Phase 1 Bookend Alternatives

Nechako WEI Meeting 30 - Wednesday, March 8, 2023

(In Vanderhoof, BC)

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Main Table Update

- Past Actions
- SSWG

Rio Tinto Update and Operations

TWG Update

TWG Update

- 5 TWG meeting since Nov 16 2022 MT meeting
 - Finalizing technical memos (some work ongoing)
 - Revising flow alternatives
 - Reviewing PMs
 - Modeling and reviewing results
 - Data gaps and monitoring



About Today

Nechako WEI Process Steps

Timeline



Assessment of Flow Alternatives – Snapshot Overview

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
- ~ 1 day 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

SDM Process Steps: as discussed





Refresher from our last meetings

Structure and Sequencing – as agreed to

Phase 1 Flow Alternatives



Phase 2 Flow Alternatives

Flow som their agre

Phase 1

(Immediate Term)

Phase 2

(Near & Med

Term)

would require Rio Tinto to seek I / authorization(s) according to ense and/or flow related mmitments with First Nations.





Refresher from our last meetings

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

Access Code (same for both): NECHAKOWEI

Nechako Water Engagement Initiative

March 8th, 2023

Pre-Reading Package – Main Table Meeting 30

This pre-reading package serves as a primer with needed background information on the assessment of Phase 1 flow alternatives <u>that were developed and agreed to following our last meeting</u>. The assessment summarized in this pre-reading package will be the focus for our upcoming Performance Measure Review session on March 7th and Main Table Meeting 30 on March 8th in Vanderhoof. You should expect to take between one and two hours to review and read through this package in advance of our meeting. Some of the material should look familiar, as it has been discussed at prior meetings and is included as reference material (e.g., performance measures, RT facilities and operations, etc.).

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 and ranking exercises that you will be asked to complete!

At our last meeting (held on November 16, 2022), we undertook an assessment of the preliminary Phase 1 "Bookend" flow alternatives, which describe how Rio Tinto's water control facilities could be operated differently (i.e., how water is held and released). The "Bookend" alternatives were "illustrative" and provided a cross section of the nature and type of operating alternatives that could be developed.

In our upcoming meeting we will be assessing four new flow alternatives that were developed with feedback from Main Table meeting #29. The latest round of alternatives do not emphasize a single interest, but attempt to provide a balance across multiple interests through revised flow releases from Skins Lake Spillway.

The TWG has been regularly meeting over the past several months to review the draft performance measures (PMs) and identify a shortlist of them that provides an accurate and comprehensive (but not overwhelming) summary to compare flow alternatives and identify which ones are performing better than others. Through this work, the TWG has recommended a shortlist of 19 PMs to use out of the full set of 56 PMs for our upcoming meeting.

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

1	Workshop Details	3
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4	Phase 1 Bookend Alternatives (SDM Step 3)	<mark>11</mark>
5	Assessing the Phase 1 Bookend Alternatives (SDM Step 4)	22
AF	PPENDIX A – Full List of Performance Measures	<mark>50</mark>

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**.





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Some observations from Last Meeting ...

- Frustration at not being able to discuss more substantive flow changes and specifically in relation to whole scale changes such as with a water release facility at Kenney Dam, etc.
 - This was discussed again at Mtg 29 and the Main Table agreed that we would start with Phase 1 and then move onto Phases 2 & 3
- Frustration with being asked to carry out a ranking exercise when some members did not feel they had enough time to get familiar with the preliminary performance measures
 - Bookends served as a dress rehearsal to test out and use the PMs
 - Pre-reading package to explain & summarize PMs & AltaViz interactive tool
 - Extra PM session added to more deeply go into the PMs and values
- Challenge with talking about flow changes without factoring in White Sturgeon recovery
 - TWG has reviewed and discussed a draft strategy for how White Sturgeon will be incorporated into the flow decisions, given its importance!

- Recognize importance of sturgeon in flow decisions
- TWG work is ongoing
 - Completed review of other jurisdictions
 - Collaboration with NWSRI
- Best science unable to provide PM



- Establish a path forward to consider sturgeon in absence of PM
- Recommended 3-phase approach:
 - Collaborate w/ NWSRI
 - Monitor effects
 - Trigger to re-open WEI



- <u>Collaborate w/ NWSRI</u>
 - Ongoing communication and information sharing
 - NWSRI review of preferred flow alternatives
 - Best guess: is the alternative better, worse, or no change?
 - Impacts to ongoing research?
 - Any other concerns with alternatives
 - Support research, flow trials



- <u>Monitor</u>
 - How do flow changes affect sturgeon?
 - Specific studies, objectives related to operational changes
 - Monitoring beyond current NWSRI?
 - WEI commitment to monitor



- Trigger to re-open WEI
 - What happens if new information arises?
 - How much information/certainty is required to trigger a WEI action?
 - When/how do we introduce a sturgeon PM and reassess alternatives?
 - Technical or other committee review?
 - Fully open WEI (re-do SDM process)?
 - Implement alternative flows?



Questions?



Timeline

Step 1 (2017) Pre-engagement on methods and topics for the water engagement Step 2 (January – March 2018) Report out on Step 1 and develop plan for ocused Water Step 3 (March – July 2018) Launch search for independent facilitator

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Step 4 We are here! Broad based engagement is underway to gain an understanding of interests to be addressed. Includes public meetings, small group workshops and one on one dialogue.



Develop options to address interests raised in Step 4.

Step 6 (Future stage)

Report back and present draft options for further refinement. Includes public meetings, small group workshops and one on one dialogue.

Step 7 (Future stage)

Finalise options and develop implementation plan, including regulatory approval where required.

Introduction to Phase 1 Flow Alternatives (Round 1)

How were these Flow Alternatives Developed?

At our Last Meeting (Mtg #29)

- Review and assessed six "bookend" flow alternatives
- Highlighted four of the bookends to carry forward and improve upon during the development of Round 1 Flow Alterns
- A survey was sent out to Main Table members for new flow altern ideas



- TWG worked with advice and developed a total of 8 Flow Alterns
- Ecofish / Rio Tinto / TWG operationalized the alternatives so they could be modeled
- TWG reviewed the preliminary modeling results and made recommendations on how well they performed and met the criteria for Phase 1 alternatives

Phase 1 Flow Alternatives

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
- Hydropower flows for Tier 2 power sales
- Ramping rates at SLS
- Flood risk thresholds (e.g., Cheslatta Lake)
- Flow operations for beavers and avoiding ice jams



Proposed New Alternatives

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Pre-Read, Page 12

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Proposed Bookend Alternatives and New Flow Alternatives to Move Forward with (i.e., at Next MT Meeting 30) (Distributed to Main Table for Comment and Approval on November 25)							
Flow Alternatives Name	Carry Forward	Rationale	Recommended Revisions (if any)				
Alternative 1 Status Quo	Yes	It is important to have a reference to compare any new alternatives against.	Keep this alternative and develop an additional version that mimics the 2022 flow scenario				
Alternative 2 Nechako Aquatic Species	Maybe	There is continued interest for a hydrograph that is more like a natural freshet.	Keep this alternative and explore options for improvements for freshet flow.				
Alternative 3 Sockeye Migration	No	This was ranked as one of the least preferred (swing weighting). Also, the doubling of STMP portion of this alternative does not appear to provide much benefit for migrating sockeye.					
Alternative 4 Cheslatta Aquatic Species	Yes	Performed well and was one of the two most preferred alternatives during the ranking exercises. That was specific concern about the low winter flows.	Keep this alternative and explore new options that increase winter flows.				
Alternative 5 Wildlife (reservoir)	No	This alternative was one of the least preferred during the ranking exercises. Alternative 6 outperformed Alternative 5 for reservoir wildlife interests.	Use alternative 6 instead.				
Alternative 6 Reservoir Aquatic Species	Yes	This alternative performed moderately well and balances competing interests.	Explore opportunities to include more gradual ramping rates and higher winter flows.				
Alternative 7 Flood Mitigation	Yes	This is one of the original bookend alternatives, modelling outputs were not available for last meeting.	Revisions to model are ongoing and will be presented at the next meeting.				

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Developing Phase 1, Round 1 Alternatives

Pre-Read, Page 13

NECHAKO

- Eight draft alternatives were developed considering three different water budgets
 - Water available for new alternatives under Phase 1 depends on the amount of water available annually (water budget), <u>and</u> timing of flow release
- Four of these alternatives met criteria for Phase 1 (maintain Tier 1 power generation)

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- We have numbered these Alt 1-2, Alt 1-3, etc.
- Remaining 4 will be retained for future Phase

Feedback for New Alternatives

Pre-Read, Page 12-13

Comment	From	Addressed In
Gradual rates of flow change (increase and decrease)	Wayne, Dennis and June, Mike	Alt 1-2, Alt 1-4, Alt 1-5
Natural flow pattern (year- round)	Dennis and June, Mike	Alt 1-4
Increase winter and early spring flows	Dennis and June	Alt 1-3, Alt 1-4, Alt 1-5
Mimic 2022 flow release schedule	Mike	Modelled but not carried forward; revisit in later phase
Concerns re: STMP	Wayne	Revisit in later phase
Concerns re: overall quantity of water	Gerd, Henry	Revisit in later phase



Pre-Read, Page 15

This alternative is a modification of the status quo to provide a gradual flow increase and decrease around the STMP





Pre-Read, Page 16

This alternative is a modification of the status quo to provide additional flow year-round, outside of the STMP period.





Modification of Alt 2 and Alt 4, which were intended to provide a natural-shaped hydrograph.

Relative to Bookend Alt 2 and Alt 4, winter flow has been increased, the freshet is of lower magnitude, and flow in the fall months is constant rather than stepped.

Rates of flow change are more gradual than Bookend Alt 2.







Pre-Read, Page 17

Modification of Bookend Alt 6, which was intended to maximize reservoir productivity by maintaining high reservoir water levels.

Relative to Bookend Alt 6, winter flow has been increased, the freshet flow release is later, rates of flow change are more gradual, and flow in the fall months is constant rather than stepped.





Assessing P1 Round 1 Flow Alterns

- 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.	
	This represents a 1 in 10 year higher river flow / or higher reservoir level event	
75 th percentile	75 % of all recorded values were below this point, and 25% were above	
50 th percentile	50% of records would be above, and 50% would be below this point.	
(median)	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.	
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.	
	This represents a 1 in 10 year lower river flow / or lower reservoir level event	
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



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HydroViz – Online Tool

https://www.hydroviz.ca/nechako

Access Code: NECHAKOWEI



A few words first about ...

Modeled Flow Alternatives

VS

Historical Water Conditions

(Compass was asked to include WSC Data in HydroViz to help provide more context when comparing the Flow Alternatives)
Inflows to Nechako Reservoir (1 Year)



































Does this mean the modeled Flow Alternatives are inaccurate and should not be relied upon?

NO!

It means that comparing Historical Flows & Levels is not an Apples-to-Apples comparison to modeled Flow Alternatives.

If the factors that led to discrepancies in the historical conditions were factored into the Flow Alternatives. The modeled results should be the same! But there are a lot of potential factors!



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Pick Year 2020 - Discharge at Vanderhoof

Assessing P1 Round 1 Flow Alterns

- Hydrology

Michael Harstone Clayton Schroeder









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HydroViz – Online Tool

https://www.hydroviz.ca/nechako

Access Code: NECHAKOWEI

Assessing P1 Round 1 Flow Alterns

- TWG Shortlisted Performance Measures

Katie Healey Jayson Kurtz

Cutting to the Chase ...



Criteria		Performance Measures	Unit	Preferre Directio	dMSIC n	Alternative 1 Status Quo	Alternative 1-2	Alternative 1-3	Alternative 1-4	Alternative 1-5
Fish										
* #6 River fish access to side/off channels	Median	Average flow	CMS	Higher	20%	92.6	114.2	100.3	115.9	113.3
* #12 Reservoir productivity-flushing	Median	Average discharge	CMS	Lower	20%	84.9	107	92.4	108.4	105.6
* #17 Cheslatta watershed fish habitat	Median	Range of flow	CMS	Lower	20%	191.8	186.5	188.1	177	180
* #18a River water temperature and migrating salmon	Median	Number of days average daily temp exceeds 18C	Days	Lower	20%	30.5	29	29.5	29	26.5
* #18c River water temperature and migrating salmon	Median	Number of days average daily temp exceeds 20C	Days	Lower	20%	5.5	4.5	5	4.5	4.5
* #21a River Chinook incubation flow	Median	Ratio of min incubation flow to average spawning flow	%	Higher	20%	50.3	40.3	57.7	42.4	40.1
* #22a V2 River CH rearing habitat post-emergent Habitat	Median	Percent of maximum available post-emergent habitat (modified Envirocon)	%	Higher	20%	100	100	100	99.3	100
* #22b V2 River CH rearing habitat pre-migrant habitat	Median	Percent of maximum available pre-migrant habitat (modified Envirocon)	%	Higher	20%	84.8	72.2	87.5	49.8	56.3
* #25a Resident fish rearing habitat	Median	Percent of maximum available juvenile Rainbow Trout habitat	%	Higher	20%	66.2	56.2	62.3	50.8	54.6
#26 Resident fish overwinter habitat	Median	Percent of maximum available overwintering habitat (modified Slaney et al. 1984)	%	Higher	20%	95.6	95.6	96.1	90.1	94
Wildlife										
* #32 Reservoir caribou land links	Median	# of days water elevation is > 852 m	Days	Higher	20%	8	30	19.5	15	21.5
* #38 Reservoir osprey nesting habitat		Number of years where reservoir elevation exceeds 852.44m	Years	Lower	20%	12	18	14	10	11
* #41b Reservoir wetland habitat		Number of years where reservoir elevation exceeds 852.94 m	Years	Higher	20%	8	9	9	8	9
* #45b River bird inundation of nests		Number of years where Cheslatta discharge exceeds 275 cms	Years	Lower	20%	5	6	6	5	4
Culture & Heritage										
* #49b Cheslatta watershed in undation of arch sites	80th %	# of days > 300 cms	Days	Lower	7	2.2	13	7.2	1.8	3.6
Flooding & Erosion										
* #53 River open-water flooding	Max	# of days flow >550 at Vanderhoof	Days	Lower	7	2	19	1	18	10
Rio Tinto Operations										
* #65b Smelter Power	Max	# of days smelter load isn't met	Days	Lower	7	0	0	0	0	0
* #66b Kemano power reliability (Tier 1)		Tier 1 power reliability	%	Higher	5	96.98	98.75	96.98	96.98	96.98
* #67 Kemano power exports (Tier 2)	Median	Mean Tier 2 power generation	MW	Higher	20	136.3	31	54.5	45.2	65.6

Pre-Read, Page 7

- Last meeting:
 - 46 issues
 - 56 PMs shortlisted to 17
- Review all PMs between rounds
- This meeting 19 PMs
 - PMs 21, 22a, 66 modified based on technical memos

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PMs 22b and 26 added

Pre-Read, Page 7

Fish and Wildlife					
Issues	#	Performance Measures	Details		
River fish access to	6	Average flow	Location:	Nechako River and Cheslatta watershed	
side/off channels			Timing:	Year round, but primarily growing season	
			Unit:	CMS	
			Direction:	More is better	
			MSIC:	20%	
Reservoir productivity-	12	Average discharge	Location:	Nechako Reservoir	
flushing			Timing:	Year round	
			Unit:	CMS	
			Direction:	Less is better	
			MSIC:	20%	
Cheslatta watershed	17	Range of flow	Location:	Cheslatta watershed (primarily River)	
fish habitat	ish habitat		Timing:	Year round	
			Unit:	CMS	
			Direction:	Lower	
			MSIC:	20%	



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Pre-Read, Page 8

Issues	#	Performance Measures	Details	
River water temperature and	18	a: # of days average daily temp exceeds 18C	Location:	Chinook: entire Nechako River Sockeye: Below confluence of Stuart River
migrating salmon		c: # of days average daily temp exceeds	Timing:	Salmon migration period: Jun 15 – Aug 29
		200	Unit:	Days
			Direction:	Fewer is better
			MSIC:	20%
River Chinook	21	21 a: Ratio of min incubation flow to average	Location:	Nechako River below Cheslatta Falls
incubation flow		spawning flow	Timing:	Aug 15 to May 31
		(rather than using m², the PM is now relevant to the maximum available habitat	Unit:	% of max available
			Direction:	Higher
		for an easier comparison)	MSIC:	20%
River Chinook rearing	22	a: Percent of maximum available post-	Location:	Nechako River below Cheslatta Falls
habitat		emergent habitat (modified Envirocon	Timing:	Apr 1 – May 15
		curve)	Unit:	% of max available
			Direction:	More is better
		(The original flow:habitat curve was modified based on learning during NFCP studies)	MSIC:	20%



Pre-Read, Page 8

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River Chinook rearing	22	b: Percent of maximum available pre-	Location:	Nechako River below Cheslatta Falls
habitat		migrant habitat (modified Envirocon curve)	Timing:	May 15 – July 15
			Unit:	% of max available
		(we had low confidence in the original	Direction:	More is better
		flow:habitat curve, however, learning	MSIC:	20%
		during NFCP studies allowed us to modify and include this PM)		
Resident fish rearing	25	a: Percent of maximum available juvenile	Location:	Nechako River below Cheslatta Falls
habitat		Rainbow Trout habitat (modified Slaney et al.1984 curve).	Timing:	May 1 – Sept 31
			Unit:	% of max available
		(rather than using m ² , the PM is now relevant to the maximum available habitat for an easier comparison)	Direction:	More is better
			MSIC:	20%
Resident fish 26 overwinter habitat	26	Percent of maximum available	Location:	Nechako River below Cheslatta Falls
		overwintering habitat (from Slaney et al. 1984 curve).	Timing:	Overwinter Period (Nov 1 – March 30)
			Unit:	% of max available
			Direction	More is better
			MSIC:	20%



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Pre-Read, Page 8/9

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Reservoir caribou land	32	# Of days water elevation is > 852 m	Location:	Nechako Reservoir
links			Timing:	May 1 – July 7
			Unit:	Days
			Direction:	More is better
			MSIC:	20%
Reservoir osprey	38	Number of years where reservoir elevation	Location:	Nechako Reservoir
nesting habitat		exceeds 852.44m	Timing:	Spring nesting period
			-	May 1 – Aug 15
			Unit:	Years
	ĺ		Direction:	Fewer is better
			MSIC:	20%
Reservoir wetland	voir wetland 41 b: Number of years where reservoir	b: Number of years where reservoir	Location:	Nechako Reservoir
habitat		elevation exceeds 852.94 m	Timing:	Growing season
			Unit:	m
			Direction:	More is better
			MSIC:	20%
River bird inundation	45	b: Number of years where Cheslatta	Location:	Entire Nechako River
of nests		discharge exceeds 275 cms	Timing:	Spring nesting period
			Unit:	Years
			Direction:	Fewer is Better
			MSIC	20%

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Pre-Read, Page 9

Culture and Heritage					
Issues		Performance Measures	Details		
Cheslatta watershed	49	b: # of days > 300 CMS	Location:	Skins Lake Spillway	
archeological sites	s	Timing:	Year round (most sensitive during STMP)		
Ŭ		Unit:	Days		
			Direction:	Fewer is better	
			MSIC:	b: 7 days	

Flooding and Erosion					
Issues		Performance Measures	Details		
River open-water flooding	53 # Of days flow >550 m3/s		Location:	Nechako River - focus at Vanderhoof Sandy-Beach subdivision / measured at Vdh	
	Timing:	Ice-free period Apr 1 – Oct 31			
			Unit:	Days	
			Direction:	Fewer is better	
			MSIC:	20%	



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Rio Tinto Operations					
Issues		Performance Measures	Details		
Kemano power	65	b: # of days smelter load isn't met	Location:	Kemano / Kitimat	
generation			Timing:	Year round	
			Unit:	Days	
			Direction:	Fewer is better	
			MSIC:	7	
Kemano power	66	Tier 1 power reliability	Location:	Kemano / Kitimat	
reliability Tier 1			Timing:	Year round	
		(based on information provided by RT, the reliability of being able to meet contractual requirements for Tier 1 power sales is more imporant than the actual MW of power sold)	Unit:	%	
			Direction:	More is better	
			MSIC:	5	
Kemano power	67	Mean Tier 2 power generation	Location:	Kemano / Kitimat	
exports (Tier 2)			Timing:	Year round	
		(the MSIC was reduced to improve sensitivity between alternatives)	Unit:	MW	
			Direction:	More is better	
			MSIC:	20	



- 19 PMs for this meeting
- PM work ongoing
 - Review between rounds of alternatives
 - Some PMs deferred until more information known
 - Interest to expand socio-economic PMs



General Results

Pre-Read, Page 48

Alternative	Performs Well For
Alt 1 (Status Quo)	
Alt 1-2	High reservoir interests (e.g., wetlands, caribou land links)
Alt 1-3	Stable flow interests (e.g., incubation, flooding)
Alt 1-4	High freshet interests (e.g., off channel access, water temperature)
Alt 1-5	Wildlife interests (e.g., bird nests, caribou land links)



Example – Fish access to off channel habitat

PM6: Average discharge	Location:	Nechako River and Cheslatta watershed
	Timing:	May 1 - Sept 30
	Unit:	CMS
	Direction:	More is better
	MSIC:	20%











Issue #6: River fish access to side/off channels Pre-Read, Page 39

PM6: Average discharge	Location:	Nechako River and Cheslatta watershed
	Timing:	May 1 - Sept 30
	Unit:	CMS
	Direction:	More is better
	MSIC:	20%



Issue #12: Reservoir productivityflushing Pre-Read, Page 39

PM12: Average discharge	Location:	Nechako Reservoir
	Timing:	May 1 - Sept 30
	Unit:	CMS
	Direction:	Less is better
	MSIC:	20%



Issue #17: Cheslatta watershed fish habitat Pre-Read, Page 40

PM17: Range of flow	Location:	Cheslatta Watershed (primarily river)
	Timing:	May 1 - Sept 30
	Unit:	CMS
	Direction:	Less is better
	MSIC:	20%



Issue #18a: River water temperature and migrating salmon Pre-Read, Page 40

PM18: River water temperature and migrating salmon a) Days > 18C

Location:	Chinook: entire Nechako River	
	Sockeye: Below confluence of Stuart River	
Timing:	Salmon migration period: Jun 15 – Aug 29	
Unit:	Days	
Direction:	Fewer is better	
MSIC:	20%	



Issue #18c: River water temperature and migrating salmon Pre-Read, Page 40

 PM18: River water temperature and migrating salmon
 Location:
 Chinook: entire Nechako River

 Sockeye: Below confluence of Stuart River
 Sockeye: Below confluence of Stuart River

 C) Days > 20C
 Unit:
 Days

 Direction:
 Fewer is better

 MSIC:
 20%



Issue #21a:River Chinook incubation flow Pre-Read, Page 41

PM21a: Ratio of min incubation
flow to average spawning flowLocation:Nechako River below Cheslatta FallsTiming:Aug 15 - May 31Unit:%Direction:HigherMSIC:20%



Issue #22a: River Chinook rearing habitat

Pre-Read, Page 41

PM22a: Percent of maximum available post-emergent habitat (modified Envirocon curve)

Location:	Nechako River below Cheslatta Falls
Timing:	Apr 1 – May 15
Unit:	% of max available habitat
Direction:	More is better
MSIC:	20%


Issue #22b: River Chinook rearing habitat Pre-Read, Page 41

PM22b: Percent of maximum available pre-migrant habitat (modified Envirocon curve)

Location:	Nechako River below Cheslatta Falls
Timing:	May 15 – July 15
Unit:	% of max available habitat
Direction:	More is better
MSIC:	20%



Issue #25a: Resident fish rearing habitat Pre-Read, Page 42

PM25a: Percent of maximum available juvenile Rainbow Trout habitat (modified Slaney et al.1984 curve).

Location:	Nechako River below Cheslatta Falls
Timing:	May 1 – Sept 31
Unit:	% of max available habitat
Direction:	More is better
MSIC:	20%



Issue #26: Resident fish overwinter habitat Pre-Read, Page 42

PM26: Percent of maximum available overwintering habitat (modified from Slaney et al. 1984 curve).

Location:	Nechako River below Cheslatta Falls
Timing:	Nov 1 to Mar 31
Unit:	% of max available habitat
Direction:	More is better
MSIC:	20%



Issue #32: Reservoir caribou land links Pre-Read, Page 42

PM32: # Of days water elevation is > 852 m	Location:	Nechako Reservoir
	Timing:	May 1 – July 7
	Unit:	Days
	Direction:	More is better
	MSIC:	20%



Issue #38: Reservoir osprey nesting habitat Pre-Read, Page 43

PM38: Number of years where reservoir elevation exceeds 852.44m

Location:	Nechako Reservoir
Timing:	Spring nesting period May 1 – Aug 15
Unit:	Years
Direction:	Fewer is better
MSIC:	20%



Issue #41b: Reservoir wetland habitat Pre-Read, Page 43

PM41b: Number of years where
reservoir elevation exceeds
852.94 mLocation:Nechako ReservoirUnit:May 1 – Sep 30Unit:YearsDirection:More is betterMSIC:20%



Issue #45b: River bird inundation of

nests

Pre-Read, Page 43

PM45b: Number of years where	Location:	Nechako River
discharge exceeds 275 cms	Timing:	May 1 – Jul 21
	Unit:	Years
	Direction:	Fewer is better
	MSIC:	20%



Issue #49b: Cheslatta watershed inundation of archeological sites Pre-Read, Page 44

PM49b: # of days > 300 CMS	Location:	Nechako River
	Timing:	Jan 1 – Dec 31
	Unit:	Days
	Direction:	Fewer is better
	MSIC:	7 Days



Issue #53: River open-water flooding Pre-Read, Page 44

PM53: # Of days flow >550 m3/s	Location:	Nechako River - focus at Vanderhoof
	Timing	Apr 1 Oct 21
	Tinning.	Apr 1 - Oct 51
	Unit:	Days
	Direction:	Fewer is better
	MSIC:	7 Days



Issue #65b: Kemano power generation Pre-Read, Page 45

PM65b: # of days smelter load	Location:	Kemano / Kitimat
isn't met	Timing:	Jan 1 – Dec 31
	Unit:	Days
	Direction:	Fewer is better
	MSIC:	7 Days



Issue #66b: Kemano power reliability Tier 1 Pre-Read, Page 45

PM66b: Tier 1 power reliability	Location:	Kemano / Kitimat
, , ,	Timing:	Jan 1 – Dec 31
	Unit:	%
	Direction:	More is better
	MSIC:	5



Issue #67: Kemano power exports Tier

2

Pre-Read, Page 45

PM67: Mean Tier 2 power	Location:	Kemano / Kitimat
generation	Timing:	Jan 1 – Dec 31
	Unit:	%
	Direction:	More is better
	MSIC:	20



Assessing P1 Round 1 Flow Alterns

- Consequence Table (PMs Summary)

Commentary: Round 1 Flow Alternatives

Alt 1 Status Quo	Again, the Status Quo appears to perform quite well across most of the interests. It does not perform well for river fish access to side/off channels, or resident caribou land links; all other alternatives perform equal to or better than Alt 1 for these two interests
Alt 1-2	Alt 1-2 performs well for high reservoir interests. Increased reservoir elevation is good for reservoir caribou land links, but high reservoir elevation is not good for osprey nest flooding, and high reservoir elevation increases the frequency of inundation of archaeological sites and flooding in Vanderhoof. For Nechako River fish, Alt 1-2 performs well for water temperature for migrating salmon and provides a moderate amount of pre-migrant Chinook rearing habitat, and increases spawning flows relative to incubation. Alt 1-2 performs worst for Tier 2 power exports.
Alt 1-3	Alt 1-3 performs well for some interests that align with stable river flow, namely, incubation and open-water flooding. It performs moderately well for both low and high reservoir interests, and performs best for pre-migrant Chinook rearing habitat.
Alt 1-4	Alt 1-4 performs well with interests that align with high freshet flow (off-channel access and water temperature) and low reservoir elevation (osprey nesting). It does not perform well for incubation, pre-migrant Chinook and resident fish habitat. Alt 1-4 does not perform well for open-water flooding, but does perform well for inundation of archaeological sites.
Alt 1-5	Alternative 1-5 performs well for wildlife interests. For fish, Alt 1-5 performs well for salmon water temperature, but less well for resident and pre-emergent Chinook habitat, and for incubation. Of the new alternatives, Alt 1-5 performs best for Tier 2 power generation. Some alternatives perform better and some worse for open water flooding, and inundation of archaeological sites.

Performance Measures: Assessing Round 1 Flow Alterns

Criteria		Performance Measures	Unit	Preferred Direction	d MSIC	Alternative 1 Status Quo	Alternative 1-2	Alternative 1-3	Alternative 1-4	Alternative 1-5
Fish										
* #6 River fish access to side/off channels	Median	Average flow	CMS	Higher	20%	92.6	114.2	100.3	115.9	113.3
* #12 Reservoir productivity-flushing	Median	Average discharge	CMS	Lower	20%	84.9	107	92.4	108.4	105.6
* #17 Cheslatta watershed fish habitat	Median	Range of flow	CMS	Lower	20%	191.8	186.5	188.1	177	180
* #18a River water temperature and migrating salmon	Median	Number of days average daily temp exceeds 18C	Days	Lower	20%	30.5	29	29.5	29	26.5
* #18c River water temperature and migrating salmon	Median	Number of days average daily temp exceeds 20C	Days	Lower	20%	5.5	4.5	5	4.5	4.5
* #21a River Chinook incubation flow	Median	Ratio of min incubation flow to average spawning flow	%	Higher	20%	50.3	40.3	57.7	42.4	40.1
* #22a V2 River CH rearing habitat post-emergent Habitat	Median	Percent of maximum available post-emergent habitat (modified Envirocon)	%	Higher	20%	100	100	100	99.3	100
* #22b V2 River CH rearing habitat pre-migrant habitat	Median	Percent of maximum available pre-migrant habitat (modified Envirocon)	%	Higher	20%	84.8	72.2	87.5	49.8	56.3
* #25a Resident fish rearing habitat	Median	Percent of maximum available juvenile Rainbow Trout habitat	%	Higher	20%	66.2	56.2	62.3	50.8	54.6
#26 Resident fish overwinter habitat	Median	Percent of maximum available overwintering habitat (modified Slaney et al. 1984)	%	Higher	20%	95.6	95.6	96.1	90.1	94
Wildlife										
* #32 Reservoir caribou land links	Median	# of days water elevation is > 852 m	Days	Higher	20%	8	30	19.5	15	21.5
* #38 Reservoir osprey nesting habitat		Number of years where reservoir elevation exceeds 852.44m	Years	Lower	20%	12	18	14	10	11
* #41b Reservoir wetland habitat		Number of years where reservoir elevation exceeds 852.94 m	Years	Higher	20%	8	9	9	8	9
* #45b River bird inundation of nests		Number of years where Cheslatta discharge exceeds 275 cms	Years	Lower	20%	5	6	6	5	4
Culture & Heritage										
* #49b Cheslatta watershed inundation of arch sites	80th %	# of days > 300 cms	Days	Lower	7	2.2	13	7.2	1.8	3.6
Flooding & Erosion										
* #53 River open-water flooding	Max	# of days flow >550 at Vanderhoof	Days	Lower	7	2	19	1	18	10
Rio Tinto Operations										
* #65b Smelter Power	Max	# of days smelter load isn't met	Days	Lower	7	0	0	0	0	0
* #66b Kemano power reliability (Tier 1)		Tier 1 power reliability	%	Higher	5	96.98	98.75	96.98	96.98	96.98
* #67 Kemano power exports (Tier 2)	Median	Mean Tier 2 power generation	MW	Higher	20	136.3	31	54.5	45.2	65.6

Performance Measures: Assessing Round 1 Flow Alterns

Criteria		Performance Measures	Unit	Preferred Direction	MSIC	Alternative 1 Status Quo	Alternative 1-2	Alternative 1-3	Alternative 1-4	Alternative 1-5
Fish										
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* #22a V2 River CH rearing habitat post-emergent Habitat	Median	Percent of maximum available post-emergent habitat (modified Envirocon)	%	Higher	20%	100	100	100	99.3	100
* #22b V2 River CH rearing habitat pre-migrant habitat	Median	Percent of maximum available pre-migrant habitat (modified Envirocon)	%	Higher	20%	84.8	72.2	87.5	49.8	56.3
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Rio Tinto Operations										
* #65b Smelter Power	Max	# of days smelter load isn't met	Days	Lower	7	0	0	0	0	0
* #66b Kemano power reliability (Tier 1)		Tier 1 power reliability	%	Higher	5	96.98	98.75	96.98	96.98	96.98
* #67 Kemano power exports (Tier 2)	Median	Mean Tier 2 power generation	MW	Higher	20	136.3	31	54.5	45.2	65.6

AltaViz – Online Tool

https://www.altaviz.ca/public/220db3fc-2aa8-4eea-9dd1-e3a26c4bb97a Access Code: NECHAKOWEI

Assessing Alternatives

- Ranking Exercise

Michael & Clayton

Phase 1 Round 1 Flow Alternatives Ranking Exercise

Purpose:

- To get a better sense of people's priorities & preferences
- To explore and highlight what we like and don't like about the flow alternatives
- To identify the flow alternatives that are performing well and that we want to keep for the next round
- AND to identify new and improved Flow Alternatives (Round 2) to model and assess at our next meeting

Phase 1 Round 1 Flow Alternatives Ranking Exercise

Only 1 ranking exercises will be used today,

 Direct Ranking – is an intuitive technique where you will be asked directly which alternative(s) you most prefer



2. Swing Weighting – is an alternative method for identifying your preferred alternative(s) through the performance measures



The goal is to get a sense of our preferences as a group in order to have a facilitated discussion

Direct Ranking Exercise



Direct Ranking

You will be asked to indicate which alternatives are your 'most preferred' and 'least preferred', the steps are:

- STEP 1: Rank each alternative from #1 (best or 'most preferred') to #5 (worst or "least preferred) according to how well the alternatives are meeting your interests
- STEP 2: Distribute 100 points to your #1 (most preferred) alternative
- STEP 3: Distribute a lesser amount of points to your next 'most preferred' alternative according to how well it meets your needs

Direct Ranking FORM 1 - Alternatives

Your Name:

	Weight	
Alternative 1 Status Quo	50 +	
Alternative 1 - 2	95	
Alternative 1 - 3	5	
Alternative 1 - 4	100 +	1
Alternative 1 - 5	45	

On-Line Direct Ranking Form 1 - AltaViz



Review & Discuss Exercise

- Emerging preferred flow alternatives

Results from Ranking Exercises

• Clayton...

Towards Improved Flow Alterns

- What have we learned?
- What are the implications for building improved alternatives?

Building New Flow Alternatives

Next Steps

Thanks!

