Environmental Guidelines
Aerial Spraying Facilities

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Environment Protection Authority

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Foreword

The NSW Environment Protection Authority (EPA) strives to ensure we have a healthy environment, healthy community and healthy business in NSW. We take our protection responsibilities for human health and the environment very seriously and this best practice guideline outlines what we expect from operators of aerial application facilities. As a leader and partner, we have prepared this environmental guideline in consultation with Cotton Australia Limited (CA), Local Government NSW, SafeWork NSW and the Aerial Application Association of Australia (AAAA). It is intended to assist the aerial spraying industry understand the regulations and their responsibilities in protecting human health and the environment in the operation of on-ground aerial spraying facilities in NSW.

This guide aims to promote good practice and assist operators to comply with the *Pesticides Act 1999* (NSW), Pesticides Regulation 2009 (NSW) and *Protection of the Environment Operations Act 1997* (NSW) (POEO Act). This guideline is intended for those in the industry seeking to construct new aerial spraying facilities and for operators who need to upgrade and manage existing facilities.

This guideline focuses on practical measures to prevent and minimise harm to human health and the environment that might result from undertaking an activity related to aerial spraying that could cause pollution. It supports risk assessment on a site-specific basis, because every site is likely to be different and have challenges requiring tailored approaches to design and planning.

My thanks to our partners for their commitment to protecting human health and the environment while undertaking aerial spraying activities.

Sarah Gardner
Executive Director, Hazardous Incidents & Environmental Health Branch, NSW EPA

Photo: John Spencer, EPA

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1 Introduction

Appropriate levels of environmental protection can be achieved by the proper siting, design, construction and management of aerial spraying facilities. Each aerial spraying facility may require a different approach to planning and designing to prevent and minimise harm to the environment and human health such as:

- appropriate siting of chemical and fuel storage
- appropriate siting of wash-down facilities for agrichemicals including types of sumps
- appropriate rinsate management
- emergency planning
- types of chemicals to be used
- potential risk to local hydrogeology from on-ground facilities to determine appropriate wastewater solutions such as in-ground evaporation ponds or above-ground tanks.

All these issues and potentially others should be considered through the risk management process. Further information on a risk management process can be found in AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines*.

Aerial spraying facilities **must** be operated in a manner that does not present a risk of actual or potential pollution to surface or ground waters. In the event of decommissioning, no contaminated sites should remain as these are difficult to manage and expensive to remediate.

A number of useful information sources are included with this guideline; these sources are not exhaustive and other guidance may be available.

A note on terminology in this guideline:

- The term ***should*** is used where a particular course of action is considered by the EPA to be best practice.
- The term ***must*** is used where a failure to comply with the action stated in the guideline will, in the EPA's view, expose the environment to a risk of harm or may lead to a breach of the POEO Act.

2 Legal requirements

The POEO Act provides the statutory framework for managing pollution in NSW. It is an offence under section 120 of the POEO Act to pollute waters. However, sections 121 and 122 of the POEO Act provide defences against prosecution under section 120 where the pollution was regulated by an environment protection licence or regulation and the licence or regulation was complied with.

The definition of 'water pollution' in the POEO Act sets out general and specific circumstances that constitute pollution. At its broadest, water pollution means introducing any matter into waters which changes the physical, chemical or biological condition of the waters. The term 'waters' includes both surface water and groundwater.

The Protection of the Environment Operations (General) Regulation 2009 (POEO Regulation) also includes a list of specific substances (prescribed matter) which, if they are introduced onto or into waters, are automatically taken to constitute pollution of waters (e.g. pesticides).

If you operate an aerial spraying facility and wish to upgrade an existing installation or construct a new one, you may need to consult with the EPA and/or local council for information on your obligations under the POEO Act. Also, any waste generated from the facility needs to be managed and disposed of in accordance with the POEO Act and the *Waste Avoidance and Resource Recovery Act 2001 (NSW)*.

Additionally, there are separate licensing and other regulatory requirements under the *Pesticides Act 1999* and Pesticides Regulation 2009 that apply to aerial operators, pilots and all users of pesticides, such as record keeping and licensing requirements. For more information on licensing requirements, notifications and record keeping, refer to the EPA's webpage for aerial applicators of pesticides.

Facilities dedicated to the storage of chemicals are subject to the requirements of the work health and safety (WHS) legislation that is administered by SafeWork NSW. For further information on the storage of workplace chemicals, please refer to the SafeWork NSW Hazardous chemicals webpage.

In addition, chemicals should always be used, handled or stored in accordance with the guidance in relevant Australian Standards such as Australian Standard AS 2507–1998 *The storage and handling of agricultural and veterinary chemicals.*

3 Siting of aerial spraying facilities

Aerial spraying facilities should be located away from rivers, creeks, any environmentally sensitive areas and separated from residential areas. They should not be located on floodways, or other land susceptible to flooding, unless adequately protected.

A good understanding of the local geology and hydrogeology is important when siting an aerial spraying facility and evaporation pond. Where possible, select a site with low infiltration rates, e.g. soil that has a high clay content. Establishing the vulnerability of the groundwater as a receptor is important, as well as the location of nearby groundwater bores, the direction of groundwater flow and baseline conditions. Potential impacts on sensitive receptors such as ground and surface waters, bores, animals and humans should be adequately considered and addressed. The volumes of wash-down collected and concentrations of contaminants collected should be considered to determine an appropriate solution.

4 Design and construction of chemical-handling and wash-down areas

Chemical-handling and plane wash-down facilities **must** be designed and constructed in such a way that chemicals do not pollute ground or surface waters. Each site may require different approaches to issues such as: the need for a pump from the pad to the evaporation pond; the size of the primary sump connected to the pad to remove debris; the need for a secondary sump if above-ground rinsate tanks are to be used; or the type of piping from the pad to the evaporation pond, e.g. closed piping or open covered with mesh. Figure 1 shows a typical design for a chemical handling and plane wash-down facility.

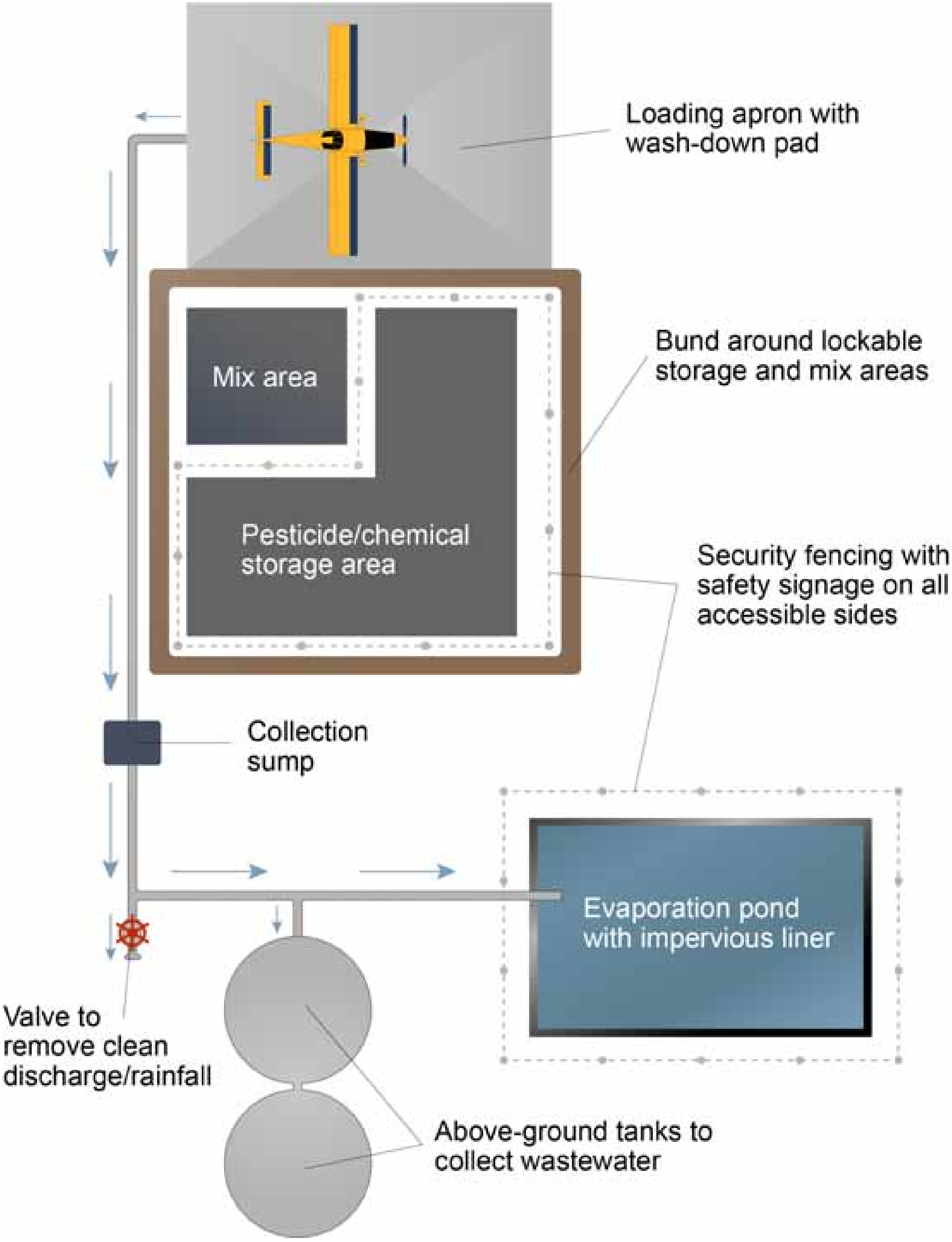

Figure 1: Diagram of an aerial spraying facility with the required design characteristics

The catchment for the disposal areas, the wash-down pad, the chemical storage area, the chemical mixing area, the loading aprons, storage tanks, drains, and any other area where chemical spillage is likely to occur **must** be constructed of impervious material and designed to contain potential chemical spillage within the immediate area.

The EPA's preferred management method for wastewaters is an above-ground tank so that wastewater can be safely contained and treated for reuse, disposed to sewer under a trade waste agreement, or removed from the site and disposed of at a lawful facility. Due to the location of aerial spraying facilities in rural and sometimes remote areas, in-ground evaporation ponds may be the only option and are often inherited by aerial spraying facilities. Evaporation ponds **must** be designed, built and maintained in accordance with this guideline to prevent risk of contamination of the groundwater and surrounding environment.

Figure 2: Appropriate wash-down area with culvert to collect run-off into a catchment area (Photo: Nina Sheer, EPA)

The wash-down pad should drain to a collection sump which should be equipped with scum baffles, partition walls, or both, to separate and remove solids that may be present in the wastewater. The wash-down pad needs to be large enough to contain any material that could be washed from the surface of the plane (that is, the whole plane should fit well within its boundaries). As a further precaution and to minimise the size of the sump required, the wash-down pad can be roofed to intercept rain which is either reused on-site or directed to stormwater. The sump **must** be sized to contain all wash-down water without overflowing.

Each bunded area should be provided with its own sump, which can be isolated from other areas if the need arises. Install suitable pipework so that any rainwater that collects in the bunded area can be transferred to the main collection sump.

Pumping systems, if required, that move wastewater from the collection sump to an above-ground tank have to be large enough to empty the collection sump as quickly as the collection sump can be filled. This allows the sump to be used as a first-flush system during rainfall. A standby pump or suitably fixed mobile submersible pump, if required, **must** be readily accessible.

Lighting for facilities involving night-time loading and washing must be adequate for efficient operation under night-time conditions and when natural light is poor.

Clean stormwater should be directed away from the catchment area.

The surface of the operational area of the facility (excluding any evaporation ponds) should be constructed of concrete and designed to withstand normal working loads. A layer of low-permeability material such as compacted clay should be placed immediately underneath the concrete. The edges of all concrete areas should incorporate a vertical cut-off wall, contiguous with the surface concrete and extending to a minimum depth of 300 millimetres below ground level. All expansion joints should be installed with conventional bitumen coated with a material that will not be corroded by chemicals.

All run-off from the concrete operational areas **must** be collected into open, mesh-covered, impervious drains (or sumps) or piping at appropriate locations. These drains or pipes must not connect to stormwater. While open construction allows for easy inspection and cleaning of the drains, consideration should be given to whether this creates an additional hazard for the particular site and layout.

Wherever possible, run-off from the concrete operational area should be directed to the disposal area in open drains or above-ground lines. Underground pipelines should only be used where open drains or above-ground pipelines are demonstrably impractical or considered to create an additional hazard, such as a risk of an uncontained spill if blocked.

All pipelines need to be properly designed and installed according to good engineering practice, and have impervious joints. Ensure that pipelines are laid on a suitable gradient that will prevent ponding, and cover pipes to protect them from damage. Install permanent signs that clearly indicate the location of pipelines.

During construction, erosion and sediment controls should be implemented consistent with the practices and principles of *Managing Urban Stormwater: Soils and Construction – Volume 1* (the Blue Book) and *Volume 2* where appropriate, see the OEH Stormwater publications webpage.

The run-off collection system should be designed to allow:

- clean water from within the catchment area to be diverted away from the operational areas of the facility and disposal areas (evaporation pond or above-ground tank) during periods of non-use. Water diverted **must** not be directed to waters (refer to definition in the POEO Act)
- petroleum products to be diverted away from the disposal facility. These liquids should be collected and appropriately disposed of
- sediment washed from the concrete catchment area to be trapped, collected and removed so it does not reach the disposal areas. This helps prevent damage to the pumps and a build-up of silt from reducing the capacity of drains and sumps.

5 Fuel storage

The Work Health and Safety Regulation 2011 (WHS Regulation 2011) requires that systems need to be in place to manage the risks associated with any leak or spill of hazardous chemicals such as fuels. The system needs to be designed such that incompatible chemicals are not mixed and any spill and associated waste can be safely disposed of. The Australian Standard AS 1940–2004 *The storage and handling of flammable and combustible liquids* sets out safety requirements for fuel handling and storage including tanks and fuel dispensers. The standard also provides recommendations for spill containment for fuel storage in above-ground tanks such as bund capacity and design to adequately contain any leakage or spillage to prevent contamination of surrounding soil or watercourses. SafeWork NSW can be contacted to clarify specific spill containment requirements.

Figure 3: Example of appropriate bunding, fencing and signage around above-ground fuel tanks (Photo: Nina Sheer, EPA)

Underground tanks also have the potential to leak and harm the environment. The EPA is the appropriate regulatory authority for implementing the Protection of the Environment Operations (Underground Petroleum Storage Systems) Regulation 2014 (UPSS Regulation) until June 2019. The UPSS Regulation requires owners and operators to regularly check for leaks in fuel tanks and pipes used to store and handle petroleum products and aims to ensure best practice to prevent land and groundwater contamination caused by leaks.

Owners/operators are required to have in place:

- a system for detecting and monitoring leaks
- a secondary system such as groundwater monitoring wells
- an environmental protection plan or equivalent for the facility for ongoing monitoring and maintenance
- systems for record keeping, reporting of leaks and notifying the local council when an underground tank is decommissioned.

Information about the UPSS Regulation and guidance documents are available on the EPA Underground petroleum storage systems webpage. The UPSS Regulation does not apply to non-operational tanks. If tanks are decommissioned or abandoned, a report **must** be made to the local council. Environmental legislation *does* apply where used or disused tanks cause an environmental risk through leakage.

The WHS Regulation 2011 requires underground tanks that are no longer intended to be used to be removed or if this is not reasonably practical, made without risks to health and safety. Guidance on appropriate removal or decommissioning is available in the Australian Standard AS 4976–2008 *The removal and disposal of underground petroleum storage tanks*. It is a requirement that SafeWork NSW be notified when a tank has been decommissioned as there may be soil contamination under the tank and remediation may also be required in accordance with EPA and local council requirements.

6 Above-ground liquid waste tanks

Above-ground tanks for the collection of wastewater are considered a good option by the EPA for aerial spraying facilities where power is available for pumping and where there are no risks from aircraft manoeuvring and tanks satisfy CASA requirements for airport locations. However, due to the generally rural and remote location of aerial spraying facilities, the non-availability of treatment or disposal options may mitigate against their use.

Wastewater treatment options could be considered, such as air agitation or treating water with products to assist with the breakdown prior to disposal off-site. Where practicable, using above-ground tanks to contain wastewater prior to disposal or treatment is the preferred option for wastewater management for new aerial spraying facilities.

Reuse on-site may be appropriate if the treatment quality is suitable and an appropriate assessment is conducted. Water reuse could make a significant reduction to wastewater disposal and the EPA's Environmental Guidelines: Use of Effluent by Irrigation may provide information to safely irrigate wastewater.

Above-ground tanks **must** be made of a corrosion-resistant material that will not react with the chemicals to be stored in them.

Tanks must be adequately designed and constructed to prevent fracture or leakage. A layer of impervious material should be placed immediately underneath the base of the tank. The tank and any pipe fittings should be within a bunded area.

Access to the top of the tank (usually by ladder) needs to be restricted. Access ladders should be designed and built to the relevant industry safety standard AS 1657–2013 *Fixed platforms, walkways, stairways and ladders – Design, construction and installation.*

The tank should have clear signage indicating the purpose of the tank. Ensure that safety measures are adequate, for example, to facilitate easy inspection. For guidance refer to the NSW Government SafeWork NSW Falls webpage.

7 In-ground evaporation ponds

Poorly constructed evaporation ponds can lead to surface and groundwater pollution as well as odour and health impacts. Evaporation ponds are normally less than one metre in depth as they are designed to maximise the water surface area for evaporation.

One of the most important factors to consider when determining the appropriate type of pond lining is the 'reactivity' of wastewater. Wastewater containing hazardous substances may require a high level of lining and construction.

A collection sump should be installed upstream of any evaporation pond to intercept solids and oils that may interfere with the evaporation process.

The storage capacity of an evaporation pond will depend on a number of site-specific considerations, including for example, the potential for pollution of surface and/or groundwater. The EPA encourages operators (and consultants) to take a risk-based approach to designing an appropriate system and consult the EPA before finalising the lining and construction details if necessary.

To determine the capacity of the evaporation pond(s) you need, you will need to calculate a water balance, which is:

- the total hydraulic loading on a monthly basis (volume of wash-down and rainfall), balanced with
- total evaporation on a monthly basis.

The 'freeboard' depth of the pond (the depth between the top of the pond and the maximum annual water level under normal conditions) **must** be calculated on a site-specific basis to avoid overflow.

8 Treatment ponds

Treatment ponds are typically deeper and wider than evaporation ponds and have aeration equipment. Geosynthetic liner manufacturers and suppliers normally provide recommended engineering designs for equipment and pipe-work installations. The EPA recommends that operators engage a suitably qualified engineer experienced in geosynthetic lining systems. Liner failures are common in very large treatment ponds. Therefore, smaller pond sections are recommended to minimise impacts on groundwater.

Regular sampling and monitoring of wastewater quality are often necessary to assess ongoing effectiveness and suitability of effluent for the proposed disposal or reuse option. Safe access should be provided to enable these activities to be undertaken.

Enzymes have been used to break down pesticide residues in contaminated ponds. A trial has previously been carried out by CSIRO in Narrabri, NSW which established a 90% reduction in pesticides in irrigation wastewaters using an enzyme from a soil bacterium. Operators seeking to reduce contaminants in water by microbial treatment should engage a suitability qualified consultant for advice on treatment options and ongoing monitoring plans. The EPA recognises that products previously developed for this purpose may not be available at the current time.

Evaporation ponds and treatment ponds lined with synthetic liners could be very slippery when wet. You **must** ensure that safety provisions (e.g. access rope or stairs, inflatable safety gear) are available. The EPA recommends that proponents consult with SafeWork NSW for further information on this matter.

9 Volume and overflow

The capacity of an evaporation and treatment pond should be designed so that, in addition to the stored wastewater arising from a monthly water balance, it can deal with rainfall run-off without overflowing. The EPA requires adequate overflow outlets and freeboard, e.g. minimum of 1m freeboard designed up to a 1 in 25 year, one duration storm event in high risk situations, e.g. waterways, groundwater or stock watering supplies nearby. As consequences of overflow could vary depending on location and community sensitivities, it is recommended that a risk assessment be undertaken by an appropriately qualified specialist to determine the appropriate pond capacity or freeboard allowance for a particular scenario.

The EPA strongly recommends that overflow be minimised by raising pond embankments. Diverting clean stormwater from the pond minimises the volume of wastewater that needs treating or containing in the pond. Any overflow should be treated as contaminated wastewater and captured on-site. This overflow could be returned to the pond when capacity permits, or transported to an EPA licensed wastewater treatment facility capable of accepting the liquid waste.

10 Desludging

Desludging can help maintain pond capacity, as solid material will deposit at the base of the pond reducing the design capacity. Operators should periodically remove sludge to maintain design capacity and dispose of it at a lawful facility. When desludging, care **must** be taken to avoid liner damage with desludging equipment and any damage sustained **must** be repaired immediately.

Guidance should be taken from the liner manufacturer or installer on appropriate desludging methods. Sludge sediments can accumulate toxic metals and other potentially hazardous substances over time, so spreading this material onto land is not permitted as it represents potential water pollution and potential human health impacts. Sludge **must** be characterised or tested before it is disposed of appropriately at a lawful facility. Alternatively, on-site containment or treatment methods **must** be approved by the EPA.

11 Pond liners

It is considered best practice to routinely check evaporation ponds and treatment ponds visually to ensure that they remain effective pollution barriers and leak detection systems are working effectively.

Evaporation and treatment ponds **must** be designed and constructed to prevent pollution of waters (including surface and groundwater). Seepage from these types of ponds can be controlled by a suitable liner. An appropriate risk assessment should be undertaken to determine a suitable liner system including appropriate hydraulic conductivity and liner thickness. The risk assessment should include consideration of:

- site conditions (including, but not limited to, geology, hydrogeology, surface hydrology and climate)
- wastewater characteristics
- nature/depth of the pond
- potential impacts on surface and groundwater.

The liner system **must** be able to resist degradation caused by specific contaminants, temperature, oxidation and stress cracking over the life of the liner.

A number of options for liner construction are available including clay and synthetic liners or a combination of both.

Figure 4: Lined evaporation pond with signage and fencing (Photo: John Spencer, EPA)

11.1 In-situ liners

Clay linings are generally considered unsuitable because the liner may shrink and crack if the pond dries out. However, in some lower risk situations, the natural soils (clay) or rock may be used as a low-permeability liner. An investigation **must** be conducted by a suitably qualified and experienced professional to prove the efficacy of the natural barrier. This assessment should confirm that the hydraulic conductivity of the in-situ material is less than 1×10^{-9} m/s to an appropriate depth at all elevations around the pond to ensure that the materials and method of construction will provide an adequate lining system. It should also show that there are no imperfections (e.g. root holes, cracks, gravel layers, fractures) or possible reactions between the liner and the wastewater to be stored that may compromise the effectiveness of the natural material as a barrier.

The top surface of the pond should be reworked to at least 300mm to remove any fissures, fractures or desiccated soil and clay compacted in-situ.

11.2 Constructed clay liners

The design of a constructed clay liner should be informed by the outcomes of a risk assessment. A compacted clay liner should have a minimum thickness of 300mm with an in-situ hydraulic conductivity of less than 1×10^{-9} m/s. In higher risk situations, a thicker liner and/or geomembrane may be required.

Compacted clay linings should be protected to minimise damage from drying and cracking until the pond contains sufficient wastewater. If ponds are subject to complete drying (such as in evaporation ponds), mechanisms to prevent desiccation of the clay liner should be included in the design or alternative liners should be used.

An investigation of the finished constructed liner **must** be conducted by a suitably qualified and experienced professional to prove the efficacy of the barrier, including a survey to confirm it meets the design specifications and testing to ensure it meets the specified hydraulic conductivity/permeability (Australian Standard AS 1289.0–2000 *Method of testing soils for engineering purposes*).

11.3 Geosynthetic clay liners

Geosynthetic clay liners (GCLs) may be used as an alternative or supplement to compacted clay liners. A GCL is a manufactured liner consisting of a thin layer of bentonite clay (or other very low-permeability materials), ‘sandwiched’ between layers of geotextiles and/or geomembranes held together by needle punching, stitching, or chemical adhesives.

The hydraulic conductivity and swell of a GCL can be affected by the presence of cations in the wastewater permeating through the liner due to the process of cation exchange. Therefore, GCLs are not suitable for reactive wastewater, subject to cation exchange capacity assessment.

Quality assurance measures **must** be implemented to make sure that all features of the GCLs are constructed according to the approved designs and specifications. Installation of the work should be supervised and signed off by a suitably qualified and experienced professional.

11.4 Geomembranes

Geomembranes, also known as flexible membrane liners, are manufactured from synthetic liner material made from various polymers. Commonly used geomembrane materials include:

- high density polyethylene (HDPE)
- polyvinyl chloride (PVC).

Each material has different characteristics which determine appropriate installation procedures, performance and lifespan. PVC geomembranes are very flexible and can be installed on uneven surfaces; however, PVC can crack from loss of plasticiser at high temperatures and under UV radiation exposure. HDPE is normally preferred due to its durability, however this material could also fail due to stress cracking and extended UV exposure.

In selecting a geomembrane liner, you should consider:

- results of risk assessments undertaken
- compatibility of the membrane with the wastewater to be stored
- factors that may cause deterioration while in service (such as resistance to UV solar radiation where the liner is exposed, chemical attack, temperature, oxidation and stress cracking)
- tensile strength and elasticity, taking into account potential shear forces that are likely to be encountered during the design life of the pond, typically associated with differential settlement, reactive soils (shrink–swell)
- tear resistance, puncture resistance, shear resistance, abrasion resistance and resistance to installation damage, and
- design life.

It should be noted that higher risk sites may also require the use of a secondary containment measure, such as additional geomembranes, constructed clay liners or geosynthetic clay liners.

Documentation should be kept confirming that the geomembrane liner complies with the specified requirements for the purpose and has been installed based on the specifications and manufacturer's requirements. After installation, geomembranes should be assessed for liner integrity.

11.5 Composite liner

A composite liner is a liner comprised of two or more low-permeability components made of different materials in contact with each other. For example, a geomembrane and a low-permeability clay layer placed in contact with each other constitute a composite liner. The purpose of a composite liner is to combine the advantages of two materials, such as geomembranes and clay, which have different hydraulic, physical and endurance properties.

11.6 Leak detection

The performance of the liner in existing ponds should be monitored by the installation of a shallow groundwater borehole down the hydraulic gradient to ensure the liner is an effective pollution barrier. Where the geomembrane is exposed to sunlight and weathering, it will have a shorter service life span than one which is submerged.

If you are constructing a new evaporation pond, you should install a leak detection system such as bores, leak collection systems and sensors or be able to justify why this is not necessary.

The manufacturer's product warranty and advice on the anticipated service life should be considered when undertaking repairs and scheduling replacements.

12 Embankments

The sides of evaporation and treatment ponds should generally have batter slopes not exceeding a gradient of one vertical to three horizontal (1:3) to enable proper access during compaction of the liner and embankment fill, and during subsequent sampling, testing and maintenance activities. The embankments **must** be constructed to prevent leakage and erosion beneath the wall.

The banks of the pond **must** be kept free of vegetation to prevent liner damage. Trees **must** not be allowed to grow in either the base or banks of the pond.

13 Health and safety

Evaporation or treatment ponds need to be fenced to an appropriate height to prevent access by domestic stock, animals and people, and to restrict access by wildlife which could damage the membrane liner or become entrapped in the pond.

Appropriate signage **must** be fitted to the enclosure around an evaporation pond, e.g. 'Water is contaminated by chemicals. Do not drink or swim in this water' or a visual sign that is appropriate for young children or people with lower literacy levels who may not be able to read.

A measuring device, such as a depth gauge or dip stick, should be installed in an evaporation pond to allow the depth of the liquid to be determined without someone having to enter the enclosure. The measuring device should be installed so that it does not pass through the impervious barrier.

Dust from dry clay-lined evaporation ponds may pose a risk to human health from pesticide residues within the dust. Appropriate management measures should be employed to minimise dust emissions from dry clay ponds.

Figure 5: Examples of appropriate safety signage for evaporation and treatment ponds (Photos: Nina Sheer, EPA)

14 Chemical storage facilities

A facility dedicated to the storage of chemicals is subject to the requirements of SafeWork NSW. Chemicals **must** always be stored in accordance with the Australian Standard AS 2507–1998 *The storage and handling of agricultural and veterinary chemicals.* Chemical storage areas should be self-contained to minimise risk from spillage or fire.

Chemicals on-site **must** be stored within a bunded facility capable of holding 120% of the volume of the largest container stored. Alternatively, where many small containers (such as 200 litre drums) are stored, the bund should be capable of holding 25% of the total volume stored within the bund, with a minimum of 100% of the volume of the largest container.

Guidelines on other aspects of chemicals storage facilities are as follows:

- Construct the bund of a material that is impervious to all chemicals stored in the bunded area, and grade it so that any spillage drains to the catchment sump.
- Direct all pipework from the enclosed tanks or pumps over the bund wall and not through it, and avoid burying pipework at any point along its entire length.
- Position the connection points in pipework so that any leakage (including spray) from connections will fall within the bunded area.
- Put up appropriate signs to indicate what chemicals are held within the storage area.
- Surround the chemical storage facility with a person-proof fence and secure all entrances by lock and key. Emergency exits should be provided.
- Ensure that facilities for disposing of any spillage or wastes (from clean-outs) are adequate and that spillages and wastes so disposed of do not pollute waters.
- A hazardous chemical register should be prepared that contains a list of all the hazardous chemicals on site and the current safety data sheet (SDS) for the product. This needs to be readily accessible to workers. For guidance refer to the Safe Work Australia Hazardous chemicals register fact sheet.
- Keep a register of the pesticides and copies of SDSs, as required by the WHS Regulation 2011.
- Where there are chemicals listed in schedule 11 of the WHS Regulation 2011 that exceed the relevant manifest quantity, a manifest must be prepared and the chemical storage details notified to SafeWork NSW. The manifest should be kept in a location that is in agreement with Fire and Rescue NSW (FRNSW) and easily accessible in a weatherproof container locked with an appropriate or approved lock. Guidance is available in the FRNSW Technical information sheet: Hazardous chemicals manifest.

If you only store a small quantity of chemicals, you should follow the minor storage conditions of Australian Standard AS 2507–1998, in a pesticides storage room which **must** be lockable. In some cases placarding may be required. Please refer to the SafeWork NSW placarding guide for more information.

Refer to SafeWork NSW Managing risks of hazardous chemicals in the workplace code of practice. This code provides guidance on appropriate personal protective equipment and appropriate chemical storage such as ensuring incompatible chemicals are not stored together and containers are not stacked.

It is illegal to possess, prepare for use or use a pesticide in NSW unless it is registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA) or covered by an APVMA permit. You can search for permits that allow off-label use of certain pesticide products on the Australian Government APVMA Permits search webpage.

To determine if a pesticide product is registered, search the APVMA database. If a product does not appear on this database it is not currently registered.

15 Management and operation of chemicals and related equipment

The following are some of the practices that are considered best practice to minimise the risk of pollution:

- Ensure there is a spill containment system (can include bunding) and spill kit to safely contain any spills and associated waste. Store all chemicals within a bunded area.
- Mix and load all chemicals within the facility's bunded area or catchment area.
- Wash-down of equipment and aircraft should be carried out on a wash-down pad within the facility's catchment area.
- Rinsate from chemical containers and spray equipment should be avoided or reused by adding it back into the spray tank for re-dispersal. If this is not possible, licensed waste disposal contractors should be contacted to collect it. Further information on appropriate rinsate disposal can be found on the EPA website.
- Unused pesticides have to be disposed of in an environmentally responsible manner. Labels contain a prohibition on disposing of concentrate on-site. ChemClear provides a reliable and responsible collection and disposal service for users of agricultural pesticides and chemicals. In the absence of ChemClear, there are licensed hazardous waste contractors who will remove pesticide waste.
- Empty used containers should be returned to the manufacturer (where appropriate), or to an available reuse/recycling scheme, or to the appropriate waste stream. DrumMuster is a national scheme for the collection and recycling of empty chemical containers, sponsored through local councils.

Figure 6: Appropriate bunding and a spill kit in chemical storage areas (Photos: Nina Sheer, EPA)

16 Drainage and run-off

The following are some of the practices that are considered best practice to minimise harmful environmental impacts from drainage and run-off:

- Cover open drains with mesh, and ensure drains are maintained in good order.
- Remove sediment collected in the catchment as often as necessary to ensure that the design capacity is available at all times to hold waste liquids and run-off from the catchment area.
- Keep the enclosure for the evaporation pond and any open drains free of vegetation.
- Liquid stored in an evaporation pond or tank may be suitable for reuse if treated to an appropriate quality.
- Check drains, silt traps and reception tank inlets and outlets at the start and end of each use period. Clear drains of any blockages and remove silt from closed drains and pipes.
- Pump out the collection sump regularly to ensure there is always sufficient storage capacity available in tanks and evaporation ponds.
- If you have an above-ground tank, operate the required agitating system whenever the facility is in use.

Figure 7: Open drain covered with mesh to prevent solids entering the culvert (Photo: John Spencer, EPA)

17 Decommissioning a site

Sites constructed with evaporation ponds are potentially contaminated sites. Prior to decommissioning an evaporation or treatment pond, an appropriate site assessment **must** be undertaken to ensure the site is suitable for the proposed new use. When an existing evaporation basin is to be decommissioned and the land put to another use, the site needs to be appropriately remediated in consultation with the relevant planning authority (usually the local authority) (and the EPA if required) in a manner consistent with planning legislation such as State Environmental Planning Policy 55 – Remediation of Land (SEPP55).

Until remediation and validation are completed, all evaporation basins no longer in use should be treated as potentially contaminated. Anyone whose activities have contaminated land and owners of land who become aware, or ought reasonably to be aware, that the land has been contaminated must notify the EPA as soon as practicable after becoming aware of the contamination, **if the contamination meets certain criteria**. The duty to notify is a requirement under *Contaminated Land Management Act 1997* (NSW) (CLM Act). Refer to the Guidelines on the Duty to Report Contamination under the *Contaminated Land Management Act 1997* for information on the notification triggers and how they should be used in determining whether the contamination should be reported to the EPA.

18 Spill reporting

Spills that discharge from the facility **must** be reported to the nearest office of the EPA as soon as possible by phoning 131 555. If the spill cannot be contained and it threatens public health, property or the environment, Fire and Rescue NSW, NSW Police and the NSW Ambulance Service **must** be contacted immediately for emergency assistance – phone 000.

19 AAAA Aerial Improvement Management System

The Aerial Application Association of Australia (AAAA) runs an operator accreditation program called the Aerial Improvement Management System (AIMS). The AIMS program is a risk-based integrated approach to managing an aerial application business. AIMS is based on a systematic assessment of risk with appropriate risk management tools such as policies, procedures, training and registers. AIMS accreditation can assist aerial operators with continuous improvement, regulatory compliance and environmental management through recognised standards and implementing policies. For example, AIMS accreditation ensures there are procedures in place for managing rinsate, keeping a chemical manifest and SDSs, providing an emergency procedure for chemicals spills and documenting applicable regulatory requirements.

Definitions

Aerial spraying facility: An on-ground facility for aerial application operations which may include evaporation or treatment ponds, above-ground treatment tanks, chemicals and pesticides storage areas, mixing area and wash-down areas for agrichemicals and equipment.

Composite liner: A liner comprised of two or more low-permeability components made of different materials in contact with each other, e.g. a geomembrane and a low-permeability clay layer placed in contact with each other constitute a composite liner.

Disposal area: The impervious catchment/containment area for one or all of the following: the wash-down pad, the chemical storage area, the chemical mixing area, the loading aprons, storage tanks, drains, rinsate and any other chemical spillage.

Environmentally sensitive area: An area that contains an environmentally sensitive receptor such as the habitat of a rare species, e.g. a national park, groundwater source, wetland, river, lake.

Fence-line: The fence around the evaporation or treatment ponds constructed to restrict unauthorised access.

Freeboard: The freeboard for a pond is the vertical distance between a specified water surface elevation and the top of the dam or spillway (if present).

Geomembrane: Flexible membrane liners manufactured from synthetic liner material made from various polymers including high density polyethylene (HDPE) and polyvinyl chloride (PVC).

Geosynthetic clay liner: Manufactured liner consisting of a thin layer of bentonite clay (or other very low-permeability materials), ‘sandwiched’ between layers of geotextiles and/or geomembranes held together by needle punching, stitching, or chemical adhesives.

Operational area of the facility: Chemical-handling areas, mixing areas, chemical storage areas and wash-down areas.

Sensitive receptors: Areas, humans or animals that may be susceptible to exposure to pesticides or other contaminants, e.g. humans, residential areas, wildlife, rivers, streams, surface water.

Waters: Any river, stream, lake, lagoon, swamp, wetlands, unconfined surface water, natural or artificial watercourse, dam or tidal waters (including the sea) or any water stored in artificial works, any water in water mains, water pipes or water channels or any underground or artesian water.