



**Government
of South Australia**

Disaster Waste Management Guidelines

State Emergency Management Plan – Part 4

DWM Capability Plan – Annex A



Acknowledgments

The *Disaster Waste Management Guidelines* were commissioned by Green Industries SA with funding assistance from the State Emergency Management Committee via the National Disaster Resilience Program.

The guidelines were prepared by the Rawtec consultancy team, in consultation with South Australian stakeholders under the guidance of the Project Steering Committee and overseen by SEMC.

Green Industries SA

Green Industries SA helps develop the green economy. Green Industries SA promotes the more efficient use of resources, and the conservation and recovery of scarce resources.

Its activities are guided by the primary objectives of the *Green Industries SA Act 2004* to promote:

- waste management practices that, as far as possible, eliminate waste or its consignment to landfill
- innovation and business activity in the waste management, resource recovery and green industry sectors, recognising that these areas present a valuable opportunity to contribute to the State's economic growth.

State Emergency Management Committee

The State Emergency Management Committee provides leadership and oversight of emergency management arrangements in South Australia. The State Emergency Management Plan is the key mechanism for ensuring an efficient and consistent approach to planning and preparing for, responding to and recovering from disasters.

Its activities are guided by the objectives of the *Emergency Management Act 2004* to:

- establish an emergency management framework that
 - promotes prompt and effective decision-making associated with emergencies, and
 - makes provision for comprehensive and integrated planning in relation to emergencies
- promote community resilience and reduce community vulnerability in the event of an emergency.

Project Steering Committee

The Project Steering Committee provided governance to the project. It comprised government agencies/organisations involved with state emergency management and waste management, including representatives from South Australian Fire and Emergency Services Commission, SA Police, the Department for Communities and Social Inclusion, Green Industries SA, the Environment Protection Authority South Australia and the Local Government Association of South Australia.

Rawtec consultancy team

The Rawtec consultancy team prepared this document in collaboration with Mike Haywood Sustainable Resource Solutions, Resilient Organisations, Resource Advisory, Resources and Waste Advisory Group, and TOMAC consulting.

Document control

Classification/DLM

Public

Authority

State Emergency Management
Committee pursuant to section
9(1)(b) of the *Emergency
Management Act 2004*

Managed and maintained by

Green Industries SA

Issued

09 July 2018

Review date

09 July 2018

VERSION DATE

COMMENTS DISTRIBUTION

1.0 09 July 2018

Table of contents

Part A – Introduction	1
A1: About the guidelines	2
A2: Disaster waste management principles	4
A3: State government support	5
Part B – General guidelines	7
B1: Overview of disaster waste management processes and activities	8
B2: Undertake initial waste assessment	10
B3: Identify short-term support needed to address acute waste issues	14
B4: Oversee delivery of short-term support.....	20
B5: Complete a more detailed waste assessment	23
B6: Identify needs for delivering support during recovery phase	29
B7: Develop a Disaster Waste Management Program.....	32
B8: Oversee implementation of Program until completion	33
B9: Review disaster waste management outcomes.....	34
Part C – Technical guidelines	35
C1: Introduction.....	36
C2: On-property handling of waste	36
C3: Collection and transport	37
C4: Establishing an interim storage facility.....	40
C5: Recycling and disposal options.....	43
C6: Asbestos and asbestos-contaminated waste	44
C7: Construction and demolition inert waste (concrete, brick and rubble).....	49
C8: Mixed waste.....	54
C9: Metal waste	60
C10: Hard waste	64
C11: E-waste and whitegoods	67
C12: Household hazardous waste.....	71
C13: Vehicle waste	75
C14: Green (vegetative) waste	79
C15: Soil and sediment waste	83
C16: Food waste.....	87
C17: Copper chrome arsenate post waste	92
C18: Unwanted donated goods	95
C19: Agricultural (including greenhouse) waste	96
C20: Animal carcass waste.....	103
C21: Chemical (hazardous) waste.....	109
C22: Empty chemical drums.....	114
C23: Sandbag waste.....	118
C24: Medical and pharmaceutical waste.....	121

Acronyms

C&D	Construction and demolition
C&I	Commercial and industrial
CCA	Copper chrome arsenate
DEW	Department for Environment and Water
DPTI	Department of Planning, Transport and Infrastructure
DWM	Disaster waste management
EMS	Environmental Management System
EP Act	<i>Environment Protection Act 1993</i>
SA EPA	Environment Protection Authority South Australia
EPP	Environment Protection Policy
FSG	Functional Support Group
GHS	Globally Harmonized System of Classification and Labelling of Chemicals
GISA	Green Industries South Australia
ICA	Insurance Council of Australia
OH&S	Operational health and safety
PIRSA	Primary Industries and Regions South Australia
PPE	Personal protection equipment
RORO	Roll-on-roll-off
RSPCA	Royal Society for the Prevention of Cruelty to Animals
SA	South Australia
SDS	Safety Data Sheets
SEMP	State Emergency Management Plan
WHS	Workplace health and safety

Part A – Introduction

Overview

Part A provides an overview of the guidelines, including what is covered, who should use them and when to use them. It identifies principles for disaster waste management (DWM) that should be followed for all events. It also identifies the level of state government support provided to DWM stakeholders.

Guidelines

- A1: About the guidelines
- A2: Disaster waste management principles
- A3: State government support

A1: About the guidelines

Managing debris and other waste following a disaster event can have real and lasting impacts on affected communities and the environment. It can:

- involve complex interactions with search and rescue and emergency response
- affect longer term economic and social recovery
- affect human health and environmental outcomes as a direct or indirect consequence of a disaster.

Disaster waste management (DWM) can also have positive impacts, such as:

- improving the mental health/wellbeing of people in the affected area, which may see the clean-up of waste as a return to normalcy and give them sense of control
- providing local employment following the disaster
- delivering recycled products to support rebuilding infrastructure and associated economic benefits.

The *Disaster Waste Management Guidelines* (the guidelines) provide advice on best practice DWM during the response and recovery phases of an event in South Australia. The guidelines were developed based on past DWM experience – both local and international – and in consultation with South Australian stakeholders.

The guidelines are an annex to the *Disaster Waste Management Capability Plan* (DWM Capability Plan).

A1.1 What the guidelines cover

The guidelines consider management of all waste types, with a focus on all solid waste (including non-hazardous, hazardous and medical) arising from natural disasters. This includes:

- debris generated by damage to property and infrastructure by the event, once it has been released by first responders
- materials deployed during disaster response stages (e.g. sandbags used in flood events)
- relief waste generated during the response and recovery phases (e.g. unwanted donated goods, medical waste)
- waste from demolished buildings and structures
- agricultural waste (including animal carcasses) resulting from the event.

Information on other waste types, such as liquid waste, radioactive waste and agricultural waste, including animal carcasses (generated from controlling or eradicating an exotic disease or contaminant), is outside of the scope of this version of the guidelines. Extensive work has occurred nationally on the disposal requirements for animal carcasses arising from controlling a disease.¹ Further work is still required to provide detailed guidance on managing liquid and radioactive waste.

¹ AUSVETPLAN (Australian Veterinary Emergency Plan) *Operational Manual – Disposal* (2015), available from animalhealthaustralia.com.au/wp-content/uploads/2015/09/DISP-08-FINAL24Aug15.pdf

A1.2 Who should use the guidelines

The guidelines are for stakeholders involved in DWM activities. This document should be read in conjunction with the State Emergency Management Plan and the DWM Capability Plan. These plans establish emergency management arrangements and corresponding roles and responsibilities for DWM.

A1.3 When to use the guidelines

The guidelines may be used in all emergency phases, as outlined in Table A1.1. The guidelines apply once the DWM Capability Plan is activated. However, stakeholders may still use the guidelines for other events.

Table A1.1: Emergency phases and when to use the guidelines

Emergency phase	Objective of using the guidelines	
Preparedness	To assess how prepared South Australia is to carry out DWM during the response and recovery phases.	
Response	To guide DWM during the response phase, with a focus on addressing the most acute waste issues required to save lives, alleviate suffering, facilitate rescue operations and counter-disaster operations, and minimise harm to the environment and human health.	
Recovery	Early recovery	To guide DWM during the early recovery phase, with a focus on laying the groundwork for implementing a DWM Program during the recovery phase. The DWM Program provides guidance on addressing key issues such as managing different types of waste; identifying, establishing and managing interim storage and disposal sites; streamlining logistics for waste collection; transportation; and reuse/recycling initiatives.
	Recovery	To guide DWM during the recovery phase, with a focus on implementing the DWM Program designed in the early recovery phase and continued monitoring and evaluation of the disaster waste situation.
Post-recovery	To guide and manage any long-term environmental and/or other impacts resulting from DWM activities.	

A1.4 Updating the guidelines

The guidelines should be revised every two years or as required to incorporate any new information, changes in regulations and best practice guidance. Responsibility and timeframes for revising the guidelines is provided in the DWM Capability Plan.

A2: Disaster waste management principles

DWM should be carried out in line with the principles in Table A2.1.

Table A2.1: Principles for disaster waste management

Principal	Description
Community resilience	Build capacity in communities to prepare for and carry out responsible disaster waste management practices. Ensure that disaster waste management is embedded in state emergency management arrangements to support local communities.
Protection of health, economic assets and the environment	Ensure that disaster waste management practices identify and avoid or minimise risks of harm to human health (including workplace health and safety considerations), economic assets (including agriculture) and the environment.
Sustainable resource management	Undertake disaster waste management in accordance with the Waste Management Hierarchy (see Figure A2.1), where safe and practical to do so. Where circumstances give rise to unacceptable levels of risk, waste is likely to be sent to landfill.
Recognition of practical constraints and community expectations	Recognise practical constraints and community expectations when deciding on methods for waste management, including the ability to act in a timely manner, and availability of skilled labour, equipment and facilities, including transport logistics when designing a waste management strategy. It is acknowledged that in a crisis sometimes streamlined processes are needed, which may not follow business-as-usual approaches.
Support positive recovery outcomes	Consider how decisions related to DWM will affect the recovery of communities. Where possible a DWM Program should support local businesses, and provide economic opportunities, including local job creation and use recovered materials for reconstruction.
Accountability	Clearly define roles and responsibilities, lines of authority and communications for DWM. Ensure that adequate procedures are in place and adhered to for record keeping.

Figure A2.1: Waste Management Hierarchy



A3: State government support

Once the DWM Capability Plan has been activated for an event, the Functional Lead for DWM is responsible for identifying and coordinating delivery of state government support to affected communities and other stakeholders. The level of state government support available to DWM stakeholders will be in line with the principles and guidance set out in the guidelines and in consultation with key stakeholders.

State government support includes advisory and operational support to landowners and other relevant DWM stakeholders. Depending on the scale and nature of waste generated by the event, state government advisory support may include (but is not limited to):

- assessing and reporting waste volumes, types, locations, sources and owners
- identifying key waste issues that pose a threat to human health, economic assets (including agriculture) and the environment and/or may impede the recovery of the affected community
- providing information and advice to state government agencies and organisations (via the State Emergency Centre) on options and considerations for managing waste during the response phase
- providing information and advice to local councils (via the State Recovery Committee) on options for re-establishing municipal waste collections, managing waste on council land, and council services to residents to manage volumes of waste
- providing information and advice to the public via the Public Information Functional Support Group (FSG) on the options and considerations for managing waste generated on private land
- liaising with the Environment Protection Authority South Australia (SA EPA) on exemptions and emergency authorisations for waste handling, transport, storage, processing and disposal
- assessing the affected community's capability to manage waste volumes and issues.

The State Government shall provide operational support to the affected community or communities and other stakeholders to assist with managing waste volumes and issues when the following two conditions concurrently exist:

- a. The affected community or communities (including landowners, residents, animal and livestock owners, businesses, and local government) do not have the capacity to deal with the waste volumes and issues

and

- b. The nature of the waste volumes or issue means there are high consequences to human health, economic assets (including agriculture) the environment and/or community recovery if it is not appropriately managed.

If condition (a) or (b) does not exist, the State Government may still decide to provide operational support if delivering this support is considered significant to support the overall recovery needs of affected communities. For example, if providing this support improves outcomes for the psychological wellbeing of individuals, the speed and/or cost of recovery and/or increased recycling outcomes.

Figure A3.1 provides a framework for identifying the need for state government DWM operational support.

Figure A3.1: Framework for identifying the need for state government DWM operational support

		Do affected communities have the capacity to manage the waste volumes or issue?	
		Yes	No
Consequences to human health, economic assets, the environment and/or community recovery of not managing the waste volumes or issue properly	Low	Advisory support (Business as usual)	Advisory support and potential operational support
	High	Advisory support and potential operational support	Advisory and operational support

Operational support may include, but is not limited to:

- implementing a state-supported or coordinated clean-up of waste
- coordinating volunteer clean-up operations
- contracting waste service providers to collectively manage waste on behalf of the affected community
- finding a location and setting up an interim storage facility and/or reprocessing/disposal facility to manage volumes of waste generated by an event
- coordinating logistics for waste collection, transportation, reuse, recycling and/or disposal initiatives
- coordinating a commercial agreement with the Insurance Council of Australia (ICA) on cooperation and cost sharing for state-supported or coordinated clean-up.

Part B – General guidelines

Overview

Part B provides guidance for the Functional Lead and Participating Agencies for DWM on how to carry out DWM activities from the response phase through to post-recovery. This guidance applies to events where the DWM Capability Plan has been activated. It includes guidance on key decisions, including identifying the level of state government support provided to DWM stakeholders.

Guidelines

- B1: Overview of disaster waste management processes and activities
- B2: Undertake initial waste assessment
- B3: Identify short-term support needed to address acute waste issues
- B4: Oversee delivery of short-term support
- B5: Complete a more detailed waste assessment
- B6: Identify needs for delivering support during recovery phase
- B7: Develop a disaster waste management Program
- B8: Oversee implementation of program until completion
- B9: Review disaster waste management outcomes

Key considerations

The guidelines have been developed to cover 'all events' and 'all waste types'. They exclude managing waste following a biosecurity event (e.g. foot-and-mouth disease outbreak) but includes management of incidental biosecurity waste from other events (e.g. flood affected crops that may carry disease).

The scope of activities involved with DWM can vary greatly depending on the nature of the event, the types of waste generated and the issues that arise. The guidelines provide a framework to enable decision-makers to identify the scope of DWM activities needed to manage the waste, and the appropriate level of state government support to help affected communities and other stakeholders.

B1: Overview of disaster waste management processes and activities

DWM is a function that often cuts across both the response and the recovery phases. The scope and methods of DWM is specific to an event, including the type of event (e.g. bushfire, earthquake, flood etc.), its location and the extent of damage caused.

Figure B1.1 provides a framework for key steps and activities to be carried out by the Functional Lead for DWM following an event, to facilitate responsible DWM. Key steps include:

- undertaking an initial assessment to identify the scale of waste generated by the event
- identifying short-term support needed to address the most acute waste issues
- overseeing delivery of short-term support
- undertaking more detailed waste assessments
- identifying longer term support needed to manage waste
- developing a program for DWM support
- overseeing program until completion
- reviewing DWM outcomes.

These activities are carried out with support from Participating Agencies for DWM in line with the roles and responsibilities identified in the DWM Capability Plan.

Part B provides practical guidance on how to undertake key DWM activities, as well as frameworks for decision-making.

Further technical guidance on managing waste streams is provided in **Part C**, including considerations for:

- on-property handling of waste
- collection and transport
- establishing an interim waste storage facility
- recycling and disposal options
- further technical guidance by waste stream.

Figure B1.1: Steps/processes and activities undertaken by Functional Lead for DWM to fulfil responsibilities

TIMELINE	STEP/ PROCESS	ACTIVITIES	GUIDELINES
RESPONSE	1 Undertake initial waste assessment	<ul style="list-style-type: none"> Undertake initial disaster waste assessment to identify key waste issues arising and estimate (at a high level) waste sources, streams, volumes, locations and ownership, based on information gathered from impact assessment and other information sources Assemble a team of subject matter experts and advisers 	See B2
	2 Identify short-term support needed to address acute waste issues	<ul style="list-style-type: none"> Identify short-term support needed (advisory and potentially operational support) by stakeholders to address the most acute waste issues to alleviate suffering, facilitate rescue and counter-disaster operations and minimise acute risks to public health and the environment 	See B3
	3 Oversee delivery of short-term support	<ul style="list-style-type: none"> Prepare Cabinet submission, if needed Liaise with Control Agency on DWM issues, and coordinate delivery of short-term support Liaise with regulators on DWM regulations and potential emergency authorisations or exemptions Provide information to Public Information FSG for dissemination 	See B4
RECOVERY	4 Undertake more detailed waste assessment	<ul style="list-style-type: none"> Undertake more detailed waste assessment for a more accurate and complete understanding of DWM volumes and issues 	See B5
	5 Identify longer term support needed to manage waste	<ul style="list-style-type: none"> Liaise with stakeholders via State Recovery Committee to assess capability of community to manage identified waste volumes and issues, and support needed Identify state government support needed to help affected communities 	See B6
	6 Develop a program for DWM support	<ul style="list-style-type: none"> Prepare Cabinet submissions, as required Develop a DWM Program to deliver support outlining objectives, actions and timeframes that support community recovery objectives 	See B7
	7 Oversee implementation of DWM Program until completion	<ul style="list-style-type: none"> Coordinate resources to deliver DWM Program Regular reporting of progress against timelines in DWM Program Monitor disaster waste situation and identify and manage any emerging issues 	See B8
POST-RECOVERY	8 Review DWM outcomes	<ul style="list-style-type: none"> Review outcomes from DWM activities on recovery of affected communities Monitor long-term environmental, human, social and economic impacts from DWM Review and update DWM Capability Plan and guidelines based on key findings from review and incorporate any new developments 	See B9

B2: Undertake initial waste assessment

As soon as possible after an event, the Functional Lead for DWM should develop a high-level understanding of the waste stream types and volumes. This information will help identify any acute waste issues that may arise, which require immediate attention and management. The collected information can be built on during the recovery phase to generate a more accurate and complete understanding of the waste sources, types, volumes and owners. This can then be used to develop a DWM Program to support recovery of the affected community.

Step 1: Identify potential waste types generated by the event

The type of waste generated by an event will depend on the type of the event (e.g. storm, earthquake, flood, bushfire etc.) and its location (e.g. what type of building stock was affected by the event). Typical waste streams generated by different event types are listed in Table B2.2. The table also references Part C of the guidelines, which provides waste stream specific guidance.

Step 2: Undertake high-level estimate of potential waste volumes

The volume of waste generated by a given event depends on the extent of damage it causes. Information can be obtained from damage assessments on:

- properties including number and type (residential, commercial, industrial) of properties damaged, their location (address and GPS coordination) and extent of damage (minor, major, destroyed)
- number of vehicles damaged
- number and type of deceased animals.

Alternatively, where property level damage is not immediately available, aerial or satellite imagery can be used to determine a rough order estimate of damage extent.

This information can be converted into high-level estimates of waste volumes (tonnes and cubic metres) using the SA Disaster Debris Estimation Tool (Green Industries SA 2015) and/or using the following method and applying estimated material compositions in Table B2.1.

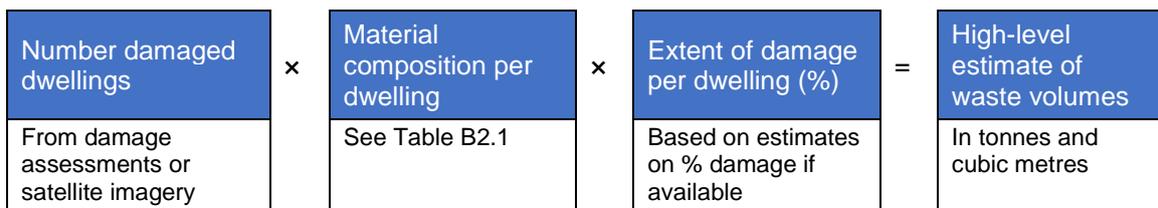


Table B2.1: Estimated material composition of average SA dwelling

Building structure	Tonnes	Building contents	Tonnes
Concrete, bricks, stones, footings	144.0	Furniture	3.8
Asbestos sheeting	0.1	Carpet	0.1
Fittings	1.5	Electronic/electrical equipment	0.2
Roof tiles	9.4	Whitegoods	0.2
Plasterboard	1.7	Total tonnes	4.3
Timber	7.9	Total m³	17.2
Metals (from structures, sheds, fences, etc.)	1.4		
Total tonnes	165.8		
Total m³	207.3		

Note: Discrepancies in the sum of contents reflects rounding. Source: Rawtec (2015).

Table B2.2: Typical waste streams by event type and relativity of waste volumes (L – low, M – medium, H – high)

Typical sources	Waste stream (see guidelines in Part C for definitions)	Guideline reference	Bushfire	Urban fire	Earthquake	Flood	Severe storm	Animal or plant disease
Common waste streams								
Damaged buildings and other structures	Asbestos-containing material	C6	M–H	M–H	H	L–M	L	–
	Construction and demolition inert waste (bricks, concrete, rubble, etc.)	C7	M–H	M–H	H	L–M	L	–
	Mixed waste	C8	M–H	M–H	H	L–M	L	–
	Metal waste	C9	M	M	M	L	M	–
	Hard waste (including furniture, carpets, etc.)	C10	M	M	M–H	M–H	L–M	–
	E-waste and whitegoods	C11	L–M	L–M	L–M	L–M	L–M	–
	Household hazardous waste	C12	L–M	L–M	L–M	L–M	L–M	–
Damaged and/or displaced vehicles	Vehicle waste	C13	L–M	L–M	L–M	L–M	L–M	–
Fallen trees and/or other damaged vegetation	Green (vegetative) waste	C14	M–H	M–H	L	L–M	H	L
Displaced soil and sediment	Soil and sediment waste	C15	L	L	L–H	M–H	L–M	–
Spoiled perishable food from supermarkets, restaurants and households	Food waste	C16	L	L	L–M	L–M	L–M	–
Additional common waste streams in regional areas								
Agricultural properties	Copper chrome arsenate posts	C17	L–M	–	L–M	L–M	L–M	–
	Agriculture (including greenhouse) waste	C19	L–M	–	L–M	L–M	L–M	L–M
	Animal carcass waste	C20	M–H	–	L–M	L–M	L–M	H
	Fencing wire*	C9	L–M	–	L–M	L–M	L–M	–
	Chemical (hazardous) waste	C21	L–M	–	L–M	L–M	L–M	–
	Empty chemical drums	C22	L–M	–	L–M	L–M	L–M	–
Other waste streams								
Flood prone properties	Sandbag waste	C23	–	–	–	L–M	L–M	–
Hospitals and medical centres	Medical and pharmaceutical waste	C24	L–M	L–M	L–M	L–M	L–M	–
Non-profit organisations and relief centres	Unwanted donated goods	C18	L–M	L–M	L–M	L–M	L–M	–

* Considered as metal waste and covered under Guideline C9: Metal waste.

Step 3: Identify acute waste issues

Acute waste issues are those that need to be addressed to save lives, alleviate suffering, facilitate rescue and counter-disaster operations, and minimise risks to public health, economic assets (including agriculture) and the environment. Table B2.3 identifies acute waste issues that could potentially need attention following an event. Note that managing some acute waste issues are already partly, or fully, covered by other arrangements under the State Emergency Management Plan (SEMP).

To identify and understand acute waste issues, the Functional Lead for DWM should assemble a team of subject matter experts. The make-up of the team will depend on the types of waste generated and issues to be addressed. See Table 5 of the DWM Capability Plan for guidance on possible subject matter experts.

Table B2.3: Potential acute DWM waste issues

Timeframe	Acute waste issue	Responsibility (landowner /other)	Guidelines	Potential DWM method
Immediate	Debris is blocking road access for first responders, or search and rescue operations	Road owner (council, SA Department of Planning, Transport and Infrastructure or federal govt)	Refer to existing arrangements under SEMP	First responders clear debris to the roadside or other location.
Immediate	Debris preventing critical infrastructure service restoration/operation (e.g. trees fallen on powerlines)	Utility providers	Refer to existing arrangements under SEMP	First responders clear fallen trees from powerlines and landowners manage resulting waste.
Immediate	Escape of hazardous materials	Owner of hazardous materials	Refer to existing arrangements under SEMP	First responders deal with escape of hazardous materials to contain and make safe on-property; landowners then arrange collection and disposal.
Immediate	Radioactive waste	Owner of radioactive waste	Refer to SA EPA for advice	Refer to SA EPA for advice.
Within 1–3 days	Friable asbestos	Landowners where friable asbestos is located	Guideline C6	Issue public information on safety measures as per Guideline C6.
Within 1–3 days	Medical waste across hospitals and medical centres (where systems have been interrupted)	Hospitals and medical centres	Guideline C24	Set up temporary systems for collection of medical waste, and/or short-term storage, until normal systems can be re-established.
Within 1–3 days	Animal carcass waste from the event	Animal owners and primary producers/ landowners	Guideline C20	Manage animal carcass waste in line with Guideline C20.
Within 1–3 days	Spoiled perishable food (from prolonged power outages)	Supermarkets, food retailers, cafes, restaurants, households, other	Guideline C16	Collect and dispose/recycle spoiled food waste in line with Guideline C16.
Within one week	Dust from burnt soil on roadways affecting visibility for road users	Road owner (council, SA Department of Planning,		Clear and remove dust from roads.

Timeframe	Acute waste issue	Responsibility (landowner /other)	Guidelines	Potential DWM method
		Transport and Infrastructure or federal govt)		
Within one week	Municipal solid waste (if system disrupted)	Local councils		Re-establish municipal solid waste collections where safe and possible, or if not, set up interim systems (e.g. skip bins across the community) until regular systems can be re-established.
Within one week	Waste from temporary accommodation camps	Housing SA		Consider waste reduction (minimise packaging) for delivery of goods to camps. Set up collections for waste generated across temporary accommodation camps, including recycling systems where practical.

Step 4: Identify preliminary considerations for medium to longer term management of waste

During the response phase, the Functional Lead for DWM should identify any preliminary considerations for medium to longer term management of waste, such as:

- potentially setting up an interim storage facility where estimated volumes of debris are likely to exceed the capacity of local infrastructure, including considerations for licensing and planning approvals
- identifying public information needs
- identifying the potential need for levy waiver, emergency authorisations and/or licence exemptions or removal of landfill bans
- communication and providing information to spontaneous volunteer groups, local recovery centres and industry participants (e.g. contractors and landfills) involved with clean-up and managing waste.

B3: Identify short-term support needed to address acute waste issues

Step 1: Identify appropriate level of state government support

Once acute waste issues have been identified, the Functional Lead for DWM in collaboration with the Control Agency and subject matter experts, needs to determine the necessary level of state government support to help landowners, local councils, individuals responsible for animals and livestock and other stakeholders to manage acute waste issues.

In all instances, this would include providing advisory support, including delivering information and advice to stakeholders on appropriate management of acute waste issues (see Figure A2 in section A2). In addition, the State Government may provide operational support, such as engaging contractors to manage hazardous waste streams.

Boxes B1 and B2 provide a decision-making framework to assist the Functional Lead for DWM to identify the appropriate level of support to help manage the different types of acute waste issues.

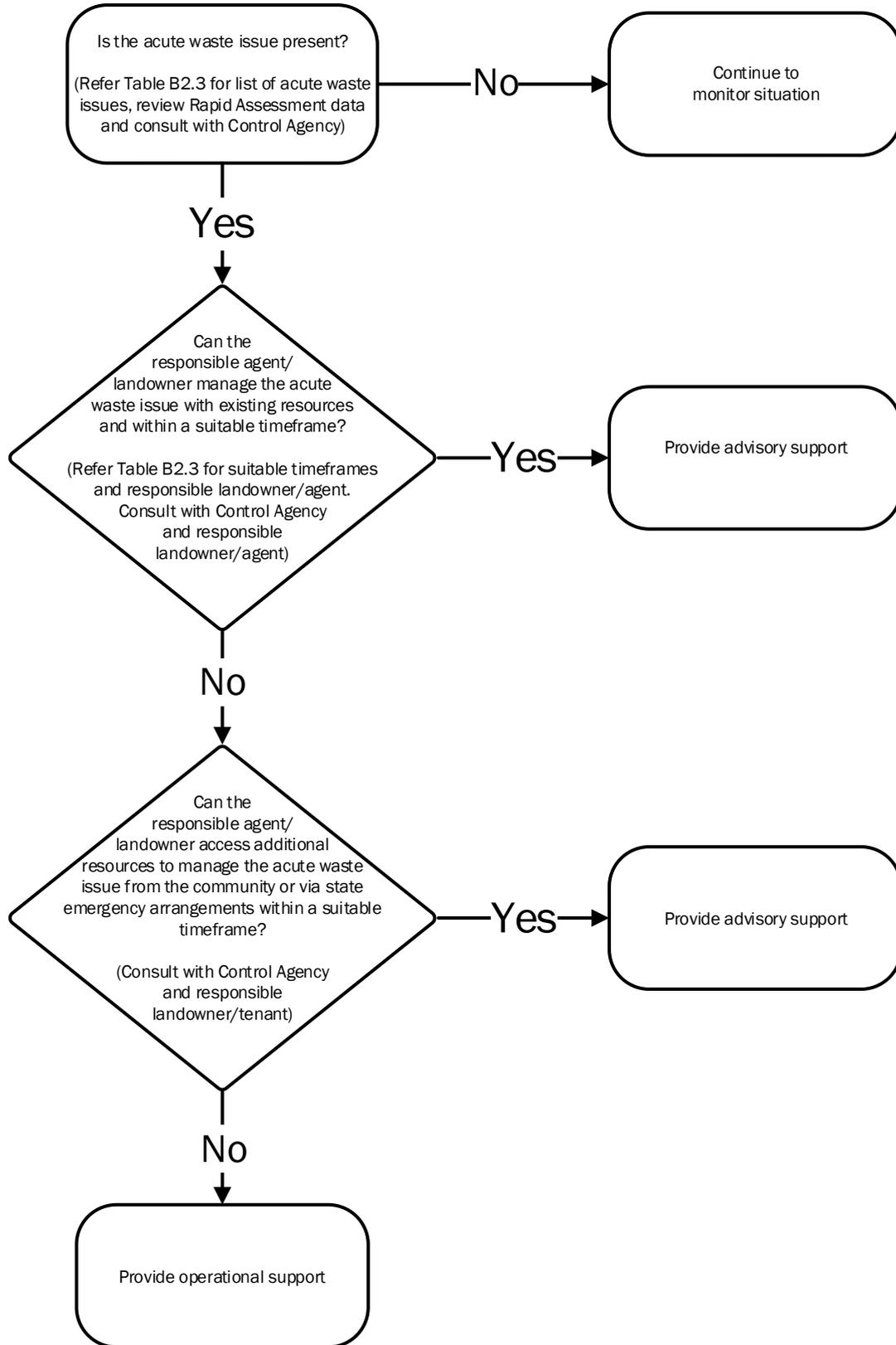
Box 1 provides a generic decision-making framework for managing acute waste issues.

Box 2 provides an example decision-making framework for managing municipal solid waste where the service has been interrupted or damaged by an event. This includes a list of guiding questions to help the Functional Lead for DWM identify the appropriate level of state government advisory and operational support.

BOX 1: DECISION-MAKING FRAMEWORK FOR MANAGING ACUTE WASTE ISSUES

Figure B3.1 provides a generic decision-making framework for identifying the appropriate level of state government support to manage an acute waste issue.

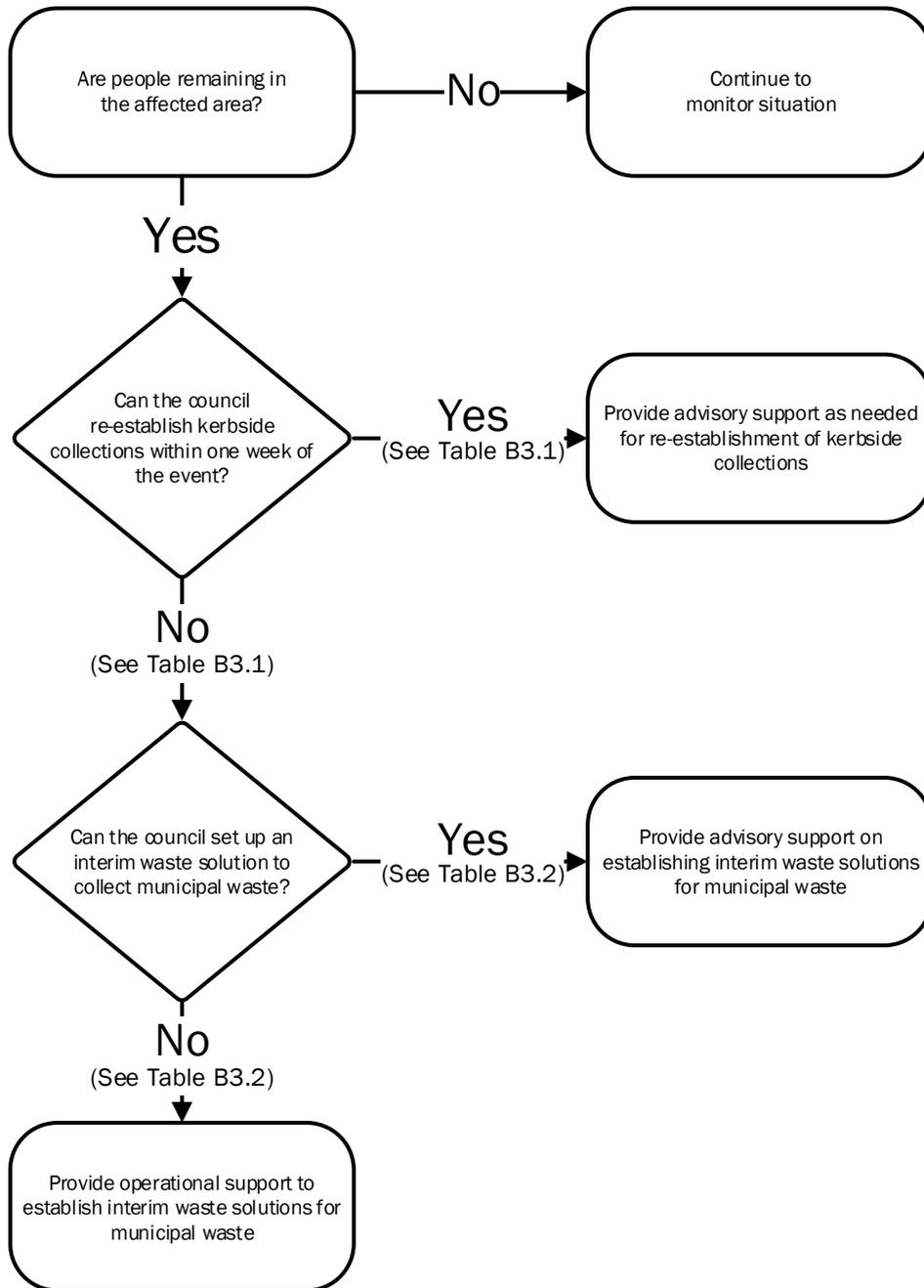
Figure B3.1: Generic decision-making framework for managing acute waste issues



BOX 2: EXAMPLE DECISION-MAKING FRAMEWORK FOR MUNICIPAL WASTE

Figure B3.2 provides an example decision-making framework for identifying the level of state government support to manage municipal solid waste following an event.

Figure B3.2: Example decision-making framework for collecting municipal solid waste



Continued overleaf

BOX 2: EXAMPLE DECISION-MAKING FRAMEWORK FOR MUNICIPAL WASTE
(Continued)

Table B3.1 provides an assessment framework to help identify whether council can re-establish kerbside services or set up an alternative interim system for municipal waste. Where possible, this assessment will be carried out by the affected council/s and reported back to the Functional Lead for DWM to determine the appropriate level of state government support.

Table B3.1: Key considerations when deciding the appropriate level of state government support for managing municipal waste following an event.

Question	Key considerations	Yes	No	Notes
Is the council able to re-establish kerbside collections within one week?	Can the council safely access streets to collect bins from occupied dwellings?			
	Are waste management vehicles in service and accessible?			
	Are employees/service providers available to collect the waste?			
	Is fuel available for the vehicles and/or are roads open/navigable?			
	Are the waste disposal/reprocessing facilities in operation and accessible? If not, are any alternative facilities available nearby? Note the distance from the affected areas.			
If you answered 'no' to one or more of the considerations above, continue with the following:				
Is the council able to set up an alternative municipal waste management system?	Can the council set up a suitable interim arrangement (e.g. neighbourhood skip bins, providing bags) for residents to dispose of their municipal waste? (e.g. through assistance from nearby councils)			
	Can the council collect and dispose of the waste collected via the interim solution?			
	Can the council effectively communicate alternative waste plans with residents?			

Continued overleaf

BOX 2: EXAMPLE DECISION-MAKING FRAMEWORK FOR MUNICIPAL WASTE (Continued)

Table B3.2 summarises potential advisory and/or operational support that the State Government may provide to stakeholders depending on the assessment outcomes from Table B3.1.

Table B3.2: Potential advisory and operational support

Level of support	Potential support
Advisory	<ul style="list-style-type: none"> • Refer councils to relevant sections in the <i>Disaster Waste Management Guidelines</i> (this document) • Advise councils on considerations (e.g. risks to workers) and appropriate controls for re-establishing kerbside services following an event • Advise councils on options for interim municipal waste services, such as: <ul style="list-style-type: none"> - setting up bins in public spaces - providing bags - contracting labour, plant and equipment - assistance from neighbouring councils - alternative disposal/reprocessing locations • Provide input into Public Information FSG, such as: <ul style="list-style-type: none"> - options for disposal of municipal waste - potential risks to human health, economic assets (including agriculture) and the environment if waste is not collected, and/or if it is dumped or inappropriately disposed
Operational	<ul style="list-style-type: none"> • Engaging and overseeing contractors for temporary delivery of municipal waste services

Step 2: Liaise with regulators to identify potential waiver of waste levy, emergency authorisations and/or exemptions, or lifting landfill bans

Once the needs for managing acute waste issues have been identified, the Functional Lead for DWM may liaise with regulators to identify the potential need for a waiver of the waste levy, emergency authorisations and/or exemptions or removal of landfill bans to help support managing acute issues in a responsible and timely manner.

Table B3.3 identifies existing provisions and considerations for:

- licensing requirements
- exemptions
- emergency authorisations
- waiving the waste levy
- other key legislative tools.

If a waiver of the waste levy cannot easily be justified (i.e. the event has not been declared a major incident, major emergency or disaster), the Functional Lead for DWM may still ask the Minister to grant a waiver of the waste levy for select waste streams. This request may be made when it is not possible and/or practical to recycle the waste stream due to the presence of one or more of the following conditions:

- recycling facilities are not readily available or accessible in the region where the event occurred
- the volume of the waste stream generated by the event is not large enough to make it economically viable to recycle
- the state of the waste makes it unsuitable for recycling (e.g. water-damaged furniture and soft furnishings from a flood or storm event)
- other extraordinary circumstances exist which make it impossible and/or impractical to recycle waste.

The Functional Lead for DWM may also request an exemption to landfill bans on the same basis.

Table B3.3: Legislation/regulations and existing provisions and considerations

Legislation/regulations	Existing provisions and considerations
Licensing requirements	<ul style="list-style-type: none"> The <i>Environment Protection Act 1993</i> (EP Act) contains legislative tools, other than standard section 36 licensing provisions, which may be used in certain circumstances such as an emergency. These may be used at the discretion of the SA EPA (see Exemptions and Emergency Authorisations).
Exemptions	<ul style="list-style-type: none"> Under section 37 of the EP Act, the SA EPA may issue an exemption to a person for a specified activity, such as a waste and recycling depot or waste transporters licence, thereby permitting these activities to be undertaken which would otherwise require a section 36 licence.
Emergency authorisations	<ul style="list-style-type: none"> Emergency authorisations (section 105 of the EP Act) may be issued by the SA EPA to enable a person to undertake an activity where circumstances or an urgency exists that it is not practicable for the person to obtain a section 37 exemption. Importantly, an emergency authorisation is justified by the need to protect life, the environment or property. As an example, during an emergency, a person without an existing licence for the transportation of waste may be granted an emergency authorisation.
Powers of authorised officers	<ul style="list-style-type: none"> Section 87 of the EP Act – Powers of authorised officers (i.e. for direction 87(1)(c) and (ia) and (m) and 87(6) and (7)).
Waste levy	<ul style="list-style-type: none"> Section 116 of EP Act – Waiver or refund of fees and levies. The Minister for the Environment may waive the waste levy for major incidents, major emergencies or disasters (as defined by the <i>Emergency Management Act 2004</i>, sections 22, 23 and 24) and in other emergency situations.
Landfill bans	<ul style="list-style-type: none"> The Environment Protection (Waste to Resources) Policy 2010 (W2R EPP) specifies in Schedule 4 those wastes and areas within the State that landfill bans apply. The SA EPA may seek to use section 37 (exemption) or section 104 (emergency authorisation) in a disaster situation with regards to landfill bans.
Mass balance reporting	<ul style="list-style-type: none"> Mass balance reporting would unlikely be exempted as the quantity of waste disposed of is important for waste levy waivers. Developing a mass balance reporting system could be beneficial to understand the scale of clean-up required post-disaster.

B4: Oversee delivery of short-term support

B4.1: Strategy development

The Functional Lead for DWM should develop and document a strategy to deliver short-term support which:

- identifies acute waste issues
- outlines the method for managing each acute waste issue
- identifies what support will be provided by the state government (advisory or operational), and the resources required (human resources, budget, other) to deliver the support
- identifies potential preliminary considerations and advice for medium to longer term management of waste.

B4.2 Reporting and communications

During the response phase, the Functional Lead for DWM shall report to the Control Agency. Where unbudgeted state costs are likely to be incurred, the Functional Lead for DWM should prepare a Cabinet submission with preliminary considerations and advice on managing waste issues.

B4.3 Incident management system

The Functional Lead for DWM should adopt an incident management system methodology (e.g. the Australasian Inter-service Incident Management System or AIIMS). Key elements of this methodology include:

- management objectives to ensure all incident personnel are working towards one set of objectives
- functional management into five areas: control, planning, public information, operations and logistics
- scalable arrangements to ensure effective span of control for the number of groups or people that can be successfully managed.

B4.4 Public information and warnings

The Functional Lead for DWM should help develop information related to waste management to be approved by the Control Agency for dissemination with the assistance of the Public Information Functional Support Group (Public Information FSG).

The types of information to be communicated include:

- human health and safety issues, in particular information on appropriate management of hazardous waste streams and risks associated with the waste streams
- municipal waste collection arrangements (even if the service remains unchanged, communities need to be reassured of this).

The technical guidelines in Part C list suggested messages for the public on managing key waste streams.

B4.4 Engaging contractors

If operational support is provided for DWM, the Functional Lead for DWM should oversee the engagement of contractors and/or other organisations to deliver operational support.

Mobilising resources in a timely manner is critical to addressing acute waste issues. A sample template for the contract service specifications is provided in Box 3. This template can be adjusted as needed to meet the requirements of the service specifications.

In many instances, due to limited information and associated uncertainty around scope of waste management requirements, it is best to set up contracts based on an:

- hourly rate (\$/hr) or service fee (\$/lift) (excluding disposal/ reprocessing gate fees), plus
- waste disposal/reprocessing gate fee (\$/tonne), if applicable.

The Functional Lead for DWM and Participating Agencies should use standard government terms and conditions for engaging contractors. Contract management will be required to monitor these contract types in accordance with the State Procurement Board requirements.

B4.5 Record keeping

The Functional Lead for DWM should ensure that the following information is collected during the response phase:

- acute waste issue description
- source/location of issue
- estimated volume (tonnes or cubic metres) or, if deceased animals, the number and species
- actual volume of waste managed to date
- management method
- ongoing management considerations, including monitoring risks to human health, economic assets (including agriculture) and the environment.

Table B4.1 is a template for record keeping during the response phase. The Functional Lead for DWM should ask contractors to provide the following data:

- volumes of waste managed to date
- volumes (tonnes) of waste (or equivalent estimate) deposited at waste/recycling facility(ies) and disposed of at landfill.

Table B4.1: Template for record keeping during the response phase

Acute waste issue description	Source / location	Estimated volume (tonnes or cubic metres)	Actual volume managed to date	Management method	Ongoing management considerations

BOX 3: TEMPLATE FOR SPECIFICATIONS TO ENGAGE CONTRACTOR DURING RESPONSE PHASE

Table B4.2: Template for specifications to engage contractor during response phase

Description of services	For example: Collection, transport and disposal of municipal solid waste dropped off by residents into temporary skip bins located on Mawson Oval, Example Park and at end of Smith Street.	
Contract type	4-week term with option to extend at the discretion of the Principal.	
Contract details	Start date	16/08/2017
	End date	4 weeks from start date.
Waste stream service details	Waste Stream(s)	Municipal solid waste
	Collection details (mode and frequency)	Daily collection of 12 x 3.0 m ³ skip bins provided by contractor
	Total volume	36.0 m ³ per day
	Disposal/reprocessing method, facility name, address & EPA licence number	Contractor to specify for each stream collected
Special handling, transport or disposal licensing requirements	None	
Fees	Hourly rate (\$/hr.) <u>or</u> per service (\$/lift) (including all fees excl. disposal/reprocessing gate fees)	Contractor to specify
	Disposal/reprocessing gate fee (\$/tonne)	Contractor to specify
Invoicing	Weekly invoicing based on work completed (e.g. hours or bins lifted) together with timesheets providing evidence of hours spent delivering services, and receipts from facility showing the total tonnes of waste deposited. Invoice to be issued within 7 days of the month ending. 60-day payment terms upon receipt of invoice.	
Any other considerations	None	

B5: Complete a more detailed waste assessment

During the recovery phase, the Functional Lead for DWM should develop a more detailed picture of waste stream types and volumes. It should identify recommended methods for managing waste and potential challenges requiring support for stakeholders. This information is used to work out the level of state government support to provide to affected communities and other stakeholders during the recovery phase and is incorporated into a DWM Program.

Step 1: Collect detailed information on waste streams and volumes

The following information should be collected where possible and practical:

- waste sources (e.g. destroyed or damaged dwellings, roads, fences)
- location of waste (street address and GPS coordinates)
- waste ‘owners’ (private property owner, animal owner, local government, state government)
- level of insurance to cover waste management costs
- waste stream types (e.g. vegetative waste)
- potential for presence of hazardous materials in the waste stream
- waste stream nature (e.g. water damaged, mixed, clean)
- estimated volumes (cubic metres and tonnes) or, if deceased animals, the number and species.

Table B5.1 describes information to be collected and potential sources for this information. This data should be collected by a specialist team engaged by the Functional Lead for DWM. Note that some of this data will have been collected during the response phase to complete the high-level initial waste assessment. The specialist team should be given this data, so they can build on it to complete the detailed waste assessment. This will avoid duplicating data collection/provision efforts by the government and affected landowners.

Table B5.1: Data collected to complete detailed waste assessment during recovery phase

Data	Potential information sources	Description and considerations
Waste source	Initial waste assessments/follow-up site assessments (where data gaps exist)	Information on waste sources can be used to identify waste owners, types and volumes (see below). Waste sources may include destroyed or damaged dwellings, sheds, powerlines, roads, fences, trees, livestock, etc. Where possible, more detailed descriptions about the waste source are useful to identify waste streams and estimate volumes. For example, describing the type of damaged building (e.g. 3-bedroom double brick home) and the extent of the damage (e.g. partially damaged).
Location	Initial waste assessments/follow-up site assessments (where data gaps exist)	Information on the location of waste (including street addresses and GPS coordinates) is needed to identify where the waste needs to be collected from and nearby facilities where the waste can be stored, recycled or disposed.
Waste owner	Initial waste assessments/ follow-up site assessments (where data gaps exist)	Unless otherwise determined, managing the waste generated by an event is the responsibility of the landowner (e.g. private property owner, local government, state government or animal owner). Where private waste is displaced from private property (e.g. waste moved by a flood or vehicles damaged on public road) special processes may be needed for public authorities to manage this.
Insurance status	Insurance Council of Australia	Information on the level of insurance (fully insured, partially insured, uninsured) can be used to identify what level of support the community may need to assist with recovery.

Data	Potential information sources	Description and considerations
Building age	Land Services, SA NEXIS, Geoscience Australia	Information on the age of damaged building/structures can be used to identify the likelihood of asbestos being present. In Australia, buildings constructed before the mid-1980s are highly likely to have asbestos-containing materials. This represents over 61 per cent of residential and 48 per cent of commercial buildings in South Australia. Buildings constructed after this date may still contain asbestos, but those constructed after the mid-1990s are generally unlikely to have asbestos-containing materials.
Presence of hazardous waste	Initial waste assessments/follow-up site assessments (where data gaps exist)	Information on likely locations of hazardous wastes, particularly in industrial building areas, should be collected to enable risk assessments, appropriate skilled management and monitoring. Hazardous wastes include oils, pesticides, refrigerants, radioactive waste, etc.
Waste types	Initial waste assessments/follow-up site assessments (where data gaps exist)	<p>Information on waste types is needed to identify appropriate methods for transport, storage, reprocessing and disposal.</p> <p>Waste types include: asbestos and asbestos-containing materials, construction and demolition inert waste, mixed waste, hard waste, green (vegetative) waste, metal waste, vehicle waste, chemical waste drums, food waste, copper chrome arsenate post waste, agricultural waste and more. See Part C for list of key waste streams.</p> <p>Waste types can be assessed by waste experts using information collected through damage assessments, the SA Disaster Debris Estimation Tool (currently in beta form) and/or other methods (e.g. visual observations of the waste).</p>
Waste nature	Initial waste assessments/follow-up site assessments (where data gaps exist)	Information on the nature of the waste stream is needed to assess the viability of recycling and/or disposal options. For example, waste that is clean, dry and easy to separate has a higher likelihood of recyclability than waste that is highly mixed or water damaged.
Estimated waste volume	Initial waste assessments/follow-up site assessments (where data gaps exist)	<p>Information on the volume of waste (both in tonnes and in cubic metres or, in the case of deceased animals, number by species) is needed to identify the level of resources required to manage the waste, such as the number of bins and truck movements to transport the waste from source to waste facilities. This information can also be used to estimate associated costs for waste transport, reprocessing and disposal.</p> <p>Waste volumes can be estimated by waste experts using information collected through damage assessments, the SA Disaster Debris Estimation Tool (currently in beta form) and/or other methods (e.g. visual observations of the waste).</p>

Table B5.2 shows an example of the data output from this detailed waste assessment. If this level of detailed data cannot be collected due to resource constraints, then more basic information may be used to inform the development of the DWM Program (such as that collected during the initial waste assessment).

Table B5.2: Example data outputs from waste assessments during the early recovery phase

Waste source	Waste owner	Building age	Insurance status	Waste location		Waste types	Nature	Estimated waste volumes	
				Street address	GPS coordinates (lat, long)			Cubic metres	Tonnes
Double brick 4-bedroom house – destroyed	Private property owner	Post-1990s	Unknown	100 Smith Avenue, Suburb	- 34.92866, 138.59863	C&D waste (inert)	Mixed with other materials	230	160
						Hard waste (e.g. furniture, carpets)	Water damaged Mixed with other materials	18	4
Shed – destroyed	Private property owner	Unknown	Fully insured	As above	As above	Metal waste	Separated onsite from other materials	8	0.2
500 metre damaged road	State government	n/a	Fully insured	Long Street, Suburb	- 34.92868, 138.59850	Asphalt	Separated onsite from other materials	2	1.4
Response waste – 10,000 sandbags	State government	n/a	n/a	Bold Street, Suburb	- 34.92889, 138.59825	Sandbags		1000	1000

Step 2: Assess methods for managing waste streams during recovery phase

Once the detailed assessment of waste types and volumes is complete, the Functional Lead for DWM should assess methods for managing the identified waste streams. This assessment should consider a range of factors including:

- potential methods for recycling or disposal of waste streams
- practical limitations, including:
 - facility locations, licensing, availability and accessibility
 - the costs of sending waste to the facility (i.e. gate fees)
 - implications for additional resource needs (e.g. needs for on-property or offsite pre-processing, transport and interim storage)
 - economic and practical feasibility of handling, storage and recyclability of waste streams
- impacts on community recovery, where possible and practical, such as:
 - impact on local employment and businesses during the recovery phase
 - impact on vulnerable communities and psychosocial recovery
 - impact on environment
 - delivery of recycled products for recovery and rebuild efforts.

Table B5.3 lists the key considerations and potential data sources to help identify and assess options for recycling or disposing of waste.

Table B5.3: Assessing options for managing waste during recovery phase

Factor	Key considerations	Potential data sources
Potential methods for recycling or disposal of waste	What are the best options for recycling/disposing of identified waste streams?	See Part C of guidelines
Facility locations	What waste and resource recovery facilities exist in the region?	See Part C of guidelines SA Disaster Facilities Database (Confidential Attachment 2 of Disaster Waste Scoping Study, Green Industries SA, 2015) And SA EPA Public Register Directory
Facility licensing	What waste streams are facilities licensed to receive?	As above
	If no facilities are licensed to accept the waste stream, can an exemption be granted from the SA EPA?	Consult SA EPA
Facility availability and accessibility	Are identified facilities in full operation, or were they impacted by the event (e.g. via power outages, limited staffing or physical destruction)?	Consult State Recovery Office, local councils, Waste Management Association of Australia network and individual owners/operators of waste facilities
	Are the facilities accessible via roads and/or other transport networks, or were transport networks damaged by the event?	
	If the operation or access to a facility was impacted by the event, how long will it take to restore the facility and/or transport networks?	
	Is it feasible for waste to be sent directly to facilities or is it beneficial to use a temporary storage facility to increase efficiency of waste transportation and clearance of affected sites?	
Facility capacities	What is the processing capacity of each identified facility (tonnes/month)?	As above
	How long (in weeks, months or years) would it take for the facility to process waste volumes?	

Factor	Key considerations	Potential data sources
	Is the facility willing and/or able to increase its processing capacity (e.g. through extended operating hours), subject to approvals?	
	If this facility is used, will it have capacity remaining to process other volumes of waste from the community post-recovery?	
Waste costs	How much will it cost to send waste to the facility? (i.e. gate rates – \$/tonne)	Consult individual owners/operators of waste facilities and waste specialists
	If considering a landfill option, has the waste levy been waived, or is it potentially beneficial to seek a waiver of the levy?	Consult SA EPA
Resource needs and timing	Does the waste need pre-processing before being sent to the facility (e.g. sorting or sizing on property or offsite?) If so, what resources and costs are involved with pre-processing?	See Part C3 of guidelines Consult waste specialists and with individual owners/operators of waste facilities
	What types and numbers of vehicles are needed to transport waste volumes to the facility?	
	Will the waste need to be placed in interim storage prior to being sent to the final location for disposal/reprocessing?	
Impact on recovery of communities	How many jobs are estimated to be provided to people in the disaster-affected areas through processing/disposal of waste?	As above
	What products (if any) will be produced from processing the waste, which can be used locally to rebuild the affected community (e.g. using recycled masonry products in the construction of new buildings)?	As above

Step 3: Identify waste issues arising during recovery phase

Waste issues may occur during the recovery phase, which need to be addressed to minimise harm to human health, economic assets (including agriculture) and the environment and/or to assist with recovery of the community. Table B5.4 identifies waste issues that could potentially need attention.

Table B5.4: Potential waste issues for DWM during recovery phase

Waste issue	Responsibility (landowner /other)	Guidelines	Potential DWM method
Large volumes of unwanted donated goods	Organisation accepting unwanted donated goods	Guideline C18	Inform the public about what items are needed and those that are not. Manage unwanted donated goods in line with the guidance in C18
Volunteer groups helping clean up properties are not managing waste responsibly	Volunteer group	See waste stream guidelines in Part C for information on responsible management of waste streams	Inform volunteer groups on responsible management of waste streams, and make them aware of potential hazards to human health, economic assets (including agriculture) and the environment
Illegal dumping and/or inappropriate stockpiling of waste	Perpetrators	Refer to SA EPA processes to manage illegal dumping	Refer to SA EPA processes to manage illegal dumping
Volumes of waste generated are greater than the capacities of local waste and recycling infrastructure	Owners of waste	See guidelines in Part C for potential management methods	Potentially set up an interim waste storage facility for waste
Slow removal of waste, hindering return of economic activity and community services	Owners of waste	See guidelines in Part C for potential management methods for collecting and managing waste	EPA may use legislative powers to require persons to remove the waste (i.e. clean up orders and/or Environment Protection Order) Potential state government advisory or operational support to collect and manage waste
Inaction by private property or animal/livestock owners – where waste poses a risk to wider public	Owners of waste	See guidelines in Part C for potential management methods for collecting and managing waste	Potential state government advisory or operational support to collect and manage waste

B6: Identify needs for delivering support during recovery phase

Step 1: Identify appropriate level of state government support

Once the detailed waste assessment is complete, the Functional Lead for DWM should identify the level of state government support that may be required in accordance with the DWM Capability Plan.

In all instances, this includes providing advisory support, including delivering information and advice to stakeholders on responsible management of waste, such as:

- considerations for safe handling and transport of waste streams
- options for recycling or disposal of waste streams
- facility locations, licensing, availability and accessibility
- the costs of sending waste to the facility (i.e. gate fees)
- implications of waste management methods on additional resource needs (e.g. need for on-property or offsite pre-processing, transport and interim storage)
- economic and practical feasibility of handling, storing and recycling waste streams
- potential impacts of waste management methods on the recovery of the community
- liaison with regulators on managing illegal dumping, stockpiling of waste, regulatory and legislative exemptions, as needed.

In addition, the State Government may provide operational support, such as:

- establishing an interim waste storage facility
- a government-led, centrally coordinated, clean-up for all or selected waste streams.

This operational support is delivered in line with the principles set out in section A2 of the guidelines.

Box 4 provides an example decision-making framework for identifying the level of state government support to set up an interim storage facility.

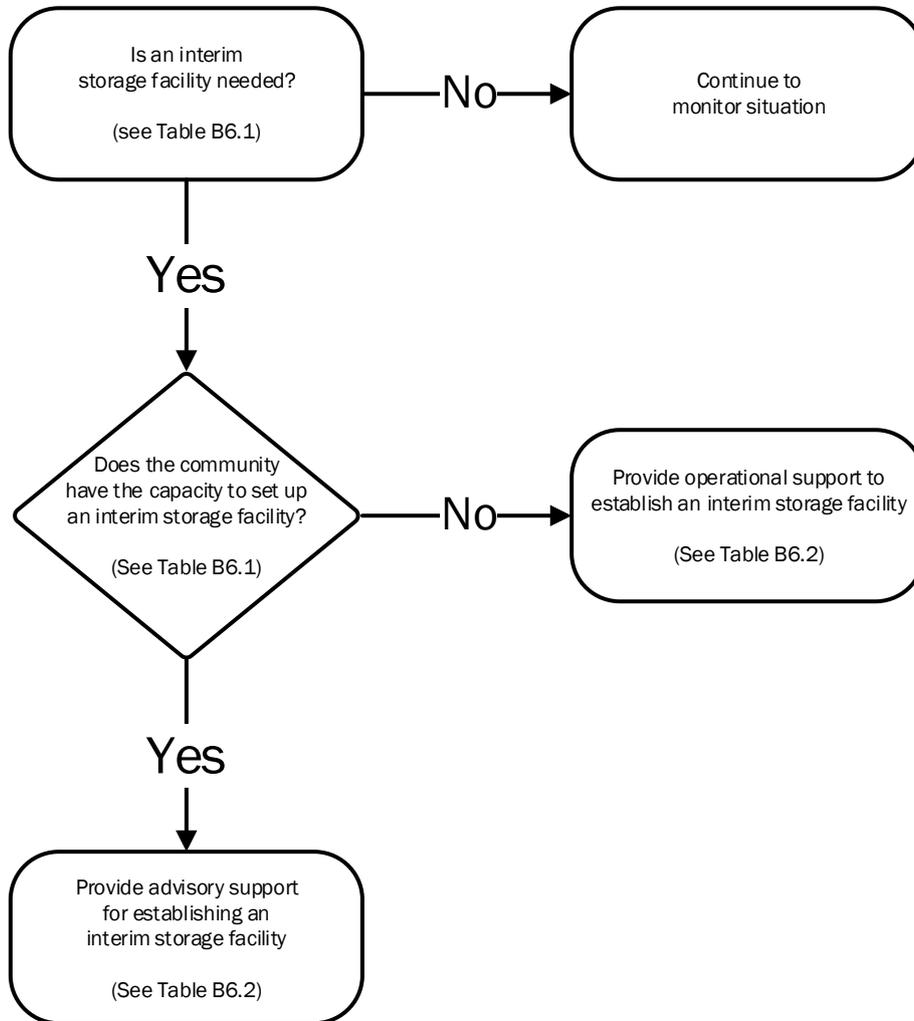
Step 2: Liaise with regulators to identify potential waiver of waste levy, emergency authorisations and/or exemptions

The Functional Lead for DWM should liaise with regulators to identify the potential need for a waiver of the waste levy, emergency authorisations and/or exemptions or removal of landfill bans to help support DWM activities during the recovery phase. Refer to information and considerations in Step 2 of Guideline B3 above.

BOX 4: EXAMPLE DECISION-MAKING FRAMEWORK FOR ESTABLISHING AN INTERIM STORAGE FACILITY

Figure B6.1 provides an example decision-making framework for identifying the level of state government support to establish an interim storage facility.

Figure B6.1: Decision-making framework for establishing an interim storage facility



Continued overleaf

BOX 4: EXAMPLE DECISION-MAKING FRAMEWORK FOR ESTABLISHING AN INTERIM STORAGE FACILITY (continued)

Table B6.1 summarises key considerations to help the Functional Lead for DWM identify the level of state government assistance for establishing an interim storage facility.

Table B6.1: Key considerations for decision-making to identify the level of state government support for establishing interim storage facility

Question	Key considerations	Yes	No	Notes
Is an interim storage facility needed?	Is the volume of waste generated greater than the capacity of local facilities to process the waste within a reasonable timeframe?			
	Is the disposal facility damaged or out of operation following the event?			
	Is access to disposal facilities limited due to damaged roads and/or other transport infrastructure?			
	Is an interim storage facility necessary to centrally control the flow of disaster debris and other waste, prior to recycling or final disposal?			
	Is more time needed to examine the waste to determine the appropriate reuse, recycling or disposal method?			
Does the community have the capacity to set up an interim storage facility?	Can the council easily identify and agree on a suitable site(s)?			
	Are there suitably qualified contractors to operate site?			
	Does the council have capacity to gain regulatory approvals in a timely manner and adequately monitor the operation(s)?			

Continued overleaf

BOX 4: EXAMPLE DECISION-MAKING FRAMEWORK FOR ESTABLISHING AN INTERIM STORAGE FACILITY (continued)

Table B6.2 lists potential levels of advisory and operational support for establishing an interim storage facility.

Table B6.2: Potential advisory and operational support

Level of support	Potential support
Advisory	<ul style="list-style-type: none"> • Refer council(s) and/or other stakeholders to relevant sections in the <i>Disaster Waste Management Guidelines</i> (this document) • Advise councils and/or other stakeholders on considerations and appropriate controls for establishing an interim storage facility following an event • Advise stakeholders on potential options for an interim storage facility, such as: <ul style="list-style-type: none"> • locations • design • options for contracting labour, plant and equipment • approvals needed • Provide input into Public Information FSG, such as potential risks to human health and the environment if waste is not collected from occupied dwellings, and/or if it is dumped or inappropriately disposed
Operational	<ul style="list-style-type: none"> • Engaging and overseeing contractors to deliver the interim storage facility

B7: Develop a Disaster Waste Management Program

Once the support needed during the recovery phase has been identified, the Functional Lead for DWM should develop a DWM Program detailing how to deliver that support. The DWM Program should be documented and include the following information:

- a description of key waste streams identified
- recommended methods for managing waste from onsite handling through to final disposal /reprocessing
- capacity of the community to responsibly manage waste streams
- level of support to be provided by the State Government to stakeholders for DWM
- resources required to deliver state government support including agencies, personnel, budgets (if required) and timelines.

This Program should be developed in consultation with relevant stakeholders and in line with the principles listed in section A2 of these guidelines.

B8: Oversee implementation of Program until completion

B8.1 Reporting and communications

The Functional Lead for DWM should attend the State Recovery Committee and report to the Chair of the Committee. The Functional Lead for DWM should prepare detailed Cabinet submissions if required.

B8.2 Public information and warnings

The Functional Lead for DWM should help develop information related to waste management to be disseminated to DWM stakeholders via the State Recovery Office.

This may include messages to the public on:

- human health and safety issues, in particular information on appropriate management of hazardous waste streams and risks associated with these waste streams
- any waste management issues that may affect insurance eligibility (if applicable) (e.g. requirements to take photos of all damage before clean-up)
- debris handling and disposal (for both individuals and contractors) including location of handling facilities and costs
- any relevant rules and regulations.

Messages to the public on managing key waste streams are provided in Part C.

B8.4 Engaging contractors

If operational support is provided for DWM, the Functional Lead for DWM should oversee the engagement of contractors and/or other organisations to deliver the operational support.

During the recovery phase, standard procurement processes should generally apply. Quotes and detailed specifications should be developed by the Functional Lead for DWM with specialist input. Lump sum contracts for well-defined, low-risk work packages should be considered. Another option to consider is engaging a single external contractor to oversee DWM clean-up activities, including potentially coordinating other resources.

Specifications for waste management services should consider the minimum requirements during the response phase, with a possible increased focus on recovery and recycling, enhanced reporting and monitoring requirements.

B8.5 Record keeping

The Functional Lead for DWM should ensure that appropriate record keeping is maintained during all phases of work and provide effective control and oversight of DWM to support cost-effective, speedy recovery. Where operational support is resourced by the state, record keeping should include monitoring contractor performance against contract requirements.

If large volumes of waste are being managed privately (for example, demolition of private premises by contractors/insurers/individuals) additional monitoring measures may be necessary to track waste and ensure responsible waste management practices are being followed.

B9: Review disaster waste management outcomes

DWM outcomes should be reviewed to identify key lessons for future events. This may include reviewing:

- volumes and types of waste generated by the event
- adequacy of tools and resources (including these guidelines)
- clarity of DWM roles and responsibilities
- timeliness and adequacy of information provided to the public and other stakeholders
- identification of any acute waste issues that arose and assessment of adequacy of the management approach
- estimated total cost of waste management (where possible to identify, or at least for parts funded by the State Government)
- long-term environmental monitoring of any sites or facilities used to manage waste, which needed emergency authorisations or exemptions, or any sites where onsite burial of large volumes of carcasses or biosecurity waste was carried out
- impact of waste operations on community recovery.

This review will need to be conducted in collaboration with stakeholders that were involved with DWM, such as Control Agencies (where applicable), local councils, the affected communities, insurance companies and contractors.

Key lessons from this review should be incorporated into updates of the DWM Capability Plan and guidelines.

Part C – Technical guidelines

Overview

DWM involves handling waste from its point of generation to destination for recycling or disposal. Part C provides technical guidance, including for:

- onsite handling of waste
- collection and transport of waste
- establishing an interim waste storage facility
- options for recycling/disposal of waste generated by an event
- further technical guidance by waste stream.

Guidelines

All streams technical guidelines:

C1: Introduction

C2: On-property handling of waste

C3: Collection and transport

C4: Establishing an interim storage facility

C5: Recycling and disposal options

Waste stream specific guidelines:

C6: Asbestos and asbestos-contaminated waste

C7: Construction and demolition inert waste (concrete, brick and rubble)

C8: Mixed waste

C9: Metal waste

C10: Hard waste

C11: E-waste and whitegoods

C12: Household hazardous waste

C13: Vehicle waste

C14: Green (vegetative) waste

C15: Soil and sediment waste

C16: Food waste

C17: Copper chrome arsenate post waste

C18: Unwanted donated goods

C19: Agriculture (including greenhouse) waste

C20: Animal carcass waste

C21: Chemical (hazardous) waste

C22: Empty chemical drums

C23: Sandbag waste

C24: Medical and pharmaceutical waste

C1: Introduction

Managing waste incorporates several stages, from on-property handling through to final reprocessing and/or disposal (see Figure C1.1). The following guidelines provide technical advice on managing waste throughout each of these stages.

Figure C1.1: Stages for managing waste volumes



C2: On-property handling of waste

Property owners may sometimes handle volumes of waste on their property prior to waste collection and recycling/disposal. For example, this could include:

- salvaging personal belongings from damaged buildings
- sorting waste into different piles
- moving waste to the boundary of their property (e.g. for kerbside collection).

It is important to inform the public and other stakeholders in a timely manner about potential risks to human health and the environment when handling waste on their property and make them aware of responsible methods for managing waste, including council or state government assistance.

Some waste streams pose high risks to human health and the environment, such as asbestos, animal carcasses, agricultural (green) waste, CCA posts and other hazardous materials. Guidelines C6 to C24 provide advice on handling each waste stream and responsible management methods. In addition, the following general guidance should be provided to the public:

- Do not enter a damaged building or structure, unless deemed safe to do so by a qualified building inspector or engineer.
- Remind residents to contact their insurance company directly and advise taking photos of any damage before removing and disposing of items.
- If removing/moving waste, use appropriate Personal Protective Equipment including dust mask, gloves, covered shoes/boots and full-length clothing cover for arms and legs.

Further specific messaging to the public for handling waste on their property (such as presenting it on the kerbside for council collection) should be developed following an event in line with the DWM Program.

C3: Collection and transport

Numerous different vehicles may be used to collect waste generated by an event, including:

- front lift vehicles
- rear loader vehicles
- roll-on-roll-off (ROROs) (rigid and articulated)
- skip trucks
- side lift vehicles
- tankers (rigid and articulated)
- tandem tipper/bobcat and dog trailer
- semi-tipper (steel and aluminium body)
- flat bed/gates
- pantech/tailgate truck.

Several factors should be considered when selecting a vehicle(s) to transport waste, including:

- waste type (e.g. liquid waste needs to be transported in a tanker)
- availability of collection vehicles (which depends on the stock of vehicles available by the council, waste and civil contractors in the region)
- method of waste loading (e.g. if the waste is presented in a pile, then a bobcat may be used to load the waste into a tipper)
- travel distance and vehicle loading capacity (e.g. if the waste is being moved long distances, then bulk loading vehicles such as ROROs are likely to be more time and cost-effective)
- other practical considerations, such as accessibility to site where waste is being collected.

Tables C3.1 and C3.2 provide a quick guide of vehicles for loading and transporting waste. It identifies vehicle type, its suitability for waste streams, typical vehicle capacity and practical considerations. This guide may be used by the Functional Lead for DWM and/or other stakeholders to identify the types of waste vehicles and number of waste collections needed to transport waste.

When selecting a waste transporter, it is important to check they are suitably licensed to transport the waste stream. An authorisation from the SA EPA for additional vehicles for transporting waste may be required if suitable waste licensed vehicles are not readily available (e.g. civil contractor vehicles for C&D waste).

Further guidance and considerations for collection and transport of specific waste streams is provided in the waste stream guidelines (C6 to C24).

Table C3.1: Waste vehicles and equipment for transporting waste streams

Vehicle type	Suitability for waste streams														Typical vehicle capacity	
	Inert C&D	Mixed	Vegetative, organics	Metal	Liquid	Asbestos	Municipal solid waste	Chemical	Medical	Agricultural (incl. greenhouse)	E-waste & whitegoods	Hard waste	CCA posts	Animal carcasses	Cubic metres	Tonnes
Front lift vehicles															27–30	9–11
Rear loader vehicles														1	18–22	9–11
ROROs (rigid)									1					1	11–30	9–11
ROROs (articulated)									1					1	11–30	16–18
Skip trucks									1					1	4–10	Up to 8T with bin
Side lift vehicles															27	9
Tanker rigid															8,000–11,000L	
Tanker articulated															Up to 30,000L	
Tandem tipper/ bobcat and dog trailer									1					1		11 in the tipper, up to 14–15 in the dog trailer
Semi-tipper steel body									1					1		22–25
Semi-tipper aluminium body									1					1		25–28
Flat bed/gates				*				*	*	*	*	*				1–16
Pantech /tailgate									1							

1 Ensure that open topped containers are appropriately tarped and do not have holes in them to avoid spillage. Vehicles need to be appropriately scrubbed and disinfected once the load has been tipped.

Table C3.2: Waste vehicles and equipment for transporting waste streams

Vehicle type	Considerations
Front lift vehicles	A front lift vehicle requires delivery and collection of waste containers.
Rear loader vehicles	Rear loader vehicles can be loaded by hand, by bobcat or small excavator. The bobcat or excavator would need to be transported on a separate vehicle.
ROROs (rigid and articulated)	RORO bins can be delivered and left onsite for filling and the vehicle can come back and collect it later. The waste container can be filled either with bobcat, excavator and wheel loader or by hand.
Skip trucks	Skip bins can be delivered and left onsite for filling and the vehicle can come back and collect it later. The waste container can be filled either with bobcat, excavator and wheel loader or by hand.
Side lift vehicles	In a disaster event, side lift vehicles would potentially have little or no role to play due to the small loading area which needs the use of mobile garbage bins, except for collection of municipal solid waste.
Tanker rigid	Tankers can vary in size depending on their use and required access. For instance, in a metro area they may be quite small and on long country runs they may be larger to minimise trips to the disposal point.
Tanker articulated	Articulated tankers are more likely to be used on long distance country runs and would generally carry liquid fuels, gases, etc.
Tandem tipper/ bobcat and dog trailers	Tandem tippers with bobcats are quite useful for clean-up during a disaster. They can carry relatively large volumes of material and can be independently moved from site to site. Tippers with bobcats are generally steel body and therefore can carry large concrete and metal objects, as well as softer materials such as hard waste and municipal solid waste, etc. Vehicle operators may not be licensed to collect the waste and could require an emergency authorisation.
Semi-tipper steel body	Steel body tippers can carry large volumes but need the additional transport of unloading equipment if moving from site to site. Steel body tippers are extremely useful in the event of a large volume of inert or heavy metal waste material being loaded from one central point, reducing the need for transporting excavators or loaders. Vehicle operators may not be licensed to collect the waste and could require an emergency authorisation.
Semi-tipper aluminium body	Aluminium body tippers can carry large volumes but much more care is needed when loading as the types of materials loaded, such as large concrete and metal objects will destroy the softer aluminium body. Vehicle operators may not be licensed to collect the waste and could require an emergency authorisation.
Flat bed/gates	Quite useful in many applications but care needs to be taken to ensure stability and to tie down freight correctly. Pallets can be used for ease of loading if materials are wrapped with clear plastic film. Using gates is also recommended. Vehicle operators may not be licensed to collect the waste and could require an emergency authorisation.
Pantech/tailgate truck	Cannot use for medical waste, which must be transported in a fully enclosed vehicle.

C4: Establishing an interim storage facility

Interim debris storage sites can be established following a disaster to manage waste volumes. These sites provide an area where the waste can be aggregated and possibly segregated before a decision is made about where the material will be sent for disposal or recycling. Waste can be sorted into piles of different materials at these sites.

Establishing an interim storage facility may be warranted when one or more of the following conditions exist:

- The volume of waste generated is greater than the capacity of local facilities to process the waste within a reasonable timeframe.
- Waste reprocessing and disposal facilities cannot be accessed due to damaged roads and/or other transport infrastructure.
- Establishing an interim storage facility is necessary to centrally control the flow of disaster debris and other waste, prior to recycling or final disposal.
- More time is needed to examine the waste to determine the appropriate reuse, recycling or disposal method. For example, to identify the presence of heritage materials in a pile of rubble that would need to be removed for reuse before sending the remaining rubble for recycling or disposal.

Establishing an interim storage facility requires an authorisation (for example, an emergency authorisation or exemption) from the SA EPA, which would include an agreed timeframe for operating the site to prevent long-term operation of the site for unauthorised uses. This timeframe could be extended via an agreement with the SA EPA should extra time be needed to process the waste generated by the disaster or event.

C4.1 Selecting an appropriate site to locate the storage facility

Table C4.1 summarises criteria to assess the suitability of a site for temporary storage of disaster waste. Considerations include:

- planning approvals (including considerations related to zoning, land ownership and buffer distances)
- environment impacts
- proximity to disaster-affected area and transport networks
- storage capacity
- business model
- site security
- site facilities (e.g. electricity, water).

Closed landfills and quarries in South Australia may be suitable sites for temporary storage of disaster waste, given that many are generally located in industrial zones, and have suitable environmental controls and storage capacity. Some potential sites for assessment include closed landfills, currently operating landfills or resource recovery facilities, large vacant land or vacant industrial sites.

Table C4.1: Site selection criteria for establishing a temporary debris storage site

Consideration	Site selection criteria
Planning approval	<ul style="list-style-type: none"> • If possible, locate in an industrial zoned area or away from sensitive uses such as residential or mixed-use zones, and/or areas of high conservation value (e.g. watershed zones, areas of significant natural and cultural heritage) to minimise potential impacts and loss of amenity (increased noise, dust, odour and traffic volumes, etc.). • Consider ownership of the land. If possible, locate on public rather than private land to expedite any required planning approvals (such approvals may be for temporary operations or be granted retrospectively). • Consider applicable separation distances, as per SA EPA guidelines, between the site and adjacent/nearby sensitive land uses (e.g. residential). • Depending on the debris materials (e.g. hazardous chemicals), consider possible longer term impacts, in particular, site and groundwater contamination, that may unduly affect future use of the land and surrounding established land uses and operations.
Environment impacts	<ul style="list-style-type: none"> • Sites need to be assessed in terms of their potential impacts and key mitigation measures identified. Attention should be paid to surface and groundwater contamination, soil contamination, odour, dust and impacts to vegetation. • To reduce the risk of water contamination: <ul style="list-style-type: none"> • locate at a suitable distance from groundwater, potable water wells and rivers, lakes and streams • do not locate in a floodplain or wetland. • Have controls in place to mitigate stormwater run-off, erosion, fires and dust.
Heritage/cultural	<ul style="list-style-type: none"> • Consider heritage and cultural issues when selecting a site, for example, a site's significance to Aboriginal and Torres Strait Islander peoples.
Proximity to disaster-affected area, and transport networks	<ul style="list-style-type: none"> • Locate close to disaster-affected area to minimise travel distances for transporting waste. • Ensure suitable transport networks between temporary storage site, disaster-affected area and end disposal and recycling facilities.
Storage capacity	<ul style="list-style-type: none"> • Ensure adequate room for storing expected waste volumes, and keep in mind maximum stockpile heights.
Business model	<ul style="list-style-type: none"> • Determine how the facility will be operated and funded, including: <ul style="list-style-type: none"> ○ who can use the facility ○ who will pay for facility operation (e.g. fully government funded or private disposal fees) ○ how disposal rate will be determined • Ideally use publicly owned land to avoid costly leases and other potential legal complications.
Site security	<ul style="list-style-type: none"> • Fence site and limit site access to permitted personnel. • If possible, install cameras and other security provisions.
Site facilities and design	<ul style="list-style-type: none"> • Large open sites are needed for any type of debris staging activity. Paved sites are best. Semi-paved or large parking lots paved in stone dust or gravel is the next best option. Meadows are least desirable because they may be inaccessible because of saturated soils after extended and heavy precipitation. • Provide an undercover area for storing potentially hazardous materials. • DWM sites should be designed to handle different waste streams. • Make sure site has access to water and electricity (for lighting, administration and staff amenities).

C4.2 Operating an interim storage facility

Table C4.2 summarises considerations for best practice operation of an interim storage facility. Considerations include:

- Workplace health and safety/operational health and safety (WHS/OH&S)
- environmental controls
- record keeping
- traffic management
- site security.

Table C4.2: Operating an interim waste storage facility

Consideration	Criteria for operating an interim storage facility
WHS/OH&S	<ul style="list-style-type: none"> • Induct all staff and visitors on WHS/OH&S at the site. • Ensure staff and contractors have adequate training to operate equipment and fulfil their responsibilities. • Ensure workers and visitors wear suitable personal protection equipment.
Environmental controls	<ul style="list-style-type: none"> • Develop an Environmental Management System (EMS) that identifies environmental hazards and how risks will be monitored and controlled at the site. • Monitor groundwater, temperature of stockpiles, dust levels and litter. • Implement environmental controls, such as stockpile height management, dust suppression, litter management, fire prevention and management equipment and procedures.
Record keeping	<ul style="list-style-type: none"> • Record incoming waste volumes, streams and sources (via weighbridge and/or volume estimations and visual inspections of loads). • Monitor stockpile heights and volumes. • Record outgoing waste volumes, types and destinations. • Ensure proper accounting procedures are followed for managing fees, income and expenses. • Document and report any WHS/OH&S or environmental incidents that occur.
Traffic management	<ul style="list-style-type: none"> • Maximise one-way traffic flow about the site. • Have separate access points and roads for small and large vehicles where possible. • Use signage to direct traffic onsite.
Site security	<ul style="list-style-type: none"> • Provide 24/7 manning of the site, in addition to fencing, video surveillance and other controls.

C4.3 Decommissioning an interim storage facility

The owner/operators of interim storage sites are responsible for closing the site in accordance with State and Commonwealth requirements. Table C4.3 identifies key considerations for decommissioning an interim storage facility, including removing any disaster debris, decommissioning of plant and equipment, completing environmental sampling, site rehabilitation, notification to authorities and post-closure monitoring.

Table C4.3: Operating an interim storage facility

Consideration	Criteria for decommissioning an interim storage facility
Removing disaster debris	<ul style="list-style-type: none"> Remove all disaster-related debris by the expiration of the emergency authorisation and/or licence, unless otherwise authorised by SA EPA. Mulch and wood chips produced from processing uncontaminated green waste may be left onsite if prior approval is obtained from SA EPA.
Decommission of plant and equipment	<ul style="list-style-type: none"> Decommission and/or remove infrastructure, utilities and services.
Environmental sampling	<ul style="list-style-type: none"> Carry out environmental sampling in line with SA EPA requirements.
Site rehabilitation	<ul style="list-style-type: none"> If applicable, landscape the site to make it safe and protect the surrounding environment.
Notifying authorities	<ul style="list-style-type: none"> Inform the Functional Lead for DWM and SA EPA in writing when all closure activities at the DWM site area are complete. If environmental sampling was conducted as part of the closure activities, the closure notice should include the results of this sampling.
Post-closure monitoring	<ul style="list-style-type: none"> Implement an appropriate post-closure monitoring program.

C5: Recycling and disposal options

The appropriate method for recycling or disposing of waste depends on the individual stream. For some streams, there are multiple options for recycling or disposal. For example, green waste can be chipped, composted, spread on property or sent for disposal at a suitably licensed landfill. Table C5.1 lists factors that influence choosing the most appropriate method with some examples.

Table C5.1: Choosing recycling and disposal option

Consideration	Examples
Volume of waste generated	Small volumes of a waste stream may make it financially unfeasible for recycling.
Event type	Soft furnishings water damaged by a flood or storm are unlikely to be suitable for recycling.
Location and capacity of local infrastructure	Recycling infrastructure may not be available in regional locations.
Levels of contamination	C&D waste that is contaminated with asbestos must be sent to a specially licensed landfill.
Potential market demand for product	No point recovering waste for recycling if no end market exists for the recycled product.
Other considerations	Some waste streams are banned from landfill disposal, so an exemption would need to be sought from SA EPA.

Advice on recycling and disposal options for each waste stream is provided in the following technical guidelines.

C6: Asbestos and asbestos-contaminated waste

Asbestos and asbestos-contaminated waste may be in buildings (particularly if built prior to 1986) that are displaced or damaged due to an event. It could include roofing, cement, steel beam coating and other building materials. Testing is required to identify asbestos. If asbestos is suspected in any materials, it is best to assume asbestos is present until proven otherwise. Asbestos materials must be sent to an appropriately licensed landfill.



A sign indicating the danger of asbestos (photo by Mark Haviland).

Sources of asbestos and asbestos-contaminated waste

Potential sources of asbestos and asbestos-contaminated waste are from damaged buildings, factories, stores, dwelling, apartment and office blocks and supermarkets.

What is asbestos and asbestos-contaminated waste?

The SA EPA defines asbestos as the fibrous form of mineral silicates belonging to the serpentine and amphibole groups of rock-forming minerals, including actinolite, amosite (brown asbestos), anthophyllite, chrysotile (white asbestos), crocidolite (blue asbestos), tremolite, or any mixture containing one or more of the mineral silicates belonging to the serpentine and amphibole groups. Asbestos-containing material is any material, object, product or debris that contains asbestos.

Friable asbestos means a non-bonded asbestos fabric, or asbestos-containing material that:

- is in the form of powder, or
- can be crumbled, pulverised or reduced to powder by hand pressure when dry.

Non-friable asbestos means asbestos-containing material in which the asbestos fibres are bonded by cement, vinyl, resin or other similar material, e.g. asbestos cement.

Asbestos may be found in corrugated asbestos cement roof sheeting, cladding materials, telephone IP boxes, sewer or water pipes, gaskets and fittings (heat resistant), vinyl tiles, fire doors, sprayed asbestos insulation/fire retardant or electrical switchboards. It also includes all disposable items used to remove the asbestos waste, such as masks and gloves.

Potential end uses for the recovered waste

Asbestos waste cannot and should not be recycled. If the material is tested and proven to contain asbestos, the only use for the material is disposal to a landfill licensed to accept asbestos waste. It will be buried, clearly labelled and its location recorded. If asbestos-containing material is mixed with general building waste, the entire load is deemed to be asbestos waste and must be disposed of at an SA EPA authorised facility able to receive asbestos waste.

Key considerations for managing this waste

The process for managing asbestos waste onsite and moving to an appropriate facility is covered in Table C6.1.

Table C6.1: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Have a qualified asbestos assessor assess the waste and confirm that it is asbestos waste. Consider hazards and WHS/OH&S requirements in Table C6.2 and information below this table. If greater than 10m² bonded asbestos waste or any volume of friable asbestos waste, have an appropriately licensed asbestos removalist manage the asbestos waste onsite and ensure that barriers are erected around the asbestos waste to prevent access by the public.
Collection and transport	<ul style="list-style-type: none"> Have a qualified asbestos removalist transport the asbestos waste. Ensure transport vehicles and containers can fully contain the waste. The asbestos must be wrapped in minimum of 200-micron thick plastic and clearly labelled when transported.
Interim storage	<ul style="list-style-type: none"> If interim storage is required, ensure it is secure and appropriately signed.
Processing/ disposal	<ul style="list-style-type: none"> Asbestos is not recyclable and should be taken to an appropriately licensed landfill.

Other important considerations when removing asbestos waste

It is important to ensure that:

- the person conducting the removal is an approved SafeWork SA licence holder (or an employee of a licence holder), if greater than 10m² of bonded asbestos or any volume of friable asbestos
- the work is under the licensable quantities and is performed under safe conditions
- protective clothing contaminated with asbestos is not removed from the site unless it is disposed of appropriately, as soon as reasonably practicable, or is contained to be commercially laundered.

Recovery and handling of asbestos can be separated into non-friable/ bonded) asbestos, friable asbestos and asbestos-contaminated soil (i.e. asbestos-containing material buried in the soil).

When moving **non-friable/bonded asbestos waste**, the asbestos and asbestos-containing material must be:

- removed from site as soon as practical
- kept damp (while preventing run-off water) until it is securely wrapped using minimum 200-micron plastic and labelled 'asbestos' or contained in plastic lined bins
- placed in trucks or bins that are large enough to contain full sheets without breaking them or the plastic wrapping
- transported by a licensed transporter and stored in a secure and appropriately signed area.

When moving **friable asbestos waste**, it must be:

- removed from site as soon as practical
- kept damp

- securely wrapped using minimum 200 micron thick appropriately labelled plastic bags, with labelling stating:
 - CAUTION – ASBESTOS
 - DO NOT DAMAGE OR OPEN BAG
 - DO NOT INHALE DUST
 - CANCER AND LUNG DISEASE HAZARD
- decontaminated through the site decontamination procedure (this should be installed and used by the licensed asbestos removalists)
- second wrapped in 200-micron thick plastic bags outside the work area
- bags must weigh less than 25 kilograms and be less than half full
- stored in a secure and appropriately signed area until removal.

When moving asbestos-contaminated soil, it must be

- dug up using an excavator and placed in a bulk truck lined with the required plastic to contain the asbestos waste
- kept damp, including the soil
- securely locked and covered with 200-micron plastic when transported, and the asbestos removalists should ensure that the truck is decontaminated before it leaves the site.

SafeWork SA has information on asbestos in the workplace. See *Further information and resources* for links.

Potential hazards and WHS/OH&S requirements

Table C6.2 lists potential hazards and WHS/OH&S requirements and control measures.

Table C6.2: Potential hazards and control measures

Hazard type	Description	Control measure
WHS/OH&S	<p>Inhaling asbestos fibres has a serious long-term (latency) health risk. Exposure can cause:</p> <ul style="list-style-type: none"> • mesothelioma • lung cancer • asbestosis • pleural plaques • pleural thickening. 	<p>There are many control measures legally required for asbestos removal to minimise risk:</p> <ul style="list-style-type: none"> • Asbestos removalists should be a fully trained and licensed • Asbestos signage and monitoring should be placed around the clean-up area to ensure asbestos has not left site. • Brushes, high-pressure water jets, power tools and similar instruments must not be used unless controlled to ensure exposure to asbestos fibres is below half the exposure standard. • After removal, all PPE is treated as asbestos-contaminated waste and should be removed and placed in 200-micron plastic bags that are appropriately labelled for disposal. • Appropriate PPE should be worn at all times, which at a minimum includes: <ul style="list-style-type: none"> ○ full piece paper overalls ○ fully enclosed shoes, preferably steel capped ○ gloves ○ respirators that comply with the AS/NZ S1716 respiratory protective devices. • The asbestos removal site should be clearly defined to ensure that non-essential people do not enter the area and to clearly delineate the removal site and warn persons that asbestos removal work is being carried out (e.g. using barriers and signs or other warning devices). • All barriers and warning signs should remain in place until a clearance to re-occupy has been granted. • Potential entry points to the asbestos work area should be signposted or labelled in accordance with AS1319-1994 Safety Signs for the Occupational Environment. These signs should be weather proof, constructed of lightweight material and adequately secured.

Hazard type	Description	Control measure
		<ul style="list-style-type: none"> Tape can be used as a barrier to define an asbestos work area for some types of asbestos removal work of short duration and, if a sign is not feasible, tape with the words 'asbestos hazard' along its length.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- Asbestos and asbestos-containing materials may be present in buildings that have been destroyed or damaged in the disaster, and this is more likely if the building was built prior to 1986.
- If you suspect the presence of asbestos in any damaged buildings or equipment at your property, leave the materials alone and let asbestos licensed removalists test and remove the products.
- Visit asbestos.sa.gov.au or call 1300 365 255 for further information.
- While asbestos or asbestos-contaminated materials are being removed, stay out of the demarcated zone that waste removalists have set up for safety purposes.

Record keeping

Quantities of asbestos can only be transported by an approved appropriately signed vehicle. All waste material must be accompanied by an appropriately completed Transport Certificate (asbestos is Code N220). Transporting asbestos in South Australia should also be uploaded into the SA EPA's [online tracking system](#). Note that in certain circumstances, tracking waste is exempt in an emergency to protect human health, the environment or property.

Further information and resources

Asbestos.sa.gov.au

Information on managing asbestos is available from asbestos.sa.gov.au

Department of Health

Information on the health aspects of exposure to asbestos products or fibres in domestic situations can be obtained from the Environmental Health Service of the Department of Health. Call 08 8226 7100 or visit sahealth.sa.gov.au

SafeWork SA

Information on asbestos in the workplace is available from safeworkaustralia.gov.au/news-and-events/news/asbestos-know-your-responsibilities-workplace.

SA EPA

- The SA EPA's online tracking system is available at epa.sa.gov.au/business_and_industry/tracking_and_transporting_waste/about_online_waste_tracking
- An online fact sheet on waste tracking is available at epa.sa.gov.au/business_and_industry/tracking_and_transporting_waste/fact_sheets/waste_that_must_be_tracked
- Non-friable asbestos disposal sites in South Australia are listed in Table C6.3 (metropolitan sites) and Table C6.4 (regional sites). This information is sourced from epa.sa.gov.au/community/waste_and_recycling/asbestos

Table C6.3: Current (2017) non-friable asbestos disposal sites in metropolitan South Australia

Licensee	Location	Contact number
D&V Services	Cheviot Rd, Salisbury South	(08) 8283 2700
Southern Waste Depot (also accepts friable asbestos)	Main South Road, Maslins Beach	(08) 8386 2212
Metro Waste Services Transfer Station	Murray Street, Thebarton	(08) 8443 8827
City of Campbelltown Transfer Station	Virginia Rd, Newton	1300 362 362
Onkaparinga Waste & Recycling	Harrison Road, Woodside	(08) 8389 7561
Heathfield Waste Transfer Station	Scott Creek Road, Heathfield	(08) 8339 4323
Integrated Waste Services Transfer Station	Cnr Hines and Wingfield Road, Wingfield	(08) 8243 2644

Table C6.4: Current (2017) non-friable asbestos disposal sites in regional South Australia

Licensee	Location	Contact number
Adelaide Hills Recycling	Callington Rd Strathalbyn	(08) 8536 3600
Alexandrina Council	Victor Harbour – Goolwa Rd Goolwa	(08) 8555 7000
Ceduna, DC of	Ten Chain Road, Ceduna	(08) 8625 3407
Coober Pedy, DC of	Oodnadatta Road, Coober Pedy	(08) 86725298
Flinders Ranges Council	Kingswood Bore Road, Quorn	(08) 8648 6031
Gambier Earthmovers	Telfords Quarry Bay Road, Mount Gambier	(08) 8725 4093
Kangaroo Island Council	North Coast Road, Kingscote	(08) 8553 4534
Loxton–Waikerie, DC of	Mackey Road, Loxton	(08) 8584 7221
Mid Murray Council	Gerschwitz Road, Cambrai	(08) 8564 6020
Mount Gambier, City of	Eucalypt Drive, Mount Gambier	(08) 8271 2555
Naracoorte and Lucindale, DC of	Blackwell Road, Naracoorte	(08) 8760 1100
Peterborough, DC of	Yatina Road, Peterborough	(08) 8651 3566
Port Augusta, DC of	Western Plains Road, Port Augusta	(08) 8641 9100
Port Lincoln, City of	Hassell Road, Port Lincoln	(08) 8682 3033
Port Pirie Regional Council	Three Chain Road, Port Pirie	(08) 8633 9777
Streaky Bay, DC of	Flinders Highway, Streaky Bay	(08) 8626 1001
Whyalla, City of	Iron Knob Road, Whyalla	(08) 8640 3444
Yorke Peninsula, DC of	Dump Road, Ramsay	(08) 8832 0000

C7: Construction and demolition inert waste (concrete, brick and rubble)

During an event, damage to infrastructure and buildings can generate significant quantities of construction and demolition (C&D) inert waste such as concrete, bricks and rubble. Post-event, more waste may be generated as buildings are damaged or demolished during the recovery phase. Most C&D inert waste can be transported to C&D reprocessing facilities for recycling, provided that no asbestos is present in the building materials and contamination is sufficiently low.



Construction and demolition inert waste (photos by Mike Haywood)

Sources of C&D inert waste

Potential sources of C&D inert waste are from damaged:

- roads and bridges
- factories and stores
- single or multistorey dwellings
- high-rise apartments and office blocks
- supermarkets and shopping centres/ precincts.

What is construction and demolition inert waste?

The SA EPA defines C&D inert waste as 'the solid inert component of the waste stream arising from the construction, demolition or refurbishment of buildings or infrastructure but [which] does not contain municipal solid waste, commercial and industrial waste (general), listed waste, hazardous waste or radioactive waste'.

C&D inert waste includes bricks, concrete, tiles and ceramics, steel and inert soils. C&D inert waste should ideally contain no foreign materials although it may be contaminated with negligible components of foreign material (as a guide, 0 to 5 per cent maximum by volume per load). Foreign material includes green waste, plastics, electrical wiring, timber, paper, insulation, tins and packaging.

Potential end uses for the recovered waste

Table C7.1 lists typical end uses for recovered C&D inert waste. Recovering and recycling these materials is likely to be useful following a disaster, with source products being recycled into items such as road base.

Table C7.1: Typical end uses for recovered C&D inert waste

Materials recovered	Potential uses
Inert materials (concrete/ bricks/ rubble/ soils*)	<ul style="list-style-type: none"> • Can be crushed and blended to make road bases (e.g. for reconstruction efforts after the event) • Construction fill • Directly reused • Quarry rehabilitation material

*Note that some soil may be picked up when collecting and recycling C&D inert waste. This is also called waste derived fill and can be sold as a product after being separated from other C&D inert waste. For a definition of this product and recovery guidance, see C15: Soil and sediment waste.

Recycling and disposal options

Table C7.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C7.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Send to C&D recycler (e.g. for road base)	All volumes	All events	Significant C&D processing capacity north and south of Adelaide	< 5% foreign materials (plastics, organics etc.) and 0% asbestos or other hazardous waste	Likely to remain high	Regional: mobile crushers can be used to process the waste onsite
Landfill	While C&D inert waste is not banned from landfill and there is significant landfill space in metro Adelaide, the waste is non-compostable, non-combustible, very stable and easy to store and stockpile for extended periods. It should therefore not need to be landfilled unless there are extenuating circumstances.					

Key considerations for managing this waste

Ideally, C&D inert waste will be taken to an SA EPA licensed C&D reprocessing facility for recycling. Professional demolition contractors will likely undertake this process and provide advice. The process for managing the waste onsite and moving to an appropriate facility is covered in Table C7.3.

Table C7.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> • Demolition contractors should manage C&D inert waste onsite and use excavators with a grapple, hammer, pulveriser or similar to separate or break up the waste for easier transportation (see Figure C7.1). • Wheel loaders can be used to pick up waste and place in transport vehicle (see Figure C7.1).
Collection and transport	<ul style="list-style-type: none"> • Transport vehicles should be fully enclosed steel-bodied trucks (either tandem or semi-tipper). • In regional areas, mobile crushers could be used along with contracted labour to process the material (Figure C7.2).

Process	Key considerations
Interim storage	<ul style="list-style-type: none"> If interim storage is needed, the material is low risk and can be stockpiled for extended periods before moving to a recycling facility.
Processing/ disposal	<ul style="list-style-type: none"> C&D inert waste can be processed into a wide range of products by SA EPA licensed facilities (see Table C7.1). It is generally more economical and environmental friendly to recycle this product. Given that it can also be stockpiled for extended periods, it should not go to landfill.



Grapple excavator



Pulveriser (photo by Mike Haywood)



Wheel loader



Hammer attachment (photo by Ildar Sagdejev)



RORO truck (photo by Rawtec)



Skip truck (photo by Eco Waste Solutions)

Figure C7.1: Recovery and transportation equipment for C&D inert waste



Figure C7.2: Mobile crusher

Potential hazards and WHS/OH&S requirements

Table C7.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C7.4: Potential hazards and control measures

Hazard/hazard type	Description	Control measure
General hazards, WHS/OH&S	There are various hazards at sites containing C&D inert waste.	Before removing C&D inert waste, it is important for a structural engineer to complete a risk assessment and the area or building has been deemed safe to enter. Utilities (such as gas, electricity and water) must be properly disconnected.
Asbestos, WHS/OH&S	Inhalation of asbestos fibres can have serious long-term (latency) health risks and exposure can cause: <ul style="list-style-type: none"> • mesothelioma • lung cancer • asbestosis • pleural plaques, etc. 	Buildings constructed in Adelaide’s metropolitan area prior to 1986 are known to potentially have materials that contain asbestos. If asbestos is suspected, treat the waste as containing asbestos until proven otherwise. See Guideline C6: Asbestos and asbestos-contaminated waste for more information.
Weight of material, WHS/OH&S	C&D inert waste is generally very dense and heavy and can cause manual handling injuries.	Waste removalists should use appropriate equipment to move this waste such as those in Figure C7.1.
Dust particles, WHS/OH&S	This material can also cause dust particles to be released into the air, which can impede vision and potential breathing difficulty.	Waste removalists should consider using the following personal protective equipment: <ul style="list-style-type: none"> • high visibility clothing • hard hats • steel cap shoes • dust masks, with a P3 dust mask recommended
Unstable stockpiles and structures, WHS/OH&S	Damaged buildings and structures may fall after the event is completed.	Do not stand or work underneath structures or next to walls or stockpiles that may topple.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If you have large volumes of concrete, bricks and rubble at or nearby your property, waste removalists should conduct the handling and removal of this material.
- If hazardous materials such as asbestos are suspected, you should avoid handling this material and contact SafeWork SA for information and guidance.
- If you are near the handling and removal of concrete, bricks and rubble, consider wearing a P3 dust mask and closing your doors and windows.
- If you are handling and removing this waste yourself, the following measures are recommended to ensure safety:
 - prior to commencing removal of material from a damaged structure, have a structural engineer conduct a risk assessment to check the building is safe to enter
 - use heavy earth-moving equipment where possible and practical, as materials are dense and heavy
 - wear appropriate PPE, such as high visibility clothing, a hard hat, steel cap shoes and a P3 dust mask
 - take the material to a C&D recycler or waste and recycling centre to be recycled.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

SA EPA

- *Reuse and recycling of clean fill and building and demolition waste* (2001), available from epa.sa.gov.au/files/8449_nolan_recycling_clean_fill.pdf
- *Guideline for stockpile management: Waste and waste derived products for recycling and reuse* (2010), available from epa.sa.gov.au/files/4771349_guidelines_stockpile.pdf
- *Standard for the production and use of Waste Derived Fill* (2013) (waste derived fill may be separated out when C&D inert waste is recycled), available from epa.sa.gov.au/files/4771359_standard_wdf.pdf

C8: Mixed waste

Damage to infrastructure and buildings after an event can generate significant quantities of waste streams mixed together. If this mixed waste has more than 5 per cent non-C&D inert waste (plastics, food, timber etc.), this waste is considered as mixed waste. Ideally, mixed waste will be separated into different waste streams, transported to a recycling facility and recycled, with the remaining materials (residual component) either sent to landfill or used for energy from waste, provided that no asbestos is present in the materials.

Sources of mixed waste

Potential sources of mixed waste are from damaged:

- factories and stores
- single or multistorey dwellings
- distribution centres
- processing and packaging facilities
- high-rise apartments and office blocks
- supermarkets and shopping centres/precincts.

What is mixed waste?

Mixed waste is the waste produced from buildings and their contents that cannot be effectively separated from C&D inert waste (rubble, bricks and concrete). For the purposes of these Guidelines, mixed waste incorporates:

- C&D mixed waste (combustible fraction), defined by the SA EPA as the solid component of a waste stream arising from the construction, demolition or refurbishment of buildings or infrastructure which contains some foreign material (as set out below)
- Commercial and industrial (C&I) waste (general), defined by the SA EPA as the solid component of the waste stream arising from commercial, industrial, government, public or domestic premises (not collected as municipal solid waste).

Mixed waste will include more than 95 per cent non-C&D inert materials (called 'foreign materials') such as green waste, plastics, electrical wiring, timber, paper, insulation, tins and packaging, but no listed waste, hazardous waste or radioactive waste.

Potential end uses for the recovered waste

Ideally, C&D mixed waste (combustible fraction) will be separated into different waste streams to enable each stream to be recycled and the non-recyclable residual fraction sent to landfill or used as a processed engineered fuel for energy. Separation can occur onsite, or the waste can be sent to a recycling facility to be separated and recycled where possible. Table C8.1 lists typical wastes and potential end uses for recovered mixed waste.

Table C8.1: Typical waste streams and uses for recovered mixed waste

Materials recovered	Potential uses
Inert materials (concrete/bricks/ rubble/ soils)	<ul style="list-style-type: none"> Can be crushed and blended to make road bases (e.g. for reconstruction efforts after the event) Construction fill Directly reused Quarry rehabilitation material
Timber	<ul style="list-style-type: none"> Can be salvaged and reused if not damaged If damaged, timber can be shredded for use as mulch (see Guideline C14: Green (vegetative) waste for more information)
Green waste	<ul style="list-style-type: none"> Can be sent to a composter or mulched
Metals	<ul style="list-style-type: none"> Salvaged and sold to the metal scrap industry (see Guideline C9: Metal waste for more information)
Cardboard and paper	<ul style="list-style-type: none"> If this can be recovered and is clean and dry, it can be sold to the paper pulp industries
Plastics	<ul style="list-style-type: none"> May be recovered and granulated (depending on the ability to recover this to a level accepted by the plastic granulator)
Mixed waste materials (if recyclable materials cannot be easily separated)	<ul style="list-style-type: none"> May be able to be turned into a PEF for use in cement kiln(s) Alternatively, these may need to be sent to landfill
E-waste	<ul style="list-style-type: none"> Can be sent to e-waste recyclers for shredding/dismantling into parts

Recycling and disposal options

Table C8.2 provides a quick guide to recycling and disposal options for this waste stream.

Table C8.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Send all waste to recycling facility to be separated and recycled	All volumes	Waste that is burnt or water damaged from flood or storm may not be recyclable	Metro can manage significant volumes of this material	0% listed, hazardous or radioactive waste. If >95% concrete, bricks and rubble, it is classed as C&D inert waste	May vary	Regional: Consider hauling interstate or to interim storage facilities
Separate waste onsite and collect as separate streams	All volumes	As above	As above	As above	As above	As above
Send to energy from waste plant	All dry volumes (excluding vegetative waste)	As above	One plant north of Adelaide will process to PEF to	Preference for plastics, timbers and textiles	May vary	As above

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
			power a cement kiln			
Landfill	Significant space in landfills servicing metropolitan Adelaide. These may be more limited in regional areas. An exemption of the landfill ban is required for wastes such as metals, glass, plastics and cardboard and paper that is already separated and aggregated. However, if the waste is mixed and cannot be easily separated, disposal to landfill may be the practical option for this waste. Note that mixed waste can be stockpiled for extended periods while it is progressively moved offsite, provided the stockpiles are well constructed and are properly monitored and as such, landfill should be avoided if possible.					

Key considerations for managing this waste

Professional demolition contractors would likely manage and remove this waste. The process for managing the waste onsite and moving to an appropriate facility is discussed in Table C8.3.

Table C8.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Demolition contractors should manage mixed waste and use excavators with a grapple, hammer or pulveriser or similar to separate or break up the waste for easier transportation (see Figure C8.1). Bobcats and wheel loaders can be used to pick up waste from the ground or building and place in a vehicle
Collection and transport	<ul style="list-style-type: none"> Materials should be placed into a transport vehicle using the equipment mentioned above Transport vehicles should be fully enclosed steel-bodied trucks (either tandem or semi tipper)
Interim storage	<ul style="list-style-type: none"> Interim storage may be required if access to recyclers is difficult, and storage should be undercover The material is low risk and can be stockpiled for extended periods before moving to a recycling facility, provided the stockpiles are managed properly
Processing/ disposal	<ul style="list-style-type: none"> This waste can be processed into a wide range of products or sent to an energy from waste facility (see Table C8.1) Some waste may need to go to landfill if not able to be recycled or used for energy recovery.



Grapple excavator



Steel-bodied semi-tipper



Wheel loader



Bobcat



RORO truck (photo by Rawtec)



Skip truck (photo by Eco Waste Solutions)

Figure C8.1: Potential recovery and transportation equipment for mixed waste

Potential hazards and WHS/OH&S requirements

Table C8.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C8.4: Potential hazards and control measures

Hazard/ hazard type	Description	Control measure
General hazards, WHS/OH&S	There are various other hazards at sites containing mixed waste.	Before removing mixed waste, it is important for a structural engineer to complete a risk assessment and the area or building deemed safe to enter. Utilities (such as gas, electricity and water) must be properly disconnected. Waste removalists should consider using PPE such as: <ul style="list-style-type: none"> • high visibility clothing • hard hats • steel cap shoes • dust masks, a P3 dust mask is recommended.
Asbestos, WHS/OH&S	Inhalation of asbestos fibres can have serious long-term (latency) health risk and exposure can cause: <ul style="list-style-type: none"> • mesothelioma • lung cancer • asbestosis • pleural plaques, etc. 	Buildings constructed in Adelaide's metropolitan area prior to 1986 are known to potentially have materials that contain asbestos. If asbestos is suspected, treat the waste as containing asbestos until proven otherwise. See Guideline C6: Asbestos and asbestos-contaminated waste for more information.
Injury from dense waste, WHS/OH&S	The waste may be very dense and heavy.	Waste removalists should use appropriate equipment to move this waste (see Figure C8.1).
Combustion and fires, WHS/OH&S and environmental	As this material is mixed, it may have combustible materials contained in the waste piles. This can spontaneously combust or catch alight from equipment that causes sparks used for cutting, welding or electrical works.	Where possible, separate out the waste by material stream for stockpiling, particularly vegetative/green organics as this material can potentially be the main source of ignition. When constructing the stockpile, ensure plenty of room between stockpiles for emergency vehicle access as well as spreading the waste in the event of a fire, as this will make it easier to extinguish. Stockpiles should be less than 3 metres high and 4 to 5 metres wide, with at least 4 metres between each row. If the stockpile is to remain in place for an extended period, ensure it is under cover. It is also important not to use equipment that will create sparks near stockpiles.
Unstable stockpiles and structures, WHS/OH&S	Damaged buildings and structures may fall after the event is completed.	Do not stand or work underneath structures or next to walls or stockpiles that may topple.
Needle stick injury, WHS/OH&S	There is a risk of needle stick injuries due to needles being in the waste piles.	Care must be taken when handling the material to minimise risk. Stay vigilant and ensure that hands and feet are not placed in holes or other areas that cannot be seen. Use machines where possible to move the waste, such as excavators and grapples (see Figure C8.1), and wear PPE as suggested above. This will minimise the chance of needle injury or receiving a bite.
Bites and stings, WHS/OH&S	This waste stream also has the potential to harbour vermin (rats, snakes etc.) due to the nature of the materials and potential for voids which readily act as a living space. These vermin may bite or sting.	

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If your house, or buildings on or nearby your property have fallen or are damaged, it is safer for waste removalists to manage and remove this material.
- If hazardous materials such as asbestos are suspected, you should avoid handling this material and contact SafeWork SA for information and guidance.
- If you are near the removal of houses or building rubble and other materials, or if dust is visible, consider wearing a P3 dust mask and closing your doors and windows.
- Keep some distance when walking or driving by piles of mixed waste, as it may topple.
- If you are handling and removing this waste, it is recommended that:
 - prior to removing waste from a damaged structure, you have a structural engineer conduct a risk assessment to check that the building is safe to enter
 - due to the potential for sharp objects (splintered timber, metals and glass) it is suggested that excavators and grapples be used to move the material
 - wear appropriate PPE, such as high visibility clothing, a hard hat, steel cap shoes and a P3 dust mask when in the work area
 - take it to a waste and recycling centre to be recycled, if practical.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

SA EPA

- *Environmental Guidelines Resource Recovery and Waste Transfer Depots* (2001), available from epa.sa.gov.au/files/4771347_rrwt.pdf
- *Guideline for stockpile management: Waste and waste derived products for recycling and reuse* (2010, updated 2017), available from epa.sa.gov.au/files/4771349_guidelines_stockpile.pdf
- *Guidelines on the handling of waste banned from landfills* (2010, issued 2012), available from epa.sa.gov.au/files/4771783_guide_banned_waste.pdf

C9: Metal waste

A disaster event can generate large volumes of metal waste, for example from steel beams from damaged buildings, that need to be appropriately and safely managed. If metal waste can be separated, collected and recycled as scrap metal, it can become a valuable product.



Metal waste

Sources of metal waste

Potential sources of metal waste are from damaged:

- buildings, factories and stores
- singles or multistorey dwellings
- high-rise apartments and office blocks
- supermarkets and shopping centres/precincts
- bridges.

What is metal waste?

For the purpose of these guidelines, metal waste is the component of the waste stream after an event that is predominantly metals, either ferrous (i.e. contains iron) or non-ferrous (does not contain iron, such as aluminium), and that requires shearing, baling or fragmenting (onsite or at a scrap metal recycler) prior to sale.

Metal waste may include:

- machinery
- metal fences
- metal roofs
- wire fencing
- from vehicles such as cars, trucks, ships and aeroplanes (note that these are covered in Guideline C13: Vehicle waste).

Potential end uses for the recovered waste

Table C9.1 lists typical end uses for recovered metal waste.

Table C9.1: Typical end uses for recovered metal waste

Material	End products
Metals such as non-ferrous metals (e.g. aluminium) and ferrous metals (e.g. steel)	Scrap metal can be traded as a commodity on the world market, which may be turned in to: <ul style="list-style-type: none"> • steel beams • valves and extrusions • automotive parts • building industry materials • aluminium cans • batteries • cables.

Recycling and disposal options

Table C9.2 provides a quick guide to recycling and disposal options for this waste stream.

Table C9.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Aggregated as scrap metal and sold to make other metal products	All volumes	All events	Numerous scrap metal recyclers/ receivers in metro Adelaide, or operators may come to the site	0% hazardous or listed waste, no oils	May vary	Regional: mobile equipment may be used to shred metals and bulk transport to metro processors
Landfill	Although there is significant space in landfills servicing metro Adelaide (noting these may be more limited in regional areas), an exemption of the landfill ban may need to be sought for aluminium, copper, steel or iron or a blend or alloy of any such metals, if it has been aggregated for resource recovery (whether alone or with other recyclables).* As metal can be stockpiled for extended periods, it should not need to be landfilled unless there are extenuating circumstances.					

* See wastes banned from landfill in South Australia at

epa.sa.gov.au/data_and_publications/standards_and_laws/waste_to_resources_policy/landfill_bans

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C9.3

Table C9.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Separate metal waste from other waste and contamination such as oils. Use machinery shown in Figure C9.1 to manage the waste onsite. Wire fencing can be difficult to handle and compress. Bundle or cut into smaller lengths for improved ease of handling prior to aggregation and transport.
Collection and transport	<ul style="list-style-type: none"> Metal processing and receival facilities may come to the site to collect the metal. Transport vehicles should be fully enclosed steel-bodied trucks such as those shown in Figure C9.2.
Interim storage	<ul style="list-style-type: none"> Interim storage facilities may be set up for metal waste if it is not contaminated.
Processing/ disposal	<ul style="list-style-type: none"> Metal should be aggregated and recycled. Aggregated metals are banned from landfill and as such, an exemption is necessary if landfill disposal is required.



Grapple

Figure C9.1: Machinery required to manage metal waste onsite



RORO truck (photo by Rawtec)



Steel-bodied truck

Figure C9.2: Vehicles to transport metal waste

Potential hazards and WHS/OH&S requirements

Table C9.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C9.4: Potential hazards and control measures

Hazard type	Description	Control measure
Manual handling, WHS/OH&S	Metal waste can be heavy or sharp.	Caution should be taken when handling this waste to avoid being cut or lifting items that are too heavy, as well as metal waste falling from piles. It may be necessary to use machinery to lift the metal waste.
Contamination with other materials, environmental	If metal waste is contaminated with oil or mixed with other waste, this may create hazards related to transportation or storage. For example, oil or any other liquid attached to metal waste, when exposed to rain, may contaminate its surrounding environment or in stockpile may lead to stockpile fires.	A risk assessment of other hazardous contaminants of scrap such as asbestos or gas bottles should be undertaken prior to removal and transport (e.g. measuring airborne emissions of asbestos fibres, or the potential for gas bottle explosion). Regarding environmental hazards when there is no contamination, metal waste does not usually pose any risk to the environment, as issues usually result from other materials. Therefore, there are no environmental risks in the transportation and storage of metal.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If you have metal waste at your site, demolition experts and scrap metal recyclers can provide help and advice on managing metal waste.
- If handling metal waste, this waste can be sharp – we suggest using gloves or equipment such as a bobcat to move the waste.
- Metal waste can be recycled – take the metal waste (if safe to do so) to a scrap metal recycler. If unsafe to transport, arrange for a scrap metal recycler to pick up the metal waste.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

C10: Hard waste

Hard waste includes items inside dwellings and buildings such as cupboards and bedding but does not include electronic or toxic items. Depending on the state of these items and the disaster, these items may be recovered and recycled, burned to produce energy or sent to landfill.



Hard waste following Hurricane Katrina (photos by Infrogmation)

Sources of hard waste

Potential sources of hard waste are from damaged:

- single or multistorey dwellings
- high-rise apartments and office blocks.

What is hard waste?

The SA EPA defines hard waste as the solid component of the waste stream arising from domestic premises which is not suitable for collection using a kerbside bin system but does not contain commercial and industrial waste (general), listed waste, hazardous waste, radioactive waste or waste that is not deemed suitable for collection by local councils.

This waste stream includes:

- furniture, bedding, cabinets, tables, sofas lounges and chairs
- mattresses, carpet and textiles
- toys, bikes, old tins, empty clean paint tins (with lids removed), scrap iron and car rims (not tyres).

Potential end uses for the recovered waste

Typical end uses for recovered hard waste are listed in Table C10.1.

Table C10.1: Typical end uses for recovered hard waste materials

Materials recovered	Potential uses
Hard waste	Depending on the nature of the waste and the event, it may be: <ul style="list-style-type: none"> reused as a product (couches, table, toys etc.), if safe to do so separated into each material stream and recycled used as a feedstock for processed engineered fuel production, or disposed to landfill.

Recycling and disposal options

Table C10.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C10.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Send all waste to recycling facility to be separated and recycled	All volumes	Waste that is burnt or water damaged from flood or storm may not be recyclable	Metro can manage significant volumes of this material		May vary	
Send to energy from waste plant	All dry volumes (excluding green waste)	Water damaged items may not be suitable for energy from waste	One plant north of Adelaide will process to PEF to power a cement kiln	Preference for plastics, timbers and textiles	May vary	
Landfill	Landfill may be the best option for this waste stream given the potentially mixed nature and the practicality of this method of disposal. There is significant space in landfills servicing metro Adelaide. Space may be more limited in regional areas.					

Key considerations for managing this waste

Table C10.3 lists the process for managing the waste onsite and moving to an appropriate facility.

Table C10.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Some items may be salvageable and can be used again onsite. For the remaining items, pile the waste onsite, separate out contaminants where possible.
Collection and transport	<ul style="list-style-type: none"> If the waste is being collected, clearly mark the waste with a sign post for waste collectors. If transporting to a waste and recycling facility, vehicle options depend on the volume and state of the waste, but may include a car, van, utilities vehicle, trailer or truck such as those shown in Figure C10.1.
Interim storage	<ul style="list-style-type: none"> Interim storage facilities may be set up for this waste as it can be stockpiled for extended periods if not contaminated.
Processing/ disposal	<ul style="list-style-type: none"> This waste may be turned into PEF for energy or disposed to landfill.



RORO truck (photo by Rawtec)



Rear loader vehicle

Figure C10.1: Vehicles to transport metal waste

Potential hazards and WHS/OH&S requirements

Table C10.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C10.4: Potential hazards and control measures

Hazard type	Description	Control measure
Needle stick injury, WHS/OH&S	There is a risk of needle stick injuries due to needles in waste piles	Care must be taken when handling the material to minimise risk. Stay vigilant and ensure that hands and feet are not placed in holes or other areas that cannot be seen. Use machines or equipment where possible to move the waste. This will minimise the chance of needle injury or receiving a bite. See Guideline C24: Medical and pharmaceutical waste for more information

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

C11: E-waste and whitegoods

Computers, televisions, fridges, washing machines and other electrical and electronic equipment in dwellings can be damaged during an event. This waste is banned from landfill and should be separated out, recovered and recycled. This can be done at numerous locations registered to accept and recycle e-waste and whitegoods waste.



E-waste

Sources of e-waste and whitegoods waste

Potential sources of e-waste and whitegoods waste are from electronic equipment in damaged:

- factories and stores
- single or multistorey dwellings
- high-rise apartments and office blocks
- supermarkets and shopping centres/ precincts.

What is e-waste and whitegoods waste?

The SA EPA defines e-waste and whitegoods waste as electrical and electronic equipment that is dependent on electric currents or electromagnetic fields to function (including all components, subassemblies and consumables which are part of the original equipment at the time of discarding). E-waste includes:

- consumer/entertainment electronics (e.g. televisions, DVD players and tuners)
- devices of office, information and communications technology (e.g. computers, telephones and mobile phones)
- lights and lighting devices (e.g. desk lamps)
- power tools (e.g. power drills) with the exclusion of stationary industrial devices
- devices used for sport and leisure including toys (e.g. fitness machines and remote-control cars).

Whitegoods includes household appliances such as fridges, washing machines and microwaves.

Potential end uses for the recovered waste

Ideally, these items will be recovered, and each component separated out and recycled. Table C11.1 lists typical end uses for recovered e-waste and whitegoods.

Table C11.1: Typical end uses for recovered e-waste and whitegoods

Materials recovered	Potential uses
Brown goods (e.g. televisions, audio equipment)	Disassembled at an e-waste recycler for metals and plastics recovery as well as heavy metals and rare earth recovery.
Other e-waste	Shredding and/or disassembly at an e-waste recycler to plastic, metal and other components for reprocessing. These separate waste streams are sold as a commodity on the market and used to make new products.
Whitegoods (refrigerators, freezers, etc.)	Transported to a metal scrapyards, degassed and the metals recovered and recycled into new metal, automotive parts, cables, etc.

Recycling and disposal options

Table C11.2 provides a quick guide to recycling and disposal options for this waste stream.

Table C11.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
E-waste: disassemble/shredding at e-waste recycler	All volumes	All events	Numerous e-waste recyclers across the state	Should be e-waste only (no other wastes)	May vary. If market demand low, safely store until demand increases	
Whitegoods: de-gas and recover metal	As above	As above	Numerous scrap metal recyclers across the state	Should be whitegoods and metal waste only (no other wastes)	As above	
Landfill	If e-waste or whitegoods waste is mixed with other wastes and cannot be separated, an exemption of the landfill ban may be needed.					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C11.3.

Table C11.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Consider hazards and WHS/OH&S requirements in Table C11.4. Separate the e-waste and whitegoods waste from other waste streams.
Collection and transport	<ul style="list-style-type: none"> If required, stockpile e-waste and whitegoods in a dry, undercover area. Transport e-waste to an e-waste recycler or e-waste collection point and whitegoods to a scrap metal recycler.
Interim storage	<ul style="list-style-type: none"> Interim storage may be needed. If so, ensure it is in a dry, undercover area and potentially caged in or fenced to prevent items falling.
Processing/ disposal	<ul style="list-style-type: none"> Do not landfill these items. The recycling facility will disassemble and recycle the components while treating the hazardous materials.

Potential hazards and WHS/OH&S requirements

Table C11.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C11.4: Potential hazards and control measures

Hazard type	Description	Control measure
Gas release, environmental	Refrigerant and air-conditioning gases can potentially be released into the atmosphere	Refrigerant and air-conditioning gases are not to be discarded into the atmosphere. These items require a suitably qualified licensed disposal facility with the approved gas capture and recovery equipment to decant the units.
Potential release of dangerous heavy metals, environmental	E-waste can potentially contain heavy metals that can be dangerous to the environment	E-waste and whitegoods should be collected and disposed of at approved e-waste recycling facilities.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- E-waste should be collected and disposed of at approved e-waste recycling facilities. See environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme for further information.
- Whitegoods should be collected and disposed of at approved metal recycling facilities.
- Store damaged e-waste and whitegoods in a dry place until ready to move to a recycling facility or e-waste scheme collection point.

Legislation and regulations to consider (WHS/OH&S and environmental)

National Television and Computer Recycling Scheme

Established in 2011 to provide Australian householders and small business with access to industry-funded collection and recycling services for televisions and computers. See environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme.

Environment Protection (Waste to Resources) Policy 2010 (EPP)

The recycling scheme and the EPP state that e-waste and whitegoods are prohibited from landfill in South Australia. See environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme

Ozone Protection and Synthetic Greenhouse Gas Management Legislation

Refrigerant and air conditioner gases are classified under this legislation. See environment.gov.au/protection/ozone/legislation

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

National Television and Computer Recycling Scheme

E-waste recycling drop off points are available at environment.gov.au/protection/national-waste-policy/television-and-computer-recycling-scheme/drop-off-points

C12: Household hazardous waste

Households may have stored hazardous materials such as household chemicals, that become displaced or damaged after an event.

Sources of household hazardous waste

Potential sources of household hazardous waste are from damage to garden sheds, garages, houses or other buildings that contain hazardous materials.

What is household hazardous waste?

Household hazardous waste includes materials such:

- acids & alkalis
- brake fluids and coolants
- car care products
- cleaning products
- other household chemicals
- paint (liquid only, up to 100 litres)
- pesticides, insecticides, rodenticides, herbicides & other garden chemicals
- photographic chemicals
- polishes
- pool chemicals
- solvents (including paint thinners, turpentine)
- varnishes & stains.

Potential end uses for the recovered waste

Where practical, these items can be recovered and sent for recycling. Table C12.1 lists typical end uses for recovered household hazardous waste.

Table C12.1: Potential end uses for recovered household hazardous waste

Materials recovered	Potential uses
Mercury	Mercury can be recovered from fluorescent lighting and used in new mercury-containing products such as lamps, thermometers and medical equipment.
Lead	Lead from lead-acid batteries can be recovered and used in new products containing lead such as new lead-acid batteries, building construction material and cable sheathing.
Paint	Paint can be recovered and recycled. Recovered paint tins can be recycling into new metal packaging and products.
Oil	Oil can be recovered and recycled.
Chemicals (various)	Acids, alkalis and other chemicals can be treated and disposed through a treatment process.

Recycling and disposal options

Table C12.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C12.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Fluorescent tube recycler	All fluorescent tubes	All events	Local network of collectors/ aggregators, which would transport to recyclers	Likely to be mixed with C&D waste stream	na	Likely to be small volumes and may not be practical to source separate for recycling
Paint recycler	All paints	All events	As above	na	na	As above
Lead-acid battery recycler	All lead-acid batteries	All events	As above	na	na	As above
Oil recycler	Oil	All events	As above	na	na	As above
Chemicals (various)	Chemicals (various)	All events	As above	na	na	As above
Landfill	Many household hazardous waste items (e.g. fluorescent tubes, oil and batteries) are banned from landfills and as such, an exemption would need to be sought to dispose of this waste at landfill.					

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C12.3.

Table C12.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Advise the public to take precautions when handling household hazardous waste.
Collection and transport	<ul style="list-style-type: none"> If quantities of household hazardous waste are significant, then set up drop-off points at transfer stations or council depots operated by suitably qualified contractors where residents/contractors can bring this material. Advise residents on precautions to take when transporting the waste, including ensuring lids are tightly fitted and hazardous wastes are securely packed in a non-returnable crate or box, and placing leaking containers into a sealed container prior to transportation. If possible, request that labels are retained or label chemicals clearly where known.
Interim storage	<ul style="list-style-type: none"> Long-term storage is not recommended. In most instances, the contractor would transport to final processing/disposal location within a few days. Store materials in a secure, undercover area. Special handling and storage requirements are required for hazardous waste streams. See Guideline C21: Chemical (hazardous) waste for more information.
Processing/ disposal	<ul style="list-style-type: none"> Where practical, send recovered materials to recyclers.

Potential hazards and WHS/OH&S requirements

Table C12.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C12.4: Potential hazards and control measures

Hazard/ hazard type	Description	Control measure
WHS/OH&S and environmental	Fluorescent lights contain many materials that can pose risks to workers, the community, public health and the environment. These include broken glass (from bulbs and tubes) and toxic chemicals, such as mercury, which is a potent neurotoxin that contaminates water supplies through leakage from landfill.	<ul style="list-style-type: none"> Take caution and wear suitable personal protection equipment (PPE) (gloves, glasses and disposable overalls) when handling fluorescent lights. Sort fluorescent lighting into types, and store in purpose-built stillages or sealed cardboard boxes in a secure, suitably labelled, undercover area. Send fluorescent tubes to recyclers where possible and practical for recycling, rather than landfill disposal.
WHS/OH&S	Chemicals from leaking batteries can be toxic and cause burns of skin irritation.	When handling batteries: <ul style="list-style-type: none"> always treat batteries as though they are fully charged use equipment to aid handling (e.g. forklifts) wear PPE, particularly gloves and eye protection have a minimum of one person per work area trained in spill response follow correct and safe manual handling and management procedures.
WHS/OH&S	Electrocution from larger batteries still containing significant energy.	
WHS/OH&S and environmental	If not stored correctly, batteries can leak toxic chemicals and potentially explode or be an ignition source.	<ul style="list-style-type: none"> Keep batteries away from flammable and combustible materials and ignition sources. For lead-acid car batteries, best practice is to store batteries undercover, on pallets, up to two batteries high, and then shrink wrap ready for transport. It is recommended that no more than two pallets of lead-acid batteries (approximately 56 batteries) are stored before collection for recycling.
WHS/OH&S and environmental	Motor oil contains materials and properties that can pose hazards to workers	<ul style="list-style-type: none"> Keep heat and potential ignition sources away from waste oils storage and handling areas. Ensure containers and drums containing waste oil are not cut with any heat producing equipment. Follow correct safe manual handling and management procedures when handling large/heavy drums or containers. Ensure both operators and others who carry out decanting wear appropriate PPE, including gloves and eye protection. Employ waste oil spill management plans and spill kits at sites to ensure spills are contained and cleaned up correctly. Ensure each facility has onsite staff trained in the use of suitable firefighting equipment.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- It is important to take the following precautions when transporting household hazardous wastes to a collection point:
 - Always handle hazardous wastes carefully and avoid direct contact. Wear protective gear/equipment where possible.
 - Prior to transporting, ensure lids are tightly fitted and hazardous wastes are securely packed in a non-returnable crate or box. Place leaking containers into a sealed container prior to transportation.
 - If possible, retain all labels or label chemicals clearly where known.
 - When transporting, put the crate or box on a tarpaulin in the boot of the car.
 - It is suggested that passengers are excluded from vehicles when transporting hazardous household waste to drop-off point.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Related guidelines

If household hazardous waste is present after a disaster, refer to Guideline C21: Chemical (hazardous) waste for more information and guidance.

C13: Vehicle waste

Vehicles may be damaged or destroyed during an event. Managing this waste properly can maximise reuse of this resource, reduce environmental impacts and improve amenity. South Australia has a well-established vehicle waste recycling industry for vehicles that are written-off or destroyed in disasters.

Sources of vehicle waste

Potential sources of vehicle waste are from damaged:

- roads, bridges or carpark or anywhere else where vehicles may be stored or in use at the time of the event
- water infrastructure and areas with water vessels.

What is vehicle waste?

Vehicle waste includes damaged or destroyed vehicles that are unsafe to operate as a result of a disaster event. Vehicle waste cannot be repaired onsite and/or safely driven to a location to be repaired. These vehicles will often not start due to water, fire or crush damage. Examples of vehicle waste include damaged cars, motorbikes, trucks and water vessels.

Potential end uses for the recovered waste

The priority is to repair and reuse the vehicle, if possible. However, if the vehicle is written-off and cannot be repaired, Table C13.1 refers to the recycling options.

Table C13.1: Potential end uses for recovered vehicle waste

Materials recovered	Potential uses
Vehicle that is written-off and can be used for spare parts	<ul style="list-style-type: none"> • Wrecking yard may salvage the parts and re-sell as spare vehicle parts.
Vehicle that is written-off and cannot be used for spare parts (scrap metal waste)	<ul style="list-style-type: none"> • Metal waste from vehicles can be traded as a commodity on the world market, which may be turned into: <ul style="list-style-type: none"> ○ valves and extrusions ○ automotive parts ○ building industry materials ○ batteries ○ cables.
Batteries, oils, petrol	<ul style="list-style-type: none"> • Likely to be disposed safely and not recycled.

Recycling and disposal options

Table C13.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C13.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Repair and reuse	All volumes	All events	Numerous repair shops in metro Adelaide	na	Will likely remain high	This is the priority if practical
Vehicle disassembled and parts at	As above	As above	Numerous wrecking yards in	May be required to remove	Demand for spare parts may be high	

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
wrecking yard			metro Adelaide, or vehicle transporters can be used	contaminants and vehicle components such as batteries, oils and petrol	after an event	
Scrap metal waste extracted from vehicle and recycled	As above	As above	Numerous scrap metal and vehicle recyclers/ receivers in metro Adelaide, or operators may come to the site	As above	May vary	Regional: mobile operators may come to the site to crush and haul the waste
Landfill	Vehicles and contents in vehicles (petrol, oil and batteries) are banned from landfills and as such, an exemption would need to be sought to dispose of this waste at landfill.					

Key considerations for managing this waste

Ideally, the vehicle will be repairable for reuse. Professional vehicle repairers will likely undertake this process and provide advice. Vehicle wrecking yard operators and scrap metal recyclers will advise on re-using parts or recycling the vehicle if it cannot be repaired. The process for managing the waste onsite and moving to an appropriate facility is covered in Table C13.3.

Table C13.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> First identify (if possible) the owner of the vehicle/ vessel, who is responsible for the waste. If the vehicle is not safe to drive, leave it onsite and seek professional advice as to the reparability of the vehicle. A mobile metal crusher and baler may be required at the site. If vehicle waste is on private property but is impeding recovery, authorities have the right to seize/manage this waste.
Collection and transport	<ul style="list-style-type: none"> If the vehicle can be repaired and is safe to drive, take it to a repair shop from the site. For vehicles that are not safe to drive, seek advice from an expert. If it is written-off and parts cannot be salvaged, have the vehicle collected (see Figure C13.1) from the site when safe to do so.
Interim storage	<ul style="list-style-type: none"> It may be necessary to establish interim storage for damaged vehicles. Follow the WHS/OH&S requirements in this guideline if interim storage is required.
Processing/ disposal	<ul style="list-style-type: none"> Vehicle waste has three end-use options: <ul style="list-style-type: none"> repair and reuse/sell send to a wrecker to salvage parts and re-sell, or remove parts, crush the remaining vehicle and sell the metal. This waste is banned from landfill and exemptions would be required if needing to dispose to landfill.



Figure C13.1: Vehicles used to collect damaged vehicles from site

Potential hazards and WHS/OH&S requirements

Table C13.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C13.4: Potential hazards and control measures

Hazard/hazard type	Description	Control measure
WHS/OH&S and environmental	Vehicle waste can produce liquid or gas fuel leakage, which can explode or cause a fire. The risk is higher after or during a fire.	<ul style="list-style-type: none"> Handling by a professional is required to ensure the vehicle is safe to move. If the event is a fire, care should be taken to ensure that the cars are cooled before attempting to recover of the metal and other waste materials.
Injury, WHS/OH&S	Driving damaged vehicles could increase the risk of a car accident.	<ul style="list-style-type: none"> Ensure that the vehicle is roadworthy and drivable before driving to a repair shop. If in doubt, have a repair person inspect the car first.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- Your vehicle may have been damaged in the event.
- Contact your insurer to discuss your options for reimbursement and appropriate course of action.
- If your vehicle is not a write-off, ensure it is safe and can be legally driven before driving from the area.
- If you are unsure whether the vehicle can be driven or repaired, the car needs to be inspected in its current location or towed to an automotive shop for evaluation.
- If driving the vehicle, ensure there are safe travel routes from the event area to your destination.
- If the vehicle is a write-off, it is recommended that
 - you do not drive the vehicle
 - you contact a tow to take it to a car yard/wrecker for individual parts to be re-sold, or a scrap metal recycling facility. If this is not possible, have it crushed and baled onsite by car recyclers who are appropriately trained and have the necessary equipment.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic meters) and destinations for recycling, storage or final disposal.

In addition, it is important to follow the vehicle insurance requirements as well as statutory requirements for writing off the vehicle.

Legislation and regulations to consider (WHS/OH&S and environmental)

Motor Vehicles Standards Act 1989

The Act requires all road vehicles, whether newly manufactured in Australia or imported as new or second-hand vehicles, to comply with the relevant Australian Design Rules. These Rules are national standards for vehicle safety, anti-theft and emissions at the time of manufacture and supply to the Australian market. See infrastructure.gov.au/roads/motor/design for more information.

Motor Vehicles Regulations 2010

The regulations require certain entities to provide information about written-off vehicles to the Registrar. The entities include:

- insurers
- vehicle dealers (including auction houses)
- vehicle wreckers
- any other person responsible for a notifiable vehicle (for example, the owner of a vehicle).

Further information and resources

SA Government

Guidelines for the South Australian Written-Off Vehicle Register, available from sa.gov.au/_data/assets/pdf_file/0013/11236/MR78-Guidelines-for-the-SA-Written-Off-Vehicle-Register.pdf

The guidelines explain when a vehicle is a write-off, and what type of write-off it is.

C14: Green (vegetative) waste

A disaster can lead to large volumes of green waste, which is the vegetative portion of the waste stream such as trees (including ornamental and fruit) and shrubs damaged in the event. It does not include food (see Guideline C16: Food waste for information on this stream) and may be found on private, commercial or municipal properties or in transport vehicles. If possible, green (vegetative) waste will be composted, chipped or mulched, as it is a valuable recycled product.



Green waste (photo by Rawtec)

Sources of green (vegetative) waste

Potential sources of green (vegetative) waste include:

- trees, shrubs, garden waste at factories, stores, municipal facilities, houses or commercial premises
- plant or wood transport vehicles
- distribution centres.

What is green (vegetative) waste?

The SA EPA defines green waste as 'the vegetative portion of the waste stream arising from various sources including waste from domestic and commercial premises and municipal operations'.

It does not contain listed waste, radioactive waste, hazardous waste, inorganic waste (e.g. plastics and metal), or food waste. Examples of green (vegetative) waste include plants, shrubs, wood, clippings and branches that are free of plastic and other contaminants.

Aspects of green (vegetative) waste is also covered in Guideline C19: Agricultural (including greenhouse) waste.

Potential end uses for the recovered waste

Table C14.1 lists typical end uses for recovered green (vegetative) waste.

Table C14.1: Typical end uses for recovered green (vegetative) waste materials

Materials recovered	Potential uses
Green waste (trees, shrubs, timber etc.)	<ul style="list-style-type: none"> • Chipped or mulched. • Composted (with other materials such as food waste) *. • Timber may be able to be reused. • Some property owners may wish to break down the material and spread it on their property. • Used for energy to waste, for example, timber may be used to make processed engineered fuel that is burnt for energy. In South Australia, timber has also been used as an energy source in paddle steamers after an event.

*A licensed composting facility will have a range of control measures to effectively handle, compost, mulch or chip and then re-sell the green (vegetative) waste. The composting process should be controlled, and the treatment should significantly reduce plant and animal pathogens. If composting onsite, it is recommended that an experienced composter provides advice.

Recycling and disposal options

Table C14.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C14.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Chipped or mulched	All volumes	Flood affected waste or green waste from a plant pest/disease quarantine zone (e.g. fruit fly) are not accepted as may carry disease	Sufficient facilities and mobile equipment across South Australia to use local options	Cannot accept other waste	May vary	
Compost (onsite or at a compost facility)	All volumes if offsite, onsite must be less than 200 tonnes	As above	Sites north and south of Adelaide potentially available	< 0.5% non-organic material, 0% listed or hazardous waste	May vary	Regional: potential to use large-scale compost facility in the state's south-east
Spread on property	Low volumes	As above	Dependent on property	No contamination	na	Be careful of potential to create fire hazard
Send to energy from waste plant or use as another energy means (e.g. paddle steamers)	All volumes	All events	One alternative fuels plant north of Adelaide, other options for energy recovery will depend on	Preference for dry material (e.g. logs)	Demand will remain high if energy from waste plant is in operation and other energy source	

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
			what is available in the region		demands may vary	
Landfill	While green (vegetative) waste is not banned from landfill and there is significant space in landfills servicing metro Adelaide, the waste can be stockpiled for extended periods (provided it contains no food) and landfill should be avoided if possible.					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C14.3.

Table C14.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> When managing the material onsite, wear appropriate PPE and consider using vehicles as shown in Figure C14.1. Pile the waste onsite, separating out contaminants where safe and practical.
Collection and transport	<ul style="list-style-type: none"> Waste should be fully enclosed when transporting to prevent leakage or items blowing off piles during transport.
Interim storage	<ul style="list-style-type: none"> Interim storage facilities may be used for this waste provided stockpiles are well-managed and they contain no food waste or come from a plant pest/disease quarantine zone (e.g. fruit fly).
Processing/ Disposal	<ul style="list-style-type: none"> Ideally, waste will be taken to a local chipping/mulching facility, or a composting facility where it will be turned into a compost or mulch that can be sold. If impractical to compost or mulch, consider spreading it on-property, using it for energy or sending to landfill.



Bobcat



Tipper

Figure C14.1: Potential supporting equipment to help move green (vegetative) waste

Potential hazards and WHS/OH&S requirements

Table C14.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C14.4: Potential hazards and control measures

Hazard/hazard type	Description	Control measure
Attracting vermin, WHS/OH&S	Green (vegetative) waste can become a home for vermin, snakes and other wildlife. These insects and animals have the potential to bite, scratch or sting. There is also a risk of a manual handling or needle stick injury.	Care must be taken when handling the waste to minimise risk. Ensure hands and feet are not placed in holes or other areas that cannot be seen. Use gloves when moving the waste and if necessary, the waste can be moved by bobcats and tippers (see Figure C14.1). Using machinery will minimise the chance of a manual handling or needle injury or receiving a bite.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- When moving tree branches, leaves and plants, wear eye protection, closed shoes and strong rubber gloves to reduce the chance of cuts.
- Contact Primary Industries and Regions South Australia (PIRSA) to find out how to treat and dispose of green waste from a biosecurity quarantine zone or properties.

Legislation and regulations to consider (WHS/OH&S and environmental)

Composting

If composting less than 200 tonnes of green (vegetative) waste, use the SA EPA's environmental assessment guideline, *Assessment of composting works* (updated September 2017) for composting guidance. Available from epa.sa.gov.au/files/47777_ea_composting.pdf.

If more than 200 tonnes, alternative licensing and processing is required.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

SA EPA

Standard for the production and use of Waste Derived Soil Enhancer (2010), available from epa.sa.gov.au/files/4771360_standard_wdse.pdf

C15: Soil and sediment waste

Disasters may result in significant volumes of soil and sediment waste being displaced or unearthed. This waste stream is ideally used on the land or as a road base.

Sources of soil and sediment waste

Potential sources of soil and sediment waste are from damaged:

- roads and bridges
- paddocks and rural properties
- embankment erosion
- liquefaction (earthquake).

What is soil and sediment waste?

There are different classifications of soil and sediment waste according to the level of contamination, including:

- waste derived fill
- intermediate waste soil
- soil that is more contaminated than intermediate waste soil.

See *Standard for the Production and Use of Waste Derived Fill* (2013) for SA EPA definitions.

Potential end uses for the recovered waste

Table C15.1 lists typical end uses for recovered soil and sediment waste. Recovering and recycling these materials is likely to be useful following a disaster, with source products being recycled into items such as road base. Determining whether the waste contains contamination (which includes biosecurity hazards that may affect commercial horticulture production) requires an independent environmental auditor.²

For further guidance on the potential uses listed in Table C15.1, refer to SA EPA's *Standard for the production and use of Waste Derived Fill* (see *Further information and resources* at the end of this guideline).

Table C15.1: Typical end uses for recovered soil and sediment waste materials

Materials recovered	Potential uses
Waste derived fill (no contamination)	Use onsite for land reclamation or export to approved land reclamation fill sites: <ul style="list-style-type: none"> • road base • batters/ bunds • compost (bulking agent) • quarry rehabilitation material.
Intermediate (i.e. a proportion with contamination) waste soils	Remediation or use onsite for land reclamation or export to approved land reclamation fill sites. Note that classification of soil needs approval from SA EPA via an EPA-approved auditor for use of the materials within approved site reclamation projects.

² Sourced from Appendix A of the SA EPA Guidelines for environmental management of onsite remediation (2008), available at epa.sa.gov.au/files/4771274_guide_remediation.pdf

Recycling and disposal options

Table C15.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C15.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Reuse (e.g. clean fill and intermediate fill used for road base)	Higher volumes	Floodwater or soil/sediment from biosecurity quarantine areas /properties may carry disease and prevent this option		Site auditor to determine contamination level and best approach to manage	Likely to be high after an event	Determined by SA EPA conditions of licence, waste derived fill Standards and PIRSA
Spread back onsite (clean fill only)	Lower volumes	As above	Dependent onsite	As above	Dependent onsite	As above
Land reclamation (clean fill and potentially intermediate waste soil)		As above	Many land reclamation sites in outer metro Adelaide areas	As above	May vary	As above
Landfill (contaminated soil)	The site auditor would need to determine if landfill disposal is most appropriate given the potential opportunities for beneficial reuse. Contaminated soil requires disposal to an appropriately lined landfill. Hazardous fill may require remediation or taking to an appropriate landfill interstate (for contaminated soil).					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C15.3.

Table C15.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Push the material to the side while cleaning a site but take care as the soil may be contaminated. Have the stockpile tested by an EPA-approved auditor. Consult PIRSA to confirm quarantine zone/property location.
Collection and transport	<ul style="list-style-type: none"> Audit results will indicate where the waste can be transported. Allow sufficient room for the waste collector to pick up the waste.
Interim storage	<ul style="list-style-type: none"> Waste may be temporarily stored, subject to not having contaminants and aligning with the stockpiling requirements in Table C15.4.
Processing/ disposal	<ul style="list-style-type: none"> Several potential destinations exist for this waste depending on the audit results, level of contamination and available recycling options.

Note: Irrespective of whether the soil/sediment has come from a biosecurity quarantine zone/property or not, contractors used to collect and transport this product from agricultural properties/regions need to be conscious of the risk of spreading endemic diseases and weeds between properties. For this reason, vehicles may need to be decontaminated. Advice on this can be accessed from PIRSA.

Potential hazards and WHS/OH&S requirements

Table C15.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C15.4: Potential hazards and control measures

Hazard type	Description	Control measure
WHS/OH&S	This waste may contain contaminants including heavy metals, carcinogens and asbestos	Have the soil appropriately sampled, tested and analysed by an approved independent SA EPA auditor.
WHS/OH&S	Stockpiling can present hazards such as dust and injury from the stockpile collapsing	Stockpiles should where possible be kept covered or damp to avoid dust emanating from the stockpile. The SA EPA generally requires a maximum stockpile height in the range of 3 to 5 metres for material management or resource recovery activities. These stockpile height limits are largely based on stockpile manageability, dust impacts, stability, potential impact on underlying infrastructure and fire risk. The height of stockpiles should generally be lower than surrounding structures.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If this event has led to large piles of soil or dirt, contact the SA EPA to have it tested prior to trying to move or manage this yourself.
- The SA EPA will advise on the best approach to take after the soil has been sampled.
- Contact Primary Industries and Regions South Australia (PIRSA) on how to decontaminate vehicles entering multiple properties in agricultural areas to reduce the risk of endemic disease and to confirm if any soil/sediment may have come from a biosecurity quarantine zone/property.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

A remediation management plan is required if volumes are significant (usually >100 tonnes). Advice should be sought from the SA EPA and all relevant sampling and reporting documentation should be logged and managed in accordance with the relevant legislation.

Legislation and regulations to consider (WHS/OH&S and environmental)

Environment Protection (Water Quality) Policy 2015

This policy is relevant to this guideline and should be considered when assessing the suitability of using soil and sediment waste (waste fill) as it relates to protection of waters.

Guideline on the Investigation Levels for Soil and Groundwater (Schedule B1) (April 2011)

Provides guidance on appropriate human and ecological exposure levels. This schedule is part of the National Environmental Protection (Assessment of Site Contamination) Measure and is available from nepc.gov.au/system/files/resources/93ae0e77-e697-e494-656f-afaaf9fb4277/files/schedule-b1-guideline-investigation-levels-soil-and-groundwater-sep10.pdf

Further information and resources

SA EPA

- For the current criteria for classifying intermediate and low-level contaminated soils as they appear on SA EPA licences, see *Current criteria for the classification of waste—including Industrial and Commercial Waste (Listed) and Waste Soil* (2010) (EPA 889/10), available from epa.sa.gov.au/files/4771346_current_waste_criteria.pdf
- For advice on the environmental management of onsite (site contamination) remediation activities to minimise any actual or potential adverse impacts and to provide adequate protection to the community, see *EPA Guidelines for environmental management of onsite remediation* (2008) (EPA 623/06), available from epa.sa.gov.au/files/4771274_guide_remediation.pdf
- *Standard for the production and use of Waste Derived Fill* (2013), available from epa.sa.gov.au/files/4771359_standard_wdf.pdf

C16: Food waste

Spoiled or damaged food may result from an event due to power outages or damage to equipment or transport vehicles. The ideal way to manage this waste stream is by composting at a commercial composter.

Sources of food waste

Potential sources of food waste are from:

- damaged packing sheds or cold stores
- refrigerators and freezers at residential and commercial properties used to store food, where loss of power has resulted in spoiled food
- food transport vehicles
- packaged or containerised food in supermarkets, shops, markets etc. that is no longer edible as it has been left too long.

What is food waste?

Food waste fits under putrescible waste in the SA EPA definition, which is the component of the waste stream liable to become putrid. Food waste may be any food item that is now inedible.

Potential end uses for the recovered waste

Table C16.1 lists typical end uses for recovered food waste. If composting onsite, it is recommended that expert advice is provided by an experienced composter.

Table C16.1: Typical end uses for recovered food waste materials

Materials recovered	Potential uses
Food waste (free of plastics)	Compost (offsite or onsite if appropriate level of expertise)

Recycling and disposal options

Table C16.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C16.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Compost (onsite or compost facility)	All volumes if offsite, onsite must be less than 200 tonnes.	A fire may have blended or melted packaged materials to food which would make it unsuitable for composting. Food that has sat in floodwater should also	Sites north and south of Adelaide potentially available	< 0.5% non-organic material, 0% listed or hazardous waste	May vary	Regional: potential to use large-scale compost facility in the state's south-east.

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
		not be recycled.				
Landfill	If access to composting facilities is limited or the food is contaminated or cannot be safely handled, landfill may be the best option for this waste stream, particularly given unmonitored stockpiling for extended periods can be dangerous					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C16.3. Managing food waste requires proper cleaning of fridges and freezers. There may be resources to manage the appropriate and professional clean-out of commercial and some residential fridges and freezers, but in some cases these items will need to be disposed of together with the food inside.

Food waste, once rotten, is generally not safe for the public to handle, so it needs to be collected/handled by professionals. In Hurricane Katrina for example, duct-taped fridges were placed on the kerbside for collection.

Table C16.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Consider hazards and WHS/OH&S requirements in Table C16.4. To manage the material onsite, wear appropriate PPE. Pile the food waste and separate it from contaminants such as packaging where possible.
Collection and transport	<ul style="list-style-type: none"> As soon as practical, move the waste offsite or to an appropriate onsite/nearby composting location and consider using vehicle shown in Figure C16.1. Fully enclose the waste when transporting to prevent any leakage or items blowing off piles during transport.
Interim storage	<ul style="list-style-type: none"> Interim storage is not an option for this waste unless it is taken through the usual composting process. Seek advice from a composting expert on the requirements for composting.
Processing/disposal	<ul style="list-style-type: none"> Take the waste to a composting facility. South Australian large-scale composting facilities are located within 50 km north and south of Adelaide, and in the south-east. Discard food waste mixed with other materials such as packaging and plastics to landfill.



Rear loader vehicle

Figure C16.1: Potential supporting equipment to help move food waste

Potential hazards and WHS/OH&S requirements

Table C16.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C16.4: Potential hazards and control measures

Hazard type	Description	Control measure
WHS/OH&S	Damage to the eyes or skin from handling rotten food waste	When handling rotten food waste, wear appropriate PPE such as: <ul style="list-style-type: none"> gloves glasses waterproof apron or similar.
Spread of disease or pathogens, WHS/OH&S	Poorly managed stockpiles or composted waste can lead to rotting and the spread of dangerous pathogens (see Table C16.5)	Follow the following general safety precautions to avoid transmission of dangerous fungi, bacteria and other pathogens found in compost or rotting food: <ul style="list-style-type: none"> Always wear dry, breathable gloves to avoid direct contact with the skin, and to protect yourself from injury while using gardening tools and implements. Wear protective footwear that covers your skin adequately to avoid direct contact with rotting vegetation and compost, and do not wear them anywhere except outdoors. When collecting and removing rotting vegetation, always wear a nose and mouth guard or dust mask (e.g. a P3 mask) to avoid inhaling the various spores that can become airborne. Wash your hands after dealing with rotting food (while this may sound obvious, many forget the potential dangers from poisoning). If you develop a severe cough or infection of the skin (especially if there is an open sore or puncture wound), seek medical attention immediately, as you may require antibiotics or a tetanus shot.

Some of the more common physical ailments that can result from unprotected contact with compost are listed in Table C16.5.

Table C16.5: Potential ailments from unprotected contact with compost

Physical ailment	Description	Risk/effect
Aspergillosis	A fungal infection of the lungs caused by inhaling a fungus commonly found in rotting plant matter.	While normally not life-threatening, aspergillosis can be extremely dangerous if enough spores are inhaled. For example, the disease killed a 47-year-old British man after he was engulfed in clouds of dust from the compost he had intended to use in his garden.
Farmer's Lung	Symptoms resemble pneumonia and may result from respiratory exposure to certain fungal and bacterial pathogens present in rotting organic materials such as mushrooms, hay and sugar cane.	Beware of dusty white patches, as they are a sign that dangerous spores are present. Farmer's Lung can usually be treated with antibiotics.
Hepatitis A, B and C	Viral infections that cause inflammation of the liver*. Transmission of these infections may be through contact with compost and rotting food. Symptoms include fever, malaise, abdominal pain, weakness, nausea and vomiting, fatigue, dark urine, pale stools and jaundice.	If exposed, see a GP or local health centre as soon as possible to discuss the options.
Histoplasmosis	Caused by a soil-based fungus that grows in guano and bird droppings.	Healthy immune systems can usually fight off histoplasmosis, although infections can become serious if large amounts of the toxin are inhaled, or if the infected person has a weakened immune system.
Legionnaire's Disease	A respiratory infection caused by inhaling <i>Legionella pneumophila</i> , which is found in potting soil and compost.	The infection can be very serious, often leading to hospitalisation and sometimes death. Person-to-person transmission has not been documented.
Paronychia	A local infection that occurs in the tissue around the fingernails and toenails.	Prolonged moisture and the abrasive effects of soil can create openings in the skin that allow the infection to occur, producing pain and throbbing.
Tetanus	A disease of the central nervous system caused by bacteria that is very common in soil.	While even a minor cut can allow the bacteria to enter the bloodstream, vaccinations for tetanus are generally easy to access. Immediate and good wound care can also help prevent infection.

* See *Hepatitis A for health professionals*, available from SA Health at sahealth.sa.gov.au/wps/wcm/connect/public+content/sa+health+internet/-clinical+resources/clinical+topics/infectious+disease+control/hepatitis+a+for+health+professionals.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If individuals choose to compost food waste, it is important to note that rotting and composted materials can harbour bugs and diseases unless they have been composted properly. Consider seeking advice from a professional composter or ideally, send this waste to a composting facility as soon as possible. If a composter cannot be accessed, discard the food waste with other general waste or have it managed by a professional.
- It is advised that commercial cleaners are used to clean out commercial fridges.
- Rotten food is generally not safe to handle, so it needs to be collected/ handled by professionals. This may include taping up the fridge containing rotten food and having the entire fridge collected.
- When moving or touching food waste, wear strong rubber gloves to reduce the chance of cuts, as well as closed shoes to avoid direct contact with rotting food and compost.
- Wash your hands after dealing with rotting food.
- If you develop a severe cough or infection of the skin (especially if there is an open sore or puncture wound), seek medical attention as soon as possible.
- Keep pets and animals away from food waste.
- Do not consume the food waste.

Legislation and regulations to consider (WHS/OH&S and environmental)

Composting

If composting less than 200 tonnes of food waste, use the SA EPA's environmental assessment guideline, *Assessment of composting works* (updated September 2017) for composting guidance. Available from epa.sa.gov.au/files/47777_ea_composting.pdf.

If more than 200 tonnes, alternative licensing and processing is required.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

C17: Copper chrome arsenate post waste

Copper chrome arsenate (CCA) posts are treated timber posts often found at wineries and farms. After an event, damaged CCA posts require special treatment and disposal to a licensed landfill due to the chemicals used in their production.

Sources of CCA post waste

Potential sources of CCA post waste are from damaged:

- agricultural farms and orchards
- wineries (posts used in vineyards).

What is CCA post waste?

The SA EPA defines CCA posts as ‘timber treated with copper chrome arsenate (or CCA; commonly known as ‘permapipe’)

CCA posts are recognisable by a greenish tinge on the raw timber, and are commonly used in:

- viticulture as posts to support the trellis wire
- pergolas and decking
- pallets and skids.

Potential end uses for the recovered waste

CCA post waste cannot be recycled and at present an economically and environmentally sound disposal technology for this waste timber is not available in South Australia. This waste cannot be burnt or chipped, and the only disposal technique is sending it to a suitably engineered and licensed landfill.

Key considerations for managing this waste

The process for managing CCA post waste onsite and moving to an appropriate facility is covered in Table C17.1.

Table C17.1: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Pack the CCA waste onto non-CCA pallets, into dedicated waste bins or in readily accessible stockpiles. A shovel and large crowbar may be sufficient to move the waste, although it may be necessary to use a tractor with appropriate post removal equipment.
Collection and transport	<ul style="list-style-type: none"> Items can be transported by smaller vehicles (e.g. a ute or car with trailer) or larger trucks.
Interim storage	<ul style="list-style-type: none"> If necessary to temporarily store CCA post waste, it needs to be managed on a site-specific basis. The SA EPA recommends that sites develop their own waste management plans (see below). See the SA EPA's waste management guideline on CCA timber waste (listed under <i>Further information and resources</i>).
Processing/ disposal	This waste cannot be recycled and must be taken to a suitably engineered and licensed landfill.

Other considerations for managing this waste

Temporary stockpiling of CCA post waste should be done on non-CCA pallets or dedicated waste bins. Cover the CCA posts (above and below) with strong plastic or tarpaulins to reduce the potential for contaminated leachate production.

For interim storage of this waste, complete a site waste management plan for CCA posts that addresses the following:

- ensure that CCA post waste is sorted and stored separately from other material
- keep the CCA post waste as dry as possible
- store larger quantities of CCA post waste in appropriately constructed roofed and bunded structures (see SA EPA's *Bunding and spill management* guideline under *Further information and Resources*)
- elevate stockpiles above the ground surface, noting that storing small quantities on high ground may be an acceptable interim measure in some environments.

Refer to SA EPA's guide to CCA timber waste listed under *Further information and Resources*.

Potential hazards and WHS/OH&S requirements

Potential hazards and WHS/OH&S requirements and control measures are highlighted in Table C17.2.

Table C17.2: Potential hazards and control measures

Hazard type	Description	Control measure
WHS/OH&S, environmental	Large quantities of CCA post waste in stockpiles have the potential to release toxic quantities of contaminated leachate into the ground.	See the 'other considerations for managing this waste' above as well as SA EPA's waste management guideline on CCA timber waste (listed under <i>Further information and resources</i>).
WHS/OH&S, environmental	During combustion, CCA post waste releases toxic gases and the residual ash would be toxic containing heavy metals.	Never burn CCA post waste. If CCA post waste is on fire due to an uncontrolled event, do not breathe in the emissions. Stay upwind from the fire, and if required, douse the CCA post waste in water until flames and smoke are extinguished. If available, wear breathing apparatus.
WHS/OH&S	Manual handling of product leads to injury.	Use supportive equipment and machinery to remove and transport the material, such as a shovel, large crowbar or a tractor with post removal equipment attached.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- Your property may have damaged permapine or CCA posts or pallets due to the event that need to be discarded.
- These are stained timber posts and may have a green tinge.
- Do not under any circumstances try to burn, chip or destroy by burning the CCA post waste materials, as they contain toxic chemicals.
- If you need to temporarily stockpile CCA posts, use non-CCA pallets or dedicated waste bins. Cover the CCA posts (above and below) with either strong plastic or tarpaulins to reduce the potential for contaminated leachate production.
- If the CCA posts are on fire due to the event, stay upwind and wear breathing apparatus when dousing the posts to put out the fire.
- Contact the EPA for further information.

Legislation and regulations to consider (WHS/OH&S and environmental)

Environment Protection (Air Quality) Policy 2016

Under this policy, a person must not cause or permit the burning of copper chromium arsenate or other timber preservation substances by fire.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

SA EPA

Copper chromated arsenate (CCA) timber waste—storage and management (2016), available from epa.sa.gov.au/files/7565_guide_cca.pdf

Liquid storage guideline, *Bunding and spill management* (2016), available from epa.sa.gov.au/pdfs/guide_bunding.pdf

C18: Unwanted donated goods

After an event, there may be an influx of donated goods from other areas or states into the affected area. Many of these goods may become unwanted or unused and eventually turn into a waste stream. This needs to be managed appropriately.

Sources of unwanted donated goods

Potential sources of unwanted donated goods waste are:

- donated goods such as tables, chairs, teddy bears, clothing, pet food and other animal supplies
- unused emergency supplies, such as food and water bottles.

Waste prevention

To help prevent donations of unwanted goods, inform the public about what items are needed and those that are not.

Related guidelines

Unwanted donated goods should preferably be used or reused before disposal. Unwanted donated goods include multiple alternative waste streams and the relevant waste stream guideline should be referred to for further information. This may include:

- Guideline C10: Hard waste
- Guideline C16: Food waste

C19: Agricultural (including greenhouse) waste

Events can impact agricultural businesses and land, leading to destroyed greenhouses, crops and other items. It can be difficult to separate these materials and work out the risk of disease. Where waste is highly mixed or contaminated, the most practical option is sending waste to landfill. Some aspects of this guideline may also apply to disposing of waste generated as a result of an exotic pest or disease incident affecting plants.



Agricultural waste

Sources of agriculture organics waste and greenhouse waste

Potential sources of agriculture organics waste and greenhouse waste are from damaged:

- broadacre farms, which may include:
 - vegetable and fruit crops (predominately from flood damage)
 - forestry (predominately from bushfires)
 - viticulture (predominately from bushfires and floods)
- greenhouses, which may include:
 - plastic sheeting
 - irrigation pipes
 - immature plants and fruit/vegetables
 - growing media (hydroponics)
 - chemical drums.³

What is agriculture (including greenhouse) waste?

This waste stream is defined as the destroyed or semi-destroyed organic fraction (such as broadacre crops) from a disaster event, and the waste generated from or within greenhouses.

Agriculture waste does not include treated timbers, copper chrome arsenic (CCA) posts or animal carcasses. This guideline should be read in conjunction with Guidelines C14: Green (vegetative) waste, C16: Food waste and C20: Animal carcass waste.

³ See Guideline C22: Empty chemical drums for information on this waste stream.

Potential end uses for the recovered waste

Table C19.1 lists typical end uses for agricultural waste. Separating these materials may be difficult and determining disease risk challenging, resulting in most of this waste requiring landfill disposal.

Table C19.1: Typical end uses for agricultural (including greenhouse) waste materials

Materials recovered	Potential uses
Vegetative waste	<ul style="list-style-type: none"> Refer to Guideline C14: Green (vegetative) waste
Vegetable waste in greenhouses	<ul style="list-style-type: none"> Compost (free of twine) Mulch Wood chip Onsite spreading of waste material (small volumes) Energy from waste
Horticulture waste (including greenhouse) where a biosecurity risk exists	<ul style="list-style-type: none"> Where technology exists and if appropriate or accessible, incineration or autoclaving is also an option Deep burial on or offsite
Trees and shrubs	<ul style="list-style-type: none"> Leaf mulch Wood chip Compost Onsite spreading of waste material (small volumes)
Crops and food waste (free of plastics)	<ul style="list-style-type: none"> Compost offsite or onsite (if landowner has appropriate level of expertise) Crops may be spread onsite (small volumes)
Plastics from greenhouses	<ul style="list-style-type: none"> Plastic granulating – if single source plastic
Irrigation tubing	<ul style="list-style-type: none"> Plastic granulating – if single source plastic
Greenhouse metal frames	<ul style="list-style-type: none"> Salvaged and sold to the metal scrap industry
Broadacre plants (partially destroyed and no endemic biosecurity risk)	<ul style="list-style-type: none"> Depending on the issue, broadacre plant destruction can occur, which involves ploughing the plants back into the soil

Recycling and disposal options

Table C19.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C19.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Compost (onsite or at a compost facility)	Food and vegetative waste	Flood or biosecurity affected waste not accepted as may carry disease	Sites north and south of Adelaide potentially available	<0.5% non-organic material, 0% listed or hazardous waste	May vary	Regional: potential to use large-scale compost facility in the state's south-east
Chipped or mulched	Vegetative waste, all volumes if offsite, onsite must be less than 200 tonnes	As above	Sufficient facilities and mobile equipment across South Australia to use local options	Cannot accept other waste	May vary	

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Spread on property	Green waste, low volumes	As above	Dependent on property	No contamination	NA	Be careful of potential to create fire hazard
Plastic granulation	Greenhouse plastic, all volumes	If left in floodwater and mixed with other waste, do not recycle	May need to be exported interstate or overseas due to limited plastic recyclers in South Australia	No contamination	May vary	
Metal recycling, aggregated as scrap metal and sold to make other metal products	Metal waste, all volumes	All events	Numerous scrap metal recyclers/ receivers in metro Adelaide, or operators may come to the site	0% hazardous or listed waste, no oils	May vary	Regional: mobile equipment may be used to shred metals and bulk transport to metro processors
Landfill	If the waste is mixed and cannot be easily separated, or the waste has been through a flood and is wet or potentially carrying disease, the practical disposal option for this waste is to landfill.					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C19.3.

Table C19.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Where possible, separate items into different waste streams (e.g. food, plastic, metal etc.), and place these in separate piles (see Figure C19.1 for potential equipment and machinery to use). Be particularly careful to avoid cross contamination of green organics with twine and irrigation equipment, and where possible, keep irrigation equipment separate and waste stockpiled for collection and recycling.
Collection and transport	<ul style="list-style-type: none"> Ensure clear access pathways to waste on the property. Stockpile these wastes as close as possible to a boundary access point for collection, while not blocking access and egress to and from public roads – this will reduce the possibility of cross contamination of sites, which is a biosecurity issue. Clearly mark stockpiles and access areas with a flag or marker hammered into the ground that is easily recognisable for collection. Where possible, take GPS coordinates and give this information to the waste collection company or companies. The waste trucks will then arrive onsite and collect the waste using their equipment. Waste should be fully enclosed to prevent any leakage or items blowing off piles during transport. It may be beneficial to speak to the waste removalist to outline the requirements to remove the waste, including plant and equipment that may be needed to move waste to a stockpile, accessibility requirements to accommodate the various waste vehicles used

Process	Key considerations
	to collect the waste (e.g. semitrailers or tandem trucks) and decontamination requirements to prevent spread of disease between properties.
Interim storage	<ul style="list-style-type: none"> Interim storage of the organics component is not an option for this waste unless it is taken through the usual composting process. It may be appropriate to stockpile the non-organic fraction of the waste at an interim storage location.
Processing/ disposal	<ul style="list-style-type: none"> Seek advice from a composting expert on the requirements for composting the organic fraction of the waste (must also take into consideration efficacy of this process if a biosecurity pest/disease is present), and advice from waste collection contractors is recommended. In most cases, this waste will be sent to landfill as it will be highly mixed.



Bobcat



Tipper

Figure C19.1: Potential supporting equipment to help move agriculture organics waste and greenhouse waste

Potential hazards and WHS/OH&S requirements

Table C19.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C19.4: Potential hazards and control measures

Hazard/hazard type	Description	Control measure
Attraction of vermin, WHS/OH&S	Waste can become home to vermin, snakes and other wildlife. These insects and animals have the potential to bite, scratch or sting.	Care must be taken when handling the waste to minimise risk. Ensure that hands and feet are not placed in holes or other areas that cannot be seen. Use gloves when moving the waste as well as a P3 dust mask. If necessary, the waste can be moved by bobcats and tippers (see Figure C19.1). Using machinery will minimise the risk of being bitten, scratched or stung.
Biosecurity risk, WHS/OH&S	There is a risk of biosecurity issues such as diseased plants. <i>See Further information and resources</i> in this guideline for biosecurity contact details.	This waste is assumed not to have a biosecurity issue. If this is suspected, contact the SA EPA or PIRSA. For extra precaution, clean all boots and shoes that touch the ground in or near agricultural waste. Decontaminate any other equipment that touches the agricultural waste. Speak to PIRSA for further information. Where possible, leave vehicles at the boundary or in designated parking areas.
Spread of disease or pathogens from poor	Poorly managed stockpiles or composted organics waste can lead to	PIRSA is responsible for responding to exotic pest or disease outbreak. They have measures in place to minimise risk and check waste over time to ensure known biosecurity risks have been controlled. It is

management of stockpiles and compost, WHS/OH&S	the potential for further disease outbreak.	important to follow the advice of PIRSA and work with them to help reduce the risk.
--	---	---

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- Personal protective equipment (PPE) and equipment used to move agricultural waste should be decontaminated before being used on another property. Advice on decontamination can be sourced from Primary Industries and Regions SA (PIRSA).
- Rotting food and compost piles can harbour bugs and diseases unless they have been composted properly. As such, onsite composting should be done by someone with the appropriate level of expertise and experience in composting.
- Consider seeking advice from a professional composter or sending this waste to a composting facility rather than managing it onsite.
- Do not place hands or feet into waste piles as animals such as snakes may be lying underneath or within the waste.
- Wash your hands after handling rotting vegetation.
- If you develop a severe cough or infection of the skin (especially if there is an open sore or puncture wound), seek medical attention as soon as possible.
- When moving or touching vegetative waste, wear strong rubber gloves to reduce the chance of cuts, as well as closed shoes to avoid direct contact with rotting vegetation and compost.
- Ensure that shoes and clothing that come into contact with the waste are washed thoroughly and not brought inside.

Legislation and regulations to consider (WHS/OH&S and environmental)

Composting

If composting less than 200 tonnes of food waste, use the SA EPA's environmental assessment guideline, *Assessment of composting works* (updated September 2017) for composting guidance. Available from epa.sa.gov.au/files/47777_ea_composting.pdf.

If more than 200 tonnes, alternative licensing and processing is required.

Plant Health Act 2009

Provides for the protection of plants from pests, the regulation of the movement of plants into, within and out of the State, and the control, destruction and suppression of pests.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

Australian Interstate Quarantine

If cross-border activity is a part of the clean-up, the Australian Interstate Quarantine website details what items can and cannot be moved from state to state. See interstatequarantine.org.au/travellers/ and interstatequarantine.org.au/travellers-map-landing

Biosecurity legislation

A full list of the primary legislation, associated Acts and supporting delegated legislation is available from agriculture.gov.au/biosecurity/legislation/new-biosecurity-legislation/understand-biosecurity-act/bio-legislation

Biosecurity SA, Primary Industries and Regions SA (PIRSA)

PIRSA's Biosecurity SA division manages the risks to South Australia posed by animal and plant pests and diseases, food borne illnesses and misuse of rural chemicals. See pir.sa.gov.au/biosecurity

Related guidelines

Review relevant waste guidelines in this document, which may include:

- C14: Green (vegetative) waste
- C15: Soil and sediment waste
- C16: Food waste
- C17: CCA post waste
- C20: Animal carcass waste
- C21: Chemical (hazardous) waste
- C22: Empty chemical drums.

C20: Animal carcass waste

Natural disasters such as fire or flood may lead to many deceased animals, particularly livestock, pets and animals in the wild.

In general terms the responsibility for managing this waste lies with the animal owner. Where the animal is not 'owned' or the owner is affected by the disaster, the landowner or person in charge of the animals at the time of the event may be responsible.

There are numerous methods for disposing of animal carcasses. The ideal disposal method can be determined based on the type of event and the scale and volume of animal carcass waste, with support from PIRSA, the SA EPA and the Department for Environment and Water (DEW).

Although this guideline is for use for responses other than exotic disease control, many of the same definitions and end uses equally apply for a biosecurity incident that results in animal carcasses.

Sources of animal carcass waste

Potential sources of animal carcass waste are from:

- agricultural farms
- abattoirs
- saleyards and showgrounds
- business premises that hold animals (e.g. veterinary clinics, pet boarding facilities, research laboratories)
- live export docks/depots
- livestock transport vehicles
- wildlife sanctuaries and zoos
- animals in the wild (e.g. feral species and wildlife)
- private homes
- fish deaths.

What is animal carcass waste?

Animal carcass waste is the waste arising from the whole or any part of a deceased animal. This may include:

- livestock
- companion animals/pets
- assistance animals
- animals used for work, sport, recreation, research and display
- animals from the wild
- aquatic species (farmed or wild).

Animal carcass waste does not include animals disposed of in the course of veterinary or medical practice or research – this waste falls under medical and pharmaceutical waste (see Guidelines C24: Medical and pharmaceutical waste for more information).

Potential end uses for the recovered waste

Table C20.1 lists potential end uses for recovered animal carcass waste and key considerations for each option, which may help with decision-making regarding what can be done with animal carcasses after an event.

PIRSA and the SA EPA are to be consulted on the advice to provide to the community on the best disposal/recycling options applicable for the event. Roles and responsibilities for carcass disposal after emergency incidents in South Australia are defined in the Carcass Disposal Arrangements for Emergencies in South Australia. The AUSVETPLAN Disposal Manual 2015 is a good reference for carcass disposal requirements in a large event or where animal or zoonotic diseases risks are present. Both documents are available in *Further information and resources*.

Table C20.1: Typical end uses for recovered animal carcass waste materials

Potential uses	Key considerations
Composting (recycling option)	According to the SA EPA, the successful composting of animal carcasses by commercial composting companies, abattoirs and saleyards in South Australia is well established and should therefore be considered as the primary method for recycling this waste subject to available quantities of carbon. See <i>Further information and resources</i> for more information.
Burial (disposal option)	Livestock burial can be onsite (shallow burial or a trench), disposal to landfill, burial at a nominated location for high volumes of carcasses, or mounding (a temporary solution where carcasses on top of the ground are covered with soil or woodchips). Burial is generally regarded as the most economical option and, if nearby, can reduce transportation requirements. The volume of carcasses, proximity to the water table and available sites will determine the viability of this option. A mass burial site requires SA EPA approval. This option is suitable for carcasses from all types of hazards. Disposal of deceased companion animals/pets may be via onsite burial, depending on the number and size of the deceased animals and site suitability.
Incineration (disposal option)	Incineration may be used to significantly reduce the volume of animal carcass waste. SA has only a few small fixed incineration facilities, which generally only take medical and veterinary waste. Interstate, there are some mobile 'air curtain incinerators' which burn at high temperatures and produce very little smoke. This option is suitable for carcasses resulting from most types of hazards but is unlikely to be the most practical option and is not a recommended approach. Cremating deceased companion animals/pets through a veterinary clinic or the Animal Welfare League is an option.
Leave in situ (disposal option)	Isolated carcasses located throughout a property in the order of one per hectare (1/ha) can be left to decompose naturally onsite. Shallow burial or a soil cover will help reduce flies, odour and scavenging. This option is suitable for carcasses caused by natural disasters.
Rendering (recycling option)	Commercial rendering businesses may NOT be able to render animal carcass not deemed fit for human consumption to extract valuable materials such as fertiliser additives and tallow. Although there will still be some waste after the material has been rendered, it will be of significantly lower volume than burning. There may be a lack of potential capacity in the rendering market to take the goods.

Recycling and disposal options

Table C20.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C20.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Onsite burial	Lower volumes	All events	Will be on a case-by-case basis	Ensure no hazardous waste is buried with the animal carcass (e.g. CCA posts)	NA	Refer to SA EPA information sheet, On-farm disposal of animal carcasses
Leave in situ	< 1 carcass per hectare	Not suitable for an exotic biosecurity event	NA		NA	
Compost (off and onsite)	All volumes if offsite. If onsite, must be less than 200 tonnes	Not suitable for an exotic biosecurity event	Sites north and south of Adelaide potentially available	< 0.5% non-organic material, 0% listed or hazardous waste	May vary	Regional: potential to use large-scale compost facility in the state's south-east On-farm composting of > 200 tonnes may be an option subject to EPA approval
Rendering	All volumes up to what renderers can accept	May not accept animal carcasses deemed unfit for human consumption	May be limited rendering sites available to take animal carcasses	No other wastes accepted	May vary	Note sensitivities around transporting carcasses
Mass carcass burial or mounding	High volumes	Likely to be restricted to a biosecurity incident	Confirmation would need to be sought with SA EPA	Only waste approved by PIRSA	NA	As above. Large volumes may require a joint/coordinated effort to manage (landowner, SA EPA, Council, PIRSA etc.)
Landfill	All volumes	All events	Significant space in landfills servicing metro Adelaide. May be more limited in regional areas	No listed, hazardous or radioactive wastes	NA	Licensing, transport costs

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C20.3.

Table C20.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Estimate the number and type of animal carcasses at the site. Contact PIRSA and the SA EPA to determine the appropriate recycling/disposal method for the animal carcass waste. Determine the risk of animal or zoonotic disease spread.
Collection and transport	<ul style="list-style-type: none"> If sending the waste offsite, stockpile the waste ready for collection or removal using appropriate machinery and equipment – decontamination of vehicles may be required to minimise spread of endemic biosecurity diseases. Alternatively, move the waste to the appropriate location onsite for disposal.
Interim storage	<ul style="list-style-type: none"> If interim storage is required, cover the waste and do not store for extended periods. The waste may need to be sealed to prevent leachate escaping.
Processing/ disposal	<ul style="list-style-type: none"> Options for recycling include composting. Options for disposal include burial, burning, leaving in situ or landfilling. All disposal should be completed as quickly as possible (ideally within 1–3 days) to avoid possible human and animal health impacts.

Potential hazards and WHS/OH&S requirements

Table C20.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C20.4: Potential hazards and control measures

Hazard type	Description	Control measure
Environmental and WHS/ OH&S	The potential for disease to spread through unsanitary disposal of animal carcass waste	PIRSA can provide details on sanitary disposal of animal carcass waste to prevent the spread of disease.
Environmental	Various environmental risks are associated with each of the described recycling/disposal methods	<p>Consider any environmental impacts before selecting a recycling or disposal method.</p> <p>Mass or onsite burial locations for animal carcasses need to be rigorously assessed to quantify access of leachate to the water table. It may require a plastic liner to reduce the risk of leachate leaking into waterways.</p> <p>Burning will release emissions into the atmosphere.</p> <p>PIRSA and the SA EPA will consider these aspects before providing advice or deciding on a disposal method.</p>
WHS/OH&S	Cuts or manual handling injury from moving waste	Where appropriate PPE while handling animal carcass waste. Use appropriate equipment to reduce handling risks.
Other	Humane killing of animals that are alive but require euthanasia	Any animals that survive but require euthanasia must be done humanely (see <i>Animal Welfare Act 1985</i>). For companion animals, a private veterinarian can provide advice or undertake the process.
Other	Emotional/psychological trauma from dealing with deceased animals	Ensure public messages advise on where to access support.

Critical information to provide to the public

It is important to provide information to the community on the appropriate disposal method(s), their responsibilities and support or advice options. Messages may include the following:

- Animal owners are responsible for:
 - managing the disposal of deceased animals that they own
 - promptly disposing of deceased animals in an environmentally responsible manner
 - keeping details for insurance purposes (e.g. livestock number and type, including photos)
 - seeking advice if overwhelmed or unable to carry out disposal themselves (see below).⁴
- If animal owners are unsure of the best disposal option or are overwhelmed with the volume of deceased animals, Primary Industries and Regions SA (PIRSA) can provide advice and links with service providers that may be able to help (e.g. local council, contractors, stock agents and waste disposal facilities).
- the SA EPA can also provide advice in relation to disposal methods (including dead wildlife) and locations
- Physical support for disposing of deceased animals includes:
 - hiring contractors (livestock and large animals)
 - local veterinary clinics or Animal Welfare League (household pets)
 - local councils, who might also provide physical support for disposing of deceased animals (primarily stock disposal), depending on individual council policies and availability of suitable resources.
- Animals that survive but require euthanasia must be treated humanely. Seek advice from a veterinary medical centre, Primary Industries and Regions SA (PIRSA) and the RSPCA.

Record keeping

The animal owner is responsible for keeping information on livestock and animals they own for insurance purposes, such as livestock number and type, and photos.

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Legislation and regulations to consider (WHS/OH&S and environmental)

Animal Welfare Act 1985

Part 3 lists the penalties for ill treatment of animals.

Livestock Act 1997

Defines notifiable conditions (disease) and requirements to control or eradicate disease, which may affect the disposal option used.

⁴ See Primary Industries and Regions SA (PIRSA) under *Further information and resources*.

Further information and resources

Animal Health Australia

AUSVETPLAN (*Australian Veterinary Emergency Plan*) Operational Manual – Disposal (2015), available from animalhealthaustralia.com.au/wp-content/uploads/2015/09/DISP-08-FINAL24Aug15.pdf

For AUSVETPLAN information on methods for animal carcass disposal, see animalhealthaustralia.com.au/our-publications/ausvetplan-manuals-and-documents/

Primary Industries and Regions SA (PIRSA)

Carcass disposal Arrangements for Emergencies in South Australia (2018)

PIRSA

Managing Animals In Emergencies: a Framework for South Australia (January 2017), available from pir.sa.gov.au/_data/assets/pdf_file/0004/287734/Managing_Animals_in_Emergencies_Framework_PIRSA_format_20170201.pdf

SA EPA

On-farm disposal of animal carcasses (2016), available from epa.sa.gov.au/files/7566_onfarm_disposal.pdf

C21: Chemical (hazardous) waste

Damaged buildings, vehicles or other infrastructure may contain chemical (hazardous) waste that needs to be appropriately managed after an event, or the event may be caused by chemical (hazardous) waste. There are strict processes to follow when faced with this waste to ensure safe and sound disposal.

Sources of chemical (hazardous) waste

Potential sources of chemical (hazardous) waste are from dangerous substances found in damaged:

- factories and stores
- agriculture sites such as farms and greenhouses
- transport vehicles
- food processing facilities.

What is chemical (hazardous) waste?

The SA EPA defines chemical (hazardous) waste as listed waste having a characteristic described in Schedule A list 2 of the National Environment Protection (movement of controlled waste between States and Territories) Measure (see legislation.gov.au/Details/F2012C00858). Listed wastes are also included in Part B of Schedule 1 of the *Environment Protection Act 1993* (see *Further information and resources* at the end of this Guideline for the entire list).

Listed wastes fall into the following categories:

- explosive substances
- flammable liquids and solids
- substances or wastes liable to spontaneous combustion
- substances or wastes which, in contact with water, emit flammable gases
- oxidising substances
- organic peroxides
- poisons
- infectious substances
- corrosives
- liberation of toxic gases in contact with air or water
- toxic substances
- ecotoxic substances
- substances capable of yielding a material with any of these substances.

Potential end uses for the recovered waste

Safety is the priority – when the chemical waste is no longer a threat to human health or the environment, there are limited recycling options for this waste, especially if it is mixed or not well labelled. As such, safe treatment and disposal at a hazardous waste treatment/disposal facility, based on advice from SafeWork SA and the SA EPA, is the only option for this waste.

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C21.1.

Table C21.1: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Ensure the site is safe from a health and environmental perspective (this should be done by the emergency respondents). When safe, arrange removal of the chemical waste, based on advice from SafeWork SA and the SA EPA.
Collection and transport	<ul style="list-style-type: none"> Follow the advice of the waste removalists and cordon off the area from the public. Follow requirements for transporting chemical waste when transporting the waste.
Interim storage	<ul style="list-style-type: none"> Interim storage facilities may be set up if they can safely store and contain the waste, and appropriate monitoring and recording of waste in the facility is undertaken
Processing/ disposal	<ul style="list-style-type: none"> This waste will be treated or potentially recycled into other chemical products

Potential hazards and WHS/OH&S requirements

Due to its physical, chemical or infectious characteristics, chemical (hazardous) waste can be a significant hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed. Table C21.2 lists potential hazards and WHS/OH&S requirements and control measures.

Table C21.2: Potential hazards and control measures

Hazard type	Description	Control measure
Injury from chemical (hazardous) waste, WHS/OH&S	Chemical (hazardous) waste includes dangerous substances that may cause injury or illness if inhaled or touched	<p>It is the responsibility of all Emergency Services workers to identify any hazards and ensure they are reported to supervisors or management, so that effective controls and or assistance can be implemented. SafeWork SA has engaged professionals who can provide specific advice on materials and the best way to manage these materials.</p> <p>The use of PPE should always be considered when handling any form of chemical (hazardous) waste spills. Key considerations for PPE include:</p> <ul style="list-style-type: none"> usually, PPE is used in combination with other control measures to provide the best solution when using PPE, ensure it is suited to the task, clean and in good condition before and after use when using or handling chemical (hazardous) waste, it is important to read the label or Safety Data Sheet which specifies which PPE to use for persons who operate, service or maintain machinery, the individual is responsible for having the correct type of PPE in good working order, with regular inspections shared use of PPE is discouraged, particularly items such as gloves and footwear.
Chemical leakage to water streams, environmental	Chemical (hazardous) waste may mix with water streams and cause environmental damage	SafeWork SA has engaged professionals who can provide specific advice on materials and the best means of managing these materials to minimise the environmental impact (for example, dilute or flush out). Local chemical waste companies may also be able to provide advice and support.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- If you encounter chemical or hazardous waste materials check for appropriate warnings and labelling such as:

Label element	Examples
Signal words – these provide an immediate warning to the reader	Danger or Warning
Hazard statements – these describe the nature and severity of the chemical hazard based on a chemical's classification	May cause cancer Fatal if inhaled Flammable liquid and vapour Causes severe skin burns and eye damage May cause respiratory irritation
Pictograms – these provide a pictorial representation of the type of hazard that can be easily recognised at a glance	 Flammable Acute toxicity Warning Human health Corrosive

- Unless you have experience with these chemicals, seek advice from your local government office or ring SafeWork SA before attempting recovery or removal.
- Wear appropriate protective gear/equipment including chemical resistant clothes and safety goggles. As a minimum, wear clothes to fully cover you – long sleeves, trousers and shoes.
- Do not breathe in vapours/gases and keep your back to the wind so it does not blow into your face.
- Do not get materials onto your skin.
- Dispose of gloves appropriately, or if safe to do so, wash gloves with water to remove all traces of the chemical.

Record keeping

For chemical (hazardous) waste, transport documents must be readily available and located in the cabin of the vehicle in an emergency information holder and include the following:

- the consignor's name and telephone number
- if the dangerous goods are in a tank vehicle, portable tank or bulk container with a capacity of more than 500 kg or 500 L, it must include the number of a 'telephone advisory service'
- the United Nations number of the dangerous goods
- the proper shipping name of the goods, or name that appears on the packaging
- the Class or Division of the goods
- each Subsidiary Risk (if any) of the goods
- each Packing Group (if any) of the goods

- a description of each type of package or receptacle (e.g. drum, intermediate bulk container, etc.)
- the number of each type of package
- the aggregate quantity of the dangerous goods.

Legislation and regulations to consider (WHS/OH&S and environmental)

Dangerous Substance Act 1979 / Dangerous Substances (Dangerous Goods Transport) Regulations 2008

Provide guidance on keeping, handling, transporting, conveyance, use and disposal, and the quality of dangerous substances. See safework.sa.gov.au/show_page.jsp?id=2466

Further information and resources

National Transport Commission

Australian Code for the Transport of Dangerous Goods by Road & Rail, Edition 7.5 (2017). Referred to as the ADG Code, it provides guidance on when dangerous goods driver licences must be issued.

United Nations

The Globally Harmonized System of Classification and Labelling of Chemicals (GHS) is a United Nations initiative to internationally standardise chemical classification, labelling and Safety Data Sheets in the workplace. For GHS symbols and abbreviations, see safework.sa.gov.au/uploaded_files/03949_RO_GHS%20factsheet_v10.pdf

Environment Protection Act 1993

Listed wastes from the *Environment Protection Act 1993* (for details on asbestos waste, see Guideline C6: Asbestos and asbestos-contaminated waste) include:

- Acids and acidic solutions
- Adhesives (excluding solid inert polymeric materials)
- Alkali metals and alkaline earth metals
- Alkalis and alkaline solutions
- Antimony and antimony compounds and solutions
- Arsenic and arsenic compounds and solutions
- Asbestos
- Barium compounds and solutions
- Beryllium and beryllium compounds
- Boron and boron compounds
- Cadmium and cadmium compounds and solutions
- Calcium carbide
- Carbon disulphide
- Carcinogens teratogens and mutagens
- Chlorates
- Chromium compounds and solutions
- Copper compounds and solutions
- Cyanides or cyanide solutions and cyanide complexes
- Cytotoxic wastes
- Dangerous substances within the meaning of the *Dangerous Substances Act 1979*
- Distillation residues
- Fluoride compounds
- Halogens
- Heterocyclic organic compounds containing oxygen, nitrogen or sulphur
- Hydrocarbons and their oxygen, nitrogen and sulphur compounds (including oils)
- Isocyanate compounds (excluding solid inert polymeric materials)
- Laboratory chemicals
- Lead compounds and solutions
- Lime sludges or slurries
- Manganese compounds
- Medical waste
- Mercaptans
- Mercury compounds and equipment containing mercury
- Nickel compounds and solutions
- Nitrates
- Organic halogen compounds (excluding solid inert polymeric materials)
- Organic phosphates
- Organic solvents
- Organometallic residues
- Oxidising agents
- Paint sludges and residues
- Perchlorates
- Peroxides
- Pesticides (including herbicides and fungicides)
- Pharmaceutical wastes and residues Phenolic compounds (excluding solid inert polymeric materials)
- Phosphorus and its compounds
- Polychlorinated biphenyls
- Poisons within the meaning of the *Drugs Act 1908*
- Reactive chemicals Reducing agents
- Selenium and selenium compounds and solutions
- Silver compounds and solutions
- Solvent recovery residues
- Sulphides and sulphide solutions
- Surfactants
- Thallium and thallium compounds and solutions
- Vanadium compounds
- Zinc compounds and solutions.

C22: Empty chemical drums

Farms and other properties may have empty chemical drums affected by the disaster. These drums may have previously contained chemical waste and as such, certain processes and precautions must be taken when managing this waste stream.

Sources of empty chemical drums

Potential sources of empty chemical drums are from:

- factories and stores
- agricultural farms
- orchards
- wineries.

What are empty chemical drums?

Empty chemical drums are drums or containers that formerly contained hazardous liquids or other materials (e.g. disinfectants, liquid fertilisers and herbicides). Empty chemical waste drums may be made of plastic or metal. The drums were stored on a property and became displaced or damaged due to the event.

If a chemical waste drum still contains a hazardous liquid, it is no longer empty and becomes a different waste stream. See Guideline C21: Chemical (hazardous) waste for guidance on this waste stream.

Potential end uses for the recovered waste

Table C22.1 lists typical end uses for recovered chemical drum waste.

Table C22.1: Typical end uses for recovered empty chemical waste drums

Materials recovered	Potential uses
Plastic drums	<ul style="list-style-type: none"> • Plastic empty chemical drums are either shredded, granulated or heat-extruded back to a resin suitable for plastics component production.
Metal drums	<ul style="list-style-type: none"> • Metal empty chemical drums are recycled through the normal metal recycling process.

Recycling and disposal options

Table C22.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Recycling of some drums may be covered under the **drumMUSTER** program.

DrumMUSTER is a voluntary product stewardship scheme of AgStewardship Australia Limited and provides a way of disposing of empty farming chemical containers across rural Australia.

Where this is the case, the empty chemical drums may be taken to a **drumMUSTER** collection point for inspection, before being taken to an approved processor. It is possible that **drumMUSTER** and other drum collection points/recycling facilities may not be available or practical to use after the event.

Table C22.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Drum recyclers	All volumes	Floodwater may carry disease and prevent this option		0% listed or hazardous waste (drums must be empty)	May vary	If the drum contains hazardous liquids, refer to Guideline C21: Chemical (hazardous) waste
Recycling via drumMUSTER program	Only eligible containers under program*	As above	Over 800 disposal sites across Australia†	As above	As above	As above
Landfill	Significant space in landfills servicing metro Adelaide, although these may be more limited in regional areas. Landfill may be required if the waste is mixed with other wastes that are not listed, hazardous or radioactive, or if the drumMUSTER program is not in operation and the waste cannot be stockpiled or stored appropriately until recycling sites become available					

* See drummuster.org.au/container-recycling/eligible-containers

† See drummuster.org.au/find-a-collection-site

Key considerations for managing this waste

Ideally, empty chemical drums will be separated, appropriately washed⁵, and recycled. The process for managing the waste onsite and moving to an appropriate facility is covered in Table C22.3.

Table C22.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> Separate empty chemical waste drums from other waste streams and ensure they are empty. Appropriately rinse the empty chemical drums (capturing rinse water for appropriate disposal). If chemical waste drums are not empty, or if rinsing/washing them is not practical, the drums must be treated via the hazardous waste disposal route.
Collection and transport	<ul style="list-style-type: none"> Once appropriately rinsed or washed, transport or organise collection to a drum recycler, or bring to a drumMUSTER collection point (if covered by the scheme).
Interim storage	<ul style="list-style-type: none"> If needed, interim storage can be set up onsite or at a central location.
Processing/ Disposal	<ul style="list-style-type: none"> Plastic or metal drums collected via drumMUSTER or those sent directly to a drum recycler will be recycled. If a drum recycling option is not practical, disposal to landfill may be required.

⁵ See drummuster.org.au/container-recycling/drummuster-standard

Potential hazards and WHS/OH&S requirements

Table C22.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C22.4: Potential hazards and control measures

Hazard/ hazard type	Description	Control measure
Hazardous chemicals, WHS/OH&S	Empty chemical drums may contain traces of hazardous chemicals	<p>Sufficient washing is needed for transport and disposal. If empty chemical drums have been emptied, they must be triple-washed prior to transport to a recycling or drumMUSTER facility. It is important to use appropriate PPE, including:</p> <ul style="list-style-type: none"> • safety glasses, preferably goggles • chemical resistant safety gloves • long trousers • fully enclosed shoes.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- The public should be advised about the requirements for appropriate rinsing/washing if they are going transport any drums, collecting the rinse water for appropriate disposal (see drummuster.org.au/container-recycling/drummuster-standard/).
- Drums that are not rinsed need to be managed via a hazardous waste disposal route.
- When managing empty chemical drums, wear appropriate protective gear/equipment, including:
 - safety glasses, preferably goggles
 - chemical resistant safety gloves
 - long trousers
 - fully enclosed shoes.

Legislation and regulations to consider (WHS/OH&S and environmental)

SA Work Health and Safety Regulations 2012

All chemicals in Australia need to be labelled with appropriate warnings and minimum safety and handling data. Safety Data Sheets are available from the manufacturer's website.

These regulations established a new system of chemical classification and hazard communication on labels and Safety Data Sheets, based on the Globally Harmonised System of Classification and Labelling of Chemicals (GHS).

From January 2017, all workplace chemicals must be classified according to the GHS, and labels and Safety Data Sheets updated. Some hazardous chemicals are excluded from the labelling provisions in these regulations and the Code does not apply to those chemicals.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

Australian Pesticides and Veterinary Medicines Authority

Information on labelling codes available from apvma.gov.au/node/870 and apvma.gov.au/registrations-and-permits/labelling-codes?qt-labelling_codes=0#qt-labelling_codes

DrumMUSTER

drumMUSTER provides an easy, environmentally-friendly way of disposing of empty farming chemical containers across rural Australia. See drummuster.org.au/

SafeWork SA

Information on labelling workplace hazardous chemicals available from safework.sa.gov.au/show_page.jsp?id=113698

United Nations

The Globally Harmonized System of Classification and Labelling of Chemicals, or GHS, is a United Nations initiative to internationally standardise chemical classification, labelling and Safety Data Sheets (SDS) in the workplace. For GHS symbols and abbreviations, see safework.sa.gov.au/uploaded_files/03949_RO_GHS%20factsheet_v10.pdf

C23: Sandbag waste

Sandbags may be used to mitigate the impact of a flood or storm by providing a temporary wall to protect infrastructure and equipment from water damage. After sandbags have been used they become a waste that needs to be managed. This may be disposal to landfill or, if it has not come in contact with water, the hessian bag and sand can be reused.



Sandbag wall

Sources of sandbag waste

Potential sources of sandbag waste are from sandbags used to mitigate flood or storm damage that are left over after the storm or flood is no longer a threat.

What is sandbag waste?

Sandbag waste is the remaining sand-filled bags used to hold back water during a flood or storm after their use.

Potential end uses for the recovered waste

Table C23.1 lists typical end uses for recovered sandbag waste. If the sandbags have been in contact with water, they will require disposal to landfill due to potential contamination.

Table C23.1: Typical end uses for recovered sandbag waste

Material	End products
Sand and hessian bags that have not come in contact with water	<ul style="list-style-type: none"> • Reuse as a sandbag • Empty sand onto ground and reuse hessian bags as a bag or sack.
Sandbags that have come in contact with water	<ul style="list-style-type: none"> • Disposal to landfill.

Recycling and disposal options

Table C23.2 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C23.2: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Reuse entire sandbag or the sand and hessian bag	All volumes	Contact with floodwater would prevent this option	NA	0% listed or hazardous waste	If further events possible, may be high	Non-contaminated sandbags can be stockpiled for some time
Spread sand on property	Lower volumes	As above	Dependent on property	As above	NA	
Landfill	If sandbags are mixed with other wastes and cannot be separated, or the sandbags have touched floodwater, they should be sent to landfill. If hessian bags are not being reused, these should be sent to landfill.					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C23.3.

Table C23.3: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> If sandbags have not come in contact with floodwater but may be required again at the site due to a potential follow-up event, stockpile at the site until needed (following the WHS/OH&S requirements below). If the event is unlikely to occur in the near future, sandbags can be stockpiled or the sand emptied, with the hessian bags piled as well.
Collection and transport	<ul style="list-style-type: none"> A waste contractor may collect the sandbags and dispose to landfill if they have come in contact with water, or the landowner may take it to a landfill.
Interim storage	<ul style="list-style-type: none"> Non-contaminated/dry sand and hessian bags should be safe to stockpile for extended periods until an appropriate long-term storage solution arises. Interim storage of contaminated sandbag waste (i.e. those that have come in contact with floodwater) is not recommended and it should be taken directly to a landfill.
Processing/ disposal	<ul style="list-style-type: none"> Ideally, the sandbag waste will be reused as sandbags or as sand and hessian bags if they have not come in contact with floodwater. If there are minimal uncontaminated sandbags, it may be more logical to simply empty the sand onsite and dispose of the hessian bag in the general waste bin. If the sandbags have come in contact with floodwater, this waste will need to be disposed of to landfill.

Potential hazards and WHS/OH&S requirements

Table C23.4 lists potential hazards and WHS/OH&S requirements and control measures.

Table C23.4: Potential hazards and control measures

Hazard type	Description	Control measure
Manual handling injury, WHS/OH&S	Sandbag waste can be very wet and heavy to lift. The sandbags could also contain chemicals, other waste materials and diseases from floodwater	Wear thick gloves when handling wet sandbags and ensure that the weight of the sandbag is not too heavy – it may be beneficial to pick up the waste using two people (if the sandbag is over 15 kilograms). When lifting, bend at the knees, not with your back.

Critical information to provide to the public

It is recommended that information circulated to the public includes or incorporates the following:

- The property owner is responsible for safely removing and discarding sandbags on the property.
- Wear thick gloves when handling wet sandbags as they may contain chemicals, waste and diseases.
- When lifting sandbags, bend at the knees, not with your back.
- If the sandbag is over 15 kilograms, use two people to pick it up.
- Sandbags that have been in contact with floodwater should be disposed of to landfill
- If the sandbag has not come in contact with water, store it for reuse – either as an entire sandbag or as a sand pile and separate hessian bag pile.
- If you have minimal sandbags and these have not come in contact with floodwater, empty the sand onto your site and reuse or dispose of the hessian bag in the general waste bin.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

C24: Medical and pharmaceutical waste

Waste in hospitals, medical centres and veterinary clinics, such as needles, surgical instruments, human tissue, medical specimens and so forth, require safe and effective removal processes to minimise any risk of injury.

Sources of medical and pharmaceutical waste

Potential sources of medical and pharmaceutical waste are from damaged:

- hospitals
- medical centres/clinics
- veterinary clinics.

What is medical and pharmaceutical waste?

The SA EPA defines medical and pharmaceutical waste as the wastes listed in Part B of Schedule 1 (Page 14) of the *Environment Protection Act 1993* which include:

- a needle, syringe with needle, surgical instrument or other article that is discarded in the course of medical*, dental or veterinary practice or research and has a sharp edge or point capable of inflicting a penetrating injury on a person who comes into contact with it; or
- human tissue, bone, organ, body part or foetus; or
- a vessel, bag or tube containing a liquid body substance; or
- an animal carcass discarded in the course of veterinary or medical* practice or research; or
- a specimen or culture discarded in the course of medical*, dental or veterinary practice or research and any material that has come into contact with such a specimen or culture; or
- any other article or matter that is discarded in the course of medical*, dental or veterinary practice or research and that poses a significant risk to the health of a person who comes into contact with it.

* Medical practice includes the practice of pathology and the operation of an immunisation clinic.

Potential end uses for the recovered waste

Treatment and incineration or autoclaving are the most appropriate end uses for this waste. A waste autoclave is a form of solid waste treatment that uses heat, steam and pressure of an industrial autoclave in the processing of waste.

However, the Environment Protection (Waste to Resources) Policy 2010 now enables the SA EPA to approve alternative methods of treatment or disposal for medical waste in addition to incineration.

Recycling and disposal options

Table C24.1 provides a quick guide to recycling and disposal options for managing this waste stream.

Table C24.1: Quick guide to disposal and recycling options

Recycling or disposal option(s)	Suitable volumes	Event type considerations	Location & capacity of infrastructure	Waste stream contamination	Likely demand for recycled product	Other considerations
Treatment and disposal/ incineration	All volumes	All events	Two major facilities servicing metro Adelaide. Regional areas may have autoclaves at hospitals, or may need to temporarily store and transport to other facilities		NA	
Autoclaving	Small volumes	All events	Large commercial autoclave in metro Adelaide		NA	
Landfill	Medical and pharmaceutical waste is banned from landfill and as such, a waiver would be required to dispose of this waste to landfill.					

Key considerations for managing this waste

The process for managing the waste onsite and moving to an appropriate facility is covered in Table C24.2.

Table C24.2: Managing the waste

Process	Key considerations
Onsite handling	<ul style="list-style-type: none"> If sharps (needles, syringes) are identified in the area that you are trying to remediate/recover, stop all further activity while the sharps are contained. Store the sharps and waste in safe yellow marked boxes (see <i>Potential hazards and WHS/OH&S requirements</i>).
Collection and transport	<ul style="list-style-type: none"> Once stored in the sharps disposal unit, contact the SA EPA to determine the most appropriate location to transport sharps and other medical and pharmaceutical waste.
Interim storage	<ul style="list-style-type: none"> Sharps disposal units can be stored at an interim storage facility until they are incinerated.
Processing/ disposal	<ul style="list-style-type: none"> Incineration or autoclaving at an SA EPA licensed site is the most appropriate disposal method for medical waste. Contact the SA EPA to determine the most appropriate disposal location and method.

Potential hazards and WHS/OH&S requirements

Table C24.3 lists potential hazards and WHS/OH&S requirements and control measures.

Table C24.3: Potential hazards and control measures

Hazard type	Description	Control measure
WHS/OH&S	<p>All sharps such as needles, syringes with needles and surgical instruments have the potential to transmit diseases through accidental skin penetration such as, but not limited to:</p> <ul style="list-style-type: none"> • AIDS • hepatitis including type C • tetanus. 	<p>If sharps are found, contact the local council immediately for advice or support for removal of this waste.</p> <p>It is important to watch for needles and use equipment such as tongs to move the waste into sharps disposal units where possible. Wear appropriate PPE for handling sharps, specifically medical sharps, such as safety gloves and eyewear. Eyewear is particularly important for soiled or blood-soaked materials.</p> <p>If an item cuts or penetrates the skin during the removal process, ensure appropriate testing is undertaken. Note that it can take several months after an injury of this nature to have health cleared of any long-term ramifications/ injuries.</p> <p>To safely place items in the sharps disposal unit:</p> <ul style="list-style-type: none"> • place the unit on the floor or a stable surface • pick up one syringe at a time using tongs or other available safety tool to collect and place in the unit • do not hold the unit while disposing of the sharps and do not place a plastic cap or cover over the sharp, as this increases the risk of injury • once all visible sharps have been removed, put the sharps disposal unit back in the area it belongs • continue to remediate/recover other items in the area with caution as some sharps may have been missed.

Critical information to provide the public

It is recommended that information circulated to the public includes or incorporates the following:

- If you see a syringe or needle or other sharp medical objects, contact your local council immediately
- If responsible for removing sharps (such as needles and syringes), make sure you:
 - wear appropriate protective gear/equipment such as needle-proof gloves and goggles
 - avoid touching the sharps where possible (even with gloves) by using tongs and other similar items to pick them up
 - discard sharps into a yellow sharps disposal unit, available from the local council or hospital/medical centre or some stores (e.g. Officeworks). Place the yellow sharps disposal units on a sturdy surface and discard the sharps into the unit using tongs, taking care not to hold the unit while disposing of the items
 - contact the SA EPA after disposing of the sharps in the sharps disposal unit, to determine the most appropriate location to send these items.

Legislation and regulations to consider (WHS/OH&S and environmental)

Environment Protection Act 1993

Part B of Schedule 1 (Page 14) defines medical and pharmaceutical waste.

Environment Protection (Waste to Resources) Policy 2010

This policy outlines the duties of councils, hospitals and pharmacies in relation to medical waste.

Record keeping

Where possible and practical, keep records of waste sources, volumes (tonnes or cubic metres) and destinations for recycling, storage or final disposal.

Further information and resources

SA EPA

For more information on medical waste disposal methods, refer to:

- the SA EPA website at epa.sa.gov.au/community/waste_and_recycling/medical_waste
- the SA EPA guideline on medical waste procedures, *Medical waste – storage, transport and disposal* (EPA 044/03) (2003), available from epa.sa.gov.au/files/4771338_guide_medical.pdf