

Appendix D

2022 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, April through August, 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. This appendix provides the TDG tracking system results. 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. Table D-2 through D-9 identify the daily TDG regulatory value (computed using the methods described in the previous paragraph) and exceedance type if applicable (as defined in Table D- 1) by project forebay and tailwater.

Table D- 10 and Table D-11 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 April through August, the maximum two consecutive hour TDG must not exceed 127 percent and 126 percent, respectively. Table D- 12 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- 13 provides a list of TDG gauges that malfunctioned during the 2022 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-9.

Table D- 1: TDG instance definitions

<p>Forced Spill Exceedance (FSE)</p>	<p>TDG WQS exceedance due to 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 WQS exceedance 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>Transition Exceedance (TE)</p>	<p>TDG WQS exceedance due to change in the WQS from spring spill to summer spill.</p> <ul style="list-style-type: none"> • Because spring WQS are higher than summer WQS and travel time between projects can be greater than a week, there may be a transition period while the system degasses subsequent to the spring spill operation.
<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>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>
<p>Gauge Not Yet Installed (•)</p>	<p>Data not collected at forebay gauges during the spring as the 125% TDG WQS applies only to the tailwater gauges.</p>

Table D- 2: Daily TDG Instances in April 2022

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCN A	MCP W	JDY	JHAW	TDA	TDDO	BON	CCIW
4/1/2022	101	100	104	103	103	103	104	105	105	105	106	106	106	106	106	112
4/2/2022	101	100	103	103	103	103	104	104	105	104	106	105	105	105	105	112
4/3/2022	102	115	103	115	104	117	104	114	106	105	106	106	106	106	106	112
4/4/2022	103	116	103	116	105	114	105	113	108	106	107	106	106	107	107	113
4/5/2022	101	115	100	113	102	114	102	113	104	103	104	103	103	103	103	110
4/6/2022	100	115	99	116	103	119	104	114	103	101	103	102	102	103	103	110
4/7/2022	101	115	100	116	107	119	106	113	104	103	105	104	104	104	104	111
4/8/2022	102	116	105	116	109	115	109	114	105	104	104	103	104	104	104	110
4/9/2022	101	115	105	113	111	114	111	113	104	107	103	102	103	103	103	110
4/10/2022	102	115	107	114	112	114	113	114	104	113	103	115	103	111	104	117
4/11/2022	104	115	110	116	114	114	114	114	105	115	104	116	110	114	104	117
4/12/2022	103	115	108	113	110	113	110	114	103	115	103	116	111	115	107	119
4/13/2022	102	115	108	113	109	116	110	114	103	115	102	116	113	116	111	119
4/14/2022	102	115	109	-	111	117	110	113	103	116	103	116	115	117	114	120
4/15/2022	101	114	110	-	111	117	110	114	104	116	102	115	114	116	114	117
4/16/2022	101	114	111	-	112	113	111	115	105	115	103	111	114	115	114	116
4/17/2022	100	114	109	-	110	114	111	114	104	115	104	113	111	115	114	116
4/18/2022	103	114	111	-	112	115	114	115	107	116	107	113	115	116	114	114
4/19/2022	102	118	110	-	112	113	113	115	106	116	108	114	113	116	114	114
4/20/2022	103	115	110	-	112	114	113	115	108	116	110	116	114	117	114	117
4/21/2022	103	117	110	-	113	114	113	115	107	116	111	116	115	117	114	117
4/22/2022	103	117	110	-	113	116	112	114	106	116	110	117	114	117	114	118
4/23/2022	102	115	110	-	114	120	112	114	106	117	109	114	112	116	113	116
4/24/2022	103	115	111	-	115	120	113	114	110	118	111	115	115	117	114	117
4/25/2022	103	114	112	-	116	118	114	114	112	117	111	115	116	118	115	117
4/26/2022	103	115	113	-	115	120	115	114	112	116	111	115	113	116	114	117
4/27/2022	103	115	114	115	114	122	116	114	111	117	111	115	113	116	114	117
4/28/2022	104	116	114	116	114	121	116	114	110	117	111	116	113	116	114	119
4/29/2022	103	116	114	117	113	124	115	113	109	116	111	-	114	117	113	119
4/30/2022	103	115	114	116	114	124	117	113	110	116	112	117	116	118	114	119
Exceedances:																
DQE:				13								1				

Table D- 3: Daily TDG Instances in May 2022

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
5/1/2022	102	116	113	116	114	123	118	115	110	116	112	117	115	118	116	120
5/2/2022	102	116	114	116	116	122	120	114	112	116	112	116	116	118	115	119
5/3/2022	102	116	112	116	115	121	119	114	109	115	109	117	111	115	112	117
5/4/2022	103	116	113	118	116	122	119	114	110	115	110	117	114	117	112	119
5/5/2022	103	118	114	119	116	123	119	116	111	117	111	118	116	117	113	120
5/6/2022	104	120	115	120	118	124	120	116	112	118	111	118	117	118	114	120
5/7/2022	104	123	114	124	117	126	118	124	111	118	111	119	116	118	114	121
5/8/2022	102	124	114	125	118	126	116	124	108	119	110	121	118	120	114	121
5/9/2022	101	123	113	124	123	124	117	122	109	118	109	120	117	120	114	121
5/10/2022	101	122	112	123	121	124	117	117	109	119	108	119	114	118	114	120
5/11/2022	102	121	115	122	122	124	119	117	110	120	107	122	117	120	114	121
5/12/2022	102	119	115	120	121	121	120	116	110	120	107	121	120	121	116	121
5/13/2022	103	118	115	120	120	118	119	116	109	119	109	121	118	121	118	121
5/14/2022	104	118	115	120	119	119	119	116	109	119	112	123	121	122	119	121
5/15/2022	104	119	117	120	119	119	117	116	111	119	115	121	122	122	120	122
5/16/2022	103	120	116	122	120	119	117	116	110	118	114	121	119	120	119	121
5/17/2022	103	123	115	124	119	122	116	117	110	120	114	121	118	120	115	121
5/18/2022	103	124	116	125	121	123	117	124	111	119	115	122	120	121	115	122
5/19/2022	103	124	114	125	121	124	118	124	109	121	114	123	116	119	114	121
5/20/2022	102	124	113	124	120	123	118	124	109	121	110	124	119	122	114	122
5/21/2022	102	123	114	124	123	122	120	120	112	121	111	123	122	123	119	122
5/22/2022	104	123	117	124	124	121	121	117	112	121	111	123	123	123	121	122
5/23/2022	104	122	120	123	•	120	121	117	113	122	114	123	122	122	121	121
5/24/2022	104	121	119	123	•	120	121	117	113	123	117	121	120	121	119	121
5/25/2022	•	121	120	123	•	120	120	117	113	123	118	123	122	122	118	122
5/26/2022	•	122	119	124	•	121	120	117	113	122	119	123	124	124	120	122
5/27/2022	104	125	119	124	•	122	119	123	113	122	119	124	123	123	120	122
5/28/2022	104	127	118	126	•	125	120	124	113	122	119	124	125	125	120	123
5/29/2022	104	127	118	126	•	125	121	125	113	123	118	126	120	123	119	122
5/30/2022	103	126	115	125	•	125	120	125	111	123	113	126	120	122	115	123
5/31/2022	103	126	117	125	•	124	121	126	113	124	113	124	123	125	120	123
Exceedances:		4		2		2		1				2				
DQE:	2				9											

Table D- 4: Daily TDG Instances in June 2022

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
6/1/2022	105	125	120	125	•	124	123	126	116	124	113	125	126	127	123	124
6/2/2022	106	125	121	125	•	124	124	126	117	124	119	125	126	127	125	124
6/3/2022	106	125	120	126	•	125	123	126	118	125	123	125	125	126	124	124
6/4/2022	105	125	120	126	•	126	123	126	117	125	123	125	126	127	124	124
6/5/2022	104	125	120	127	•	126	123	126	116	125	123	126	125	126	124	124
6/6/2022	104	125	117	129	•	126	122	128	113	125	119	126	122	125	121	124
6/7/2022	104	124	117	129	•	128	123	127	115	125	119	126	124	127	122	123
6/8/2022	105	125	119	127	•	126	124	125	116	124	118	126	122	125	124	124
6/9/2022	106	125	118	126	•	126	124	125	118	125	120	126	122	126	124	124
6/10/2022	105	125	118	128	•	125	123	125	117	125	121	126	121	125	124	126
6/11/2022	105	-	118	129	•	127	122	130	117	125	121	127	121	124	123	127
6/12/2022	106	-	118	129*	•	127*	124	132*	116	126*	120	127*	122	124	122	127
6/13/2022	105	-	118	128*	•	127*	122	130*	113	125	116	126*	117	122	118	127
6/14/2022	105	-	116	129*	•	127*	121	130*	111	126	111	125	116	122	118	126
6/15/2022	108	-	121	128	131	127	125	127	114	128	111	126	118	123	122	126
6/16/2022	109	-	122	127	131	126	125	125	116	128	113	125	118	124	122	127
6/17/2022	108	-	122	126	128	125	125	125	118	128	118	125	118	125	123	126
6/18/2022	105	-	118	125	126	124	122	125	116	126	118	125	118	125	120	126
6/19/2022	103	-	117	125	124	124	120	125	115	125	116	124	118	123	121	126
6/20/2022	103	-	119	124	125	124	120	125	116	125	115	124	116	123	119	125
6/21/2022	104	-	120	120	124	118	121	119	118	125	118	125	121	125	122	125
6/22/2022	106	-	122	118	125	122	122	119	121	125	120	122	119	124	124	125
6/23/2022	107	-	120	116	122	121	121	117	121	124	121	123	119	124	120	124
6/24/2022	106	-	112	115	119	120	119	117	119	124	121	123	121	125	122	124
6/25/2022	104	-	110	118	116	119	118	118	119	124	120	123	122	126	124	124
6/26/2022	105	-	111	119	116	117	117	118	120	124	122	123	122	126	125	124
6/27/2022	106	-	114	115	119	119	118	117	122	125	123	122	122	125	125	124
6/28/2022	105	113	116	115	120	119	118	116	121	124	122	123	119	123	122	123
6/29/2022	104	111	112	113	114	118	115	116	117	123	119	121	118	124	120	124
6/30/2022	104	109	111	112	114	118	115	116	119	122	117	121	119	122	120	125
Exceedances:			4	15	8	14	8	12	14	18	13	25	15	22	15	21
DQE:		17			14											

Table D- 5: Daily TDG Instances in July 2022

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
7/1/2022	103	109	110	112	114	118	116	116	120	122	116	119	116	120	118	120
7/2/2022	104	110	112	112	115	119	117	116	119	122	118	118	115	118	115	120
7/3/2022	104	111	111	112	114	118	116	115	117	121	118	117	113	118	112	119
7/4/2022	103	111	111	111	112	117	115	114	115	121	115	116	113	118	113	118
7/5/2022	103	111	111	112	112	117	114	115	114	119	115	118	114	118	115	119
7/6/2022	102	111	111	112	112	117	114	115	114	118	113	117	114	118	116	119
7/7/2022	102	111	110	112	112	117	114	114	115	118	112	117	112	117	115	118
7/8/2022	103	117	112	112	112	117	114	114	115	119	114	118	113	117	117	118
7/9/2022	103	116	111	113	111	118	114	115	114	119	114	118	113	117	117	118
7/10/2022	103	117	109	112	111	117	114	113	114	118	112	116	112	117	115	118
7/11/2022	104	117	112	113	112	118	114	113	115	120	113	117	114	118	115	118
7/12/2022	104	118	113	114	113	118	115	113	117	121	115	117	115	119	118	119
7/13/2022	103	118	113	114	113	117	115	114	117	121	114	116	112	116	114	118
7/14/2022	103	118	116	114	113	117	116	114	117	-	114	117	112	116	111	118
7/15/2022	104	118	115	114	113	117	115	115	115	-	114	117	112	117	111	-
7/16/2022	103	118	115	114	112	118	115	114	114	118	113	116	111	117	111	-
7/17/2022	103	117	115	113	113	117	114	114	113	118	112	116	111	116	110	-
7/18/2022	103	117	114	112	111	117	113	113	112	117	110	116	109	116	110	-
7/19/2022	104	118	113	112	111	117	112	113	113	118	111	115	112	118	113	117
7/20/2022	104	118	112	111	111	118	112	113	114	119	110	116	111	117	114	117
7/21/2022	103	118	112	110	112	117	112	113	115	120	110	115	111	117	113	117
7/22/2022	102	117	112	110	113	117	113	113	114	118	109	114	109	115	110	117
7/23/2022	102	115	112	109	112	117	114	114	112	118	109	114	108	114	108	117
7/24/2022	102	115	112	109	111	117	114	114	113	119	110	115	110	116	109	117
7/25/2022	102	115	112	111	111	117	115	114	112	117	111	116	113	118	114	117
7/26/2022	103	115	112	114	112	117	115	114	113	118	112	116	113	118	116	117
7/27/2022	103	115	112	114	112	117	115	114	113	117	113	115	112	117	115	117
7/28/2022	104	115	112	114	113	117	115	114	113	117	114	116	113	117	113	117
7/29/2022	105	115	113	114	113	117	116	114	114	117	116	115	114	118	113	117
7/30/2022	104	115	113	114	113	117	116	114	113	118	115	117	114	119	115	117
7/31/2022	104	115	112	114	113	117	116	114	113	117	115	116	114	118	115	117
Exceedances:			1				7		6	6	4		1		6	
DQE:										2						4

Table D- 6: Daily TDG Instances in August 2022

Station:	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW
8/1/2022	104	115	112	114	113	117	115	113	113	118	114	115	112	116	112	117
8/2/2022	103	115	112	115	112	116	115	113	111	117	112	115	110	115	110	117
8/3/2022	104	115	111	115	112	117	115	114	110	117	111	115	111	116	109	117
8/4/2022	103	115	111	112	111	116	114	112	108	117	108	115	110	114	108	117
8/5/2022	103	115	110	113	110	115	112	108	108	117	106	115	109	115	108	117
8/6/2022	103	115	109	114	110	115	111	108	108	117	106	114	110	116	111	117
8/7/2022	103	116	109	114	110	113	111	108	108	117	106	115	110	116	112	117
8/8/2022	102	119	109	112	109	115	111	108	111	117	107	115	111	116	114	117
8/9/2022	101	119	109	114	110	114	111	108	111	117	108	115	110	115	111	117
8/10/2022	100	119	109	115	110	115	111	108	110	117	108	115	109	115	108	117
8/11/2022	101	-	109	114	110	114	111	108	109	117	109	114	109	115	109	117
8/12/2022	103	117	111	114	109	113	111	108	109	117	109	115	109	115	108	117
8/13/2022	103	115	111	114	108	114	110	107	108	116	108	115	108	113	107	116
8/14/2022	101	115	110	110	109	113	110	108	108	117	107	114	108	114	107	116
8/15/2022	101	115	110	110	110	110	110	108	107	114	107	113	109	113	109	113
8/16/2022	102	113	112	111	110	110	110	108	109	113	108	113	108	112	110	114
8/17/2022	102	113	112	111	110	111	109	108	111	115	109	114	108	113	110	115
8/18/2022	101	113	112	111	110	111	111	108	110	114	110	114	109	113	111	115
8/19/2022	101	112	112	111	109	110	112	108	111	114	110	115	109	112	110	114
8/20/2022	103	114	112	111	108	110	110	108	110	113	110	115	108	112	107	114
8/21/2022	102	114	111	111	108	110	109	107	109	112	109	113	108	112	106	113
8/22/2022	102	114	110	111	108	112	108	107	108	111	107	113	108	112	107	113
8/23/2022	102	114	110	111	108	110	108	107	109	111	106	113	106	111	107	114
8/24/2022	102	114	110	110	108	110	107	107	109	112	107	113	107	112	108	114
8/25/2022	102	113	109	110	108	110	106	107	108	112	107	113	108	-	109	114
8/26/2022	101	113	109	110	108	110	107	107	109	111	106	113	108	112	108	114
8/27/2022	101	113	108	109	107	110	108	107	107	110	105	112	105	110	105	113
8/28/2022	100	114	108	110	106	110	107	107	105	110	105	113	104	110	105	113
8/29/2022	100	113	108	110	106	110	106	107	104	109	105	113	108	112	105	113
8/30/2022	100	113	106	110	105	110	105	107	104	109	104	112	109	112	106	113
8/31/2022	104	114	107	109	105	110	105	107	104	109	104	112	108	112	108	113
Exceedances:																
DQE:		1												1		

Table D- 7¹: Total juvenile fish passage season exceedances by project and type for the Lower Snake River

TDG Exceedance Type	LWG	LGNW	LGSA	LGSW	LMNA	LMNW	IHRA	IDSW	Total
FSE	0	0	1	10	2	6	3	5	27
ME	0	0	0	0	0	1	0	0	1
UE	0	4	1	4	0	6	6	5	26
TE	0	0	3	0	6	0	6	0	15
Grand Total	0	4	5	14	8	13	15	10	69

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

TDG Exceedance Type	MCNA	MCPW	JDY	JHAW	TDA	TDDO	BON	CCIW	Total
FSE	10	18	16	17	16	17	16	21	131
ME	0	0	0	0	0	0	0	0	0
UE	0	5	1	8	0	5	5	0	24
TE	10	0	0	0	0	0	0	0	10
Grand Total	10	23	17	25	16	22	21	21	155

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	127.8	3	
Little Goose Tailwater	LGSW	130.3	13	
Lower Monumental Tailwater	LMNW	128.7	13	
Ice Harbor Tailwater	IDSW	135.6	8	
McNary Tailwater	MCPW	130.2	5	3
John Day Tailwater	JHAW	129.6	7	3
The Dalles Tailwater	TDDO	127.3	5	0
Bonneville Tailwater	CCIW	126.9	6	0
		Total	60	6

Table D- 10³: Malfunctioning TDG gauges

Project	Gauge ID	Dates	Days of Missing or Erroneous Data	Reason for Erroneous Data
Little Goose Tailwater	LGSW	4/14/2022-4/26/22	13	Defective sonde
John Day Tailwater	JHAW	4/29/2022	1	Sonde not deployed to pipe end after pipe flushing
Lower Granite Forebay	LWG	5/25-5/26	2	Defective sonde
Lower Monumental Forebay	LMNA	5/22-6/14	23	Defective sonde
Lower Granite Tailrace	LGNW	6/11-6/27	17	Catastrophic pipe failure due to high flows.
McNary Tailrace	MCPW	7/14-7/15	2	Defective membrane
Bonneville Tailrace	CCIW	7/15-7/18	4	Ruptured membrane
Lower Granite Tailrace	LGNW	8/11/2022	1	Missing DCP Data
The Dalles Tailrace	TDDO	8/25/2022	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.