SYSTEM OPERATIONAL REQUEST: #2026-01

U.S. Bureau of Reclamation
Columbia-Pacific Northwest Interior Region 9

The following State, Federal, and Tribal Salmon Managers have participated in the preparation and support this SOR: Columbia River Inter-Tribal Fish Commission, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife, Confederated Bands and Tribes of the Yakama Nation, Idaho Department of Fish and Game

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FROM: Tom Lorz (CRITFC)

DATE: April 10, 2026

SUBJECT: Releases of water from Grand Coulee Dam for flow augmentation in the Columbia River from Chief Joseph Dam to Bonneville Dam.

SPECIFICATIONS:
We request the United States Bureau of Reclamation (USBR) to implement a 4-week strategy in 2026 to augment river discharge in the Columbia River from Chief Joseph Dam to Bonneville Dam. The requested strategy consists of:

- Releasing volumes of water from Grand Coulee Dam each week from 17 April to 15 May.
- Each week's flow augmentation from Lake Roosevelt will begin on Friday and end on Thursday.
- The fish managers will request each week's augmentation volume no later than the Tuesday before the Friday start of a week's augmentation (Table 1).
- The volume should be released as evenly as economically, logistically, and environmentally feasible; said another way, the daily average draft rate should be relatively stable within weeks.
- The aggregate 4-week drafted volume requested in 2026 will not exceed 1 Maf, but the USBR may release more than 1 Maf from GCL storage if doing so is consistent with guiding documents and authorizations (Appendix 1).
- A weekly request under this SOR may range from 0 to 500 Kaf and will be informed by river conditions, fish passage timing, and existing constraints of the CRS.

Specific Request for 17-23 April 2026: Begin release of 200 Kaf of stored water from GCL on 17 April 2026 to augment flow from Chief Joseph Dam to Bonneville Dam. Complete release on 23 April 2026 with smooth transition to forthcoming Week 2 request that will be provided on 21 April 2026.

Table 1. Schedule of dates when requests for drafts will occur and corresponding dates for actual draft volumes.

Request Sequence	Request Date	Requested Volume to be Drafted	Draft Start Date	Draft End Date
First	**Thursday 09 April**	**200 Kaf**[1]	**Friday 17 April**	**Thursday 23 April**
Second	Tuesday 21 April	TBD[1]	Friday 24 April	Thursday 30 April
Third	Tuesday 28 April	TBD[1]	Friday 01 May	Thursday 07 May
Fourth	Tuesday 05 May	TBD[1]	Friday 08 May	Thursday 14 May

[1] Examples of different series of weekly volume requests and the projected changes in river discharge and water transit time from those requests are provided in (SOR 2026-1 Supplementary Material). We've provided four examples that show the most probable range of requests for 2026 but stress that the strategy outlined above is structured to adapt to the dynamic nature of spring-runoff, high weekly variation in forecasted conditions, fish passage patterns, and hydrosystem needs (i.e., flood risk management, power generation, unrelated operational decisions).

JUSTIFICATION:
The goal of the request is to increase survival of yearling Chinook salmon and steelhead and reduce the amount of time required for smolts to move through the hydrosystem. The 4-week volume-based strategy in this SOR is designed to make spring flow augmentation from Grand Coulee Dam more directly quantifiable and permit effectiveness evaluation as part of the adaptive management process.

Background and concepts underlying requested operation:

Storage reservoirs and run-of-river dams had profound effects on water velocity through the mainstem Columbia River with consequences for anadromous fishes. Run-of-river projects reduce water velocity year-round by increasing the cross-sectional area of the river channel, while storage reservoirs reduced peak river discharge during spring runoff. The completion of storage reservoirs and implementation of coordinated flood control in the upper Columbia River Basin reduced median spring discharge by 53% at Priest Rapids and 42% at The Dalles (Appendix 2).

The consequences of reduced river discharge combined with mainstem run-of-river dam development were quickly apparent (McCann et al. 2024 Chapter 8) and flow augmentation was one of the first strategies implemented to mitigate for hydroelectric development under the Northwest Power Act of 1980. The first Water Budget called for 3.45 Maf of flow augmentation measured at Priest Rapids that fish managers could shape between 15 April and 15 June — this water was shaped out of Grand Coulee Dam. Spring flow augmentation from Grand Coulee continued in modified form following ESA-listing of Snake and Columbia River salmon and steelhead through the 1995 NMFS Biological Opinion and subsequent ESA consultations on the operations of the FCRPS/CRS. The 2020 Proposed Action maintains flow augmentation from Grand Coulee Dam as a mitigation action as weekly flow requests and seasonal average flow targets (USACE, BPA, USBR 2020 Appendix V Section 2.3.2.1).

Despite flow augmentation's prominence as a mitigation action of the CRS and 40 years of implementation, fish managers struggle to quantify improvements to spring-migrating juvenile anadromous fish travel time and survival that may accrue from flow augmentation. A lack of a clear, consistently applied definition of flow augmentation and complications arising from sequential storage reservoirs make the analysis intractable. In turn, fish and water resource managers cannot apply adaptive management principles to the action.

The goal of flow augmentation in the CRB is to improve conditions for migratory or resident fish. Flow augmentation can be defined as the release of water that has been stored, would be stored, or would be allocated to another use to increase river discharge relative to baseline levels. The baseline level vaguely refers to "what would have otherwise been there" which can be reinterpreted as "in the eye of the beholder." For brevity's sake, if near-term status quo operations of a storage reservoir are to pass inflow that inflow is the baseline level, augmentation is a drafted volume, and total flow downstream equals *inflow + volume drafted + downstream inputs*. Most flow augmentation programs around the Columbia River basin *consistently* apply this definition with differences in how "baseline level" is applied.

- The original Water Budget loosely applied this definition by setting a baseline of firm power flow and attributing a flow augmentation volume as discharge in excess of that value;
- As currently implemented, summer flow augmentation from Libby Dam and Hungry Horse Dam follows the definition more closely — the reservoirs are drafted to a forebay elevation set by the water supply forecast and the releases mostly occur when downstream storage reservoirs are passing inflow or drafting;
- Flow augmentation from the Reclamation reservoirs along the Snake River above Brownlee because Reclamation forgoes refilling certain reservoirs, rents and releases stored water that would otherwise be consumed by irrigation, foregone consumptive use of natural flow, or releases other "buckets" of stored water. The releases are then accounted for as flow over set minimums at different points along the rivers (See McCann et al. 2024 Chapter 7 for details);
- Summer flow augmentation from Grand Coulee Dam is implemented as a draft occurring between refill and the end of August;

The amount of water released and its impact on river discharge at some downstream points associated with each of these programs can be estimated with relatively few assumptions, but the issue of sequential storage dams still complicates quantitative connection to fish responses.

Spring flow augmentation from Grand Coulee as described in the Proposed Action lacks a direct connection to a "baseline level" which makes it difficult to quantify how much augmentation occurred and when it occurred. This precludes managers' ability to assess fish responses and apply adaptive management principles to increase the effectiveness and efficiency of the program.

The strategy requested in this SOR seeks to improve smolt survival and travel times in 2026 while also improving adaptive management capability.

Wild Chinook salmon smolts appear to be migrating early and the request will improve migration conditions from MCN-BON

Effective and efficient flow augmentation targets specific groups of fish because water allocated to this purpose is limited. Flow augmentation is often distributed across entire seasons — either for logistical, economic or ecological reasons. Often, the slow release of flow augmentation is communicated as needed to cover the passage timing of as many imperiled species and populations as possible. In doing so, however, the benefits to all migrating fish diminish to near-zero.

Compressing flow augmentation releases in time increases the magnitude of benefit to fish present when and where the water flows by. Necessarily, that strategy decreases water availability to populations and species *not* present. Evaluating, prioritizing, and accepting trade-offs is an essential and constant process in resource management.

Natural-origin upper and middle Columbia spring Chinook Salmon, Snake River spring/summer Chinook Salmon, and summer steelhead will be present and will benefit from flow augmentation implemented as requested in this SOR. These groups are priority species for management actions due to their low abundance and cultural importance.

This past winter has witnessed higher than normal temperatures for most if not the entire season in the Mid-Columbia and Snake basins. Currently, temperatures at McNary are 1°F above 2025, 1.5°F above the 10-year average, and nearly 3°F above the 25-year average. Similar patterns have occurred in lower elevation tributary habitats where portions of many populations overwinter. Increased temperatures lead to increased growth rates for many species of fish. Increases in size tend to lead fish to out-migrating sooner than low temperature – lower growth rate conditions. Smolt monitoring data from the mainstem dams and tributaries indicate an earlier than average migration is occurring in 2026. We expect this earlier migration timing for a majority of the migrants in the system including ocean-type Chinook Salmon (i.e., subyearling migration life history strategies).

In the Snake River, wild spring/summer Chinook Salmon smolts appear to be migrating earlier than typical while wild summer steelhead migration have begun to increase above the 5-year average (Figure 1). These groups will increase in abundance throughout the lower Columbia during April and early May.

Wild spring Chinook and summer steelhead from the middle and upper Columbia are also moving through the mainstem and will continue through April and into May. At McNary Dam (Figure 2), the rapid increase of 2026 PIT tag detections for middle Columbia wild steelhead (Touchet River population) and the recent increase off the 5-year average for wild spring Chinook Salmon is comprised mostly of middle Columbia River spring Chinook Salmon (Walla Walla River and Yakima River populations). In the Upper Columbia, a series of 4 major freshets since November 2025 (Figure 3) has triggered an earlier than normal migration of wild Spring Chinook from the Wenatchee River into the Columbia River (Figure 4). These data suggest middle and upper Columbia River spring Chinook Salmon and summer steelhead have begun actively migrating towards and through the mainstem reaches.

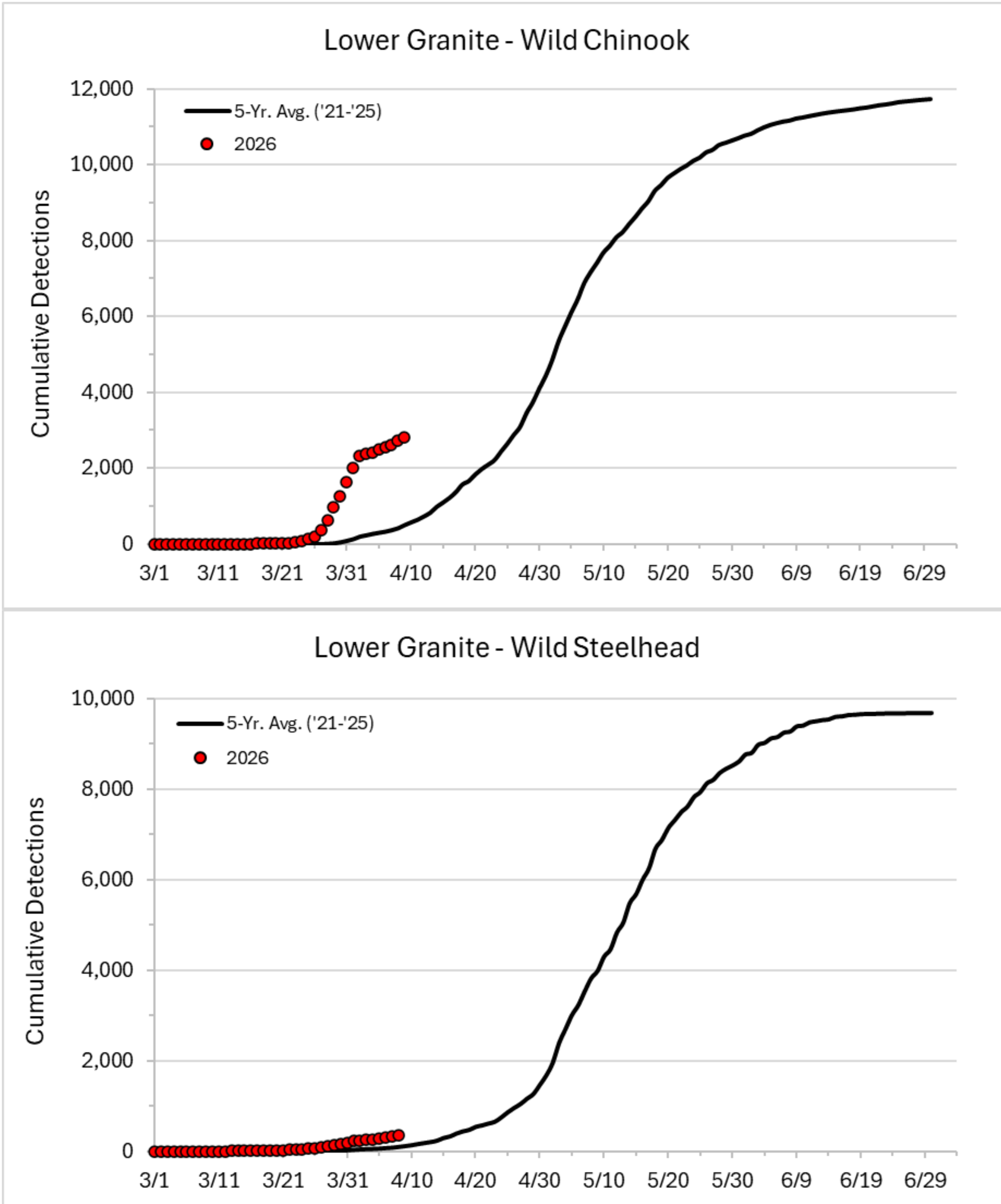

Figure 1. Cumulative PIT tag detections of wild Chinook salmon and steelhead at Lower Granite Dam. Data provided by the Fish Passage Center – 09 April 2026.

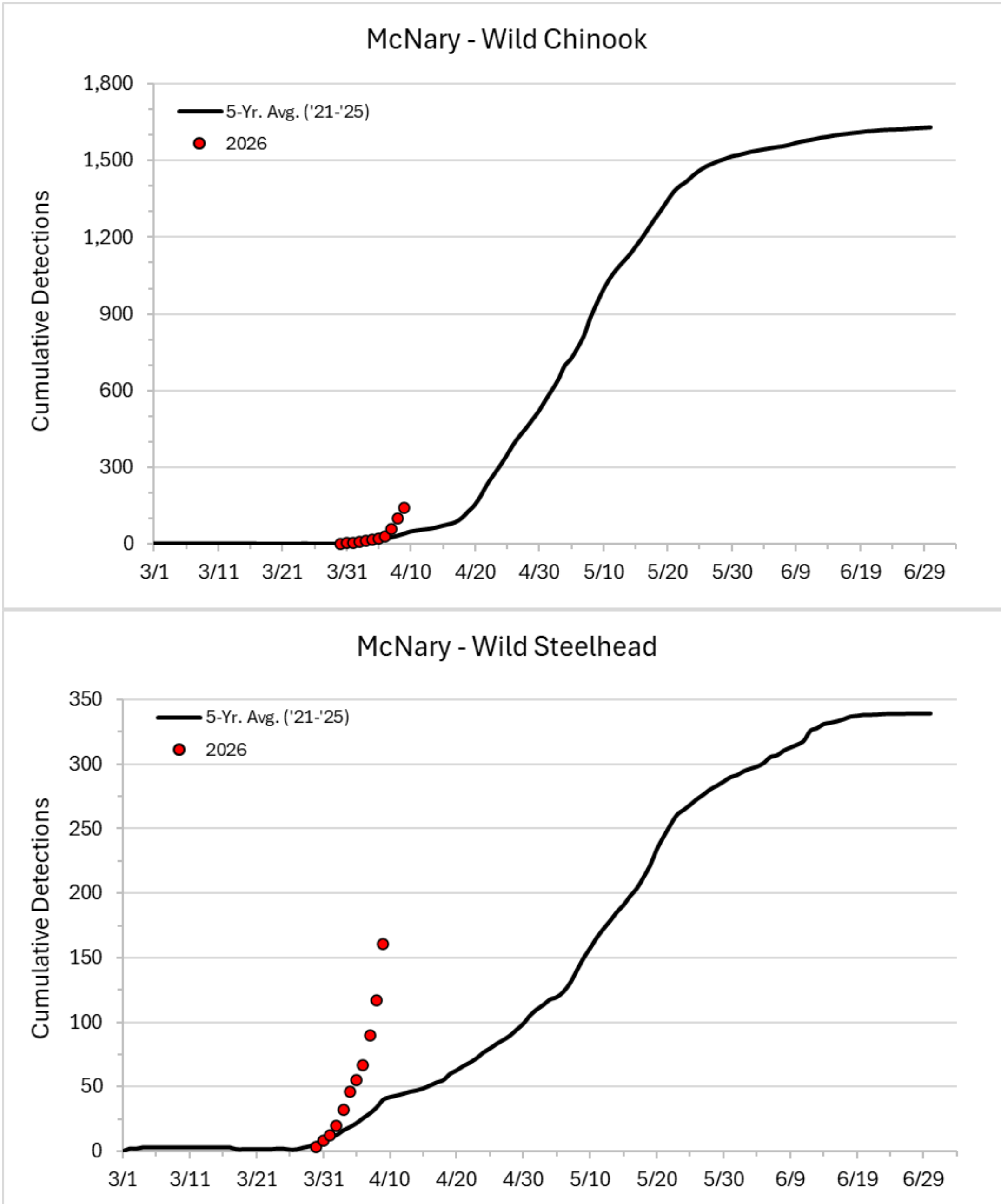

Figure 2. Cumulative PIT tag detections of wild Chinook salmon and steelhead at McNary Dam. Data provided by the Fish Passage Center – 09 April 2026.

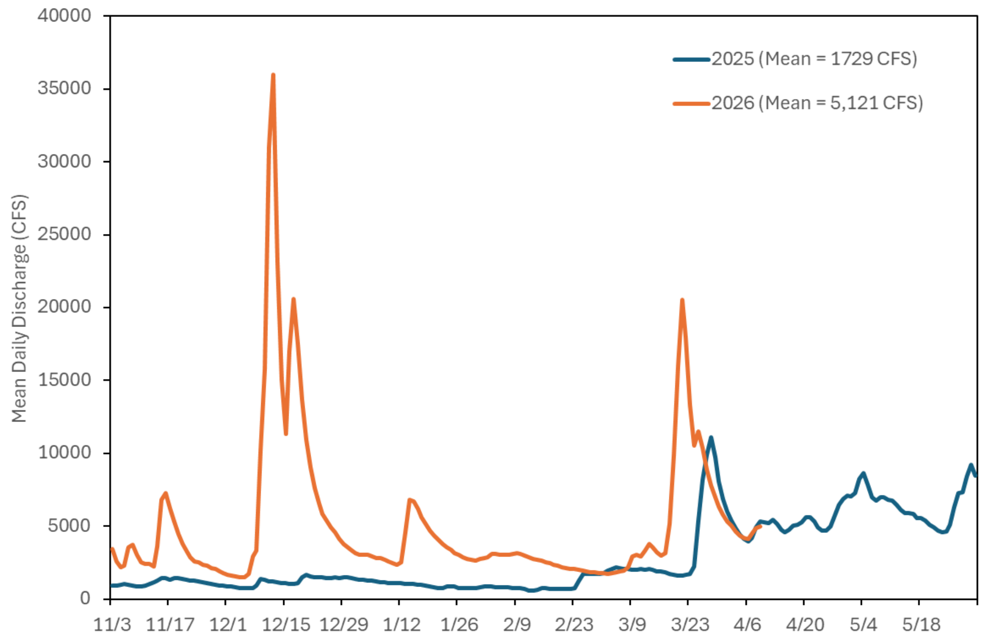

Figure 3. Comparison of mean daily discharge in the Wenatchee River prior to spring smolt migration for 2025 and 2026 smolt years. Data provided by Washington Department of Fish and Wildlife.

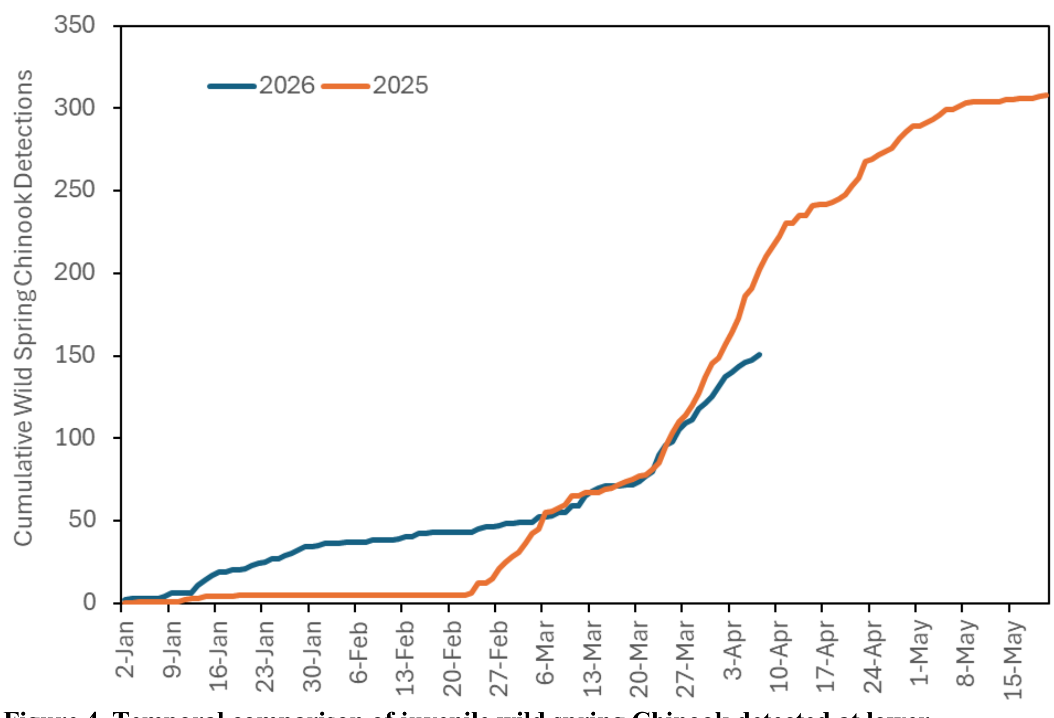

Figure 4. Temporal comparison of juvenile wild spring Chinook detected at lower Wenatchee River PIT barge (uncorrected for detection probability). Data provided by Washington Department of Fish and Wildlife.

Request should not impact refill probability or timing

Assessment provided by the Fish Passage Center

Currently, April – July runoff volume above Grand Coulee is projected to be 103% of historical average. This operation would draft Grand Coulee to approximately 1,236-1,237' based on the April 15th forebay elevation projected by the April 6th ESP.

Since 1970, there have been eight years with an April – July runoff volume above Grand Coulee between 88 – 118% of the historical average that have also had a May 15th forebay elevation between 1,230 – 1,242' (Table 2). The most comparable years by runoff volume are likely to be 1984, 2000, 2006, and 2014; and the most comparable years by May 15th forebay elevation would be 2000 and 2014.

Table 2. Years since 1970 with April – July runoff volume above Grand Coulee between 88 – 118% of average and a May 15th forebay elevation of 1,230.0 – 1,242.1'.

Year	April – July runoff volume (percent of average)	May 15th Grand Coulee Forebay Elevation	Average May discharge (kcfs)	Average June discharge (kcfs)	Average July discharge (kcfs)
1984	97	1240.8'	127.7	112.5	111.2
1991	118	1230.3'	145.9	129.8	138.4
2000	100	1238.8'	138.4	106.0	111.0
2002	115	1241.6'	118.2	178.2	163.2
2006	108	1232.6'	141.7	172.9	141.7
2014	108	1237.3'	159.6	157.3	147.4
2017	115	1239.8'	198.8	180.3	115.6
2018	117	1232.0'	227.1	161.6	118.3

Of these eight years, refill or near refill occurred by early or mid-July in all years except 2000 (Figure 5). Of these same eight years, discharge was highly variable, especially in May, but did not interfere with refill (Figure 6). Due to the high runoff volumes above Grand Coulee in Canada, it is reasonable to expect that runoff from Canada and other sources will make refill simple for WY2026.

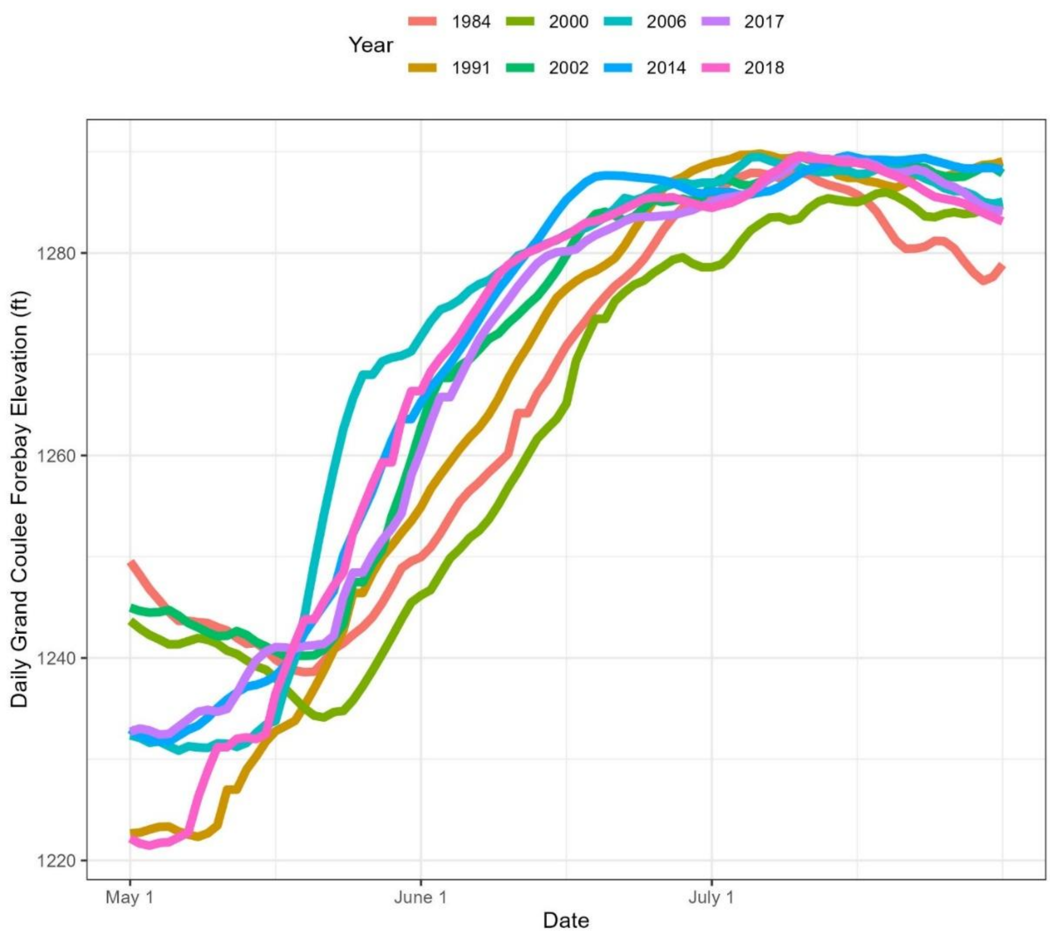

Figure 5. May – July forebay elevations for all years since 1970 with runoff volume above Grand Coulee between 88 – 118% of average and a May 15th forebay elevation of 1,230.0 – 1,242.1'.

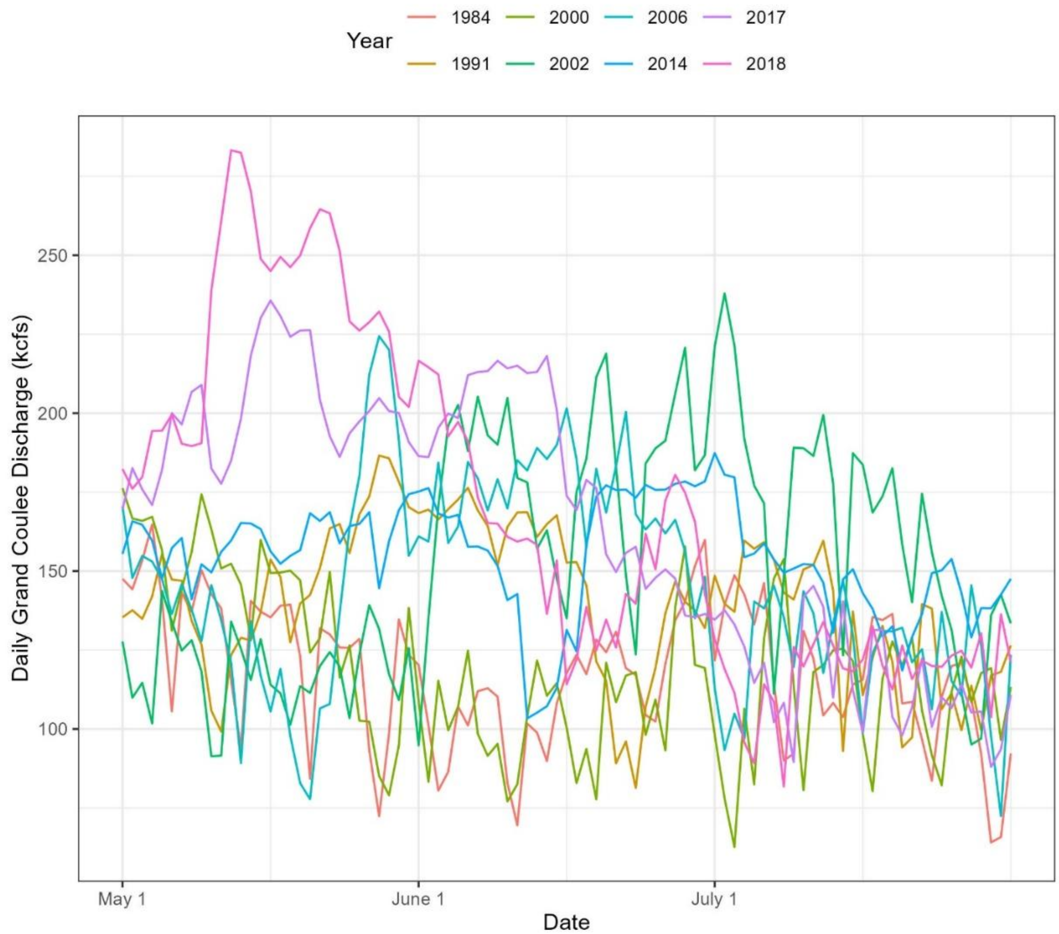

Figure 6. May – July Grand Coulee daily outflows for all years since 1970 with runoff volume above Grand Coulee between 88 – 118% of average and a May 15th forebay elevation of 1,230.0 – 1,242.1'.

At a projected May 15th forebay elevation of approximately 1236.0', a volume of 3,754 KAF would be required for refill to full pool. For refill to occur by July 4th, an average of 75.08 KAF would be used for refill per day after May 15th, which is equal to a 37.9 Kcfs daily average difference between inflows and outflows from May 15th – July 4th.

The April 6th ESP projects a 28.6 Kcfs difference between inflows and outflows, and it is reasonable to expect that June inflows will continue to increase, particularly given the 1 MAF Canadian treaty water that will be delivered by July. This rate of refill appears reasonable within the context of the conditions above Grand Coulee in WY2026.

References:

McCann, J., B. Chockley, E. Cooper, G. Scheer, R. Tessier, S. Haeseker, B. Lessard, T. Copeland, J. Ebel, A. Storch, and D. Rawding. 2024. Comparative Survival Study of PIT-tagged Spring/Summer/Fall Chinook, Summer Steelhead, and Sockeye, 2024 Annual Report. BPA Contract #19960200

Appendix 1: Existing implementation constraints

The strategy is designed to be implemented within the existing constraints of the CRS including operational guidance included in the 2026 Water Management Plan. A non-exclusive list of constraints on the full implementation of the strategy and weekly requests include:

- Implementation should not cause projected flow to exceed 410 Kcfs at McNary Dam because of the engineered lifts planned for spill gates 1 & 2 and potential opening of spillbay 18.
- Implementation should not draft Lake Roosevelt below 1234 ft and impact the Inchelium Ferry operation (limit 1232 ft).
- Implementation should not result in TDG saturation below Grand Coulee Dam or Chief Joseph Dam to exceed 110%.
- Flood risk management may result in more storage being released than the aggregate 4-week request.
- GCL will be refilled on schedule with small potential reductions in river flow at Priest Rapids Dam, McNary Dam, and Bonneville Dam 15 May – 30 Jun if the request is implemented. However, the magnitude of reduction will be determined by the timing of snowmelt and operational decisions not related to this request. We expect water managers will adapt operations at a system level to meet system needs, individual project authorizations, and various agreements.

Appendix 2: Historic spring discharge in the Columbia River from McCann et al. (2024) Chapter 8

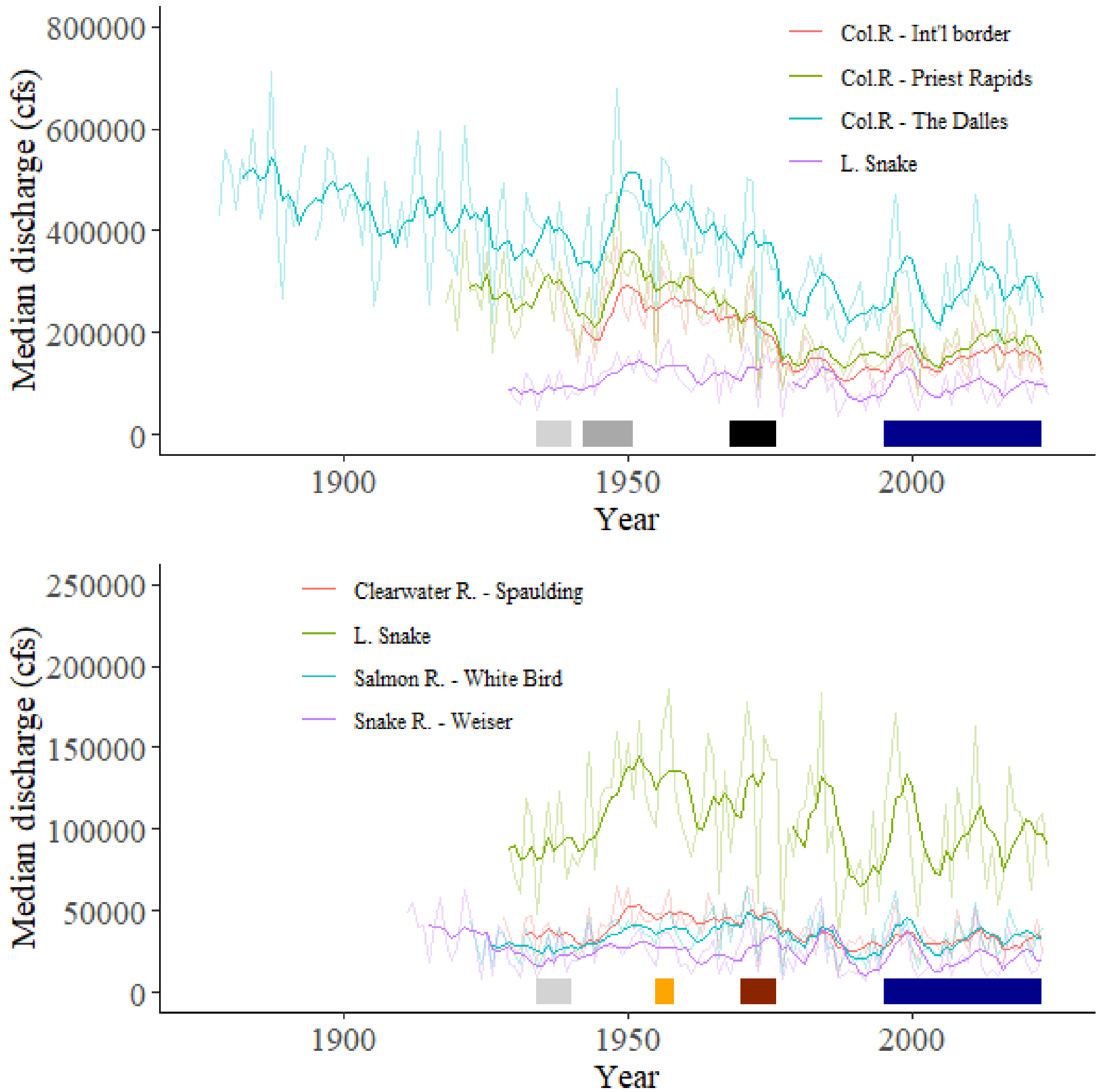

Figure 8.2. Time series at selected long-term river discharge monitoring sites in the Columbia River Basin. Transparent lines depict median daily discharge across May and June of each year and solid lines depict the 5 year moving average. The Columbia River sites (top panel) include Columbia River at the International Border (USGS site no. 12399500), below Priest Rapids Dam (USGS site no. 12472800), and at The Dalles, OR (USGS site no. 14105700). The Lower Snake River is included in both the top (pink line) and bottom (green line) panels for reference. The Lower Snake River time series is compiled from Snake River near Clarkston (1929-1972; USGS site no. 13343500), Snake River below Ice Harbor Dam (1972-1974; USGS site no. 13353000), and inflow to Lower Granite Reservoir queried from CBR DART. The bottom panel shows the relative contribution of sites to Lower Snake River flow and includes the Clearwater River at Spaulding (USGS site no. 13342500), Salmon River near White Bird (USGS site no. 13317000), Snake River at Weiser (USGS site no. 13269000). Solid blocks above the x-axis delineate hydrologically important events (see text and figure 8.3) include the most severe drought in 250 years (“The Dust Bowl”; light gray), the construction of Grand Coulee dam and associated water delivery (dark gray), Columbia River Treaty Dams (black), Brownlee and Palisades dams (orange), Dworshak Dam (dark orange), and the discharge after the 1995 NMFS Biological Opinion mandating flow augmentation.

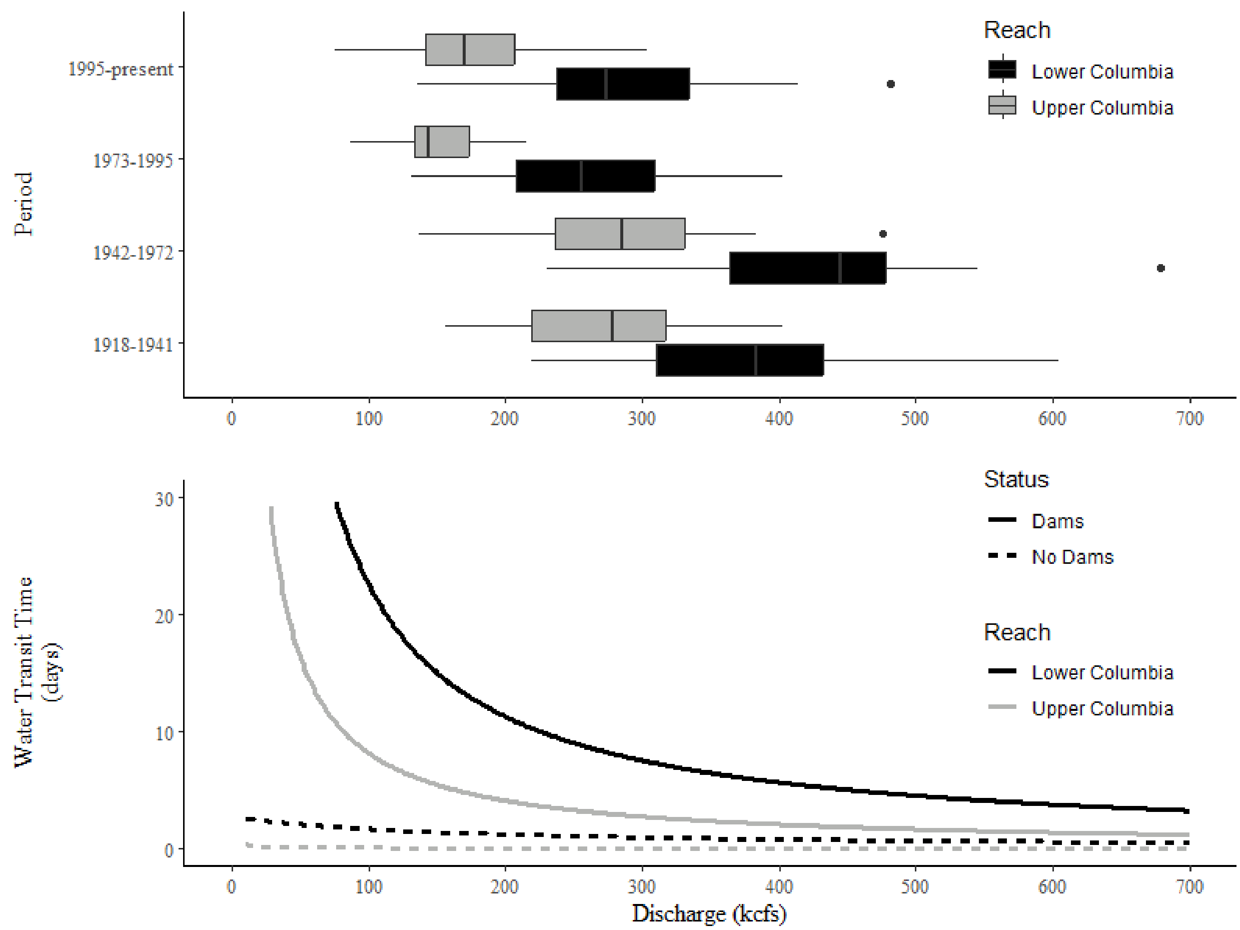

Figure 8.3. ***Top panel*****: Median daily discharge in the upper Columbia (Priest Rapids; USGS site no. 12472800) and lower Columbia (The Dalles; USGS site no. 14105700) in May through June summarized by time periods defined by major events such as completion of Grand Coulee Dam (1942), Mica Dam (1973), and the 1995 NMFS Biological Opinion. Boxes depict the upper and lower quartiles; lines the largest or smallest value within 1.5 times the interquartile range above or below 75th or 25th percentile; closed circles are outliers.** ***Bottom panel*****: Water Transit Time (WTT) in days for the upper Columbia (Wells Dam to Priest Rapids Dam) and lower Columbia River (McNary Dam to Bonneville Dam) as a function of discharge. Discharge is assumed to be uniform across a reach. Solid lines show WTT with all dams in place and operating at full pool whereas the dashed lines show WTT if the reach was free flowing (i.e., no dams).**

Appendix 3: Answers to initial set of questions posed by the Bureau of Reclamation (27 March 2026)

(1) What was the average Apr15-May15 McNary flow and water transit times (WTT) over the last 10 years and what is the current 2026 forecast predicting?

Since 2015, Lewiston – Bonneville WTTs have averaged 18.88 – 26.16 days and Wells – Bonneville WTTs have averaged 14.40 – 19.96 days across these four weeks (Table 3.1). As flows increase later in the season, WTTs tend to decrease.

Table 3.1. Average Weekly WTT (days) from 2015 - 2025

Dates	Lewiston – McNary	Wells-McNary	McNary – Bonneville	Lewiston – Bonneville	Wells - Bonneville
4/15 – 4/21	17.09	7.31	9.07	26.16	19.96
4/22 – 4/29	15.92	6.83	8.44	24.36	18.60
4/30 – 5/6	13.81	6.18	7.63	21.44	16.79
5/7 – 5/14	12.26	5.19	6.61	18.88	14.40

The March 23 ESP flows project Lewiston – Bonneville WTTs between 22.85 – 24.53 days, with slightly faster than 2015 – 2025 average WTTs in late April and slightly slower than the 2015 - 2025 average WTTs in early May (Table 3.2). The March 23 ESP flows project Wells – Bonneville WTTs between 14.77 – 15.83 days, also slightly faster than the 2015 – 2025 average in late April and slightly slower than the 2015 – 2025 average in early May.

Table 3.2. Current Projected Reach WTTs (days) based on March 23 ESP.

Dates	Lewiston – McNary	Wells-McNary	McNary – Bonneville	Lewiston – Bonneville	Wells - Bonneville
4/15 – 4/21	13.84	5.25	10.57	24.42	15.83
4/22 – 4/29	12.97	4.89	9.89	22.85	14.77
4/30 – 5/6	14.23	4.97	10.30	24.53	15.27
5/7 – 5/14	13.67	4.94	10.19	23.86	15.13

(2) What is the decrease in WTT during the Apr15-May15 period for smolts in various reaches (i.e. Lower Columbia, Upper Columbia, and Snake River) for this proposal?

Please see Supplementary Material [SOR 2026-1 Supplementary Material.xlsx] for projected changes to WTT for a variety of release sequences.

(3) What if any impacts would there be to streamflow and adult migration (Chinook, Sockeye, Steelhead, etc.) after May15?

The ability to refill Grand Coulee is improved by the higher freshet flows projected to pass through the system in May and June. Drafting exactly 1 MAF from Grand Coulee from April 15 – May 14 would require an additional 1 MAF of inflow after May 15 to be dedicated to refill relative to operations that would occur if this SOR is not implemented.

(4) When would the 1 MAF of Canadian NTS delivery be completed to "refill" Lake Roosevelt?

SOR 2026-1 focuses solely on drafting Lake Roosevelt on a weekly basis and therefore is only concerned with storage in Lake Roosevelt and outflow from Grand Coulee Dam. Any storage release from Canadian storage is considered background inflow from the perspective of this SOR.

It is our understanding that storage referred to in this question is actually provided in the context of the Agreement in Principle within the renegotiation process of the Columbia River Treaty. It is not non-treaty storage. Regardless, the states, tribes, and federal fisheries agencies do not manage the delivery from Canada's reservoirs across the border or determine its fate once within the United States. We recommend requesting the 1 MAF of augmentation water stored in Canada for delivery across the Canada/USA border beginning 01 May. Functionally, any of the water released after 11 May 2026 as a result of the release from maintenance restrictions and the water could be attributed to refill Grand Coulee or it could be attributed to outflow.

(5) If not all of the NTS was delivered by early July, would this impact the normal July refill timing at Lake Roosevelt?

See clarification in answer to #4. Whether or not full delivery occurs by early July is based on guidelines, negotiations, and operational decisions beyond the scope of the TMT. This SOR is distinct from the release of water stored in Canada.

(6) Would this impact the delivery of summer flow augmentation and end of August drafts at Lake Roosevelt?

No. Lake Roosevelt will fill by early July regardless of spring migration flows because that is the primary objective of the spring refill season. Upon refill in early July, operations should no longer be influenced by SOR 2026-1.

SOR 2026-1: Supplementary Material
Downstream effects of example SOR implementation scenarios
7-Apr-26

README: Examples of weekly augmentation requests in series of 4 weeks. Volumes would be released from Grand Coulee Dam and the table includes the forebay elevations, projected flow, and projected water transit times at different points in the mainstem Columbia and Snake River with and without the requested draft. Dates and flows provided in this table do not necessarily align with the specifics of the request because *these are provided as examples* .

Source: Values were provided by the Fish Passage Center on 07 April 2026 and based on the ESP Media forecast for 06 April 2026 (version distributed to non-federal entities by Dudgeon, Catherine L CIV USARMY CENWD (USA). 06Apr2026 4:08pm PDT).

Scenario	Dates	Volume request (Kaf drafted from GCL)	Start Forebay Elevation (GCL)	End Forebay Elevation (GCL)	Flow added from GCL draft (kcfs)	Projected Flow (kcfs)				
						CHJ	PRD	MCN	BON	LGR
	15-22 Apr	200	1252.6	1249.4	12.6	119.3	133.6	211.2	221.5	72.5
1	23-30Apr	300	1249.4	1245.3	18.9	132.9	147.6	224.3	233.4	73.4
	01-07May	300	1245.3	1239.9	21.6	147.0	162.8	237.8	246.9	72.6
	08-14May	200	1239.9	1236.6	14.4	131.5	152.8	237.0	245.8	78.6
	15-22 Apr	300	1252.6	1248.1	18.9	119.3	133.6	211.2	221.5	72.5
	23-30Apr	300	1248.1	1243.2	18.9	132.9	147.6	224.3	233.4	73.4
	01-07May	200	1243.2	1240.3	14.4	147.0	162.8	237.8	246.9	72.6
2	08-14May	200	1240.3	1237	21.6	131.5	152.8	237.0	245.8	78.6
	15-22 Apr	300	1252.6	1248.1	18.9	119.3	133.6	211.2	221.5	72.5
	23-30Apr	400	1248.1	1241.8	25.2	132.9	147.6	224.3	233.4	73.4
	01-07May	200	1241.8	1238.5	14.4	147.0	162.8	237.8	246.9	72.6
3	08-14May	100	1238.5	1236.9	7.2	131.5	152.8	237.0	245.8	78.6
	15-22 Apr	200	1252.6	1249.4	12.6	119.3	133.6	211.2	221.5	72.5
	23-30Apr	300	1249.4	1245.3	18.9	132.9	147.6	224.3	233.4	73.4
	01-07May	Maintain median Q previous week	1245.3	1243.5	4.6	147.0	162.8	237.8	246.9	72.6
4	08-14May	Maintain median Q previous week	1242.5	1240.7	13.4	131.5	152.8	237.0	245.8	78.6

Projected Flow with GCL Draft					ESP-Projected WTT (days)					Projected WTT (ESP plus flow augmentation; days)				
CHJ	PRD	MCN	BON	LGR	WEL-MCN	MCN-BON	WEL-BON	LGR-MCN	LGR-BON	WEL-MCN	MCN-BON	WEL-BON	LGR-MCN	LGR-BON
131.9	146.2	223.8	234.1	72.5	5.92	11.18	17.10	12.93	24.11	5.43	10.56	15.99	12.93	23.48
151.8	166.5	243.2	252.3	73.4	5.39	10.54	15.93	12.77	23.31	4.80	9.73	14.53	12.77	22.49
168.6	184.4	259.4	268.5	72.6	4.92	9.95	14.87	12.91	22.85	4.37	9.12	13.49	12.91	22.03
145.9	167.2	251.4	260.2	78.6	5.31	9.98	15.29	11.92	21.90	4.86	9.41	14.27	11.92	21.34
138.2	152.5	230.1	240.4	72.5	5.92	11.18	17.10	12.93	24.11	5.22	10.27	15.49	12.93	23.20
151.8	166.5	243.2	252.3	73.4	5.39	10.54	15.93	12.77	23.31	4.80	9.73	14.53	12.77	22.49
161.4	177.2	252.2	261.3	72.6	4.92	9.95	14.87	12.91	22.85	4.54	9.38	13.92	12.91	22.29
153.1	174.4	258.6	267.4	78.6	5.31	9.98	15.29	11.92	21.90	4.67	9.15	13.82	11.92	21.07
138.2	152.5	230.1	240.4	72.5	5.92	11.18	17.10	12.93	24.11	5.22	10.27	15.49	12.93	23.20
158.1	172.8	249.5	258.6	73.4	5.39	10.54	15.93	12.77	23.31	4.64	9.48	14.12	12.77	22.25
161.4	177.2	252.2	261.3	72.6	4.92	9.95	14.87	12.91	22.85	4.54	9.38	13.92	12.91	22.29
138.7	160.0	244.2	253.0	78.6	5.31	9.98	15.29	11.92	21.90	5.07	9.69	14.76	11.92	21.61
131.9	146.2	223.8	234.1	72.5	5.92	11.18	17.10	12.93	24.11	5.43	10.56	15.99	12.93	23.48
151.8	166.5	243.2	252.3	73.4	5.39	10.54	15.93	12.77	23.31	4.80	9.73	14.53	12.77	22.49
151.8	166.5	243.2	251.5	72.6	4.92	9.95	14.87	12.91	22.85	4.80	9.73	14.53	12.91	22.64
151.8	166.5	243.2	259.2	78.6	5.31	9.98	15.29	11.92	21.90	4.80	9.69	14.49	11.92	21.61

Percent Reduction in WTT with flow augmentation

WEL-MCN	MCN-BON	WEL-BON	LGR-MCN	LGR-BON
-8.3%	-5.6%	-6.5%	0.0%	-2.6%
-10.8%	-7.7%	-8.8%	0.0%	-3.5%
-11.1%	-8.3%	-9.2%	0.0%	-3.6%
-8.4%	-5.7%	-6.6%	0.0%	-2.6%
-11.9%	-8.2%	-9.5%	0.0%	-3.8%
-10.8%	-7.7%	-8.8%	0.0%	-3.5%
-7.7%	-5.7%	-6.4%	0.0%	-2.5%
-12.0%	-8.3%	-9.6%	0.0%	-3.8%
-11.9%	-8.2%	-9.5%	0.0%	-3.8%
-13.9%	-10.0%	-11.4%	0.0%	-4.5%
-7.7%	-5.7%	-6.4%	0.0%	-2.5%
-4.4%	-2.9%	-3.4%	0.0%	-1.3%
-8.3%	-5.6%	-6.5%	0.0%	-2.6%
-10.8%	-7.7%	-8.8%	0.0%	-3.5%
-2.4%	-2.2%	-2.2%	0.0%	-0.9%
-9.5%	-2.9%	-5.2%	0.0%	-1.3%