South East Regional Hospital (SERH) - Bega

New Development & Construction Waste Management Plan Stage 2 (CWMP)

- SERH CWMP Rev E

Revision	Comments	Date
A	Issued as Draft	20/09/2012
B	Corrections and modifications to metrics	02/10/2012
C	Revised	08/10/2012
D	FINAL	21/11/2012
E	FINAL - Includes Geothermal system waste	08/01/2013

Project Abstract

Site:
South East Regional Hospital, located on the Mid North Coast of New South Wales at: Tathra Road, Bega 2550, New South Wales

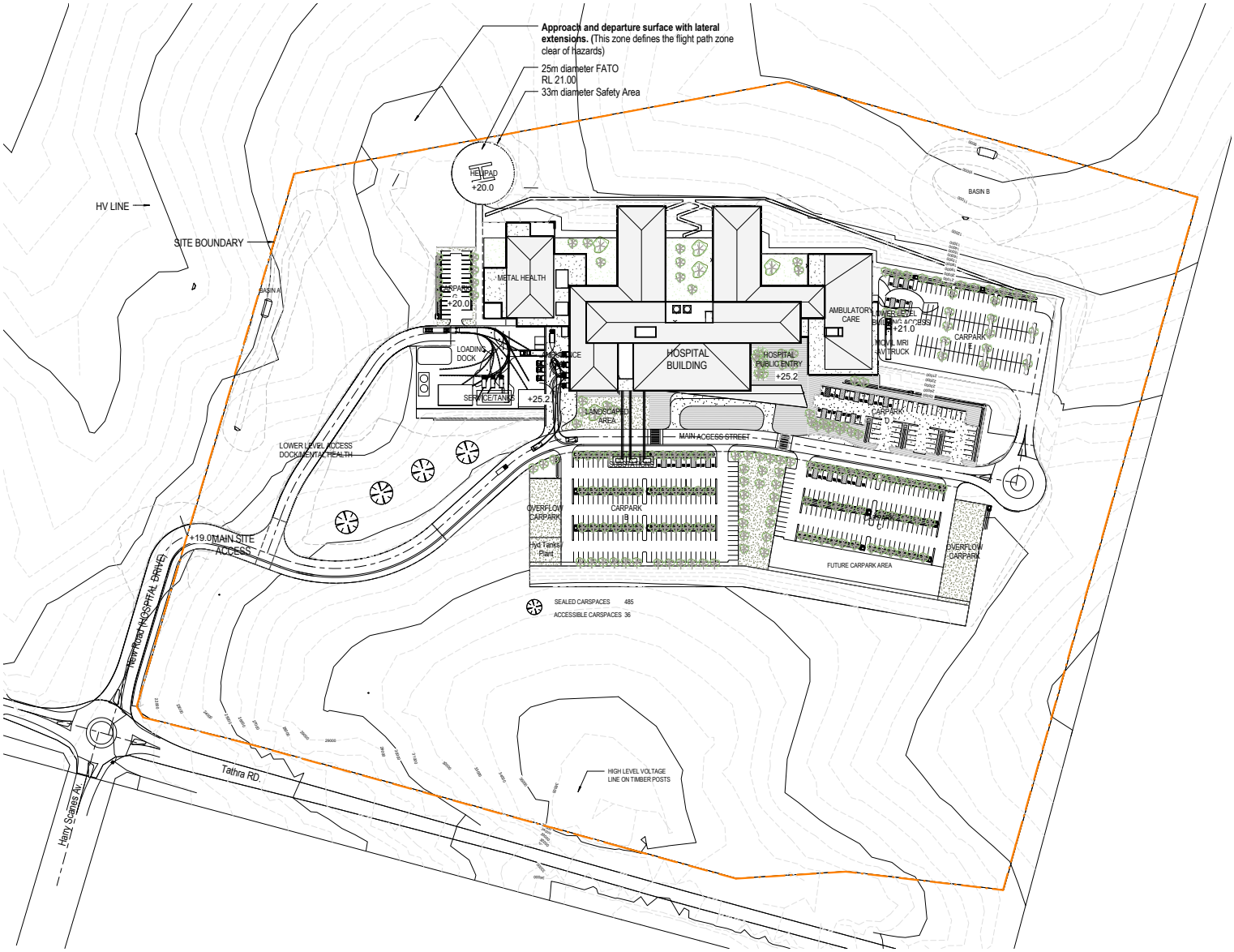
Structures Currently On Site:
Nil.

Outline of Work:
A new hospital, the South East Regional Hospital, is to be built in Bega. The development will include: Emergency Services, Intensive Care Unit and Critical Care Unit, Maternity Services, Regional orthopaedic services,
Surgical services, Acute inpatient services, Sub-acute inpatient services, regional inpatient mental health service, Drug and alcohol services, Community health, Clinical support services, medical imaging, pharmacy and pathology & teaching and training facilities. The total development will be:

- 17.5 hectare site development
- 26,000m^2 new build
- 50,000m^2 hard stand, roads, landscaping

Waste Operations:
The SERH will not be in operation until after construction is complete. The Construction Waste Management Plan (CWMP) will not require provisions for operational waste

Construction Waste Management Strategy :
Contract mandated minimisation and education, waste stream collection and measurement and proof of next life to minimise land fill.



SERH

e^3 - Ecology/Energy/Environment

Executive Summary

Elimination and Minimisation

Objective
To control waste the generated during construction and control the end use of waste generated from construction activities and augment the The Bega Valley Shire Council Waste and Resource Recovery Reforms, especially in regard to Food, Hazardous and land fill initiatives to minimise underground methane generation.

Waste Management Philosophy
The South East Regional Hospital Redevelopment will have a Waste Management Strategy. The seven-tier waste management hierarchy shown in Figure one below is a visual representation of the preferred approach to waste management. The first tier, waste avoidance, is the most sustainable form of action. The second and third tiers involve the reuse and recycling, including composting of wastes, using products again instead of throwing them out and creating new materials from old without the energy expense or environmental damage from mining for raw materials. Waste that cannot be prevented, reused or recycled can be combusted with energy recovery (tier 4). Treatment and containment both involve energy use and are relatively poor outcomes for waste. The final tier, disposal, refers to landfilling or incineration without energy recovery which is the least preferred option. Actions for SERH's waste management will be prioritised according to this hierarchy:

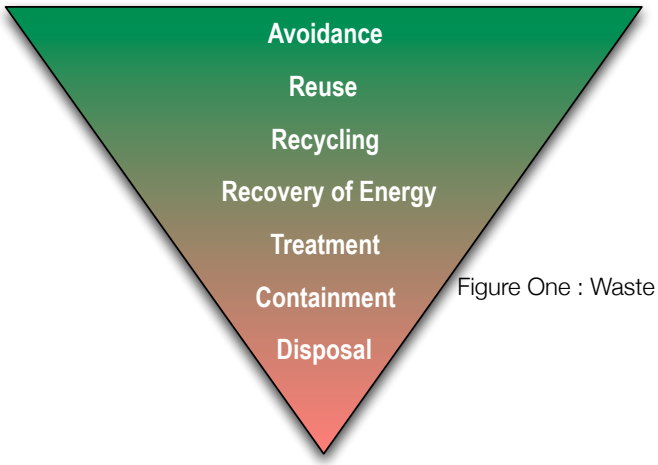


Figure One : Waste Hierarchy

Of course, all Australian Standards need to be satisfied, as do the Bega Valley Shire Council local regulations and ordinances, and those of the New South Wales Government, specifically:

- **Waste management and resource recovery framework**
- **Environmental guidelines for waste**

Environmental guidelines for waste

The EPA produces guidance material to assist the community in meeting regulatory requirements.

Waste classification guidelines

It is the responsibility of those who generate the waste to classify it. To assist waste generators classify the wastes they produce, the EPA has developed the Waste Classification Guidelines, which outline a clear and easy-to-follow, step-by-step process for classifying waste under the current classification system.

The guidelines are comprised of four parts:

1. Part 1: Classifying waste
2. Part 2: Immobilisation of waste
3. Part 3: Waste containing radioactive material
4. Part 4: Acid sulfate soils

Resource recovery exemption guidelines

The guidelines below provide an assessment framework and application structure for any person applying to the EPA for a Resource Recovery Exemption to enable the use of waste as a fuel or the land application of a waste material as fill or as a fertiliser or soil amendment. Proponents wishing to apply for a Resource Recovery Exemption must, in accordance with these guidelines, demonstrate the waste material is of benefit in its proposed use and poses minimal risk of harm to the environment or human health.

1. Guidelines on Resource Recovery Exemptions (Land Application of Waste Materials as Fertiliser or Soil Amendment)
2. Guidelines on Resource Recovery Exemptions (Land Application of Waste Materials as Fill)
3. Guidance Note: Assessment of Non-Standard Fuels

Biosolids guidelines

The land application of biosolids and any material mixed with or produced with biosolids is regulated in NSW under the *Environmental Guidelines: Use and Disposal of Biosolids Products* (the Biosolids Guidelines) and *the Biosolids Exemption 2008* (the Biosolids Exemption).

The Biosolids Guidelines help planners, designers and operators of sewerage systems, and those involved with the processing and end-use of biosolids, by establishing requirements for the beneficial use and disposal of biosolids to land in NSW.

1. Environmental Guidelines: Use and Disposal of Biosolids Products

The conditions of the Biosolids Exemption defers to the Biosolids Guidelines in their entirety so where biosolids are managed in accordance with the Biosolids Guidelines, the land application of that material is exempted from certain requirements of the waste regulatory framework. For more information about exemptions, please refer to the Resource Recovery Exemptions page of this website.

Landfill guidelines

The guidelines below provide a consistent and environmentally responsible approach to managing landfills across NSW.

1. Environmental guidelines: solid waste landfills, including Table of environmentally sensitive areas
2. Draft environmental guidelines for industrial waste landfilling

Waste management and resource recovery framework

The focus of the Environment Protection Authority (EPA) in managing waste is to provide a clear and consistent regulatory and policy framework that minimises harm to the environment and encourages waste avoidance and resource recovery. This framework uses a mix of legislative, policy, educative and economic tools.

The EPA administers the waste regulatory framework through the state's primary environment protection legislation, the Protection of the Environment Operations Act 1997 (POEO Act), together with the Waste Avoidance and Resource Recovery Act 2001 and the Protection of the Environment Operations (Waste) Regulation 2005. These key statutes contain the requirements for managing, storing, transporting, processing, recovering and disposing of waste. Regulatory mechanisms in the legislation, such as the waste and environment levy, help drive waste avoidance and resource recovery by providing an economic incentive to reduce waste disposal and stimulate investment and innovation in resource recovery technologies.

To facilitate the beneficial reuse of waste materials, the EPA is able to exempt from certain regulatory requirements the use of waste as fuel or its application to land. These exemptions are known as resource recovery exemptions and are only issued where the proposed use of the waste material is beneficial and does not harm the environment or human health.

Reducing the generation of waste and turning it into recoverable resources are priorities for NSW. To meet this challenge, a number of programs have been established under the Waste Avoidance and Resource Recovery Strategy. These area:

- Managing waste in NSW
- Waste legislation
- Waste licensing
- Waste classification
- Resource recovery exemptions
- Waste and environment levy
- Types of waste

Waste Identification

Safety, Elimination and

Establishing Spaces to efficiently collect construction waste during the construction period

The construction period generates a variety of waste streams. Each of which will need a home at various stages of the construction period.

When the construction program is finalised a location and strategy for handling the waste streams will be devised. The project will mandate the construction contractor must construct a plan in accordance with this document, and describe how the initiatives will be measured in terms of elimination and minimisation. It will need to identify:

- The waste streams and quantities that are likely to be generated during the site establishment and construction process
- The construction contractors procurement documents which mandate elimination and minimization of packaging waste and recycling capability of products in the construction contractors supply chain
- An area on the construction site to safely collect and segregate waste streams - *The area must also be able to contain the waste and not have the collection skips, bins and compactors at risk of wind and weather fouling that may cause spillage or infiltration into soils nor water runoffs nor sources. The management of these areas is collaborative, and will require supervision by all project participants.*
- Show how this area will be accessed by collection vehicles, which are normally heavy rigid vehicles, and comply with all regulations

Indicative Construction Waste

An analysis based on the current architectural plans has been performed and the predicted demolition and construction waste profile detail can be found in Attachment-2: Estimated Construction Waste Stream Metrics.

Waste Type	Stage 1 DA Earthworks (kg) (excluding acid sulphate soils)	New Construction (kg)
Recycled/Reused	40,000	8,264
Disposed	0	1,132
TOTAL Waste	0	9,396
Recovery %	100%	88%

This will be revised as the detailed architectural specifications become known.

Waste Avoidance

Responsible and Creative Procurement, Reuse & Recycling

Format of Arrival

Clauses will be placed in the Construction Contracts and Purchase Orders that will:

- Preclude the purchase and use of any materials that contravene the current Australian Standards Occupational Health and Safety Act, the State of New South Wales definition of Hazardous Waste Materials, the Bega Valley Shire Council list of Hazardous Materials and any other materials that will be identified as part of the design process.
- Identify any Hazardous Materials prior to procurement: All construction materials used on site will require a Material Safety Data Sheet that will identify any hazardous materials and flag a disposal process if required.
- Provide demolition material waste volumes and a summary of disposal to recyclers with dockets and documentation will be required.
- Salvage of any existing structures, roads, concrete slabs on the greenfields site will encouraged where possible.
- All paints, flooring materials and manufactured wood products will have a low VOC content that complies with E1 Formaldehyde emission schedule in AS 1859.1, of less than 1.0mg/L
- Additional clauses maybe added during the Detail Design process and/or as mandated by the project stakeholders.

Waste Collection

Collection & Separation

Streams of Collection

At the time of constructing this plan, the waste streams that are recommended to be collected for reuse, recycling and disposal are identified in Attachment-2: Construction Waste Streams and Volumes, and are:

- Timber
- Bricks
- Asphalt
- Vegetation
- Insulation
- Lining Board
- Metals
- Batteries
- Fluorescent Tubes
- Electrical
- Concrete
- Plastics (including Packaging)
- Polystyrenes
- Paper and Cardboard
- CoMingled (Glass/Aluminum/Plastic)
- Mixed Waste
- Food scraps (if possible)

Recycled/Reuse Metrics

Based and benchmarked on projects occurring around Australia, at least 85% of the total weight of construction waste streams should be recycled and/or reused other supply chain streams. The process of weighing the total waste and the percentage that goes on to be recycled and/or reused will be at the discretion of the constructor, however, it must be recorded and presented in a format that show evidentiary data and dockets.

Geothermal Drilling Waste

Drilling mud and slurry shall be collected in area AEC3 (silage pit in the western portion of the site) and will be removed from site prior to the commissioning of the hospital. The district regional land fill accepts this waste stream.

Hazardous Waste

There is always potential for hazardous waste to be found during construction. Even though a greenfields site has been selected, the site may reveal remnant materials. A clause will be stipulated in the constructors contract for the constructor to identify, inform the principal and agree on a disposal method for hazardous waste such as:

- Asbestos Containing Building Materials (ACBMs).
- Lead-based Paint (LBP)/ Poly-chlorinated Biphenyls (PCBs).
- Batteries containing lead and cadmium.
- Mercury/ Chlorofluorocarbons (CFCs).
- Treated Wood.
- Miscellaneous (e.g., fluorescent lights, thermostats).

Waste Management

Responsibility & Pride

Waste management will be a formal process during the construction period.

A protocol will be established so that the constructor will be required to submit a project Waste Management Plan addressing the needs of this document. The guidelines for demolition and salvage, procurement and the combination of site collection and/or off site segregation will be measured and captured in monthly progress reports and a final overall report that includes all, MSDS, Certificates, Dockets, Photographs and any other evidentiary material at the end of the project. It will also provide project construction waste metrics on the following key measures:

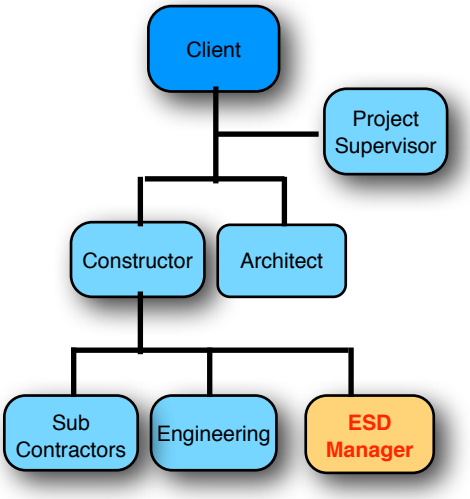
- ☑ Total Tonnage and/or Volume per waste stream
- ☑ % Recycled, Reused
- ☑ Land Fill Tonnage and/or Volume per waste stream

The Waste Management Plan will be an agenda item on all Project Control Group (PCG) meetings and will be assessed for compliance at each meeting.

A weekly report that itemises waste type, measures the volume and weight collected and measure the % recycled will be a mandatory reporting criterion at PCG meetings.

A formal manifest and report will be issued at the completion of the project that highlights measurable and strategies on all waste streams such that the information can be shared with HINFRA and included in The Bega Valley Shire Council Management Strategy statistics.

It is strongly recommended that the Construction Contractor allocate a resource (if they do not already have one), to manage the Environmentally Sustainable Development (ESD) initiatives, of which waste management will be a part. This resource should be the entity issuing the waste management progress report and metrics for presentation at the PCG



Attachment 1

Construction Waste Streams, Area and Materials Handling Requirements

SERH - Waste Streams and Volumes During Construction

- Quantity Expected Estimate
- Space Estimate for
- Access Estimate

COMPACTOR	GENERAL WASTE COMPACTOR EMPTIED BY WASTE TRUCK - Waste Contractor	YARD AREA to Accommodate compactor and 4 Large Skips AREA 300m^2
BIN 1100L BIN 1100L BIN 1100L	RECYCLING – Comingled *(Plastic Metals Glass Paper)* *3500L* *EMPTTIED BY WASTE CONTRACTOR - Waste Truck*	
BIN 1100L	RECYCLING - UNSECURE Paper/Cardboard	
Nil	RECYCLING - SECURE Paper	
COLLECTION SKIP SELF DRAINING	Geothermal Drilling Mud &Slurry	Area AEC3

Nil	MEDICAL/CLINICAL 240LBINS EXCHANGED Inlcuding SHARPS	*These streams will not be required until hospital is built (see OWMP for details)*
Nil	RADIOACTIVE/CYTOTOXIC Including SHARPS	
Nil	PHARMACEUTICAL	
Nil	ANATOMICAL	

Safe, Accessible & Contained Collection Systems

Attachment 2

Estimated Construction Waste Stream Metrics

METRIC/MATERIAL	Timber	Lining Board (no lead paint)	Metals	Crates and Pallets	Fluorescent Tubes	Electrical	Concrete/Bricks/Blocks	Fibre and Styrenes	Paper and Cardboard	CoMingled (Glass/Aluminium/Plastic)	Other	Hazardous (mercury thermostats/unknowns)	TOTAL WASTE (weight) per square metre	SERH NEW CONSTRUCTIONTotal Square Metres	TOTAL WASTE WEIGHT ESTIMATE (kg)
New Build Material (% Weight)	29.05	15.00	18.00	0.90		0.10	30.00	0.05	3.90	3.00	-	-	0.36	26,000	9,396.21
New Build Material Actual Weight	2,729.60	1,409.43	1,691.32	84.57		9.40	2,818.86	4.70	366.45	281.89	-	-			
* Earthworks (estimate) for New Bu	*To be confimred during detail design (includes hard stand for car parks, loading dock, roadways @ 50,000m² and landscaping @ 30,000m²)*												*0.50*	*80,000*	*40,000.00*

	SERH NEW CONSTRUCTIONTotal Cubic Metres Current Estimate
Geothermal Drilling Waste	To be confimred during design as loops and legs may vary with design and supplier (will be collected and then disposed to landfill)	50 Wet/10 Dray

New Build Material Waste	Weight (kg)	Recovery Target
REUSED/RECYCLED	5,163.22	88%
RECYCLED	3,100.75	
DISPOSED	1132.24	0%
TOTAL	9,396.21	

NOTE: This analysis does **NOT** include **bitumen, rocks, acid sulpate soils (ASS)**.

Attachment 3

New South Wales Government

Waste Classification Guidelines Part 1, 2, 3 & 4

Part 1: Classifying Waste

Part 2: Immobilisation of Waste

Part 3: Waste Containing Radioactive Material

Part 4: Acid Sulfate Soils

Waste Classification Guidelines

Part 1:
Classifying Waste

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Contents

Note: *The Environment Protection Authority (EPA) is a statutory body with specific powers under environment protection legislation, including the regulation of waste. The EPA is part of the Department of Environment, Climate Change and Water, which carries out these waste regulation activities on its behalf.*

Introduction

Classifying wastes into groups that pose similar risks to the environment and human health facilitates their management and appropriate disposal.

Six waste classes are used:

- special waste
- liquid waste
- hazardous waste
- restricted solid waste
- general solid waste (putrescible)
- general solid waste (non-putrescible).

Who should use this guide?

This guide should be used by waste generators to classify the wastes they produce.

Waste classification helps those involved in the management and treatment of waste for disposal to ensure the environmental and human health risks associated with it are managed appropriately and in accordance with the *Protection of the Environment Operations Act 1997* (the POEO Act) and its associated regulations.

Generators of waste may need to further classify their waste to meet waste tracking or dangerous goods storage and transport requirements.

Under the POEO Act, it is an offence to supply false or misleading information to another person, including information about the type, classification, characteristics, composition or quantity of the waste, among other things. Significant penalties apply (s.144AA).

How to use this guide

This guide explains the six basic steps for classifying your waste. These steps are briefly outlined below. A full explanation of each is provided later in this document.

Step 1: Establish if the waste should be classified as special waste. If the waste is special waste due to its contamination with asbestos (i.e. classified as asbestos waste), continue to classify the waste in accordance with the steps below.

Step 2: If not special waste (other than asbestos waste), establish whether the waste should be classified as liquid waste.

Step 3: If not special waste (other than asbestos waste) or liquid waste, establish whether the waste is of a type that has been ‘pre-classified’. To simplify the classification process, the Environment Protection Authority (EPA) has pre-classified a number of commonly generated wastes as either hazardous, restricted solid or general solid waste (putrescible) or general solid waste (non-putrescible).

Step 4: If the waste is not special waste (other than asbestos waste), liquid waste or pre-classified, establish if it has certain hazardous characteristics and can therefore be classified as hazardous waste.

Step 5: If the waste does not possess hazardous characteristics, it needs to be chemically assessed to determine whether it is hazardous, restricted solid or general solid waste (putrescible and non-putrescible). If the waste is not chemically assessed, you must manage the waste as if it were hazardous waste.

Step 6: If the waste is chemically assessed as general solid waste, a further assessment is available to determine whether the waste is putrescible or non-putrescible. The assessment determines whether the waste is capable of significant biological transformation. If you do not wish to undertake this assessment, you must manage the waste as if it were general solid waste (putrescible).

In using this guide to classify waste, it should be noted that:

- the steps for waste classification must be applied in the order presented
- once a waste's class has been established under a particular step, do not go to the next step (unless the waste is asbestos waste).

Note: Air pollution from gaseous emissions is regulated under Part 5.4 of the POEO Act. The occupier of any premises dealing with waste must also comply with these laws.

Other DECCW guidance on managing waste

This guide assists waste generators in classifying waste to ensure it is appropriately managed, transported and disposed of. It forms part of the *Waste Classification Guidelines* issued by the Department of Environment, Climate Change and Water (DECCW). Other guidance materials that may also assist in managing waste are available from DECCW's website at www.environment.nsw.gov.au/waste/envguidlns/index.htm.

General classification principles

The following principles must be applied at all times when using the step-by-step waste classification process.

- Where practicable, it is desirable to separate a mixture of wastes before classifying them separately. For example, if waste tyres (special waste) are mixed with lead-acid batteries (hazardous waste), it would be desirable to separate the wastes so only the hazardous component needs to be managed as hazardous waste.
- If it is not possible to separate wastes, the whole waste must be classified according to the highest class of waste. For example, if clinical and related waste (special waste) is thoroughly mixed with municipal waste (general solid waste (putrescible)), the whole waste stream must be managed as special waste.
- If asbestos is mixed with other waste to form asbestos waste, the waste must continue to be assessed in accordance with these guidelines to enable the disposal of the asbestos waste at an appropriate waste facility. Asbestos waste must then be managed to meet the management and disposal requirements of both asbestos *and* the other class of waste with which it is mixed (if any).
- If liquid waste is mixed with hazardous or solid waste and retains the characteristics of liquid waste specified in Step 2, the waste remains liquid waste.

- Two or more classes of waste must not be mixed in order to reduce the concentration of chemical contaminants. Dilution of contaminants is not an acceptable waste management option.

What to do once a waste has been classified

Once a waste has been properly classified, appropriate management options for it can be considered, as required under the POEO Act and its associated regulations. DECCW's website has further guidance on managing specific wastes: visit www.environment.nsw.gov.au/waste/wastetypes.htm

A waste generator may also seek an immobilisation approval from DECCW for a waste stream or particular waste type. A waste may be able to be immobilised so that it can be safely disposed of in an appropriate landfill. Further guidance on immobilisation approvals is available from DECCW's website at www.environment.nsw.gov.au/waste/immobilisation.htm.

Step 1: Is the waste 'special waste'?

'Special waste' is a class of waste that has unique regulatory requirements. The potential environmental impacts of special waste need to be managed to minimise the risk of harm to the environment and human health.

Special waste means any of the following:

- clinical and related waste
- asbestos waste
- waste tyres.

Generators of special waste (except asbestos mixed with other waste – see below) do not need to make any further assessment of their waste if it falls within the definitions of special wastes below.

Note: Where asbestos is mixed with other waste to form asbestos waste, the generator must continue to assess the waste in accordance with the remainder of the steps in this guide. Asbestos waste can only be disposed of at a waste facility that can lawfully receive asbestos *and* the other class of waste with which it is mixed (if any).

The EPA may classify additional wastes as special waste from time to time by a notice published in the *NSW Government Gazette.* All currently gazetted special wastes are listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm.

Clinical and related waste

Clinical and related waste means:

- clinical waste, or
- cytotoxic waste, or
- pharmaceutical, drug or medicine waste, or
- sharps waste.

Clinical waste means any waste resulting from medical, nursing, dental, pharmaceutical, skin penetration or other related clinical activity, being waste that has the potential to cause injury, infection or offence, and includes waste containing any of the following:

- human tissue (other than hair, teeth and nails)
- bulk body fluids or blood
- visibly blood-stained body fluids, materials or equipment
- laboratory specimens or cultures
- animal tissue, carcasses or other waste from animals used for medical research

but does not include any such waste that has been treated by a method approved in writing by the Director-General of the Department of Health.

Cytotoxic waste means any substance contaminated with any residues or preparations that contain materials that are toxic to cells principally through their action on cell reproduction.

Pharmaceutical, drug or medicine waste means waste that has been generated by activities carried out for business or other commercial purposes and that consists of pharmaceutical or other chemical substances specified in the Poisons List made under section 8 of the *Poisons and Therapeutic Goods Act 1966.*

It does not include pharmaceutical, drug or medicine waste generated in the home.

Sharps waste means any waste collected from designated sharps waste containers used in the course of business, commercial or community service activities, being waste resulting from the use of sharps for any of the following purposes:

- human health care by health professionals and other health care providers
- medical research or work on cadavers
- veterinary care or veterinary research
- skin penetration or the injection of drugs or other substances for medical or non-medical reasons

but does not include waste that has been treated on the site where it was generated, and to a standard specified in an EPA gazettal notice.

Sharps means those things:

- that have sharp points or edges capable of cutting, piercing or penetrating the skin (such as needles, syringes with needles or surgical instruments), and
- that are designed for the purpose of cutting, piercing or penetrating the skin, and
- that have the potential to cause injury or infection.

Asbestos waste

Asbestos means the fibrous form of those mineral silicates that belong to the serpentine or amphibole groups of rock-forming minerals, including actinolite, amosite (brown asbestos), anthophyllite, chrysotile (white asbestos), crocidolite (blue asbestos) and tremolite.

Asbestos waste means any waste that contains asbestos.

Waste tyres

Waste tyres means used, rejected or unwanted tyres, including shredded tyres or tyre pieces.

Note: Waste tyres must be tracked when transported interstate but not when transported within NSW.

Step 2: Is the waste 'liquid waste'?

If you have established that the waste is not special waste, decide whether it is 'liquid waste'.

Liquid waste means any waste that:

- has an angle of repose of less than 5 degrees above horizontal, or
- becomes free-flowing at or below 60 degrees Celsius or when it is transported, or
- is generally not capable of being picked up by a spade or shovel.

If the waste meets the criteria outlined above, there is no need for any further assessment.

If the waste does not satisfy any of these criteria, move to Step 3 to classify the waste.

The waste generator may choose to separate the waste into the liquid and solid fractions so that only the solid fraction needs to be further classified in accordance with the following steps.

The EPA may classify additional wastes as liquid waste from time to time by a notice published in the *NSW Government Gazette.* All currently gazetted liquid wastes are listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm.

Step 3: Is the waste 'pre-classified'?

If the waste is neither special nor liquid waste, establish whether the waste has already been classified by the EPA. Some commonly generated wastes have been pre-classified as hazardous waste, general solid waste (putrescible) or general solid waste (non-putrescible). Wastes that have been classified by the EPA cannot be reclassified by any other party.

The following wastes have already been classified by the EPA.

Hazardous waste

The following wastes have been pre-classified by the EPA as 'hazardous waste':

- containers, having previously contained a substance of Class 1, 3, 4, 5 or 8 within the meaning of the *Transport of Dangerous Goods Code*, or a substance to which Division 6.1 of the *Transport of Dangerous Goods Code* applies, from which residues have not been removed by washing or vacuuming
- coal tar or coal tar pitch waste (being the tarry residue from the heating, processing or burning of coal or coke) comprising of more than 1% (by weight) of coal tar or coal tar pitch waste
- lead-acid or nickel-cadmium batteries (being waste generated or separately collected by activities carried out for business, commercial or community services purposes)
- lead paint waste arising otherwise than from residential premises or educational or child care institutions
- any mixture of the wastes referred to above.

The EPA may pre-classify additional wastes as hazardous waste from time to time by a notice published in the *NSW Government Gazette*. All currently gazetted hazardous wastes are listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm.

Restricted solid waste

Currently, no wastes have been pre-classified by the EPA as 'restricted solid waste'. Restricted solid waste therefore only includes wastes assessed and classified as such in accordance with the procedures in Step 5 of this guide.

However the EPA may classify waste as restricted solid waste from time to time by a notice published in the *NSW Government Gazette*. All currently gazetted restricted wastes will be listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm.

General solid waste (putrescible)

The following wastes have been pre-classified by the EPA as 'general solid waste (putrescible)':

- household waste that contains putrescible organics
- waste from litter bins collected by or on behalf of local councils
- manure and night soil
- disposable nappies, incontinence pads or sanitary napkins
- food waste

- animal waste
- grit or screenings from sewage treatment systems that have been dewatered so that the grit or screenings do not contain free liquids
- any mixture of the wastes referred to above.

In assessing whether waste has been pre-classified as general solid waste (putrescible), the following definitions apply:

Animal waste includes dead animals and animal parts and any mixture of dead animals and animal parts.

Food waste means waste from the manufacture, preparation, sale or consumption of food but does not include grease-trap waste.

Manure includes any mixture of manure and biodegradable animal bedding, such as straw.

Wastes may be classified as general solid waste (putrescible) by the EPA from time to time by a notice published in the *NSW Government Gazette*. All currently gazetted general solid wastes (putrescible) are listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm

General solid waste (non-putrescible)

The following wastes have been pre-classified as 'general solid waste (non-putrescible)':

- glass, plastic, rubber, plasterboard, ceramics, bricks, concrete or metal
- paper or cardboard
- household waste from municipal clean-up that does not contain food waste
- waste collected by, or on behalf of, local councils from street sweepings
- grit, sediment, litter and gross pollutants collected in, and removed from, stormwater treatment devices and/or stormwater management systems that have been dewatered so that they do not contain free liquids
- grit and screenings from potable water and water reticulation plants that have been dewatered so that they do not contain free liquids
- garden waste
- wood waste
- waste contaminated with lead (including lead paint waste) from residential premises or educational or child care institutions
- containers, previously containing dangerous goods, from which residues have been removed by washing or vacuuming
- drained oil filters (mechanically crushed), rags and oil-absorbent materials that only contain non-volatile petroleum hydrocarbons and do not contain free liquids
- drained motor oil containers that do not contain free liquids
- non-putrescible vegetative waste from agriculture, silviculture or horticulture
- building cavity dust waste removed from residential premises or educational or child care institutions, being waste that is packaged securely to prevent dust emissions and direct contact

- synthetic fibre waste (from materials such as fibreglass, polyesters and other plastics) being waste that is packaged securely to prevent dust emissions, but excluding asbestos waste
- virgin excavated natural material
- building and demolition waste
- asphalt waste (including asphalt resulting from road construction and waterproofing works)
- biosolids categorised as unrestricted use, or restricted use 1, 2 or 3, in accordance with the criteria set out in the *Biosolids Guidelines* (EPA 2000)
- cured concrete waste from a batch plant
- fully cured and set thermosetting polymers and fibre-reinforcing resins
- fully cured and dried residues of resins, glues, paints, coatings and inks
- any mixture of the wastes referred to above.

In assessing whether waste has been pre-classified as general solid waste (non-putrescible), the following definitions apply:

Building and demolition waste means unsegregated material (other than material containing asbestos waste) that results from:

- the demolition, erection, construction, refurbishment or alteration of buildings other than:
  - chemical works, or
  - mineral processing works, or
  - container reconditioning works, or
  - waste treatment facilities, or
- the construction, replacement, repair or alteration of infrastructure development such as roads, tunnels, sewage, water, electricity, telecommunications and airports,

and includes materials such as:

> bricks, concrete, paper, plastics, glass and metal, and timber, including unsegregated timber, that may contain timber treated with chemicals such as copper chrome arsenate (CCA), high temperature creosote (HTC), pigmented emulsified creosote (PEC) and light organic solvent preservative (LOSP)

but does not include excavated soil (for example, soil excavated to level off a site prior to construction or to enable foundations to be laid or infrastructure to be constructed).

Garden waste means waste that consists of branches, grass, leaves, plants, loppings, tree trunks, tree stumps and similar materials, and includes any mixture of those materials.

Virgin excavated natural material means natural material (such as clay, gravel, sand, soil or rock fines):

- that has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities, and
- that does not contain sulfidic ores or soils, or any other waste,

and includes excavated natural material that meets such criteria for virgin excavated natural material as may be approved from time to time by a notice published in the *NSW Government Gazette*.

Wood waste means sawdust, timber offcuts, wooden crates, wooden packaging, wooden pallets, wood shavings and similar materials, and includes any mixture of those materials, but does not include wood treated with chemicals such as copper chrome arsenate (CCA), high temperature creosote (HTC), pigmented emulsified creosote (PEC) and light organic solvent preservative (LOSP).

Additional wastes may be classified as general solid waste (non-putrescible) by the EPA from time to time by a notice published in the *NSW Government Gazette*. All currently gazetted general solid wastes (non-putrescible) are listed on DECCW's website at www.environment.nsw.gov.au/waste/wastetypes.htm.

Step 4: Does the waste possess hazardous characteristics?

Waste must be classified as 'hazardous waste' if it is a dangerous good under any of the following classes or divisions of the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission 2008):

- Class 1: Explosives
- Class 2: Gases (compressed, liquefied or dissolved under pressure)
- Division 4.1: Flammable solids (excluding garden waste, natural organic fibrous material and wood waste, and all physical forms of carbon such as activated carbon and graphite)
- Division 4.2: Substances liable to spontaneous combustion (excluding garden waste, natural organic fibrous material and wood waste, and all physical forms of carbon such as activated carbon and graphite)
- Division 4.3: Substances which when in contact with water emit flammable gases
- Class 5: Oxidising agents and organic peroxides
- Division 6.1: Toxic substances
- Class 8: Corrosive substances.

For further information on the test methods to establish whether the waste exhibits any of the above characteristics, please refer to the *Australian Code for the Transport of Dangerous Goods by Road and Rail* (National Transport Commission 2008).

Step 5: Determining a waste's classification using chemical assessment

Waste generators should chemically assess their waste to determine its classification where:

- the waste is not special waste, liquid waste, a waste pre-classified by the EPA or a waste possessing hazardous characteristics, and
- the composition of the waste is not known.

Chemical assessment may not be necessary where the waste generator knows the processes which produced the waste and the maximum possible levels of contaminants it contains. The generator must be certain that the waste can be classified without SCC and/or TCLP testing (see below). In these cases, the generator must ensure that the reasons for not undertaking the chemical assessment are documented and records of the decision retained for three years.

Where waste generators are unsure of the appropriate sampling or analytical methods for a particular waste, they are strongly encouraged to seek expert help, either from a laboratory that specialises in waste analysis or someone specialising in waste management issues, or both.

The chemical assessment process is based around the waste's potential to release chemical contaminants into the environment through contact with liquids, mainly water, which leads to the production of leachates.

Information on sampling and analytical methods is provided in Appendix I.

Where a waste generator does not wish to undertake this chemical assessment, the waste must be managed as if it were hazardous waste, which cannot be disposed of and must be treated.

Measurable properties of waste

The two measurable properties of chemical contaminants used to classify waste are:

- the specific contaminant concentration (SCC) of any chemical contaminant in the waste, expressed as milligrams per kilogram (mg/kg)
- the leachable concentration of any chemical contaminant using the toxicity characteristics leaching procedure (TCLP), expressed as milligrams per litre (mg/L).

Test methods for determining SCC and TCLP

The reference test methods for determining both the SCC and TCLP values are as described in the United States Environmental Protection Agency's *Test Methods for Evaluating Solid Waste, Physical/Chemical Methods* (USEPA 1986) and Updates I, II, IIIA, IIIB, IVA and IVB, available at www.epa.gov/epaoswer/hazwaste/test/sw846.htm.

The following procedures for leachate preparation are recommended:

- *AS 4439.1–1999: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Preliminary Assessment* (Australian Standard 1999b)
- *AS 4439.3–1997: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Bottle Leaching Procedure* (Australian Standard 1997a)
- *AS 4439.2–1997: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Zero Headspace Procedure* (Australian Standard 1997b).

The standard pH for the leaching solutions used must be either 4.93 ± 0.05 if the pH of the waste sample is less than 5.0, or 2.88 ± 0.05 if the pH of the waste sample is greater than 5.0.

To determine the pH of the waste sample, use the test method specified in Clause 7.5 (Selection of Leaching Fluid) of *AS 4439.3–1997* (above).

In some instances the EPA may permit the use of leachates with a pH different from those specified above. EPA authorisation to use an alternative must be sought in writing and will only be provided with adequate justification for the proposed variation. An example might be the testing of a non-putrescible waste for disposal into a monofill or monocell which it can be shown will not be penetrated by acidic leachate or groundwater. For further assistance, contact DECCW's Waste Management Section.

Classifying a waste using the SCC test

The first test that should be used to chemically assess waste is the specific contaminant concentration (SCC) test.

The SCC test acts as an initial screening test for the classification of a waste. Based on SCC alone, the test value for each contaminant must be less than or equal to the contaminant threshold (CT) value specified for that contaminant in Table 1 for it to fall into the following classes:

- general solid waste ≤ CT1
- restricted solid waste ≤ CT2.

If a waste's SCC test value exceeds the contaminant threshold value set for general solid waste (CT1), further assessment using the TCLP test may be used.

Where the contaminant threshold value set for restricted solid waste (CT2) is exceeded, a TCLP test is necessary to determine the leachable concentration and class of waste.

Note: For waste assessment and classification, it is recommended that the sample mean, the sample standard deviation and the 95% upper confidence limit (UCL) of the mean concentration is calculated for each contaminant to ensure that the 95% UCL for the mean concentration is less than or equal to the CT limit value specified for that contaminant.

Classifying a waste using both the SCC test and TCLP

To establish the waste's classification using both SCC and TCLP, the test values for each chemical contaminant must be compared with the threshold values set in Table 2.

Classification	SCC value	TCLP value
General solid waste	≤ SCC1	≤ TCLP1
Restricted solid waste	≤ SCC2	≤ TCLP2
Hazardous waste	> SCC2	> TCLP2

If any of the SCC or TCLP threshold values specified in Table 2 are exceeded for general solid waste, the waste must be classified as restricted solid waste. If any of the SCC or TCLP threshold values specified in Table 2 are exceeded for restricted solid waste, the waste must be classified as hazardous waste. Detailed interpretative guidance regarding the use of both SCC and TCLP values to establish a waste's classification is provided in Table 3.

It is important to note that wherever an EPA approval has been given for the immobilisation of the contaminant(s), the waste can be classified according to its TCLP test results alone.

Note: For waste assessment and classification, it is recommended that the sample mean, the sample standard deviation and the 95% UCL of the mean concentration is calculated for each contaminant to ensure that the 95% UCL for the mean concentration is less than or equal to the SCC or TCLP limit value specified for that contaminant.

Table 1: Contaminant threshold values (CT1 & CT2) for classifying waste by chemical assessment without the leaching (TCLP) test

For disposal requirements for organic and inorganic chemical contaminants not listed below, contact DECCW. Aluminium, barium, boron, chromium (0 and III oxidation states), cobalt, copper, iron, manganese, vanadium and zinc have not been listed with values in this table and need not be tested for.

	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		
	General solid waste[1]	**Restricted solid waste**	
Contaminant	**CT1 (mg/kg)**	**CT2 (mg/kg)**	**CAS Registry Number**
Arsenic	100	400	
Benzene	10	40	71-43-2
Benzo(a)pyrene[2]	0.8	3.2	50-32-8
Beryllium	20	80	
Cadmium	20	80	
Carbon tetrachloride	10	40	56-23-5
Chlorobenzene	2000	8000	108-90-7
Chloroform	120	480	67-66-3
Chlorpyrifos	4	16	2921-88-2
Chromium (VI)[3]	100	400	
m-Cresol	4000	16000	108-39-4
o-Cresol	4000	16000	95-48-7
p-Cresol	4000	16000	106-44-5
Cresol (total)	4000	16000	1319-77-3
Cyanide (amenable)[4]	70	280	
Cyanide (total)	320	1280	
2,4-D	200	800	94-75-7
1,2-Dichlorobenzene	86	344	95-50-1
1,4-Dichlorobenzene	150	600	106-46-7
1,2-Dichloroethane	10	40	107-06-2
1,1-Dichloroethylene	14	56	75-35-4
Dichloromethane	172	688	75-09-2
2,4-Dinitrotoluene	2.6	10.4	121-14-2
Endosulfan[5]	60	240	See below[5]
Ethylbenzene	600	2400	100-41-4
Fluoride	3000	12000	
Fluroxypyr	40	160	69377-81-7

	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		
	General solid waste[1]	Restricted solid waste	
Contaminant	CT1 (mg/kg)	CT2 (mg/kg)	CAS Registry Number
Lead	100	400	
Mercury	4	16	
Methyl ethyl ketone	4000	16000	78-93-3
Moderately harmful pesticides[6] (total)	N/A[7]	N/A[7]	See below[6]
Molybdenum	100	400	
Nickel	40	160	
Nitrobenzene	40	160	98-95-3
C6-C9 petroleum hydrocarbons	N/A[7]	N/A[7]	
C10-C36 petroleum hydrocarbons	N/A[7]	N/A[7]	
Phenol (non-halogenated)	288	1152	108-95-2
Picloram	60	240	1918-02-1
Plasticiser compounds[8]	20	80	See below[8]
Polychlorinated biphenyls	N/A[7]	N/A[7]	1336-36-3
Polycyclic aromatic hydrocarbons (total)	N/A[7]	N/A[7]	
Scheduled chemicals	N/A[7]	N/A[7]	
Selenium	20	80	
Silver	100	400	
Styrene (vinyl benzene)	60	240	100-42-5
Tebuconazole	128	512	107534-96-3
1,2,3,4-Tetrachlorobenzene	10	40	634-66-2
1,1,1,2-Tetrachloroethane	200	800	630-20-6
1,1,2,2-Tetrachloroethane	26	104	79-34-5
Tetrachloroethylene	14	56	127-18-4
Toluene	288	1152	108-88-3
1,1,1-Trichloroethane	600	2400	71-55-6
1,1,2-Trichloroethane	24	96	79-00-5
Trichloroethylene	10	40	79-01-6
2,4,5-Trichlorophenol	8000	32000	95-95-4
2,4,6-Trichlorophenol	40	160	88-06-2

	Maximum values of *specific contaminant concentration* (SCC) for classification without TCLP		
	General solid waste[1]	Restricted solid waste	
Contaminant	**CT1 (mg/kg)**	**CT2 (mg/kg)**	**CAS Registry Number**
Triclopyr	40	160	55335-06-3
Vinyl chloride	4	16	75-01-4
Xylenes (total)	1000	4000	1330-20-7

Notes

1. Values are the same for both general solid waste (putrescible) and general solid waste (non-putrescible).

2. There may be a need for the laboratory to concentrate the sample to achieve the TCLP limit value for benzo(a)pyrene with confidence.

3. These limits apply to chromium in the +6 oxidation state only.

4. Analysis for cyanide (amenable) is the established method for assessing potentially leachable cyanide. DECCW may consider other methods if it can be demonstrated that these methods yield the same information.

5. Endosulfan (CAS Registry Number 115-29-7) means the total of Endosulfan I (CAS Registry Number 959-98-8), Endosulfan II (CAS Registry Number 891-86-1) and Endosulfan sulfate (CAS Registry Number 1031-07-8).

6. The following moderately harmful pesticides (CAS Registry Number) are to be included in the total values specified:

   Atrazine (1912-24-9), Azoxystrobin (131860-33-8), Bifenthrin (82657-04-3), Brodifacoum (56073-10-0), Carboxin (5234-68-4), Copper naphthenate (1338-02-9), Cyfluthrin (68359-37-5), Cyhalothrin (68085-85-8), Cypermethrin (52315-07-08), Deltamethrin (52918-63-5), Dichlofluanid (1085-98-9), Dichlorvos (62-73-7), Difenoconazole (119446-68-3), Dimethoate (60-51-5), Diquat dibromide (85-00-7), Emamectin benzoate (137515-75-4 & 155569-91-8), Ethion (563-12-2), Fenthion (55-38-9), Fenitrothion (122-14-5), Fipronil (120068-37-3), Fluazifop-P-butyl (79241-46-6), Fludioxonil (131341-86-1), Glyphosate (1071-83-6), Imidacloprid (138261-41-3), Indoxacarb (173584-44-6), Malathion (Maldison) (121-75-5), Metalaxyl (57837-19-1), Metalaxyl-M (70630-17-0), Methidathion (950-37-8), 3-Methyl-4-chlorophenol (59-50-7), Methyl chlorpyrifos (5598-13-0), N-Methyl pyrrolidone (872-50-4), 2-octylthiazol-3-one (26530-20-1), Oxyfluorfen (42874-03-3), Paraquat dichloride (1910-42-5), Parathion methyl (298-00-0), Permethrin (52645-53-1), Profenofos (41198-08-7), Prometryn (7287-19-6), Propargite (2312-35-8), Pentachloronitrobenzene (Quintozene) (82-68-8), Simazine (122-34-9), Thiabendazole (148-79-8),Thiamethoxam (153719-23-4), Thiodicarb (59669-26-0) and Thiram (137-26-8).

7. N/A means not applicable, because these contaminants are only assessed using SCC - see Table 2 for SCC criteria.

8. Plasticiser compounds means the total of di-2-ethyl hexyl phthalate (CAS Registry Number 117-81-7) and di-2-ethyl hexyl adipate (CAS Registry Number 103-23-1) contained within a waste.

Table 2: Leachable concentration (TCLP) and specific contaminant concentration (SCC) values for classifying waste by chemical assessment

For disposal requirements for organic and inorganic chemical contaminants not listed below, contact DECCW. Aluminium, barium, boron, chromium (0 and III oxidation states), cobalt, copper, iron, manganese, vanadium and zinc have not been listed with values in this table and need not be tested for.

	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				
	General solid waste[1]		**Restricted solid waste**		
Contaminant	**Leachable concentration**	**Specific contaminant concentration**	**Leachable concentration**	**Specific contaminant concentration**	**CAS Registry Number**
	TCLP1 (mg/L)	**SCC1 (mg/kg)**	**TCLP2 (mg/L)**	**SCC2 (mg/kg)**	
Arsenic	5.0[2]	500	20	2000	
Benzene	0.5[2]	18	2	72	71-43-2
Benzo(a)pyrene[3]	0.04[4]	10	0.16	23	50-32-8
Beryllium	1.0[5]	100	4	400	
Cadmium	1.0[2]	100	4	400	
Carbon tetrachloride	0.5[2]	18	2	72	56-23-5
Chlorobenzene	100[2]	3600	400	14400	108-90-7
Chloroform	6[2]	216	24	864	67-66-3
Chlorpyrifos	0.2	7.5	0.8	30	2921-88-2
Chromium (VI)[6]	5[2]	1900	20	7600	
m-Cresol	200[2]	7200	800	28800	108-39-4
o-Cresol	200[2]	7200	800	28800	95-48-7
p-Cresol	200[2]	7200	800	28800	106-44-5
Cresol (total)	200[2]	7200	800	28800	1319-77-3
Cyanide (amenable)[7, 8]	3.5[7]	300	14	1200	
Cyanide (total)[7]	16[7]	5900	64	23600	
2,4-D	10[2]	360	40	1440	94-75-7
1,2-Dichlorobenzene	4.3[2]	155	17.2	620	95-50-1
1,4-Dichlorobenzene	7.5[2]	270	30	1080	106-46-7
1,2-Dichloroethane	0.5[2]	18	2	72	107-06-2
1,1-Dichloro-ethylene	0.7[2]	25	2.8	100	75-35-4
Dichloromethane	8.6[2]	310	34.4	1240	75-09-2

	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				
	General solid waste[1]		Restricted solid waste		
Contaminant	Leachable concentration	Specific contaminant concentration	Leachable concentration	Specific contaminant concentration	CAS Registry Number
	TCLP1 (mg/L)	SCC1 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	
2,4-Dinitrotoluene	0.13[2]	4.68	0.52	18.7	121-14-2
Endosulfan[9]	3	108	12	432	See below[9]
Ethylbenzene	30[10]	1080	120	4320	100-41-4
Fluoride	150[10]	10000	600	40000	
Fluroxypyr	2	75	8	300	69377-81-7
Lead	5[2]	1500	20	6000	
Mercury	0.2[2]	50	0.8	200	
Methyl ethyl ketone	200[2]	7200	800	28800	78-93-3
Moderately harmful pesticides[11](total)	N/A[12]	250	N/A[12]	1000	See below[11]
Molybdenum	5[10]	1000	20	4000	
Nickel	2[10]	1050	8	4200	
Nitrobenzene	2[2]	72	8	288	98-95-3
C6-C9 petroleum hydrocarbons[13]	N/A[12]	650	N/A[12]	2600	
C10-C36 petroleum hydrocarbons[13]	N/A[12]	10000	N/A[12]	40000	
Phenol (non-halogenated)	14.4[14]	518	57.6	2073	108-95-2
Picloram	3	110	12	440	1918-02-1
Plasticiser compounds[15]	1	600	4	2400	See below[15]
Polychlorinated biphenyls[12]	N/A[12]	< 50	N/A[12]	< 50	1336-36-3
Polycyclic aromatic hydrocarbons (total)[16]	N/A[12]	200	N/A[12]	800	
Scheduled chemicals[17]	N/A[12]	< 50	N/A[12]	< 50	See below[17]
Selenium	1[2]	50	4	200	

Contaminant	Maximum values for *leachable concentration* and *specific contaminant concentration* when used together				CAS Registry Number
	General solid waste[1]		Restricted solid waste		
	Leachable concentration	Specific contaminant concentration	Leachable concentration	Specific contaminant concentration	
	TCLP1 (mg/L)	SCC1 (mg/kg)	TCLP2 (mg/L)	SCC2 (mg/kg)	
Silver	5.0[2]	180	20	720	
Styrene (vinyl benzene)	3[10]	108	12	432	100-42-5
Tebuconazole	6.4	230	25.6	920	107534-96-3
1,2,3,4-Tetrachloro-benzene	0.5	18	2	72	634-66-2
1,1,1,2-Tetrachloro-ethane	10[2]	360	40	1440	630-20-6
1,1,2,2-Tetrachloro-ethane	1.3[2]	46.8	5.2	187.2	79-34-5
Tetrachloro-ethylene	0.7[2]	25.2	2.8	100.8	127-18-4
Toluene	14.4[14]	518	57.6	2073	108-88-3
1,1,1-Trichloroethane	30[2]	1080	120	4320	71-55-6
1,1,2-Trichloroethane	1.2[2]	43.2	4.8	172.8	79-00-5
Trichloroethylene	0.5[2]	18	2	72	79-01-6
2,4,5-Trichlorophenol	400[2]	14400	1600	57600	95-95-4
2,4,6-Trichlorophenol	2[2]	72	8	288	88-06-2
Triclopyr	2	75	8	300	55335-06-3
Vinyl chloride	0.2[2]	7.2	0.8	28.8	75-01-4
Xylenes (total)	50[18]	1800	200	7200	1330-20-7

Notes

1. Values are the same for general solid waste (putrescible) and general solid waste (non-putrescible).

2. See *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule* (USEPA 1990) for TCLP levels.

3. There may be a need for the laboratory to concentrate the sample to achieve the TCLP limit value for benzo(a)pyrene with confidence.

4. Calculated from *Hazardous Waste: Identification and Listing – Proposed Rule* (USEPA 1995)

5. Calculated from 'Beryllium' in *The Health Risk Assessment and Management of Contaminated Sites* (DiMarco & Buckett 1996)

6. These limits apply to chromium in the +6 oxidation state only.

7. Taken from the *Land Disposal Restrictions for Newly Identified and Listed Hazardous Wastes and Hazardous Soil: Proposed Rule* (USEPA 1993)

8. Analysis for cyanide (amenable) is the established method used to assess the potentially leachable cyanide. DECCW may consider other methods if it can be demonstrated that these methods yield the same information.

9. Endosulfan (CAS Registry Number 115-29-7) means the total of Endosulfan I (CAS Registry Number 959-98-8), Endosulfan II (CAS Registry Number 891-86-1) and Endosulfan sulfate (CAS Registry Number 1031-07-8).

10. Calculated from *Australian Drinking Water Guidelines* (NHMRC 1994)

11. The following moderately harmful pesticides (CAS Registry Number) are to be included in the total values specified:

    Atrazine (1912-24-9), Azoxystrobin (131860-33-8), Bifenthrin (82657-04-3), Brodifacoum (56073-10-0), Carboxin (5234-68-4), Copper naphthenate (1338-02-9), Cyfluthrin (68359-37-5), Cyhalothrin (68085-85-8), Cypermethrin (52315-07-08), Deltamethrin (52918-63-5), Dichlofluanid (1085-98-9), Dichlorvos (62-73-7), Difenoconazole (119446-68-3), Dimethoate (60-51-5), Diquat dibromide (85-00-7), Emamectin benzoate (137515-75-4 & 155569-91-8), Ethion (563-12-2), Fenthion (55-38-9), Fenitrothion (122-14-5), Fipronil (120068-37-3), Fluazifop-P-butyl (79241-46-6), Fludioxonil (131341-86-1), Glyphosate (1071-83-6), Imidacloprid (138261-41-3), Indoxacarb (173584-44-6), Malathion (Maldison) (121-75-5), Metalaxyl (57837-19-1), Metalaxyl-M (70630-17-0), Methidathion (950-37-8), 3-Methyl-4-chlorophenol (59-50-7), Methyl chlorpyrifos (5598-13-0), N-Methyl pyrrolidone (872-50-4), 2-octylthiazol-3-one (26530-20-1), Oxyfluorfen (42874-03-3), Paraquat dichloride (1910-42-5), Parathion methyl (298-00-0), Permethrin (52645-53-1), Profenofos (41198-08-7), Prometryn (7287-19-6), Propargite (2312-35-8), Pentachloronitrobenzene (Quintozene) (82-68-8), Simazine (122-34-9), Thiabendazole (148-79-8),Thiamethoxam (153719-23-4), Thiodicarb (59669-26-0) and Thiram (137-26-8).

12. No TCLP analysis is required. Moderately harmful pesticides, petroleum hydrocarbons, polychlorinated biphenyls, polycyclic aromatic hydrocarbons and scheduled chemicals are assessed using SCC1 and SCC2.

13. Approximate range of petroleum hydrocarbon fractions: petrol C6-C9, kerosene C10-C18, diesel C12-C18, and lubricating oils above C18. Laboratory results are reported as four different fractions: C6-C9, C10-C14, C15-C28 and C29-C36. The results of total petroleum hydrocarbons (C10-C36) analyses are reported as a sum of the relevant three fractions. Please note that hydrocarbons are defined as molecules that only contain carbon and hydrogen atoms. Prior to TPH (C10-C36) analysis, cleanup may be necessary to remove non-petroleum hydrocarbon compounds. Where the presence of other materials that will interfere with the analysis may be present, such as oils and fats from food sources, you are advised to treat the extract that has been solvent exchanged to hexane with silica gel as described in *USEPA Method 1664A* (USEPA 1999).

14. Proposed level for phenol and toluene in *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule* (USEPA 1990)

15. Plasticiser compounds means the total of di-2-ethyl hexyl phthalate (CAS Registry Number 117-81-7) and di-2-ethyl hexyl adipate (CAS Registry Number 103-23-1) contained within a waste.

16. The following polycyclic aromatic hydrocarbons (CAS number) are assessed as the total concentration of 16 USEPA Priority Pollutant PAHs, as follows:

Polycyclic aromatic hydrocarbons (total)			
PAH name	**CAS Registry Number**	**PAH name**	**CAS Registry Number**
Acenaphthene	83-32-9	Chrysene	218-01-9
Acenaphthylene	208-96-8	Dibenzo(a,h)anthracene	53-70-3
Anthracene	120-12-7	Fluoranthene	206-44-0
Benzo(a)anthracene	56-55-3	Fluorene	86-73-7
Benzo(a)pyrene	50-32-8	Indeno(1,2,3-cd)pyrene	193-39-5
Benzo(b)fluoranthene	205-99-2	Naphthalene	91-20-3
Benzo(ghi)perylene	191-24-2	Phenanthrene	85-01-8
Benzo(k)fluoranthene	207-08-9	Pyrene	129-00-0

17. The following Scheduled Chemicals (CAS Registry Number) are to be included in the total values specified:

    Aldrin (309-00-2), Alpha-BHC (319-84-6), Beta-BHC (319-85-7), Gamma-BHC (Lindane) (58-89-9), Delta-BHC (319-86-8), Chlordane (57-74-9), DDD (72-54-8), DDE (72-55-9), DDT (50-29-3), Dieldrin (60-57-1), Endrin (72-20-8), Endrin aldehyde (7421-93-4), Heptachlor (76-44-8), Heptachlor epoxide (1024-57-3), Hexachlorobenzene (118-74-1), Hexachlorophene (70-30-4), Isodrin (465-73-6), Pentachlorobenzene (608-93-5), Pentachloronitrobenzene (82-68-8), Pentachlorophenol (87-86-5), 1,2,4,5-Tetrachlorobenzene (95-94-3), 2,3,4,6 Tetrachlorophenol (58-90-2), 1,2,4-Trichlorobenzene (120-82-1), 2,4,5-Trichlorophenoxyacetic acid, salts and esters (93-76-5).

18. Calculated from *Guidelines for Drinking Water Quality* (WHO 1993)

Table 3: Summary of criteria for chemical assessment to determine waste classification

Waste classification[1]	Criteria[2] for classification by chemical assessment (any of the alternative options given)	Comments
General solid waste	1. SCC test values ≤ CT1	TCLP test not required
	2. TCLP test values ≤ TCLP1 and SCC test values ≤ SCC1	
	3. TCLP test values ≤ TCLP1 and SCC test values > SCC1 and DECCW approves immobilisation[3]	Without DECCW approval of immobilisation, classify as restricted solid or hazardous (as applicable)
Restricted solid waste	1. SCC test values ≤ CT2	TCLP test not required
	2. TCLP1 < TCLP test values ≤ TCLP2 and SCC test values ≤ SCC2	
	3.TCLP test values ≤ TCLP2 and SCC1 < SCC test values ≤ SCC2	
	4. TCLP1 < TCLP test values ≤ TCLP2 and SCC test values > SCC2 and DECCW approves immobilisation[3]	Without DECCW approval of immobilisation, classify as hazardous
Hazardous waste	1. TCLP test values > TCLP 2	
	2. TCLP test values ≤ TCLP2 and SCC test values > SCC2 and no DECCW approval for immobilisation	

Notes:
1. See also the general waste classification principles on page 2 for other criteria that must be satisfied before the waste can be classified.
2. These criteria apply to each toxic and ecotoxic contaminant present in the waste (see Tables 1 and 2).
3. In certain cases DECCW will consider specific conditions, such as segregation of the waste from all other types of waste in a monofill or monocell in order to achieve a greater margin of safety against a possible failure of the immobilisation in the future. Information about the construction and operation of a monofill/monocell is available in the *Draft Environmental Guidelines for Industrial Waste Landfilling* (EPA 1998).

Step 6: Is the waste putrescible?

Where chemical assessment of a waste results in classification of the waste as general solid waste, further assessment may be undertaken to determine whether the waste can be classified as 'general solid waste (putrescible)' or 'general solid waste (non-putrescible)'.

General solid waste may only be classified as non-putrescible if:

- it does not readily decay under standard conditions, does not emit offensive odours and does not attract vermin or other vectors (such as flies, birds and rodents), or
- has a specific oxygen uptake of less than 1.5 milligrams O_2 per hour per gram of total organic solids at 20 degrees Celsius, or
- is such that, during composting (for the purpose of stabilisation), the mass of volatile solids in the organic waste has been reduced by at least 38%, or
- has been treated by composting for at least 14 days, during which time the temperature of the organic waste must have been greater than 40 degrees Celsius and the average temperature greater than 45 degrees Celsius, or
- in the case of biologically treated putrescible wastes, the temperature of the organics fraction does not exceed a self-heating temperature of 40 degrees Celsius, when tested in accordance with the test method in Appendix K of *AS 4454–2003: Composts, Soils, Conditioners and Mulches* (Australian Standard 2003a), or
- has been subjected to and has met the requirements of alternative tests approved by the EPA from time to time by notice published in the *NSW Government Gazette* and published on DECCW's website.

Non-putrescible materials typically do not:

- readily decay under standard conditions
- emit offensive odours
- attract vermin or other vectors (such as flies, birds and rodents).

Wastes that are generally not classified as putrescible include soils, timber, garden trimmings, agricultural, forestry and crop materials, and natural fibrous organic and vegetative materials.

Note: Output from Alternative Waste Technology facilities (AWTs) that requires disposal must be assessed in accordance with the above to determine its putrescibility.

Where a waste generator does not wish to undertake further assessment of the waste in accordance with this step, the waste must be classified as 'general solid waste (putrescible)'.

Appendix 1: Chemical assessment

Sampling and analytical methods

Sampling identifies the average levels of contaminants in the waste being assessed. While the following is provided as a guide, it is not possible to recommend sampling methods for all waste types. Appropriate sampling depends on how consistent any tested property is throughout a batch of waste. It is the waste generator's responsibility to ensure that the sampling and analytical methods used are appropriate for the contaminants they are testing for.

Where the property being tested for is highly consistent throughout the waste, sampling is relatively straightforward and useful guidance can be found in the following Australian Standards:

- *AS 1199.0–2003: Sampling Procedures for Inspection by Attributes – Introduction to the ISO2859 Attribute Sampling System* (Australian Standard 2003b)
- *AS 1141.0–1999: Methods for Sampling and Testing Aggregates* (Australian Standard 1999a) is useful for sampling wastes such as aggregates, foundry sand, furnace slag or mining waste.

It is more difficult to accurately sample waste that consists of many different types of waste materials or has chemical contaminants that are not distributed evenly throughout the batch. In such situations, keeping different waste types separate, or separating portions of waste that contain high levels of contaminants from the rest, can be of great benefit.

If unsure of the appropriate sampling or analytical methods for a particular waste, waste generators are strongly encouraged to seek expert help, either from a laboratory that specialises in waste analysis or an appropriately qualified person specialising in such waste management issues, or both. Since most incorrect chemical assessments of waste are due to poor sampling, it is essential that the sampling regime and analytical method used ensure the results are representative of all components and their variability in the waste.

Precision in chemical analyses

It is important that the test methods and instruments used in analysing a waste are capable of measuring the concentration of each chemical contaminant with enough confidence to assure correct classification.

It is recommended that the upper limit of the combined confidence interval of sampling and analysis (at a probability of 95%) is used for comparison with the maximum values specified in Tables 1 and 2. This approach should give the assessor confidence that a correct classification has been made.

Who can do the chemical analysis and leaching tests?

It is strongly recommended that analytical laboratories accredited by the National Association of Testing Authorities (NATA) are used to perform these analyses and tests. If accredited laboratories are not available locally, contact DECCW's Waste Management Section for advice.

Frequency of testing

There may be situations in which frequent testing of the waste for an initial period establishes that the characteristics of the waste are consistent enough to give the waste generator confidence to reduce the frequency of testing.

On the other hand, some waste streams may show such large variations in properties that every load of waste would need to be tested before classification.

It is the responsibility of the waste generator to ensure that frequency of testing provides representative samples for all contaminants in that waste.

Which contaminants should be tested for?

Tables 1 and 2 in this guidance note list the chemical contaminants that are used in the classification of wastes. If a waste contains chemical contaminants that are not in these tables, contact DECCW's Waste Management Section for advice.

References

Australian Standard 1997a, *AS 4439.3–1997: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Bottle Leaching Procedure*, Standards Australia, Sydney

Australian Standard 1997b, *AS 4439.2–1997: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Zero Headspace Procedure*, Standards Australia, Sydney

Australian Standard 1999a, *AS 1141.0–1999: Methods for Sampling and Testing Aggregate*, Standards Australia, Sydney

Australian Standard 1999b, *AS 4439.1–1999: Wastes, Sediments and Contaminated Soils – Preparation of Leachates, Preliminary Assessment*, Standards Australia, Sydney

Australian Standard 2003a, *AS 4454–2003: Composts, Soils, Conditioners and Mulches*, Standards Australia Sydney

Australian Standard 2003b, *AS 1199.0–2003: Sampling Procedures for Inspection by Attributes – Introduction to the ISO2859 Attribute Sampling System*, Standards Australia Sydney

DiMarco, P and Buckett, KJ 1996, 'Beryllium' in A Langley, B Markey and H Hill (eds), *The Health Risk Assessment and Management of Contaminated Sites*, Proceedings of the Third National Workshop on the Health Risk Assessment and Management of Contaminated Sites, Contaminated Sites Monograph Series No. 5, South Australian Health Commission, Adelaide

EPA 1998, *Draft Environmental Guidelines for Industrial Waste Landfilling*, NSW Environment Protection Authority, Sydney

EPA 2000, *Environmental Guidelines: Use and Disposal of Biosolids Products*, NSW Environment Protection Authority, Sydney

National Transport Commission 2008, *Australian Code for the Transport of Dangerous Goods by Road and Rail*, 7th edition, Melbourne

NHMRC 1994, *Australian Drinking Water Guidelines*, National Health and Medical Research Council, Canberra

USEPA 1986, *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW–846, Third Edition, 1986 and Updates I, II, IIIA, IIIB, IVA and IVB, Office of Solid Waste and Emergency Response, United States Environmental Protection Agency, available at www.epa.gov/epaoswer/hazwaste/test/sw846.htm

USEPA 1990, *Hazardous Waste Management System: Identification and Listing of Hazardous Waste – Toxicity Characteristics Revisions, Final Rule*, United States Environmental Protection Agency, Federal Register, Vol. 55, No. 61, Washington DC

USEPA 1993, *Land Disposal Restrictions for Newly Identified and Listed Hazardous Wastes and Hazardous Soil – Proposed Rule*, United States Environmental Protection Agency, Federal Register, Vol. 58, No. 176, 48103–48106, Washington DC

USEPA 1995, *Hazardous Waste: Identification and Listing – Proposed Rule,* United States Environmental Protection Agency, Federal Register, Vol. 60, No. 245, 66445, Washington DC

USEPA 1999, *USEPA Method 1664A: n-Hexane Extractable Material (HEM; Oil and Grease) and Silica Gel Treated n-Hexane Extractable Material (SGT-HEM; Non-polar Material) by Extraction and Gravimetry*, Revision A, United States Environmental Protection Agency, Washington DC

WHO 1993, *Guidelines for Drinking Water Quality*, World Health Organisation, Geneva

Waste Classification Guidelines

Part 2:
Immobilisation of Waste

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Contents

Introduction

Certain wastes have properties that make them hazardous and potentially harmful to human health or the environment. New South Wales has established a stringent regulatory regime for managing harmful wastes at their source, during transport and when they are treated or disposed of.

As a first measure, industries generating waste must classify the waste in order to assess its properties and determine appropriate avenues for handling, transporting and disposing of it. Waste is classified in accordance with the *Protection of the Environment Operations Act 1997* and as outlined in 'Part A: Classifying waste' in these *Waste Classification Guidelines* (also known as the 'Waste Guidelines'). These are available from the Department of Environment and Climate Change (DECC) website at www.environment.nsw.gov.au/waste/envguidlns/index.htm.

Waste classified as 'hazardous' in accordance with the Waste Guidelines because of the high levels of contaminant(s) it contains is not suitable for disposal to landfill in NSW.

However, sometimes the contaminants are able to be 'immobilised' so that they will not be released into the landfill leachate at levels of concern. In these cases, DECC may grant an immobilisation approval. Immobilisation of a contaminant in waste is a measure of how securely that contaminant is fixed or locked-up in the waste for the long term. DECC issues immobilisation approvals in accordance with clause 50 of the Protection of the Environment Operations (Waste) Regulation 2005. The approval granted under this clause may be a 'general approval' or a 'specific approval'.

An immobilisation approval enables a waste to be reassessed and reclassified. Conformity with an immobilisation approval would enable a waste to be disposed of at a landfill appropriate to its reclassification.

Who should use this guide?

This guide should be used by waste generators and treatment facilities who:

- classify their waste as hazardous under the Waste Guidelines because of its high levels of contaminants
- establish that it is not possible to reuse, recycle or reprocess the waste by specific treatment to remove or destroy the contaminants
- need to dispose of the waste
- establish that the contaminants of concern can be immobilised so that they will not be released into landfill leachate at levels of concern.

How to use this guide

This guide provides an overview of the immobilisation of contaminants in waste and explains how to receive DECC approval to enable legal disposal of immobilised waste to landfill.

It also explains the two types of immobilisation approvals issued by DECC, and the assessment process that supports immobilisation approvals.

Applicants for a specific immobilisation approval should read these guidelines before downloading the application form available at www.environment.nsw.gov.au/waste/ApplyforSpecificImmobApp.htm. The application form provides more detail in Section B on information that needs to be provided to DECC in an application.

How is immobilisation achieved?

There are several ways to immobilise contaminants in waste:

- **Natural immobilisation** where the contaminant(s) are already present in an immobilised form and the waste is suitable for landfilling without additional treatment
- **Chemical fixation** where the contaminant(s) are chemically converted to a stable form
- **Micro-encapsulation** where the waste is treated to physically lock up the contaminant(s) in the structure of the treated waste
- **Macro-encapsulation** where an enduring physical barrier is placed between the contaminated waste and the surrounding landfill environment.

Immobilisation approvals

Immobilisation approvals may specify conditions relating to the subsequent storage, treatment or disposal of the waste. The two types of immobilisation approvals issued by DECC are discussed below to provide the waste generator with a clear understanding of how the immobilisation approval will be issued by DECC.

General immobilisation

DECC has published a number of general immobilisation approvals on its website. These approvals are for commonly generated hazardous wastes. DECC has assessed these commonly generated hazardous wastes as either being naturally immobilised or able to be immobilised using well-established treatment technology. Setting up general immobilisation approvals helps to streamline the disposal process for these commonly generated wastes.

General immobilisation approvals specify:

- the waste to which the approval applies
- for waste that is not naturally immobilised, the treatment required to immobilise the waste
- any other conditions, such as testing, record keeping and waste tracking, which are required
- how waste subject to the approval may be classified for disposal.

Generally, a person who generates waste that has the same properties described in a general immobilisation approval does not have to apply to DECC to dispose of this waste. It should be noted however that some general immobilisation approvals might require the generator to advise DECC if they intend to dispose of waste. A generator should check the details within the approval. A list of general immobilisation approvals is published on the DECC website at www.environment.nsw.gov.au/waste/genimmobilisationapp.htm.

Specific immobilisation

Where no general immobilisation approval exists, DECC may issue a specific immobilisation approval for a certain hazardous waste. The person generating the waste would need to apply to DECC for a specific immobilisation approval and comply with the conditions in that approval before this waste could be disposed of to landfill. Applicants should follow the ‘specific immobilisation approval’ application process outlined in the following section.

Applying for a specific immobilisation approval

Things to check before you apply to DECC

Before applying for a specific immobilisation approval:

1. Ensure that you have characterised the waste through assessment and testing as required under the Waste Guidelines, identifying contaminants of concern and their variability. Immobilisation is only necessary where waste is classified under the Waste Guidelines as 'hazardous'.

2. Investigate alternatives to immobilisation. Specific immobilisation approvals will only be issued where it is not practical to reuse, recycle or reprocess the waste. Where feasible, treatment to remove or destroy the contaminants is preferable to immobilisation.

3. Check the DECC website to see whether there is a general immobilisation approval for your waste already granted by DECC at www.environment.nsw.gov.au/waste/genimmobilisationapp.htm.

   Important note: A general immobilisation approval will only be applicable if the waste is the same as that described in the approval, including any restrictions, such as its method of formation, and the contaminants listed in the approval include all the contaminants of concern in the waste. Also, if the waste is not covered by, but is similar to, a waste covered by a general immobilisation approval, contact DECC as it may be possible to submit an abridged application based on the general immobilisation approval.

Information to be provided as part of an application

Ensure that you have followed the above checklist before downloading the application form at www.environment.nsw.gov.au/waste/ApplyforSpecificImmobApp.htm. The application may take longer to process if DECC has to go back to the applicant for additional information before it can complete its assessment. The application form includes details of where to send the form and the fee payable to DECC.

Section A of the application form asks for general information such as the applicant's contact details and, where applicable, licensee details; where the waste is stored; and the proposed disposal facility the waste will be sent to.

Section B of the application form asks the applicant to address the proposed treatment and immobilisation mechanism in the form of a report. Information to be provided includes evidence that it is not possible to reprocess the waste in order to reuse or recycle it. Details on quantity, form, background information and chemical composition of the waste should be provided. The applicant should also describe the proposed treatment methods or process, if applicable, to be used, the equipment to be used and evidence of quality assurance/quality control.

Applicants will need to provide details about 'treatability', including total concentration of the contaminants and the leaching performance based on 'toxicity characteristics leaching procedure' (TCLP) tests or other relevant tests. It should be noted, however, that TCLP results alone are not generally accepted as proof of immobilisation. The scientific basis for claiming immobilisation must also be included in an application for a specific immobilisation approval.

Where the waste is not naturally immobilised or is being macro-encapsulated, it may be necessary to undertake treatment trials to determine the effectiveness of the proposed treatment. Attention should be paid to addressing scale-up issues between laboratory trials

and the actual treatment. Laboratory trials, for example, often do not reproduce the conditions needed to achieve effective mixing during full scale treatment. Refer to DECC's technical note on mixing for more information available at http://www.environment.nsw.gov.au/waste/immobtechnote1.htm.

The most important part of Section B is providing scientific justification for the proposed immobilisation method or process. More information on proving scientific justification is provided in the following section.

Additional information to support an application should also be attached to an application. This additional information may include test results and articles from reputable scientific journals that support the successful immobilisation of contaminants.

Providing scientific justification to DECC

Section B of a specific immobilisation approval application asks the applicant to explain the scientific basis that underpins the process by which immobilisation of contaminants in waste will be achieved. This is the most important part of the report and should include a summary of the following as relevant:

1. Demonstrate the means by which the contaminants of concern are immobilised (including formation of chemical compounds during treatment which are claimed to result in the immobilisation of some or all of the contaminants):
   - for natural immobilisation, identify the chemical compounds of the contaminants of concern present in the waste
   - for chemical fixation, identify the chemical reactions which convert the contaminants of concern into an immobilised form
   - for micro-encapsulation, identify the mechanism by which the contaminants of concern are micro-encapsulated
   - for macro-encapsulation, describe the nature of the physical barrier to be established between the waste and the surrounding landfill environment
2. Demonstrate that the means by which the contaminants are immobilised will be maintained over time in the landfill environment.
3. For chemical fixation or micro-encapsulation, confirm that any other substances present in the waste will not interfere with the chemical fixation or micro-encapsulation, as well as that any untreated reagent will not present an environmental problem.
4. For macro-encapsulation, demonstrate that no other form of immobilisation is viable.
5. Confirm, with TCLP results, that the contaminants of concern are immobilised in the waste to be landfilled (not necessary for macro-encapsulation). In some cases, multiple extraction procedure results will also be required to demonstrate long-term stability in the landfill environment.

Waste Classification Guidelines

Part 3:
Waste Containing Radioactive Material

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Who should use this guide?

This guide should be used by waste generators to assist in identifying the classification and management requirements for solid and liquid wastes containing radionuclides.

How to use this guide

Wastes containing any natural or artificial substance that emits ionising radiation spontaneously must be classified on the basis of both their radioactive and other characteristics, according to the step-by-step procedure outlined below.

Classification of wastes containing radioactive material

Step 1

The radioactivity of the waste must be assessed in accordance with the *Radiation Control Act 1990* and the Radiation Control Regulation 2003.

Step 2

Liquid or non-liquid wastes with a specific activity greater than 100 becquerels per gram and consisting of, or containing more than, the prescribed activity of a radioactive element in Schedule 1 of the Radiation Control Regulation 2003, whether natural or artificial, must be classified as *hazardous* wastes.

Step 3

For liquid or non-liquid wastes with a specific activity of 100 becquerels per gram or less and/or consisting of, or containing, the prescribed activity or less of a radioactive element in Schedule 1 of the Radiation Control Regulation 2003, whether natural or artificial, the *total activity ratio* and *specific activity ratio* must be calculated according to the mathematical expressions below:

Total activity ratio is calculated using the expression:

$$\text{Total activity ratio} = (A1 \times 10^{-3}) + (A2 \times 10^{-4}) + (A3 \times 10^{-5}) + (A4 \times 10^{-6})$$

where A1 to A4 are the total activity of Group 1 to Group 4 radionuclides, as set out in Column 1 of Schedule 1 of the Radiation Control Regulation 2003.

Specific activity ratio is calculated using the expression:

$$\text{Specific activity ratio} = SA1 + (SA2 \times 10^{-1}) + (SA3 \times 10^{-2}) + (SA4 \times 10^{-3})$$

where SA1 to SA4 are the specific activity (of the material) of Group 1 to Group 4 radionuclides, as set out in Column 1 of Schedule 1 of the Radiation Control Regulation 2003.

'*Specific activity*' is defined in the *Code of Practice for the Safe Transport of Radioactive Materials* (Australian Radiation Protection and Nuclear Safety Agency 2008) as follows:

'Specific activity of a radionuclide shall mean the activity per unit mass of that nuclide. The specific activity of a material shall mean the activity per unit mass of the material in which the radionuclides are essentially uniformly distributed.'

The Code is referred to in clause 25 of the Radiation Control Regulation 2003.

'*Total activity*' of a material means the activity of the whole of the material in which the radionuclides are essentially uniformly distributed (determined using 1-kilogram representative samples of the whole material).

Step 4

Where the specific activity ratio or total activity ratio is greater than one, the waste must be classified as follows:

Liquid wastes must be managed on a case-by-case basis. Advice on the appropriate management of such materials should be sought from DECC on (02) 9995 5959.

Non-liquid wastes must be classified as *restricted solid waste* **unless**:

- other characteristics of the waste mean that it must be classified as *hazardous waste* (for example, it may be pre-classified as *hazardous waste* in accordance with Step 3 of Part 1 of the *Waste Classification Guidelines* [DECC 2008; available at www.environment.nsw.gov.au/waste/envguidlns/index.htm])

or

- it may contain chemical contaminants that will lead to its assessment as *hazardous waste* (see Step 5 of Part 1 of the *Waste Classification Guidelines* [DECC 2008; available at www.environment.nsw.gov.au/waste/envguidlns/index.htm]).

Step 5

Where the *specific activity ratio* and *total activity ratio* are equal to or less than one, the waste must be classified according to its other characteristics in line with Part 1 of the *Waste Classification Guidelines* [DECC 2008; available at www.environment.nsw.gov.au/waste/envguidlns/index.htm].

Notes

The principal legislation for the control of radioactive materials in NSW is the *Radiation Control Act 1990* (the Radiation Act) and Radiation Control Regulation 2003. The Radiation Act requires those who use or sell radioactive substances to hold a licence for all high activity sources that, when requiring disposal, correspond to the types of sources classified as *hazardous waste* in these guidelines. The Radiation Act also controls the disposal of such sources. Any person handling radioactive sources in this category requires a Radiation Act licence to do so.

In the case of liquid radioactive wastes, the *hazardous waste* criteria used in these guidelines have been extended downwards in activity by a factor of 100 to reflect the additional risk associated with these wastes. The corresponding classification for non-liquid radioactive wastes is *restricted solid waste*. In both cases the Radiation Act does not directly control the disposal of these low-level radioactive wastes: rather, a system of licence conditions and 'consent to dispose' is attached to a licence, either under the Radiation Act or the *Protection of the Environment Operations Act 1997*.

Radioactive material that has very low levels of activity (including materials with naturally occurring background levels) is recognised as being 'below regulatory concern'. The criteria adopted in these guidelines for the levels of radioactivity that permit wastes to be classified in the general solid waste categories closely relate to the international criteria used to assess radioactive materials as being 'below regulatory concern'. Disposal of such materials does not require formal approval, but advice should be sought in the case of liquid wastes to ensure compliance with other requirements (for example, trade waste agreements).

These guidelines have been adapted from those in *Environmental Guidelines: Assessment, classification and management of liquid and non-liquid wastes* (Environment Protection Authority 1999), which have been replaced by DECC's *Waste Classification Guidelines*.

Waste Classification Guidelines

Part 4:
Acid Sulfate Soils

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Introduction

Acid sulfate soils (ASS) are those naturally occurring sediments and soils which contain sulfides, mainly iron sulfide and iron disulfide or their precursors. Exposure of these sulfides in the soil to oxygen – often as a result of drainage or excavation – can produce sulfuric acid, which may have a significant impact on the environment. Leaching of sulfuric acid into waterways can cause serious water quality problems, resulting in fish kills and damage to infrastructure, such as floodgates and bridges.

ASS are most commonly found in NSW along the coast and they need to be managed appropriately to avoid major environmental damage.

The *NSW Acid Sulfate Soil Manual* provides 'best practice' guidance for planning, assessing and managing activities in areas prone to developing ASS. The manual is available from the NSW Department of Planning: phone 1300 305 695.

Using this guideline

This guideline applies to acid sulfate soils which are unable to be managed on-site. In these cases, off-site disposal to landfill is often the most appropriate management option.

Waste generators need to assess the status of ASS at their point of generation, using the techniques outlined in the *Acid Sulfate Soil Manual*. The manual also provides guidance for on-site management while this guideline details disposal requirements for ASS that need to be transported and managed off-site.

This guideline has advice on dealing with both 'potential' ASS and 'actual' ASS. The two types are often found together in the same soil profile, with actual ASS generally overlying potential ASS horizons.

Potential acid sulfate soils

Potential ASS are soils that contain iron sulfides or sulfidic materials that have not been exposed to air and thus are not oxidised. The pH of these soils in their undisturbed state is 5.5 or more, making them neutral or slightly alkaline. If not managed appropriately, potential ASS pose a considerable environmental risk: disturbance and exposure to air may render them severely acidic.

Handling potential acid sulfate soils prior to disposal

Potential ASS must be kept wet at all times during excavation and subsequent handling, transport and storage until they can be disposed of safely. They must be received at the proposed disposal point within 16 hours of being dug up.

Disposal of potential acid sulfate soils *below* the water table

Potential ASS may be disposed of in water below the permanent water table, provided:

- this occurs before they have had a chance to oxidise, i.e. within 24 hours of excavation
- they meet the definition of 'virgin excavated natural material' (VENM) under the *Protection of the Environment Operations Act 1997*, even though they contain sulfidic ores or soils.

Landfills must be licensed by DECC to dispose of potential ASS below the water table. DECC's Environment Line has details on facilities able to accept this waste: phone 131 555.

Potential ASS must be disposed of within 8 hours of their receipt at a landfill and kept wet at all times until their burial at least 2 metres below the lowest historical level of the water table at the disposal site.

Documentation must be provided to the occupier of the landfill for each truckload of potential ASS received, indicating that the soil's excavation, transport and handling have been in accordance with the *Acid Sulfate Soil Manual*, thus preventing the generation of acid.

The occupier of the disposal site must also test the pH of each load of soil received immediately prior to its placement under water using the test method(s) in the *Acid Sulfate Soil Manual* (Methods 21A and/or 21Af). These details, together with the pH of the soil recorded at the time of its extraction, must be retained by the occupier of the landfill site.

The disposal site's licence will outline what documentation needs to be kept and for how long.

Soil that has dried out, undergone any oxidation of its sulfidic minerals, or which has a pH of less than 5.5 must be treated by neutralisation and disposed of at a landfill that can lawfully accept it (see 'Disposal of actual acid sulfate soils' below).

The pH of the water at the landfill into which the potential ASS is placed must not be less than 6.0 at any time. Landfill licence conditions require the occupiers of potential ASS disposal sites to regularly monitor the pH of ground and surface waters at their premises.

Disposal of potential acid sulfate soils *above* the water table

Where potential ASS cannot be classified as VENM or a suitable underwater disposal site at a landfill is not available, the soil must be treated in accordance with the neutralising techniques in the *Acid Sulfate Soil Manual*. After treatment the soil should be chemically assessed in accordance with Step 5 in Part 1 of the *Waste Classification Guidelines*, available at www.environment.nsw.gov.au/waste/envguidlns. This will determine whether any other contaminants are present in the material. When the classification has been established, the soil should be disposed of to a landfill that can lawfully accept that class of waste.

Actual acid sulfate soils

Actual ASS contain highly acidic soil horizons or layers resulting from the aeration of soil materials that are rich in iron sulfides, primarily sulfide. This oxidation produces more hydrogen ions than the sediment is able to neutralise, resulting in soils with a pH of 5.5 or less when measured in dry season conditions. These soils can usually be identified by the presence of pale yellow mottles and coatings of jarosite.

Treatment of actual acid sulfate soils prior to disposal

Actual ASS must be treated by the generator of the waste before they can be considered for disposal. Treatment should be in accordance with the neutralising techniques outlined in the *Acid Sulfate Soil Manual*.

Disposal of actual acid sulfate soils

Following neutralisation, the generator of the waste must chemically assess the soil in accordance with Step 5 of the *Waste Classification Guidelines: Part 1 – Classifying waste* (available at www.environment.nsw.gov.au/waste/envguidlns). This will determine whether there are any other contaminants that may affect how the waste is classified for disposal.

Once classified, the waste must be taken to a landfill licensed to accept that class of waste.

Prior arrangements should be made with the occupier of the landfill to ensure that it is licensed to accept the waste. The landfill should be informed that the actual ASS has been treated in accordance with the neutralising techniques outlined in the *Acid Sulfate Soil Manual* and that the waste has also been classified in accordance with Part 1 of the *Waste Classification Guidelines*.