Lot Scale Rainwater Harvesting and Future Flood and Drought Risks in the City of Whittlesea

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City of Whittlesea

A place for all

City of Whittlesea Program

- **CEO Water and Energy Flagship Projects (Karen Rosenberg)**
  - Council potable water savings by 2030
  - Community potable water savings by 2040

- **Integrated Water Management Strategy & Action Plan (Fleur Anderson)**
  - CRC for Water Sensitive Cities
  - E2Design Lab

Lot Scale Investment by Residents

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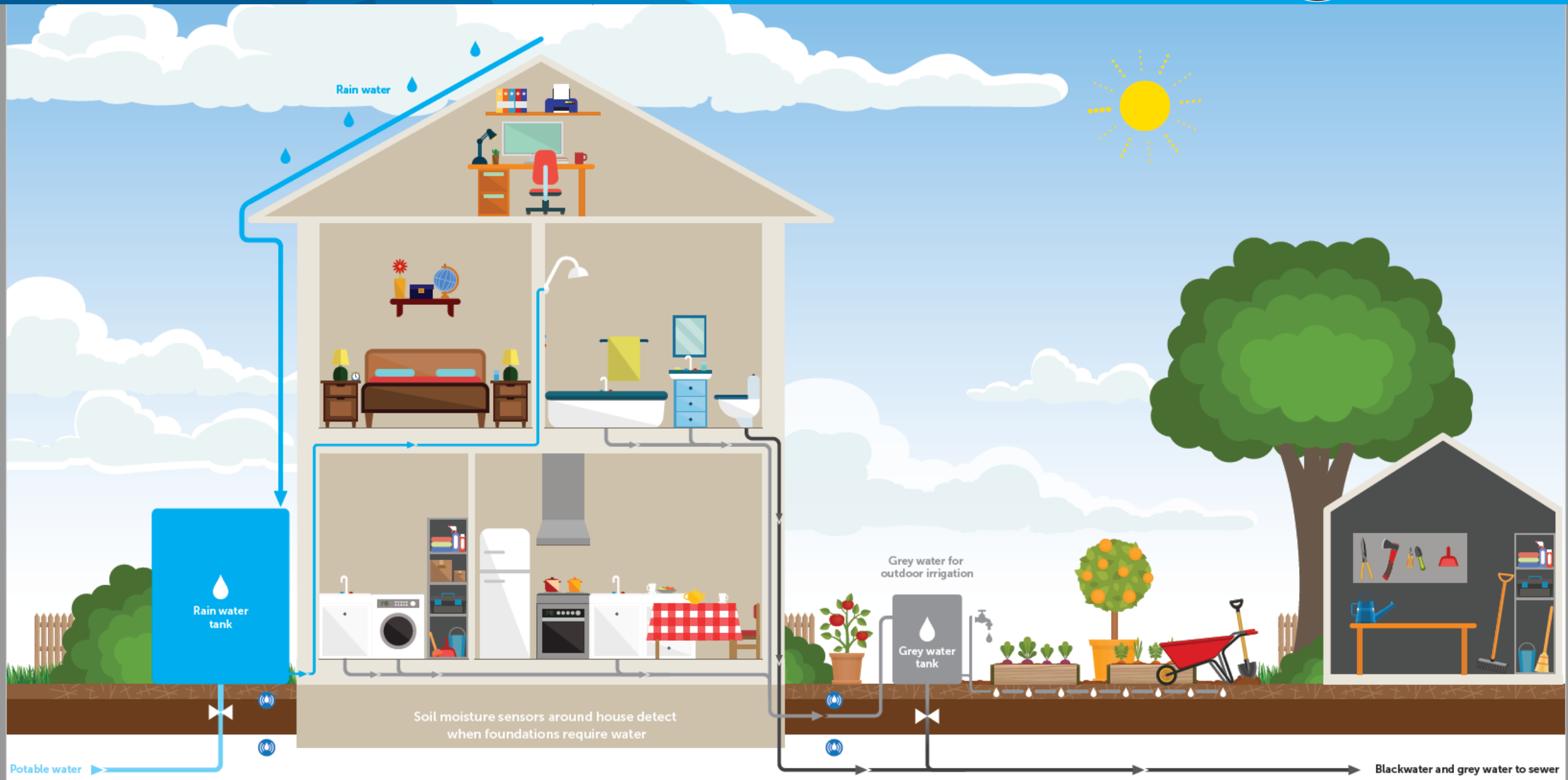
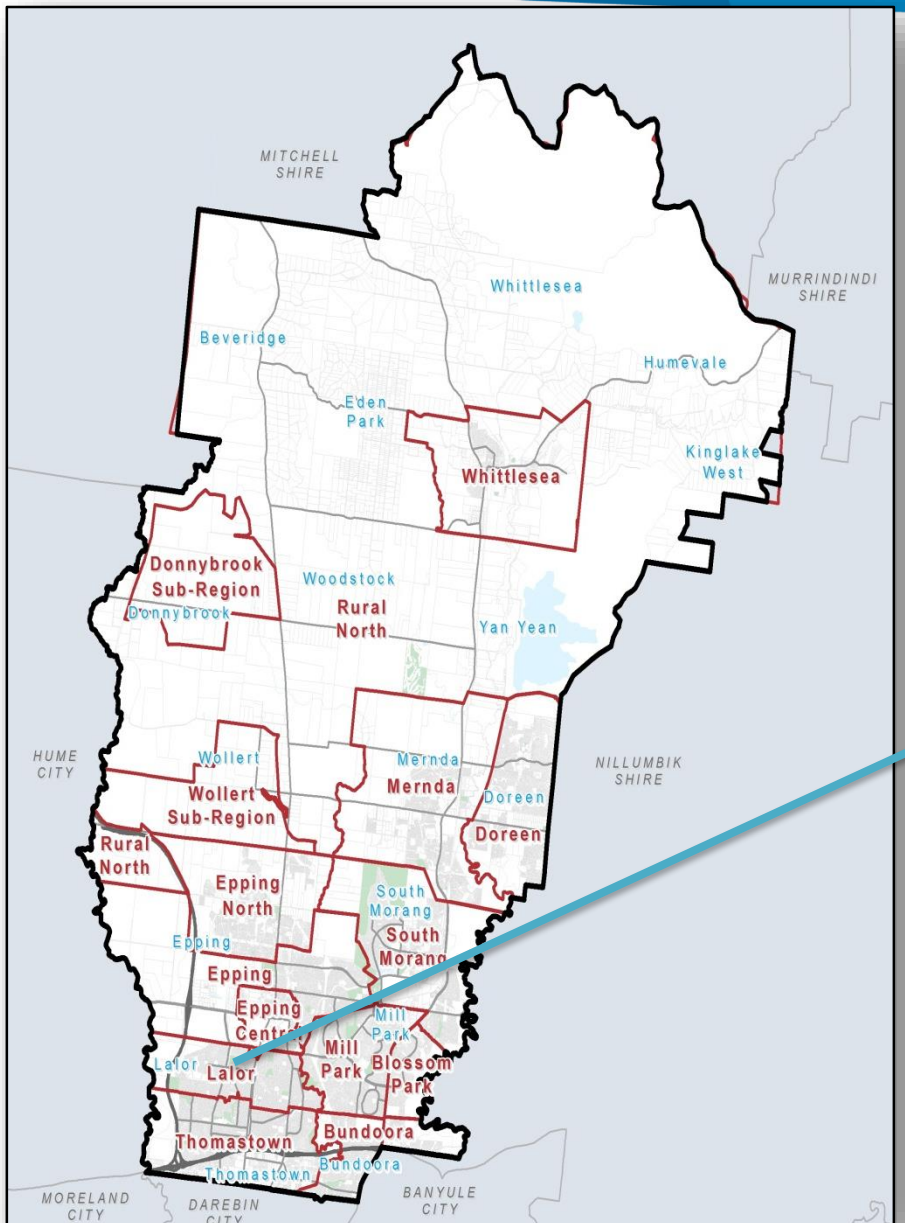
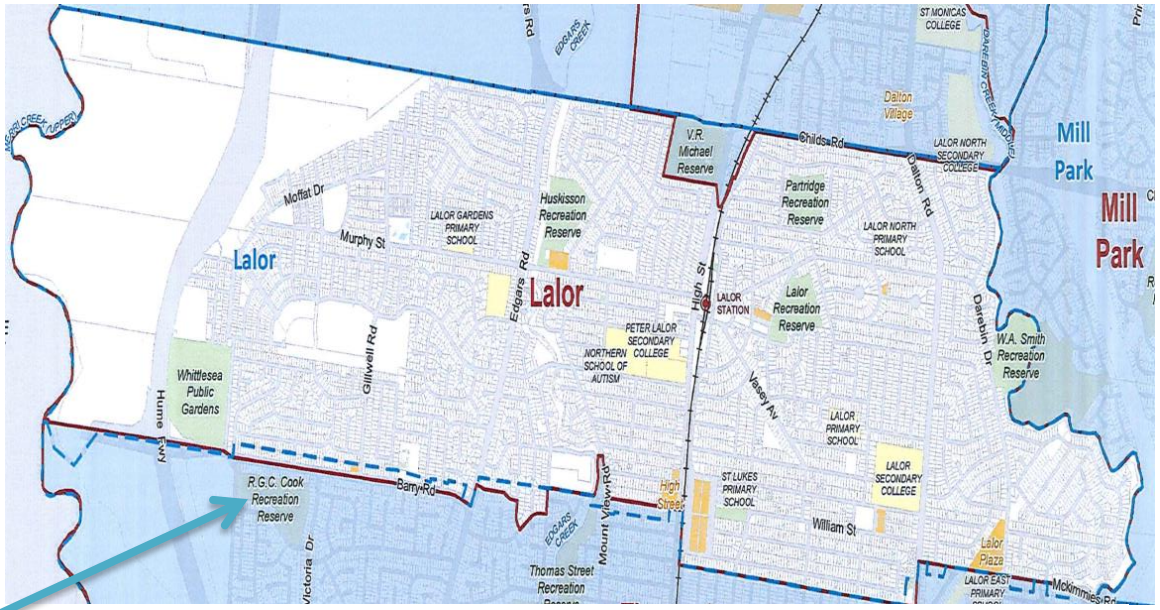


Urban Flooding Epping December 2016 – 89mm

Lalor Suburb Case Study



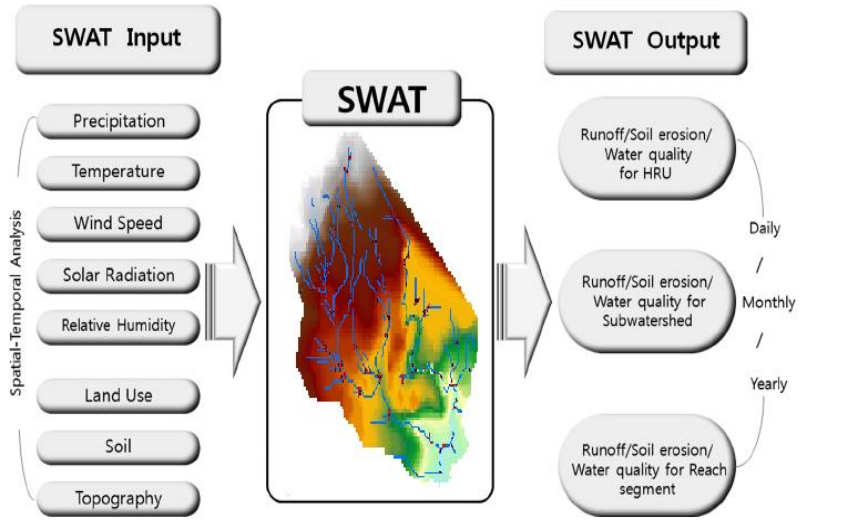


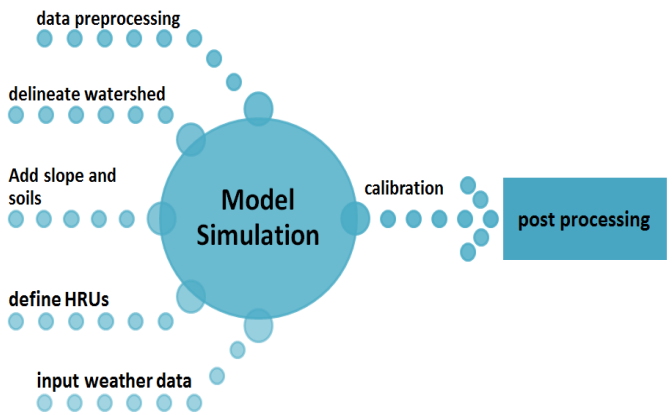
How to Measure Shared Community Flood Risk?

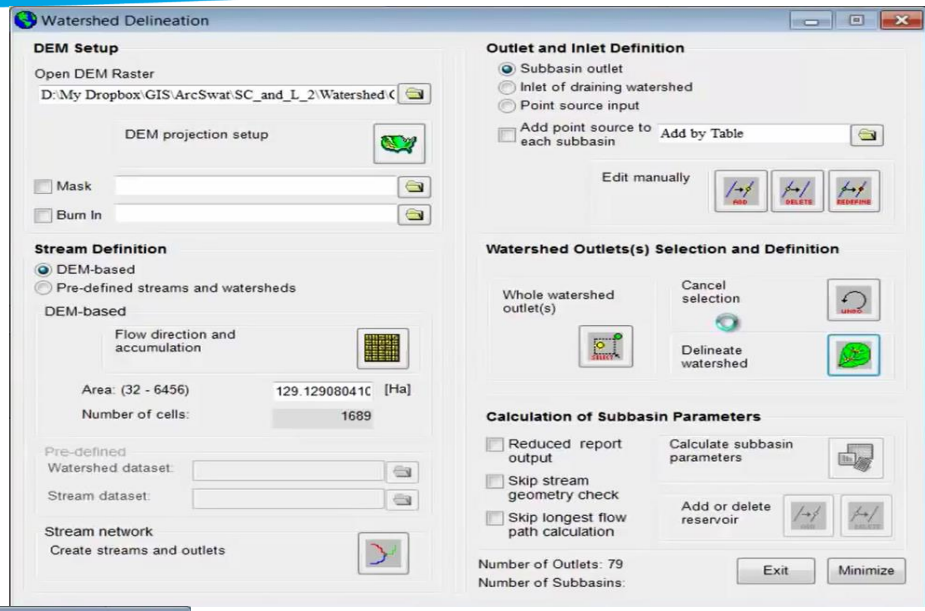
1. Average overland flow depth

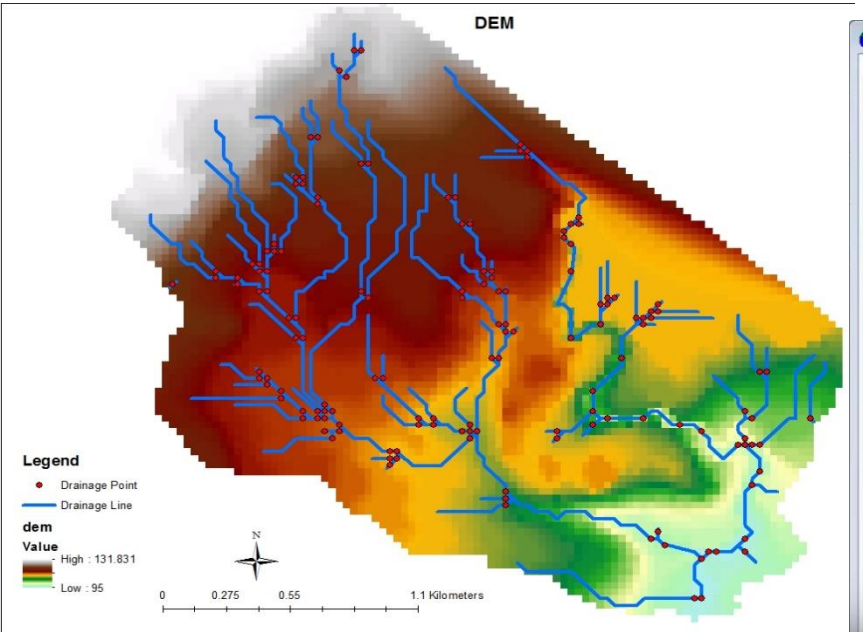
2. Rainfall event equivalent

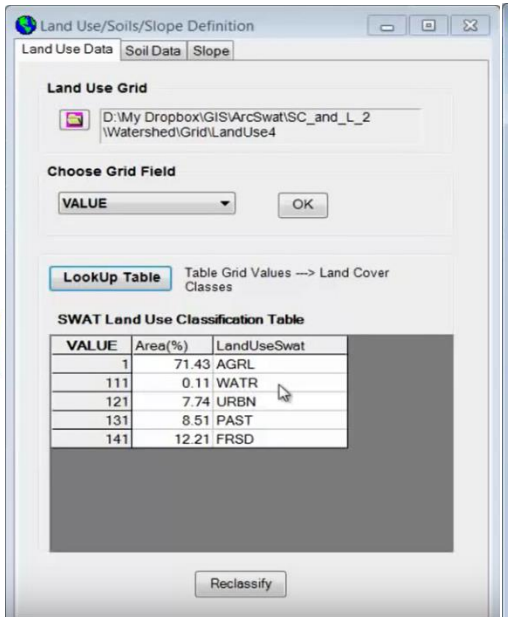
Flood Modelling

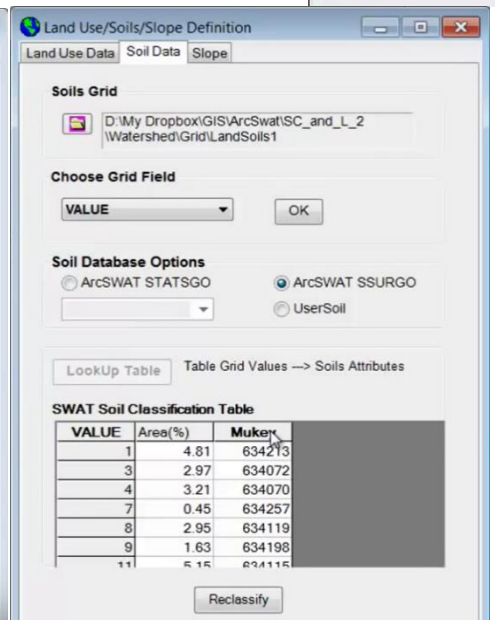


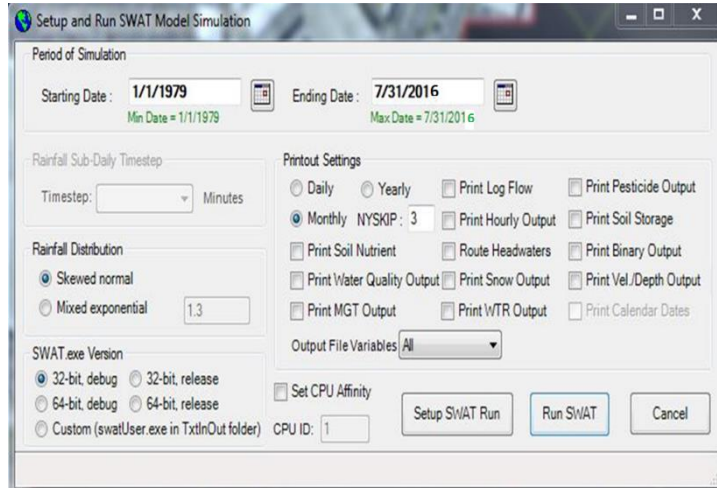












Rainwater tank installations – 89mm event

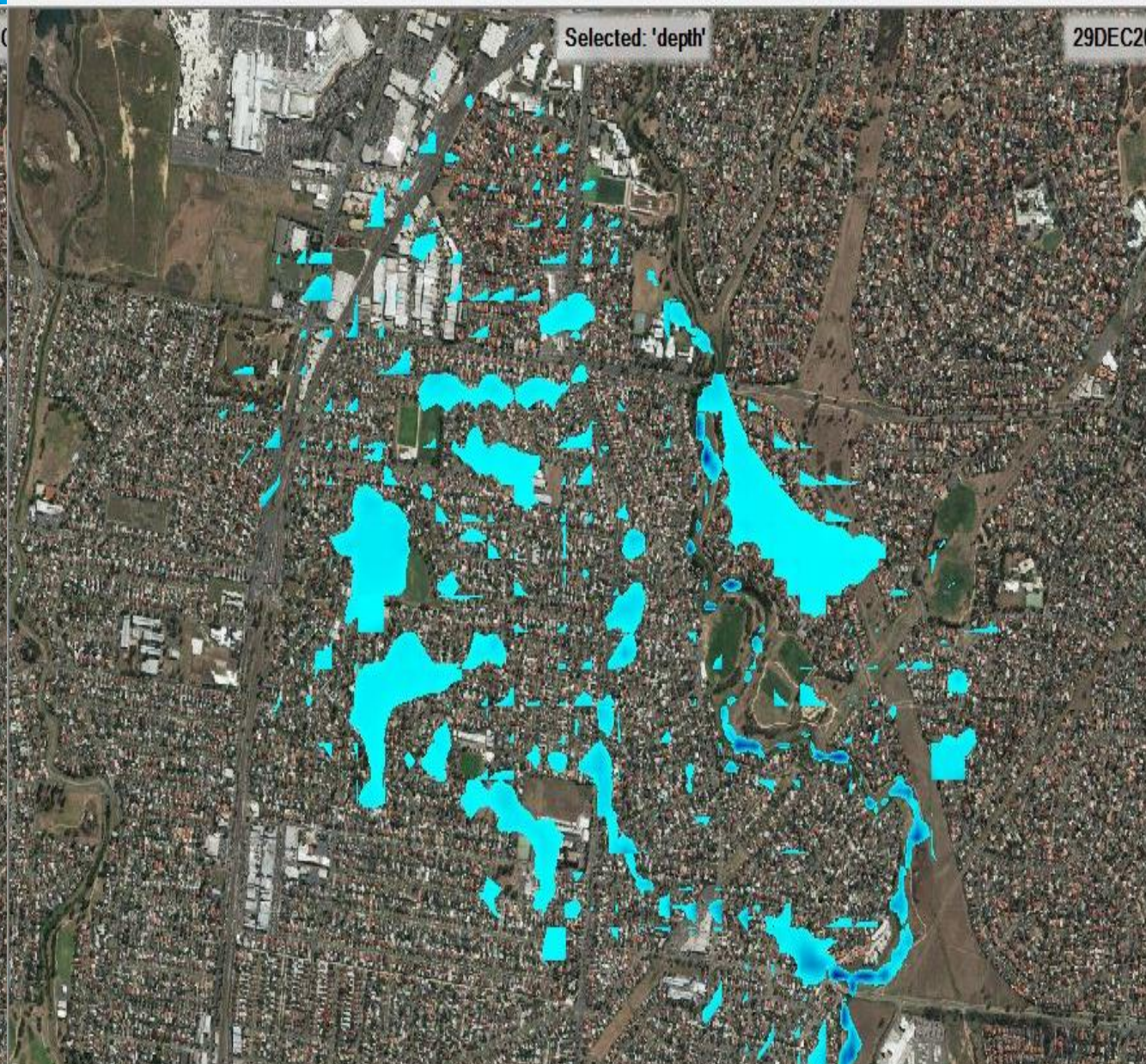
Rainwater tank installation per house	Average overland flows (mm)	Rainfall event equivalent (mm)
No tank installations	**42.0 mm**	**89 mm**
1 x 5,000 L tank	36.0 mm	77 mm
2 x 5,000 L tanks	30.0 mm	64 mm
3 x 5,000 L tanks	27.5 mm	59 mm
4 x 5,000 L tanks	**26.8 mm**	**57.5 mm**
Infinite size tank	25.7 mm	55.0 mm

Overland Flows no Tank

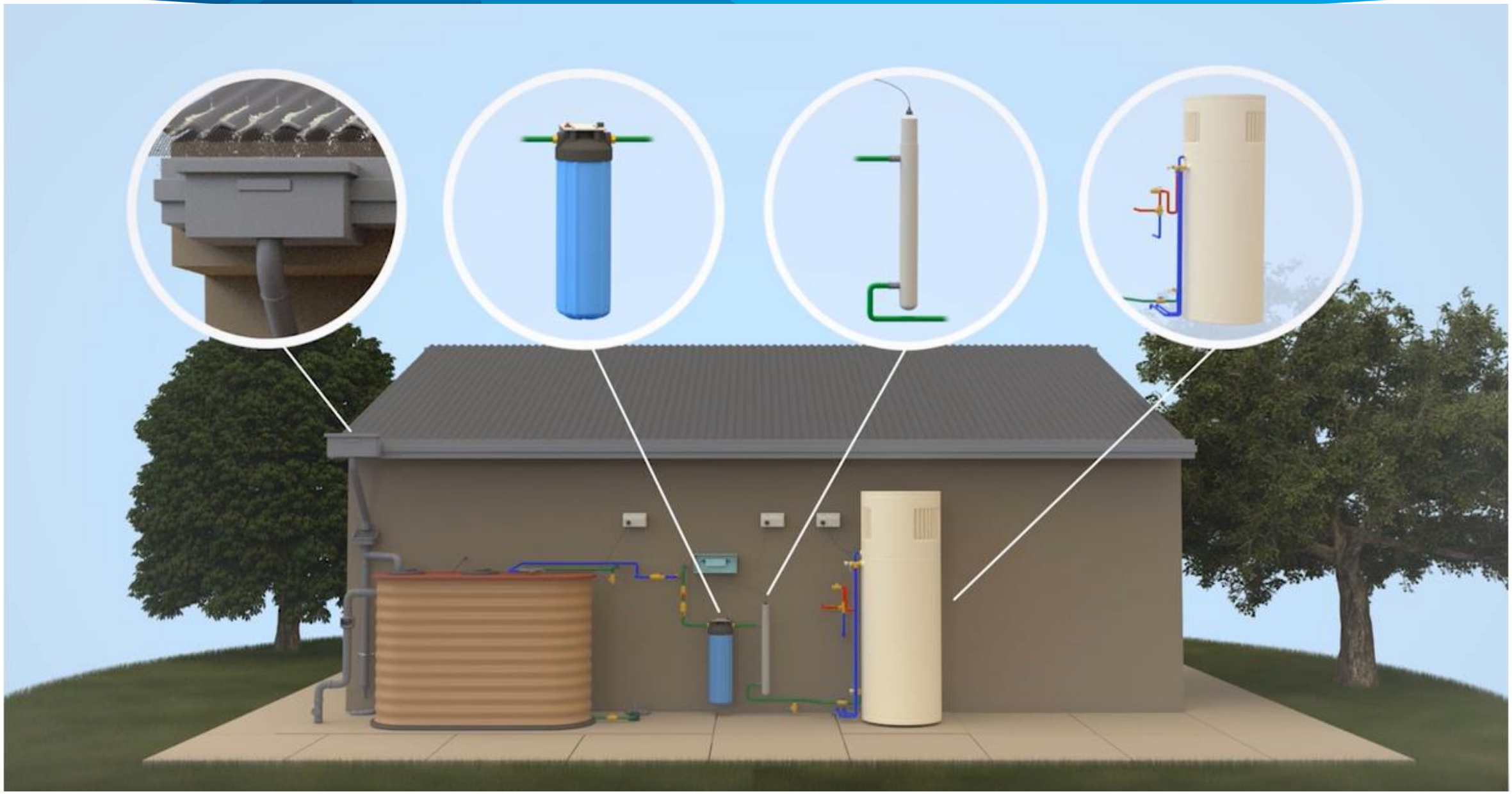
Overland Flow with Tanks

Overland Flows no Tank

Overland Flows with Tanks



Aquarevo – Tank to Shower Treatment Train

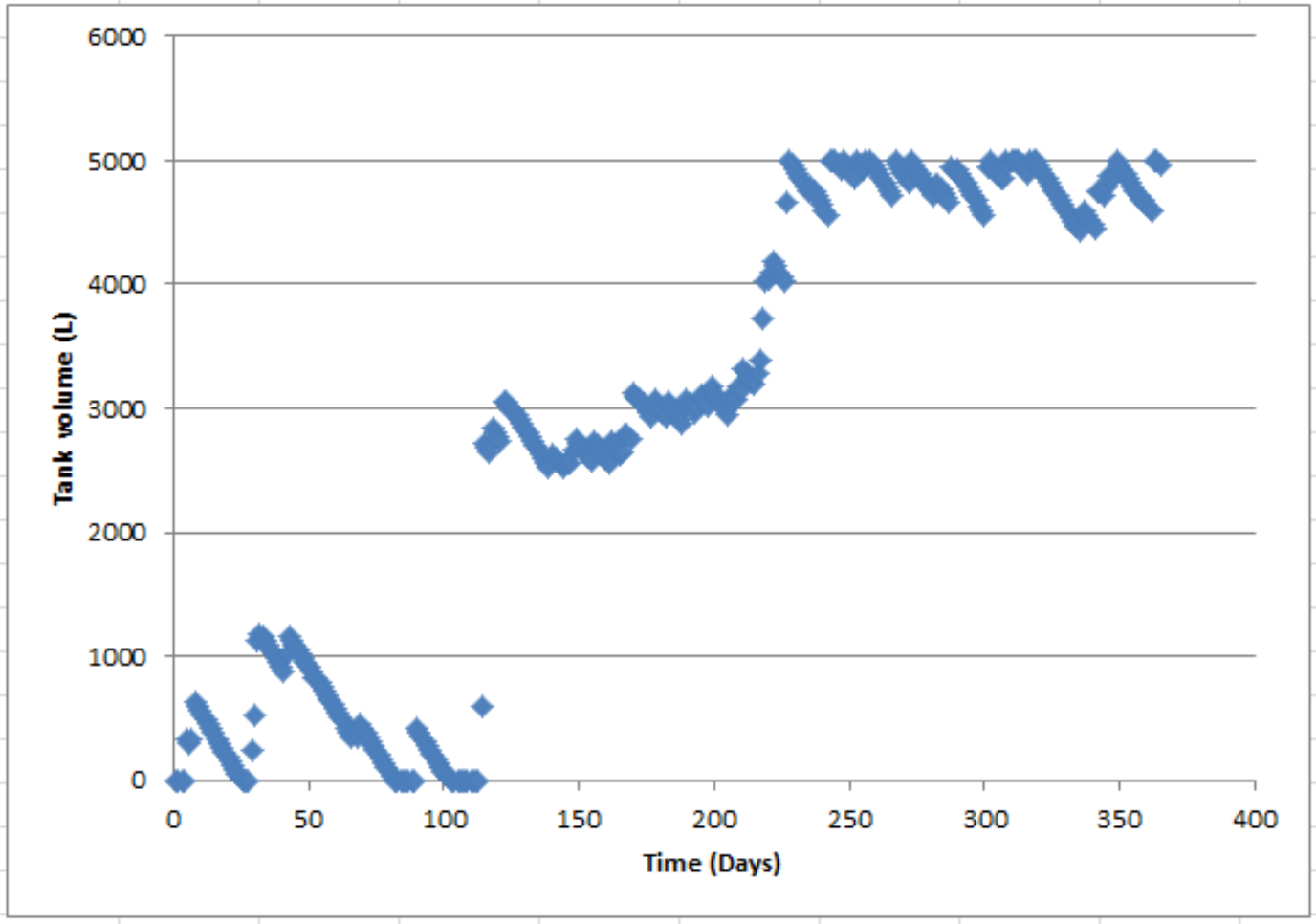


Rainwater Tank for Showering during Drought

- Modelling during **Millennium Drought** 2004-2009
- 1 x 5,000 L tank connected to 42.5m2 of roof
- Tank being used by one person
- Using 36L/day for showering

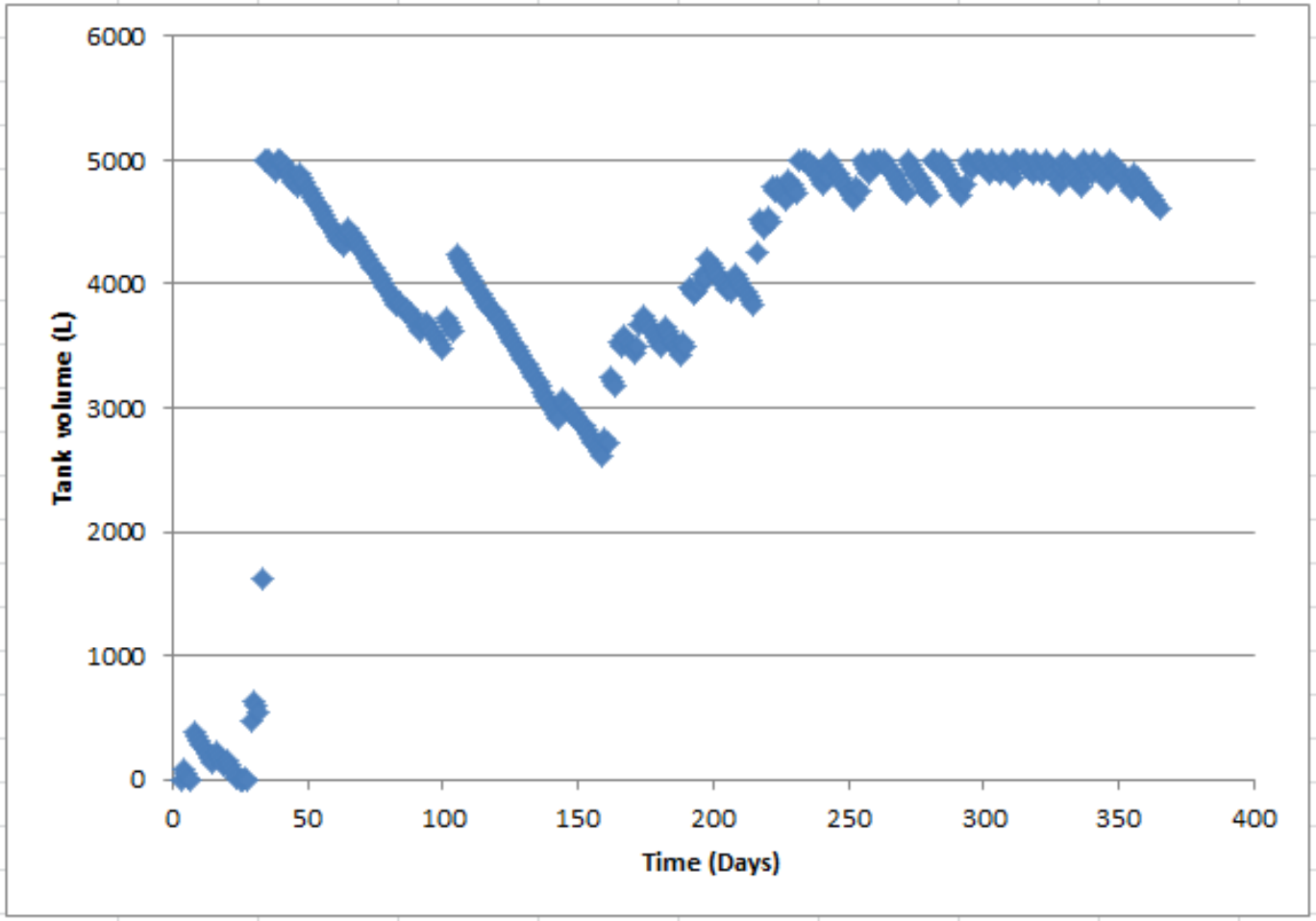
Millennium Drought – 2004 (633mm)

Tank volume (L)	Roof area (m2)	Daily use	36		Rainwater use (L/yr)
5000	42.5				12060



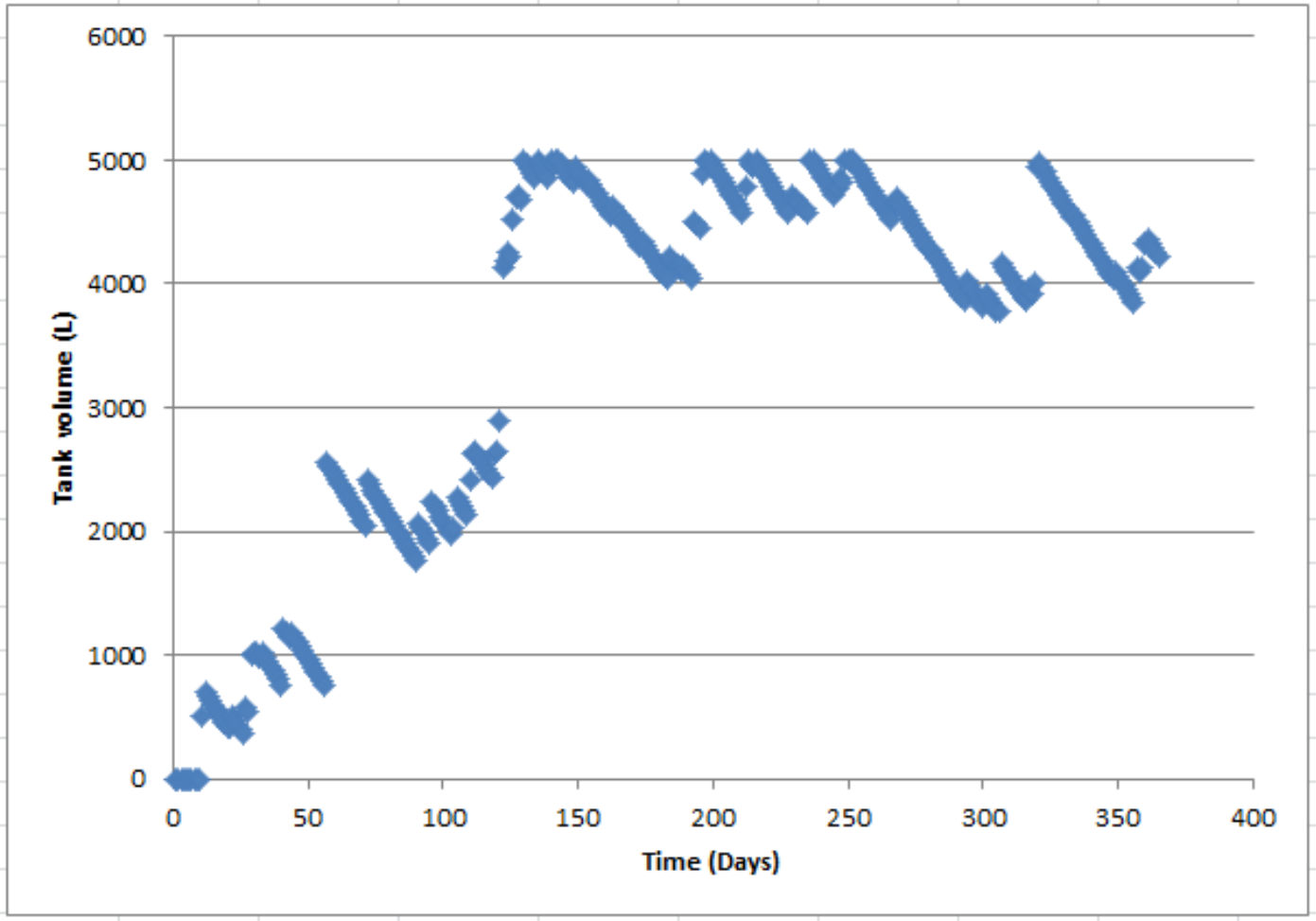
Millennium Drought – 2005 (628mm)

Tank volume (L)	Roof area (m2)	Daily use (	36	Rainwater use (L/yr)
5000	42.5			12780



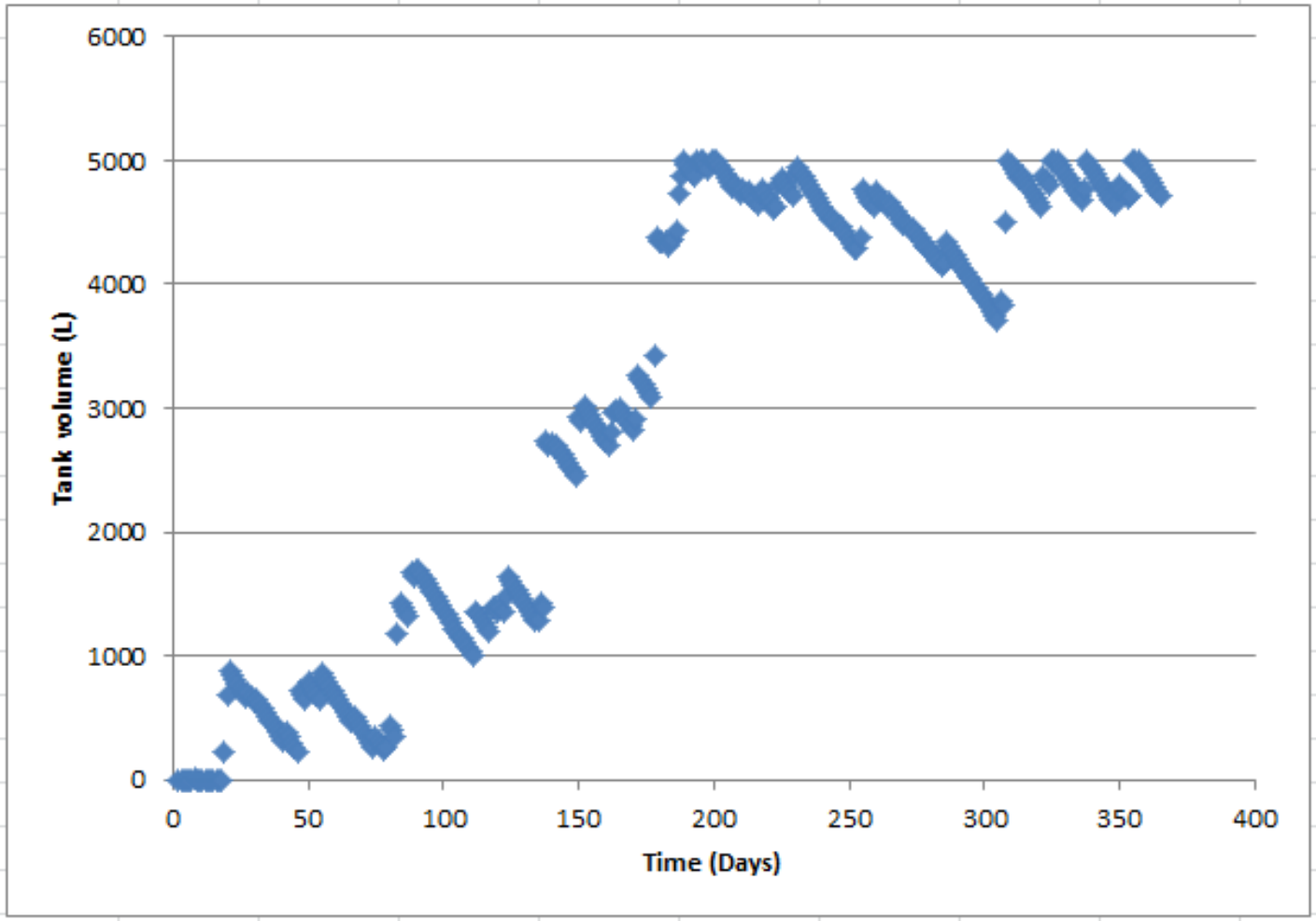
Millennium Drought – 2006 (472mm)

Tank volume (L)	Roof area (m2)	Daily use (	36	Rainwater use (L/yr)
5000	42.5			12780
				97%



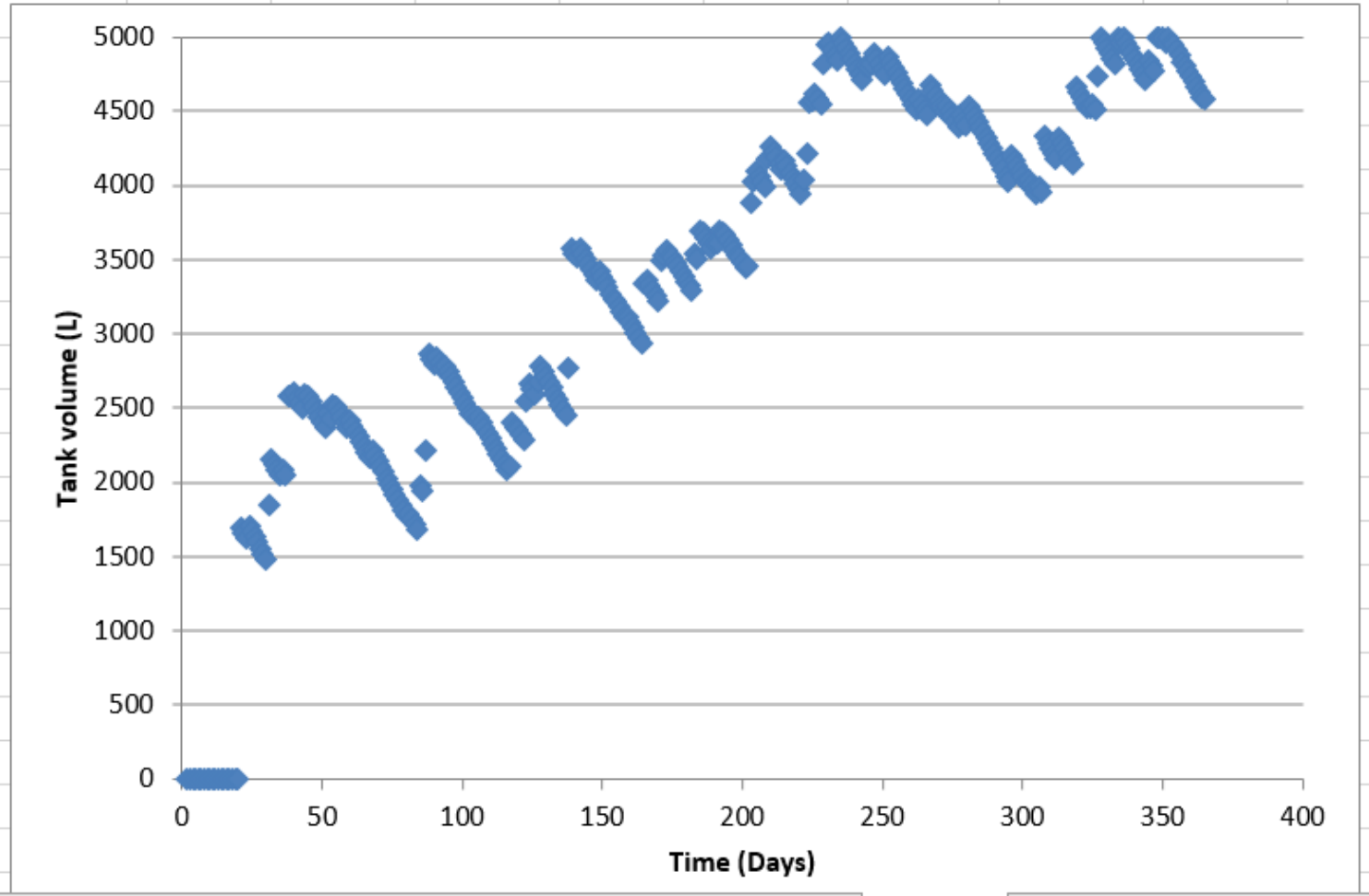
Millennium Drought – 2007 (519mm)

Tank volume (L)	Roof area (m2)	Daily use	36	Rainwater use (L/yr)
5000	42.5			12492
				95%



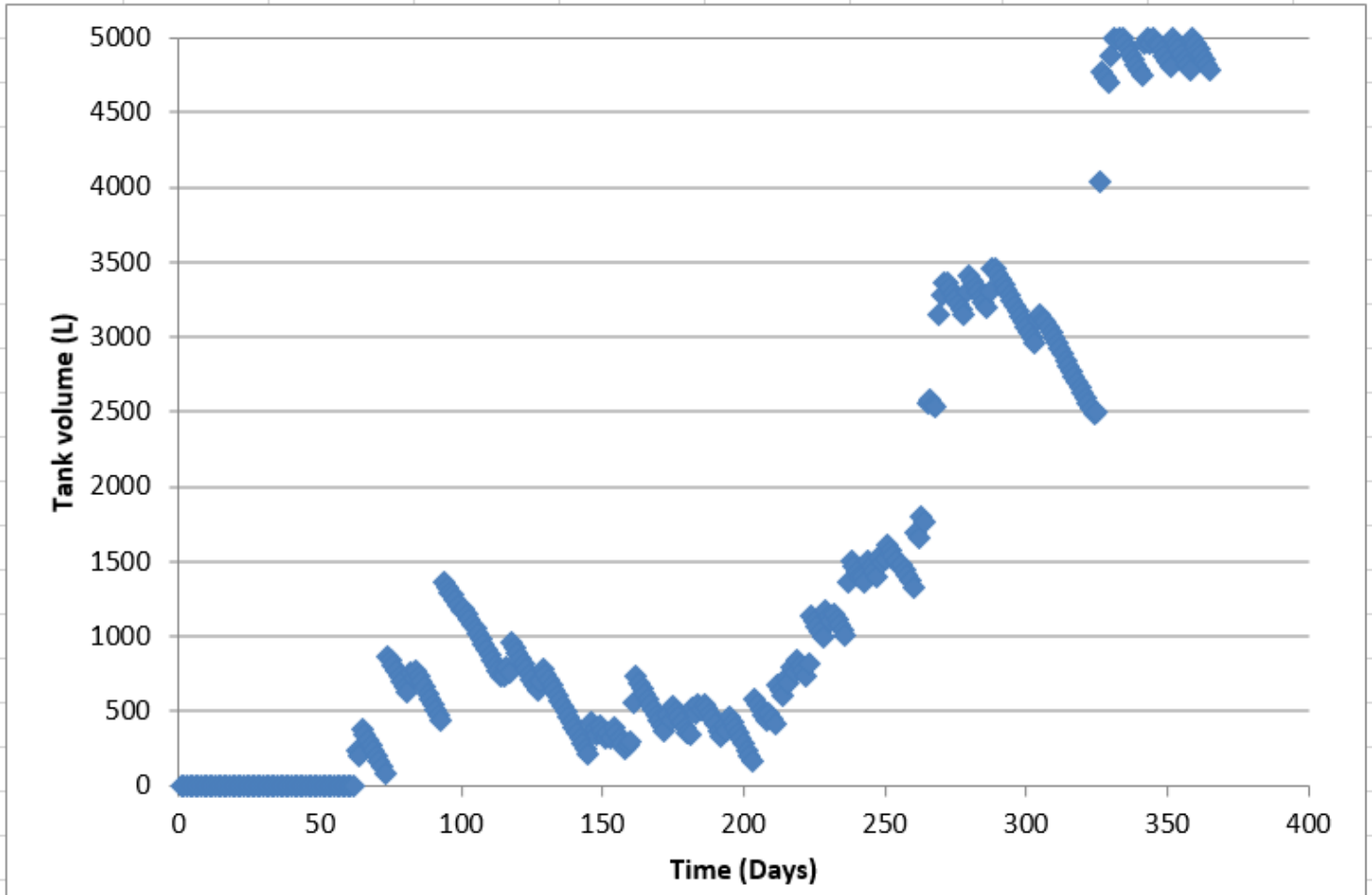
Millennium Drought – 2008 (509mm)

Tank volume (L)	Roof area (m2)	Daily use (	36	Rainwater use (L/yr)
5000	42.5			12420
				95%



Millennium Drought – 2009 (416mm)

Tank volume (L)	Roof area (m2)	Daily use (	36	Rainwater use (L/yr)
5000	42.5			10908
				83%



Grey Water Use and Recycling on the Lot Scale

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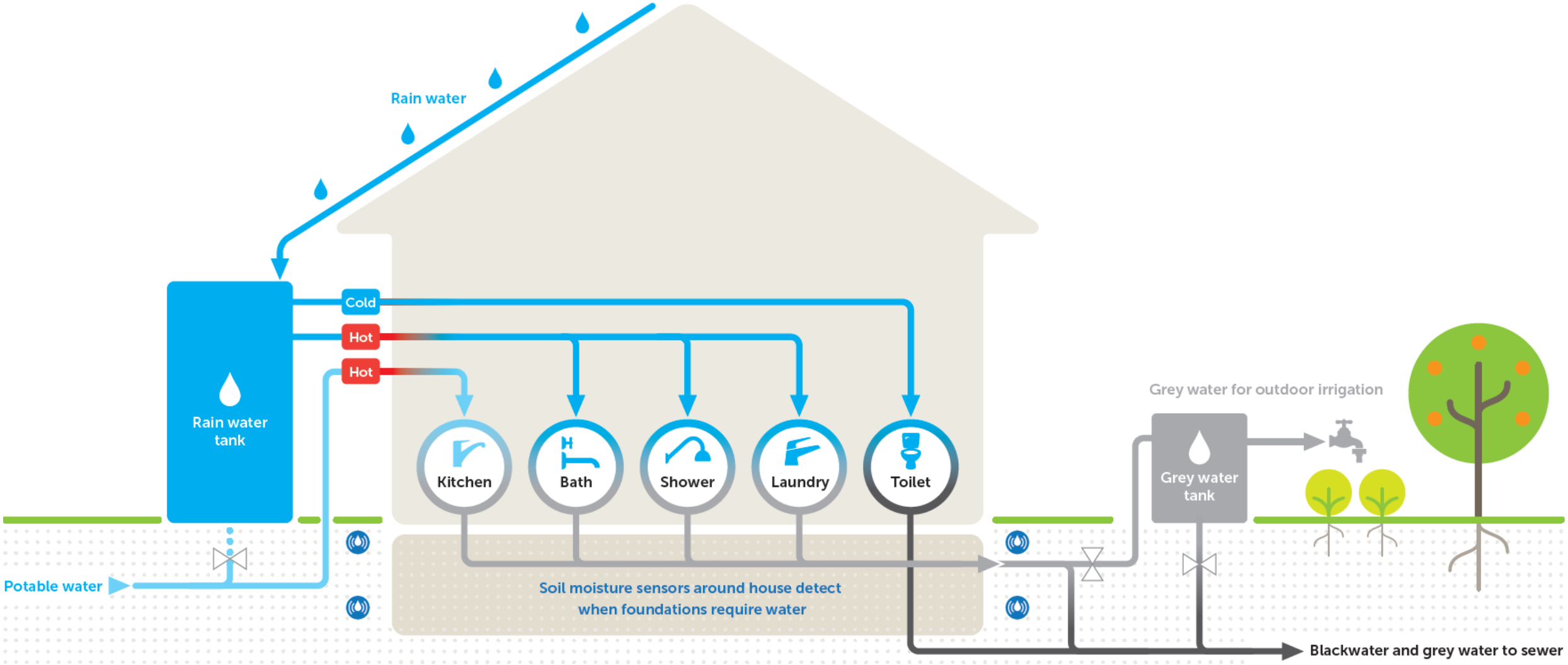
1. Greening and urban cooling
2. Stabilising soil moisture
3. Local food production
4. Roof top solar distillation

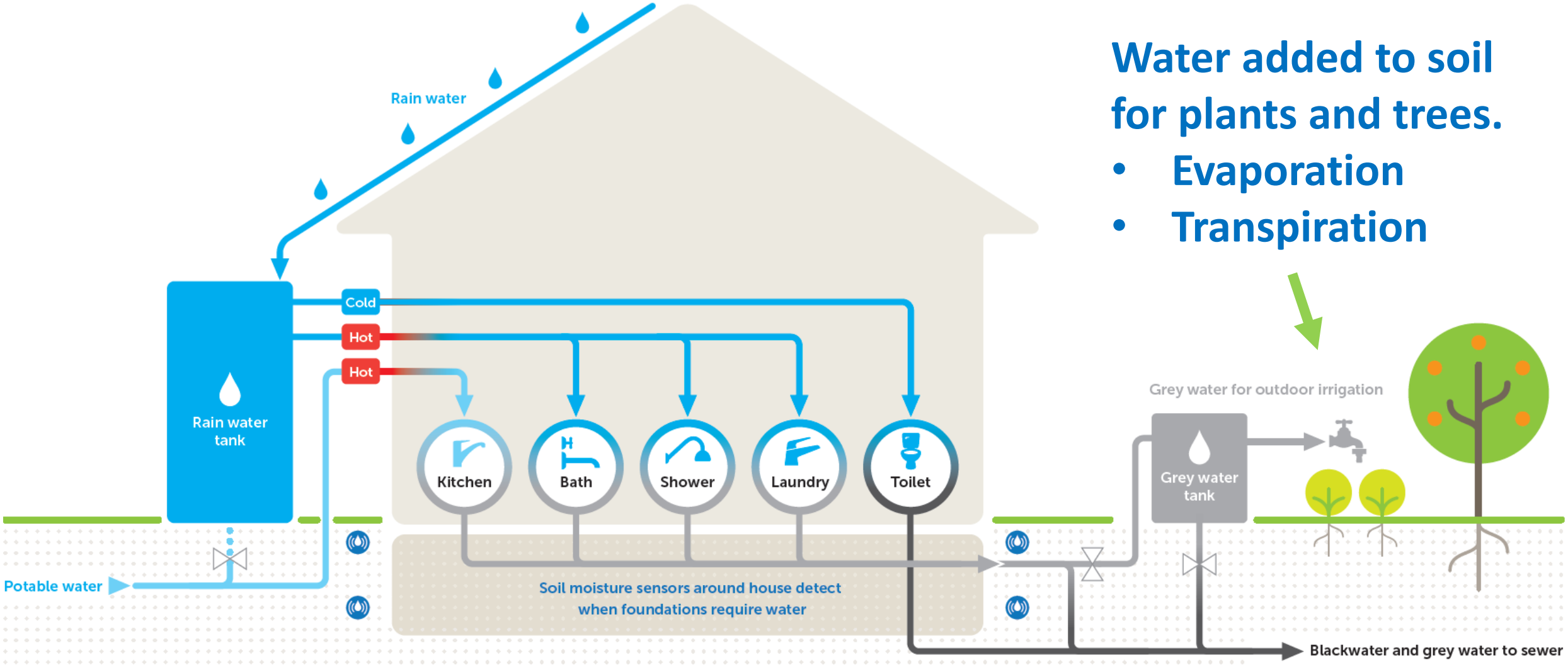
Water Sensitive House

City of Whittlesea



Water Sensitive House – Urban Cooling

City of Whittlesea



Water added to soil for plants and trees.

- **Evaporation**
- **Transpiration**

Water Sensitive House – Soil Moisture Sensors

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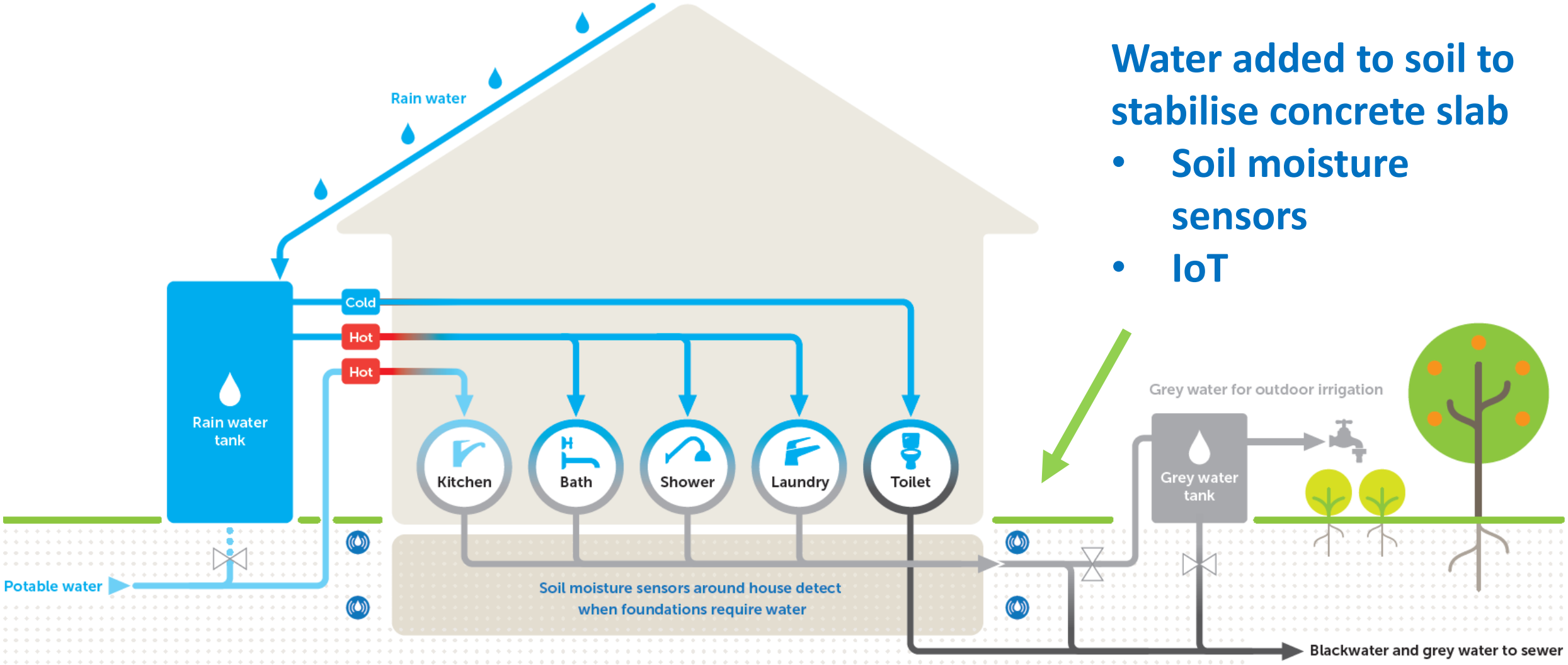

Water added to soil to stabilise concrete slab

- **Soil moisture sensors**
- **IoT**

Water Sensitive House – Local Food Production

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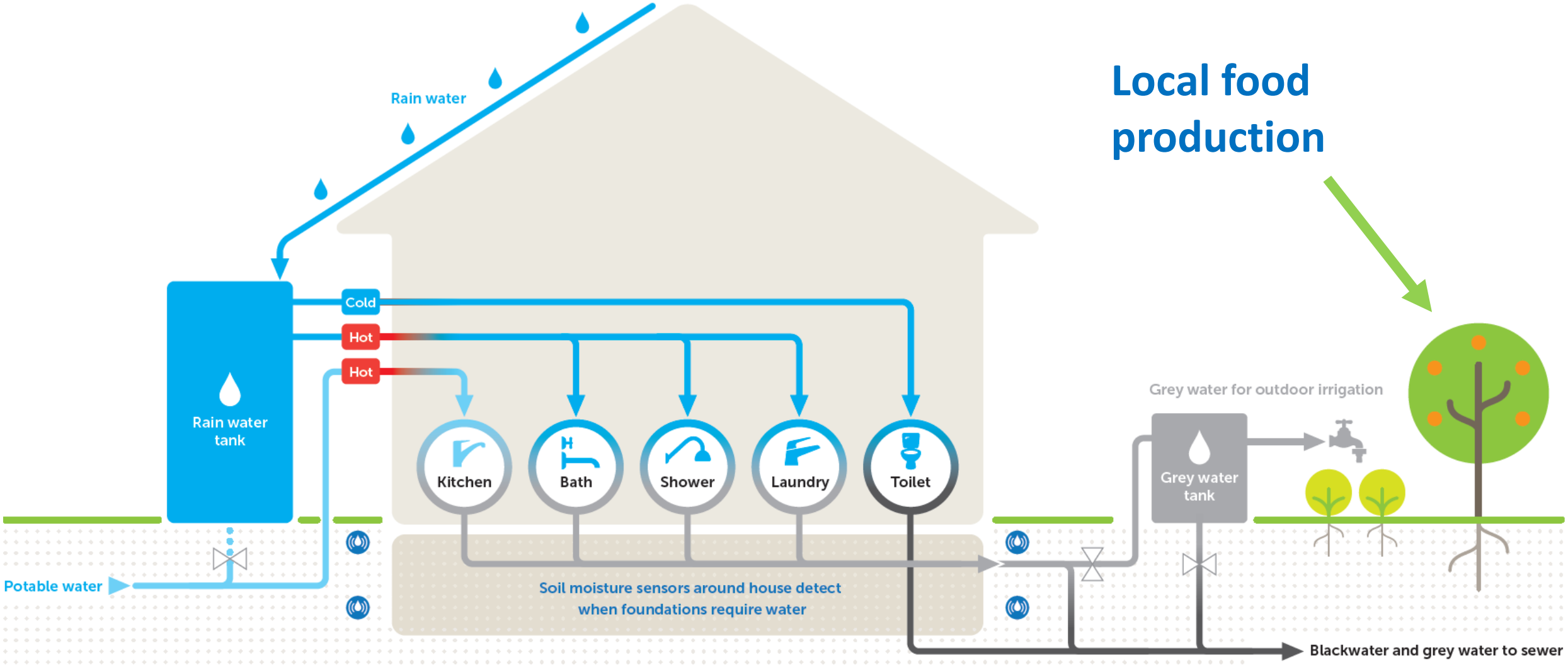

Pre-Development Flows – 89mm Event

Treatment	Average overland flows (mm)	Rainfall event equivalent (mm)
Control - Existing Lalor catchment (no rainwater tanks)	**41 mm**	**89 mm**
4 x 5,000 L tanks	27 mm	57.5 mm
4 x 5,000 L tanks + 100% permeable garden	8 mm	20 mm
Predevelopment	**23 mm**	**55 mm**

Water Sensitive House with Solar Distillation

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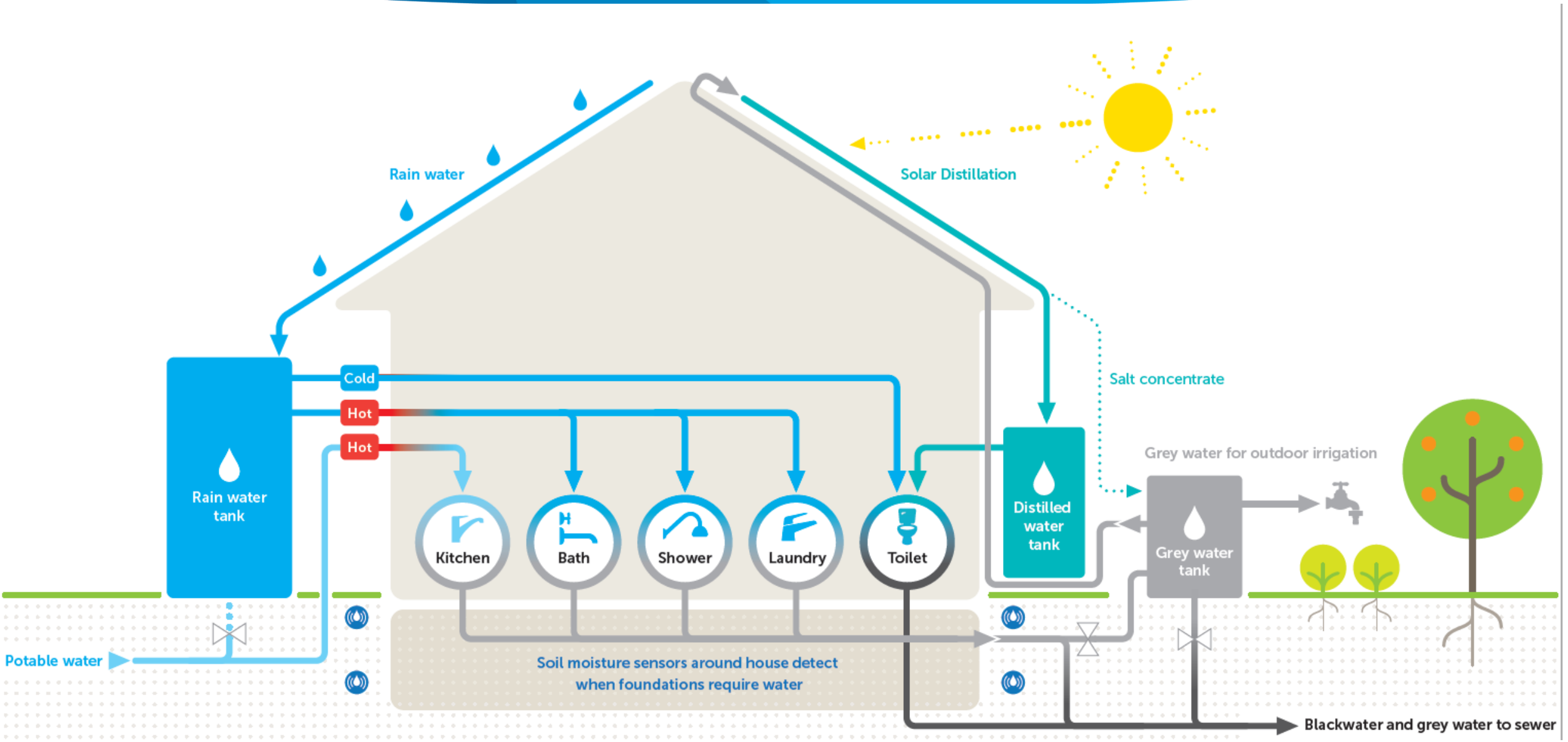
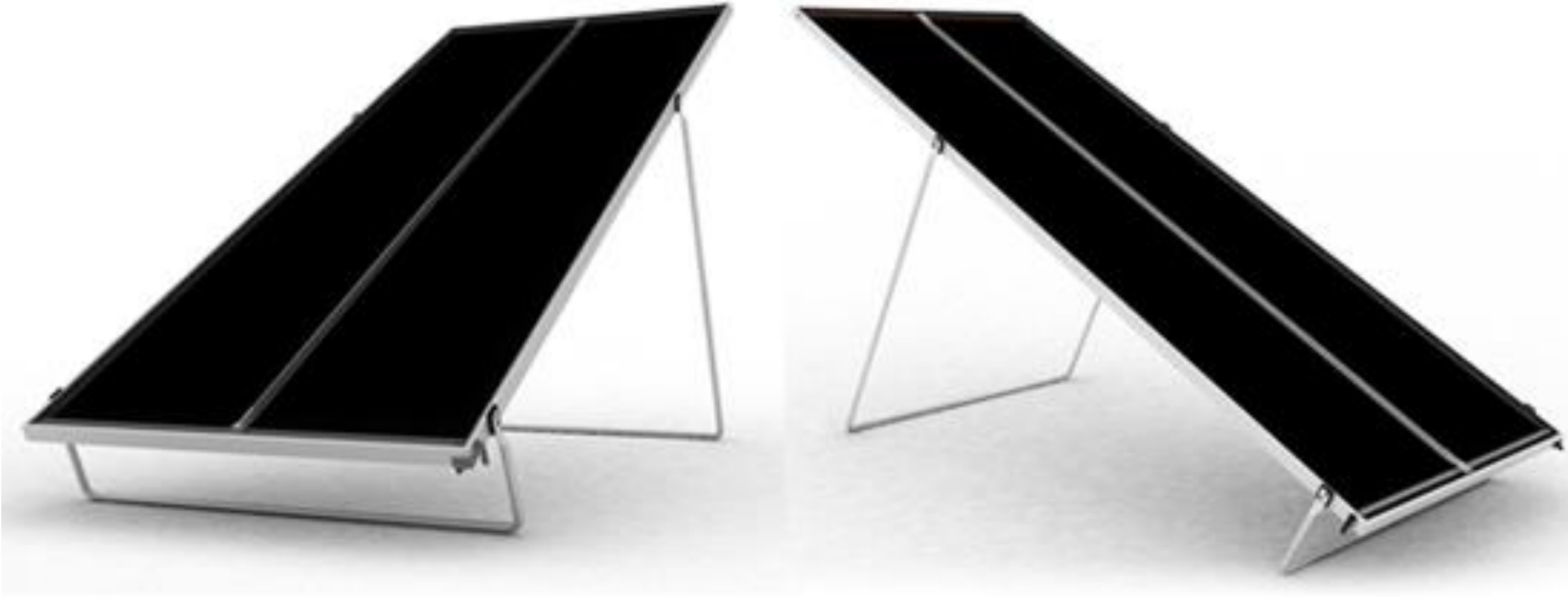


Solar Distillation Panels



Conclusions

- Potential of rainwater tanks on residential lot
- Residents are prepared to invest in a variety of initiatives and technologies
- External influences include Millennium Droughts, Climate Change and Internet of Things (IoT)
- Financial contribution of residents may be necessary.

Acknowledgements

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- 2009 LiDAR Data,
- Darebin Creek daily water flows
- Local rainfall data