Appendix D

2012

Fish Operations Plan Spill
(Plus Chief Joseph Dam Spill Operations)

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Introduction

Each year from April through the end of August, the US Army Corps of Engineers (Corps) spills water at its lower four Snake and lower four Columbia River dams to facilitate downstream passage of juvenile salmonids. , The Fish Operations Plan (FOP) shown in Appendix C was implemented at these hydroelectric projects in 2012. This appendix provides an overview of how much FOP target spill is called for, how much spill occurred, the total river flow and total generation for each day from April 1 through August 31. In addition, data for Chief Joseph Dam is included in this Appendix to account for 2012 spill operations. This information for all the projects is provided in both tabular and graphical summaries (Figures D-1 through D-9; Tables D-1 through D-9). Tables D-10 through D-13 provides a comparison of actual spill, FOP spill and total flow at each project in 2012 to the previous 13 years (the information in these tables is discussed in the narrative of the Annual TDG and Temperature report).

Overview of Spill Calculations

Calculations of hourly FOP spill levels for juvenile fish passage are based on methods developed and used over the past several years. These methods monitor how closely each project and BPA are implementing juvenile fish spill based on the operating instructions (teletypes) provided to the projects and BPA by the Corps. Microsoft Excel spreadsheets have been developed to display actual project spill level and the level of spill specified for juvenile fish passage in the FOP. Both of these metrics are then displayed graphically so that spill operations can be monitored visually to identify deviations in actual spill from FOP specified spill.

The mathematical functions developed to calculate FOP spill take into consideration FOP maximum spill levels, 115 percent forebay/120 percent tailrace TDG spill caps in effect, minimum generation requirements, fish research and testing during the spill season, and in some cases, within 1 percent best turbine efficiency operating requirements. Each project has its own set of mathematical functions depending on the FOP prescribed spill operation and season. Several of these functions are modified to account for spill operations in effect for the current year. These changes are usually driven by fish research to evaluate fish passage and survival or modifications in target spill levels. Typically, functions for a given project are not modified for short duration spill operational changes at projects, such as a three-day spill test or other short-term regulation adjustments.

One item considered when determining if the projects and BPA are complying with spill operation instructions is to review individual spill gate settings or spill patterns at each project. Spill gates are opened a set number of “stops” to provide a specific discharge through each spill bay. The minimum increment for opening a spill gate is either ½ stop or a full stop, which is generally equivalent to spill discharges of 0.8 - 1.9 kcfs per increment respectively, but can vary depending on project. The project’s ability to operate continuously at a stop setting also varies due to the changing hydraulic conditions and the speed at which the spill gate control system can react to these changes. This limitation often results in spill levels that are slightly above or below the desired spill level for a period of time.

Project-Specific Spill Operations for Fish Passage

In the following paragraphs, "spill" refers to the target spill level provided for juvenile fish passage as described in the 2012 FOP (Appendix C). The target spill is the desired spill amount, but can vary in some cases due to factors such as fluctuating TDG spill caps, minimum generation requirements, altered spill patterns, fish research and testing, and prescribed court-ordered spill levels. The target spill will often be lower than actual spill during involuntary spill events; otherwise, target spill and actual spill are identical (Figures D-1 through D-9; Tables D-1 through D-9).

Because total river flows were unusually high in 2012, continuous spill began before or on March 30 at all eight fish passage projects on the Columbia and lower Snake rivers, with Ice Harbor beginning on March 21 and McNary beginning on March 14. Chief Joseph spill began March 27. For the purposes of this report, tracking of spill volumes and rates starts on April 1. The differences between spill for high flows in early April and the FOP fish passage spill are shown in Figures D-1 through D-9 and Tables D-1 through D-9.

There are notable instances shown in the tables and graphs when actual spill and FOP spill were not the same. At all fish passage dams, spill may have been limited by the spill cap which attempts to maintain TDG levels at 120 percent in the tailwater or 115 percent in the next downstream forebay, whichever is less. The affects of the spill cap limiting spill is most noticeable at Bonneville, Lower Granite, and Lower Monumental Dams, where the FOP spill operation is a constant rate. To see the affects of the spill cap limiting percent spill, see 2012 Annual TDG and Temperature Report, Appendix E graphs.

Bonneville

Spill for fish passage began at Bonneville Dam on April 10 at 0001 hours and continued until 0001 hours on September 1 (Figure D-1; Table D-1). The FOP spring spill operation was 100 kcfs 24 hours per day from April 10 to June 16. The FOP spill operation was targeted from June 16 through July 20 as an alternating spill test of 85 kcfs during daytime hours and 121 kcfs at night versus a constant 95 kcfs for 24 hours per day. Although the FOP operations teletype was sent on June 14, it could not be implemented consistently until August 1because flows were too high. From July 21 to August 31, FOP spill operation was 75 kcfs during daytime hours and to the 120 percent TDG spill cap at night. The B2 corner collector operated from March 19 at 0800 hours through September 15 at 2400 hours.

The Dalles

Spill for fish passage began at The Dalles Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-2; Table D-2). The FOP spill operation at The Dalles Dam for both spring and summer was 40 percent of total river discharge for 24 hours per day.

John Day
Spill for fish passage began at John Day Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-3; Table D-3). The FOP spill operation was an alternating spill test of 30 percent vs. 40 percent of total river discharge 24 hours per day from April 27 through July14. John Day Dam spill operation was 30 percent of total river discharge, 24 hours per day from April 10 through April 27 and July 14 through August 31.

McNary
Spill for fish passage began at McNary Dam on April 10 at 0001 hours and continued until 2400 hours on August 31 (Figure D-4; Table D-4). Per the FOP, the spring (April 10 through June 12) spill operation was 40 percent of total river discharge 24 hours per day. The summer (June 12 through August 31) spill operation was 50 percent of total river discharge 24 hours per day.

Ice Harbor
Spill for fish passage began at Ice Harbor dam on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-5; Table D-5). From April 3 through April 28 and from July 13 through August 13, the FOP spill operation was 45 kcfs during the day and to the spill cap night. From April 28 through July 13, the FOP spill operation was an alternating spill test of 30 percent of total river discharge 24 hours per day versus 45 kcfs during the day and to the spill cap at night.

Lower Monumental
Spill for fish passage at Lower Monumental Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-6; Table D-6). Per the FOP, the spring (April 3 through June 20) spill operation was to the 115/120 percent TDG spill cap 24 hours per day with the RSW operating. The summer (June 21 through August 31) spill operation was 17 kcfs 24 hours per day (subject to 120 percent /115 percent TDG spill cap limits) with the RSW operating.

Little Goose
Spill for fish passage at Little Goose Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-7; Table D-7). The FOP spill operation for both the spring (April 3 through June 20) and summer (June 21 through August 31) was 30 percent of the total river discharge for 24 hours per day.

Lower Granite
Spill for fish passage at Lower Granite Dam began on April 3 at 0001 hours and continued until 0001 hours on September 1 (Figure D-8; Table D-8) per the FOP. The spring (April 3 through June 20) spill operation was 20 kcfs for 24 hours per day (including approximately 6 kcfs from the RSW and 14 kcfs from training spill). The summer (June 21 through August 31) spill operation was18 kcfs for 24 hours per day.

Chief Joseph

As discussed in Section 1.1.7 of the Annual TDG and Temperature report narrative, there was a change in the Chief Joseph[1] spill management process in 2011 and it is used to manage system-wide TDG levels. In order to account for spill operations, Chief Joseph is included in this appendix. Involuntary spill was managed to attempt to achieve 120 percent TDG in the tailwater or 115 percent TDG in the Wells forebay, whichever is less, for systemwide TDG management. The total flow, generation and involuntary spill at Chief Joseph are shown on Figure D-9; Table D-9.

[1] Chief Joseph spill is for trying to manage system wide TDG levels, it is not a fish passage project.

Figure D-1
FOP Spill at Bonneville

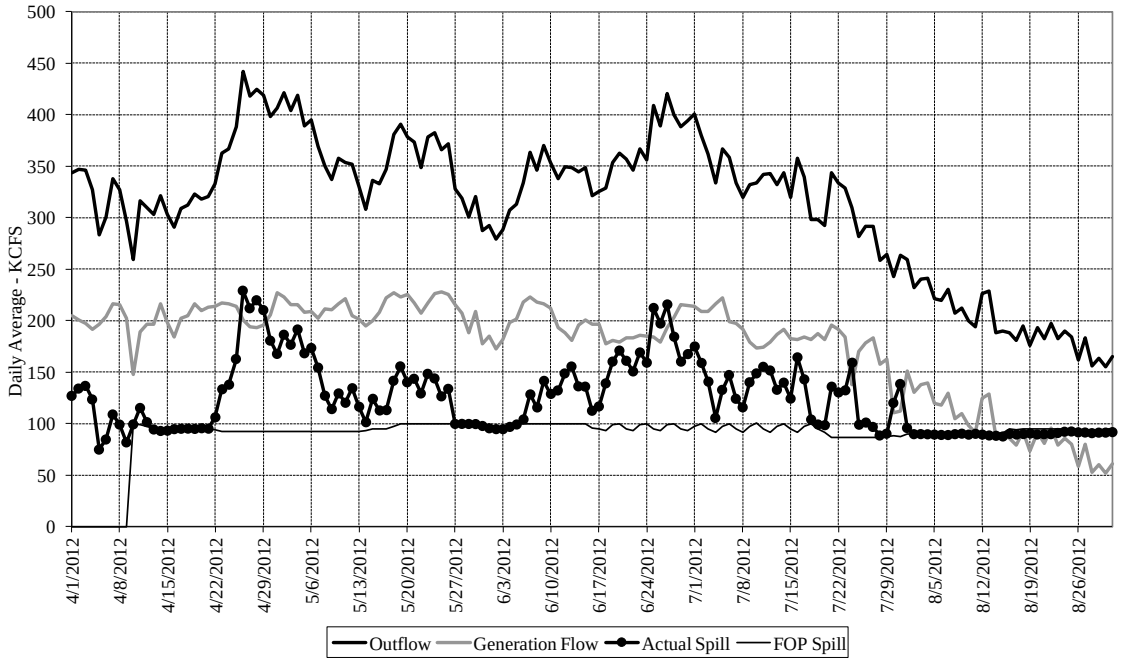

Figure D-2
FOP Spill at The Dalles

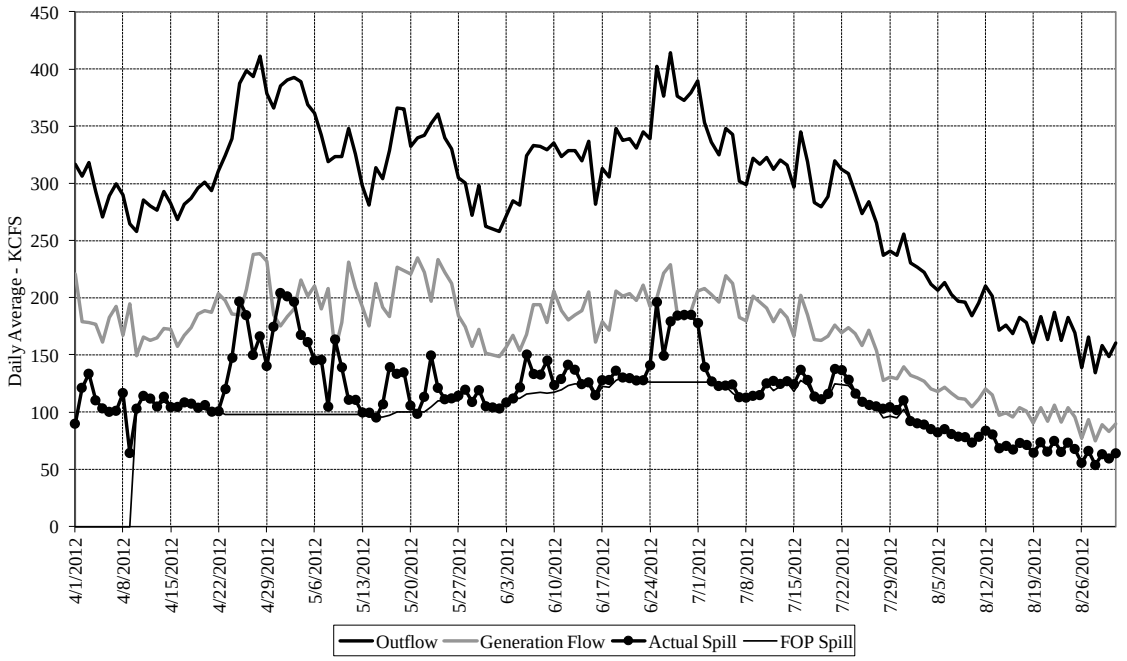

Figure D-3
FOP Spill at John Day

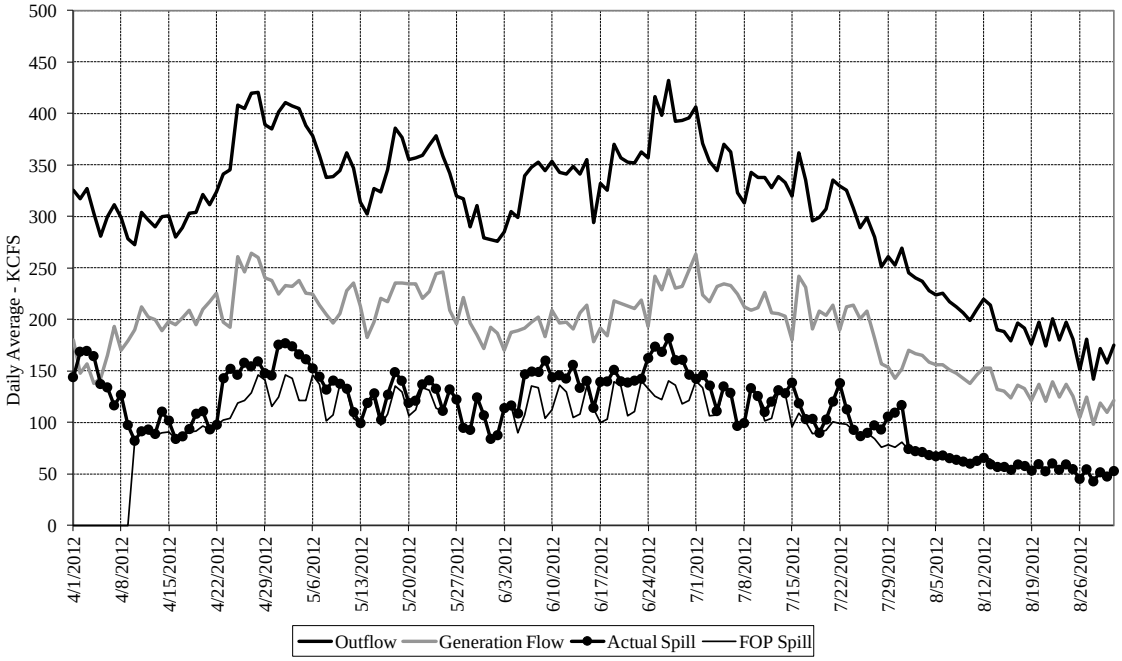

Figure D-4
FOP Spill at McNary

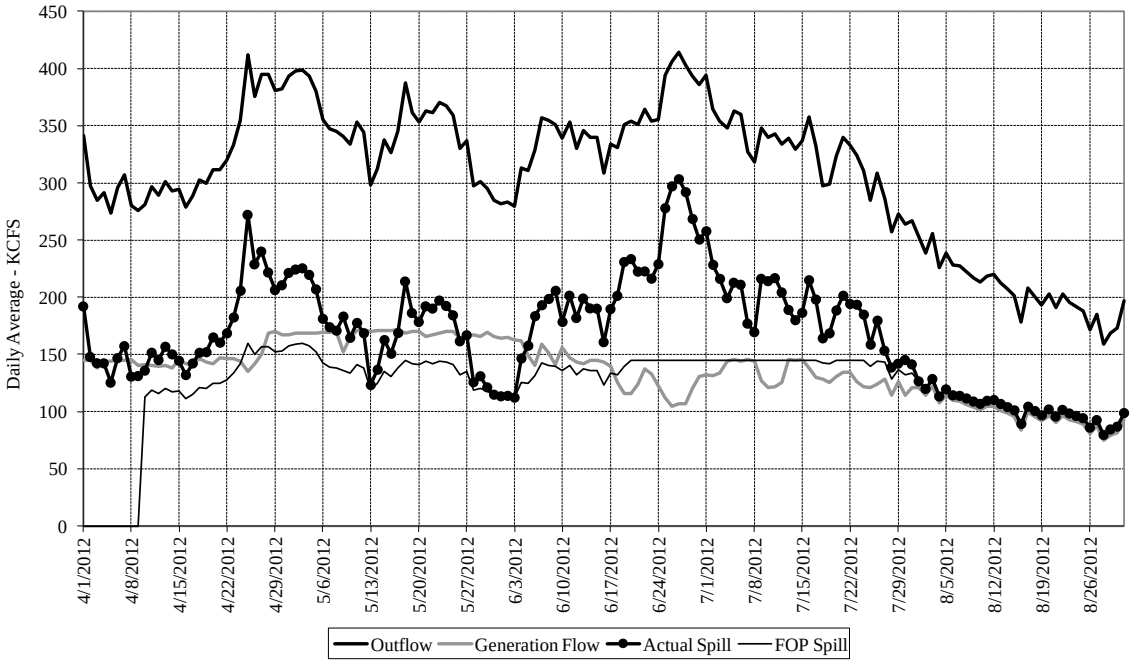

Figure D-5
FOP Spill at Ice Harbor

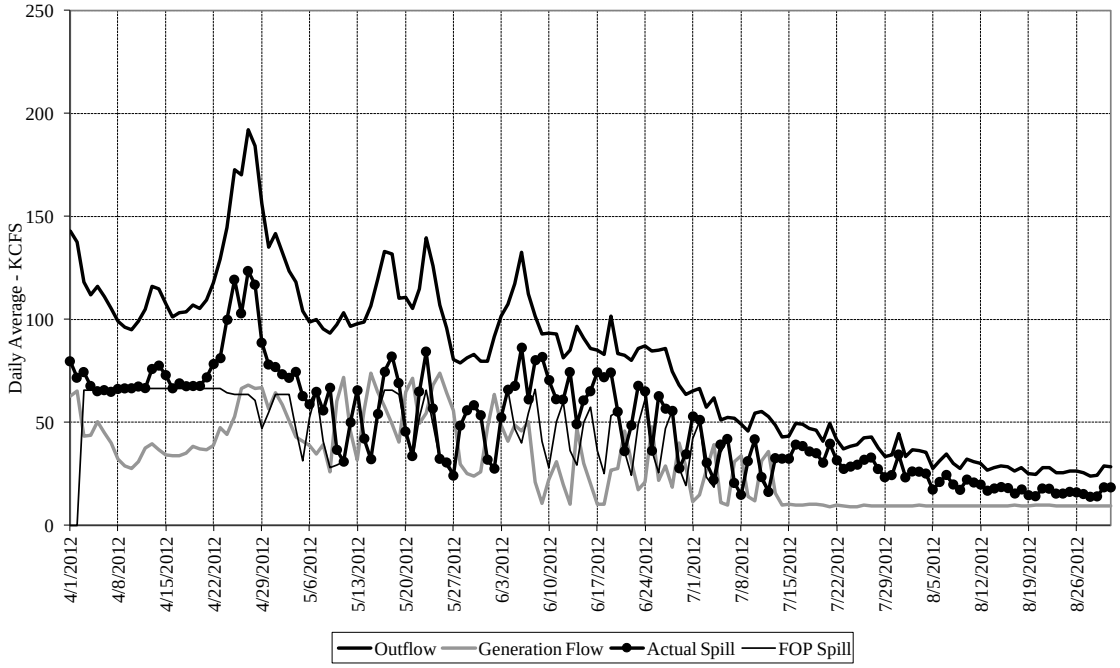

Figure D-6
FOP Spill at Lower Monumental

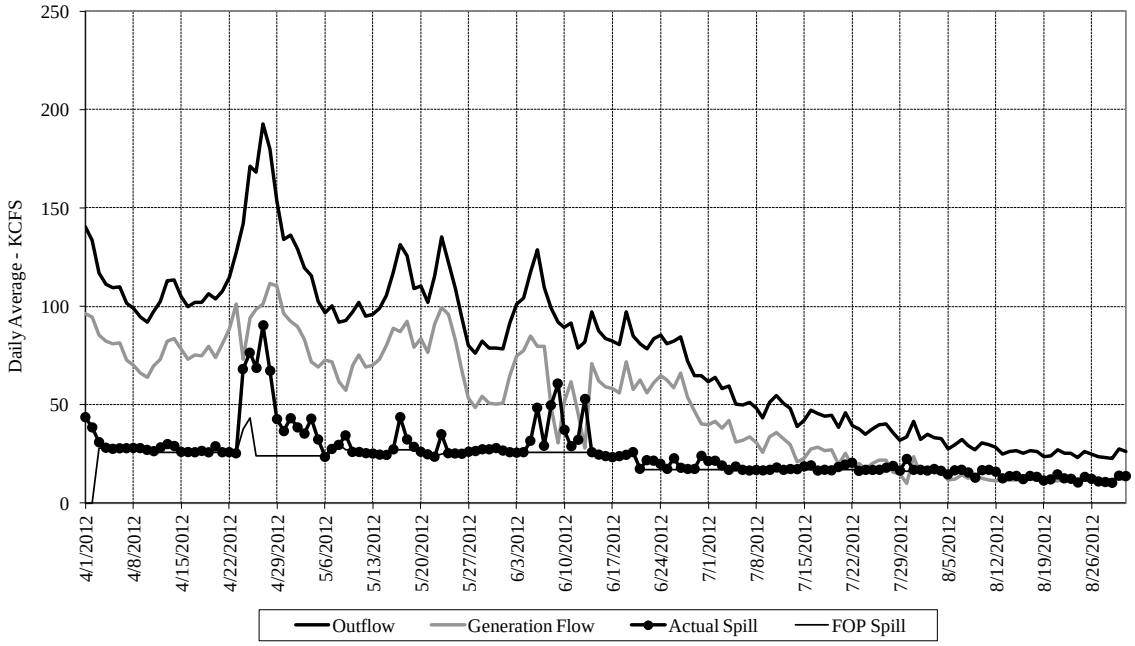

Figure D-7
FOP Spill at Little Goose

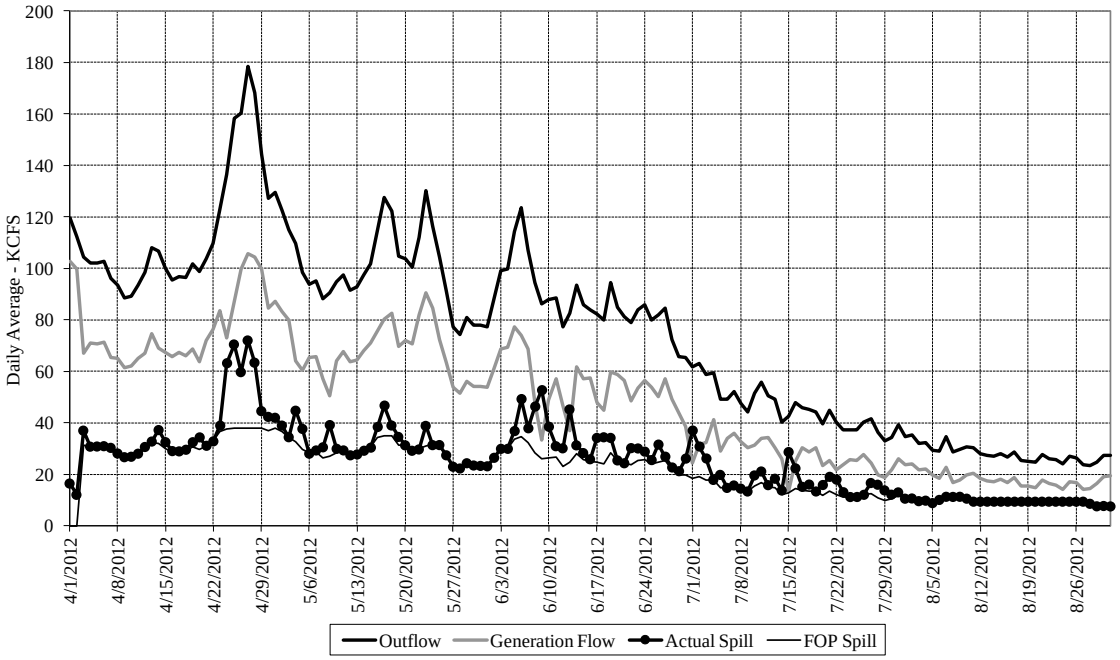

Figure D-8
FOP Spill at Lower Granite

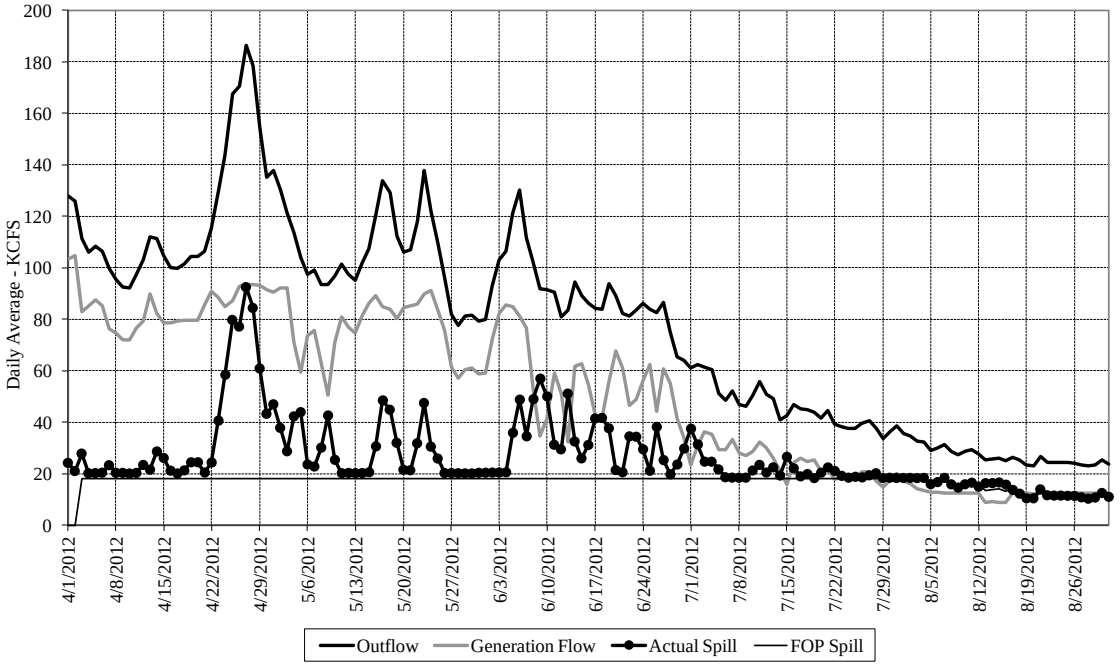

Figure D-9
Spill at Chief Joseph

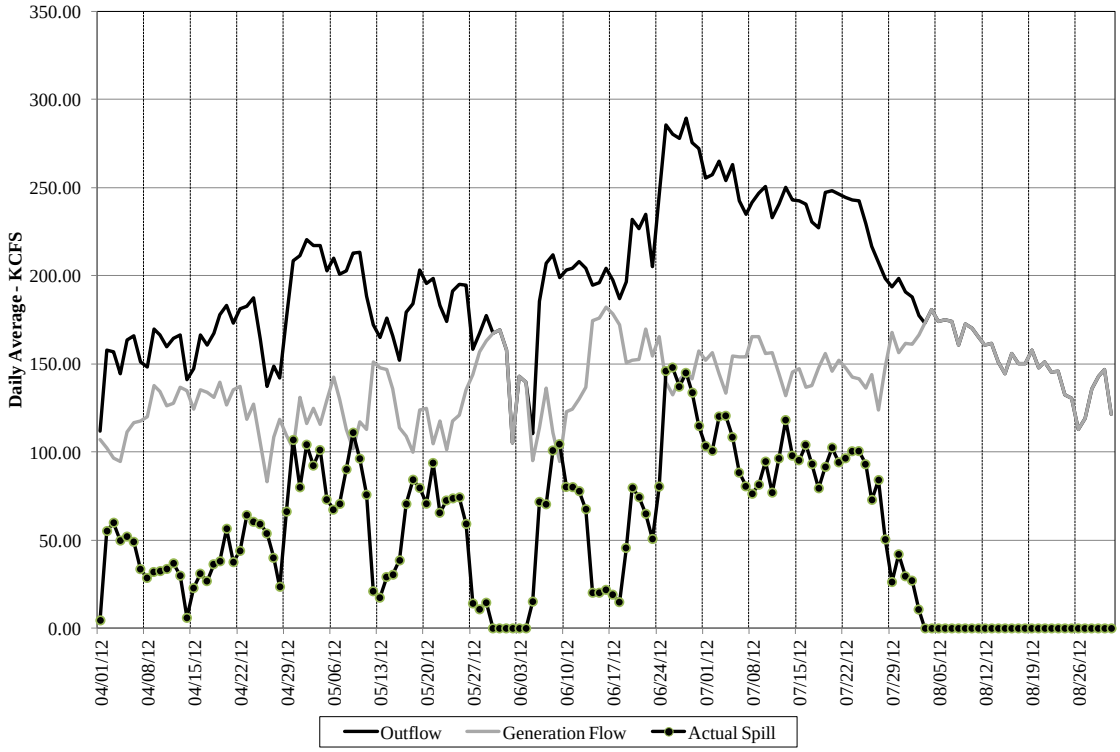

Table D-1
FOP Spill at Bonneville

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	344	205	127	0	05/22/12	349	207	129	100	7/12/2012	343	179	152	91
04/02/12	347	201	134	0	05/23/12	378	217	148	100	7/13/2012	332	187	133	97
04/03/12	346	197	137	0	05/24/12	382	226	144	100	7/14/2012	343	191	140	100
04/04/12	327	192	123	0	05/25/12	366	228	126	100	7/15/2012	319	183	124	95
04/05/12	283	196	75	0	05/26/12	372	226	134	100	7/16/2012	358	181	164	91
04/06/12	301	204	84	0	05/27/12	328	216	100	100	7/17/2012	339	184	143	97
04/07/12	338	216	109	0	05/28/12	319	207	100	100	7/18/2012	298	182	104	100
04/08/12	327	215	99	0	05/29/12	300	188	100	100	7/19/2012	298	187	99	95
04/09/12	297	203	82	0	05/30/12	320	209	99	100	7/20/2012	292	181	98	92
04/10/12	259	147	99	100	05/31/12	288	178	98	98	7/21/2012	344	196	136	87
04/11/12	316	189	115	99	06/01/12	293	185	95	96	7/22/2012	334	191	130	87
04/12/12	310	196	101	97	06/02/12	279	172	95	95	7/23/2012	329	184	132	87
04/13/12	303	196	94	95	06/03/12	288	181	94	95	7/24/2012	309	138	159	87
04/14/12	321	216	93	92	06/04/12	308	198	97	97	7/25/2012	281	170	99	87
04/15/12	303	198	93	94	06/05/12	313	202	99	100	7/26/2012	292	178	101	87
04/16/12	291	184	94	95	06/06/12	334	218	104	100	7/27/2012	292	183	97	87
04/17/12	309	202	95	95	06/07/12	363	223	128	100	7/28/2012	258	157	88	87
04/18/12	312	205	95	95	06/08/12	346	218	116	100	7/29/2012	265	162	90	87
04/19/12	323	216	95	95	06/09/12	370	216	141	100	7/30/2012	242	110	120	88
04/20/12	318	210	95	95	06/10/12	354	212	129	100	7/31/2012	263	112	138	88
04/21/12	321	213	95	95	06/11/12	338	193	132	100	8/1/2012	259	151	96	90
04/22/12	333	214	106	94	06/12/12	349	188	149	100	8/2/2012	232	130	90	90
04/23/12	363	217	133	92	06/13/12	348	181	155	100	8/3/2012	240	138	90	90
04/24/12	367	216	138	92	06/14/12	344	196	136	100	8/4/2012	241	139	90	90
04/25/12	388	213	163	92	06/15/12	348	200	136	100	8/5/2012	221	120	89	89
04/26/12	442	201	229	92	06/16/12	322	197	112	96	8/6/2012	219	118	89	89
04/27/12	418	194	212	92	06/17/12	325	196	117	95	8/7/2012	230	129	89	89
04/28/12	425	193	220	92	06/18/12	329	178	139	93	8/8/2012	207	105	90	89
04/29/12	419	196	210	92	06/19/12	353	181	160	99	8/9/2012	212	109	90	90
04/30/12	399	206	181	92	06/20/12	363	179	171	100	8/10/2012	200	98	89	90
05/01/12	407	227	168	92	06/21/12	357	183	161	95	8/11/2012	194	92	90	90
05/02/12	421	223	186	92	06/22/12	346	183	151	93	8/12/2012	226	124	89	90
05/03/12	404	215	176	92	06/23/12	367	186	169	99	8/13/2012	229	128	88	90
05/04/12	419	215	191	92	06/24/12	356	185	159	100	8/14/2012	188	88	88	90
05/05/12	389	208	168	92	06/25/12	409	184	212	95	8/15/2012	189	90	87	90
05/06/12	395	209	173	92	06/26/12	389	179	197	93	8/16/2012	188	86	90	95
05/07/12	369	203	154	92	06/27/12	421	193	216	99	8/17/2012	181	79	89	94
05/08/12	351	211	127	92	06/28/12	400	203	184	100	8/18/2012	195	93	90	95
05/09/12	337	210	114	92	06/29/12	388	215	160	95	8/19/2012	176	73	90	95
05/10/12	358	216	129	92	06/30/12	394	214	167	93	8/20/2012	193	92	89	95
05/11/12	354	221	120	92	07/01/12	401	214	175	97	8/21/2012	183	81	90	95
05/12/12	352	205	134	92	07/02/12	380	208	159	100	8/22/2012	198	96	90	95
05/13/12	330	201	116	92	07/03/12	362	209	141	95	8/23/2012	182	79	91	95
05/14/12	308	195	101	93	07/04/12	334	216	105	91	8/24/2012	190	85	92	95
05/15/12	336	200	124	95	07/05/12	367	222	133	97	8/25/2012	184	80	92	95
05/16/12	333	208	113	95	07/06/12	359	199	147	100	8/26/2012	162	58	91	94
05/17/12	347	222	113	95	07/07/12	334	197	124	95	8/27/2012	183	79	91	94
05/18/12	381	227	142	97	07/08/12	320	192	116	91	8/28/2012	156	53	91	92
05/19/12	391	223	156	100	07/09/12	332	179	140	97	8/29/2012	163	60	91	93
05/20/12	378	226	140	100	07/10/12	334	173	149	100	8/30/2012	155	52	91	94
05/21/12	373	217	143	100	07/11/12	342	174	155	95	8/31/2012	165	61	92	95

Table D-2
FOP Spill at The Dalles

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	317	221	90	0	05/22/12	342	222	113	100	7/12/2012	312	179	127	119
04/02/12	307	179	121	0	05/23/12	353	197	150	105	7/13/2012	321	190	125	122
04/03/12	318	179	134	0	05/24/12	361	233	121	110	7/14/2012	316	183	127	126
04/04/12	293	176	110	0	05/25/12	340	222	111	110	7/15/2012	297	166	124	118
04/05/12	270	161	103	0	05/26/12	331	212	112	110	7/16/2012	345	202	137	128
04/06/12	289	183	100	0	05/27/12	304	184	114	110	7/17/2012	319	185	128	124
04/07/12	300	193	101	0	05/28/12	301	175	120	119	7/18/2012	283	163	114	113
04/08/12	290	167	117	0	05/29/12	272	157	109	109	7/19/2012	280	162	111	111
04/09/12	265	195	64	0	05/30/12	298	173	119	119	7/20/2012	289	167	116	112
04/10/12	258	149	103	103	05/31/12	263	151	105	105	7/21/2012	320	176	138	125
04/11/12	286	165	114	114	06/01/12	260	150	104	104	7/22/2012	312	169	137	124
04/12/12	281	163	112	111	06/02/12	258	149	103	103	7/23/2012	308	174	128	123
04/13/12	276	165	105	105	06/03/12	271	156	108	108	7/24/2012	291	169	116	116
04/14/12	293	173	113	109	06/04/12	285	167	112	112	7/25/2012	273	158	109	109
04/15/12	283	172	104	105	06/05/12	281	153	122	112	7/26/2012	284	172	106	105
04/16/12	268	158	105	106	06/06/12	324	168	150	116	7/27/2012	265	154	105	104
04/17/12	282	167	108	109	06/07/12	333	194	133	116	7/28/2012	237	128	103	95
04/18/12	287	174	107	107	06/08/12	333	194	133	117	7/29/2012	241	131	104	96
04/19/12	296	186	104	104	06/09/12	329	178	145	117	7/30/2012	237	129	102	95
04/20/12	301	189	106	102	06/10/12	335	206	124	117	7/31/2012	256	140	110	102
04/21/12	294	187	100	100	06/11/12	324	189	129	119	8/1/2012	230	132	92	92
04/22/12	311	204	101	101	06/12/12	328	181	141	123	8/2/2012	226	130	90	91
04/23/12	324	198	120	98	06/13/12	328	185	137	125	8/3/2012	222	127	89	89
04/24/12	339	186	147	98	06/14/12	320	189	124	124	8/4/2012	212	120	85	85
04/25/12	387	185	197	98	06/15/12	337	205	126	124	8/5/2012	206	118	82	83
04/26/12	398	207	185	98	06/16/12	282	161	115	112	8/6/2012	213	122	85	85
04/27/12	394	238	150	98	06/17/12	313	179	128	122	8/7/2012	203	116	81	81
04/28/12	411	239	166	98	06/18/12	306	172	128	122	8/8/2012	197	112	79	79
04/29/12	379	232	140	98	06/19/12	348	206	136	127	8/9/2012	196	112	78	78
04/30/12	366	185	175	98	06/20/12	338	201	130	131	8/10/2012	184	104	73	74
05/01/12	385	175	204	98	06/21/12	339	203	130	130	8/11/2012	196	111	78	78
05/02/12	391	183	201	98	06/22/12	331	197	128	125	8/12/2012	210	121	84	84
05/03/12	392	190	196	98	06/23/12	345	211	128	127	8/13/2012	201	115	80	81
05/04/12	389	215	167	98	06/24/12	339	192	141	126	8/14/2012	172	97	68	69
05/05/12	369	202	161	98	06/25/12	402	200	196	126	8/15/2012	176	99	70	70
05/06/12	361	210	145	98	06/26/12	377	221	149	126	8/16/2012	169	95	67	67
05/07/12	342	191	146	98	06/27/12	414	229	179	126	8/17/2012	183	104	73	73
05/08/12	319	208	105	98	06/28/12	376	186	184	126	8/18/2012	178	101	71	71
05/09/12	323	154	163	98	06/29/12	372	181	185	126	8/19/2012	161	90	64	64
05/10/12	324	178	139	98	06/30/12	379	188	185	126	8/20/2012	183	104	74	73
05/11/12	348	231	111	98	07/01/12	390	206	178	126	8/21/2012	164	92	65	65
05/12/12	325	209	111	98	07/02/12	353	208	139	126	8/22/2012	187	106	75	75
05/13/12	298	192	100	98	07/03/12	336	203	127	126	8/23/2012	163	91	65	65
05/14/12	281	175	100	96	07/04/12	325	196	123	123	8/24/2012	183	104	73	73
05/15/12	314	212	95	96	07/05/12	348	219	123	123	8/25/2012	170	96	68	68
05/16/12	304	191	107	96	07/06/12	343	212	124	117	8/26/2012	139	77	56	56
05/17/12	329	184	139	98	07/07/12	302	183	113	112	8/27/2012	165	93	66	66
05/18/12	366	226	133	100	07/08/12	299	180	113	112	8/28/2012	134	75	54	54
05/19/12	365	224	135	100	07/09/12	322	202	114	114	8/29/2012	158	89	63	63
05/20/12	333	221	106	100	07/10/12	317	196	115	116	8/30/2012	149	83	59	60
05/21/12	340	235	98	100	07/11/12	322	191	125	126	8/31/2012	160	90	64	64

Table D-3
FOP Spill at John Day

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	325	180	144	0		05/22/12	359	221	137	134		7/12/2012	328	206	120	104
04/02/12	317	147	169	0		05/23/12	370	227	141	131		7/13/2012	338	206	131	129
04/03/12	327	156	169	0		05/24/12	379	245	133	114		7/14/2012	333	203	128	127
04/04/12	303	137	164	0		05/25/12	358	246	111	111		7/15/2012	320	180	138	96
04/05/12	281	143	137	0		05/26/12	342	209	132	132		7/16/2012	362	242	118	109
04/06/12	300	165	134	0		05/27/12	320	196	122	122		7/17/2012	335	231	103	101
04/07/12	311	194	116	0		05/28/12	317	221	95	95		7/18/2012	295	191	103	89
04/08/12	299	170	127	0		05/29/12	290	196	93	92		7/19/2012	299	208	90	90
04/09/12	278	179	97	0		05/30/12	311	185	124	124		7/20/2012	308	204	103	92
04/10/12	273	189	82	82		05/31/12	279	171	107	107		7/21/2012	335	214	120	101
04/11/12	304	212	91	91		06/01/12	278	193	84	83		7/22/2012	329	190	138	99
04/12/12	296	202	93	89		06/02/12	276	187	87	87		7/23/2012	326	212	113	98
04/13/12	290	200	89	87		06/03/12	285	170	114	114		7/24/2012	308	214	93	92
04/14/12	300	189	110	90		06/04/12	305	187	116	116		7/25/2012	289	201	87	87
04/15/12	301	198	102	90		06/05/12	299	189	109	90		7/26/2012	299	208	90	90
04/16/12	280	195	84	84		06/06/12	340	191	147	107		7/27/2012	280	182	97	84
04/17/12	289	201	86	87		06/07/12	348	197	149	135		7/28/2012	251	157	93	75
04/18/12	303	209	93	91		06/08/12	353	202	149	134		7/29/2012	261	154	106	78
04/19/12	304	194	108	91		06/09/12	345	184	160	103		7/30/2012	253	142	109	76
04/20/12	322	210	111	96		06/10/12	354	209	144	112		7/31/2012	270	151	117	81
04/21/12	311	217	93	93		06/11/12	343	196	146	136		8/1/2012	245	170	74	74
04/22/12	324	225	98	97		06/12/12	341	197	143	130		8/2/2012	240	167	72	72
04/23/12	341	197	143	102		06/13/12	348	191	156	104		8/3/2012	237	165	71	71
04/24/12	345	192	152	104		06/14/12	341	206	133	108		8/4/2012	228	159	68	68
04/25/12	409	261	146	119		06/15/12	356	214	140	135		8/5/2012	224	156	67	67
04/26/12	405	246	158	121		06/16/12	294	178	114	113		8/6/2012	225	156	68	68
04/27/12	420	264	154	128		06/17/12	332	191	139	100		8/7/2012	217	151	65	65
04/28/12	421	260	159	146		06/18/12	325	184	140	103		8/8/2012	212	147	64	64
04/29/12	389	240	148	141		06/19/12	370	218	151	140		8/9/2012	206	143	62	62
04/30/12	385	238	146	115		06/20/12	357	216	140	135		8/10/2012	199	138	60	60
05/01/12	401	225	175	125		06/21/12	353	213	139	106		8/11/2012	210	146	62	63
05/02/12	411	233	177	146		06/22/12	352	210	140	111		8/12/2012	219	153	65	66
05/03/12	407	232	174	142		06/23/12	363	219	142	141		8/13/2012	214	153	59	64
05/04/12	405	238	166	122		06/24/12	357	193	162	133		8/14/2012	190	132	57	57
05/05/12	388	225	161	121		06/25/12	417	242	174	125		8/15/2012	188	130	57	57
05/06/12	379	225	152	146		06/26/12	398	228	168	122		8/16/2012	179	124	54	54
05/07/12	359	213	144	137		06/27/12	432	249	182	140		8/17/2012	196	136	59	59
05/08/12	338	205	132	101		06/28/12	392	230	160	136		8/18/2012	191	133	58	57
05/09/12	339	197	141	107		06/29/12	394	232	161	118		8/19/2012	176	121	53	53
05/10/12	345	206	137	137		06/30/12	396	248	146	121		8/20/2012	198	137	59	59
05/11/12	362	228	133	132		07/01/12	407	264	142	140		8/21/2012	174	120	52	52
05/12/12	347	236	110	104		07/02/12	371	224	146	134		8/22/2012	201	139	60	60
05/13/12	314	213	99	99		07/03/12	354	217	136	106		8/23/2012	180	124	54	54
05/14/12	302	182	119	119		07/04/12	344	232	111	107		8/24/2012	197	137	59	59
05/15/12	327	198	128	123		07/05/12	370	234	135	135		8/25/2012	181	125	54	54
05/16/12	324	220	102	97		07/06/12	363	233	129	128		8/26/2012	151	104	45	45
05/17/12	346	217	127	108		07/07/12	323	225	96	97		8/27/2012	181	125	54	54
05/18/12	386	236	149	135		07/08/12	313	212	99	99		8/28/2012	142	98	43	43
05/19/12	377	235	140	129		07/09/12	343	209	133	133		8/29/2012	172	119	51	52
05/20/12	355	235	119	107		07/10/12	338	211	126	124		8/30/2012	158	109	47	47
05/21/12	357	235	121	112		07/11/12	338	226	110	101		8/31/2012	175	121	53	52

Table D-4

FOP Spill at McNary

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	342	145	192	0		05/22/12	362	167	190	142		7/12/2012	334	125	204	145
04/02/12	297	145	148	0		05/23/12	371	169	197	144		7/13/2012	339	145	189	145
04/03/12	285	138	142	0		05/24/12	367	170	192	143		7/14/2012	330	145	180	145
04/04/12	291	144	142	0		05/25/12	359	170	184	141		7/15/2012	337	146	186	145
04/05/12	274	144	125	0		05/26/12	330	164	161	132		7/16/2012	357	138	215	145
04/06/12	296	145	147	0		05/27/12	337	165	167	135		7/17/2012	333	130	198	145
04/07/12	307	145	157	0		05/28/12	298	167	126	119		7/18/2012	297	129	164	143
04/08/12	280	145	131	0		05/29/12	301	166	131	120		7/19/2012	299	126	168	141
04/09/12	276	140	131	0		05/30/12	295	169	121	118		7/20/2012	323	130	188	145
04/10/12	281	141	136	113		05/31/12	285	166	115	114		7/21/2012	340	134	201	145
04/11/12	296	140	151	119		06/01/12	282	164	113	113		7/22/2012	333	135	194	145
04/12/12	289	139	145	116		06/02/12	283	165	114	113		7/23/2012	324	126	193	145
04/13/12	301	140	157	121		06/03/12	280	163	112	112		7/24/2012	311	122	185	145
04/14/12	293	138	150	117		06/04/12	313	162	146	125		7/25/2012	285	121	159	140
04/15/12	294	145	144	118		06/05/12	311	149	158	124		7/26/2012	308	124	180	144
04/16/12	279	142	132	112		06/06/12	328	140	183	131		7/27/2012	286	128	153	143
04/17/12	288	142	142	115		06/07/12	357	159	193	143		7/28/2012	257	114	138	129
04/18/12	303	146	151	121		06/08/12	355	151	198	140		7/29/2012	273	126	142	136
04/19/12	300	143	152	120		06/09/12	351	141	206	140		7/30/2012	264	114	145	132
04/20/12	312	142	165	125		06/10/12	339	156	178	136		7/31/2012	267	121	141	133
04/21/12	312	147	160	125		06/11/12	353	147	201	140		8/1/2012	252	121	126	126
04/22/12	320	147	168	128		06/12/12	330	144	182	132		8/2/2012	238	114	120	119
04/23/12	333	146	182	133		06/13/12	346	142	199	137		8/3/2012	256	123	128	128
04/24/12	355	144	206	142		06/14/12	340	145	190	136		8/4/2012	226	108	113	113
04/25/12	412	135	272	160		06/15/12	340	145	190	136		8/5/2012	238	114	119	119
04/26/12	376	142	229	150		06/16/12	308	143	161	123		8/6/2012	228	110	114	114
04/27/12	395	150	240	156		06/17/12	334	139	190	134		8/7/2012	227	109	114	114
04/28/12	395	169	222	157		06/18/12	331	125	201	132		8/8/2012	222	106	111	111
04/29/12	381	170	206	152		06/19/12	351	116	231	140		8/9/2012	217	104	109	109
04/30/12	383	167	210	153		06/20/12	354	116	233	145		8/10/2012	213	102	107	107
05/01/12	393	167	221	157		06/21/12	351	124	222	145		8/11/2012	218	104	109	109
05/02/12	398	169	224	159		06/22/12	364	137	223	145		8/12/2012	220	105	110	110
05/03/12	399	169	225	160		06/23/12	354	133	216	145		8/13/2012	213	101	107	106
05/04/12	393	169	220	157		06/24/12	356	122	229	145		8/14/2012	207	99	104	104
05/05/12	380	168	207	152		06/25/12	394	112	278	145		8/15/2012	201	96	101	101
05/06/12	356	170	181	142		06/26/12	406	105	297	145		8/16/2012	178	84	89	89
05/07/12	348	169	174	139		06/27/12	414	107	303	145		8/17/2012	208	99	104	104
05/08/12	345	169	171	138		06/28/12	403	107	292	145		8/18/2012	201	96	100	100
05/09/12	340	152	183	136		06/29/12	393	120	268	145		8/19/2012	193	92	97	97
05/10/12	334	165	165	134		06/30/12	386	131	250	145		8/20/2012	203	96	102	101
05/11/12	353	171	177	141		07/01/12	394	132	258	145		8/21/2012	191	90	96	95
05/12/12	345	171	168	138		07/02/12	364	131	228	145		8/22/2012	203	96	101	101
05/13/12	298	170	123	119		07/03/12	354	134	216	145		8/23/2012	196	93	98	98
05/14/12	312	171	137	125		07/04/12	348	144	199	145		8/24/2012	192	91	96	96
05/15/12	338	171	163	135		07/05/12	363	145	213	145		8/25/2012	188	89	94	94
05/16/12	326	171	151	131		07/06/12	360	144	211	145		8/26/2012	172	81	86	86
05/17/12	345	172	169	138		07/07/12	327	145	177	145		8/27/2012	185	88	93	92
05/18/12	387	169	214	145		07/08/12	318	144	169	145		8/28/2012	159	75	80	79
05/19/12	361	170	186	142		07/09/12	348	127	216	145		8/29/2012	169	80	84	84
05/20/12	353	170	178	141		07/10/12	340	121	214	145		8/30/2012	173	82	87	87
05/21/12	363	166	192	144		07/11/12	343	122	217	145		8/31/2012	197	94	99	98

Table D-5
FOP Spill at Ice Harbor

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	143	63	80	0	05/22/12	115	49	65	52	7/12/2012	53	36	16	16
04/02/12	137	65	72	0	05/23/12	139	54	84	66	7/13/2012	49	16	33	32
04/03/12	118	43	74	66	05/24/12	126	68	57	49	7/14/2012	43	10	32	33
04/04/12	112	43	68	66	05/25/12	107	74	32	32	7/15/2012	43	10	32	33
04/05/12	116	50	65	66	05/26/12	96	64	30	29	7/16/2012	50	10	39	39
04/06/12	111	45	66	66	05/27/12	80	56	24	24	7/17/2012	49	10	38	39
04/07/12	105	40	65	65	05/28/12	79	29	48	48	7/18/2012	47	10	36	36
04/08/12	99	32	66	66	05/29/12	81	25	56	56	7/19/2012	46	10	35	35
04/09/12	96	29	66	67	05/30/12	83	24	58	58	7/20/2012	41	10	30	30
04/10/12	95	28	66	67	05/31/12	80	26	53	53	7/21/2012	49	9	40	39
04/11/12	99	31	67	67	06/01/12	80	47	32	32	7/22/2012	42	10	32	32
04/12/12	105	37	67	67	06/02/12	92	64	27	27	7/23/2012	37	9	27	27
04/13/12	116	39	76	67	06/03/12	102	49	52	52	7/24/2012	38	9	28	28
04/14/12	115	36	78	67	06/04/12	107	41	66	66	7/25/2012	39	9	29	29
04/15/12	108	34	73	67	06/05/12	117	49	68	47	7/26/2012	42	10	32	32
04/16/12	101	34	66	67	06/06/12	133	46	86	40	7/27/2012	43	9	33	33
04/17/12	103	34	69	67	06/07/12	112	50	61	54	7/28/2012	37	9	27	27
04/18/12	103	35	67	67	06/08/12	102	21	80	66	7/29/2012	33	9	23	23
04/19/12	107	38	68	67	06/09/12	93	10	82	41	7/30/2012	34	9	24	24
04/20/12	105	37	68	67	06/10/12	93	22	70	28	7/31/2012	44	9	34	34
04/21/12	109	37	72	67	06/11/12	93	31	61	50	8/1/2012	33	9	23	23
04/22/12	118	39	78	67	06/12/12	81	20	61	60	8/2/2012	37	9	26	26
04/23/12	129	48	81	67	06/13/12	85	10	74	36	8/3/2012	36	10	26	26
04/24/12	145	44	100	64	06/14/12	97	47	49	29	8/4/2012	36	9	25	25
04/25/12	173	53	119	63	06/15/12	91	30	61	50	8/5/2012	27	9	17	17
04/26/12	170	66	103	63	06/16/12	86	20	65	57	8/6/2012	31	9	21	21
04/27/12	192	68	123	63	06/17/12	85	10	74	36	8/7/2012	35	9	24	24
04/28/12	184	66	117	61	06/18/12	83	10	72	25	8/8/2012	30	9	20	20
04/29/12	156	67	89	47	06/19/12	101	27	74	53	8/9/2012	27	9	17	17
04/30/12	135	56	78	55	06/20/12	83	27	55	55	8/10/2012	32	9	22	22
05/01/12	142	64	77	63	06/21/12	83	46	36	36	8/11/2012	31	9	21	20
05/02/12	133	58	73	63	06/22/12	80	31	48	24	8/12/2012	30	9	20	19
05/03/12	123	51	72	63	06/23/12	86	17	68	49	8/13/2012	27	9	17	16
05/04/12	118	43	74	46	06/24/12	87	21	65	61	8/14/2012	28	9	18	18
05/05/12	104	41	63	31	06/25/12	85	48	36	36	8/15/2012	29	9	18	18
05/06/12	98	39	59	52	06/26/12	85	22	63	25	8/16/2012	28	9	18	18
05/07/12	100	35	65	65	06/27/12	86	29	57	47	8/17/2012	26	10	15	16
05/08/12	95	39	56	41	06/28/12	75	18	55	56	8/18/2012	28	9	17	17
05/09/12	93	26	67	28	06/29/12	68	40	28	28	8/19/2012	25	9	15	14
05/10/12	98	60	37	29	06/30/12	64	28	34	19	8/20/2012	25	10	14	14
05/11/12	103	72	31	31	07/01/12	65	11	53	42	8/21/2012	28	10	18	18
05/12/12	96	46	50	51	07/02/12	66	15	51	50	8/22/2012	28	10	18	18
05/13/12	98	32	65	66	07/03/12	57	26	30	23	8/23/2012	26	9	15	15
05/14/12	99	56	42	42	07/04/12	62	39	22	19	8/24/2012	25	9	15	15
05/15/12	106	74	32	32	07/05/12	51	11	39	35	8/25/2012	26	9	16	16
05/16/12	119	65	54	54	07/06/12	52	10	42	42	8/26/2012	26	9	16	16
05/17/12	133	58	74	66	07/07/12	52	31	20	20	8/27/2012	25	9	15	15
05/18/12	132	49	82	66	07/08/12	49	34	15	15	8/28/2012	24	9	14	14
05/19/12	110	40	69	64	07/09/12	46	14	31	31	8/29/2012	24	9	14	14
05/20/12	111	65	45	46	07/10/12	54	12	42	42	8/30/2012	29	9	18	18
05/21/12	105	71	34	32	07/11/12	55	31	23	22	8/31/2012	29	9	18	18

Table D-6
FOP Spill at Lower Monumental

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS		Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	140	96	44	0		05/22/12	115	91	24	24		7/12/2012	51	33	17	17
04/02/12	134	94	39	0		05/23/12	135	99	35	25		7/13/2012	48	30	17	17
04/03/12	117	85	31	28		05/24/12	122	96	25	26		7/14/2012	39	21	17	17
04/04/12	111	82	28	28		05/25/12	109	83	25	26		7/15/2012	42	23	19	17
04/05/12	109	81	28	28		05/26/12	95	69	25	26		7/16/2012	47	27	19	17
04/06/12	110	81	28	28		05/27/12	80	53	26	27		7/17/2012	46	28	17	17
04/07/12	101	73	28	28		05/28/12	76	49	27	27		7/18/2012	44	27	17	17
04/08/12	99	70	28	28		05/29/12	82	54	27	27		7/19/2012	44	27	17	17
04/09/12	95	66	28	28		05/30/12	79	51	27	28		7/20/2012	39	20	18	17
04/10/12	92	64	27	27		05/31/12	79	50	28	28		7/21/2012	46	26	20	17
04/11/12	97	70	26	26		06/01/12	78	51	27	27		7/22/2012	40	18	21	17
04/12/12	103	73	28	26		06/02/12	91	65	26	26		7/23/2012	37	20	16	17
04/13/12	113	82	30	26		06/03/12	101	75	26	26		7/24/2012	35	17	17	17
04/14/12	113	84	29	26		06/04/12	104	78	26	26		7/25/2012	38	20	17	17
04/15/12	105	78	26	26		06/05/12	117	85	32	26		7/26/2012	40	22	17	17
04/16/12	100	73	26	26		06/06/12	129	80	48	26		7/27/2012	40	22	18	17
04/17/12	102	75	26	26		06/07/12	110	80	29	26		7/28/2012	36	16	19	17
04/18/12	102	75	27	26		06/08/12	99	49	50	26		7/29/2012	32	15	17	17
04/19/12	107	80	26	26		06/09/12	92	31	61	26		7/30/2012	34	10	23	16
04/20/12	104	74	29	26		06/10/12	89	51	37	26		7/31/2012	41	24	17	17
04/21/12	108	81	26	26		06/11/12	91	62	29	26		8/1/2012	33	15	17	17
04/22/12	115	88	26	26		06/12/12	79	46	32	26		8/2/2012	35	17	17	17
04/23/12	127	101	25	25		06/13/12	82	28	53	26		8/3/2012	33	15	17	16
04/24/12	142	73	68	38		06/14/12	97	71	26	26		8/4/2012	33	16	16	17
04/25/12	171	94	76	44		06/15/12	88	62	25	25		8/5/2012	27	12	15	15
04/26/12	168	99	69	24		06/16/12	84	59	24	24		8/6/2012	30	12	17	17
04/27/12	193	101	90	24		06/17/12	82	58	23	24		8/7/2012	32	15	17	17
04/28/12	180	112	67	24		06/18/12	80	56	24	24		8/8/2012	29	13	16	16
04/29/12	154	110	43	24		06/19/12	97	72	25	25		8/9/2012	27	13	13	13
04/30/12	134	97	37	24		06/20/12	85	58	26	26		8/10/2012	31	13	17	17
05/01/12	136	92	43	24		06/21/12	81	63	17	17		8/11/2012	30	12	17	17
05/02/12	129	90	39	24		06/22/12	79	56	22	17		8/12/2012	28	12	16	16
05/03/12	120	83	35	24		06/23/12	84	61	22	17		8/13/2012	25	12	13	13
05/04/12	115	72	43	24		06/24/12	85	65	20	17		8/14/2012	26	12	14	14
05/05/12	102	69	32	24		06/25/12	81	63	17	17		8/15/2012	27	12	14	14
05/06/12	97	73	24	24		06/26/12	82	59	23	17		8/16/2012	25	12	12	13
05/07/12	100	72	28	28		06/27/12	85	66	18	17		8/17/2012	27	12	14	14
05/08/12	92	62	30	30		06/28/12	72	54	17	17		8/18/2012	26	12	13	14
05/09/12	93	57	34	27		06/29/12	65	47	17	17		8/19/2012	24	11	12	11
05/10/12	97	70	26	27		06/30/12	65	40	24	17		8/20/2012	24	11	12	12
05/11/12	102	75	26	27		07/01/12	62	40	21	17		8/21/2012	27	12	15	15
05/12/12	95	69	25	26		07/02/12	64	42	22	17		8/22/2012	25	12	13	13
05/13/12	96	70	25	26		07/03/12	58	38	19	17		8/23/2012	25	12	12	13
05/14/12	99	73	25	25		07/04/12	60	42	17	17		8/24/2012	23	12	11	11
05/15/12	105	80	25	25		07/05/12	50	31	19	17		8/25/2012	26	12	13	14
05/16/12	117	89	27	27		07/06/12	50	32	17	17		8/26/2012	25	12	12	13
05/17/12	132	87	44	27		07/07/12	51	34	17	17		8/27/2012	24	12	11	11
05/18/12	126	92	32	27		07/08/12	48	31	17	17		8/28/2012	23	12	11	11
05/19/12	109	79	29	27		07/09/12	43	26	17	17		8/29/2012	23	12	10	11
05/20/12	110	84	26	27		07/10/12	51	34	17	17		8/30/2012	28	13	14	14
05/21/12	102	76	25	26		07/11/12	55	36	18	17		8/31/2012	26	12	14	14

Table D-7
FOP Spill at Little Goose

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	120	103	16	0	05/22/12	112	82	30	30	7/12/2012	50	34	16	15
04/02/12	112	100	12	0	05/23/12	130	91	39	31	7/13/2012	49	30	18	15
04/03/12	105	67	37	31	05/24/12	116	85	31	32	7/14/2012	40	26	14	12
04/04/12	102	71	31	31	05/25/12	104	72	31	31	7/15/2012	42	13	29	13
04/05/12	102	71	31	31	05/26/12	91	63	27	27	7/16/2012	48	25	22	14
04/06/12	103	71	31	31	05/27/12	77	54	23	23	7/17/2012	46	30	15	14
04/07/12	96	65	30	29	05/28/12	74	51	22	22	7/18/2012	45	29	16	14
04/08/12	93	65	28	28	05/29/12	81	56	24	24	7/19/2012	44	30	13	13
04/09/12	89	61	27	27	05/30/12	78	54	23	23	7/20/2012	40	23	16	12
04/10/12	89	62	27	27	05/31/12	78	54	23	23	7/21/2012	45	25	19	13
04/11/12	94	65	28	28	06/01/12	77	54	23	23	7/22/2012	40	22	18	12
04/12/12	98	67	31	29	06/02/12	88	61	26	26	7/23/2012	37	24	13	11
04/13/12	108	75	33	32	06/03/12	99	69	30	30	7/24/2012	37	26	11	11
04/14/12	107	69	37	32	06/04/12	100	69	30	30	7/25/2012	37	25	11	11
04/15/12	100	67	32	30	06/05/12	114	77	37	33	7/26/2012	40	28	12	12
04/16/12	95	66	29	29	06/06/12	124	74	49	35	7/27/2012	42	24	17	12
04/17/12	97	67	29	29	06/07/12	107	69	38	32	7/28/2012	36	20	16	11
04/18/12	96	66	29	29	06/08/12	95	48	46	28	7/29/2012	33	19	14	10
04/19/12	102	69	32	31	06/09/12	86	33	53	26	7/30/2012	34	22	12	10
04/20/12	99	64	34	30	06/10/12	88	49	38	26	7/31/2012	39	26	13	12
04/21/12	104	72	31	31	06/11/12	88	57	31	27	8/1/2012	35	24	10	10
04/22/12	110	76	33	33	06/12/12	77	47	30	23	8/2/2012	35	24	11	11
04/23/12	123	83	39	36	06/13/12	83	37	45	25	8/3/2012	32	22	10	10
04/24/12	137	73	63	38	06/14/12	93	62	31	28	8/4/2012	32	22	10	10
04/25/12	158	87	70	38	06/15/12	86	57	28	26	8/5/2012	29	20	9	9
04/26/12	160	100	60	38	06/16/12	84	57	26	25	8/6/2012	29	18	10	10
04/27/12	178	106	72	38	06/17/12	82	48	34	25	8/7/2012	34	23	11	11
04/28/12	168	104	63	38	06/18/12	80	45	34	24	8/8/2012	29	17	11	11
04/29/12	145	100	44	38	06/19/12	95	60	34	28	8/9/2012	30	18	11	11
04/30/12	127	84	42	37	06/20/12	85	59	25	25	8/10/2012	31	20	10	10
05/01/12	130	87	42	38	06/21/12	81	57	24	24	8/11/2012	30	20	9	9
05/02/12	123	83	39	36	06/22/12	79	48	30	24	8/12/2012	28	18	9	9
05/03/12	115	80	34	34	06/23/12	84	53	30	25	8/13/2012	27	17	9	9
05/04/12	110	64	45	33	06/24/12	86	56	29	26	8/14/2012	27	17	9	9
05/05/12	99	60	38	30	06/25/12	80	54	25	24	8/15/2012	28	18	9	9
05/06/12	94	65	28	28	06/26/12	82	50	31	25	8/16/2012	27	17	9	9
05/07/12	95	66	29	29	06/27/12	85	57	27	25	8/17/2012	29	19	9	9
05/08/12	88	57	30	26	06/28/12	72	49	23	22	8/18/2012	25	15	9	9
05/09/12	90	50	39	27	06/29/12	66	44	21	20	8/19/2012	25	15	9	9
05/10/12	95	64	30	28	06/30/12	65	39	26	20	8/20/2012	25	15	9	9
05/11/12	97	68	29	29	07/01/12	62	24	37	18	8/21/2012	28	18	9	9
05/12/12	91	64	27	27	07/02/12	63	32	31	19	8/22/2012	26	16	9	9
05/13/12	93	65	28	28	07/03/12	59	32	26	18	8/23/2012	26	16	9	9
05/14/12	98	68	29	29	07/04/12	60	41	18	18	8/24/2012	24	14	9	9
05/15/12	102	71	30	31	07/05/12	49	29	20	15	8/25/2012	27	17	9	9
05/16/12	115	76	38	34	07/06/12	49	34	15	15	8/26/2012	26	17	9	9
05/17/12	127	80	47	35	07/07/12	52	36	16	16	8/27/2012	24	14	9	9
05/18/12	122	82	39	35	07/08/12	48	33	14	14	8/28/2012	23	14	8	8
05/19/12	105	70	34	31	07/09/12	44	30	13	13	8/29/2012	25	17	8	8
05/20/12	104	72	31	31	07/10/12	51	31	19	15	8/30/2012	27	19	8	8
05/21/12	100	71	29	29	07/11/12	56	34	21	17	8/31/2012	27	19	7	8

Table D-8
FOP Spill at Lower Granite

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	128	103	24	0	05/22/12	118	86	32	18	7/12/2012	51	30	20	18
04/02/12	126	105	21	0	05/23/12	138	90	47	18	7/13/2012	49	26	22	18
04/03/12	111	83	28	18	05/24/12	122	91	30	18	7/14/2012	41	21	19	18
04/04/12	106	85	20	18	05/25/12	110	83	26	18	7/15/2012	42	16	26	18
04/05/12	108	88	20	18	05/26/12	96	76	20	18	7/16/2012	47	24	22	18
04/06/12	106	85	20	18	05/27/12	82	61	20	18	7/17/2012	45	26	19	18
04/07/12	100	76	23	18	05/28/12	78	57	20	18	7/18/2012	45	25	20	18
04/08/12	95	75	20	18	05/29/12	81	60	20	18	7/19/2012	44	25	18	18
04/09/12	93	72	20	18	05/30/12	82	61	20	18	7/20/2012	42	21	20	18
04/10/12	92	72	20	18	05/31/12	79	59	20	18	7/21/2012	45	22	22	18
04/11/12	97	77	20	18	06/01/12	80	59	20	18	7/22/2012	39	18	21	18
04/12/12	103	79	23	18	06/02/12	93	72	20	18	7/23/2012	38	19	19	18
04/13/12	112	90	22	18	06/03/12	103	82	20	18	7/24/2012	38	19	18	18
04/14/12	111	82	29	18	06/04/12	106	86	20	18	7/25/2012	38	18	19	18
04/15/12	105	78	26	18	06/05/12	121	85	36	18	7/26/2012	40	21	19	18
04/16/12	100	79	21	18	06/06/12	130	81	49	18	7/27/2012	41	21	19	18
04/17/12	100	79	20	18	06/07/12	112	77	34	18	7/28/2012	38	17	20	18
04/18/12	101	80	21	18	06/08/12	102	53	49	18	7/29/2012	34	15	18	18
04/19/12	104	80	24	18	06/09/12	92	35	57	18	7/30/2012	36	17	18	18
04/20/12	104	79	24	18	06/10/12	92	41	50	18	7/31/2012	38	20	18	18
04/21/12	106	86	20	18	06/11/12	90	59	31	18	8/1/2012	36	17	18	18
04/22/12	115	91	24	18	06/12/12	81	51	29	18	8/2/2012	35	16	18	18
04/23/12	129	88	41	18	06/13/12	84	32	51	18	8/3/2012	33	14	18	18
04/24/12	144	85	58	18	06/14/12	95	62	32	18	8/4/2012	32	13	18	18
04/25/12	167	87	80	18	06/15/12	89	63	26	18	8/5/2012	29	13	16	17
04/26/12	170	93	77	18	06/16/12	86	55	31	18	8/6/2012	30	13	17	17
04/27/12	186	93	92	18	06/17/12	84	43	41	18	8/7/2012	31	12	18	18
04/28/12	178	94	84	18	06/18/12	84	42	42	18	8/8/2012	29	12	16	16
04/29/12	154	93	61	18	06/19/12	94	56	38	18	8/9/2012	27	12	15	15
04/30/12	135	91	43	18	06/20/12	89	68	21	18	8/10/2012	29	12	16	17
05/01/12	138	90	47	18	06/21/12	82	61	21	18	8/11/2012	29	12	16	17
05/02/12	130	92	38	18	06/22/12	81	46	34	18	8/12/2012	28	12	15	16
05/03/12	121	92	29	18	06/23/12	84	49	34	18	8/13/2012	25	9	16	13
05/04/12	114	71	42	18	06/24/12	86	56	29	18	8/14/2012	26	9	16	14
05/05/12	104	60	44	18	06/25/12	84	62	21	18	8/15/2012	26	9	17	14
05/06/12	97	74	24	18	06/26/12	83	44	38	18	8/16/2012	25	9	16	13
05/07/12	99	76	23	18	06/27/12	86	61	25	18	8/17/2012	26	12	14	15
05/08/12	94	63	30	18	06/28/12	75	55	20	18	8/18/2012	25	12	12	13
05/09/12	93	50	43	18	06/29/12	65	41	24	18	8/19/2012	23	12	10	11
05/10/12	97	71	25	18	06/30/12	64	34	30	18	8/20/2012	23	12	10	11
05/11/12	101	81	20	18	07/01/12	61	23	37	18	8/21/2012	27	12	14	14
05/12/12	97	77	20	18	07/02/12	62	31	31	18	8/22/2012	24	12	12	12
05/13/12	95	75	20	18	07/03/12	61	36	25	18	8/23/2012	24	12	11	12
05/14/12	102	81	20	18	07/04/12	60	35	25	18	8/24/2012	24	12	11	12
05/15/12	107	86	21	18	07/05/12	51	29	22	18	8/25/2012	24	12	11	12
05/16/12	120	89	31	18	07/06/12	48	29	19	18	8/26/2012	24	12	11	12
05/17/12	134	85	48	18	07/07/12	52	33	18	18	8/27/2012	23	12	11	12
05/18/12	129	84	45	18	07/08/12	47	28	18	18	8/28/2012	23	12	10	11
05/19/12	112	80	32	18	07/09/12	46	27	18	18	8/29/2012	23	12	11	12
05/20/12	106	84	21	18	07/10/12	50	29	21	18	8/30/2012	25	12	12	13
05/21/12	107	85	21	18	07/11/12	56	32	23	18	8/31/2012	24	12	11	12

Table D-9
Spill at Chief Joseph

Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS	Date	Outflow KCFS	Generation Flow KCFS	Actual Spill KCFS	FOP Spill KCFS
04/01/12	112	107	5	0	05/22/12	183	117	66	0	7/12/2012	241	144	96	0
04/02/12	158	102	55	0	05/23/12	174	101	73	0	7/13/2012	250	132	118	0
04/03/12	157	97	60	0	05/24/12	191	117	74	0	7/14/2012	243	145	98	0
04/04/12	144	95	50	0	05/25/12	195	121	74	0	7/15/2012	243	147	95	0
04/05/12	163	111	52	0	05/26/12	194	135	59	0	7/16/2012	241	137	104	0
04/06/12	166	117	49	0	05/27/12	158	144	14	0	7/17/2012	231	138	93	0
04/07/12	151	118	34	0	05/28/12	167	157	11	0	7/18/2012	227	148	79	0
04/08/12	148	120	29	0	05/29/12	177	163	15	0	7/19/2012	247	156	92	0
04/09/12	170	138	32	0	05/30/12	167	167	0	0	7/20/2012	248	146	103	0
04/10/12	167	134	32	0	05/31/12	169	169	0	0	7/21/2012	246	152	94	0
04/11/12	160	126	34	0	06/01/12	158	158	0	0	7/22/2012	244	148	96	0
04/12/12	165	128	37	0	06/02/12	105	105	0	0	7/23/2012	243	143	100	0
04/13/12	166	137	30	0	06/03/12	143	143	0	0	7/24/2012	242	142	101	0
04/14/12	141	135	6	0	06/04/12	140	140	0	0	7/25/2012	229	136	93	0
04/15/12	147	124	23	0	06/05/12	111	95	15	0	7/26/2012	217	144	73	0
04/16/12	166	135	31	0	06/06/12	185	114	72	0	7/27/2012	208	124	84	0
04/17/12	161	134	27	0	06/07/12	207	136	70	0	7/28/2012	198	148	50	0
04/18/12	167	131	36	0	06/08/12	212	111	101	0	7/29/2012	194	168	26	0
04/19/12	178	140	38	0	06/09/12	199	95	104	0	7/30/2012	198	156	42	0
04/20/12	183	127	56	0	06/10/12	203	123	80	0	7/31/2012	191	161	30	0
04/21/12	173	135	38	0	06/11/12	204	124	80	0	8/1/2012	188	161	27	0
04/22/12	181	137	44	0	06/12/12	208	130	78	0	8/2/2012	177	166	11	0
04/23/12	183	119	64	0	06/13/12	204	137	68	0	8/3/2012	173	173	0	0
04/24/12	188	127	60	0	06/14/12	195	174	20	0	8/4/2012	181	181	0	0
04/25/12	164	105	59	0	06/15/12	196	176	20	0	8/5/2012	174	174	0	0
04/26/12	137	83	54	0	06/16/12	204	182	22	0	8/6/2012	175	175	0	0
04/27/12	149	109	40	0	06/17/12	198	179	19	0	8/7/2012	174	174	0	0
04/28/12	142	118	24	0	06/18/12	187	172	15	0	8/8/2012	161	161	0	0
04/29/12	176	110	66	0	06/19/12	196	151	46	0	8/9/2012	172	172	0	0
04/30/12	209	102	107	0	06/20/12	232	152	80	0	8/10/2012	170	170	0	0
05/01/12	211	131	80	0	06/21/12	227	152	74	0	8/11/2012	165	165	0	0
05/02/12	220	116	104	0	06/22/12	235	170	65	0	8/12/2012	161	161	0	0
05/03/12	217	125	92	0	06/23/12	205	155	51	0	8/13/2012	162	162	0	0
05/04/12	217	116	101	0	06/24/12	246	166	80	0	8/14/2012	151	151	0	0
05/05/12	203	130	73	0	06/25/12	286	140	146	0	8/15/2012	144	144	0	0
05/06/12	210	142	67	0	06/26/12	280	132	148	0	8/16/2012	156	156	0	0
05/07/12	201	130	71	0	06/27/12	278	141	137	0	8/17/2012	150	150	0	0
05/08/12	203	113	90	0	06/28/12	289	145	145	0	8/18/2012	150	150	0	0
05/09/12	213	102	111	0	06/29/12	275	142	134	0	8/19/2012	158	158	0	0
05/10/12	213	117	96	0	06/30/12	272	157	115	0	8/20/2012	148	148	0	0
05/11/12	189	113	76	0	07/01/12	255	152	103	0	8/21/2012	151	151	0	0
05/12/12	172	151	21	0	07/02/12	257	156	101	0	8/22/2012	145	145	0	0
05/13/12	165	148	17	0	07/03/12	265	145	120	0	8/23/2012	146	146	0	0
05/14/12	176	147	29	0	07/04/12	254	133	121	0	8/24/2012	133	133	0	0
05/15/12	166	136	30	0	07/05/12	263	154	108	0	8/25/2012	130	130	0	0
05/16/12	152	114	39	0	07/06/12	242	154	88	0	8/26/2012	113	113	0	0
05/17/12	179	109	71	0	07/07/12	235	154	81	0	8/27/2012	119	119	0	0
05/18/12	184	100	84	0	07/08/12	242	165	76	0	8/28/2012	136	136	0	0
05/19/12	203	124	80	0	07/09/12	247	165	81	0	8/29/2012	143	143	0	0
05/20/12	196	125	71	0	07/10/12	251	156	95	0	8/30/2012	147	147	0	0
05/21/12	199	105	94	0	07/11/12	233	156	77	0	8/31/2012	122	122	0	0

TABLE D-10
Project-Specific FOP Spill Volumes in kaf
April through August, 2000 – 2012

Year	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Yearly Totals
2012	5,165	6,568	6,385	12,143	37,168	28,616	29,350	26,978	---	152,373
2011	5,704	8,586	6,677	15,204	40,500	28,439	32,149	27,642	---	164,901
2010	7,222	5,782	7,047	10,846	25,945	18,641	20,749	27,819	---	124,051
2009	5,662	6,157	6,705	12,383	26,671	18,682	22,322	25,868	---	124,450
2008	5,703	6,624	6,326	11,920	29,115	21,671	25,645	25,967	---	132,971
2007	5,283	4,071	5,513	7,915	26,001	15,350	22,007	27,084	---	113,224
2006	5,612	5,684	6,003	11,493	26,359	15,007	24,671	24,042	---	118,871
2005	2,806	2,306	2,868	8,932	25,079	14,445	18,496	24,195	---	99,127
2004	715	631	948	11,188	10,488	13,943	19,440	25,216	---	82,569
2003	3,098	2,820	4,424	9,945	9,094	13,279	20,451	31,732	---	94,843
2002	3,100	3,770	0	13,408	10,497	17,863	24,122	30,803	---	103,562
2001	2,992	2,356	3,786	9,153	325	803	4,821	5,527	---	29,762
2000	3,605	3,039	4,856	14,022	9,297	18,500	21,647	25,417	---	100,383
Project Average	4,359	4,492	4,734	11,427	21,272	17,326	21,990	25,253		

* 2012 and 2011 includes Chief Joseph dam.

TABLE D-11
Average Project Flow and FOP Spill in kcfs
April through August, 2012

Average Flow	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Total
Outflow	77	74	76	78	309	309	292	313	191	**1,719**
Generation Flow	50	48	51	29	135	195	169	175	139	**991**
Actual Spill	26	26	25	48	169	112	117	125	52	**700**
FOP Spill	17	22	21	41	130	100	103	94	0	**528**
Involuntary Spill	9	4	4	7	39	12	14	31	49	**120**

*2012 and 2011 includes Chief Joseph Dam spill information, but not for fish passage.

TABLE D-12
Total Project Flow and FOP Spill Volumes in kaf
April through August, 2012

Volume Flow	Lower Granite	Little Goose	Lower Monumental	Ice Harbor	McNary	John Day	The Dalles	Bonneville	Chief Joseph	Total
Outflow	22,961	22,245	22,881	23,409	88,301	88,132	88,532	89,274	57,210	**502,945**
Generation Flow	14,983	14,425	15,153	8,801	38,692	55,679	48,329	50,054	41,671	**287,787**
Actual Spill	7,849	7,646	7,495	14,372	48,267	32,065	33,462	35,678	15,539	**202,373**
FOP Spill	5,165	6,568	6,385	12,143	37,168	28,616	29,350	26,978	0	**152,373**
Involuntary spill	2,684	1,078	1,110	2,229	11,099	3,449	4,112	8,700	15,539	**50,000**

*2012 and 2011 includes Chief Joseph Dam spill information, but not for fish passage.

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TABLE D-13
Total Project Flow and BiOp Spill Volumes in kaf
April through August, 2000 – 2012

Year	Total Project * Outflow	Generation * Outflow	Actual Spill *	FOP Spill *
2012	502,945	287,787	202,373	152,373
2011	559,931	305,313	246,837	164,901
2010	296,571	164,830	124,051	116,031
2009	335,784	196,691	131,444	124,450
2008	363,125	200,728	154,901	132,989
2007	283,680	162,927	113,174	113,224
2006	406,601	238,580	160,146	118,878
2005	274,635	167,402	99,333	99,127
2004	280,692	190,388	82,551	82,569
2003	311,458	206,927	98,001	94,843
2002	357,155	225,072	125,688	103,522
2001	182,996	164,738	11,460	29,762
2000	327,334	209,851	96,931	100,383
Average	331,663	202,787	120,376	106,723

*2012 and 2011 includes Chief Joseph dam.