

Appendix D

2020 Summary of TDG Exceedance Tracking

INTRODUCTION

The U.S. Army Corps of Engineers (Corps) tracks the number of days when the percent TDG exceeds the Oregon (set by Oregon Department of Environmental Quality, ODEQ) and Washington (set by Washington Department of Ecology, WDOE) water quality standards (WQS). During spill for fish passage, WDOE's and ODEQ's WQSs use the same method for calculating a daily value of TDG: the average of the 12 highest hourly readings in a calendar day (referred to here as the 'regulatory' TDG value). This appendix provides the TDG tracking system results during the 2020 fish passage season from April 1 through August 31. A description of each table follows.

Table D- 1 provides a definition of TDG instances (including exceedance types, 7Q10 flows, and data quality events) with the associated format used to identify the type in Table D- 2 through Table D- 2 through Table D- 6 identify the daily TDG regulatory value and exceedance type if applicable (as defined in Table D- 1) by project forebay and tailwater.

Table D- 7 and Table D-8 provide the total number of TDG exceedances by type for each project for the lower Snake River projects and lower Columbia River projects, respectively.

Oregon and Washington also specify that the maximum two consecutive hour TDG must not exceed 127 percent and 126 percent, respectively. Table D- 9 breaks down the maximum two-hour consecutive TDG value, the number of days that exceed 126 percent Washington TDG standard, and the number of days that exceed the 127 percent Oregon TDG standard.

Table D- 10 provides a list of TDG gauges that malfunctioned during the 2020 spill season, which resulted in six hours or more of either missing or erroneous data. Malfunctioning gauge TDG instances are noted as data quality event in Table D- 2 through Table D-6.

Table D- 1: TDG instance definitions

<p>Forced Spill Exceedance (FSE)</p>	<p>TDG levels exceed the TDG standard due to exceeding powerhouse capacity at run-of-river projects resulting in spill above the BiOp fish spill levels. This includes exceedances due to:</p> <ul style="list-style-type: none"> • High runoff flows and flood risk management efforts. • Periods when BPA load requirements are lower than actual powerhouse capacity or project is carrying system-wide reserves. • Involuntary spill at Mid-Columbia River dams resulting in high TDG levels entering the lower Columbia River. • Involuntary spill at Snake River dams resulting in high TDG levels entering the lower Columbia River. • Planned and unplanned outages of hydro power equipment including generation unit, intertie line, or powerhouse outages.
<p><u>Mechanical Exceedance (ME)</u></p>	<p>TDG instances due to the operation or mechanical failure of non-generating equipment. This includes exceedances due to:</p> <ul style="list-style-type: none"> • Spill gates stuck in open position or inadvertently left open. • Increased spill in a bulk spill operation to pass debris or other special operations. • Communication errors, such as teletype were transmitted but change was not timely made or misinterpretation of intent of teletype by Project operator.
<p><i>Uncertainty Exceedance (UE)</i></p>	<p>TDG WQS exceedance due to uncertainties when using best professional judgment, SYSTDG model and forecasts. This includes exceedances due to:</p> <ul style="list-style-type: none"> • Uncertainties when using best professional judgment to apply the spill guidance criteria, e.g., travel time, degassing, and spill patterns. • Uncertainties when using the SYSTDG model to predict the effects of various hydro system operations, temperature, degassing, and travel time. • Uncertainties when using forecasts for flows, temperature and wind. • Unanticipated sharp rise in water temperature (a 1.5 degree F. or greater change in a day).
<p>Data Quality Event (-)</p>	<p>Malfunctioning FMS gauge that resulted in missing or erroneous data. The TDG cannot be evaluated for these days.</p>
<p>TDG Exceedance During 7Q10 Flow (*)</p>	<p>TDG above the WQS during project flow higher than 7Q10 flows. These instances are not counted towards the total number of exceedances.</p>

Table D- 2: Daily TDG Instances, Values Computed using the Regulatory Method, April 2020

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
4/1/2020	100	101	102	101	101	101	101	102	103	104	104	103	104	104	104	112
4/2/2020	100	102	101	100	100	101	101	101	102	105	103	103	103	104	104	112
4/3/2020	100	114	102	116	101	120	102	113	103	102	103	104	104	105	104	112
4/4/2020	101	115	102	117	102	121	102	113	105	106	105	105	104	105	105	115
4/5/2020	101	114	102	115	102	122	103	113	105	107	105	105	105	106	105	116
4/6/2020	101	114	102	115	104	120	106	113	104	105	104	105	104	105	105	116
4/7/2020	101	115	102	114	110	119	112	114	105	106	103	104	104	105	104	115
4/8/2020	101	116	103	116	113	120	115	115	108	107	104	104	104	105	104	116
4/9/2020	102	116	106	115	113	122	117	115	108	109	105	105	105	106	106	116
4/10/2020	102	116	110	117	114	121	118	115	109	117	106	114	105	112	106	116
4/11/2020	102	116	110	118	115	120	118	115	108	116	104	114	108	113	105	116
4/12/2020	101	117	111	118	113	120	117	116	109	116	104	113	110	115	107	116
4/13/2020	100	117	112	121	113	120	116	116	108	115	105	113	112	116	110	117
4/14/2020	100	117	113	119	115	120	116	116	108	116	105	113	112	116	112	117
4/15/2020	100	116	112	116	116	117	116	114	108	116	105	115	110	115	110	117
4/16/2020	101	116	113	117	117	120	116	115	110	115	106	115	113	117	111	117
4/17/2020	103	116	116	118	117	120	117	116	110	116	109	116	115	118	114	119
4/18/2020	103	116	115	117	116	121	116	114	111	115	109	116	113	116	114	118
4/19/2020	102	116	115	118	115	120	116	114	108	115	110	115	110	115	112	117
4/20/2020	103	116	115	118	116	119	116	114	108	116	110	117	113	117	112	117
4/21/2020	103	116	115	118	115	120	116	115	107	116	109	117	112	116	111	118
4/22/2020	103	117	114	118	115	120	116	114	108	115	109	117	112	117	112	118
4/23/2020	103	118	113	121	115	120	116	116	107	116	109	117	113	117	111	120
4/24/2020	103	120	113	123	115	121	115	116	108	117	108	117	114	117	113	120
4/25/2020	103	120	114	122	118	121	117	116	109	116	108	117	116	119	115	120
4/26/2020	103	120	115	124	120	120	118	117	111	116	108	118	117	119	116	119
4/27/2020	103	121	115	123	120	121	118	116	111	116	108	118	116	119	116	120
4/28/2020	103	122	114	124	119	122	116	117	110	118	109	118	117	120	116	120
4/29/2020	104	123	116	125	122	123	119	118	111	119	112	119	117	121	117	121
4/30/2020	104	124	116	125	122	122	120	119	111	119	111	118	115	119	116	120
Exceedances:																
DQE:																

Table D- 3: Daily TDG Instances, Values Computed using the Regulatory Method, May 2020

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
5/1/2020	103	125	116	125	121	124	119	124	111	119	111	119	116	120	115	120
5/2/2020	103	125	117	125	124	123	122	125	113	120	112	120	119	122	117	121
5/3/2020	103	124	115	124	123	122	120	119	113	119	111	120	117	120	116	121
5/4/2020	103	124	114	124	121	123	119	123	111	120	111	119	120	122	116	121
5/5/2020	104	123	118	124	124	123	122	119	113	120	114	119	120	122	120	121
5/6/2020	104	122	117	124	123	122	120	117	113	119	112	119	116	119	116	121
5/7/2020	103	123	115	123	119	122	117	118	109	120	111	119	118	121	115	121
5/8/2020	103	123	115	124	122	123	120	118	111	120	113	120	121	123	118	123
5/9/2020	105	122	116	122	124	123	121	117	113	120	114	120	122	123	120	122
5/10/2020	106	122	119	122	124	122	122	118	115	120	114	119	122	123	121	121
5/11/2020	106	124	120	125	123	123	121	120	114	122	119	120	122	124	123	122
5/12/2020	105	125	119	125	122	123	119	121	114	124	118	121	120	123	121	123
5/13/2020	104	125	117	125	123	123	118	122	113	124	116	121	120	122	120	123
5/14/2020	103	125	115	124	122	123	118	124	111	126	114	121	118	122	119	124
5/15/2020	103	124	114	124	123	122	120	121	113	125	114	121	117	121	120	123
5/16/2020	105	124	118	124	125	123	122	121	114	126	116	121	119	123	121	123
5/17/2020	105	124	118	124	126	122	122	119	116	126	117	120	120	123	121	123
5/18/2020	105	124	121	124	125	123	121	120	115	123	118	120	118	122	120	123
5/19/2020	103	125	120	125	123	123	120	124	113	124	118	120	116	121	116	123
5/20/2020	103	125	118	125	124	123	120	124	113	124	115	121	114	120	114	123
5/21/2020	103	126	117	125	123	123	120	124	111	125	111	120	114	119	115	123
5/22/2020	103	126	114	125	122	124	118	125	109	126	109	121	112	119	114	123
5/23/2020	103	126	113	125	122	124	120	125	110	126	107	120	114	119	115	123
5/24/2020	104	124	117	125	124	122	122	122	112	126	109	120	116	120	116	123
5/25/2020	104	124	120	125	127	123	123	120	114	125	113	120	116	121	118	123
5/26/2020	105	124	119	124	125	123	122	120	114	124	116	120	117	122	118	123
5/27/2020	104	125	119	125	124	123	122	122	114	124	119	120	120	124	119	123
5/28/2020	104	125	119	125	126	123	123	124	116	125	120	120	121	124	123	123
5/29/2020	105	126	121	126	128	124	124	126	119	124	121	123	122	125	124	124
5/30/2020	106	127	123	126	128	124	126	126	119	125	123	122	121	124	121	125
5/31/2020	104	125	118	126	123	126	120	125	112	123	116	124	117	122	115	124
Exceedances:		5		3		1		2		6						
DQE:																

Table D- 4: Daily TDG Instances, Values Computed using the Regulatory Method, June 2020

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
6/1/2020	105	125	116	126	128	126	123	125	114	123	114	125	118	123	118	124
6/2/2020	106	125	120	126	129	126	125	124	117	124	110	125	118	124	121	124
6/3/2020	107	125	121	126	127	124	124	124	118	126	115	122	119	124	121	124
6/4/2020	107	125	122	125	127	123	124	125	119	128	117	121	119	124	120	124
6/5/2020	106	125	123	124	127	123	124	125	120	124	120	121	119	123	121	125
6/6/2020	106	125	119	124	126	123	123	123	118	125	119	123	119	122	118	124
6/7/2020	104	125	116	124	123	122	120	120	113	126	118	123	116	125	117	124
6/8/2020	102	124	113	124	119	123	116	124	110	-	111	124	116	123	116	123
6/9/2020	102	124	113	124	121	122	117	122	112	-	108	119	116	121	121	123
6/10/2020	104	123	115	123	123	121	121	119	116	-	110	119	118	121	121	122
6/11/2020	105	123	117	124	125	120	122	118	117	126	114	120	118	122	119	122
6/12/2020	106	-	119	124	124	121	122	118	118	121	122	120	118	122	118	123
6/13/2020	106	123	119	124	122	122	120	118	117	124	122	120	116	120	116	122
6/14/2020	103	123	116	124	120	121	116	118	112	124	117	120	117	121	116	122
6/15/2020	102	123	115	124	120	122	117	120	111	123	114	120	118	122	118	122
6/16/2020	102	122	116	124	122	122	118	117	113	119	111	117	115	120	118	119
6/17/2020	102	123	117	124	121	122	118	118	112	119	109	118	112	117	115	119
6/18/2020	103	122	116	124	122	120	119	118	114	119	111	117	113	118	114	119
6/19/2020	104	123	118	124	125	121	120	118	115	120	113	118	115	119	117	120
6/20/2020	105	122	119	125	125	122	121	118	116	120	113	118	114	118	117	120
6/21/2020	105	118	118	116	122	120	119	117	114	119	114	118	114	119	114	119
6/22/2020	103	114	118	116	122	118	118	117	113	119	113	119	117	120	114	119
6/23/2020	105	114	120	116	119	120	119	118	117	120	114	120	119	122	119	120
6/24/2020	106	116	118	117	119	120	120	119	118	120	114	119	116	121	119	120
6/25/2020	105	117	114	113	118	119	117	118	115	120	115	119	117	120	115	120
6/26/2020	105	119	114	116	117	119	117	118	116	120	116	119	116	119	115	120
6/27/2020	105	120	114	119	116	119	117	118	116	120	114	119	113	118	114	120
6/28/2020	104	120	114	121	115	118	116	119	114	120	110	120	114	120	111	120
6/29/2020	103	118	114	116	115	119	114	119	113	120	109	120	113	119	112	120
6/30/2020	102	118	112	116	116	120	114	120	113	120	108	121	113	119	111	120
Exceedances:			4	4	8	2	8		5	4	1	1	5	2	5	
DQE:										3						

Table D- 5: Daily TDG Instances, Values Computed using the Regulatory Method, July 2020

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
7/1/2020	101	118	111	113	113	119	112	117	111	119	106	120	114	120	112	119
7/2/2020	101	118	109	113	111	118	110	115	109	120	105	120	115	120	114	120
7/3/2020	102	114	108	111	110	118	109	115	111	119	105	120	115	120	115	120
7/4/2020	102	111	109	113	110	118	110	115	113	119	106	117	114	119	114	120
7/5/2020	103	112	112	113	111	118	112	115	114	118	107	116	110	116	114	118
7/6/2020	103	112	113	113	112	117	113	116	114	119	109	115	109	116	112	117
7/7/2020	103	112	111	112	113	117	113	114	113	118	108	115	108	115	109	117
7/8/2020	103	112	111	112	112	118	112	114	110	118	108	115	110	116	110	117
7/9/2020	103	112	111	112	111	117	112	114	111	119	108	116	110	116	111	117
7/10/2020	102	112	110	112	112	118	113	114	110	119	107	117	111	117	112	118
7/11/2020	103	112	112	113	112	118	114	113	111	119	107	117	111	117	113	118
7/12/2020	103	112	111	113	112	118	114	114	111	119	108	116	109	116	111	117
7/13/2020	103	112	110	113	111	118	114	113	111	119	110	115	110	117	112	117
7/14/2020	103	114	110	113	111	117	113	112	111	120	111	116	112	118	113	117
7/15/2020	102	114	110	113	112	118	114	112	112	120	111	115	112	118	113	117
7/16/2020	102	113	110	114	112	118	115	113	112	119	111	115	111	116	112	117
7/17/2020	102	114	111	114	112	118	115	113	112	119	110	-	109	115	109	117
7/18/2020	103	113	113	115	112	119	115	112	111	118	111	-	109	116	109	117
7/19/2020	103	114	113	115	111	118	114	113	111	118	111	-	113	118	111	117
7/20/2020	103	114	112	115	113	119	114	114	112	119	112	-	113	118	113	117
7/21/2020	103	114	111	114	114	119	116	113	113	119	113	115	113	118	114	117
7/22/2020	103	114	113	115	113	119	117	114	113	119	111	115	110	116	111	117
7/23/2020	104	114	112	115	113	119	117	114	111	118	110	115	108	115	109	117
7/24/2020	103	114	111	114	112	117	115	113	110	117	108	115	107	114	106	116
7/25/2020	103	114	110	114	110	114	114	112	108	117	107	115	108	115	107	117
7/26/2020	102	114	109	113	109	114	113	112	108	118	108	115	111	118	110	117
7/27/2020	102	114	108	118	111	116	113	112	109	118	107	115	111	117	114	117
7/28/2020	101	114	109	114	113	115	114	113	110	117	107	115	110	116	114	117
7/29/2020	102	114	109	114	112	116	114	114	111	119	108	115	109	116	111	117
7/30/2020	105	114	111	114	113	114	114	114	111	118	110	115	111	117	111	117
7/31/2020	105	115	112	114	113	115	114	113	110	117	111	114	111	116	110	117
Exceedances:							3									
DQE:												4				

Table D- 6: Daily TDG Instances, Values Computed using the Regulatory Method, August 2020

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
8/1/2020	104	114	111	114	112	113	113	113	109	118	109	115	107	114	107	117
8/2/2020	105	114	111	114	111	113	111	112	109	117	109	115	108	114	107	116
8/3/2020	104	118	110	114	110	113	109	111	108	117	107	116	108	115	107	117
8/4/2020	104	118	111	115	110	117	109	112	108	119	107	116	110	116	109	117
8/5/2020	105	117	111	114	111	117	110	112	110	118	108	115	111	116	109	117
8/6/2020	104	117	112	117	111	117	110	111	109	116	106	115	108	113	108	117
8/7/2020	102	115	109	113	109	117	108	111	107	116	105	114	106	114	106	117
8/8/2020	103	116	109	110	110	115	109	111	106	116	104	114	108	114	106	117
8/9/2020	102	116	109	109	108	115	109	111	106	116	104	115	106	113	106	117
8/10/2020	101	117	110	110	109	115	110	111	107	118	106	115	110	116	108	117
8/11/2020	101	117	110	110	109	115	112	108	108	117	105	115	109	115	108	116
8/12/2020	101	114	108	109	108	114	111	107	108	116	104	115	106	113	106	117
8/13/2020	101	114	107	109	106	113	110	108	106	116	103	115	106	112	105	117
8/14/2020	101	114	107	109	106	113	110	108	106	116	104	115	107	114	106	117
8/15/2020	101	112	107	109	105	110	109	108	106	111	105	113	110	114	108	114
8/16/2020	101	113	108	109	105	109	109	108	106	111	107	114	109	113	112	114
8/17/2020	100	111	107	109	106	110	109	108	107	112	106	113	108	113	112	114
8/18/2020	102	112	107	109	107	110	110	108	108	113	106	113	108	113	110	114
8/19/2020	102	112	108	109	107	110	110	107	109	112	107	114	107	112	108	113
8/20/2020	103	112	108	109	107	110	109	107	110	112	108	116	107	112	107	113
8/21/2020	104	113	109	109	107	110	109	107	109	112	108	116	109	112	107	113
8/22/2020	102	113	107	109	106	110	108	106	108	112	106	115	108	113	107	113
8/23/2020	103	113	108	109	107	110	108	106	109	112	106	114	110	113	109	113
8/24/2020	103	113	108	109	106	110	107	105	108	111	105	113	107	-	108	113
8/25/2020	103	112	108	109	106	110	107	106	107	112	106	113	106	111	106	113
8/26/2020	102	113	108	109	106	110	106	106	107	111	106	113	106	111	105	113
8/27/2020	101	113	108	109	106	110	106	105	106	111	105	112	107	111	104	113
8/28/2020	101	112	108	109	106	110	107	106	106	110	105	112	106	112	105	113
8/29/2020	101	113	109	109	106	110	107	106	106	110	105	113	106	111	105	113
8/30/2020	100	112	107	108	106	110	106	105	104	110	104	112	104	109	103	113
8/31/2020	100	113	107	107	106	110	107	105	104	111	103	112	106	110	103	113
Exceedances:																
DQE:														1		

Table D- 7¹: Total Fish Passage Season Exceedances by Project and Type for the Lower Snake River

TDG Exceedance Type	Lower Granite Forebay	Lower Granite Tailwater	Little Goose Forebay	Little Goose Tailwater	Lower Monumental Forebay	Lower Monumental Tailwater	Ice Harbor Forebay	Ice Harbor Tailwater	Total
FSE	0	0	4	1	8	0	8	0	21
ME	0	0	0	0	0	0	0	0	0
UE	0	5	0	6	0	3	3	2	19
Total	0	5	4	7	8	3	11	2	40

Table D-8: Total fish passage season TDG exceedances by project and type for the Lower Columbia River

TDG Exceedance Type	McNary Forebay	McNary Tailwater	John Day Forebay	John Day Tailwater	The Dalles Forebay	The Dalles Tailwater	Bonneville Forebay	Bonneville Tailwater	Total
FSE	4	0	1	1	5	2	2	0	15
ME	0	1	0	0	0	0	0	0	1
UE	1	9	0	0	0	0	3	0	13
Total	5	10	1	1	5	2	5	0	29

¹ TDG thresholds are 125% Tailwater during Spring Spill and 115% Forebay; 120% Tailwater during Summer Spill

Table D- 9²: Maximum two consecutive hour TDG, number of days with two consecutive hour TDG above 126%, number of days with two consecutive hour TDG above 127% at project tailwaters

Station	Gauge ID	Maximum two consecutive hour % TDG	126% Exceedance Days (WA)	127% Exceedance Days (OR)
Lower Granite Tailwater	LGNW	126.7	1	0
Little Goose Tailwater	LGSW	126.9	1	0
Lower Monumental Tailwater	LMNW	126.0	0	0
Ice Harbor Tailwater	IDSW	127.1	1	0
McNary Tailwater	MCPW	128.5	3	2
John Day Tailwater	JHAW	124.9	0	0
The Dalles Tailwater	TDDO	128.8	1	1
Bonneville Tailwater	CCIW	124.8	0	0
		Total Exceedance Days:	7	3

Table D- 10³: Malfunctioning TDG gauges, 2020

Project	Gauge ID	Dates	Days of Missing or Erroneous Data	Reason for Erroneous Data
McNary Tailwater	MCPW	6/8-6/10	3	Defective membrane
Lower Granite Tailwater	LGNW	6/11	1	Gauge Maintenance
John Day Tailwater	JHAW	7/17-7/20	4	Ruptured Membrane
The Dalles Tailwater	TDDO	8/24	1	Ruptured Membrane

² April through August were assessed for TDG values greater than 126%. TDG instances were not included when project flow exceeded 7Q10 flows.

³ Table D-5 includes only days when there is 6 hours or more of either missing or erroneous gauge data.