WATER SENSITIVE SA

Water sensitive urban design (WSUD) assets

Inspection and maintenance guidelines

Stormwater detention basins

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Image: City of Port Adelaide Enfield

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This guideline has been adapted from:

- Blacktown City Council (2019) *Water sensitive urban design (WSUD) inspection and maintenance guidelines*. Developed with assistance from E2Designlab Pty Ltd. A previous version was developed with assistance from Alluvium Consulting Australia Pty Ltd.

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This guide is of a general nature only. Advice from a suitably qualified professional should be sought for your particular circumstances. Depending on each unique situation, there may be occasions where compliance is not achieved.

Water Sensitive SA welcomes feedback on improvements to these guidelines, particularly WSUD assets images in differing conditions for the *Condition assessment audit visual reference sheets*.

Contents

1 Asset description and functional components

Inspection and maintenance guidelines of stormwater detention must be read in conjunction with *Water sensitive urban design (WSUD) assets: Inspection and maintenance guidelines | Overview*

Stormwater detention basins

Stormwater detention is the temporary storage and controlled rate of release of stormwater generated on-site so that it does not worsen flooding downstream. Detention systems can be located above ground or below ground. This document provides guidance for the maintenance of above ground systems, commonly referred to as detention basins. They should remain empty except during rainfall and for a short period after the rainfall ceases. Ponding of water in detention basins should not last for more than two hours following most rain events. If ponding persists, it is likely that maintenance attention is required.

Functional components

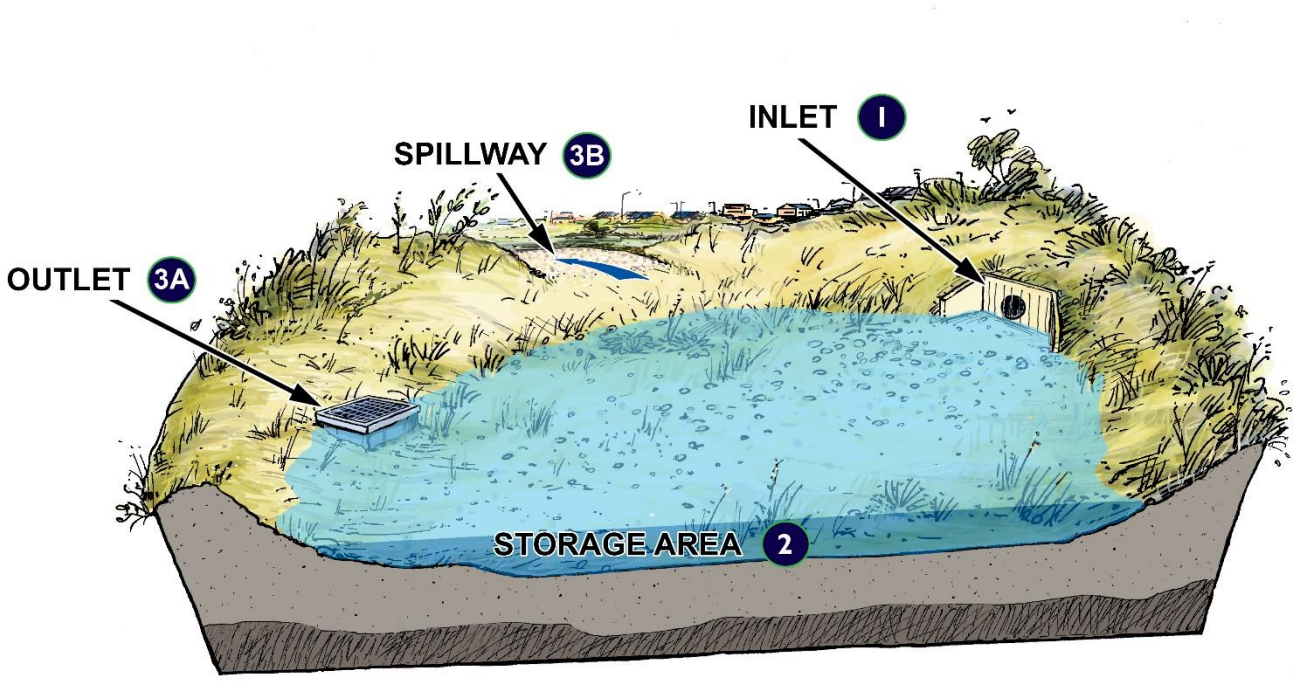

Figure 1.1 Schematic of stormwater detention with above ground storage showing functional components

Stormwater detention basins comprise four functional components (Figure 1.1):

1. **Inlet** The inlet to a detention storage area can simply be the area where water first flows into the asset. This may include a standard inlet pit, pipe, and rock apron or vertical riser pit.
2. **Storage area** The storage area of an above ground detention system is usually a walled-in or battered area that fills with stormwater during rain, and slowly drains afterwards. It may be a landscaped area, lawned area, car park, paved courtyard, tank, or a combination of these spaces, that temporarily store stormwater. It is vital to ensure the required volume to store water is preserved.

3a. The **Outlet** is where the water in the storage area drains through a discharge control pit and then through an outlet pipe. The discharge control pit usually has an orifice plate to control the rate at which stormwater leaves the site. This causes stormwater to pond in the storage area where it remains until the rain eases.

3b. **Overflow** When the storage area is filled to capacity, water should be allowed to overflow from the system. This is usually achieved with an elevated pit or weir that allows water to fill up and spill over into the pit, or over the crest of the weir.

Expertise required

Detention basin condition inspections can be undertaken by an asset owner, as specialised equipment to access and view the system is generally not required.

During the establishment period, the vegetated components should be inspected more frequently than indicated in sheet *02: Condition assessment audit – descriptive reference sheet* | *Stormwater detention basins* as additional maintenance may be required, e.g. supplementary watering.

2 Inspection and maintenance forms and activities

Routine inspection requirements typically involve:

- Check for sediment and debris build-up in inlets and outlets
- Check for sediment accumulation in the vegetated base
- Check for permanent bogging/pooled areas following rainfall events
- Check for evidence of erosion
- Check for evidence of preferential flow paths
- Check plant health
- Monitor weed growth within the batters and base/channel

Routine (proactive) maintenance requirements typically involve:

Activity	Frequency
Clean blocked inlets and outlets	After significant rain events
Remove sediment from base/channel	As required
Replace soil and re-profile eroded areas	As required
Prune plants (where applicable)	Every 8-12 weeks during high-growth season[1]
Replant eroded areas	As required
Remove weeds, targeted use of herbicide	Every 4 weeks during high-growth season[1]
Mow/slash grass	Every 4 weeks during high-growth season[1]

[1] Fortnightly during high-growth season for high amenity sites

Major maintenance or rectification activities typically involve:

- Desilt with an excavator (or similar)
- Rectify weir, inlet or outlet structure invert levels to ensure design water levels within the detention basin are achieved.

Details of the routine inspection and maintenance activity to maintain the amenity of stormwater detention basins can be found in form

01: Inspection and maintenance sheet | Stormwater detention basins – routine (proactive)

Routine inspections include the performance of a condition assessment audit to inform asset management planning. The condition assessment score matrices are detailed in form

02: Condition assessment audit – descriptive reference sheet | Stormwater detention basins.

Trouble shooting

Erosion Persistent erosion problems within detention basins may indicate excessive flow velocities, excessive batter slopes or the development of preferential flow paths, and may require further investigation and potentially rectification.

Sediment accumulation Areas of standing water or boggy conditions are generally indicative of accumulated sediment. Accumulated sediment should only be removed from a detention basin if the function of the detention basin is being impeded. The installation of upstream sediment traps, e.g. gross pollutant traps or sediment basins, may need to be considered if excessive sedimentation persists.

01: Inspection & maintenance sheet | Stormwater detention basins – routine (proactive)

Date	_____	**Purpose of visit**	**Rainfall conditions**
Location	_____	☐ Routine inspection	☐ Rainfall today (_____mm)
Asset name	_____	☐ Response to complaint	☐ Rainfall in last 3 days (__mm)
Asset ID	_____	☐ Other (specify)	☐ No recent rainfall
Inspected by (name /company)			

INSTRUCTIONS

Prior to maintenance activities occurring, rate asset functional component condition score (from 0 to 5) as per the scoring system below and circle the relevant score.

If score = 0, generate Works Request to refer matter to relevant Council team to decommission the asset or investigate further.
If score = 1, no action is required.
If score = 2, action may be required in some circumstances.
If score = 3, undertake the necessary maintenance and record action taken in right hand side column.
If score = 4 or 5, generate Works Request to refer matter to relevant Council team for rectification works.

Scoring

0 – Asset has been decommissioned, no longer exists or was not able to be rated due to serviceability issues
1 – As new
2 – Working well, PI met
3 – Routine (proactive) maintenance required
4 – Major maintenance/minor rectification works required
5 – Major rectification required

Actions

If further action is required, raise a Works Request for relevant department.
Provide reason for 0 rating/not rated.

Functional component		Performance indicator (PI)	Existing condition score and action(s)
1		**Inlet**	
1a	Blockage	Limited blockage Limited standing water	0 1 2 3 4 5 ☐ Clear accumulated litter, sediment or debris from inlet ☐ Other (provide details):
1b	Damage	Limited damage	0 1 2 3 4 5 ☐ Repair damaged inlet structure ☐ Replace damaged inlet structure ☐ Other (provide details):
1c	Erosion	Limited and localised erosion	0 1 2 3 4 5 ☐ Re-profile or reinforce eroded areas ☐ Replant eroded areas **Information:** Only use approved plant species, refer to original design specifications. ☐ Other (provide details):
2		**Storage area (vegetated base and batters)**	
2a	Erosion	Limited and localised erosion	0 1 2 3 4 5 ☐ Re-profile or reinforce eroded areas ☐ Place and suitably compact fill in areas of minor erosion (requiring <1m^3 soil) and re-profile affected area

Functional component		Performance indicator (PI)	Existing condition score and action(s)
			☐ Place and suitably compact fill to remediate areas of moderate or significant erosion ☐ Other (provide details):
2b	Plant/turf health	Good plant/turf health, free from disease and growing vigorously	0 1 2 3 4 5 ☐ Remove dead or diseased vegetation ☐ Replant/re-turf bare areas **Information:** Only use approved plant species, refer to original design specifications. ☐ Irrigate stressed plants/turf during extended dry periods ☐ Other (provide details):
2c	Plant/turf cover	Good plant/turf cover (80-90%)	0 1 2 3 4 5 ☐ Replant/re-turf bare areas **Information:** Only use approved plant species, refer to original design specifications. ☐ Irrigate stressed plants during extended dry periods ☐ Other (provide details):
2d	Weeds	Limited weed cover (<10%) No declared invasive weeds	0 1 2 3 4 5 ☐ Treat weeds with targeted-use herbicides **Information: Herbicides must be approved for use in proximity to waterways**. This will minimise potential impact on desirable species and reduce likelihood of chemical residue within soil profile, or local waterways. ☐ Other (provide details):
2e	Litter and/or debris (larger than a soft drink can)	1 piece of litter and/or debris/50m^2 Limited impact on aesthetics	0 1 2 3 4 5 ☐ Remove all litter and/or debris **Information:** Contact with sharp objects is a risk when removing litter. All workers must follow WHS practices to reduce risk, including wearing personal protective equipment. Forks and tongs may be used to pick up litter. ☐ Other (provide details):
2f	Accumulated sediment (flow path impacts)	Limited amount of accumulated sediment (<10% of surface) No impact on flows through system	0 1 2 3 4 5 ☐ Remove accumulated sediment on surface by flat shovel, rake treatment surface and restore design levels ☐ Mechanically remove excess sediment and restore design levels ☐ Other (provide details):
2g	Standing water and/or boggy conditions	Limited standing water and/or boggy conditions after rain events Typically dries out within 12 hours	0 1 2 3 4 5 ☐ Re-profile minor depressions or mounds, ensuring basin is as even as possible and sloped towards outlet to allow water to drain ☐ Re-profile moderate to significant depressions, mounds or short-circuiting channels, ensuring basin is as even as possible and sloped towards outlet to allow water to drain ☐ Other (provide details):
2h	Storage volume	Limited accumulated sediment Limited impact on storage volume	0 1 2 3 4 5 ☐ Remove accumulated sediment on surface by flat shovel, rake treatment surface and restore design levels ☐ Mechanically remove excess sediment and restore design levels ☐ Other (provide details):

Functional component		Performance indicator (PI)	Existing condition score and action(s)
3		**Outlet (discharge control pit/weir)**	
3a	Blockage	Limited blockage	0 1 2 3 4 5 ☐ Unblock outlet pipes ☐ Remove sediment from outflow areas ☐ Report damage to outlet or pit ☐ Other (provide details):
3b	Damage	Limited damage	0 1 2 3 4 5 ☐ Reaffix screen to pit wall **Information**: Access to pit may require a confined spaces license. ☐ Repair damaged screen ☐ Replace damaged screen ☐ Repair damaged outlet pit ☐ Repair damaged weir ☐ Other (provide details):
3c	Erosion	Limited and localised erosion	0 1 2 3 4 5 ☐ Repair erosion of base or batters surrounding outlet structure/weir ☐ Other (provide details):
4		**Other structures, e.g. handrails, bollards, access ramps**	
4a	Damage to or removal of structure/s (Annual)	Limited damage	0 1 2 3 4 5 ☐ Repair damaged structure/s ☐ Replace significantly damaged or removed structure/s ☐ Other (provide details):

Waste and soil disposal, general

Note: Waste and soil disposal procedures must adhere with South Australian EPA and local authorities requirements.

Functional component		Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)
1		**Inlet**					
1a	Blockage	3 (and after significant rain events)	No blockage	Limited blockage	Minor blockage causing slight bypass of flows or restricted inflows	Moderate blockage causing moderate to significant bypass of flows or restricted inflows	Complete blockage causing total bypass of inflows
				Limited standing water	Minor amount of standing water	Moderate amount of standing water	Significant amount of standing water
1b	Damage	3 (and after significant rain events)	No damage	Limited damage	Minor damage	Moderate damage	Significant damage
						Minor risk to structural integrity of asset, public safety or asset function	Moderate to significant risk to structural integrity of asset, public safety or asset function
1c	Erosion	3 (and after significant rain events)	No erosion	Limited and localised erosion	Minor erosion	Moderate erosion	Significant erosion
						Minor risk to structural integrity of asset, public safety or asset function	Moderate to significant risk to structural integrity of asset, public safety or asset function
2		**Storage area (vegetated base and batters)**					
2a	Erosion	3	No erosion	Limited and localised erosion	Minor erosion	Moderate erosion (e.g. short circuiting of flows)	Significant erosion (e.g. short circuiting of flows)
						Minor risk to structural integrity of asset, public safety or asset function	Moderate to significant risk to structural integrity of asset, public safety or asset function
2b	Plant/turf health	3	Excellent plant/turf health	Good plant/turf health, free from disease and growing vigorously	Fair plant/turf health	Poor plant/turf health	Very poor plant/turf health
					Minor signs of disease and/or pests	Moderate signs of disease and/or pests	Significant signs of disease and/or pests
					Wilting in <10% of plants/turf	Wilting in 10-25% of plants/turf	Wilting in >25% of plants/turf

Functional component		Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)
2c	Plant/turf cover	3	Excellent plant/turf cover (>90%)	Good plant/turf cover (80-90%)	Fair plant/turf cover (50-80%)	Poor plant/turf cover (30-50%)	Very poor plant/turf cover (<30%)
2d	Weeds	3	No visible weed cover No declared invasive weeds	Limited weed cover (<10%) No declared invasive weeds	Minor weed cover (10-20%) No declared invasive weeds	Moderate weed cover (20-40%) and/or declared invasive weeds present	Significant weed cover (>40%) and/or declared invasive weeds present
2e	Litter and/or debris (larger than a soft drink can)	3	No litter and/or debris	1 piece of litter and/or debris/50m^2 Limited impact on aesthetics	2-3 pieces of litter and/or debris/50m^2 Minor impact on aesthetics	4-5 pieces of litter and/or debris/50m^2 Moderate impact on aesthetics	Significant amount of litter and/or debris Significant impact on aesthetics
2f	Accumulated sediment (flow path impacts)	3	No accumulated sediment	Limited amount of accumulated sediment (<10% of surface)	Minor amount of accumulated sediment (10-25% of surface) Minor redirection of flows through system	Moderate amount of accumulated sediment (25-50% of surface) Moderate redirection of flows through system	Significant amount of accumulated sediment (>50% of surface) Impeding flows
2g	Standing water and/or boggy conditions	3	Well drained with no standing water or boggy areas	Limited standing water and/or boggy conditions after rain events Typically dries out within 12 hours	Standing water and/or boggy conditions after rain events Typically dries out within 24-48 hours	Standing water and/or boggy conditions after rain events Typically dries out after 2-5 days	Standing water and/or continued boggy conditions for 5+ days, affecting asset performance and ease of maintenance
2h	Storage volume	6	No sediment accumulation or storage volume reduction	Limited accumulated sediment Limited impact on storage volume	Minor amount of sediment accumulated, ≤2.5% of storage volume lost	Moderate amount of sediment accumulated, 2.5- 5% of storage volume lost	Significant amount of sediment accumulated, >5% of storage volume lost
3		**Outlet (discharge control pit/weir)**					
3a	Blockage	3 (and after significant rain events	No blockage	Limited blockage	Blockage causing minor obstruction of outflows	Blockage causing moderate obstruction of outflows	Blockage causing significant obstruction of outflows
3b	Damage	6	No damage	Limited damage	Minor damage (e.g. minor number of small holes and/or damage to screen)	Moderate damage (e.g. moderate number of holes and/or screen not securely attached to pit wall) Minor risk to structural integrity of asset, public safety or asset function	Significant damage (e.g.screen completely detached from pit wall) Moderate to significant risk to structural integrity of asset, public safety or asset function

Functional component		Inspection frequency (months)	Very good (condition score – 1)	Good – Performance indicator (PI) met (condition score – 2)	Fair (condition score – 3)	Poor (condition score – 4)	Very poor (condition score – 5)
3c	Erosion	3 (and after significant rain events)	No erosion	Limited and localised erosion	Minor erosion	Moderate erosion Minor risk to structural integrity of asset, public safety or asset function	Significant erosion Moderate to significant risk to structural integrity of asset, public safety or asset function
4		**Other structures, e.g. handrails, bollards, access ramps**					
4a	Damage to or removal of structure/s	Annual	No damage	Limited damage	Minor damage	Moderate damage Minor risk to structural integrity of asset, public safety or asset function	Significant damage Moderate to significant risk to structural integrity of asset, public safety or asset function