Appendix 1 - to submission by A. Bolch, A. Pollitt, C. Heislers, D. Wingfield, J. Gemmill, J. Wright, N. Rankine and R. Thorrowgood.

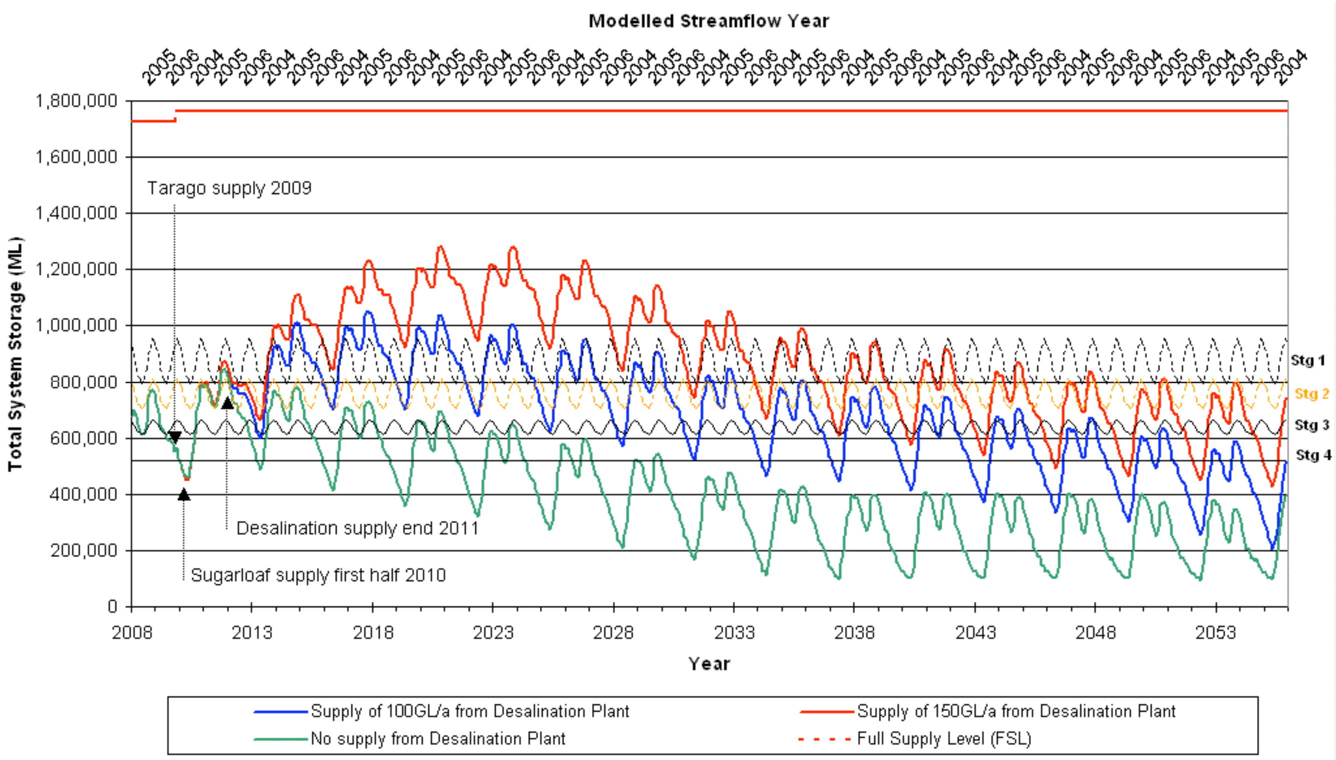
Level of Augmentation required for Greater Melbourne's water supply:

We believes that it is important to consider the level of augmentation that is actually required for Greater Melbourne to achieve realistic and sustainable water in to the future. We have modelled the governments preferred augmentation options and derived the following results from two climate scenarios.

Augmentation required after Tarago and sugarloaf augmentations to achieve 15 - 20 years before falling in to restrictions again			
10 year low inflow scenario with further reductions	60 Gigalitres	to	90 Gigalitres
3 year low inflow scenario with further reductions	115 Gigalitres	to	140 Gigalitres

Table 1.

The government proposes that the next augmentation should be desalination at a scale of 150 gigalitres, on stream by the end of 2011. Our modeling (Fig 1) gives similar results to the Government's 3 year scenario presented in the EES as justification for the decision to adopt desalination, reproduced here:



The two main contentions are that we have to look at the possibility of the 2004 to 2006 low inflow continuing and that we don't want storage levels dropping to a level requiring restrictions to be triggered. Our 3 year scenario uses this level of inflow and a further reduction at the rate of 11% per 20 year period. We have considered a period of 15 to 20 years in to the future as being adequate for current planning to avoid restrictions, and to allow ample time for future augmentation planning.

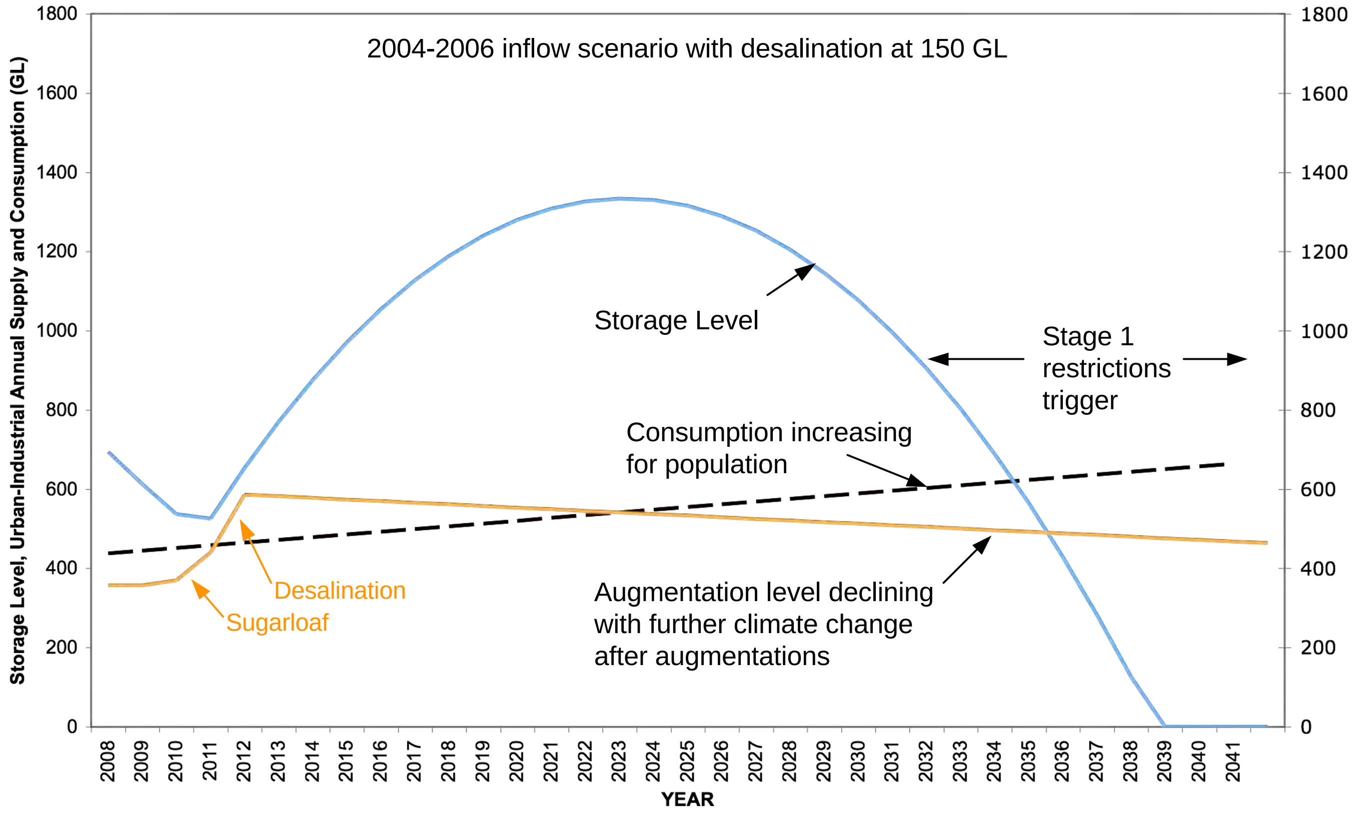


Figure 1

Other augmentation options and their effect on storage must be considered. Below is presented the same scenario with an additional 60 GL augmentation from the Eastern Treatment Plant, coming on line in 2013. It will be noted that the storages are now full for a period of around ten years. One of the augmentations will need to be scaled back (presumably desalination due to its huge energy cost). This asset is then under-utilised and a considerable portion of augmentation winds up evaporating in storage, awaiting usage.

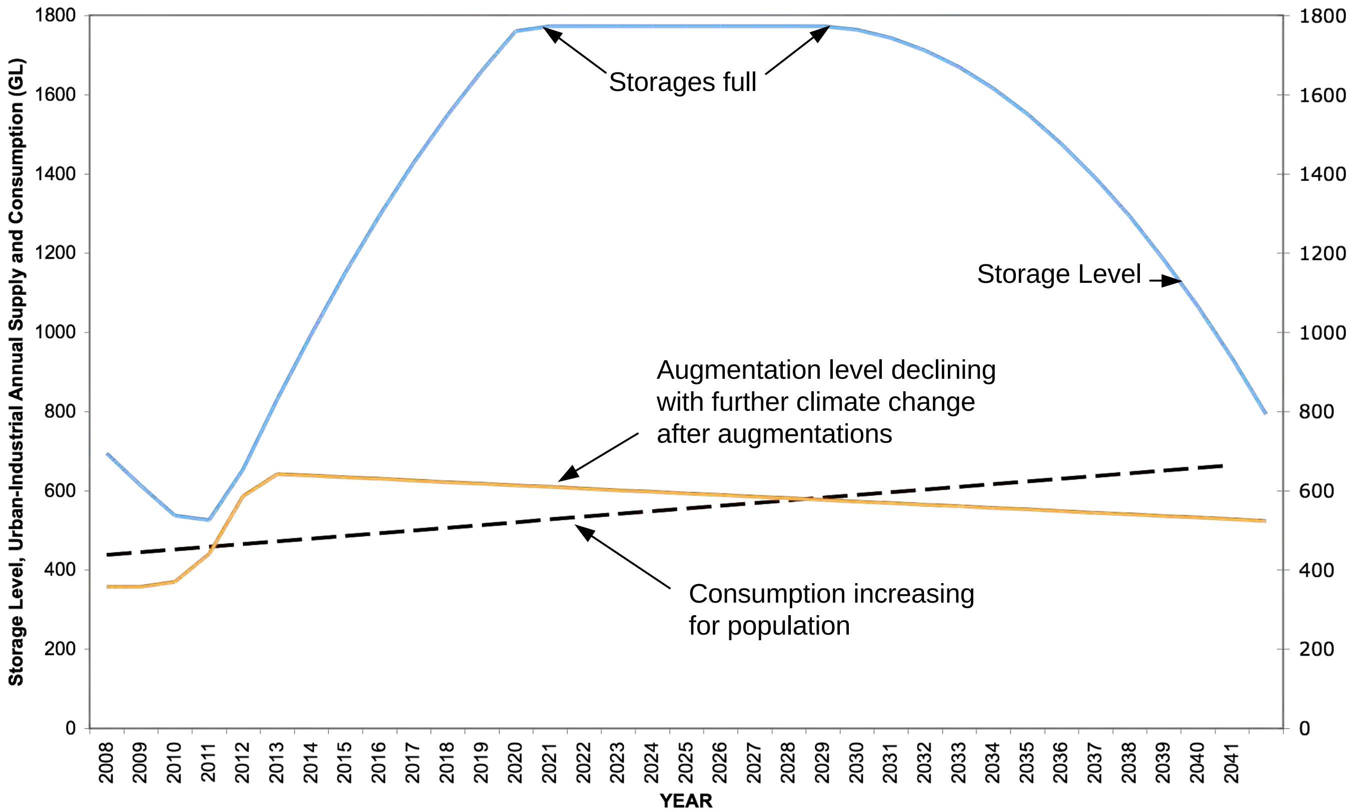


Figure 2

The augmentation producing the situation on the previous page need not be from the ETP plant but could come from any other practical alternative. By implementing the desalination plant at this scale other augmentations must in reality be minimised. These may have been cheaper, produced less greenhouse gases or had positive environmental spin-offs. Taking the ETP as an example, the government has already committed to upgrading the plant's output to class A standard. The public have considerable ownership and investment in this water and would not like to see that pumped out to sea (at further expense in the construction of a new 2 kilometre discharge pipe). Part of the governments 'Our Water Our Future' policy is to increase recycling, and they state that their water policy will follow 'Principles of Environmental Sustainability'. It is difficult to see then how one option (desalination) which actually adds more to the problem of global warming and hence reduced inflows, that is at the heart of the problem, can have such a prominent role in the solution. Within the bounds of acceptable total levels of augmentation each option must be assessed to determine its place so as to achieve the best outcomes, taking cost, emissions, benefits and disadvantages into account.

The results of numerous different scales for the desalination plant and Eastern Treatment plant are presented in table 3 and table 4, for the two different inflow scenarios. The same overall levels of augmentation from any other options brought on line between 2009 and 2013 would produce similar storage level results. The options could even be a combination of a completely different set of augmentations as long as the total level is in the range shown below. These are derived from the [red shaded] values in tables 3 and 4.

Total augmentation required (implemented between 2008 and 2013) to achieve 15 - 20 years before falling in to restrictions again			
10 year low inflow scenario with further reductions	**150 Gigalitres**	**to**	**180 Gigalitres**
3 year low inflow scenario with further reductions	**205 Gigalitres**	**to**	**230 Gigalitres**

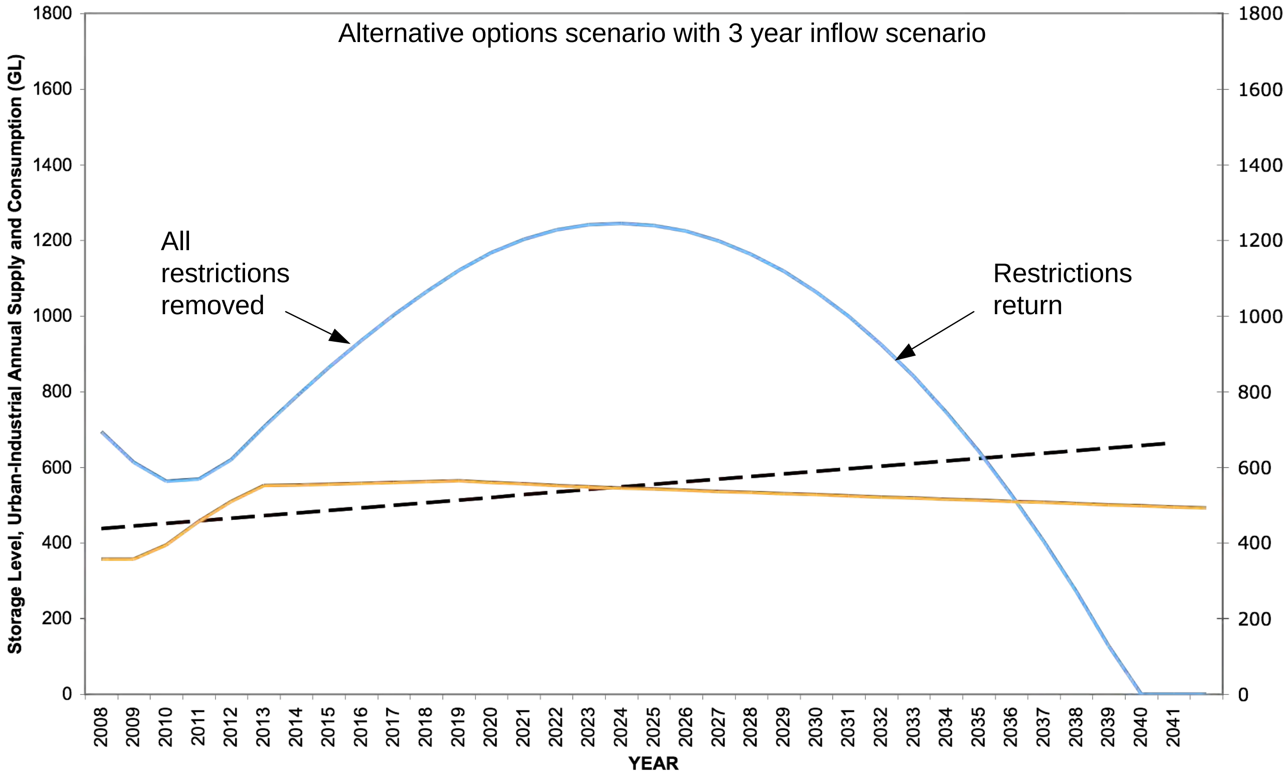
Table 2

The difference in storage level scenarios between the 3 and 10 year inflow scenarios should be considered. Given that the 10 year scenario incorporates a continuing reduction in inflows, it is likely that this will be the situation in to the future with climate change. Within these time frames the 3 year scenario represents a more than 50% average inflow reduction on long term trends. If this were the case we would need to take more drastic steps to halt climate change, rather than just respond to it as we are doing to date.

A demonstration that other options are also feasible:

Sourcing new augmentation as in the table below will be seen from the graph of resultant storage levels to adequately solve Greater Melbourne's water supply problems. This is based on an inflow scenario less than the last decade of drought, equal to the average 2004-2006 inflows initially, but this and other inflows decreasing at the rate of 11% per 20 year period. Consumption is also increasing at the highest predicted rate (one million extra people in Greater Melbourne by 2020).

Year	Augmentation option/s	(GL)	Supplied
2008	Cease logging in catchments - no benefit till 2023		
2009	Begin tank installation at 6GL/year for 10 years	60	6GL per year
	Tarago reconnection	15	
	Efficiencies, pressure reductions & leakage reduction	20	
2010	Flood diversion to Aberfeldy River	20	
	Sugarloaf Interconnector at 40GL	40	
2011	Stormwater capture/reuse projects including ASR	50	
2012	ETP to Yarra and industry on route	40	
2023-48	Earlier cessation of logging giving 1GL per year	25	1GL per year



Here restrictions do not return for nearly 25 years into the future. An adequate solution to Greater Melbourne's water supply has been secured, for that time frame, with a diversity of augmentation options.

Years to restrictions return (Years to Stage 2 restrictions return)
<Years storages overflowing> [Total augmentation (GL)]
10 year low inflow scenario with further climate reductions (11%/20years)
assumes 15GL Tarago and 75GL Sugarloaf

Desalination (GL)	No other Augmentation i.e. ETP = 0	60 GL Augmentation i.e. ETP = 60GL	100 GL Augmentation i.e. ETP additional or other
0	0 [90]	13 (15) [150]	22 (23) [190]
30	0 10 [120]	21 (22) [180]	28 (29) [220]
40	9 (12) [130]	23 (24) [190]	30 (31) <6> [230]
50	12 (14) [140]	25 (26) [200]	31 (32) <9> [240]
60	15 (16) [150]	27 (28) [210]	31 (32) <10> [250]
70	17 (18) [160]	29 (30) <2> [220]	32 (33) <12> [260]
100	23 (24) [190]	32 (33) <10> [250]	35 (36) <16> [290]
150	31 (32) <9> [240]	37 (38) <18> [300]	40 (41) <23> [340]
200	35 (36) <17> [290]	41 (42) <24> [350]	43 (44) <29> [390]

Indicates total augmentation to achieve 15-20 years before restrictions return is 150-180GL
i.e. 60 to 90 GL required after Tarago Reconnection and Sugarloaf Interconnector

- Inadequate augmentation levels
- Adequate augmentation giving 15 - 20 years before storage levels fall to Stage 1 restriction trigger point
- Excessive levels of augmentation

Table 3

Years to restrictions return (Years to Stage 2 restrictions return)
<Years storages overflowing> [Total augmentation (GL)]
3 year low inflow scenario - assumes 15GL Tarago and 75GL Sugarloaf
2004 to 2006 inflows repeating with further climate reduction

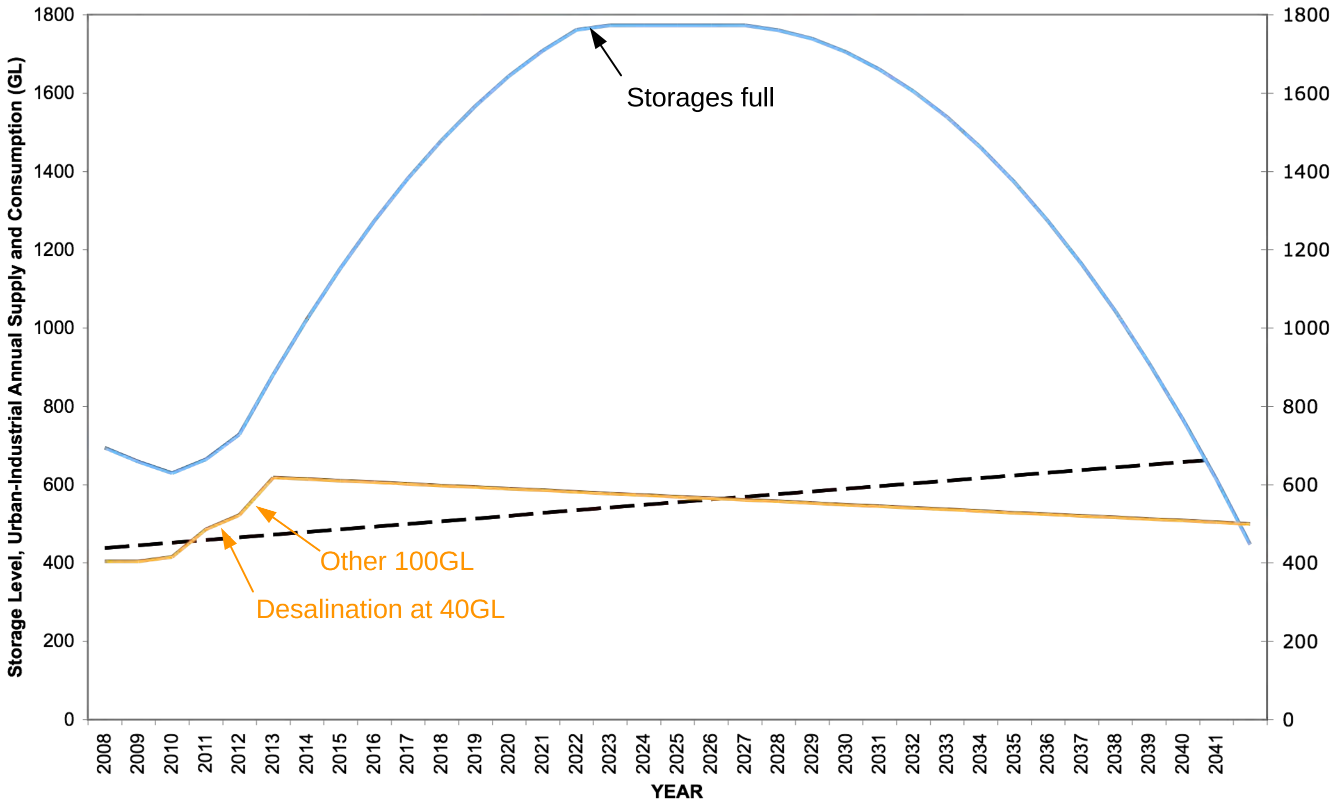
Desalination (GL)	No other Augmentation i.e. ETP = 0	60 GL Augmentation i.e. ETP = 60GL	100 GL Augmentation i.e. ETP plus other
0	0 (0) [90]	0 (0) [150]	0 (3) [190]
40	0 (0) [130]	1 (0) [190]	19 (21) [230]
60	0 (0) [150]	14 (17) [210]	24 (25) [250]
80	0 (0) [170]	20 (21) [230]	28 (29) [270]
100	0 (7) [190]	24 (25) [250]	31 (32) <8> [290]
115	14 (16) [205]	27 (28) [265]	32 (33) <11> [305]
130	18 (20) [220]	30 (31) <6> [280]	34 (35) <14> [320]
140	20 (22) [230]	31 (32) <8> [290]	35 (36) <15> [330]
150	23 (24) [240]	32 (33) <11> [300]	36 (37) <16> [340]
200	31 (32) <9> [290]	36 (37) <17> [350]	40 (41) <22> [390]

Indicates total augmentation needed to achieve 15-20 years before restrictions return is 205-230GL
i.e. 115 to 140 GL required after Tarago Reconnection and Sugarloaf Interconnector

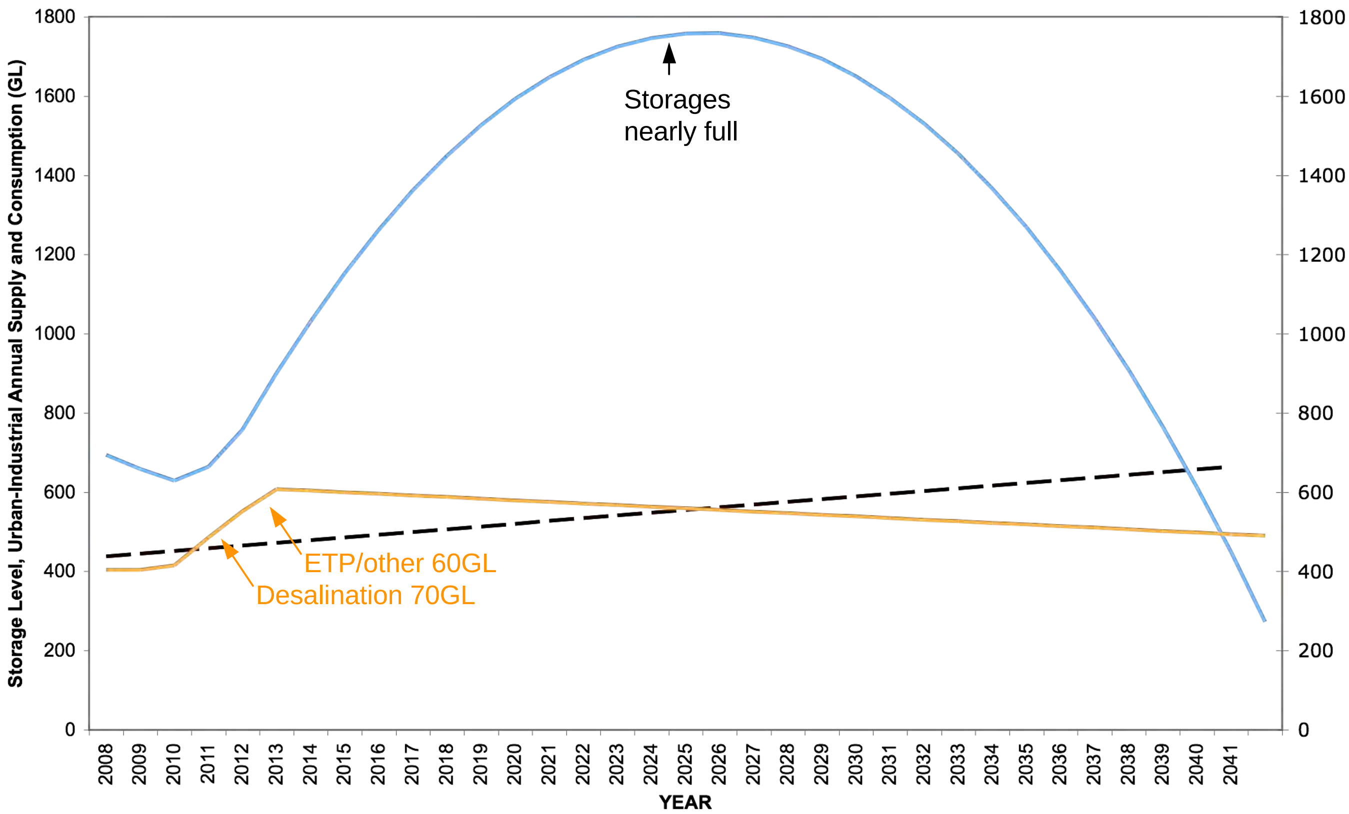
- (white) Inadequate augmentation levels
- (pink) Adequate augmentation giving 15 - 20 years before storage levels fall to Stage 1 restriction trigger point
- (orange) Excessive levels of augmentation

Table 4

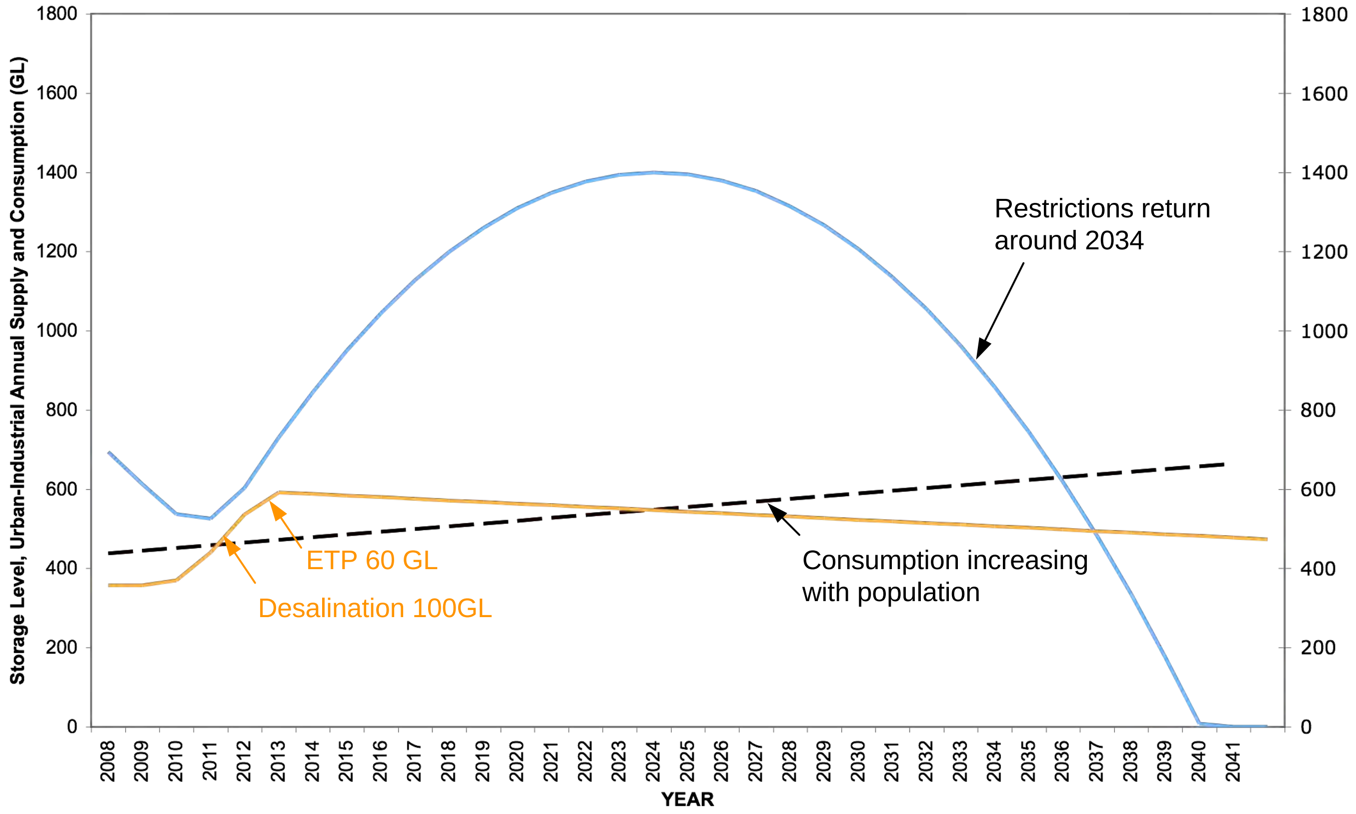
Appendix: Charts for a few of the option combinations in tables 3 and 4:



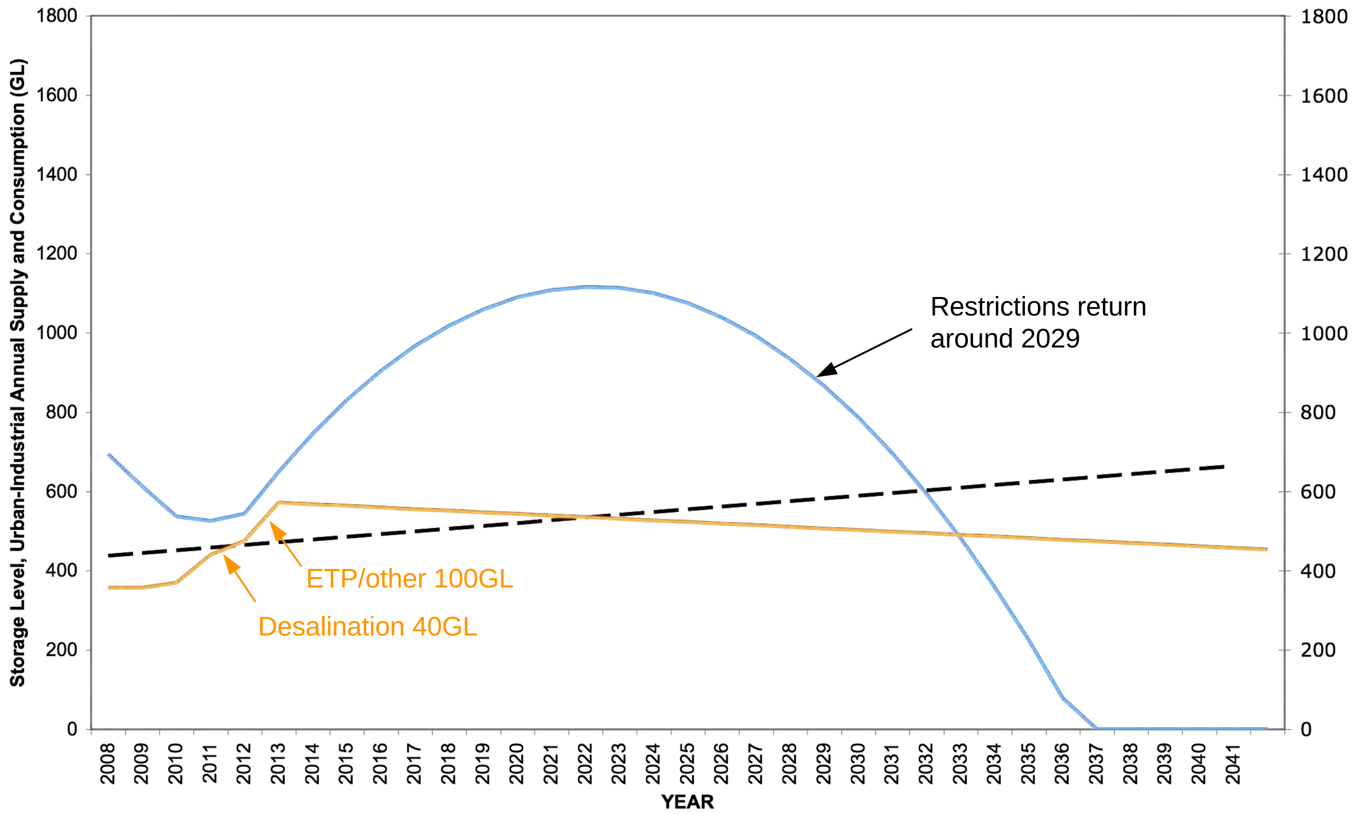
10 year scenario Desalination at 40 GL and Others at 100GL



10 year scenario Desalination at 70 GL and ETP/other at 60 GL



3 year scenario Desalination at 100 GL and ETP at 60 GL



3 year scenario Desalination at 40 GL ETP/other at 100 GL