



**Minister's Specification SA 78AA**  
September 2003

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# **On-Site Retention of Stormwater**





# Development Act 1993

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### On-Site Retention of Stormwater

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#### SCOPE

This Minister's Specification has been developed to provide cost-effective technical solutions to the requirements for the on-site retention of roof stormwater run-off. Design and installation of appropriate devices in accordance with this Minister's Specification are deemed-to-satisfy the on-site stormwater retention requirements of the relevant authority.

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#### APPLICATION

This specification applies to all new residential building work, including new dwellings, and additions to dwellings (classified as Class 1 or 2) and Class 10a structures associated with Class 1 and 2 dwellings, as defined by the Building Code of Australia (BCA).

This specification applies where the relevant authority has directed the applicant to incorporate on-site stormwater retention devices as part of the stormwater drainage system.

This specification provides a range of minimum deemed-to-satisfy solutions that achieve the on-site stormwater management requirements of the relevant authority. Nothing in this specification precludes the relevant authority from accepting alternative solutions or proprietary systems.

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#### INTERPRETATION

**ARI (Average Recurrence Interval)** means the average or expected value of the period between exceedances of a given discharge. This period is itself a random variant. (*Australian Rainfall and Run-off*).

**Catchment area** means the proportion of the roof catchment area, expressed in square metres, that the relevant authority requires stormwater run-off from, to be retained.

**Final ground surface** means the ground surface from which the device is installed.

**Natural ground surface** means the ground surface prior to human intervention.

**Over-flow device** means a device used with the on-site stormwater retention system to divert overflow away from structures and buildings in the event of a blockage of the system or run-off exceeding the system's capacity.

**Roof catchment area** means the total area, expressed in square metres, of the roof measured on the horizontal (no allowance for slope or vertical surfaces) and is to include the roof area of any fully or partly covered carport, portico, verandah, balcony, porch or similar structure attached to the building.

**Soakage trench** means a retention device, installed horizontally.

**Soakage well** means a retention device installed vertically.

**Stormwater retention** means the practice of inhibiting the release of roof stormwater run-off into the existing infrastructure through the implementation of on-site soakage devices that retain roof stormwater run-off on-site. The run-off is absorbed into, and percolates through, the surrounding soil strata.

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### REFERENCED DOCUMENTS

SCHEDULE OF REFERENCED DOCUMENTS		
No.	Date	Title
AS/NZS 3500.3.2	1998	National Plumbing and Drainage Stormwater Drainage – Acceptable Solutions
AS 2870	1996	Residential Slabs and Footings – Construction
	1987	Australian Rainfall and Run-off The Institution of Engineers, Australia



#### ON-SITE RETENTION OF STORMWATER

The use of on-site retention devices is restricted to soil types classified as class A and S or class M-D where the characteristic surface movement, ( $y_s$  value), is equal to or less than 25mm, as defined in AS 2870 and where the following conditions exist:

- the slope of the natural ground does not exceed 1 in 10; and
- the depth to rock is 1.2m or greater; and
- the ground-water table is permanently below 1.5m from the natural ground surface or the final ground surface, whichever is the lowest.

The use of on-site retention devices is not recommended on sites classified as H-D, E-D and P as defined in AS 2870.

On-site retention devices shall not be installed in fill (refer Diagrams 1 and 2).

##### 1.1 Acceptable retention devices

On-site retention of roof stormwater run-off can be achieved by the installation of an appropriate soakage device, acceptable forms of which are either soakage trenches or soakage wells which shall be sized in accordance with the tables that form part of this specification.

##### 1.2 Selection of appropriate design table

Selection of the appropriate table for the purposes of sizing the retention device shall be as directed by the appropriate relevant authority.

##### 1.3 Soakage trenches

Where soakage trenches are selected to achieve on-site retention of roof stormwater run-off, sizing of the device/s shall be in accordance with the following tables. The total required length shall be achieved by the installation of a single trench or multiple trenches.

Construction of the trenches shall be in accordance with Figure RA. Interpolation of the tables is permitted. Figures greater than 10 have been rounded to the nearest whole number for simplicity.

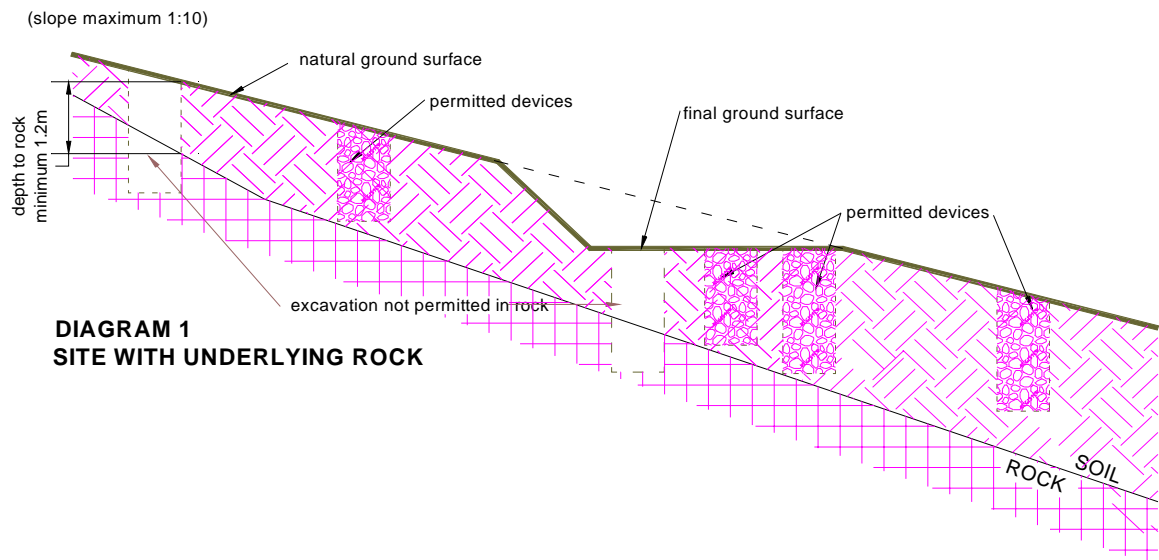
Refer to the Appendices for examples.



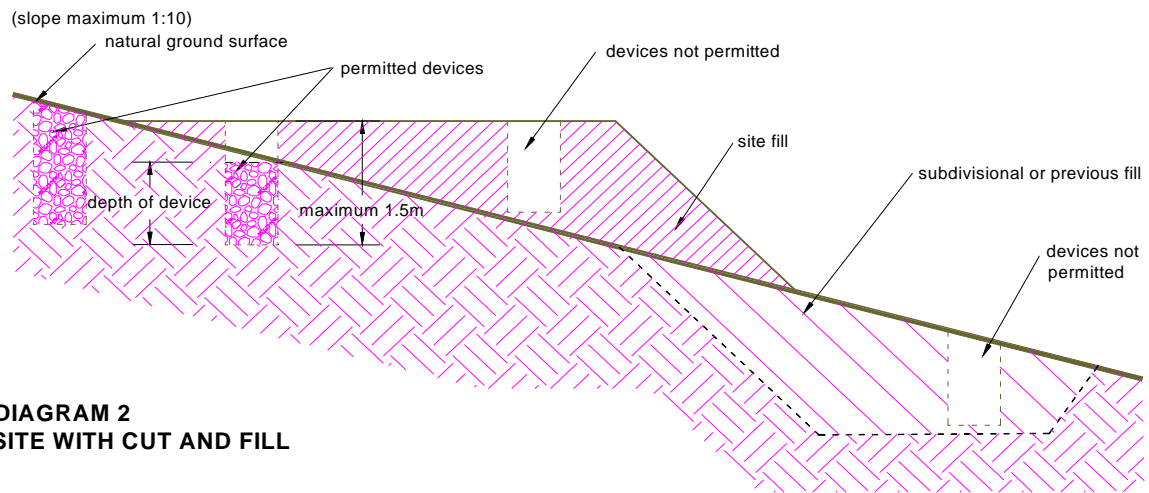
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## On-Site Retention of Stormwater



**DIAGRAM 1**  
**SITE WITH UNDERLYING ROCK**



**DIAGRAM 2**  
**SITE WITH CUT AND FILL**

## PERMITTED DEVICE LOCATIONS

Note: Diagrams 1 and 2 are not to scale



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Table 1-Total required length of trench (metres)  
ARI = 1 in 5 year, 30 minute storm event

Trench Dimensions (metres)		Soil Type	Catchment Area (m <sup>2</sup> )									
			20	40	60	80	100	120	140	160	180	200
		Total required length of trench (metres)										
width 0.3 depth 0.5	A/S	4.3	8.6	13	17	22	26	30	35	39	43	
	M-D	5.8	12	18	23	29	35	41	47	53	58	
width 0.3 depth 1	A/S	2.4	4.8	7.2	9.6	12	14	17	19	22	24	
	M-D	3.0	6.0	9.0	12	15	18	21	24	27	30	
width 0.3 depth 1.2	A/S	2.0	4.0	6.1	8.1	10	12	14	16	18	20	
	M-D	2.5	5.0	7.6	10	13	15	18	20	23	25	
width 0.6 depth 0.5	A/S	2.3	4.6	6.9	9.2	12	14	16	18	21	23	
	M-D	3.0	5.9	8.9	12	15	18	21	24	27	30	
width 0.6 depth 1	A/S	1.2	2.5	3.8	5.1	6.4	7.7	9.0	10	12	13	
	M-D	1.5	3.1	4.6	6.1	7.7	9.2	11	12	14	15	
width 0.6 depth 1.2	A/S	1.1	2.1	3.2	4.3	5.4	6.5	7.6	8.7	9.8	11	
	M-D	1.3	2.6	3.8	5.1	6.4	7.7	9.0	10	12	13	
width 0.9 depth 0.5	A/S	1.5	3.1	4.7	6.2	7.8	9.4	11	13	14	16	
	M-D	2.0	4.0	6.0	8.0	10	12	14	16	18	20	
width 0.9 depth 1	A/S	0.8	1.7	2.6	3.5	4.4	5.2	6.1	7.0	7.9	8.8	
	M-D	1.0	2.0	3.1	4.1	5.1	6.2	7.2	8.2	9.3	10	
width 0.9 depth 1.2	A/S	0.7	1.5	2.2	3.0	3.7	4.5	5.2	6.0	6.7	7.5	
	M-D	0.9	1.7	2.6	3.4	4.3	5.2	6.0	6.9	7.8	8.6	



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## On-Site Retention of Stormwater

**Table 2-Total required length of trench (metres)**  
ARI = 1 in 5 year, 1 hour storm event

Trench Dimensions (metres)		Soil Type	Catchment Area (m <sup>2</sup> )									
			20	40	60	80	100	120	140	160	180	200
		Total required length of trench (metres)										
width 0.3 depth 0.5	A/S	4.7	9.4	14	19	24	28	33	38	43	47	
	M-D	7.2	14	22	29	36	43	50	58	65	72	
width 0.3 depth 1	A/S	2.6	5.3	8.0	11	13	16	19	22	24	27	
	M-D	3.8	7.6	11	15	19	23	27	30	34	38	
width 0.3 depth 1.2	A/S	2.2	4.5	6.8	9.1	11	14	16	18	21	23	
	M-D	3.2	6.3	9.5	13	16	19	22	25	29	32	
width 0.6 depth 0.5	A/S	2.5	5.0	7.6	10	13	15	18	20	23	25	
	M-D	3.7	7.4	11	15	19	22	26	30	33	37	
width 0.6 depth 1	A/S	1.4	2.9	4.4	5.8	7.3	8.8	10	12	13	15	
	M-D	1.9	3.9	5.9	7.8	9.8	12	14	16	18	20	
width 0.6 depth 1.2	A/S	1.2	2.5	3.7	5.0	6.3	7.5	8.8	10	11	13	
	M-D	1.6	3.3	4.9	6.6	8.2	9.9	12	13	15	17	
width 0.9 depth 0.5	A/S	1.7	3.4	5.2	6.9	8.6	10	12	14	16	17	
	M-D	2.5	5.0	7.5	10	13	15	18	20	22	25	
width 0.9 depth 1	A/S	1.0	2.0	3.0	4.0	5.0	6.0	7.1	8.1	9.1	10	
	M-D	1.3	2.6	3.9	5.3	6.6	7.9	9.2	11	12	13	
width 0.9 depth 1.2	A/S	0.8	1.7	2.6	3.4	4.3	5.2	6.1	6.9	7.8	8.7	
	M-D	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.9	10	11	



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## On-Site Retention of Stormwater

**Table 3-Total required length of trench (metres)**  
ARI = 1 in 5 year, 2 hour storm event

Trench Dimensions (metres)		Soil Type	Catchment Area (m <sup>2</sup> )									
			20	40	60	80	100	120	140	160	180	200
		Total required length of trench (metres)										
width 0.3 depth 0.5	A/S	4.6	9.2	14	19	23	28	32	37	42	46	
	M-D	8.1	16	24	33	41	49	57	65	73	81	
width 0.3 depth 1	A/S	2.6	5.3	7.9	11	13	16	19	21	24	27	
	M-D	4.4	8.7	13	18	22	26	31	35	40	44	
width 0.3 depth 1.2	A/S	2.2	4.5	6.8	9.1	11	14	16	18	21	23	
	M-D	3.7	7.4	11	15	19	22	26	30	33	37	
width 0.6 depth 0.5	A/S	2.5	5.0	7.6	10	13	15	18	20	23	25	
	M-D	4.3	8.5	13	17	21	26	30	34	39	43	
width 0.6 depth 1	A/S	1.5	3.0	4.5	6.1	7.6	9.2	11	12	14	15	
	M-D	2.3	4.6	7.0	9.3	12	14	16	19	21	23	
width 0.6 depth 1.2	A/S	1.2	2.6	3.9	5.2	6.6	7.9	9.2	11	12	13	
	M-D	1.9	3.9	5.9	7.9	9.8	12	14	16	18	20	
width 0.9 depth 0.5	A/S	1.7	3.5	5.2	7.0	8.8	11	12	14	16	18	
	M-D	2.9	5.8	8.7	12	15	17	20	23	26	29	
width 0.9 depth 1	A/S	1.0	2.1	3.1	4.2	5.3	6.4	7.5	8.6	9.6	11	
	M-D	1.5	3.1	4.7	6.3	7.9	9.5	11	13	14	16	
width 0.9 depth 1.2	A/S	0.8	1.8	2.7	3.7	4.6	5.5	6.5	7.4	8.3	9.3	
	M-D	1.3	2.7	4.0	5.3	6.7	8.0	9.4	11	12	13	

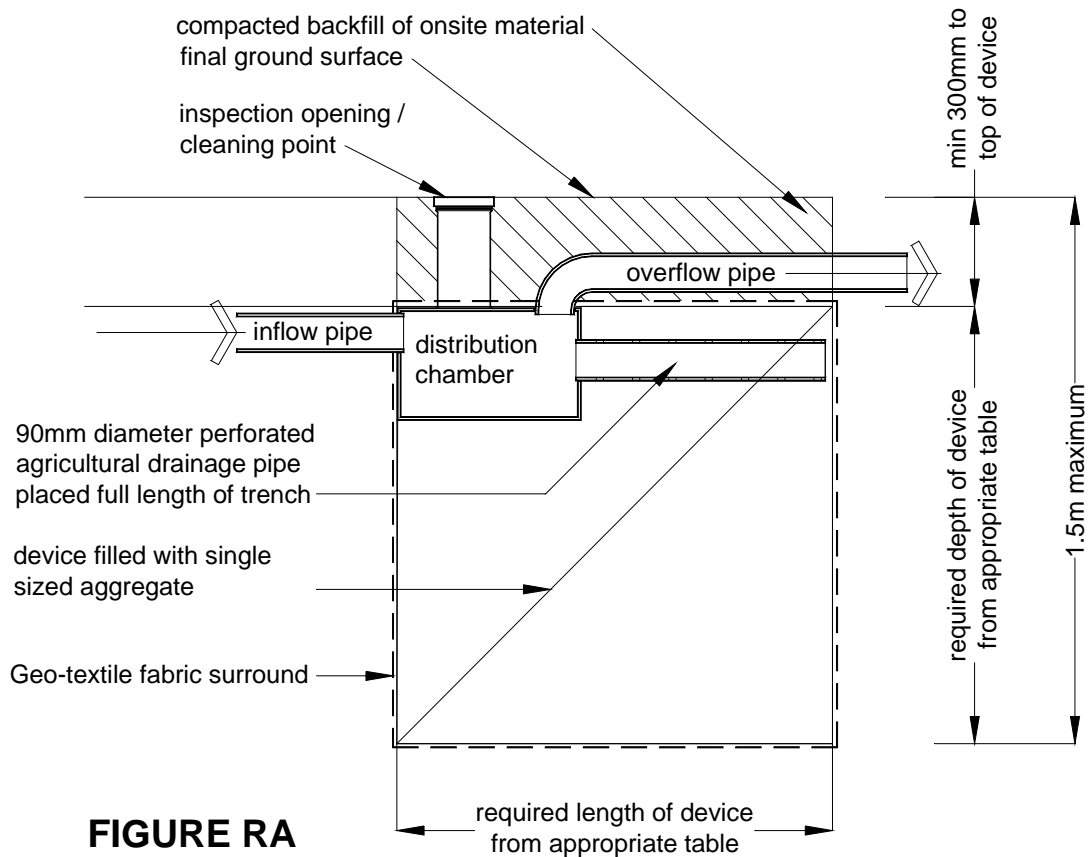




## On-Site Retention of Stormwater

### Deemed-to-satisfy construction of soakage trenches.

- The top of the soakage device shall be a minimum of 300mm below the final ground surface.
- The distance from the final ground surface to the base of the trench shall not exceed 1.5m\* (*Refer Notes-.DEPTH LIMITATIONS*)
- Retention trenches shall be orientated parallel to the contour lines of the natural ground surface of the area in which the trench is to be located.
- The soakage trench shall be filled with single size aggregate with a minimum particle size of 20mm and maximum size of 75mm.
- The geo-textile fabric shall completely encapsulate the aggregate backfilled trench.
- The trench shall be fitted with an inspection point to enable maintenance and cleaning.
- All pipework shall be a minimum of 90mm diameter.
- Cover to pipework shall comply with AS 3500.3.2-1998.



**FIGURE RA**  
**SOAKAGE TRENCH**

Note: Figure RA is not to scale



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## On-Site Retention of Stormwater

### 1.4 Soakage wells

Where soakage wells are selected to achieve the on-site retention of roof stormwater run-off, sizing of the device/s shall be in accordance with the following tables. Total required depths greater than 1.2m shall be achieved by the installation of multiple wells.

Construction of the well/s shall be in accordance with Figure RB. Interpolation of the tables is permitted. Figures greater than 10 have been rounded to the nearest whole number for simplicity.

Refer to the Appendices for examples.

**Table 4-Total required depth of well (metres)  
ARI = 1 in 5 year, 30 minute storm event.**

Well Diameter (metres)	Soil Type	Catchment Area (m <sup>2</sup> )									
		20	40	60	80	100	120	140	160	180	200
		<b>Total required depth of well (metres)</b>									
0.1	A/S	17	*	*	*	*	*	*	*	*	*
	M-D	33	*	*	*	*	*	*	*	*	*
0.2	A/S	5.6	11	17	23	*	*	*	*	*	*
	M-D	9.2	18	*	*	*	*	*	*	*	*
0.3	A/S	2.8	5.6	8.5	11	14	17	*	*	*	*
	M-D	4.2	7.2	13	17	*	*	*	*	*	*
0.6	A/S	0.8	1.7	2.6	3.4	4.3	5.2	6.1	6.9	7.8	8.7
	M-D	1.1	2.2	3.3	4.4	5.5	6.6	7.7	8.8	9.9	11
0.9	A/S	*	0.8	1.2	1.6	2.0	2.5	2.9	3.3	3.7	4.2
	M-D	*	1.0	1.5	2.0	2.5	3.0	3.5	4.0	4.4	4.9
1.2	A/S	*	*	0.7	0.9	1.2	1.4	1.7	1.9	2.2	2.4
	M-D	*	0.6	0.8	1.1	1.4	1.7	2.0	2.2	2.5	2.8
1.5	A/S	*	*	*	0.6	0.7	0.9	1.1	1.2	1.4	1.6
	M-D	*	*	*	0.7	0.9	1.1	1.3	1.4	1.6	1.8

\* well configuration not recommended



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**Table 5-Total required depth of well (metres)**  
ARI = 1 in 5 year, 1 hour storm event.

Well Diameter (metres)	Soil Type	Catchment Area (m <sup>2</sup> )									
		20	40	60	80	100	120	140	160	180	200
		Total required depth of well (metres)									
0.1	A/S	20	*	*	*	*	*	*	*	*	*
	M-D	35	*	*	*	*	*	*	*	*	*
0.2	A/S	6.5	13	*	*	*	*	*	*	*	*
	M-D	10	20	*	*	*	*	*	*	*	*
0.3	A/S	3.3	6.6	10	13	17	*	*	*	*	*
	M-D	4.7	9.5	14	19	*	*	*	*	*	*
0.6	A/S	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10
	M-D	1.3	2.5	3.8	5.1	6.3	7.6	8.9	10	11	13
0.9	A/S	*	0.9	1.4	1.9	2.4	2.9	3.3	3.8	4.3	4.8
	M-D	0.6	1.1	1.7	2.3	2.9	3.5	4.0	4.6	5.2	5.8
1.2	A/S	*	0.5	0.8	1.1	1.4	1.7	1.9	2.2	2.5	2.8
	M-D	*	0.6	1.0	1.3	1.6	2.0	2.3	2.6	2.9	3.3
1.5	A/S	*	*	0.5	0.7	0.9	1.1	1.3	1.4	1.6	1.8
	M-D	*	*	0.6	0.8	1.0	1.3	1.5	1.7	1.9	2.1

\* well configuration not recommended



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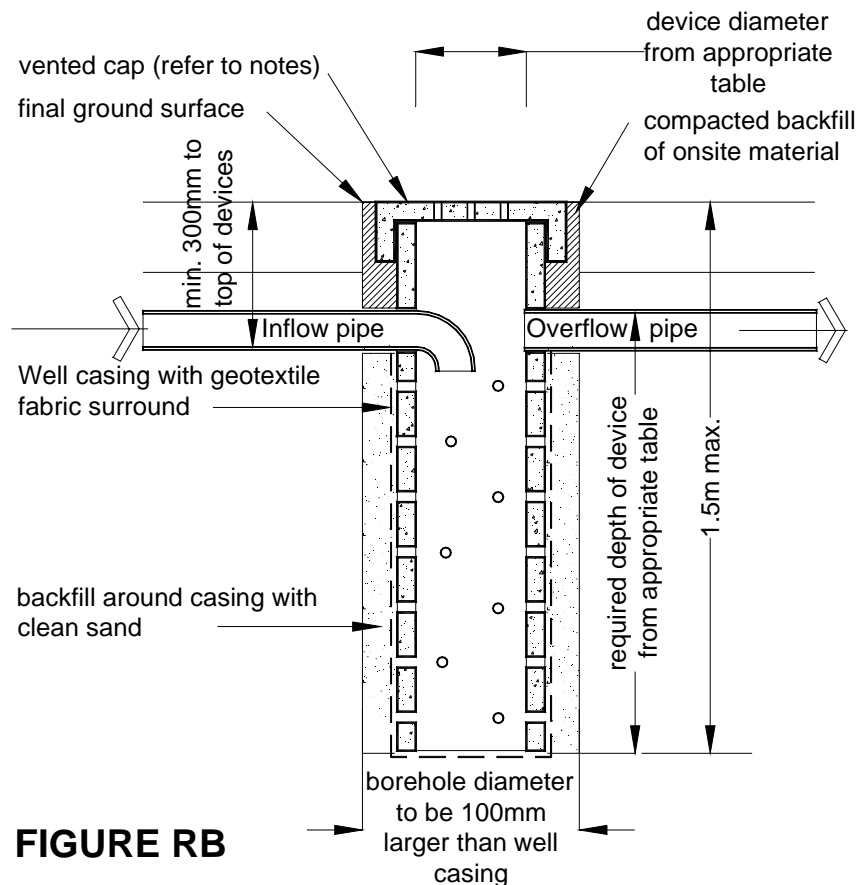
**Table 6-Total required depth of well (metres)**  
ARI = 1 in 5 year, 2 hour storm event.

Well Diameter (metres)	Soil Type	Catchment Area (m <sup>2</sup> )									
		20	40	60	80	100	120	140	160	180	200
Total required depth of well (metres)											
0.1	A/S	16	*	*	*	*	*	*	*	*	*
	M-D	36	*	*	*	*	*	*	*	*	*
0.2	A/S	6.0	12	18	*	*	*	*	*	*	*
	M-D	11	22	*	*	*	*	*	*	*	*
0.3	A/S	3.2	6.4	9.6	13	16	*	*	*	*	*
	M-D	5.4	11	16	*	*	*	*	*	*	*
0.6	A/S	1.0	2.0	3.1	4.1	5.2	6.2	7.3	8.3	9.3	10
	M-D	1.5	3.0	4.5	6.0	7.6	9.1	11	12	14	15
0.9	A/S	*	*	*	*	*	*	*	*	*	5.2
	M-D	0.7	1.4	2.1	2.8	3.5	4.2	4.9	5.6	6.3	7.0
1.2	A/S	*	0.5	0.9	1.2	1.5	1.8	2.1	2.4	2.8	3.1
	M-D	*	0.8	1.2	1.6	2.0	2.4	2.8	3.2	3.6	4.1
1.5	A/S	*	*	0.5	0.8	1.0	1.2	1.4	1.6	1.8	2.0
	M-D	*	0.5	0.8	1.0	1.3	1.6	1.8	2.1	2.4	2.6

\* well configuration not recommended

## Deemed-to-satisfy construction of soakage wells.

- The top of the perforated section of well casing shall be a minimum of 300mm below the final ground surface.
- The distance from the final ground surface to the base of the well shall not exceed 1.5m\* (*Refer Notes-.DEPTH LIMITATIONS*).
- Perforations to the concrete or uPVC casing shall be a minimum of 5% of the surface area of the casing and shall be uniformly distributed.
- All pipework shall be a minimum of 90mm diameter.
- The well shall not be filled with aggregate.
- The well shall be capped for safety reasons.
- The cap shall be vented to the final ground surface.
- The cap shall be easily identifiable and accessible for cleaning purposes.
- Cover to pipework shall comply with AS 3500.3.2-1998.



**FIGURE RB**  
**SOAKAGE WELL**

Note: Figure RB is not to scale



### On-Site Retention of Stormwater

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#### 1.5 Setback distances

- (a) Retention devices shall be located a minimum of three (3) metres from all property boundaries, (excluding front boundaries and/or reserves) and 3m from footings of all structures located on the allotment.
- (b) A minimum clear spacing of 1 metre between the sides of the retention device and any service trench is required.

#### 1.6 Distances between devices

Where two or more retention devices are installed, the clear distance between the edges of the devices shall be 1.5 times the depth of the deepest device.

#### 1.7 Overflow device

All on-site retention devices shall be fitted with an overflow device at the inlet end of the device.

#### 1.8 Overflows

- (a) Overflows shall be disposed of to the existing infrastructure in accordance with the requirements of the relevant authority.
- (b) Surface stormwater run-off discharging from overflows shall be disposed of in a way that avoids the likelihood of damage or nuisance to other property.

#### 1.9 Filtration device

A device for the filtration of the roof stormwater run-off shall be located between the gutter and the inlet pipe of the retention device. Filtration devices shall be identifiable, accessible, and cleanable.

#### 1.10 Gutters and pipework

All associated gutters and pipework required to direct the roof stormwater run-off to the device, and pipework from the device to the off-site system shall be designed and installed in accordance with AS/NZS 3500.3.2.

#### 1.11 Appendices

##### Example RC - Soakage Trench/es (Figure RC)

A single unit development having a total roof catchment area of 160sqm is located on an allotment with Class A soil. The relevant authority has specified the following design parameters:

<i>ARI</i>	<i>= 1 in 5</i>
<i>Storm event</i>	<i>= 1 hour</i>
<i>Roof run-off to be retained</i>	<i>= 50% of the total roof catchment area.</i>

The design parameters specified necessitate the use of **Table 2**. By determining the catchment area required to be retained, an appropriately sized device can be selected for the configuration of the allotment.

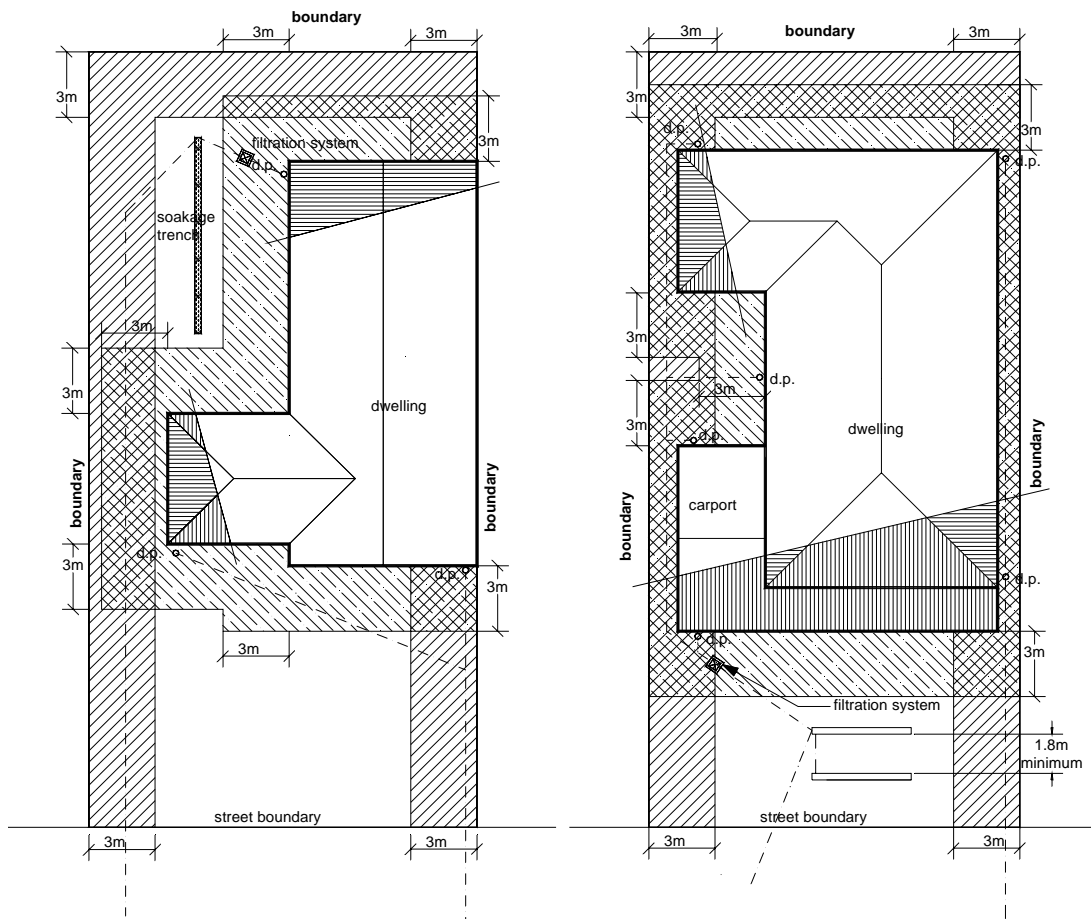
<i>Catchment area</i>	<i>=80sqm (50% of 160sqm)</i>
<i>Selected device</i>	<i>=one 0.3m wide by 1.2m deep by 9.1m long trench or two 0.3m wide by 1.2m deep by 4.55m long trenches.</i>



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**OPTION 1** - Single Trench -  
 one trench @ 300mm wide  
 x 1.2m deep x 9.1m long

**Notes**

- Stormwater disposal including overflows as directed by the relevant authority
- Stormwater drainage system to AS/NZS 3500.3.2
- Construction of soakage trenches is not permitted in these zones



**OPTION 2** - Multiple Trenches  
 two trenches @ 300mm wide  
 x 1.2m deep x 4.55m long

Minimum clear distance between sides of devices  
 = 1.5m deep x 1.2  
 = 1.8m

**FIGURE RC**  
**LOCATION OF SOAKAGE TRENCHES**

*Note: Figure RC is not to scale*



## Example RD - Soakage Well/s (Figure RD)

A single unit development having a total roof catchment area of 200sqm is located on an allotment with Class M-D ( $y_s < 25\text{mm}$ ) soil. The relevant authority has specified the following design parameters:

<i>ARI</i>	<i>= 1 in 5</i>
<i>Storm Event</i>	<i>= 30 minutes</i>
<i>Run-off to be retained</i>	<i>= 50% of the total roof catchment area.</i>

The design parameters specified necessitate the use of **Table 4**. By determining the catchment area to be retained, an appropriately sized device can be selected for the configuration of the allotment.

<i>Catchment area</i>	<i>= 100sqm (50% of 200sqm)</i>
<i>Selected devices</i>	<i>= 0.9m diameter well with total depth of 2.5m</i> <i>= multiple wells required - two @ 0.8m deep plus one @ 0.9m deep</i>

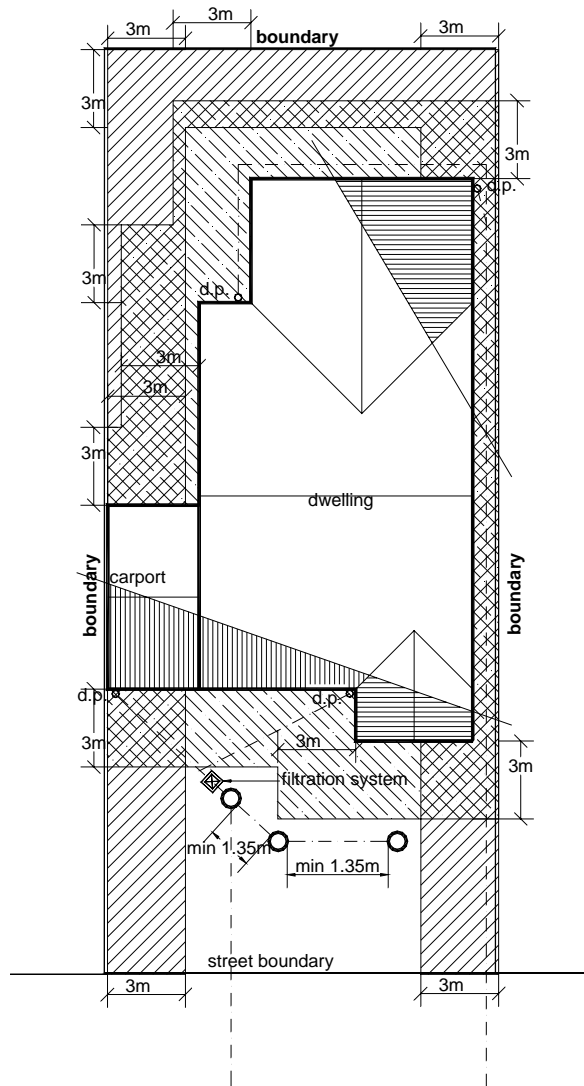




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September 2003

## On-Site Retention of Stormwater



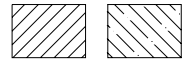
### Multiple wells

three x 900mm diameter wells:  
two @ 0.8m deep and one @ 0.9m deep = 2.5m in total

minimum clear distance between wells =  $0.9 \times 1.5\text{m} = 1.35\text{m}$

### Notes

- Stormwater disposal including overflows as directed by the relevant authority
- Stormwater drainage system to AS/NZS 3500.3.2
- Construction of soakage wells is not permitted in these zones



**FIGURE RD**  
**LOCATION OF SOAKAGE WELLS**

Note: Figure RD is not to scale



# Development Act 1993

## Minister's Specification SA 78AA

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#### NOTES

##### DEPTH LIMITATIONS

- The specification has limited the depth of soakage devices to 1.5m due to restrictions imposed on excavation depths greater than 1.5m by the Occupational Health, Safety and Welfare Regulations 1995. In addition, under the Water Resources Act 1997, a permit is required to construct soakage devices greater than 2.5m in depth.

The maximum depth of 1.5m used in the specification may be exceeded if:

- a) the allotment conditions (slope, depth to water table and rock) permit and
- b) the additional requirements of the Occupational, Health, Safety and Welfare Regulations are complied with, and/or
- c) an appropriate permit under the Water Resources Act 1997 is obtained.

##### MAINTENANCE

- In addition to the installation of filtration devices to the on-site stormwater retention system, retention trenches and wells should be inspected and cleaned on a regular basis.
- Overflow, discharge or bleed-off pipes from roof mounted appliances such as evaporative air conditioners, hot water services and solar heaters should not discharge onto the catchment area.

##### SIZING TABLES

- The sizing tables were prepared by the Urban Water Resource Centre – University of South Australia incorporating the following design parameters:
  - Rainfall intensity (1 in 5 year ARI)
    - 30 minute storm duration = 33.4mm/hr
    - 1 hour storm duration = 21.7mm/hr
    - 2 hour storm duration = 14.0mm/hr
  - The hydraulic conductivity used to calculate the size of the soakage devices in Class A and S sites is  $2.5 \times 10^{-5}$  m/s (assumes a blockage of 50%).
  - The hydraulic conductivity used to calculate the size of the soakage devices in Class M-D sites is  $5 \times 10^{-6}$  m/s (assumes a blockage of 50%).
  - Infiltration rates were based on Darcy's steady-state equation with a time step of 1 minute.

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