

Description of Modeling Runs:

Name: 2010_10OCT_09_ NRNIIntegratedPlan

Description: A comparison of model results between Future without Integrated Plan (FWIP) and Integrated Plan. This run was made without shaping Bumping outflows to test how the model balances outflows from reservoirs. The Integrated Plan implements all projects with the following instream flow targets:

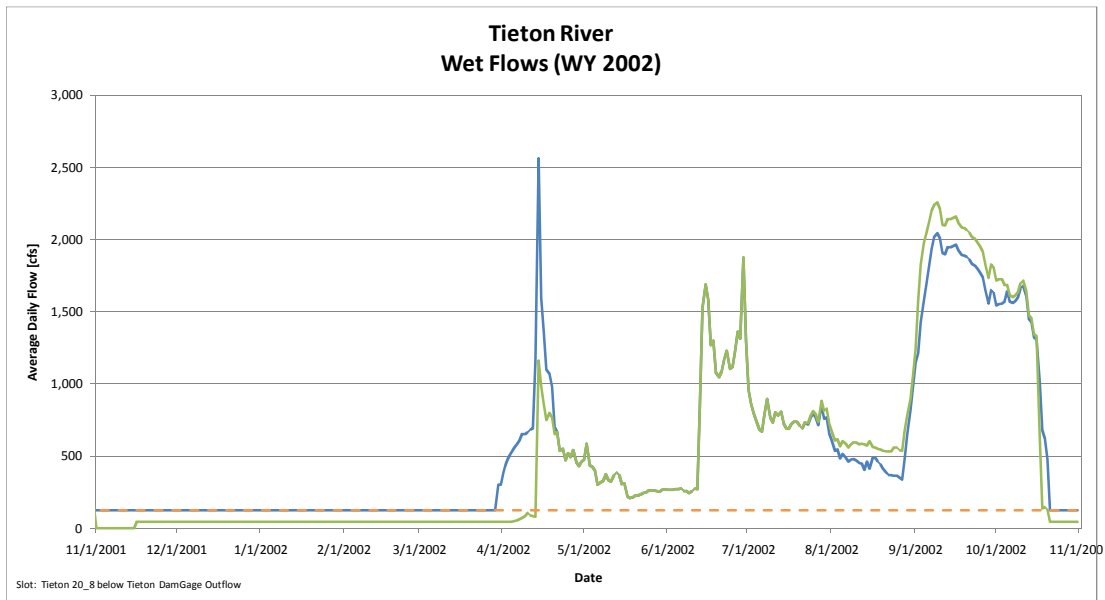
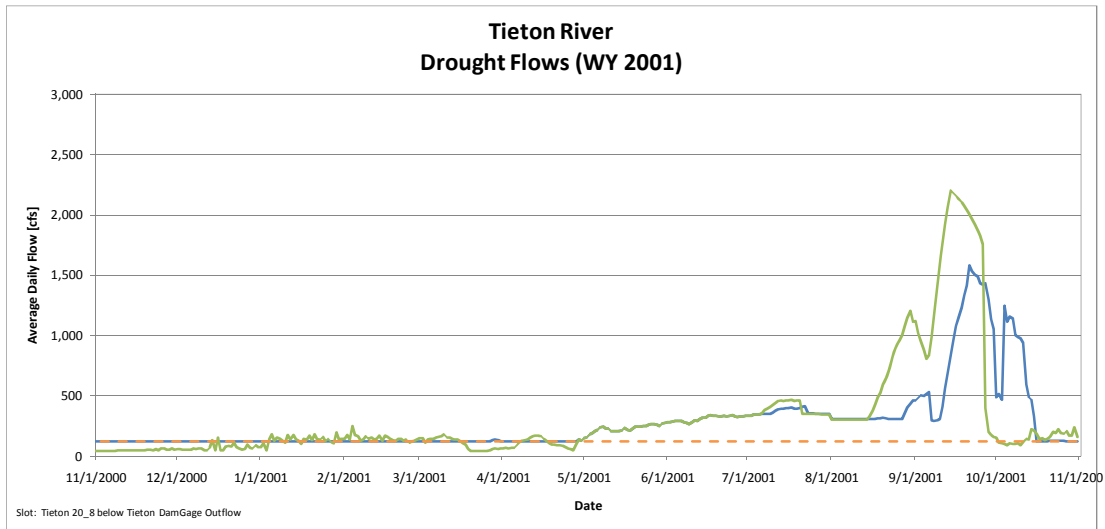
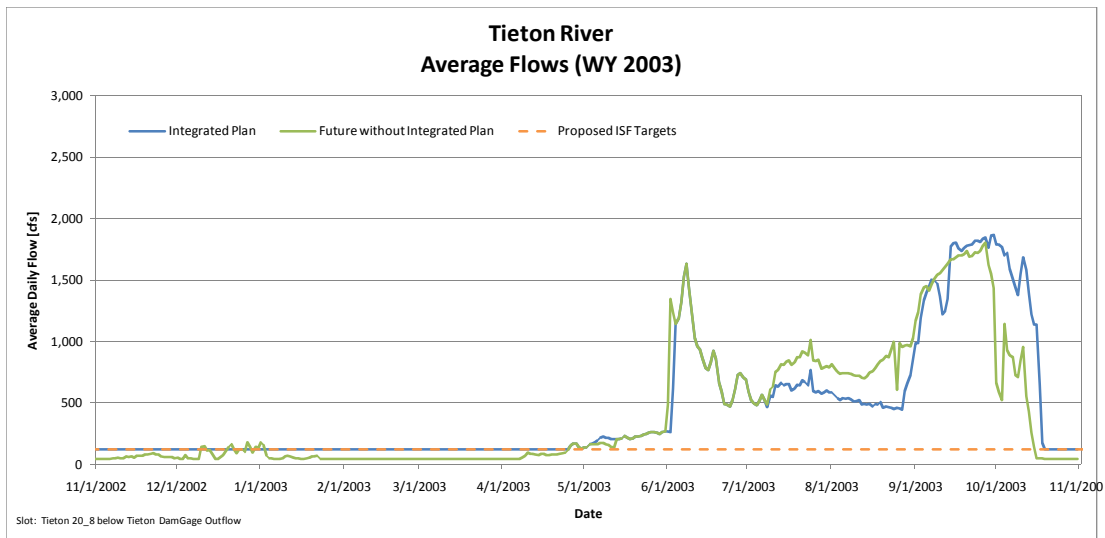
Reach	ISF Targets for Integrated Plan Model Run
Tieton River (below Tieton Dam)	125 cfs all year
Lower Naches River (at Naches)	550 cfs summer flow July 1-September 30
Yakima River – Keechelus to Lake Easton	Pulse with 500 cfs peak near end of April during drought (up to 4000 AF) 500 cfs maximum July 1-31 Ramp from 500 cfs to 120 cfs August 1-31
Yakima River – Easton Reach	Pulse with 1000 cfs peak near end of April during drought (up to 7500 AF) 220 cfs spawning flow October 1-31 250 cfs winter flow November 1-April 30
Cle Elum River	Pulse with 1000 cfs peak near end of April (up to 7000 AF) Try to reduce summer flow by 1000 cfs starting July 1 (minimum 300 cfs) 300 cfs minimum November 1-April 30
Yakima River – Ellensburg Reach	Try to reduce summer flow by 1000 cfs starting July 1 (minimum 1000 cfs)

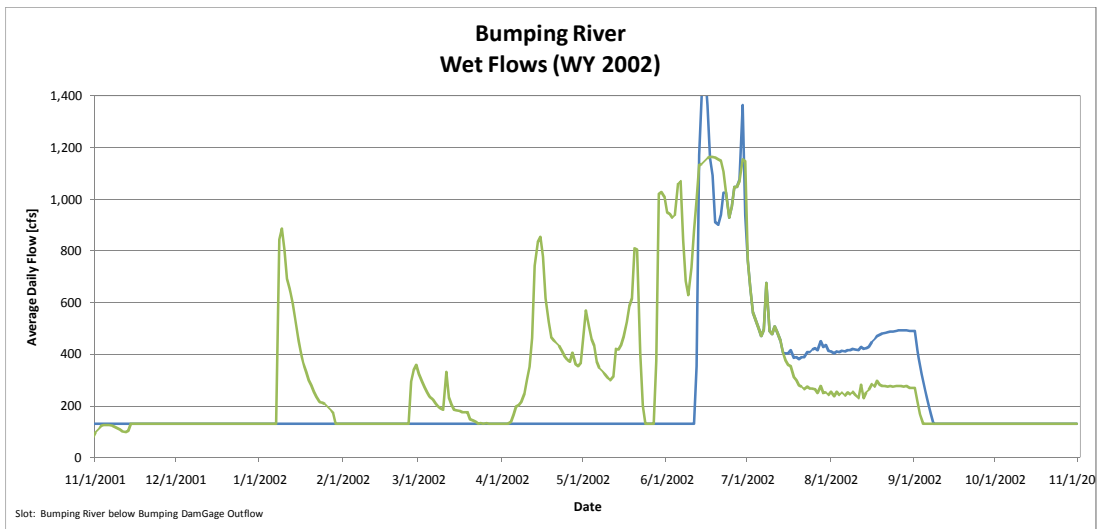
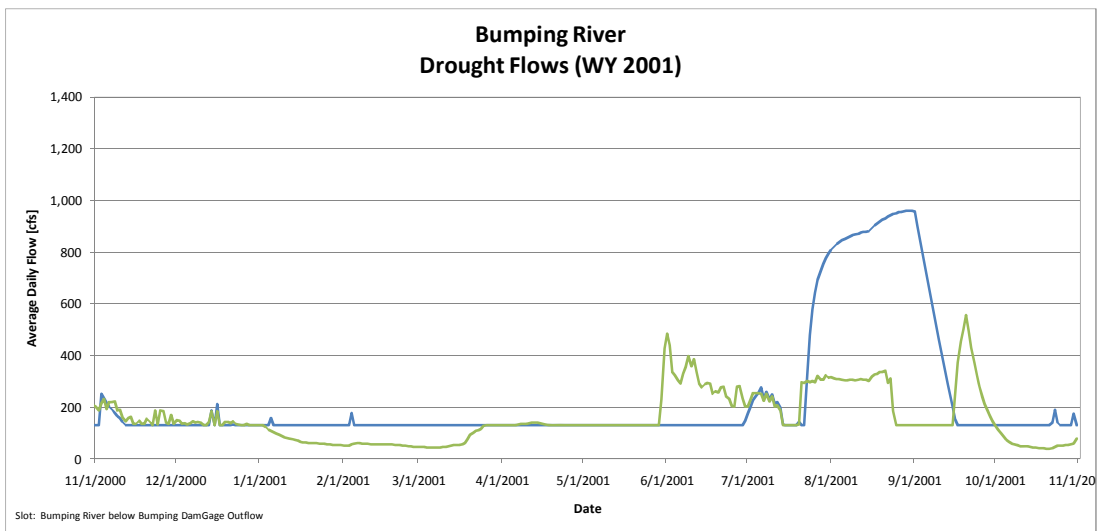
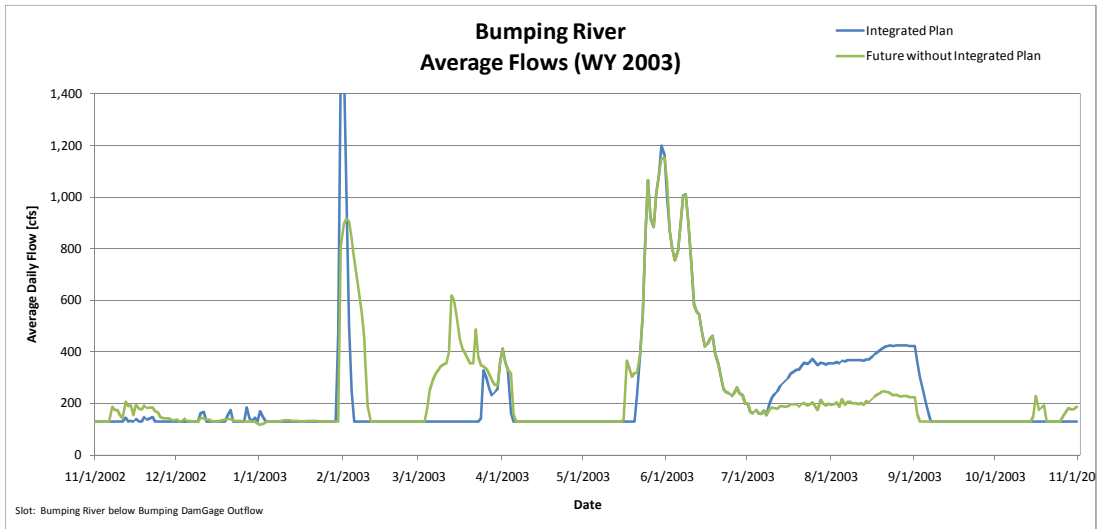
Resource indicator (measurement)	Integrated Plan	Future without Integrated Plan
WATER RESOURCES		
<i>Average for water years 1981–2005 (maf)</i>		
Water supply		
April 1 total water supply available (TWSA)	3.02	2.83
Water distribution		
April–September Parker flow volume	0.59	0.59
April–September diversion	1.64	1.63
September 30 reservoir contents	0.59	0.29
April–September flow volume at mouth of Yakima River	0.99	0.83
<i>1994 dry-year (maf)</i>		
Water supply		
April 1 TWSA	2.22	1.75
Water distribution		
April–September Parker flow volume	0.24	0.26
April–September diversion	1.53	1.28
September 30 reservoir contents	-0.05	0.04
April–September flow volume at mouth of Yakima River	0.46	0.33
Irrigation proration level	70%	35%

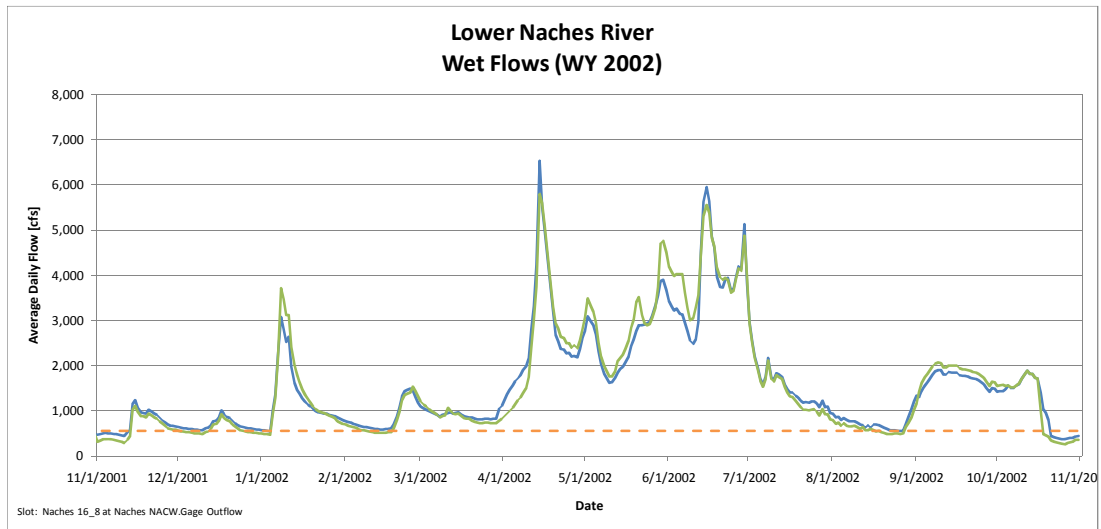
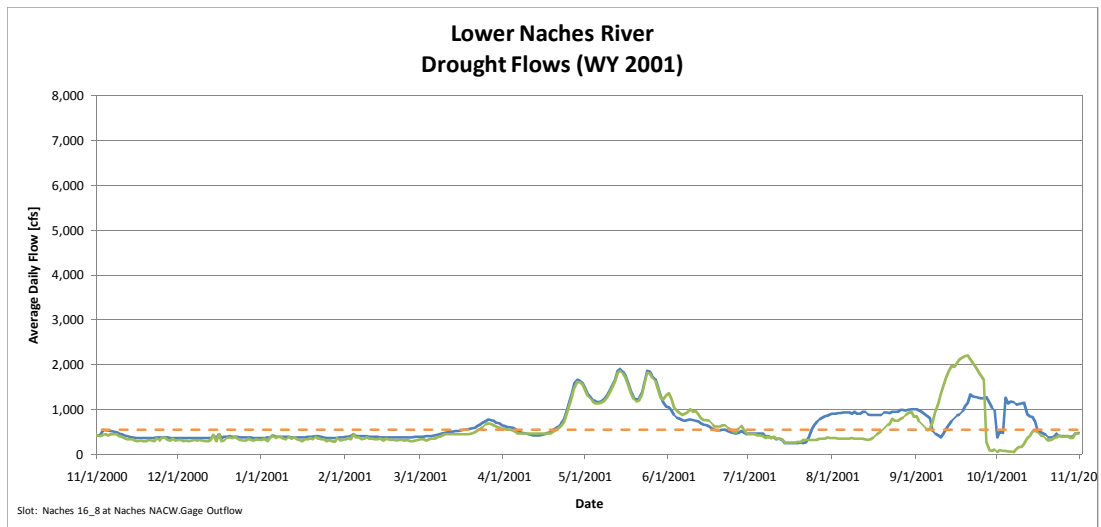
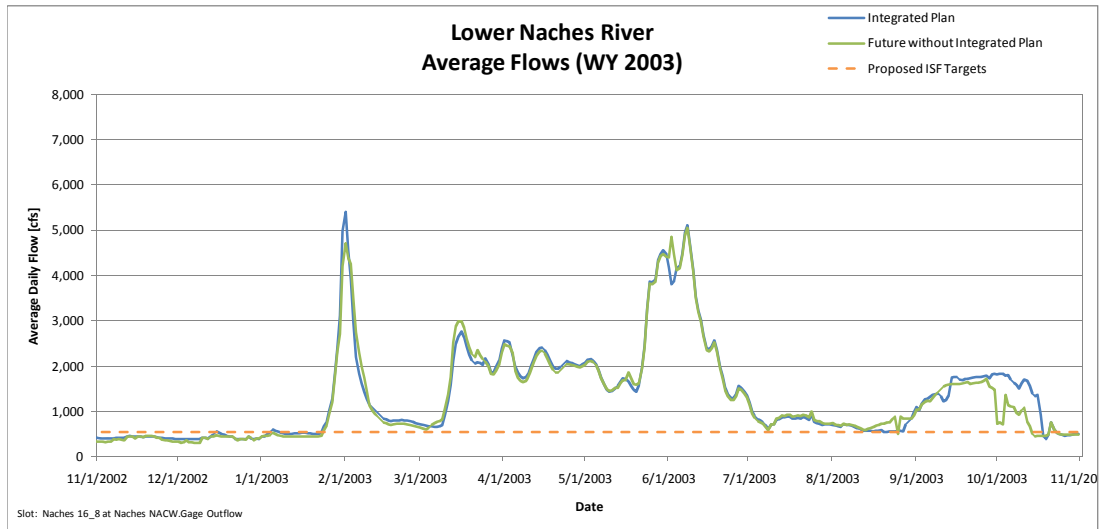
Resource indicator (measurement)	Integrated Plan	Future without Integrated Plan
ANADROMOUS FISH		
<i>Rate of change in flow during flip-flop (average cfs/day August 16–September 14)</i>		
Easton reach	-4	-13
Ellensburg reach	-51	-85
Lower Naches River reach	21	35
<i>Pre- (August 1-15) and post- (September 14-28) flip-flop flow and absolute change in flow</i>		
Easton reach		
Pre-flip-flop flow (cfs)	485	651
Post-flip-flop flow (cfs)	375	287
Absolute change in flow (cfs)	-109	-363
Ellensburg reach		
Pre-flip-flop flow (cfs)	3,103	3,824
Post-flip-flop flow (cfs)	1,616	1,368
Absolute change in flow (cfs)	-1,488	-2,456
Lower Naches River reach		
Pre-flip-flop flow (cfs)	897	771
Post-flip-flop flow (cfs)	1,513	1,772
Absolute change in flow (cfs)	616	1,002
Average, minimum, and maximum reservoir elevation (feet) during bull trout spawning migration: July 15–September 15 (feet)		
Kachess Lake	2237.17 2151.02-2261.96	2240.66 2195.95-2261.96
Keechelus Lake	2476.88 2432.24-2516.96	2467.82 2432.03-2516.88
Rimrock Lake	2916.74 2846.37-2926	2909.19 2828.75-2926

Hydrologic Indicator	Integrated Plan					Future without Integrated Plan				
	Average 1981-2005	Drought Year 1994	Drought Year 2001	Drought Year 2005	Wet Year 1997	Average 1981-2005	Drought Year 1994	Drought Year 2001	Drought Year 2005	Wet Year 1997
April 1 TWSA (maf)						2.83				
April-September flow volume at Parker gage (kaf)	3.02 592	2.22 237	190	2.37 177	4.73 1909	591	1.75 256	1.85 192	1.80 195	4.55 1898
March-October flow volume at Parker gage (kaf)	896	394	2.46 331	291	2629	893	397	315	298	2589
April-September diversion volume upstream of Parker gage (maf)	1.64	1.53	1.54	1.54	1.68	1.63	1.28	1.40	1.38	1.71
September 30 non- Bumping or Wymer reservoir contents (kaf)	379	-112	125	79	737	274	35	38	39	583
October 31 non- Bumping or Wymer reservoir contents (kaf)	355	-114	119	72	810	265	63	63	49	692
September 30 Bumping and Wymer reservoir contents (kaf)	210	61	102	91	240	14	2	3	3	18
April-September flow volume at mouth of Yakima River (kaf)	995	464	390	413	2382	833	329	241	277	2203
Irrigation proration level (percent) ¹	92%	70%	70%	70%	100%	86%	35%	51%	48%	100%

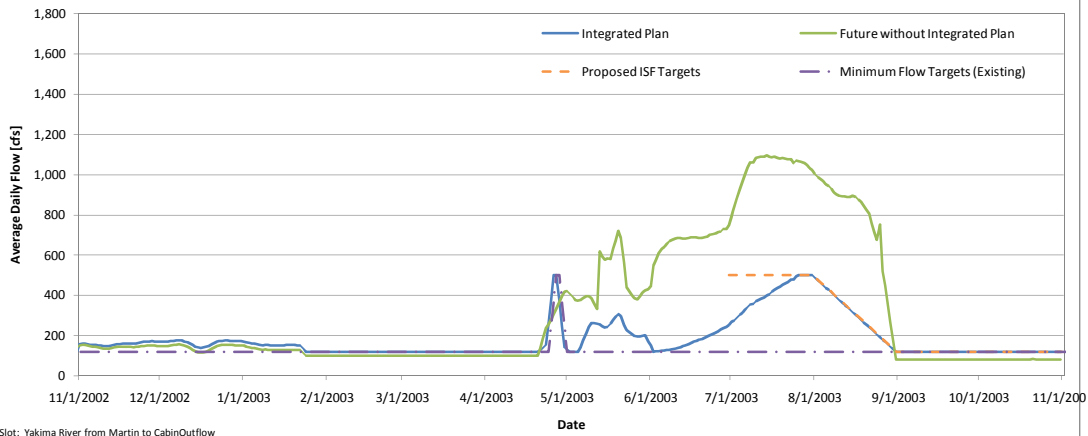
Item	Future without Integrated Plan	Integrated Plan	Improvement
Average 1981-2005			
TWSA [April 1, kaf]	2825.9	3020.2	194.3
March-October flow volume at Parker gage [kaf]	893.0	895.7	2.7
Drought Year 1994			
TWSA [April 1, kaf]	1746.8	2224.0	477.2
March-October flow volume at Parker gage [kaf]	397.5	394.2	-3.3
Drought Year 2001			
TWSA [April 1, kaf]	1848.2	2455.5	607.3
March-October flow volume at Parker gage [kaf]	314.6	331.1	16.5
Drought Year 2005			
TWSA [April 1, kaf]	1803.7	2366.2	562.4
March-October flow volume at Parker gage [kaf]	298.3	290.5	-7.8
Wet Year 1997			
TWSA [April 1, kaf]	4551.9	4734.9	183.0
March-October flow volume at Parker gage [kaf]	2588.9	2628.8	39.9



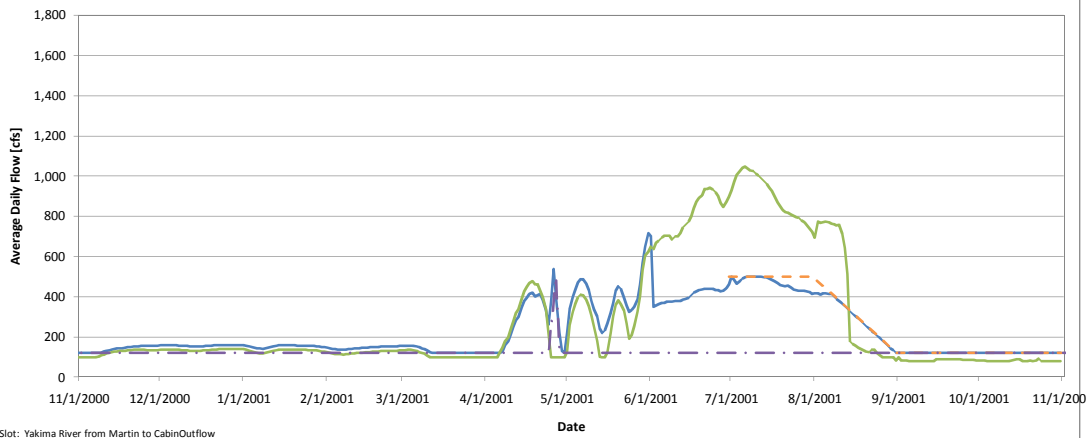




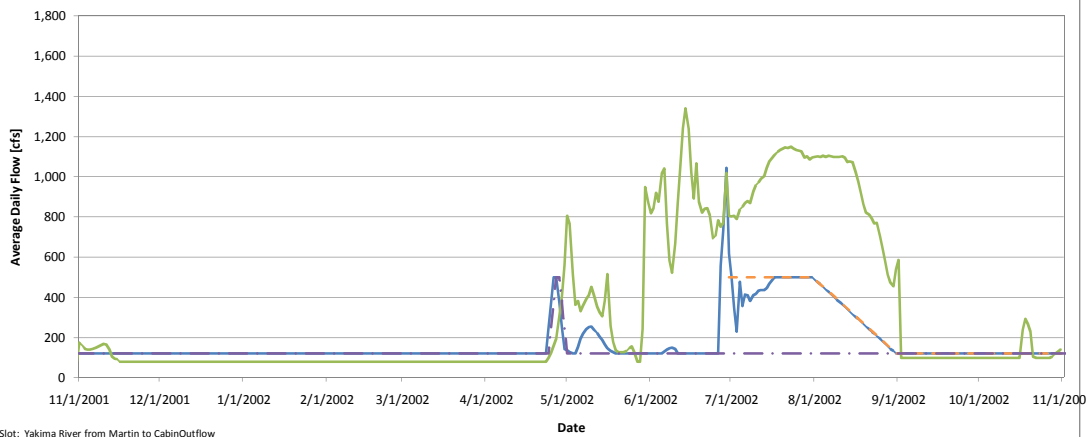
Yakima River, Keechelus Reservoir to Lake Easton Reach Average Flows (WY 2003)



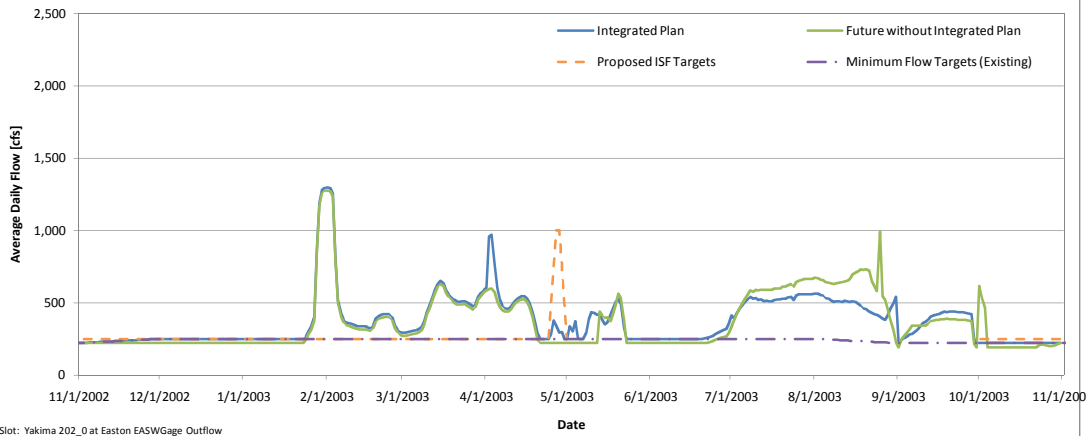
Yakima River, Keechelus Reservoir to Lake Easton Reach Drought Flows (WY 2001)



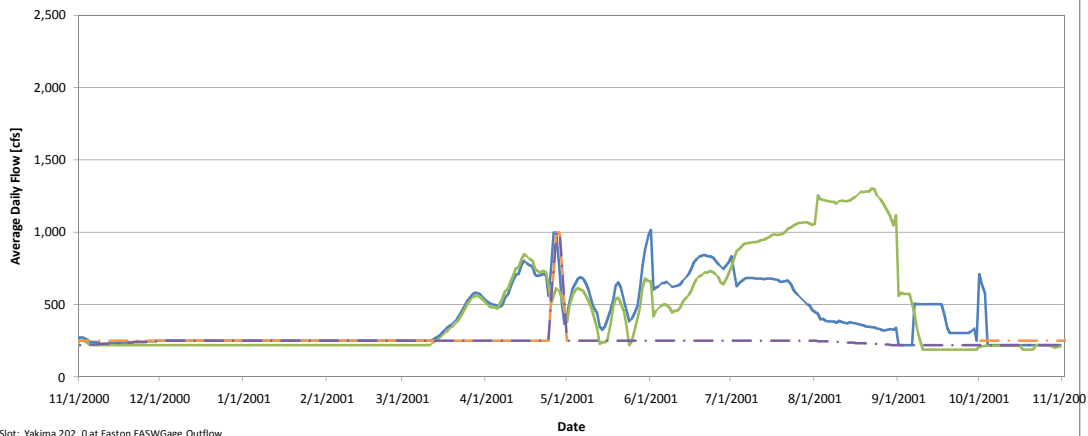
Yakima River, Keechelus Reservoir to Lake Easton Reach Wet Flows (WY 2002)



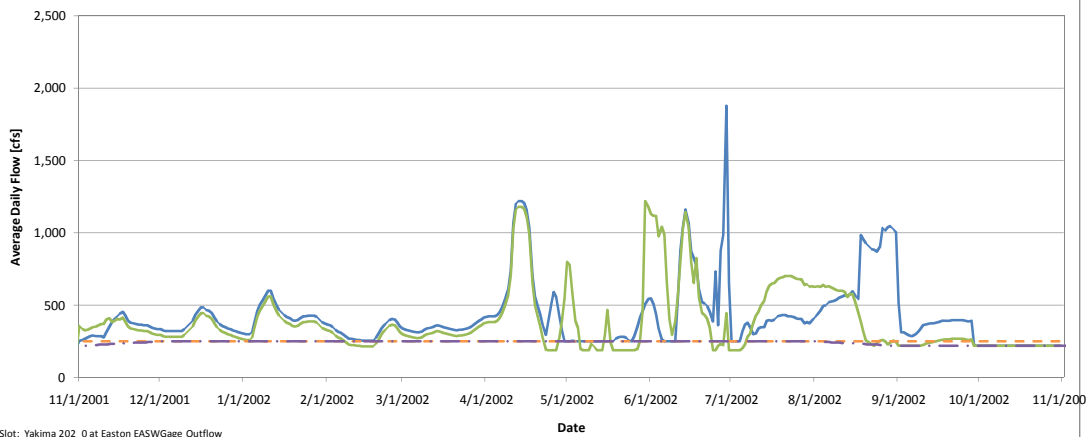
Yakima River - Easton Reach Average Flows (WY 2003)



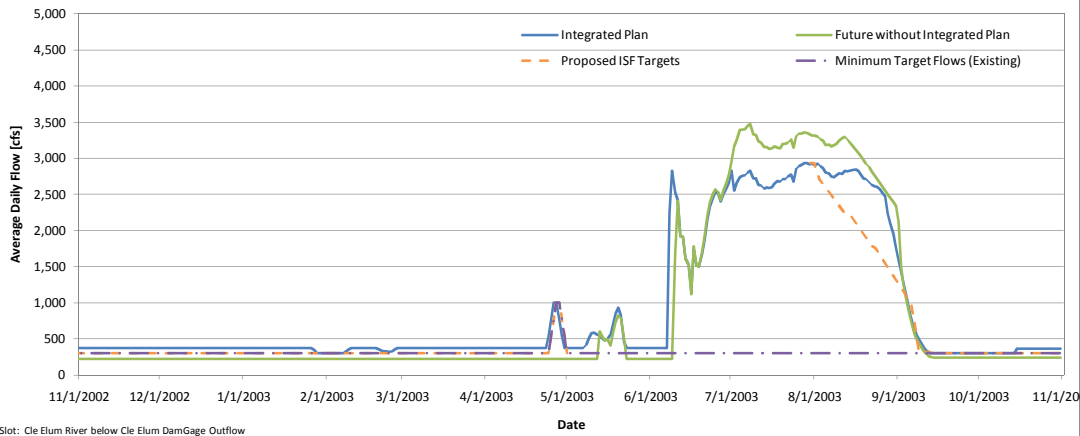
Yakima River - Easton Reach Drought Flows (WY 2001)



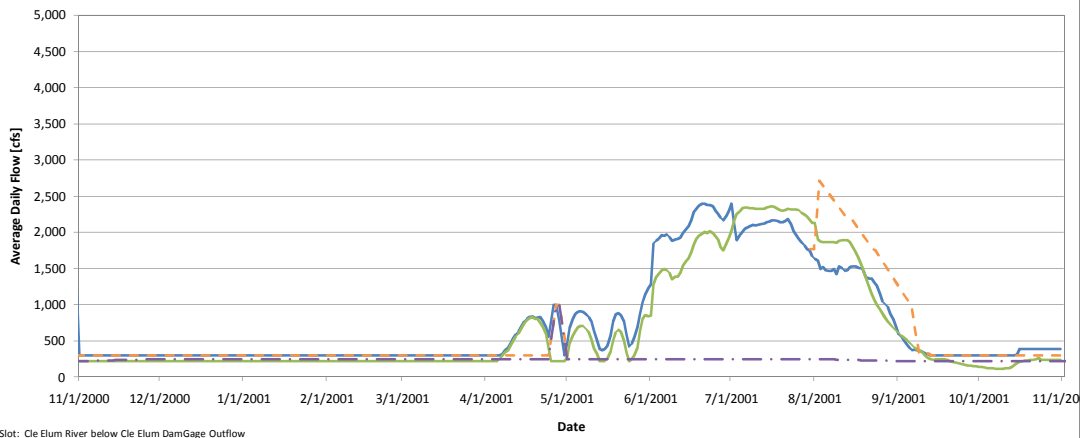
Yakima River - Easton Reach Wet Flows (WY 2002)



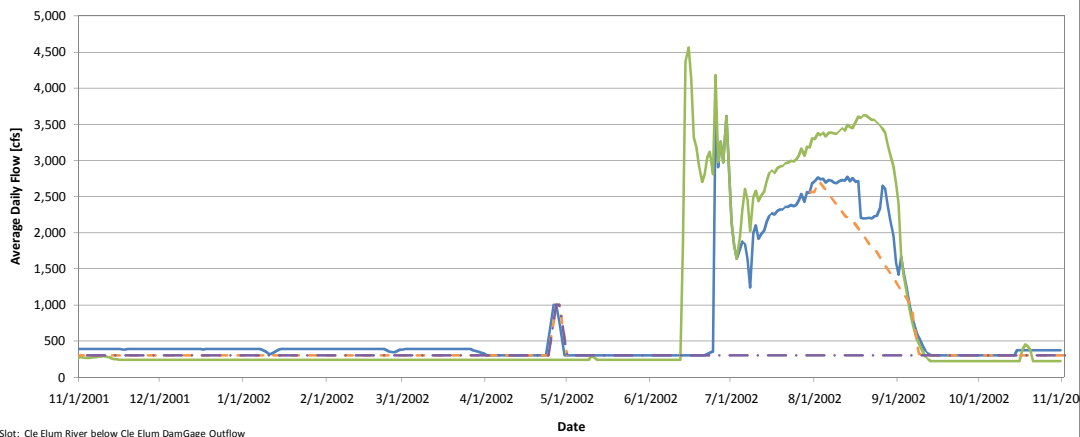
Cle Elum River Average Flows (WY 2003)

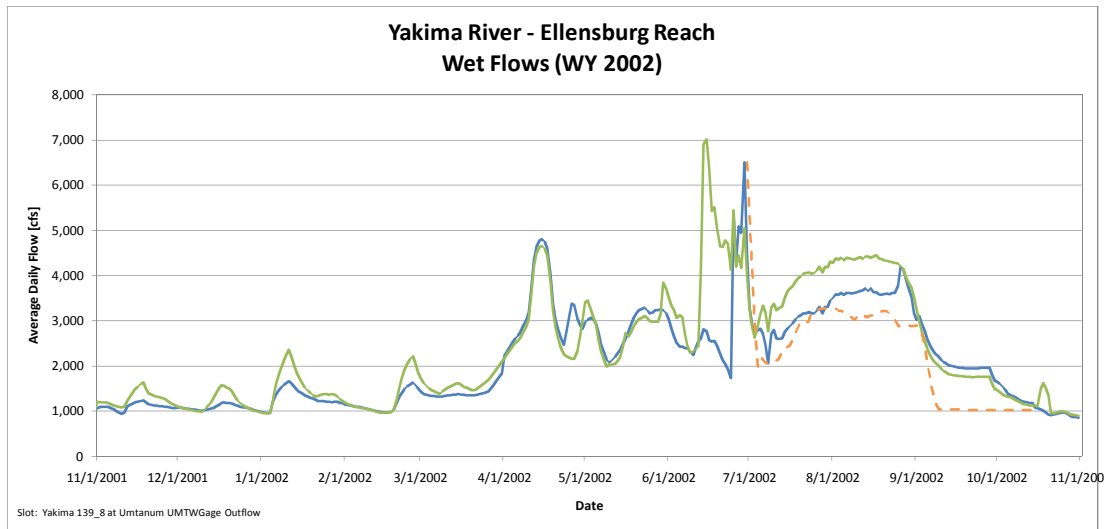
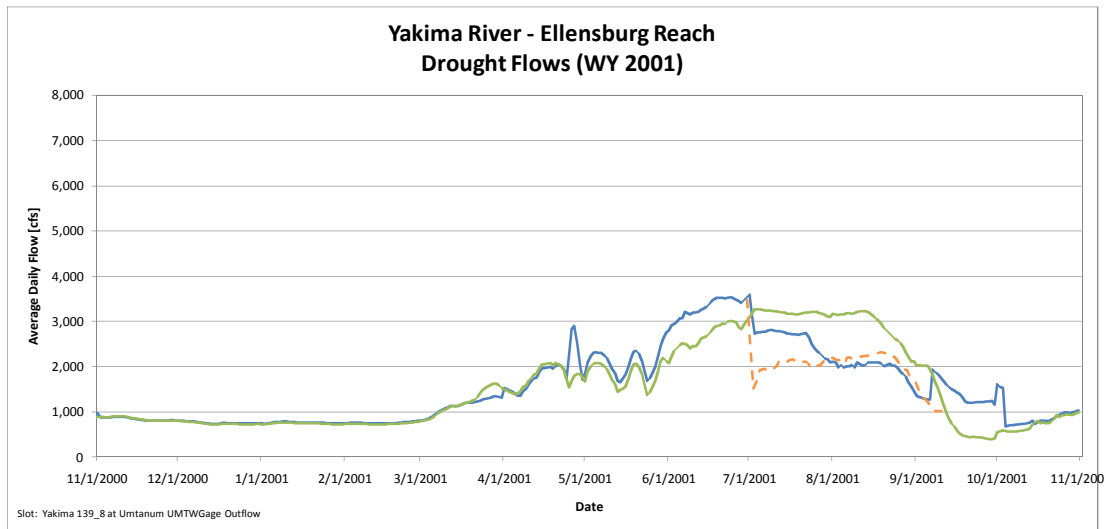
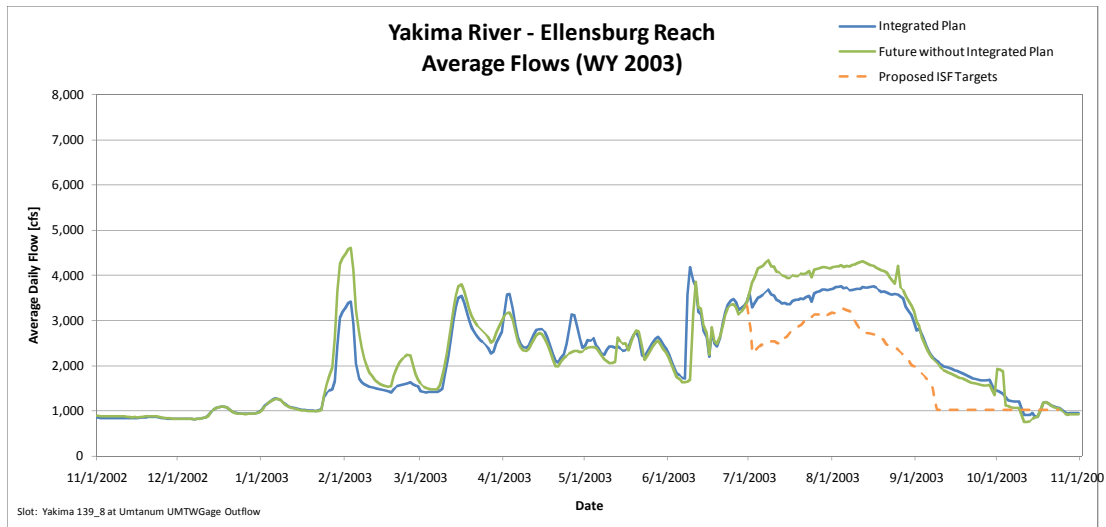


Cle Elum River Drought Flows (WY 2001)

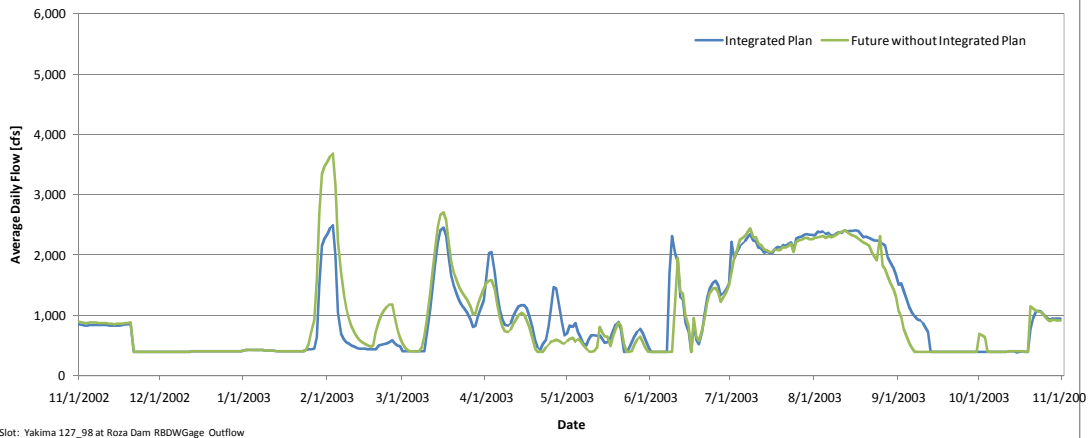


Cle Elum River Wet Flows (WY 2002)

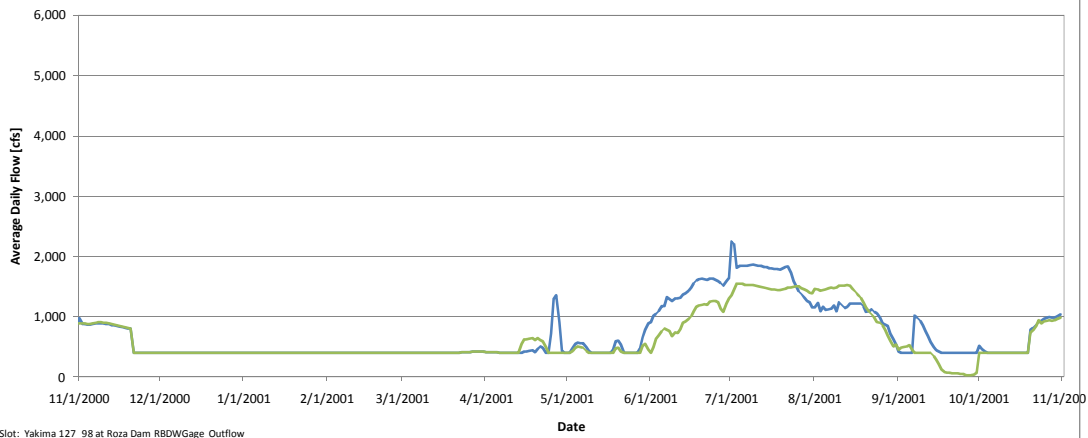




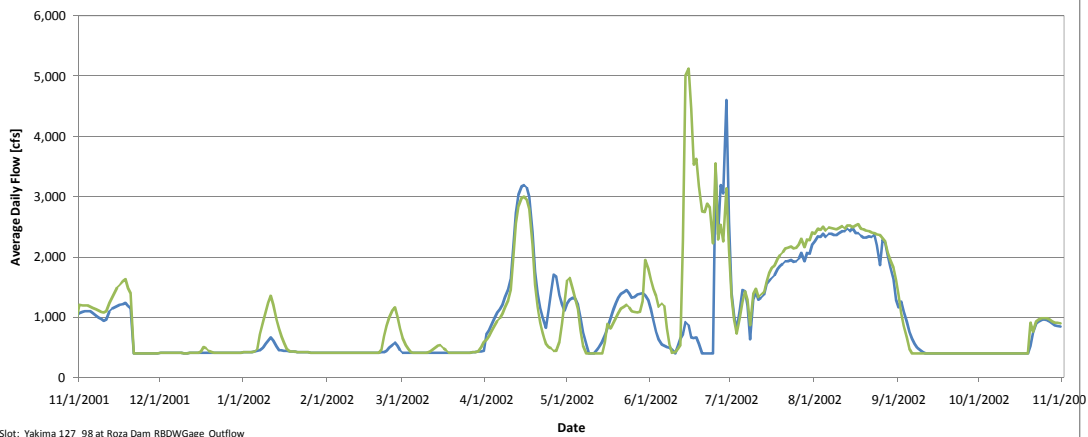
Yakima River - Selah Reach Average Flows (WY 2003)

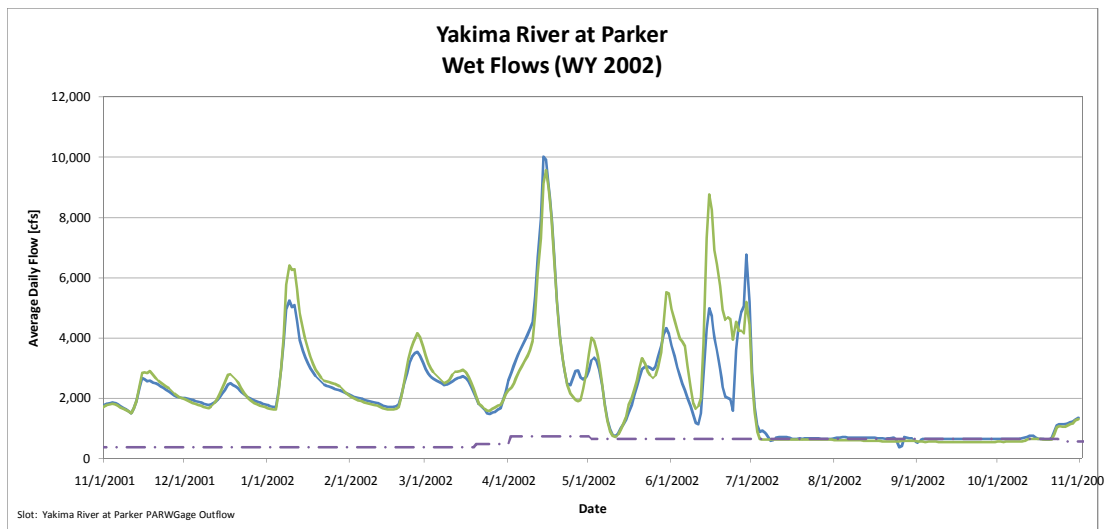
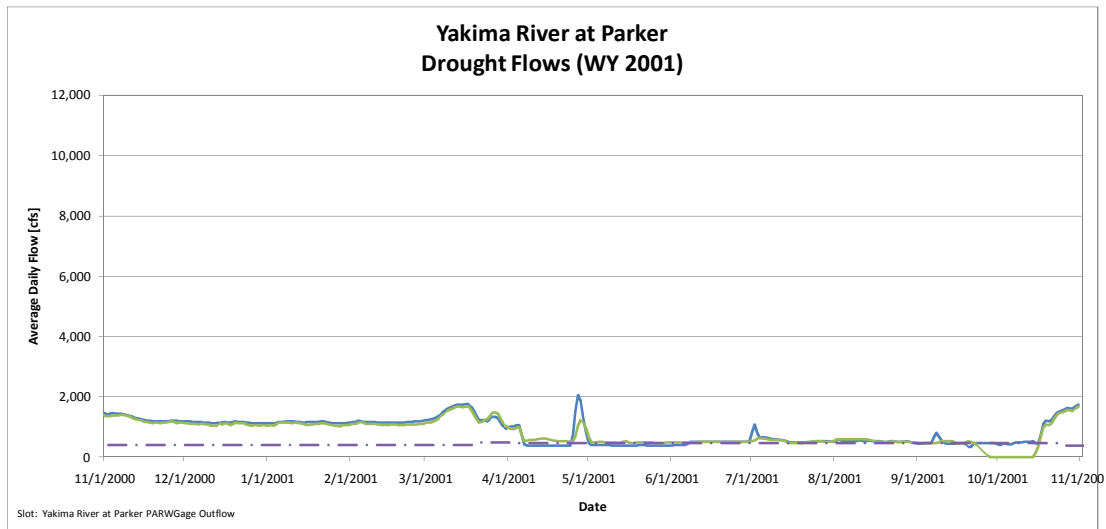
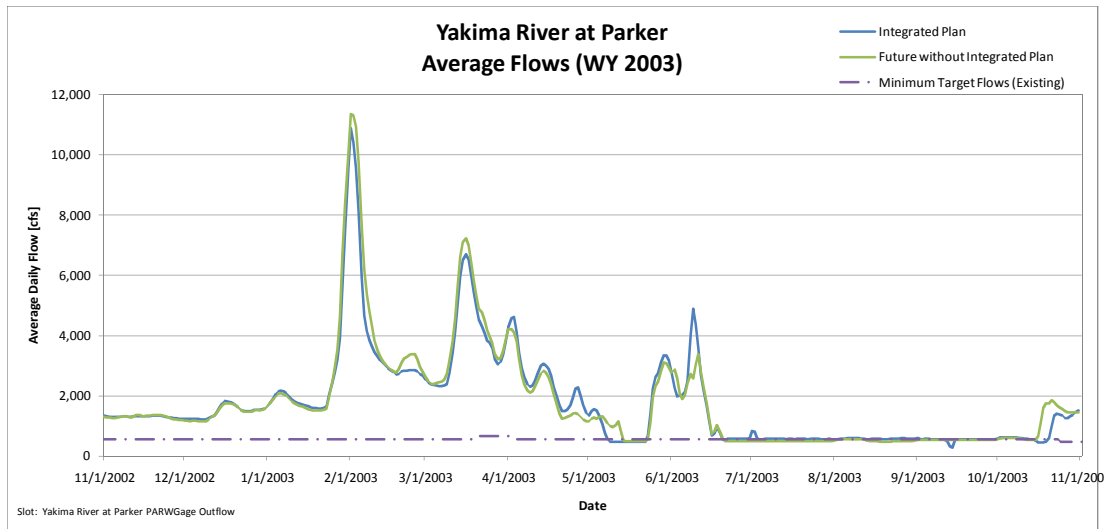


Yakima River - Selah Reach Drought Flows (WY 2001)

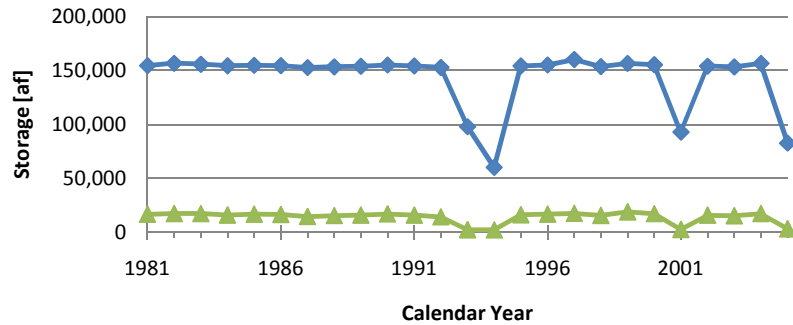


Yakima River - Selah Reach Wet Flows (WY 2002)



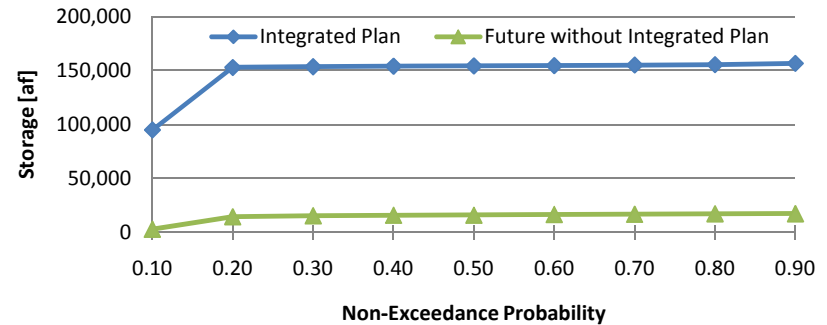


Bumping Reservoir September End of Month Storage



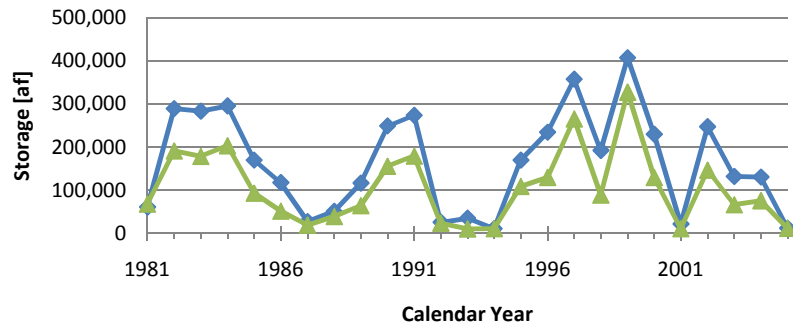
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Bumping Reservoir September End of Month Storage



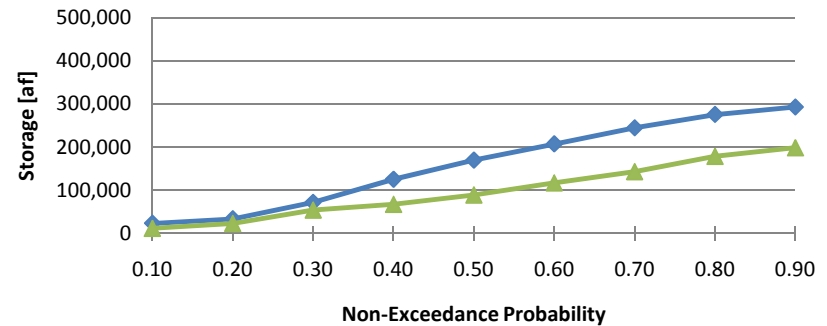
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Cle Elum Reservoir September End of Month Storage



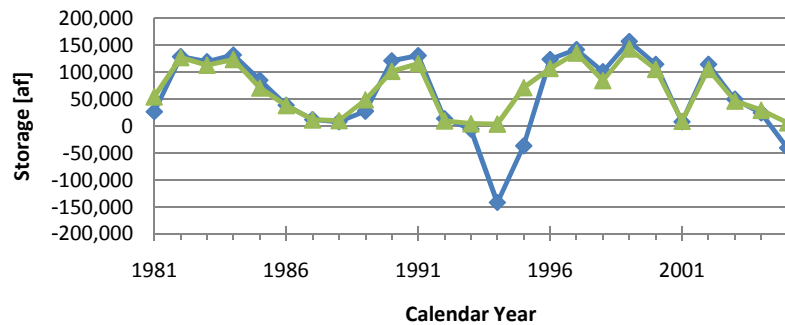
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Cle Elum Reservoir September End of Month Storage



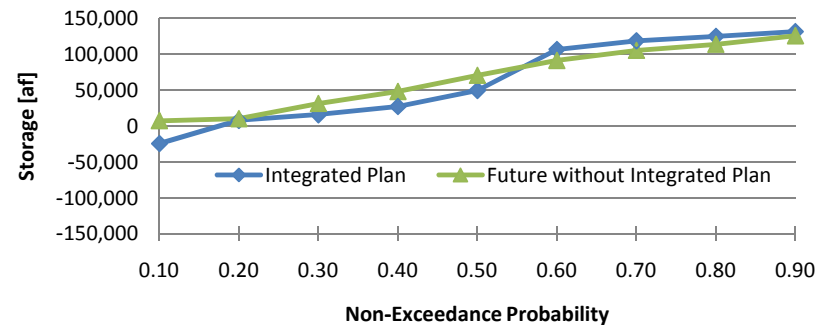
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Kachess Reservoir September End of Month Storage



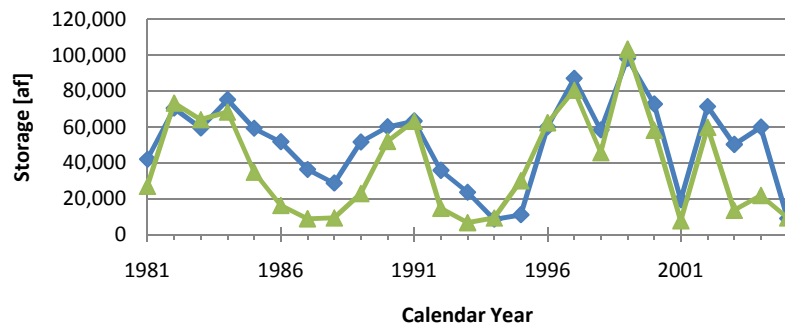
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Kachess Reservoir September End of Month Storage



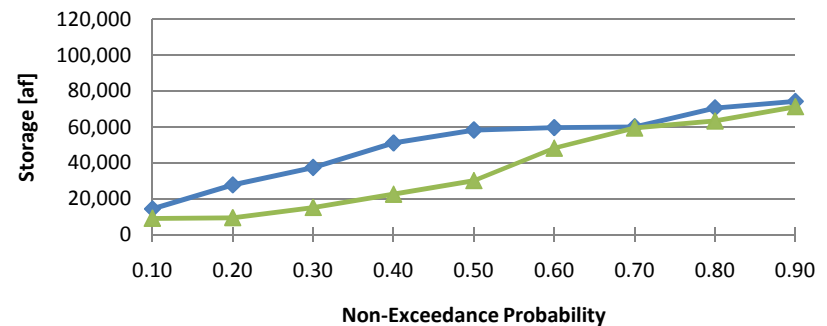
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Keechelus Reservoir September End of Month Storage



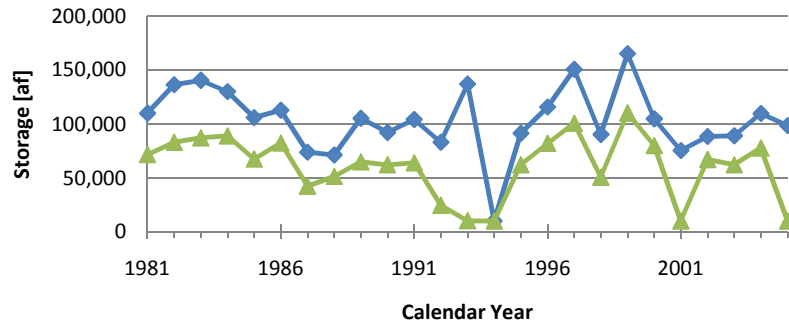
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Keechelus Reservoir September End of Month Storage



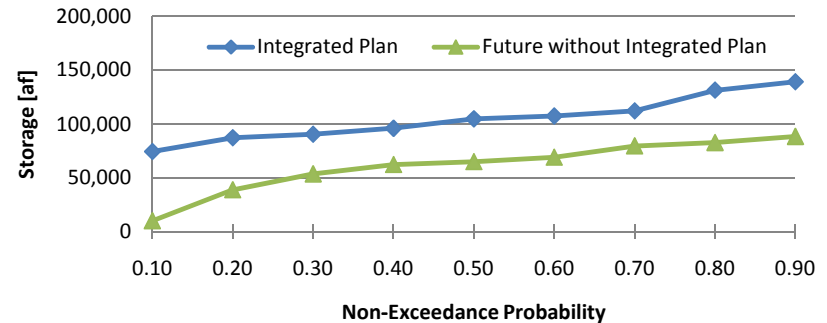
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Rimrock Reservoir September End of Month Storage



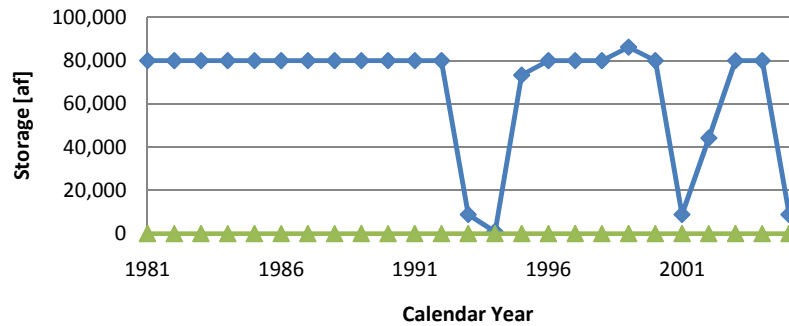
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Rimrock Reservoir September End of Month Storage



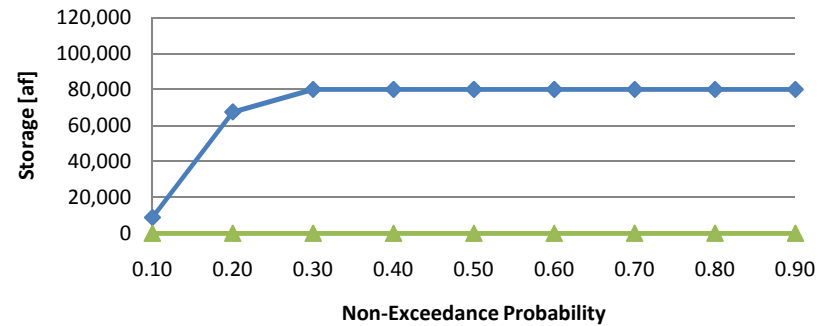
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Wymer Reservoir September End of Month Storage



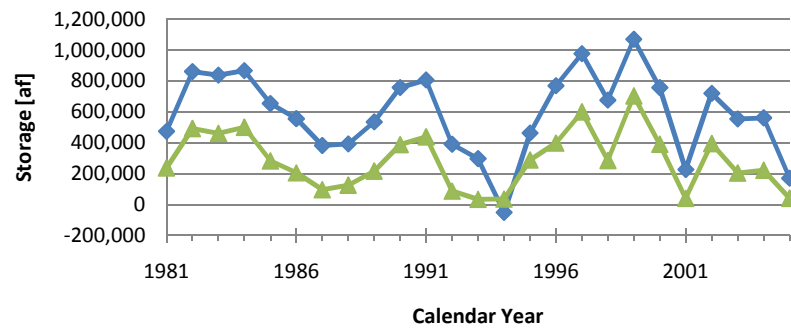
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Wymer Reservoir September End of Month Storage

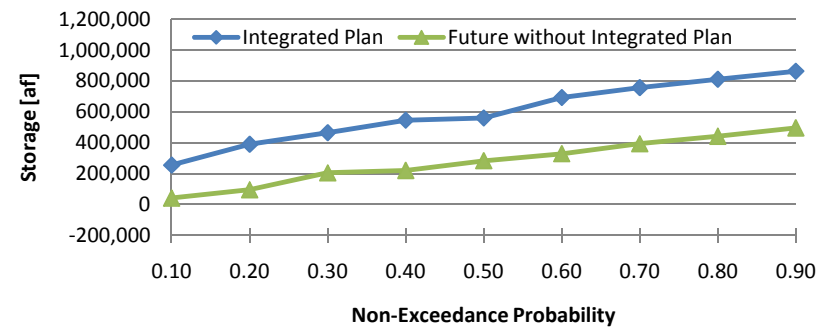


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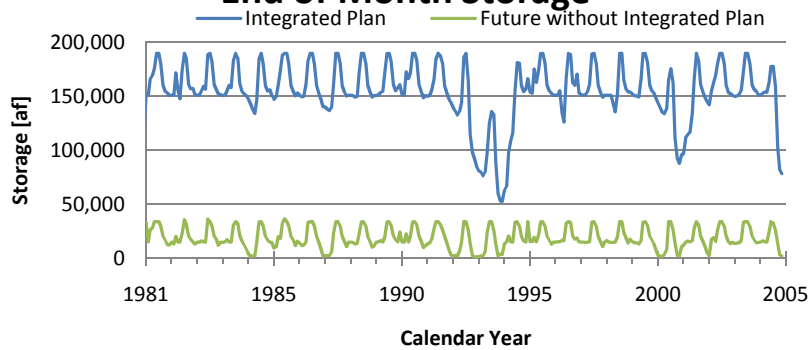
All Reservoirs September End of Month Storage



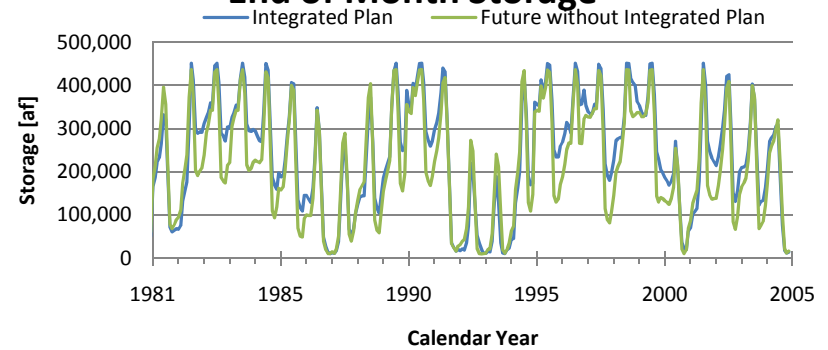
All Reservoirs September End of Month Storage



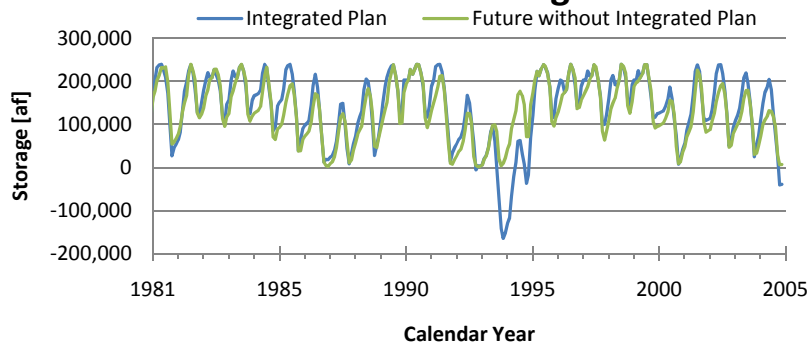
Bumping Reservoir End of Month Storage



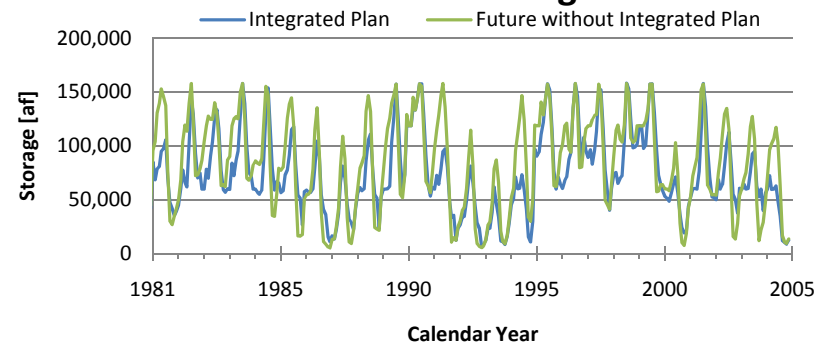
Cle Elum Reservoir End of Month Storage



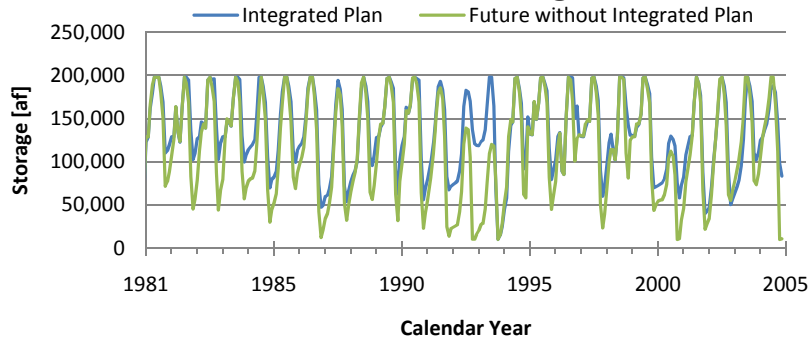
Kachess Reservoir End of Month Storage



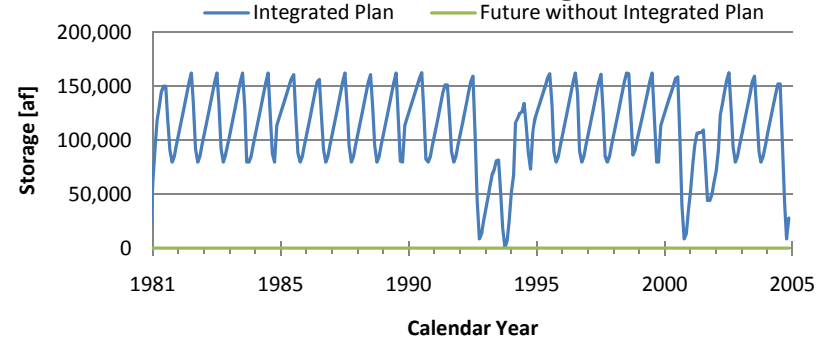
Keechelus Reservoir End of Month Storage



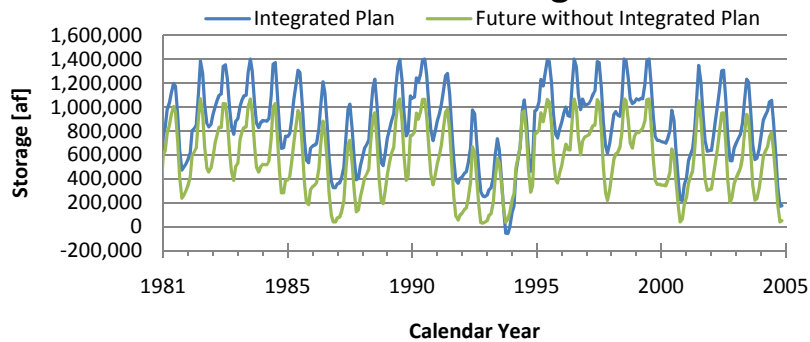
Rimrock Reservoir End of Month Storage



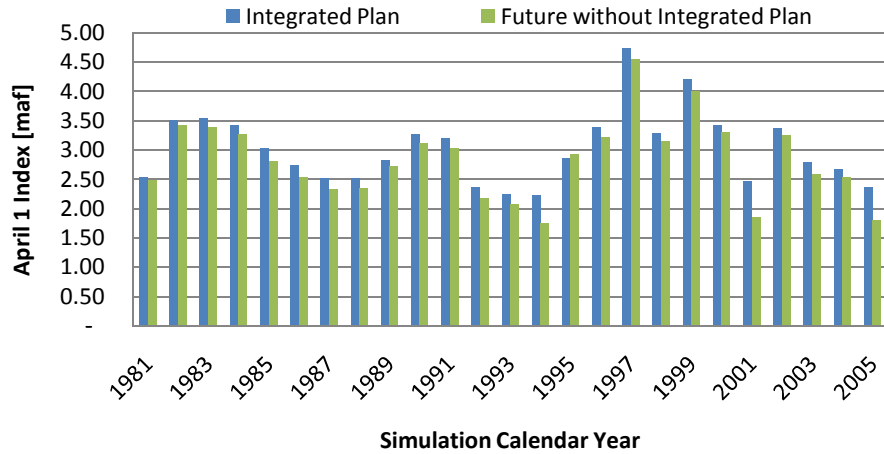
Wymer Reservoir End of Month Storage



All Reservoirs End of Month Storage

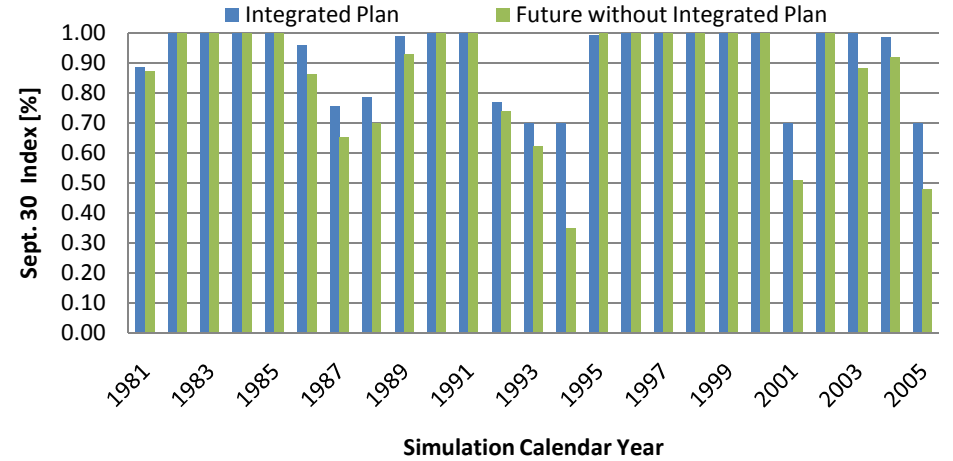


Water Supply Index: TWSA



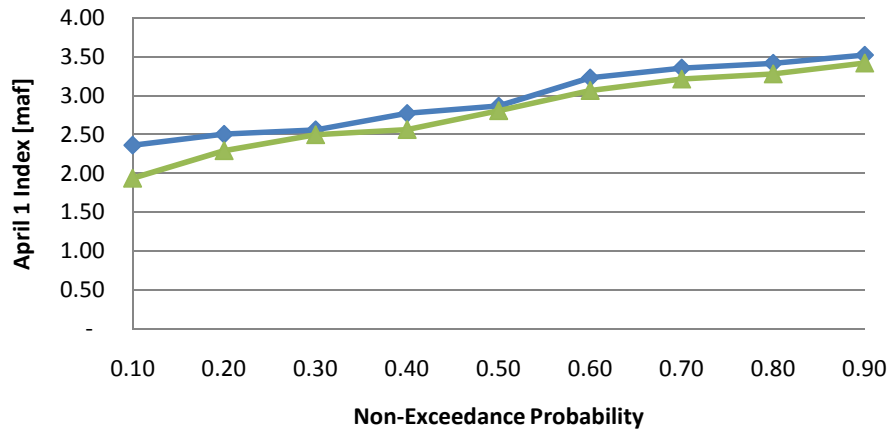
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Water Supply Index: Proration



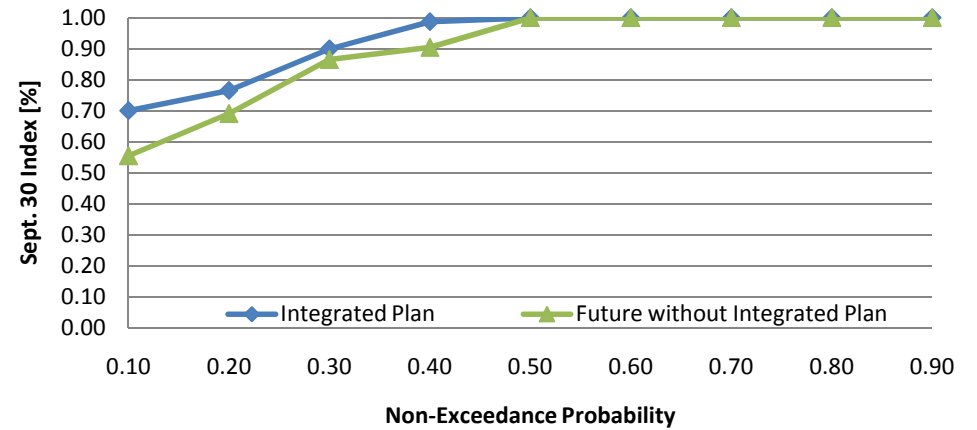
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Water Supply Index: TWSA

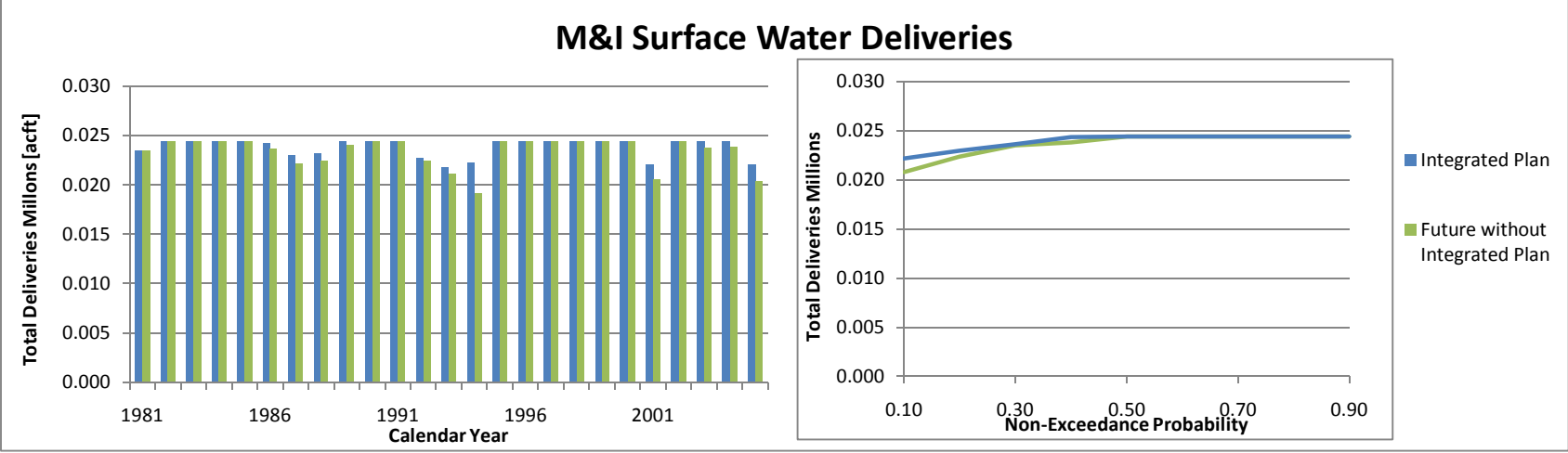
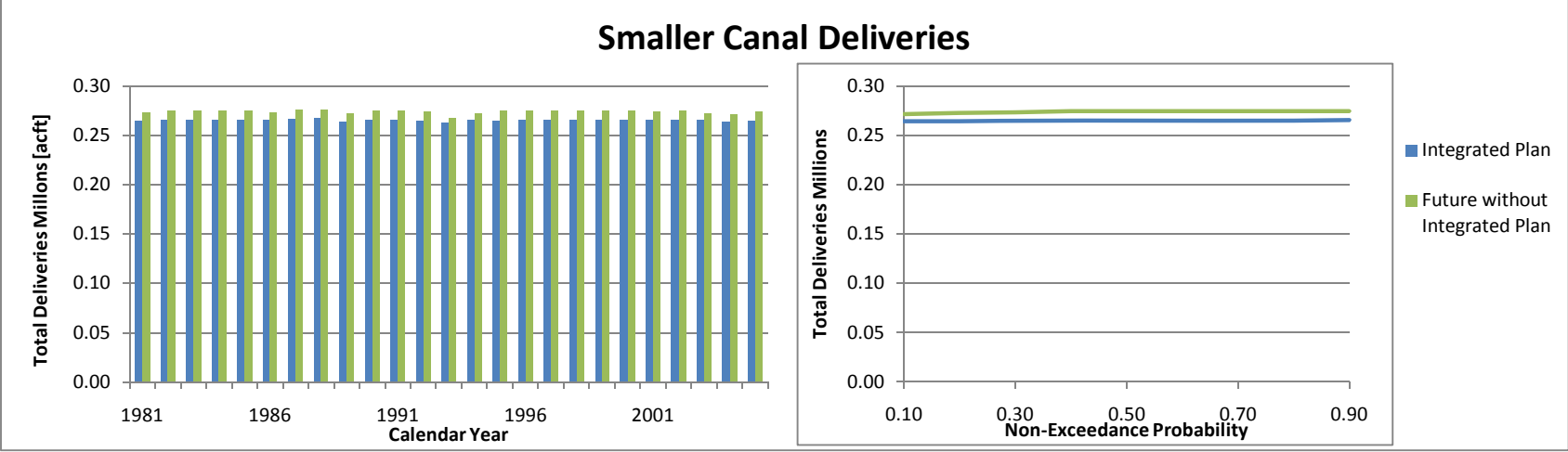
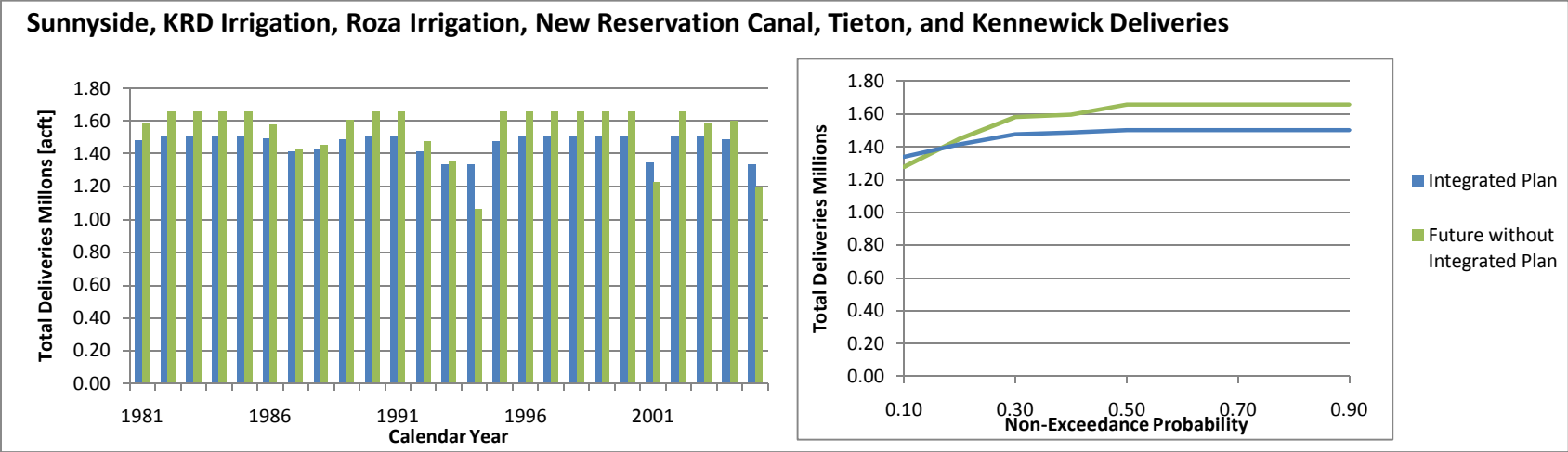
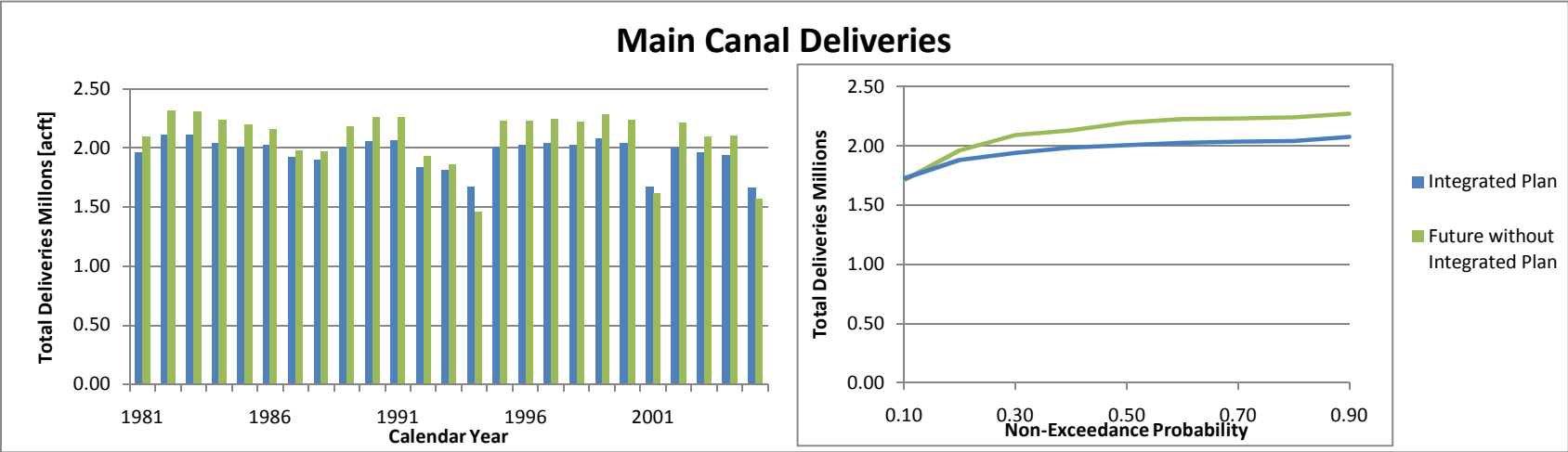


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Water Supply Index: Proration

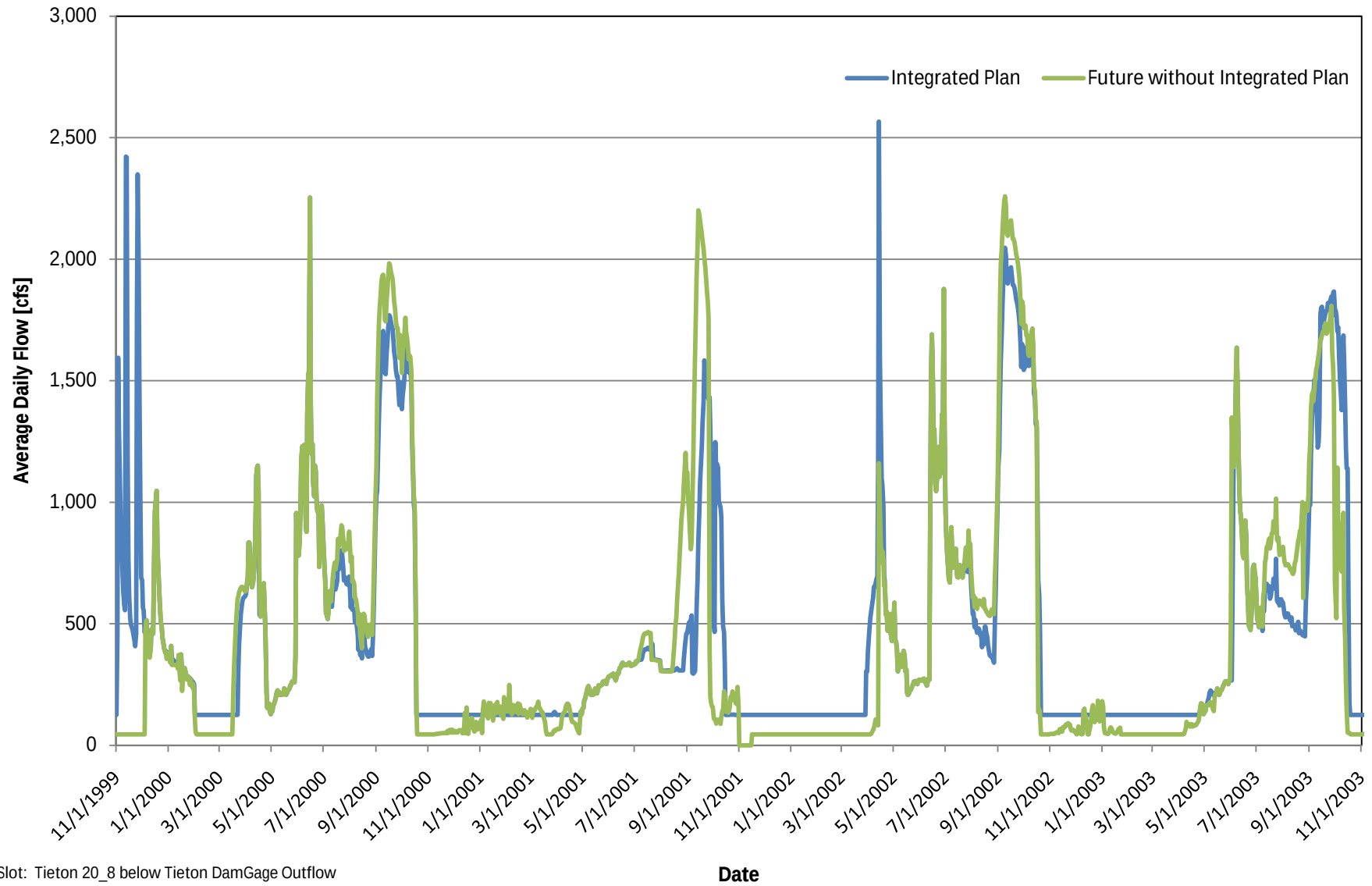


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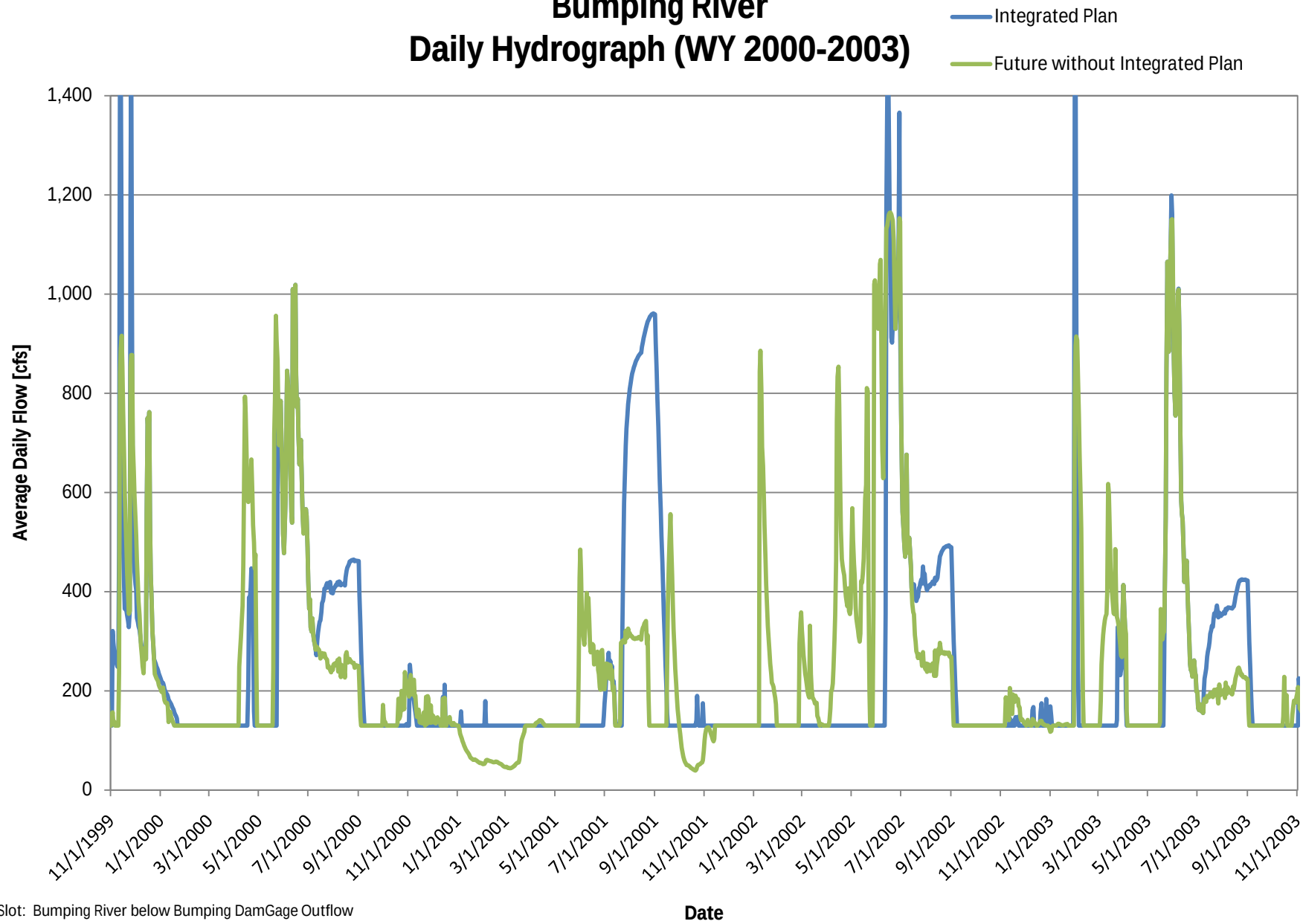


Tieton River

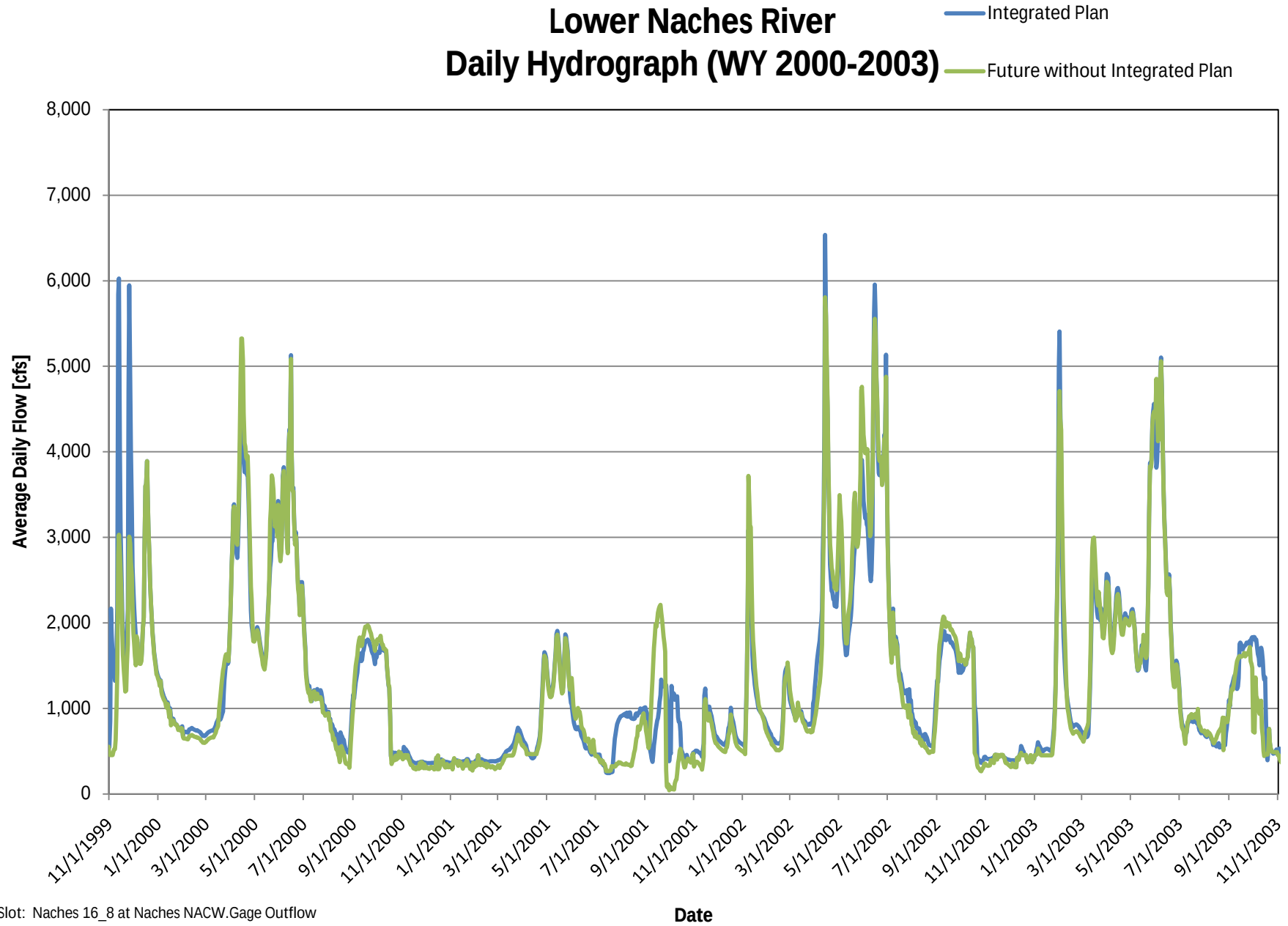
Daily Hydrograph (WY 2000-2003)



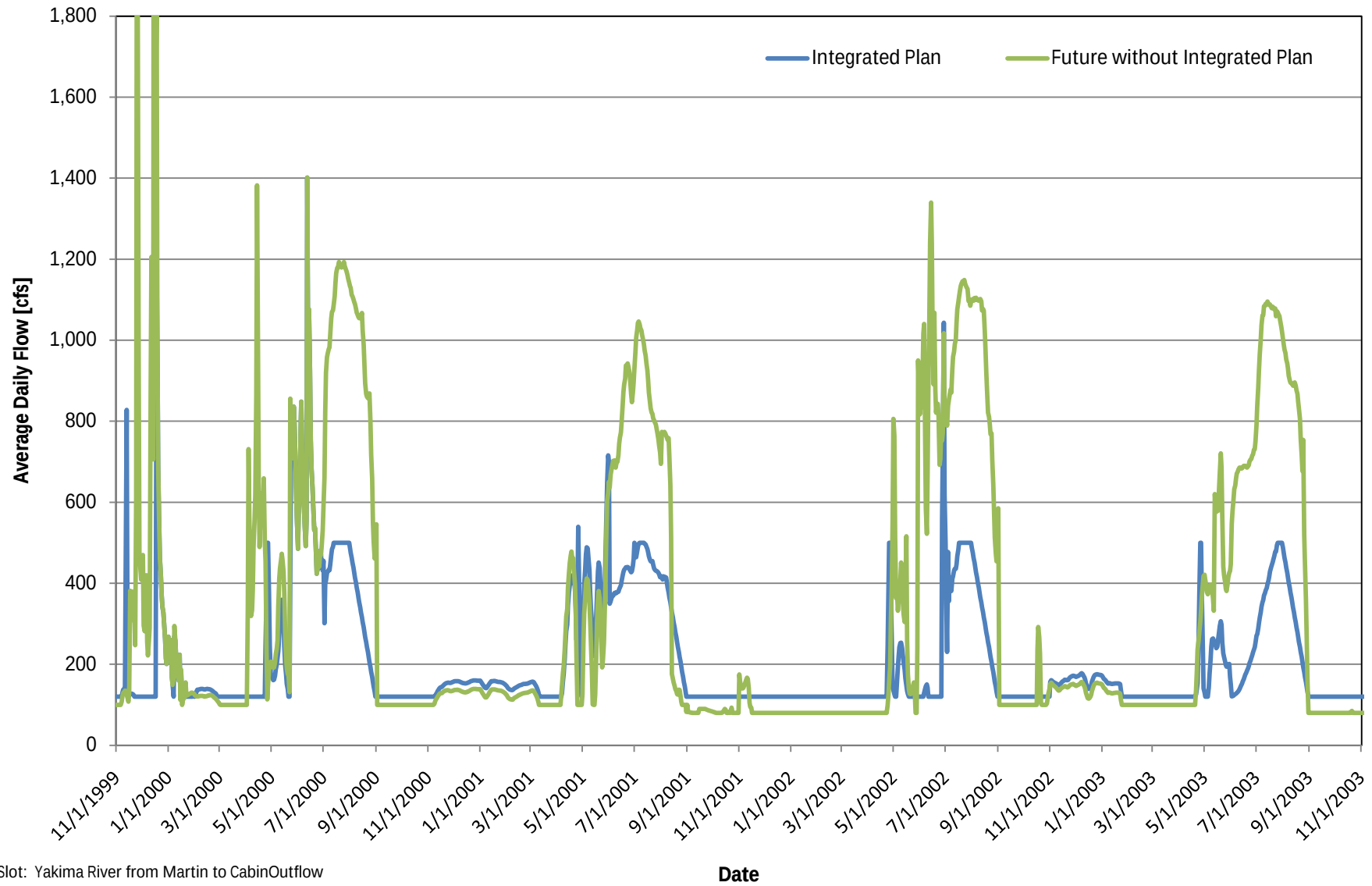
Bumping River Daily Hydrograph (WY 2000-2003)



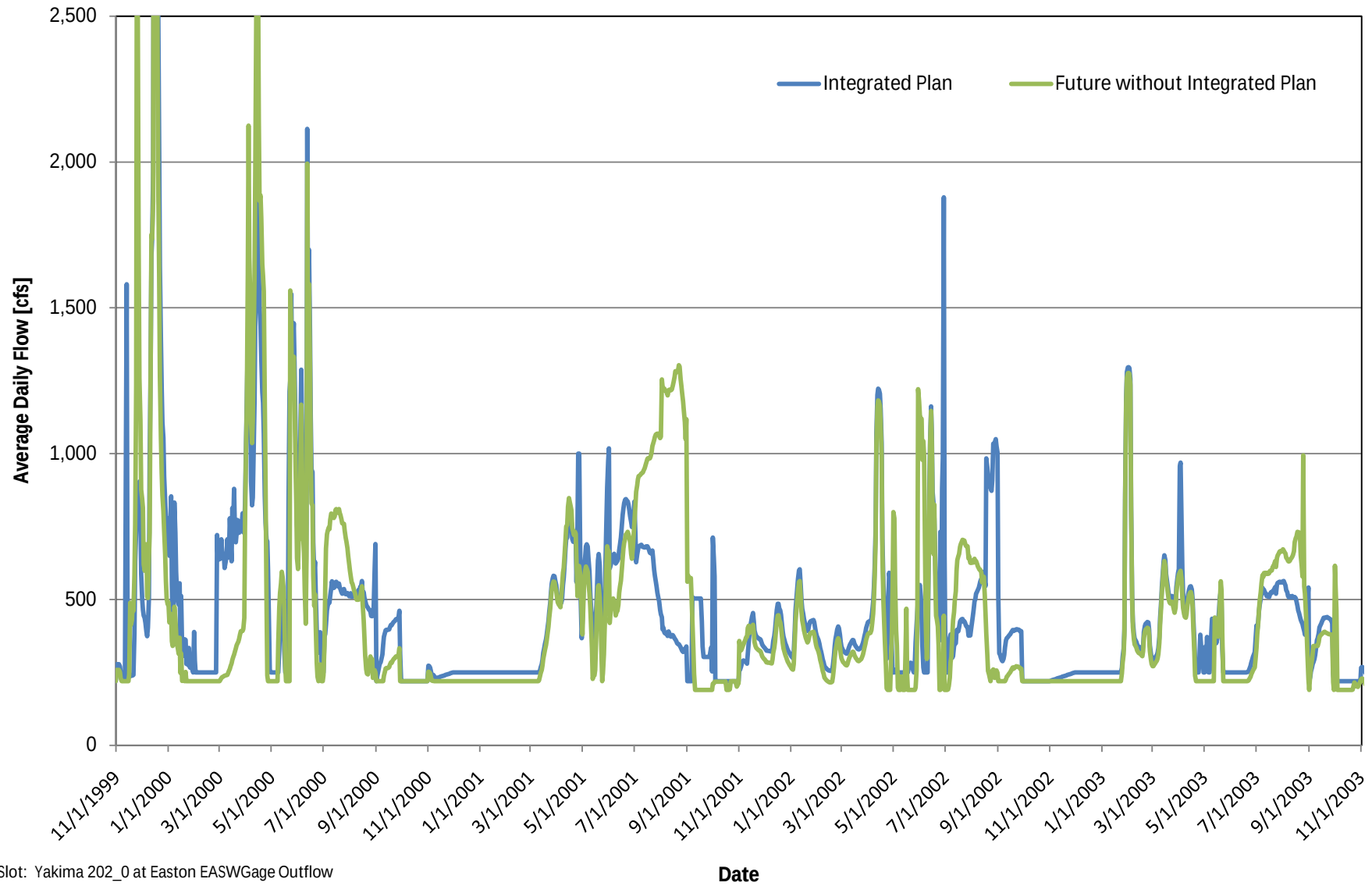
Lower Naches River Daily Hydrograph (WY 2000-2003)



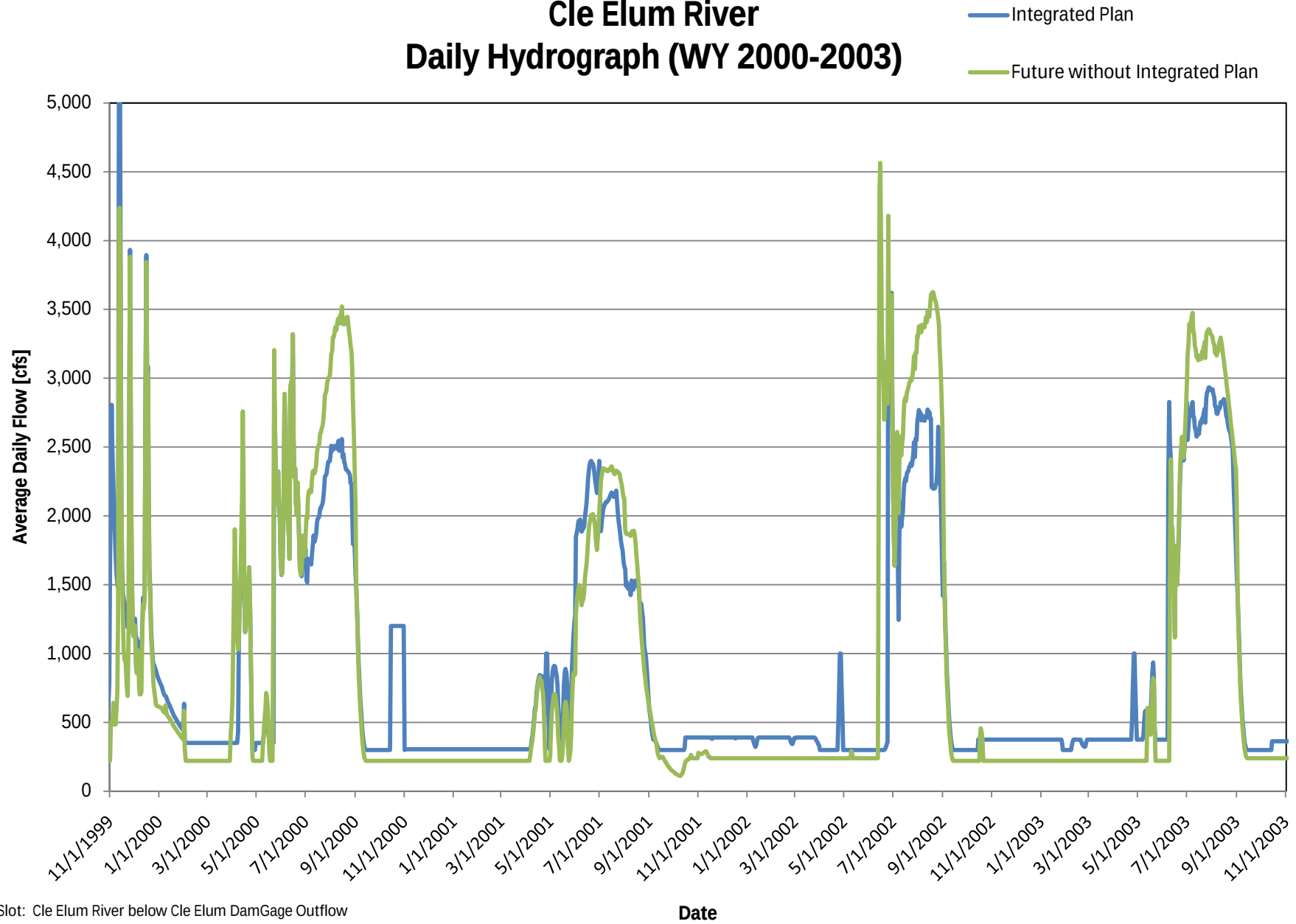
Yakima River, Keechelus Reservoir to Lake Easton Reach Daily Hydrograph (WY 2000-2003)



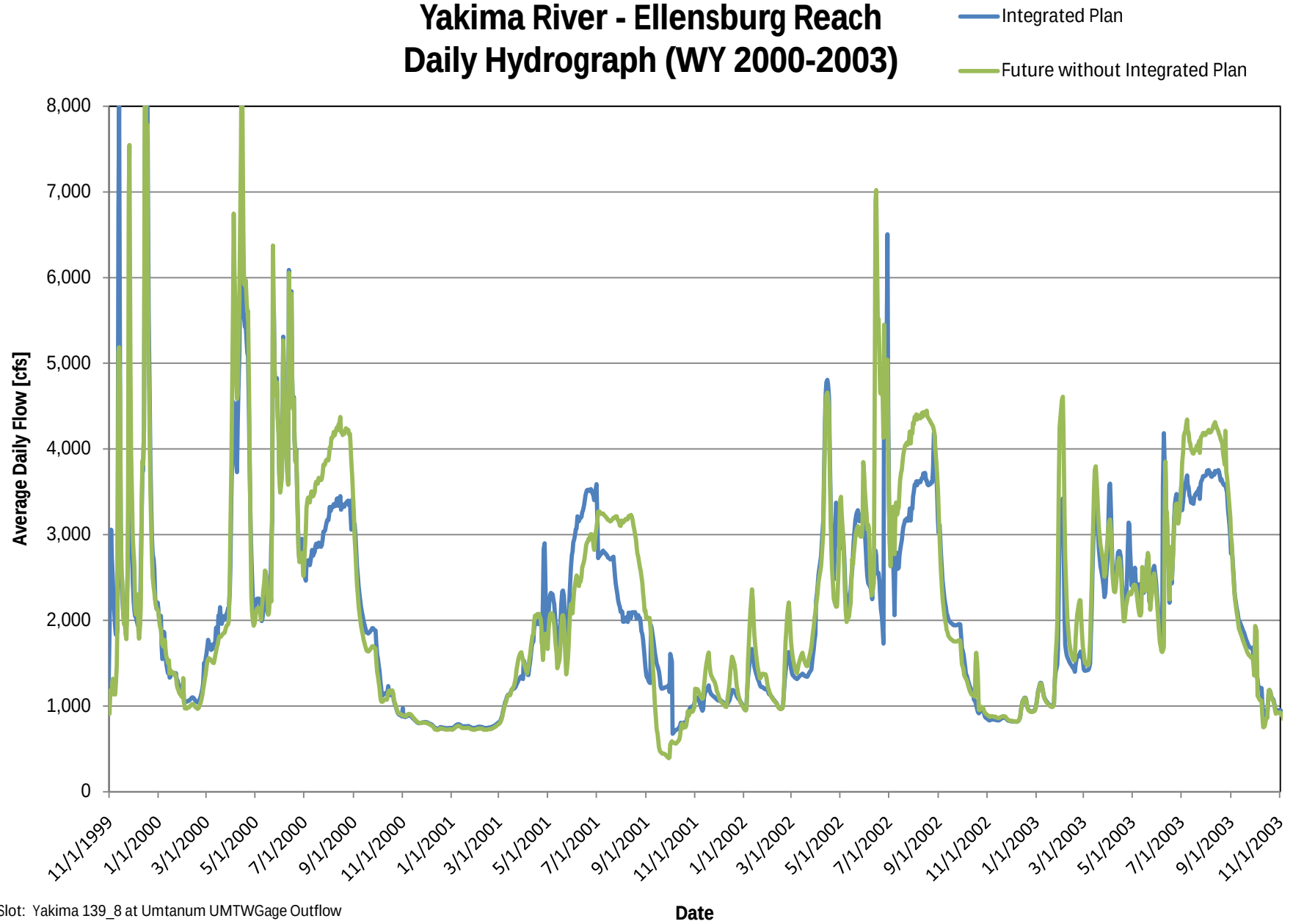
Yakima River - Easton Reach Daily Hydrograph (WY 2000-2003)



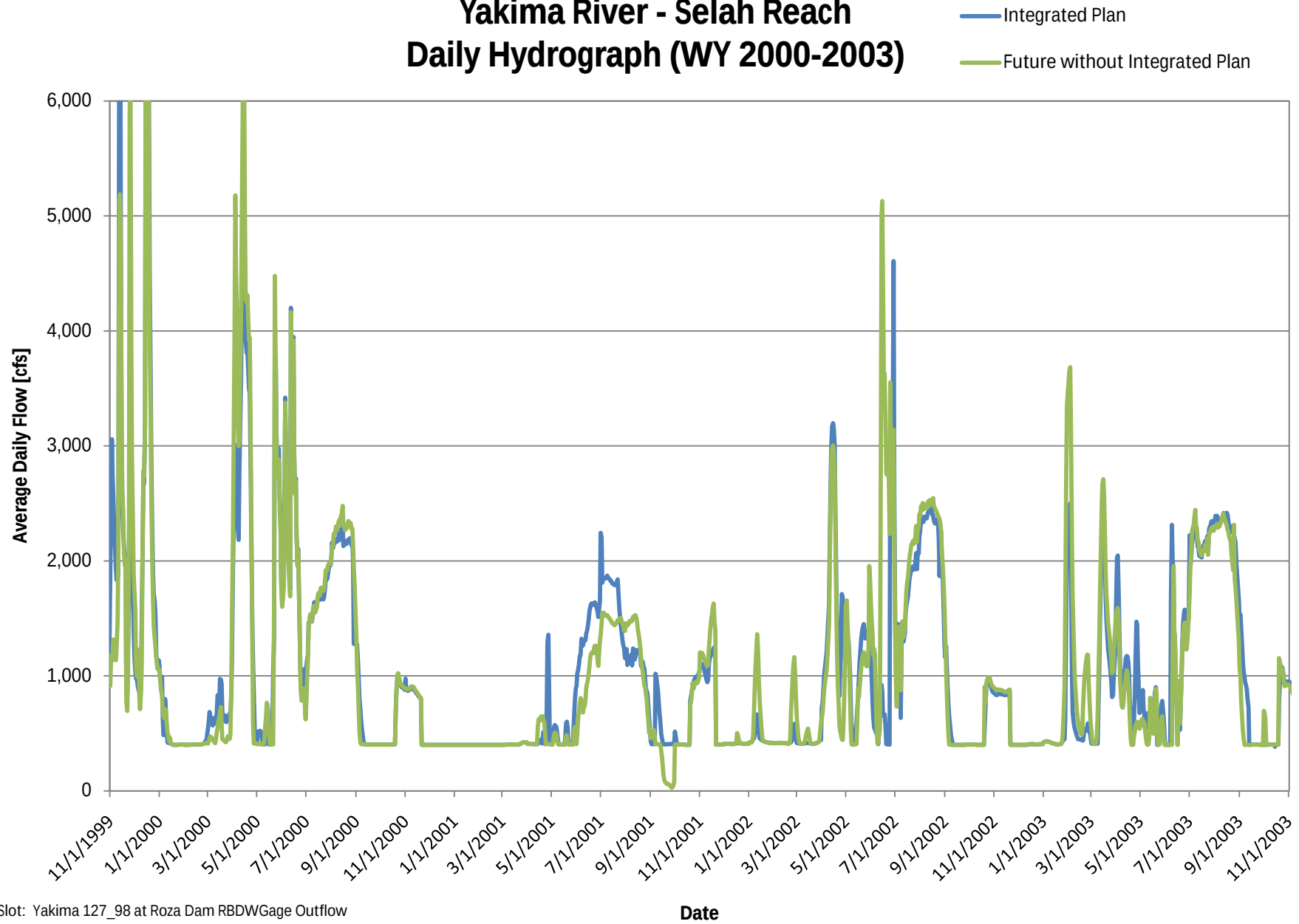
Cle Elum River Daily Hydrograph (WY 2000-2003)



Yakima River - Ellensburg Reach Daily Hydrograph (WY 2000-2003)

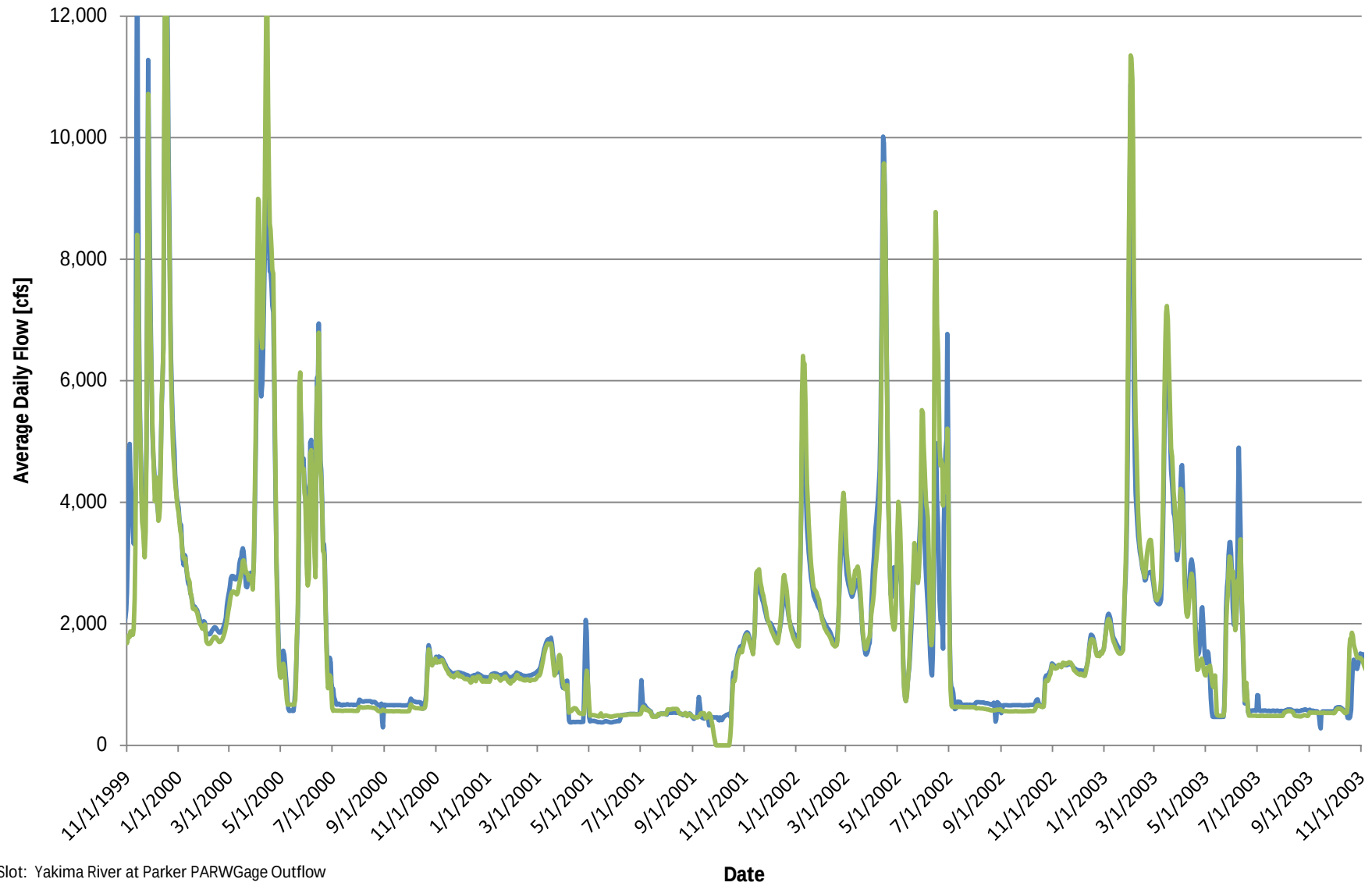


Yakima River - Selah Reach Daily Hydrograph (WY 2000-2003)



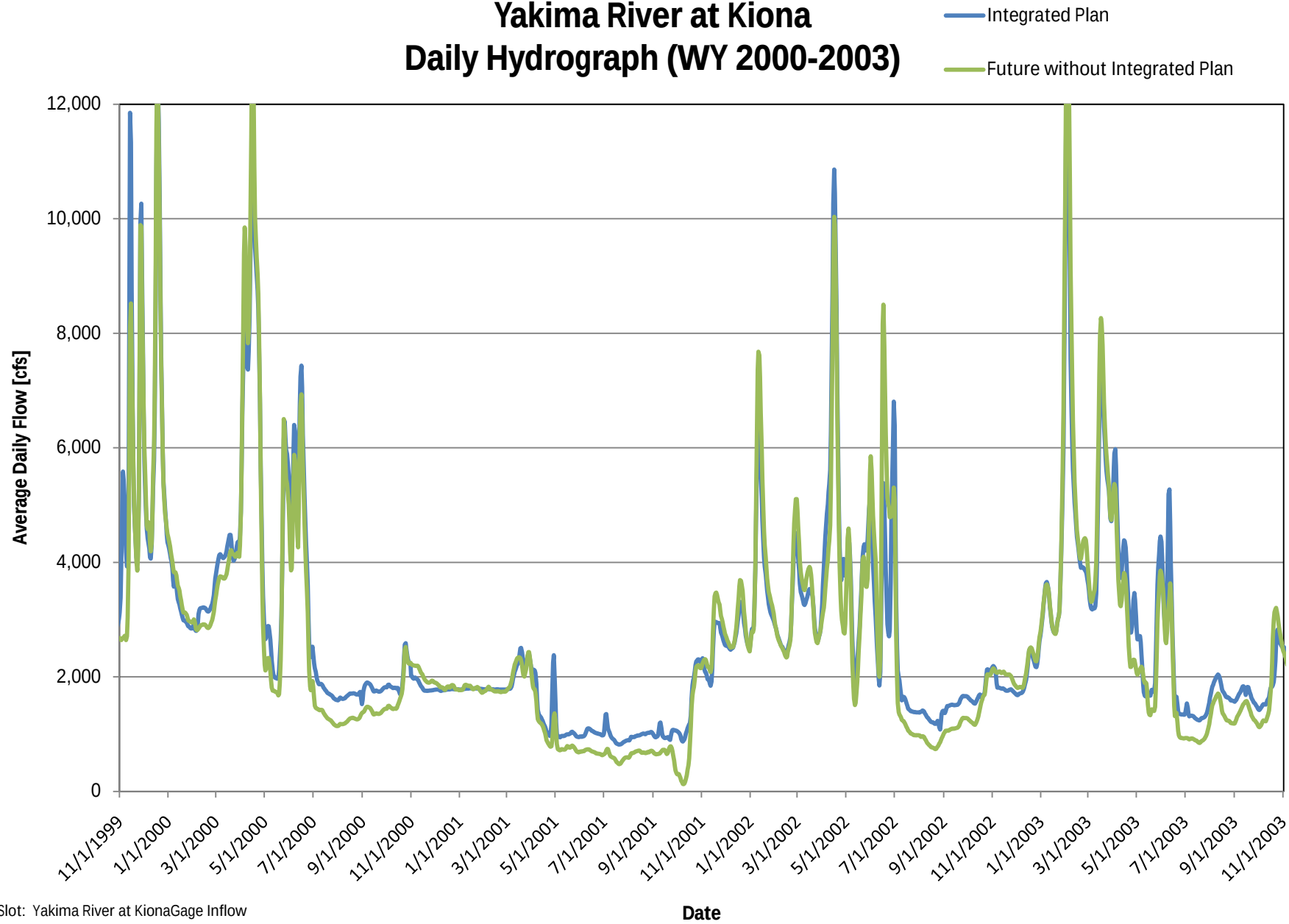
Yakima River at Parker Daily Hydrograph (WY 2000-2003)

Integrated Plan
Future without Integrated Plan

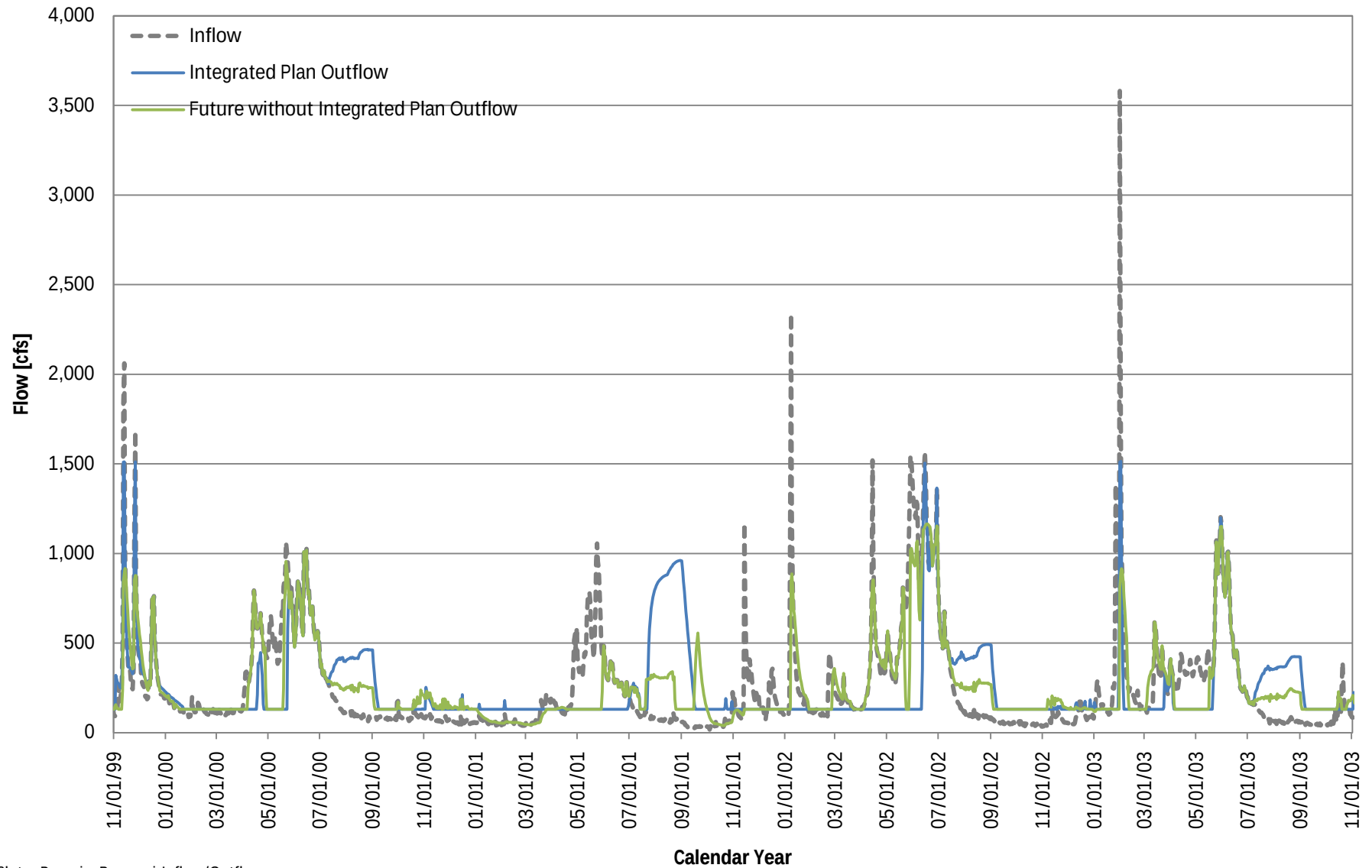


Slot: Yakima River at Parker PARWGage Outflow

Yakima River at Kiona Daily Hydrograph (WY 2000-2003)



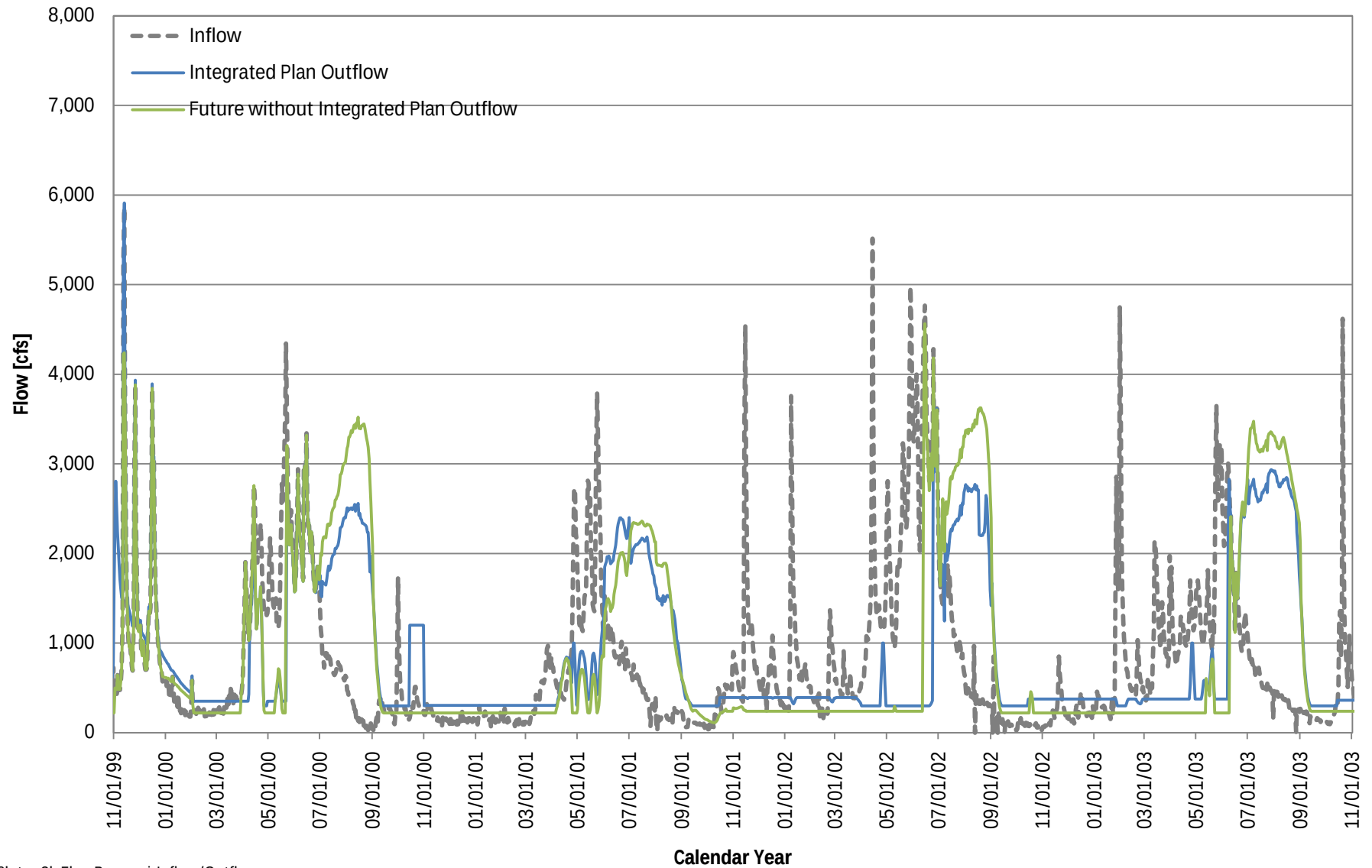
Bumping Reservoir Daily Hydrograph (WY 2000-2003)



Slots: BumpingReservoirInflow/Outflow

Cle Elum Reservoir

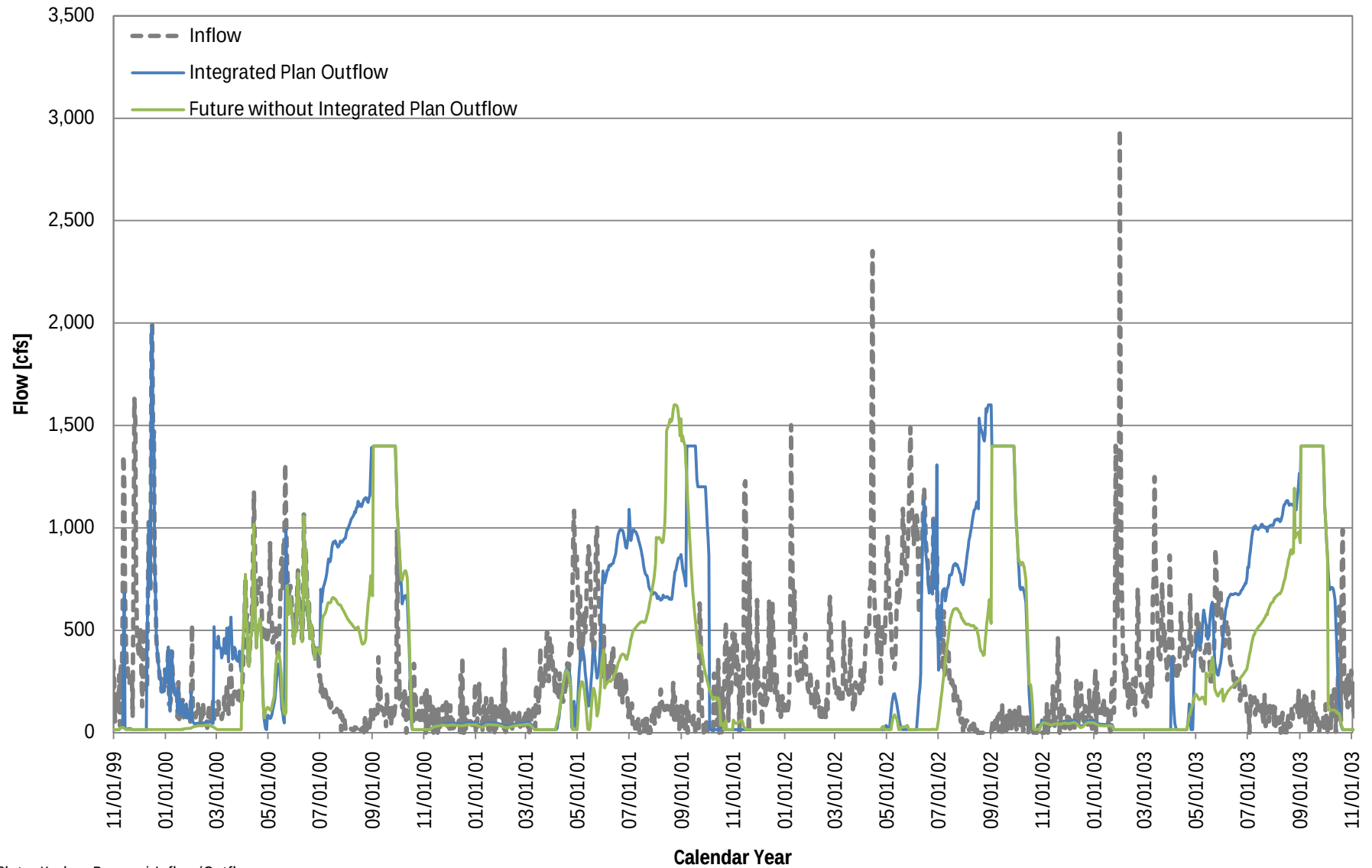
Daily Hydrograph (WY 2000-2003)



Slots: CleElumReservoirInflow/Outflow

Kachess Reservoir

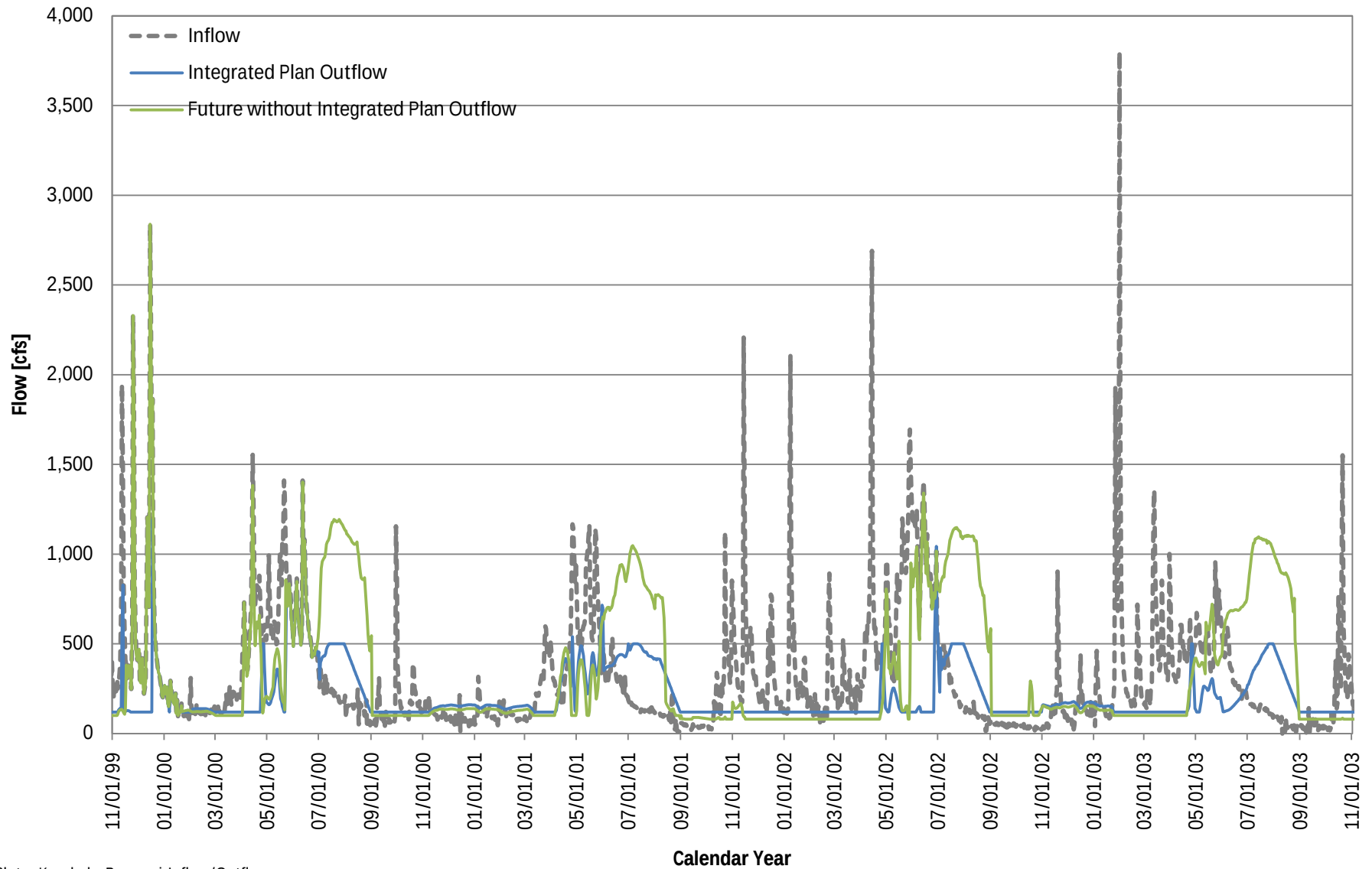
Daily Hydrograph (WY 2000-2003)



Slots: KachessReservoirInflow/Outflow

Keechelus Reservoir

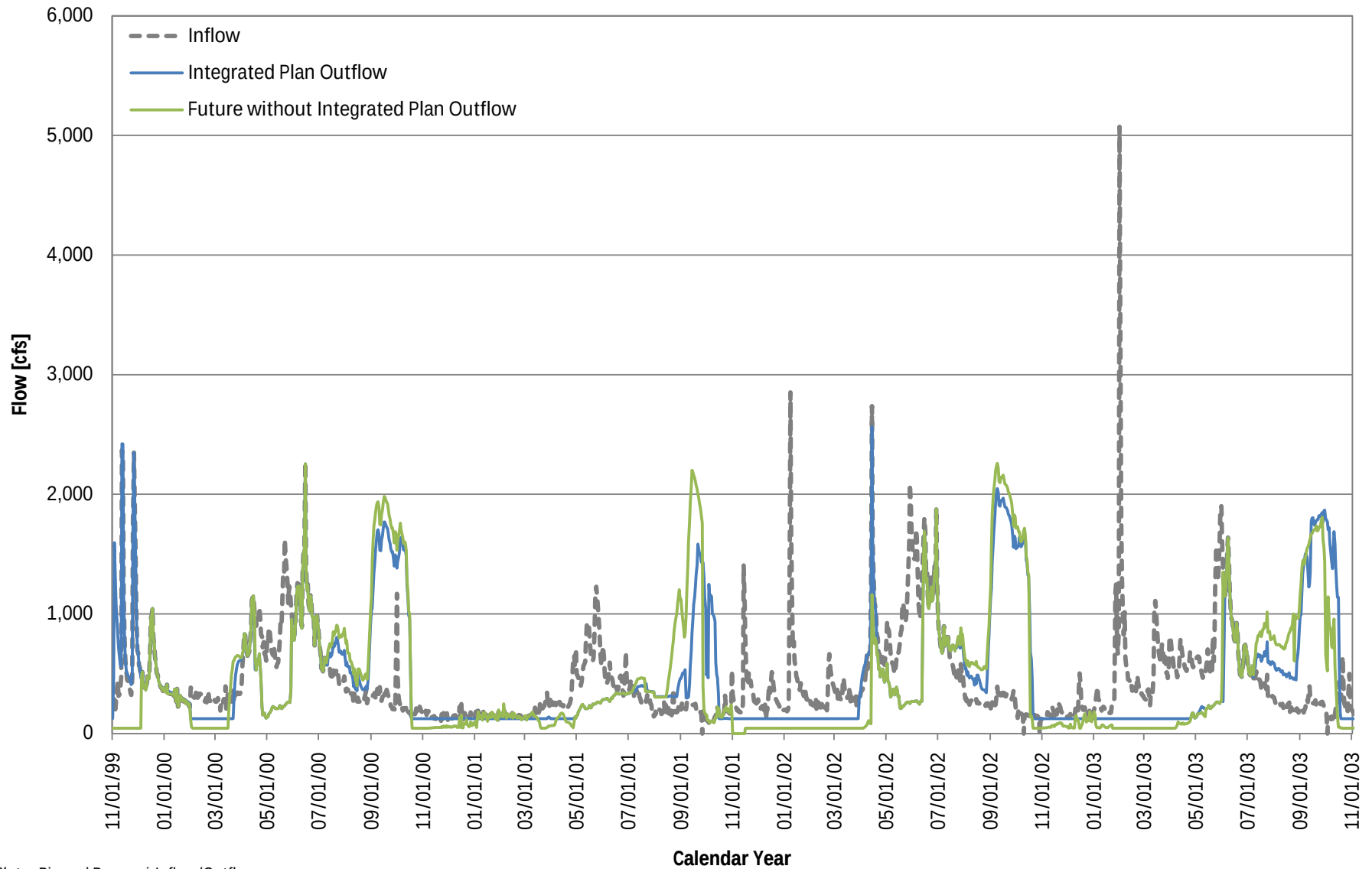
Daily Hydrograph (WY 2000-2003)



Slots: KeechelusReservoirInflow/Outflow

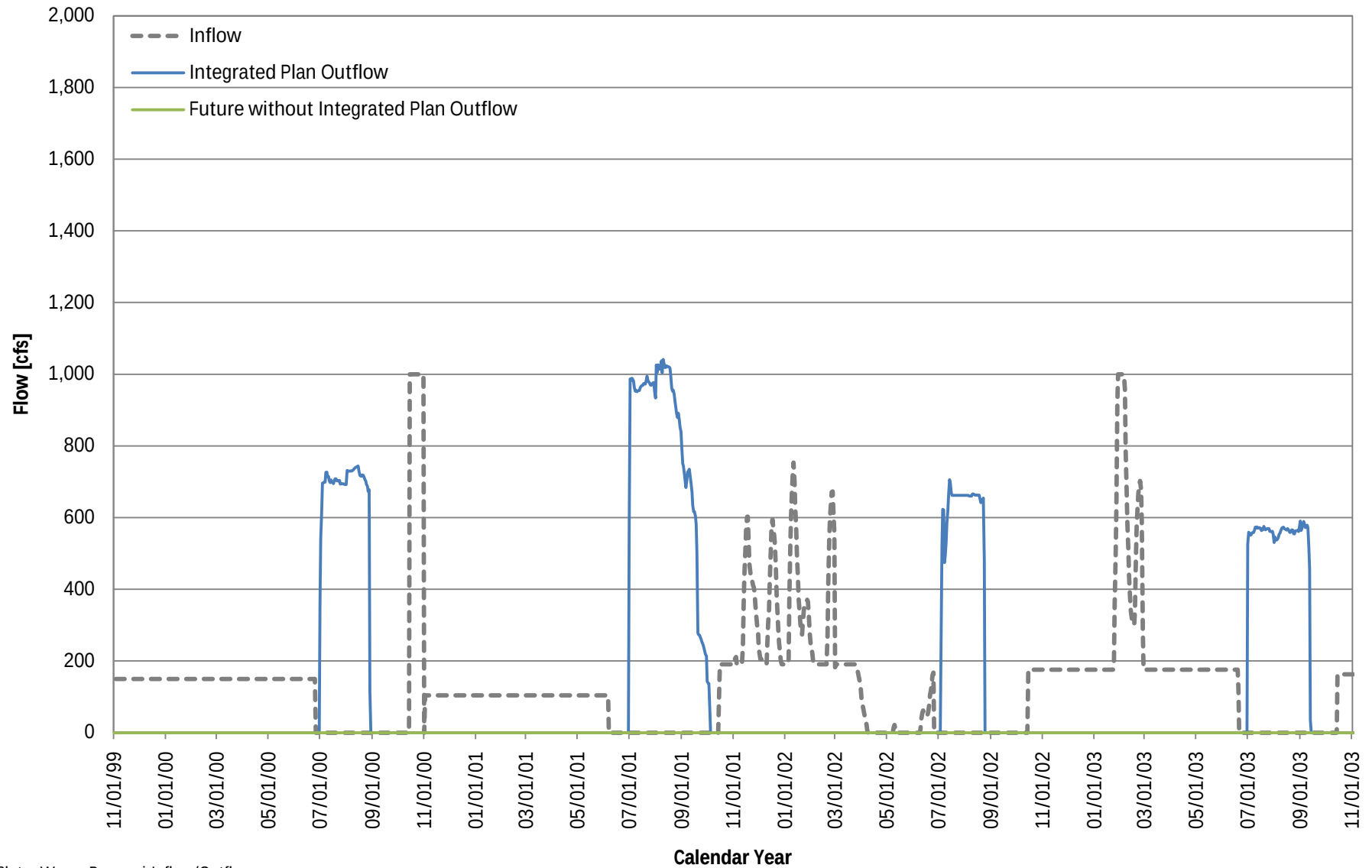
Rimrock Reservoir

Daily Hydrograph (WY 2000-2003)



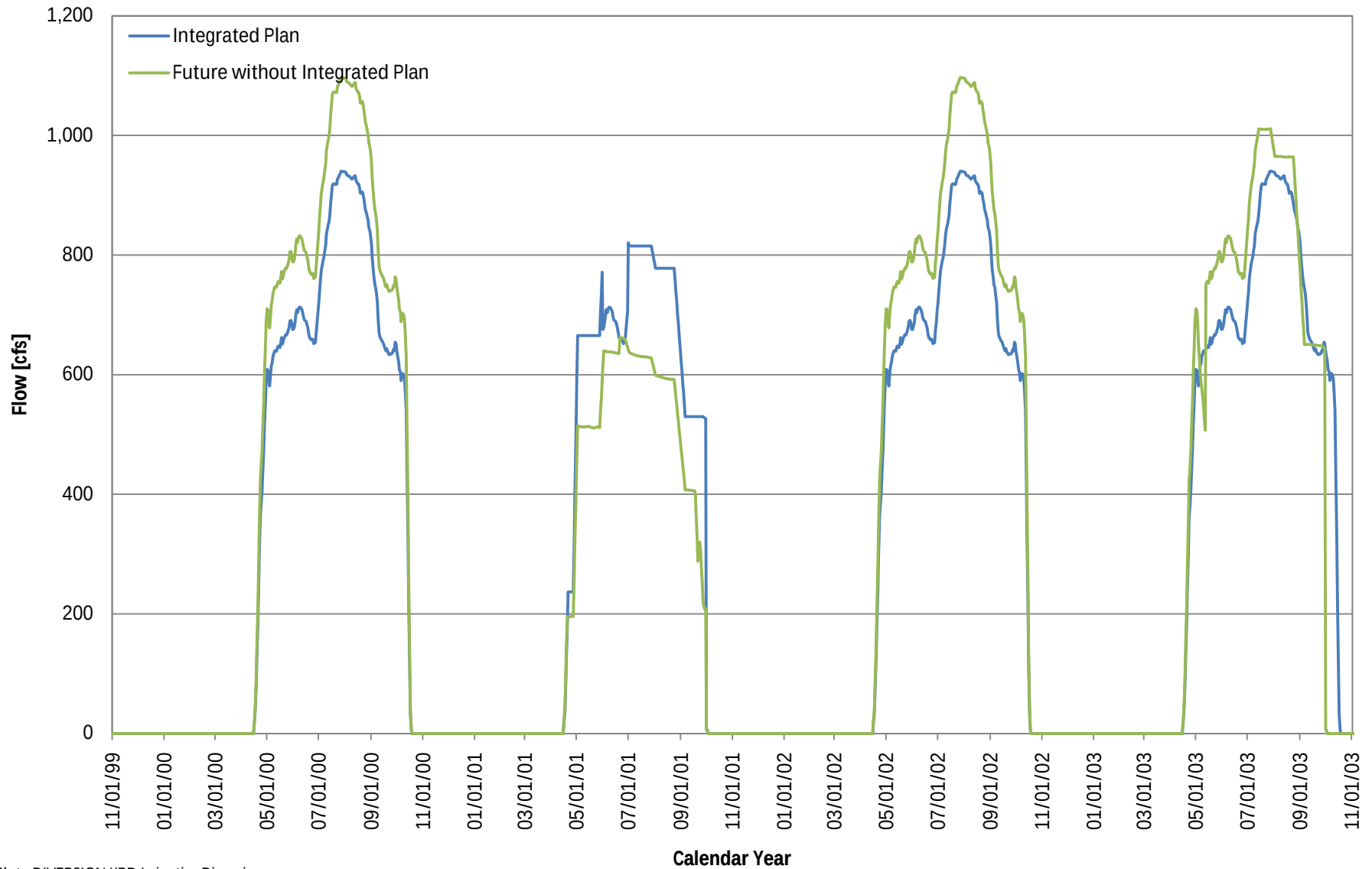
Slots: RimrockReservoirInflow/Outflow

Wymer Reservoir Daily Hydrograph (WY 2000-2003)



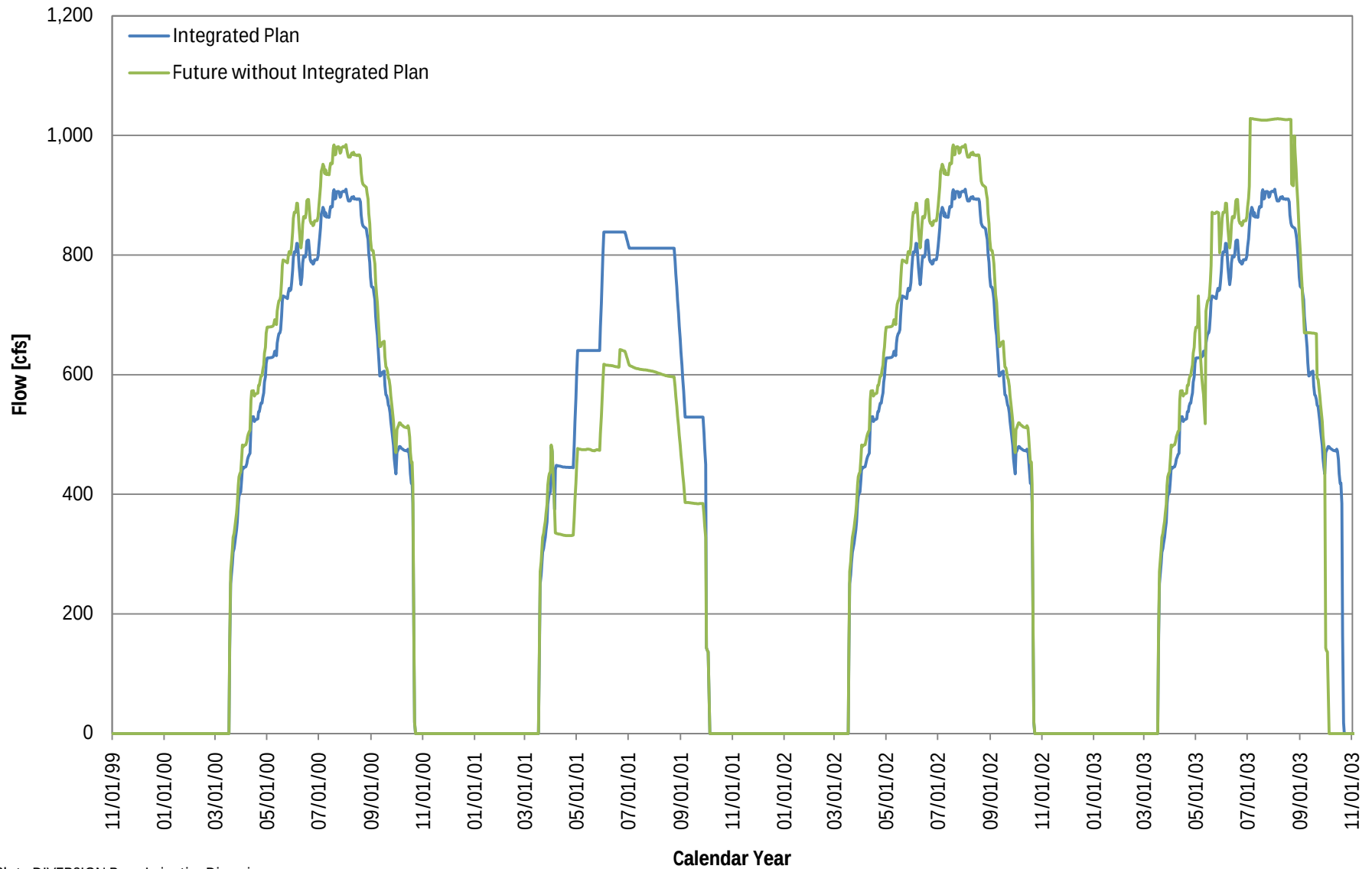
Slots: WymerReservoirInflow/Outflow

KRD Diversion Daily Diversion (WY 2000-2003)



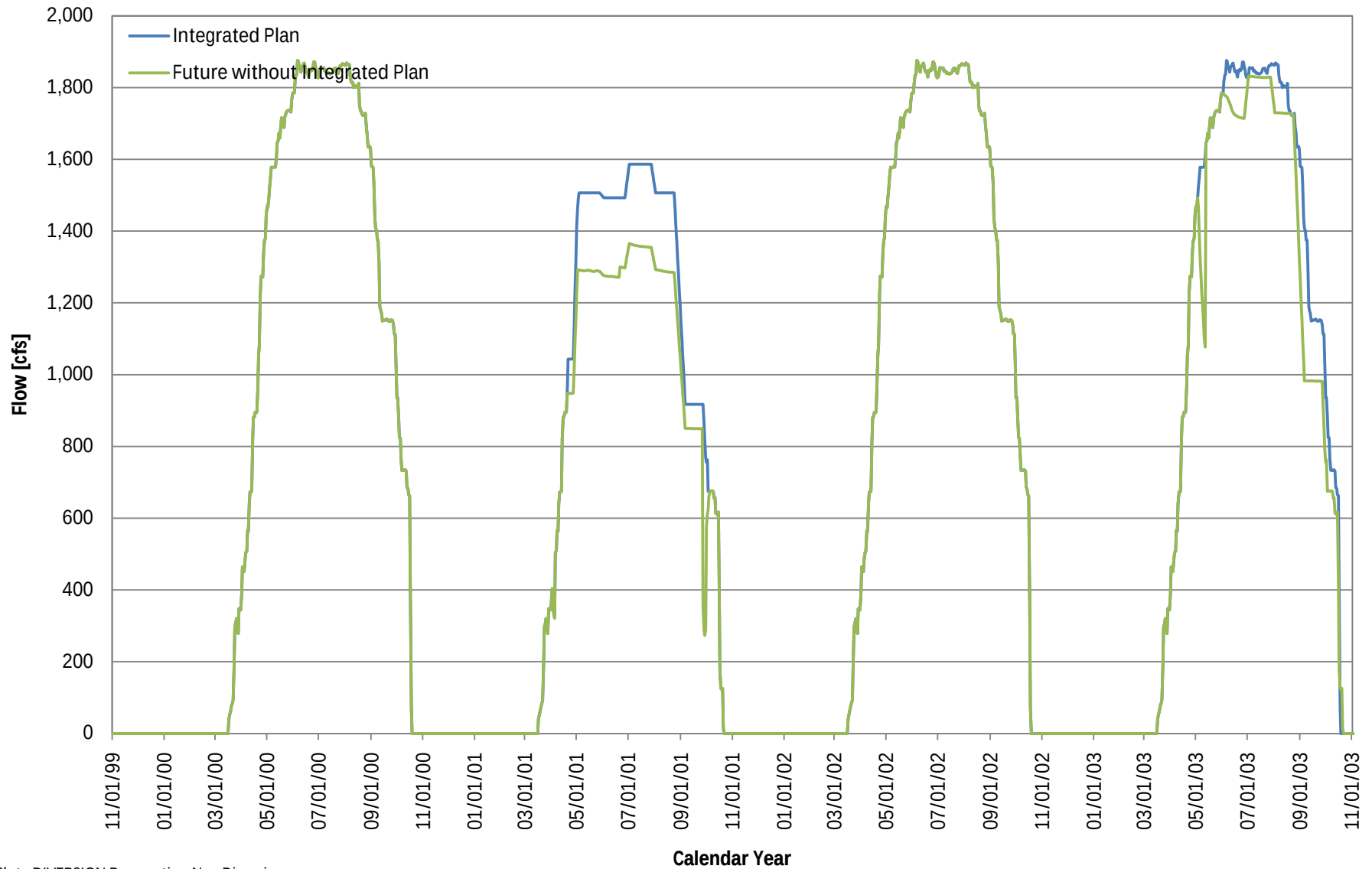
Slot: DIVERSION KRD IrrigationDiversion

Roza Diversion Daily Diversion (WY 2000-2003)



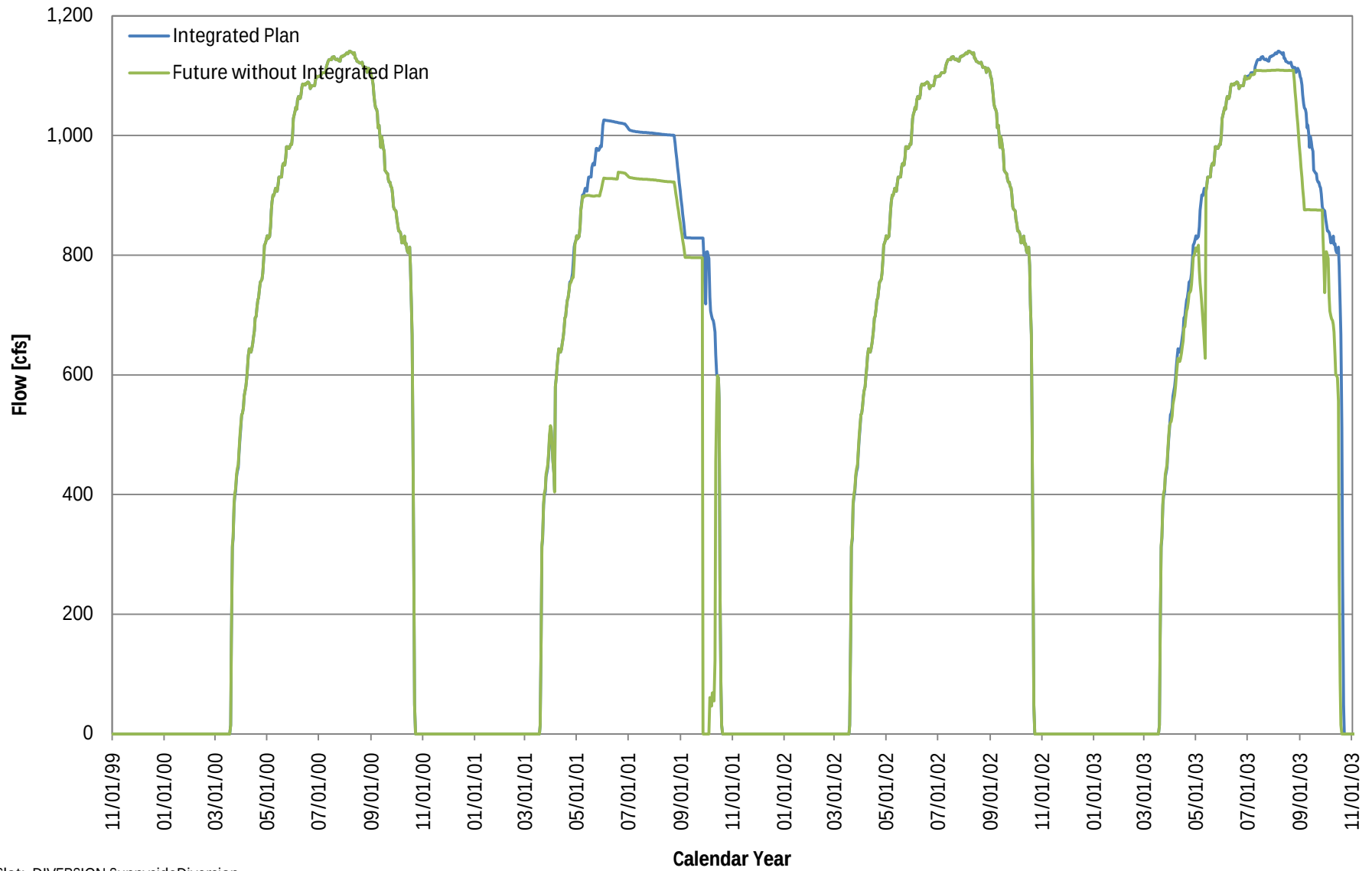
Slot: DIVERSION Roza IrrigationDiversion

Wapato Diversion Daily Diversion (WY 2000-2003)



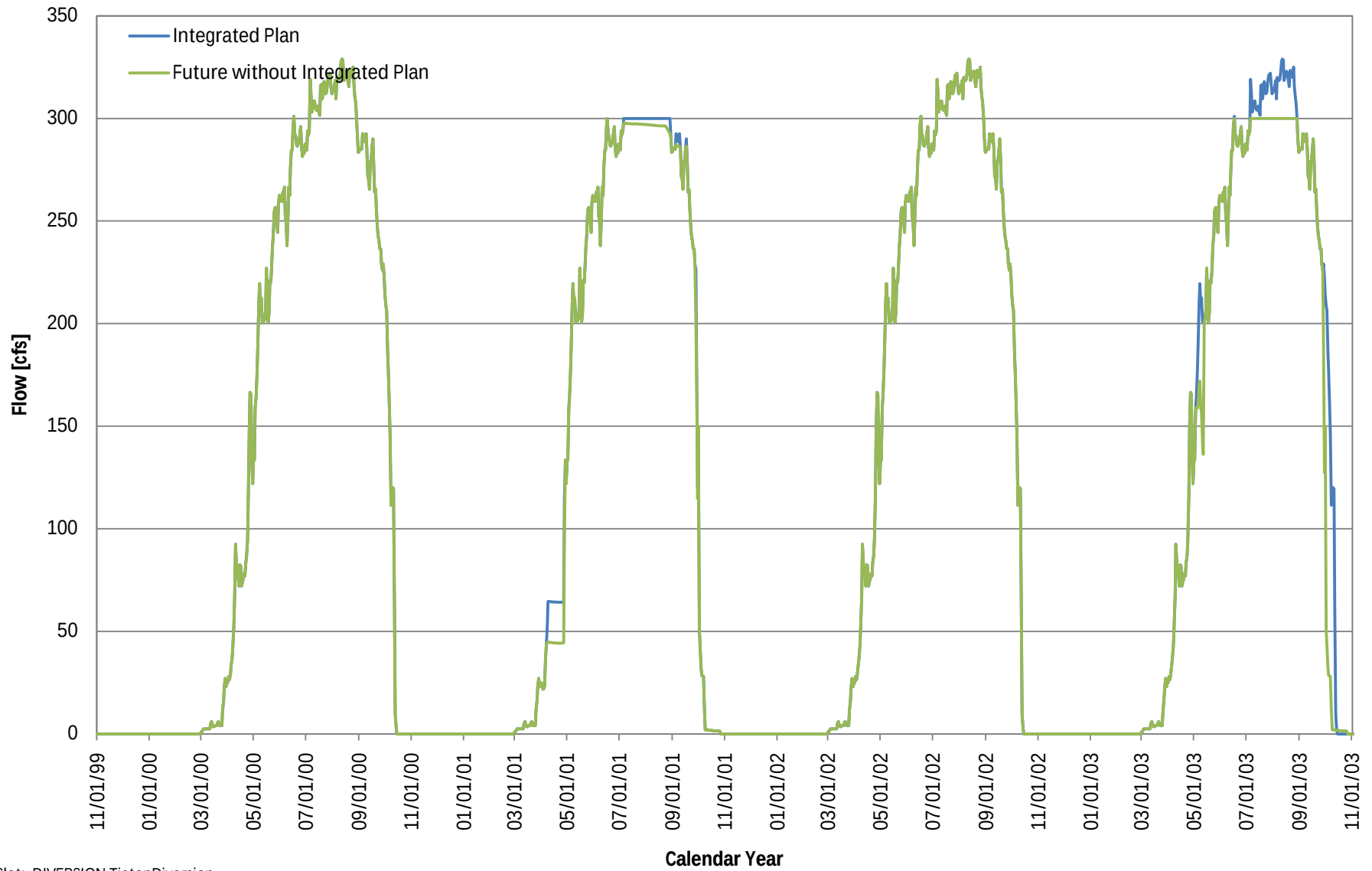
Slot: DIVERSION Reservation NewDiversion

Sunnyside Diversion Daily Diversion (WY 2000-2003)



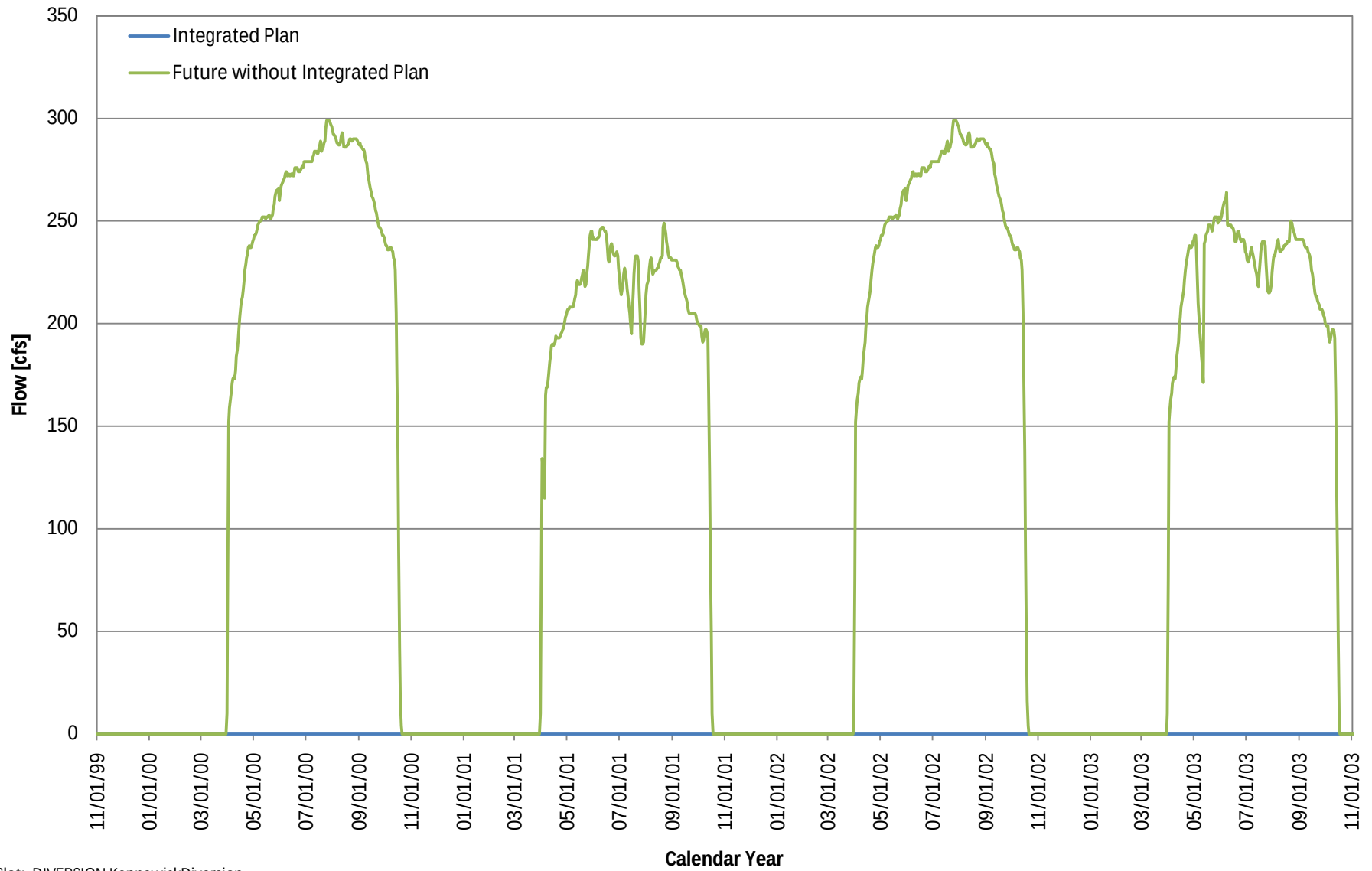
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Tieton Diversion Daily Diversion (WY 2000-2003)



Slot: DIVERSION TietonDiversion

Kennewick Diversion Daily Diversion (WY 2000-2003)



Slot: DIVERSION KennewickDiversion