WAIMEA WATER AUGMENTATION PROJECT

OPTIONS ASSESSMENTS

Richard Kirby
Engineering Services Manager

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tasman district council

What is the problem Tasman is facing?

- Frequent and severe water shortages in summer months in urban areas
- Regional water security problems affect regional economic security
- Waimea River health is declining
- TRMP for Waimea River has 1,100 litres/sec as minimum flow at Appleby Bridge to maintain river health, not currently being achieved year-round
- NPS-FWM requires territorial authorities to achieve river health measures, it has not been confirmed whether 1,100 l/s as minimum flow will achieve compliance
- Irrigators on Waimea Plains lack water security

Tasman already has water rationing in dry months

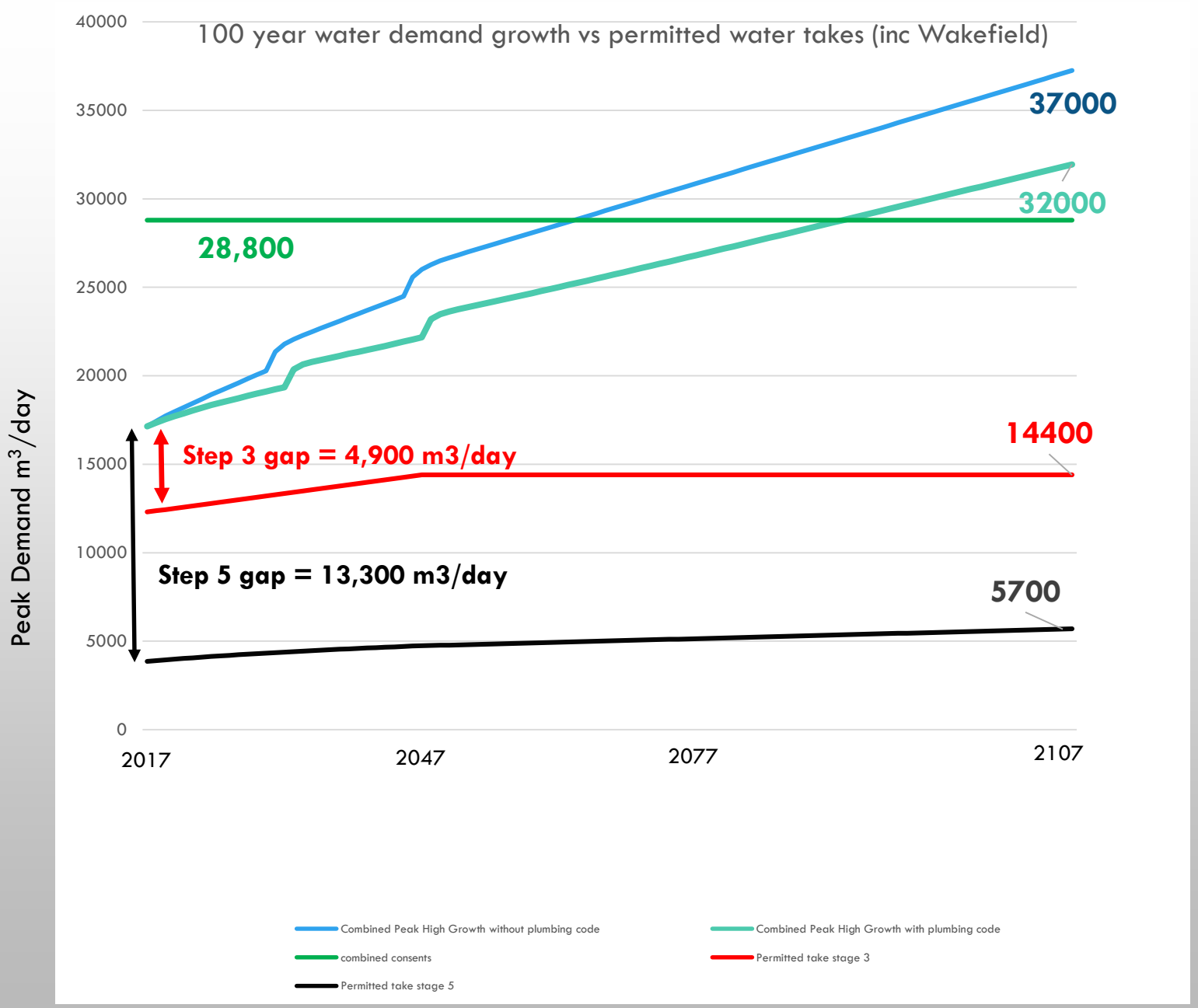
- Step 1 rationing, greater of:
  - 10% of consumption reduction (average last 8 years)
  - 20% of consent
- Step 2 rationing, greater of:
  - 17.5% of consumption reduction (average last 8 years)
  - 35% of consent
- Step 3 rationing, greater of:
  - 25% of consumption reduction (average last 8 years)
  - 50% of consent
- Step 4 (does not apply to community water supplies)
- Step 5 - essential human health
  - 125L/day/person (occurred 2000/2001)

Based on last 16 years could occur 9 out of every 10 years

Based on last 16 years could occur 1 out of every 6-10 years

Combined 100-Year Demand

(incl. Wakefield)



This graph shows the gap between supply and demand as and when rationing is triggered. It shows that with time the gap becomes larger which means the rationing will need to be greater to comply with the TRMP.

Demand forecasts

Urban areas only: Richmond, Mapua, Brightwater and Wakefield

- Demand is rising
- Presently: combined consents allow 28,800 m3/day
- High growth scenario for 100 years: 37,000 m3/day needed
- High growth scenario for 30 years: 24,000 m3/day needed
  - This 24,000 m3/day excludes Wakefield because it has a 30-year secure water supply through the Wai-iti Dam at Kainui

Water demands and rationing gaps

Urban areas only: Richmond, Mapua, Ruby Bay and Wakefield

	Daily 2017 (excl. Wakefield) (m3/day)	Daily 2047 (excl. Wakefield) (m3/day)	Daily 2117 (incl. Wakefield) (m3/day)
Peak Week Daily Demand	**15,900**	**24,000**	**37,000**
Stage 3 permitted take	11,000	12,200	14,400
Stage 5 permitted take	2,600	3,500	5,700
Rationing stage water gaps	2017	2047	2117
Stage 3	-4,900	-11,800	-22,600
Stage 5	-13,300	-20,500	-31,300

Rationing scenario based on 2000/2001 drought

- 60 days at stage 3 rationing
- 40 days at stage 5 rationing

Water storage requirements

Rationing Stage	2017 (m3)	2047 (m3)	2117 (m3)
Stage 3 (60 days)	249,000	601,000	1,153,000
Stage 5 (40 days)	452,000	697,000	1,064,000
Total (100 days)	**701,000**	**1,298,000**	**2,217,000**

Summary

- 700,000 m3 in 2017
- 1,300,000 m3 in 2047
- 2,200,000 m3 in 2117 (incl Wakefield)
- Add to each figure 100,000m3 storage required for water loss, evaporation and refreshing flows

Community-driven research into the problem

- 1991 Agriculture New Zealand (MAF) Report – Water Augmentation Options Waimea Basin
- 2003 Tasman Regional Water Study
- Waimea Water Augmentation Committee (WWAC)
  - 2004 to 2007 - Phase 1 Feasibility Study
    - Identified 18 sites; Lee Valley Dam identified as preferred option
  - 2007 to 2010 - Phase 2 Detailed Investigation – Lee Valley Dam (Site 11)
  - 2011 to 2014 – Phase 3 Detailed Design – Lee Valley Dam (Site 11)
  - March 2015 – Resource Consent Granted – Lee Valley Dam (Site 11)

Options that have been explored and discounted

- Investigations began in 2004; analysis ongoing since that time
- Most viable potential options supply between 500,000 m3 – 2,300,000 m3 to meet Stages 3 and 5 demands
  - Option 1: Riverside storage
  - Option 2: Motueka aquifer
  - Option 3: Roding River storage
  - Option 4: Teapot Valley storage
  - **Option 5 / Preferred option: Waimea Dam**

Option 1: Riverside storage – cost summary

Storage	Capital Cost ($'000)	Opex ($ p.a.)
500,000 m3	$24,600	$788,000
800,000 m3	$54,000	$2,297,000
1,400,000 m3	$84,000	$3,498,000
2,300,000 m3	$108,000	$5,024,000

Each includes additional 100,000m3 storage that is required for water loss, evaporation and refreshing flows

Option 1: Riverside storage – daily water gap summary

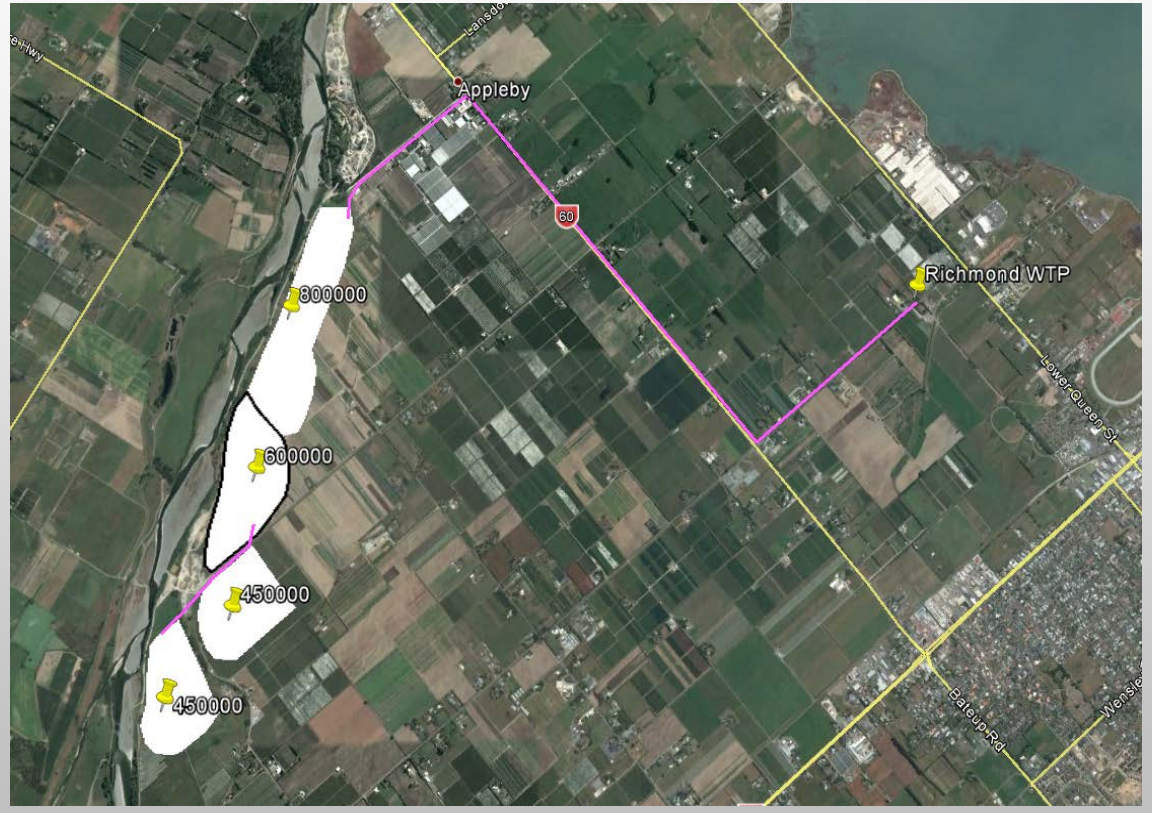
Green – meets water gap demand

Red – does not meet demand

Storage	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
500,000 m3	4,000	4,900	11,800	22,600
		13,300	20,500	31,300
800,000 m3	13,000	4,900	11,800	22,600
		13,300	20,500	31,300
1,400,000 m3	20,000	4,900	11,800	22,600
		13,300	20,500	31,300
2,300,000 m3	31,000	4,900	11,800	22,600
		13,300	20,500	31,300

Option 1: Riverside storage – issues

- Potential consent issues
- Land acquisition required 20 ha up to 92 ha, covering significant land along the river (see image)
- May not be able to go deeper than 1.0 m without affecting groundwater
- Seismic considerations - earth retaining structures above ground
- Can the ground support pond walls
- Sitting water requires aeration and pre-treatment before going to water treatment plant



4 storage ponds along the river to allow for 2,300,000m3 storage, piped to Richmond water treatment plan in underground pipes along existing arterials.

Option 1: Riverside storage – conclusion

- The only storage option at 2,300,000 m3 that meets water demand for 100 years will cost over $5,000,000 annually in operating expenses
- Only contributes to urban water supply, not river health or irrigation water security
- Significant issues that present challenges in consenting, geological constraints, seismic issues, and storage location amenity concerns
- **Option 1: Riverside storage is not an affordable solution**

Option 2: Motueka Aquifer

- Aquifer capacity
  - 35,000 – 45,000 m3/day potential
  - 21,200 – 31,200 m3/day could be available for Mapua, Richmond, Brightwater
- Scope
  - Abstraction bores
  - New trunk mains required for
    - Pumping to Old Coach Road
    - Transfer trunk main 17.0 km from bores to Mapua
    - Gravity trunk mains from Old Coach Road site to Richmond WTP
  - Storage tanks needed at Old Coach Road site
- Consenting additional volumes requires plan change to increase community supply abstraction

Option 2: Motueka aquifer – cost summary

Supply (m3/day)	Capital Cost ($'000)	Opex ($ p.a.)
5,900	$35 - $40,000	$750,000
13,000	$100 - $120,000	$1,600,000
31,000	$160 - $200,000	$2,800,000

Option 2: Motueka aquifer – daily water gap summary

Green – meets water gap demand

Red – does not meet demand

Supply (m3/day)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
5,900	4,900	11,800	22,600
	13,300	20,500	31,300
13,000	4,900	11,800	22,600
	13,300	20,500	31,300
31,000	4,900	11,800	22,600
	13,300	20,500	31,300

Option 2: Motueka Aquifer - conclusion

- The only supply option of 31,000 m3/day that meets water demand for 100 years will cost at least $160,000,000 to construct and $2,800,000 annually in operating expenses
- Only contributes to urban water supply, not river health or irrigation water security
- Requires a pipe to be installed across the Moutere inlet, which significantly raises capital cost
- **Option 2: Motueka aquifer is not an affordable solution**

Option 3: Roding River Storage

- Roding High Dam
  - Two dam options at current weir site
  - Dam volumes vary between 1,200,000 m3 – 5,100,000 m3
- Scope includes
  - Cost of building dam and headworks
  - Piping to Marsden Valley Pump station
  - Piping from Marsden Valley to Richmond Reticulation
  - Treatment Plant, likely located in Marsden Valley or along Richmond Hills
- Consenting
  - Similar considerations as Lee Valley Dam consent (already in place)
  - Requires additional consent from Nelson City Council (to existing one)

Option 3: Roding River Storage – cost summary

Storage capacity 1,200,000m3 – 5,100,000m3	**Capital Cost** **($'000)**	**Opex** **($ p.a.)**
Dam and piping	$45 - $75,000	
Trunk main to Richmond	$15 - $25,000	
Treatment	$35 - $45,000	
Operational costs		
Dam		$1,000,000 - $1,200,000
Treatment		$2,400,000 - $2,600,000
TOTAL ESTIMATE	$95 - $145,000	$3,400,000 - $3,800,000

Option 3: Roding River Storage - conclusion

- Requires new dam, extensive trunk main installation, and a new water treatment plant
- Capital costs exceed $95,000,000 and annual operating costs would start at $3,400,000
- Only contributes to urban water supply, not river health or irrigation water security
- Consent required similar to Waimea Community Dam consent, which is already in place
- **Option 3: Roding River Storage is not an affordable solution**

Option 4: Teapot Valley – Dam Site

- Not originally shortlisted due to issues:
  - Storage volume only 500,000 m3
  - Catchment can only support 200,000 m3
  - Requires additional water to be pumped into the dam in winter from Wai-iti River to supplement storage (300,000 m3/pa)
  - Only contributes to urban water supply, not river health or irrigation water security
  - Catchment geology results in poor water quality
  - Water treatment would be required
  - Considerable social impact due to local habitation

Option 4: Teapot Valley – Dam Site

- Scope includes
  - Dam Construction (500,000m3)
  - Land Acquisition 40 ha
  - Riverside pump station to supplement storage and pump to Richmond WTP
  - Trunk Main from Riverside pump station to Dam 1.35 km x 450mm dia pipe
  - Transfer trunk main to Richmond WTP 11.0 km x 500mm dia pipe
  - Riverside Treatment Plant (4,000 m3/day capacity)

Option 4: Teapot Valley Dam – cost summary

Storage capacity 500,000m3	**Capital Cost ($'000)**	**Opex ($ p.a.)**
Dam and pump station	$6,900	
Trunk mains	$13,200	
Treatment	$8,100	
Land purchase, consents, other	$17,950	
Operational costs		$1,111,000
TOTAL ESTIMATE	$46,150	$1,111,000

Option 4: Teapot Valley Dam – water gap summary

Green – meets water gap demand

Red – does not meet demand

Storage	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
500,000 m3	4,000	4,900	11,800	22,600
		13,300	20,500	31,300

Option 4: Teapot Valley Dam - conclusion

- Significant list of issues to overcome
- Maximum water storage with this option will not meet water demand
- Capital costs include significant land purchase
- Only contributes to urban water supply, not river health or irrigation water security
- **Option 4: Teapot Valley Dam is not an affordable solution**

Option 5 / Preferred option: Waimea Community Dam

- Already consented
- Storage volume 13,000,000m3
- 53 m high earth embankment dam
- Meets current shortfall and demand projections for 100 years
- Meets 1 in 60 year drought
- Contributes to urban water supply, river health and irrigation water security
  - Maintains minimum flow of 1,100 l/s at Appleby bridge, as required by NPS-FWM
  - Supplies up to 60,000 m3/day for urban supply (replenishing aquifer)
  - Irrigates up to 5,860 hectares (replenishing aquifer)

Option 5: Waimea Community Dam – Capacity Allocations

Allocations	Ha/Ha.e	Extractive (%)	Volume (m3/day)	Portion of Dam Capacity (%)
Environmental Flow			**95,200** (1,100 l/s)	**30%**
Consented Irrigation	3,800	49%	163,000	34%
Future Irrigation Waimea Plains	1,500	19%	64,400	14%
Future Irrigation outside Waimea Plains	550	7%	23,600	5%
Total Ha	**5,850**		**251,000**	**53%**
Current Consented Urban & Industrial	620	8%	26,600	6%
Future Consented Urban & Industrial	780	10%	33,400	7%
Total Ha.e	**1,400**	**18%**	**60,000**	**13%**
Regional Future Capacity (NCC and other)	515	7%	**22,000**	**5%**
Total Extractive Capacity Ha.e	**7,765**	**100%**	**428,200**	**100%**

Option 5: Waimea Community Dam – water gap summary

Green – meets water gap demand

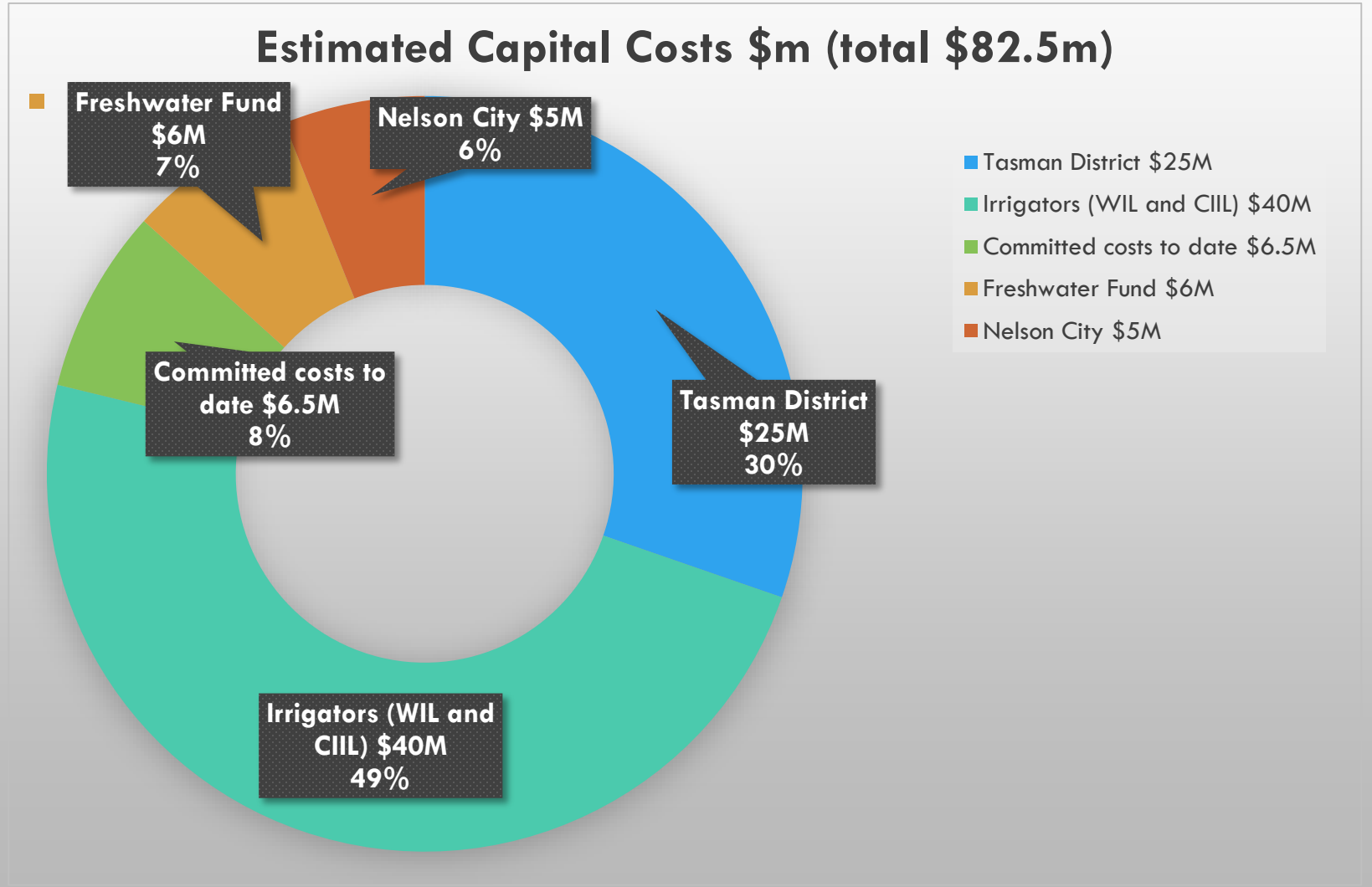
Red – does not meet demand

Storage (m3)	Allocation	Daily Flow (m3)	Daily Water Gap 2017	Daily Water Gap 2047	Daily Water Gap 2117
13,000,000	Environment (min. river flow)	95,200 (1100 l/s)	N/A	N/A	N/A
	Urban	60,000	4,900	11,800	22,600
			13,300	20,500	31,300
	Irrigators	251,000	N/A	N/A	N/A
	Nelson CC	22,000	N/A	N/A	N/A

Option 5: Waimea Community Dam – cost summary

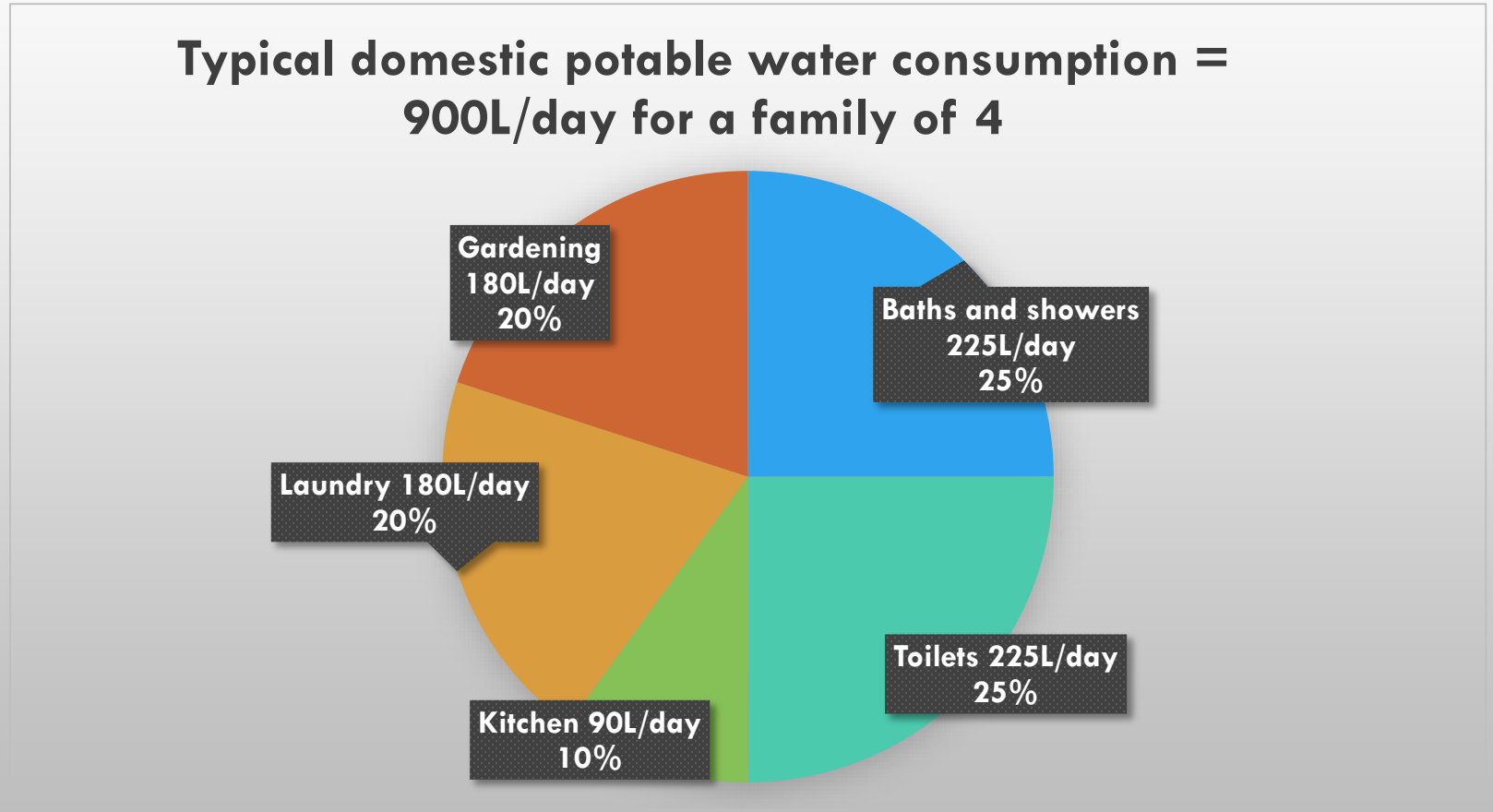
In Long-Term Plan 2015-2025

Committed $25M to Waimea Community Dam



Other alternatives?

Domestic water harvesting / Residential water conservation



Rainwater tanks can also provide

Toilets	225 L/day
Gardening	180 L/day
Total	**405 L/day**

Domestic harvesting – cost summary

- Total per property cost = $5,000 each, including
  - Supplying a water tank
  - Supplying pump and power
  - Supplying rainwater collection materials
  - Plumbing for toilet and gardening
- Total cost for 6,481 urban properties = $32,400,000
- Annual power costs = $40
- Pumps and plumbing will need to be maintained = approx $60/pa

Domestic harvesting - issues

- Conserves up to 2,630 m3/day at 100% take-up, which only contributes 16.5% of Peak Week Daily Demand (unlikely to get 100% take-up)
- Only contributes to urban water supply, not river health or irrigation water security
- Not sufficient to meet water augmentation requirements
- Data shows public increase water usage during restrictions
- **Domestic harvesting is a future option for conservation but it's insufficient to meet water gap during restrictions**

Option assessment and analysis

Option affordability analysis

Water Augmentation Options	Storage (m3)	Capital Cost ($'000)	Opex ($'000 p.a.)	Daily Flow (m3)	Capital Cost/Daily Flow ($'000/m3 per day)
Waimea Community Dam	**13,000,000**	$25,000	$714	31,000	**0.81**
Riverside Storage	**500,000**	$24,600	$788	4,000	**6.15**
	800,000	$54,000	$2,297	13,000	**4.15**
	1,400,000	$84,000	$3,498	20,000	**4.20**
	2,300,000	$108,000	$5,024	31,000	**3.48**
Motueka Aquifer	**Aquifer**	$35 - $40,000	$750	5,900	**6.36**
	Aquifer	$100 - $120,000	$1,600	13,000	**8.46**
	Aquifer	$160 - $200,000	$2,800	31,000	**5.81**
Roding River Storage	**4,000,000**	$110,000	$3,600	30,000	**3.67**
Teapot Valley Dam	**500,000**	$46,150	$1,111	4,000	**11.54**

Option compliance analysis

Green – Low risk/compliant Orange – medium risk/marginally compliant Red – high risk/not compliant

		Risks				Benefits					Disbenefits		Strategic Fit			
Option	Daily Flow (m3/day)	Consentability	Constructability	Operability	Land/Access	Regional	Urban	River Flows	Irrigators	Wider District	Harvesting Impact on others	Economic Opportunity Cost	Meets Growth Demands	NPS-FWM Obligations	LTP 2015-2025 Objectives	Council Vision
Waimea Community Dam	37,000															
River Storage	4,000															
	13,000															
	20,000															
	31,000															
Motueka Aquifer	5,900															
	13,000															
	31,000															
Roding River Dam	30,000															
Teapot Valley Dam	4,000															

Preferred option:
Waimea Community Dam

- **Most affordable solution for ratepayers and funders**
- Lowest capital cost per daily flow requirement
- Lowest overall risk
- Highest compliance