



Appendices

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Note that some of these appendices (marked with **W**) may be downloaded from the DECC website, www.environment.nsw.gov.au/stormwater.

Appendix A: Ten tips for success

(From section 1.3 p.9)

- 1 **Plan, plan, plan**
- 2 **Recognise there will be barriers**
- 3 **Don't go it alone**
- 4 **Develop ownership**
- 5 **Make sure you get a budget**
- 6 **Learn to prioritise**
- 7 **'Train' the people above you**
- 8 **Train yourself**
- 9 **Recognise good practice**
- 10 **Communicate, communicate, communicate**

Appendix B: Example framework project plan

W

Project name _____ Project officer _____

Project element/title _____ Council _____

Overview

Rationale and project objectives

Project components

Task	Responsibility	Deadline

Specialised skills and resources

Specialised skills and resources required	Possible sources	Responsibility for identification

Methodology

Task	Responsibility	Deadline

Budget

Timetable

Communication

Task	Responsibility	Deadline

Evaluation/performance indicators

Last updated _____

Project officer signature _____

Line manager signature _____

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C.1 Road construction and maintenance



Overview

Councils aim to keep existing roads to a standard acceptable to the community, while in outer urban and growing regional areas they provide new infrastructure to meet the demands of developing areas.

Local government is responsible for the construction and maintenance of many roads and related infrastructure such as bridges, footpaths and stormwater channels. Councils are often involved in maintenance activities such as patching, regrading and street sweeping.

In performing these operations, councils and their employees should meet their legislative responsibilities under the *Protection of the Environment Operations Act 1997* (POEO Act).

Risk assessment

Before commencing any activity it is important that council operational personnel complete either a formal or informal environmental risk assessment. This involves the site supervisor taking into account:

- the potential environmental impacts of the project (these are identified in the procedures outlined on the following pages)
- the likelihood that these impacts will occur, taking into account site conditions including slope, local flora and fauna; weather conditions; proximity of the site to residential and business communities and sensitive environmental areas
- the potential environmental consequences of these impacts – if the likelihood of these impacts and of the environmental consequences are moderate or high, actions should be taken to reduce the likelihood and/or consequences.

Once the risk assessment has been completed, appropriate controls should be put in place.


Scope of procedures

The following twelve issues cover many aspects of environmental management for road construction and maintenance. Some of the suggested techniques are for everyday use and some relate more to the need for council maintenance planning:

- earthworks
- storing materials
- bitumen spraying
- asphalt laying
- pavement patching and repair
- concreting
- maintaining unsealed roads
- bridge maintenance
- road line marking and removal
- saw cutting
- drain and sump cleaning
- street cleaning.

Potential impacts


The pollution potential of each activity is indicated by a table such as this:

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

where:

- 'water' indicates a potential to cause water pollution
- 'air' indicates a potential to cause air pollution
- 'noise' indicates a potential to cause noise pollution
- 'waste' indicates a potential to generate excessive waste
- 'soil' indicates a potential for soil contamination.

C.1.1 Earthworks

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Earthworks for road construction and maintenance involve clearing vegetation, modifying the ground surface, bringing in new materials, grading, compacting and other activities.

Earthworks that remain exposed lead to erosion of soil by rain and wind. This may damage your works and could cost council both time and money to repair, rework and clean up the damaged areas. Sediment from the eroding soil could enter stormwater drains and pits causing blockages and flooding. When sediment enters waterways it causes serious problems to the ecosystem. Sediment can smother aquatic life and it transports nutrients, heavy metals, bacteria, pesticides and other toxic substances that damage our waterways and cause algal blooms.

Clearing land surfaces can lead to flooding, erosion of banks, exposure of acid sulphate soils, and the loss of vegetation growing near water.

For further information on erosion and sediment control for road construction, see *Managing urban stormwater: soils and construction vol. 2* (DECC 2007).

Actions


In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- carefully select road routes to avoid sensitive areas, minimise cut and fill etc.
- if possible schedule construction activities to periods of low rainfall erosivity (low rainfall months)
- limit the area of land disturbance and avoid disturbance near watercourses, drainage lines and sensitive areas. These restricted 'do not disturb' areas may require clear identification with barrier mesh, sediment fencing etc.
- consult the council's services plan before beginning work to avoid damage to services, water mains etc.
- determine from soil maps whether acid sulphate soils are present and, if they are, develop a management plan to deal with this
- ensure all downstream drains or waterways are protected by installing and maintaining appropriate erosion and sediment controls before beginning the work, which could include:
 - ensure drain cross-sections are parabolic (spoon shaped) or trapezoidal (flat bottomed) rather than V-shaped, as these profiles are more stable, allowing water to spread out and minimise erosion
 - install site drainage works to convey stormwater away and around the disturbed site. Where possible, divert clean run-on water from upslope land around the site while development is taking place. This can be done by using stabilised diversion drains, earth banks, rock, fallen trees, straw bales, sandbags, gravel or sand sausages
 - disturb or expose areas in stages if possible to minimise the potential for erosion
 - install site drainage works to convey stormwater safely through the disturbed site.

Reduce stormwater runoff by keeping gradients as low as possible. Progressive revegetation will encourage infiltration of water on the site. Leave the soil surfaces scarified (e.g. track walking). Install check dams to slow down the water and limit erosion

- protect batters and embankments by stabilising them with biodegradable blankets, hydro-seeding or mulch
- transport water down a batter as a temporary measure using a stabilised chute such as plastic, heavy-duty flexible corrugated pipe or half-round corrugated metal or concrete pipes. Install them progressively as construction proceeds. This can also be done as a permanent measure with concrete or rock
- install sediment retention traps at the low points of major work sites. Materials used include straw bales, woven geotextile (sediment fence), earth, rock or suitable crushed concrete products. The minimum number of straw bales to be used is four and they should be properly embedded into the ground to 100 mm depth to prevent polluted water passing underneath them. Sediment fencing should be trenched into the ground, at least 150 mm depth, backfilled and compacted. Turn up the ends of the sediment fence equal to the height of the crest to contain water and sediment
- installation all-weather access to the site. The site should be managed such that sediment is not tracked off the site. The entry/exit point should be restricted to one location. The stabilised access should be constructed with 200 mm of 40 mm diameter aggregate. The access should be a minimum of 3 metres wide and 15 metres long
- install sandbags, strawbales, gravel or sand sausages around downstream drains
- stabilise disturbed areas immediately after final grading has been completed by vegetating and mulching, either temporarily or permanently. Use annuals where a quick, temporary cover is required and perennials for long-term protection. Alternatively use mulch or biodegradable blankets such as jute mesh and plant fibre matting. Hydro-seeding is suitable if supplementary watering is available to establish growth quickly
- if the soil is dry, water down the traffic areas to reduce dust as needed. A watering truck should be available at all times. Keep the surfaces moist rather than wet
- rehabilitate shoulders and open drains with vegetation rather than with earth or concrete unless trickle flows are expected
- ensure that all trucks and other equipment carrying chemicals or with significant hydraulic reservoirs carry absorbent spill kits and material safety data sheets (MSD sheets)
- develop, document and implement a maintenance program with scheduled inspections – it is important to inspect and maintain erosion and sediment controls regularly following installation. As development proceeds, changes occur in slope gradients and drainage paths with their exact form frequently unpredictable before works begin. At times erosion and sediment controls need to be relocated. After a storm event, the effectiveness of the established controls can be readily seen, together with any shortcomings and damage – ineffective controls should be fixed and damage rectified
- trucks entering and leaving construction sites should be well maintained in accordance with the manufacturers' specifications and comply with all relevant clean air regulations
- truck movements should be controlled both in relation to times of operation and best routes to the site if there are houses close by
- select the most suitable equipment based on the particular task required. Select less noisy equipment wherever possible
- conduct letter drops to residents providing a contact name and number and details of any proposed work if the work is required to be conducted outside normal hours of operation or will have other impacts on residents.

C.1.2 Storing materials

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


Stockpiles of materials used in road construction and maintenance activities, such as sand and gravel, can contribute to stormwater pollution if rain or other water passes through or over them. Many other materials – petroleum products, sealants and paints etc. – have the potential to pollute stormwater if they are not correctly stored on-site.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- locate stockpiles at least 2 metres (preferably 5 metres) away from waterways, roads, slopes steeper than 10%, and areas of concentrated water flow
- locate stockpiles within the sediment control zone
- keep the height of the stockpile below 2 metres
- prevent runoff from washing through storage areas by locating stockpiles high on the site or diverting runoff around the site or the stockpile areas using diversion drains, earthbanks, straw bales, sandbags, gravel or sand sausages
- place sediment control structures or bunding immediately down-slope from stockpiles and provide a cover if possible
- stabilise topsoil that is to be stockpiled for extended periods
- store potentially harmful chemicals in safe, secure, on-site storage facilities and in accordance with current regulations. Material safety data (MSD) sheets should be readily available.

C.1.3 Bitumen spraying

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Bitumen spraying is commonly undertaken in order to provide a surface on road pavements and/or as a waterproof membrane between an asphalt surface and the road base. This process involves spraying a liquid asphalt binder (asphaltic cement derived from the distillation of crude oil that has been thinned to a liquid state).

If it rains before the bitumen can cure, liquid bitumen can get into the drainage system and pollute waterways. It can also enter waterways because of excessive application rates, over-spraying, spills and inappropriate cleaning practices for equipment.


During the process of chip-sealing (a method for surfacing roads), the binder is generally combined with an aggregate. The aggregate used in this operation also has the potential to wash into drains.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- always complete a risk assessment before beginning any works
- protect downstream drains or waterways using sandbags or gravel or sand sausages
- select appropriate sealing material for site conditions such as traffic volume, temperature, gradient, shade and humidity
- use bitumen emulsion where possible
- try to time spraying so it does not coincide with rainfall during or immediately after sealing
- ensure correct bitumen application and spray rates to avoid overspraying and waste
- start rolling only after sufficient curing, to prevent pickup of bitumen on the roller tyres
- ensure the pre-coating on aggregate has cured before placing it on the road
- sweep up loose materials from gutters immediately on finishing, and routinely as required
- remove all waste and debris from the site
- clean all equipment at a stockpile site or other safe site (i.e. one which is least environmentally sensitive and has pollution controls in place)
- collect spoil from the uncovering of hydrants and manholes and dispose of it correctly
- dispose of all liquids used to clean tools appropriately
- ensure soiled tar paper and pavement marker covers are collected and disposed of correctly
- ensure that all trucks and other equipment carrying chemicals or with significant hydraulic reservoirs carry absorbent spill kits and MSD Sheets
- conduct letter drops to residents providing a contact name and number and details of any proposed work. Odours and noise levels from this type of activity may be offensive to some residents, therefore prior notification is often appropriate.

C.1.4 Asphalt laying

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Asphaltic concrete is commonly used as a surface on main roads and pavements to give a smooth and sealed finish.

When used as pavement, asphalt is generally heated and mixed with aggregate off-site before being transported in a heated state to the site. The material is then deposited in layers using special machinery and compacted before curing into a solid mass.


This has the potential to impact on stormwater if runoff occurs before curing, if compacting is inadequate, or if solvents such as kerosene are used for cleaning tools and machinery.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- install sand bags or gravel or sand sausages next to stormwater inlets which receive drainage from the site
- select appropriate sealing material for site conditions – traffic volume, temperature, gradient, shade, humidity etc.
- try to time the laying so it does not coincide with rainfall during or immediately after sealing
- sweep up loose metal from gutters immediately following the laying, and routinely as required
- remove all waste and debris from the site
- clean all equipment at stockpile sites or other safe sites
- ensure that all trucks and other equipment carrying chemicals or with significant hydraulic reservoirs carry absorbent spill kits and MSD sheets
- conduct letter drops to residents providing a contact name and number and details of any proposed work. Odours and noise levels from this type of activity may be offensive to some residents, therefore prior notification is often appropriate.

C.1.5 Pavement patching and repair

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Faults in the pavement (e.g. potholes and breaking edges) may be a source of sediments that can wash out during rain. Pavement patching principally involves patching a spot with a new surface, or replacing the sub-grade before resurfacing. Repairing pavements can contaminate stormwater with sediments if waste is not properly disposed of, if compacting is inadequate, or if runoff occurs before curing.

Sometimes reshaping and stabilisation is needed, requiring the mixing of cement and lime before moistening, compacting and replacing the surface. This lime and cement can wash off and enter waterways.


Before patching, the work may require investigation using an auger (boring tool) or by digging test pits. This can contribute sediments to stormwater if waste is not properly disposed of, if test pits are left exposed to rain, or if water mains are hit when using an auger.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- ensure downstream drains are protected if required using sandbags, straw bales or gravel or sand sausages
- monitor roads for potholes and fix them promptly
- investigate the pavement to identify exactly how much work is needed and how best to do it; after the investigation, replace and compact soil into any auger holes and test pits, and seal them the same day
- when stabilising, mix materials during periods of dry weather and little wind, and seal as soon as possible after dressing
- fill and compact soil, gravel and asphalt in layers
- reuse spoil in repairs; otherwise sweep it up
- eliminate 'edge break' by fully sealing road shoulders
- dispose of used soil samples and excess spoil at a suitable fill site
- use suitable facilities for washing tools, plant etc.

C.1.6 Concreting

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Concrete residues and wastes can enter waterways in many ways:

- runoff from washing concrete-delivery trucks
- on-site mixing, washing tools, and hosing
- acid cleaning concrete surfaces, such as exposed aggregate, etc.


Concrete waste is also highly alkaline which means that even a small amount can cause significant problems for local waterways. Note: DECC has released a guideline for the concreting industry called *Environmental best management practice guideline for concreting contractors*, available from the DECC website www.environment.nsw.gov.au

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- ensure downstream drains are protected if required using sandbags, sponges or gravel or sand sausages – straw bales are not suitable
- avoid mixing or pumping concrete in areas where excess material could enter the drainage system, or else install containment measures
- have waste concrete taken back to the supplier for reuse – it may be a condition of councils' contracts for all concrete suppliers to take their waste back to their depots
- ensure that concrete residue from washing concrete truck chutes and pumping equipment is either diverted to the area that is being concreted, or deposited in a contained area on site and allowed to set before disposal
- wash tools in the area that is being concreted, or contain washing water in a drum for safe disposal later
- when hosing down concreted areas (e.g. exposed aggregate) use minimal water and allow sediments to settle in an area made with sandbags, sponges or sand sausages. Larger jobs may need a sandbag dam.

C.1.7 Maintaining unsealed roads

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Maintaining unsealed roads involves grading, patching and re-surfacing of the road, and ensuring effective operation of the road drainage system. Each of these activities can affect the stormwater system through erosion and flow of sediments. Unsealed road shoulders can also be a source of sediments.

Reducing the potential for erosion is the key to minimising the impact on the environment from unsealed roads. Proper methods of grading, the selection of suitable materials, good compaction and the provision of good road drainage are the keys to achieve this.


For further information on maintaining unsealed roads, see *Managing urban stormwater: soils and construction* vol. 2 (DECC 2007).

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- make busy roads a priority for sealing
- stabilise shoulders and open drains by vegetative or other means
- avoid grading when the road is extremely dry or water down the road, keeping the surface moist rather than wet
- use compacting equipment when grading
- use road materials that bind easily together to minimise sediment runoff
- for road verges, make sure the fill materials are suitably cohesive and thoroughly compacted
- maintain a structurally sound surface while providing adequate crown and drainage so that erosion or scattering of gravel is avoided
- implement soil erosion and sediment controls where necessary. Check dams may be required in the gutters to slow down the water and help prevent erosion. As these are areas of concentrated flow, sediment fences are not to be used, although sandbags and rock can be used. A spillway should be installed in these structures to avoid water running around the structure and causing erosion around the sides.

C.1.8 Bridge maintenance

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Bridges that are situated or designed incorrectly may lead to increased erosion of channels and stream banks, and destruction of important aquatic habitats. Maintenance materials – such as paints, solvents, and timber preservatives – can pollute stormwater if they enter waterways by runoff or wind drift.


For further information on bridge maintenance, see *Managing urban stormwater: soils and construction* vol. 2 (DECC 2007).

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- regularly inspect bridges over waterways for any erosion upstream or downstream of the bridge – address the cause of any erosion to the extent practical and install erosion controls
- when working in creeks or rivers, plan carefully to limit the impact of sediment pollution occurring because of works. Where possible, divert water (by pipe or bank) around culverts and/or bridges during construction so that the entire system is stable. Seek expert advice and take all care when forming temporary dams and draining or pumping water around the site to control polluted water.
- do works such as sandblasting and timber treatment off-site, if possible
- when cleaning bridges use suspended nets, tarpaulins or a vacuum to capture paint, rust and other chemicals
- avoid spraying chemicals in windy conditions
- paint the surfaces regularly, so there is less old paint to remove
- use materials that require minimal maintenance (e.g. galvanised or aluminium rails, rot-resistant hardwood timbers).

C.1.9 Road line marking and removal

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Line marking is done on new as well as existing roads. Generally it involves applying either paint or thermoplastic material to the road surface by machine or by hand. Line marking can have an impact on stormwater if the site isn't cleaned properly or if marking is done in the rain.


Line removal generally involves techniques such as grinding and sandblasting, resulting in residue which can be washed or blown into nearby waters.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- always complete a risk assessment before beginning any works
- use water-based paints or thermoplastics rather than solvent-based materials
- avoid using materials while the pavement is wet, during humid conditions, or if rain is likely
- avoid applying thermoplastics at low temperatures (i.e. below 13°C)
- use a portable drip tray under plant to catch spills when possible
- use a skirt around the blaster to minimise the spraying of material away from the work site
- coordinate street-sweeping with line removal, so that waste material is picked up before it can be transported by rain, wind and traffic
- do not leave waste paint on the roadway overnight – it should be swept up and returned to the depot for appropriate disposal. All spray cans should also be returned to the depot for appropriate disposal.

C.1.10 Saw cutting

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	

Background

Saw cutting of concrete, bitumen and brickwork is periodically done by councils or their contractors as part of pavement repair, concreting, bricklaying, and footpath repair or placement. The grinding process produces a fine particle residue that combines with the cooling water to produce a slurry which typically ends up in the stormwater system and then into waterways.


This slurry, even in small amounts, can have a significant impact upon waterways. All waste from saw cutting should be collected and disposed of away from the site. No wastewater should enter stormwater drains.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- where a stormwater inlet is next to the work area, that drain should be blocked completely and controls put in place between the worksite and the next stormwater inlet
- use sandbags, sponges or gravel or sand sausages to slow the flow of the water and allow sediments to settle – for larger jobs a sandbag dam may be needed
- use as little cooling water as possible; switch the water off when the saw is not in use
- prevent cooling water from flowing across exposed soil or other pollutants by diverting the cooling water around the exposed areas using sandbags, or gravel or sand sausages
- confine waste water to an infiltration trench or collect it for disposal off-site
- where sandbags are used, ensure there is enough capacity for materials to settle before treatment, disposal or reuse. One sandbag will not do the job. You need to dam the water to allow sediment to settle
- at the end of a job, collect sediment and liquid from behind sandbags and within the gutter and dispose of it, preferably off-site, where the material will not wash into waters
- consider obtaining equipment that will suck up the waste during cutting.

C.1.11 Drain and sump cleaning

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	

Background

This includes the inspection, cleaning and repair of open and piped drains, sumps, stormwater pits, treatment devices and outfall structures.


Inappropriate cleaning practices can affect stormwater if materials are transported downstream. Cleaning sumps and piped drains can put pollutants into the water system. The cleaning of open drains can have a similar impact, and may also cause erosion by disturbing the banks and bed of the drain. If pollutant traps are not maintained frequently they lose their effectiveness.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- monitor how waste accumulates in each part of the system and develop a routine cleaning program
- protect downstream drains or waterways using sandbags, straw bales, sediment or gravel socks if required
- ensure no hazardous chemicals are put into drains
- clean only those parts of grassed or natural drains that need it and, if possible, leave existing vegetation intact to act as natural filter
- remove all materials from sumps, and use a sucker broom where possible
- ensure that no spillage occurs when transporting waste
- if waste is to be kept on-site for some time (e.g. for drying out), ensure suitable silt controls are in place, for example by bunding or covering stockpiles. Have regard for appropriate siting of this material as it may generate offensive odours.

C.1.12 Street cleaning

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Roads, carparks, footpaths and cycleways are places where pollutants accumulate. During rain these pollutants often run off into adjacent stormwater drains.

Pollutants include soil erosion particles, nutrients, litter, organic matter, dust (from wearing of asphalt surfaces), and grease, oils and heavy metals from vehicles.

Inadequate disposal of the waste from street sweeping or flushing contaminants into drains can affect stormwater quality.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any works
- ensure street sweeping techniques collect pollutants rather than putting them into drains
- monitor cleaning areas to determine the 'hot spots' for pollutants, and give these areas more attention
- coordinate street cleaning with other maintenance programs such as grass cutting and tree pruning
- schedule street cleaning for off-peak periods, as cleaning is easier and more effective when there are fewer cars
- identify when 'one-off' cleaning is required (e.g. special events or road works), and plan accordingly
- in areas where a mechanical sweeper cannot reach, either sweep by hand or extract material into a contained area and collect it
- ensure sweepers are well maintained including checking the seals on water tanks
- ensure sweepers are cleaned every day in a designated wash bay where runoff water can be collected in an oil and water separator
- take waste water to a suitable treatment site.

Emergency response advice to field staff

If you find dumped chemicals or other materials and you are unsure whether it is safe to collect them and return them to the depot, please contact your supervisor immediately for advice.

Council has a set procedure for dealing with these situations. Ensure that you are familiar with that procedure and emergency requirements at all times.

C.2 Parks and gardens



Overview

Parks and gardens include public parks, playing fields, foreshore reserves and road verges, plus associated facilities such as children's play equipment, picnic tables and barbecues. The management of these areas requires work practices ranging from routine mowing, rubbish removal and building maintenance through to specialist horticultural practices.

These activities are carried out by council employees, private contractors and, in some instances, community groups. Councils and their employees should meet their legislative responsibilities under the *Protection of the Environment Operations Act 1997* (POEO Act).

The following nine areas cover the various aspects of stormwater management for parks and gardens. Some of the suggested techniques are for everyday use and some relate more to the need for council planning.

Risk assessment

Parks and Gardens personnel tend to work outside or at facilities like golf courses and sporting venues. It is important that all field staff complete either a formal or informal risk assessment before completing each project. This involves the site supervisor taking into account:

- the potential environmental impacts of the project (these are identified in the procedures outlined on the following pages)
- the likelihood that these impacts will occur, taking into account site conditions including slope, local flora and fauna, weather conditions, proximity of the site to residential and business communities, and sensitive environmental areas
- the potential environmental consequences of these impacts – if the likelihood of these impacts and of the environmental consequences are moderate or high, actions should be taken to reduce the likelihood and/or consequences.

Once the risk assessment has been completed, appropriate controls should be put in place.


Personnel working out of facilities should develop environmental management plans for their routine activities. These should also include spill response procedures.

Scope of procedures

The following pages describe SOPs for the following activities in parks and gardens:

- mowing and edging
- applying pesticides
- applying fertilisers
- mixing and storing chemicals
- working in garden beds
- collecting seagrass on foreshores
- maintaining buildings, furniture and playgrounds
- maintaining sporting fields
- graffiti protection, management and removal.

C.2.1 Mowing and edging

Activity	Pollution potential			
	WATER		NOISE	WASTE

Background

Grass clippings from mowing and edging are generally left on-site by councils to save on removal costs and because the materials are seen as a natural mulch or fertiliser. Many grassed areas next to stormwater drains, gutters and paved areas are a source of grass clippings that may be washed or blown into stormwater drains. Grass clippings can contribute to water quality problems in waterways.

Mowing can remove vegetation from riparian zones (i.e. from the banks or margins of waterways). This vegetation can be important for maintaining aquatic habitats and often acts as a buffer to protect waterways from neighbouring land uses and their pollutants.


With mowing and edging, there is the potential for spills of petroleum products when decanting fuels and operating machinery.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning the work
- remove all litter and debris before mowing and edging
- ensure mowers and edgers project grass clippings away from waterways, drains and gutters
- use a grass catcher in sensitive areas. If possible, send collected grass clippings to a composting facility or worm farm (to be recycled for use in gardens)
- use mowers which mulch clippings into smaller particles to help break them down
- mow high and often as this creates smaller volumes of grass clippings which will break down more easily than larger volumes
- remove clippings from paved areas such as footpaths, driveways, roads and gutters; this may be easier if mowing is coordinated with street-cleaning operations
- avoid mowing if the ground is very wet, as this can lead to erosion, and tyre tracks can make paths for water to flow down
- wash plant and equipment where waste water will not flow into waterways
- remove clods of soil from mowers before going to the next site
- reduce mowing near buffer zones between water and land if possible. The buffer zone will act as a filter for runoff from the park
- when planning parks and gardens use low-growing and slow-growing grass species, as these require less maintenance, and check that the design includes buffer areas between water and land
- recolonise buffer zones with native grasses and shrubs which need no mowing
- if possible, refuel on a bunded hard-stand area (e.g. concrete) and mop up all spills immediately
- if carrying fuels make sure the MSD sheets for those fuels are easily accessible.

C.2.2 Applying pesticides

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

Councils have a responsibility to control animal pests and weeds in parks and gardens, and often use a variety of chemicals to achieve this. Pesticides include insecticides (to kill insects), rodenticides (rodents), herbicides (plants) and fungicides (mould and mildew).

These chemicals may present a risk to organisms other than the target species, and can cause dramatic changes within ecosystems through direct destruction of organisms and habitats and, more subtly, through small doses making organisms less resistant to disease and inhibiting their growth. Aquatic animals in particular are susceptible to chemicals because they can absorb the pesticides readily from the water and sediments in which they live.

Chemicals used by councils can be introduced into waterways in a number of ways:

- direct application
- air drift from nearby treatment areas
- migrating organisms
- percolation through the soil
- spills and poor disposal
- surface runoff.

Inappropriate herbicide application can render land susceptible to erosion by killing grass cover.

The *Pesticides Act 1999* places specific responsibilities on organisations and individuals using pesticides. It is important that all officers using pesticides are familiar with the requirements of the Act including those relating to training and notification.


Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning the work
- mix and apply chemicals as indicated by labels
- address all risks to satisfy the Act's requirements for 'due diligence'
- use pesticides when needed, not regularly, and use them only where needed, not all over
- choose plant varieties that are resistant to diseases known to be prevalent in that area, and match species to a site.
- carry minimum amounts of chemicals on work vehicles and ensure they are safely secured and contained
- ensure MSD sheets for all chemicals used and spill kits are easily accessible
- don't use chemicals during unsuitable weather conditions (e.g. windy periods), when soil is very wet, during rain or when rain is forecast.
- don't apply chemicals near drains or gutters

- ensure you keep a detailed record of pesticide application as required by the Pesticides Regulation
- wash chemical containers at the depot where waste water can be appropriately dispersed
- purchase chemicals from a supplier that recycles empty chemical containers, or follow label directions for disposal of containers
- monitor sites to ensure that chemicals are having the desired effect, and adjust accordingly
- ensure all staff are trained in dealing effectively with chemical spills
- ensure all staff are familiar with emergency response procedures.

C.2.3 Applying fertilisers

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

Councils apply fertilisers to parks and gardens to maintain the vegetation coverage, appearance and usefulness of these areas. Areas where fertilisers are used include road verges, ovals, garden beds and prominent parkland locations.


If fertilisers are incorrectly applied or overused, or an unsuitable product is used, they could end up causing stormwater pollution.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning any work
- use the correct rates and procedures for applying fertilisers
- assess the need for fertilising, rather than applying on a calendar basis without consideration being given to need
- apply fertilisers during growth periods to help uptake of nutrients by plants
- use controlled release fertilisers wherever possible, as they are less prone to leaching and causing pollution than soluble fertilisers
- maintain a buffer between the area of application and drains, gutters and waterways
- reduce the need for fertilisers by planting species that do not require additional nutrients to those naturally present in the soil
- assess the value of applying small doses of fertiliser more frequently rather than larger doses less frequently, to reduce the chance of runoff
- monitor sites to ensure that fertilisers are having the desired effect, and adjust accordingly
- dispose of containers properly
- ensure MSD sheets for all chemicals used are easily accessible
- ensure all personnel are familiar with chemical spill and emergency response requirements.

C.2.4 Mixing and storing chemicals

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

The chemicals, such as pesticides, needed for parks and gardens maintenance are often stored on-site. They need to be stored properly and mixed carefully to reduce the potential for stormwater pollution.

Actions


In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment
- store and mix chemicals in a covered, bunded area, with an impervious surface, ensuring that all uncontaminated stormwater is directed away from the bunded area
- ensure that facilities are available for disposing of any waste collected in the bunded area and any uncontaminated bund water should be used beneficially on-site if practicable
- mix chemicals according to the manufacturer's specifications
- inspect bulk storage containers regularly, and replace them if rusted or damaged
- if storing products classified under the NSW *Occupational Health and Safety Act 2000* (OH&S Act), store them in a manner which complies with the requirements of this Act
- store empty drums and containers undercover on impervious surfaces, and have them removed as soon as possible
- make sure there is a spill plan and that staff are trained to deal with spills; a spill kit containing dry absorbent spill material should be clearly identified and easily accessible
- ensure MSD sheets for all stored chemicals are easily accessible
- ensure somebody is responsible for regularly updating MSD sheet folders.

Building and maintaining an effective bund

Effective bunding is very important when dealing with chemicals – see activity C.3.4.

C.2.5 Garden beds

Activity	Pollution potential			
	WATER			WASTE

Background

Councils maintain garden beds in prominent locations for aesthetic reasons. They feature shrubs, trees and other plants.

Exposed garden beds can cause sediment pollution if they are near drains or impervious surfaces and are not adequately mulched. They may contribute organic pollution, for example shrubs shed leaves near drains, or weeds and prunings that are not removed after maintenance activities. Mulch material may also become a pollutant if it is washed from garden beds.


The high density of garden beds, combined with the tendency to create areas of monoculture, makes them susceptible to pest attack. Also many introduced plant species have requirements regarding soil, water and nutrients that are conducive to weed growth, requiring more herbicides.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- select pest-resistant plants that suit the site (pH in soil, moisture retention, rainfall, sunlight)
- select and plant trees and shrubs that don't drop a lot of leaves
- have low-maintenance groundcovers near drains and watercourses
- mulch garden beds to prevent soil erosion or install garden bed borders to contain soil
- remove excess prunings, soil and weeds after maintenance activities.

C.2.6 Seagrass on foreshores

Activity	Pollution potential				
	WATER			WASTE	

Background

Many coastal councils remove decaying seagrass (wrack) which has been pushed by wind or currents onto the foreshore and into water inlets. The machinery used can impact on the riparian zone (near the water's edge) and on aquatic habitats if the operation is carried out below the high-water mark. It may also affect the food chain.


The *Fisheries Management Act 1994* requires that councils obtain a permit for the removal of live seagrass.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before beginning work
- only remove seagrass where it is causing a public nuisance (e.g. swimming areas, picnic areas)
- remove it from above the high-water line only
- avoid damaging riparian habitats with machinery
- ensure all collected seagrasses are appropriately disposed of
- ensure all heavy machinery with hydraulic oil reservoirs have appropriate spill response equipment available.

C.2.7 Buildings, furniture and playgrounds

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Maintaining facilities such as playground equipment, park furniture, barbecues, amenity blocks and community buildings requires the use of chemicals that may impact on stormwater quality. Activities such as painting and paint removal, graffiti removal and the use of preservatives to protect timber can contaminate stormwater.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before commencing work
- use the least toxic products for the given purpose
- sweep paved areas clean rather than hosing
- ensure all MSD sheets for chemicals used are easily accessible
- develop and use procedures to prevent and manage chemical spills
- direct waste water to vegetated areas and away from drainage channels and gutters
- ensure all solvents and other chemicals used for maintenance are collected and disposed of appropriately
- ensure all waste paint is disposed of appropriately
- ensure all chemical containers are disposed of appropriately.

C.2.8 Sporting fields

Activity	Pollution potential				
	WATER			WASTE	SOIL

Background

Many maintenance activities for sporting fields can affect stormwater quality. These include marking lines, installing posts, maintaining cricket pitches, controlling weeds and pests, fertilising, removing graffiti, applying top soil, and maintaining clubhouses, canteens and amenity blocks.


Problems often arise with hosing of amenities blocks, disposing of wastes such as cooking oils from canteens, inadequate waste collection facilities, using toxic chemicals, and using poor methods of application for chemicals.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- complete a risk assessment before doing any work
- assist sporting clubs to understand and minimise stormwater impacts by showing them best practice techniques (e.g. no hosing of hardstand areas – use a broom instead)
- spread and screed topsoil into turf to avoid overland flow paths, and leave a buffer between topsoiled areas and drains
- ensure all chemicals are stored appropriately (see C.4.2 Mixing and storing chemicals for more information)
- ensure all people applying pesticides are properly trained (see C.4.4 Applying pesticides for more information)
- ensure MSD sheets for all chemicals used are easily accessible
- ensure appropriate spill response equipment is available. Regularly check spill response equipment as part of EMP for the site
- ensure all personnel using chemicals are appropriately trained in spill response.

C.2.9 Graffiti protection, management and removal

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Graffiti has been an environmental issue for a long time. Councils across the state are adopting different approaches including establishing designated graffiti walls, immediate-removal programs and a use of a range of coatings that claim to be 'graffiti proof.'

Most councils however have recognised that any programs designed to manage graffiti need to approach the problem with a mix of three broad approaches:

- protection
- management
- removal.

An overview of these approaches is outlined below. Also outlined below are some basic environmental management considerations when implementing a graffiti removal program.

Actions

Protection

Properties can be made more resistant to graffiti by using various techniques. They include:

- textured surfaces
- high density, low absorbency materials, such as hard burnt brick, tiles, etc
- improved lighting
- landscaping to break up large surfaces
- appropriate colour schemes
- legal art opportunities
- appropriate fencing or grilles
- anti-graffiti coatings.

Management

A number of councils have developed 'graffiti flying squads', based on the view that people paint graffiti so 'tags' are seen by the wider community. The longer the graffiti stays in place, the more effective the graffiti artists appear to believe their work has been. The flying squad covers or removes the graffiti as soon as possible thereby minimising the impact of the tag.

Removal

Prompt removal of graffiti provides a disincentive for further graffiti. Various products are available for removing graffiti. Graffitiists use a variety of markers, most commonly aerosol paints and felt-tip pens. Ease of removal depends on the type of surface and how the graffiti was applied. Test a small area first to see whether any of the methods of removal indicated below will work on your surfaces.

The three main ways of removing graffiti are:

- paint-out
- chemical
- mechanical.

Paint-out – if the graffiti is on a painted surface, paint over it after removing as much of the graffiti as possible – some graffiti markers tend to ‘bleed’ through the new coat of paint, so use a sealer coat as needed before painting the whole surface. Also:

- match gloss levels as well as colour for a more professional paint-out and prevent the need to repaint the entire surface
- choose darker colours to paint out graffiti. The marks are less likely to show through, and the colour may make the site less attractive to other graffiti artists
- record all paint types and colours used on your property to simplify the matching process. Keep excess paint if possible to ensure true match of colours.

Chemical – the simplest chemical method is liquid laundry or dishwashing detergent, which will remove felt-pen graffiti from glass, aluminium, terrazzo, smooth cement and similar surfaces. Liquid cleanser, eucalyptus oil and mineral turpentine may also be effective. The best household product for removing paint from these surfaces is oven cleaner.

If the graffiti artist has used aerosol paint on an unpainted surface, act swiftly where possible. Paint will quickly penetrate absorbent surfaces like brickwork and can be very difficult to remove. Try a solvent, such as mineral turpentine, or a chemical paint remover, like caustic soda or a commercial paint stripper. For best results agitate the paint stripper with a scourer pad or stiff bristled brush to break up the graffiti and allow the chemical to penetrate better. (Gloves and protective eye wear are important for graffiti removal processes)

Whatever chemical you use follow the safety procedures recommended by the manufacturer.

Mechanical – removing extensive aerosol graffiti from an unpainted surface may require soda or water blasting. (Hot or cold water may be required in different circumstances.) For smaller areas, try scrubbing the graffiti with an abrasive cleaner. In difficult cases, you could call a specialist contractor with access to specialised products.

Environmental management considerations

All appropriate care should be taken to ensure the local environment is protected when graffiti removal programs are implemented. If hazardous chemicals have been used as part of the graffiti removal program it is important to:

- complete a risk assessment before beginning work
- use all chemicals as per the instructions on the labels
- ensure all MSD sheets for those chemicals are available on-site
- build an impervious bund around the treatment area to capture all waste liquid. Any waste liquid should then be vacuumed into containers
- seek advice from the local sewer authority as to the appropriate disposal for this liquid.

If water blasting is being used to remove the graffiti it is important to:

- protect all downstream drains with sandbags or gravel sausages
- direct all runoff water from the cleaning site to grassed areas and away from stormwater drains, after it has been filtered through sandbags or gravel sausages.

It is also important that the site be left completely clean following treatment. All used drums should be removed, and all waste paint should be swept up and placed in a bag for appropriate disposal.

C.3 Depots



Overview

A council depot is rather like an industrial estate. In many cases a depot will bring together a range of facilities and services: mechanical workshops, painters and signwriters, carpentry workshops, bricklayers, chemical suppliers, nurseries, truck washers, landscapers and gardeners. The range and size will vary depending on the council.

Depots which tend to have the best environmental performance are often those at which one manager, based at the depot, is responsible for the environmental performance of the whole depot. Sometimes there are also managers or supervisors in each section of the depot responsible for their individual sections. All operations staff should be trained in stormwater management and pollution prevention techniques. This environmental responsibility should form part of a job description, performance agreement or employment contract.

Councils and their employees should meet their legislative responsibilities under the *Protection of the Environment Operations Act 1997* (POEO Act).

Risk assessment

Depots should have an environmental management plan (EMP) in place. The EMP should be developed following an extensive audit/review of all depot activities that rates the risks associated with all activities carried out at the depot as high, medium or low. The plan should then identify appropriate environmental management controls for each of the medium and high-risk activities.


The plan should also include appropriate incident and emergency response procedures.

Scope of procedures

The following eleven issues cover many aspects of stormwater management for depots. Some of the suggested techniques are for everyday use and some relate more to the need for council management planning:

- general provisions
- bulk materials storage
- storing and decanting chemicals
- bunding
- refuelling areas
- mechanical workshops
- nurseries
- painting and signwriting
- equipment storage and parking
- wash bays
- waste storage and disposal.

C.3.1 General provisions

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

In order to minimise the overall environmental impact of the depot it is strongly recommended that an individual officer trained in this area is allocated responsibility for monitoring all aspects of depot operations.


A series of checklists should be developed for that officer to provide them with a guide as to what is required. There should also be a formal incident reporting and incident response system initiated within council in order to give the person in charge of that responsibility a level of authority.

Actions

In order to minimise the overall impacts of depots, the following actions should be considered:

- stencil stormwater drains to indicate that they are not to receive solid or liquid waste
- adopt an environmental policy which includes a documented stormwater management plan
- formulate a spill prevention and clean-up plan for liquids, powders, and solids
- provide staff with regular environmental training.

C.3.2 Bulk materials storage

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


Sand, soil, woodchips and so on from bulk storage areas should be prevented from entering the stormwater system.

Actions

In order to minimise these potential impacts, the following actions should be considered:

- divert runoff around storage areas so it does not carry materials into drains. Impervious 'speed bump' type structures could be used
- grade storage bays so that the entrance is the highest point, with drainage through a silt arrester
- keep stockpile levels below the level of surrounding walls to reduce windblown dust
- cover storage areas permanently or temporarily (e.g. during rain or after hours) where possible
- spray or cover stockpiles on dry windy days to reduce dust; trees may be planted as a windbreak for permanent stockpile areas
- if a bay is to be established for the temporary storage of dumped material make sure it is bunded and covered. If the dumped material is considered hazardous make sure it is stored in line with Work Cover requirements
- provide, if possible, a grassed area between the storage bay access area and the stormwater system to act as a filter
- decide which areas are 'dirty' and which are 'clean', depending on what they are used for, then keep them as separate as possible
- make sure dirty areas drain to a sediment removal device and/or are swept regularly
- ensure trucks have sediment removed from tyres (using a wheel shaker, wash-down area etc.) before entering the street or any area that drains to the stormwater system and does not have a sediment removal device attached.

C.3.3 Storing and decanting chemicals

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


The NSW WorkCover Authority should license storage of dangerous goods, and storage of any hazardous materials should be in accordance with current legislation.

Actions

In order to minimise these potential impacts, the following actions should be considered:

- store any chemicals classified under the NSW *Occupational Health and Safety Act 2000* to comply with the requirements of the Act. Work Cover NSW can provide information on these requirements
- ensure containers are in good shape (e.g. not rusted or split)
- keep lids on all containers when not in use
- store empty drums and containers in a covered or bunded area; have them recycled as soon as possible
- protect drums and tanks from possible collisions with vehicles and equipment
- keep spill containment kits in the chemical storage area, and ensure all staff are properly trained in their use and disposal
- store and decant chemicals in a bunded area so that any spills or leaks cannot travel to a stormwater drain; this is advisable even if only small containers are being stored
- ensure MSD sheets are easily accessible for all stored chemicals
- make it someone's responsibility to ensure that all MSD sheet files for all chemicals used by council are kept up to date and distributed to all users
- ensure all staff are familiar with emergency response procedures
- avoid storing chemicals on pervious surfaces, as spills can cause soil contamination.

C.3.4 Bunding

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


Effective bunding is extremely important when dealing with chemicals.

Actions

In order to build effective bunding, the following information should be considered:

- construct bunds for strong flammable and combustible liquids to comply with Australian Standard AS1940: 2004 *The storage and handling of flammable and combustible liquids*
- construct the walls and floor of the bund with impervious material
- use reinforced concrete walls; mortared brick walls are not considered adequate for bund walls around above-ground storage tanks
- size the bund to hold a volume equivalent to 110% of the largest container
- if fire protection is provided, size the bund capacity to retain the firewater as well as the spilled substance
- if possible provide a collection sump in the bund floor for removal of liquids
- make drain valves leakproof and place outside the banded area
- if possible provide a roof to stop rainwater getting in, but always check with WorkCover NSW regarding safety considerations before installing a roof over banded chemicals
- ensure bunds are regularly inspected and documented as part of the depot's routine maintenance program.

C.3.5 Refuelling areas

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Refuelling is an important depot activity which should be well managed so that spills are avoided.

Actions

In order to minimise the potential environmental impacts of refuelling areas, the following actions should be considered:

- clean up spills immediately using dry methods; absorbent materials should be readily available for this purpose and staff should be trained in spill management. A full spill kit should be accessible at all times.
- an emergency stop button should be installed on all pumps
- record the quantity of fuel drawn from underground storage tanks; balance these amounts with the amount of fuel delivered, as unexplained fuel losses may indicate that underground tanks are leaking
- include a test for water in the tanks as part of the depots routine maintenance. Water in the tank will also indicate leaks.
- ensure refuelling areas are concrete (bitumen deteriorates from fuel or oil spillage) and covered; divert runoff from elsewhere and install a 'blind' pit or bund to prevent spills from flowing out of the area.
- ensure that fuel bowser hoses can not reach outside the bunded area
- if the refuelling area cannot be covered, divert runoff to a treatment device capable of removing fuel products. Minimise the catchment area with bunding to stop stormwater running into and through the forecourt refuelling area
- ensure regular inspections of bunds, blind pits and treatment devices are conducted and documented
- investigate a fuel card system to supply vehicles with petrol at service stations; this may remove the need for fuelling at depots
- ensure all appropriate staff are familiar with council's emergency response procedures particularly in the refuelling area.

C.3.6 Mechanical workshops

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Regular cleaning, effective design and other measures can make workshops efficient and safe.

Actions

In order to minimise the potential environmental impacts of mechanical workshops, the following actions should be considered:

- workshop areas should be indoors or in covered bunded areas and no maintenance should be done outside these areas
- adopt and promote a policy of immediate clean-up of all spills
- workshops should drain to the sewer, with treatment as required by a trade waste agreement
- floors should be swept regularly, rather than washed down; if washing is necessary, water should flow to the sewer not the stormwater system
- oil, waste oil, coolants, lubricants and any other liquids should be stored in an area bunded or graded so that spills cannot reach the stormwater system
- liquid wastes such as oils, solvents, oil filter and radiator coolant should be recycled, where possible, or disposed of through a licensed waste contractor
- batteries should be stored in a covered and bunded area
- hands should be washed over a basin draining to the sewer, and not under outside taps near stormwater inlets
- drainage systems, sumps and traps should be regularly maintained
- dry absorbent material for cleaning up spills should be clearly identified and easily accessible
- MSD sheets for all chemicals should be easily accessible
- ensure all staff are familiar with councils emergency response procedures.

C.3.7 Nurseries

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


Nurseries can be an area of concern because of the use of fertilisers and other chemicals.

Actions

In order to minimise the potential environmental impacts of nurseries, the following actions should be considered:

- mix chemicals on an impervious area fitted with a collection sump to capture any spills
- ensure runoff from the nursery area is collected and reused, or discharged through an approved treatment device. Runoff from the nursery should not be allowed to reach the off-site stormwater system
- use controlled release fertilisers that minimise the leaching of nutrients
- mix fertiliser into the potting medium when planting, to minimise spillage later
- add zeolite or clay to potting mix to increase the retention of soluble nutrients
- maintain watering systems so they deliver uniform water quantities
- when using overhead sprinkler systems, collect pots into irrigation bays, and minimise the area between pots so that irrigation water is less likely to fall between them
- re-pot plants into bigger containers; this will increase the amount of stored water in the pot and allow for longer periods between watering, saving water and the potential for leaching
- water plants and apply liquid fertilisers using drip irrigation or sub-irrigation systems (sub-irrigation systems deliver water to the bottom of pots); these two methods can provide water savings of up to 75% compared to fixed sprinklers

C.3.8 Painting and signwriting

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background


Painters and signwriters traditionally use solvents and oil- and water-based paints. They also conduct their work both in paint shops, spray booths and outside. The potential for this type of work to pollute the environment is significant.

Actions

In order to minimise the potential impacts in painting and signwriting, the following actions should be considered:

- store all paints, solvents, liquid wastes and empty containers appropriately – see C.3.4
- ensure spray painting is carried out within an approved spray booth, with drainage to collect spills
- dispose of solvent and paint waste only through a licensed waste contractor
- consider using solvent recovery units; these reduce the amount of used solvents that need to be disposed of
- have dry, absorbent spill clean-up material clearly identified and easily accessible in spray booths and workshops.
- have MSD sheets for all chemicals used in the painting and signwriting areas easily accessible
- ensure all staff are familiar with councils emergency response procedures
- ensure all equipment is cleaned in a designated environmentally safe area
- ensure all cleaning liquids are appropriately disposed of
- ensure all rags and other material used for cleaning are recycled or appropriately disposed of
- designate an area for painters and signwriter for handwashing in order to minimise the amount of paint washed into the sewer system.

C.3.9 Equipment storage and parking

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Leaks from equipment, vehicles and plant, and spills from refuelling are significant contributors to stormwater pollution from depots.

Actions

In order to minimise the potential impacts of equipment, storage and parking, the following actions should be considered:

- regularly sweep parking areas; otherwise keep them clean of waste
- ensure that earthmoving equipment is washed in a designated wash bay before storage
- try to ensure parking areas for vehicles likely to contribute debris and residues to stormwater pollution (e.g. garbage trucks) are bunded; alternately, ensure that stormwater inlets that drain such parking areas are fitted with a treatment device
- ensure parking areas discharge to the stormwater system via an approved treatment device to capture litter and sediment; where oil contamination is likely, treatment should also include oil separation
- promptly report oil and fluid leaks from vehicles and plant to enable repairs to be done. Designate the same parking spots for all major equipment every day in order to identify which pieces of equipment may be leaking
- ensure noise at start-up is kept to a minimum in order to minimise impact on neighbours
- maintenance work should not be carried out in the equipment storage and parking area.

C.3.10 Wash bays

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


A designated area for washing vehicles should be established with hose lengths limited so that staff cannot wash vehicles outside that area.

Actions

In order to minimise the environmental impacts of wash bays, the following actions should be considered:

- wash bays should be covered, bunded, and have a treatment device connected to the sewer, particularly if detergents and high-pressure hoses are used; ensure that you have a trade waste agreement with the authorities for discharges to the sewer
- the treatment device (oil and water separator) and bunding should be maintained. Inspections and other actions should be documented
- ensure that the vehicle is parked within the bunded area and no overspray or wastewater can leave the bunded area (signs to advise drivers should be installed)
- for wash bays used only to remove soil from vehicles, without the use of detergents or high pressure hoses, the area could drain to a suitable sediment removal device
- ensure the area within the wash bay is paved with concrete
- use only quick-break degreasing compounds, to reduce the emulsification of oils and other hydrocarbons
- ensure the wash bay area is cleaned at the end of every day.

C.3.11 Waste storage and disposal

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Councils are often required to store material dumped in parks and other areas before disposal. It is strongly recommend these materials should if possible be taken directly to land fill or a licensed transfer station.

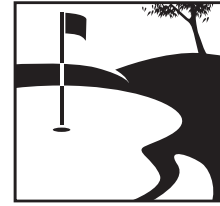
Council also generates a lot of its own waste from workshops and other areas. This waste also requires attention.

Actions

In order to minimise potential impacts of waste storage and disposal, the following actions should be considered:

- store disused car and truck batteries under cover and in a spill tray or bund
- store radiators awaiting disposal or exchange under cover within a bunded area
- drain used oil filters of excess oil and store them under cover in an impervious container awaiting collection for recycling
- store all potentially polluting wastes under cover where possible. If they have to be stored outside, keep them in an impervious waste container; in bunded areas with a drain leading to a dead-end sump made of impervious material such as concrete. This should be covered if possible
- recycle waste oils, coolants and solvents wherever possible.

C.4 Golf courses



Overview

Managing a golf course in an environmentally responsible way requires councils to balance the needs of golfers with those of the wider community and the surrounding environment. Council could let the members or clients of the club know of its intention to change practices to become more environmentally sustainable and what they can do to help. A leaflet in the pro shop of the club can explain the reasons for the changing appearance of the course and signage on the course near wetlands and areas of rough will explain the role they play in protecting local waterways. Articles in local newspapers can inform the community of what council is doing, in this regard.

Best management practices can mean, for example, changing or lowering the amount of fertiliser used, developing wider areas of rough particularly around waterways, planting more native species which require less fertiliser, and building ponds or lagoons on the golf course which act as nutrient traps or stormwater reuse ponds.

The document *Improving the environmental management of NSW golf courses* (Australian Golf Course Superintendents Association, 2003) is a useful resource – call (03) 9548 8600 or visit www.agcsa.com.au. Councils and their employees should also meet their legislative responsibilities under the *Protection of the Environment Operations Act 1997* (POEO Act).

Risk assessment

Golf courses should have an environmental management plan (EMP) in place. The EMP should identify the potential impacts of all routine maintenance activity and the controls that should be put in place to minimise the environmental risks associated with these activities. It also should include an emergency response procedure.


The EMP should also identify high-risk or environmentally sensitive areas within the golf course that need extra attention when work is being completed in or near them.

Scope of procedures

The following eight issues cover many aspects of environmental management for golf courses. Some of the suggested techniques are for everyday use and some relate more to the need for council planning:

- bulk materials storage
- mixing and storing chemicals
- earthworks
- applying pesticides
- applying fertilisers
- irrigation
- mowing
- vehicle and equipment washing.

C.4.1 Bulk materials storage

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Golf courses need to store sand, soil, gravel and other landscaping materials in bulk storage areas. They should be established and managed in a way that minimises potential flows from the areas into the stormwater system.

Actions

In order to minimise these potential impacts, the following actions should be considered:

- locate material stockpiles at least 2 metres (preferably 5 metres) from waterways, roads, slopes steeper than 10% and areas of concentrated water flow
- divert run-on water around storage areas by placing diversion banks up-slope and with sediment control structures placed immediately down-slope to protect other lands and waterways from sediment pollution
- grade storage bays so that the entrance is the highest point with drains through a silt arrester or grass filter area
- keep stockpile levels below the level of surrounding walls to reduce windblown dust. If you do not have surrounding walls then the height of the stockpile should be less than 2 metres
- for long-term stockpiles where regular access is required, bund the area on three sides with concrete, brick or timber walls
- cover temporary stockpiles with a weighted down plastic sheet. Such stockpiles could be protected with straw bales, sandbags or other similar sediment controls as necessary
- minimise noise impacts from machinery on surrounding residents by timing operations appropriately.

C.4.2 Mixing and storing chemicals

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

The chemicals needed for parks and gardens maintenance, such as pesticides, are often stored on-site. There is potential for stormwater pollution if they are not stored properly and mixed carefully.

Actions


In order to minimise these impacts, the following actions should be considered:

- store and mix chemicals in a covered, bunded area, ensuring that all stormwater is directed away from the bunded area to a dead-end collection sump. All stormwater should be directed away from the bunded area
- prepare a spill plan and train staff to deal with spills
- keep a spill kit and clear instructions near where chemicals are stored
- mix chemicals according to the manufacturer's specifications
- inspect bulk storage containers regularly, and replace them if rusted or damaged
- store products classified under the NSW *Occupational Health and Safety Act 2000* (OH&S Act) to comply with the requirements of this Act; depending upon the quantity stored, licensing by the WorkCover Authority may be required
- store empty drums and containers under cover, and have them removed as soon as possible
- ensure MSD sheets for all stored chemicals are easily accessible
- ensure somebody is responsible for regularly updating MSD sheet folders.

Building an effective bund

Effective bunding is extremely important when dealing with chemicals – see activity C.3.4.

C.4.3 Earthworks

Activity	Pollution potential				
	WATER			WASTE	SOIL

Background

A comprehensive erosion and sediment control plan or soil and water management plan should be put in place for any major earthworks undertaken on the golf course.

The potential for erosion should firstly be minimised by limiting the extent and duration of land disturbance and protecting areas once exposed.


The amount of runoff from the site should be controlled by keeping flows on-site and impeding flows. Sediment should be retained within the site. For further information see *Managing urban stormwater: soils and construction* vol. 1 (Landcom 2004).

Actions

In order to minimise these potential impacts, the following actions should be considered:

- develop a comprehensive erosion and sediment control plan to a level of detail consistent with the works being undertaken
- ensure all downstream drains or waterways are protected by installing and maintaining appropriate erosion and sediment controls. Install site drainage works to convey stormwater away from the site
- where possible, divert clean run-on water from lands upslope around the site while development is taking place by using stabilised diversion drains, earth banks, rock, fallen trees, straw bales, sandbags, gravel or sand sausages
- install site drainage works to convey stormwater safely through the site. Reduce stormwater runoff by keeping gradients as low as possible. Encourage infiltration of water on the site using progressive revegetation. Leave the soil surfaces scarified by track-walking. Install check dams to slow the water down and limit erosion
- install sediment retention traps at the low points of major work sites using materials such as straw bales, woven geotextile (sediment fence), earth, rock or suitable crushed concrete products
- place sandbags, straw bales, gravel or sand sausages around downstream drains
- if the soil is dry and dust is active, water down the traffic areas to reduce dust
- ensure someone is responsible for checking that the erosion and sediment control devices remain in place and are maintained throughout the life of a job. Document these inspections and actions that have been taken
- if possible schedule activities to periods when rainfall erosivity is lowest (e.g. low rainfall months)
- limit the area of land disturbance and avoid disturbance near watercourses, drainage lines and sensitive areas. These restricted 'do-not-disturb' areas may require clear identification with barrier mesh, sediment fencing etc.
- stabilise disturbed areas immediately after final grading has been completed. This can be done with vegetation and can be either temporary or permanent restabilisation.

C.4.4 Applying pesticides

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

Golf course managers have a responsibility to control animal pests and weeds in golf courses, and often use a variety of chemicals to achieve this. Pesticides include insecticides (to kill insects), rodenticides (rodents), herbicides (plants) and fungicides (mould and mildew).

These chemicals may present a risk to organisms other than the target species, and can cause dramatic changes within ecosystems through direct destruction of organisms and habitats and, more subtly, through small doses making organisms less resistant to disease and inhibiting their growth. Aquatic animals in particular are susceptible to chemicals because they can absorb the pesticides readily from the water and sediments in which they live.

Chemicals can be introduced into waterways in a number of ways:

- direct application
- air drift from nearby treatment areas
- migrating organisms
- percolation through the soil
- spills and poor disposal
- surface runoff.

Inappropriate herbicide application can render land susceptible to erosion.

The *Pesticides Act 1999* places specific responsibilities on organisations and individuals using pesticides. It is important that all officers using pesticides are familiar with the requirements of the Act.


Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- mix and apply chemicals as indicated by labels
- address all risks to satisfy the Act's requirements for 'due diligence'
- use pesticides when needed, not regularly, and use them only where needed, not all over
- choose plant varieties that are resistant to diseases known to be prevalent in that area, and match species to a site
- carry minimum amounts of chemicals on work vehicles and ensure they are safely secured and contained
- ensure MSD sheets for all chemicals used and spill kits are easily accessible
- don't use chemicals during unsuitable weather conditions (e.g. windy periods) when soil is very wet, during rain or when rain is forecast
- don't apply chemicals near drains or gutters
- ensure you keep a detailed record of pesticide application and staff are appropriately trained as required by the Pesticides Regulation

- wash chemical containers at the depot where waste water can go to the sewer
- purchase chemicals from a supplier that recycles empty chemical containers, or follow label directions for disposal of containers
- monitor sites to ensure that chemicals are having the desired effect, and adjust accordingly
- ensure all staff are trained in dealing effectively with chemical spills
- ensure all staff are familiar with emergency response procedures.

C.4.5 Applying fertilisers

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

Councils apply fertilisers to golf courses to maintain the vegetation coverage, appearance and usefulness of these areas. Areas where fertilisers are used include road verges, ovals, garden beds and prominent parkland locations.


If fertilisers are incorrectly applied or overused, or an unsuitable product is used, they could end up causing stormwater pollution.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- use the correct rates and procedures for applying fertilisers
- assess the need for fertilising, rather than applying regularly
- apply fertilisers during growth periods to help uptake of nutrients by plants
- use controlled release fertilisers wherever possible, as they are less prone to leaching and pollution than soluble fertilisers
- maintain a buffer between the area of application and drains, gutters and waterways
- reduce the need for fertilisers by planting species that do not require additional nutrients to those naturally present in the soil
- apply small doses of fertiliser more frequently rather than larger doses less frequently, to reduce the chance for runoff
- monitor sites to ensure that fertilisers are having the desired effect, and adjust accordingly
- dispose of containers properly
- ensure MSD sheets for all chemicals used are easily accessible
- ensure all personnel are familiar with emergency response requirements.

C.4.6 Irrigation

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background


Golf courses use a lot of water. Timing water use and different methods of application can minimise the amount of water required and it can also help to reduce stormwater flows from the course.

Actions

In order to minimise the environmental impact of irrigation, the following actions should be considered:

- develop an irrigation plan which considers the relative costs of different types of irrigation equipment
- time irrigation so that plants make best use of water
- check equipment regularly to ensure accurate, efficient and reliable metering and dispersal
- ensure that there is no concentrated runoff causing erosion
- install soil moisture monitoring equipment, which can improve irrigation efficiency
- consider having a stormwater harvesting and reuse scheme for irrigation (see *Managing urban stormwater: harvesting and reuse*, DEC 2006).

C.4.7 Mowing

Activity	Pollution potential				
	WATER		NOISE	WASTE	SOIL

Background

Mowing on golf courses should be completed to a plan.

There is a potential for grass clipping runoff from fairways in some rough areas to enter waterways, which adds to the nutrient load in those waterways.

Species selection will also influence the type and frequency of mowing on golf courses.

Actions

In order to minimise the potential impact of mowing on golf courses, the following actions should be considered:

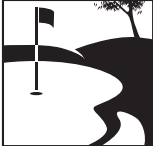
- remove all litter and debris before cutting grass
- ensure the mower projects grass clippings away from waterways, drains, gutters etc.
- maintain a buffer adjacent to waterways by reducing mowing near these areas
- use a grass catcher near sensitive areas such as creeks and wetlands
- remove grass residue from paved areas such as footpaths and driveways
- if feasible, send grass clippings to a composting facility or worm farm
- consider creating 'no-go' mowing areas and recolonise the area with native grasses and shrubs, particularly adjacent to watercourses and wetlands.

Species selection

Select turf grasses with consideration of their suitability for the local climate. Species grown outside their optimum climate range may require greater inputs for their management.

Turf grasses with a healthy root mass in healthy soil are less likely to develop disease or come under attack from pests. The use of 'organic' products generally aims to facilitate a lively soil microbiology, high nutrient availability, high water retention and high root mass, thereby keeping the need for chemical additives to a minimum.

C.4.8 Vehicle and equipment washing

Activity	Pollution potential				
	WATER				SOIL

Background

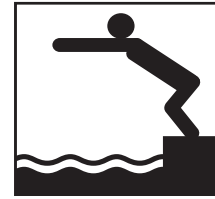
A range of different equipment is used on golf courses, all of which needs to be washed and maintained. There is a significant potential for pollution in the washing and maintenance of that equipment.

Actions

In order to minimise these potential impacts, the following actions should be considered:

- always wash down equipment in a designated bunded wash bay and collect wash water for reuse or appropriate disposal
- select chemicals for cleaning of equipment having minimal environmental impact
- all MSD sheets for cleaning and maintenance should be easily accessible

C.5 Swimming pools



Overview

Local government commonly plays a key role in providing swimming pool facilities to the community. Keeping pool water quality to a standard compatible with public health requirements is particularly important. It includes filtration, disinfection, pH adjustment, and recirculation of treated water.

Different pools use different techniques to achieve these functions, particularly for disinfection. While some pools rely solely on chlorine, many newer ones also use ozone and bromine technology. The environmental impact of swimming pools largely depends on these disinfection methods.

Risk assessment


Councils should develop environmental management plans (EMPs) for their swimming pools. The EMP should identify the potential environmental impacts of all routine maintenance activities and the controls that should be put in place to minimise those impacts, focusing particularly on high-risk activities. The EMP should include an emergency response procedure and should note how any regulatory requirements will be met.

Scope of procedures

The following five issues cover many aspects of environmental management for swimming pools. Some of the suggested techniques are for everyday use and some relate more to the need for council maintenance planning:

- water runoff
- using chemicals
- filter backwash water
- emptying the whole pool
- pool structure.

C.5.1 Water runoff

Activity	Pollution potential				
	WATER				SOIL

Background

Runoff from 'hardstand' areas at the sides of pools typically goes into stormwater inlets around the pool perimeter. A major source of this runoff is 'splash' from the pool and the 'dragging' of water as people leave the pool.

Pool water may encourage algal growth around the pool and in the stormwater system. Regular maintenance work is required to remove the algae, commonly using agents such as concrete cleaner, acid and chlorine. This, in turn, adds pollutants to the runoff.


In pool amenity blocks it is standard practice to use an industrial-grade disinfectant, and occasionally sodium hypochlorite combined with water from a hose on the floor, to maintain hygiene. The hosing of these areas combined with the use of chemicals can cause pollution problems if water flows to the stormwater system rather than the sewer.

Actions

Minimising the impact of water runoff at swimming pools requires a systematic management approach. The following actions should be considered:

- sweep the hardstand and amenities areas instead of hosing or washing
- use biodegradable disinfectants
- change the drainage system so that runoff from the amenities blocks drains to the sewer (subject to approval from the water authority).

C.5.2 Using chemicals

Activity	Pollution potential				
	WATER	AIR		WASTE	SOIL

Background

Operating swimming pools involves unloading, storing and handling a large number of potentially harmful chemicals and materials, including chlorine compounds and acids. If they are not properly managed there is the potential for spills.

Due to the corrosive nature of chemicals such as chlorine compounds and acids, spills are likely to occur if materials are not stored in suitable containers. The corrosive qualities of these materials may also result in the degradation of storage and bunding structures. This is especially the case where brickwork is used in the bunding of bulk acids and chlorine compounds.


Most chemicals are applied with automatic dosing, thus minimising the potential for spills from handling. In some cases, however, manual handling is undertaken and there is the potential for spills and runoff into stormwater.

Actions

The use of chemicals at swimming pools requires a systematic approach. The following actions should be considered:

- ensure all staff are familiar with SOPs for handling chemicals (see section C.3)
- ensure all staff are familiar with spill response procedures
- ensure all appropriate MSD sheets are available at storage and application sites
- ensure appropriate spill response equipment as outlined in the MSD sheets is available
- design chemical storage areas that can contain spills, allowing particularly for corrosive chemicals
- use bunding at the spot where bulk filling of chemicals is done, or isolate this area so that spilt chemicals do not flow to the stormwater system
- use correct labels for hazardous and other materials, and store them in appropriate containers
- store spill response equipment in a clearly marked container close to where the chemicals are used and stored so that the equipment is easily accessible
- the banded areas should be able to contain 110% of the volume of the largest container within the bund.

C.5.3 Filter backwash water

Activity	Pollution potential				
	WATER			WASTE	SOIL

Background

Over time, materials accumulate in pool filters. This reduces the effectiveness of the filter, so it should be cleaned by reversing the flow of water for a short time (backwashing).


The backwash water, which contains high levels of suspended solids and other pollutants, cannot be discharged back into the pool untreated, so it should be either treated for reuse or discharged to the sewer (subject to water authority approval).

Actions

The management of filter backwash water requires a systematic approach. The following actions should be considered:

- treat backwash water for reuse or irrigation
- discharge it to the sewer system. Contact your local water and sewer supply service operator to discuss their requirements
- treat the water to meet required water quality requirements.

C.5.4 Emptying the whole pool

Activity	Pollution potential				
	WATER				SOIL

Background

Municipal pools are often emptied to conduct routine maintenance work and/or for the winter close-down period. It has been common practice to discharge this wastewater to the stormwater system.

The regulations in relation to the discharge of swimming pool water are changing regularly. It is strongly recommend advice be sought from DECC before completing any discharge to stormwater.


The chemicals in swimming pool water can strongly affect the environment, but especially when large volumes of water are discharged. The water generally contains high concentrations of a disinfectant/oxidising agent, total nitrogen and total dissolved solids. Furthermore, water flow is affected by large volumes of water discharged in short periods.

Actions

The emptying of pool water requires a systematic approach. Recommended actions include:

- avoid draining a pool unless necessary
- consider using maintenance products that can be applied to water in the pool
- if discharging to the environment, allow water to stay in the pool for a time so that chlorine can dissipate (add sodium thiosulphate if necessary) and for pH to adjust to that of the receiving waters (chemically modify if necessary).
- monitor chlorine levels and pH before discharging the water
- if approved for discharge to stormwater, discharge the water at a slow rate to avoid erosion in the receiving water body
- prior to the pool water being released, the water temperature should be given time to return to the ambient temperature
- swimming pool operators should investigate options for the reuse of pool water.

C.5.5 Pool structure

Activity	Pollution potential				
	WATER				SOIL

Background

Water from municipal pools can continually leak into the environment from faults in the pool structure, as a result of broken pipes, or as a result of faulty float valves and inadequate balance tank design.

This means that chlorinated water can leak into the groundwater and/or nearby surface waters, with a resulting impact on aquatic ecosystems and soil microenvironments.

Actions

Minimising the impact of the pool structure on the local environment requires a systematic approach. The following actions should be considered:

- undertake routine maintenance of filters, pipework and valves
- routinely test for significant water losses and investigate the source of losses; this involves checking water consumption figures and stormwater pits, and switching off filters and water for a period
- identify leaks and repair sources of significant water leakage; finding leaks can involve a high degree of investigative work and may require specialist help
- quantify other sources of water use, such as evaporation and splash water.

C.6 Waste collection and management



Overview

Waste management can involve:

- garbage collection
- litter management programs
- domestic and industrial waste reuse and minimisation programs
- kerbside recycling
- public place recycling
- public place waste minimisation
- domestic and industrial collection services.

Council operations personnel can be involved in this broad range of waste minimisation activities. Managed well, these activities will help to reduce the environmental impact of waste. Managed poorly they can add significantly to the pollution load in our parks and gardens, in our stormwater channels and our rivers and waterways.

Any council developing programs for waste minimisation and management can utilise a broad range of excellent resources. Some resources are available from

- Department of Environment and Climate Change NSW at www.environment.nsw.gov.au
- Sustainability Victoria at www.sustainability.vic.gov.au

These guidelines and publications provide important information and advice to councils planning to minimise the environmental impact of their waste collection and litter management services.

The key message is that council personnel should accept responsibility for spilt or littered rubbish within their areas. Council officers or contractors involved in collection of waste should ensure all waste in and around the bin is collected and not just the waste in the bin. It is the responsibility of their personnel or their contractors collecting the rubbish or recyclable materials to ensure that areas where they work are kept clean at all times.

Scope of procedures


The following issues cover key aspects of environmental management for waste collection and management:

- rubbish collection and removal
- waste and recyclables collection and management.

Councils may also develop other procedures for:

- collecting unwanted household chemicals
- management of illegally dumped waste
- management of waste from retail, commercial and industrial premises

C.6.1 Litter reduction

Activity	Pollution potential				
	WATER			WASTE	SOIL

Background

Litter can be a continual stormwater problem where there are inadequate facilities for waste disposal and collection.


In retail areas, entertainment venues and sporting fields, litter bins can provide a continual source of pollutants if the type of bin, its location and frequency of emptying is not suitable.

Actions

In order to minimise these potential environmental impacts, the following actions should be considered:

- consider the types of rubbish receptacles used including their size and how well designed they are to adequately contain the intended waste materials, where they are located and how often they are emptied
- provide separate bins for waste/rubbish and recyclables
- look at collection, transport and disposal of receptacles
- monitor litter 'hotspots' to ensure that receptacles are being placed effectively
- develop and implement a system to deal with 'unknown disposed rubbish'. This system should discourage council personnel from handling this type of rubbish until they are sure of what it is and the most effective way of dealing with it. Contact appropriate authorities if dumped waste or spilt material cannot be readily identified.

C.6.2 Waste and recyclables collection and management

Activity	Pollution potential				
	WATER	AIR	NOISE	WASTE	SOIL

Background

Kerbside waste collection and recycling collections generate considerable amounts of pollution through spillage and the collection and emptying processes. The amount of litter created is related to windy conditions, lack of care by recycling and garbage operators and householders, and the type of collection systems used. Other issues creating litter can include spillage from unstable smaller bins, dogs scavenging and the regularity of the collection operation.

Actions

Minimising the environmental impact of waste and recyclables collection and management requires a systematic approach. The following actions should be considered:

- ensure all trucks and other vehicles used to collect waste materials are properly maintained, particularly in regard to the hydraulic mechanism used for lifting – ensure that a scheduled maintenance program is developed
- ensure all trucks and other vehicles used to collect waste and recyclables are checked for leaks every morning before leaving the depot
- use only vehicles fitted with lifting and emptying mechanisms which minimise the risk of spillage
- require council personnel or contractors involved in collection to immediately clean up all spillage of waste or recyclables
- ensure that all trucks carry an adequate supply of dry absorbent materials and other necessary equipment for use in the event of a spillage
- require council personnel or contractors to immediately notify council of the location of any spilled material not resulting from the collection operation
- ensure all machinery and equipment is stored on hard stand areas
- ensure all staff are familiar with spill response procedures
- wash garbage trucks and public rubbish bins in areas where facilities are available for the collection and appropriate disposal of the resulting waste water
- rotate times for rubbish removal activities in residential areas to minimise the continual early morning noise impacts on any one site of residents
- provide facilities for the collection of chemicals, and inform residents of the availability of these.

Appendix D: Example environmental audit tool for council work sites



The following checklist can be used to assess erosion and sediment controls on council developments, from major construction sites to routine maintenance activities. Councils can adapt the checklist as required. An electronic copy can be found at www.environment.nsw.gov.au/stormwater.

Council name _____

Date _____ Time _____

Auditors on site _____

Job address

Street _____

Suburb _____

Staff on site

Name _____

Name _____

Name of supervisor and activity type

Name _____

Type of activity _____

Machinery/truck/vehicle (including registration numbers)

Vehicle: _____ Reg: _____

Vehicle: _____ Reg: _____

Overall assessment (to be completed at the conclusion of the audit)

A. Major construction or maintenance activities (planning)

QUESTION	YES / NO	COMMENT
1a) Is there a formal erosion and sediment control plan for the site?		
	If no go to Q 2	*Please note if not necessary
1b) Are the requirements of the plan in place?		
1c) Have there been any significant amendments to the plan since the project began?		
2) Has the project manager developed an informal plan for erosion and sediment control on the site?		
3) Do you think the project should have been the subject of a formal erosion and sediment control plan?		

B. All sites (on-site practices)

Minimising erosion

QUESTION	YES / NO	COMMENT
1) Are any measures in place to divert water around the site?		
		*Please note if not necessary
2) Are there any measures in place to minimise the impact of rainfall on the exposed soil (e.g. mulching?)		
		*Please note if not necessary
3a) Are there any stockpiles on site containing materials that could add to erosion from the site?		
	If no go to Q 4	
3b) Is there any up-slope or down-slope protection of the stockpiles?		
3c) Are stockpiles covered?		
		*Please note if not necessary
4a) Is there a single stabilised entry/access point to the site?		
	If no go to Section C	*Please note if not necessary

4b) What material is used in the access way?		
4c) Does the access point drain to the sediment fence or other sediment control devices?		

Managing sediment loss

QUESTION	YES / NO	COMMENT
1) Is there a possibility that sediment or any other material can be washed from the site?		
2) Are the downstream drains protected and if so in what way?		
3) What type of protection is in place?		
Sediment socks		
• are they an effective barrier?		
Straw bales		
• are they dug into the soil?		
• are they stabilised?		
Sandbags		
• will they be effective?		
Sediment fence		
• fabric buried in 150 mm?		
• stakes placed at 3 m intervals?		
• construction along contour?		
• turnbacks installed?		
• fence at least 2 m from slope?		
Other		
4) Will these devices be effective at controlling runoff from the site?		
5) How long do the devices need to stay in place after the project?		
6) What arrangements has the manager made to ensure the devices remain in place?		

C. Maintenance

QUESTION	YES / NO	COMMENT
1a) Are the erosion and sediment control structures being maintained?		
1b) Is this part of an overall plan?		

D. Site impacts

QUESTION	YES / NO	COMMENT
1) Are there any indications of litter, sediment or other material from the job site in the downstream drains?		
2) Is there a specified area for waste storage on-site?		
3) Is this disposal area well maintained and positioned away from any drains?		
4) Is there any indication of litter, sediment or other materials on the roads around the site?		

E. Hazardous materials management

QUESTION	YES / NO	COMMENT
1) Are hazardous materials used on site?		<input type="checkbox"/> Petrol <input type="checkbox"/> Oil <input type="checkbox"/> Roundup <input type="checkbox"/> Paints <input type="checkbox"/> Others _____
2) Can the staff identify where the material safety data sheets can be found?		
3) What procedures are in place to deal with chemical spills?		
4) Are the tools and equipment for spill response available on site?		
5) Is there any evidence of chemical spills on site?		

F. Site management / waste management

QUESTION	YES / NO	COMMENT
1) Is this disposal area well maintained and positioned away from any drains?		
2) Have arrangements been made for the removal/transport of any waste generated from the site?		
3) Are these arrangements in line with council procedures?		

G. Air pollution

QUESTION	YES / NO	COMMENT
1) Is there the potential for air pollution (dust, smoke or chemical fumes) at the job site?		
2) Are you satisfied with the efforts to control air pollution?		

H. Noise pollution

QUESTION	YES / NO	COMMENT
1) Are you satisfied with efforts to control noise pollution?		

I. Flora and fauna

QUESTION	YES / NO	COMMENT
1) Is there the potential for local flora and fauna to be affected by this project?		
2) Are you satisfied with the efforts to protect flora and fauna?		
3) Is the work being completed on or near areas of critical habitat?		
4) Are you satisfied with the extra efforts required to protect the critical habitat?		

H. Heritage

QUESTION	YES / NO	COMMENT
1) Is there the potential for local heritage to be affected by this project?		
2) Are you satisfied with the efforts to protect heritage?		
3) Is the work being completed on or near a heritage site or precinct?		
4) Are you satisfied with the extra efforts required to protect the heritage values?		

Appendix E: General contract conditions

W

The general conditions of contract from a NSW council designed to guide appropriate environmental management of sites are outlined below.

Clause 'X' Environmental systems planning

The Contractor shall

- a) Comply with all requirements of the Contract and statutory requirements for protection of the environment.
- b) Ensure that each of its Subcontractors and Consultants comply in like manner.
- c) Demonstrate to the Principal by mutual inspection and/or documentation whenever requested that requirements of the Contract and statutory requirements for the protection of the environment are being met.
- d) Prior to the commencement of work, provide the Principal with certification that the requirements of the Contract and statutory requirements of the protection of the environment are capable of being met by the Contractors' organisation and management.
- e) If the period of the contract exceeds three months the Contractor is to provide the Principal with a monthly certification that the requirements of the Contract and statutory requirements for protecting the environment are being met.
- f) The Contractor is responsible for and must at its own cost make good any damage to the environment caused by the execution of the works.

Where inappropriate or inadequate provision of environmental management by the Contractor or Contractor's Subcontractor results in costs, losses or damages incurred by the Principal or claims by third parties against the Principal for either or consequential costs, losses or damages, the Contractor shall be liable for costs, losses or damages associated with any claim including but not limited to administration costs incurred by the Principal in resolving such claim.

From 'Special conditions of contract'

SC1 Environmental protection

The Contractor has an overall responsibility within the limits of the work to protect and preserve the existing environment and to avoid pollution.

The Contractor shall take all necessary measures to remove or minimise any impact by the works on the existing environment to the satisfaction of the Superintendent and where appropriate the Protection of the Environment Operations Act, the Pesticides Act and any other relevant legislation or sound practices.

The Contractor shall ensure that polluted stormwater runoff and/or silt and soil does not enter the drainage system.

The Contractor shall also take all steps necessary to suppress any atmospheric dust and shall, whenever directed, dampen the work with a water cart or other approved means. The Contractor shall be on call at weekends and holidays to carry out this work, if so required by the Superintendent.

Noise generating machinery shall be properly muffled and/or silenced to current standards and shall be located as far from residences as is practicable.

In the event that council's staff are 'called out' to rectify any non-compliance by the Contractor, all costs thereof will be charged to the Contractor.

In general the Contractor shall at all times comply with the requirements of all environmental legislation in force in New South Wales. No variation in costs will be considered due to having to meet these requirements.

Where appropriate or inadequate provision of environmental management by the Contractor or Contractor's Subcontractor results in costs, losses or damage incurred by the Principal or claims by third parties against the Principal for either direct or consequential costs, losses or damages, the Contractor shall be liable for costs, losses or damages associated with any claim including but not limited to administration costs incurred by the Principal in resolving such claim.

Specialist contract conditions

Council may consider incorporating special conditions in relevant specialist contracts. Examples of these conditions are outlined below.

a) For planning operations and maintenance activities

'The impact of any activity of asset construction and/or maintenance must take into consideration the issue of stormwater quality and include treatments and operational features to minimise the pollution of the stormwater. (Potential techniques are contained in the *Managing urban stormwater: soils & construction and Treatment techniques* documents.)

b) For street cleaning

'Sweeping shall be carried out in accordance with the specified schedule and no dirt, debris, paper, rubbish or waste shall be swept into any drainage system.'

c) For open space management

'Prior to grass cutting, all loose litter, rubbish or debris shall be cleared from the mowing area.' (Performance criterion: Absence of litter, rubbish or debris).

'All grass clippings and other debris to be swept or cleared from adjoining paths, gutters, paved surfaces and garden areas.' (Performance criterion: No clippings or other debris after cutting operations.)

d) For waste collection

'*Clearing of bins* – The Contractor should empty litter bins at the frequency specified in the schedule. Notwithstanding that a collection frequency for litter bins has been specified, the contractor should ensure that the litter bins are useable by the public at all times and that the volume of matter in the litter bin never exceeds seventy-five percent (75%) of the capacity of the bin.'

'*Spilt litter* – At the time of emptying the litter bin, the contractor should clean up any spilt litter within a radius of two (or three) metres of the litter bin whether the spillage was caused by the contractor or others.'

e) For site management

'All sites must be kept neat and tidy at all times. For long term sites the contractor is responsible for ensuring the cleanliness of the site at the end of every workday.'

f) For roadworks

'All machinery must be checked for fluid leaks on a daily basis.'

g) For swimming pools

'All chemicals must be stored in line with environmental responsibilities and the requirements of WorkCover, and the material safety data sheets for chemicals must be readily available at the site.'

h) For parks and gardens

'All contractors must ensure that all work is managed in line with council's waste minimisation and management policy.'

i) For all areas using machinery

'Contractors are responsible for ensuring all equipment is maintained in line with manufacturer's specifications. Copies of service records for machinery must be kept by the contractor.'

'Equipment cleaning is only to be carried out in a way that minimises environmental harm. This may include establishing bunded cleaning areas or ensuring all equipment is cleaned in a dedicated bunded area.'