Designing, constructing and operating composting facilities

Environment Protection Authority Victoria

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Guideline

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1. Introduction

1.1. Scope and purpose of the guideline

The scope of this guideline is restricted to thermophilic, aerobic composting processes only. It does not cover the entire range of organic waste processing activities that are scheduled under A07 in the Environment Protection (Scheduled Premises) Regulations 2017. It does not cover vermiculture/vermicomposting, anaerobic digestion, dehydration or the composting of contaminated wastes for the purpose of bioremediation.1

This guideline provides information on thermophilic, aerobic composting operators' obligations under laws administered by the Environment Protection Authority Victoria (EPA) and provides suggestions on how to comply. Specifically it:

- provides composting operators with advice on how to design, construct and manage composting facilities in a manner that protects human health and the environment in Victoria
- will be used to inform EPA decision making for facilities that require research, design and demonstration approvals, works approvals and licences
- will be used by EPA as a guide for how premises could resolve issues of non-compliance.

1.2. Legal status of the guideline

This guideline contains information and recommendations for meeting the legislative requirements for composting in the:

- Environment Protection Act 1970 (EP Act)
- State Environment Protection Policies (SEPPs)
- Environment Protection (Industrial Waste Resource) Regulations 2009 (IWR Regulations)
- Environment Protection (Scheduled Premises) Regulations 2017 (Scheduled Premises Regulations 2017).

The guideline itself is advisory only and is not the source of any mandatory legal requirements.

1.3. How to use this guideline

If you are a composting operator:

- section 3 explains the legislative requirements under the EP Act and subordinate instruments
- sections 4 to 9 provide recommendations on how to meet the legislative requirements.

This guideline may also be used by planning authorities, EPA, the Victorian community, residential developers and others to understand EPA requirements and recommendations for new and existing composting facilities.

2. What is composting?

Composting is the microbiological transformation of organic materials under controlled aerobic conditions. There are two phases to the thermophilic composting process:

- pasteurisation which generates heat within the material to significantly reduce the number of viable pathogens and plant propagules
- maturation which sees the decline in microbial activity and an increase in biological stability of the organic material.

These phases are discussed further in section 7 below.

A combination of feedstock (organic wastes), siting and process factors determine the level of risk that composting facilities pose to the environment, human health and amenity. Best practice design and operation of facilities can minimise many of the potential impacts.

Australian Standard 4452: 2012 – Composts, Soil Conditioners and Mulches (AS 4454: 2012) is a voluntary standard for the production of composts, soil conditioners and mulches. The standard provides information on the composting process as well as product standards. This guideline has been informed by elements of the 2012 edition of the standard that relate to environment protection. If there are changes to these standards the most recent version of AS 4454 can be used by industry alongside this guideline.

[1] More information on bioremediation is available in EPA Publication IWRG622.1 Soil Remediation Technologies in Victoria.

3. Legislative requirements for composting

3.1. Environment Protection Act 1970

The EP Act establishes the powers, duties and functions of EPA and enables the issuing of works approvals, licences and permits. The Act also sets out 11 Principles of Environment Protection including, for example, the principle of the wastes hierarchy and the principle of integrated environmental management. The guideline Application of the Environment Protection Principles to EPA's Approvals Process (EPA Publication 1565) outlines how these principles should be considered in the context of works approval applications.

The EP Act also sets out provisions in relation to litter, which require that no litter leaves a site. Compost product leaving the site that has high levels of physical contamination (above recommended levels stated in section 8 of this guideline) could also be considered litter.

The EP Act also requires that industry not emit odours that are offensive to human beings, for example, in residential areas or public open spaces adjacent to a residential area. This is further defined in the SEPP (Air quality management).

3.2. State environment protection policies

3.2.1 Requirement for best practice

The SEPPs set out, among other things, requirements for industry including those for the best practice management of emissions and discharges to air, land, surface water or groundwater. Compliance with SEPP best practice is a legal requirement under the EP Act.

This guideline provides suggestions on how a thermophilic, aerobic composting facility can demonstrate best practice. The Demonstrating Best Practice Guideline (EPA publication 1517) provides details on how applicants can undertake their own assessment of best practice to demonstrate that their proposal meets the relevant requirements.

3.2.2 SEPP (Waters of Victoria) (SEPP (WoV))

SEPP (WoV) states that:

- EPA will not approve a discharge where a discharge would pose an environmental risk to beneficial uses and where best environment practice has not been adopted (Clause 28(3)(c))
- chemicals including biocides, fertilisers, oil and fuel, other hazardous substances and prescribed industrial wastes need to be managed to minimise environmental risks to beneficial uses (Clause 37(1)).

3.2.3 SEPP (Groundwaters of Victoria) (SEPP (GoV))

SEPP (GoV) states that an operator:

- must take all practicable measures to prevent pollution of groundwater
- must protect the beneficial use of the groundwater of the area
- may be required by EPA to conduct an assessment of groundwater quality to determine any existing groundwater contamination or any potential risk to groundwater quality and beneficial uses.

3.2.4 SEPP (Prevention and Management of Contamination of Land) (SEPP (PMCL))

SEPP (PMCL) states that the beneficial uses of land protected by the policy are:

(a) maintenance of natural ecosystems, modified ecosystems and highly modified ecosystems

(b) human health

(c) buildings and structures

(d) aesthetics

(e) production of food, flora and fibre.

There is the potential for these beneficial uses to be impacted by composting operations.

3.2.5 SEPP (Air Quality Management) (SEPP (AQM))

SEPP (AQM) requires that all air emissions be controlled by the application of best practice (Clause 18(3)(c)).

For odour SEPP (AQM) requires that:

- emissions of mixed odorous substances need to be minimised and controlled to ensure that the beneficial uses of the environment are protected (Schedule A. 8)
- the odour detection threshold is met at and beyond the boundary (Schedule A. 8).

A facility can undertake a risk assessment if it believes it will contribute to a better understanding of the impact of the activities on the beneficial uses (defined in clause 9 of SEPP (AQM)). In addition, EPA may use the findings of a risk assessment in making statutory decisions or determining whether a generator of emissions complies with the policy (as stated in clause 16 of SEPP (AQM))

For dust SEPP (AQM) requires that:

- particles at PM_{10} from point sources have a design criteria of equal to or less than 0.080 mg/m^3 (for composting this point source would primarily be the trommel)[2].

Protocol for Environmental Management: Greenhouse Gas Emissions and Energy Efficiency in Industry

The Protocol for Environmental Management: Greenhouse Gas Emissions and Energy Efficiency in Industry (PEM) (EPA Publication 824) is an incorporated document under SEPP (AQM) and requires implementation of best practice with respect to greenhouse gas emissions and energy consumption. This means selecting and operating energy-efficient machinery for the process.

The PEM outlines:

- the steps that EPA requires works approval applicants to follow. They are:
    1. estimate energy consumption
    2. estimate direct greenhouse gas emissions
    3. identify and evaluate opportunities to reduce greenhouse gas emissions
    4. submit documentation that shows steps 1–3 in works approval application.
- how existing facilities can regularly review their greenhouse gas emissions
- the audit requirements for licence holders that use energy.

3.2.6 SEPP (Control of Noise from Commerce, Industry and Trade (SEPP (N-1))

SEPP (N-1) requires noise emissions to not exceed the noise limits for the area. Noise limits are determined based on land use zoning using a method set out in SEPP (N-1). The policy also requires the quietest equipment available to be used where new or replacement equipment is being installed.

SEPP (N-1) does not apply to regional areas. Operations in these areas are managed through two noise guidelines:

- EPA Publication 1411 Noise from Industry in Regional Victoria (NIRV)
- EPA Publication 1413 Applying NIRV to Proposed and Existing Industry.

3.3. EPA approvals

The Environment Protection (Scheduled Premises) Regulations 2017 (Scheduled Premises Regulations 2017) prescribe the premises that are subject to works approval and/or licensing by EPA.

3.3.1 Works approval and licensing

Applicants proposing to build a composting facility should complete EPA's works approval proposal form and pathway form[3]. This enables EPA to determine what level of assessment is required for the proposal and the most appropriate approval pathway. The different approval pathways for composting are:

- works approval and licence or
- research, development and demonstration approval.

EPA issues a licence following the construction of a facility in line with the works approval. A licence covers the operation of the site, and sets operating conditions, waste discharge limits and waste acceptance conditions, as appropriate. Licence conditions are consistent with the requirements of the EP Act, SEPPs and EPA regulations.

[2] Gas volumes are expressed at 25°C and at an absolute pressure of one atmosphere 101.325 kPa

[3] For more information on the approvals processes and pathways available see EPA's Approvals proposal form and pathway guidelines, (EPA Publication 1560)

The two types of premises in the Scheduled Premises Regulations 2017 that cover composting (and the triggers for when a works approval and licence are required) are:

- Organic waste processing (A07) – Premises on which organic waste is processed by aerobic or anaerobic biological conversion and which—(a) accept more than 100 tonnes or 200 cubic metres of organic waste in any month; or (b) accept more than 70 tonnes or 140 cubic metres of organic waste in any month and produce more than 50 tonnes of pasteurised material, compost or digestate in any month; or
- PIW management (A01) – Storage, treatment, reprocessing, containment or disposal facilities handling any prescribed industrial waste not generated at the premises (regardless of the size of the operation). Liquid waste is PIW as defined in IWR regulations.

Premises that process organic waste generated at the premises and retain the processed organic waste on the premises are exempt from works approval and licensing. The EP Act and SEPP requirements still apply for sites not requiring works approval and licensing.

A composter must apply for a works approval if they plan to accept organic waste that exceeds the thresholds outlined in the Scheduled Premises Regulations 2017. They must then apply for a licence to operate. These thresholds include accepting more than 100 tonnes (or 200 cubic metres) of organic waste in any given month. The 100 tonnes in any month cannot be averaged out over months. A composter would also trigger the threshold if they accepted 70 tonnes (or 140 cubic metres) and produced more than 50 tonnes of pasteurised material, compost or digestate in any month. This is regardless of whether onsite materials have been used to produce the 50 tonnes of pasteurised material, compost or digestate.

3.3.2 Research, development and demonstration

EPA may ask an applicant to gather more evidence on the operation to inform a works approval application. Research, development and demonstration (RD&D) approvals can be a mechanism to gather this information through a pilot program.

For example an RD&D would be important for composting operations to gather evidence when:

- the proposed pasteurisation method is not in line with the method outlined in section 7 of this guideline
- an applicant wants to process new feedstocks in an unproven technology
- data needs to be obtained to demonstrate compliance with SEPPs for the purpose of a works approval.

EPA will inform an applicant if the proposed facility requires an RD&D approval. More information on this process is available in EPA Publication 1369 Research, Development and Demonstration (RD&D) Approval Guidelines.

3.3.3 Adding new feedstocks

Where a licensed, operating composting facility seeks to accept and treat new feedstocks (for example, wastes suitable for composting that are currently not on the premises licence of a site), the operator must discuss their intentions with EPA and seek approval and a licence amendment, as outlined in section 3.3. The assessment of the risk will be based on the:

- change in volume of material processed
- type of composting operation and current licence category
- feedstocks already listed on the licence
- risk category associated with the new feedstock (see Table 4)
- impact of the new feedstock on the potential for odour generation
- current levels of compliance of the facility
- impact on the end product (see Section 8).

In some cases, it will be assessed that the new feedstock poses little risk of not meeting SEPP requirements and the licence can be amended to include the new waste. If that is not the case, the proponent will be advised whether an RD&D or a works approval should be sought. The applicant will need to demonstrate that the risks to the environment and human health are acceptable and that the process is capable of handling the additional feedstock and that it will have a beneficial impact on the product.

3.3.4 Fees

Scheduled facilities are required to pay an annual licence fee. The fee is based on the volume of waste accepted and/or produced by a premises per year. These are prescribed by the Environment Protection (Fees) Regulations 2012 (as amended by the Environment Protection (Scheduled Premises) Regulations 2017), and are outlined below in Table 1.

Table 1 – processing capacity and associated fee units

Acceptance and production thresholds	Fee[4]
accept up to 3600 tonnes or 7200 cubic metres of organic waste, or produce up to 1800 tonnes of pasteurised material, compost or digestate per year	140 fee units
accept more than 3600 and up to 12 000 tonnes or more than 7200 and up to 24 000 cubic metres of organic waste, or produce more than 1800 and up to 6000 tonnes of pasteurised material, compost or digestate, per year	297.5 fee units
accept more than 12 000 and up to 36 000 tonnes or more than 24 000 and up to 72 000 cubic metres of organic waste, or produce more than 6000 and up to 18 000 tonnes of pasteurised material, compost or digestate, per year	490.25 fee units
accept more than 36 000 tonnes or 72 000 cubic metres of organic waste, or produce more than 18 000 tonnes of pasteurised material, compost or digestate, per year	910.25 fee units

[4] Current value of fee units can be found on EPA's website (epa.vic.gov.au/our-work/compliance-and-enforcement/fees-and-penalties)

4. Location and siting

As composting facilities have the potential to impact human health, amenity and environment, location and siting are important factors that should be considered by both potential operators and planning authorities. This section provides guidance for determining location and siting of a facility. This guideline can also be used by local government when considering potential changes to land use near existing composting facilities. Note that this is guidance only: it does not guarantee that nearby sensitive land uses will not experience amenity impacts.

As part of the works approval assessment, EPA considers feedstocks, technology, meteorological and topographic factors and proximity to sensitive land use when determining suitability of a composting facility location. EPA recognises that the composting industry in Victoria is growing and new technologies are being investigated. This advancement in technology will lead to options for sites to be located in industrial zones with reduced buffer distances.

Composting facilities should not be situated on land liable to flooding and should be sited at least 100 metres from surface waters.

4.1. Separation distances

'Separation distance' means the distance between the premises and the sensitive land use, for example, land used for a residential dwelling (other than a caretaker's house on industrial or commercial premises), hospitals, schools, caravan parks or other similar use involving the presence of individual people for extended periods). More information on separation distances can be found in EPA Publication 1518 Recommended Separation Distances for Industrial Residual Air Emissions.

Separation distances are required for composting facilities to protect sensitive land users being affected by odour generated in instances of upset conditions (for example, equipment failure, accidents or abnormal weather conditions).

While separation distances are a way to reduce impacts of odour emissions from upset conditions, they are not an alternative to preventing odour from occurring in the first place.

How to calculate your separation distances

1. Identify the differences between the proposed facility from the appropriate reference facility.
2. Identify:
    a. appropriate method for calculating distance (section 4.1.3)
    b. meteorology
    c. topography.
3. Discuss the need for odour modelling with EPA.
4. Undertake odour modelling where necessary, covering all aspects of the process (for example, feedstock receipt, pre-treatment, turning/aeration and maturation) as well as the pathways for odour dispersion.

4.1.1 Meteorology

The following meteorological factors, including the seasonal fluctuations, should be considered when selecting a location for a composting facility:

- rainfall
- hydraulic flow/liability of flooding
- wind strength and direction
- temperature.

4.1.2 Topography

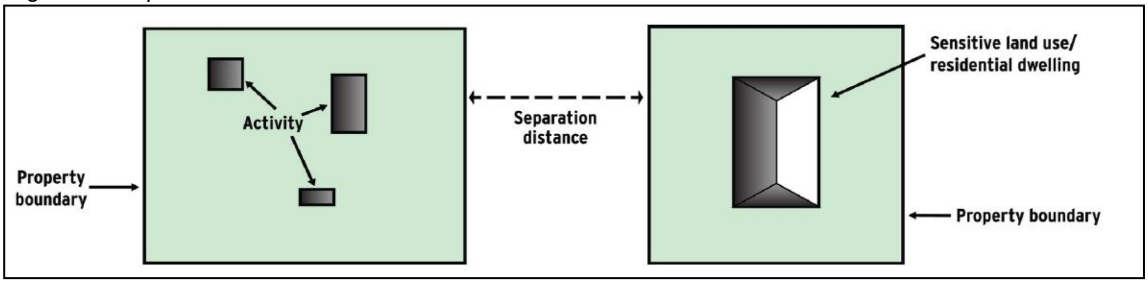
Analysis of the topography of the project area and surrounds helps to determine the potential pathways for the transportation of odour, noise and other impacts. For example, sensitive land uses that are located downslope in a drainage valley may increase the risk of odour impacts and would need to be taken into account in calculating an appropriate separation distance.

4.1.3 Calculating separation distances

There are two acceptable methods for calculating a separation distance and a proponent should state which method has been used. Method 1 is generally the most appropriate, and if method 2 has been used, the proponent must provide the reason why this is appropriate.

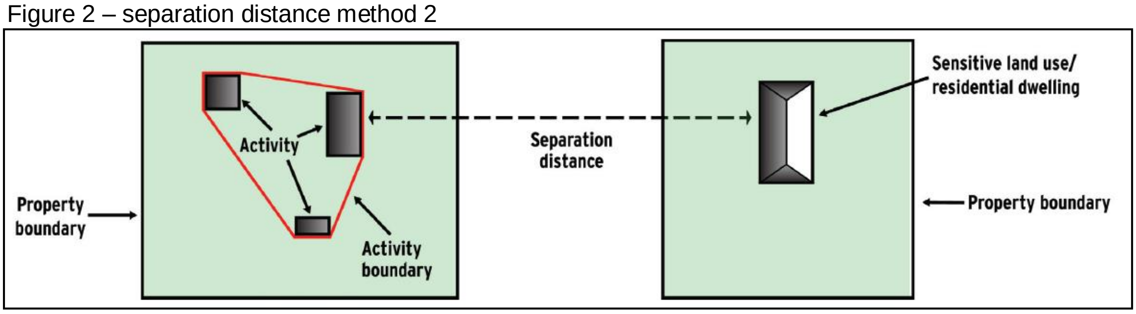
Normally, the separation distance should be measured from the boundary of the premises to the boundary of the sensitive land use (method 1) as per Figure 1. This gives the operator flexibility to relocate equipment and expand their operations within the premises. It also recognises the existence of multiple sensitive receptors within a sensitive land use zone and affords the maximum opportunity to develop any part of the zone without encroaching on the industry. It is appropriate to use the sensitive land use boundaries when there is no existing land use, for example, a property zoned residential with dwelling yet to be constructed.

Figure 1 – separation distance method 1



In some cases, for example, in sparsely populated areas, the separation distance can be measured from the activity boundary of the emission source to the sensitive receptors as per Figure 2. The activity boundary is an imaginary boundary that encloses all activities, plant, buildings or other sources from which residual emissions may arise.

Figure 2 – separation distance method 2



This method may be appropriate where there are only a few sensitive receptors, usually in rural settings, which are located outside of a sensitive land use zone and the activity area will not change. The distance required for odour dispersion should be within the property boundary of the facility.

A facility should site infrastructure within the premises to minimise potential impact on sensitive receptors. For example where the site is bounded by sensitive receptors on one or two sides then it would be advisable to locate the high impact process areas on the opposite side on the site. In addition, aspect, contour, and natural topography should be taken into consideration as these parameters may offer natural attenuation or if ignored, amplification of potential impacts.

4.2. Examples of separation distances

The following two examples provide separation distances for two different types of facilities. The separation distances are based on feedstocks, process design and site capacity. Given the variation in composting facilities the recommended separation distances are only provided as a guide to protect against beneficial uses and upset conditions. Separation distances for both the reference facilities assume predominantly flat or slightly undulating topography and standard meteorology.

Table 2 – reference facility 1

Types of feedstock	Technology being used	Size of the plant	Recommended separation distance (metres)
Green waste Vegetable organics Grease inceptor trap waste	Open air receival Enclosed aerobic composting with secondary odour capture and treatment equipment Open air maturation	1,200 tonnes per annum	>300
		14,000 tonnes per annum	>500
		36,000 tonnes per annum	>800
		55,000 tonnes per annum	>1,000
		75,000 tonnes per annum	>1,200
		90,000 tonnes per annum	>1,400

Table 3 – reference facility 2

Types of feedstock	Technology being used	Size of the plant	Recommended separation distance (metres)
Green wastes	Open air receival Open turned windrow Open air maturation	1,200 tonnes per annum	>600
		14,000 tonnes per annum	>1,100
		36,000 tonnes per annum	>2,000
		50,000 tonnes per annum	>2,000

Where a greater separation distance is not possible, the design should be upgraded or other controls applied to meet the separation distance available. For example, for reference facility 1 it might be assessed that the highest risk of odour is the open air receival and that if an enclosed receival area was developed the recommended separation distance could be reduced.

5. Managing feedstock

The appropriate management of feedstock is an important part of protecting the environment, human health and amenity. The main factors that influence the risk associated with a particular feedstock are its potential to:

- generate offensive odours
- attract vermin and vectors
- generate harmful leachate, which could contaminate surface water, land and groundwater
- contain harmful pathogens
- contain plant pests and propagules.

These risks can lead to non-compliance with the SEPPs. For example harmful leachate could impact the beneficial uses protected in SEPP (WoV), SEPP (GoV) and SEPP (PMCL).

5.1. Feedstock categories

The categorisation approach adopted by EPA ranks feedstock into four categories from lowest to highest potential risk of harm to human health and the environment.

Table 4 – feedstock categories

Category	Risk level	Waste types	Definitions and examples
1	Lowest	Garden and landscaping organics	Grass, leaves, plants, branches, tree trunks and tree stumps
		Untreated timber	Sawdust, shavings, timber offcuts, crates, pallets, wood packaging
		Natural organic fibrous organics	Peat, seed hulls/husks, straw, bagasse and other natural organic fibrous organics
2	Medium	Municipal source separated kerbside garden waste	Grass, leaves, plants, branches, tree trunks and tree stumps
		Biosolids and aged manure	Biosolids that meet treatment grades T1 to T3[5]. Aged manure that has a dry matter greater than 35%
3	Medium to high	Dewatered sewage sludge and fresh manures	Dewatered sewage sludge (does not meet the T1 to T3 standards), animal manure and mixtures of animal manure and animal bedding organics
		Other natural or processed vegetable organics	Vegetables, fruits and seeds and processing wastes, winery, brewery and distillery wastes, food organics excluding organics in category 4
		Mixed source separated kerbside (Garden waste/food waste – FOGO)	Grass, leaves, plants, branches, tree trunks and stumps, vegetables, fruit and meat
		Grease interceptor trap wastes	Grease trap waste with less than 10% solids
4	Highest	Liquid organic wastes (excluding grease interceptor trap waste with less than 10% solids)	Liquid food waste and liquid food processing wastes (including sludges), liquid animal wastes (blood) and paunch (sludge), grease trap with greater than 10% solids
		Meat, fish and fatty foods	Animal mortalities, parts of carcasses, bone, fish and fatty processing or food

[5] As defined in EPA Guidelines for Biosolids Land Application (EPA Publication 943)

5.2. Prescribed industrial waste feedstocks

Liquid organic wastes are prescribed industrial wastes (PIW) and are required to be transported in line with the EP Act and IWR Regulations. PIW can only be processed at a facility authorised by EPA to accept the wastes. Liquid organic waste would fall under one of the following waste codes:

- K100 – animal effluent and residues
- K120 – grease interceptor trap effluent
- K200 – food and beverage processing wastes, including animal and vegetable oils and derivatives.

PIWs that are not listed in the feedstock categories (Table 4) are not considered as appropriate for aerobic composting due to the increased risk to the environment and risks of dilution and impact on the final product. In some cases, the composting process can be used for bioremediation of some PIW provided tight controls are in place; this is out of the scope of this guideline.

5.3. Recommended technology types

The risks associated with specific categories of waste need to be managed throughout the composting operation, from its receival through to the end product, including the wastewater generated. Table 5 specifies the recommended composting technology for each feedstock category. Operators need to ensure the feedstock they intend to use is appropriate for the chosen technology. The categories 2, 3 and 4 feedstocks should be processed as soon as practicable and the most odourous wastes should not be stored for more than 48 hours.

Table 5 below recommends technologies that are most appropriate for the four categories of waste so as to not breach SEPP requirements.

Table 5 – recommended feedstock to composting technology types

Feedstock category	Recommended technology requirements		
	Open environment	Enclosed or covered environment	Enclosed with secondary odour control
1: Lowest potential risk of harm to human health and the environment	Yes	Yes	Yes
2: Medium potential risk of harm to human health and the environment	Yes	Yes	Yes
3: Medium to high potential risk of harm to human health and environment	No	Yes	Yes
4: Highest potential risk of harm to human health and the environment	No	No	Yes

Open environment – Low risk wastes can be processed in open air composting methods where the process can be kept aerated. This may not be appropriate in locations where there are insufficient separation distances for upset conditions.

Enclosed or covered environment – Medium risk wastes can be processed in enclosed or covered systems that provide a level of engineered control through the enclosure, as well as a limited level of control over the odour emissions.

In different locations the requirements for enclosed and covered may vary. In some situations, covered environment can include material covers or an appropriate layer of mature compost.

Enclosed with secondary odour controls – Higher risk wastes require a higher level of engineered odour controls as process management alone is not sufficient to effectively minimise risks of odour impact. The most common type of secondary odour control for composting is biofilters.

6. Recommendations for best practice design and operation

This section provides recommendations for the design and operation of composting facilities in order to meet the legislative requirements summarised in section 3. These are not mandatory requirements and an applicant can undertake their own best practice assessment to demonstrate compliance.

6.1. Surface water, groundwater and land contamination

Composting can result in the contamination of groundwater, surface water and land when water that has come into contact with organic matter during any part of the composting operation (contact water[6]) escapes via seepage or run-off into the local environment. Contact water includes the contaminated stormwater and any run-off from the composting process. It also has a high biological oxygen demand, which can impact on freshwater ecosystems by reducing the available oxygen.

6.1.1 Recommended design and operational measures

Unlicensed discharge of liquid waste or contact water from the composting facility to surface waters, groundwater or land is an offence under the EP Act. Water at a composting facility must be carefully managed, particularly from areas used for feedstock receival and storage, feedstock pre-processing and mixing, processing (pasteurisation and maturation), post-screening and product storage.

Preventive infrastructure can include appropriately engineered:

- sealed surfaces for feedstock receival, mixing and processing, and for product and other bulk materials storage
- liquid mixing pit, where excessively moist feedstock is mixed with drier feedstock to achieve the desired moisture content
- bunding and interception drains around the perimeter of the process and storage areas
- wastewater storage tanks or pond.

EPA may require groundwater monitoring bores to be established on premises, for example, when a site is accepting liquid organic wastes. These are used for assessing groundwater quality, including identifying any changes in groundwater quality.

Sealed surfaces

All process areas should be sealed using suitable, stable, low-permeability construction material, strong enough to support the weight of the composting material as well as movement of trucks and mobile equipment. Concrete is considered as best practice, however clay can also be appropriate if it meets required standards.

Where process areas are sealed using clay, the impermeable clay layer should:

- have a hydraulic conductivity of less than 1×10^{-9} m/s using both fresh water and 50,000 ppm NaCl solution. (Australian Standard (AS) 1289.6.7.1: 2001 Methods of Testing Soils for Engineering Purposes details how hydraulic conductivity testing should be performed[7].)
- be covered with a suitable material to physically protect the clay from desiccation and subsequent cracking and from physical damage from composting activities, vehicle movements and removal (scraping) of compost mass during or after processing.

The surface of the process areas should be graded to carry surface run-off to collection drains. The grade should be between 2 and 4 per cent to provide sufficient fall and to avoid erosion from excessive flow rates. These areas should drain to the contact water collection system at the premises.

Liquid mixing pit

Liquid mixing pits are used to prevent contamination of surrounding soil and groundwater from liquid feedstocks or excessively moist feedstocks. They can also be a source of odour. The pits should:

- be completely impervious (for example, made of concrete with high-density polyethylene (HDPE) liner
- have associated drainage infrastructure
- be fully bunded to prevent spillages from the mixing pits polluting nearby land or surface water.

[6] Contact water is also referred to as leachate in other documentation on composting
[7] Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3)

Bunding and interception drains

Wastewater may be managed by separation, containment and reuse, or by disposal. The premises should be designed to separate surface water run-off from ‘clean’ stormwater catchment areas and contact water from ‘process’ areas. This separation can be achieved using strategically located cut-off drains, bunds (barriers) and water-sensitive design of the premises. For example a site could align process pads along contour lines so that water collected from clean areas automatically drains into a different storage area to that from process areas.

Where required, the premises should have bunding that enables all contact water to be collected and directed to storage points. Further guidance on bunding is available in Bunding Guidelines (EPA publication 347).

Contact water storage

Contact water should be captured, pre-treated (for example, using a silt trap) and directed to a storage structure, such as a tank or pond that prevents pollution of the underlying land and groundwater. It can be reused during the early stages of the composting process but should not be added to the composting material after it has been pasteurised, as it may contaminate the material.

When designing a contact water flow and storage system, an operator should undertake a water balance calculation to determine how much contact water will be generated in a rainfall event. Overflow connection to sewer is advised for contingency management, with an appropriate trade waste agreement from the local water corporation.

The storage structure should:

- be sufficient in capacity to accommodate run-off from the total process area resulting from a one-in-20-year storm event
- have sufficient built-in redundant capacity to accommodate contact water during periods of persistent rainfall, and when process needs are low
- be lined to provide a hydraulic conductivity of less than 1×10^{-9} m/s using both fresh water and 50,000 ppm NaCl solution. Australian Standard (AS) 1289.6.7.1: 2001 details how hydraulic conductivity testing should be performed[8]
- maintain a minimum freeboard depth to protect against overtopping
- be maintained in an aerobic state in order to minimise the generation of odour from the nutrient-rich water.

In order to minimise the hydraulic load on the wastewater storage structure, the process area should, where practicable, be minimised to limit the volume of stormwater caught.

The operator of the composting facility needs to be able to demonstrate that the level of environmental protection provided by the wastewater catchment and storage infrastructure is sufficient to meet regulatory and licensing requirements.

Clean stormwater capture and storage

EPA recommends clean stormwater is captured and stored for reuse onsite wherever possible (for example, for moisture adjustment of curing compost mass, firefighting, wheel washes, etc.). The catchment for clean stormwater may include roofs, private vehicle parking areas, administration and amenities areas and other areas in which potentially contaminating materials are absent. The surface of the ‘clean’ areas should be gravel or sealed to limit entrainment of sediment by the stormwater.

The storage infrastructure for the clean stormwater (for example, tank, pond) should have sufficient capacity to accommodate run-off.

6.2. Odour

A consequence of the uncontrolled breakdown of organic materials (for example, when decomposition occurs anaerobically) is the production of a wide range of odorous chemical compounds. Some of these compounds are highly odorous and extremely offensive to humans (for example, hydrogen sulfide), whilst others are perceived as reasonably benign. The odour compounds that are generated at composting premises can result in odour impacts beyond the boundary of the premises. Odour is one of the most common causes of community pollution reports relating to composting operations.

Odour can be generated from various sources on the premises, which can be separated into continuous odour sources and discontinuous (event) odour sources. The following are examples of potential odour sources:

[8] Best Practice Environmental Management Siting, Design, Operation and Rehabilitation of Landfills (EPA Publication 788.3)

Continuous odour sources

- Raw organics: On receipt feedstocks can be odourous if they have begun to decay.
- Product: The stockpiling of the product can become odourous if it is not well managed.
- Composting process: Breakdown of organic material generates volatile organic compounds (VOCs). If the recipe and the process is well managed the VOCs are less offensive and less prevalent.
- Contact water and leachate: The storage of contact water can become especially odourous if it turns anaerobic.

Discontinuous odour sources

- Machinery: Machinery and vehicles may become vectors for odour associated with material stuck to surfaces or wheels.
- Turning/aeration: Odour can be generated in the mixing and preparation phase as it breaks up any zones of anaerobic decay in raw feedstocks. The aeration of the organics being processed, either through aeration systems or turning, can be the peak odour generation point at the facility.
- Screening and movement of feedstock and compost.

6.2.1 Recommended design and operational measures

The design and operation of a compost facility will affect odour emissions and whether it complies with SEPP (AQM) objectives.

The following are recommended measures compost facilities can use to meet the SEPP (AQM) requirements:

- fit and maintain appropriate odour control equipment
- develop and implement an odour management plan as part of an Environmental Management Plan (refer to section 9)
- create a balanced compost recipe that enables key parameters to be met for oxygen, temperature, carbon/nitrogen ratio and pH levels (refer to section 7)
- train staff to prepare and process material according to best practice.

Odour control infrastructure

The requirement for odour control infrastructure is dependent on the feedstocks and technology being used by the facility. A review of best practice odour control equipment and a rationale for selecting specific equipment for a site should be included in a works approval application[9].

- For enclosed facilities, odour control equipment such as biofiltration can be installed to filter the odorous components of the composting emissions.
- An open facility may need to enclose operations and build suitable odour control equipment to minimise odours if, once operating, the facility fails to meet SEPP (AQM) criteria.
- To reduce the risk of odour generation from the contact water collection pond, anaerobic conditions should be prevented.

Odour management plan

The purpose of an odour management plan is to proactively reduce the potential for odour generation as well as to have a reactive plan for managing odour during upset conditions. An odour management plan may include the following:

- an inventory of all sources of odour
- odour sources and controls under normal conditions
- odour monitoring and recording regime
- odour management during upset conditions
- routine maintenance of odour control equipment (where installed).

[9] Demonstrating Best Practice Guideline (EPA Publication 1517)

6.3. Dust and bioaerosols

Bioaerosols are airborne particulates and/or water droplets that may contain bacteria, fungi and fungal spores, pathogens or other micro-organisms. Bioaerosols may be generated during the movement or agitation of materials at any stage of the operation. This is most likely to occur when dust is also produced.

Dust may be generated at composting sites:

- by movement of materials by front-end loaders and delivery trucks
- during storage, grinding, mixing and screening of feedstocks and products
- from the turning of composting materials (although this is less likely due to the normally high moisture content of compost – dust in this case, but can however indicate insufficient moisture content in the composting mass, which may require adjustment)
- from stockpiles.

6.3.1 Recommended design and operational measures

Site layout should be designed to minimise generation and spread of dust. Once a site is operating there are several dust suppression activities that can be put into practice when needed, including:

- covering dusty materials or applying a light water spray
- enclosing fixed mechanical equipment used to process the raw and finished materials
- suction-sweeping machines to maintain dust-free sealed surfaces
- applying a light water spray before or during turning.

Excessive amounts of water for dust suppression should be avoided to prevent undue run-off or water-logging of the organic material, as this may increase the likelihood of anaerobic conditions.

Provided good management practices are followed, the concentration of bioaerosols in the neighbourhood and workplace should not increase significantly above background levels.

6.4. Animal and human health

Vermin, birds, water and wind can act as vectors to transport waste, weeds and/or pathogens offsite. This can be a potential risk to the environment, biosecurity, amenity and human health. Compost facilities can also act as habitats for populations of pests to proliferate.

Proper pasteurisation of the compost material is crucial in order to eliminate most of the human, animal and plant pathogens and plant propagules. Some spores and weed seeds may survive the compost process if the temperature/time relationship is not suitable and if the pasteurisation is not uniform.

Human and plant pathogens

Possible pathogens of concern are:

- viruses (for example; hepatitis, enteric viruses)
- bacteria (for example; faecal coliforms, Salmonella spp., Legionella, epidermal and respiratory pathogens)
- protozoa (Cryptosporidium, Giardia)
- helminths (parasitic worms; tapeworms, roundworms and flukes).

Weeds, weed seeds and plant propagules

Garden organics are likely to contain weeds, weed seeds or plant propagules. The spread of noxious weeds can have a negative impact on the environment as well as on human health. This can be a problem onsite as well as offsite if the organic waste has not been properly processed or has been recontaminated prior to leaving the premises.

6.4.1 Recommended design and operational measures

To reduce the risk of pathogen transmission, the compost facility operator should ensure that:

1. every part of the material is effectively pasteurised
2. the product does not become recontaminated
3. appropriate quality assurance is conducted and required standards are met.

Best practices to avoid re-infection of the product include:

- separation of the feedstock and product handling equipment, vehicles and areas

- washing of machinery between use for handling untreated feedstock and compost product
- not applying contact water to composted material after it has gone through the heat treatment stages for pathogen control.

A compost facility operator should confirm pathogen reduction procedures by testing the compost for pathogens:

- at the start of production of each new product type
- every time there is a significant change in feedstock or processing procedures.

Compost derived from animal excreta or offal, unsegregated municipal solid waste, sewage sludge or other wastes with a high pathogen risk should be regularly tested for pathogen content. Compost derived from sewage sludge should be tested in line with the EPA Guidelines for Environmental Management – Biosolids Land Application (EPA Publication 943).

6.5. Noise

Noise nuisance from composting operations may arise from the use of both mobile and fixed machinery within the premises and from movements of transport vehicles servicing the premises.

6.5.1 Recommended design and operational measures

Compost facilities may use the following measures to meet SEPP (N-1) requirements:

- select and maintain appropriate equipment for the facility
- fit and maintain appropriate mufflers on mobile equipment
- enclose noisy equipment
- provide noise attenuation screens where required
- develop and implement noise control strategies in the environmental management plan.

Noise impacts can also be reduced through management practices, including limiting the hours that a facility is operating. It may be necessary to avoid certain operations before 7 am and after 6 pm on weekdays, before 7 am and after 1 pm on Saturdays and throughout Sundays and public holidays.

Note that any changes to facility operating hours to reduce noise need to be consistent with existing planning permits, processing contracts and collection contracts held by councils.

6.6. Litter

Litter, from contamination of feedstock, vehicles entering or leaving the facility, or from other sources, can be wind-blown into the surrounding areas and can impact on the local amenity. Windblown litter must be prevented from leaving the premises. Any litter that does escape from the premises must be cleaned up immediately.

6.6.1 Recommended design and operational measures

Composting premises should be suitably designed to prevent litter from leaving the premises, this can include fences and moveable litter screens combined with regular clean up of the premises.

To minimise the risk of litter being spread offsite, procedures for decontamination of feedstocks and other materials should be in place and any visible litter on vehicles should be removed prior to leaving the premises.

The environment management plan should include a plan to monitor and clean up any litter that moves offsite.

Any rejected material or residual waste should be stored appropriately and removed and disposed of in a timely manner so that it does not spread offsite and become litter. Disposal must be in accordance with requirements for the most offensive waste in the feedstock, or as otherwise agreed with EPA.

6.7. Greenhouse gas emissions

Greenhouse gas emissions at a composting facility are generated through:

- the use of machinery and vehicles onsite
- electricity used for forced aeration and automated systems.

6.7.1 Recommended design and operational measures

The opportunities to reduce greenhouse gas emissions will be dependent on the type of composting technology being used and will include using efficient vehicles, machinery and technology.

EPA considers greenhouse gas emissions when assessing an application for a new composting facility.

6.8. Fire

Fire at composting operations can arise from a number of sources, including:

- spontaneous combustion occurring as a result of the piles overheating. Overheating can occur as a result of piles being made too high or restricted airflow through the pile
- a spark igniting the piles from cigarettes, lightning strikes, bushfires and potentially other activities occurring on the premises
- fragments and shards of glass acting like a magnifying lens.

Fire can pose a risk to the local air quality and human health, the facility and surrounding residential and industrial uses.

6.8.1 Recommended design and operational measures

A fire contingency plan should be prepared for the composting operations. The plan should, at a minimum, identify the areas where a fire might occur, conditions that might lead to a fire and measures to prevent and control fires.

Appropriate fire control equipment and water supplies must be maintained at the premises. The appropriate fire authority should be consulted regarding facility layout, suitable fire prevention and control measures and to agree on a plan of action to be followed in the event of a fire.

7. Composting process

The composting process is separated into two phases, pasteurisation and maturation. The two phases have different processing parameters. These are described in the following two sections.

7.1. Pasteurisation

In the Scheduled Premises Regulations 2017, ‘pasteurised material’ is defined as organic material with reduced pathogens and plant propagules following exposure to heat.

Pasteurisation is an important part of the active composting phase during which the number of plant and animal pathogens (organisms responsible for diseases) and plant pests and propagules (viable regenerative plant materials or seeds) are significantly reduced.

This section outlines pasteurisation criteria that are important to facilitate effective pasteurisation which assists in achieving a minimum impact on the environment (odour generation, contamination of water etc.). EPA may use these criteria to provide advice to a compost facility (licensed or un-licensed) on how to minimise offsite impacts.

Table 6 – key processing parameters for pasteurisation

Processing parameters for pasteurisation	Ideal range or ratio	Description
Nutrient balance (carbon to nitrogen ratio)	25:1 and 35:1	The nutrient balance of primary interest in creating a blend for composting is the carbon to nitrogen ratio. Feedstock with high nitrogen content should be blended with a carbon-rich feedstock to provide a starting carbon to nitrogen ratio between 25:1 and 35:1. Low carbon to nitrogen ratios can lead to nitrogen levels surplus to the microbes’ needs and will result in the release of odorous nitrogen to the atmosphere in the form of ammonia gas.
Total moisture	optimum level 45–60 %	Total moisture contents between 45 and 60 % are important for effective pathogen and weed control during the thermophilic stage of composting. Microbial activity virtually stops if the moisture content drops below about 30 %.
Oxygen content	>10 %	Aerobic composting requires a minimum oxygen concentration of 5 %, with an optimal concentration of around 10 %. The availability of oxygen in the composting pile is influenced by porosity, moisture content, bulk density, windrow size or bed depth and frequency of turning. A lack of oxygen will likely result in the release of odorous methane gas.
pH	between 6.5 and 8.0	Maintenance of the composting material at a relatively neutral pH (6.5 to 8.0) supports the required microbial activity and fosters more complete composting. A lower (more acidic) pH, coupled with anaerobic conditions, can foster an environment that is associated with production of odorous compounds such as sulfides, amines, ammonia, and volatile fatty acids. At a pH higher than 7.5, gaseous losses of ammonia are more likely to occur.
Porosity and bulk density	400 – 600 kg/m^3	Porosity indicates the degree to which a feedstock is permeated with cavities or pores. This measure is usually expressed as per cent of the total volume, and ideally porosity in a composting mass should range between 45–65 %. Bulk density, on the other hand, describes the mass of matter per unit bulk matter. The ideal bulk density of composting material is 600 kg/m^3. The bulk density and porosity of the feedstock have a great influence on oxygen availability. Anaerobic conditions are more likely to occur with low porosity and high-density feedstock. Piles should be made to between a height of 1.5 metres and 3 metres to minimise the effects of compression, yet enable the material to heat up sufficiently and also to allow oxygen to move throughout the pile.
Temperature	55ºC–75ºC	The temperature reached by the composting material influences the rate of decomposition and therefore oxygen demand, microbial population and overall propensity to generate odorous compounds. The desired pasteurising temperature range is from 55ºC to 75ºC.

EPA has adopted the pasteurisation processes and parameters verified (and published) by the United States Environmental Protection Agency[10] and required as a process criteria in Australian Standard (AS) 4454: 2012 Composts, Soil Conditioners and Mulches.

Table 7 – Time/temperature ratio for pasteurisation

Process type	Type of wastes	Time/temperature ratio
Open windrow composting	Low-risk wastes	Appropriate turning of the windrow so that the whole mass is subjected to a minimum of three turns with the internal temperature reaching a minimum of 55ºC for three consecutive days before each turn.
	High-risk wastes	The core of the compost mass shall be maintained at 55ºC or higher for 15 days or longer, during which the windrow shall be turned a minimum of five times.
Enclosed composting	All wastes	The whole mass should be maintained at 55ºC or higher for a minimum of three consecutive days. (To meet this, the material will need to be in the enclosed vessel for longer to ensure it gets to and maintains temperature.)

Scheduled composting operators may use demonstrated methods of pasteurisation or, alternatively, seek EPA approval to use practices that are not listed above. All composters are encouraged to follow these parameters or approved alternative processes.

7.1.1 Demonstrating pasteurisation

Pasteurisation is achieved when the feedstocks have been exposed to the appropriate time/temperature ratio and the product meets the standards in Table 8 below.

Table 8 – pathogen and plant propagules reduction performance standards for alternative methods of pasteurisation

Parameter	Standard
Enteric viruses[11]	<1 PFU per 10 grams total (dry weight)
Helminth ova (Ascaris sp. and Taenia sp.)	<1 per 4 grams total dry solids
E. coli	<100 MPN per gram (dry weight)
Faecal coliforms[12]	<1,000 MPN per gram (dry weight)
Salmonella spp.	Absent in 50 grams of final product (dry weight)
Destruction of noxious weeds (viable plant materials and propagules)	Nil (germination) after 21 days incubation

MPN = most probable number. PFU = plaque-forming unit

7.2. Alternative processes of pasteurisation

Any proposed alternative method of pasteurisation should guarantee that the elimination of plant propagules and reduction of human and animal pathogen numbers meets the same level as the approved methods.

A proponent for an alternative method of pasteurisation should speak with EPA about demonstrating the process through an RD&D approval. More information on this process is available in EPA Publication 1369 Research, Development and Demonstration (RD&D) Approval Guidelines.

Some alternative processes (time/temperature requirements) that guarantee the same level of pathogen reduction as stated in AS 4454: 2012 have been tested in Australia and overseas. Evidence of these tests could, in some cases, be used by an applicant to apply directly for a works approval application.

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[10] US EPA, 2003, Environmental Regulations and Technology Control of Pathogens and Vector Attraction in Sewage Sludge (Including Domestic Septage) Under 40 CFR Part 503

[11] Biosolids Land Application – Guidelines for Environmental Management (EPA Publication 943), April 2004

[12] AS 4454: 2012 – Australian Standards Compost, Soil Conditioners and Mulches

EPA recommends alternative processes demonstrate they can meet the standards listed above in Table 8; these are based on AS 4454: 2012 and EPA Guidelines for Biosolids Land Application (EPA Publication 943). Where possible, NATA (or equivalent) accredited laboratories should be used.

7.3. Maturation

Maturation is the second stage of the composting process where the microbial activity slows and the compost begins to stabilise to an extent that it can be safely used on land and to come into direct contact with plants without any negative effects.

Once the pasteurisation phase is complete the process will start to move into the maturation phase, which is characterised by declining temperatures within the pile and decreasing moisture levels.

AS 4454: 2012 outlines a variety of methods to demonstrate the level of maturity of the product. These include reporting the details of the processing conditions and a variety of laboratory tests that can be undertaken by NATA-accredited laboratories.

8. Compost product standard

A compost product should meet the contamination requirements listed in Section 8.1. Compost that does not meet these requirements can sometimes be acceptable if made for a very specific use, as outlined in section 8.2.

The operator is responsible for ensuring that the composting process produces a genuine product suitable for its intended purpose. Where a compost product does not meet the requirements listed below and has no designated use, it should be considered as a waste. A facility operator whose product causes pollution not only risks fines but also endangers the viability of the business with potential liability for damages and cleanup costs.

A product testing regime (along with the feedstock analysis regime) should be established as part of the environment management plan (refer to section 9).

8.1. Product requirements

The chemical and physical contaminant limits appropriate for compost designated for unrestricted use are listed in tables 9 and 10. Appropriate pathogen limits are presented in Table 8.

The limits for chemical and physical contamination are consistent with AS 4454: 2012 - Composts, Soil Conditioners, and Mulches.

8.1.1 Chemical contaminants

Chemical contaminants which are not present in the feedstock may be excluded from the specification and testing regime, however reasoning for excluding these contaminants should be documented and provided to EPA when requested. Contaminants may change with different batches depending on the feedstocks.

For guidance on testing product using biosolids as a feedstock, refer to EPA publication 943 Guidelines for Environmental Management: Biosolids Land Application.

Table 9 – chemical contaminants limits for unrestricted use

Contaminant	Unrestricted use upper limits Dry weight basis (mg/kg)
Arsenic	20
Cadmium	1
Boron	100
Chromium	100
Copper	150
Lead	150
Mercury	1
Nickel	60
Selenium	5
Zinc	300

Contaminant	Unrestricted use upper limits Dry weight basis (mg/kg)
DDT/DDD/DDE	0.5
Aldrin	0.02
Dieldrin	0.02
Chlordane	0.02
Heptachlor	0.02
HCB	0.02
Lindane	0.02
BHC	0.02
PCBs	Not detectable (detection limit (0.2mg/kg)

8.1.2 Physical contamination

The contamination of feedstocks varies depending on their origin. Most contamination should be removed in the pre-processing stage as remaining physical contamination can have an impact on the quality of the final product and can be difficult to remove at a later stage. The table below outlines physical contamination limits, as specified in AS 4454: 2012.

Table 10 – physical contamination limits

Physical contaminants	Percentage of dry matter w/w
Glass, metal and rigid plastics	≤0.5
Plastics – light and flexible or film	≤0.05

8.2. A product – not a waste

There are a number of pieces of legislation (EP Act, SEPP (PMCL) and IWR regulations) that prohibit or control the disposal to land of various wastes – such as municipal waste, prescribed waste, sewage sludge and litter. Composts, soil conditioners and mulches produced from suitably composted materials that meet the general requirements of AS 4454: 2012 (outlined in this guideline under sections 7.2 Pasteurisation and 8.1 Product requirements) are regarded as a genuine product and not as a waste. Compost that does not meet these general requirements can sometimes be acceptable if made for a very specific use. EPA may grant approval for land application of a particular waste product after suitable processing where:

- it does not constitute an environmental hazard in the proposed application
- it is fully pasteurised
- a particular need is satisfied in its use and
- appropriate controls are in place to ensure these criteria are always met.

8.2.1 Product classification

The output from a composting operation ceases to be waste if it can be classified as a product. Products are classified based on a range of factors. These include the protection of the environment, animal and human health, and the end users' needs. The definitions provided in AS 4454: 2012 for the following three products have been reproduced below as the three classifications that EPA describes products as:

> Pasteurised product: An organic product that has undergone pasteurisation as defined in section 7.1.1 but is relatively immature and lacking biological stability.
>
> Compost: An organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and reduce phytotoxic compounds, and has achieved a specified level of maturity for compost (as stated in AS 4454: 2012 Appendix N).
>
> Mature compost: An organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and exhibits lower levels of phytotoxicity and a higher degree of biological stability (as stated in AS 4454: 2012 Appendix N).

If the product is being blended with other materials to create a product for a specific end market it should still meet one of these product requirements before blending to ensure that at a minimum pasteurisation has occurred.

9. Environmental management plan

An environmental management plan (EMP) can assist facilities in addressing the environmental issues outlined in this guideline and in demonstrating compliance with EPA requirements. It can also help to identify any problems with the process that may lead to an instant of non-compliance. A well-developed and implemented plan can minimise the impact a change in staff, feedstock supplies or weather will have on the compost process.

The EMP should include a plan to address environmental risks at each stage of the process. The actions required will vary depending on the type of facility and the way it is designed.

The EMP should also include a monitoring plan for the feedstock, process and the products. This will provide quality assurance for the process and product as well as assisting in preventing environmental impacts. For example, identifying that the moisture content of the pile has dropped can assist in reducing the potential generation of dust.

Odour issues can be addressed either within the EMP or in a separate odour management plan. Odour is the reason for the majority of community complaints about composting facilities and it is important that facilities have a clear plan to manage offensive odours.

EPA officers may request an EMP is developed as part of a notice to address an issue of non-compliance.

9.1. Waste characterisation

The characterisation of the incoming feedstocks is important in understanding the wastes that are being accepted, what waste code they are covered by (when appropriate), and the processing requirements for the different waste streams. It also enables a site to reject loads that are contaminated or do not meet the facility’s requirements.

9.2. Monitoring plan

The elements that are important in the composting recipe remain important throughout the pasteurisation and maturation phases. These need to be monitored as part of a monitoring plan for the premises. The requirements for a monitoring plan vary depending on the category of waste being accepted and the associated technology. Enclosed designs are able to have real-time monitoring for the many parameters whereas for the lower order technologies the monitoring plan will need to articulate when and what will be monitored, and how this will be done. Monitoring for the parameters listed in section 7.1 will ensure that the optimal conditions for pasteurisation are being maintained and will minimise the generation of offensive odour.

9.3. Product testing

Products should be tested in accordance with this guideline or AS 4454: 2012 to demonstrate that the feedstocks and processes being employed are able to meet the required standard. Once this has been clearly established the product testing should be adjusted to suit the ongoing management and quality assurance requirements of the premises. If significant changes are to be made to the feedstocks being processed, an increase in product testing may be recommended.

10. Definitions

Aerated static windrow/pile – Forced aeration method of composting in which a free-standing pile is aerated by a fan blowing air through perforated pipes located beneath the pile.

Aerobic – In the presence of oxygen.

Agitated bed or tunnel – Material is placed into a controlled environment. Air is forced through the material, which is also mechanically mixed.

Anaerobic – In the absence of oxygen. Composting systems subject to anaerobic conditions often produce odorous compounds and other metabolites that are partly responsible for the temporary phytotoxic properties of compost. Anaerobic conditions are employed in anaerobic digestion systems.

AS 4454: 2012 – Australian Standard 4454:2012 for Composts, Soil Conditioners, and Mulches. A manufacturing standard that provides quality assurance on the process and product.

Biochemical oxygen demand (BOD) – The quantity of oxygen used in the biochemical oxidation of organic matter in a specified time, at a specified temperature, and under specified conditions. Normally five days at 20ºC unless otherwise stated. There is a standard test used in assessing the biodegradable organic matter in municipal wastewater.

Biosolids – Biosolids are organic solids derived from the sewage treatment processes that are in a state that they can be managed to sustainably utilise their nutrient, soil conditioning, energy, or other value (if they achieve minimum EPA standards for classification as T3 and C2 biosolids). The solids that do not meet these criteria are defined as sewage sludge.

Carbon to nitrogen ratio (C:N ratio) – The ratio of the weight of organic carbon (C) to that of total nitrogen (N) in an organic material.

Compost – An organic product that has undergone controlled aerobic and thermophilic biological transformation through the composting process to achieve pasteurisation and reduce phytotoxic compounds, and achieved a specified level of maturity required for compost.

Composting – The process whereby organic materials are microbiologically transformed under controlled aerobic conditions to achieve pasteurisation and a specified level of maturity.

Contact water – Water that has come from or in contact with organic materials and contains dissolved or suspended organic matter.

Contamination – Contaminants within this context include physical and non-biodegradable materials (metals, glass, plastics, etc.), chemical compounds and/or biological agents that can have a detrimental impact on the quality of any recycled organic products manufactured from source-separated compostable organic materials.

Liquid mixing pit – Impervious (normally concrete) storage structure designed to mitigate the risk of spills during receipt of excessively moist feedstocks and mixing with drier feedstocks.

Maturation – The final stage of composting where the temperature is shown to decline and stabilise to an extent that it can be safely used on land and to come into direct contact with plants without any negative effects.

Mulch – Any organic product (excluding polymers that do not degrade, such as plastics, rubber and coatings) that is suitable for placing on soil surfaces to help conserve moisture or restrict weed growth.

Pasteurisation – A process whereby organic materials are heat-treated to significantly reduce the numbers of plant and animal pathogens and plant propagules.

Pasteurised product – An organic product that has undergone pasteurisation, but is relatively immature and lacking in biological stability.

Separation distance – The space between the composting facility and neighbouring sensitive receptors.

Soil conditioner – Any composted or pasteurised product, including vermicast, manure and mushroom substrate, that are suitable for adding to soils. This also includes products termed ‘soil amendment’, ‘soil additive’, ‘soil improver’ and similar, but excludes polymers that do not biodegrade, such as plastics, rubber and coatings. Soil conditioners may be either ‘composted soil conditioners’ or ‘pasteurised soil conditioners’.

11. Appendix 1: Checklist

This checklist summarises the specific environmental issues which need to be addressed by a composting facility. The checklist should be used when developing a facility as well as on an ongoing basis to ensure EPA requirements are met.

Issue	Guideline reference
Do you need a works approval and licence? Does your facility : • accept more than 100 tonnes or 200 cubic metres of organic waste in any month? or • accept more than 70 tonnes or 140 cubic metres of organic waste in any month and produce more than 50 tonnes of pasteurised material, compost or digestate in any month? • intend to process prescribed industrial waste?	Section 3
Does the facility have an appropriate separation distance?	Section 4
Is the technology selected for the facility appropriate for the feedstocks?	Section 5
Does the design of the facility meet the requirements for: • sealed surfaces • mixing pits • bunding and drainage • contact water management	Section 6
Does your facility have an operational environmental management plan?	Section 9