

# **Bunding and Spill Management Guidelines**

**December 2015**



**ENVIRONMENT PROTECTION AUTHORITY**

# Bunding and Spill Management Guidelines

First edition  
December 2015

Issued by the Director, EPA to assist operators to meet relevant environmental management requirements.

## ENQUIRIES

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Recommended citation: EPA Tasmania (2015) *Bunding and Spill Management Guidelines*, Published on behalf of the EPA by the EPA Division, Department of Primary Industries, Parks, Water and Environment, Tasmania.

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## CONTENTS

1	INTRODUCTION .....	2
1.1	Purpose and scope of the guidelines .....	2
1.2	Who should use the guidelines? .....	2
2	Legislation.....	2
3	What is a bund? .....	2
4	Do I need bunding? .....	3
4.1	Level of risk.....	3
4.2	Type of facility .....	3
5	Permanent Bunds or Spill Containment Systems.....	4
5.1	Designing and constructing bunds .....	4
5.2	Minimising the risk of spills to the environment .....	5
5.3	Approvals .....	5
5.4	Net capacity of the bund .....	6
5.4.1	Tank storages .....	6
5.4.2	Package storages .....	6
5.5	Materials used for bunding .....	6
5.6	Bund heights and tank distance from the wall .....	6
5.7	Storage of liquid classed as a dangerous substance .....	7
5.8	Drainage .....	7
5.9	Piping and pumping facilities .....	7
5.10	Roof design.....	7
6	Temporary storage .....	8
7	Operating and maintaining bunds.....	8
7.1	Maintenance items requiring checking .....	8
7.2	Common problems with un-maintained or incorrectly constructed bunds.....	8
8	Alternatives to bunded containment systems .....	9
9	Spill Management .....	9
9.1	Loading/unloading aprons .....	9
9.2	Spill kits.....	9
10	Further reading .....	10
11	Acknowledgements.....	10

## **I INTRODUCTION**

### **1.1 Purpose and scope of the guidelines**

Environmentally hazardous materials/liquids stored above ground represent a potential source of contaminants that may cause significant environmental damage. A bund, or spill containment system (SCS), is designed to contain spillages and leaks of environmentally hazardous materials/liquids to minimise the risk of pollution, and to reduce the risk of injury and damage to property. All operators working with bunds/SCSs should know how to carry out preventative maintenance and use standard operating procedures to prevent escaped materials from entering the environment.

It should be noted that almost all liquids, other than uncontaminated water, may cause pollution or pose an environmental hazard if released to the environment in sufficient quantities.

### **1.2 Who should use the guidelines?**

This document applies to those facilities that use or store environmentally hazardous materials/liquids in tanks or containers above ground, and provides information on spill containment systems (particularly bunds) to minimise the risk of environmental harm from material/liquid spills or leaks. Unless compliance with this document is explicitly called up in a Permit, Environment Protection Notice, or other legal instrument, this document should only be used as a guide.

## **2 LEGISLATION**

The principal legislation addressing environmental pollution in Tasmania is the *Environmental Management and Pollution Control Act 1994* (EMPCA). In particular, Section 23A of EMPCA imposes the general environmental duty on all persons undertaking an activity that may pollute, to take such steps as are practicable and reasonable to prevent or minimise environmental harm or environmental nuisance being caused by an activity.

In the case of an environmentally relevant activity, as defined in Section 3 of EMPCA, an Environment Protection Notice may be issued to the person responsible for that activity if serious or material environmental harm or environmental nuisance is being, has been or is likely to be caused. Under Section 45 of EMPCA, contravention of a requirement of an Environment Protection Notice carries significant penalties.

## **3 WHAT IS A BUND?**

Bunding is adopted widely as an effective approach to spill containment. A bund is an impervious embankment, or wall, made of brick, stone or concrete, or other suitable materials, which may form part, or all, of the perimeter of a compound that acts as a secondary containment area to retain spilt material/liquid. Since the bund is the main part of the spill containment system, the whole system (or banded area) is colloquially referred to within industry as the 'bund'. The bund is designed to contain spillages and leaks from tanks or containers containing materials/liquids used, stored or processed above ground, and to facilitate clean-up operations.

Apart from being used to minimise the risk of spillage from tanks or containers polluting the receiving environment, bunds are also used for fire protection, product recovery and process isolation. They are also a useful management measure to reduce the likelihood of site soil and groundwater contamination and subsequent remediation and rehabilitation costs.

Generally, a bund consists of, but is not necessarily limited to, the following:

- An impervious bund wall or embankment surrounding the facility or tank;
- An impervious floor within the banded area; and
- Any associated facilities designed to remove materials/liquids safely from the banded area without polluting the environment.

## 4 DO I NEED BUNDING?

This guide applies to facilities that use, store or process any environmentally hazardous materials/liquids in above ground tanks or containers. Uncontaminated water, whether potable water or stormwater, is not considered to be an environmentally hazardous liquid. Whether bunding is required, and what type should be used, must be determined on a site-by-site basis. This will be determined by:

- The level of risk; and
- The type of facility.

### 4.1 Level of risk

The level of risk posed to the environment from a facility should be based on consideration of site-specific factors, such as:

- The type of material/liquid being used, stored or processed, and its potential to impact on the environment;
- The amount of stored material/liquid;
- The ability of the facility or storage system to prevent spillages or leakages through existing controls;
- The duration of any temporary storage;
- The type of on-site drainage; and
- The sensitivity, and proximity, of the receiving environment.

Bunding of an area is recommended if the area drains to or has a pathway to the receiving environment. Examples of pathways to the environment include, but are not limited to:

- Stormwater or sewer systems;
- Across/into soil or through the soil structure; and
- Across hardstand areas.

**Environmentally hazardous materials/liquids should not be discharged to a sewer without an appropriate trade waste consent from the operator of the sewer system.**

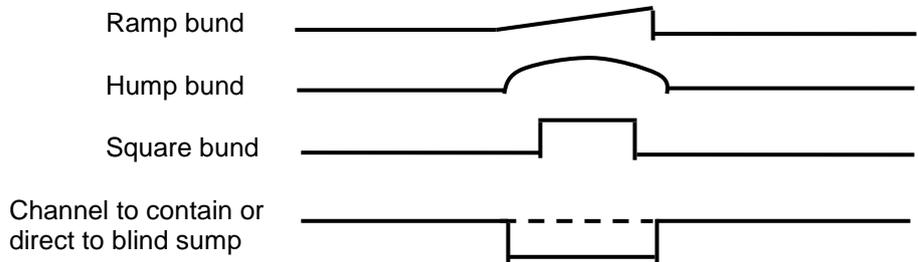
### 4.2 Type of facility

Facilities that should have banded areas that comply with these guidelines include:

- Facilities that are designed for the storage of chemical reagents, pesticides or petroleum;
- Electrical transformers containing oil and/or PCBs;
- Facilities used in the transfer of environmentally hazardous materials/liquids (i.e. transport facilities);
- Temporary or permanent drum storage areas;
- Chemical, pesticide or petroleum processing areas;
- Any facilities storing substances which, while not hazardous on worker or public health grounds, will have significant environmental impacts if released. For example, milk, which has a high biological oxygen demand, can cause serious environmental harm in receiving waters, if released in large quantities.

- Any other facilities or locations where spills are common, including transfer points, workshops, factories, service stations, buildings or pieces of machinery, wash bays, and other areas in which a material is transferred from its container. In situations like these, common forms of bunding are short brick or concrete walls, grading of the ground towards a sump for liquid collection, or using “speed bump” style bunding.

Examples of different types of bunds:



## 5 PERMANENT BUNDS OR SPILL CONTAINMENT SYSTEMS

### 5.1 Designing and constructing bunds

There are some general rules to follow when designing and constructing bunds for tank and drum storages. The following two diagrams illustrate many of the points that should be incorporated into the bund design.

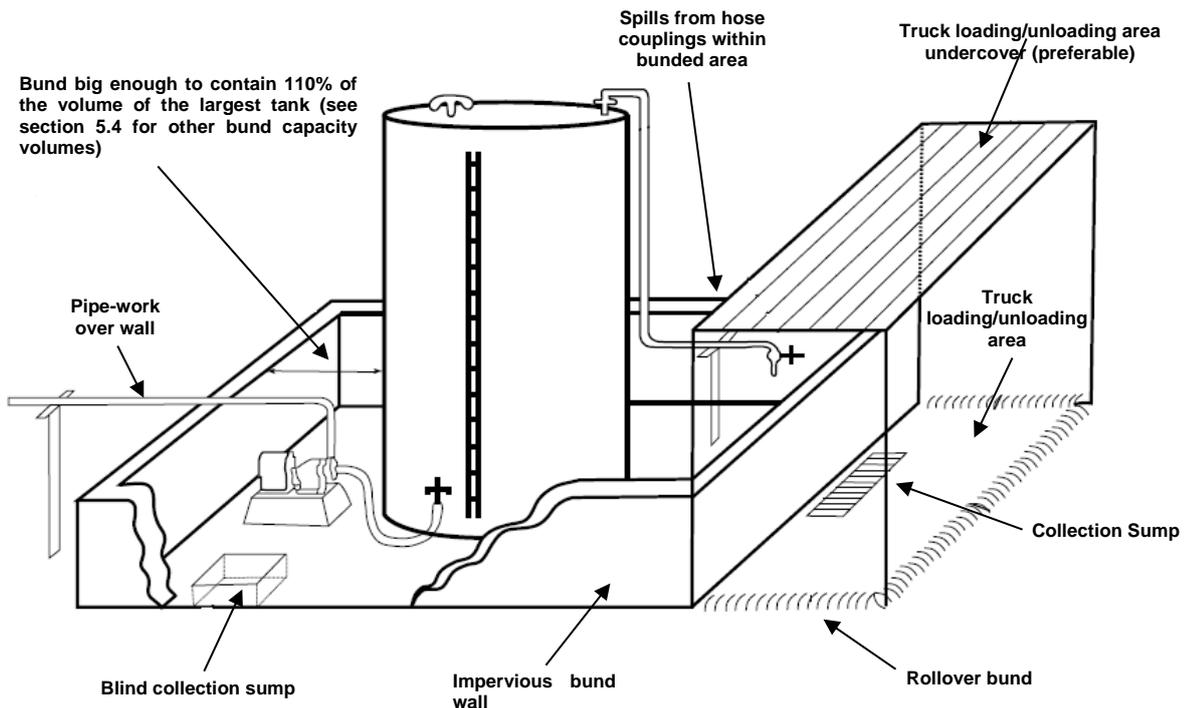
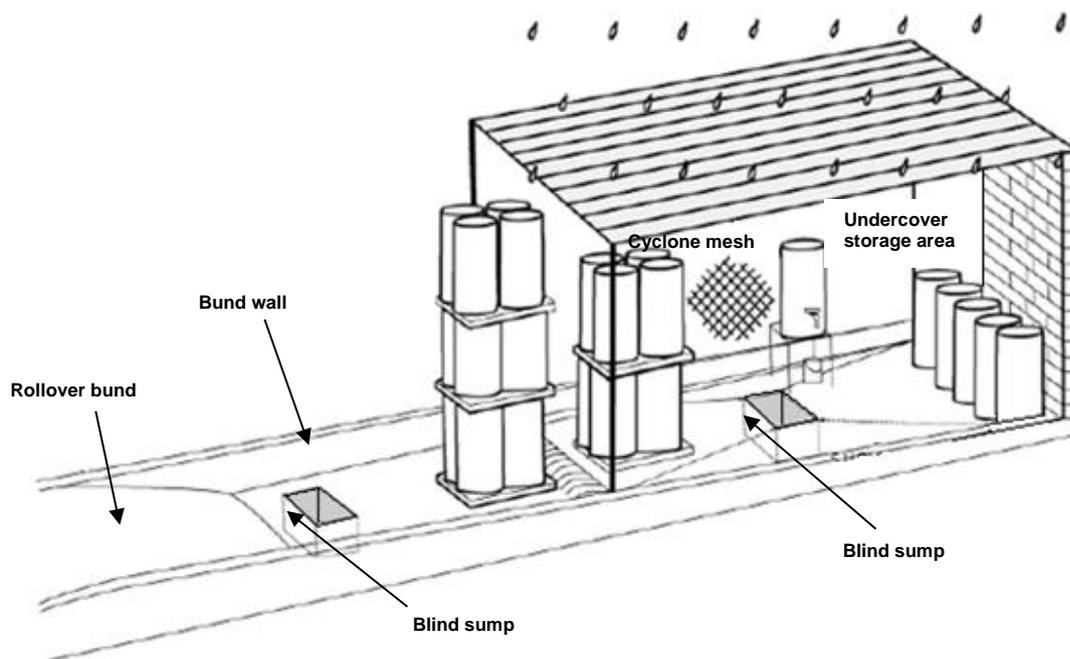


Figure 1: Example of bunding for bulk liquid storage tanks (adapted from NSW DECC, South Australian EPA and Victorian EPA).



**Figure 2: Example of bunding for drums and containers (adapted from NSW DECC, South Australian EPA and Victorian EPA).**

## 5.2 Minimising the risk of spills to the environment

The use of bunds is the primary measure employed to minimise the risk of environmentally hazardous materials/liquids entering the environment from storage/processing facilities. All employees working with bunds should know how to:

- Carry out regular inspections of valves, pumps, pipes and hoses;
- Implement preventative maintenance procedures;
- Use standard operating procedures in the event of an on-site emergency;
- Isolate a tank or bund;
- Use fire-fighting equipment, if required; and
- Stop substances entering the environment if they have escaped the bunding.

This guide does not address other issues that must be considered when storing materials/liquids, such as fire safety and restriction of access.

## 5.3 Approvals

Before any work is started on the construction of a bund or spill containment area, consult the relevant planning authority regarding necessary planning approvals. The EPA should also be consulted regarding environmental requirements or approvals as per Permit or EPN requirements.

## 5.4 Net capacity of the bund

### 5.4.1 Tank storages

The designed net capacity of a bunded compound in a tank storage facility should be whichever is the largest of the following:

- At least 110% of the volume of the largest storage vessel; or
- At least 110% of the combined volume of any inter-connected vessels within that bunded area; or
- At least 25% of the total volume of all vessels stored in that bunded area; or
- The capacity of the largest vessel plus the output of any appropriate fire suppression system fitted, over a 20-minute period.

Consideration must also be given to the capacity displaced by other storage vessels contained within the same bunded area. For the storage of any flammable and combustible materials, refer to Australian Standard AS 1940-2004: *The storage and handling of flammable and combustible liquids*.

### 5.4.2 Package storages

If the materials to be bunded are contained in drums (or other small containers), the bunded area should be designed to contain whichever of the following gives the largest bund capacity:

- at least 110% of the volume of the largest storage vessel; or
- 25% of the total volume stored in that bund.

In addition, provision should be made for the containment of firewater on-site by designing and constructing adequate drainage controls, and by formulating emergency response plans.

## 5.5 Materials used for bunding

The bund floor and walls should be constructed of materials that are impervious to the contents of any tank or container within the bund. The bunded area should be capable of preventing the migration of any spillage or leakage to the surrounding environment.

The bund should be built out of materials that will resist attack by any substances that may be put inside it, and have sufficient strength and structural integrity to ensure that it is unlikely to leak or burst in all foreseeable circumstances, and should not have a damp course. A wall of brick, stone or concrete or other suitable material could form part, or all, of the perimeter of the bund. Reinforced concrete is recommended, as it is robust and generally impervious. If brick or stone is used, an impervious coating should be applied as the number of mortar joints results in a low integrity bund (note: if Besser blocks are used, they are particularly porous and should have an impervious coating applied to the complete internal surface of the bund wall).

Concrete bund walls should be poured integrally with the slab floor. When joints are used in concrete or masonry systems, they should be sealed with a suitable sealant material that is impervious to, and compatible with, the liquids to be contained. The use of un-reinforced materials is not recommended for bund wall construction.

## 5.6 Bund heights and tank distance from the wall

Wall type bunds of tank storages should be 0.5m to 1.5m high, depending on the containment capacity that is required and the distance to the tank – the closer the wall is to the tank, the higher it should be. The minimum distance between tank and bund wall should be 1m. If the bund walls are higher than 1m above the compound floor, steps or ladders should be provided for quick escape. For bund walls close to the tank or higher than 1.5m, apply safety precautions for confined spaces (consult AS 2865-2001 *Safe Working in a Confined Space*). If bund walls are lower than 0.5m a larger bunded area will be needed, which results in a greater surface area for the capture of stormwater if uncovered.

When designing a bund for an elevated storage, consult AS 1940-2004, Figure 5.2, to ensure that bund wall heights and the distance between bund walls and tanks are adequate.

## 5.7 Storage of liquid classed as a dangerous substance

If the liquid to be stored has been classified as a dangerous good (refer to the *Australian Code for the Transport of Dangerous Goods by Road and Rail*, or ADG Code) an allowance should be made for the trajectory of a liquid leak, assuming the tank is full and has an elevated point of leakage. A splatter shield might need to be installed, or a generous distance provided between the tank and the bund wall – half the height of the tank would be appropriate. This is not necessary for drums provided they are stored in such a way that a wall or fence can prevent them from falling outside the bunded area (refer Figure 2).

## 5.8 Drainage

A collection sump should be provided in the bund floor to facilitate the easy removal of liquids, with the floor of the bund graded such that liquid collects in the sump. The sumps provides a collection point from which to recover liquid, using a pump or other means, and should not be connected to a sewer or stormwater system, or have access to a stormwater system.

If bund drain valves are installed, they should be leak-proof and able to continue functioning in the event of a fire. The controls of the drain valve should be situated outside the bunded area, and should be able to be locked in the closed position. 'Open' and 'closed' positions on the valve should be clearly indicated.

Stormwater that accumulates in the sump or bund may be contaminated and should not be disposed of to the stormwater system. Treatment and disposal of this water should be by either through removal by an authorised liquid waste contractor, or disposed to sewer in accordance with a trade waste agreement with the operator of the sewer system.

Any disposal of contaminated material must be carried out in accordance with the *Environmental Management and Pollution Control (Waste Management) Regulations 2010*. If there is any doubt as to whether the material to be disposed of is a contaminated material, or how it should be dealt with, contact the EPA Division, Department of Primary Industries, Parks, Water and Environment.

## 5.9 Piping and pumping facilities

Piping and pumping facilities should be arranged such that any leaks cannot escape the confines of the bund, and if the bund is full of liquid, the pumps will remain operational. A flameproof pump should be provided if pumping flammable liquids or water containing flammable liquids.

All pipes should be directed over the bund walls. If any pipes pass through the bund wall, the bund wall-pipe interface should be designed to remain gap-proof and crack-proof, even in the event of fire.

If there are hose couplings in the bund, they should be placed in positions where spills or leakages from those couplings are contained within the bund. If couplings are remote from the bund, there should be provision of a suitable means of collecting and retaining any spills or leakages.

Any piping to and from the bunded area should be sited aboveground to facilitate ease of inspection and maintenance. Fill pipes, draw-off pipes and vent pipes should be positioned away from vehicle traffic to minimise damage through collisions.

## 5.10 Roof design

It is recommended to provide a roof to stop rainwater from entering the bund. Incorporate an overhang, extending 12° beyond vertical, to help prevent rain from entering the bunded area. Risk assessment and planning processes should be done on a case-by-case basis, to ensure that a roof structure will not cause a build-up of dangerous or poisonous gases, and will not impede any firefighting measures. The options for roofing should be explored. In the absence of a roof, arrangements should be put in place for safe disposal/management of potentially contaminated stormwater that accumulates within the bund.

## 6 TEMPORARY STORAGE

It is sometimes acceptable to store drums temporarily on spill containment pallets. Each pallet must be capable of capturing at least the entire contents of one drum. If these pallets are to be used, the drums and spill containment pallets should be stored on a level surface to ensure that the entire spill capacity remains available, and they should be covered to prevent pallets filling with rainwater.

Mobile fuel tanks may be brought onto site on a daily basis, or for a short term campaign of operations. In this case a temporary earthen bund with an impervious clay or plastic/PVC lining may be sufficient. The bund should be large enough to surround the vehicle and/or trailer on which the fuel tank is mounted and should be designed so as to prevent surface water runoff from entering the bund. As with permanent bunds, any temporary bund should be designed to have a capacity of at least 110% of the volume of the largest tank stored within it.

## 7 OPERATING AND MAINTAINING BUNDS

### 7.1 Maintenance items requiring checking

The person responsible for operation and maintenance of the bund should ensure that:

- The drain valve (if fitted) remains in the fully closed position at all times when not in use, and can be opened only by persons authorised to do so;
- The 'open' or 'closed' positions on the drain valve are clearly marked and locked when not in use;
- An Authorised Officer of the EPA or Council can gain access to inspect the drain valve;
- The drain valve is routinely maintained to ensure it operates as designed;
- The bund wall is routinely maintained to ensure that it remains impervious to liquids;
- Pipes, valves and other equipment in the bund are routinely maintained;
- Spillages of solid or liquid material within the bund is cleaned up immediately;
- After rainfall, all bunds are emptied as soon as possible to maintain fill capacity. Rainwater must not accumulate in bund up to a level where leaking dangerous and/or environmentally hazardous substances can float over the top of the bund wall; and
- Bunds are regularly checked for issues listed in 7.2.

### 7.2 Common problems with un-maintained or incorrectly constructed bunds

The following are some common problems associated with bunding that is incorrectly maintained or has been constructed inappropriately:

- Chemical resistant linings on bunds becoming damaged;
- Stormwater allowed to accumulate within bunds thereby reducing the effective capacity;
- Spills of materials stored within the bund allowed to accumulate within the bund thereby reducing the effective capacity;
- Spills of acidic material stored within concrete bunds being allowed to accumulate resulting in chemical attack leading to loss of bund integrity;
- The flexible joints between concreted sections shrinking resulting in gaps in the bund;
- Concreted sections being poured separately without any jointing material between them which results in gaps in the bund;
- Concrete bunds cracking due to movement of foundations or damage from mobile machinery;
- Besser blocks being used to build bund walls (the porosity of besser blocks and the number of mortar joints can result in a low integrity bund);

- Pipe-work being installed through bund walls and floors without any specific design provision to isolate the bund from pipe-work movement;
- Bunds being constructed with stormwater drainage holes (without valves) in the walls;
- Earthing systems being installed through bund walls;
- Storage of pallets and drums in banded area reducing effective capacity of bund;
- Bunds being used as rubbish dumps; and
- Pipes, pipefittings (valves and flanges) or hoses being installed on top of or outside the bund walls.
- Bund floor being inadequately sealed, resulting in soil contamination.

## 8 ALTERNATIVES TO BUNDED CONTAINMENT SYSTEMS

Where an aboveground tank has an integral secondary containment system complying with Clause 5.9 of AS 1940-2004, that tank does not have to be installed within a compound, such as a banded area. Tanks complying with this Clause are the following:

- Double-walled tanks;
- Tanks having secondary containment and an external, fire-rated covering; and
- Tanks with an attached or integrated spillage compound.

## 9 SPILL MANAGEMENT

### 9.1 Loading/unloading aprons

Activities that involve a significant risk of spillages of environmentally hazardous materials/liquids, such as the refuelling of a vehicle from a storage system, should take place within a banded containment area or on a vehicle loading apron (Figure 1). As with bunds, vehicle loading aprons should be impervious and be graded or drain to a sump to allow for the recovery of liquids.

### 9.2 Spill kits

There are many types of spill kits available on the market today. Any activity where there is a reasonable risk of spillages of environmentally hazardous materials/liquids should have spill kits appropriate for the type and volumes of materials/liquids stored by the activity kept in appropriate locations to assist with the containment of any spilt environmentally hazardous materials/liquids.

## 10 FURTHER READING

The following standards are available from Standards Australia – telephone 1800 035 822:

- AS 1940-2004 *The storage and handling of flammable and combustible liquids*
- AS 2507-1998 *The storage and handling of agricultural and veterinary chemicals*
- AS 2714-2008 *The storage and handling of organic peroxides*
- AS 3780-2008 *The storage and handling of corrosive substances*
- AS 4326-2008 *The storage and handling of oxidising agents*
- AS/NZS 2865-2001 *Safe working in a confined space*
- AS/NZS 4081-2001 *The storage and handling of liquid and liquefied polyfunctional isocyanates*
- AS/NZS 4452-1997 *The storage and handling of toxic substances*

All standards quoted in this document were current at time of writing.

### Also:

Relevant legislation, policies and codes that should be consulted are:

- *Environmental Management and Pollution Control Act 1994*
- *Environmental Management and Pollution Control (Waste Management) Regulations 2010*
- *Work Health and Safety Act 2012*
- *State Policy on Water Quality Management 1997*
- *Australian Code for the Transport of Dangerous Goods by Road and Rail*

## 11 ACKNOWLEDGEMENTS

The Tasmanian Environment Protection Authority (EPA) wishes to acknowledge the New South Wales Department of Environment, Climate Change and Water (DECCW), the Victorian EPA and the South Australian EPA for material and diagrams used in this guideline.

New South Wales DECC 2008, *Bunding and Spill Management*  
< [www.environment.nsw.gov.au/mao/bundingspill.htm](http://www.environment.nsw.gov.au/mao/bundingspill.htm) >

South Australian EPA 2007, *Bunding and Spill Management*  
<[www.epa.sa.gov.au/documents](http://www.epa.sa.gov.au/documents)>

Victorian EPA 1992, *Bunding Guidelines*  
<[www.epa.vic.gov.au/publications](http://www.epa.vic.gov.au/publications)>



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