

Water Engagement Initiative Main Table Meeting 31

Wednesday, June 28, 1:00 pm to 5:00 pm

Thursday, June 29, 2023, 9:00 am to 4:00 pm

Vanderhoof Community Event Centre



Meeting Objectives

- To provide an update since our last meeting,
- To review and assess the performance of the second round Phase 1 Flow Alternatives (Round 2),
- To discuss and identify preferred Phase 1 Flow Alternative(s); and, whether there are new and improved flow alternatives to model and assess at the next meeting (e.g., Fall 2023),
- To discuss other flow – related recommendations that would make up a “Package” of Phase 1 Recommendations,
- To discuss our upcoming workplan and schedule for the remainder of 2023, and
- To review any other next steps.

Agenda (Day 1)

Wednesday, June 28, 2023

1:00 pm: Welcome and update

2:00 pm: Overview of the Development of Round 2
Flow Alternatives

3:00 pm: Q and A Discussion

3:30 pm: Break

3:45 pm: Assessing Flow Alternatives, Hydrology

5:00 pm: Adjourn for the day

5:30 pm: Dinner by the river

Agenda (Day 2)

Thursday, June 29, 2023

9:00 am: Overview of Day 2

9:30 am: Assessing the Flow Alternatives: Performance Measures

10:45 am: Break

11:00 am: Ranking the Flow Alternatives: Exercises

12:00 pm: Lunch

12:45 pm: Reaching Agreement on P1 Flow Alterns and Next Steps

2:00 pm: Intro “Package” of Phase 1 Flow Related Recdns

2:15 pm: Break

2:30 pm: Package of Phase 1 Flow Related Recommendations

3:45 pm: Next steps

4:00 pm: Adjourn

WEI Approved Meeting Ground Rules

1. Be respectful
2. Listen actively and be attentive
3. Try to understand other participant's perspectives, even if you disagree with them
4. Be collaborative
5. Focus on the future

WEI Approved Meeting Ground Rules

6. Stay on topic and be concise
7. Give others a chance to speak (some participants may be shy—but have valuable things to say)
8. Turn off your electronics (use breaks to respond to emails or make phone calls)
9. Speak about your interests
10. Respect the facilitator's requests

Main Table Meeting 30 summary

- Final meeting summary available at:
<https://www.getinvolvednechako.ca/wp-content/uploads/2023/03/Final WEI Main Table Meeting 30 Summary.pdf>
- Summary of supplemental session emailed last week

Meeting 30 Action Items

- **Action item:** There was agreement to move forward with this 3-phased approach regarding sturgeon as presented.
- **Update:** The 3-phase approach will guide sturgeon efforts moving forward

Meeting 30 Action Items

- **Action item:** Materials will be reviewed to make sure there is consistency with the measurement units.
- **Update:** Unit check completed

Meeting 30 Action Items

- **Action item:** A Doodle Poll will be sent out to members with date and time options to continue the flow alternative discussion. This is to be a one-hour meeting.
- **Update:** Continuation meeting held on March 22, 2023

Meeting 30 Action Items

- **Action item:** RR to send out a one-page summary of the meeting will be created and sent out to the Main Table for review before posting.
- **Update:** Draft developed, but did not complete. I will develop a one-page summary of this meeting for review by the WEI Main Table

Update: Southside Working Group

- **Navigation buoys:**
Update from Quinten:
The buoys have been installed
- **Reservoir navigation signs:** the plan to improve existing signs is being discussed by the team.



Update: Southside Working Group (2)

- **Docks:** have reached out to BC Parks representatives regarding plans to improve dock at the Wistaria boat launch



Expanded Communication: Last meeting

- Goal of increasing awareness of WEI in the community
- Last meeting I spoke about presenting to elected officials
- Presentations given to:
 - District of Vanderhoof Council
 - Village of Burns Lake Council

Rio Tinto Update and Operations

TWG Update

TWG Update

MT Meeting 31, June 28/29, 2023



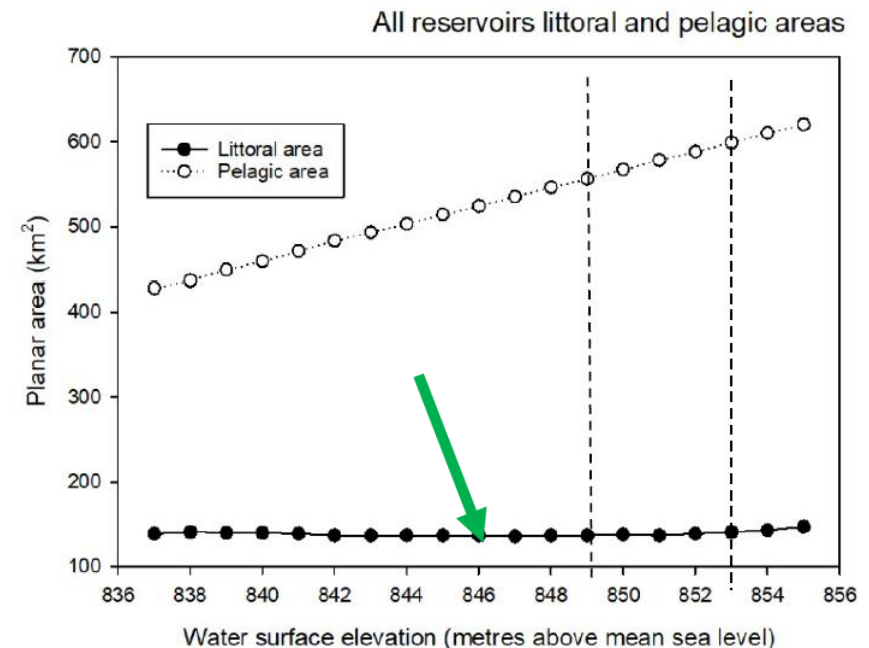
TWG Update

- 4 meetings since last MT meeting
- Flow Alternatives
 - Develop/model/review revised Round 1 and new alternatives, flow targets
 - Iterative approach to present best options to MT
- Review shortlist PMs, identify PM confidence
- Data gaps, physical works, monitoring
- NFN TWG
 - Agreement to share information
 - TWG participation
- Technical work: productivity, beavers, ice, HEC-RAS model, erosion, Nautley backwatering,



TWG Update

- Reservoir productivity: effective littoral zone (ELZ)
 - Accounts for wetting and drying effect on organisms
 - 2001 Nechako ELZ model
 - Less sensitive in Nechako:
 - Littoral productivity small compared to pelagic
 - Reservoir management steady



TWG Update

- Beaver population
 - River:
 - 450-650 beavers 1978-82
 - 595 beavers/119 lodges 1998, 2002
 - Steady population
 - Reservoir
 - no reliable studies

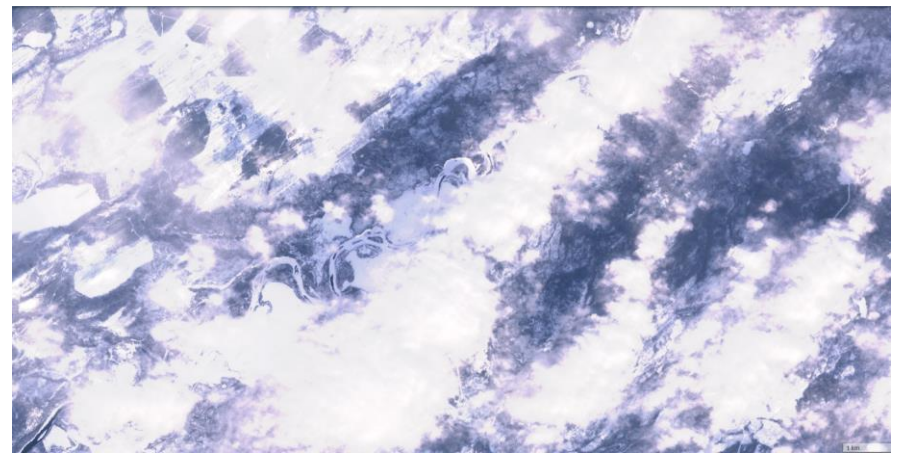
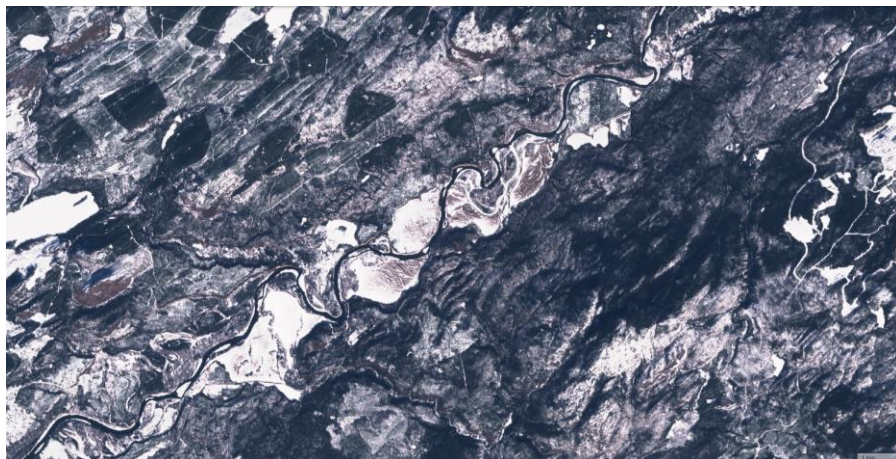
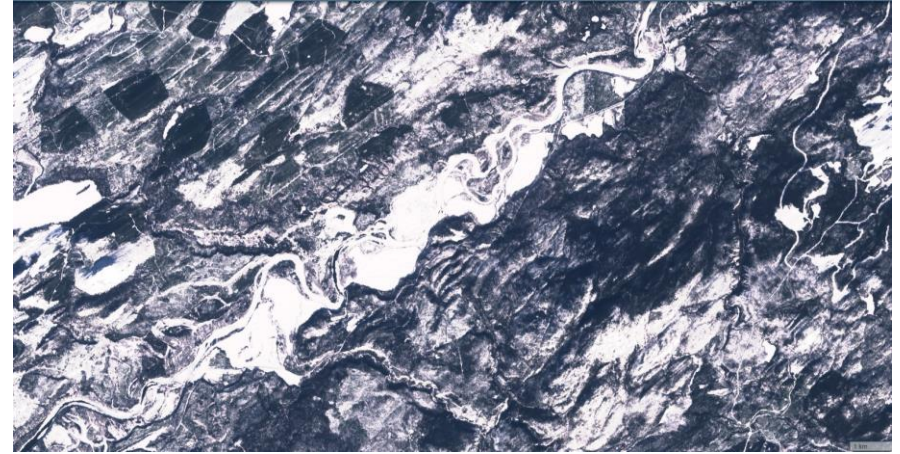
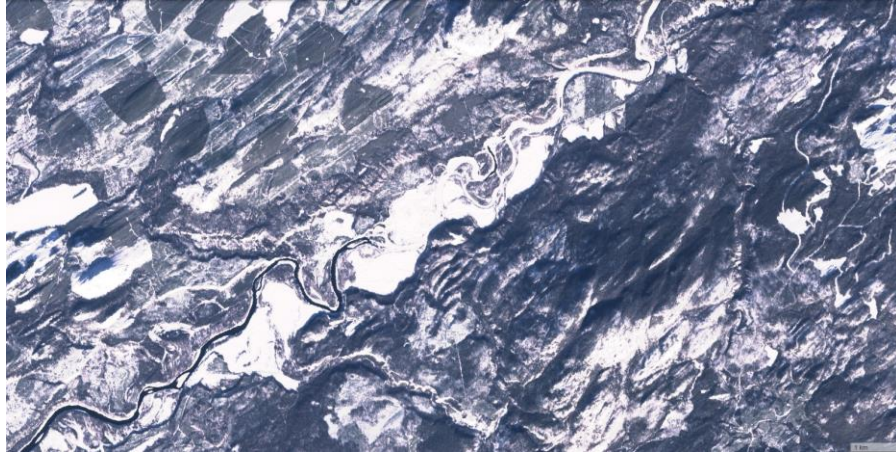


TWG Update

- Upper river ice
 - MT interest, but no direct PM
 - No studies to date
 - Water temp freezing Nov – Apr
 - Satellite imagery
 - ice cover variable
 - data limited by satellite coverage, cloud
 - Other studies possible



River Ice Coverage



TWG Update

- HEC-RAS model
 - Model of river depth, width, velocity (includes Cheslatta)
 - Based on NHC 2021 LiDAR, orthoimagery, bathymetry and flow measurements, and DEM model
 - Will allow us to investigate flow: habitat relationships, improve/develop PMs
 - Also riverbank/substrate data, photos
 - Also aerial drone imagery



TWG Update

- NHC technical memos:
 - River Erosion
 - Nautley backwatering
 - Review in-progress

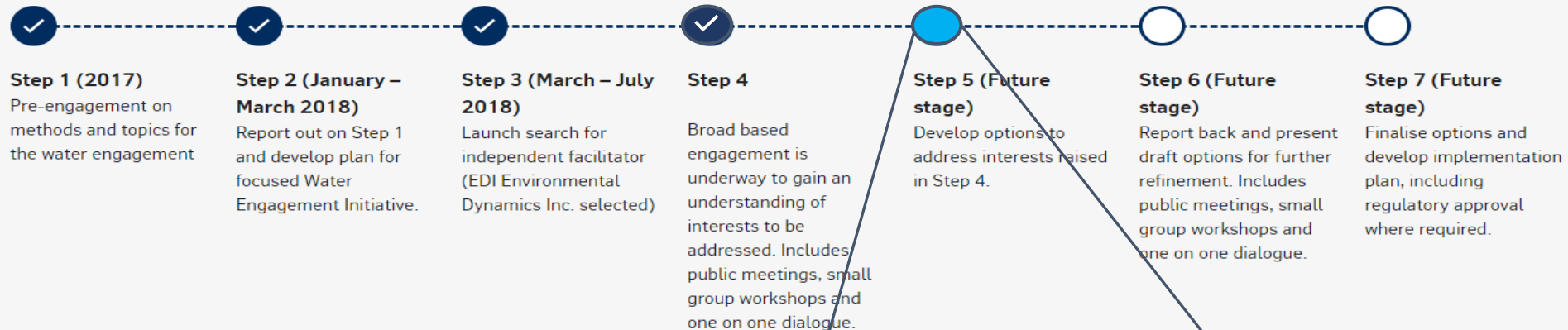


About Today

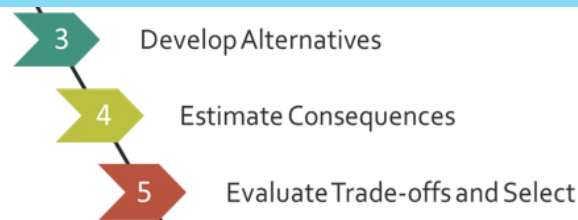
SDM Assessment of Round 2 Flow Alternatives

Nechako WEI Process Steps

Timeline



We are here!



Assessment Process of Flow Alternatives – in a Snapshot

Purpose

To explore and determine ways to improve Rio Tinto water management operations on the Nechako, given the multiple and competing water uses

Schedule

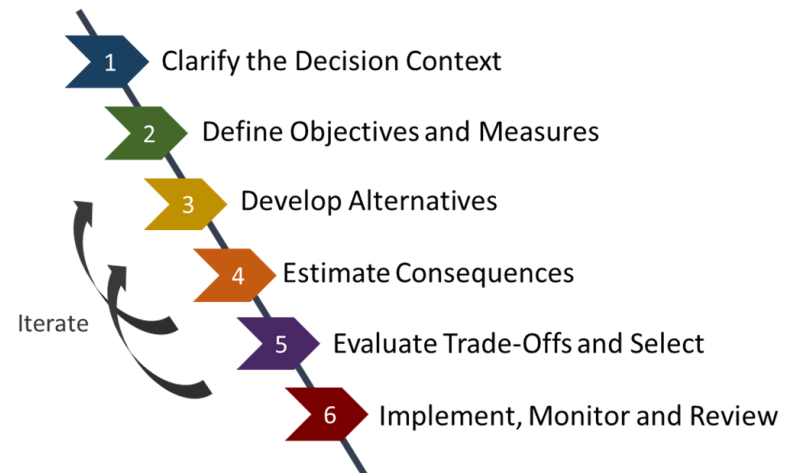
- Multiple Main Table Meetings over the next 12 months or so
- Meetings every ~8-12 weeks

Planning Framework

Structured Decision Making (consistent with *Provincial WUP Guidelines*)

WEI Main Table

To collaboratively share interests; identify and assess different flow alternatives; and **aim to reach agreement on a preferred (and balanced) flow regime** for the water control facilities



Refresher from our last meetings

Phase 1 (Immediate Term)



Phase 1 Flow Alternatives

- Flow alternatives that Rio Tinto could unilaterally make within the immediate term (e.g., next calendar year) with notification to regulators, First Nations and stakeholders with time to undertake any internal assessments that may need to be carried out.

Phase 2 (Near & Med Term)



Phase 2 Flow Alternatives

Phase 3 (Med & Longer Term)



Phase 3 Flow Alternatives



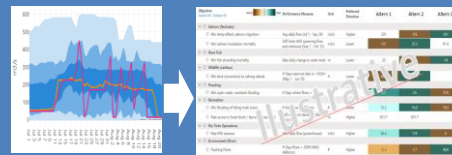
Refresher from our last meetings

SDM Process Steps:



ROUND 1

- Alt 1
- Alt 2
- Alt 3
- Alt 4
- Alt 5
- Alt 6
- Alt 7



ROUND 2

- Alt 1
- Alt 2
- Alt 7
- Alt 10
- Alt 11
- Alt 12
- Alt 13



ROUND ...

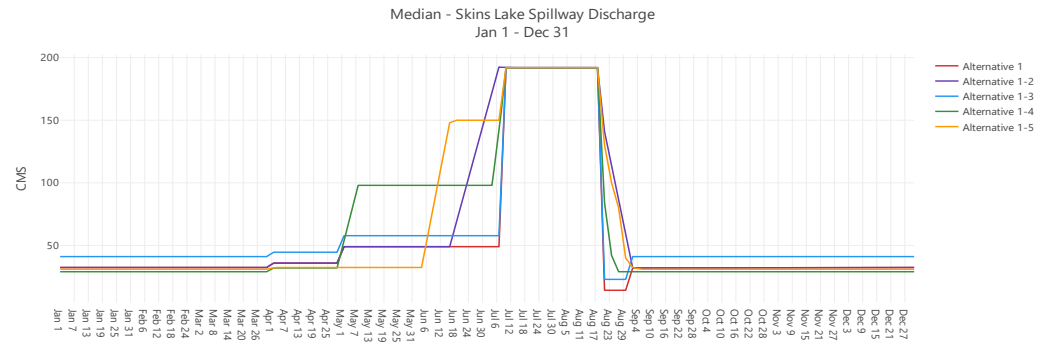
- Alt 1
- Alt 2
- Alt 7
- Alt 10
- Alt 11
- Alt 12
- Alt 20
- Alt 21
- Alt 22

Working Towards the End of Phase 1

Phase 1 (Immediate Term)



Phase 1 Flow Alternatives



Phase 2 (Near & Med Term)



Phase 2 Flow Alternatives

Phase 3 (Med & Longer Term)



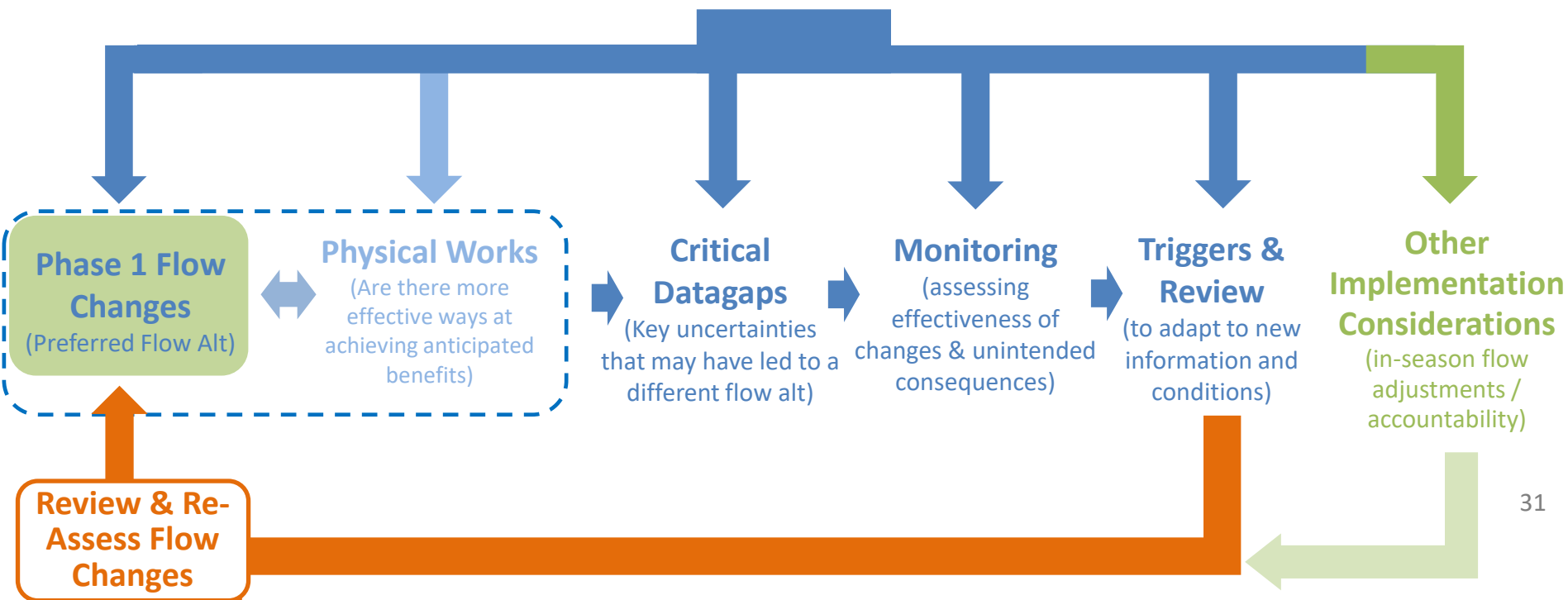
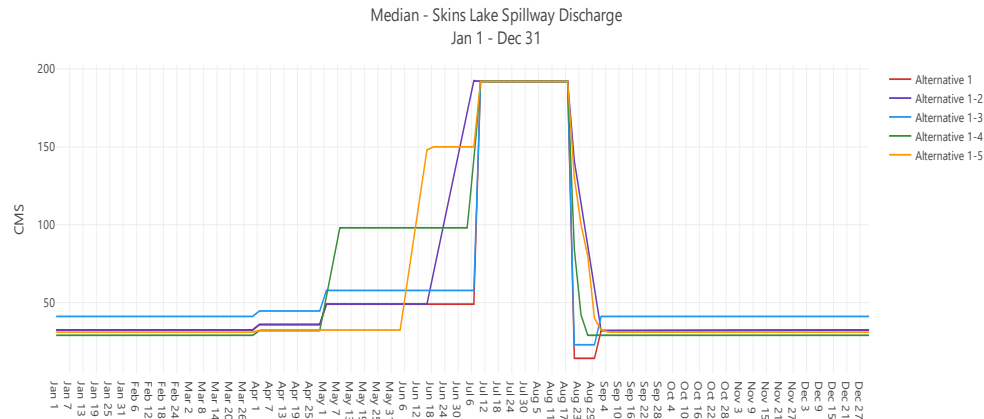
Phase 3 Flow Alternatives



Working Towards the End of Phase 1

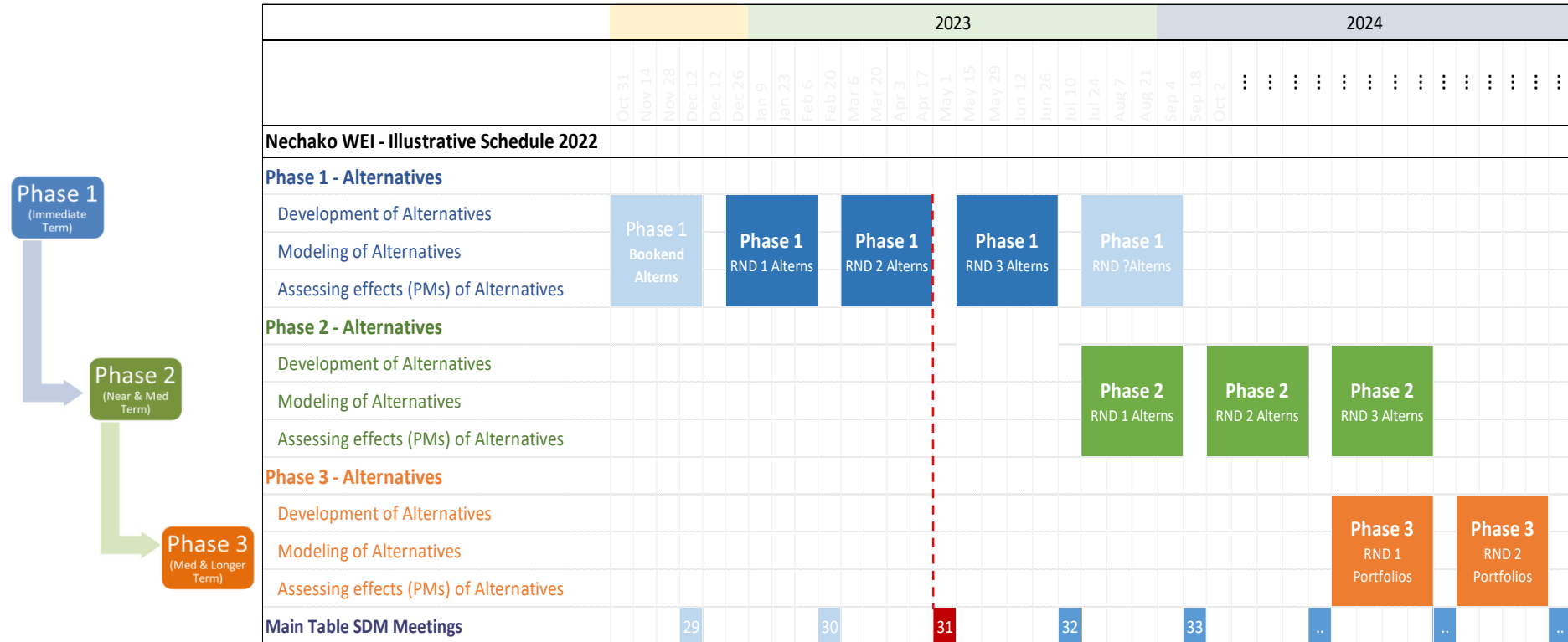
A “Package” of Phase 1 Flow Related Recommendations

Phase 1
(Immediate Term)

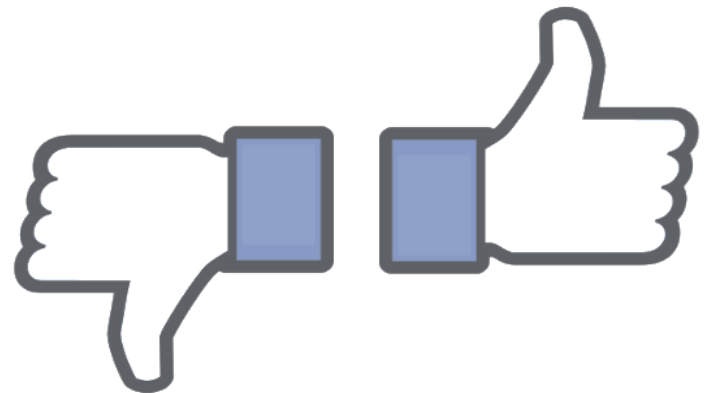
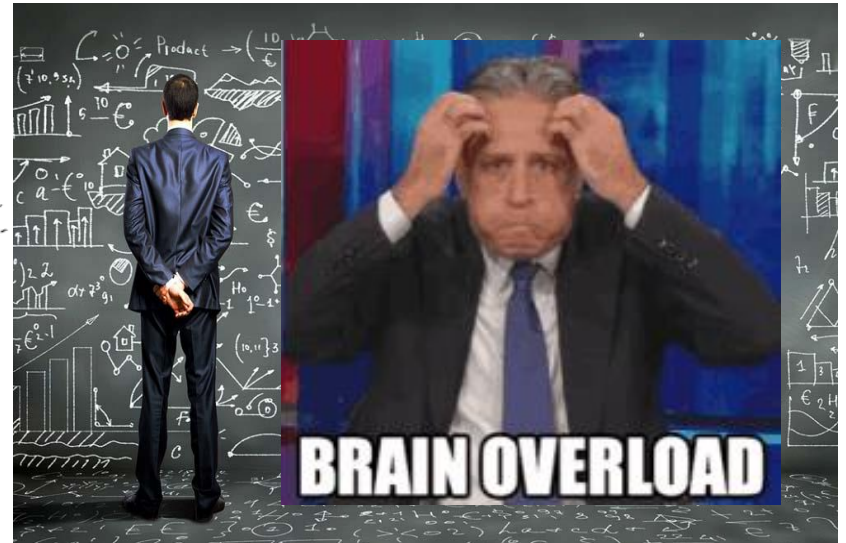
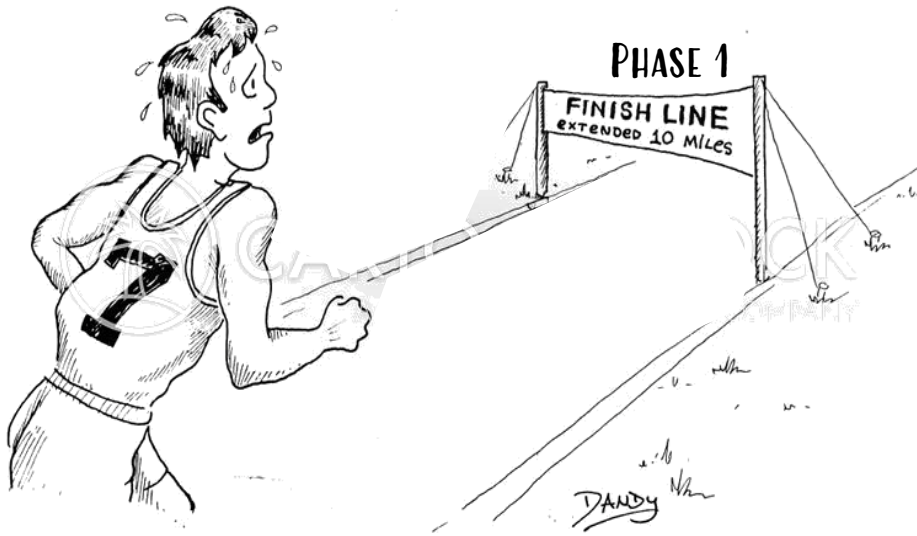


Working Towards the End of Phase 1

Draft Workplan: as discussed



About Today



About Today

Pre-Reading that was sent out ➡

On-line webtools Training Session

HydroViz – Link here: <https://www.hydroviz.ca/nechako>

AltaViz – Link here: <https://www.altaviz.ca/public/220db3fc-2aa8-4eea-9dd1-e3a26c4bb97a>

Access Code (same for both): NECHAKOWEI

Nechako Water Engagement Initiative

June 28-29th, 2023

Pre-Reading Package – Main Table Meeting 31

We are nearing the end of the Phase 1 Flow Alternatives. We think that sometime over the next meeting or two we will be reaching the point of diminishing returns in terms of developing new flow alternatives to model and assess. Since our last meeting, the Planning Team and the Technical Working Group (TWG) have modeled and reviewed 12 new flow alternatives, based on the general feedback we received at the last meeting. At our upcoming meeting we will be reviewing seven of these (which performed the best) in detail!

In addition, as we near the end of Phase 1 and before we shift our attention to Phase 2 Flow Alternatives, we need to give more attention to other key considerations associated with any recommended flow changes. We anticipate that beyond a recommended flow alternative, there will be a “package” of flow-related recommendations that the Main Table will want to discuss and provide direction on such as (a) critical data gaps (i.e., key uncertainties that should be addressed, as this information could have led to new or improved performance measures that may have affected the Main Table’s flow recommendation); (b) physical works projects to address key issues more efficiently than making flow changes; (c) monitoring studies to make sure any flow changes are providing the intended benefits and/or not resulting in unintended consequences; (d) triggers and review period for when to change or adjust any implemented flow changes (i.e., based on new information from the monitoring or filling the critical data gaps); and (e) other implementation considerations such as governance and in-season flow adjustments to respond to unexpected weather or conditions. We will introduce and begin to discuss these potential additional Phase 1 recommendation areas at the meeting.

In preparation for our upcoming meeting next week, this pre-reading package serves as a primer with needed background information. The focus is on the second round of flow alternatives that have been modeled and assessed and, as such, it serves as a key input to inform our discussions towards a recommended and preferred Phase 1 flow alternative. Some of the material will look familiar as it is unchanged from our last meeting (e.g., recommended shortlist of performance measures) and in some cases, we have provided additional details in the appendices (e.g., more details and rationale of the process that led to the Round 2 flow alternatives).

Please ensure you take the time to read and become familiar with the information and context summarized in this pre-reading package, as it will serve as the basis for our upcoming discussions!

This pre-reading package was prepared by Compass and Ecofish and has organized, as follows,

1	Workshop Details	3
2	Meeting Overview	6
3	Water Use Issues to Performance Measures (SDM Step 2)	8
4	Phase 1 Round 2 Flow Alternatives (SDM Step 3)	12
5	Assessing the Round 2 Flow Alternatives (SDM Step 4)	29
	APPENDIX A – Individual Hydrographs by Flow Alternative (Round 2).....	50

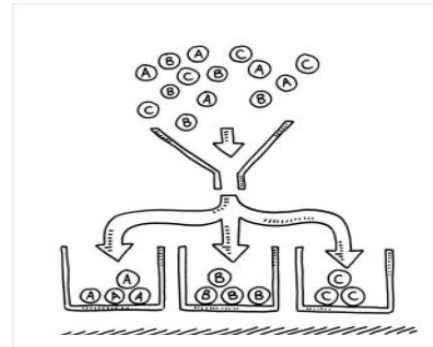
CONFIDENTIALITY

This pre-reading package and the access and use of the two online tools (HydroViz & AltaViz) are confidential; solely meant to support the deliberations of the Main Table. We recognize that some of the draft materials we will be sharing and discussing could be taken out of context by people outside the process. We therefore ask that you DO NOT DISTRIBUTE this document or the on-line links and passwords EXTERNALLY.

About Today



About Today



57 Water Use Issues

Draft 56 PMs (for 46 Issues)

TWG Recommended → 19 Shortlisted 19 PMs

Flooding and Erosion				
Culture and Heritage				
Fish and Wildlife				
Issues	#	Performance Measures	Details	
Reservoir fish habitat	13	Average annual pelagic habitat	Location:	Nechako Reservoir
			Timing:	All Year
			Unit:	Km2
			Direction:	More is better
			MSIC:	20%
River water temperature and migrating salmon	18	a: # of days average daily temp exceeds 18C (at Finmore)	Location:	Chinook: entire Nechako River Sockeye: below confluence with Stuart River
		b: # of days average daily temp exceeds 19C	Timing:	Salmon migration period Jun 15 – Aug 29
		c: # of days average daily temp exceeds 20C	Unit:	Days
			Direction:	Fewer is better
			MSIC:	20%
River water temperature and juvenile salmon	19	Maximum # of consecutive days average daily temp >18C	Location:	Chinook: entire Nechako River
			Timing:	Growing season, Jun 15 – Aug 30
			Unit:	Days
			Direction:	Less is better
			MSIC:	20%
River Chinook spawning habitat	20	Average habitat based on flow curve	Location:	Nechako River between Cheslatta Falls and Vanderhoof
			Timing:	Aug 15 - Oct 15
			Unit:	m ²
			Direction:	More is better
			MSIC:	20%

About Today

Assessment of Phase 1 Flow Alternatives



Round 1

Alternative 1 – Status Quo
Alternative 1 – 2
Alternative 1 – 3
Alternative 1 – 4
Alternative 1 – 5

Round 2

Alternative 1 – Status Quo
Alternative 1 – 3
Alternative 1 – 4
Alternative 1 – 5
Alternative 3A
Alternative 3B
Alternative 3C
Alternative 3D
Alternative 4A
Alternative 4B
Alternative 4C
Alternative 4D
Alternative 5A
Alternative 5B
Alternative 5C
Alternative 5D

About Today



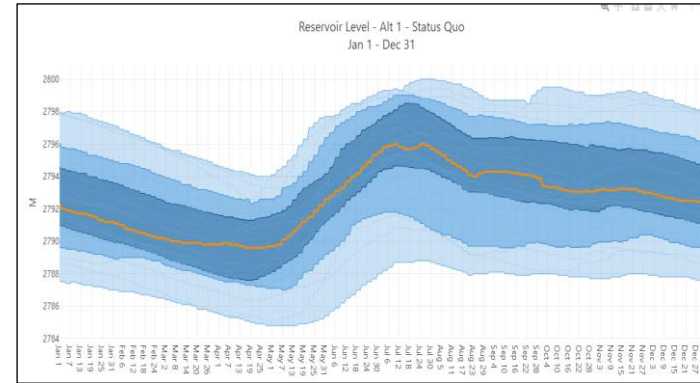
Assessment



Criteria	Performance Measure	Unit	Preferred Direction	MEQC	Alternative 1 Status Data	Alternative 2 Post-Implementation / Aquatic Species	Alternative 3 Baseline
Fish							
Resident Fish - Nichabuk River							
#13 Spawning fish habitat	Median - Area of average annual daily spawning habitat	km ²	Higher	10%	607.4	609.2	606.0
Anadromous Fish - Nichabuk River							
#13a River water temperature and migrating salmon	Median - Number of days average daily temp exceeds 10°C	Days	Lower	20%	20	20	21
#13b River water temperature and migrating salmon	Median - Number of days average daily temp exceeds 10°C	Days	Lower	10%	16	11	8
#13c River water temperature and migrating salmon	Median - Number of days average daily temp exceeds 10°C	Days	Lower	20%	3	2	1
#13d River water temperature and juvenile salmon	Median - Maximum # of juvenile daily average daily temp > 10°C	Days	Lower	10%	13	15	16
#13e River Chinook spawning habitat	Median - Amount of power generation habitat (Chinook) (km ²)	km ²	Higher	20%	3128.7	3128.4	2959.7
#13f River Chinook spawning habitat	Median - Amount of power generation habitat (Chinook) (km ²)	km ²	Higher	20%	79163.4	62900.7	19676.8
#13g River Chinook spawning habitat	Median - Amount of power generation habitat (Chinook) (km ²)	km ²	Higher	20%	16798.8	16693.6	16678.8
Resident Fish - Nichabuk River							
#13a Resident fish spawning habitat	Median - Average juvenile habitat	km ²	Higher	20%	64607.9	31047.2	60740.3
#13b Resident fish spawning habitat	Median - Average adult habitat	km ²	Higher	20%	111425.3	121754.7	136751.9
Wildlife							
Endangered Species - Caribou & Moose							
#13 Resident caribou herd size	Median - # of days water elevation is > 0.24 m	Days	Higher	10%	10	1	36
Nichabuk Reservoir - Watershed & ground nesting birds							
#13 Reservoir avian nesting habitat	Median - Number of years where reservoir elevation exceeds 85.0 dm	m	Lower	20%	85.3	85.21	85.3
Caribou & Moose							
#13a Caribou watershed inundation of arch sites	Median - # of days > 100 mm	Days	Lower	7	0	0	46
#13b Caribou watershed inundation of arch sites	Median - # of days > 100 mm	Days	Lower	7	0	0	46
Reservoir & Reservoir							
#13a River open water flooding	Median - # of days > 100 mm at watershed	Days	Lower	7	0	0	0
#13b River ice jam flooding	Median - # of days > 100 mm during freeze up	Days	Lower	7	0	0	0
Recreation and Recreation							
#13a River fishing trip access	Median - # days flow > 100 mm	Days	Lower	7	0	0	35
Rio Link Operations							
#13a Maximum power generation	Median - Mean baseline power generation	MW	Higher	30	276.7	228.0	121.2
#13b Maximum power generation (Tier 1)	Median - Mean Tier 1 power generation	MW	Higher	30	35.1	33.1	35.1
#13c Maximum power generation (Tier 2)	Median - Mean Tier 2 power generation	MW	Higher	30	116.6	6.8	6.8

About Today

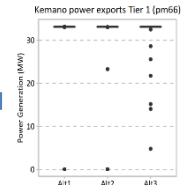
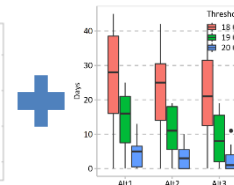
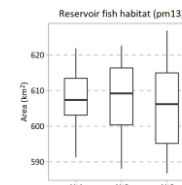
1 Clarify the Decision Context



Criteria	Performance Measures	Units	Preferred Direction	MSOL	Alternative 1 Status Quo	Alternative 2 Start topography / rigidly specified	Alternative 3
max							
Reservoir Reservoir							
#10 Reservoir fish habitat	Median - Area of average annual periphyton habitat	km ²	Higher	20%	551.5	547.1	547.1
Arable/Non-Arable Fish - Nishakawa River	Median - Number of days average daily temp exceeds 19C	Days	Lower	20%	26	25	25
#10a Blue water temperature and migrating salmon	Median - Number of days average daily temp exceeds 19C	Days	Lower	20%	16	15	15
#10b Blue water temperature and migrating salmon	Median - Number of days average daily temp exceeds 19C	Days	Lower	20%	1	1	1
#10c Blue water temperature and juvenile salmon	Median - Maximum # of days average daily temp exceeds 19C	Days	Lower	20%	1	1	1
#10d Blue water temperature and juvenile salmon	Median - Average habitat based on flow, same	Higher	20%	20%	1175.7	1175.4	1175.7
#10e Blue water temperature and juvenile salmon	Median - Amount of year-migrant habitat (Cumulative count)	m ²	Higher	20%	79443.6	79443.7	79443.6
#10f Blue water temperature and juvenile salmon	Median - Amount of year-migrant habitat (Cumulative count)	m ²	Higher	20%	10765.6	10765.6	10765.6
Reservoir Fish - Nishakawa River	Median - Average juvenile habitat	m ²	Higher	20%	56597.9	57467.2	60742.3
#20a Reservoir fish habitat	Median - Average adult habitat	m ²	Higher	20%	121438.3	121438.7	121438.3
Reservoir Reservoir - Carlson & Moore							
#10 Reservoir reservoir level	Median - # at days water elevation at > 102 m	Days	Higher	20%	16	4	16
Reservoir Reservoir - Waterford & general meeting birds	Median - Number of years where reservoir elevation exceeds 102m	yr	Lower	20%	852.3	852.1	852.3
Culture & Heritage							
#10a Cultural watershed elevation at each view	Median - # at days > 100 mm	Days	Lower	2	0	0	0
#10b Cultural watershed elevation at each view	Median - # at days > 100 mm	Days	Lower	2	0	0	0
Flooded & Erosion							
#10a Blue water flooding	Median - # at days flow > 100 m (downstream)	Days	Lower	2	0	0	0
#10b Blue water flooding	Median - # at days > 100 mm during flood-up	Days	Lower	2	0	0	0
Recreation and Navigation							
#10a Blue water flooding	Median - # days flow > 100 mm	Days	Lower	2	0	0	0
Hydro Operations							
#10a Reservoir power generation	Median - Mean Reservoir power generation	MW	Higher	20	475.7	779.8	1272.7
#10b Reservoir power generation	Median - Mean Tier 1 power generation	MW	Higher	20	23.3	23.3	23.3
#10c Reservoir power generation	Median - Mean Tier 2 power generation	MW	Higher	20	116.0	4.8	4.8

5 Evaluate Trade-Offs and Select

6 Implement, Monitor and Review



Questions?



Timeline



Development of Round 2 Flow Alternatives

Overview

How were Round 2 Flow Alternatives Developed?

At our Last Meeting (Mtg #30)

Round 1 Flow Alternatives

- No preferred Round 2 flow alternatives were identified.
- Main Table members split in their preferred altern between SQ, Alt 1-3, 1-4 and 1-5
- No one preferred Alt 1-2 and it was agreed to be dropped



Round 2 Flow Alternatives

Direction for building new and improved flow alternatives...

- Reshape flow releases to meet flow objectives being aimed for in Alterns 1-3, 1-4, and 1-5 both with and without Tier 2 hydropower to provide additional benefits
- Set higher flow targets in wetter years when more water was available and to minimize Tier 2 hydropower water and explore addn benefits

Reminder - Phase 1 Operating Parameters

Base Flow Conditions

(i.e., Aim was not to alter these parameters)

- Meet hydropower flows to meet Smelter load and Tier 1 power sales
- Meet minimum AWA and STMP flow requirements
- Meet Skins Lake Spillway (SLS) min flows
- Physical constraints of system (e.g., max/min reservoir elevs)

Flexible Operating Parameters

(i.e., parameters that could be altered and/or re-prioritized in development of bookends)

- Re-allocating monthly AWA flow release schedule
- Re-allocating water from Tier 2 Hydropower sales
- Ramping rates at SLS
- Flood risk thresholds (e.g., Cheslatta Lake)
- Flow operations for beavers and avoiding ice jams



Overview of the Development of Round 2 Flow Alternatives



Round 1 Flow Alternatives Review (MT meeting #30 March 2023)

- Assessed 5 alternatives, retained 4:
 - Status quo
 - 3 alternatives w/ additional water budget (Tier 2 power)
 - ~~Alt 1-2: STMP ramping~~
 - Alt 1-3: higher flows (winter, spring, post-STMP)
 - Alt 1-4: freshet/stepped increase to STMP
 - Alt 1-5: maximize reservoir productivity (delay freshet)



Round 1 Flow Alternatives Review

- MT requested TWG:
 - Improve upon 3 retained alternatives that dip into Tier 2
 - Investigate options to achieve benefits of retained alternatives, without dipping into Tier 2 (i.e., using current water budget)
 - Look into flow “targets” rather than just minimums



Summary – Round 1 flow alternatives

Summary of Phase 1, Round 1 Flow Alternatives and Requested Modifications for Round 2					
Altern Name	Objective	Water Budget	Carry Forward	Rationale	Recommended Revisions (if any)
Alt 1 Status Quo	Current operations	Current	Yes	It is important to have a reference to compare any new alternatives against and to continue to assess current water budget.	Keep this alternative as is.
Alt -2	Ramping before and after STMP	Enhanced	No	This was the least preferred option. There was agreement among Main Table participants not to proceed with this alternative, but incorporate gradual rates of flow change into other alternatives.	Drop alternative, but incorporate ramping in other alternatives
Alt 1-3	Higher flows during winter, spring, and fall	Enhanced	Yes?	There was concern about whether Tier 2 water was actually available, and the costs associated with it. The concept of higher flows, winter in particular, was popular despite no PMs. There was no specific decision to retain or reject this alternative.	Keep this alternative and build in more gradual rates of flow change, step flow prior to STMP
Alt 1-4	More natural freshet (increased flow), and stepped flows leading to STMP	Enhanced	Yes?	There was concern about whether Tier 2 water was actually available, and the costs associated with it. The concept of freshet flows was popular, and there was interest in capitalizing on tributary freshet flows. There was no specific decision to retain or reject this alternative.	Keep this alternative and incorporate stepped flow increases, rather than a single increase
Alt 1-5	Maximize reservoir productivity (fill reservoir quickly, resulting in a delayed freshet)	Enhanced	Yes?	There was concern about whether Tier 2 water was actually available, and the costs associated with it. There was no specific decision to retain or reject this alternative.	Keep this alternative and increase winter flows, delay freshet further

Round 2 Flow Alternatives Overview

- 6 flow alternatives recommended for consideration:
 - Status quo for all years
 - 1 stand-alone alternative for all years, using current water budget (e.g., not dipping into Tier 2)
 - 5 hybrid alternatives: minimum flows during “dry/normal” years, higher targets during “wet” years (not targeting Tier 2)



Round 2 Alternatives Overview

- A. Reshaped Round 1 Alternatives
- B. Hybrid alternatives (Reshaped Round 1 as target, status quo as minimum)
- C. Existing Water Budget Reshaped
- D. Hybrid alternatives (Reshaped Round 1 as target, existing water budget reshaped as minimum)



Round 2 Flow Alternatives:

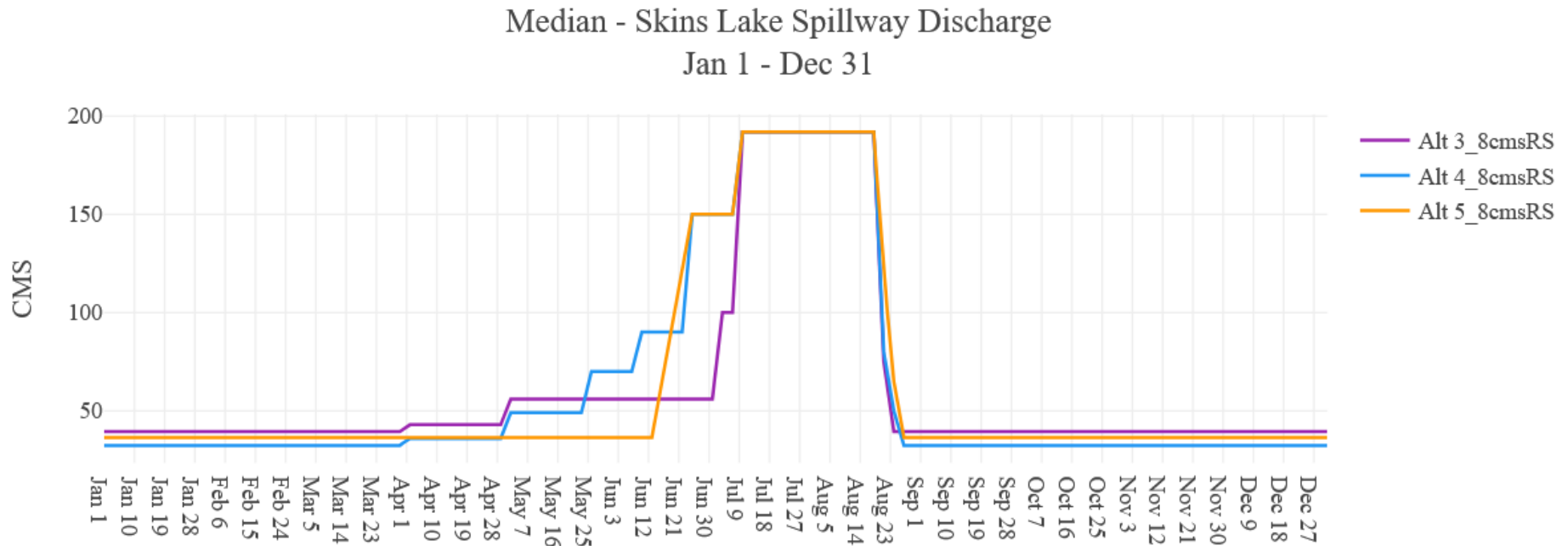
A. Reshaped Round 1 Alts (dip into Tier 2)

- Several revisions investigated to look for potential improvements
- Most promising revision modeled for each alternative
- Not recommended as stand-alone alternatives, but incorporated into all hybrid alternatives



Round 2 Flow Alternatives:

A. Reshaped Round 1 Alts (dip into Tier 2)



Round 2 Flow Alternatives:

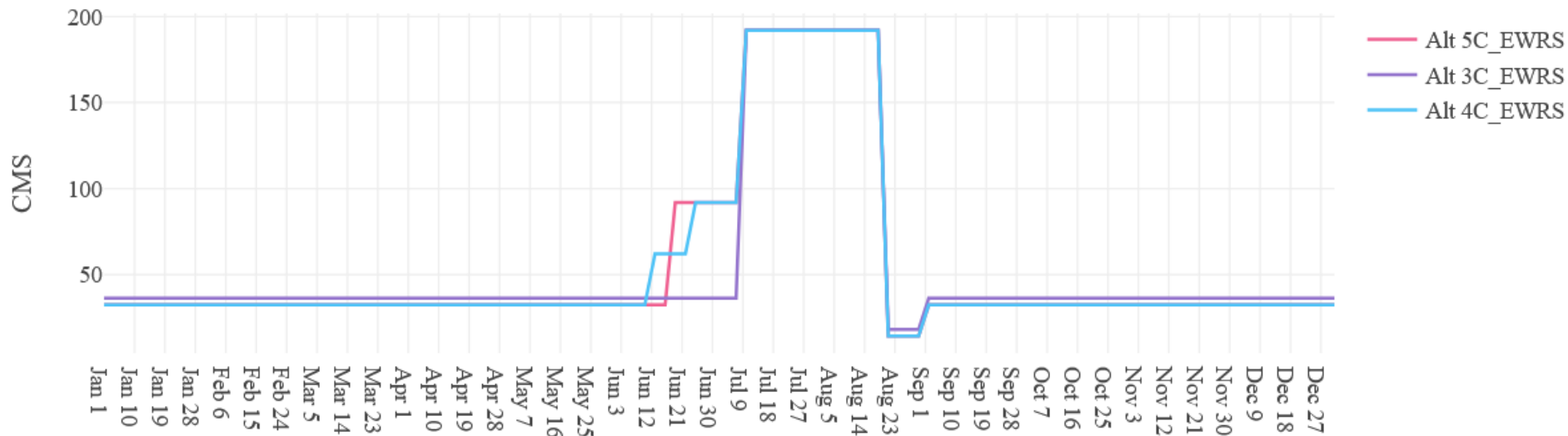
C. Existing Water Budget Reshaped

- Several revisions investigated to look for potential improvements using same 3 objectives as Round 1 flow alternatives (higher flow, freshet, reservoir productivity).
- Very little difference from status quo
- TWG recommended 1 of the 3 new stand-alone alternative for all years, using current water budget (not targeting into Tier 2) (Alt 5C_EWRS)



Round 2 Flow Alternatives: C. Reshaped Current Water Budget

Median - Skins Lake Spillway Discharge
Jan 1 - Dec 31



Round 2 Flow Alternatives:

Hybrids between flow min and targets

- Flow record analysis suggests ~ 1 out of every 3 years is a “wet” year where there is additional water (more than status quo)
- Considered combinations of different base flows (minimum applied to “dry/normal” water years) with different surplus flows (targets applied to “wet” years)



Round 2 Flow Alternatives:

Hybrids between flow min and targets

- 5 new “hybrid” flow alternatives recommended for consideration:
 - 2 with **status quo** on dry/normal years (Alt 4B and Alt 5B)
 - 3 with **existing water budget** but **reshaped** (Alt 3D, 4D, 5D)



Round 2 Flow Alternatives:

B. Status Quo Hybrids

- Alt 4B_SQ_WYF
 - Status quo on dry/normal years
 - Alt 4B in **wet year flows** (provides extra flow during freshet, and steps flow into STMP).
- Alt 5B_SQ_WYF
 - Status quo on dry/normal years
 - Alt 5B in **wet year flows** (maximizes reservoir level/productivity, but results in a delayed freshet).



Round 2 Flow Alternatives:

D. Existing Water Budget Reshaped hybrids

- **Alt 3D_EWRS_WYF**
 - **Alt 3C** Existing **w**ater budget reshaped on dry/normal years
 - Alt 3A in wet year flows (provides extra flow during freshet, and steps flow into STMP).
- **Alt 4D_EWRS_WYF**
 - **Alt 4C** Existing **w**ater budget reshaped on dry/normal years
 - Alt 4A in **w**et year **f**lows (provides extra flow during freshet, and steps flow into STMP).
- **Alt 5D_EWRS_WYF**
 - **Alt 5C_** Existing **w**ater budget reshaped on dry/normal years
 - Alt 5A in wet year flows (maximizes reservoir level/productivity, but results in a delayed freshet).



Summary – flow alternatives for Round 2

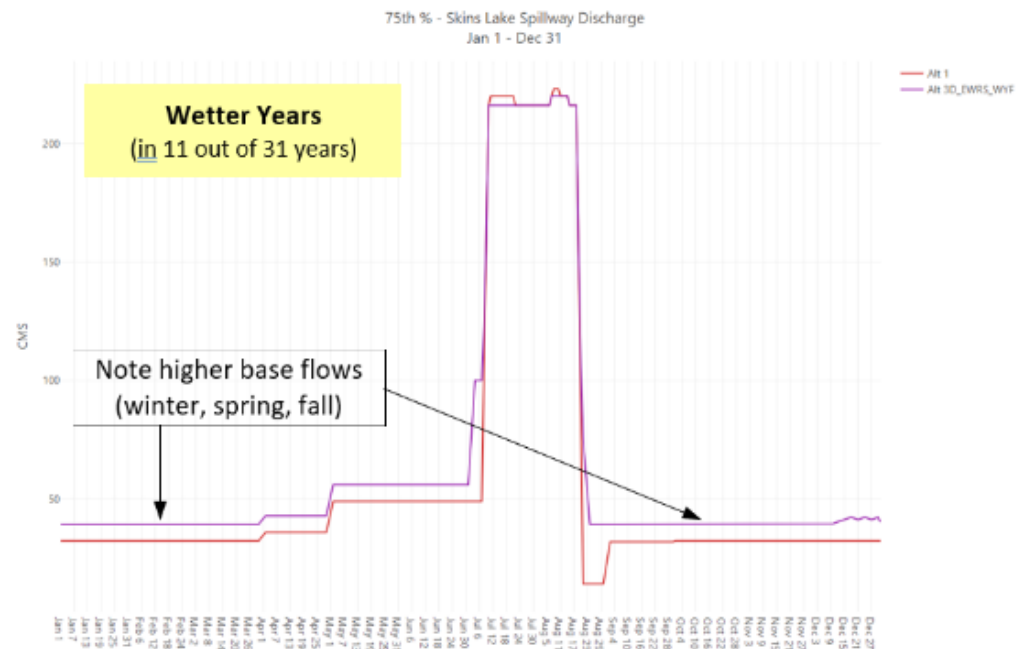
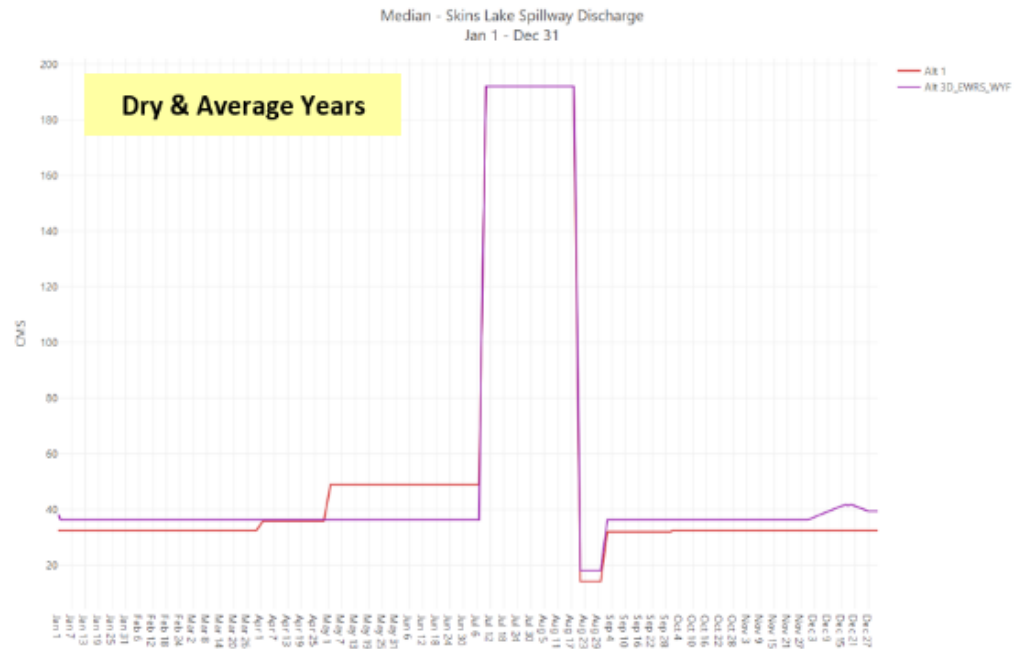
Flow Objective	Round 1	Round 2	Round 2B	Round 2C	Round 2D
	<ul style="list-style-type: none"> uses Tier 2 water 	(“improved” Round 1 Alts) <ul style="list-style-type: none"> reshapes Tier 2 water 	(status quo hybrids) <ul style="list-style-type: none"> Status quo minimum flow in “dry/normal” years Flow targets (extra water) in “wet” years 	(improved status quo) <ul style="list-style-type: none"> Reshapes existing water budget 	(reshaped hybrids) <ul style="list-style-type: none"> Reshapes existing water budget quo minimum flow in “dry/normal” years Flow targets (extra water) in “wet” years
Retain					
Do not retain					
Unsure					
Higher flows (higher flows during winter, spring, and fall)	Alt 1-3	Alt 3A (8cmsRS)	Alt 3B (SQ_WYF)	Alt 3C (EWRS)	Alt 3D (EWRS_WYF)
More natural freshet (increased flow, stepped flows leading to STMP)	Alt 1-4	Alt 4A (8cmsRS)	Alt 4B (SQ_WYF)	Alt 4C (EWRS)	Alt 4D (EWRS_WYF)
Reservoir Productivity (higher reservoir, delayed freshet)	Alt 1-5	Alt 5A (8cmsRS)	Alt 5B (SQ_WYF)	Alt 5C (EWRS)	Alt 5D (EWRS_WYF)

New - Alternative 3D (EWRS-WYF)

Alternative 3D (EWRS-WYF) (purple)

During dry to typical years, the status quo hydrograph has been reshaped to provide an additional $\sim 4 \text{ m}^3/\text{s}$ year-round outside of the STMP, rather than the current stepped freshet release.

During wet years, a modified version of Alt 1-3 (higher winter flows) is provided. Modifications to Alt 1-3 are the addition of a 1 week flow increase prior to STMP (100 m^3/s) and removal of the low flow period immediately following STMP.

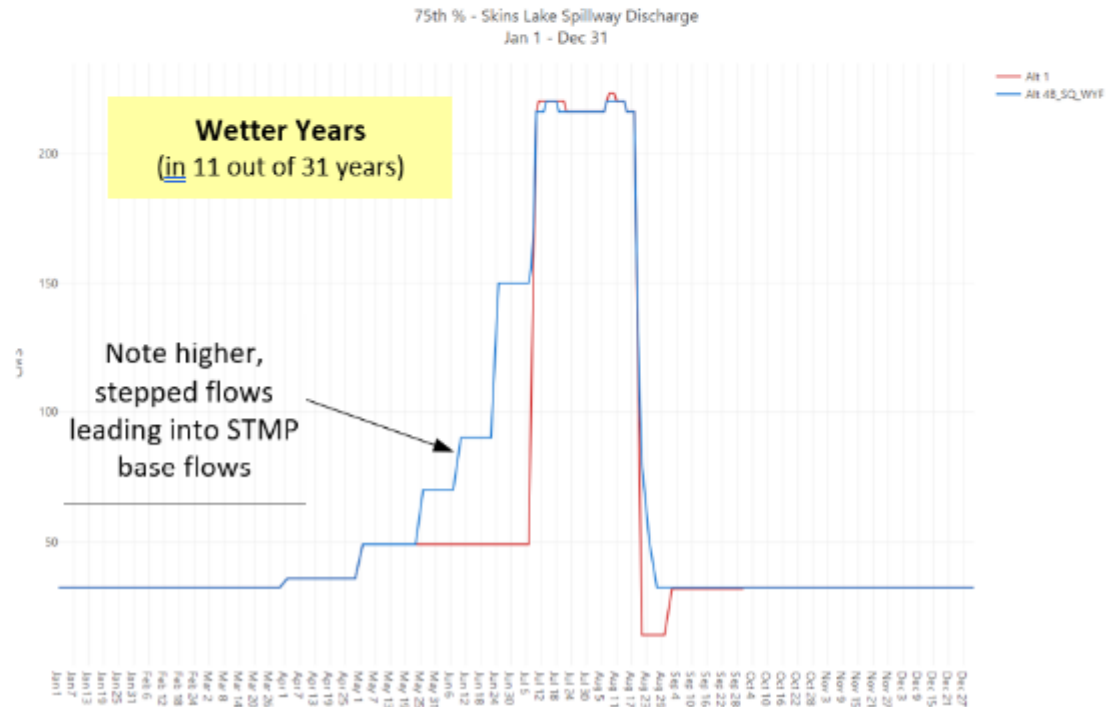
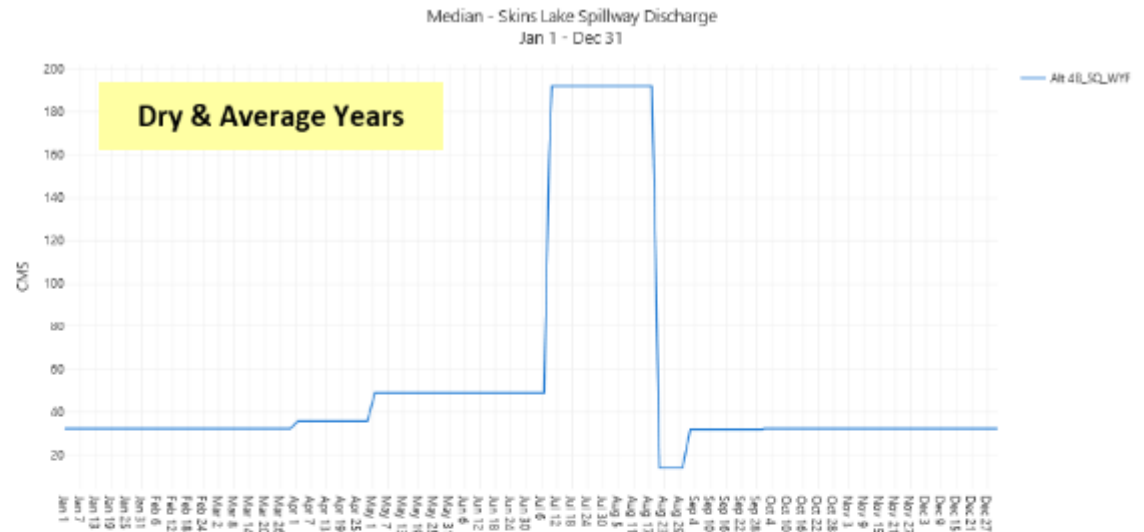


New - Alternative 4B (SQ_WYF)

Alternative 4B (SQ_WYF) (blue)

During dry and typical years, the status quo hydrograph is provided.

During wet years, a modified version of Alt 1-4 (enhanced freshet release) is provided. The freshet flow release in Alt 1-4 has been re-shaped to provide a multi-step flow increase prior to STMP, and flow outside of the STMP has been increased.

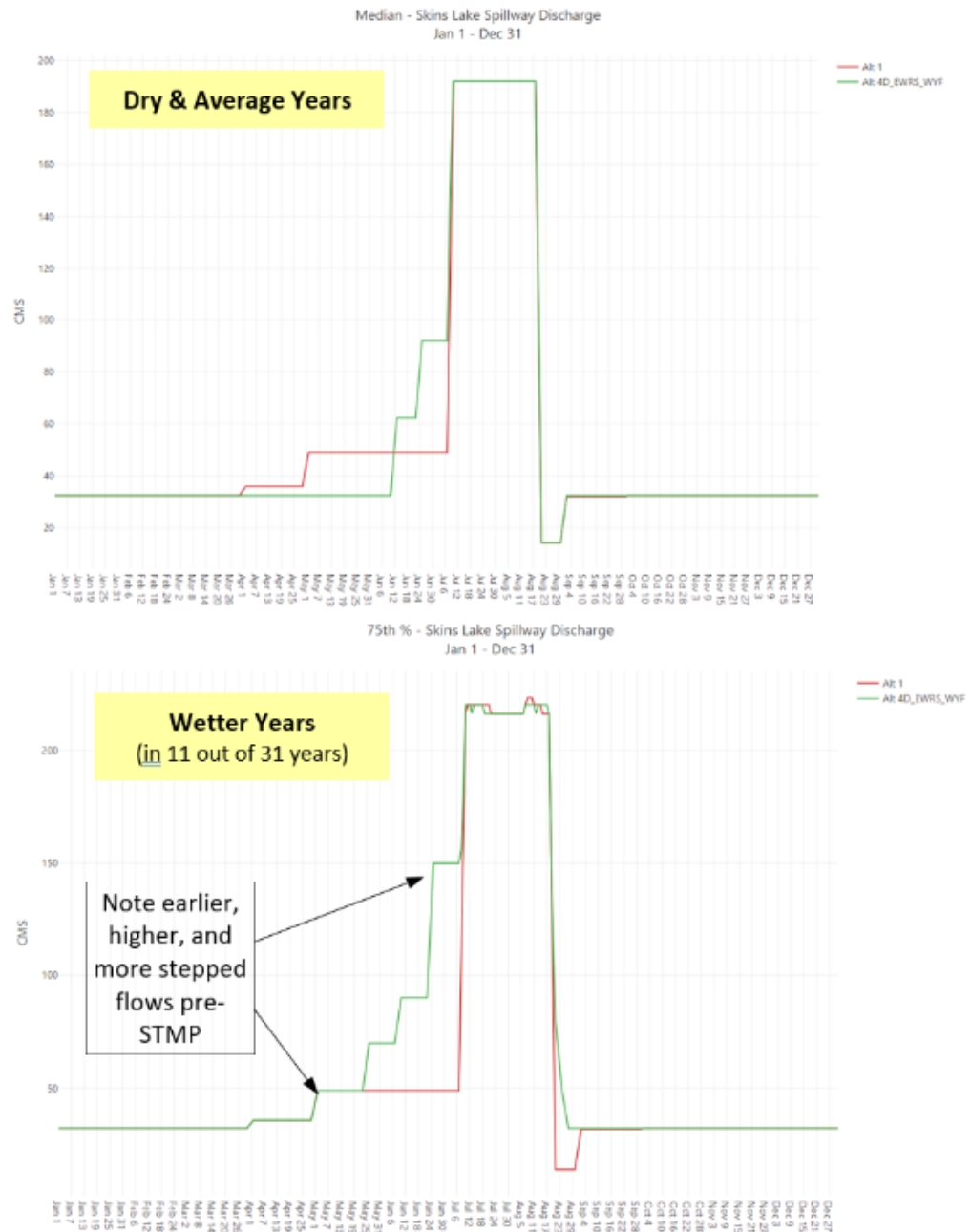


New - Alternative 4D (ERRS_WYF)

Alternative 4D (ERRS_WYF) (green)

During dry and typical years, the status quo hydrograph has been reshaped to provide a two step flow increase over 4 weeks prior to STMP (each increase is $\sim 30 \text{ m}^3/\text{s}$).

During wet years, a modified version of Alt 1-4 (enhanced freshet release) is provided. The freshet flow release in Alt 1-4 has been re-shaped to provide a multi-step flow increase prior to STMP, and flow outside of the STMP has been increased.

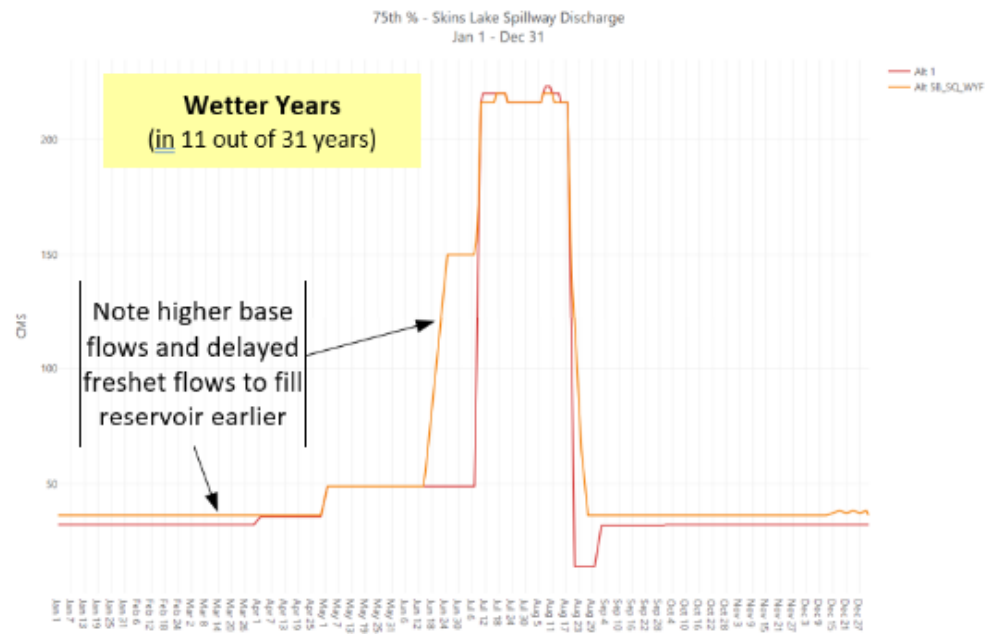
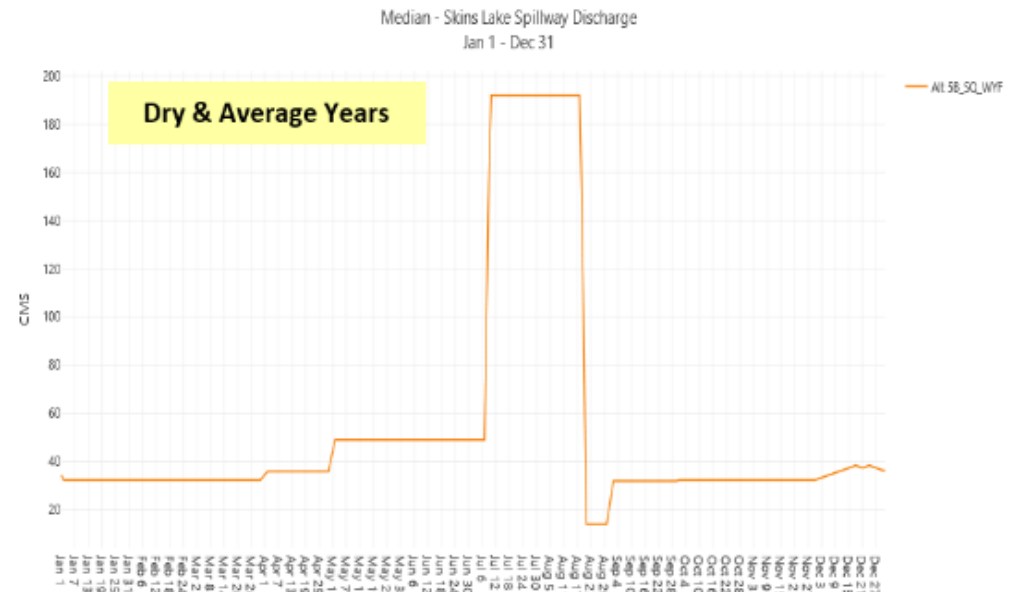


New - Alternative 5B (SQ_WYF)

Alternative 5B (SQ_WYF) (orange)

During dry and typical years, the status quo hydrograph is provided.

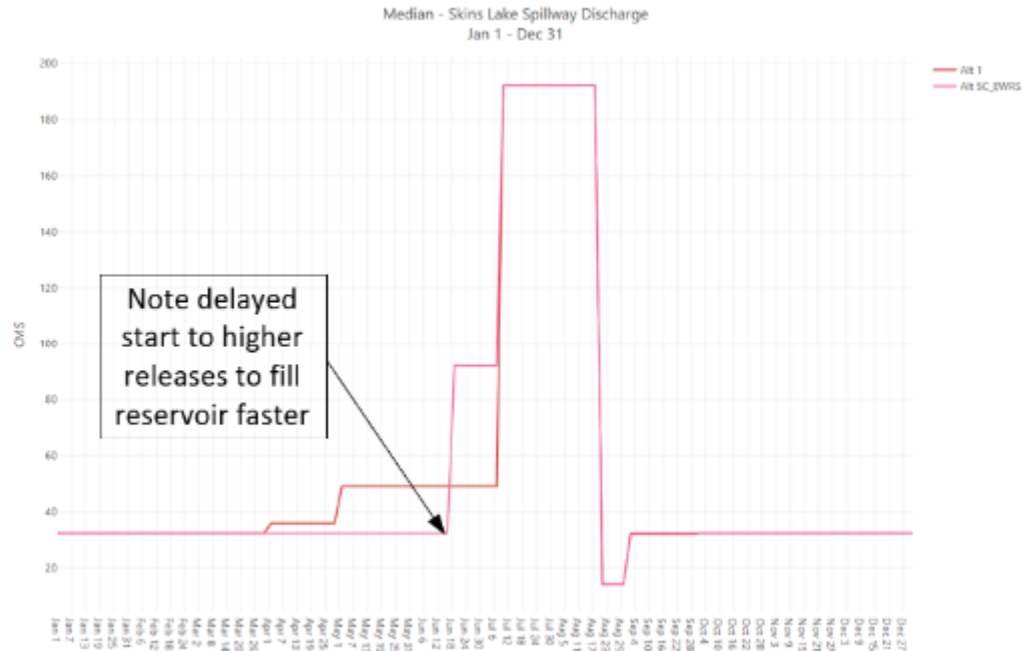
During wet years, a modified version of Alt 1-5 (reservoir productivity) is provided. Relative to Alt 1-5, flow outside of the STMP has been increased, the freshet flow release is delayed, and more gradual rates of flow change (ramping rates) are provided.



New - Alternative 5C (EWRS)

Alternative 5C (EWRS) (pink)

During dry and typical years, the status quo hydrograph has been reshaped to provide a single stepped flow increase for 3 weeks prior to STMP (~92 m³/s).

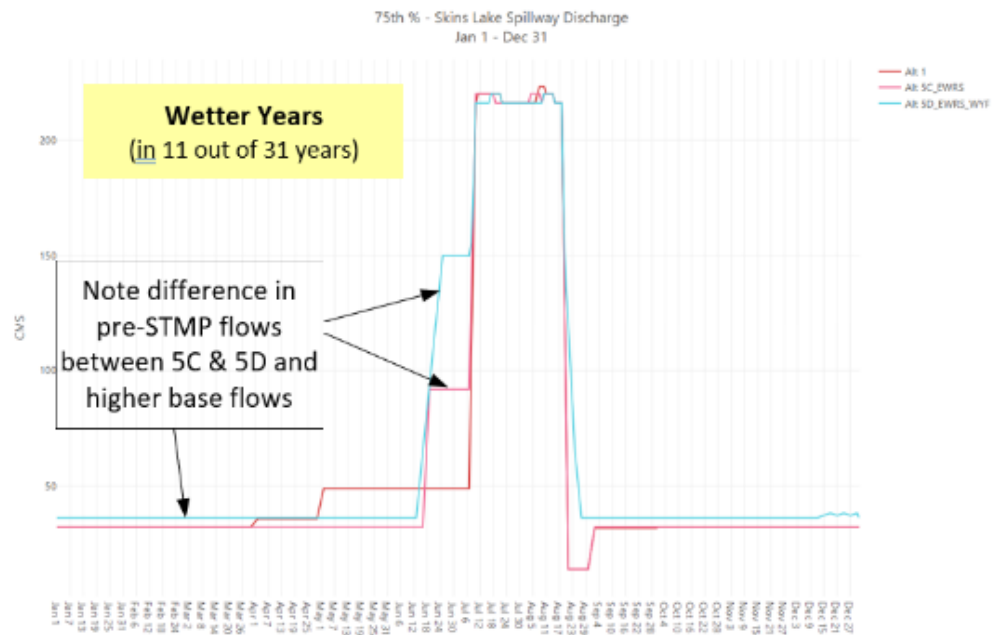
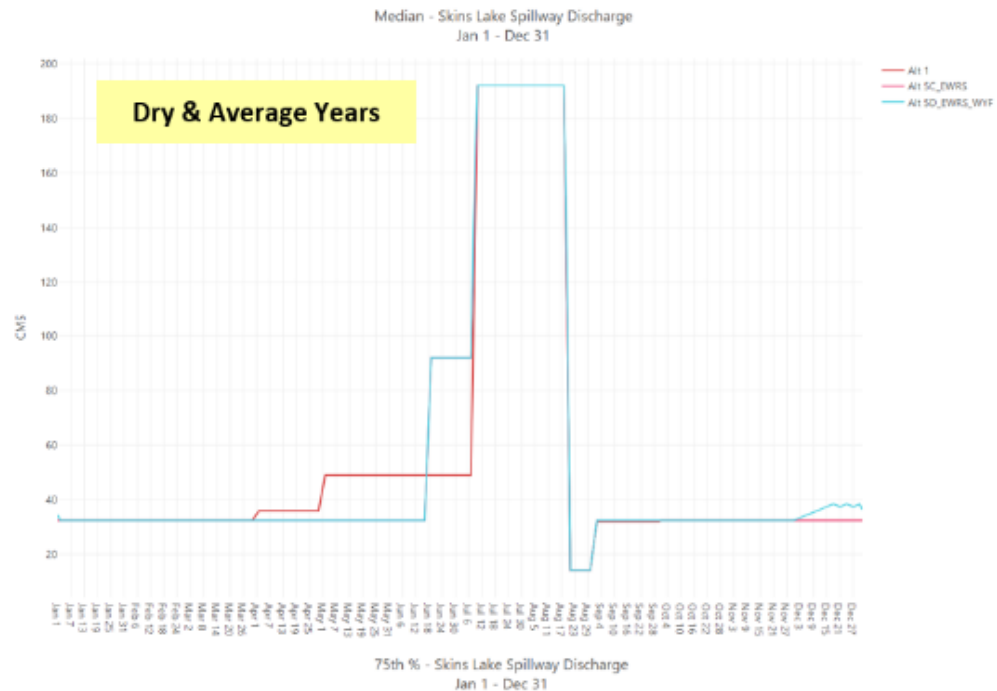


New - Alternative 5D (EWRS_WYF)

Alternative 5D (EWRS_WYF) (cyan)

During dry and typical years, the status quo hydrograph has been reshaped to provide a single step flow increase for 3 weeks prior to STMP (~92 m³/s).

During wet years, a modified version of Alt 1-5 (reservoir productivity) is provided. Relative to Alt 1-5, flow outside of the STMP has been increased, the freshet flow release is delayed, and more gradual rates of flow change (ramping rates) are provided.



**Questions or
clarifications on
the process or
selection of
Recommended
Round 2 Flow
Alternatives?**



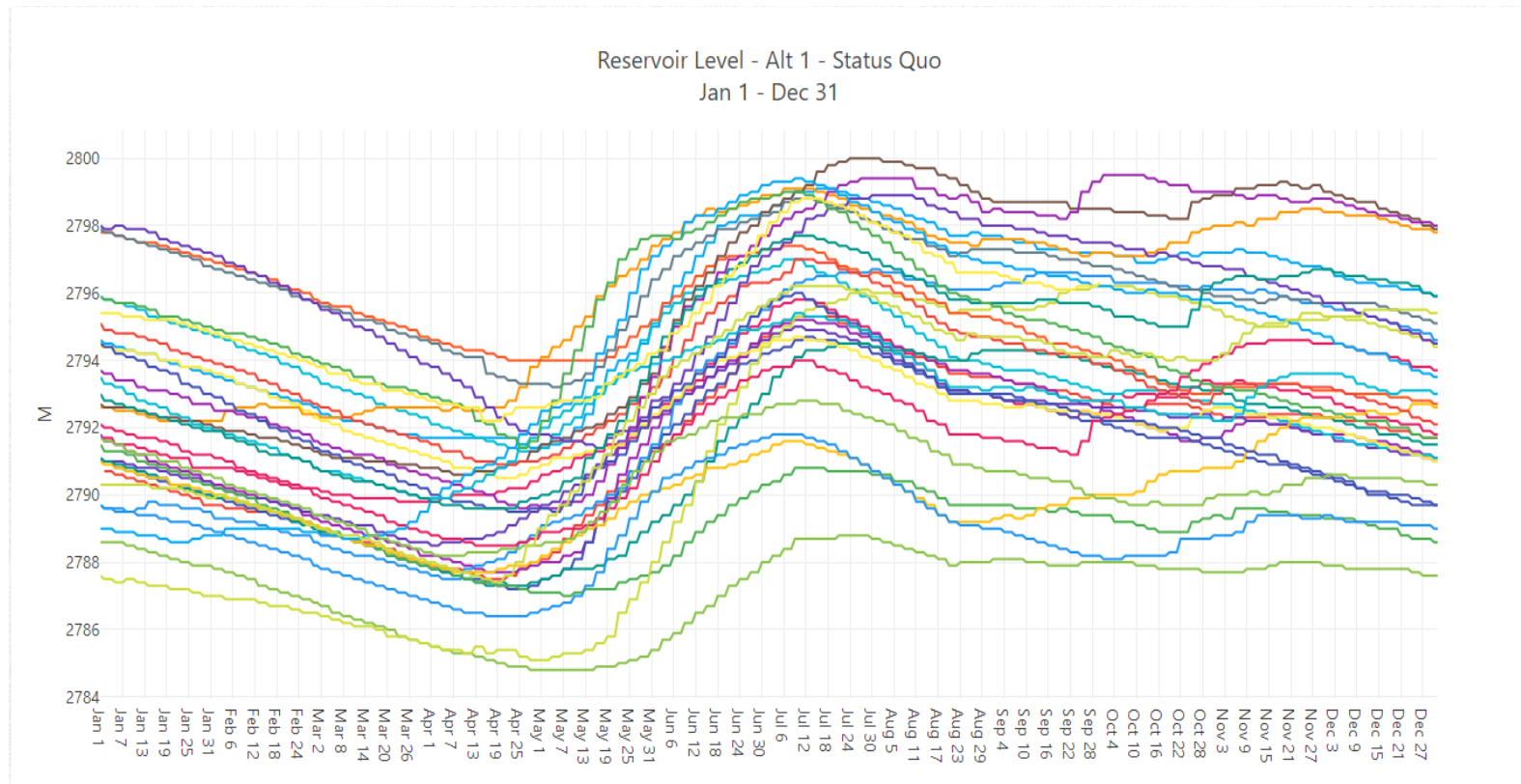
Phase 1

Assessing Round 2 Flow Alternatives

- Hydrology

Michael Harstone
Clayton Schroeder

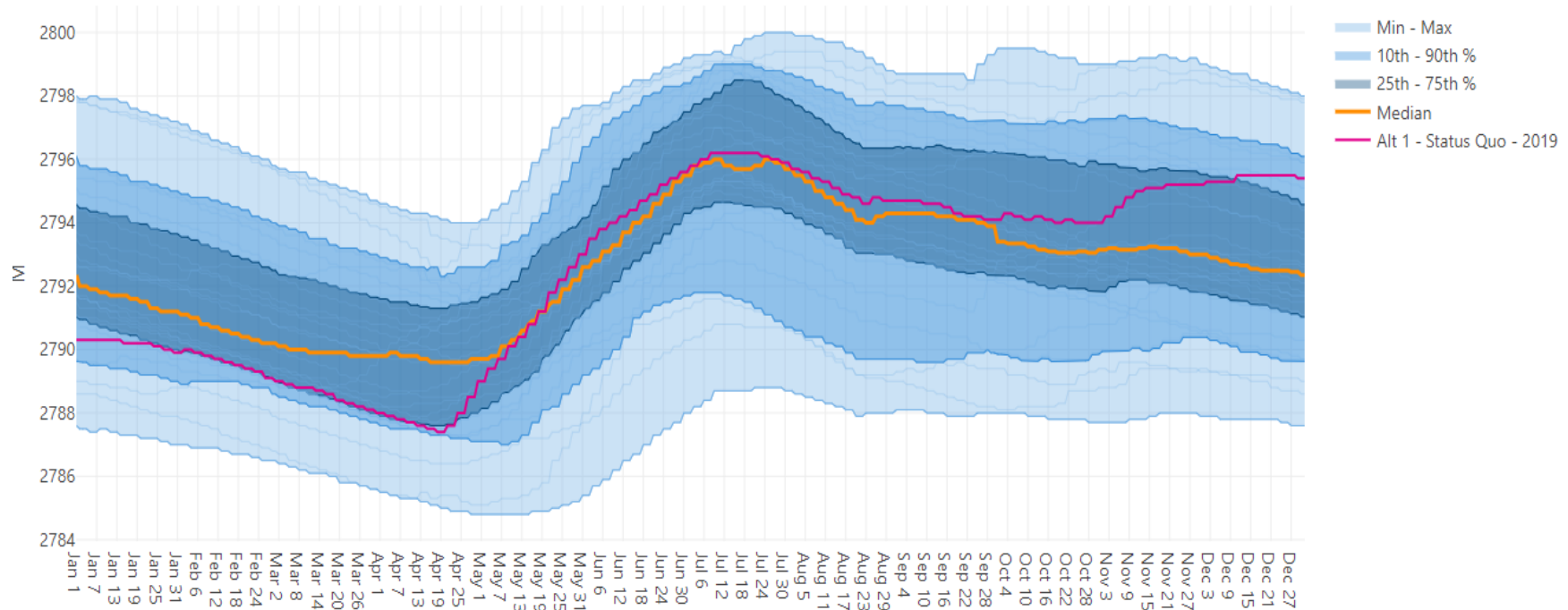
Modeling Outputs: Using Hydrographs



Modeling Outputs: Using Hydrographs

Reservoir Level - Alt 1 - Status Quo

Jan 1, 2019 - Dec 31, 2019



Maximum	Across the entire dataset, the maximum value recorded on a given day
90 th percentile	90 % of all recorded values were below this point, and 10% were above. <i>This represents a 1 in 10 year higher river flow / or higher reservoir level event</i>
75 th percentile	75 % of all recorded values were below this point, and 25% were above
50 th percentile (median)	50% of records would be above, and 50% would be below this point. <i>This represents an <u>average'y</u> river flow or reservoir level where half the years would be expected to be above or below this point.</i>
25 th percentile	25 % of all recorded values were below this point, and 75% were above
10 th percentile	10% of all recorded values were below this point, and 90% were above. <i>This represents a 1 in 10 year lower river flow / or lower reservoir level event</i>
Minimum	Across the entire dataset, the minimum value recorded on a given day
Selected Year	Represents a single year from the selected dataset

HydroViz – Online Tool

<https://www.hydroviz.ca/nechako>

Access Code: NECHAKOWEI

Chart Builder

Performance Measures

New Spaghetti Chart

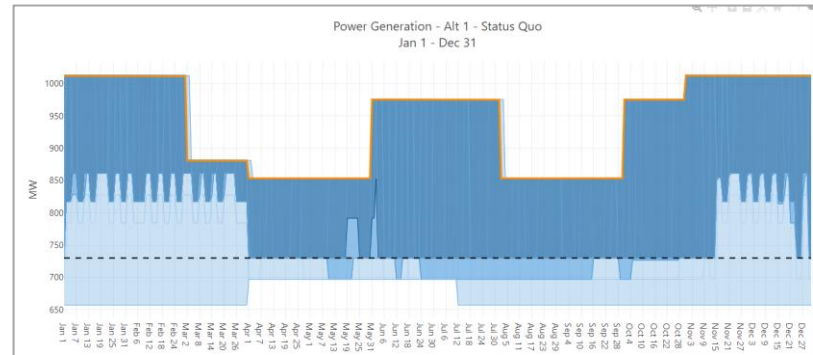
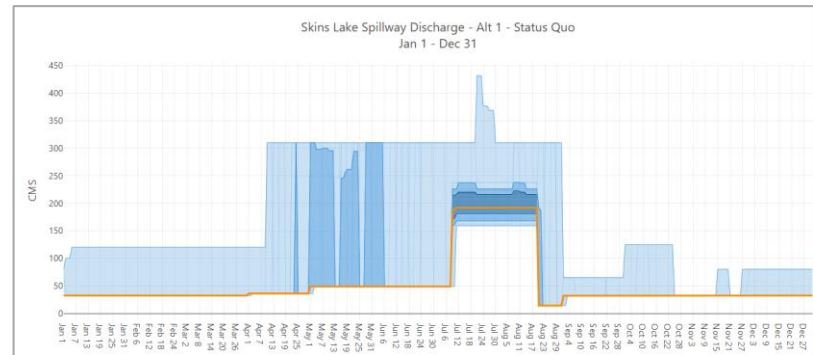
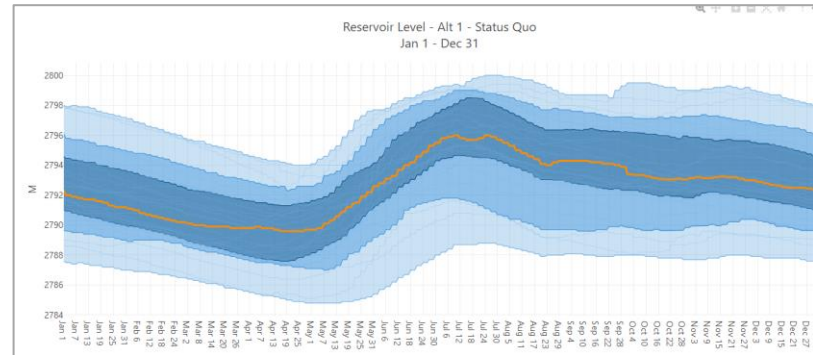
New Multiple Alternative Chart

New Single Alternative Chart

New Multiple Location Chart

New Period of Record Chart

New Historical Record Chart



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New Spaghetti Chart

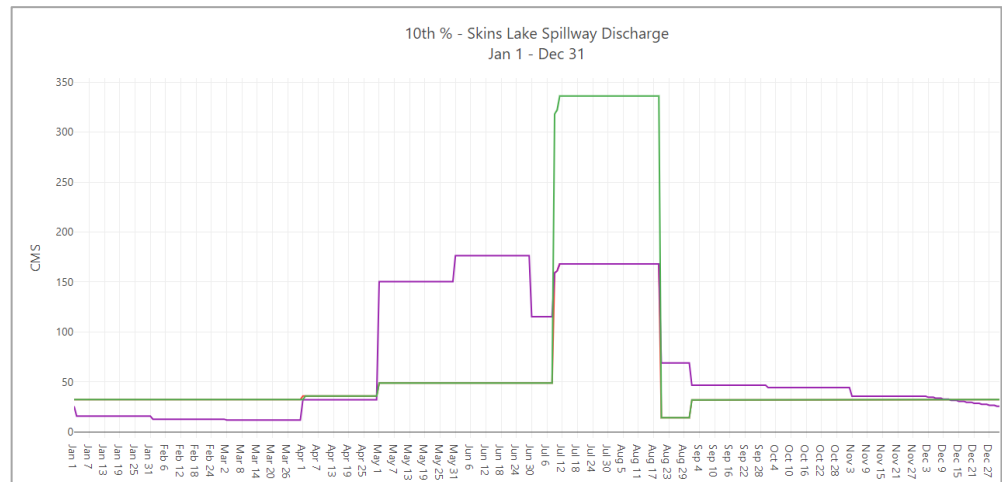
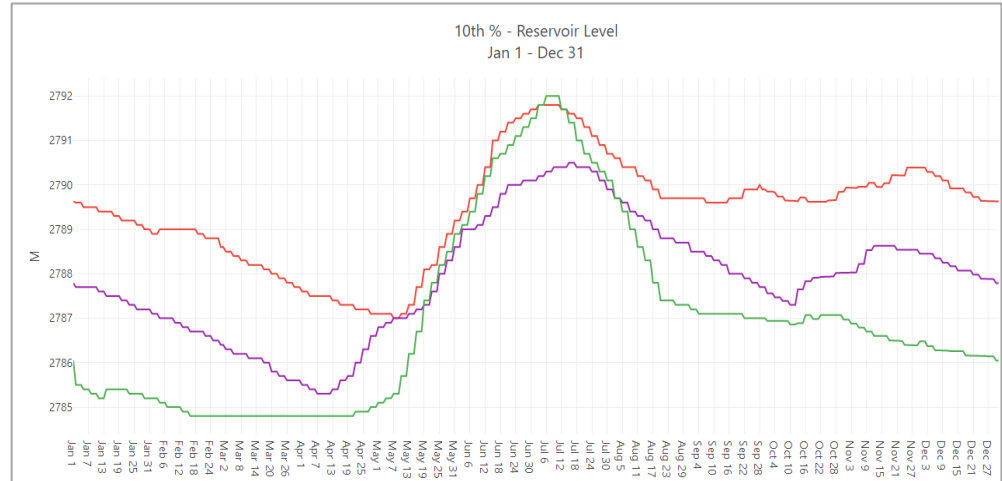
New Multiple Alternative Chart

New Single Alternative Chart

New Multiple Location Chart

New Period of Record Chart

New Historical Record Chart

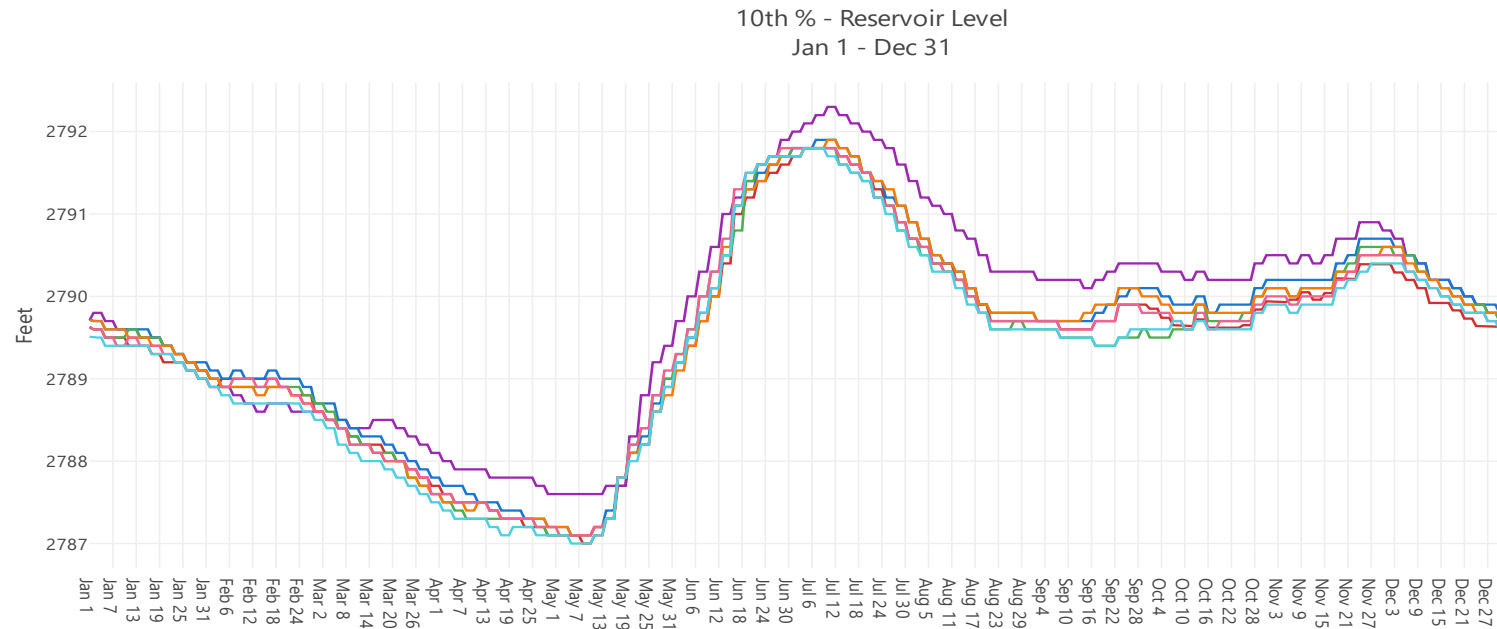
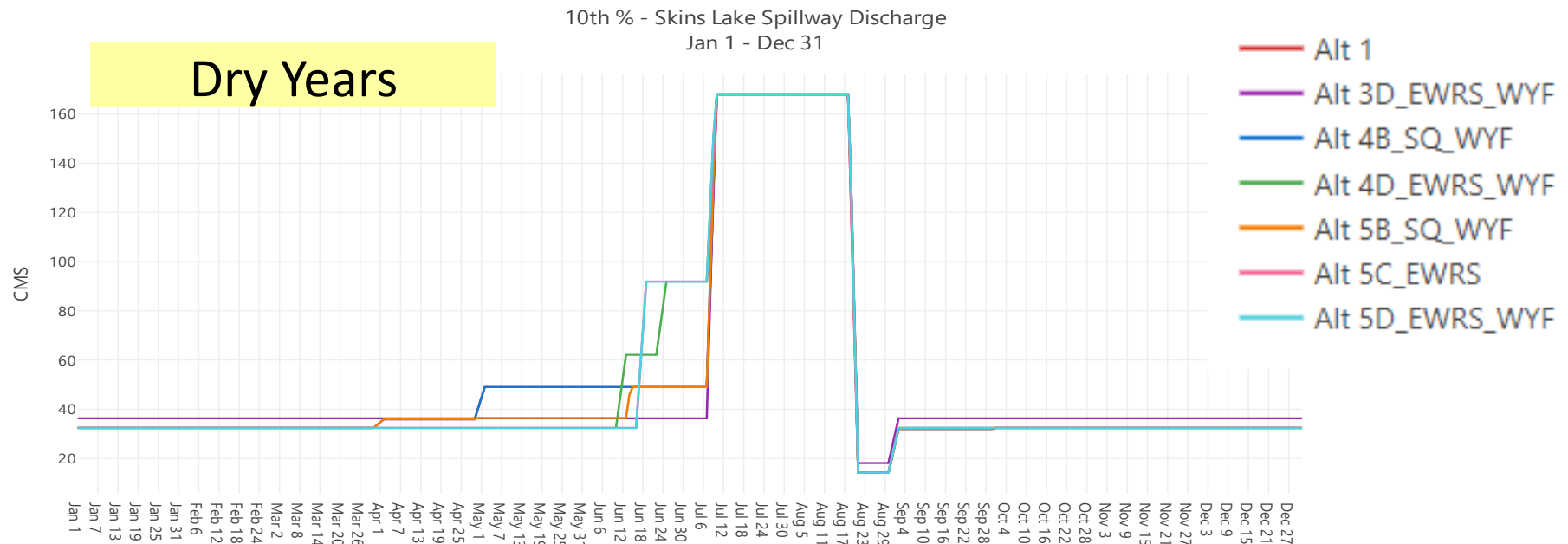


Phase 1

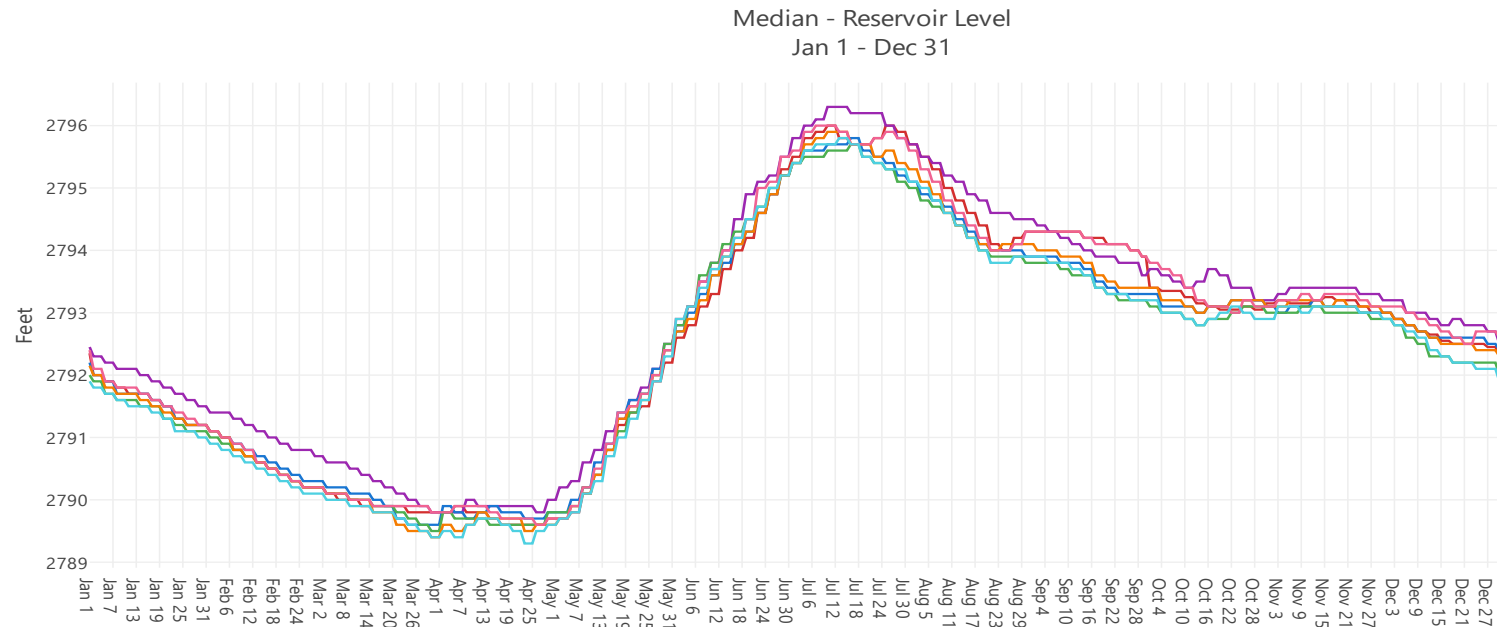
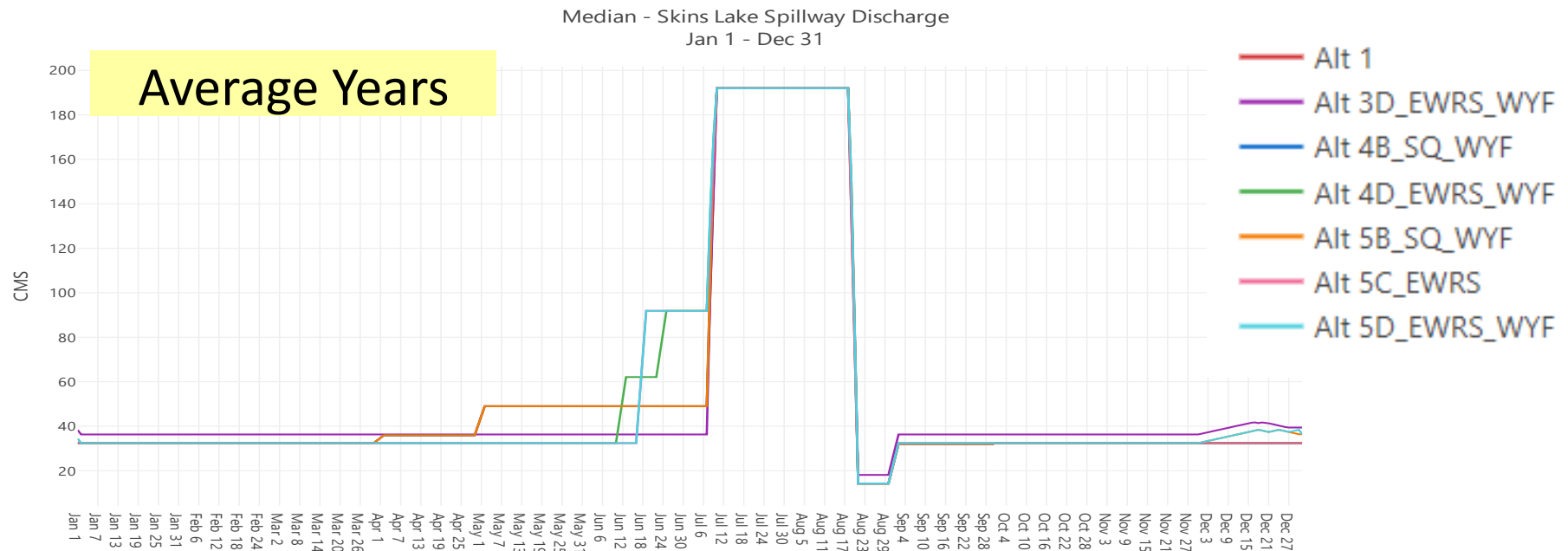
Round 2 Flow Alternatives

- Hydrographs

Hydrograph Comparisons – P1 Round 1 Flow Alternatives

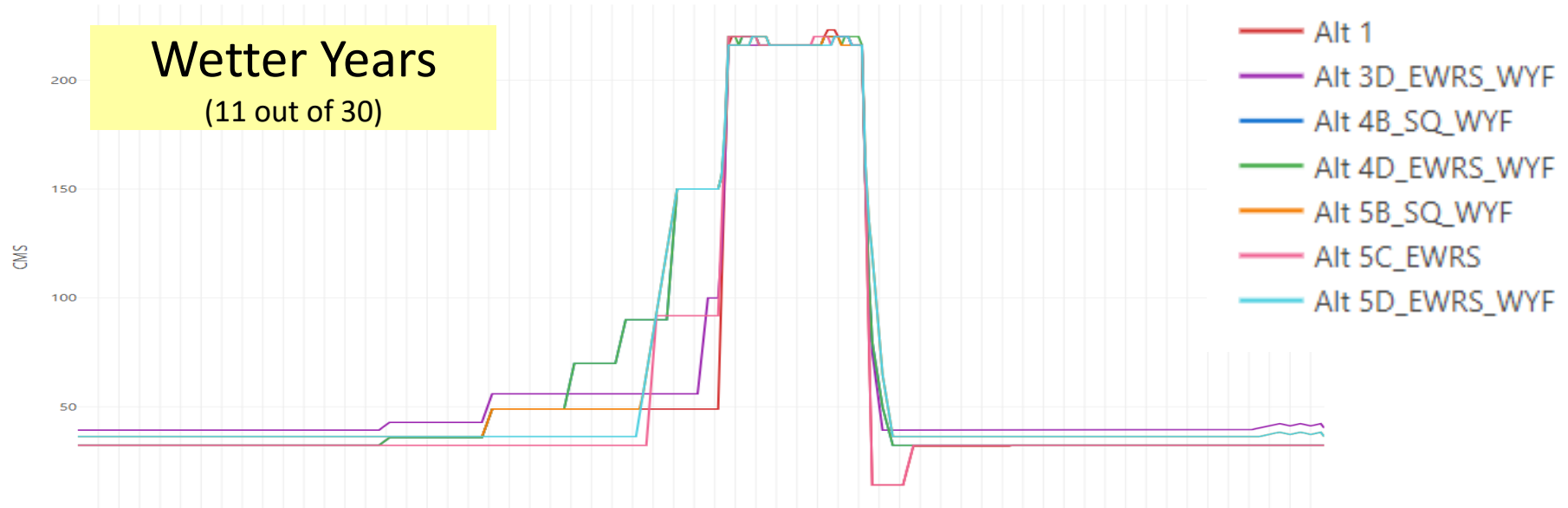


Hydrograph Comparisons – P1 Round 1 Flow Alternatives

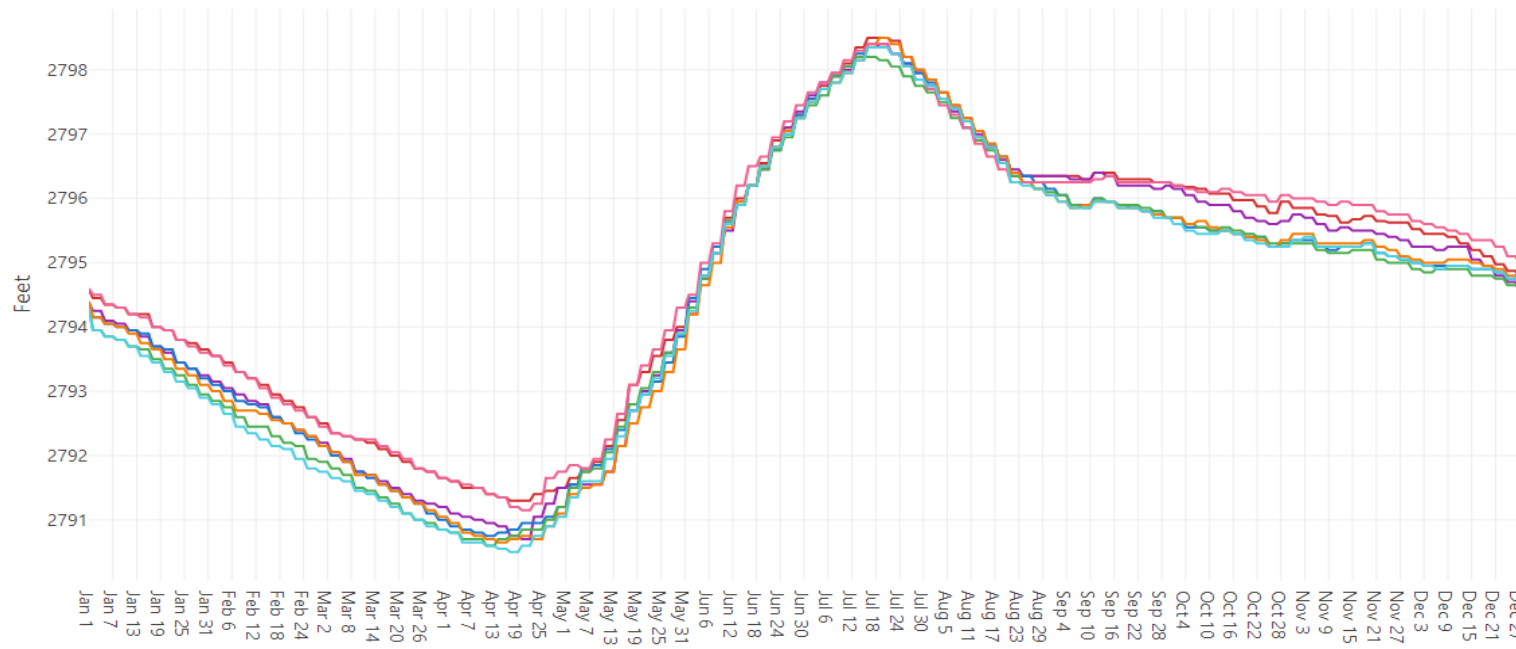


Hydrograph Comparisons – P1 Round 1 Flow Alternatives

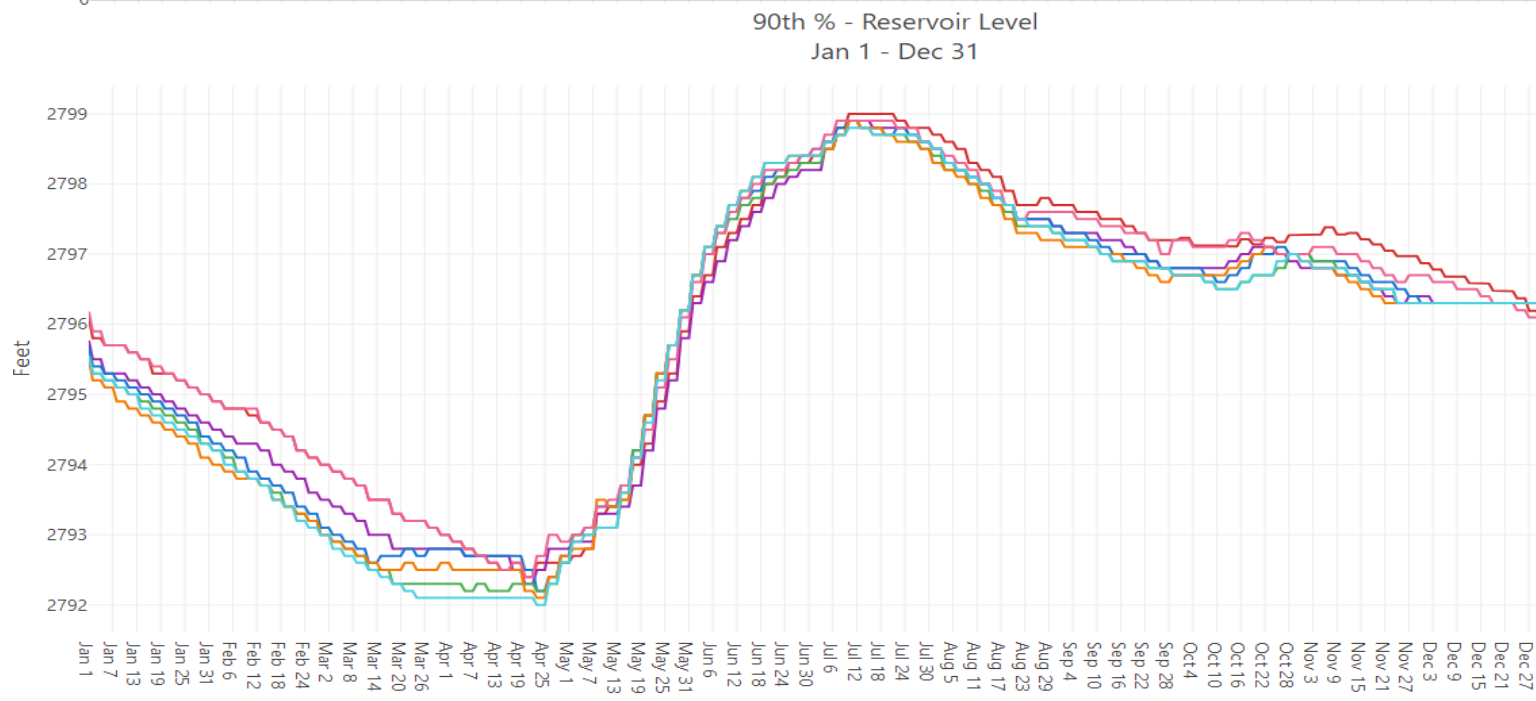
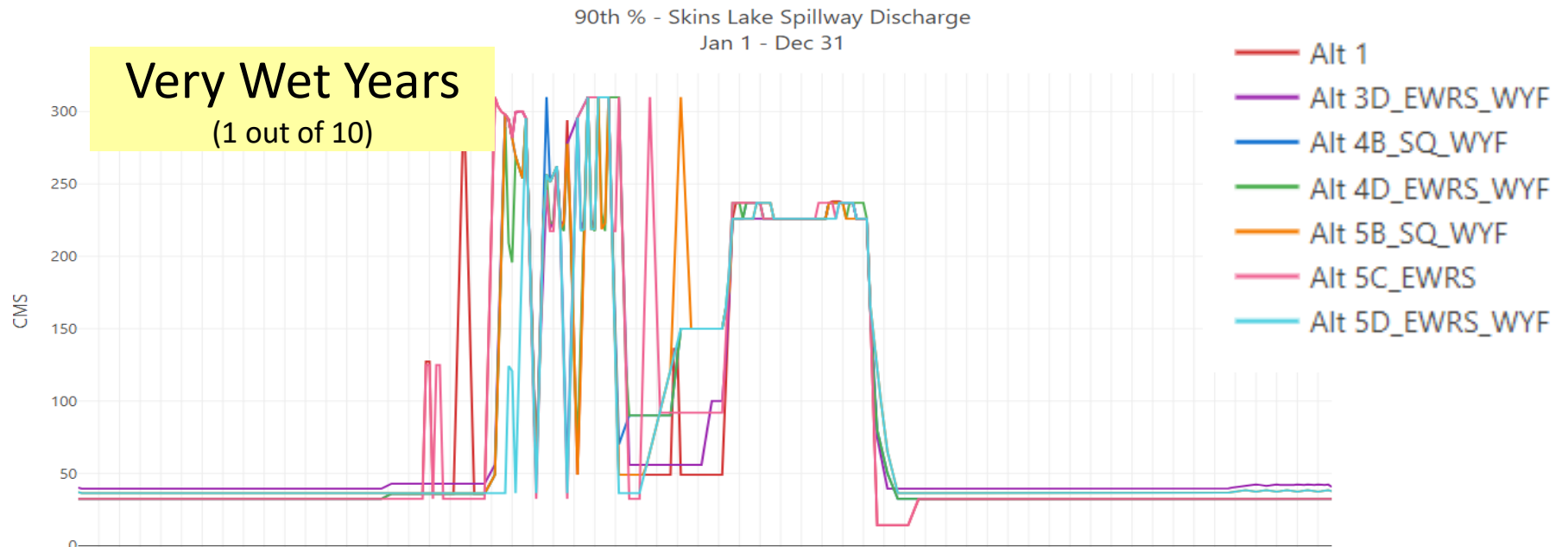
75th % - Skins Lake Spillway Discharge
Jan 1 - Dec 31



75th % - Reservoir Level
Jan 1 - Dec 31



Hydrograph Comparisons – P1 Round 1 Flow Alternatives



HydroViz – Online Tool

<https://www.hydroviz.ca/nechako>

Access Code: NECHAKOWEI

About tomorrow ...

DRAFT Agenda – DAY 2

Thursday – June 29, 2023

9:00am	Overview Day 2 <ul style="list-style-type: none"> About Today - Meeting Overview and Objectives Insights about flow differences (Day 1) 	EDI Compass
9:30am	Assessing the Flow Alternatives – Performance Measures (PMs) <ul style="list-style-type: none"> Preliminary calculated PM results Review overall Consequence Table (<u>Altaviz</u>) Commentary and Discussion 	Ecofish Compass
10:45am	Break (15mins)	
11:00am	Ranking the Flow Alternatives – Exercises <ul style="list-style-type: none"> Ranking exercises 	Compass
12:00pm	Lunch – 45min	
12:45pm	Reaching Agreement on Phase 1 Flow Alternatives & Next Steps <ul style="list-style-type: none"> Next Steps with Phase 1 Flow Alternatives 	Compass Ecofish
2:00pm	INTRO: “Package” of Phase 1 Flow Related Recommendations <ul style="list-style-type: none"> Introduction and overview of other flow-related recommendations for P1 	Ecofish
2:15pm	Break – 15mins	
2:30pm	“Package” of Phase 1 Flow Related Recommendations <ul style="list-style-type: none"> Building a coherent “package” of Phase 1 flow recommendations Next steps 	Ecofish
3:45pm	Next Steps <ul style="list-style-type: none"> Transitioning to P2 Flow Alternatives (process & steps) Upcoming Work over the summer Next meeting dates 	EDI
4:00pm	Adjourn	EDI



Dinner by the river ...

Thanks!

