WSUD 02

WATER SENSITIVE SA

Residential development, deemed-to-satisfy solutions for stormwater management

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Contents

This guide provides simple options to meet stormwater management requirements. Simplified options are called deemed-to-satisfy solutions. If implemented, these designs will satisfy the stormwater management performance objectives for runoff volume, flow and quality and water conservation for your Council. The options provided will suit the majority of applicants to:

- increase the efficiency of development application and approval processes
- achieve better outcomes for flood risk, stormwater quality, amenity and microclimate (where possible).

The design solutions are suitable for smaller sites up to 500 m^2 per dwelling as indicated.

For larger sites:

(i) where the gross area of the allotment to be subdivided is above 500 m^2 and less than 2,500 m^2; and

(ii) for sites where the deemed-to-satisfy solutions are unsuitable,

compliance with the stormwater management performance objectives can be demonstrated by applying the Insite Water Tool instead of this guide.

Councils will require that the approach chosen must be supported by the design details for a development and with subsequent construction, commissioning and maintenance. Prior to construction the design must be checked by a qualified professional.

This guideline offers six deemed-to-satisfy options:

- Option 1 - rainwater tank approach:
  - Option 1A – Combined retention and detention rainwater tank approach with an impervious (hard surface) driveway
  - Option 1B – Combined retention and detention rainwater tank approach with pervious (or porous) driveway
  - Option 1C – Retention only Rainwater tank approach – for Detached, row or semi-detached dwellings
  - Option 1D – Retention only Rainwater tank approach – for Hammerhead dwellings
- Option 2 - infiltration approach.
  - Option 2A – Infiltration systems approach for Sand or Sandy Loam soils (Soil Class A) and for Sandy Clay soils (Soil Class S)
  - Option 2B – Infiltration systems approach for Medium Clay soils (Soil Class M/M-D)

Residential dwellings include single allotments and townhouse subdivisions. If more than one dwelling per lot, the allotment size for the purpose of this deemed-to-satisfy guideline is the area of each residential land parcel post land division (e.g. a 700 m^2 block divided equally into two land parcels would each have an allotment size of 350 m^2).

Option 1: Rainwater tank approach

The most common deemed-to-satisfy solutions for stormwater management will involve a retention tank or combined retention and detention tank with reticulated supply for household uses including toilets and laundry cold taps and/or hot water services, as shown in Figures 1 and 2.

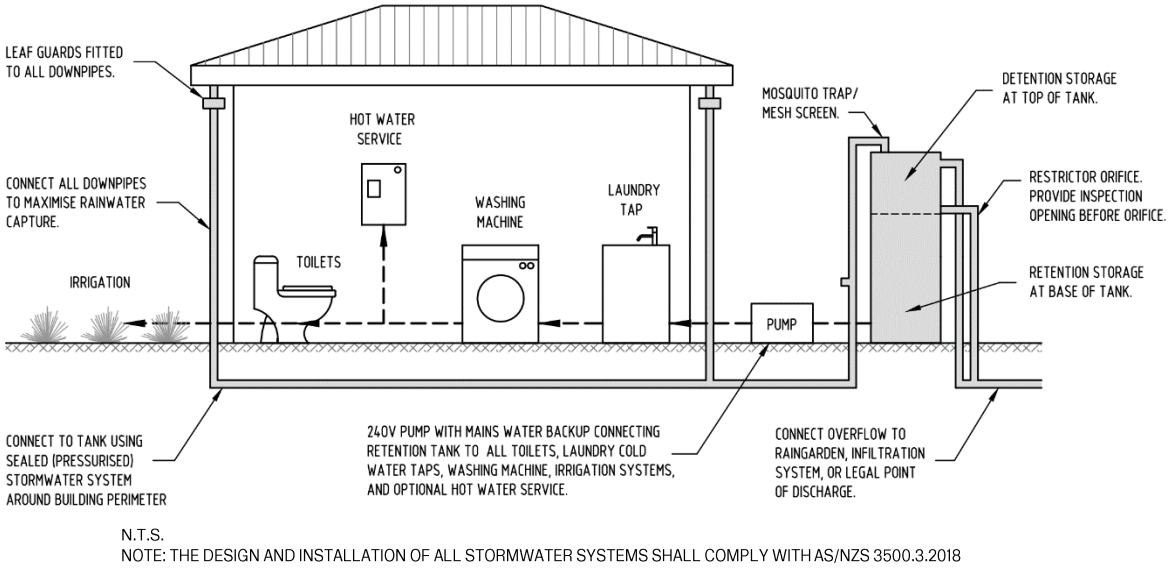


Figure 1 Retention tank reticulation detail

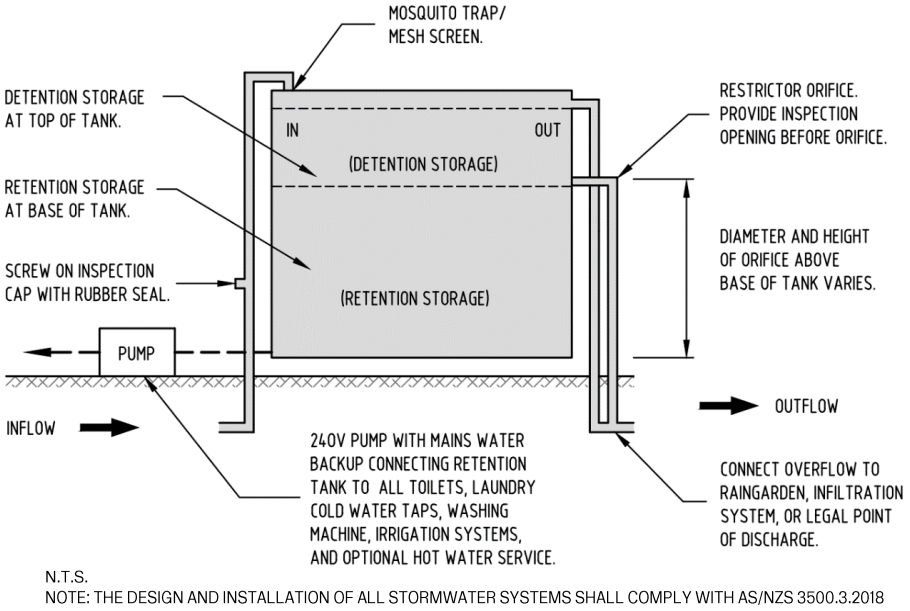


Figure 2 Above ground combination retention and detention tank

Option 1A: Combined retention and detention rainwater tank approach with an impervious (hard surface) driveway

To meet stormwater runoff volume, peak flow reduction and water quality targets this approach uses rainwater tanks, incorporating combined retention (usable rainwater tank volume) and detention (tank volume with a slow release orifice that will gradually empty)

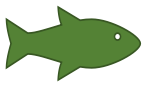
Rainwater tank approach	Stormwater objectives met
Residential development designed to capture and re-use stormwater to: a) maximise conservation of water resources b) manage peak stormwater runoff flows and volume to ensure the carrying capacities of downstream systems are not overloaded; and c) manage stormwater runoff quality. **Design criteria** Dwellings with an impervious (hard surface) driveway include a rainwater tank storage: ☑ connected to at least 80% of the roof area of the dwelling ☑ connected to all toilets and washing machine cold taps ☑ with the dwelling roof at least 80% of the impervious area ☑ that includes a 20-25 mm diameter slow release orifice at the bottom of the detention component of the tank ☑ that has a total capacity in accordance with Table 1 **Notes** 1. To reduce the percentage imperviousness, install permeable or porous paving for the driveway/parking areas and courtyards 2. Stormwater quality is improved by rainwater tanks because water is retained for reuse rather than entering the stormwater system. The rate of pollutant removal is proportional to the amount of rainwater used indoors and outdoors versus the total rainfall that would otherwise become runoff from the site.	  

Table 1: Rainwater tank (combined retention and detention) approach – deemed-to-satisfy solutions (with impervious driveway)

		Allotment size (m^2)				
		< 200	201-300	301-400	401-500	501-600
Site % imperviousness	60%	Retention: 1000 plus Detention: 300 L	Retention: 1500 L plus Detention: 600 L	Retention 2000 L plus Detention: 900 L	Retention 2500 L plus Detention 1000 L	Retention: 3000 L plus Detention: 1000 L
	70%	Retention: 1200 L plus Detention: 500 L	Retention 1800L plus Detention: 800 L	Retention: 3000L plus Detention: 1000 L	Retention: 3500 L plus Detention: 1250 L	Retention: 4000 L plus Detention: 1500 L
	80%	Retention 1400 L plus Detention 700 L	Retention 2200 L plus Detention 1200 L	Retention 3000 L plus Detention 1500 L	Retention 4000 L plus Detention 1800 L	Retention 4500 L plus Detention 2100 L

Note: Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.

Option 1B: Combined retention and detention rainwater tank approach with pervious driveway

To meet stormwater runoff volume, peak flow reduction and water quality targets this approach uses rainwater tanks, incorporating combined retention (usable rainwater tank volume) and detention (tank volume with a slow release orifice that will gradually empty).

Rainwater tank approach	Stormwater objectives met
Residential development designed to capture and re-use stormwater to: a) maximise conservation of water resources b) manage peak stormwater runoff flows and volume to ensure the carrying capacities of downstream systems are not overloaded; and c) manage stormwater runoff quality. **Design criteria** Dwellings with a pervious driveway include a rainwater tank storage: ☑ connected to at least 60% of the roof area of the dwelling ☑ connected to all toilets and washing machine cold taps ☑ that includes a 20-25 mm diameter slow release orifice at the bottom of the detention component of the tank ☑ that has a total capacity in accordance with Table 2 ☑ Impervious surfaces including roofs, carparks and driveways should be used to calculate the percentage imperviousness of the site. **Notes** 1. To reduce the percentage imperviousness, install permeable or porous paving for the driveway/parking areas and courtyards. 2. Stormwater quality is improved by rainwater tanks because water is retained for reuse rather than entering the stormwater system. The rate of pollutant removal is proportional to the amount of rainwater used indoors and outdoors versus the total rainfall that would otherwise become runoff from the site.	 FLOW  VOLUME  QUALITY

Table 2: Rainwater tank (combined retention and detention) approach – deemed-to-satisfy solutions

		Allotment size (m^2)				
		< 200	201-300	301-400	401-500	501-600
Site % imperviousness	60%	Retention: 1000 L plus Detention: 800 L	Retention: 1000 L plus Detention: 800 L	Retention: 1000 L plus Detention: 800 L	Retention: 2000 L plus Detention: 800 L	Retention: 3000 L plus Detention: 800 L
	70%	Retention: 1000 L plus Detention: 1000 L	Retention: 1000 L plus Detention: 1000 L	Retention: 1000 L plus Detention: 1000 L	Retention: 2000 L plus Detention: 1000 L	Retention: 3000 L plus Detention: 1000 L
	80%	Retention: 1000 L plus Detention: 1000 L	Retention: 1000 L plus Detention: 1000 L	Retention: 2000 L plus Detention: 1000 L	Retention: 2000 L plus Detention: 1000 L	Retention: 4000 L Plus Detention: 1500 L
	90%	Retention: 1000 L plus Detention: 1000 L	N/A	N/A	N/A	N/A

Note: Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.

Option 1C: Retention only rainwater tank approach – detached, row or semi-detached dwellings

Detached, row or semi-detached dwellings

Rainwater tank approach	Stormwater objectives met
Residential development designed to capture and re-use stormwater to: a) maximise conservation of water resources b) manage peak stormwater runoff flows and volume to ensure the carrying capacities of downstream systems are not overloaded; and c) manage stormwater runoff quality. **Design criteria** Dwellings include a rainwater tank storage: ☑ connected to at least 80% of the roof area of the dwelling (row dwelling); OR ☑ connected to at least 60%of the roof area of the dwelling (detached and semi-detached dwellings) AND ☑ connected to all toilets AND laundry cold water outlets OR hot water service ☑ that has a minimum total capacity in accordance with Table 3 ☑ the roof is at least 80% of the impervious area. **Notes** 1. To reduce the percentage imperviousness, install permeable or porous paving for the driveway/parking areas and courtyards. 2. Stormwater quality is improved by rainwater tanks because water is retained for reuse rather than entering the stormwater system. The rate of pollutant removal is proportional to the amount of rainwater used indoors and outdoors versus the total rainfall that would otherwise become runoff from the site.	Refer Note 2

Table 3: Rainwater tank (retention only) approach – deemed-to-satisfy solutions

		Allotment size (m2)		
		< 200	201-400	401-500
Minimum requirements	Minimum site % perviousness	15%	20%	25%
	Minimum rainwater tank volume (L)	2000	3000	5000
Additional site permeability discount	Minimum site % perviousness	N/A	30%	35%
	Minimum rainwater tank volume (L)	N/A	2000	3000

Notes:

1. *Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.*
2. *Concessions with respect to achievement of the stormwater objectives have been made for the retention only rainwater tank option in the interest of providing a simplified solution for compliance purposes.*

Option 1D: Retention only rainwater tank approach – hammerhead dwellings

Hammerhead dwellings

Rainwater tank approach	Stormwater objectives met
Residential development designed to capture and re-use stormwater to: d) maximise conservation of water resources e) manage peak stormwater runoff flows and volume to ensure the carrying capacities of downstream systems are not overloaded; and a) manage stormwater runoff quality. **Design criteria** Hammerhead dwellings have driveways and pathways constructed of a minimum of 50% permeable or porous material and include a retention rainwater tank storage: ☑ connected to at least 60%of the roof area of the dwelling ☑ connected to all toilets AND laundry cold water outlets OR hot water service ☑ that has a minimum total capacity in accordance with Table 4. **Notes** 1. To reduce the percentage imperviousness, install permeable or porous paving for the driveway/parking areas and courtyards. 2. Stormwater quality is improved by rainwater tanks because water is retained for reuse rather than entering the stormwater system. The rate of pollutant removal is proportional to the amount of rainwater used indoors and outdoors versus the total rainfall that would otherwise become runoff from the site.	Refer Note 2

Table 4: Rainwater tank (retention only) approach – deemed-to-satisfy solutions

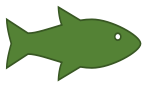
		Allotment size (m^2)		
		< 200	201-400	401-500
Minimum requirements	Minimum site % perviousness	15%	20%	25%
	Minimum rainwater tank volume (L)	2000	3000	5000

Notes:

1. *Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.*
2. *Concessions with respect to achievement of the stormwater objectives have been made for the retention only rainwater tank option in the interest of providing a simplified solution for compliance purposes*.

Option 2: Infiltration and urban cooling

The approach uses infiltration systems only to meet Council flow, volume and quality targets. This approach will maximise the infiltration of stormwater to the soil to help sustain the health of trees, shrubs and grassed areas in private landscaped areas and adjacent street verges. Increasing the moisture in the soil available to plants will also keep outdoor areas cooler.

Infiltration approach	Council objectives
Residential development designed to capture and re-use stormwater to: a) maximise conservation of water resources b) manage peak stormwater runoff flows and volume to ensure the carrying capacities of downstream systems are not overloaded; and c) manage stormwater runoff quality. **Design criteria** Residential development including ☑ A sedimentation trap, a grass filter strip or swale must be built before any infiltration pits ☑ Infiltration pits and trenches are sized to allow the volume outlined as per Tables 5 and 6 ☑ Wrapping of infiltration devices in geotextile to prevent the ingress of fines ☑ An overflow to direct excess flows to Council stormwater drainage systems ☑ Suitable offsets from buildings and other structures, in accordance with the Minister's Specification SA 78AA September 2003 – *On-site retention of stormwater*[1] or advice from a suitably qualified engineer ☑ The final design will be a product of contributory area, quality and quantity of runoff, soil infiltration capacity, and the geometry and void space of the infiltration device used and soil characteristics ☑ Consideration of soil type and swell is important when locating gravel trenches near buildings and other structures. **Notes** 1. This approach will not directly reduce potable water demand. 2. Impervious surfaces including roofs, parking bays and driveways should be used to calculate the percentage imperviousness. 3. To reduce the percentage imperviousness, install permeable or porous paving for the driveway/parking areas and courtyards.	 FLOW  VOLUME  QUALITY

Additional guidance is provided in the:

- *Minister's Specification SA 78AA September 2003 – On-site retention of stormwater*[1], including guidance on separation distance from footings in different soil types
- Australian Standard AS 2870 – Residential slabs and footings[2] regarding soil classification.

[1] Minister's Specification SA 78AA September 2003 – *On-site retention of stormwater*, https://www.sa.gov.au/__data/assets/pdf_file/0017/7046/SA_78AA_Onsite_retention_of_stormwater.pdf

[2] AS 2870-2011 – Residential slabs and footings available from SAI Global https://infostore.saiglobal.com/

Table 5: Infiltration systems approach for Sand or Sandy Loam soils (Soil Class A) and for Sandy Clay soils (Soil Class S) – deemed-to-satisfy solutions

		Allotment size (m^2)					
		< 300	301-400	401 -500	501- 600	601-700	701-800
Site % imperviousness	60%	Use InSite Water Tool	Infiltration volume 3.3 m^3	Infiltration volume 4.1 m^3	Infiltration volume 4.9 m^3	Infiltration volume 5.7 m^3	Infiltration volume 6.5 m^3
	70%		Infiltration volume 3.8 m^3	Infiltration volume 4.8 m^3	Infiltration volume 5.7 m^3	Infiltration volume 6.7 m^3	Infiltration volume 7.6 m^3
	80%		Infiltration volume 4.4 m^3	Infiltration volume 5.4 m^3	Infiltration volume 6.5 m^3	Infiltration volume 7.6 m^3	Infiltration volume 8.7 m^3

Note: Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.

Table 6: Infiltration systems approach for Medium Clay soils (Soil Class M/M-D) – deemed-to-satisfy solutions

		Allotment size (m^2)					
		< 300	301-400	401-500	501-600	601-700	701-800
Site % imperviousness	60%?	Use InSite Water Tool	Infiltration volume 3.7 m^3	Infiltration volume 4.6 m^3	Infiltration volume 5.5 m^3	Infiltration volume 6.5 m^3	Infiltration volume 7.4 m^3
	70%		Infiltration volume 4.3 m^3	Infiltration volume 5.4 m^3	Infiltration volume 6.5 m^3	Infiltration volume 7.5 m^3	Infiltration volume 8.6 m^3
	80%		Infiltration volume 4.9 m^3	Infiltration volume 6.2 m^3	Infiltration volume 7.4 m^3	Infiltration volume 8.6 m^3	Infiltration volume 9.9 m^3
	90%		N/A	Infiltration volume 6.9 m^3	Infiltration volume 8.3 m^3	Infiltration volume 9.7 m^3	Infiltration volume 11.1 m^3

Note: Allotment size and percentage imperviousness should be calculated by dividing total areas for the site by the number of allotments.