



# Modelling Symposium

# RAINWATER TANK CALCULATOR TOOL TO OPTIMISE RAINWATER TANK SIZE

Presented by  
Wui-Shen Tay

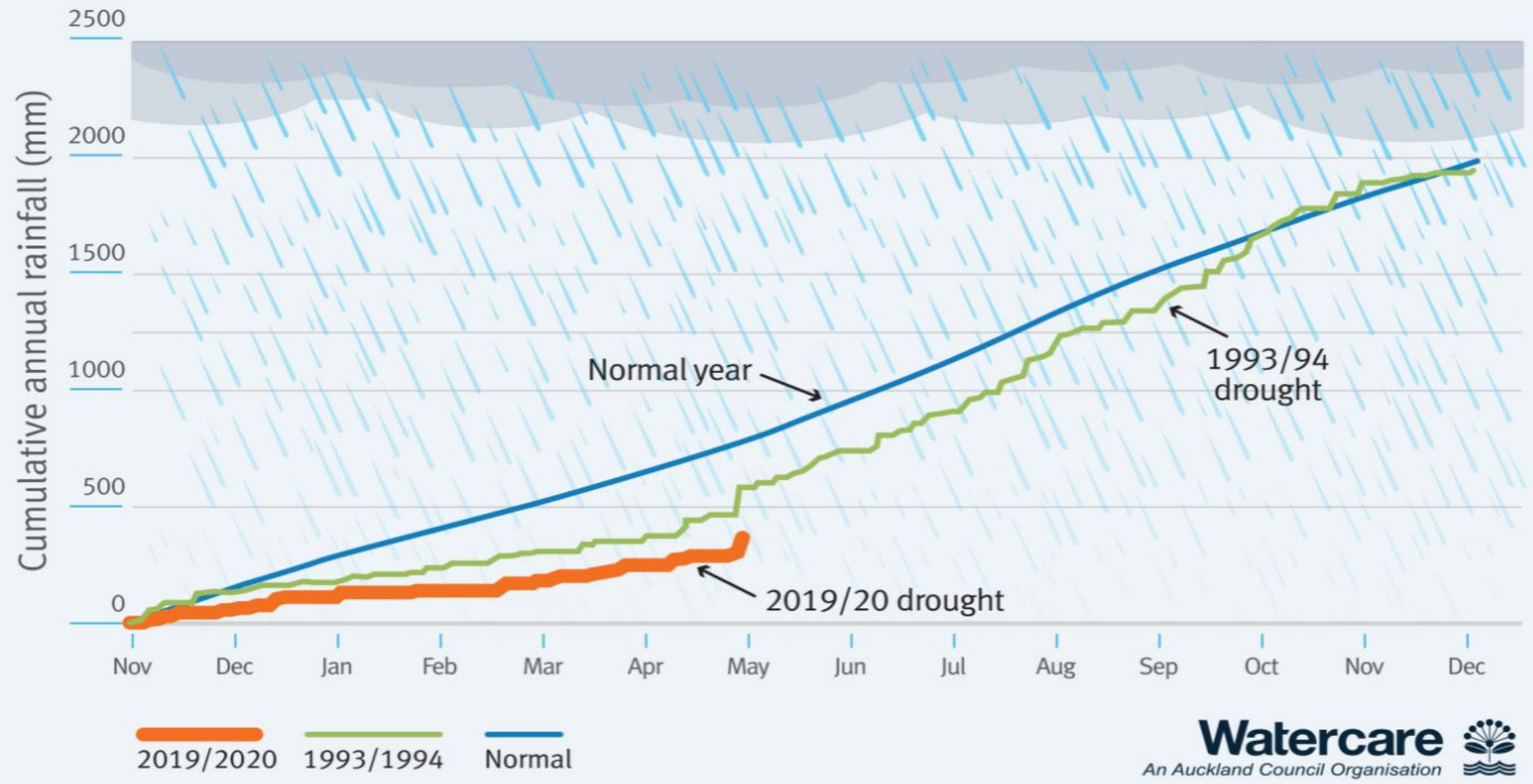


# Introduction

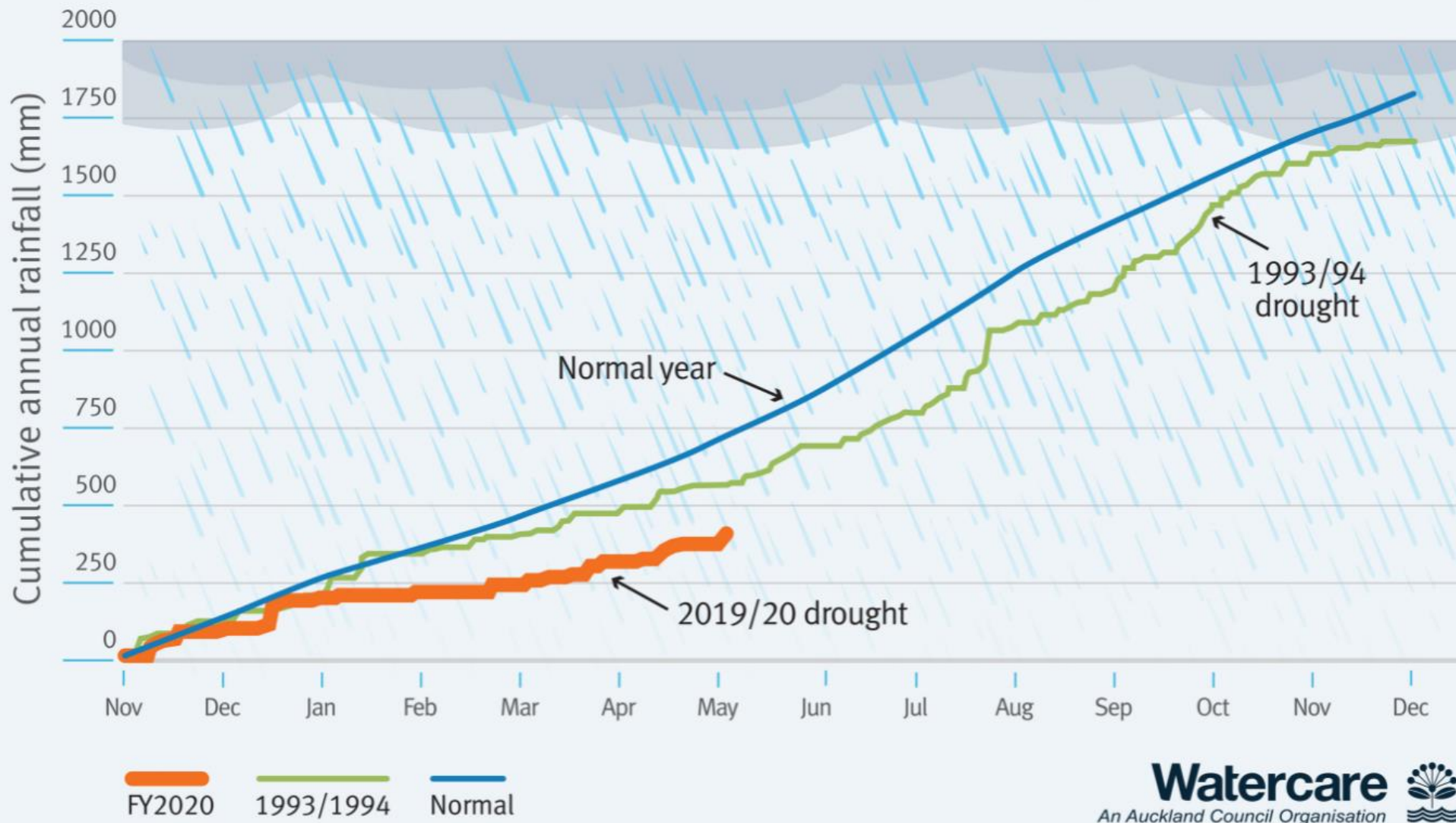


- More than half of NZ's population growth in Auckland in next 30 years
- Water demand is growing fast, need to secure more water resources
- Increase global temperature increase evaporation.
- Serious drought in the summer of 2020 in NZ
- Dry spell of consecutive 39 days in Auckland

# Rainfall in the Hunua Ranges



# Rainfall in the Waitakere Ranges

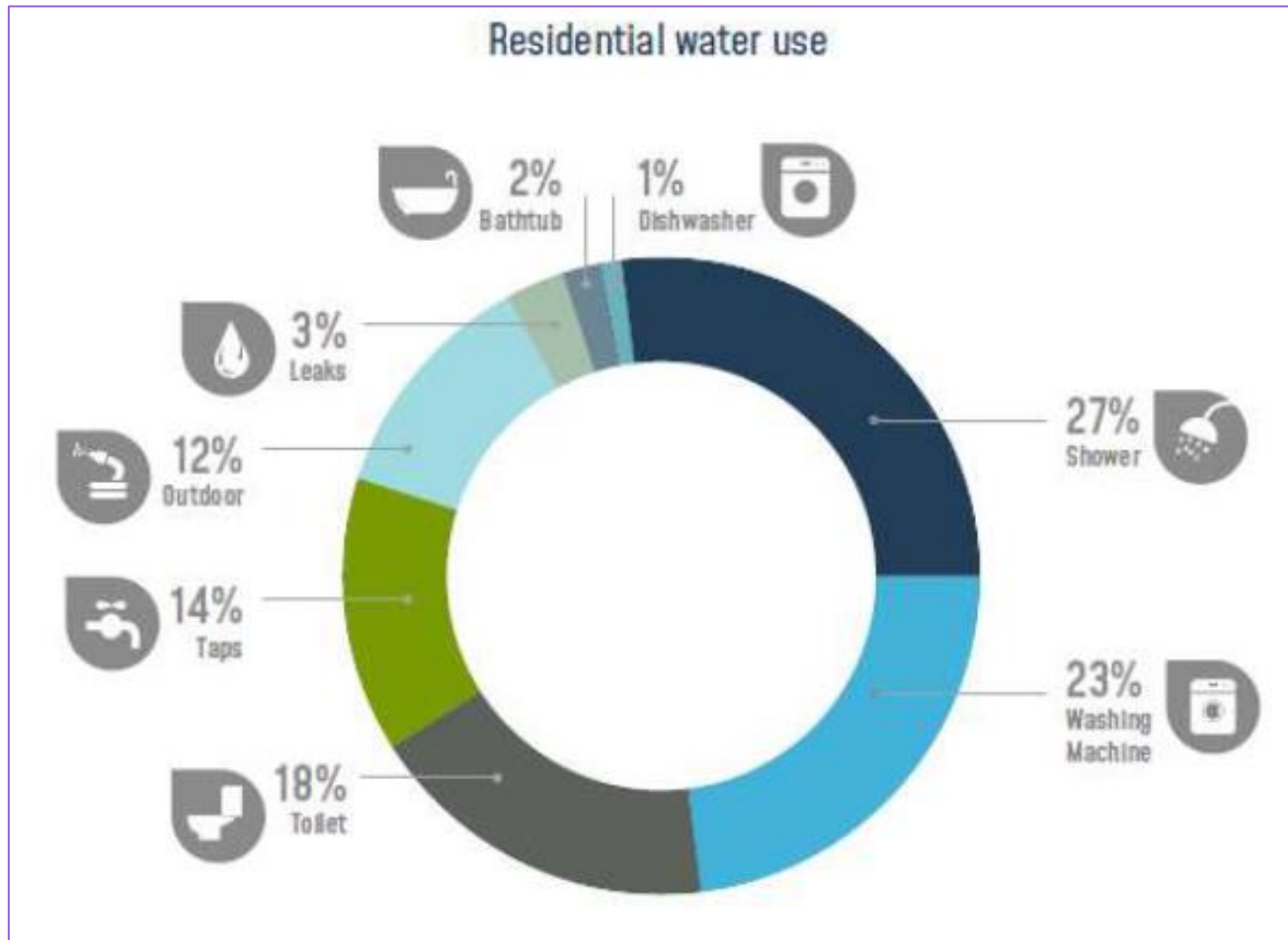


## Water storage level in Auckland



- In 1993/1994, Reservoir level dropped to 32%
- In 2019/2020, dam level dropped to 42%
- Water restriction was imposed in 2020, first time since 1993/1994.

# Auckland Water Strategy



- Current average household water usage is 180 L/d/p (BRANZ Study)
- AC set water use target for first time to reduce use of potable water
  - By 2030, average household target is 145L/d/p
  - By 2050, an average household target is 135 L/d/p
- From 2025, AC hopes new homes with rainwater tank to be built with water efficient fixtures and fittings

# Rainwater Tank

- Rainwater tank can be an alternative source of water supply for non-potable and potable household water use
- Benefit of using rainwater tank
  - Provides resilience to the domestic water supply
  - Useful in rural area and can be supplemented during drought
  - Save potable water as it enhance sustainability
  - Reduce the abstraction, treatment and conveyance cost of water
  - Reduce runoff volume and peak flow to receiving environment
  - Increase groundwater recharge by non-potable uses e.g. gardening

# Rainwater Tank Sizing Tool



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## He tātaitai āwhata kurawai

### Rainwater tank size calculator

Find out the right rainwater tank size for your property, depending on your intended use and the number of people living there.

Rainwater tanks can store water for future use and help you to save money on your water bill.

If you are planning to use your rainwater tank as a stormwater management device to meet Auckland Unitary Plan rules, see our [Stormwater device sizing tool](#).

#### What will you use the rainwater tank for?

- Outdoor activities (e.g. garden watering, car washing).
- Indoor non-drinking water only (e.g. toilet, laundry).
- Indoor non-drinking water and outdoor activities (e.g. toilet, laundry, garden watering).
- All water usage (e.g. drinking water, toilet, garden watering).

#### What size of roof area will contribute rainwater to the tank?

This is the estimated roof area with gutters that will collect water and distribute it into your rainwater tank.

 m<sup>2</sup>

#### How many people live in your household?

Calculate rainwater tank size

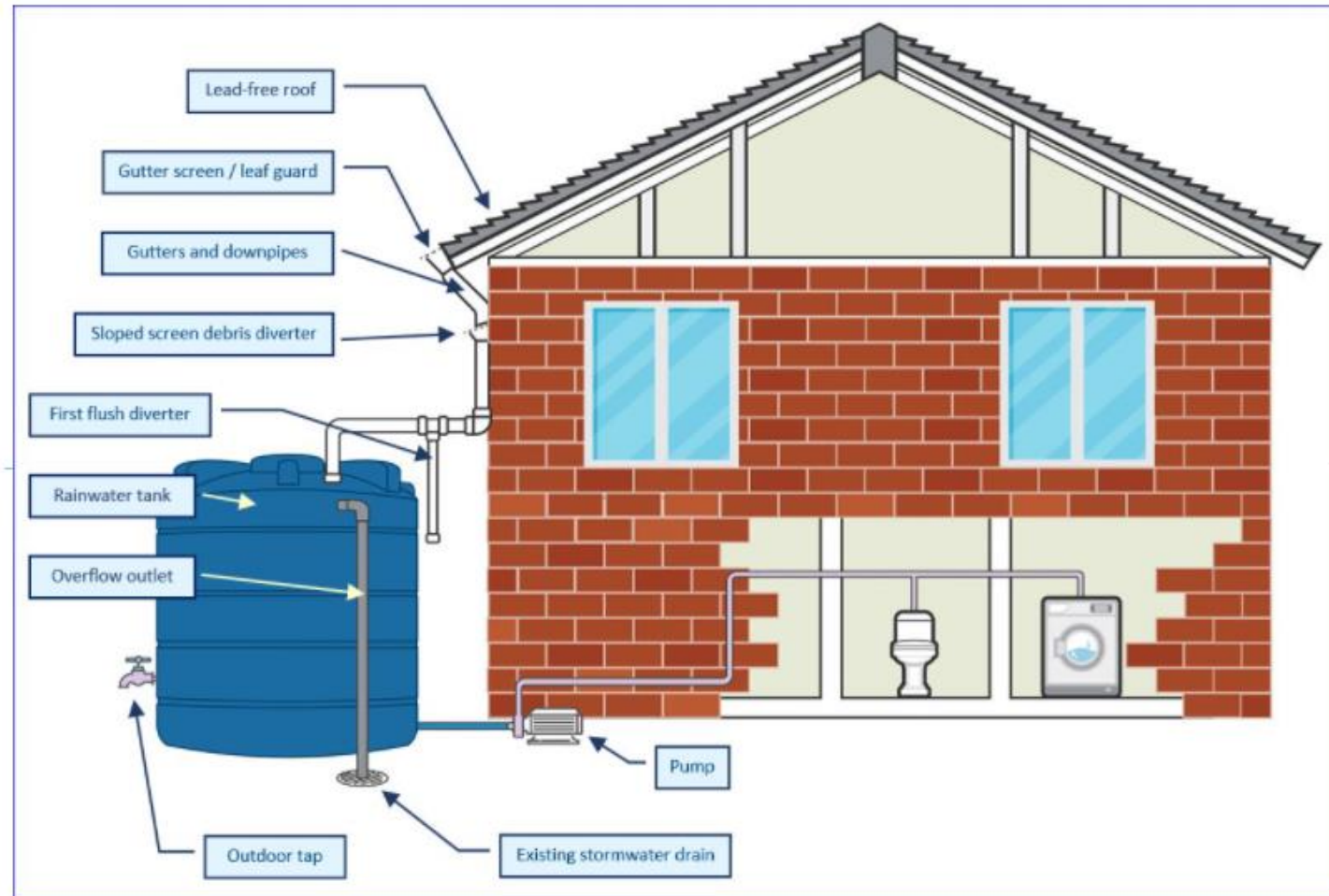
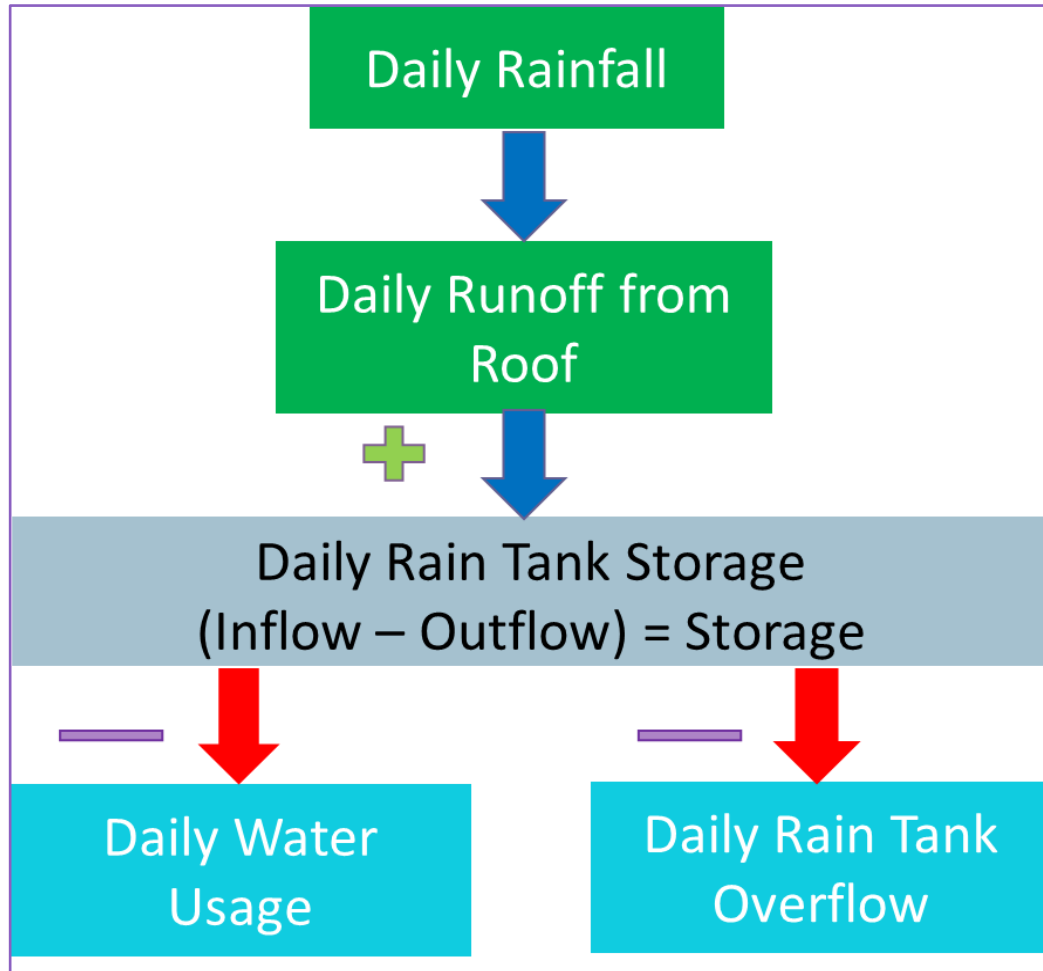
Reset

- Optimal sizing of rainwater tank
- Based on daily water balance analysis
- Uses 30-years daily rainfall (1991-2020)
- Household water uses – BRANZ Study
- Not applicable for design of GD01 SW management devices

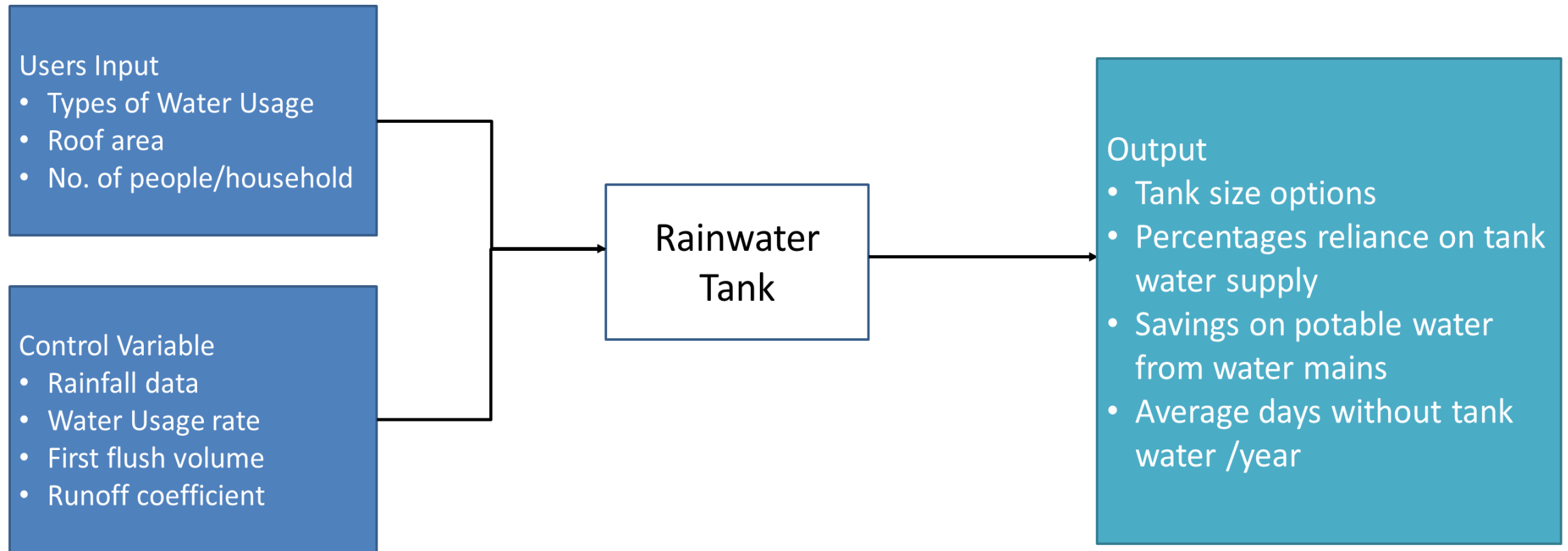




# Rainwater Tank Water Balance Analysis



# Rainwater Tank Calculator Model



# Input Scenario

## He tātaītai āwhata kurawai

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Calculate rainwater tank size

Reset

- Roof Area => 30m<sup>2</sup> to 600m<sup>2</sup>
- Number of people per household = 1 to 7
- Four types of water usage
  - Outdoor activities (e.g. gardening)
  - Indoor non-drinking water (e.g. laundry, toilet)
  - Indoor non-drinking water and outdoor activities
  - All water usage including drinking water

# Non-Potable and Potable Water Usage

Types of Water Usage	Water Usage
Outdoor Activities	25L/d/p
Indoor Non-drinking Water	73L/d/p
Indoor Non-drinking Water and Outdoor Activities	98L/d/p
All Water Usage	177L/d/p

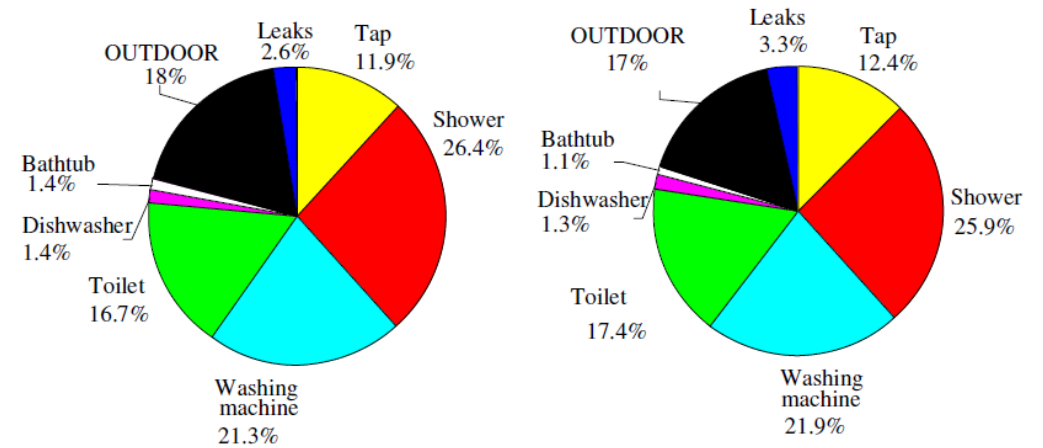


Figure 2: Household (left) and per capita (right) end use distribution in summer

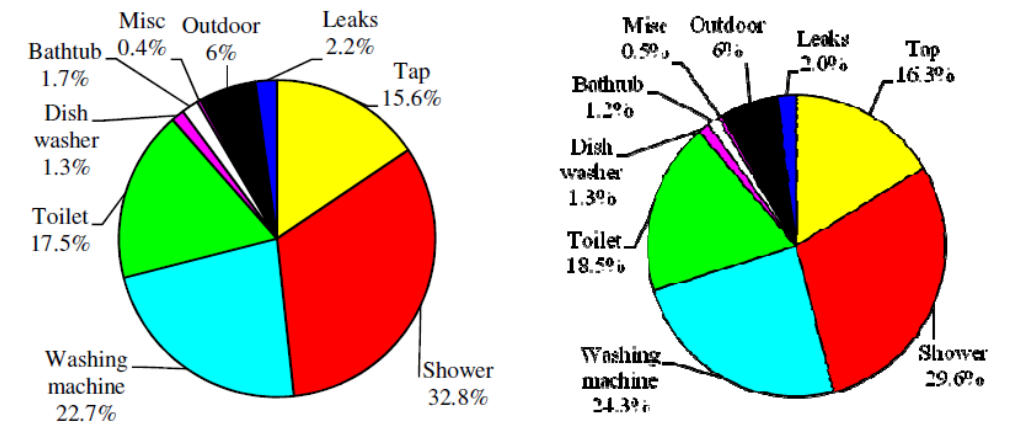


Figure 3: Total end uses per household (left) and per capita (right) in winter

# Output for Rainwater Tank Calculator Tool

## Rainwater tank size recommendations

We have calculated that you need **219 litres** per day. Based on your roof size, you could collect an average **315,000 litres** per year.

We have rounded these tank sizes up to the nearest 100 litres.

Tank size options	Potential water savings per month	Average days without tank water per year	Reliance on tank water
<b>3,700 litres</b>	6,400 litres	14 days	95.5%
<b>3,000 litres</b>	6,300 litres	21 days	93.3%
<b>2,600 litres</b>	6,100 litres	28 days	91.1%

Find out if you need a consent to [add an outdoor water tank](#).

### Disclaimer

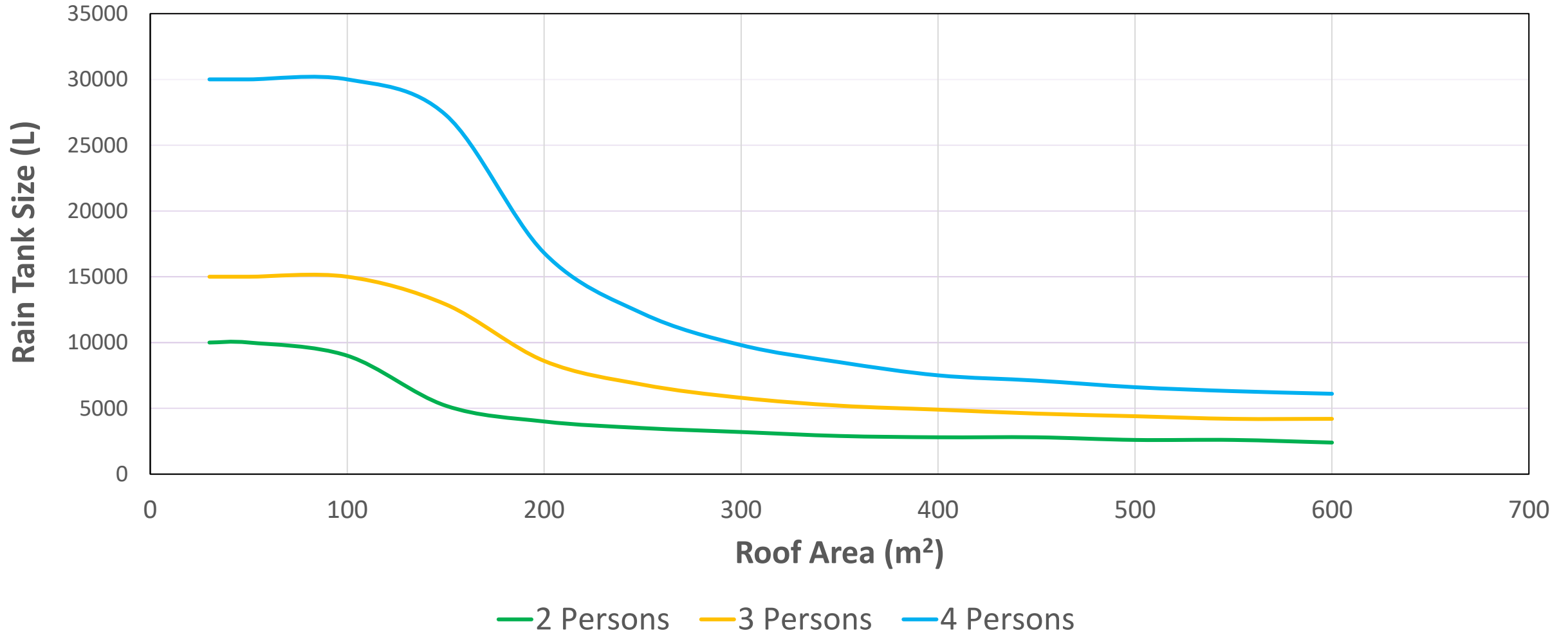
These results are an estimation based on full reliance on tank water. You will need to carefully consider an appropriate tank size if you are not connected to the existing water network.

This calculator is designed to be used for initial estimation of the tank size you may need. It is not a substitute for professional expert advice and design. It uses household water usage data provided by BRANZ and rainfall data from the last 30 years in Auckland.

The council cannot be held liable for losses incurred as a result of using or relying on the calculator.

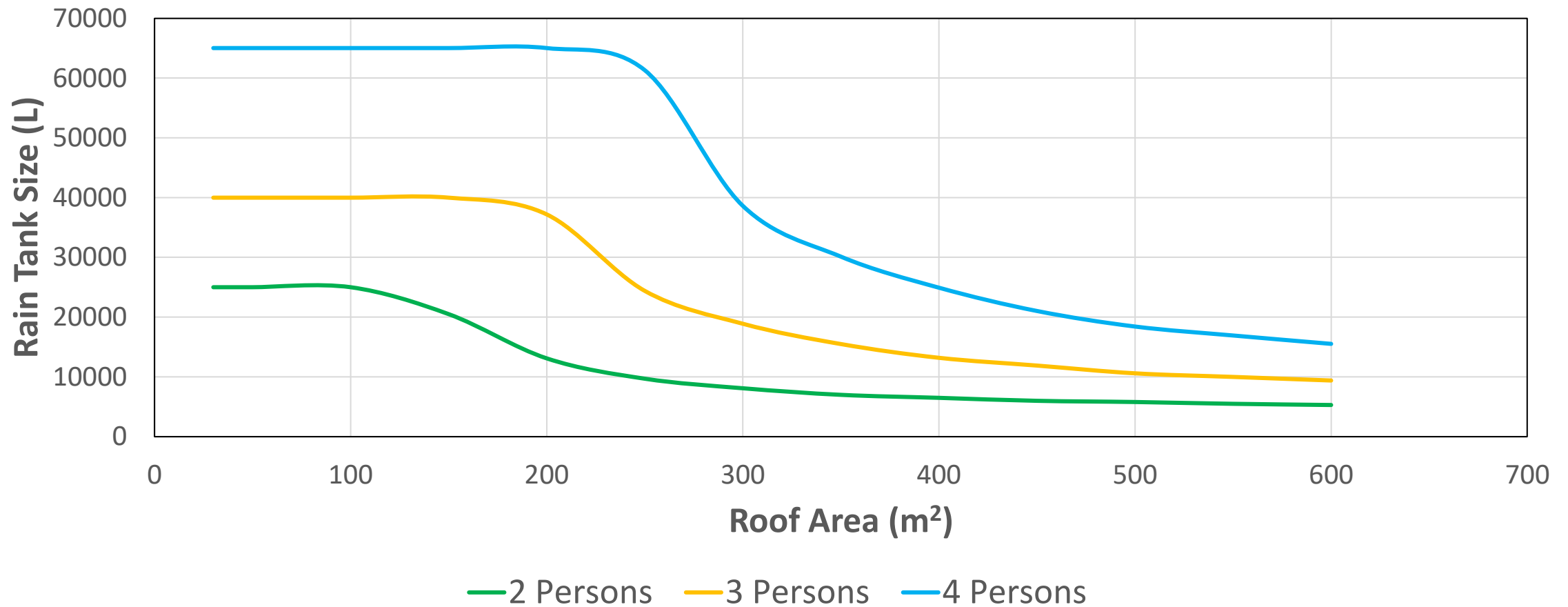
# Rain Tank Size VS Roof Area

Non-potable Water Usages

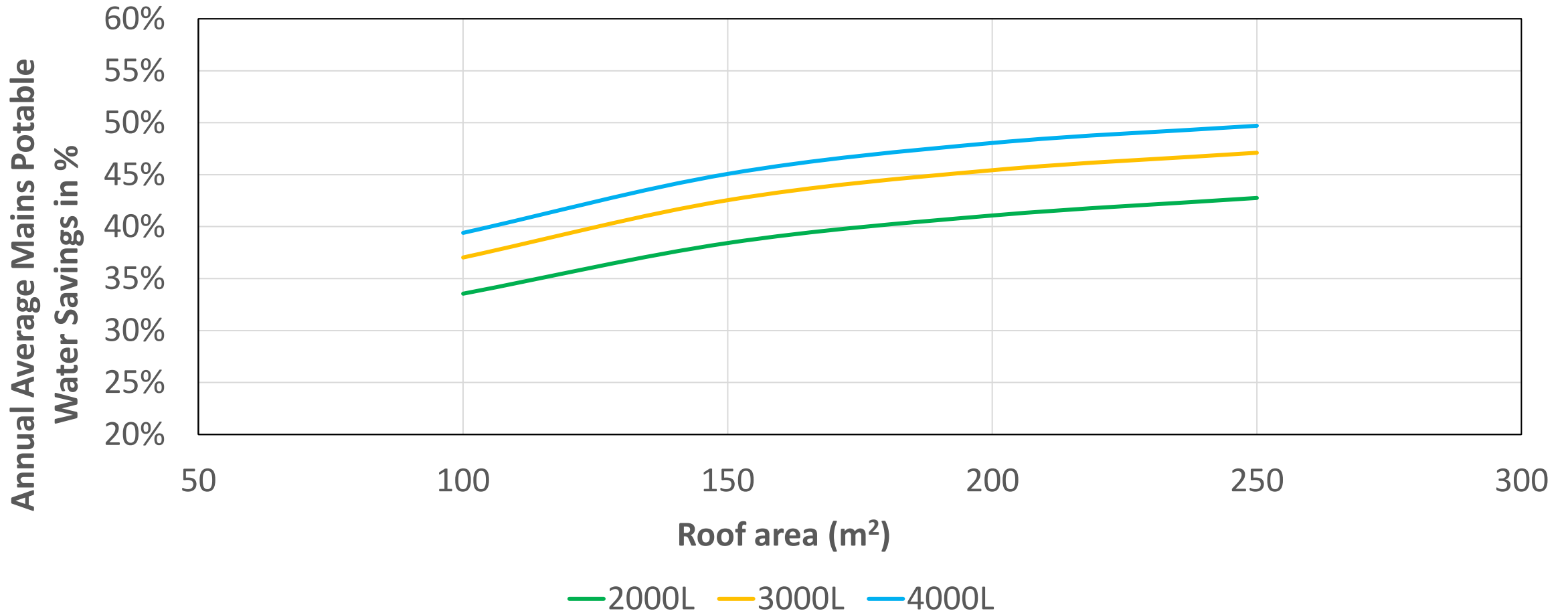


# Rain Tank Size VS Roof Area

All Water Usage

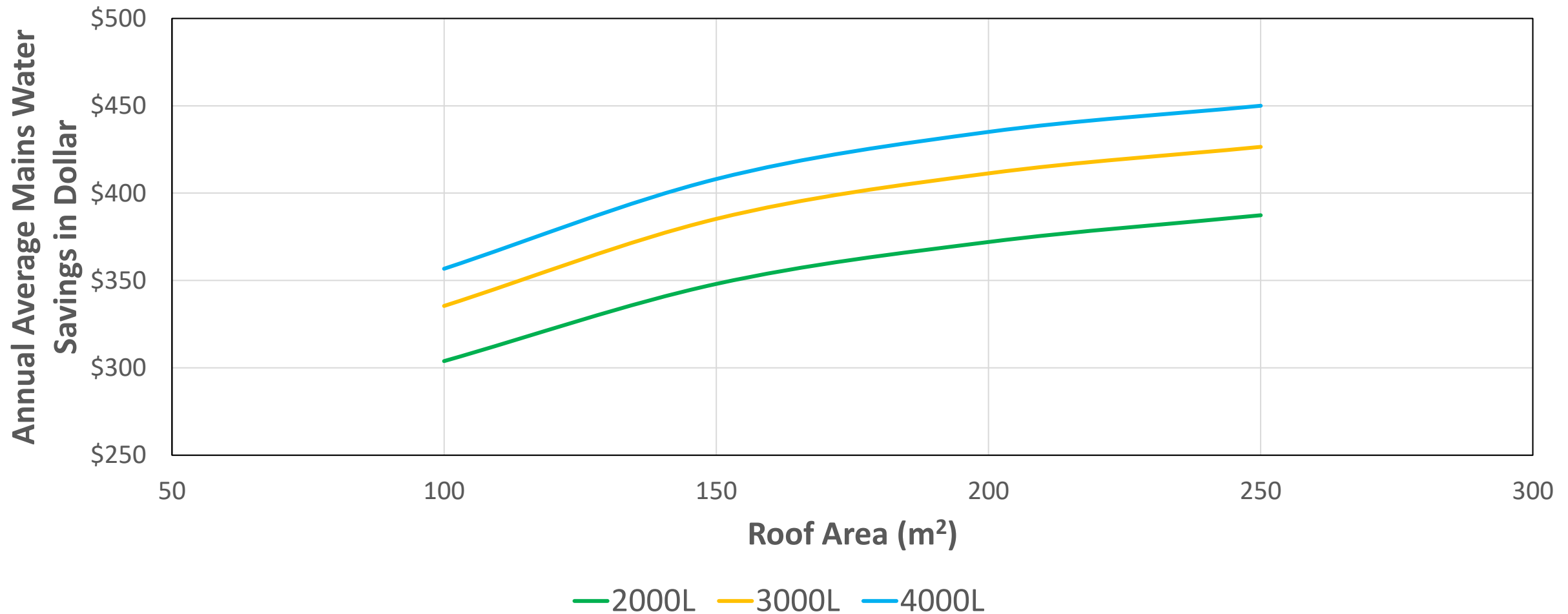


# Mains Potable Water Savings using Rain Tank as Non-potable Water Usage (%)



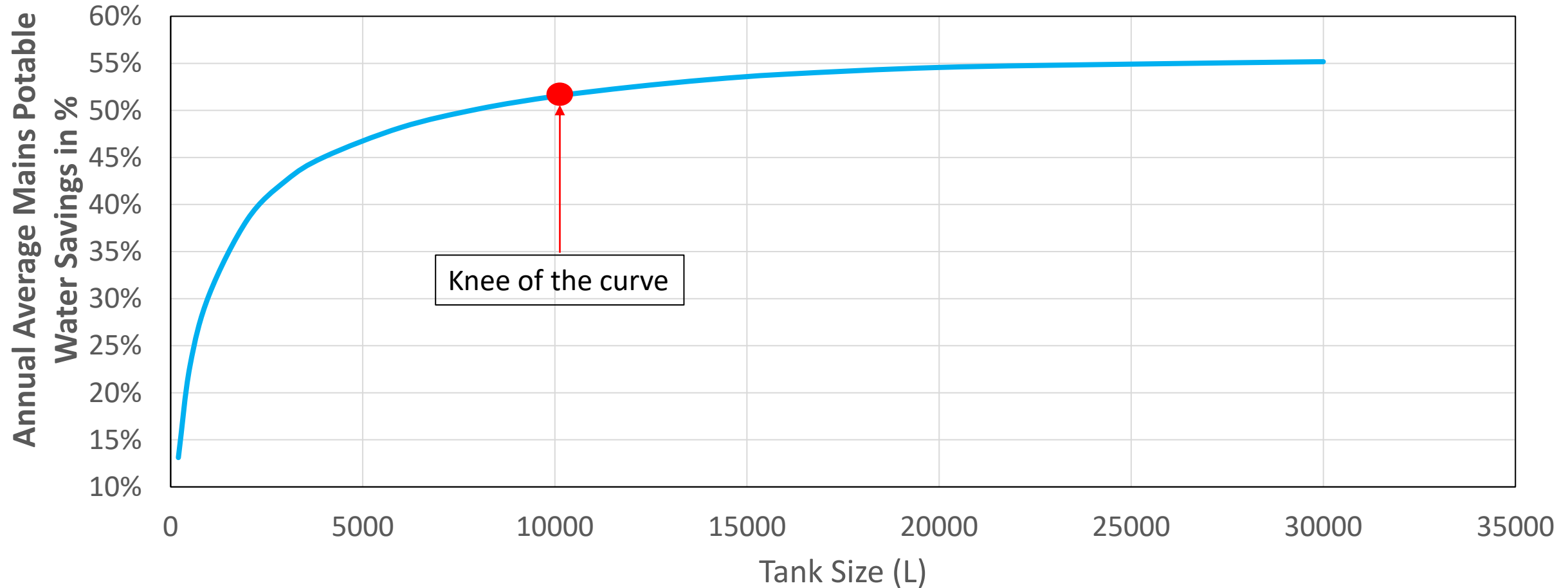


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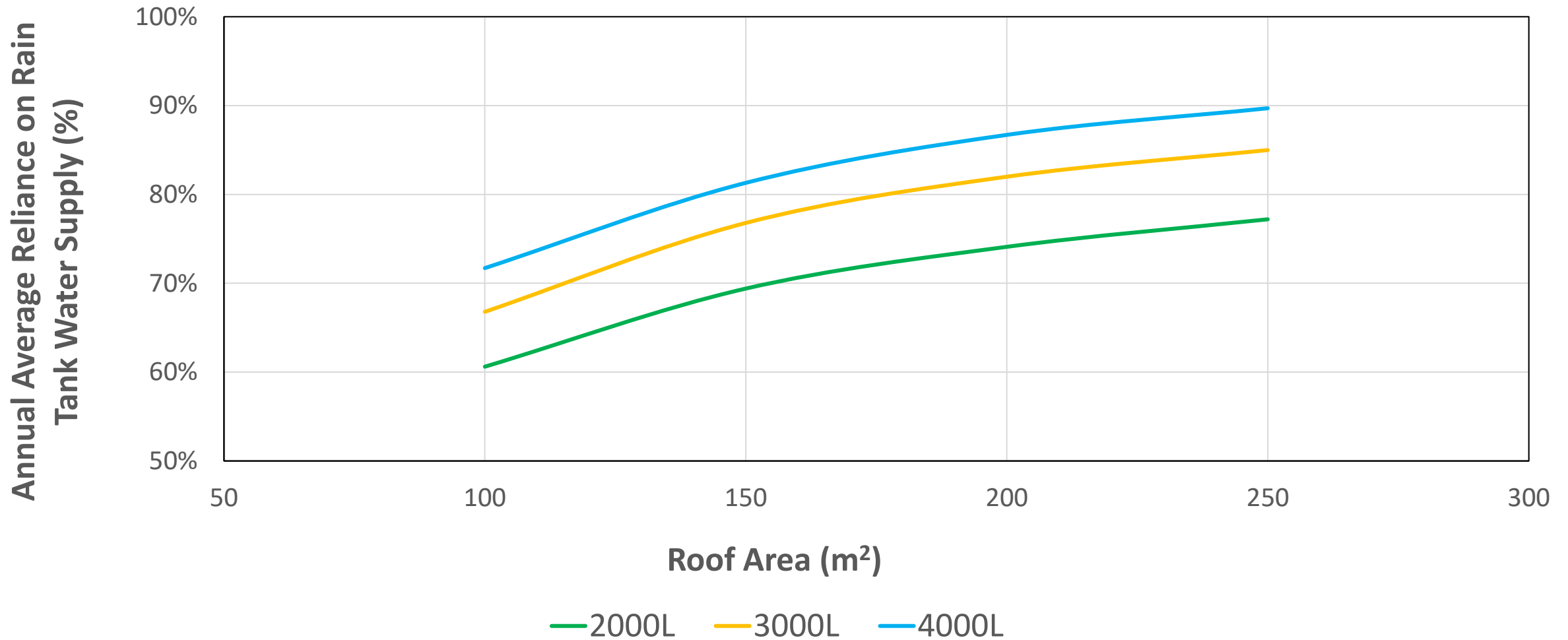


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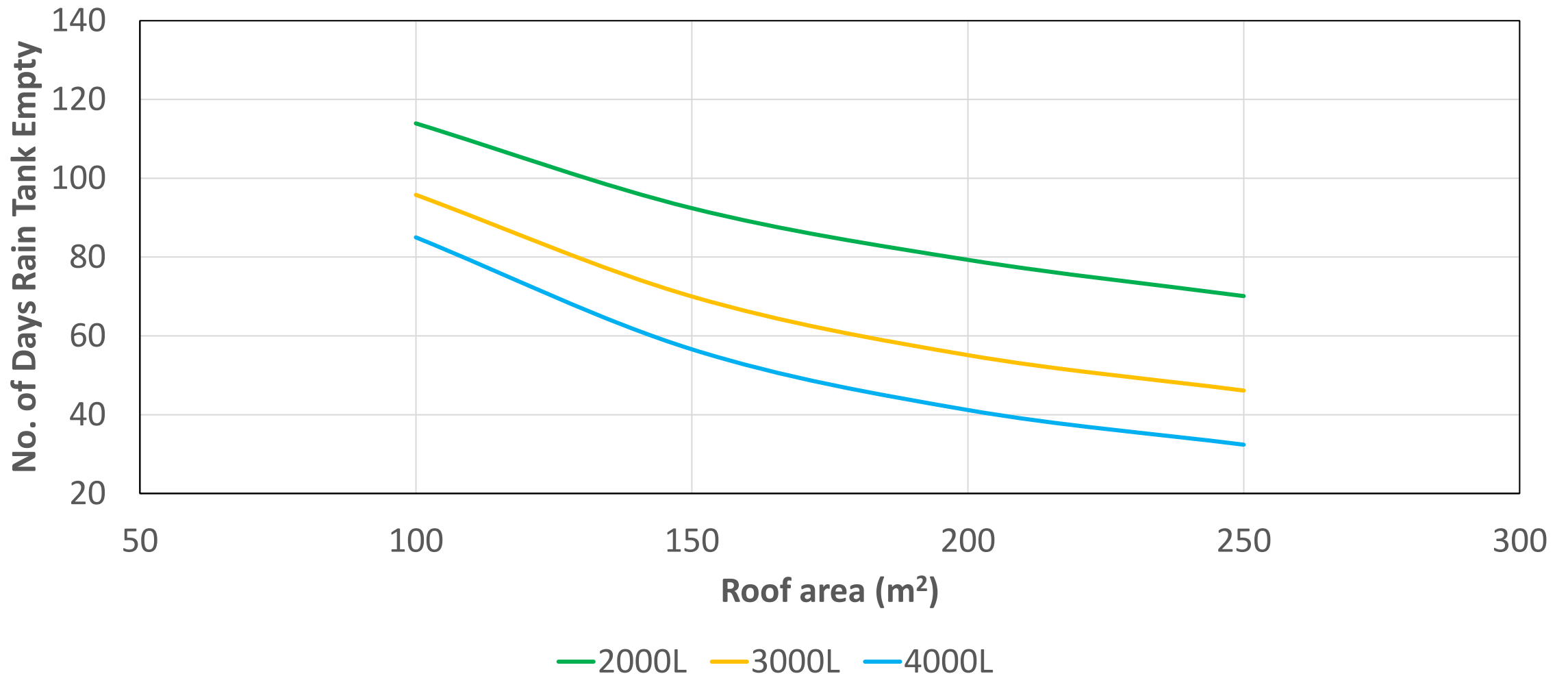
150m<sup>2</sup> Roof Area



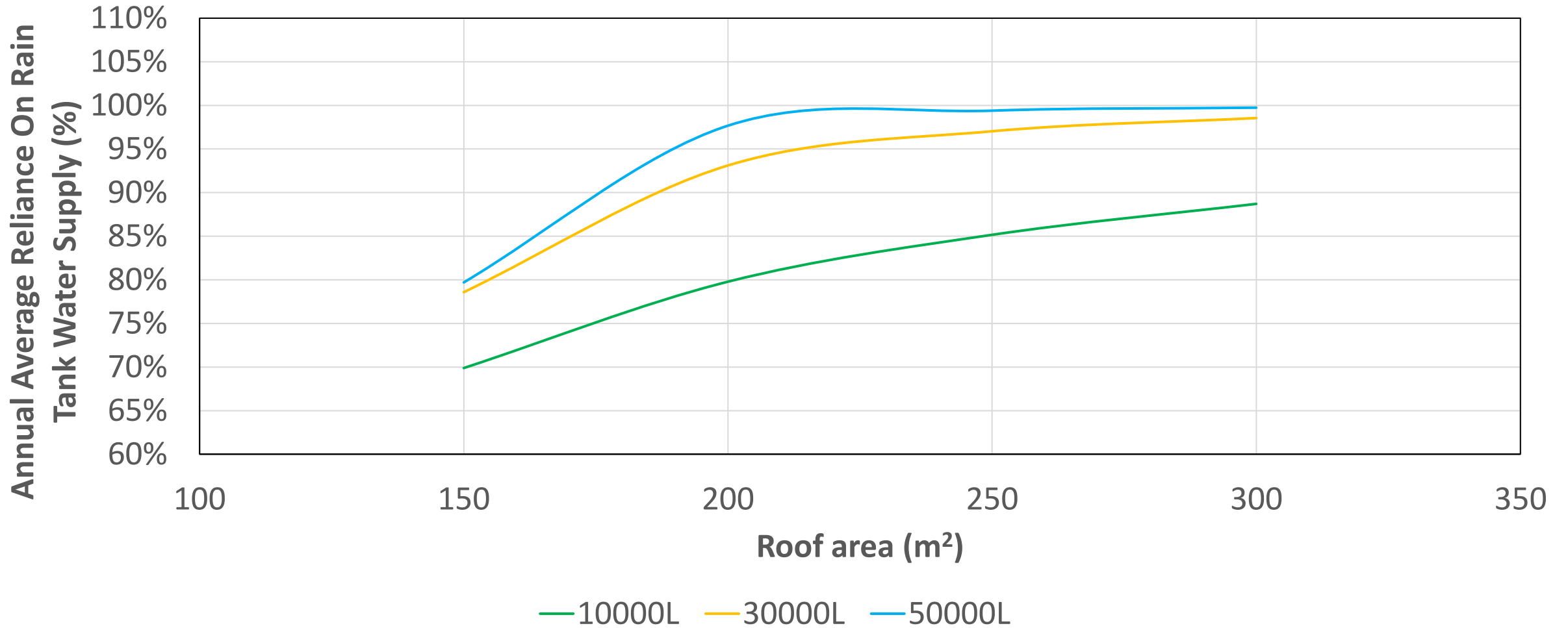
# Reliance on Rain Tank Water Supply as Non-potable Water Usage



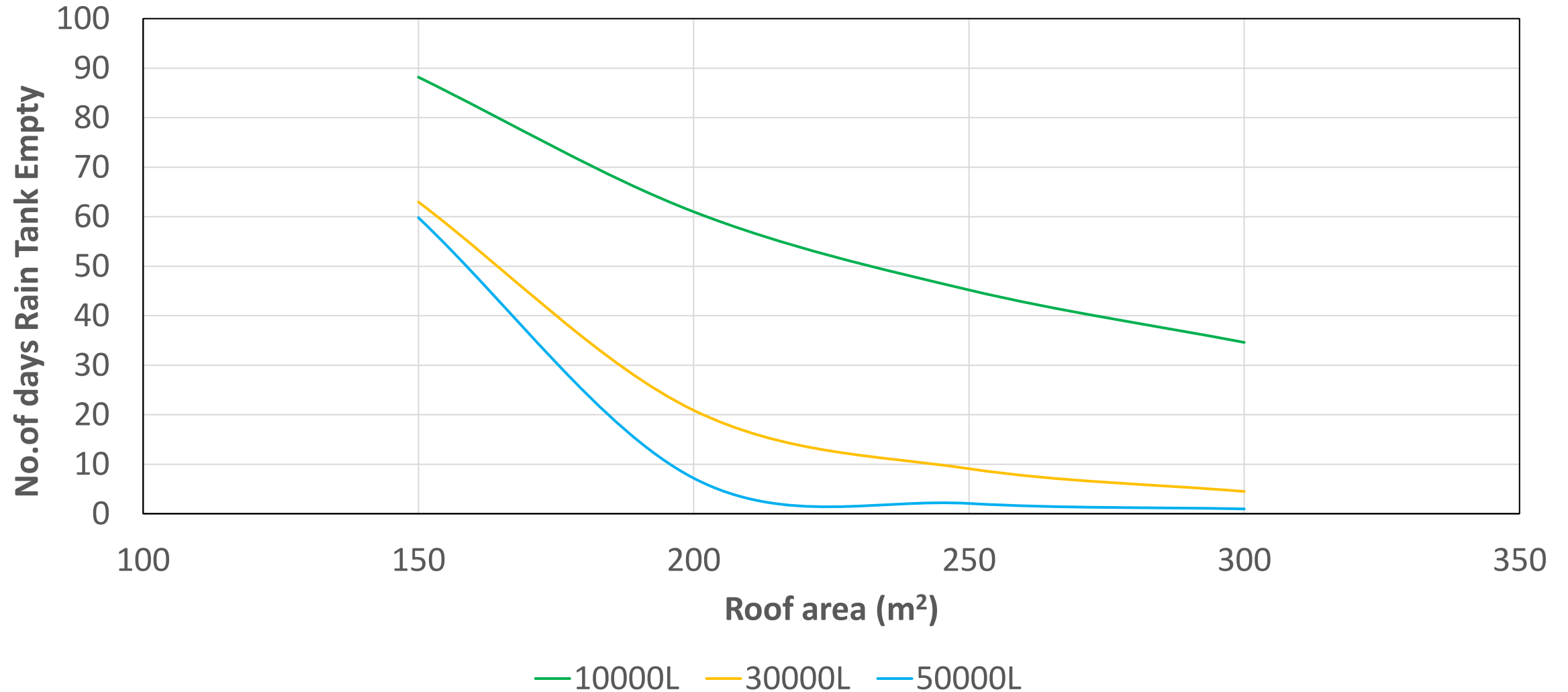
# Rain Tank Empty (days/year) as Non-Potable Water Usage



# Reliance on Rain Tank Water Supply as All Water Usage

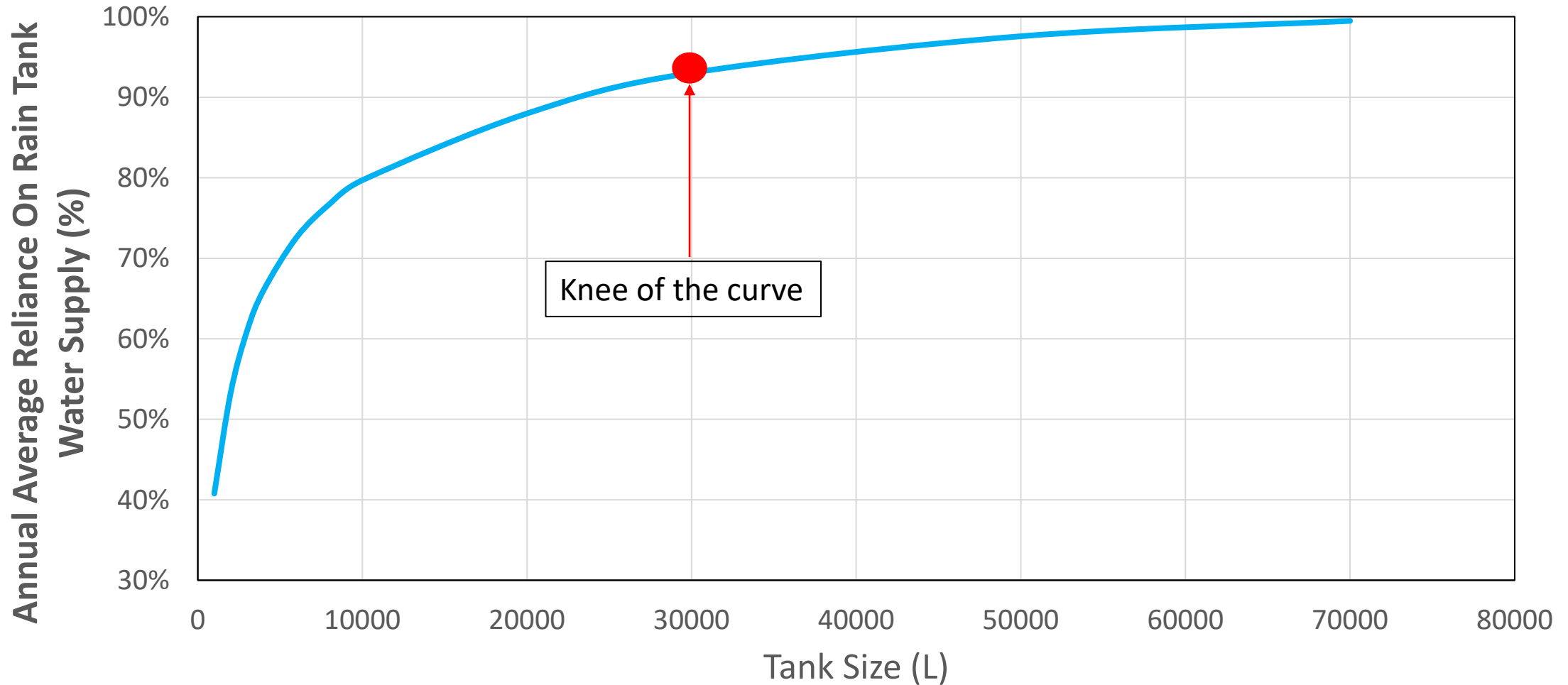


# Rain Tank Empty (day/year) as All Water Usage



# Reliance on Rain Tank Water Supply as All Water Usage

200m<sup>2</sup> Roof Area



# Conclusions

- Rainwater tank water balance analysis shows a non-linear relationship between roof area and rainwater tank size.
- This tool provides better understanding of potential benefits and sizing of rainwater tanks as household non-potable and potable water usages.
- It also provides the reliance of rainwater tank water supply as percentage of total household water demand and number of days tank would be empty.
- Use of rainwater tanks for the supply of non-potable water in urban areas could provide substantial mains water saving benefits.
- This tool can be used in other parts of New Zealand to quantify better performance assessment of rainwater tanks for household water usage.



# Future Investigation

- This tool can also provide better understanding of the potential effects of rainwater tanks on the performance of the three waters networks in the future. This information will be useful in three water modelling.
- This tool can be used to assess the effects of spatial variability of rainfall on the optimal sizing of rainwater tanks from various rainfall gauges.
- This tool can also be used to assess the effects of future climate change variability of rainfall on the optimal sizing of rainwater tanks.



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Thank you!  
Questions? Patai?