



# Water sensitive urban design

## Maintaining water sensitive urban design assets

### Summary

Maintenance refers to the actions that are necessary to ensure an asset continues to function effectively and achieves its design objectives.

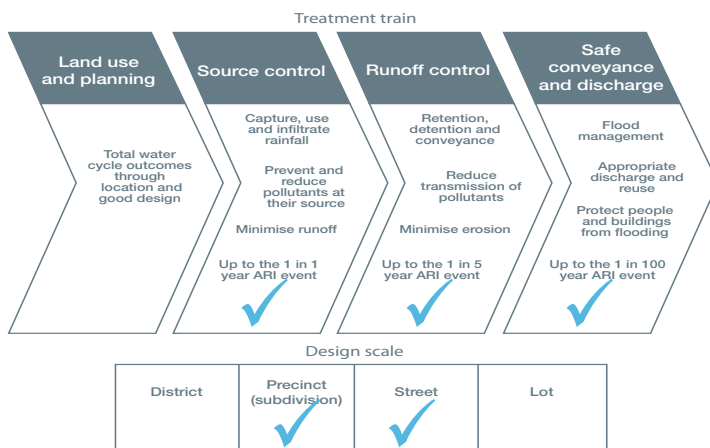
Maintenance does not mean:

- fixing poorly performing assets; or
- undertaking works on systems that have been built before the catchment is fully developed.

Maintenance is required to ensure systems will function effectively, optimising their life span. Maintenance also ensures that the multiple objectives of WSUD systems, which include environmental protection, flood protection and amenity, can be delivered.

Maintenance tasks for WSUD assets are similar to conventional drainage systems and parks.

Effective maintenance requires time and resources to be allocated to actions which are scheduled in response to planned inspections. Try to fix small problems before they get big.



### Maintenance process

- Inspect assets – inspection checklist
- Record maintenance needs
- Undertake maintenance as identified (planned/preventative)
- Undertake rectification/ corrective maintenance as required
- Record requirements and cost
- Share the information!

### Timing for inspection

- System-wide major (civil and natural areas) inspection – annual and/or following major rainfall events to assess overall system performance. Record with photos and standard forms.
- Standard inspections – 6 monthly to consider individual asset function. Record with photos and standard forms.
- Specified asset inspections – 1-2 monthly depending on type/location of asset i.e. if high profile or unusual site conditions, or newly installed systems/assets.
- Inspections inform timing of maintenance requirements.
- Biofilters, swales and buffer strips to be 'inspected' during regular maintenance visits for mowing/ weeding/litter removal.
- Inspections after heavy rainfall events are recommended.

### Designing for maintenance

Good design and construction may cost more, but it is likely to result in cheaper maintenance throughout the asset life-cycle. Key elements of design that influence maintenance are:

- Clear edge of asset to delineate mowing
- Good and safe access for maintenance staff and equipment
- Simple inlet and outlet arrangements
- Vegetation – preferably locally native species appropriate to hydrological regime

Maintenance will be reduced if:

- maintenance and landscape staff are part of the design team;
- future responsibilities are agreed;
- the construction team is briefed on the purpose of the asset and the maintenance requirements;
- risks are understood and managed as agreed; and
- landscape context and seasonal variations are understood and site conditions (including slope) are appropriately addressed.

### Maintenance planning

Determine:

- who is going to undertake maintenance (internal, external, community)
- what is to be maintained
- when it will be maintained (rainfall based, routinely, intermittently)
- how will it be funded

Consult the community where possible.

Keep records.

Systems are key:

- Asset database
- Asset management plans
- Asset handover procedures

### Key tips

- Many WSUD systems are more like living ecosystems than hard infrastructure
- Maintenance begins at project design stage
- Establishment period typically requires most active involvement in maintenance
- Maintenance requires systematic thinking and processes
- Handover is important - understand design and construction history
- Safety risks should be identified and understood



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## Maintaining water sensitive urban design assets: Activity table

### Required reading

- Department of Water, *Stormwater Management Manual for WA*: <http://www.water.wa.gov.au/urban-water/urban-development/stormwater/stormwater-management-manual>
- Water by Design (Qld), *Maintaining vegetated stormwater assets*: <http://waterbydesign.com.au/maintenanceguide/>
- Melbourne Water, *WSUD maintenance guidelines: A guide for asset managers*: <http://www.melbournewater.com.au/Planning-and-building/Forms-guidelines-and-standard-drawings/Documents/WSUD-Maintenance-manager-guidelines.pdf>

Activity/ consideration	Swales and buffer strips	Detention, infiltration and sediment areas	Underground detention/ infiltration systems	Biofilters	Tree pits	Green roofs	Pervious paving	Living streams	Constructed wetlands
Removal of sediment	✓	if > 60% of basin or 10% detention depth	Removal of rubbish and sediment from forebay	✓	✓		✓	✓	✓
Repair damage from scour, erosion or vehicles	✓	✓		✓	✓		✓	✓	✓
Clear blockages of inlets or outlets	✓	✓	✓	✓	✓	✓	✓		✓
Water/irrigate vegetation until established	✓			✓	✓	✓			✓
Mow turf or slash vegetation	✓	✓		✓				✓	✓
Pruning, removal of dead plants and replacement	✓			✓	✓	✓		✓	✓
Litter and weed removal/ management	✓	✓		✓	✓	✓	✓	✓	✓
Address problems such as mosquitoes and boggy areas	✓	✓	✓	✓	✓			✓	✓
Check bank/batter stability		✓		✓				✓	✓
Manage algal growth		✓		✓				✓	✓
Create shade	✓			✓	✓			✓	
<b>Key indicators of need for maintenance or rectification</b>	Vegetation health Inlet/outlet blockage Erosion and sedimentation Weeds Standing Water Mosquitoes	Standing water Inlet/outlet blockage Erosion Mosquitoes	Inlet/outlet blockage Sediment accumulation Note: confined space OH&S is likely to apply Mosquitoes	Vegetation health Inlet/outlet blockage Clogging of filter media Weeds Standing water Mosquitoes	Standing water Blocked media Inlet and outlet levels Vegetation health Weeds	Leaks Poor vegetation health Weeds	Ponding of water 48hr after rainfall event Sediment accumulation	Vegetation health Weeds Algal blooms and fish deaths Erosion Mosquitoes	Sediment accumulation Mosquitoes or midges Algal blooms Vegetation health and weeds
<b>Timing for inspection</b>	Inspected on a biennial basis or following major rainfall events. Maintenance likely at time of each inspection. Determine long-term maintenance frequency after 2 years (catchment and swale has stabilised).	Inspect regularly during first year after construction and maintain as needed. Bi-annual maintenance to remove stored sediment likely. Inspect after major rainfall events (within 48 hours) and maintain as needed.	Inspect regularly during first year after construction and maintain as needed. Bi-annual maintenance to remove stored sediment likely. Inspect after major rainfall events (within 48 hours) and maintain as needed.	Inspected on a quarterly basis or following major rainfall events. Maintenance likely at time of each inspection. Re-evaluate after 2 years of operation (catchment and biofilter stabilised).	Inspected on a quarterly basis or following major rainfall events. Maintenance likely at time of each inspection. Re-evaluate after 2 years of operation (catchment and biofilter stabilised).	Inspect regularly during first year after installation and maintain as needed. Inspect regularly during first year after installation and maintain as needed. Inspect after large rainfall events.	Inspect regularly during first year after construction (settling) and maintain as needed. Maintenance will depend on the system installed and the level of sediment in the catchment. Cleaning (high pressure hose or appropriate equipment) might be required at least annually.	Inspect regularly during first year after installation and maintain as needed. Inspect after major rainfall events.	Inspect regularly during first year after construction and maintain as needed. Water quality monitoring may be required. Inspect after major rainfall events and maintain as needed. Aesthetic/nuisance maintenance is important for public acceptance of the wetland. Will also reduce functional maintenance.

