposing to continue its involvement in such forums to further improve coordination with other regional water quality managers.

2.2.4 Water Quality Attainment Plan and Quality Assurance Project Plans

In November 2012, Douglas PUD received a new operating license for Wells Dam from the FERC. By October 2013 Douglas PUD is required to submit a Water Quality Attainment Plan (WQAP) and Water Quality Assurance Project plans (QAPP) for temperature and total dissolved gas monitoring to Ecology for review and approval. After Ecology approval, Douglas PUD shall submit the WQAP and QAPP plans to FERC for approval prior to implementation.

The WQAP shall include a compliance schedule to ensure compliance with TDG criteria within 10 years. The WQAP will also allow time for the completion of the necessary studies or for the resolution of the issue of elevated incoming TDG from upstream projects through rule-making or other means. The WQAP shall be prepared in consultation with the Aquatic Settlement Work Group (Aquatic SWG) and the HCP Coordinating Committee and shall meet the requirements of WAC 173-201A-510(5). The WQAP shall:

- Identify all reasonable and feasible improvements that could be used to meet TDG criteria. Data on high TDG levels and flow coming into the Wells forebay and its effects on Project compliance shall be included;
- Contain the analytical methods that will be used to evaluate all reasonable and feasible improvements;

- Provide for any supplemental monitoring that is necessary to track compliance with the numeric WQS; and
- Include benchmarks and reporting sufficient for Ecology to track Douglas PUD's progress toward implementing this plan and achieving compliance within ten years of Ecology's approval of the plan.

If implementing the compliance schedule does not result in compliance with TDG criteria at the time the compliance schedule expires, Douglas PUD may explore other alternative approaches available in the water quality standards, including a second compliance schedule or alternatives provided in WAC 173-201A-510(5)(g).

3.0 Structural Activities

No structural modifications related to spill are scheduled to occur at the Wells Project in 2013. As in 2012, high flow volume and spill may require JBS barrier removal per this GAP (see Appendix 2: 2013 Spill Playbook). The removal of JBS barriers to reduce TDG production at Wells Dam has been integrated into the Juvenile Fish Bypass Operating Plan that is annually approved by the HCP Coordinating Committee.

4.0 Compliance and Physical Monitoring

4.1 Monitoring Locations

4.1.1 TDG

TDG monitoring has been implemented in the Wells Dam forebay since 1984. Douglas PUD began monitoring TDG levels in the Wells Dam tailrace in 1997 by collecting data from a boat and drifting through the tailrace at four points across the width of the river. During the transect monitoring, no TDG "hot spots" were detected; the river appeared completely mixed horizontally. A fixed TDG monitoring station was established in 1998. The placement of the fixed monitoring station was determined based upon the 1997 work and was further verified as collecting data representative of river conditions during a 2006 TDG assessment at Wells Dam (EES et. al. 2007). Results of the 2008-2009 TDG numerical modeling activities conducted by University of Iowa/IIHR also confirmed that the tailrace monitoring station is located at a site representative of the mixed river flow, particularly during higher flows. Furthermore, locations of both forebay and tailrace sensors had to be protected to avoid sensor/data loss and damage and for safe accessibility during extreme high flows. The current locations of both the forebay and tailrace monitors took these criteria into consideration.

TDG monitoring at the Wells Project typically commences on April 1 and continues until September 15 annually. This monitoring period encompasses the operation of the Wells JBS as well as when river flows are at their highest and when a majority of spill occurs. Throughout this period, data from both forebay and tailrace sensors are transmitted by radio transmitters to a master radio at Wells Dam. This system is checked at the beginning of the season for communication between the probes and

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transmitters by technicians at Wells Dam. TDG data are sent and logged at the Douglas PUD Headquarters' building in 15-minute intervals. Information on barometric pressure, water temperature and river gas pressure is sent to the USACE on the hour over the Internet. The four data points (15 minute) within an hour are used in compiling hourly TDG values, the 24-hour TDG average and the 12C-High readings in a day (24-hour period).

In 2013, Douglas PUD intends to operate a redundant TDG sensor in the tailrace location. Should the primary sensor fail data gaps can be filled from the second sensor. Installation timeframe will be contingent upon regulatory agencies' approvals for in-water work and modification of the shoreline within the ordinary high water mark. Hourly TDG data transmissions to the USACE of Wells forebay and tailrace station data will be expanded to cover the year-round monitoring requirement (starting April 1, 2013.

Starting in 2013, Douglas PUD is planning on installing and operating a new TDG sensor station in the Wells Reservoir located several miles downstream of Chief Joseph Dam. This new TDG sensor station will provide reliable mixed flow TDG readings from Chief Joseph Dam. The current system operated by the USACE below Chief Joseph Dam collects TDG values from the spillways at the dam and does not provide information on TDG passing through the turbines at Chief Joseph Dam originating from Grand Coulee Dam and does not provide an accurate reading of mixed flow TDG being directed at the Wells forebay.

4.2 Quality Assurance

The broad purpose of a well-designed Quality Assurance Project Plan (QAPP) is to attain data of the type and quality needed to make future decisions surrounding the need, or lack thereof, for changes to project operation and construction related to compliance with TDG and temperature standards.

4.2.1 TDG

Douglas PUD will develop a QAPP for TDG in early 2013 in coordination with the Department of Ecology. Briefly, as part of the Douglas PUD's Quality Assurance/Quality Control (QA/QC) program, Douglas PUD's water quality consultant will visit the TDG sensor sites monthly for maintenance and calibration of TDG instruments. Calibration follows criteria established by the USACE, with the exception of monthly rather than bi-weekly calibration of sensors. A spare probe will be available and field-ready in the event that a probe needs to be removed from the field for repairs.

The consultant will inspect instruments during the monthly site visits and TDG data will be monitored weekly by Douglas PUD personnel. If, upon inspection of instruments or data, it is deemed that repairs are needed, they will be promptly made. Occasionally during the monthly sensor calibration, an error may develop with the data communication. These problems are handled immediately by technicians located at Wells Dam. Generally, the radio transmitters at each fixed station will run the entire season without any problems.

Douglas PUD will collect TDG data year round beginning April 1, 2013 but spill season data (April 9 – August 19) will be reported separately in an annual GAP report submitted to the Department of Ecology

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and FERC. As part of the quality assurance process, data anomalies will be removed. This would include data within a 2-hour window of probe calibration and any recording errors that result from communication problems. Data errors will prompt a technician or water quality specialist or consultant site visit, to inspect the instrument and repair or replace, if necessary. Real time data will be made available to the public by November 2013.

4.3 Reporting

Upon approval of the Wells GAP and issuance of a Wells Project TDG adjustment, Douglas PUD will submit an annual report to Ecology no later than February 28 subsequent to each year that the TDG adjustment is approved. The annual report will summarize all GAP activities conducted for the prior year (i.e., annual report filed February 28, 2013 will be for all GAP activities conducted in 2012) as required by Ecology and the FERC. In addition to reporting on spill season compliance, the annual report will include TDG compliance outside the spill season (110%), per the 401 Certification Section 6.7 2) c) iii).

5.0 Conclusions

Pending approval by Ecology, implementation of the measures identified within the 2013 GAP are intended to serve as a long-term strategy to maintain compliance with the Washington State WQS for TDG in the Columbia River at the Wells Project while continuing to provide safe passage for downstream migrating juvenile salmonids.

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7.0 Appendices

Appendix 1. Wells Hydroelectric Project Spill Playbook, 2012.

I. No Forced Spill

The Wells Dam JBS should be operated continuously throughout the juvenile salmon outmigration (April 9 to August 19 for 2013). The standard Wells HCP operating criteria, as described in Section 4.3.1 of the Wells HCP, will apply to the 2013 operating season. The operating criteria includes requirements that at least one bypass bay be operated during the entire JBS season, requires that no turbine is operated without an adjacent bypass bay being open and requires that all five bypass bays be operated continuously for 24 hours when the Chief Joseph Dam uncoordinated discharge estimate for that day is 140 kcfs or greater. The Wells JBS is normally operated with 1.7 kcfs passed through S2 and S10, and 2.2 kcfs through S4, S6, and S8. Figure 1 (below) assumes that the Chief Joseph Dam uncoordinated discharge estimate is greater than 140 kcfs or sufficient turbines units are operating that all five bypass bays are open .

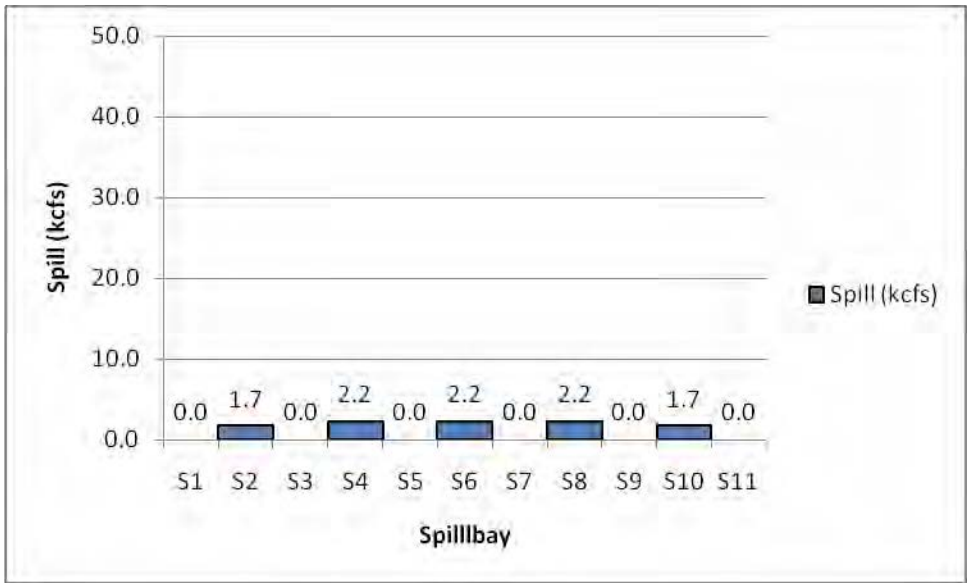

Figure 2. Operational configuration under no forced spill (JBS only).

I. Total Spill ≤ 53.0 kcfs, JBS barriers in place

As forced spill increases, Project Operators should allocate all spill through *S5* until the maximum capacity is reached through that spillbay (~43.0 kcfs). Note that *S5* spill requires support of generation flows from units 4 and 5 to minimize TDG production. This, along with the already established JBS spill (10.0 kcfs) would equal 53.0 kcfs (Figure 3). Over 90% of the spill events over the past decade could have been handled under this configuration.

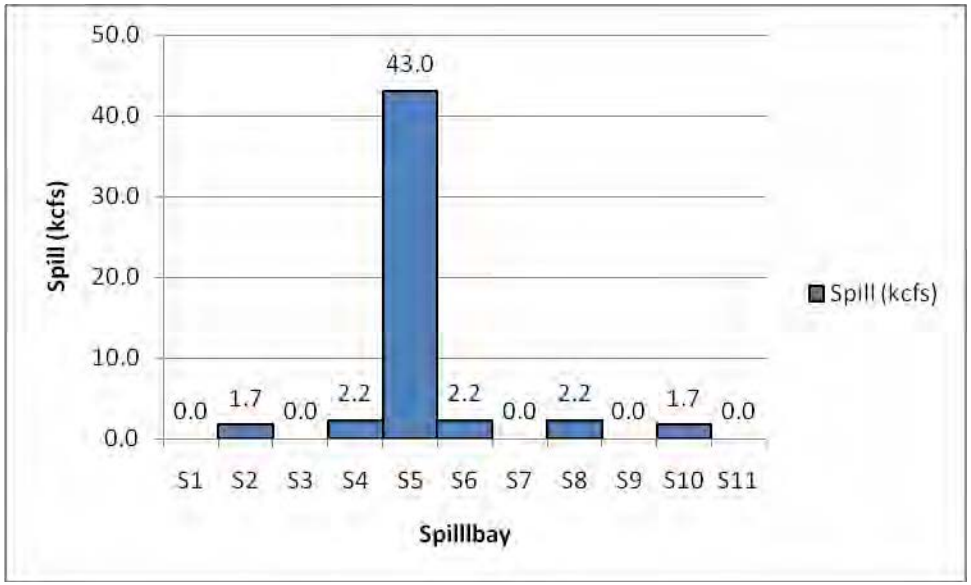

Figure 3. Operational configuration under spill ≤ 53.0 kcfs (including JBS).

II. JBS Barrier Removal Criteria

When either of the following occurs, remove the JBS barrier in *S6*:

Spill in *S5* reaches 30 kcfs and total spill is expected to exceed 40 kcfs for more than 8 hours, *or* total spill is expected to exceed 53 kcfs. After the JBS barrier is removed from *S6* and when flow through S5 is at least 30kcfs, shift 15 kcfs to *S6* (Figure 3). It is best to have generating units 4, 5, and 6 operating to support this spill configuration. Once at least 15 kcfs is being spilled through *S6*, spill can be allocated to *S5* until 43.0 kcfs is reached.

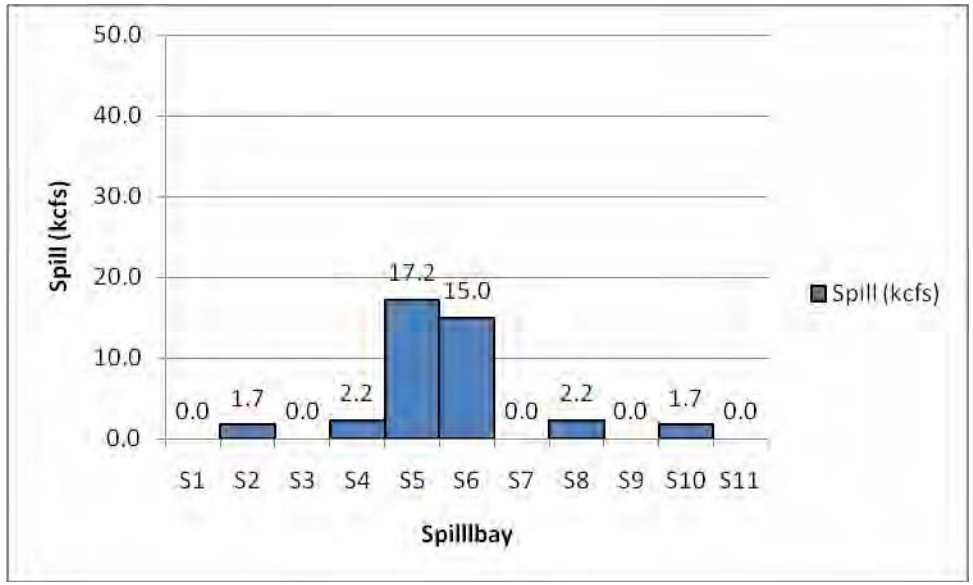

Figure 3. Operational configuration once spill reaches 30 kcfs in S5 and is expected to be above 40 kcfs for more than 8 hours (JBS removed). Shift sufficient spill from S5 to maintain a minimum of 15 kcfs spill at S6. Note that the 15.0 kcfs includes the existing 2.2 kcfs JBS flow.

III. Short duration decreases in Forced Spill (<53.0 kcfs) and JBS Barriers in *S6* Removed

If after removal of JBS barrier in *S6*, total spill drops below 53 kcfs (between 10-53 kcfs), and is expected to stay in this range for only a short period (4 days or less), direct spill through *S6* up to 15 kcfs (total spill < 22.9 kcfs). When total spill exceeds 22.8 kcfs, direct the remainder of spill through *S5*.

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

After *S5* reaches 43.0 kcfs, additional spill should be allocated to *S6* (*S6* is already spilling at least 15.0 kcfs need to fully engage the submerged spillway lip below the ogee). As flow increases, spill should continually increase through *S6* until paired with *S5* (e.g., 43.0 kcfs through *S5* and 26.0 kcfs through *S6*) (Figure 4). Eventually, *S6* will reach 43.0 kcfs (93.8 kcfs, **Figure** 4).

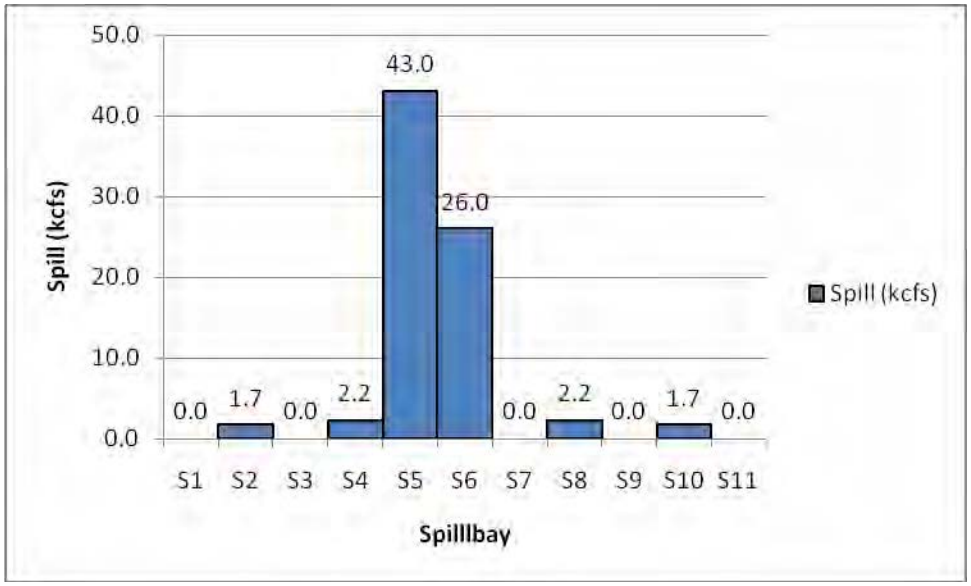

Figure 4. Operational configuration under forced spill > 53.0 kcfs (including JBS flow, with removal of JBS barriers in *S6*). In this instance spill has reached the 43.0 kcfs maximum in S5 and additional spill is being allocated to S6 (26.0 kcfs).

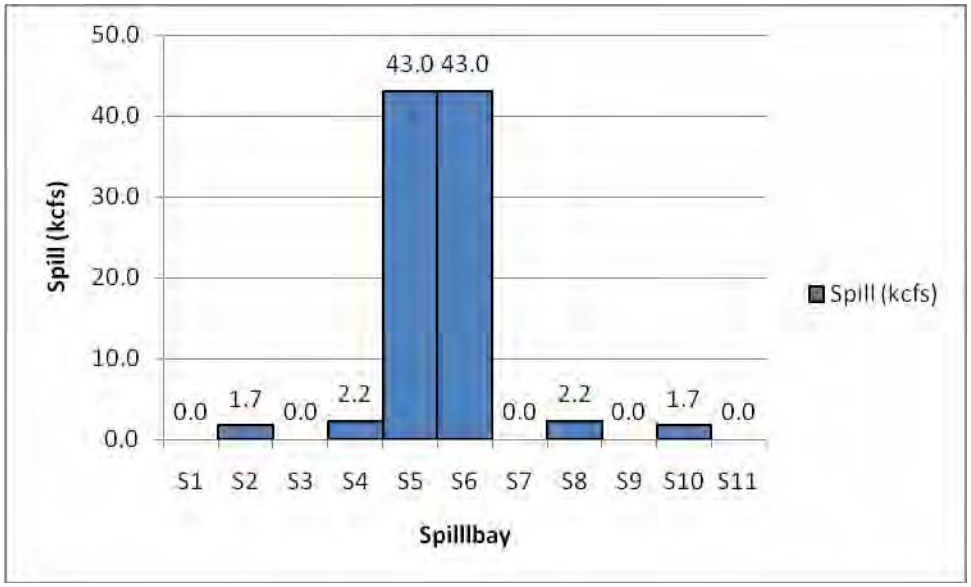

Figure 5. Operational configuration under forced spill > 53.0 kcfs (including JBS). In this instance (93.8 kcfs of spill), S6 has been fully allocated and 43.0 kcfs is now allocated through both *S5* and *S6*.

V. Forced Spill (> 93.8 kcfs) and JBS Barriers in *S6* Removed

After both *S5* and *S6* reach 43.0 kcfs, spill can also be allocated to *S7*. Since a minimum of 15.0 kcfs is needed to fully engage the submerged spillway lip below the ogee, spill through *S6* should be relocated to *S7* (Figure 6). As flow increases, spill can be continually increased through *S7* until paired with *S6* (30.0 kcfs through S6 and S7, while S5 continues at 43.0 kcfs). After this point, both *S6* and *S7* can be increased until all three spillbays have reached 43.0 kcfs (136.8 kcfs of spill, Figure 7).

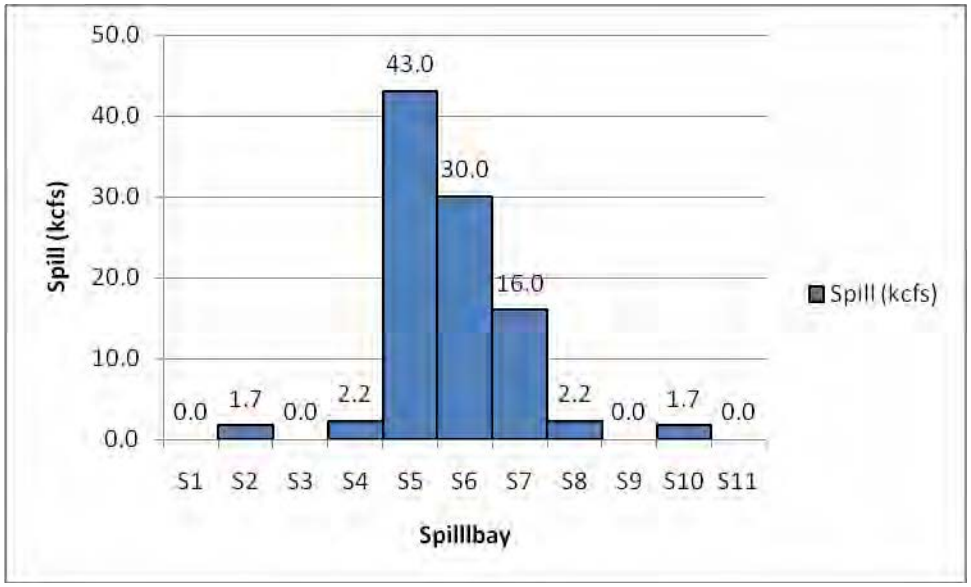

Figure 6. Operational configuration under forced spill > 96.0 kcfs. In this instance (96.8 kcfs of total spill), spill from *S6* is relocated to *S7* to maintain concentrated flow with *S5*. A spill of 16.0 kcfs is maintained in *S7* as to engage the submerged spillway lip.

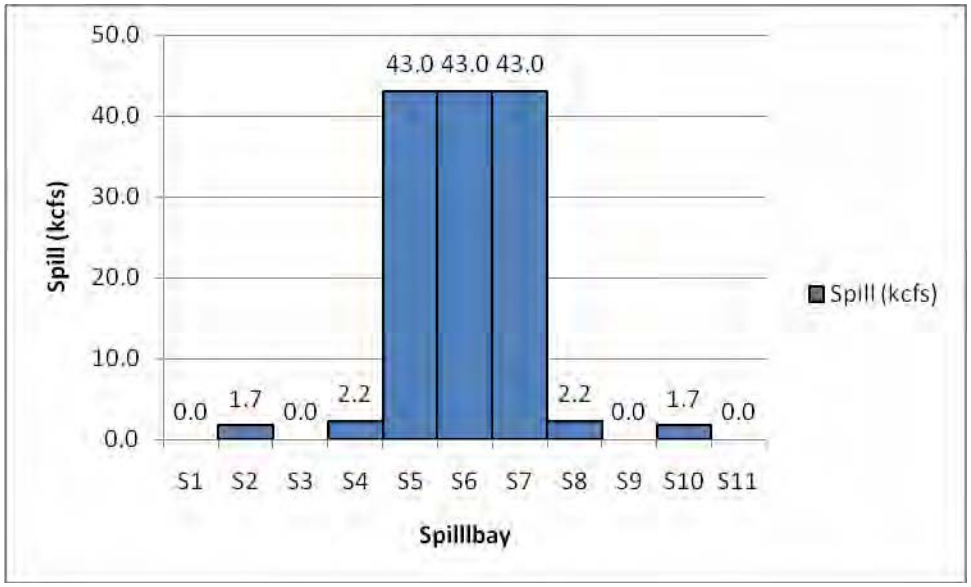

Figure 7. Operational configuration under forced spill > 96.0 kcfs (with removal of JBS barriers in *S6*). In this instance (136.8 kcfs of total spill), 43.0 kcfs is allocated through *S5*, *S6*, and *S7*.

VI. Forced Spill (> 136.8 kcfs)

Forced spill exceeding 136.8 kcfs rarely occurs (less than 0.5%). If these conditions arise and total river flow exceeds 246.0 kcfs, then 7Q-10 conditions are occurring and Wells Dam is exempt from the TDG standards. Under this situation, Project Operators may perform any combination of operations to ensure that flood waters are safely passed. Also, at this point, JBS barriers will likely be removed allowing additional flexibility to spill up to 43 kcfs each through *S2*, *S4*, *S6*, and *S8*. Project Operators may pass spill through *S3* in a similar fashion to operations mentioned above (starting at a minimum of 15.0 kcfs to ensure that spillway lips are engaged).

VII. JBS Re-Installment Criteria

Once spills of less than 40.0 kcfs are predicted for at least four days, JBS barriers should be re-installed in *S6*.

II. Spill Lookup Table

Operation	Total Spill	Spillbay Number										
		S1 -	*S2* JBS	***S3***	*S4* JBS	***S5***	*S6* JBS	***S7***	*S8* JBS	***S9***	*S10* JBS	*S11* -
I. No Forced Spill	10.0	0.0	1.7	0.0	2.2	0.0	2.2	0.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), min.	11.0	0.0	1.7	0.0	2.2	1.0	2.2	0.0	2.2	0.0	1.7	0.0
II. Spill (≤ 53.0 kcfs), max.	53.0	0.0	1.7	0.0	2.2	43.0	2.2	0.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs, *S6* JBS out), min.	54.0	0.0	1.7	0.0	2.2	31.2	15.0	0.0	2.2	0.0	1.7	0.0
III. Spill (> 53.0 kcfs, *S6* JBS out), max.	93.8	0.0	1.7	0.0	2.2	43.0	43.0	0.0	2.2	0.0	1.7	0.0
IV. Spill (> 93.8 kcfs, *S6* JBS out), min.	96.8	0.0	1.7	0.0	2.2	43.0	38.8	15.0	2.2	0.0	1.7	0.0
IV. Spill (> 93.8 kcfs, *S6* JBS out), max.	136.8	0.0	1.7	0.0	2.2	43.0	43.0	43.0	2.2	0.0	1.7	0.0
V. Spill (>137.0 kcfs), min.	137.0	0.0	1.7	15.0	2.2	43.0	43.0	28.2	2.2	0.0	1.7	0.0
V. Total Flow (>246 kcfs), max.	-	*Operators may adjust as needed.* *TDG exemption in place when total river flows exceed 246.0 kcfs.*										

Notes: (1) No spill through *S1* and *S11* as to minimize interference with fish ladders. (2) Even-numbered spillbays are designated as the Juvenile Bypass System (JBS). (3) Primary spillbays for forced spill are *S5*, *S6*, *S7*, *S3*, and *S9* (in that order).

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Appendix 2. Letter of 2013 Gas Abatement Plan 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

February 12, 2013

Andrew Gingerich
Douglas County Public Utility District No. 1
1151 Valley Mall Parkway
East Wenatchee, WA 98802

Re: Wells Hydroelectric Project No. 2149
2013 TDG Gas Abatement Plan

Dear Andrew Gingerich:

The Washington State Department of Ecology approves the 2013 Gas Abatement Plan (GAP) for the Wells Hydropower project, submitted in accordance with WAC 173-201A-200(1)(f)(ii)) and the Clean Water Act (CWA) 401 certification Section 6.7(2)(a). Approval of this GAP allows higher TDG levels that occur during spill for downstream fish passage during spring and summer of 2013.

In addition, it appears that the GAP and the Bypass Operating Plan are appropriately coordinated, in accordance with the 401 Certification, Section 6.7(2)(d).

Thank you for the quality of your products. If you have any questions, please feel free to call me at (509) 454-7864.

Sincerely,

Patricia S. Irle
Hydropower Projects Manager

By Certified Mail 7006 0100 0002 8191 2315

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Appendix 3. Letter from the FERC Approving 2013 GAP and BOP

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142 FERC ¶ 62,244
UNITED STATES OF AMERICA
FEDERAL ENERGY REGULATORY COMMISSION

Public Utility District No. 1 of Douglas County, Washington — Project Nos. 2149-156

ORDER APPROVING 2013 TOTAL DISSOLVED GAS ABATEMENT PLAN AND 2013 BYPASS OPERATING PLAN

(March 25, 2013)

1. On February 22, 2013, Public Utility District No. 1 of Douglas County, Washington (licensee) filed its 2013 total dissolved gas abatement plan and 2013 bypass operating plan pursuant to article 401(a) of the license for the Wells Hydroelectric Project No. 2149.[1] The project is located on the Columbia River in Douglas, Okanogan, and Chelan counties, Washington. The project occupies 8.60 acres of land administered by the U.S. Department of the Interior and 6.55 acres of land administered by the U.S. Army Corps of Engineers.

BACKGROUND AND LICENSE REQUIREMENTS

2. Various conditions of the license require the licensee to prepare and implement specific plans without prior Federal Energy Regulatory Commission (Commission) approval. The plans are to be developed in consultation with various entities and be approved by the Washington State Department of Ecology (Ecology) or the U.S. Department of the Interior or the National Marine Fisheries Service (NMFS). Article 401(a) requires that each such plan also be submitted to the Commission for approval.

2013 Total Dissolved Gas Abatement Plan

3. Article 401(a) requires the licensee to annually prepare a total dissolved gas abatement plan (GAP), pursuant to Ecology's section 401 Water Quality Certification (WQC) Condition No. 6.7(2)(a) and NMFS's Incidental Take Statement Term and Condition No. 2. The GAP is to be developed in consultation with the parties to the Aquatic Settlement Agreement and Habitat Conservation Plan (HCP), including Ecology, NMFS, the U.S. Fish and Wildlife Service (FWS), U.S. Bureau of Land Management

[1] Order Issuing New License issued November 9, 2012 (141 FERC ¶ 62,104).

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(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). The GAP is to provide details on operational and structural measures to be implemented by the licensee and is intended to result in compliance with the Washington State water quality standards for allowable total dissolved gas (TDG). The 2013 GAP was approved by Ecology and NMFS.

2013 Bypass Operating Plan

4. Article 401(a) requires the licensee to annually prepare a bypass operating plan (BOP), pursuant to Ecology's section 401 WQC Condition No. 6.7(2)(d) and NMFS's Incidental Take Statement Term and Condition No. 2. The BOP is to provide for the safe outmigration during the spring and summer for naturally produced juvenile salmonids spawned above Wells Dam. The HCP requires the licensee to submit the BOP to the HCP Coordinating Committee for review and approval. The 2013 BOP was approved by the HCP Coordinating Committee, which includes NMFS.

Total Dissolved Gas Abatement Plan/Bypass Operating Plan Coordination

5. Article 401(a) requires the licensee to annually coordinate the GAP and the BOP with the Aquatic Settlement Work Group, using best available information to minimize the production of TDG during periods of spill. The coordination of the GAP and the BOP is to provide compliance with Washington State water quality standards for TDG and safe outmigration passage for juvenile salmonids during spill operations. Ecology has indicated that the licensee has appropriately coordinated the GAP and the BOP.

LICENSEE'S PROPOSED PLANS

2013 Total Dissolved Gate Abatement Plan

6. The Wells Project, consisting of 10 generating units with relatively small storage capacity, operates in a "run-of-river" mode releasing river flows in excess of the project's hydraulic capacity over the spillways. Washington State water quality standards require that TDG not exceed 110 percent in any State water body. However, a dam operator is not held to the TDG standards when the river flow exceeds the 7-day, 10-year frequency flood (7Q-10). The 7Q-10 flow is the highest calculated flow of a running seven consecutive day average, using the daily average flows that may be seen in a 10-year period.

7. The licensee used a two-phase computational fluid dynamics tool to predict the hydrodynamics of TDG distribution and to identify operational configurations that would minimize TDG production within the Wells Dam tailrace. The licensee develops an annual Spill Playbook to concentrate releases through specific spillways. In an April 2009 report, the model demonstrated that Wells Dam can be operated to meet TDG

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criteria during the fish passage season with flows up to the 7Q-10 levels provided the forebay TDG levels are below 115 percent. Compliance was achieved through the use of a concentrated spill pattern through Spillway No. 7 and surplus flow volume through adjacent odd-numbered spillways in a defined pattern and volume.

8. Based on the TDG performance associated with implementation of the 2012 Spill Playbook, similar operating principles will be implemented for the 2013 fish passage (spill) season. In 2012, high Columbia River flows resulted in flood flows and subsequent forced spill. Often, incoming water from the forebay was already above tailrace compliance levels. However, operations following the 2012 Spill Playbook, when forebay flows were above 115 percent TDG adjustment criterion and below 7Q-10 flows, resulted in high rates of compliance.

9. In addition to minimizing involuntary spill through implementation of the 2013 Spill Playbook, the licensee will manage spill toward meeting Washington State water quality criteria for TDG during all flows below 7Q-10, as follows:

- minimize voluntary spill through operations including to the extent practicable, by scheduling maintenance based on predicted flows;
- avoid spill by continuing to coordinate operations with upstream users, to the extent that it reduces TDG;
- maximize powerhouse discharge, especially during periods of high river flows; and
- during fish passage (spill) season, manage voluntary spill levels in real time in an effort to continue to meet TDG numeric criteria.

2013 Bypass Operating Plan

10. The 2013 spring and summer outmigration of naturally produced juvenile salmonids will consist of offspring of adults that spawned above Wells Dam during brood years 2011 and 2012. The spring migration will include juvenile spring Chinook, coho, sockeye, and steelhead, and summer/fall Chinook sub-yearlings will migrate during both spring and summer bypass operations.

11. Operation of the bypass system throughout the 2013 season will follow criteria contained in the Wells Dam Juvenile Dam Passage Survival Plan in the HCP. One of the main goals of the plan is to provide bypass operations for at least 95 percent of both the spring and summer migration of juvenile salmonids. Upon completion of the 2012 bypass season, the updated analysis determined that the adjusted dates of bypass operations (commenced at 00:00 on April 9 and ended at 24:00 hours on August 19) at Wells Dam provided bypass passage for 99.96 percent of yearling Chinook, 99.86

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percent of steelhead, 100 percent of sockeye, and 99.30 percent of sub-yearling Chinook. Based upon this high level of compliance with HCP bypass operating criteria (exceeding the 95 percent bypass-passage criteria for all species), the licensee proposes to commence operation of the bypass system starting at 00:00 hours on April 9 and to end operations at 24:00 hours on August 19.

Coordination of the Two Plans

12. Seasonal bypass operations generally coincide with the spring freshet, an event during which hydroelectric operators must cope with flows that often exceed the project's hydraulic capacity. When flows exceed the hydraulic capacity of the generating units, water must be passed via spillways. These spills increase the concentration of atmospheric gases in the water downstream of project and can result in excessive levels of TDG that may injure fish. The licensee has developed annual spill playbooks for operation of spillways at the Wells Dam.

13. The Wells 2013 Spill Playbook specifies the release and operation of the spillways at the Wells Dam to achieve Washington State water quality standards for TDG in the project tailrace. The licensee has determined that concentrating spill through the middle of the spillway and supporting that concentrated spill with turbine discharge results in the most effective minimization of TDG in the tailrace.

AGENCY CONSULTATION

14. The licensee has developed the 2013 total dissolved gas abatement plan (GAP) and the 2013 bypass operating plan (BOP) in consultation with the parties to the Aquatic Settlement Agreement and Habitat Conservation Plan. The Washington Department of Ecology and the National Marine Fisheries Service (NMFS) have approved the GAP. The HCP Coordinating Committee, which includes the NMFS, has approved the BOP.

15. On December 28, 2012, a draft copy of the BOP was provided to the Aquatic Settlement Work Group to coordinate the BOP with the GAP. No comments were received from any of the agencies. On February 12, 2013, Ecology submitted a letter indicating that the GAP and BOP were appropriately coordinated in accordance with its Section 401 WQC. The licensee provides documentation of consultation with mail correspondence and email communications in support of its agency approval requirements.

CONCLUSIONS

16. The licensee's 2013 total dissolved gas abatement and 2013 bypass operating plans fulfill the requirements of its license article and Section 401WQC requirements and provide guidelines for compliance with Washington State water quality standards for TDG and safe downstream fish migration. Accordingly, the plans should be approved.

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17. The licensee's 2014 total dissolved gas abatement plan and 2014 bypass operating plan, pursuant to license article 401(a), are due by February 28, 2014. Further, the licensee's 2012 total dissolved gas report, filed February 25, 2013, pursuant to license article 401(b), is under Commission staff review and will be addressed under a separate proceeding.

18. The Commission should reserve the right to require changes to the plans based on staff's review of the annual plans, annual reports, and agency recommendations.

The Director orders:

(A) Public Utility District No. 1 of Douglas County, Washington's 2013 total dissolved gas abatement plan, filed February 22, 2013, pursuant to license article 401(a) for the Wells Hydroelectric Project No. 2149, as modified by ordering paragraph (C), is approved.

(B) Public Utility District No. 1 of Douglas County, Washington's 2013 bypass operating plan, filed February 22, 2013, pursuant to license article 401(a) for the Wells Hydroelectric Project No. 2149, as modified by ordering paragraph (C), is approved.

(C) The Commission reserves the right to require changes to the plans based on staff's review of the annual plans, annual reports, and agency recommendations.

(D) This order constitutes final agency action. Requests for rehearing by the Commission may be filed within 30 days of the date of issuance, as provided in section 313(a) of the Federal Power Act, 16 U.S.C. § 8251 (2006), and the Commission's regulations at C.F.R. § 385.713 (2012). The filing of a request for rehearing does not operate as a stay of the effective date of this order, or of any other date specified in this order. The licensee's failure to file a request for rehearing shall constitute acceptance of this order.

Thomas J. LoVullo
Chief, Aquatic Resources Branch
Division of Hydropower Administration
and Compliance

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Appendix 4. 2013 Post Season BOP Report

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Summary of 2013 Juvenile Fish Bypass Operations at Wells Hydroelectric Project
11 October 2013

Douglas PUD operated the Wells bypass system in 2013 as guided by the Wells HCP Coordinating Committee-approved *2013 Bypass Operating Plan.* The plan was intended to provide non-turbine passage during 95 percent of the juvenile Plan Species migration passing Wells Dam. Bypass operations were initiated on April 9 at 00:00 hours, and operated continuously until terminated at 24:00 hours on August 19, for a total of 133 days.

The *2013 Bypass Operating Plan* included measures for complying with Federal Energy Regulatory Commission (FERC) requirements for maintaining minimum automatic-gate-opening capacity under the *Wells Project Emergency Action Plan* and Washington Department of Ecology (Ecology) requirements for compliance with total dissolved gas (TDG) standards as directed by the FERC-approved *Total Dissolved Gas Abatement Plan* for the Wells Project. Compliance with the requirements of both of these plans was achieved by systematic removal of bypass barriers under increasing discharge as described in the *2013 Bypass Operating Plan*. The strategy for compliance with Ecology's TDG standards included the concentration of spill through adjacent spillways at the center of Wells Dam and spilling over the discharge from active turbine units. To implement these compliance measures as described in the *2013 Bypass Operating Plan*, Douglas PUD removed bypass barriers from Spillway 6 on May 23 and reinstalled them on May 30; then removed them again on July 1 and reinstalled them on July 11.

Based on analysis conducted by John Skalski and Richard Townsend of Columbia Basin Research (Appendix A), Douglas PUD achieved the HCP requirement to provide bypass operations during 95 percent of the juvenile salmon and steelhead migration passing Wells Dam by providing bypass passage during 98.29 percent of the yearling Chinook migration, 99.21 percent of the steelhead migration, 99.99 percent of the sockeye migration, 100 percent of the coho migration, and 99.33 percent of the sub-yearling Chinook migration passing Wells Dam in 2013.

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Appendix A

Analysis of Proportion of Outmigration Affected by Bypass Operations at Wells Dam, 2005-2013

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Analysis of Proportion of Outmigration Affected by Bypass Operations at Wells Dam, 2005-2013

Prepared for:

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

Prepared by:

John R. Skalski
Richard L. Townsend

Columbia Basin Research
School of Aquatic and Fishery Sciences
University of Washington
1325 Fourth Avenue, Suite 1820
Seattle, Washington 98101-2509

16 September 2013

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Outmigration has been monitored at the juvenile sampling facility at Rocky Reach Dam for four stocks of salmonids (yearling and subyearling Chinook, steelhead, and sockeye) from 2005 onward. Coho were added this year, using the detections at Rocky Reach of PIT-tagged fish. The proportion of each stock covered by the bypass operations at Wells Dam can be estimated using the historical daily counts at Rocky Reach, and adding the travel time from Wells to Rocky Reach Dam. Table 1 has the average travel times based on Douglas PUD's 2010 PIT-tag study for yearling Chinook, and acoustic-tag studies for steelhead and sockeye. Due to a dearth of PIT-tag or acoustic-tag studies performed with subyearling Chinook and Coho, travel time was assumed to be 2 days.

Table 1: Average travel times from Wells tailrace to Rocky Reach Dam.

Stock	Travel time
Yearling Chinook	5 days
Subyearling Chinook	2 days
Steelhead	2 days
Sockeye	2 days
Coho	2 days

Plots of the annual cumulative proportion of the outmigration for spring migrants (yearling Chinook, steelhead, sockeye, and coho), and the subyearling Chinook in the summer had fairly consistent start and end dates at Rocky Reach (Figure 1). The timing of bypass operations for the spring outmigration at Wells from 2004 through 2011 was from 00:00 12 April – 24:00 13 June of each year for the "spring" spill season, and from 00:00 14 June – 24:00 26 August for the "summer" spill season. For 2012 and beyond, the Wells Habitat Conservation Plan (HCP) Coordinating Committee approved the modification of the timing of bypass operations at Wells Dam as follows: bypass operations commenced at 00:00 on April 9 and continued through 24:00 on August 19. This current timing of bypass operations will continue annually, unless modified as a result of future investigations that demonstrate an inadequacy of these dates at providing bypass passage for 95% of both spring- and summer-migrating Plan Species at Wells Dam. Table 2 has the estimated proportion of the annual outmigration covered by the spring, summer, and total bypass operations from 2005 through 2013. Steelhead, sockeye, coho, and subyearling Chinook are estimated to have greater than 98% of their annual outmigration pass through Wells Dam during one or both of the two periods covered by bypass operations for the most recent nine years of record. For yearling Chinook, being the earliest arriving stock, proportion covered ranged from 94.49% to 99.96% over the period of record. To assess the effectiveness of the selected start date for spring bypass operations, Table 3 has the date that, with hindsight, the spring bypass operations should have started to achieve 95% coverage of the yearling Chinook outmigration for that year. These dates ranged from 9 April to 3 May. For the two years when yearling Chinook coverage was less than 95%, bypass starting dates should have been 9 and 11 April, respectively, instead of 12 April.

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Similarly, Table 4 compares the actual date of bypass termination with the date on which bypass operations covered 95% of the subyearling Chinook outmigration. In each year, an earlier termination of bypass operations would have been possible without jeopardizing the achievement of the HCP standard of providing a bypass route for ≥ 95% of outmigrating subyearling Chinook. During the nine years analyzed, the 95% HCP standard was achieved 4 to 32 days prior to the actual date on which bypass operations were terminated.

Table 2. Total proportion of each stock's migration affected by bypass operations (spring, summer) at Wells Dam, based on travel times from Wells to Rocky Reach Dam, the cumulative proportion of the annual migration of each stock at Rocky Reach, and the start and stop dates of Wells bypass operations.

		Annual migration proportion								
	Proportion passed	2005	2006	2007	2008	2009	2010	2011	2012	2013
Spring Outmigration	**Yearling Chinook**									
	prior to spring Bypass Ops period	0.0528	0.0259	0.0551	0.0025	0.0116	0.0067	0.0085	0.0004	0.0171
	during spring Bypass Ops period	0.9455	0.9559	0.9154	0.9972	0.9827	0.9917	0.9910	0.9996	0.9823
	during summer Bypass Ops period	0.0017	0.0.182	0.0296	0.0002	0.0056	0.0016	0.0005	0.0001	0.0006
	after Bypass Ops period	0	0	0	0	0	0	0	0	0
	Total Covered by Bypass ops	**0.9472**	**0.9741**	**0.9449**	**0.9975**	**0.9884**	**0.9933**	**0.9915**	**0.9996***	**0.9829**
	Steelhead									
	prior to spring Bypass Ops period	0.0015	0.0101	0.0066	0.0009	0.0019	0.0045	0.0190	0.0014	0.0079
	during spring Bypass Ops period	0.9903	0.9762	0.9887	0.9901	0.9965	0.9763	0.9513	0.9885	0.9847
	during summer Bypass Ops period	0.0081	0.0137	0.0042	0.0089	0.0016	0.0188	0.0297	0.0101	0.0074
	after Bypass Ops period	0	0	0.0004	0.0001	0	0.0004	0	0	0
	Total Covered by Bypass ops	**0.9985**	**0.9899**	**0.9930**	**0.9990**	**0.9981**	**0.9951**	**0.9810**	**0.9986**	**0.9921**
	Sockeye									
	prior to spring Bypass Ops period	0	0	0	0	0	0	0	0	0
	during spring Bypass Ops period	0.9983	0.9984	0.9998	0.9972	0.9957	0.9992	0.9923	0.9995	0.9990
	during summer Bypass Ops period	0.0017	0.0016	0.0001	0.0028	0.0043	0.0008	0.0077	0.0005	0.0009
	after Bypass Ops period	0	0	0	0	0	0	0	0	0.0001
	Total Covered by Bypass ops	**1.0000**	**1.0000**	**0.9999**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**1.0000**	**0.9999**
	Coho									
	prior to spring Bypass Ops period									0
	during spring Bypass Ops period									0.9910
	during summer Bypass Ops period									0.0090
	after Bypass Ops period									0
	Total Covered by Bypass ops									**1.0000**
Summer Outmigration	**Subyearling Chinook**									
	prior to spring Bypass Ops period	0	0	0	0	0	0	0	0	0
	during spring Bypass Ops period	0.1937	0.1894	0.2136	0.1266	0.1029	0.5212	0.5628	0.5871	0.1670
	during summer Bypass Ops period	0.8022	0.8077	0.7847	0.8620	0.8882	0.4723	0.4331	0.4059	0.8263
	after Bypass Ops period	0.0041	0.0029	0.0017	0.0113	0.0089	0.0064	0.0041	0.0070	0.0067
	Total Covered by Bypass ops	**0.9959**	**0.9971**	**0.9983**	**0.9887**	**0.9911**	**0.9936**	**0.9959**	**0.9930**	**0.9933**

***Proportions not summing to 1 are due to round-off error.**

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Table 3. Comparison of the actual start date for spring bypass operations at Wells Dam each year, versus the start date necessary to have covered at least 95% of the yearling Chinook outmigration that year. Operations are assumed to begin at 00:00 for the date listed.

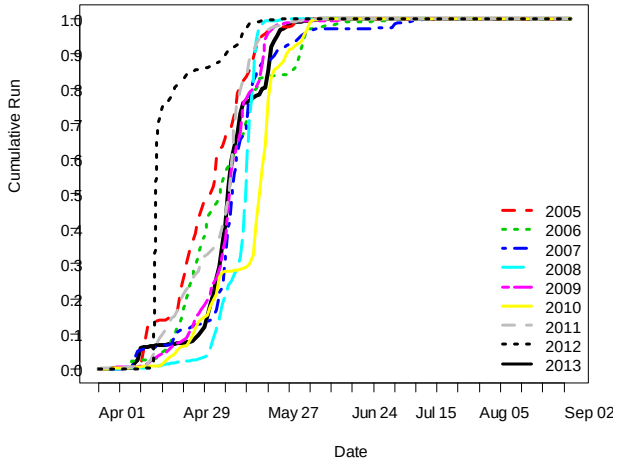
Migration Year	Actual Date	Cumulative proportion passed before 00:00	Proportion Covered by Bypass Ops	Date by which the first 5% passed	Cumulative proportion passed before 00:00	Bypass Ops would have Covered this Proportion	# Days before or after actual date to get 95%
2005	April 12	0.0528	0.9472	April 11	0.0039	0.9961	1 before
2006	April 12	0.0259	0.9741	April 18	0.0468	0.9532	6 after
2007	April 12	0.0551	0.9449	April 9	0.0243	0.9757	3 before
2008	April 12	0.0025	0.9975	May 3	0.0406	0.9594	21 after
2009	April 12	0.0116	0.9884	April 19	0.0436	0.9564	7 after
2010	April 12	0.0067	0.9933	April 22	0.0410	0.9590	10 after
2011	April 12	0.0085	0.9915	April 15	0.0446	0.9554	3 after
2012	April 9	0.0004	0.9996	April 15	0.0115	0.9885	6 after
2013	April 9	0.0171	0.9829	April 10	0.0240	0.9760	1 after

Table 4. Comparison of the actual stop date for summer bypass operations at Wells Dam each year, versus the stop date necessary to have covered at least 95% of the subyearling Chinook outmigration that year. Operations are assumed to end at 24:00 for the date listed.

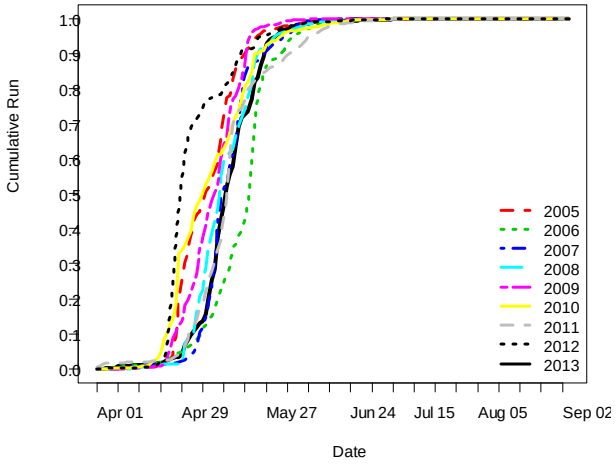
Migration Year	Actual Stop Date	Cumulative proportion passed by 11:59:59 PM	Date on or before the last 5% passed	Cumulative proportion passed by 11:59:59 PM (Bypass Ops would have Covered this Proportion)	# Days before actual date to get 95%
2005	August 26	0.9959	August 3	0.9525	23
2006	August 26	0.9971	August 2	0.9524	24
2007	August 26	0.9983	August 11	0.9538	15
2008	August 26	0.9887	August 19	0.9502	7
2009	August 26	0.9911	August 22	0.9709	4
2010	August 26	0.9936	August 10	0.9537	16
2011	August 26	0.9959	July 25	0.9528	32
2012	August 19	0.9930	July 29	0.9502	22
2013	August 19	0.9933	August 7	0.9592	12

Figure 1. Passage dates at Rocky Reach Dam for spring and summer migrating stocks, 2005-2013. Cumulative proportions are based on the expanded counts obtained from sampling daily from 1 April – 31 August (or through 4 September in 2008).

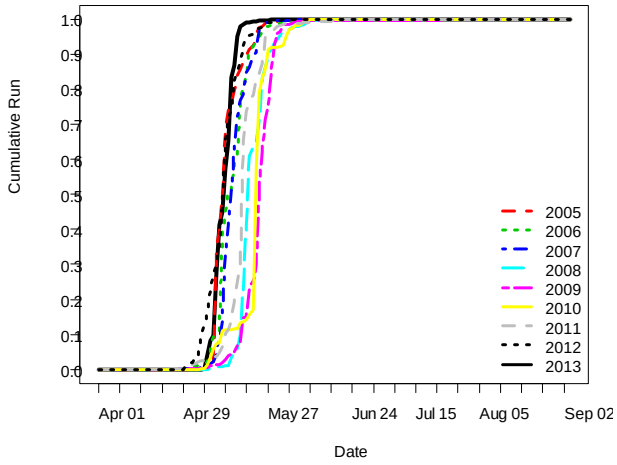
a. Yearling Chinook



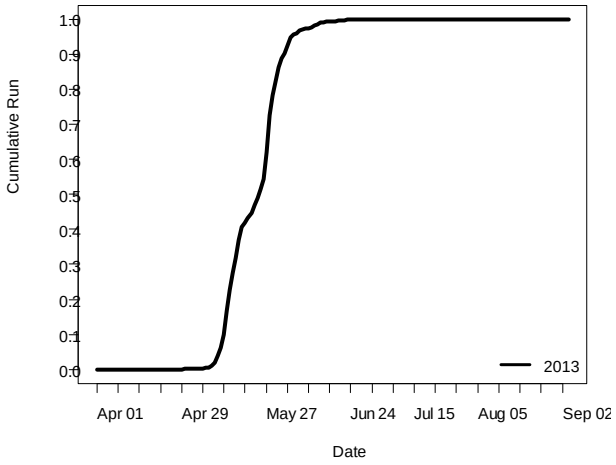
b. Steelhead



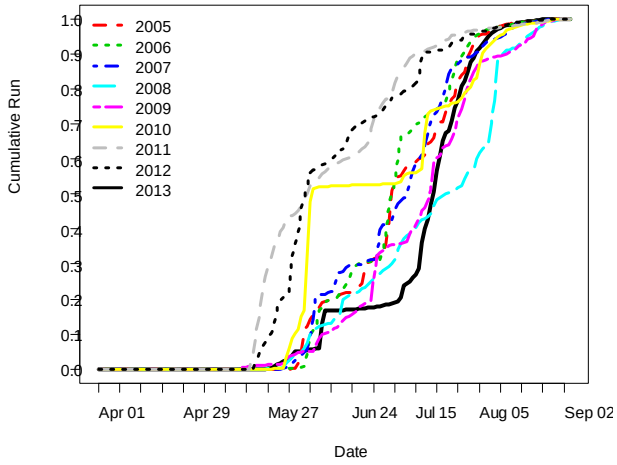
c. Sockeye



d. Coho



e. Subyearling Chinook



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Appendix B – Pre-filing consultation record for the 2013 TDG Report

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Notice to the Aquatic Settlement Work Group to review the 2013 TDG Report

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Thursday, January 09, 2014 8:27 AM
To: Andrew Gingerich; Bao Le; Beau Patterson; Bill Towey (bill.towey@colvilletribes.com); Bob Rose; 'Brad James'; 'Bret Nine'; 'Bryan Nordlund (bryan.nordlund@noaa.gov)'; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chas Kyger; Chris Coffin (ccof461@ecy.wa.gov); Chris Sheridan; Donella Miller (mild@yakamafish-nsn.gov); Jason McLellan; Jeff Korth (korthjwk@dfw.wa.gov); 'Jessi Gonzales'; Keith Kirkendall (Keith.Kirkendall@noaa.gov); kirk.truscott@colvilletribes.com; Kristi Geris; Mary Mayo; Mike Schiewe; Pat Irle (pirl461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); Paul Ward (ward@yakama.com); Shane Bickford; 'Steve Lewis'; 'Steve Parker (parker@yakama.com)'
Subject: FW: 2013 Annual GAP/TDG report

Hi Aquatic SWG: please see the email below from Andrew regarding the draft 2013 Annual GAP/TDG report, which is now posted to the Aquatic SWG Extranet site, under "Reports" (instructions below). This draft report is out for a 30-day review period with comments due to Andrew no later than Friday, February 7, 2014. Douglas PUD will seek formal approval of the draft report at the Aquatic SWG meeting on February 12, 2014. 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
T 509.491.3151 x104
C 360.220.3988

From: Andrew Gingerich [mailto:andrewg@dcpud.org]
Sent: Thursday, January 09, 2014 8:19 AM
To: Kristi Geris
Subject: 2013 Annual GAP/TDG report

Krisiti, please find attached the 2013 GAP and TDG report. Please upload this to SharePoint and notify Aquatic SWG membership.

As discussed on the phone yesterday this report covers TDG performance during the spill/bypass season and following the end of the spill/bypass season in 2013. I.e. TDG performance outside of spill/bypass season (a new license requirement).

Douglas is seeking a 30 day review for this document. We will incorporate edits and suggestions and seek approval of the revised document at the the Feb. 12, 2014 Aquatic SWG meeting. Douglas needs to file this report with the FERC by February 28th, 2014 along with the 2014 GAP/BOP that is currently under review.

Please let me know if you have questions.
Andrew

Andrew Gingerich
Sr. Aquatic Resource Biologist
Douglas County Public Utility District
1151 Valley Mall Parkway, East Wenatchee, WA 98802
Office Phone: (509) 881-2323
Email: andrewg@dcpud.org

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Reminder to the Aquatic SWG to review the 2013 TDG Report

From: Kristi Geris <kgeris@anchorqea.com>
Sent: Wednesday, January 29, 2014 9:41 AM
To: Andrew Gingerich; Bob Rose; Jason McLellan; Pat Irle (pirl461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); 'Steve Lewis'
Cc: Bao Le; Paul Ward (ward@yakama.com); Beau Patterson; Bill Towey (bill.towey@colvilletribes.com); Shane Bickford; 'Brad James'; 'Steve Parker (parker@yakama.com)'; 'Bret Nine'; 'Bryan Nordlund (bryan.nordlund@noaa.gov)'; Chas Kyger; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chris Coffin (ccof461 @ecy.wa.gov); Chris Sheridan; Donella Miller (mild@yakamafish-nsn.gov); Jeff Korth (korthjwk@dfw.wa.gov); 'Jessi Gonzales'; Keith Kirkendall (Keith.Kirkendall@noaa.gov); kirk.truscott@colvilletribes.com; Kristi Geris; Mary Mayo; Mike Schiewe
Subject: FW: 2013 Annual GAP/TDG report

Hi Aquatic SWG: just a friendly reminder, if you have not already done so, to please submit edits and comments on the draft 2013 Annual GAP/TDG report to Douglas PUD by next Friday, February 7, 2014. Thanks! –kristi ☺

From: Kristi Geris
Sent: Thursday, January 09, 2014 8:27 AM
To: Andrew Gingerich (andrewg@dcpud.org); Bao Le; Beau Patterson (bpatterson@dcpud.org); Bill Towey (bill.towey@colvilletribes.com); Bob Rose; 'Brad James'; 'Bret Nine'; 'Bryan Nordlund (bryan.nordlund@noaa.gov)'; 'Chad Jackson'; Charlie McKinney (cmck461@ecy.wa.gov); Chas Kyger; Chris Coffin (ccof461@ecy.wa.gov); Chris Sheridan; Donella Miller (mild@yakamafish-nsn.gov); Jason McLellan; Jeff Korth (korthjwk@dfw.wa.gov); 'Jessi Gonzales'; Keith Kirkendall (Keith.Kirkendall@noaa.gov); kirk.truscott@colvilletribes.com; Kristi Geris; 'Mary Mayo'; Mike Schiewe; Pat Irle (pirl461@ecy.wa.gov); Patrick Verhey (Patrick.Verhey@dfw.wa.gov); Paul Ward (ward@yakama.com); Shane Bickford (sbickford@dcpud.org); 'Steve Lewis'; 'Steve Parker (parker@yakama.com)'
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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
T 509.491.3151 x104
C 360.220.3988

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Sent: Thursday, January 09, 2014 8:19 AM
To: Kristi Geris
Subject: 2013 Annual GAP/TDG report

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Please let me know if you have questions.
Andrew

Andrew Gingerich
Sr. Aquatic Resource Biologist
Douglas County Public Utility District
1151 Valley Mall Parkway, East Wenatchee, WA 98802
Office Phone: (509) 881-2323
Email: andrewg@dcpud.org

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Approval of the 2013 TDG Report from the Aquatic Settlement Work Group

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Final Conference Call Action Items

Aquatic Settlement Work Group

To: Aquatic SWG Parties **Date**: February 12, 2014

From: Michael Schiewe, Chair (Anchor QEA, LLC)

Re: Final Action Items of the February 12, 2014 Aquatic SWG Conference Call

Below is a summary of Action Items from the Aquatic SWG meeting that was held by conference call from 10:00 am to 11:00 am on Wednesday, February 12, 2014. These action items include the following:

I. Summary of Action Items

1. Douglas PUD will obtain Washington State Department of Ecology (Ecology) comments/approval of the 2013 Gas Abatement Plan (GAP) and Total Dissolved Gas (TDG) Report, and provide the approval to Kristi Geris for distribution to the Aquatic SWG (Item VI-3).
2. Aquatic SWG members will submit edits and comments on the draft 2013 Methow Basin Bull Trout Passive Integrated Transponder (PIT) Tag Summary to Douglas PUD no later than Friday, February 21, 2014 (Item VI-6).
3. Douglas PUD will provide a draft 2014 Sturgeon Stocking Proposal for Aquatic SWG review no later than Friday, February 14, 2014 (Item VI-7).
4. Aquatic SWG members will submit edits and comments on the draft 2013 Aquatic Nuisance Species Management Plan Annual Report to Douglas PUD no later than Tuesday, March 11, 2014; Douglas PUD will be requesting approval of the draft report at the Aquatic SWG in-person meeting on March 12, 2014 (Item VI-8).
5. The Washington Department of Fish and Wildlife (WDFW) will coordinate with the Yakama Nation (YN) and the Colville Confederated Tribes (CCT) to finalize a draft standardized White Sturgeon Fish Health Protocol to be presented at the Aquatic SWG in-person meeting on March 12, 2014 (Item VI-10).
6. **The Aquatic SWG meeting on March 12, 2014 will be held in person at Wells Dam, starting at approximately 10:45 a.m. (Item VII-1).**

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II. Summary of Decisions

1. The Aquatic SWG members present approved the 2014 GAP and Bypass Operating Plan (BOP), as revised (Item VI-2).
2. The Aquatic SWG members present approved the 2013 GAP and TDG Report, contingent upon Ecology's approval of the report (Item VI-3).
3. The Aquatic SWG members present approved the 2014 Resident Fish Assemblage Study Plan, as revised (Item VI-4).
4. The Aquatic SWG members present approved the 2014 Aquatic SWG Action Plan (Item VI-5).

III. Agreements

1. The Aquatic SWG members present agreed to hold the Aquatic SWG meeting on March 12, 2014, in person at Wells Dam. A carpool to Wells Dam will depart from Douglas PUD Headquarters in East Wenatchee, Washington, at 9:30 a.m. (Item VII-1).

IV. Review Items

1. Kristi Geris sent an email to the Aquatic SWG on January 23, 2014, notifying them that the draft 2013 Methow Basin Bull Trout PIT Tag Summary is available for review, with comments due to Douglas PUD no later than Friday, February 21, 2014 (Item VI-6).
2. Kristi Geris sent an email to the Aquatic SWG on February 10, 2014, notifying them that the draft 2013 Aquatic Nuisance Species Management Plan Annual Report is out for a 30-day review period, with comments due to Douglas PUD no later than Tuesday, March 11, 2014 (Item VI-8).

V. Documents Finalized

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

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Attachment A
List of Attendees

Name	Role	Organization
Mike Schiewe	SWG Chair	Anchor QEA, LLC
Kristi Geris	Administration/Technical Support	Anchor QEA, LLC
Andrew Gingerich	SWG Technical Representative	Douglas PUD
Chas Kyger	Technical Support	Douglas PUD
Chad Jackson	Technical Support	Washington Department of Fish and Wildlife
Jason McLellan	SWG Technical Representative	Colville Confederated Tribes

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Approval of the 2013 TDG Report from Washington Department of Ecology

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From: Irle, Pat (ECY) <PIRL461@ECY.WA.GOV>
Sent: Friday, February 14, 2014 1:29 PM
To: Andrew Gingerich
Subject: 2013 GAP TDG report and 2014 GAP/BOP

Follow Up Flag: Follow up
Flag Status: Completed

Ecology approves the following two documents:

1. 2014 Gas Abatement Plan and Bypass Operating Plan
2. 2013 GAP and TDG Report

Pat Irle
Hydropower Projects Manager
WA Dept of Ecology
CRO WQ

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Document Content(s)

Transmittal to FERC final 2013 TDG Report.PDF.....1-95