Cowichan Water Use Plan

Public Advisory Group Meeting 2

February 1st, 2018

A community planning initiative in partnership with:

compass kwl ECOFISH RESEARCH

CVRD Cowichan Watershed BOARD Catalyst

Welcome

Partner Organizations

CVRD

Cowichan Watershed BOARD

Catalyst

Introductions

Q *Share one thing about yourself that probably nobody else in the room knows?*

Meeting Objectives

- To review and provide an update since the last meeting
- To finalize the PAG Terms of Reference
- To review a screening assessment of water use issues and the drafting of some preliminary objectives
- To review a preliminary set of draft performance measures
- To review a partial assessment of the preliminary bookend alternatives
- To discuss and agree to new alternatives (or strategies) to be modeled for PAG Mtg 3
- To review the next steps of the planning process

Draft Agenda

8:30am	**Welcome and Update**
9:00am	**Issues Scoping, Objectives & Performance Measures (PMs)**
10:15am	**Preliminary Bookend Alternatives** • Primer on the facilities, operations, hydrology, and modeling • Refresher on the bookend alternatives
10:45am	**Break** – *15mins*
11:00am	**Assessing the Bookend Alternatives - Hydrology** • Review Hydrology / HydroViz
12:00pm	**Lunch** *(Provided)* – *45mins*
12:45pm	**Assessing the Bookend Alternatives – Draft PMs** • Overview of Prelim PMs & Draft Results
2:30pm	**Break** – *15mins*
2:45pm	**Break-Out Groups: Creating New Alternatives**
4:00pm	**Next Steps**
4:30pm	**Adjourn**

About Today

Ground Rules

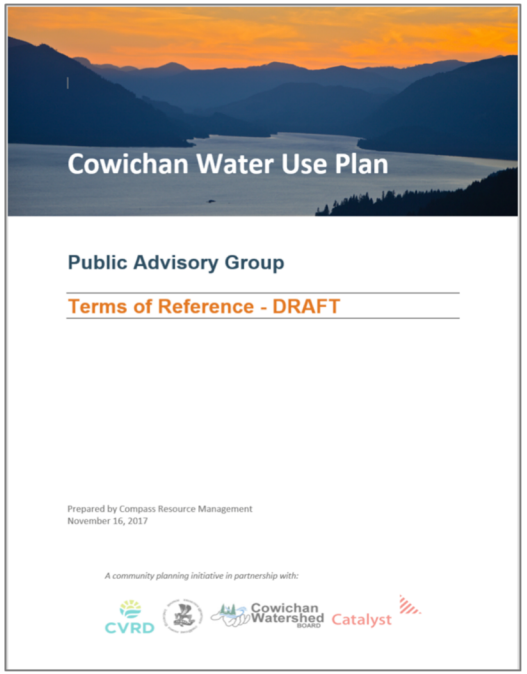
- Come prepared
- Strive for Inclusion and Respect
- Challenge ideas, not people
- Speak in Terms of Interests, Not Positions
- Seek Common Ground
- Provide Rationale for Your Opinions
- Stay Focused
- Be Open-Minded, Participatory, and Concise

Update

- Lakefront Technical Sub-Group
  - Issues definition and scoping
  - PM development
- Aquatic & Riparian Technical Sub-Group
  - Issues definition and scoping
  - PM development
- Steering Committee
- Hydrological Modeling and calculating some draft PMs
- Public Website (PAG Members listed, PAG ToR, Process Guidelines)
- Internal Website
- Other ?

Past Action Items

- PAG members to send comments on Draft ToR and Draft Process Guidelines
- PAG members to send any additional water use issues / interests for the WUP
- Compass to review water use interests and frame into a set objective areas and a list of draft performance measures
- Compass to follow-up with volunteers to strike a TSG on lakefront property issues
- Schedule and confirm upcoming PAG Meetings, as follows:
  - **PAG Mtg 3 – March 8**
  - **PAG Mtg 4 – May 8 (Final)**



Cowichan WUP Planning Process

Snapshot Overview

Cowichan WUP Process

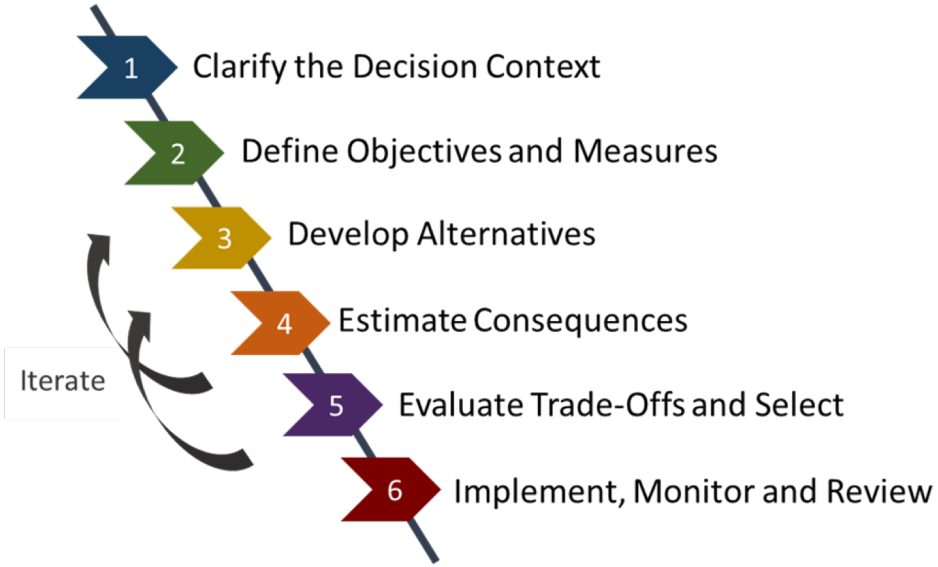
Snapshot Overview

Purpose

To explore and determine the best solution to meet the region's long term water use requirements for Cowichan Lake's water mgt system

Schedule

- 4 Public Advisory Group meetings
- ~ 1 day meeting every 6 weeks
- Completion by Spring 2018

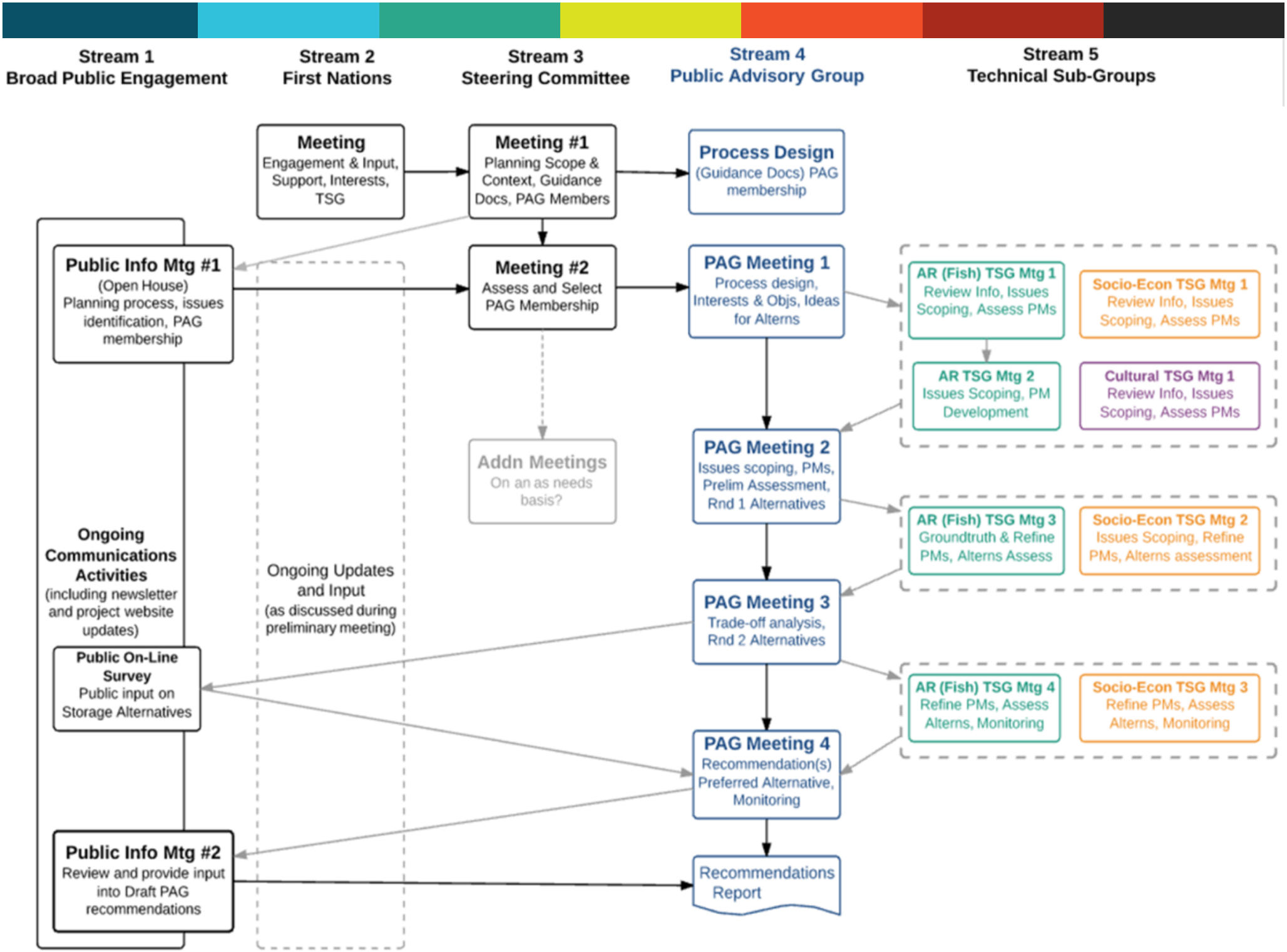


Planning Framework

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

Public Advisory Group

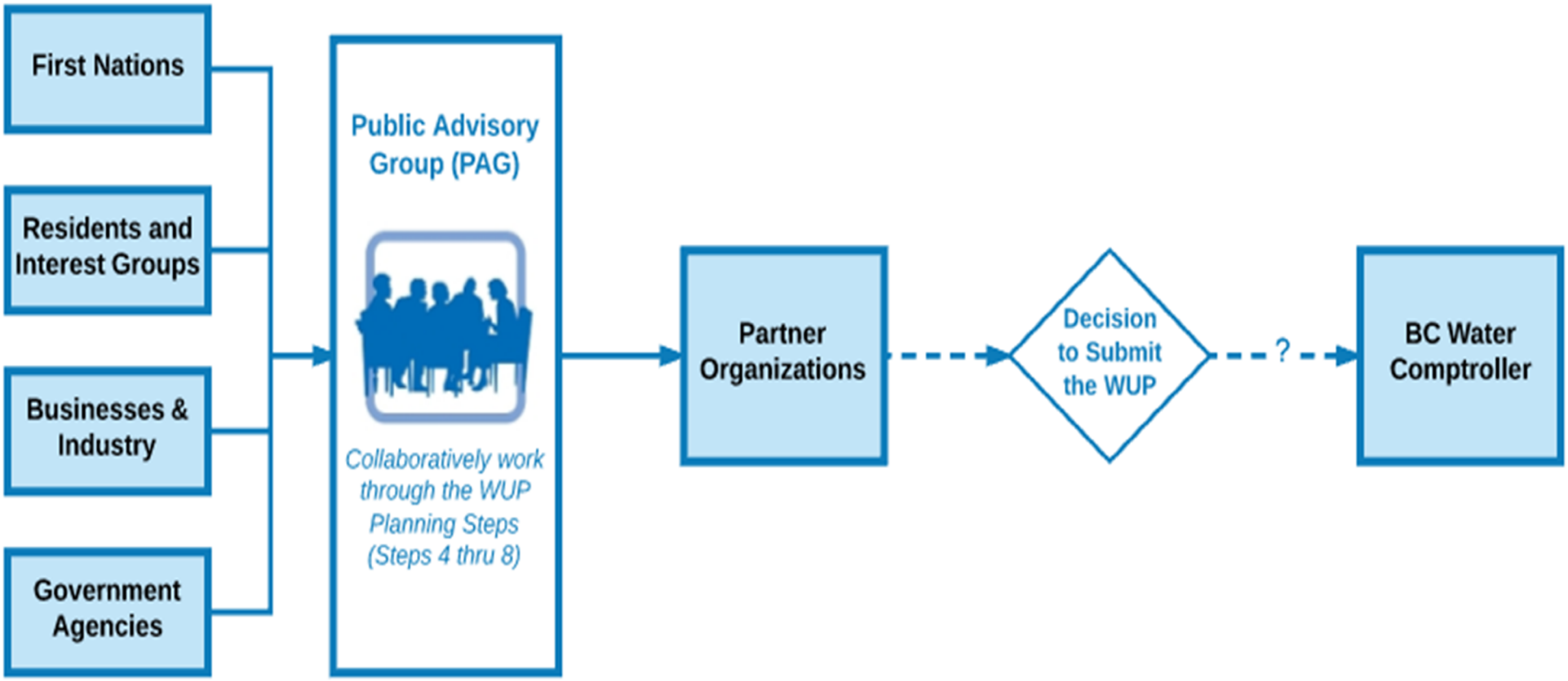
To identify and assess different water use alternatives and collaboratively develop recommendations for consideration by the Partner Organization


Stream 1
Broad Public Engagement
Stream 2
First Nations
Stream 3
Steering Committee
Stream 4
Public Advisory Group
Stream 5
Technical Sub-Groups
Meeting
Engagement & Input, Support, Interests, TSG
Meeting #1
Planning Scope & Context, Guidance Docs, PAG Members
Process Design
(Guidance Docs) PAG membership
Public Info Mtg #1
(Open House)
Planning process, issues identification, PAG membership
Meeting #2
Assess and Select PAG Membership
PAG Meeting 1
Process design, Interests & Objs, Ideas for Alterns
AR (Fish) TSG Mtg 1
Review Info, Issues Scoping, Assess PMs
Socio-Econ TSG Mtg 1
Review Info, Issues Scoping, Assess PMs
AR TSG Mtg 2
Issues Scoping, PM Development
Cultural TSG Mtg 1
Review Info, Issues Scoping, Assess PMs
Addn Meetings
On an as needs basis?
PAG Meeting 2
Issues scoping, PMs, Prelim Assessment, Rnd 1 Alternatives
AR (Fish) TSG Mtg 3
Groundtruth & Refine PMs, Alterns Assess
Socio-Econ TSG Mtg 2
Issues Scoping, Refine PMs, Alterns assessment
Ongoing Communications Activities
(including newsletter and project website updates)
Ongoing Updates and Input
(as discussed during preliminary meeting)
PAG Meeting 3
Trade-off analysis, Rnd 2 Alternatives
Public On-Line Survey
Public input on Storage Alternatives
AR (Fish) TSG Mtg 4
Refine PMs, Assess Alterns, Monitoring
Socio-Econ TSG Mtg 3
Refine PMs, Assess Alterns, Monitoring
PAG Meeting 4
Recommendation(s) Preferred Alternative, Monitoring
Public Info Mtg #2
Review and provide input into Draft PAG recommendations
Recommendations Report

Cowichan WUP Process

Snapshot Overview

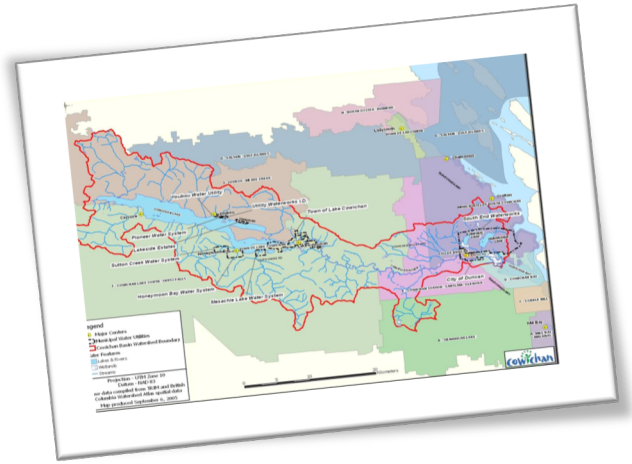
Process for developing the Cowichan WUP



Cowichan WUP Process

Snapshot Overview

Scope of the Planning:



- The planning boundary will encompass the Cowichan watershed, but the primary focus will be on water use related to potential changes in lake levels on Cowichan Lake and potential changes in flows down the Cowichan River.
- The scope of options to be explored is constrained by those issues that can be addressed under the *Water Sustainability Act*, i.e.,
  - Minimum flow requirements to the Cowichan River,
  - Rule Curve and water levels for Cowichan Lake,
  - Water storage capacity of Cowichan Lake (e.g., weir modifications, permanent pump station, etc.)
- Datagaps will be addressed through a reliance of past studies, expert judgement, and future recommended monitoring

Cowichan WUP

Issues Scoping

Cowichan WUP

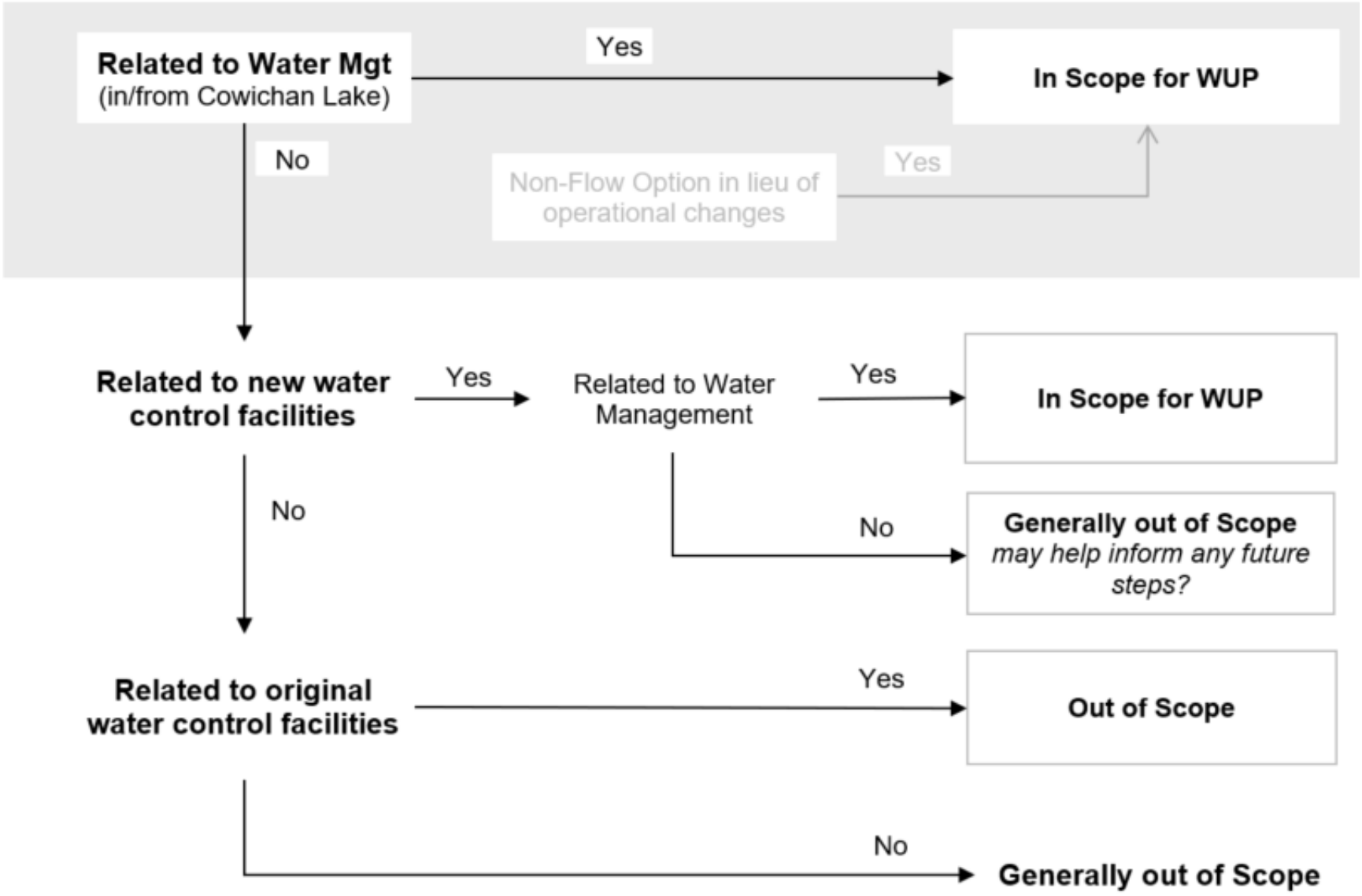
Issues Scoping

One of the first tasks of the PAG will be confirming the issues and interests to be included within the WUP planning process.

A preliminary scoping assessment has been carried out on the issues previously identified, the PAG's brainstormed list, and the issues that have been raised during the TSG discussions.

Cowichan WUP

Issues Scoping



Issues Scoping

- **Issues were organized into the following groups, as follows:**
  - Culture and Heritage
  - Environment
  - Industry and Commercial
  - Lakefront Properties, Flooding, and Erosion
  - Municipal
  - Recreation and Tourism
  - Water Management

- Appendix A in the pre-reading package summarized the results from the initial scoping of water use issues.

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
Traditional Activities and Cultural Practices	Access for spear fishing • Safe access to Skutz Falls for spear fishing could be prohibitively dangerous if high flow levels occur earlier in fall	A review of the hydrology modeling across the bookend alternatives, did not show any noticeable increases in river flows during the fall period. ⇨ While important, this issue is not expected to be affected across the water use alternatives that are considered.
	FNs right to access salmon for FSC purposes – the interest/concern is a constitutional right (i.e. not like other interests)	⇨ Potential impacts on First Nations access and opportunities for harvesting fish (for FSC purposes) can be initially assessed based on the Fish PMs that are being developed by the ARTSG. These PMs will serve as a proxy to see whether more detailed PMs are required later in the process.
	Lost cultural knowledge • Lack of water limits access to fish in river in fall and spring (early chinook run), resulting in less people fishing and loss of cultural knowledge	⇨ These potential impacts are directly tied with FN harvesting opportunities and impacts on aboriginal fisheries. Fish and Aquatic PMs will serve as a proxy in the interim to assess these possible effects.
	• Adequate flows and access to practice ceremonial bathing and other cultural practices	Whether there could be impacts on this interest depends on the timing and location of these cultural practices and whether potential changes in river flows across the bookend alternatives would lead to adverse effects. ⇨ Work with Cowichan Tribes and Lake Cowichan to better understand preferred flows for ceremonial and other cultural practices and develop a PM(s) as required

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
Archaeological Sites	Important sites on lake and river • Lake sites - submerged by higher levels • River sites - eroded with higher river flows	**Lake sites** – increased summertime lake levels with the bookend alternative (i.e., +1.0m) are below the normal high water lake level and considerably lower than lake levels during the winter time and late fall period ⇨ Accordingly archaeology sites are not expected to be affected by higher summertime lake levels. No PM is being proposed. **River Sites** – based on the hydrology modeling across the bookend alternatives, river flows are not associated with any increases in river levels compared to historical and current levels. ⇨ Check with Cowichan Tribes (and Lake Cowichan FN), but otherwise do not expect a PM being developed.
Heritage River Status	Will Heritage River status be affected by proposed water use alternatives? This is central to identity	This depends on the outcome from the planning process and whether there are any recommendations and, if so, what alternative gets supported. ⇨ No action in relation to this issue at this point for the WUP
Naturalness	Will increased manipulation of a permanent pumphouse increase technological dependency and reduce natural ability of the river?	Same as above.

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
RIVER: Water Quality & Temperature	• Lethal temps are mitigated by high summer flows • Impacts to river temperature from aquifer use (Increased popn = increased impact on river, especially in areas where GW flows in & keeps the temperature of river lower in pockets for fish)	The likelihood of impacts from water temperatures differences across the different flow alternatives is considered insensitive by the ARTSG. ⇨ Groundwater flows into the Cowichan River is a small fraction of the overall flows in the river. Changes in aquifer use from a growing population and the resulting potential impacts on river flows is unlikely to cause any significant changes in river water temperatures across the bookend alternatives. [NB. This could be revisited at the end of the options assessment in the event that there are significantly different flows in the river].
RIVER: Wetland / Estuary	• Low flow in summer may be negatively impacting the estuarine ecosystem (i.e. higher salinity, fish access barriers, predation impacts, eelgrass bed loss, etc. • Linkages between low flows and eelgrass (timing and limiting factors to eelgrass growth)	ARTSG to review ⇨ As an interim approach, we could look at net changes in flows in the lower river to see the degree to which there are significant differences across the alternatives and then decide whether a more sophisticated PM is warranted
RIVER: Fish	• Springtime trout and low flows	Under review by ARTSG

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
LAKE: Riparian	Changes to riparian habitat and stability from erosion and flood killed areas • -1m – loss of critical riparian habitat impacting fish, erosion, vegetation, lamprey • +1m – plants already used to getting their "feet wet" so not a big concern	Under review by ARTSG
LAKE: Pelagic Productivity	Potential impacts on pelagic productivity due to changes in residence time with higher or lower summer time lake levels	⇨ ARTSG scoped out potential impacts on pelagic productivity based on analysis of lake water residence time
LAKE: Riparian Water Quality	Water quality issues associated with lake levels above the current annual maximum levels adversely affecting riparian habitats	⇨ ARTSG considered riparian impacts insensitive to the alternatives as currently scoped. This could be revisited should alternatives that cause the lake level extend above the current annual range be considered.
LAKE: Terrestrial	Habitat and wildlife (impacts from high and low water)	ARTSG to review (assessment of potential riparian and littoral areas will inform this)
LAKE: Pollution from Industrial Properties	• Potential for mobilization of contaminants from historical properties around lake (i.e. old log storage areas) resulting in water quality issues. Dynamics might be different if lake levels are changed (i.e. longer duration of inundation with more active mixing, and drying out). • Other pollutants from land-based activities (septic systems, fuel spills, etc.)	⇨ A review of the hydrological modeling of lake levels across the bookend alternatives did not show any difference in lake levels above the normal high water level. Accordingly, this issue is not expected to be affected through the WUP alternatives. ⇨ Water quality issues associated with land uses or practices would also generally be considered outside the scope of the WUP as this would fall under other legislation and should be covered under land use zoning by-laws or other regulations
General	Water management strategies should all be viewed through the lens of environmental sustainability	⇨ This is the role for the PAG to find a sustainable and balanced water management recommendation.

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
Groundwater Wells	Drawdown of aquifers - need better understanding of link to SW	⇨ This could be a recommendation for additional monitoring post WUP.
Catalyst Paper	• Concerns with meeting minimum river flows to meet Crofton mills water demand • Supply of domestic water supply to Crofton mill • Improved level of water security for Catalyst mill operations in face of climate change	⇨ PM will be developed to assess this.
Agriculture	• Increased water use by agriculture for increased local food production • SW/GW interaction at irrigation wells used within of river tributaries (at what distance?) • Impacts of decreased river flows on irrigation and agriculture / local food growing abilities in the region (is agriculture being promoted in region?)	⇨ The surface water – groundwater hydrological interface is complicated in terms of estimating the degree to which aquifer levels could be affected through decreased river flows. As a course proxy, a comparison can be made between annual river flows (ie. river water levels) and a qualitative PM (constructed scale) could be used to assess this issue.
Fish Hatcheries	• Production and injection wells – no net GW loss, injection water should be monitored and strictly regulated for GW protection	⇨ GW-SW interactions is similar to above ⇨ Monitoring and regulations of GW is outside the scope of the WUP
Commercial Fisheries	• The commercial value of recreational fisheries was noted. FLNRO's perspective is that commercial benefits are derived from taking the best care of the fish and ecosystem.	⇨ Fish PMs are being developed which will serve as a proxy for potential impacts on commercial fishery.

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
LAKE: Flooding and Inundation	Flooding and/or inundation of lakefront properties and areas as a result of higher lake levels. Issues include loss of property use, aesthetic concerns, and property damage (e.g., septic fields, homes, secondary structures, campsites at top end of lake, etc.).	⇨ PM will be developed to assess this. [Note a prelim review of the hydrological modeling is not showing any increases in lake levels across the bookend alternatives, but this also depends on the date for the start of the control period which is currently April 1]
RIVER: Flooding and Inundation	• Flooding and/or inundation of lakefront properties as a result of higher river levels • Logjams and debris jams by bridges /trestles could cause increased flooding risk	⇨ River flows are not expected to increase during the control period across the bookend alternatives. Accordingly, the Cowichan WUP alternatives should not increase in downstream high flow events that could result in seepage, inundation or flooding of downstream areas (below the lake) ⇨ Debris and logjams is considered outside the scope of the WUP
Weir / Dam Failure	• Concerns that a raised weir would fail and pose increased flooding risks downstream	⇨ The safety and standards of any new infrastructure is governed by other legislation and registrations. ⇨ This is considered outside the scope of the WUP
LAKE: Erosion	• Changes to erosion zone (levels, wave action, or rate of changes in lake levels) and the effects on property loss / aggregation • Potential impacts on riparian and littoral plant communities	⇨ All the bookend alternatives show significantly lower lake levels through the later summer and fall period. This is very hard to assess and may need to rely on professional opinion once there is a smaller number of alternatives to evaluate later in the process
Private Property Lakefront Areas	Loss of exposed lakefront areas for aesthetic and property value impacts and this includes effects on adjacent private or public lakefront areas	⇨ PM will be developed to assess this.
Private Lakefront Beaches	Higher summer time lake levels could reduce and significantly affect the size, accessibility and use of the private beaches (or public beaches) in front of lakefront properties	⇨ PM will be developed to assess this (under general recreation category)
Docks and Wharves	Changes in lake levels should not require modifications or damage to lakefront structures including docks and wharves.	⇨ PM will be developed to assess this.
Water pump intakes	Dropping lake levels could affect the reliable access of water supply from private and municipal pumps that have their intakes in the lake	⇨ PM will be developed to assess this.

Municipal

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
RIVER/AQUIFERS: Drinking Water Supply	• Water supply reliability for municipal systems • Ensure adequate access to drinking water taking into account SW/GW connectivity • Protect aquifers for municipal and rural wells along river corridor • South End Water System takes water from aquifer connected to river – consider impacts to river from water supply, impacts to water supply from changes in river flow?	⇨ The surface water – groundwater hydrological interface is complicated in terms of estimating the degree to which aquifer levels could be affected through decreased river flows. As a course proxy, a comparison can be made between annual river flows (ie. river water levels) and a qualitative PM (constructed scale) could be used to assess this issue. ⇨ It is also noted that the estimated loss of river flows to recharge aquifers down the length of the river is a small fraction of the total volume of water flowing down the river. Accordingly, the likelihood that domestic drinking water supply from aquifers will be affected in any meaningful way, is quite small.
LAKE: Drinking Water Supply	Impacts from lower lake levels on the Town of Cowichan Lake water supply intake	⇨ PM will be developed to assess this.
LAKE: Sewerage Infrastructure	Sewage back-ups/overflow from increased lake levels	⇨ PM is being developed to assess this
RIVER: Wastewater Dilution	• Capacity to dilute effluent discharge in lower river at low flow periods / Need to ensure adequate flows for waste water effluent dilution • Adverse effects on sewage outflow associated with lower flow? (WQ algae blooms with warmer conditions, drinking water impacts?) • Current JUB outlet discharges to river. Outfall to be relocated to Cowichan Bay (~4 years in future) but intent is to maintain existing outfall as an overflow/emergency outfall	⇨ PM will be used to assess this issue [Noted that timeframe for WUP is in the future in the 2050s. Accordingly, if the 4 year plan is to relocate the outlet discharge, then these effects should not be included in the assessment of WUP options (as an emergency measure, this would be assessed independently during that EA)]

Recreation and Tourism

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP
LAKE: Aesthetics	Visual and aesthetic impacts caused by lower (or more variable) lake levels	⇨ Could develop a PM to assess this, if needed but depends on the differences across the alternatives and this should be evaluated when preferred alternatives are emerging later in the process
LAKE: Recreation Beach Use Areas	Higher (and possibly lower) summertime lake levels affecting the access and usability of beach areas for recreation purposes (both private and public)	⇨ PM is being developed
LAKE: Boat Access / Navigation	Lower lake levels could adversely impact water-based recreation / boating (i.e., safety and navigation) and maintaining the usability of docks/wharves for boating and swimming	⇨ PM is being developed
RIVER: Water based recreation	• Small boat use on river (kayak, canoe) / Impacts to boating/tubing in the river • Some impact at <10cms, greatly impacted at <7cms • Impacts to recreational fishing/angling • Maintain 15-25cms from April-July for rec fishing opportunities – value of angling to BC economy	⇨ PMs will be developed to evaluate ⇨ Fish PMs will be used as a proxy to assess impacts on recreation fishing / angling opportunities

Water Management

Sub-Category	Potential Water Use Issue(s)	Status for Cowichan WUP

Infrastructure Capital and Operating Costs	• Potential costs to improve or replace infrastructure
	• Operating costs
	  ○ Funding for weir operation and river monitoring costs
	  ○ New infrastructure (e.g., pumping)
	• Cost to tax payers
	• Increased taxes with new infrastructure?
		⇨ PM will be developed to assess capital costs / operating costs

Cowichan WUP

Objectives & Performance Measures

Objective Areas

- The next step is to organize the water use issues into objective and sub-objective areas that the alternatives will be trying to achieve or avoid.
- Together the objectives and performance measures represent **“what matters”** and **“what can be affected”** (and is in “scope”) for the Cowichan WUP

- The organization of the objective and PMs serve as the evaluation framework that we will use to assess different potential water use alternatives.
- *See following summary table..*

Objective	Sub-Objective	PM?
Culture & Heritage	First Nations Salmon Harvesting Rights (FSC)	Proxy
	Traditional Knowledge Transfer & Generation	Proxy
	Ceremonial Bathing (and Cultural Practices)	Maybe
	Archaeological Sites (Cowichan River)	No
Environment – Cowichan River	Geomorphology	Yes
	Connectivity (lateral)	Yes
	Water Quality	No
	Fish Passage	Yes
	Salmonid Rearing	
	Salmonid Spawning	
	Wildlife and Riparian	Proxy
Environment – Cowichan Lake	Water Quality	Yes
	Vancouver Lamprey	
	Lake Littoral Habitat	
	Wildlife and Riparian	Maybe
Environ – Estuary	Estuary / Wetland	Maybe
Industry & Commercial	Catalyst Paper	Yes
	Agriculture (Irrigation / GW Wells)	Maybe
	Commercial Fisheries	Proxy
Lakefront Private Properties	Flooding and Inundation	Yes
	Private Property Lakefront Areas	
	Docks / Wharves	Proxy
	Private water pump intakes	Proxy
Municipal	Waste Water	Yes
	Water Supply - Lake	
	Water Supply - River	
Recreation & Tourism	Lake - Recreational Beach Use	Yes
	Lake – Boat Access / Navigation	
	River – Boating and Tubing	
	Angling / Fishing	Proxy
Water Management	Infrastructure Capital / Oper. Costs	Yes

Hydrology & Operations Primer

Bookend Alternatives

Cowichan WUP

Bookend Alternatives

The PAG agreed to a number of illustrative bookend alternative. The main purpose of these alterns were four-fold:

- Identify and screen potential **water use interests**
- Develop and test preliminary **performance measures**
- Facilitate early discussions on the significance and acceptability of different **consequences**
- Gain insight into building better **alternatives**

Reminder:

The scope of options to be explored is constrained by those issues that can be addressed under the *Water Sustainability Act*, i.e.,

- Minimum flow requirements to the Cowichan River,
- Rule Curve and water levels for Cowichan Lake,
- Water storage capacity of Cowichan Lake (e.g., weir modifications, permanent pump station, etc.)

Cowichan WUP

Bookend Alternatives

Alternative Name	Description	Short Name
Alt 1 Status Quo	• Status Quo / Current infrastructure / Current rule curve	ALT1_SQ
Alt 2 Status Quo (with Pumps)	Same as Status Quo (Alt 1) except: • Temp. pumps installed / Pumping capacity = up to 5cms when needed	ALT2_P5
Alt 3 Increased Weir Ht +1.0m	• Increased weir height +1m • Current rule curve	ALT3_W+1
Alt 4 Permanent Pump House	• Permanent pump house built in order to pump up to 7cms (when needed) / current rule curve / Max. drawdown up to 1m below '0' supply level in reservoir	ALT4_P7
Alt 5 Modified Rule Curve 1	• Current infrastructure / Modified Rule Curve (MRC) ○ Reduce spring flows (25cms/15cms) to better meet 7cms target	ALT5_MRC1

Alt 6 Modified Rule Curve 2	• Current infrastructure / Modified Rule Curve (MRC)
	  ○ Eliminate increased spring flows (25 & 15cms)
	  ○ Target 7cms throughout control period (i.e., from April 1 to Nov 5)
		ALT6_MRC2

Alt 7 Modified Rule Curve Weir +1m	• Increased weir height +1m / Modified Rule Curve (MRC)
	  ○ Start control period on March 1 (instead of April 1)
	  ○ Target 25cms spring flow release starting on March 1 until April 30
	  ○ Target 15cms spring flow release is unchanged (from May 1 to June 15)
		ALT7_W1M

Bookend Alternatives

Assessment

Bookend Alternatives

Assessment

Assessment based on a 3 step approach:

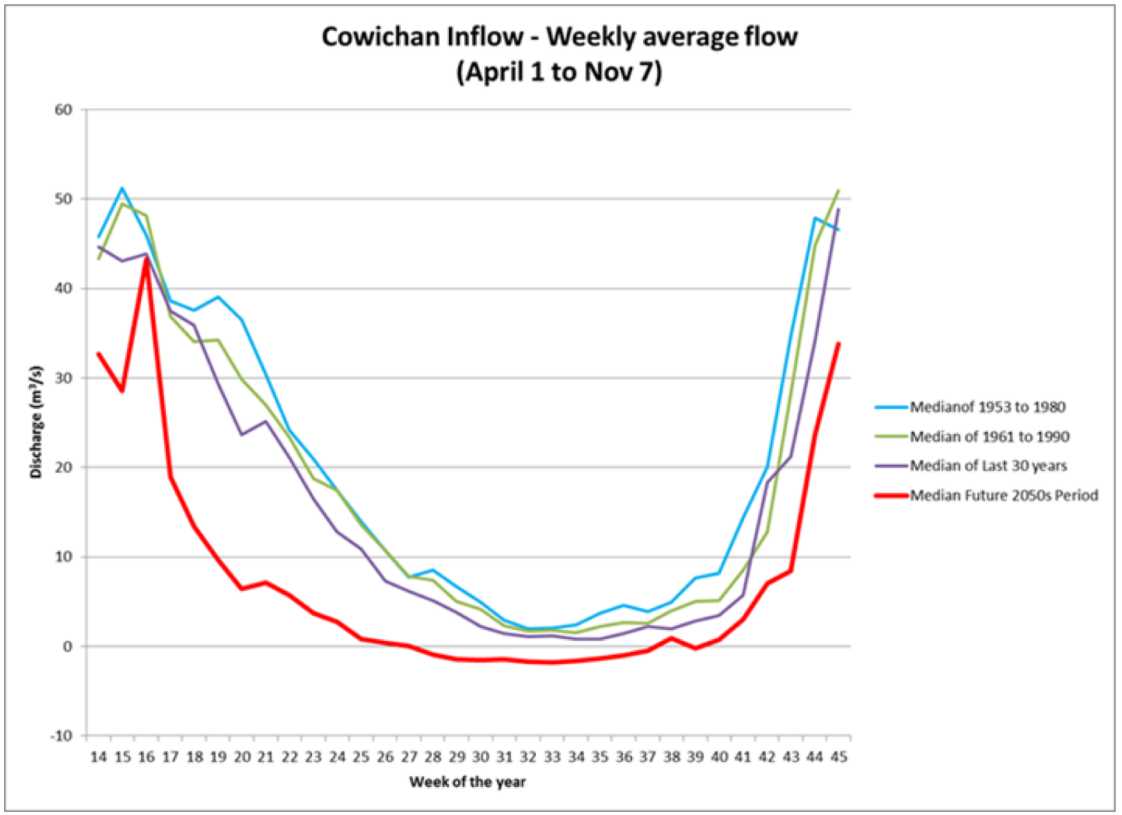
1. Review changes in hydrological conditions (i.e., water levels and flows)
2. Review preliminary performance measure values
3. Facilitated discussion

Bookend Alternatives

Hydrological Modeling

A couple of points to highlight

- Datasets matter
  - Historical inflow dataset (1953 to 2016)
  - Simulated future 10-yr dataset based on climate change projections (in the 2050s)

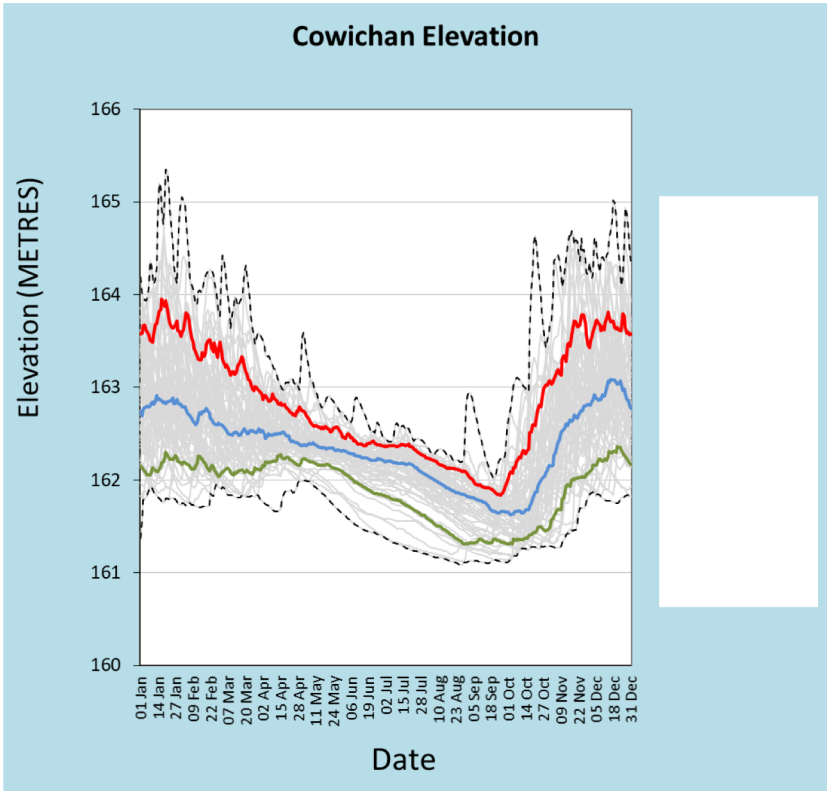


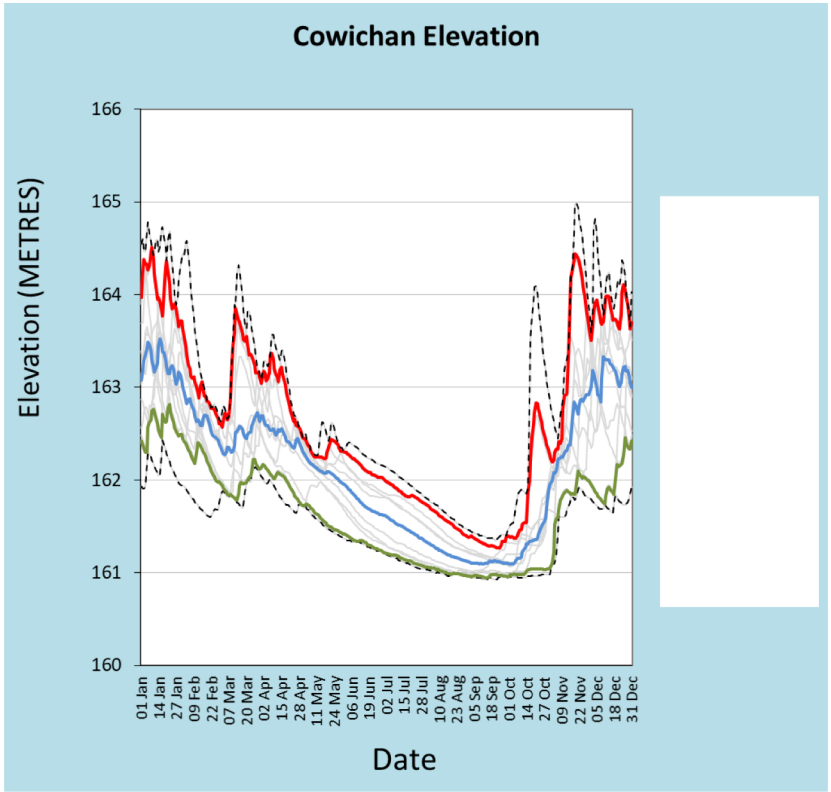
Bookend Alternatives

Hydrological Modeling

A couple of points to highlight

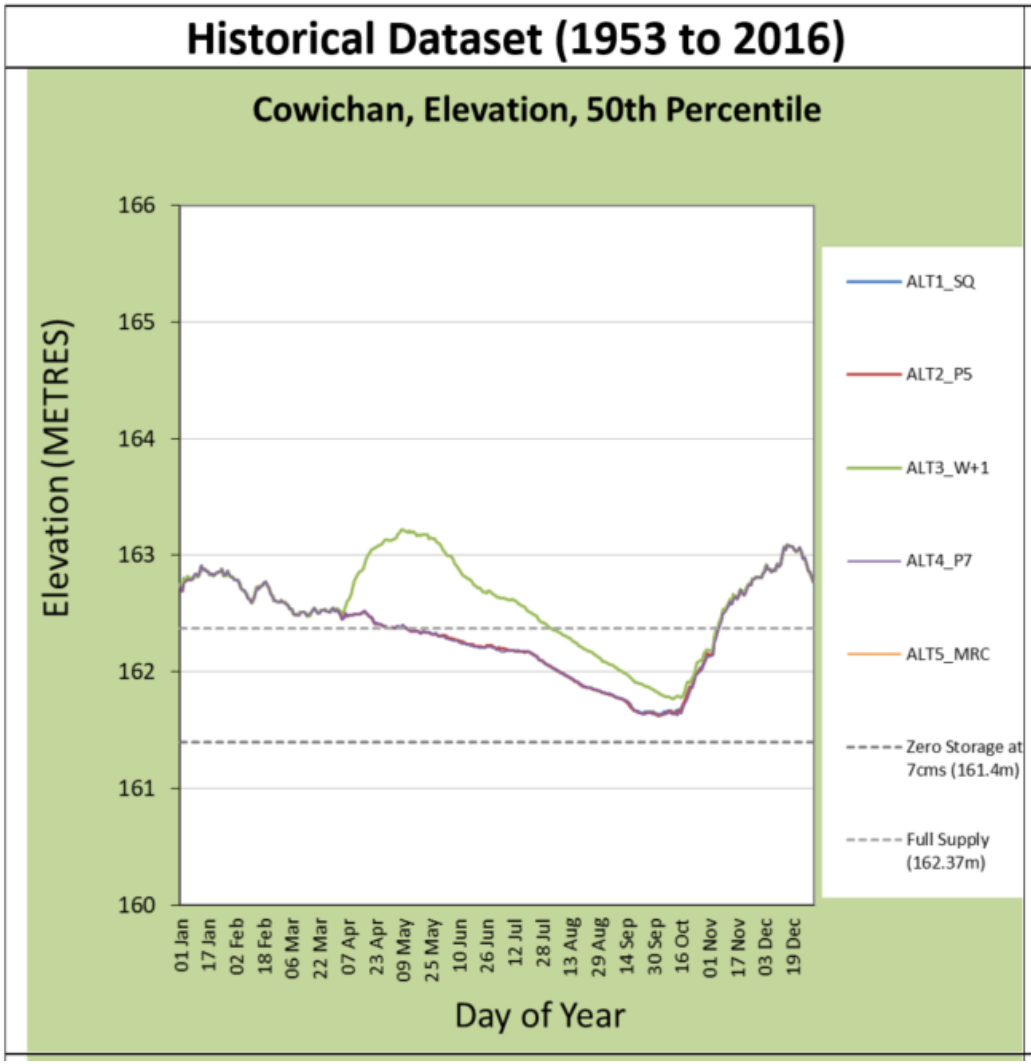
- Statistical summaries are not as meaningful when working with small datasets (n=10)

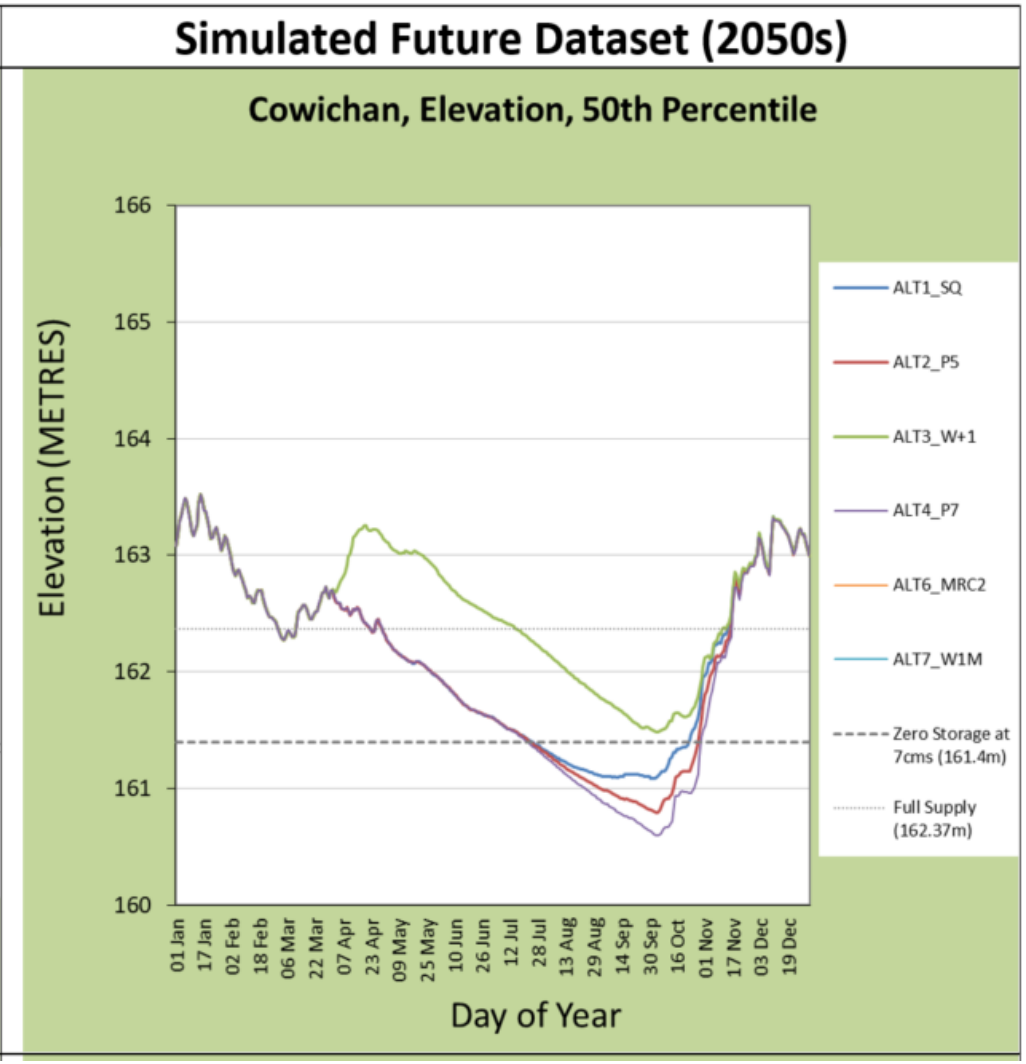




Bookend Alternatives

Comparison of Historical vs Future Water Conditions

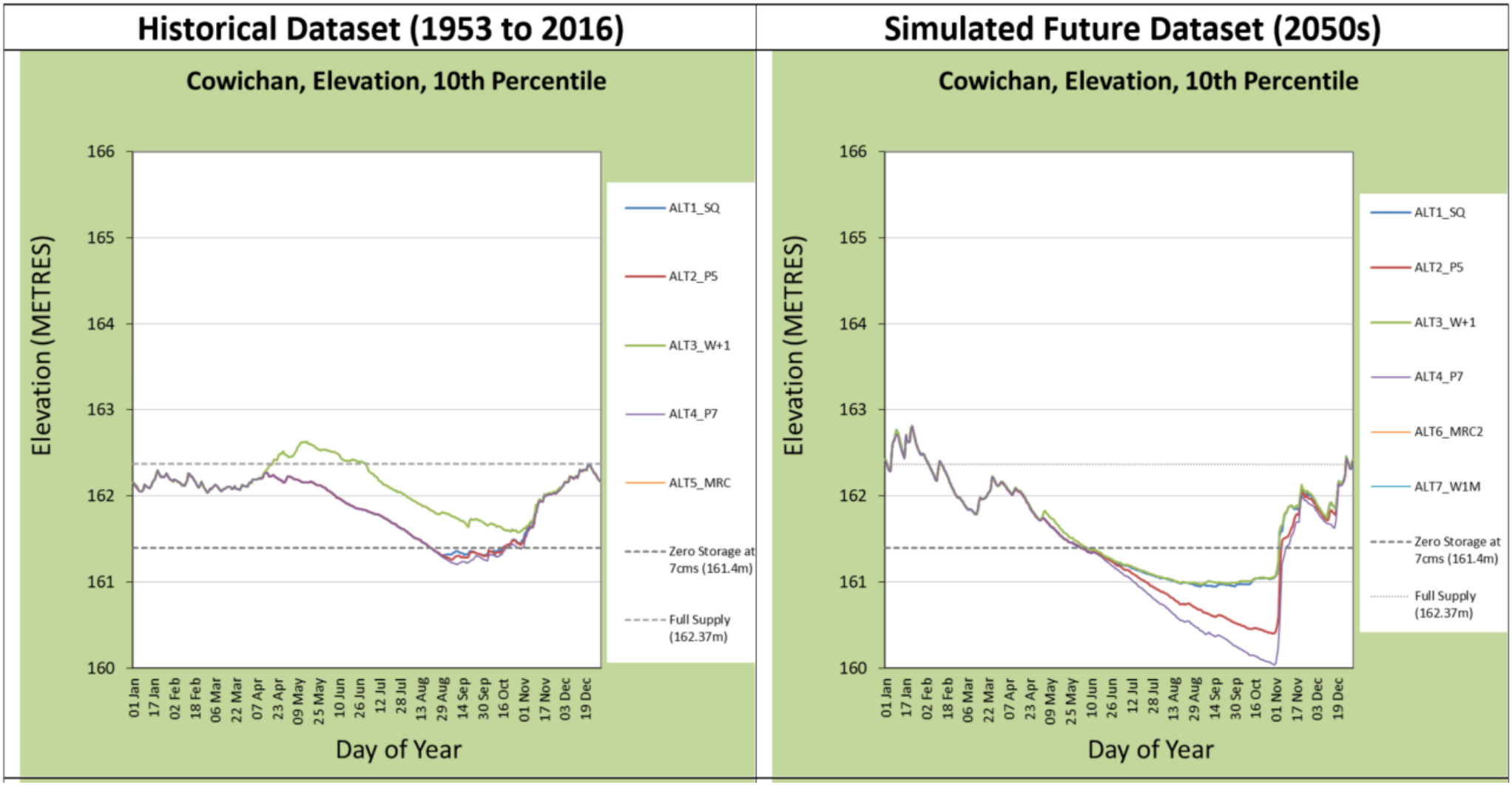




Note. Lake levels in the future will be slightly higher in the early winter (Jan) period as precipitation will more often be rain rather than snow at higher elevations.

Bookend Alternatives

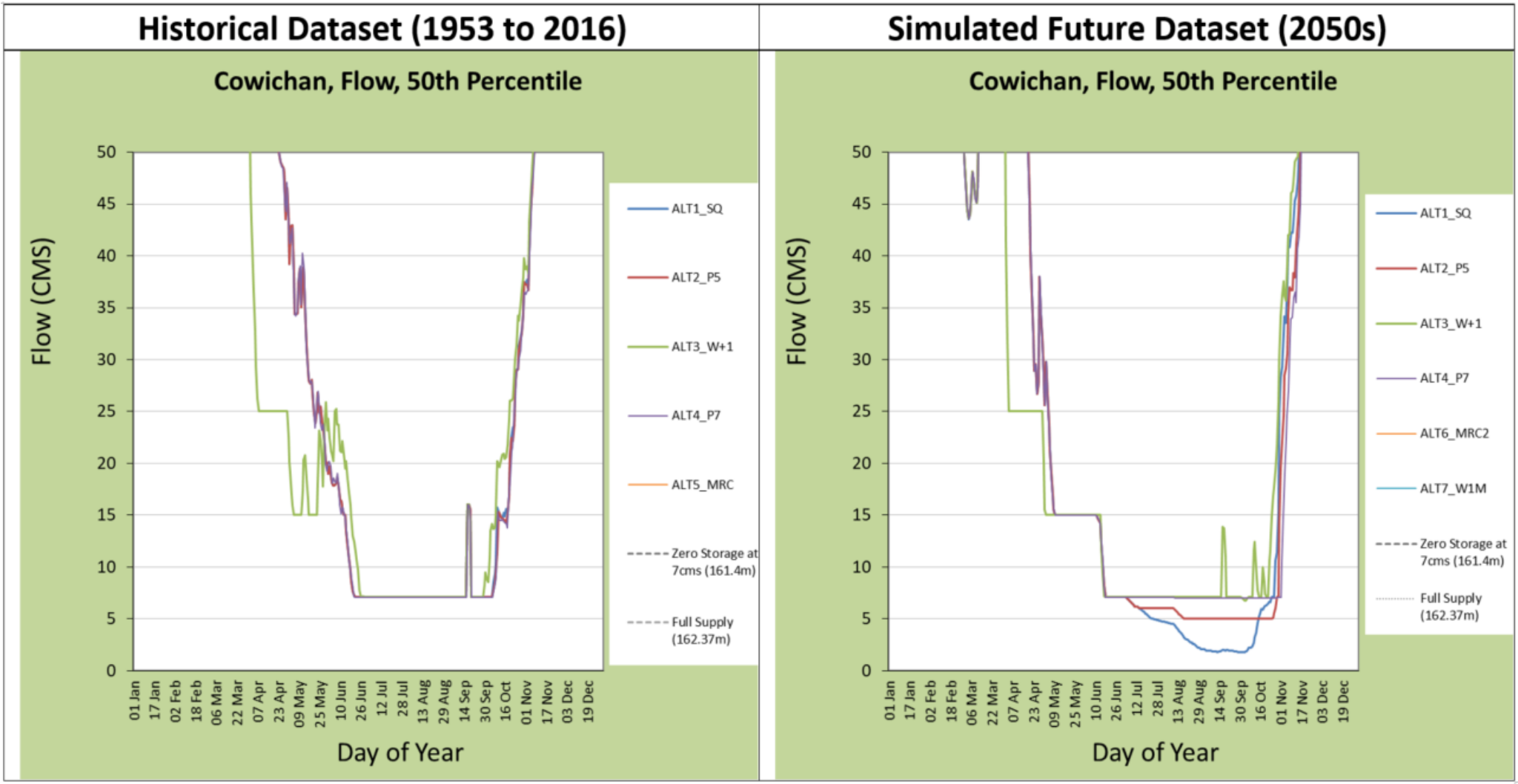
Comparison of Historical vs Future Water Conditions



Note. While an increase in the weir height of 1m (Alt 3) would have dealt with past summer droughts, in the future this won't be the case.

Bookend Alternatives

Comparison of Historical vs Future Water Conditions

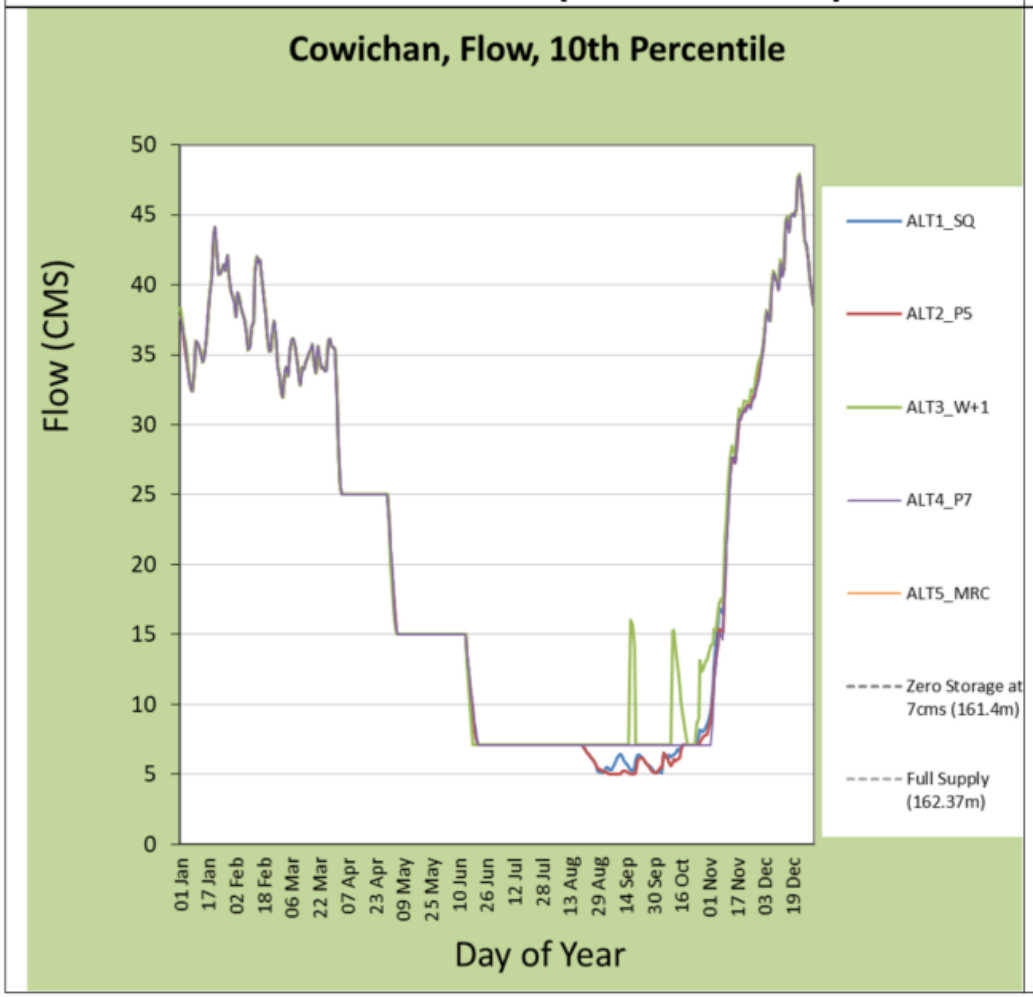


Note. In general, normal (50th%ile) spring/summer inflows in the future (2050s) will be equivalent to about 1 in 10 year spring/summer drought (10th%ile) today (based on last 30yrs)

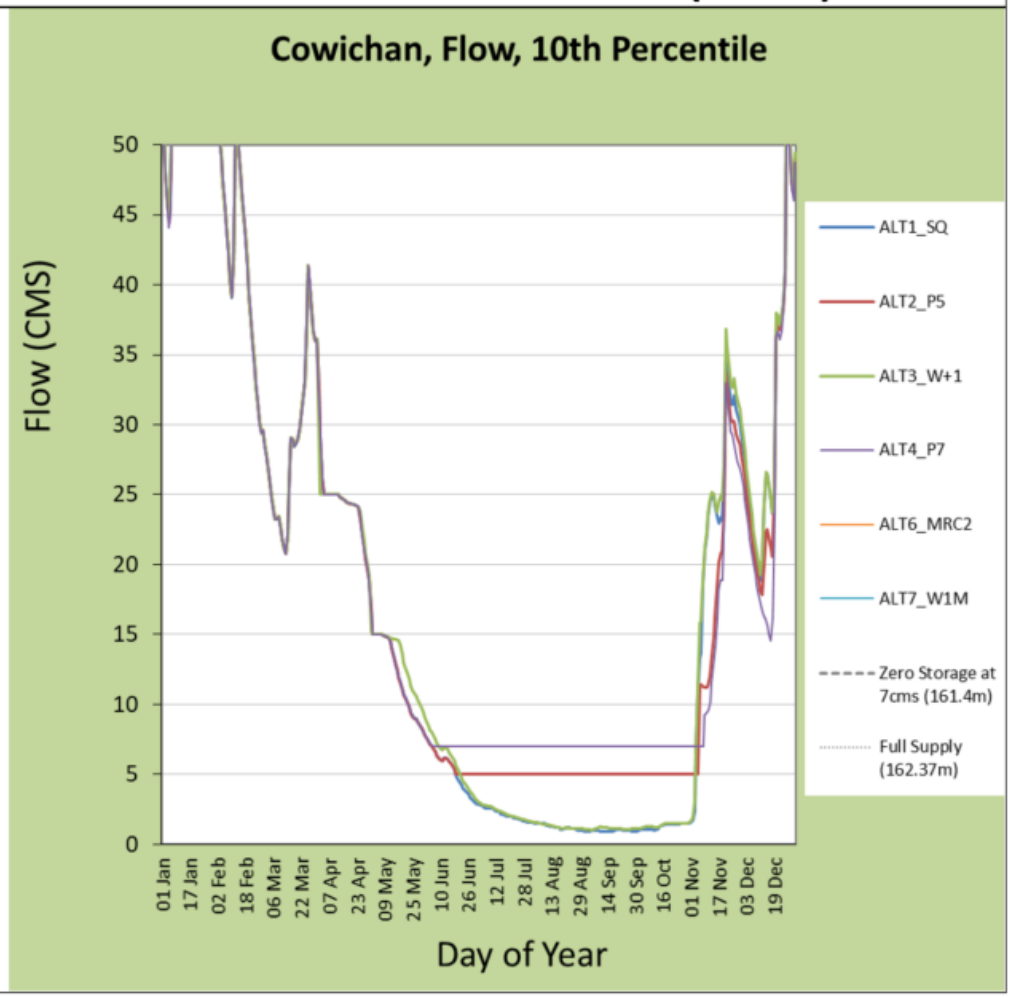
Bookend Alternatives

Comparison of Historical vs Future Water Conditions

Historical Dataset (1953 to 2016)



Simulated Future Dataset (2050s)



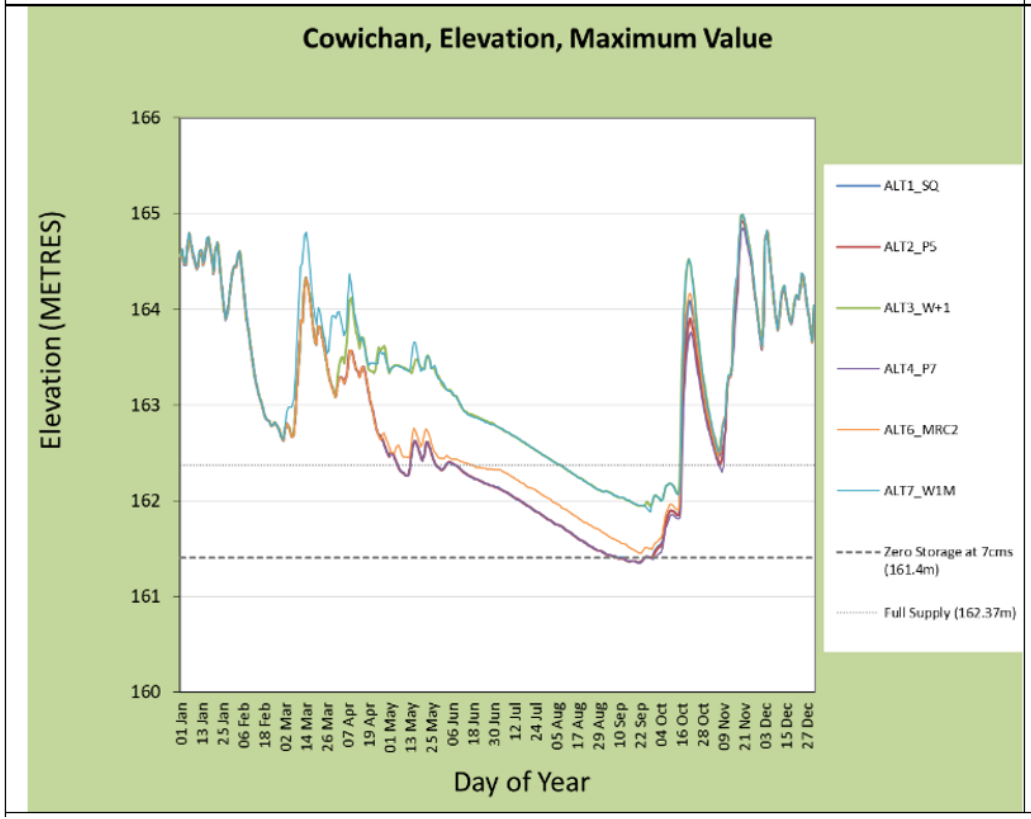
Comparison of Bookend Alternatives

Future Simulated 2050s Dataset

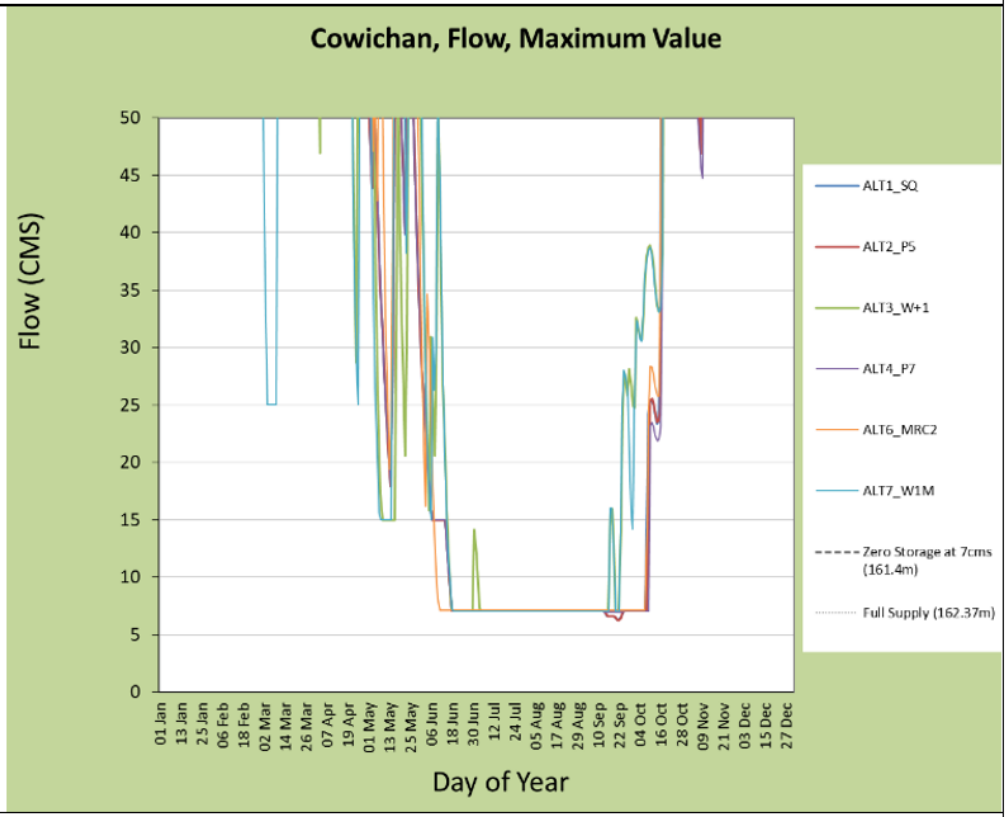
Bookend Alternatives

Future Simulated 2050s Dataset

LAKE LEVELS



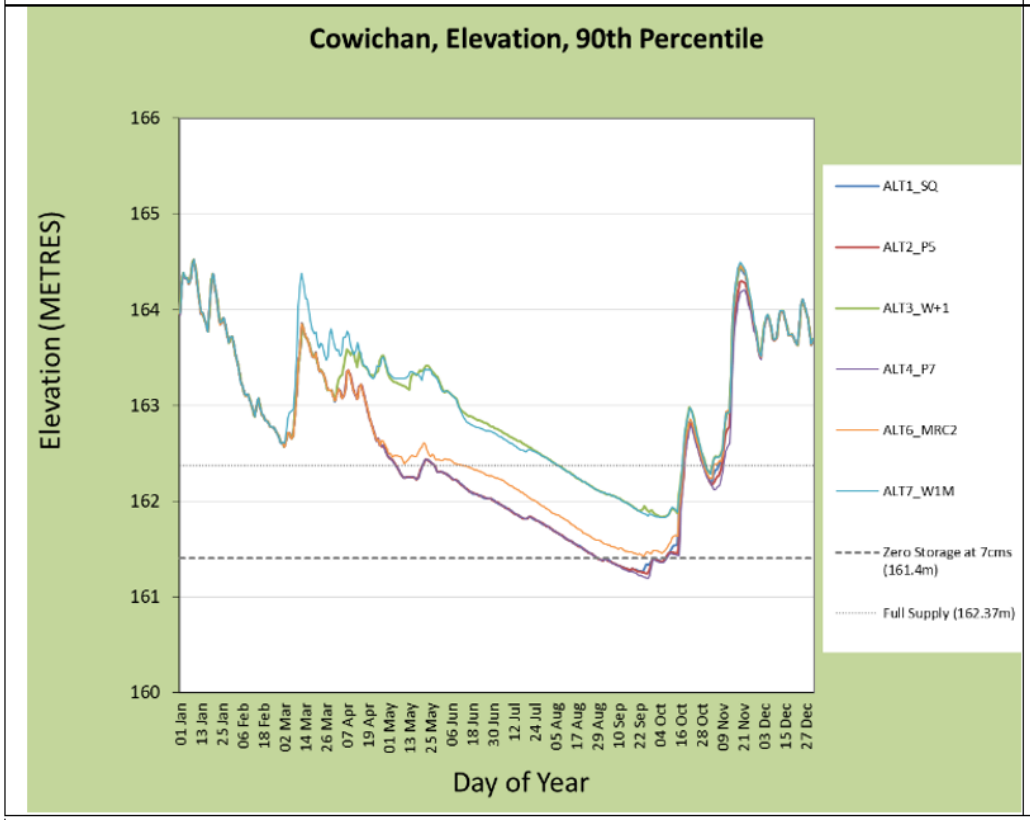
RIVER FLOWS



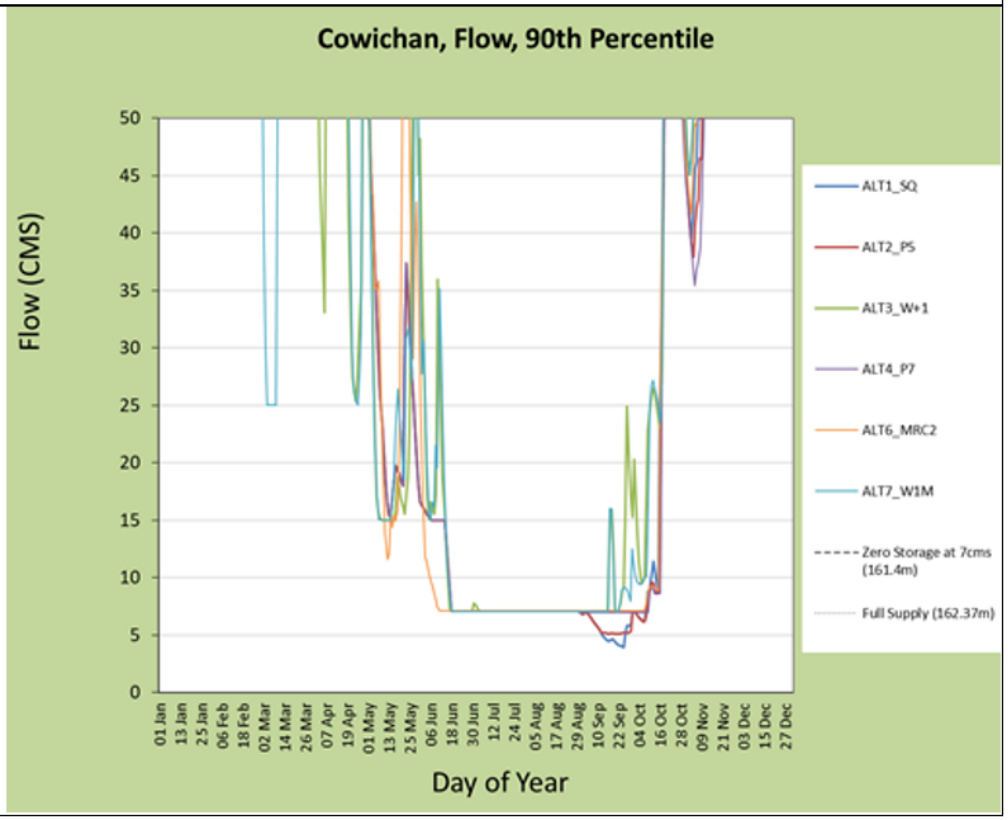
Bookend Alternatives

Future Simulated 2050s Dataset

LAKE LEVELS



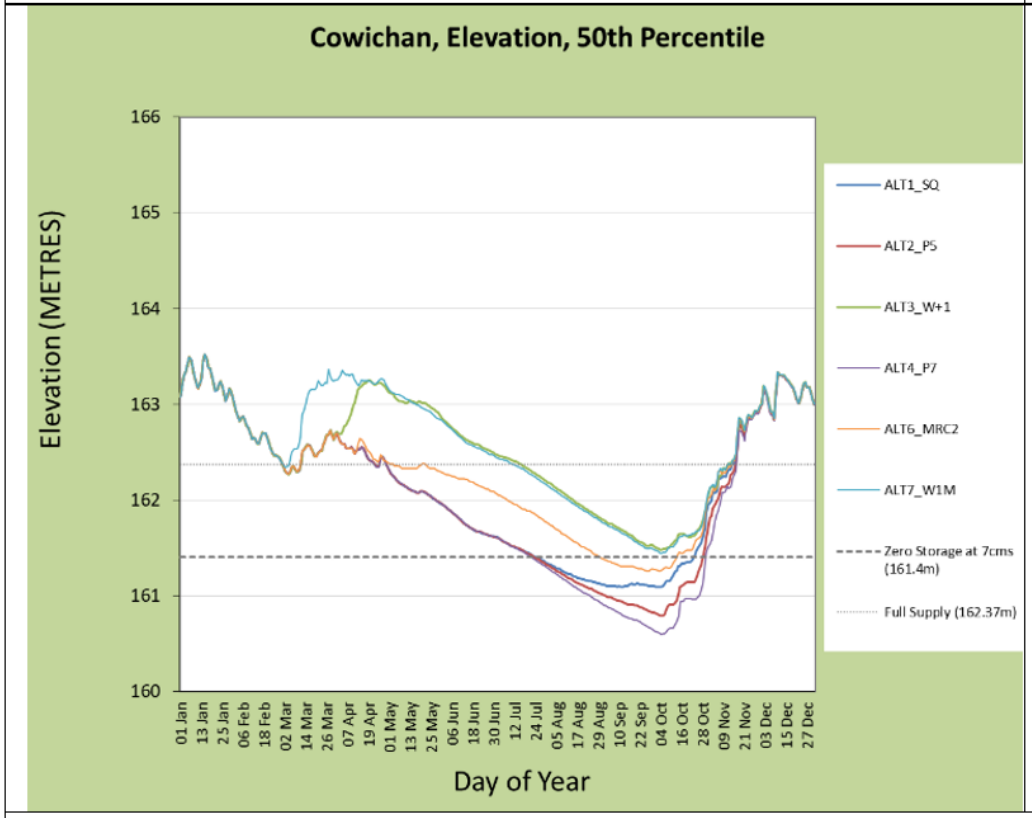
RIVER FLOWS



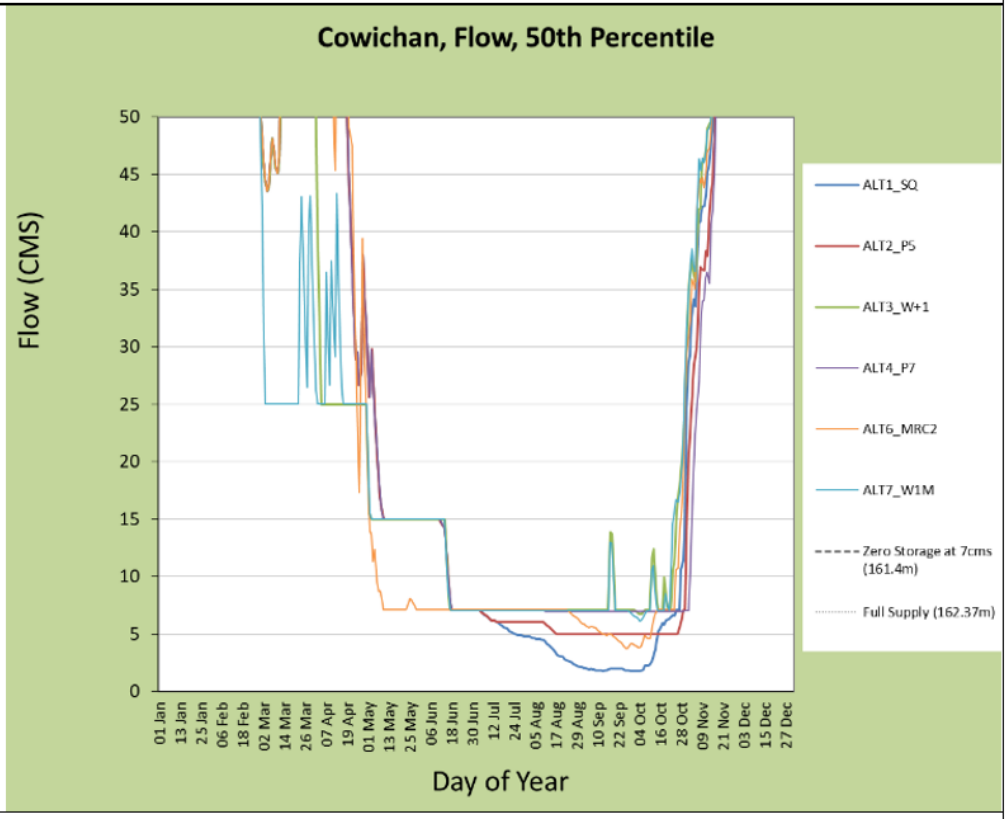
Bookend Alternatives

Future Simulated 2050s Dataset

LAKE LEVELS



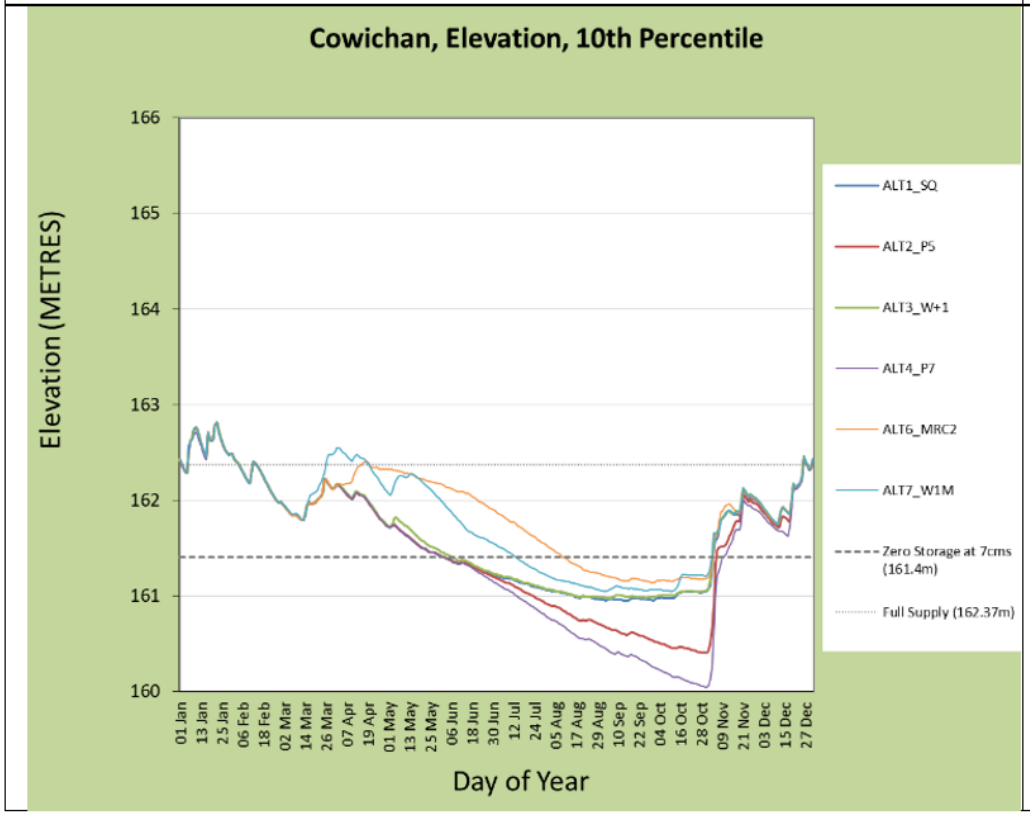
RIVER FLOWS



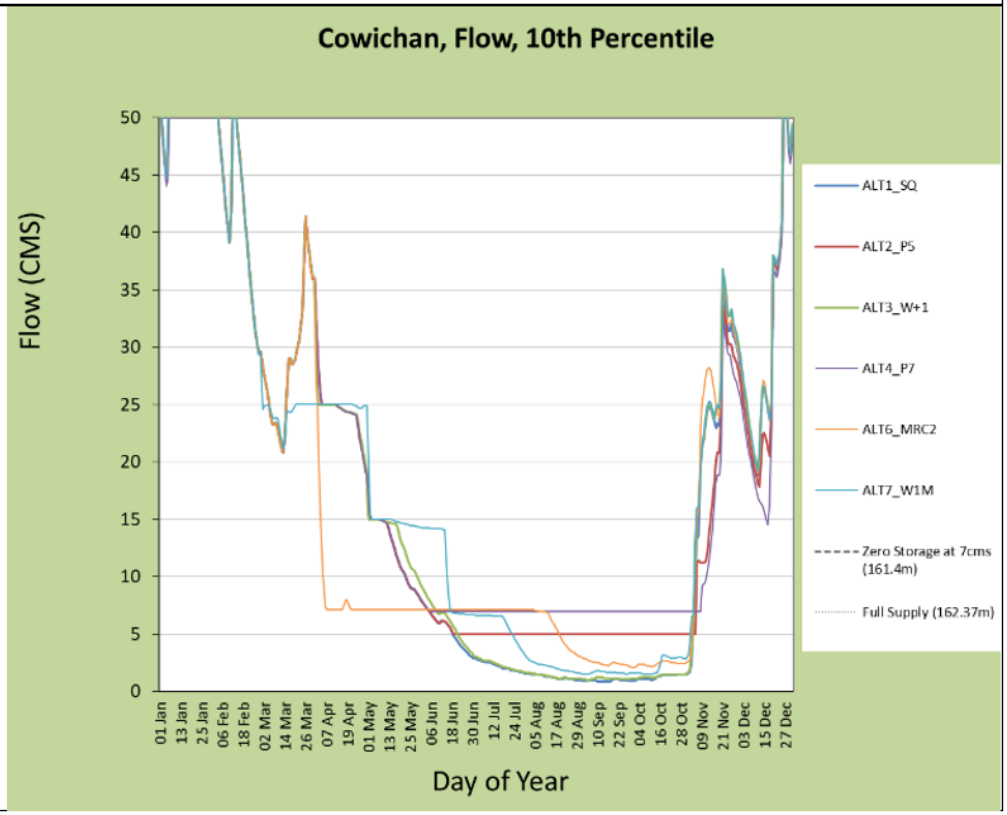
Bookend Alternatives

Future Simulated 2050s Dataset

LAKE LEVELS

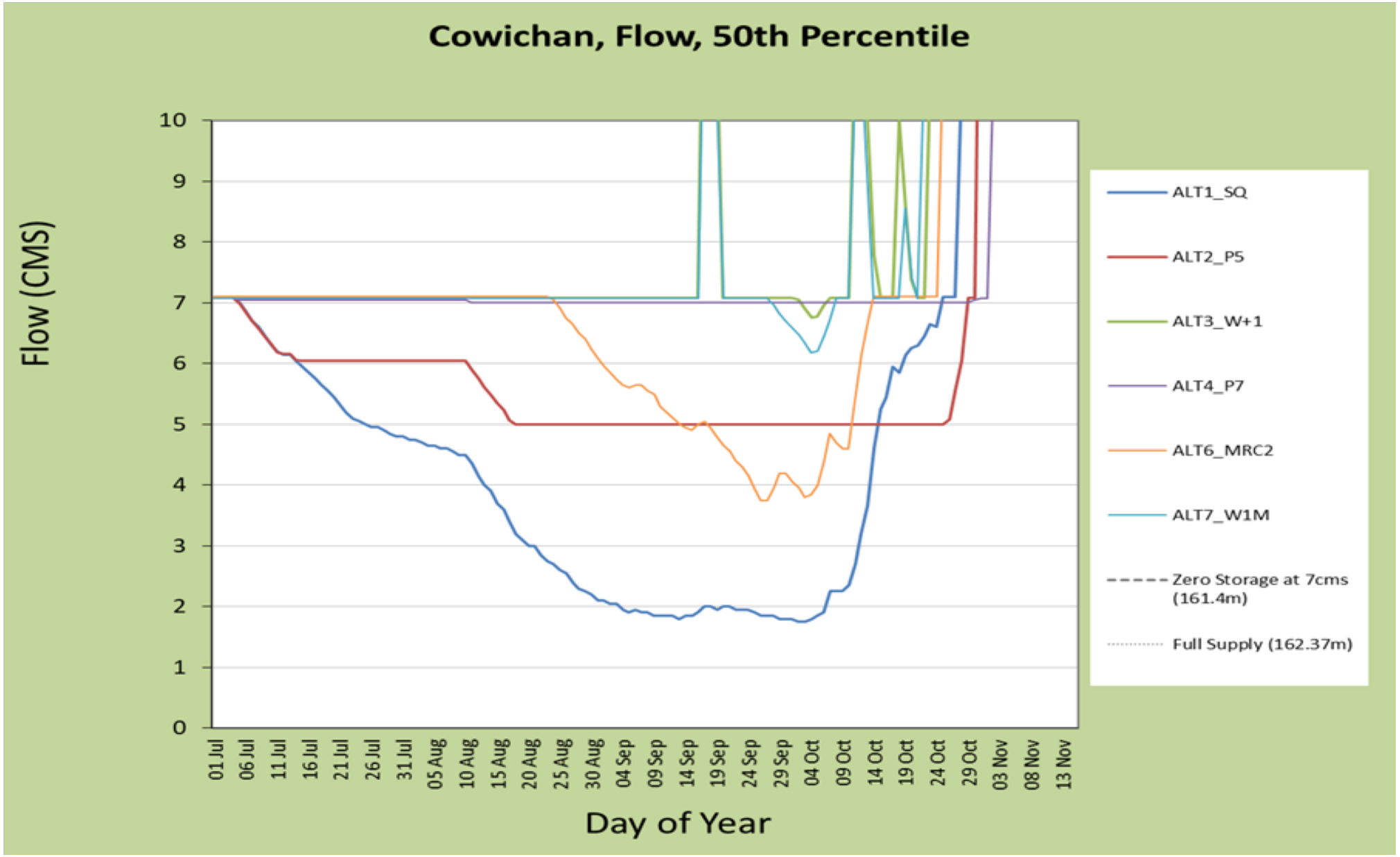


RIVER FLOWS



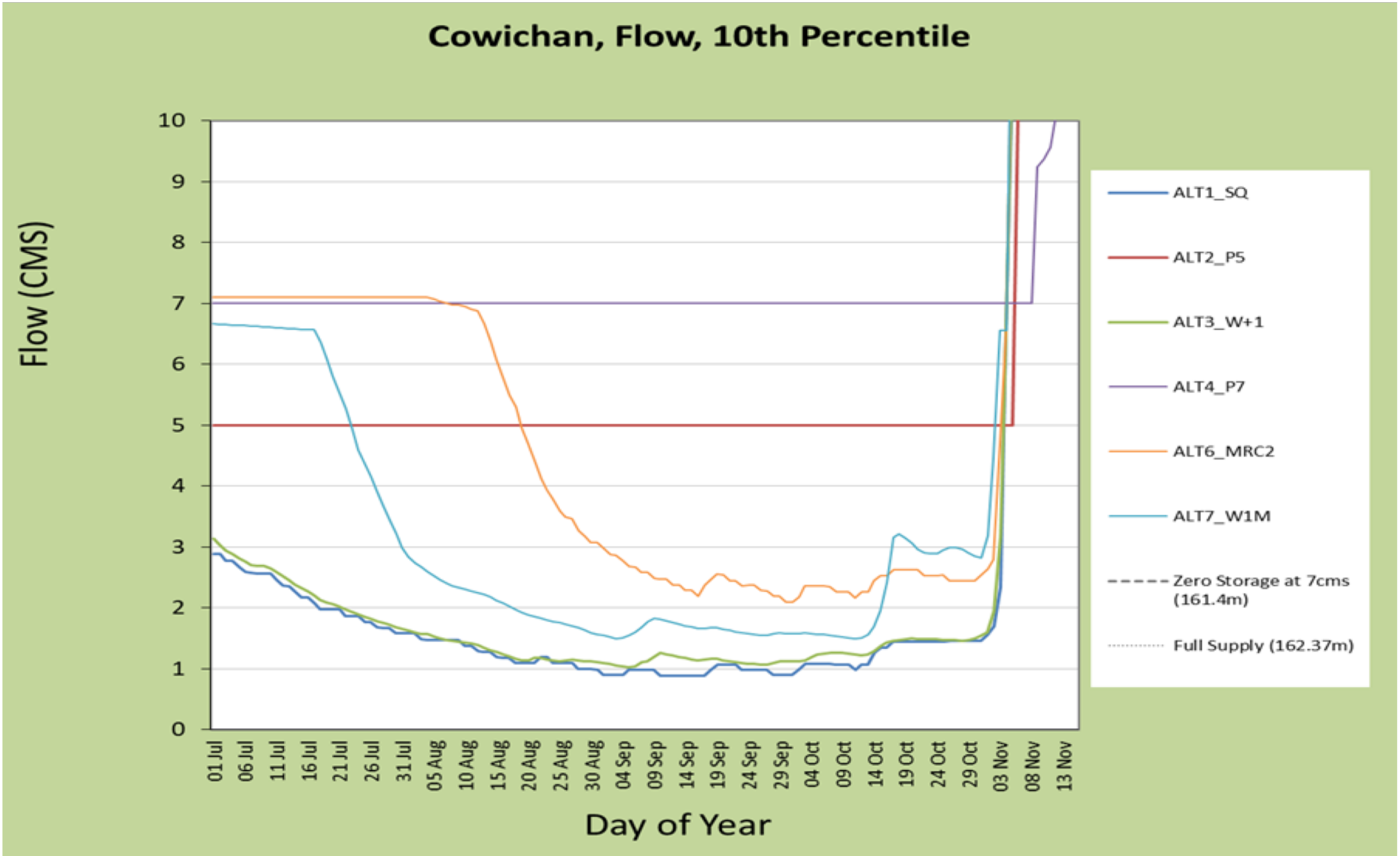
Bookend Alternatives

Future Simulated 2050s Dataset



Bookend Alternatives

Future Simulated 2050s Dataset



Bookend Alternatives

Future Simulated 2050s Dataset

Some observations:

- **Raising the weir alone does little to increase storage in the system during dry springs / summers** (in 4 out of 10 years lake levels do not reach the top of the existing weir, let alone any increases in height: Note: even moving the control period up by one month, still results in 2 out of 10 years not filling the lake to the top of the weir). This makes sense as the snowpack will be smaller and melt much earlier in the season in the future.
- **Negative storage bookends are the best at maintaining target rivers flows late into the summer and early fall**, but lake levels will need to drop by as much as 1.4m to maintain a 7cms river flow. Even in average'y' springs and summer years, lake levels would be expected to drop between 0.6m and 1.0m for these alternatives.
- **The 25cms and 15cms higher spring releases into the Cowichan River will make it increasingly difficult to store enough water for later releases** to meet the target river flows later in the summer and fall for some alterns.

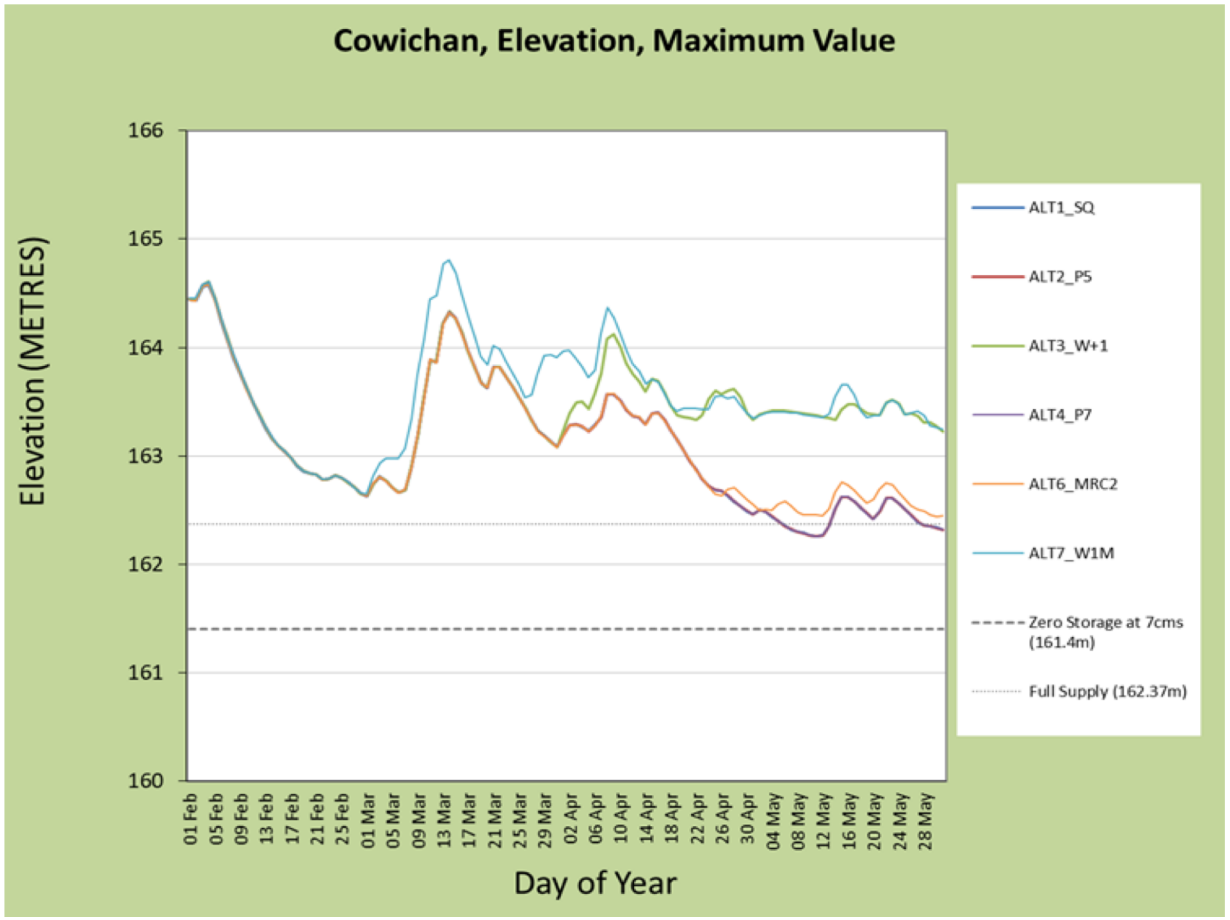
Bookend Alternatives

Future Simulated 2050s Dataset

Not much is gained through moving the control period up by one month to Mar 1 to capture more water if the weir ht is increased – in dryer summers – if the 25cms spring flow release starts earlier on Mar 1.

And there is the unintended increased risk of higher lake levels (above 164m) in high inflow springs with an earlier control period of Mar 1

➔ The following hydrograph of the wettest winter/spring year (max level across the 10year dataset in the 2050s) shows an increase in lake levels in the spring by about 0.5m (from 164.3m to 164.8m).



Assessing Bookend Alternatives

Draft Performance Measures

Performance Measures

Definition

- Specific metrics for comparing the **predicted** consequences or impacts of the alternatives on the objectives.
- Similar terms: attributes, decision criteria, indicators, evaluation criteria

How are they different from monitoring indicators?

- PMs are predictive and used prior to a decision
- Monitoring is empirical and done after

Performance Measures

Characteristics of Good Performance Measures

- Complete but concise (count what counts, as few as possible)
- Understandable (to everyone)
- Accurate and Unambiguous (if possible)
- Practical (available resources)
- Sensitive to the Alternatives (useful)
- Explicit about uncertainty

Draft Performance Measures

Culture and Heritage

- Specific PMs have not been developed at this time
- Propose that the fish PMs be used as an interim proxy for FSC rights and transfer of traditional knowledge
- PMs for cultural practices (i.e. ceremonial bathing) to be explored with Cowichan Tribes and Lake Cowichan First Nation

Draft Performance Measures

Aquatic & Riparian Ecosystems

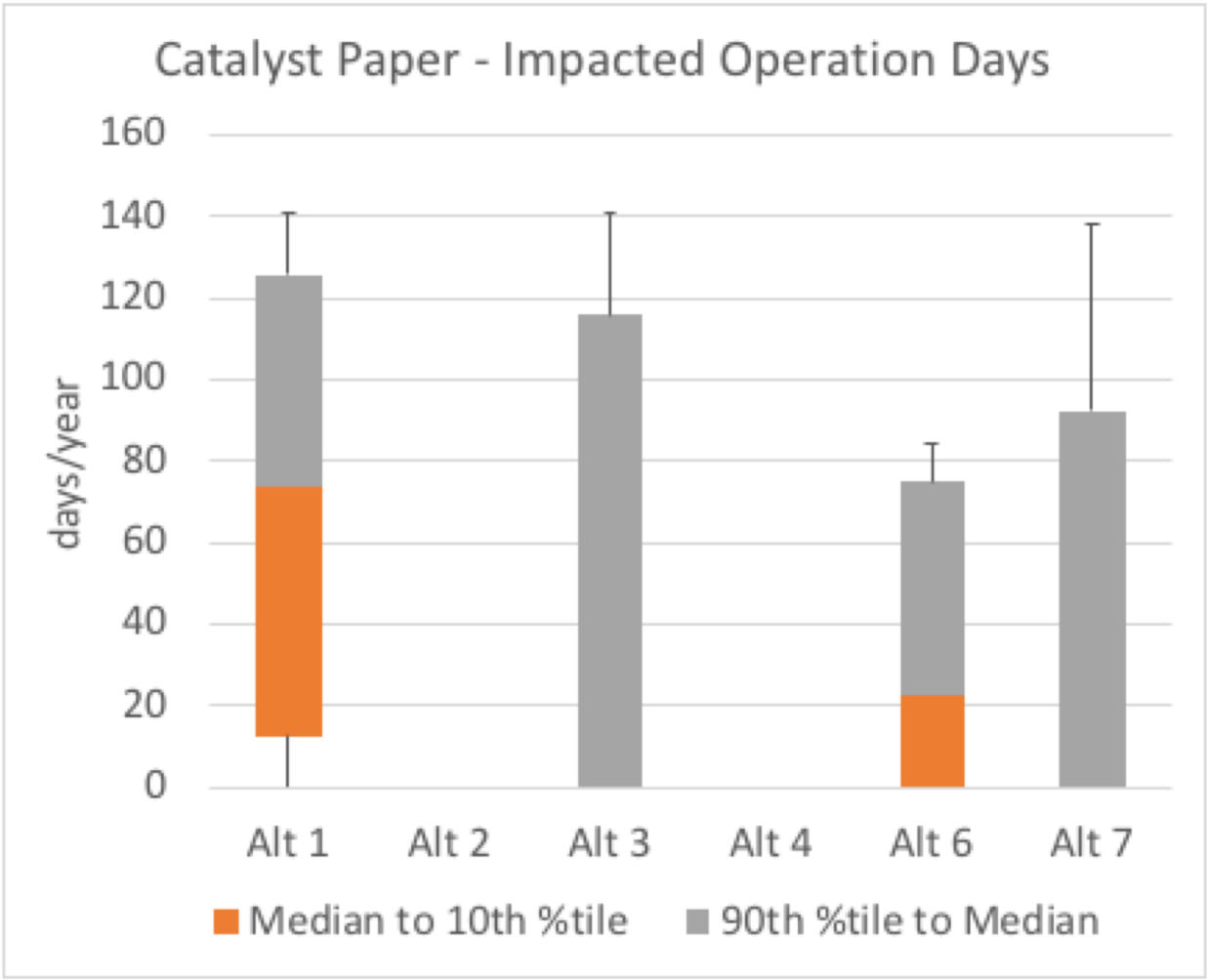
Draft Performance Measures

Industry and Commercial

- **PM: Catalyst Paper - Impacted operation days**
  - Reports the average number of days per year that river flows are below **4.5cms**.
  - Assumes an average daily withdrawal of 1.7cms by the mill and a target flow of 2.8cms to meet environmental and community water supply needs in the lower river
  - Assumes that any licence priority would be given up in order to avoid impacts to community water supply
- Specific PMs for Agriculture and Commercial fishing not been developed at this time

Draft Performance Measures

Industry and Commercial



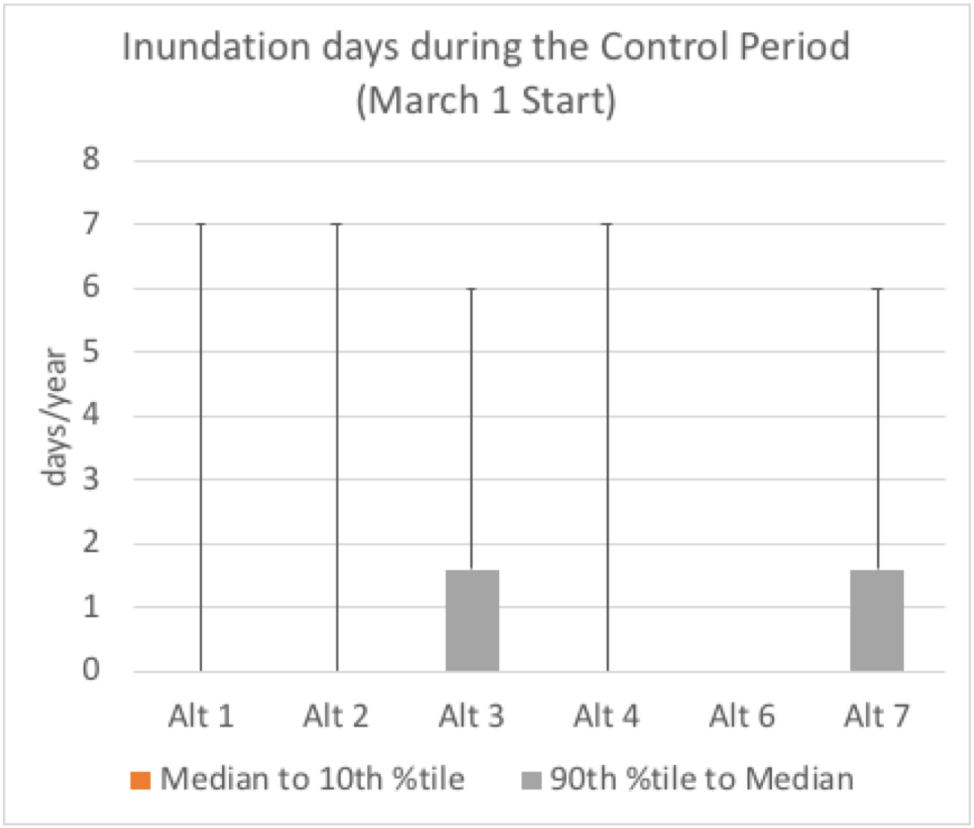
Draft Performance Measures

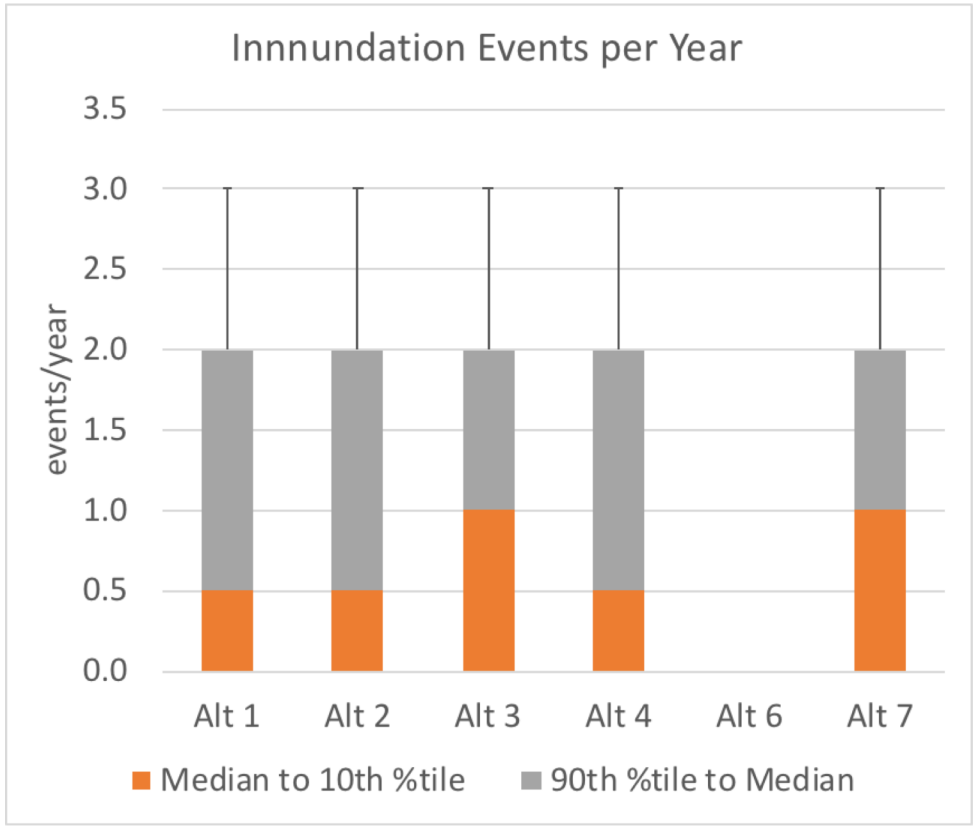
Flooding and Inundation

- **PM: High water days**
  - Report the number of days when lake levels are higher than the average winter high water mark (164m)
- **PM: High water events**
  - Report the number of events (one or more consecutive days) when lake levels are higher than the average winter high water mark (164m)

Draft Performance Measures

Flooding and Inundation





Note: PM calculated using historical dataset; Alt 6 was not modelled using this dataset

Draft Performance Measures

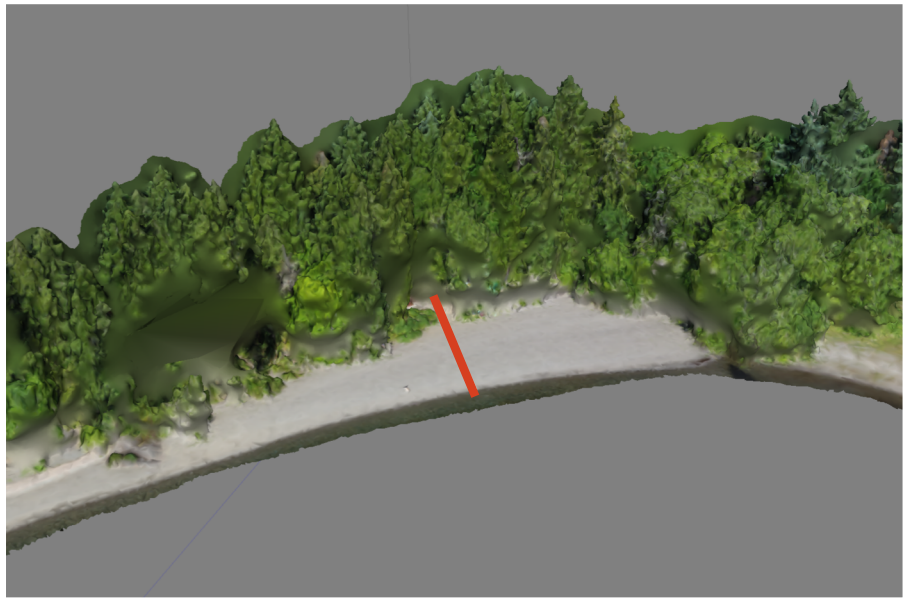
Private Property Lakefront Areas

- **PM: Frontage Length**
  - Reports the daily average lake frontage length at different lake elevations
  - Frontage length is defined as the distance from normal high water mark (164m) to the water's edge
  - Used representative sites to capture different lakefront area types

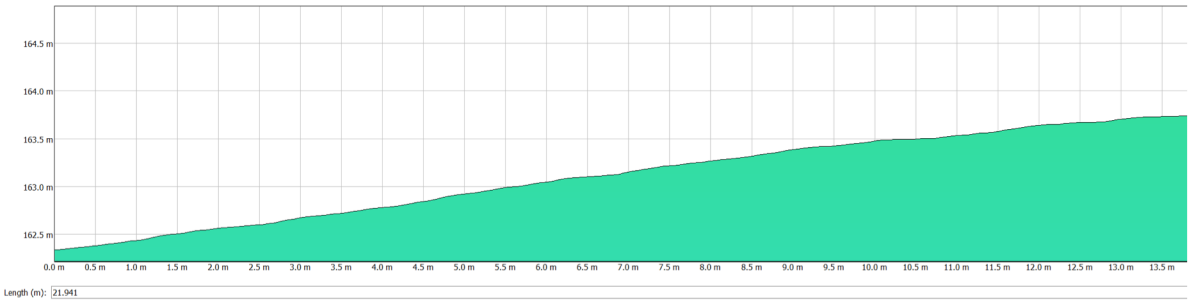
Draft Performance Measures

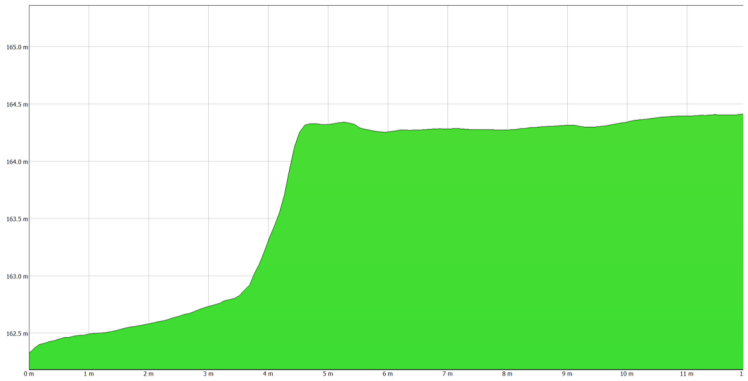
Private Property Lakefront Areas

Vegetated, Moderate Slope Type



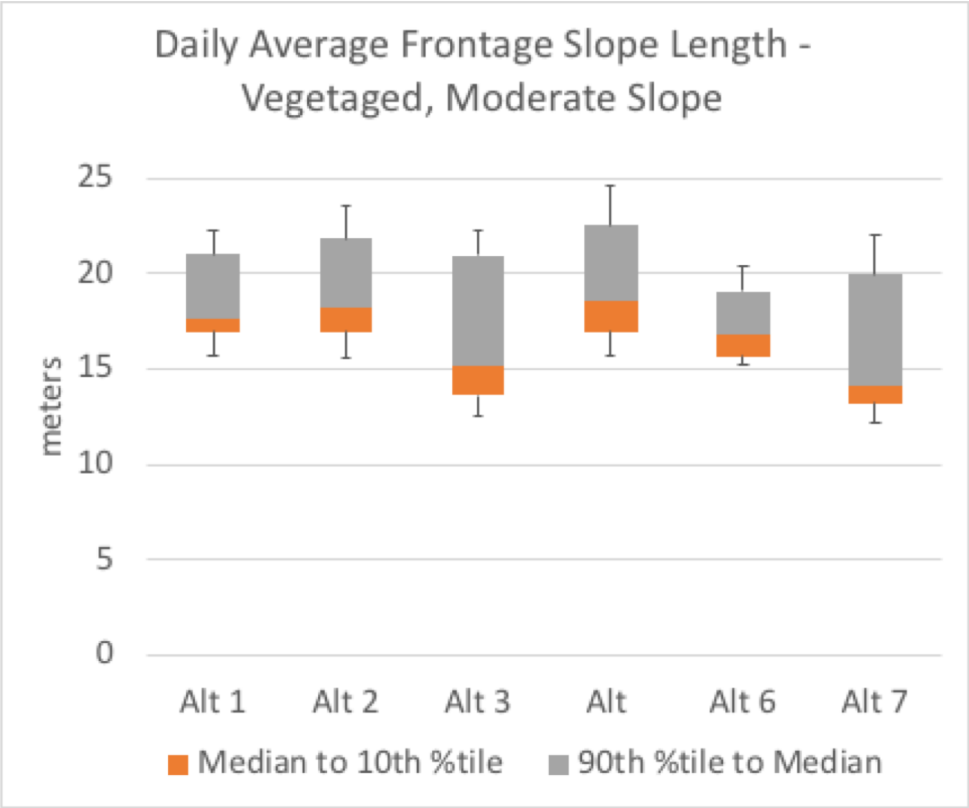
Un-Vegetated, Steep Slope Type

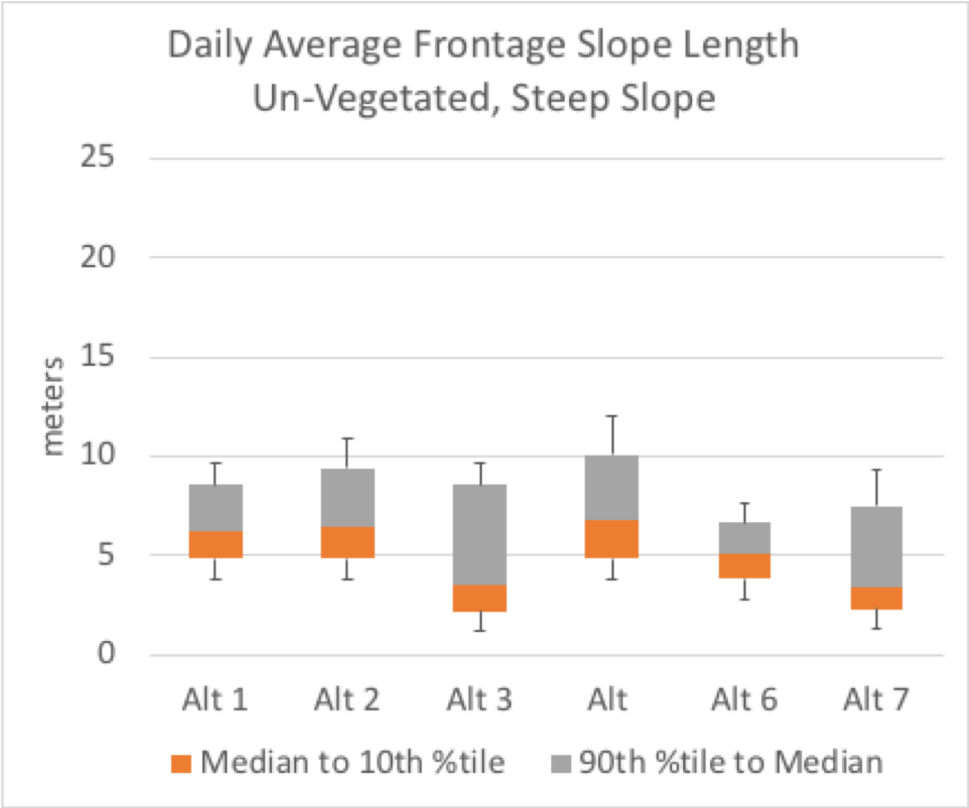




Draft Performance Measures

Private Property Lakefront Areas





Draft Performance Measures

Other Lakefront Issues

- Propose the community water supply PM for Town of Lake Cowichan be used as an interim proxy for private water pump intakes
- Placeholder PM for damage to lakefront structures (i.e. docks and wharves)

Draft Performance Measures

Waste Water Dilution

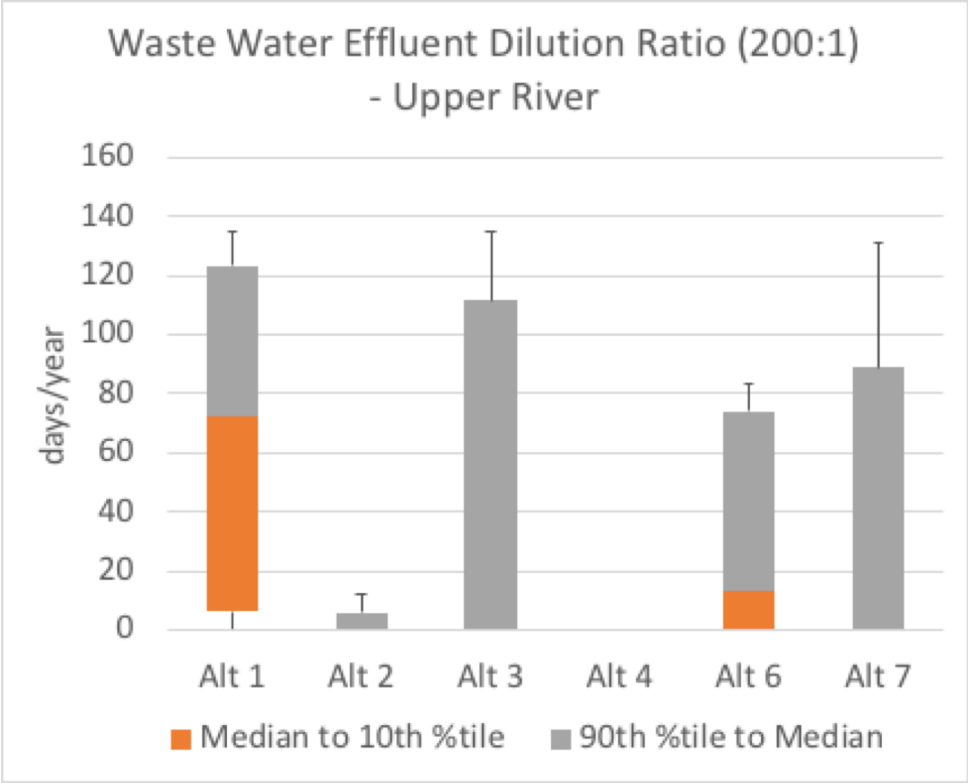
- **PM: Effluent Dilution Ratio (200:1) - Upper River**
  - Reports the number of days river flows are below the minimum threshold to meet the Town of Lake Cowichan effluent dilution requirements
  - Calculated using projected 2050s minimum effluent river flows based on average monthly flow
  - Uses the August min monthly flow for October to represent a dryer year

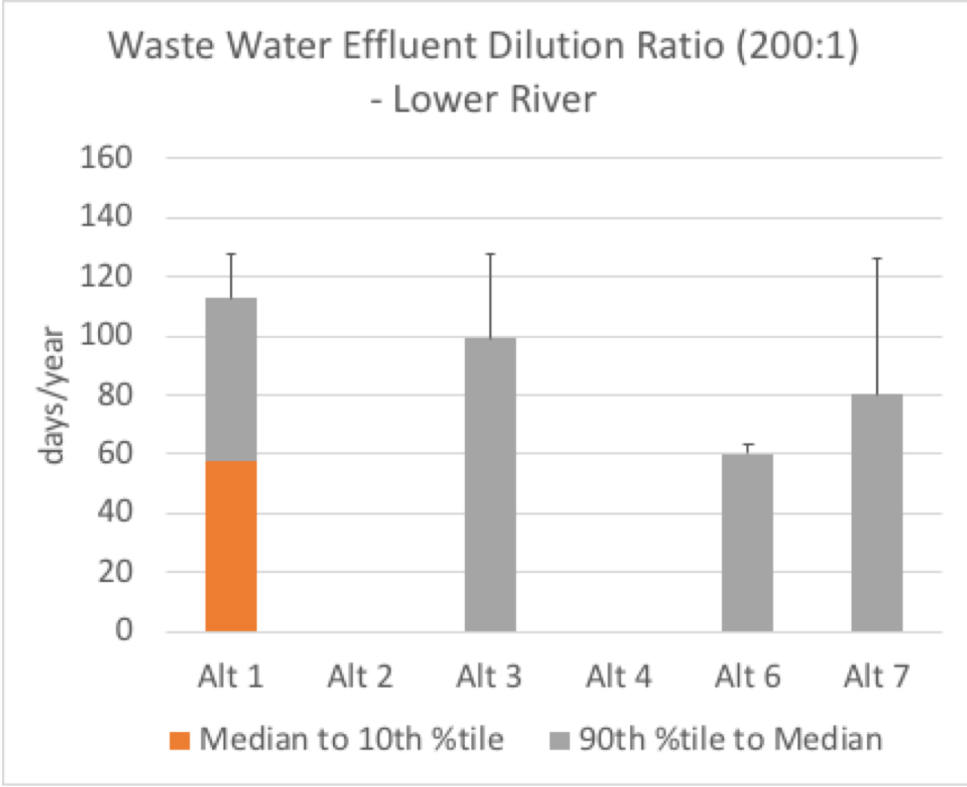
Month	Min. River Flow Required for Dilution (Projected 2050s Effluent Flows) (m^3/s)
January	6.4
February	6
March	6.7
April	3.8
May	3.6
June	3.3
July	4
August	4.2
September	4
October	6.6 (4.2)
November	6.2
December	4.5

- **PM: Effluent Dilution Ratio (40:1) – Lower River**
  - Reports the number of days river flows are below the minimum threshold (**2.8 cms**) to meet the Joint Utility Board effluent dilution guidelines

Draft Performance Measures

Waste Water Dilution





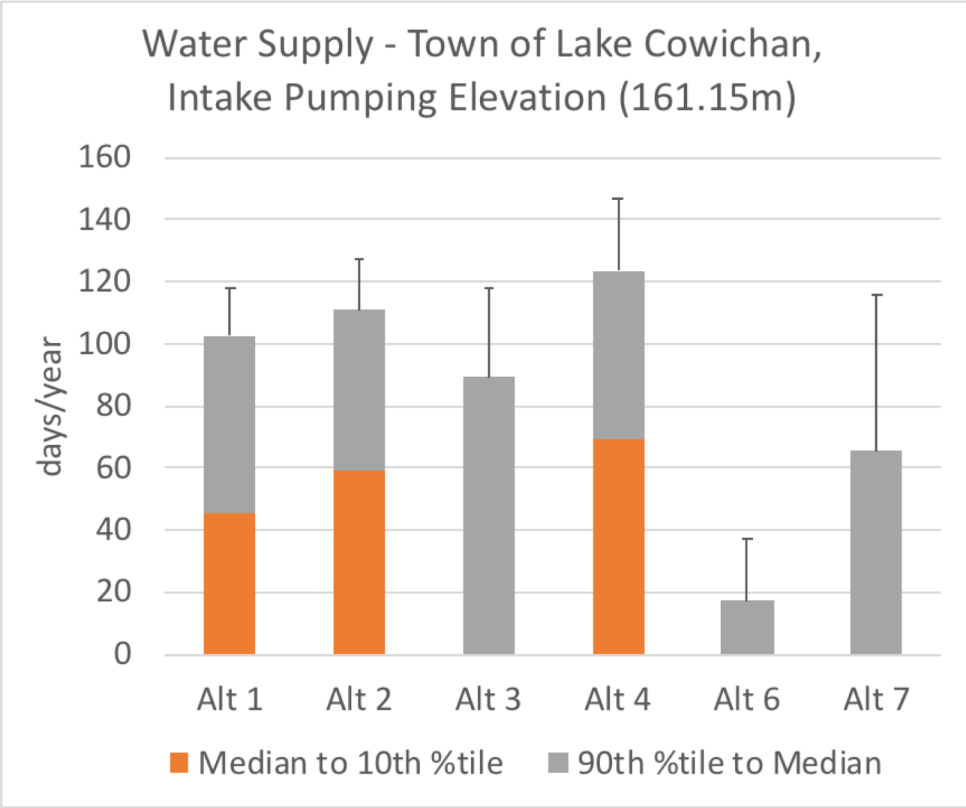
Draft Performance Measures

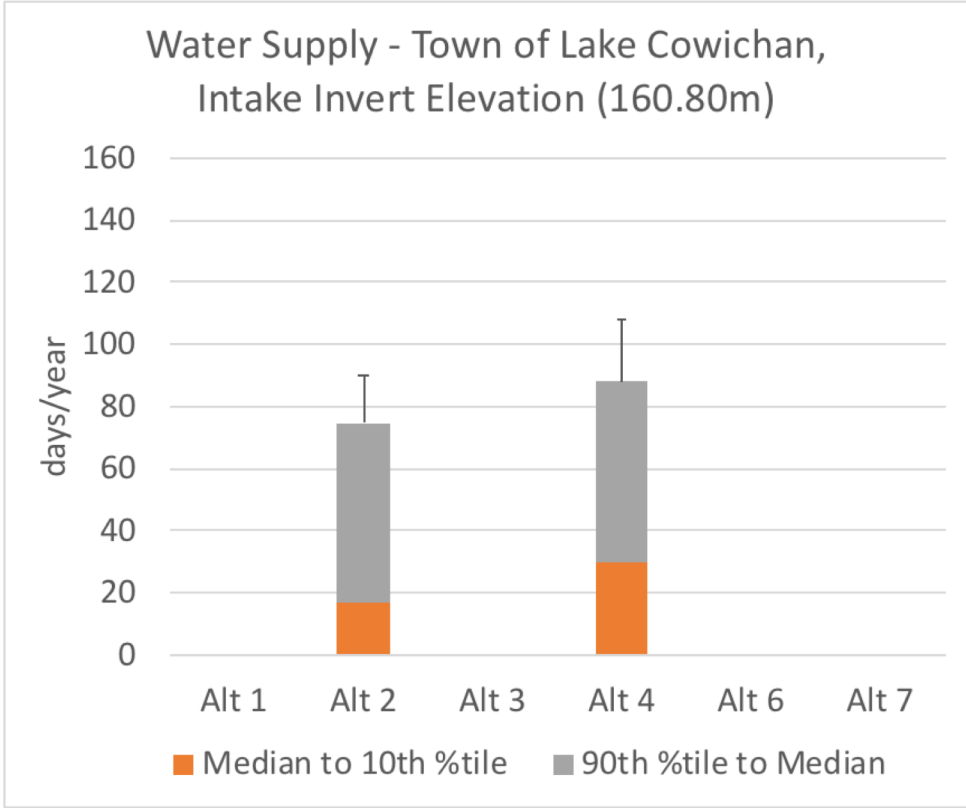
Community Water Supply

- **PM: Intake pumping capacity – Town of Lake Cowichan**
  - Reports the average number of days lake levels are below **161.15m**, the minimum elevation for the pump station to function.
- **PM: Intake invert elevation – Town of Lake Cowichan**
  - Reports the average number of days lake levels are below **160.80m**, the elevation of the pump station intake invert.
- Captures water supply for the Town of Lake Cowichan and is a proxy for private pumps using the lake
- Water supply for Duncan and North Cowichan is captured in minimum flow requirements for lower Cowichan River effluent dilution

Draft Performance Measures

Community Water Supply

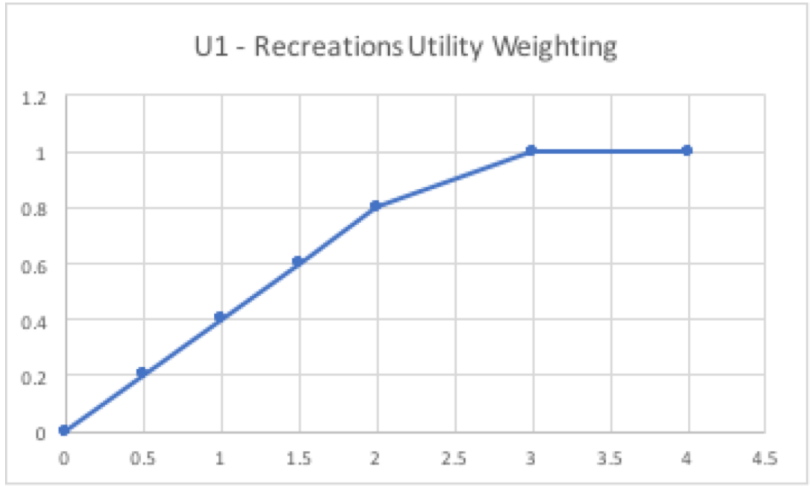


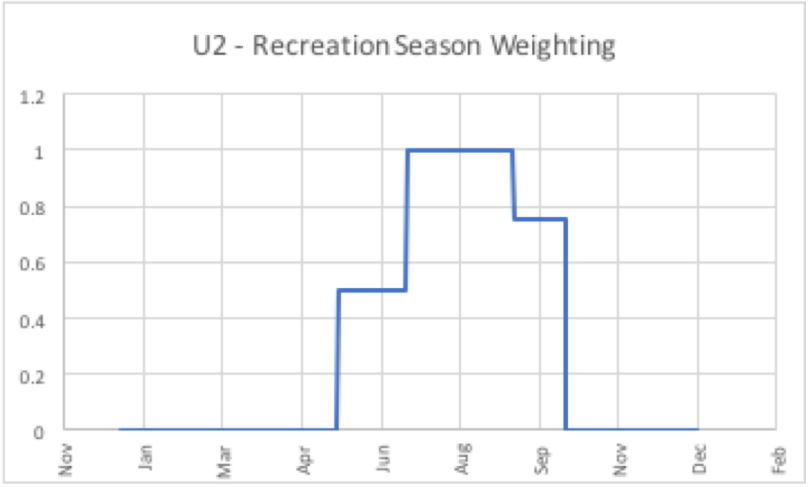


Draft Performance Measures

Recreational Beach Use - Lake

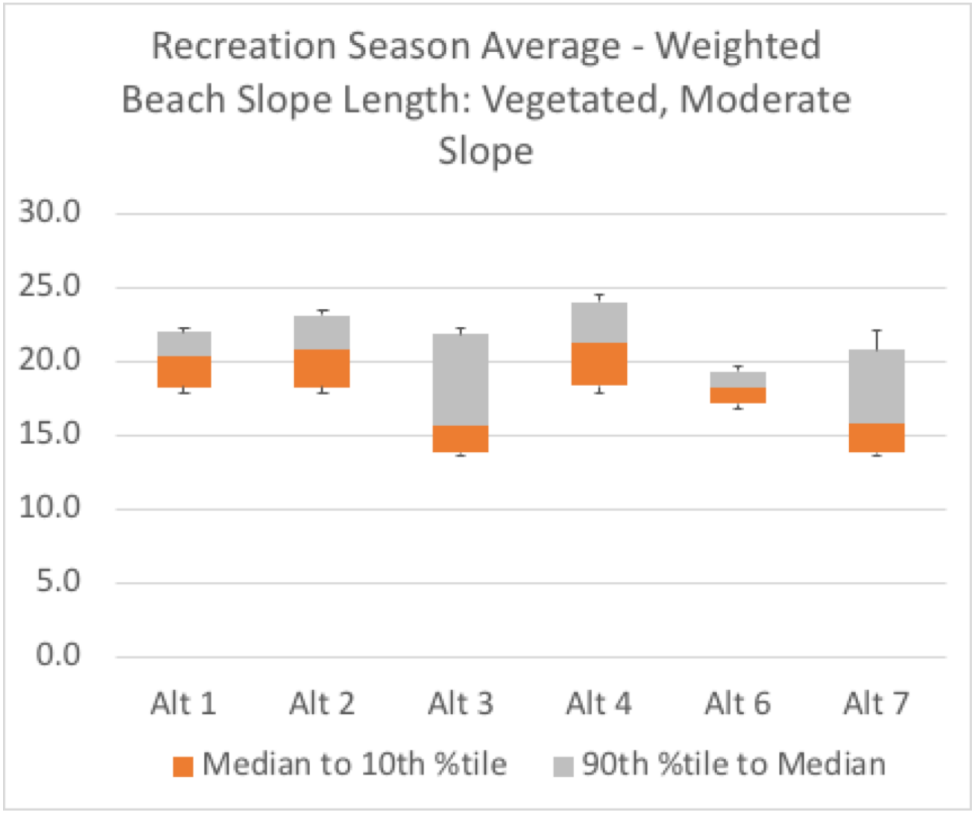
- **PMs: Weighted Beach Slope Length & Weighted Beach User Days**
- Representative lakefront areas as for the private property frontage PM
- Beach slope length is defined as the distance from the crest of beach to the water's edge
- BSL Utility weighting (U1):
  - 0m, U1 = 0
  - >0m to 3m, U1 = 0 to 1
  - ≥ 3m, U1= 1
- Seasonal weighting:
  - Peak summer season: July 1 to Sep 7
  - Spring shoulder season: start May 18
  - Fall shoulder season: end Oct 8
  - Non-rec season

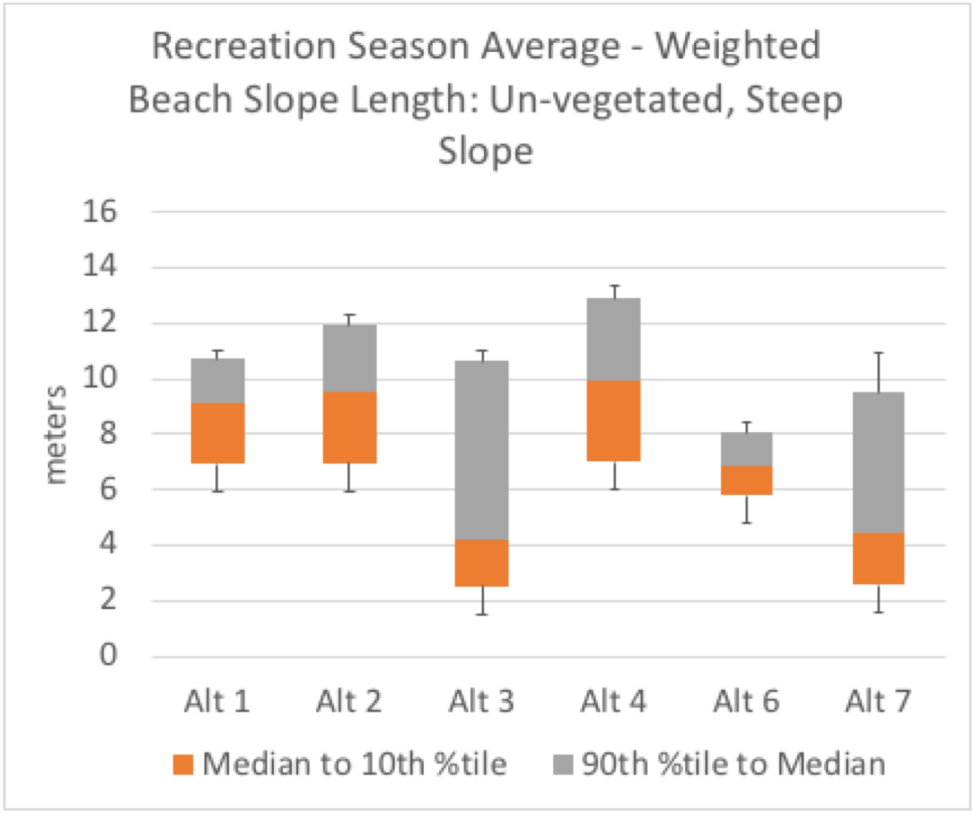




Draft Performance Measures

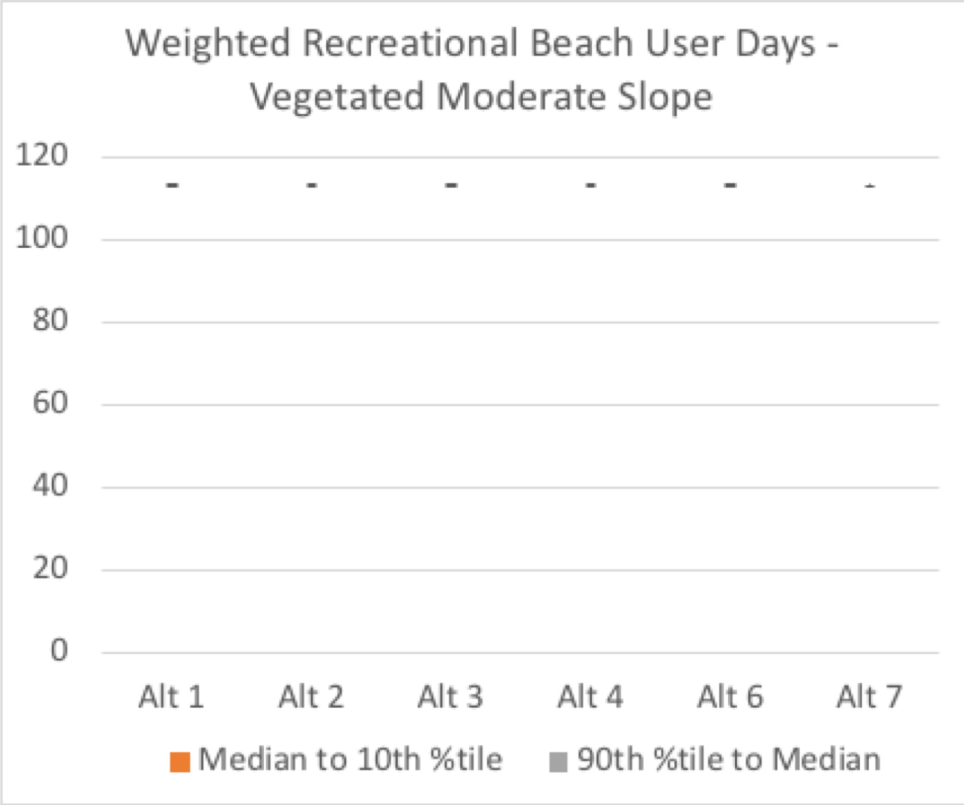
Recreational Beach Use - Lake

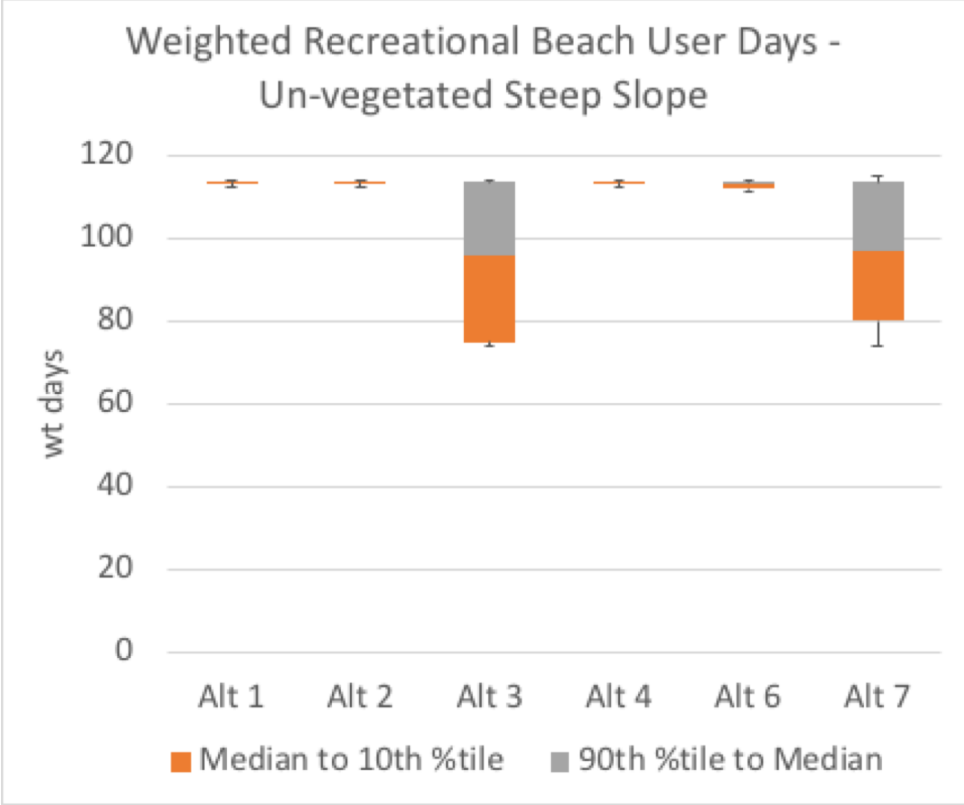




Draft Performance Measures

Recreational Beach Use - Lake

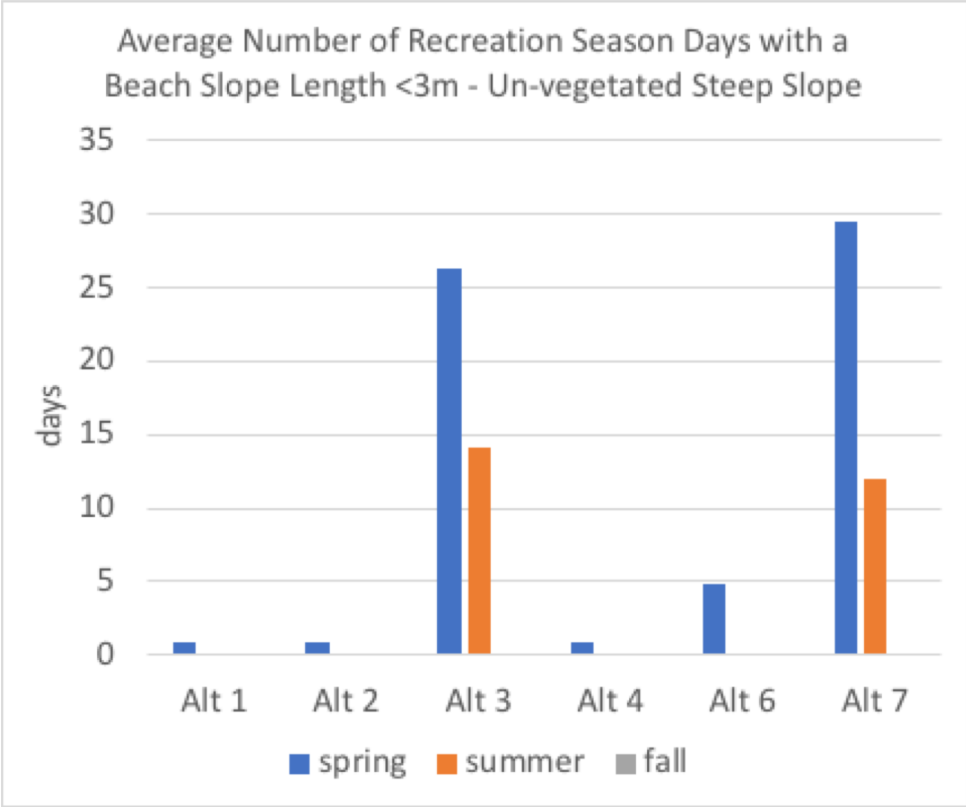


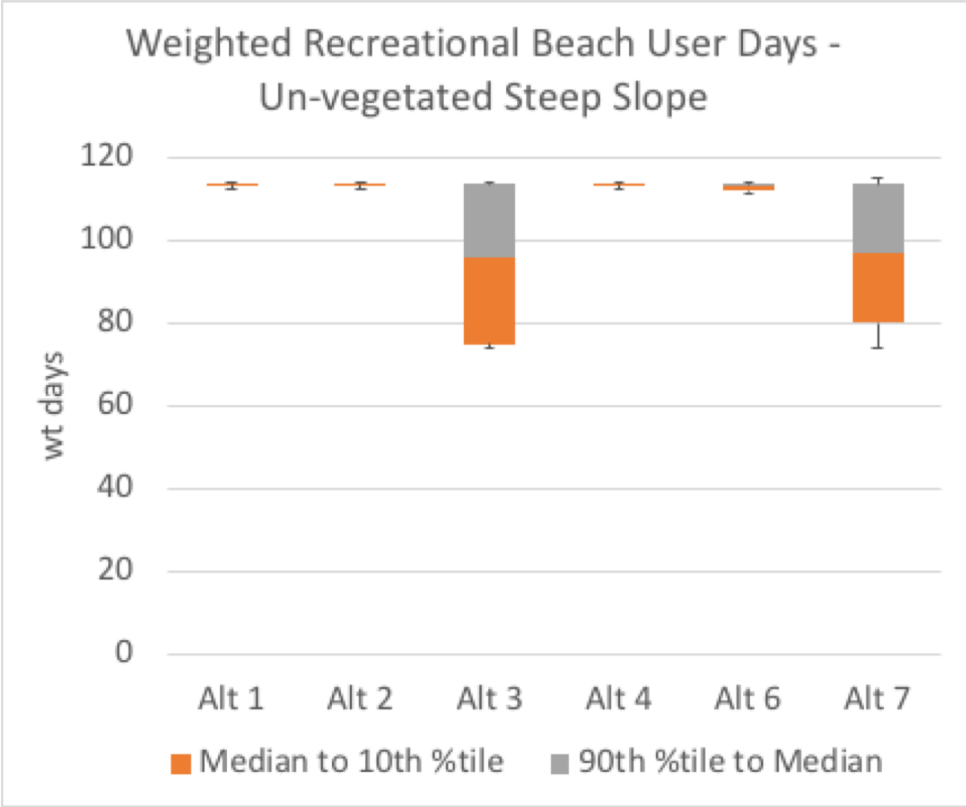


Season	U2	Days	Wt Days
Spring	0.5	44	22
Summer	1	67	24.75
Fall	0.75	33	67
Total		144	113.75

Draft Performance Measures

Recreational Beach Use - Lake





Season	U2	Days	Wt Days
Spring	0.5	44	22
Summer	1	67	24.75
Fall	0.75	33	67
Total		144	113.75

Draft Performance Measures

Boat Access and Navigation - Lake

- Proposed approach and PM in development incorporating input from LTSG
- Assess water depth against minimum boat draft and depth of water for diving
- Captures other issues including boat launches, swimming infrastructure, and shallow areas

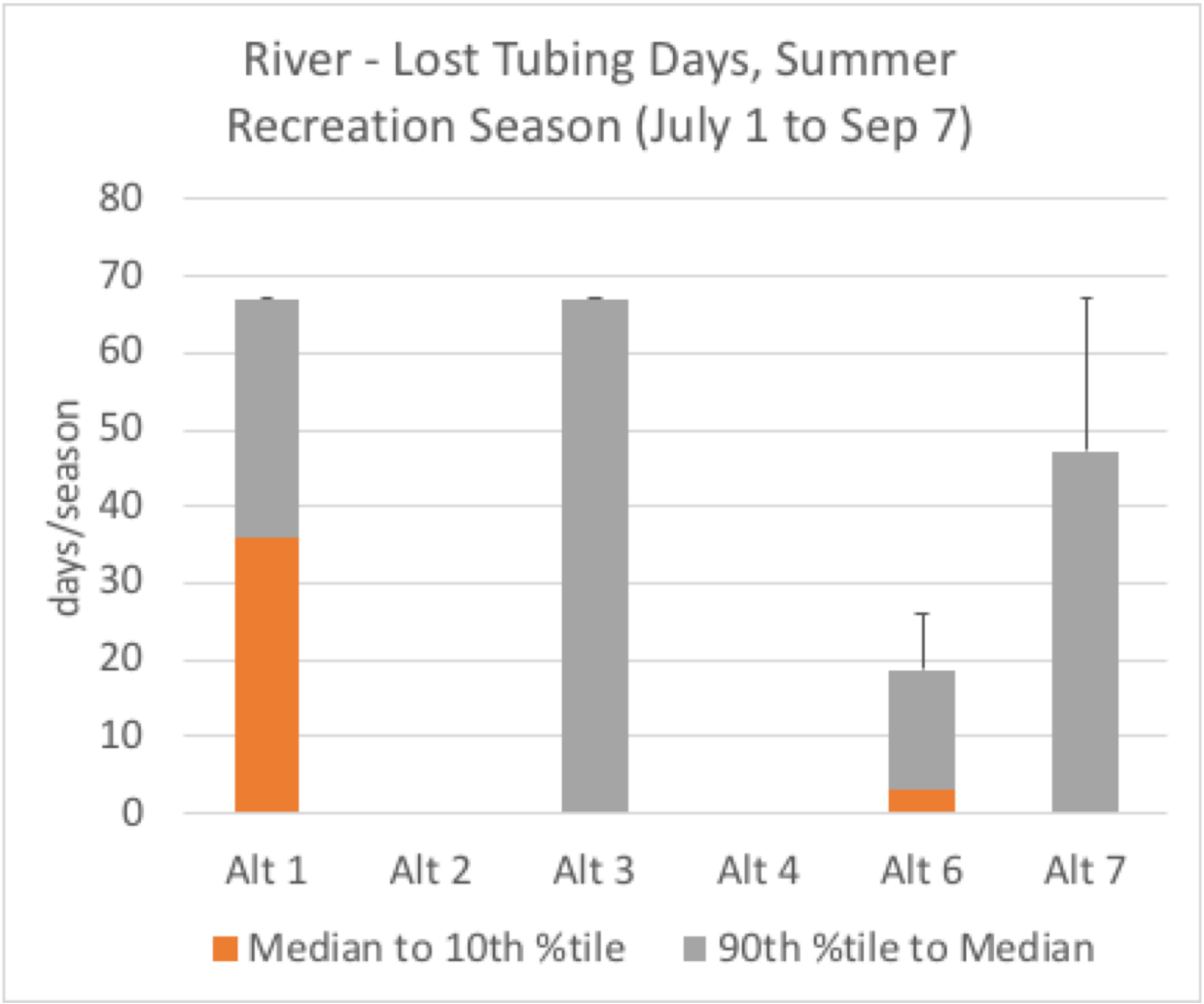
Draft Performance Measures

Boating and Tubing - River

- **PM: Decrease in tubing days**
  - Reports the number of days river flows are less than **5cms** and impact experience of tubing activities during the peak summer period (July 1 to Sept 7)
- **PM: Decrease in boating days**
  - Still in development
  - Reports the number of days river flows are less than **7cms** and impact experience of boating activities during the year

Draft Performance Measures

Boating and Tubing - River



Draft Performance Measures

Water Management

- **PMs: Capital and Operational Costs**
- Cost estimates:
  - 2015 CVRD Cowichan Lake Storage Options Review
  - Catalyst estimates for raising the weir 1m and to mobilize and operate temporary pumps

PM	Units	Dir.	Alt1_SQ	Alt2_P5	Alt3_W1	Alt4_P7	Alt6_MRC2	Alt7_W1M
Capital costs	M$	↓	0	0	20	6	0	20
Operational costs (over 10yrs)	M$	↓	0	4.5	0	0.1	0	0

Preliminary Consequence Table

Objective	Performance Measure	Units	Dir	Alt 1	Alt 2	Alt 3	Alt 4	Alt 6	Alt 7
Culture and Heritage									
FSC Harvesting	PM		H						
Traditional Knowledge	PM		H						
Ceremonial Bathing	PM		H						
Environment - River									
Fish Passage	Coho Salmon Smolt Outmigration (10th %tile)		H	0.293	0.293	0.468	0.293	0.453	-
	Adult Coho Salmon Migration (10th %tile)		H	0.000	0.000	0.000	0.472	0.000	-
Geomorphology	PM								
Lateral Connectivity	PM								
Rearing	Coho Salmon Emergent Fry Habitat (10th %tile)		H	0.390	0.391	0.391	0.391	0.391	-
	Coho Salmon Rearing Fry Habitat (10th %tile)		H	0.000	0.000	0.000	0.500	0.000	-
Spawning	PM								
Wildlife and Riparian	PM								
Environment - Lake									
Water Quality	PM		H						
Vancouver Lamprey (Lake)	PM		H						
Littoral Habitat	PM		H						
Wildlife and Riparian	PM								
Industry and Commercial									
Catalyst Paper	Impacted operations days	days/yr	L	74	0	0	0	23	0
Agriculture	PM								
Commercial Fisheries	PM								
Lakefront Properties and Flooding									
Flooding and innundation*	High water days during Control Period - Mar 1 (90th %tile)	days	L	0	0	1.6	0	-	1.6
	High water events per year (90th %tile)	events	L	2	2	2	2	-	2
Private Property Lakefront Areas	Frontage slope length - Un-veg/Steep Slope	m	H	6.2	6.5	3.5	6.7	5.1	3.4
	Frontage slope length - Veg/Moderate Slope	m	H	17.7	18.2	15.1	18.6	16.9	14.1
Docks and Wharves	PM			0.0	0.0	0.0	0.0	0.0	0.0
Private Water Pump Intakes	PM			0.0	0.0	0.0	0.0	0.0	0.0
Municipal									
Community Water Supply	Intake pumping capacity – Town of Lake Cowichan	days/yr	L	45.5	59.5	0	69	0	0
	Intake invert elevation - Town of Lake Cowichan	days/yr	L	0	17	0	30	0	0
Waste Water Dilution	Effluent dilution ratio (200:1) – Upper River	days/yr	L	72.0	0.0	0.0	0.0	13.5	0.0
	Effluent dilution ratio (200:1) – Lower River	days/yr	L	58	0	0	0	0	0
Recreation and Tourism									
Beach Use Areas - Lake	Beach slope length - Un-veg/Steep Slope	m	H	9.1	9.6	4.2	9.9	6.8	4.4
	Beach user days (BSL >3m) - Un-veg/Steep Slope	wt days	H	114	114	96	114	113	97
	Beach slope length - Veg/Moderate Slope	m	H	20.4	20.8	15.6	21.2	18.1	15.8
	Beach user days (BSL >3m) - Veg/Moderate Slope	wt days	H	114	114	114	114	114	114
Boat Access and Navigation - Lake	PM								
Boating and Tubing - River	Decrease in summer tubing days	days	L	36	0	0	0	3	0
Angling and Fishing	PM								
Water Management									
Capital Costs	Capital costs	M$	L	0	0.0	20	6	0	20
Operational Costs	Operational costs	M$	L	0.0	4.5	0.0	0.1	0.0	0.0

New Water Use Alternatives

Round 2

Water Use Alternatives

Developing

Purpose:

- Identify parameters and ideas towards improved alternatives
- Want clear direction from PAG members on elements of new alternatives that should be explored
- Idea is that these alternatives will be modelled and explored in detail at the March PAG Meeting
- Goal is to identify maybe 3 or 4 new hybrid alternatives

Alternative Description:

(describe alternative / what is the intent or theme)

Infrastructure Features

Weir Modifications (if any):	**Pumps (if any): capacity / triggers**
•	•
•	•
•	•

Operational Parameters (Rule Curve Changes)

River Flow Targets (Hard or Soft)	**Timing**
[Target 1]	[Timing Target 1]
[Target 2]	

Lake Level Targets	**Timing**
[Target A]	
[Target B]	

Other Features?

-
-

Water Use Alternatives

Break – Out Activity

Break into 3 or 4 Groups

- Work together as a team to develop one or more creative (hybrid) alternatives to meet the multiple objectives that are trying to be achieved
- Start with a sentence that states the intent of the Alternative in general terms and what it consists of
- Describe any infrastructure components of the alternative
- Describe the desired operations / targets (start with defining the approx. control period)
- 45mins

Water Use Alternatives

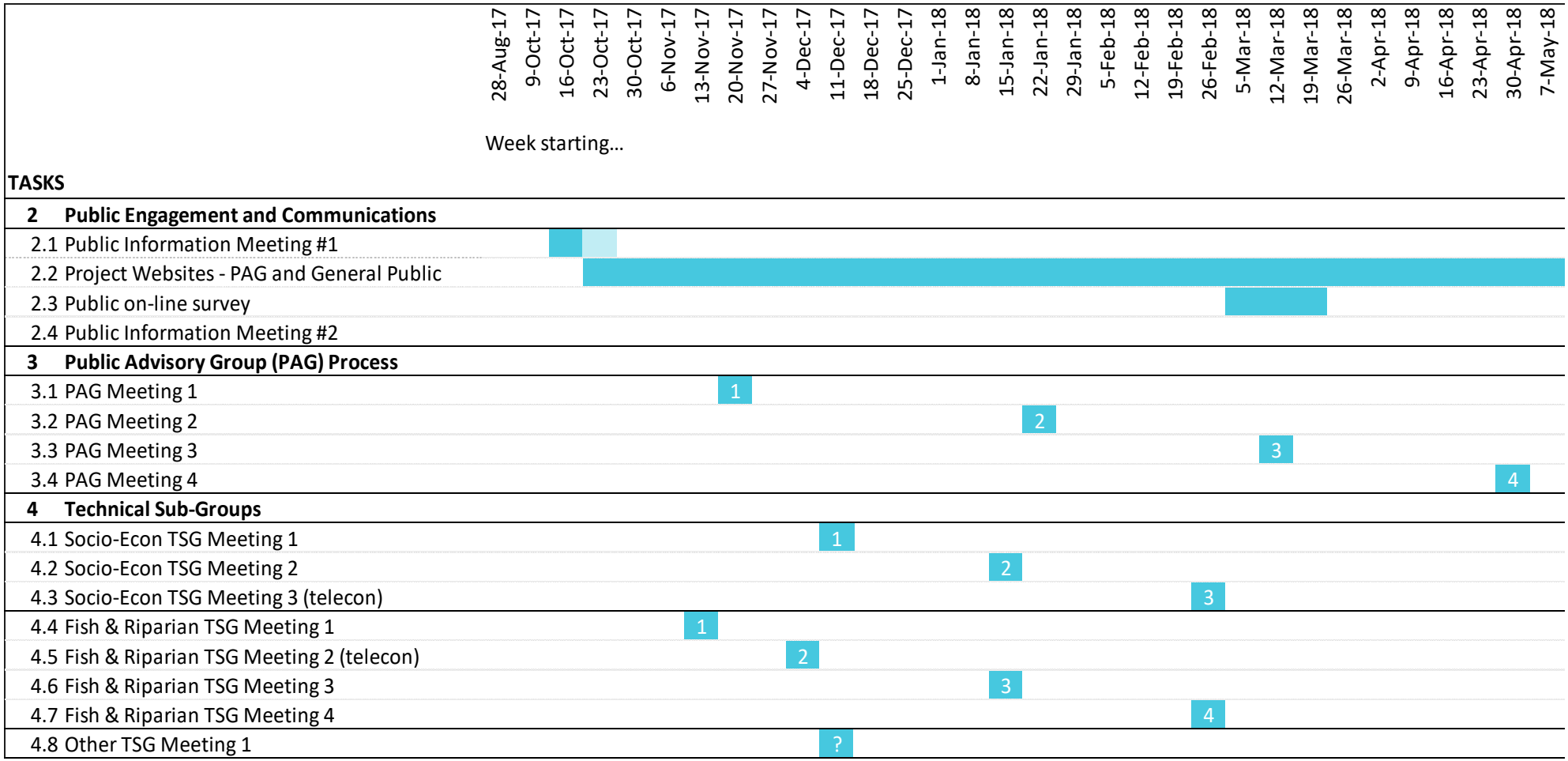
Break – Out Activity

Group 1	Group 2	Group 3
Kate	Aaron	Cheri
Graham	Greg	Dale
Shaun / Clay	Michelle M	Larry
Paul	Carol	Jaro
Joe	Nagi	Tom
Michelle G	Leroy	Sierra
Pam	Daryl	
Jen	Craig	Todd / Jonathan

Next Steps

Tentative Schedule

TASK SCHEDULE



Upcoming Meetings

PAG Meetings

- PAG Meeting 3 – March 8
- PAG Meeting 4 – May 8

Aquatic & Riparian Technical SubGroup

- ARTSG Meeting 4 – ?

Lakefront Technical Sub-Group

- LFTSG 3 – ?

Next Steps

- Draft Meeting notes
- Communication in between meetings
- Access to presentation materials and other reference materials

Cowichan WUP Public Advisory Group

HOME | **PUBLIC ADVISORY GROUP MEETINGS** | AQUATIC AND RIPARIAN TECHNICAL SUB-GROUP MEETINGS | OTHER TECHNICAL SUB-GROUPS? | ADDITIONAL RESOURCES

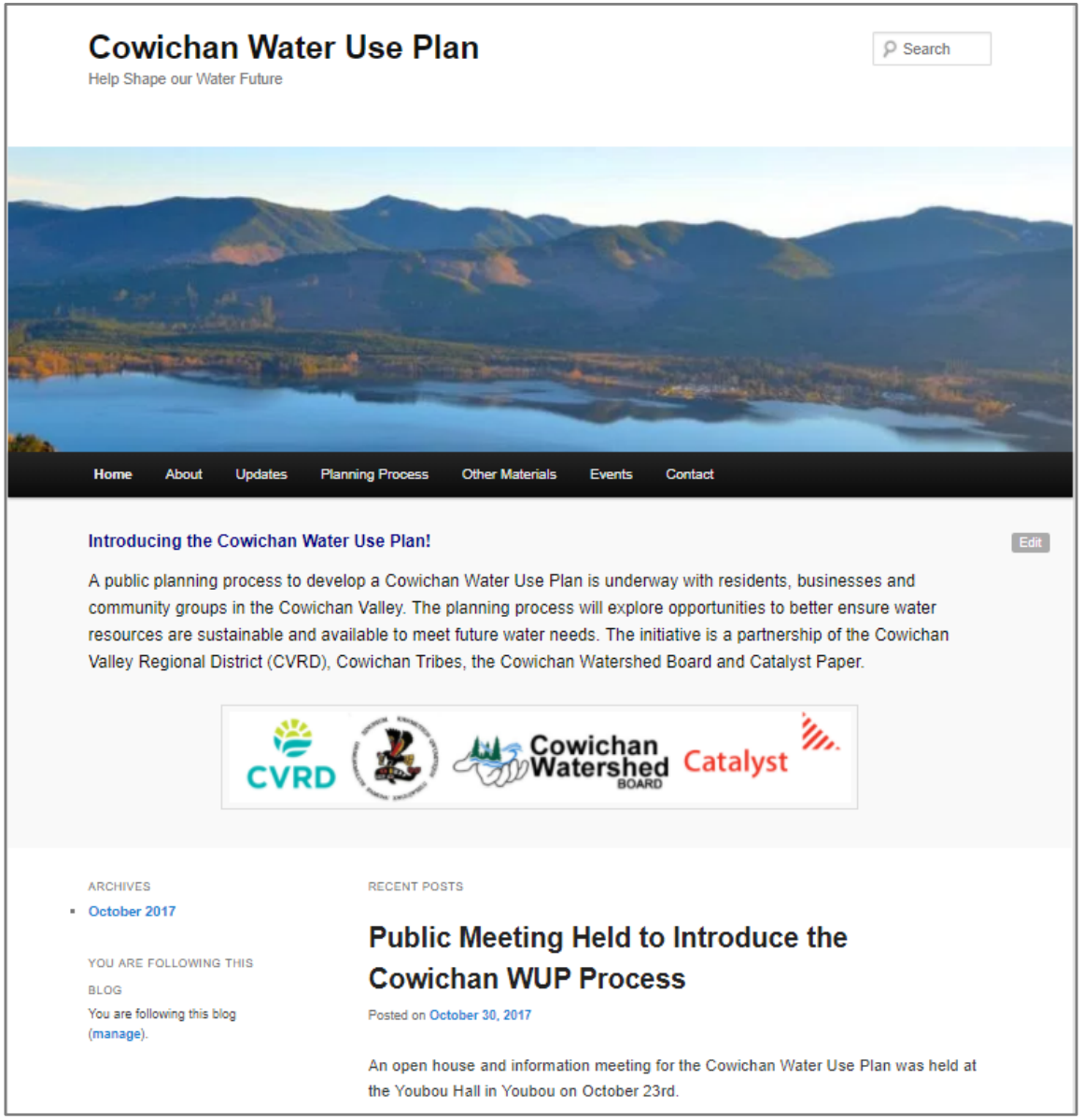
Protected: Public Advisory Group Meetings

Workshop	Pre-reading	Presentation and Handouts	Notes
PAG Meeting #1 November 22, 2017	CowichanWUP_PAG_Mtg1_22Nov2017_Agenda_v1.0_DRAFT CowichanWUP_PAG_TOR_DRAFT_v1.0 CowichanWUP_Process_Guidelines_DRAFT_v1.0		

Next Steps

Also regular updates to the public Cowichan WUP website at:

https://cowichanwup.ca/



Thanks!

Anything else?