MAINTENANCE SHEET – Wetland

PENRITH CITY COUNCIL

Date _____
Location _____
Asset name _____
Asset ID _____
Maintained by (name/company) _____

Purpose of visit
- ☐ Maintenance
- ☐ Response to complaint
- ☐ Other (specify) _____

Rainfall conditions
- ☐ Rainfall today (___ mm)
- ☐ Rainfall in last 3 days (___mm)
- ☐ No recent rainfall

Functional component		Maintenance response and information	Maintenance completed *Circle Y (yes), N (no) or NA (not applicable) and write what maintenance was done in the 'Notes' section.*
	Surrounds and other infrastructure		
	Damage or removal of structures	**Response:** Rectification works for structural issues to be undertaken immediately. **Information:** Refer to Works as Executed plans for specifications for structural repairs.	Y N NA Notes:
1	**Inlet**		
1a	Blockage	**Response:** Unblock inlet pipes. Remove sediment from inflow areas. **Information:** Waste must be transported to a waste facility that is appropriately licensed to accept such waste (if there is no opportunity for reuse on-site). A pit is considered a confined space, requiring safety equipment and training.	Y N NA Notes:
1b	Erosion	**Response:** Re-profiling using hand tools or light machinery. Replant if required. **Information:** Typically required after heavy rainfall.	Y N NA Notes:
1c	Sediment accumulation	**Response:** Remove sediment, dry on-site, dispose and re-set surface levels as designed. **Information:** Waste must be transported to a waste facility that is appropriately licensed to accept such waste (if there is no opportunity for reuse on-site). Reuse on-site requires the waste material to be tested for contaminants to ensure it is suitable for the intended purpose (e.g. top dressing grassed areas). If the inlet is cleaned regularly, it can reduce the amount of litter, debris and sediment accumulating in the macrophyte zone.	Y N NA Notes:
2	**Batters**		
2a	Erosion	**Response:** Re-profiling using hand tools or light machinery. Replant if required. **Information:** Typically required after heavy rainfall.	Y N NA Notes:
2b	Plant health	**Response:** Variable weekly watering for the first 6-8 weeks (until plants are established and actively growing) especially in dry weather. **Information:** Watering during the plant establishment phase is important to enable quick plant establishment. Watering during dry periods after establishment may be required to prevent plant death.	Y N NA Notes:
2c	Plant cover	**Response:** Maintain between 6-10 plants per m^2. Carry out infill planting as required (using the original planting density scheduled). **Information:** Plants should be evenly spaced to prevent localised erosion.	Y N NA Notes:

Functional component		Maintenance response and information	Maintenance completed *Circle Y (yes), N (no) or NA (not applicable) and write what maintenance was done in the 'Notes' section.*
2d	Weeds	**Response:** Remove weeds by using small shovels, mattocks or similar. Any trimmed or removed plant material must be taken off-site and disposed of appropriately. **Information:** The composition of plant species on the batter may change over time and vary from the original planting schedule. The system should be left to reach its own balance of plant composition (excluding weeds) provided the system is functioning as intended. If replanting is required, look at what species are performing well. Note: use of herbicides may compromise the integrity and performance of the system. Categories of weeds can be found on the NSW WeedWise website at: weeds.dpi.nsw.gov.au/Weeds/Categories	Y N NA Notes:
2e	Litter and debris	**Response:** Manually remove litter. **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 for litter pick ups. Note: all disposal procedures are to adhere with NSW EPA and local authorities' requirements.	Y N NA Notes:
3	**Macrophyte zone**		
3a	Erosion	**Response:** Minor erosion or scour can be re-profiled with hand tools while larger areas of erosion may require drawing down of the wetland levels and machinery. Affected areas should be replanted with the design vegetation. **Information:** In most cases, temporary measures, such as jute matting and establishing dense vegetation, will prevent further erosion. In some cases, additional scour protection may be needed, such as rock beaching.	Y N NA Notes:
3b	Floating plants	**Response:** Mechanical removal is best suited to larger wetlands or large amounts of floating plants. In most cases, floating plants can be removed by hand using rakes and/or floating booms. **Information:** If issues are persistent, ongoing control is best achieved by ensuring the edges and macrophyte zones are densely planted with a good cover of emergent aquatic macrophytes to create shade and control the growth rate of floating plants.	Y N NA Notes:
3c	Mosquitoes	**Response:** Remove any potential mosquito habitats. Fill in isolated depressions which could fill with water after rain. Remove dead or rafting edge vegetation around deep water zones which can create isolated pockets of water protected from predators. Maintain water in deep pools to provide ongoing refuge for mosquito predators, such as small native freshwater fish and macroinvertebrates. Ensure vegetation with thin, vertical, upright stems is maintained within the littoral zone around deep water zones. These maximise predation of mosquito larvae by allowing for passage of small fish and macroinvertebrate predators. **Information:** If there is an ongoing issue and nuisance population of mosquitoes in the WSUD asset, a site specific investigation should be undertaken to understand the cause and identify suitable actions.	Y N NA Notes:
3d	Plant health	**Response:** If there is too much water (over inundation), adjust water levels in the wetland (see 3g Water levels). If there is a lack of water (establishment period or drought), irrigation or increased flows may be required to support vegetation. If there is disease or pests, prune affected plant matter (or remove entire plant where necessary), treat if appropriate and replant any plants that have been lost or removed. If there is shade from adjacent vegetation, look to trim back adjacent trees, or plant shade tolerant species. **Information:** Where water levels and inundation periods are an issue, review species selection and replant with species more suitable for the actual inundation conditions.	Y N NA Notes:

Functional component		Maintenance response and information	Maintenance completed *Circle Y (yes), N (no) or NA (not applicable) and write what maintenance was done in the 'Notes' section.*
3e	Plant cover	**Response:** Replanting small areas can be achieved in a simple and cost effective manner by dividing and relocating existing mature vegetation with rhizomatous root systems. Choose vegetation from high density areas in a similar inundation zone. Simply remove and divide the mature plant by splitting it through the base into multiple sections. Directly plant these new sections into the area which requires replanting. **Information:** Where water levels and inundation periods are an issue, review species selection and replant with species more suitable for the actual inundation conditions. When vegetation is replanted, monitoring, weeding, infill planting and irrigation is required during establishment. If new juvenile plants are required for wetlands where water levels cannot be maintained at a low level during plant establishment, or grazing waterbirds are present, replant using larger, more mature plants. Otherwise, tube stock can be used for replanting.	Y N NA Notes:
3f	Sediment accumulation	**Response:** If excessive sediment is covering >50% of the surface, remove plants as needed and set aside. Remove sediment, dry on-site, dispose and re-set surface levels as designed. Replace plants (if required) at 6-10 plants per m^2. **Information:** Wetlands should only very slowly accumulate sediment and not require sediment removal more than once in 20-30 years. If sediment is accumulating faster, upstream sediment basin management should be reviewed. Waste must be transported to a waste facility that is appropriately licensed to accept such waste (if there is no opportunity for reuse on-site).	Y N NA Notes:
3g	Water levels	**Response:** If plants are water stressed, irrigation may be required and/or the water level topped up. Leaks at the outlet, through batters or base should be investigated and repaired, if relevant. If water levels are too high for long periods, the inundation frequency patterns should be assessed. Remedial actions may include modifying hydraulic structures (inlet and outlet) to create optimal water levels, modifying vegetation design and replanting to reflect actual inundation patterns, and modifying the outlet to release or divert frequent baseflows. **Information:** During a prolonged dry season, vegetation may become stressed (especially with a dry period of >70 days). Leaks may also result in reduced water levels causing vegetation to become water stressed. Inundation patterns with levels that are too high too frequently are a common cause of plant loss in wetlands.	Y N NA Notes:
3h	Water quality (oil slicks, odour, algae)	**Response:** Minor slicks can be left alone if not impacting vegetation or asset function. The impact of moderate or major oil slicks should be minimised immediately with barriers such as floating booms. The outlet of the asset should be closed to prevent the risk of the oil spill entering downstream environments. For major spills, it will be necessary to remove the bulk of the spill with an eductor truck. If blue-green algae is present, or if there are other public health and safety concerns, signage should be placed around the wetland and public access restricted through temporary fencing. Specialist advice should be sought before actions are undertaken. Excessive filamentous algal biomass can impact asset function by blocking inlets and outlets and smothering vegetation. If the algae is impacting aesthetics or function of the wetland system, it can be removed by hand using rakes or with specialist machinery. **Information:** Wetlands are good at processing low to moderate concentrations of hydrocarbons. Blue-green algae presents a human health risk and must be eliminated or managed to protect the safety of the public as a priority. Filamentous algae can form visible chains which can appear as algal mats in both open and shallow water areas.	Y N NA Notes:

Functional component		Maintenance response and information	Maintenance completed *Circle Y (yes), N (no) or NA (not applicable) and write what maintenance was done in the 'Notes' section.*
3i	Litter and debris	**Response:** Manually remove litter. **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 for litter pick ups. Note: all disposal procedures are to adhere with NSW EPA and local authorities' requirements.	Y N NA Notes:
3j	Weeds	**Response:** To manage free-floating aquatic weeds (e.g. Salvinia, water hyacinth), avoid large infestations by actively managing small infestations, undertake regular spot use of herbicide suitable for use in water bodies (e.g. Roundup Biactive®/ Glyphosate) on small infestations, and remove dead plants where possible to reduce carbon loading of the water body. For large infestations, mechanically remove plants where possible with a boat or harvester and spot spray remaining plants. To manage emergent weeds (e.g. lilies, *Typha*), lilies can be managed through repeated cutting below water level (but this approach requires commitment, including repeated cutting upon emergence of new leaves until plant energy reserves are diminished and plants die), and avoid large infestations by actively managing small infestations. When spraying emergent weeds, timing is critical for long term results. Spray towards the end of the growth season (e.g. February-March), wait for the spray to take effect (about 1 month for *Typha*, 1-2 weeks for lilies) then remove foliage ideally below water level, if possible. This technique and timing maximises treatment effectiveness. The timing ensures poison is transferred to the plants' roots/rhizomes (as the plant stores energy for the winter period) and removal of foliage below water level stops the transfer of oxygen to the roots. **Information:** Do not spray the whole water body. This provides spatial isolation and allows fish and other aquatic organisms to move away and seek refuge. Where harvesting of large infestations is not possible, treat small patches of weeds progressively to avoid impacts on aquatic habitat. Removal of dead foliage in and adjacent to the macrophyte zone is good practice to avoid carbon loading of the water body. Remove weeds before they flower and seed. Ensure soil and plant material is removed from tools and vehicles between maintenance activities and sites to prevent weed spread.	Y N NA Notes:
4	**Outlet and overflow**		
4a	Blockage	**Response:** Unblock outlet pipes. Remove sediment from outflow areas. **Information:** Waste must be transported to a waste facility that is appropriately licensed to accept such waste (if there is no opportunity for reuse on-site). A pit is considered a confined space, requiring safety equipment and training.	Y N NA Notes:
4b	Erosion	**Response:** Re-profiling using hand tools or light machinery. Replant if required. **Information:** Typically required after heavy rainfall.	Y N NA Notes:

Other: