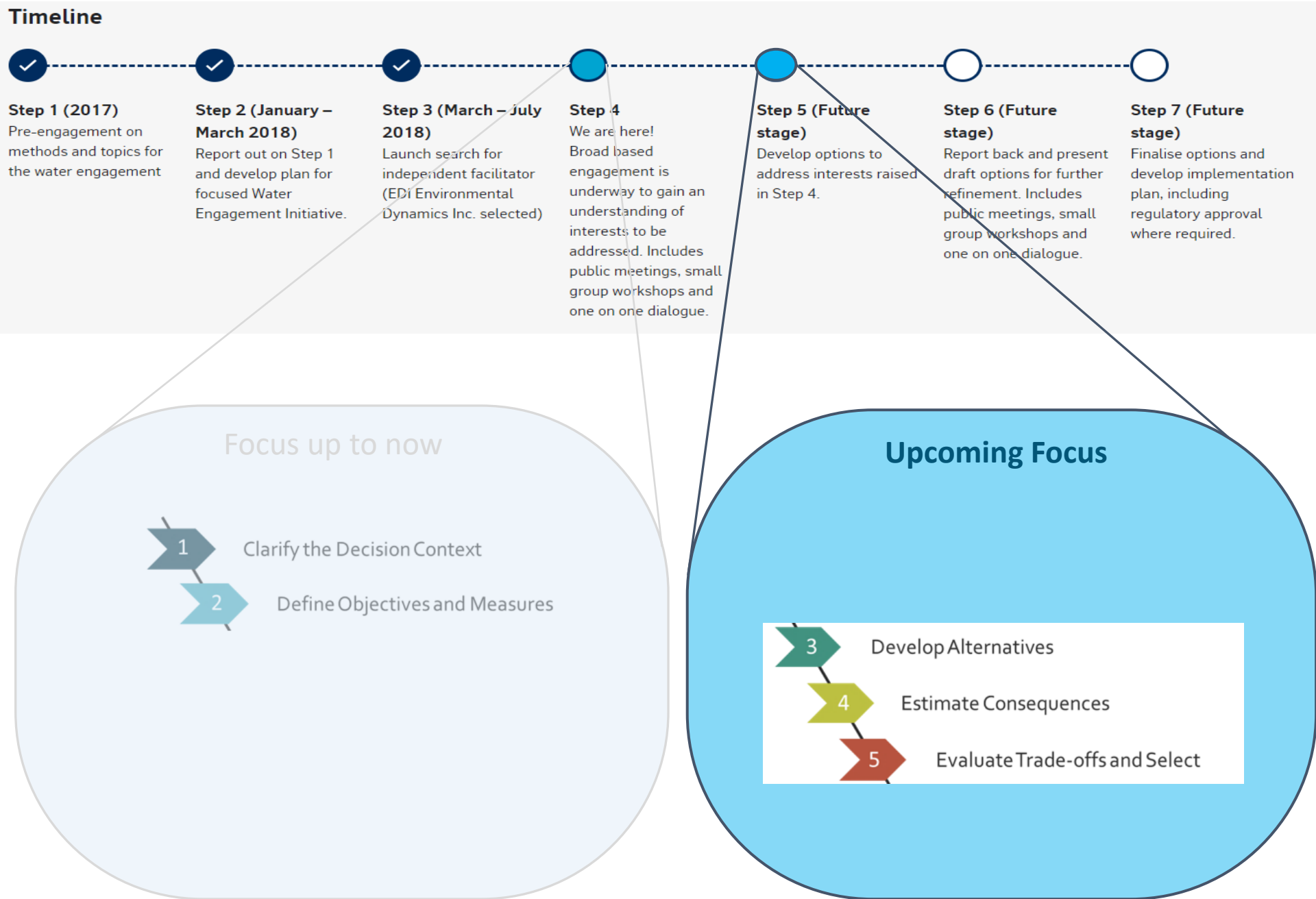
Phase 1 Draft Bookend Alternatives

WEI Meeting 27 - Wednesday, May 25, 2022

Michael Harstone, Compass Resource Management (SDM)

Nechako WEI Process Steps



A Quick Peek at the Road Ahead

Illustrative

Consequence Table

Objective	Performance Measure	Preferred Direction	Alternative 1 Status Quo	Alternative 2 River Aquatic Species / Ecosystems	Alternative 3 Sockeye	Alternative 4 M/C Aquatic Species / Ecosystems	Alternative 5 Wildlife	Alternative 6 Reservoir Aquatic Species / Ecosystems	Alternative 7 M/C & River Flood Mitigation	Alternative 8 Unregulated Flows
Fish										
General										
TGP	None	Higher	0	0	0	0	0	0	0	0
River fish access to tributaries	Average flow	Higher	270	290	290	300	275	270	260	310
Reservoir fish access to tributaries	Average water elevation	Higher	824	820	829	831	827	825	825	820
Flow ramping	Change in stage (3 day data)	Lower	48	51	53	40	45	51	39	46
River reed canary grass - fish stranding	Change in stage (3 day data)	Lower	51	51	49	50	51	45	44	46
River fish access to side/off channels	Median flow	Higher	312	330	316	325	345	326	330	330
River functional riparian and side/off channel habitat	Average flow during growing season as percent of MAD	Higher	278	289	290	267	280	300	301	295
River reed canary grass - invasive species/habitat impacts	Defer until technical memo completed	Higher	0	0	0	0	0	0	0	0
River productivity	Flow-productivity curve	Higher	8.4	10	10	9.6	7.8	10	10	9.3
Nechako Reservoir										
Fish entrainment	Variance/standard deviation of SLS discharge during STMP	Lower	0.5	0.7	0.14	0.65	0.49	0.6	0.88	0.15
Reservoir productivity-growth	Annual drawdown	Lower	8.4	7.2	7.2	6.9	6.2	8.1	9.1	10.2
Reservoir productivity-flushing	Average discharge	Lower	290	295	320	321	312	300	300	300
Reservoir fish habitat	Average annual pelagic habitat	Higher	6.8	10	9	10	6.5	10	9	7.7
Reservoir water temperature and thermocline	Average discharge	Lower	320	310	314	315	300	300	312	330
Murray - Cheslatta										
Productivity-growth	Maximum flow	Lower	575	550	590	610	600	590	590	600
Productivity-flushing	Maximum flow	Lower	550	575	585	530	500	510	490	610
Fsh habitat	Range of flow	Lower	175	210	220	215	190	200	190	212
Anadromous Fish - Nechako River										
River water temperature and migrating salmon	Number of days average daily temp exceeds 18C, 19C, 20C	Higher	32	25	23	25	31	19	21	22
River water temperature and juvenile salmon	Number of weeks average weekly temp >18C (less is better)	Lower	9	6	7	6	5	7	5	4
River CH spawning habitat	Average habitat	Higher	7.7	8.5	10	10	8.4	7.5	6.5	8.1
River CH incubation flow	% difference between avg spawning flow and min incubation flow	Lower	31%	12%	17%	22%	30%	24%	5%	9%
River Chinook rearing habitat	Number of days where flow <70cms at Cheslatta falls	Higher	61	65	77	82	64	40	40	40
River CH winter habitat	Number of days flow exceeds 85 CMS	Lower	45	52	51	66	54	51	39	41
Resident Fish - Nechako River										
Resident fish river water temperature	Number of days mean weekly maximum temp exceeds 18C	Lower	51	53	62	34	39	61	50	
Resident fish rearing habitat	Average habitat (habitat - flow curve)	Higher	7.2	6	5.5	6.1	9	9.2	7.2	
Resident fish overwinter habitat	default to CH overwinter PM	Higher	7.3	7.7	8	8.5	6.5	5.5	5.2	6.9
River mussels	Defer until technical memo complete	Higher	9	9.5	10	9.6	7.7	6.1	5.7	8.1
River White Sturgeon spawning habitat	No PM for now	Higher	0	0	0	0	0	0	0	0
River White Sturgeon rearing habitat	Defer until technical memo complete	Higher	4.1	8.8	5.6	5	4.6	5.1	5.5	5.6
River White Sturgeon productivity	General river PM will be proxy	Higher	4	5	5	5	5	3	3	4
Wildlife										
Nechako Reservoir - Caribou										
Reservoir caribou woody debris	None proposed	Higher	0	0	0	0	0	0	0	0
Reservoir caribou land links	Number of days water elevation is > 852 m	Higher	45	50	44	60	42	40		
Reservoir caribou exposed shorelines/banks	Average reservoir elevation	Higher	851	852	855	852	850	849	849	
Nechako Reservoir - Moose										
Reservoir moose exposed shorelines/banks	Average reservoir elevation	Higher	851	852	855	849	852	850	849	849
Reservoir moose large woody debris	None proposed	Higher	0	0	0	0	0	0	0	0
Nechako Reservoir - Waterfowl & ground nesting birds										
Reservoir birds inundation of nests	Maximum increase in reservoir level	Higher	12	17	15	16	12	14	14	15
Reservoir bird nest stranding (exposure to predation)	Maximum decrease in reservoir level	Higher	12	17	15	16	12	14	14	15
Nechako Reservoir - Osprey										
Reservoir osprey nesting habitat	None proposed	Higher	0	0	0	0	0	0	0	0
Reservoir osprey food availability	None proposed	Higher	0	0	0	0	0	0	0	0
Nechako Reservoir - Wildlife habitat										
Reservoir riparian habitat	range of reservoir elevation	Lower	12	17	15	16	12	14	14	15
Reservoir wetland habitat	annual maximum reservoir elevation between June and August	Higher	854	856	855	855	856	855	852	853
Nechako Reservoir - Amphibians										
Reservoir inundation of amphibian breeding habitat	Magnitude of reservoir level increase	Higher	12	17	15	16	12	14	14	15
Reservoir dewatering of amphibian breeding habitat	Magnitude of reservoir level decrease	Higher	12	17	15	16	12	14	14	15
Nechako Reservoir - Aquatic mammals (Otter, muskrat, beaver)										
Reservoir beaver inundation of dens	Magnitude of water level increase - lowest elev.to elev. @ end of June	Lower	9	9	8	9	6	7	6	3
Reservoir beaver den and food access	winter drawdown	Lower	8	6	7	5	7	8	8	9
River beaver inundation of dens	Magnitude of water level increase - lowest elev.to elev. @ end of June	Lower	9	9	8	9	6	7	6	3
Nechako River - Waterfowl & ground nesting birds										
River bird inundation of nests	Magnitude of water level increase	Lower	12	17	15	16	12	14	14	15
River bird nest stranding (exposure to predation)	Magnitude of water level decrease	Lower	12	17	15	16	12	14	14	15
Human Health										
Water quality - Reservoir methylmercury	None proposed	Higher	0	0	0	0	0	0	0	0
Culture & Heritage										
Murray-Cheslatta - Gravesites	Number of days > 300 CMS	Lower	24	22	32	32	28	28	34	30
Salmon harvest (Nechako River)	TBD	Higher	0	0	0	0	0	0	0	0
Flooding & Erosion										
Murray-Cheslatta - Bank Erosion	MAD for initial bank erosion	Higher	5	7.5	6.5	8	5.5	9	7	9
Nechako River - Municipal flooding										
River open-water flooding	# of days flow >550 at Vanderhoof	Lower	1	4	2	3	3	4	3	3
River groundwater flooding	TBD	Higher	0	0	0	0	0	0	0	0
River ice-jam flooding	number of days > 100 CMS during freeze up	Lower	4	5	8	7	8	5	4	3
Nechako River - Private property flooding & erosion	MAD for initial bank erosion	Higher	5	7.5	6.5	8	5.5	9	7	9
Nechako River - Sediment transport	TBD	Higher	0	0	0	0	0	0	0	0
Nechako River - Backwatering	TBD	Higher	0	0	0	0	0	0	0	0
Recreation and Navigation										
Nechako River - Float planes and canoes	River flow	Higher	360	410	420	450	440	410	440	510
Nechako River - Hiking trails	# days > 355 cms	Higher	64	72	78	83	80	80	83	61
Rio Tinto Operations										
Aluminum production	TBD	Higher	0	0	0	0	0	0	0	0
Revenue	TBD	Higher	0	0	0	0	0	0	0	0
Operational flexibility	TBD	Higher	0	0	0	0	0	0	0	0

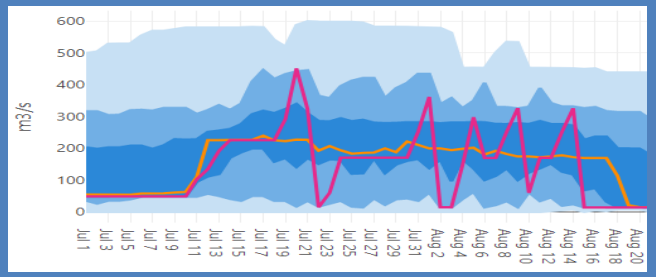
SDM Process Steps: A Picture for the WEI

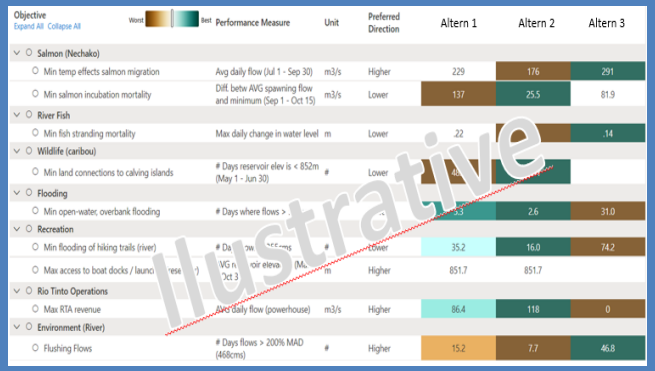
Collaborative Development and Evaluation of Operational Flow Alternatives

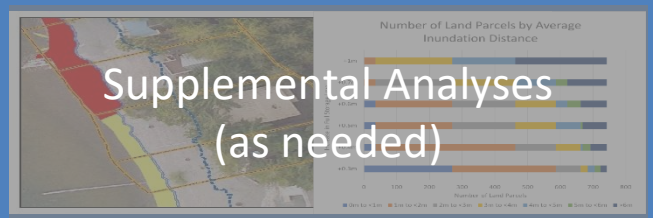
3 Develop Alternatives

4 Estimate Consequences

5 Evaluate Trade-offs and Select



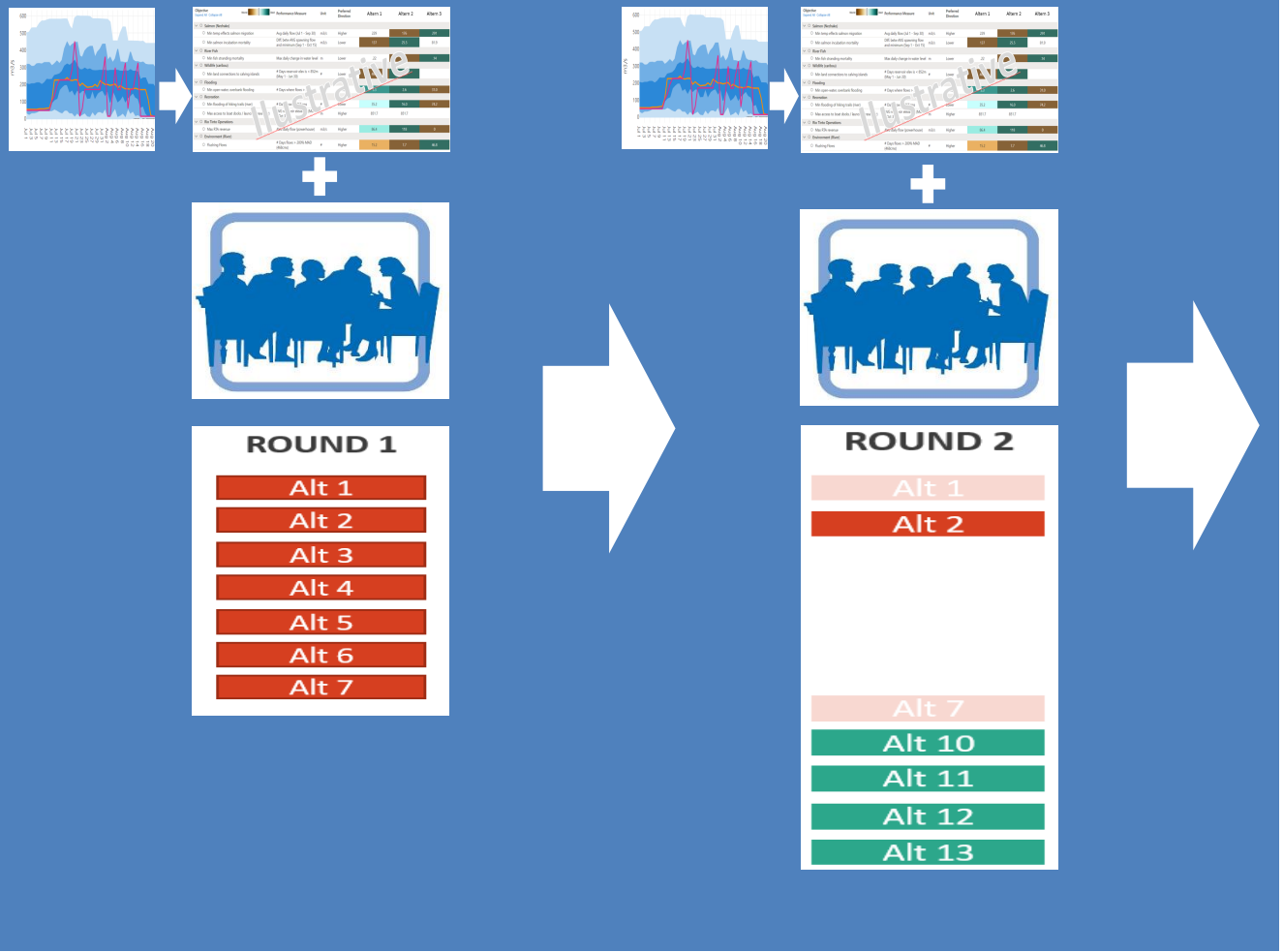


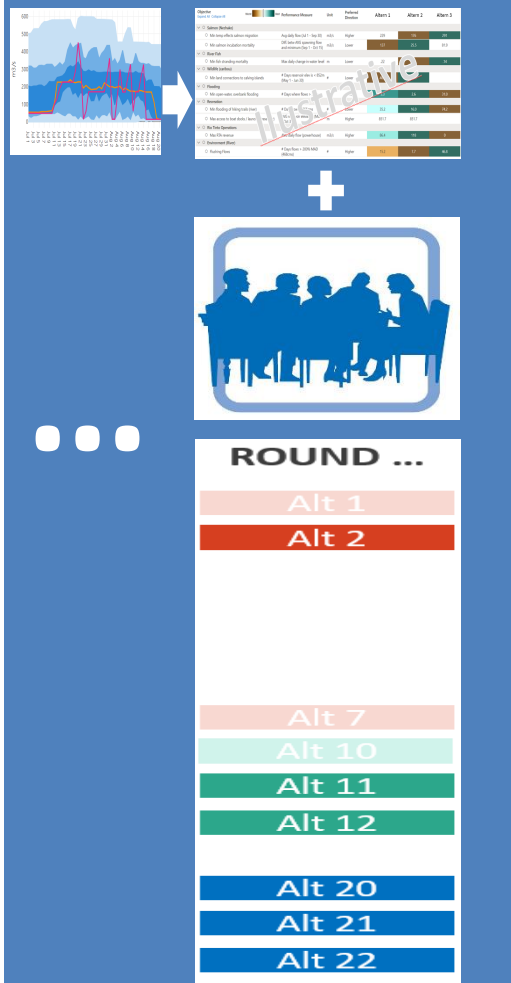


Supplemental Analyses (as needed)

SDM Process Steps: A Picture for the WEI

Collaborative Development and Evaluation of Operational Flow Alternatives

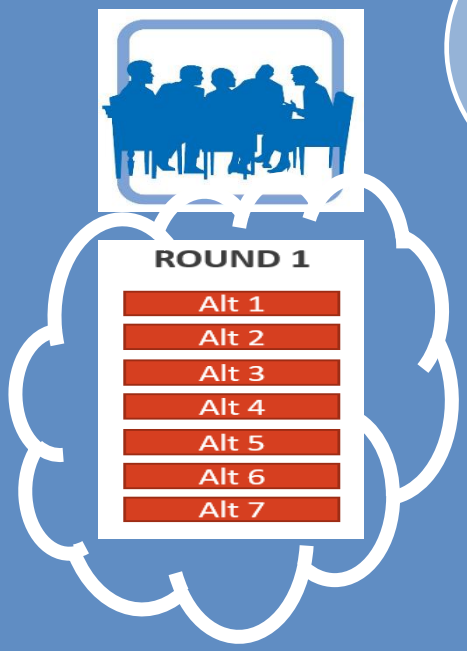




SDM Process Steps: A Picture for the WEI

Collaborative Development and Evaluation of Operational Flow Alternatives

3 Develop Alternatives



So where to start?

A word or two on developing Bookend Alternatives

Purpose:

- To explore and better understand the opportunities, challenges and constraints of the **hydrology** flowing into and out of the Nechako reservoir
- To further scope out **water uses and interests** and identify which may be most sensitive (+/-) to potential operational flow changes
- To test out the **preliminary performance measures** and how well they are doing characterizing potential effects
- To gain insight into the performance of different potential flow changes in order to develop creative and **improved flow alternatives**
- To gain insight into each others' **values** and identify which flow alternatives may offer the best path to reaching consensus on a preferred flow alternative

A word or two on developing Bookend Alternatives

Characteristics of Developing Bookends:

Generally, **theme based** according to a particular water use interest

As such,

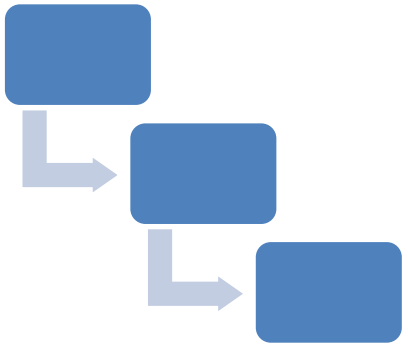
- **THEY ARE NOT** designed to be **acceptable** *but should be considered a starting point to begin the exploration of flows alternatives*
- **THEY ARE** designed as a **basis to learn from** *in order to build the next round of flow alternatives that are more multi-interest focused*

At our LAST WEI Meeting 26
Wednesday, April 6, 2022

Building Phase 1 Bookend Alternatives

- **Discussed some illustrative ideas towards developing bookend alternatives**
- **They were meant to be "illustrative" and provide a cross section of the nature and type of bookends that could be developed**
- **Since that time, Ecofish has been working with the TWG to develop and recommend a draft set of Phase 1 Bookend Alternatives to use.**

Structure and Sequencing – Bookend Alterns



Context:

- Operational flow alternatives from Rio Tinto's water control facilities are complex and complicated.
- Water management and flow releases are based on existing water licenses, flow related agreements and may be linked with other potential future regulations and legislation
- RT's operations are also influenced through flow targets that have been adopted over the years to mitigate and lessen impacts
- Water management and flow releases are also inherently tied to the hydrology on any given year and will be significantly affected by future climate changes
- New initiatives and water management projects may also provide opportunities that fundamentally affect current and future operations
- All these factors influence the sequence and structure for developing bookends

Structure and Sequencing – Proposed

Phase 1
(Immediate Term)

Phase 2
(Near & Med Term)

Phase 3
(Med & Longer 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 undertaken any internal assessments that may need to be carried out.

Phase 2 Flow Alternatives

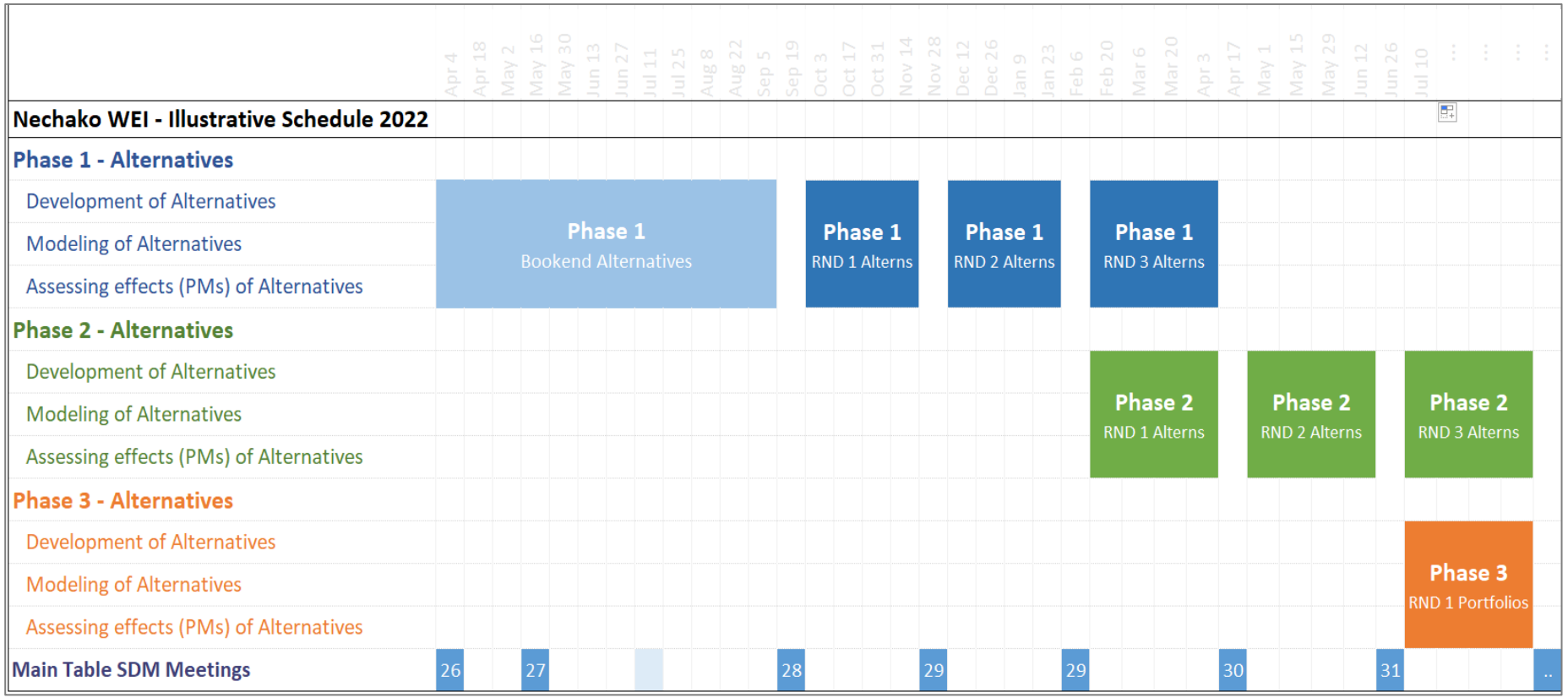
- Flow alternatives that would require Rio Tinto to seek some form of approval / authorization(s) according to their existing water license and/or flow related agreements and/or commitments with First Nations.

Phase 3 Flow Alternatives

- Combination of new water management facilities (mitigation / enhancement projects) and potential changes to flow releases to the Nechako River to maintain and/or improve conditions related to key water uses.

SDM Process Steps: A Picture for the WEI

Collaborative Development and Evaluation of Operational Flow Alternatives



Structure and Sequencing – Proposed

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 undertaken any internal assessments that may need to be carried out.
- Proposed changes would be within the current water budget for the Nechako River.

Approx Implementation Timeline: 0 to 2 years
(once decided, how long to implement changes)

- Could be implemented once any needed assessments and/or notifications are completed

Some example operational levers:

- Re-distributing the current AWA across the monthly flow releases from SLS (e.g., more naturalized, increase min base flows)
- Changing ramping rates (e.g., at end of STMP)

Pre-Reading that was sent out ➔

A Primer: Rio Tinto Water Control Facilities & Operations

(Pulled together by Compass from various background documents and presentations)

Rio Tinto's Water Control Facilities

Rio Tinto's facilities consist of the Nechako reservoir, Kenney Dam, Skins Lake Spillway, the Kemano powerhouse, transmission lines to Kitimat and the aluminum smelter at Kitimat (see Figure 1). All water releases from the reservoir, other than for hydroelectric generation at the Kemano powerhouse, are made from the Skins Lake Spillway, which routes water into the Nechako River through the Murray-Cheslatta system. Releases from the Kemano powerhouse flow into the Kemano River.

Figure 1: Rio Tinto Facilities https://www.getinvolvednechako.ca/wp-content/uploads/2021/11/Water-Engagement-Initiatve-BC-Works-Operational-Area.pdf

Kemano Power Generation Facilities

The Kemano Generating Station is built 427 m (1,400 ft) inside the base of Mt Dubose in a blasted cavern. It has 8 generators with a nameplate capacity of 122 MW, for a total of nearly 1000 MW. Rio Tinto requires approximately 730 MW of firm power to operate the Kitimat smelter. They sell the remainder of power to BC Hydro, along with additional non-firm power. Rio Tinto's licensed right to water is to divert 170cms instantaneously through their power tunnel(s). Rio Tinto's annual normal diversion rate is close to about 130cms.

Skins Lake Spillway

The Skins Lake Spillway (SLS), built in 1952, is located 200 km west of Prince George, British Columbia. The spillway is a critical flow regulating structure for the Nechako Reservoir, which supplies water to the Kemano Generating Station, providing power to the Kitimat aluminum smelter. The spillway and plunge pool were rehabilitated in 2019 (Klohn Crippen Berger 2020).

Photo: Klohn Crippen Berger

Nechako
Water Engagement Initiative

Proposed Phase 1 Bookend Alternatives