

2011 TDG Monitoring

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Overview

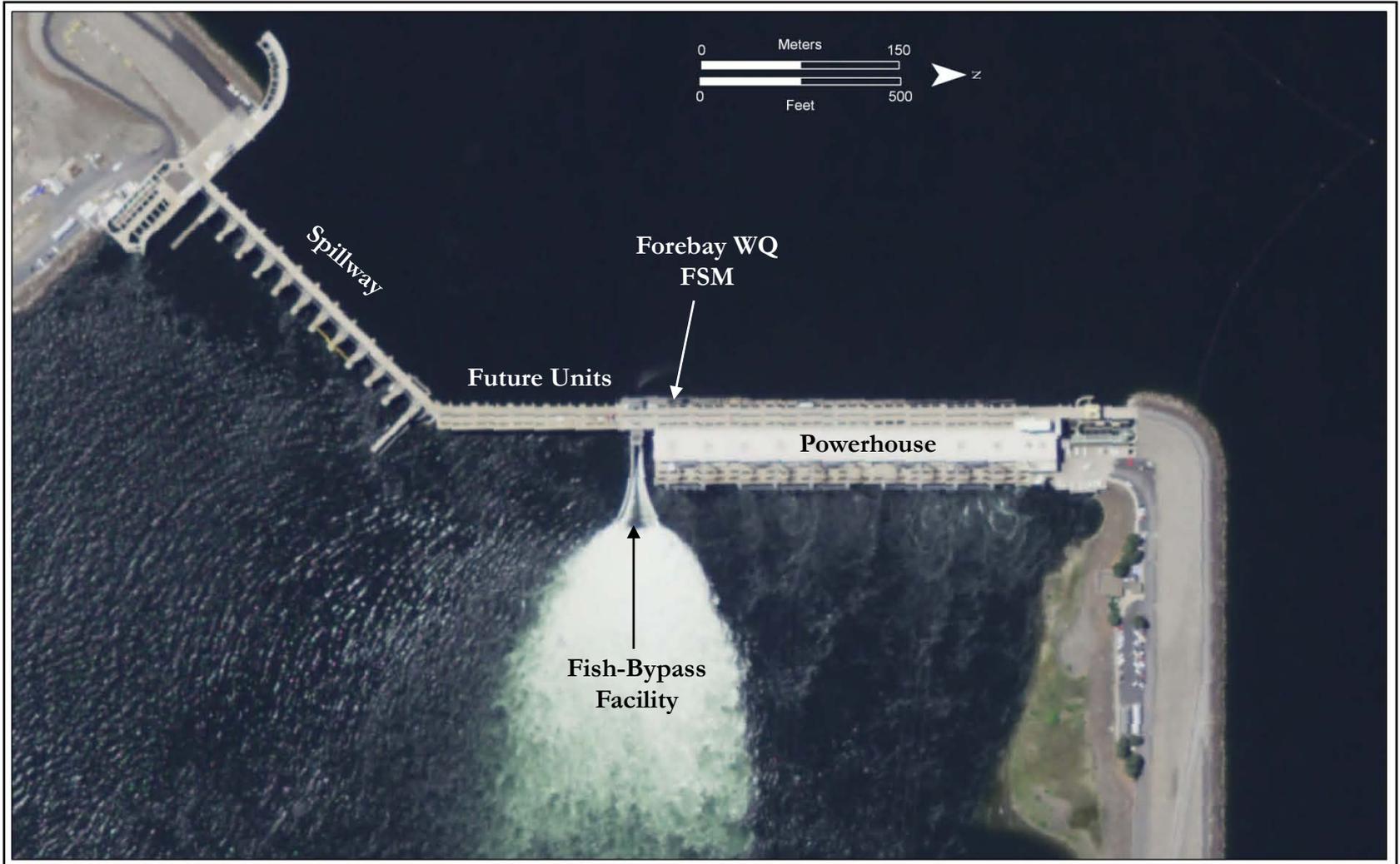
- I. Introduction
- II. Monitoring Sites
- III. Calibration and QA/QC Methods
- IV. Preliminary QA/QC Results
- V. TDG Compliance Value Calculation
- VI. Monitoring Results
- VII. TDG and Flow
- VIII. Conclusions

I. Introduction

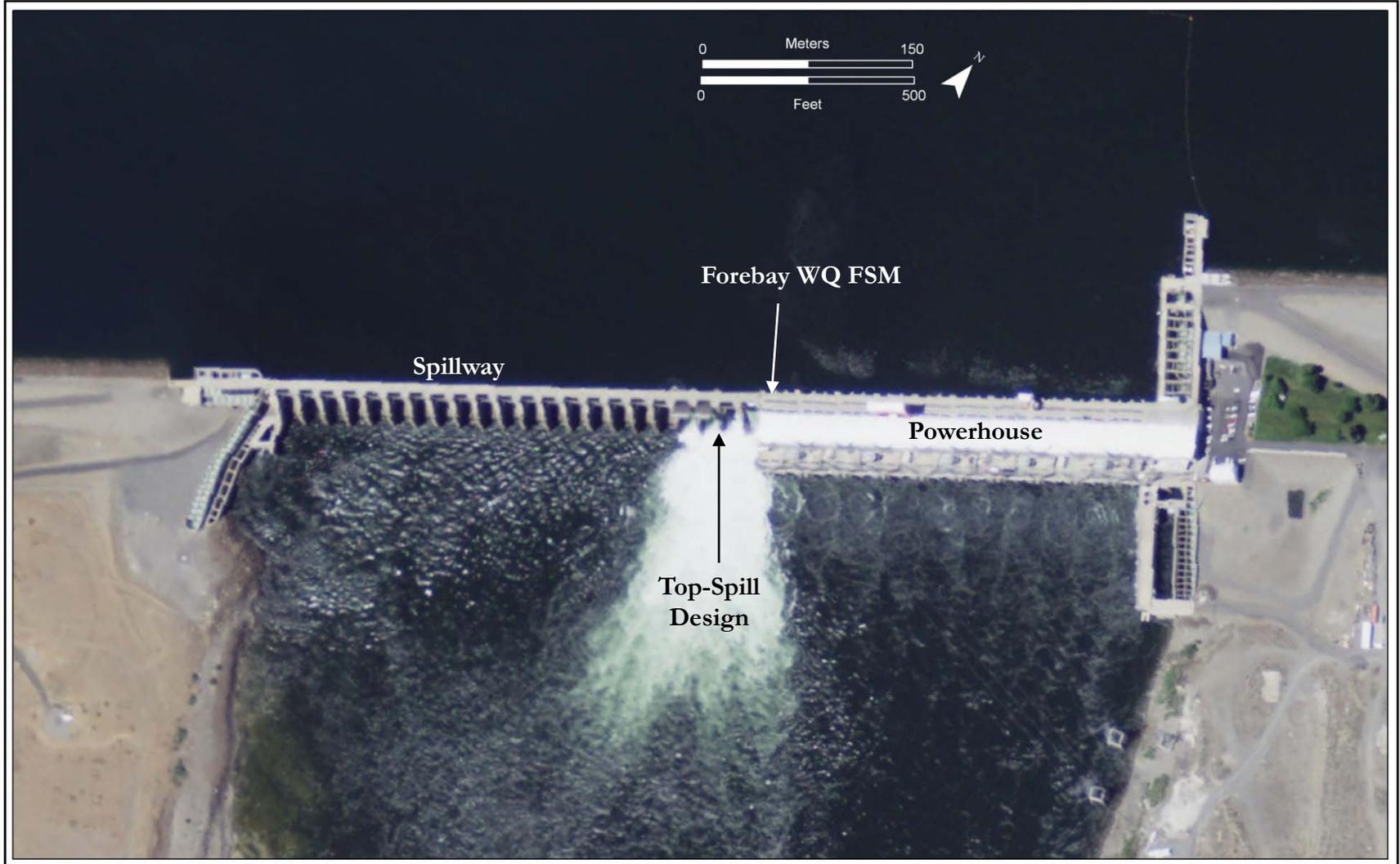
- **Monitoring Requirements**
 - April 2008 FERC License Order
 - 2008 NMFS BiOp
 - 2008 401 Water Quality Certification
 - WDOE approved QAPP

- **Monitoring parameters, Intervals, and Technology**
 - Monitor Temperature and TDG, hourly/year-around
 - Monitor trend-data for DO, pH, and Turbidity every two-three weeks
 - Hydrolab DataSonde 5x, 4a, or MiniSonde probes
 - Sutron Data Collection Platforms (DCP) at each site; data is transmitted to virtual COM-Ports and posted to web-site (~1 hr lag).

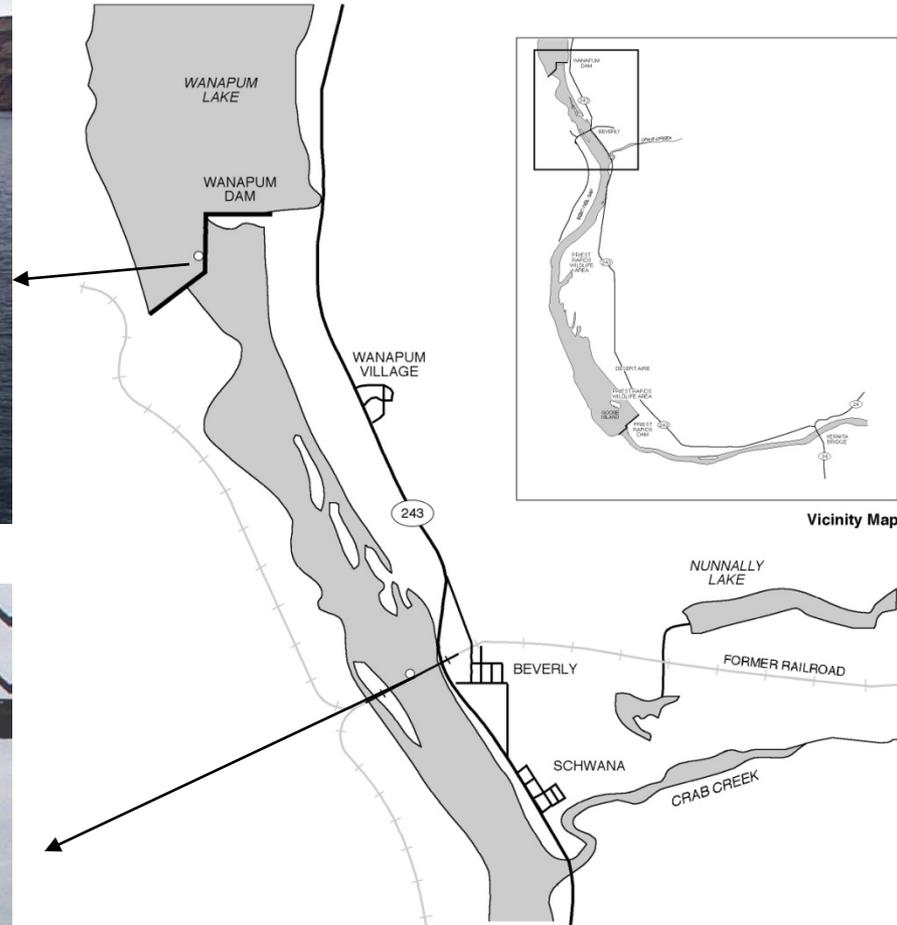
I. Wanapum Dam



II. Priest Rapids Dam



III. Monitoring Sites – Wanapum Dam



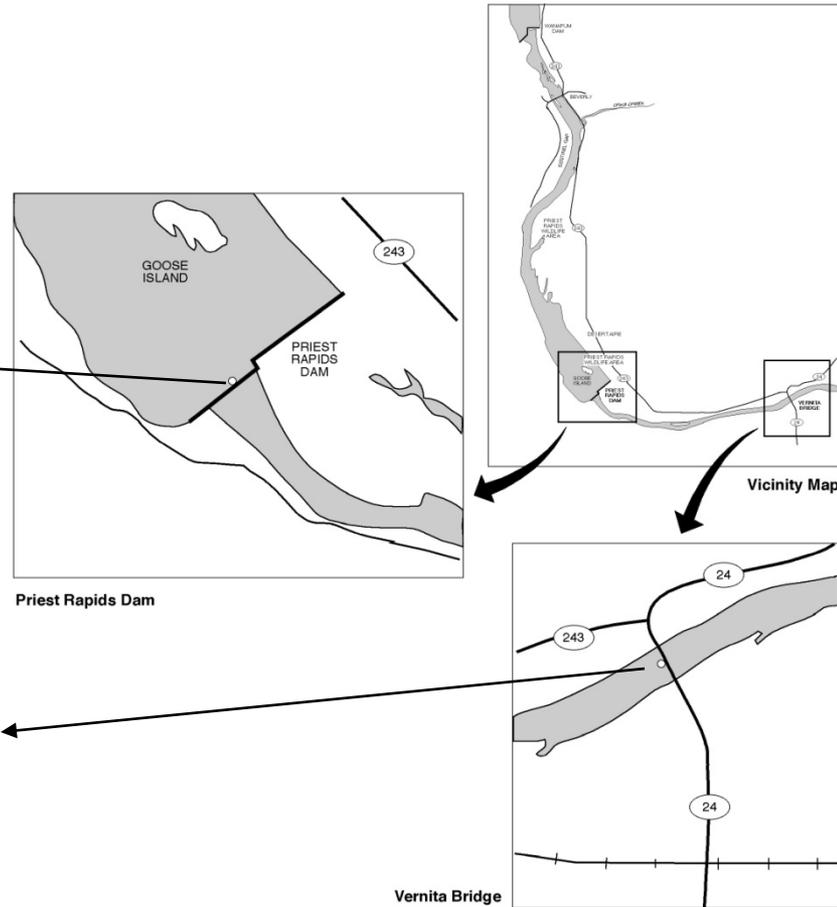
Parametrix 553-1542-037/04(036) GIS Services 8/03 (K)



NOT TO SCALE

Figure 1
Location of Water Quality
Fixed Site Monitoring Stations
for Wanapum and Beverly

IV. Monitoring Sites – Priest Rapids Dam



Parametrix 553-1542-037/04(035) GIS Services 803 (K)



○ Fixed Station

NOT TO SCALE

Figure 2
Location of Water Quality Fixed Site
Monitoring Stations for Priest and Vernita



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- Archaeology >
- Shoreline Management >

Water Quality Monitoring

Fixed Site Water Quality Monitoring

2011 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)
- [72 Hour Water Quality Information](#)

2011 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2010 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)
- [72 Hour Water Quality Information](#)

2010 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2009 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)

2009 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2008 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)

2008 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring](#)

2007 Dissolved Gas Supersaturation Measurements

- [Fixed Site Monitoring - Hourly Data](#)
- [Fixed Site Monitoring - Monthly Summary \(.xls\)](#)

2007 Dissolved Gas Biological Smolt Monitoring

[Priest Rapids Smolt Monitoring.xls](#)

http://www.gcpud.org/naturalResources/fishWaterWildlife/waterqualityMonitoring.html


 Search

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Water Quality Information

Priest Rapids Tailrace

Starting Date: 11/14/2011 11:00 End Date: 11/11/2011 11:00

DateTime	Discharge	Spill	Spill%	Sat%	Temp	TDG	BARO
11/14/2011 11:00	57	1	2	97.9	11.58	729.0	744.6
11/14/2011 10:00	57	0	2	97.9	11.55	729.0	744.3
11/14/2011 09:00	59	0	1	97.8	11.54	728.0	744.0
11/14/2011 08:00	57	0	1	97.9	11.59	728.0	743.5
11/14/2011 07:00	56	0	1	98.0	11.61	729.0	743.3
11/14/2011 06:00	46	0	1	98.2	11.63	730.0	743.2
11/14/2011 05:00	69	0	0	98.5	11.63	732.0	743.0
11/14/2011 04:00	150	0	0	98.6	11.61	733.0	743.1
11/14/2011 03:00	147	0	0	98.8	11.60	734.0	743.2
11/14/2011 02:00	120	0	0	98.8	11.60	735.0	743.6
11/14/2011 01:00	118	0	0	98.8	11.59	735.0	743.8
11/14/2011 00:00	85	0	1	98.8	11.55	735.0	743.7
11/13/2011 23:00	105	0	1	98.8	11.56	735.0	743.6
11/13/2011 22:00	102	0	1	98.9	11.55	736.0	743.6
11/13/2011 21:00	105	0	1	99.0	11.57	737.0	743.7
11/13/2011 20:00	113	0	1	99.1	11.53	737.0	743.5
11/13/2011 19:00	117	0	1	99.3	11.50	739.0	743.4
11/13/2011 18:00	102	0	1	99.3	11.56	738.0	743.3
11/13/2011 17:00	81	1	1	99.3	11.63	738.0	743.2
11/13/2011 16:00	56	1	2	99.3	11.70	738.0	743.3
11/13/2011 15:00	55	0	2	99.2	11.75	738.0	743.5
11/13/2011 14:00	56	0	1	99.0	11.78	737.0	743.4

Priest Rapids Forebay

Priest Rapids Tailrace

Wanapum Forebay

Wanapum Tailrace

Water Quality Parameter Definitions

- **Discharge:**
Project Discharge in kcfs
- **Spill:**
Project Spill in kcfs
- **Spill %:**
Percent Spill
- **Saturation %:**
Total Dissolved Gas Percentage
- **Temperature:**
Water Temperature
- **TDG:**
Total Dissolved Gas Probe Pressure
- **BARO:**
Barometer Pressure

III. Calibration Methods

- Bi-weekly schedule during spill season; every three weeks during non-spill season
- Calibration and maintenance follows established guidelines by USGS, Hydrolab Corporation, and WDOE approved QAPP.
- Calibration data recorded on Hydrolab PDA using Hydrolab pocket-PC software
- Calibrations conducted in lab; newly calibrated probes replace deployed next day

III. Probe QA/QC Methods



- QA/QC re-deployment methods follow established guidelines by USGS, WDOE approved QAPP

- Calibration data recorded on Hydrolab PDA using Hydrolab pocket-PC software

- QA/QC data recorded on three different probes upon deployment of newly calibrated probe
 - Existing probe
 - QA/QC probe (also allows for grab-samples of DO, pH, and Turbidity)
 - Newly calibrated probe

III. Data QA/QC Methods

Grant PUD employs three QA/QC methods:

1. Outlying or erroneous data highlighted as it is collected by pre-programmed software
2. Data is graphically displayed by Grant PUD staff to determine additional outlying or erroneous data
3. Maintenance and calibration of probes

IV. QA/QC- Results



2011 spill season (April 1 – August 31) – QAPP goal of less than 5% data loss

- Probe breakdowns
 - TDG membrane issues

Overview of total dissolved gas data set, 2011 fish-spill season.

Location	Available data collection hours	Number of omitted/lost hourly readings	Percent data loss (%)
WANF	3,672	0	0
WANT	3,672	132	3.6
PRDF	3,672	0	0
PRDT	3,672	0	0
Total	14,688	132	0.9

Note: WANF = Wanapum forebay, WANT = Wanapum tailrace, PRDF = Priest Rapids forebay, PRDT = Priest Rapids tailrace.

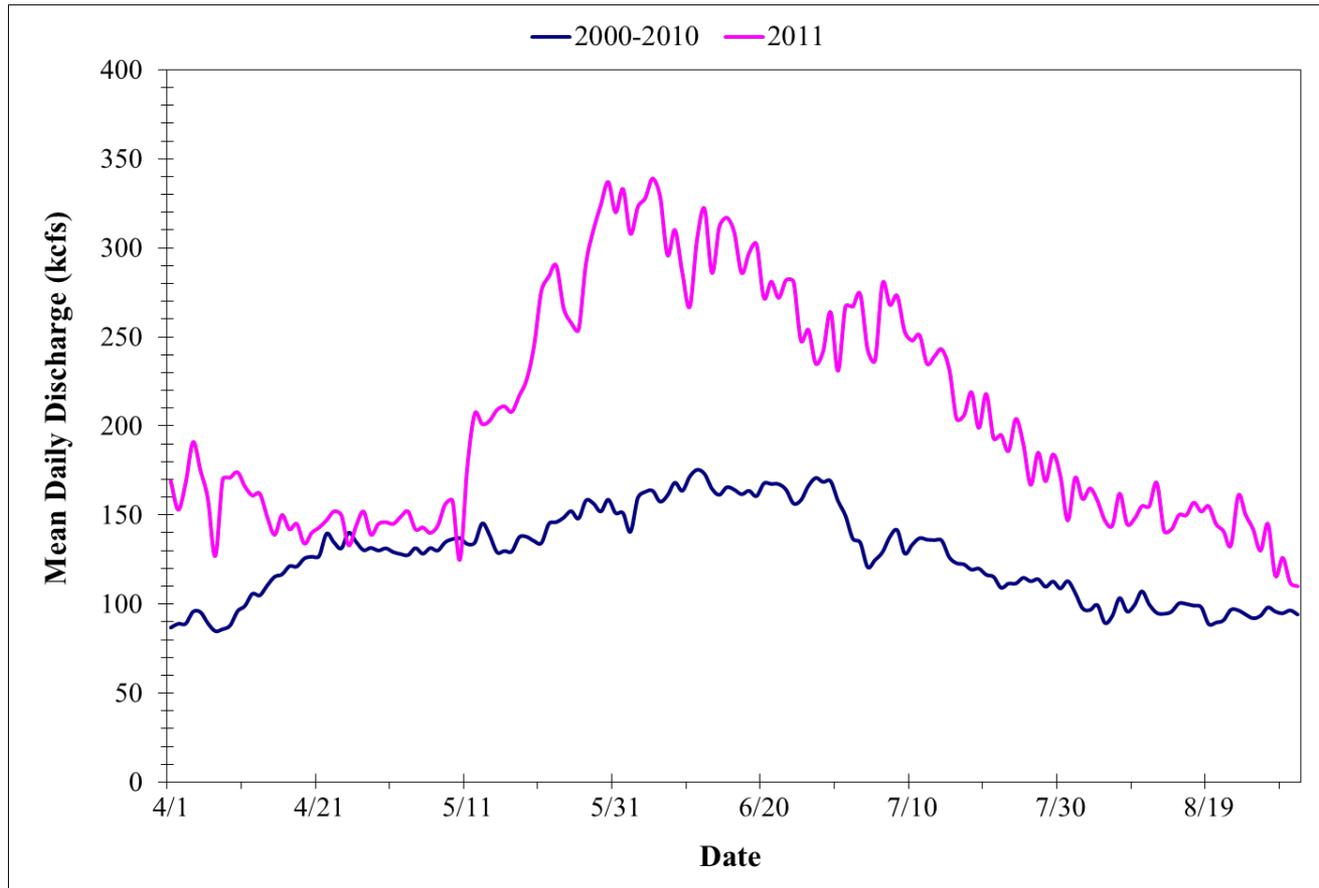
V. TDG Compliance Value Calculation Method



- Using “rolling” average method creates “double-counting” issue
- Can cause same grouping of hourly TDG values to create TDG exceedance on two separate days
- Six instances of rolling average method creating double-exceedances in 2011
 - Between 5/17 & 8/25
 - 5 @ PRD forebay site
 - 1 @ Pasco (next downstream site)
 - McNary forebay

Date	Hour	Hourly TDG Value	Average of 12 previous hours	Highest 12-hr consecutive average for each day
5/16/2011	1400	116.8	114.5	
5/16/2011	1500	117.1	114.8	
5/16/2011	1600	117.6	115.1	
5/16/2011	1700	118.4	115.5	
5/16/2011	1800	118.7	115.9	
5/16/2011	1900	118.8	116.3	
5/16/2011	2000	119.0	116.8	
5/16/2011	2100	118.7	117.2	
5/16/2011	2200	117.5	117.5	
5/16/2011	2300	116.3	117.6	
5/16/2011	2359	114.9	114.5	117.6
5/17/2011	0100	113.8	117.1	115.7
5/17/2011	0200	113.0	117.0	
5/17/2011	0300	112.6	116.9	
5/17/2011	0400	112.8	116.7	
5/17/2011	0500	114.1	116.5	
5/17/2011	0600	114.0	116.1	
5/17/2011	0700	113.4	115.8	
5/17/2011	0800	112.6	115.4	
5/17/2011	0900	112.3	115.1	
5/17/2011	1000	112.5	114.8	
5/17/2011	1100	112.8	114.5	
5/17/2011	1200	113.1	114.3	114.0
5/17/2011	1300	113.3	114.2	
5/17/2011	1400	113.4	114.1	
5/17/2011	1500	113.5	114.0	
5/17/2011	1600	113.6	114.0	
5/17/2011	1700	113.6	114.1	
5/17/2011	1800	113.6	114.2	
5/17/2011	1900	113.9	114.3	
5/17/2011	2000	114.6	114.4	
5/17/2011	2100	115.2	114.4	
5/17/2011	2200	115.4	114.4	
5/17/2011	2300	115.4	114.4	

VI. TDG Monitoring Results



Comparison of 2011 vs. previous 10-year average (2000-2010) of mean daily discharge values as measured at the U.S. Geological Survey streamflow gage #12472800 located below Priest Rapids Dam, mid-Columbia River, WA.

VI. TDG Monitoring Results



Fish-spill program: Wanapum Dam

Date	Spill Program	Quantity ¹	Purpose
<i>April 26, 2011</i>	<i>Spring Spill Initiated</i>		
April 26-June 14	WFB (Open 24 Hours/Day)	Up to 20 kcfs	RPA 1 and terms and conditions of the Biological Opinion and as approved by PRCC
<i>June 15, 2011</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 26	WFB (Open 24 Hours/Day)	Up to 20 kcfs	Priest Rapids Project Salmon and Steelhead Settlement Agreement and as approved by PRCC
<i>August 26, 2011</i>	<i>End of Summer Spill</i>		

¹Actual quantity spilled is dependent on forebay and tailwater elevations.

Fish-spill program: Priest Rapids Dam

Date	Spill Program	Quantity ¹	Purpose
<i>April 27, 2011</i>	<i>Spring Spill Initiated</i>		
April 27-June 14	Prototype top-spill test: spill-gate 19-20; spill gate open 4 ft; + sluiceway	Up to 24 kcfs	RPA 1 and terms and conditions of the Biological Opinion and as approved by PRCC
<i>June 15, 2011</i>	<i>End of Spring Spill/ Summer Spill Initiated</i>		
June 15-Aug 27	Prototype top-spill test: spill-gate 19-20; spill gate open 4 ft; + sluiceway	Up to 24 kcfs	Priest Rapids Project Salmon and Steelhead Settlement Agreement and as approved by PRCC
<i>August 27, 2011</i>	<i>End of Summer Spill</i>		

¹Actual quantity spilled is dependent on forebay and tailwater elevations.

VI. TDG Monitoring Results



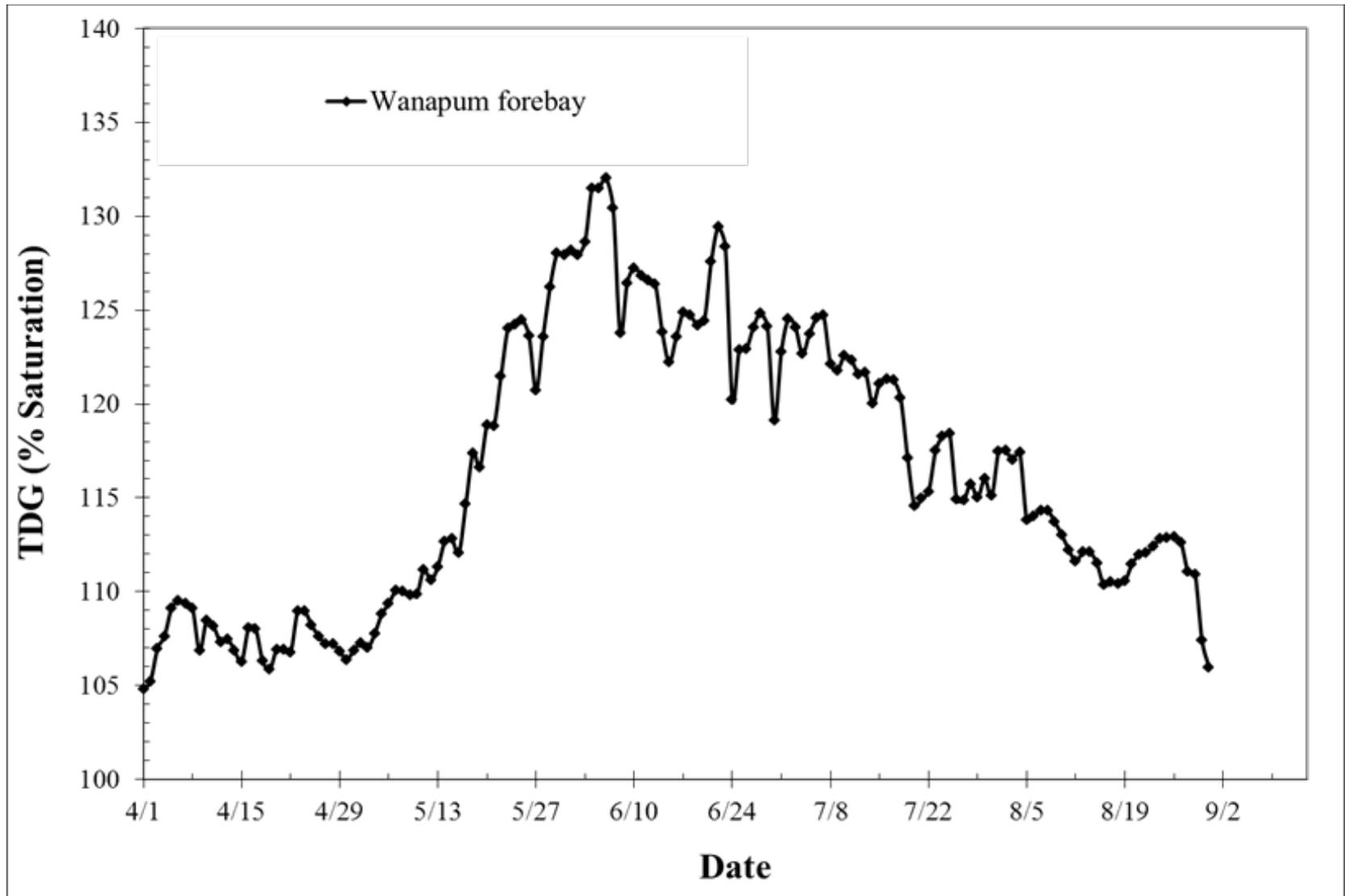
Number of 2011 fish-spill season total dissolved gas variances, Priest Rapids Project, mid-Columbia River, WA

Location ¹	Number of 115%/120% exceedances					Number of 125% of exceedances		
	Spring Spill	Summer Spill	Total	Total # of points ²	% above standard	Total	Total # of hrs ²	% above standard
WANT	2	9	11	104	11%	14	2537	0.55%
PRDF	5	16	21	108	19%	8	2537	0.32%
PRDT	3	4	7	104	7%	11	2432	0.45%
PASCO	0	6	6	80	8%	0	2432	0.00%
Total	10	35	45	396	11%	33	9938	0.33%

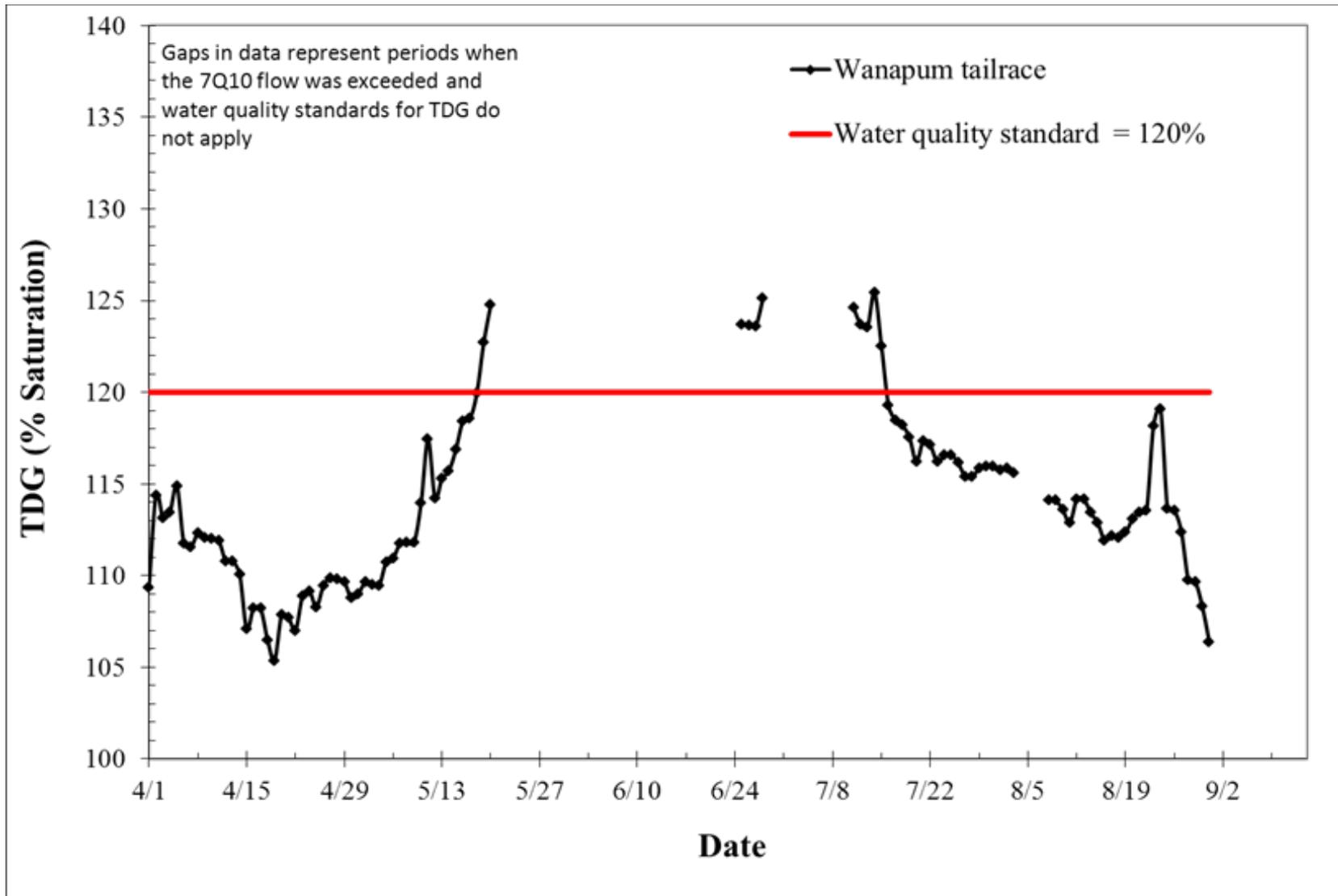
¹WANT = Wanapum tailrace, PRDF = Priest Rapids forebay, PRDT = Priest Rapids tailrace, PASCO = Pasco Fixed Site Monitor located upstream of McNary Dam (next downstream forebay), operated by the US Army Corps of Engineers.

²Based on total number of available days/hrs minus days/hrs omitted due to the 7Q10 flood flow being exceeded.

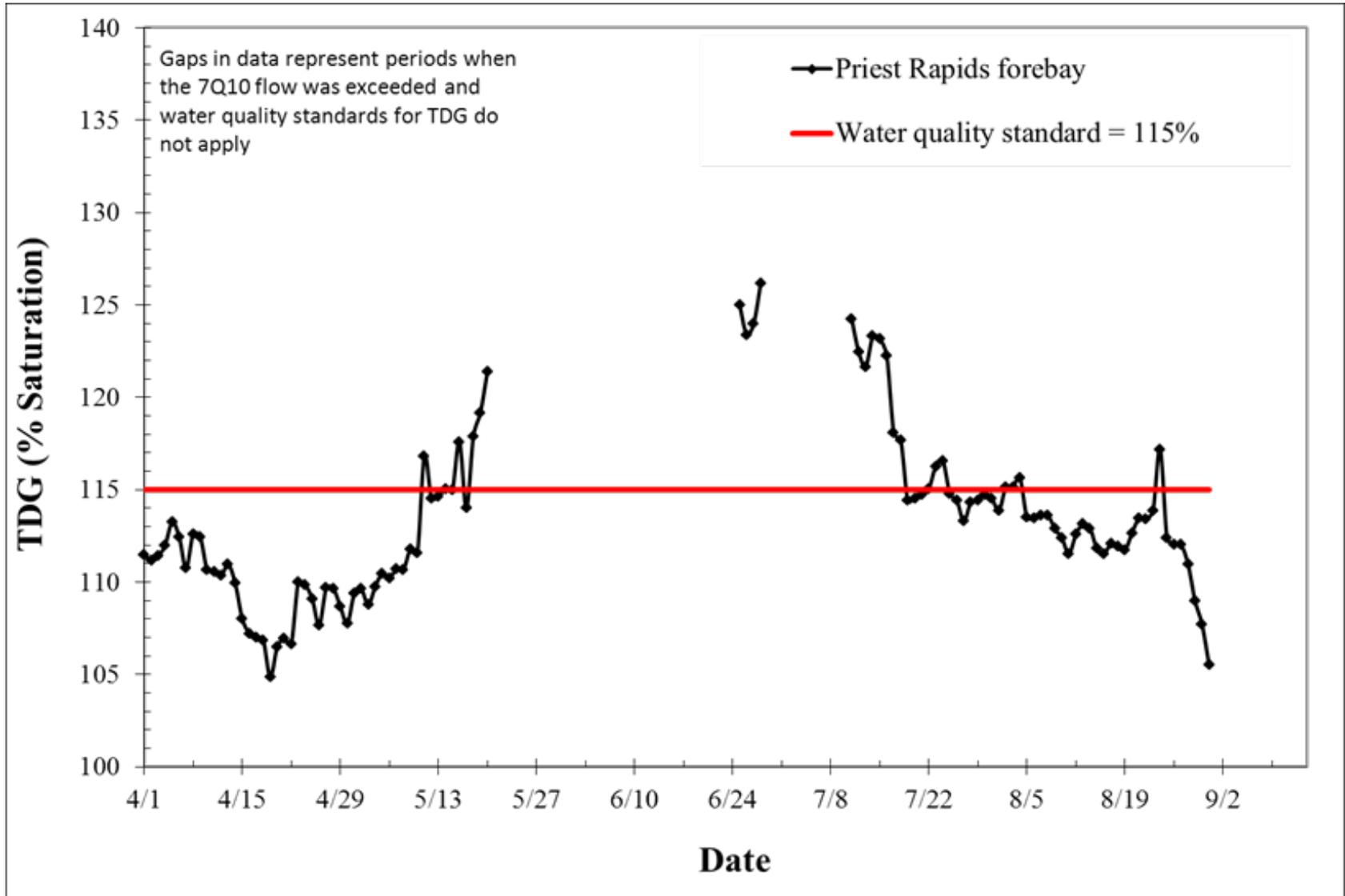
VI. TDG Monitoring Results



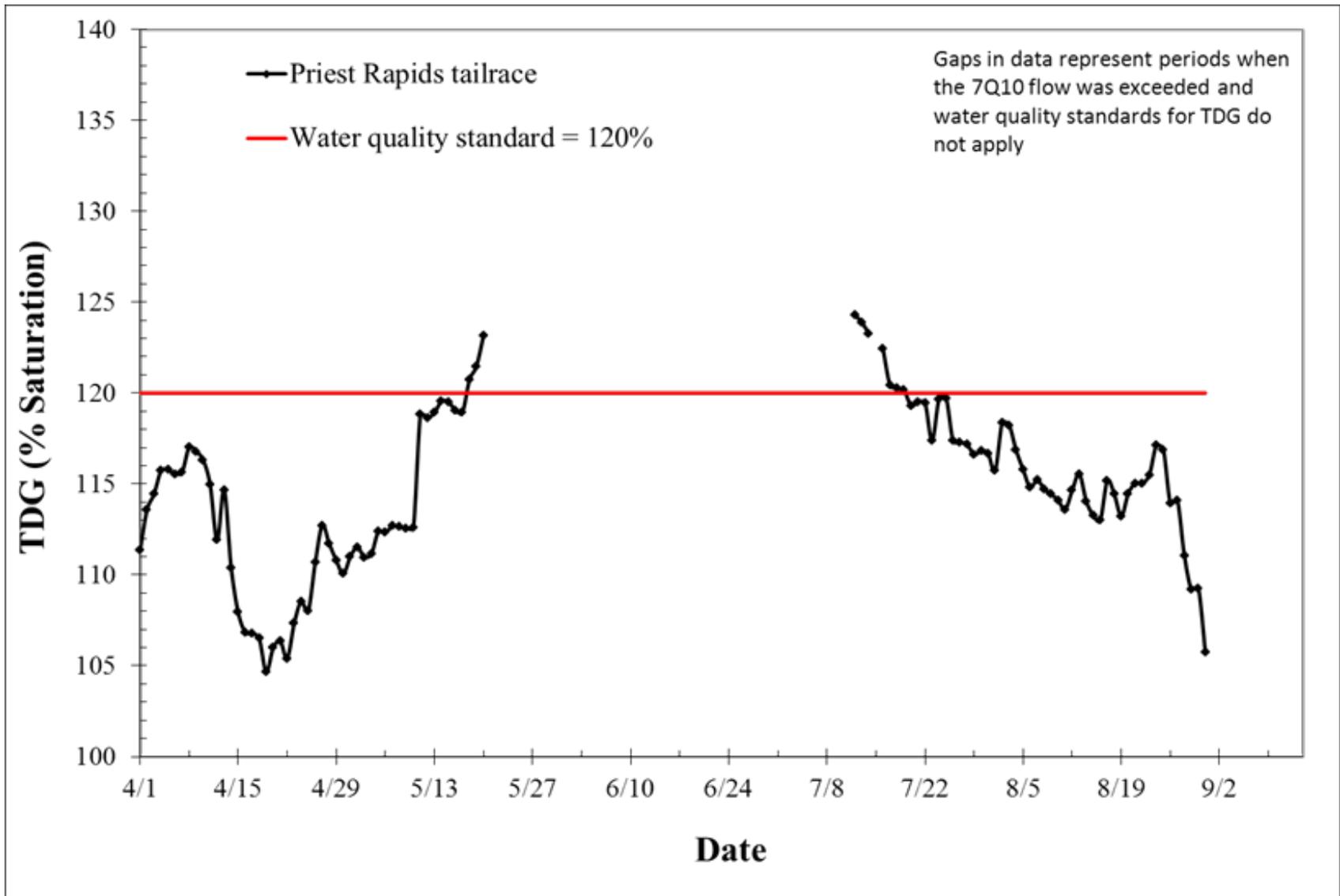
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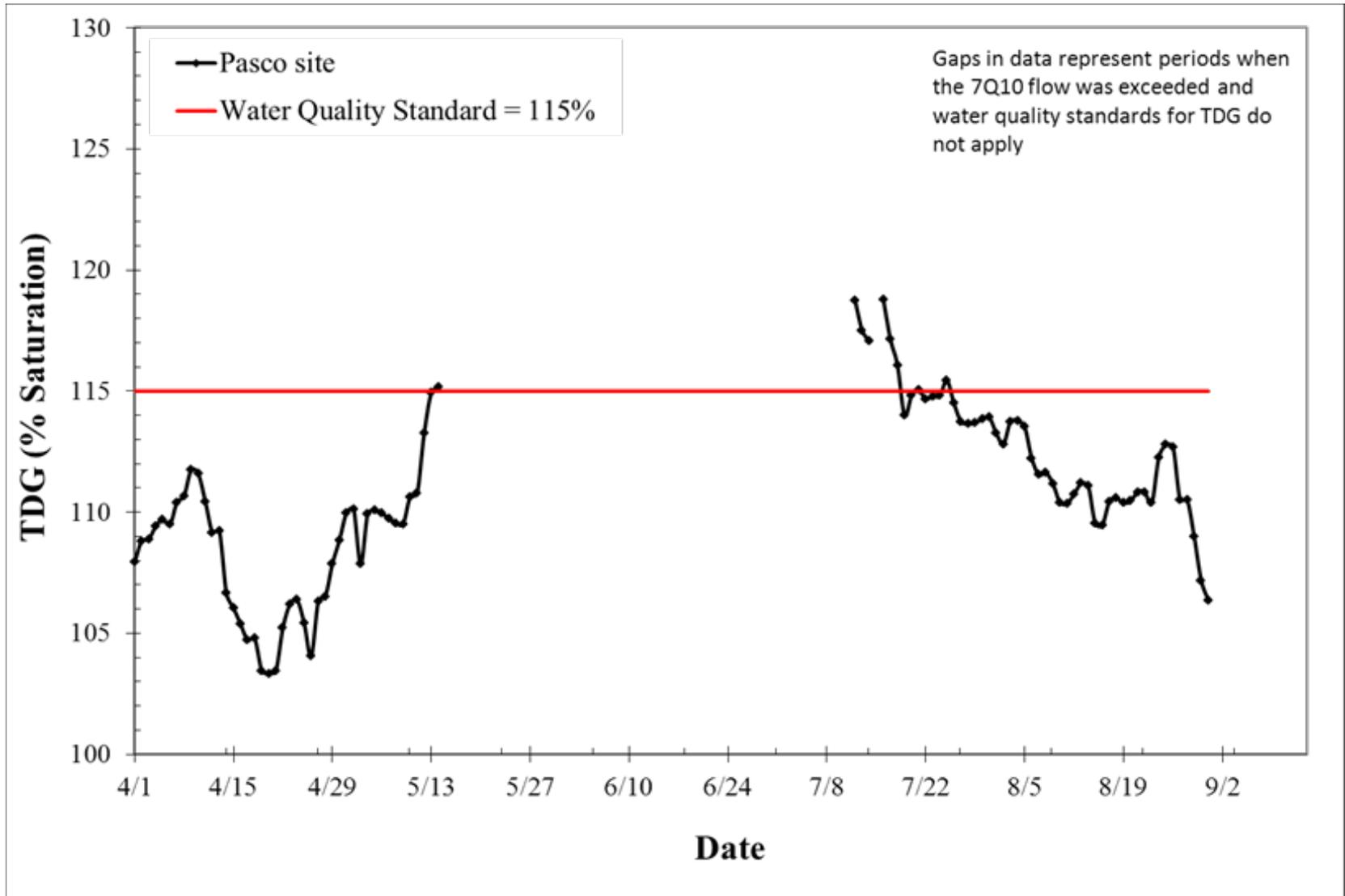
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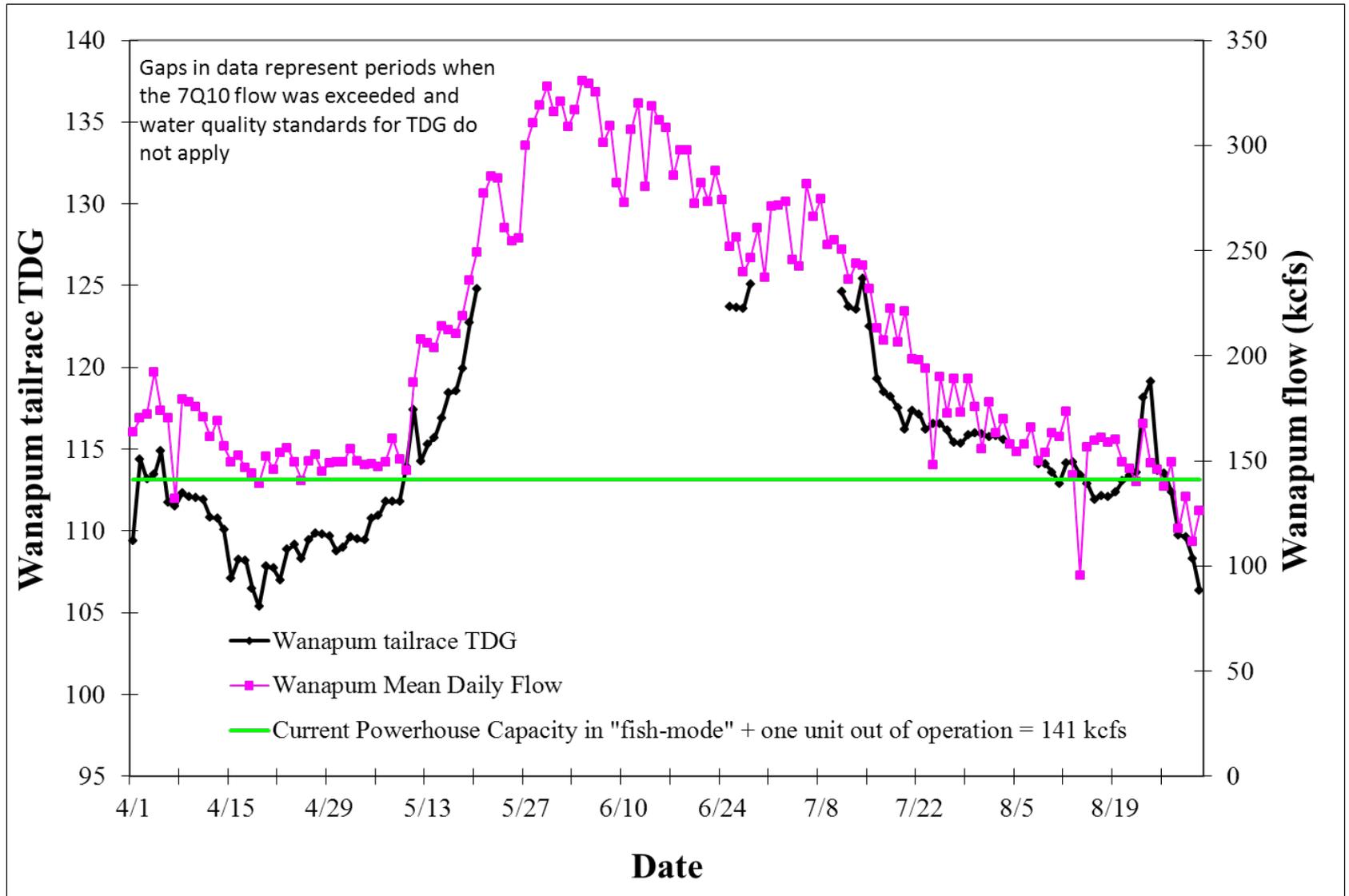
VI. TDG Monitoring Results



VI. TDG Monitoring Results



VII. TGD and Flow



VIII. Conclusions

- Grant PUD to continue hourly TDG & Temperature monitoring; bi-weekly trend monitoring of DO, pH, and Turbidity – year around
- Will follow 401 certification conditions set forth by WA. Dept. of Ecology
 - Quality Assurance Project Plan (QAPP)
 - Annual Gas Abatement Plan (GAP)
 - Annual reports
- Continue to follow established USGS guidelines for calibration, maintenance, and QA/QC procedures, as outlined in Grant PUD's QAPP
- On-going and proposed improvements to both PR and Wanapum Dams expected to decrease TDG issues
 - Wanapum Fish Bypass (operation began in 2008)
 - Wanapum Advanced Turbines will increase powerhouse capacity; (eighth unit being installed; all 10 by 2012)
 - PR top-spill fish bypass; started September 2011 (operational by fish-spill 2016)
 - PR advanced turbines; studies on-going

Questions?

