CWB Water Use Planning Update 26.03.18

- Review of Process
- Examples of Alternatives being evaluated
- Results of modelling
- Next Steps…
- Dialogue and Feedback

Process Update

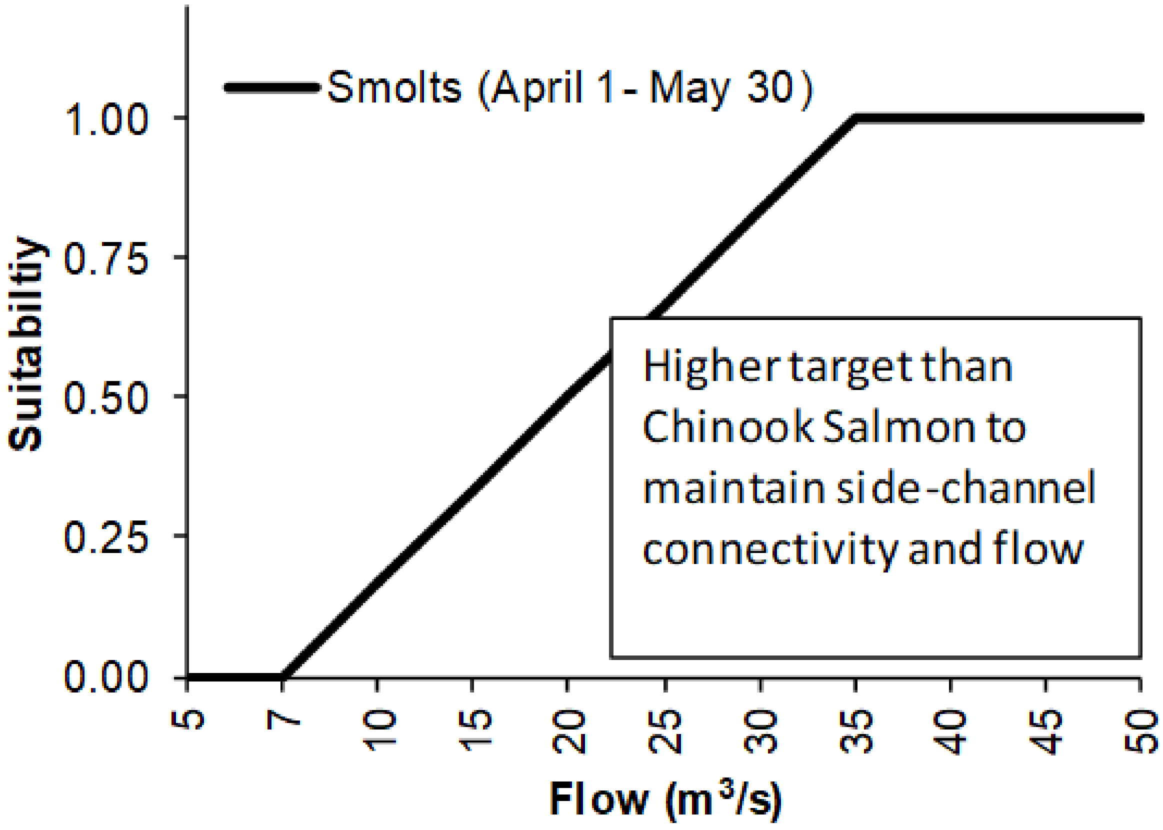
- 3 Levels of Working Groups
  - Steering Committee
    - Provides guidance and oversite to contractor
  - Technical Steering Groups
    - Develop “Performance Measures” to be evaluated for specific areas of interest eg. Aquatic and Riparian environmental values
  - Public Advisory Group
    - Representative of all interests, evaluates alternatives and makes decision on final recommendation

Process Update

- Technical Working Groups - Performance Measure Development
  - PM's developed for all areas impacted by water management
    - Culture and Heritage
    - Lake and River Environment impacts
    - Industry and Commercial
    - Lakefront Private Properties
    - Municipal
    - Recreation and Tourism

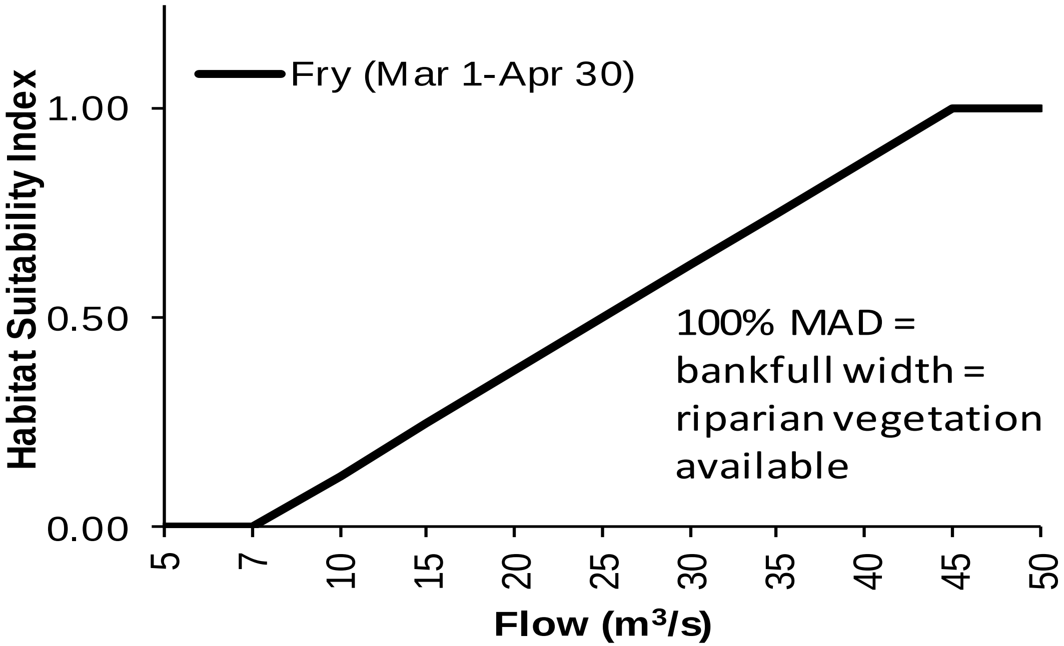
Examples of ARTSG Performance Measure Topics

- Salmon spawning
- Salmon Rearing
- Adult Migration
- Juvenile Migration
- Horizontal Connectivity
- Lateral connectivity
- Lake littoral habitat
- Cowichan Lamprey impacts



PM2: Chinook Salmon fry rearing

This PM relates to rearing habitat suitability for Chinook Salmon fry. Specifically, this PM relates to the inundation of riparian vegetation in shallow habitats, e.g., willows (Salix spp.) on gravel bars. This has been identified as important for rearing Chinook Salmon fry because submerged vegetation provides cover and food. This PM is calculated for the period March 1 to April 30 (Figure 2).



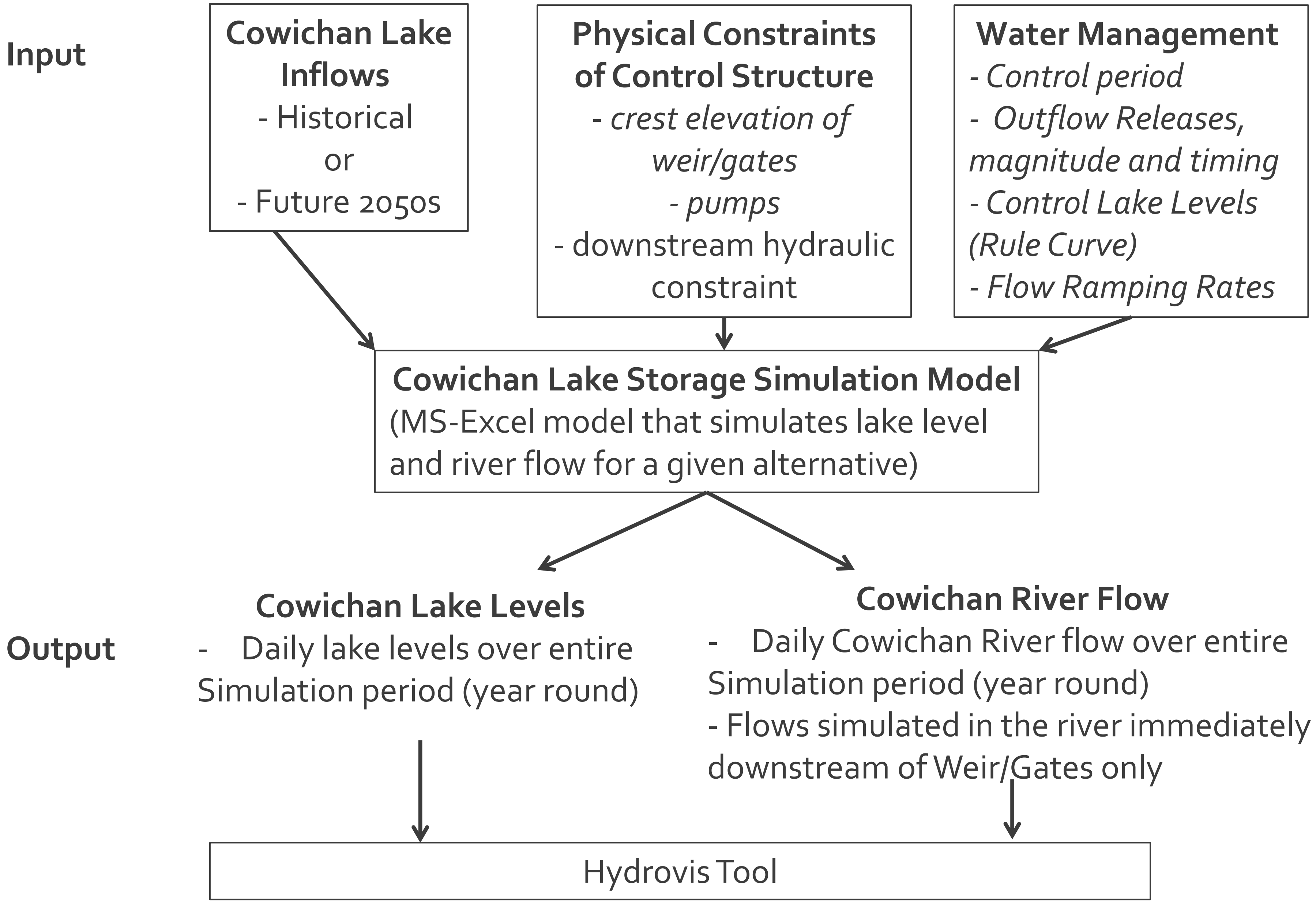
Public Advisory Group

- Development of Alternative Water Management strategies
  - Different storage and/or pumping strategies
  - Different Flow Regimes
- Hydrological modelling demonstrates relative success (or failure) of performance measures resulting from alternative water management strategies.
- Goal is to come to a consensus on the best alternative, acknowledging trade-offs….

“Bookend” Alternatives developed

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) o Reduce spring flows (25cms/15cms) to better meet 7cms target	ALT5_MRC1
Alt 6 Modified Rule Curve 2	• Current infrastructure / Modified Rule Curve (MRC) o Eliminate increased spring flows (25 & 15cms) o 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) o Start control period on March 1 (instead of April 1) o Target 25cms spring flow release starting on March 1 until April 30 o Target 15cms spring flow release is unchanged (from May 1 to June 15)	ALT7_W1M

Cowichan Lake Storage Model



CowichanWUP_PAG_Mt
file:///C:/Users/User/Documents/CWB%202018/SDM%20PAG/CowichanWUP_PAG_Mtg3_8Mar2018_PRE_READING_PACKAGE_v1.1.pdf

Objective	Performance Measure	Units	Dir	Alt 1	Alt 2	Alt 3	Alt 4	Alt 6	Alt 7	Alt 10	Alt 11	Alt 12	Alt 13
Environment													
River - Fish Passage	Adult summer-run Chinook Salmon migration (10th %tile)	HSI	H	0.09	0.09	0.09	0.09	0.00	0.09	0.09	0.09	0.09	0.10
	Adult fall-run Chinook Salmon migration (10th %tile)	HSI	H	0.00	0.00	0.26	0.26	0.00	0.26	0.00	0.26	0.26	0.26
River - Lateral Connectivity	Side channel connectivity (10th %tile)	%	H	0.90	0.90	0.90	0.90	0.89	0.90	0.90	0.87	0.84	0.84
River - Rearing	Steelhead parr (10th %tile)	HSI	H	0.71	0.77	0.80	0.80	0.75	0.80	0.80	0.80	0.80	0.80
	Chinook Slamon fry (10th %tile)	HSI	H	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.25	0.25
River - Spawning	Early Steelhead incubation (10th %tile)	HSI	H	0.52	0.52	0.52	0.52	0.50	0.52	0.50	0.50	0.00	0.16
Lake - Vancouver Lamprey	Lamprey rearing habitat (qualitative)			0									
Lake - Littoral Habitat	Productivity of littoral reasing habitat		H	0.68	0.65	0.81	0.58	0.81	0.82	0.73	0.82	0.82	0.82
Industry and Commercial													
Catalyst Paper	Impacted operations days	days/yr	L	74	0	0	0	23	0	0	0	0	0
Lakefront Properties													
Flooding and innundation	Maximum High Water Event - Mar 1 to Apr 30 (max)	meters	L	164.3	164.3	164.3	164.3	164.3	164.8	164.4	164.7	164.5	164.6
Private Property Lakefront Areas	Frontage length - un-vegetated, moderate slope	meters	H	10.7	11.1	8.6	11.3	9.9	7.9	9.6	8.2	8.1	8.5
Municipal													
Community Water Supply	Intake pumping capacity - Town of Lake Cowichan	days/yr	L	45.5	59.5	0.0	69.0	0.0	0.0	15.5	0.0	0.0	0.0
	Intake invert elevation - Town of Lake Cowichan	days/yr	L	0.0	16.5	0.0	30.0	0.0	0.0	0.0	0.0	0.0	0.0
Waste Water Dilution	Effluent dilution ratio objectives (200:1) – Upper River	days/yr	L	72.0	0.0	0.0	0.0	13.5	0.0	0.0	0.0	0.0	0.0
	Effluent dilution ratio guidelines (40:1) – Lower River	days/yr	L	58.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Recreation and Tourism													
Beach Use Areas - Lake	Beach user days - un-vegetated, steep slope	wt days	H	113.8	113.8	95.9	113.8	113.4	96.9	110.3	96.2	83.8	95.5
Boat Access and Navigation - Lake	Decrease in dock use days	days	L	113.0	113.0	38.0	113.0	72.5	40.5	71.0	37.5	15.5	36.5
Boating and Tubing - River	Decrease in summer tubing days	days	L	36	0	0	0	3	0	0	0	0	0
	Decrease in river boating days	days	L	44.5	45.5	0	0	7	0	12	0	0	0
Water Management													
Capital Costs	Capital costs	M$	L	0	0	20	6	0	20	20	26	20	26
Operational Costs	Operational costs	M$	L	89.0	90.5	2.0	0.0	47.5	5.5	38.0	0.0	0.0	0.0

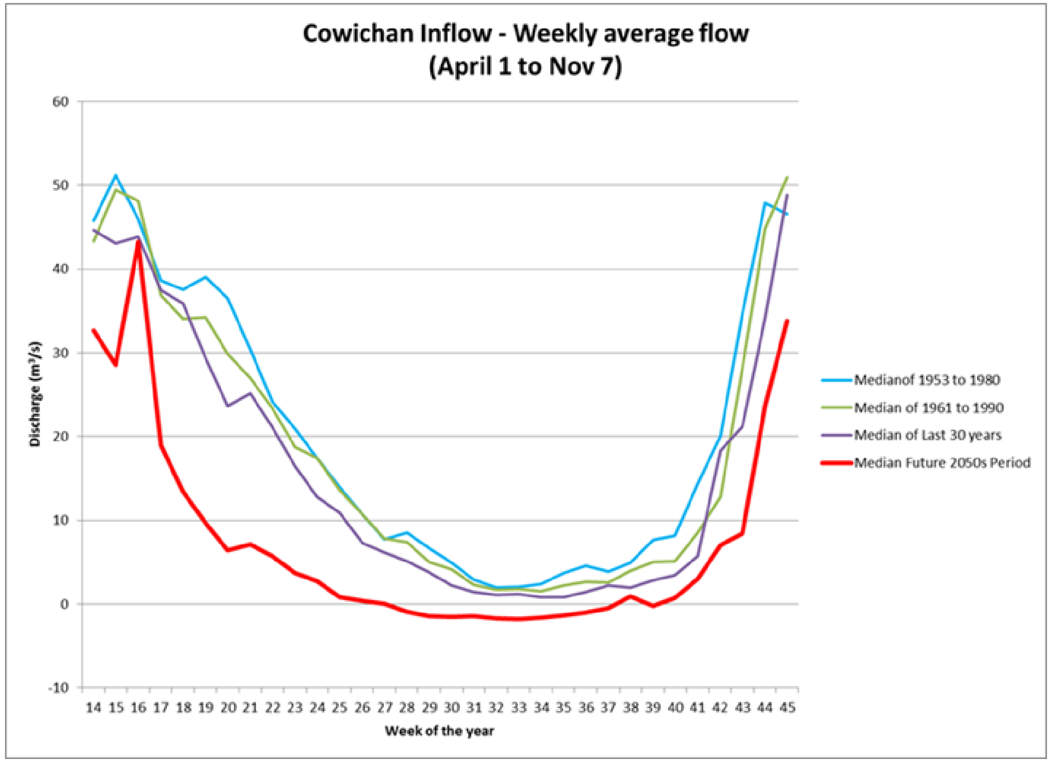
4:10 PM
2018-03-23

Bookend Alternatives

Hydrological Modeling

A couple of points to highlight

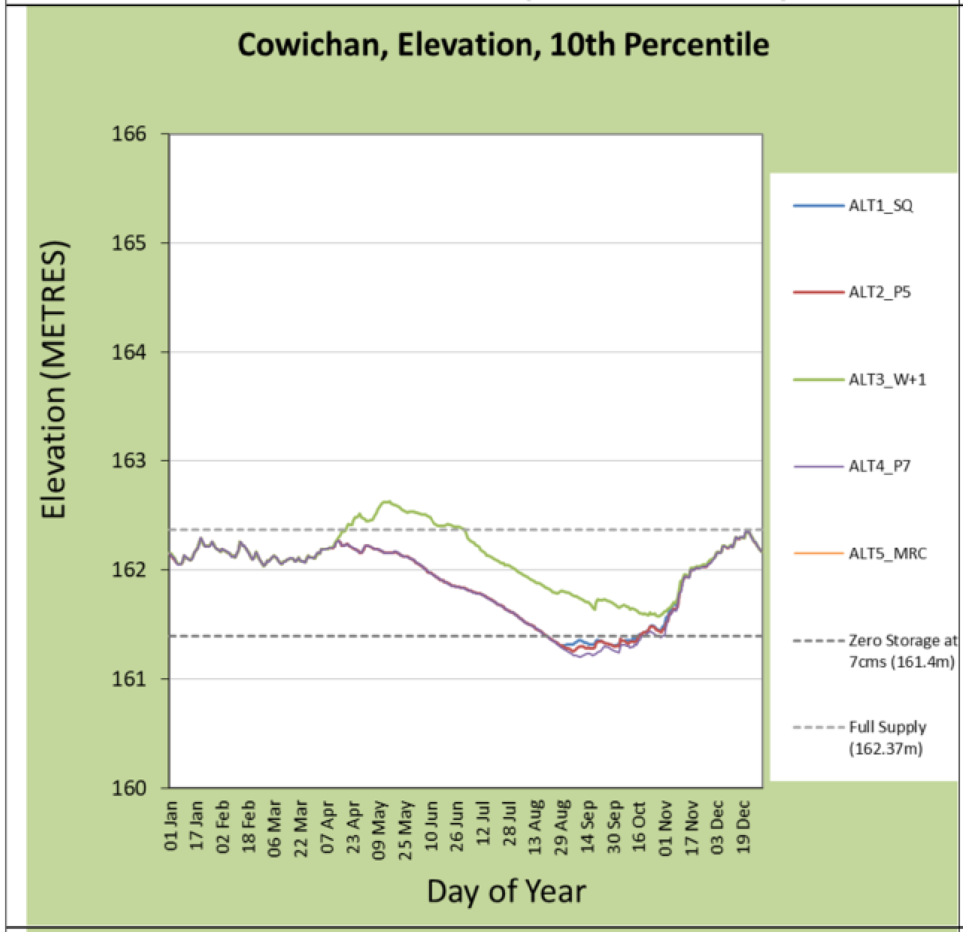
- Datasets matter
  - Historical inflow dataset (1953 to 2016)
  - Simulated future 10-yr dataset based on climate change projections (in the 2050s)



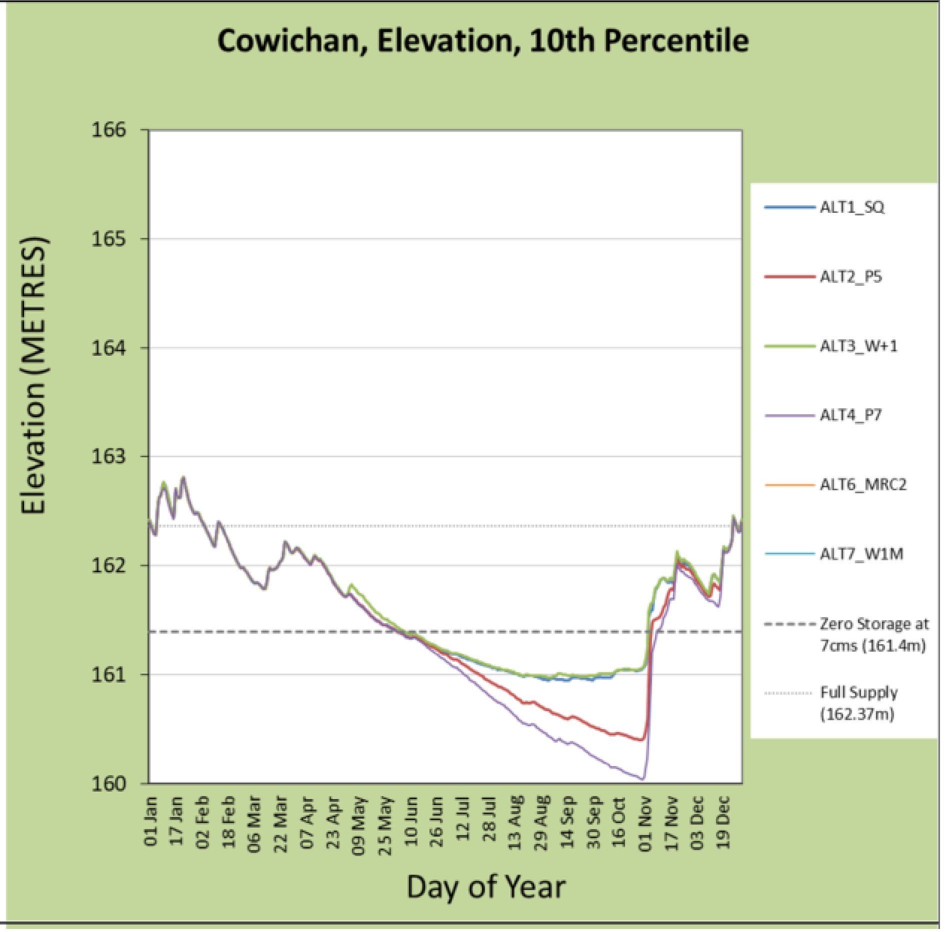
Bookend Alternatives

Comparison of Historical vs Future Water Conditions

Historical Dataset (1953 to 2016)



Simulated Future Dataset (2050s)

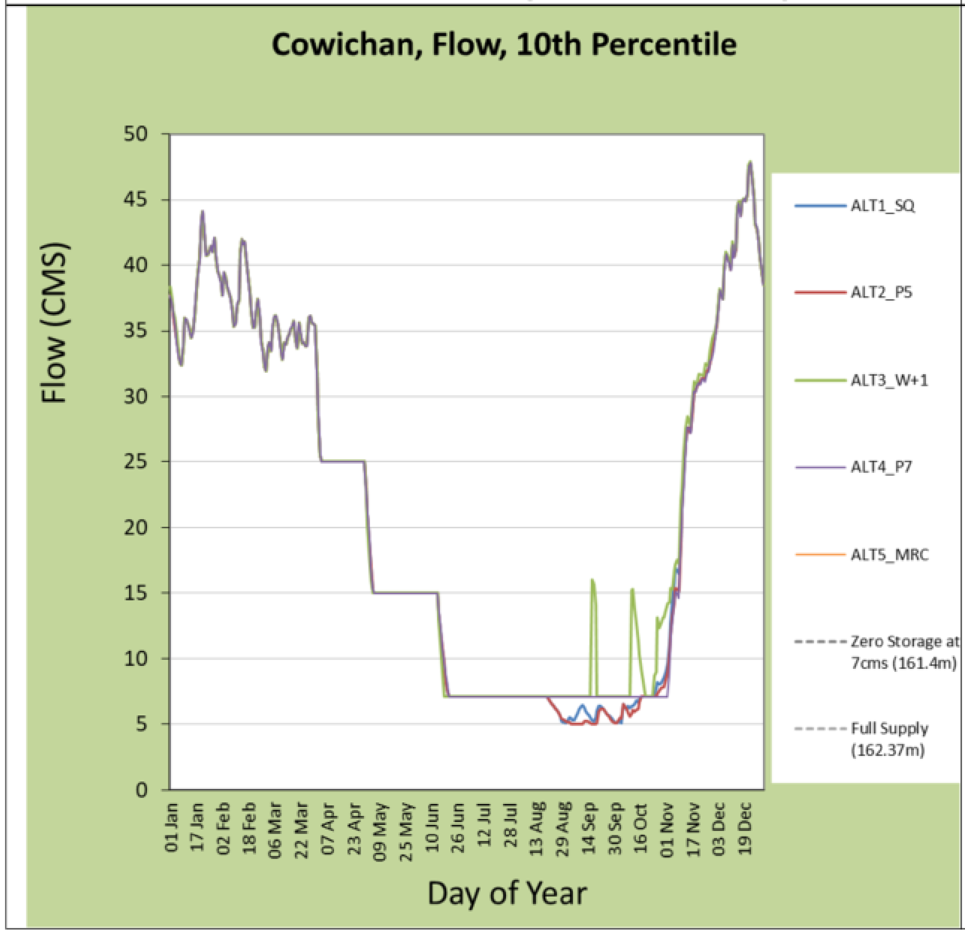


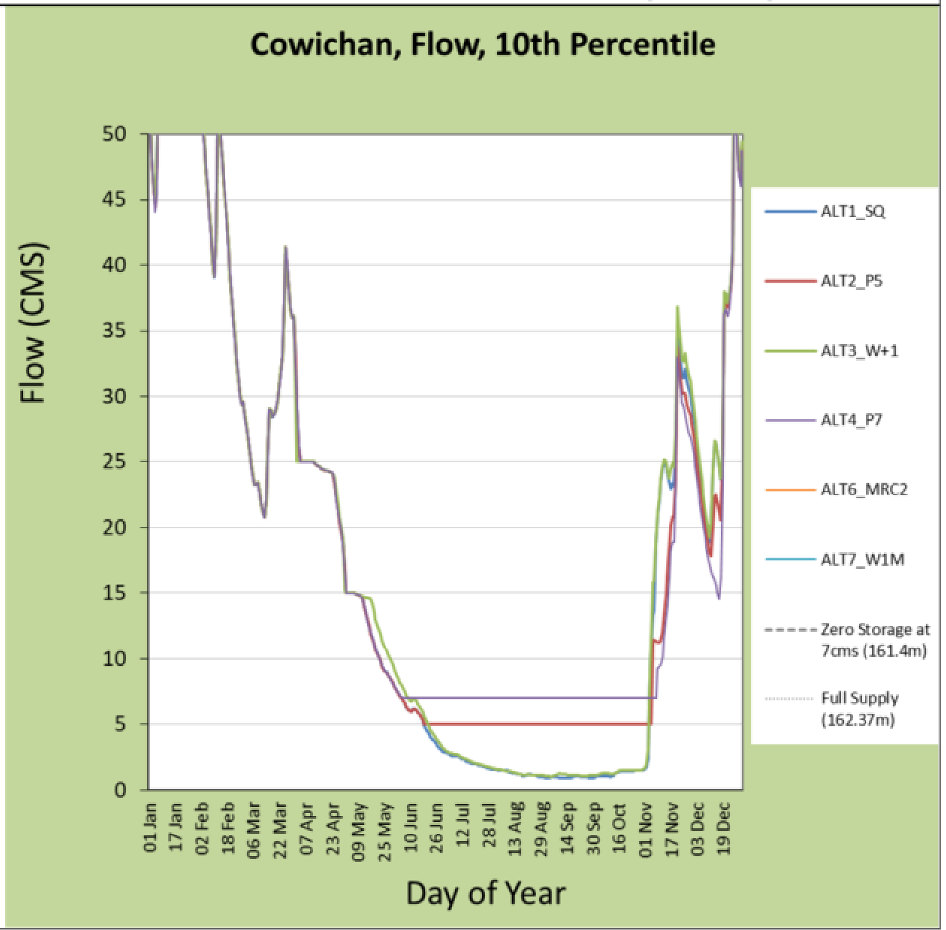
Note. While an increase in the weir height of 1m (Alt 3) would have dealt with past summer droughts, in the future this won't be the case.

Bookend Alternatives

Comparison of Historical vs Future Water Conditions

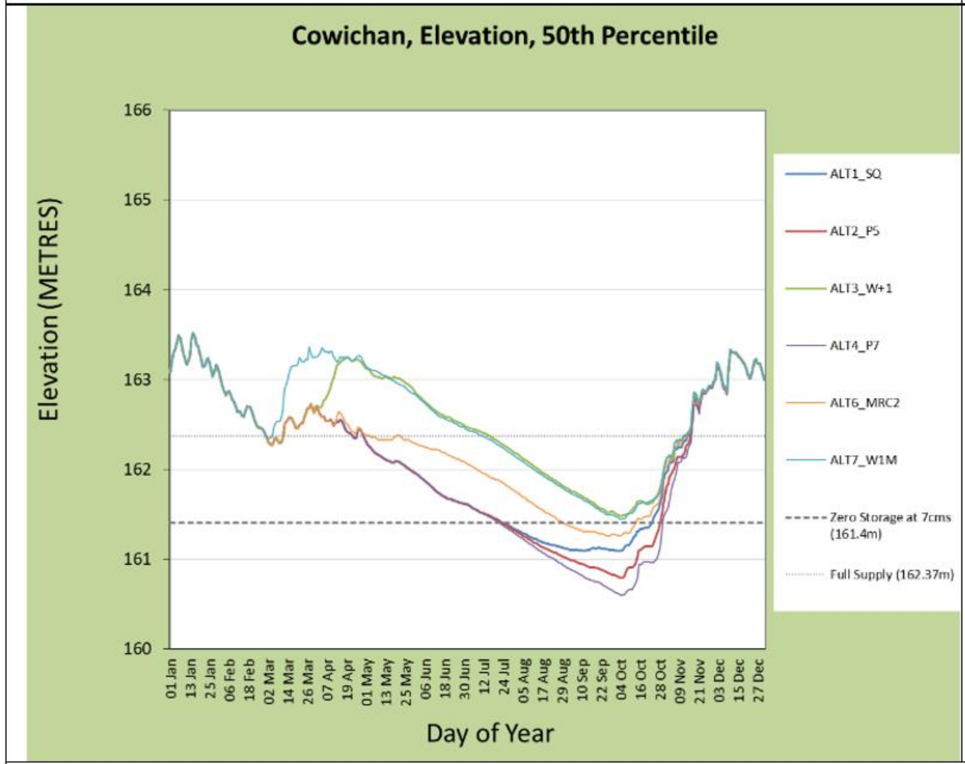
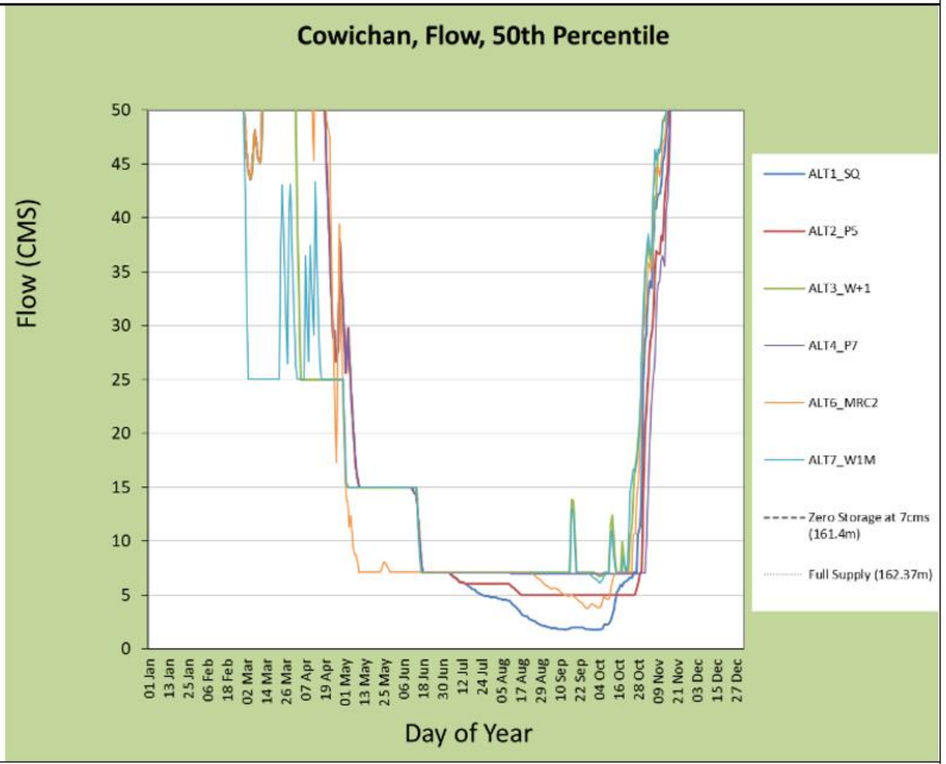
Historical Dataset (1953 to 2016)	Simulated Future Dataset (2050s)



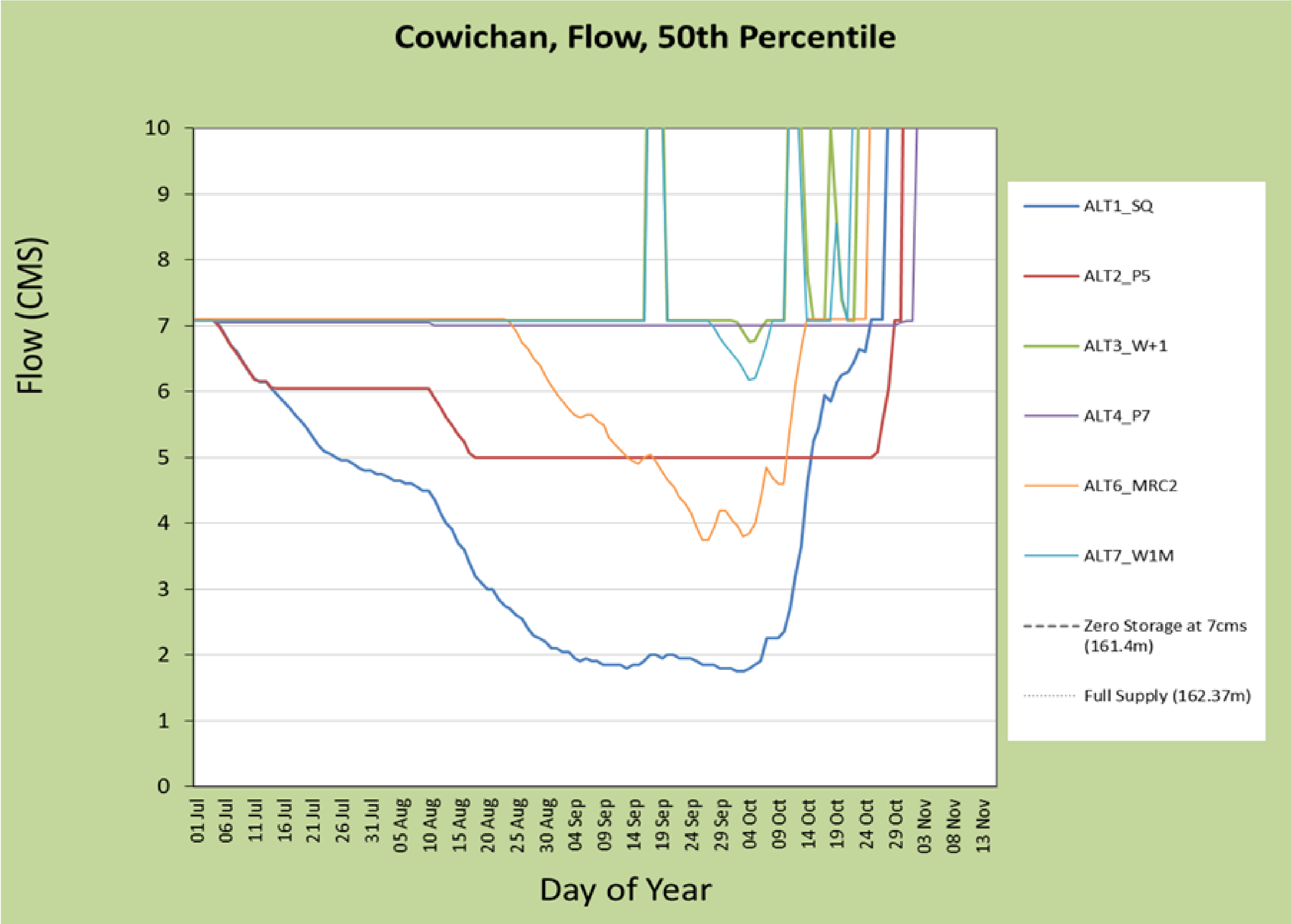


Bookend Alternatives

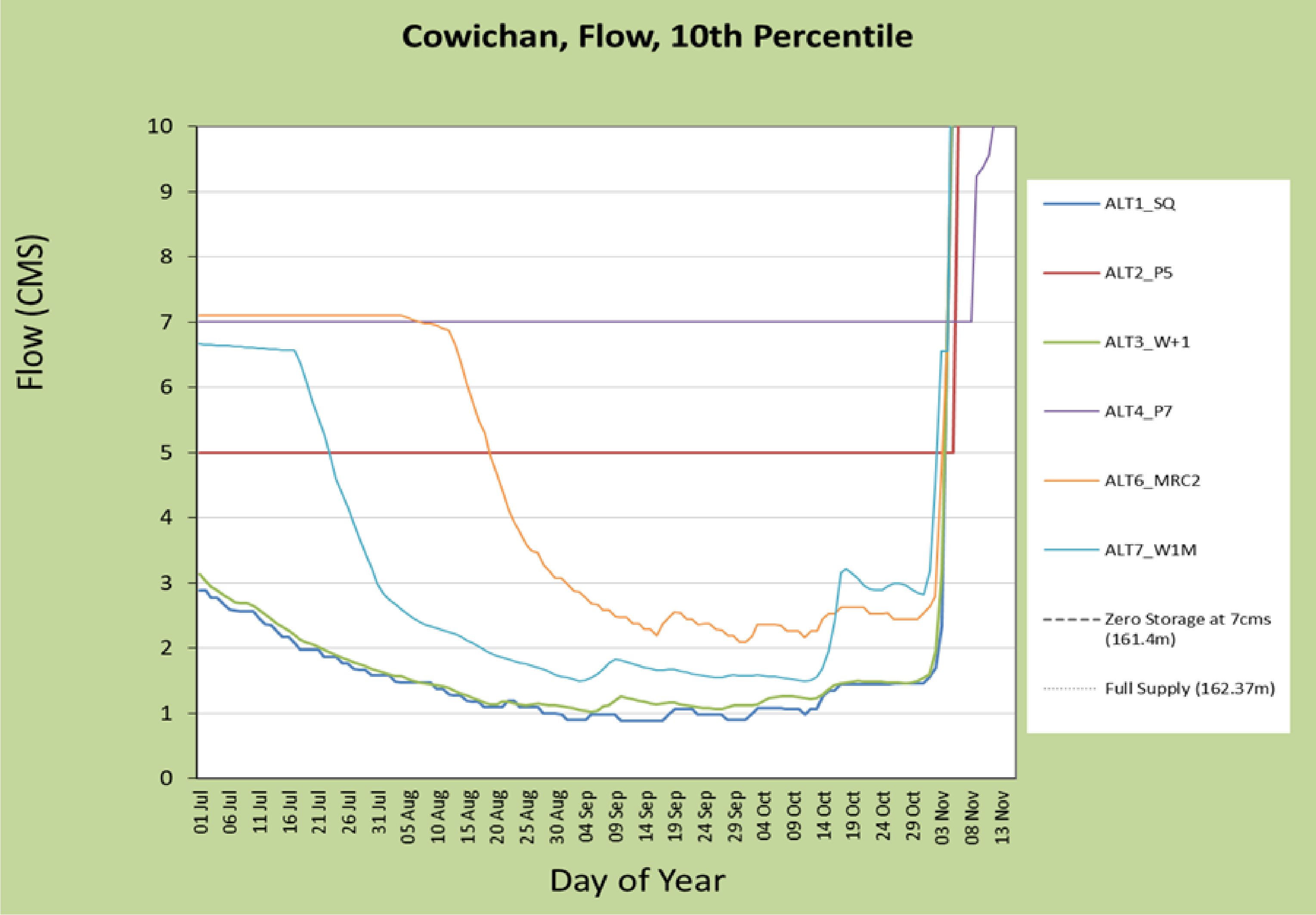
Future Simulated 2050s Dataset

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 not store enough water 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.

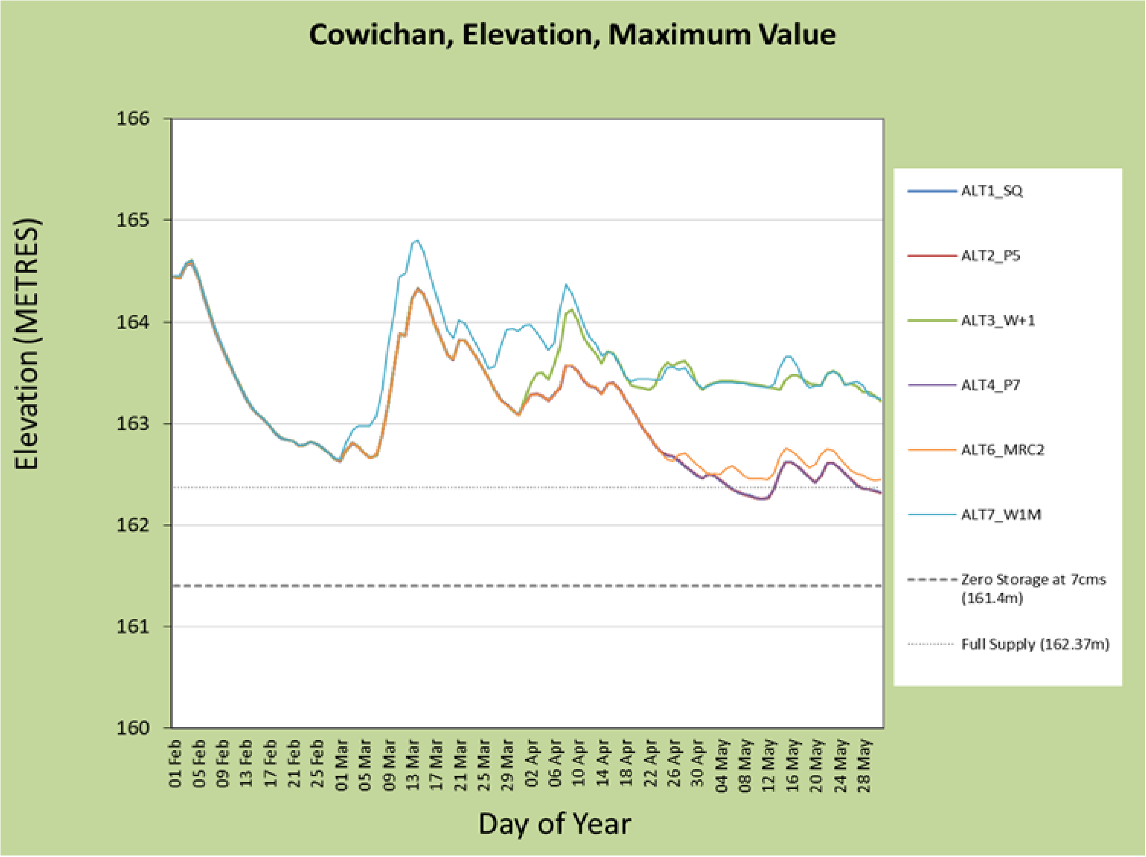
Bookend Alternatives

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).



Cowichan WUP

Round 2 Alternatives

Alternative Name	Description	Short Name

Alt 10 - Weir Ht +0.5m, 5cms Pumps	• Increased weir height +0.5m
	• Control Period: February 1 at existing weir height (162.4m), March 1 at full weir height (162.9m)
	• Target flows:
	  o 7cms throughout control period
	  o 25cms from April 1 to June 15
	  o 15cms from May 1 to June 15
	• Pumping capacity = up to 5cms when needed
		ALT10_W0.5P5

Alt 11 - Weir Ht +1m, Fish Optimized Flows	• Increased weir height +1m
	• Control Period: February 1 at half weir height (162.9m), March 1 at full weir height (163.4m)
	• Target flows – hard targets (every year):
	  o 7cms throughout control period
	  o 25cms from Feb 1 to March 31
	  o 15cms from April 1 to May 15
	• Target flows – soft targets (wet years with sufficient inflow – lake level within 30cm full storage):
	  o 25cms from Feb 1 to May 15
	• Pumping capacity = up to 7 cms when needed
		ALT11_W1P7F

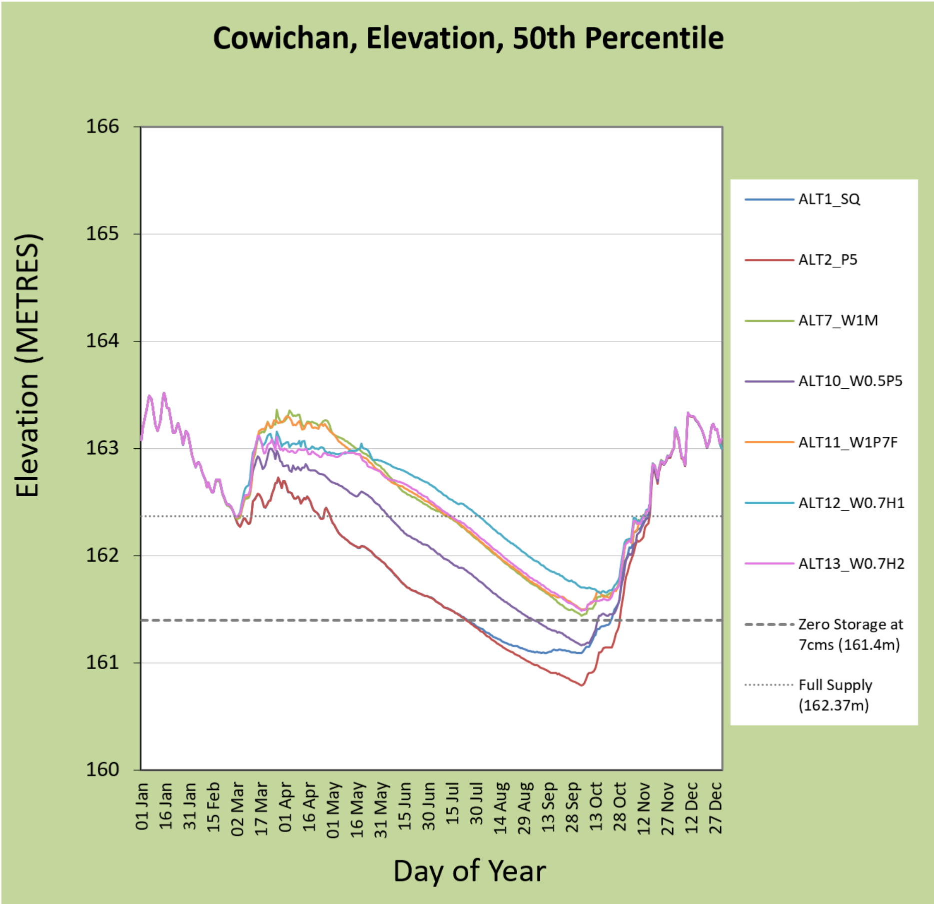
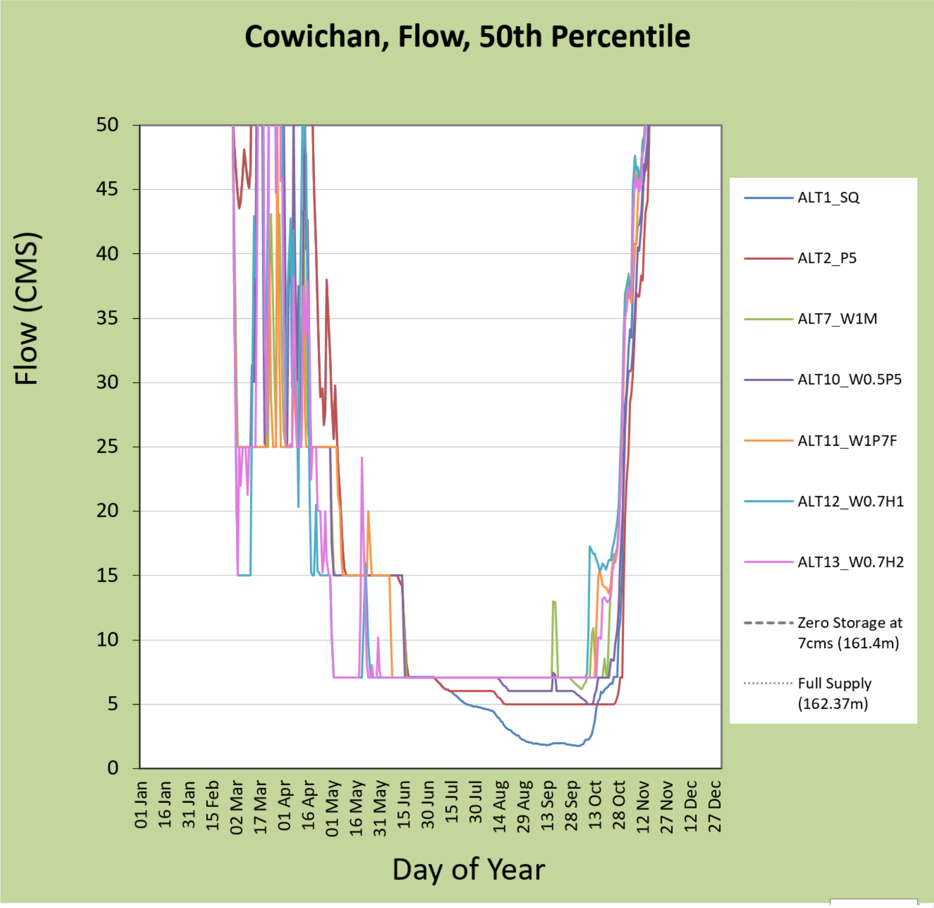
Alt 12 - Weir Ht +0.7m, Hydrology Optimized Flows	• Increased weir height +0.7m
	• Control Period: February 1 at existing weir height (162.4m), March 1 at full weir height (163.1m)
	• Target flows:
	  o 7cms throughout control period
	  o 15cms February 1 to April 30
	• No pumps
		ALT12_W0.7H1

Alt 13 - Increased Weir Ht +0.7m, Hydrology Optimized Flows	• Increased weir height +0.7m
	• Control Period: Feb 1 at existing weir height (162.4m), March 1 at full weir height (163.1m)
	• Target flows - hard targets (dry years – meet 9 out of 10 years):
	  o 7cms throughout control period
	  o 15cms from Feb 1 to April 30
	• Target flows - soft targets (wetter years – meet for above average years):
	  o 25cms from Feb 1 to April 30
	• Pumping capacity = up to 7cms as required
		ALT13_W0.7H2

Note: all Round 2 Alternatives results are preliminary

Round 2 Alternatives

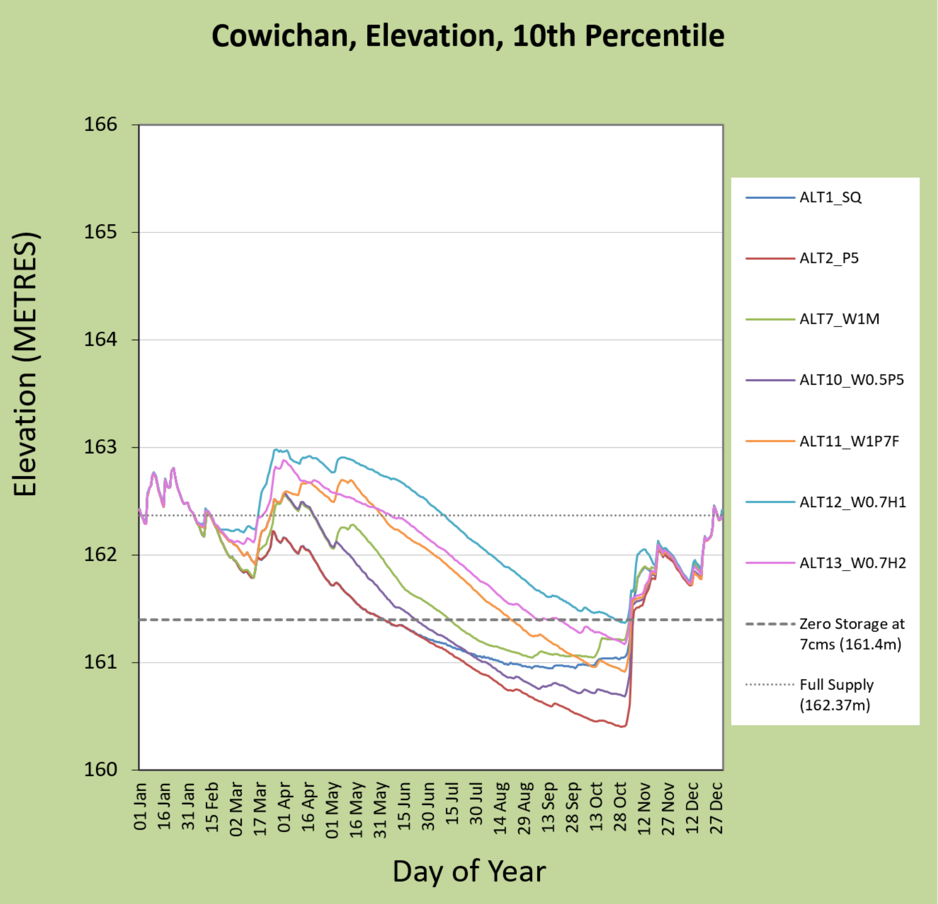
Future Simulated 2050s Dataset

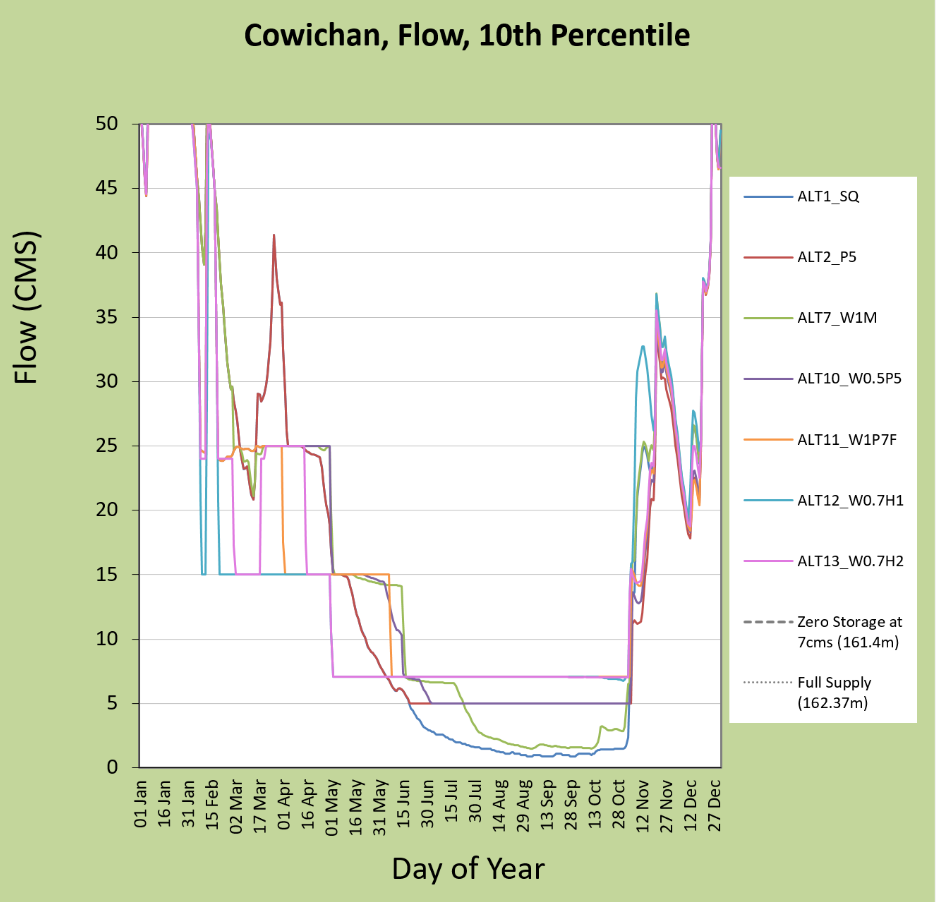
LAKE LEVELS	RIVER FLOWS
	

Round 2 Alternatives

Future Simulated 2050s Dataset

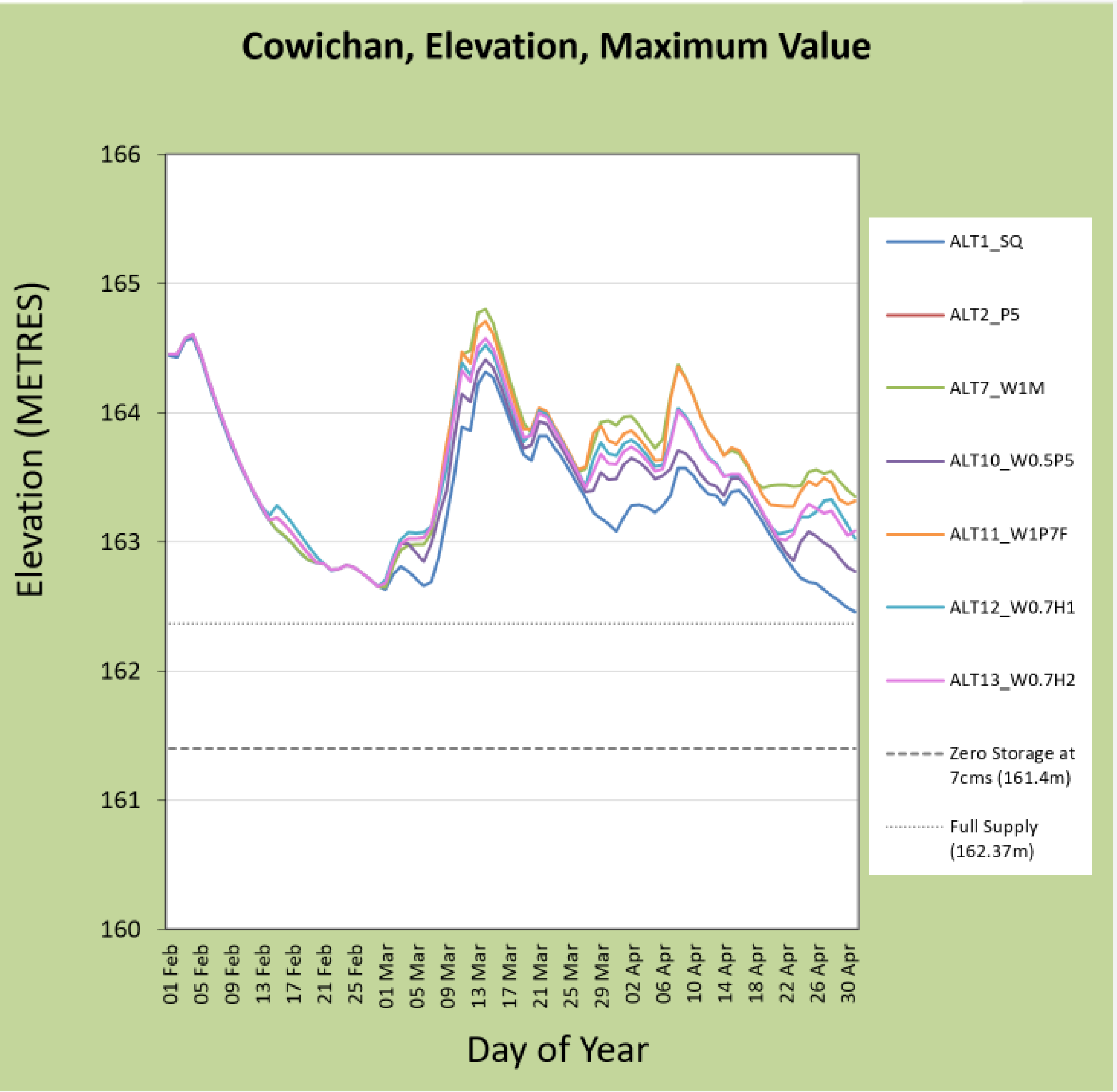
LAKE LEVELS	RIVER FLOWS





Round 2 Alternatives

Future Simulated 2050s Dataset



Bottom Line

- Even with 1M additional storage – and beginning to store water much earlier – creating flooding risk – within 30 years we will still be facing decisions about whether to use negative storage (draw lake down) or reduce flows below "minimum" fisheries flows on dry years…..
- Possible objectives for optimizing outcomes
  - Increase weir ht. by 1m and go on control earlier
  - Manage in season so as to optimize flows without raising lake level while on control above 164 (mean winter high water)
  - Have capacity to utilize negative storage to no more that 15 cm drawdown (would provide 2 weeks of 7CMS flow in drought years…..)
- Questions, Comments or Suggestions???