

3 Chemical management

Objective – agricultural chemicals are used in accordance with label or permit instructions; and all chemicals, including fuels and oils, are stored, handled, applied and disposed of in a manner that minimises environmental impacts.

Agricultural chemicals are by nature potentially dangerous to humans, flora and fauna and ecosystems.

Pesticides can have serious effects on natural ecosystems if they move off-site via water, air or soil. Of particular concern is the effect of pesticide residues on sensitive neighbouring or downstream ecosystems such as wetlands, freshwater and marine habitats, and national parks and reserves.

Spray drift, in particular, is a potential source of friction between farmers and their neighbours. Spray drift can also cause much damage to wildlife. Liability for damage, illness or injury caused by spray drift is also becoming a serious issue.

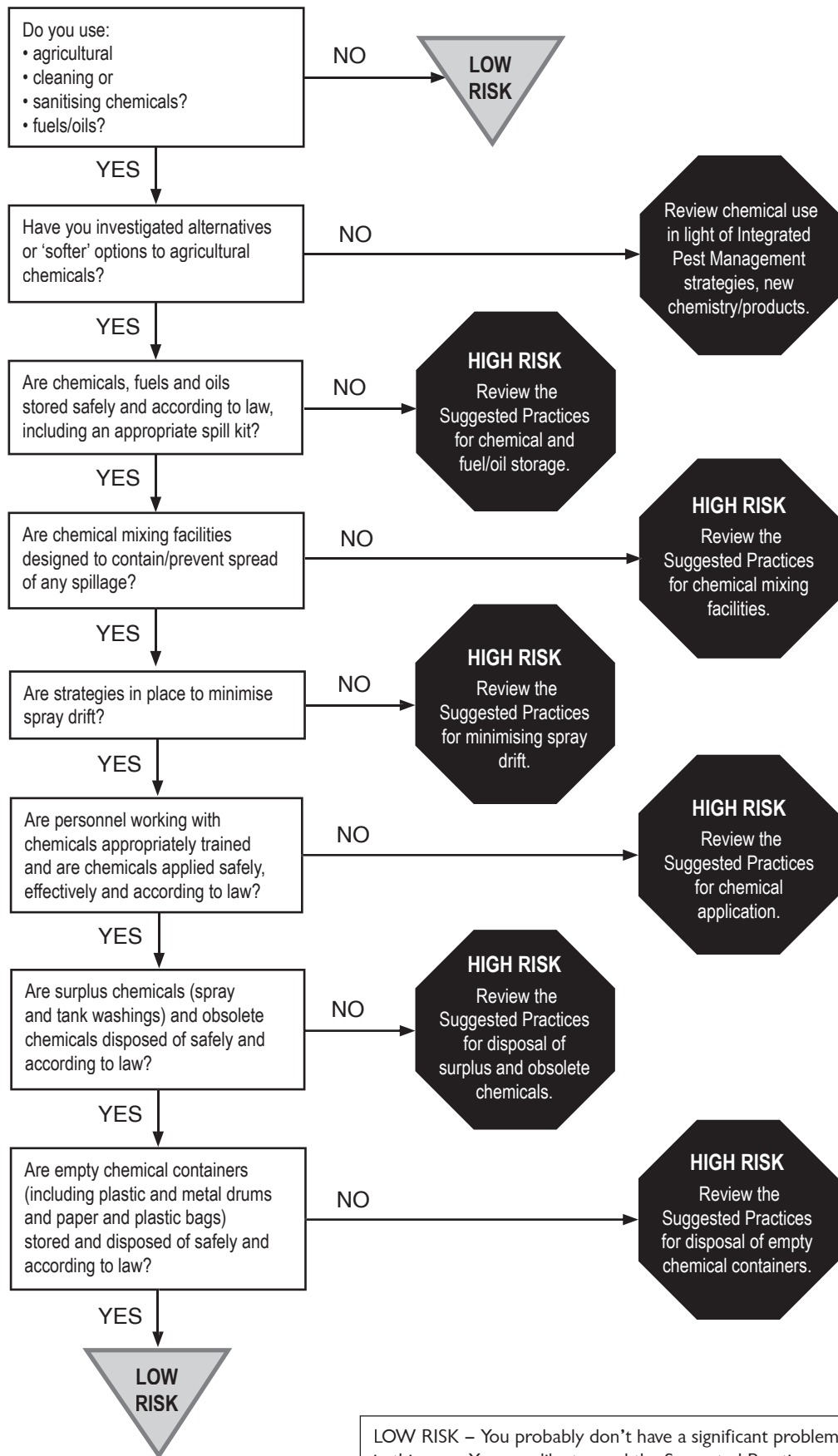
Chemicals other than pesticides are widely used for cleaning and sanitising around growing and production sites and for treating water. Care needs to be taken to ensure these chemicals do not enter waterways and drains or accidentally spill on to soils and vegetation.

To minimise harm to the environment, all aspects of chemical use, from justification of the need for chemical intervention to storage, handling and disposal of empty containers, need to be considered.



Risk assessment

Use of chemicals



LOW RISK – You probably don't have a significant problem in this area. You may like to read the Suggested Practices section to check your understanding of the issue.
HIGH RISK – You need to take some action. Read the Suggested Practices for that topic.

Spray drift

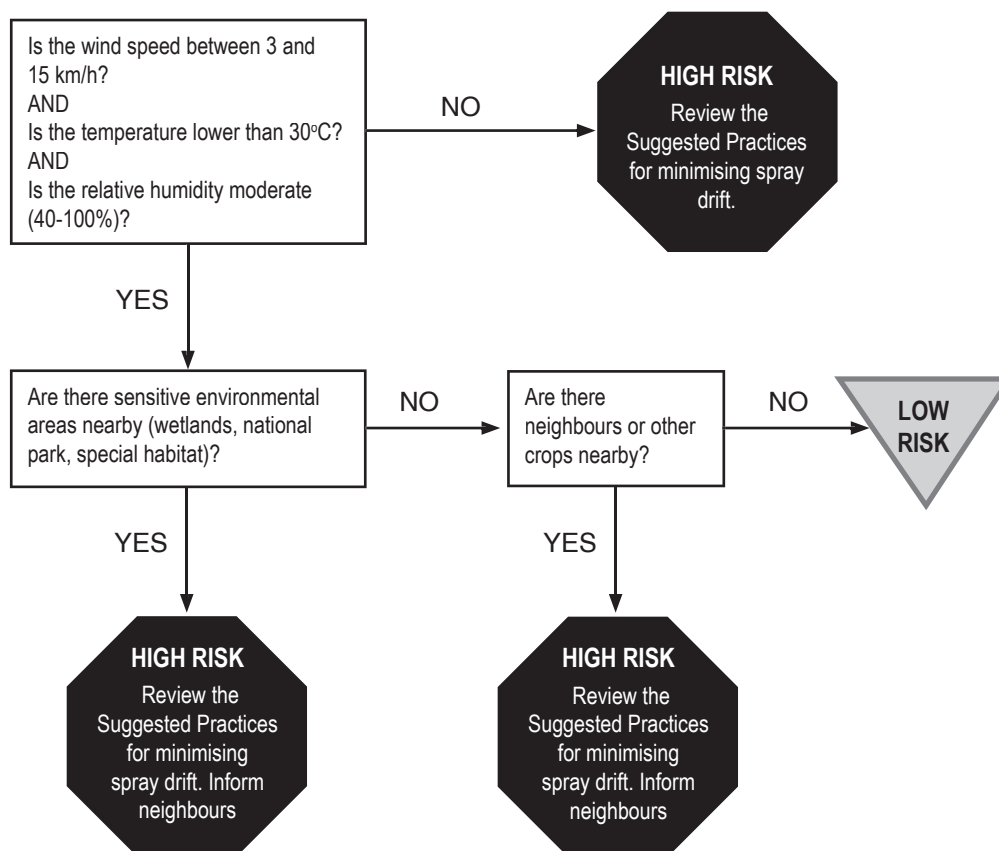
Spray drift is a potential source of friction between farmers and their neighbours. Spray drift can also harm wildlife. Liability for damage, illness or injury caused by spray drift is becoming a serious issue.

Spray drift is caused by a combination of factors, including:

- wind speed;
- instable local atmospheric conditions;
- wrong nozzles or pressure choice affecting spray quality;
- vehicle speed;
- boom height; and
- poor equipment maintenance, including incorrect equipment setting.

Risk assessment

Spray drift



LOW RISK – You probably don't have a significant problem in this area. You may like to read the Suggested Practices section to check your understanding of the issue.
HIGH RISK – You need to take some action. Read the Suggested Practices for that topic.



Suggested practices

● Minimise application

Pesticides are only one strategy for controlling pest insects, diseases and weeds.

Integrated Pest Management (IPM) involves a range of strategies:

- Training in recognition of the pests and diseases that can attack your particular crops, their symptoms of attack and life cycles.
- Regular monitoring of crops for pests, diseases and weeds.
- Only using pesticides if pest numbers exceed threshold levels, and consider using:
 - environmentally friendly pesticides, such as oils, soaps and biological control agents such as bacillus formulations;
 - narrow-spectrum pesticides instead of broad-spectrum pesticides;
 - spot applications of pesticide instead of blanket sprays;
 - strategic application when the pest or disease is most vulnerable; and
 - resistance minimisation strategies.
- Practising good hygiene to limit disease in particular.
- Having an all-year-round weed management program in place, both in and around the growing area – weeds can harbour pests and diseases and act as a constant source of reinfestation (although weeds may also be a refuge for natural predators).
- Maintaining good soil health, including an open, well aerated structure, high organic matter levels and a diverse and active soil biology, which in turn promotes healthy crops which are more resistant to disease and pests.
- Encouraging natural predators. See Section 5 – Biodiversity.

Further information about IPM is available from State departments of agriculture/primary industries.

Laws relating to chemical storage and use change frequently. Check with your State authority for the most up-to-date information.

● Safe storage

Agricultural chemicals can contaminate watercourses if not stored appropriately. Any new chemical storage should meet the highest standards of design and construction. Existing chemical sheds may need to be improved.

Chemical sheds should not be built where there is a risk of polluting watercourses or groundwater, or in areas subject to flooding.

All farm chemicals must be stored in a secure storage area that meets local regulations/ legislation. Farm chemical safety and handling training courses address chemical storage issues as do Managing Farm Safety courses. It is recommended that growers obtain specific local advice as each state and, in some cases, each local government area, may have particular requirements.

In general, when storing agricultural chemicals use the following guidelines:

- Store pesticides and chemicals away from residences and other occupied buildings.
- Store pesticides and chemicals in a lockable, weatherproof, fireproof, well-ventilated area away from production facilities, waterways, water supplies and flood-prone areas.
- Keep the storage area clear of extraneous or combustible waste materials and control ignition sources.
- Ensure adequate lighting for a safe working environment.
- The floor should be impermeable and easy to clean, and the storage area should be able to contain spills. Spilt liquid can be contained by bunding (an embankment or wall).
- Maintain a chemical spill cleanup kit near the area (see *Dealing with spills* later in this section).
- Store pesticides and chemicals in their original containers.
- Store pesticides separate from fertilisers and chlorine.
- Store liquid pesticides and chemicals below powders.
- Maintain an up-to-date inventory of stored pesticides.

Legal requirements are subject to change. Regularly check with Federal, State and Local authorities for updated requirements.

- Store only enough pesticide on site to meet short/medium-term needs.
- Regularly check pesticide and chemical containers for any leakage or damage.
- Running water should be available.
- Chemical storage areas should be appropriately signed for the size and nature of the storage, including a 'No Smoking' sign.
- Consider a central storage point based with a local spray contractor or at the airstrip.
- Keep current Material Safety Data Sheets for all chemicals in use.

For more information on appropriate signage for chemical sheds refer to Workplace Health and Safety agency in your State.

All States have strict regulations concerning storage of pesticides on farm and business sites, including occupational health and safety requirements. Check with your local authority to ensure you conform to these regulations.

● Safe transport

Ensure chemical containers are leak-proof and adequately secured when transporting on farm or between farms.

Observe safe handling practices when transporting pesticides and chemicals.

● Dealing with spills

It is a good idea to have an emergency plan in place to deal with spills of different groups of chemicals so you are prepared if it ever happens.

Know how to deal with spills and have spill kits close to storage and mixing areas. Spill kits should include:

- a shovel;
- dustless absorbent material, such as 'kitty litter', activated charcoal, vermiculite, hydrated lime, clay or earth and dry sand (avoid using sawdust or other combustible materials); and
- containers to hold the absorbent material or other leaking containers.

Wear protective clothing, including gloves, respirator, boots and eye protection when dealing with spills.

Properly dispose of the chemical-drenched absorbent clean-up material.

Use hydrated lime or bleach to decontaminate spill surfaces, but never use these two materials together.

Report the spill to authorities if it is large or if it enters waterways.

● Mixing and application

Responsible use of pesticides and chemicals

Ensure at least one person in the business has completed an accredited chemical user's training course (similar or equivalent to ChemCert) and ensure all staff that apply pesticides have adequate training.

Regularly calibrate and maintain pesticide application equipment.

Only use pesticides that are registered or permitted by the Australian Pesticides and Veterinary Medicines Authority (APVMA) or otherwise authorised for use in your State for the particular:

- crop,
- application timing,
- method of application, and/or
- tank mix.

Obtain and keep copies of any APVMA permits that are relevant to your spraying.

NSW requires all people who apply chemicals in the business to have accredited training.

Growers in Victoria do not require APVMA off-label permits for certain off-label uses.

Always follow label and permit instructions.

Seek professional advice if you have concerns.

Keep Material Safety Data Sheets (MSDSs) for all pesticides used close to areas where chemicals are handled and consider placing copies in tractors used with spray equipment. These provide information about health hazards and safe handling, including transport, storage and spill clean-up.

In case of poisoning or exposure to pesticides, contact the Poisons Information Centre on 131 126. This is a 24-hour service.

Mixing

Make sure to site the mixing and washdown area away from water sources, drains and streams. The area should be constructed to contain spills for collection and disposal.

Never leave a spray unit unattended while filling.

As some drums are difficult to pour, use a specifically-designed drum pourer to minimise spillage.

Triple-rinse empty chemical containers and mixing equipment back into the vat.

● **Minimising spray drift**

There are many strategies to minimise or prevent the chances of spray drift, starting with how you establish new horticultural sites.

Managing spray drift should be included in property management plans and specific spray plans can be developed which include identification of sensitive areas and options for minimising spray drift into those areas.

You should also consider the following strategies:

- Check the weather forecast before starting off. Do not spray if the wind direction and speed would cause the spray to drift on to sensitive areas or neighbours (see Weather Conditions section below). Under light wind conditions, wind direction is often variable and may result in unpredictable off-target movement.
- Avoid spraying on hot days (>30°C) or dry days (<40% relative humidity) as these conditions can increase the rate of evaporation of water-based sprays and may subsequently increase spray drift.
- Spray when winds are most consistent, generally early morning, early evening or at night.
- Select the right combination of spray unit, nozzle type and size, and pressure.
- Use the largest appropriate spray droplet size (except if using CDA equipment).
- When using a boom spray, keep the boom as low as possible, consistent with an even spray pattern at the correct target height. Check spray angles and adjust the height accordingly. Reduce the operating pressure and forward speed but maintain the dose, volume and spray quality within recommendations on the label.
- Consider not treating the boom-width or part of the boom-width closest to the boundary. This can also provide a useful tool to check spray efficiency and to help maintain beneficial insects.
- Modify spray equipment to help minimise spray drift. These modifications include low drift nozzles, shielded and covered spray booms and air-assisted spray equipment.
- For air-blast sprayers pay particular attention to weather conditions, good set-up and maintenance of equipment and barriers/buffer distances from neighbours.
- For aerial spraying, ensure that the spray contractor is aware of sensitive areas/neighbours and of their responsibility for any off-target application or spray drift.
- Ensure operators have appropriate training/competencies and relevant licences.
- Erect or plant barriers to catch possible spray drift, and establish buffer zones between production areas and neighbours or sensitive natural areas, such as wetlands and waterways (see *Buffer zones* later in this section).

Legal requirements are subject to change. Regularly check with Federal, State and Local authorities for updated requirements.

Weather conditions

Wind speed in the spray release zone is an important factor in determining spray drift. Meteorological measurement of wind speed is taken 10 m above ground, so care is needed in interpreting weather advice and actual wind speed at nozzle height.

Prior to spraying an assessment should be made of the wind speed and direction by using a simple wind speed meter or by watching the movement of plants, trees and clouds. This monitoring should continue during application.

Wind speed guide:

Approx. wind speed at boom height	Description	Visible signs	Spraying
Less than 2 km/hr	Calm	Smoke rises vertically	Not recommended. Use only 'medium' or 'coarse' spray quality
2 – 5 km/h	Light air	Direction shown by smoke drift	Acceptable spraying conditions
6 – 11 km/h	Light breeze	Leaves rustle, wind felt on face	Ideal spraying conditions
12 - 19 km/h	Gentle breeze	Leaves and twigs in constant motion	Increased risk of spray drift take special care
20 - 28 km/h	Moderate breeze	Small branches moved, raises dust or loose paper	Spraying inadvisable

Source: Northern Territory ChemCert Manual (Somerville 1989) and MAFF, 1998 The Green Code

Delta-T calculations can be used as indicators of acceptable spray conditions. It is indicative of evaporation rate and droplet lifetime. When applying pesticides, Delta-T should ideally be between 2 and 8. For more information see Weather for Pesticide Spraying, Bureau of Meteorology.

Buffer zones

Buffer zones are a very good way to reduce the risk of spray drift. Buffer zones can be established by planting trees and shrubs downwind of a production area. Vegetation that is tall, rough and thin is better at catching droplets than vegetation that is short, smooth and thick.

A droplet-catching barrier should be less than 50% porous, with a height about 1.5 times the height of spray release. Use multiple vegetation layers as a screen rather than a single layer. Vegetable growers should also consider establishing intercrop buffers such as rye corn or sweet corn as barriers.

● Protecting water supplies

Ensure pesticide cannot be back-syphoned into the water supply when filling spray tanks by installing an anti backflow device or pumping from a separate tank filled from the main water source.

Fill spray tanks with water and then move them away from waterways or water storages before adding chemicals.

Minimise movement of pesticides into stormwater or wastewater run-off by avoiding application of pesticides immediately before rain or irrigation, unless stated otherwise on the APVMA product label or permit.

● Consider community relations

Disputes involving environmental nuisance (for example issues related to application of agricultural chemicals, noise or dust) can lead to a breakdown of good neighbourly relations.

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The best way to avoid problems is to attempt to get on well with your neighbours. Having a “good neighbour” policy and discussing aspects of farming with neighbours is one way to achieve this. Neighbours, particularly non-farming people, need to recognise that primary producers make their living through agricultural activities and that these activities are an important part of the economy and food chain.

Primary producers need to recognise that some activities can negatively impact on their neighbours and that at times it may be appropriate to adjust activities as far as reasonable to minimise the impact.

● Disposal of pesticide containers

Under various State regulations, businesses are required to dispose of empty chemical containers safely. When purchasing, ask if used pesticide containers can be reused, returned, refilled or recycled.

Un-rinsed containers can hold as much as 3% of product concentrate. This means they can present a hazard to people who handle them and have potential to contaminate the environment.

Used containers that cannot be returned or recycled should be triple rinsed or pressure rinsed immediately after emptying the container as residues are more difficult to remove when they are dry. This is done by filling the container with clean water to approximately a quarter of capacity, replacing the cap, shaking and then adding the wastewater to the spray tank. This is repeated three times. Other disposal methods (e.g. pumping to sump or limed disposal pit) are not acceptable. Pressure rinsing is also an option and special equipment is available.

Puncture steel containers after rinsing so that they cannot be re-used. Pass a steel rod or crowbar through the neck/pouring opening and out the base of the container. Do not puncture plastic 20-litre containers included in reconditioning/reuse programs.

Empty pesticide containers must be stored in a designated, secure area (preferably locked), and disposed of either through a controlled approved disposal scheme, or according to a documented procedure that meets state or territory regulations. Access to this area must be restricted for both people and animals.

Ideally, property managers should be involved in any disposal scheme to remove rinsed chemical containers, and/or use the services of a licensed waste collector to remove unwanted pesticides.

The drumMUSTER scheme operates in all states. From January 2004, only containers carrying the eligible container logo will be collected under the drumMUSTER program. The drumMUSTER website (www.drummuster.com.au) contains details of collection days and locations. It also includes contact details for regional field officers. Pending disposal via drumMUSTER or other approved disposal methods, containers must be rinsed and stored in a separate secure area.

● Disposal of surplus spray and washings

Avoid leftover pesticide by carefully calculating how much is needed for the area to be sprayed.

Do not allow leftover spray, rinsings from a spray tank or from empty pesticide or chemical containers to enter streams or drainage from the property. Make sure that any disposal method you use is safe for your chemical waste, location and circumstances as incorrect disposal can result in prosecution. Check your local laws regarding use and management of farm chemicals.

Disposal methods may include:

- storing rinsate or surplus spray in an appropriately labelled container and use to make up the next compatible spray mix;
- diluting rinsate/surplus spray and spray on to target crop in a manner that will not exceed label rates or wash off chemical previously applied;
- spraying leftover pesticide and washings from rinsing after spraying on to an area of ground away from where people will be and from drains, low drainage areas, waterways and water

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storages (follow label guidelines);

- emptying into a lime-filled pit (obtain advice as to quantities of lime and appropriate sites before using this method); or
- consider using enzyme products (new technology enzyme products are capable of almost complete breakdown of organophosphate insecticides, either in the spray tank or in a holding tank, and provide a useful option for rapid chemical clean-up).

Post-harvest dips may also be treated with lime to deactivate the agricultural chemical. Again specific advice should be sought regarding the most appropriate disposal practices. Information may be available on the chemical label and this should be checked first.

Spray equipment should be filled and washed in an area chosen and established for that purpose. Spillages and rinsings should not be able to escape from the area. Ensure the area is well away from watercourses and dams.

Remember, damage to the environment such as fish kills and the like are prosecutable offences and should be avoided.

● Disposal of old, de-registered or unwanted pesticide concentrates

Unwanted chemicals, such as those that are no longer registered for use, should not be stored on farm for longer than is necessary to arrange for their disposal.

Make sure these chemicals are appropriately stored to prevent misuse. Storage in the chemical shed is recommended as long as the chemicals are clearly identified as not for use and, preferably, are segregated.

Ensure the containers do not leak.

One option for disposal of unwanted agricultural chemicals is ChemClear®. The ChemClear® program has a web-based booking system where growers can register chemicals for collection. There are two categories of chemicals – Group 1 and Group 2. Group 1 chemicals are collected free of charge, while disposal of Group 2 chemicals attracts a fee. For more details visit www.chemclear.com.au or call 1800 008 182.

Alternatively, a certified or approved chemical waste contractor or supply company can be used. If transporting these pesticides to a collection centre, place them on the back of a utility or truck, never in the boot or cabin of a vehicle, or back of a station wagon, where fumes may affect the driver or passengers. Ensure containers cannot leak during transport.

Contact your local council or waste management authority for advice on methods of waste disposal available in your local area. See Section 6 – Waste management for information on controlled/prescribed wastes.

● Use and disposal of other chemical products

If rat and mouse baits are used, ensure they are enclosed in bait stations to prevent native birds and animals eating them. Dispose of used rodenticides or other pesticide baits, as well as carcasses, in accordance with the product label. If carcasses are being buried and the label does not give any special instructions, take care to bury them so that there is no risk of polluting surface or groundwater, and where dogs or native animals will not dig them up. Some baits have been developed that do not cause secondary poisoning.

Dispose of contaminated wastes, such as protective clothing and materials used to deal with spillages in accordance with local regulations. Some waste disposal sites can deal with this sort of waste, while others cannot. Contact your local council or waste management authority for advice on methods of waste disposal available in your area. See Section 6 – Waste management for information on controlled/prescribed wastes.

Legal requirements are subject to change. Regularly check with Federal, State and Local authorities for updated requirements.

● Storing and handling fuels and oils

Take reasonable steps to secure vulnerable tanks against interference; this may be as simple as locking pumps or taps. Bund above-ground fuel tanks and provide some form of leakage protection for underground tanks. Materials for soaking up any spillages should be available at the storage area.

Check for leaks frequently and repair them promptly, especially with underground tanks (even slow leaks can have a major impact if allowed to continue).

If fuel tanks are banded, all valves should be inside the bund and should still be closed and locked when not in use. Store flexible hoses for refuelling vehicles with the hose outlet in the bund.

Take water or fuel/oil out of the bund and dispose of it safely, e.g. by using a blanket that is specially made to absorb fuel/oil.

Consider installing an anti-siphon device if the inlet is lower than the highest fuel level of the tank.

Fuel storage facilities should be away from watercourses and with sufficient surrounding space to permit easy access, thus reducing the chance of accidental damage.

The risk of fire should be minimised.

Mobile fuel tanks should:

- be designed to protect them from accidental damage;
- have a contents gauge and be stable enough to travel around the property;
- have all connections and valves, where fuel could empty by gravity, kept locked when not in use;
- used with care, especially when near watercourses; and
- if possible, not be left near or uphill from a watercourse.

If fuel tanks are banded, this should be done in accordance with the relevant State legislative requirements. For example, 125% of the largest container plus 25% of total volume.



Monitoring and recording

Records that can (and in some cases must) be kept include:

- staff training records;
- pesticide application records (spray diary), including details of date and time of application, operator, location/area treated, pest/disease target, pesticide used, rate, application equipment and weather conditions (particularly to support minimisation of risk of spray drift);
- chemicals register or inventory;
- waste disposal records (see Section 6 – Waste management) such as:
 - ChemClear® documentation, issued to prove chemicals have been booked in for collection and also when chemicals are collected, and
 - receipts and invoices from recycling or commercial disposal businesses;
- disposal of surplus agricultural chemicals (can be recorded on spray records, particularly if sprayed back over the crop);
- machinery maintenance;
- a farm map showing any buffer zones around paddocks, including sensitive areas and neighbours; and

Ensure that your pesticide spraying records comply with your State or Territory regulatory requirements.

References and further resources



Australian Pesticides and Veterinary Medicines Association – www.apvma.gov.au

Broadley, RH et al (2000) *Pesticide Application Manual* 3rd Edition QI00010. DPI&F Brisbane – <http://dpishop.dpi.qld.gov.au/bookweb/details.cgi?ITEMNO=9780724234523> or contact the DPI&F Call Centre (phone 13 25 23).

Bureau of Meteorology (BOM) *Weather for Pesticide Spraying* – www.bom.gov.au/info/leaflets/Pesticide-Spraying.pdf – Delta T calculations on BOM website – www.bom.gov.au/announcements/ag_bulletins.shtml

Chemclear Handling & storage tips, in *About ChemClear*, on the Chemclear® website – www.chemclear.com.au/

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Department of Agriculture, WA (2005), *Code of Practice for the use of Agricultural and Veterinary Chemicals in WA. 3rd Edition* – www.agric.wa.gov.au/pls/portal30/docs/FOLDER/IKMP/PW/CHEM/COP_BULLETIN.PDF

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Department of Environment and Conservation, NSW – www.environment.nsw.gov.au/pesticides/index.htm – and www.environment.nsw.gov.au/chemicals/index.htm

Department of Primary Industries, Fisheries and Mines, Northern Territory – www.horticulture.nt.gov.au

Department of Primary Industries, Water and Environment, Tasmania, *Guidelines for managing leftover spray mixes, rinsings and washings (Tasmania)* – www.dpiwe.tas.gov.au/inter.nsf/Attachments/CPAS-5U326X?open

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Material Safety Data Sheets are available from manufacturer's websites or – www.pestgenie.com.au

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Murray Darling Basin Commission (2004) Current recommended practice. *A directory for broadacre dryland agriculture*. See particularly the Integrated Pest Management section – www2.mdbc.gov.au/landmark/d_loads/CRPreport.pdf

Nursery and Garden Industry, *Australia Best practice manual for pesticide application in nursery and garden industry* CD – www.ngia.com.au

Wardlaw, F (2004) *Vegetable Integrated Pest Management in Tasmania, (2004)* – www.dpiwe.tas.gov.au/inter.nsf/WebPages/TTAR-68Q6CX?open

Weatherzone – www.weatherzone.com.au

Workplace Standards Tasmania Guidance note. *How to HAZCHEM placard premises storing dangerous goods* – www.workcover.tas.gov.au/attach/gb023pdf.pdf