



ACT
Government

SEPARATION DISTANCE GUIDELINES FOR AIR EMISSIONS

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CONTENTS

1. Introduction	2
2. Background	2
3. Role of the guidelines	3
4. Application of separation distances	3
4.1 Separation distance application considerations	3
4.2 Sensitive land uses	5
5. Amendments to separation distances	6
6. Separation distances for air emissions (air quality and odour)	7
6.1 Surface roughness factor	7
7. References	9
Appendix 1. Recommended separation distances for airborne emissions	9
Appendix 2. Vegetated buffer element design for agricultural spray drift	14

1. INTRODUCTION

The Environment, Planning and Sustainable Development Directorate (the Directorate) has prepared these Separation Distance Guidelines for Air Emissions (the guidelines) for use as a tool in the development application process for new or expanding developments in the Australian Capital Territory (the Territory). These guidelines may be used by the Territory's planning and land authorities, developers, planning consultants and the community.

These guidelines provide recommended separation distances between various emitters and sensitive land uses. They will ensure incompatible land uses are located in a way that minimises the impacts of odour and polluting air emissions when applied in the assessment of new development applications. While the guidelines will assist in the siting of new developments, they may also be used to ensure industrial activities in appropriate zones are protected from encroachment by residential and other sensitive land uses that would have a negative effect on the viability of industry.

The Directorate supports the use of these guidelines as one method of considering potential conflicts between incompatible land uses.

These guidelines are to be used in the assessment of new developments and are not to be applied retrospectively to existing industrial operations.

While the separation distances in these guidelines are recommended distances, there is the opportunity for a proponent to demonstrate that a separation distance, other than the recommended distance, is appropriate by using the mechanisms in these guidelines. Therefore, the distances recommended in these guidelines are indicative and may be adjusted having regard to specific site circumstances.

These guidelines are not intended to address occupational health and safety issues, or circumstances, where there is a direct health issue. These guidelines do not address major hazards such as fire or explosion, nor do they address the cumulative impacts of industrial activities.

Separation distances provide an envelope around an activity, or multiple activities, within which environmental risks should be assessed against current knowledge, technologies and practices.

2. BACKGROUND

Good planning is a major contributing factor to the achievement of sustainable development and environmental protection. The Territory Plan provides for the separation of certain classes of activities through the use of land use zones in the ACT. This separation protects the amenity of residential areas and allows businesses in industrial and commercial areas, as well as agricultural and municipal activities, to operate without hindrance.

The separation of certain land use activities is the basis for the preparation of these guidelines. The guidelines are intended to assist informed decisions that address potential conflicts between residential and other sensitive land uses and industry due to air emissions.

The use of separation distances is not an alternative to compliance by industry with its statutory obligations; it is an aid to locating industry and sensitive land uses to minimise the impacts of odour, polluting air emissions, waste water or noise that may result from accident, power failure, equipment failure, unusual meteorological conditions or human error, as well as normal operation. Under the *Environment Protection Act 1997* (the Act), industrial emissions are regulated by the requirement to comply with the general environmental duty and any relevant statutory conditions.

Similarly, the use of separation distances is not an alternative to the provision of appropriate planning policies and zoning in the Territory Plan. The guidelines may inform the planning process and should be seen as one of a number of tools available to deal with the loss of amenity caused by close proximity of incompatible land uses.

The guidelines may be used by developers and planning consultants to assist in the planning and assessment of development proposals and amendments to development.

The primary role of the guidelines is to aid in the assessment of development proposals. The application of the guidelines will assist in protecting the amenity in residential and other sensitive areas, and can be used by planning authorities to protect industry from encroachment by sensitive land uses.

3. ROLE OF THE GUIDELINES

Adequate separation distances reduce the potential for conflict between industrial and sensitive land uses, and support the fact that industrial activities cannot be undertaken with optimum emission control conditions all the time.

These guidelines are designed to be:

- simple – proponents, community and government can easily understand
- transparent – the separation distances are reproducible and consistent for all proposals with similar configurations
- quick and cheap – expert air quality advice should not be required
- generally more conservative than the separation distances predicted by air pollution modelling for a high percentage of proposals.

The recommended separation distances are based on the assumption that Best Available Technology Economically Achievable (BATEA) is implemented. BATEA involves the use of emission control technology, which, although representing a financial cost, will not be such that the viability of the enterprise is threatened. Using BATEA will help ensure an enterprise complies with the general environmental duty under the *Environment Protection Act 1997*.

Separation distances are not an alternative to source control and cleaner production methods. They are a means of reducing the effects of residual emissions and, in exceptional circumstances, the emissions from an enterprise operating under less than optimum conditions. It is important the application of separation distances is not seen as a substitute for BATEA.

While a separation distance is recommended for an industry, the ensuing buffer area can still be used for other compatible land uses.

4. APPLICATION OF SEPARATION DISTANCES

4.1 SEPARATION DISTANCE APPLICATION CONSIDERATIONS

These guidelines apply to new industries/activities and redevelopment of existing industries/activities for which a development application is required under the *Planning and Development Act 2007*. The guidelines are not to be applied retrospectively to an existing industry/activity.

In cases where the site of some proposed activities is fixed, the activity occurs infrequently and the recommended separation distance cannot be achieved, extra precautions would be required to minimise the potential impact of the activity. There may still, however, be an environmental nuisance for a short period of time. An example of this would be the abrasive blasting of a steel bridge for corrosion protection.

The guidelines may be used as a tool to assist in the planning and assessment of development proposals by the planning and land authority, developers and planning consultants. Proposed residential development near an existing industry may be assessed using the guidelines to ensure that the development does not have unsatisfactory environmental impacts and does not unduly affect the existing industry.

The guidelines do not address the cumulative impact of several industries; rather they address the potential impact from a single industry. The cumulative impact would need to be assessed on an individual site basis.

When applying the guidelines, the following concepts must be taken into consideration.

4.1.1 Activity boundary

The activity boundary is the boundary drawn to enclose all activities, plant, buildings, other structures or other sources from which residual emission may arise.

The activity boundary includes all sources of potential emissions, such as stockpiles and storage facilities. These must be identified and included within the activity boundary from which separation distances are taken. This concept allows industrial developers to provide for a buffer area or part thereof on their own premises if circumstances permit. The activity boundary may not coincide with the property boundary. The concepts of activity boundary and separation distance are shown in Figure 1.

4.1.2 Measurement point

The measurement point is the point on or adjacent to the nearest sensitive land use or zone at which a separation distance is assessed.

4.1.3 Recommended separation distance

The recommended separation distance is the distance recommended in the guidelines for the activity or activities listed. This distance is measured from the activity boundary.

The separation distances are based on typical to large sized existing developments for that industry sector. If a proposed development has the potential to have a significantly larger impact than this, the recommended distances may not be sufficient. The recommended distance can then be estimated using the procedure in Section 5 'Amendments to Separation Distances'.

4.1.4 Buffer area

The buffer area is the area from the activity boundary to the outer limit of the separation distance (Figure 1). The buffer area may have a natural or artificial feature that mitigates an adverse impact; for example, a hill. The ongoing ownership and maintenance of the buffer area must be considered. If the buffer area is not maintained there may be an increase in the potential impacts and a significant business risk to the proposed or new operation.

Where the distance between the measurement point and the activity boundary is less than the recommended separation distance, the Planning and Land Authority should request the proponent to demonstrate why the lesser distance would be appropriate in accordance with Section 5 'Amendments to Separation Distances' of these guidelines.

For the purpose of these guidelines, any land zoned for sensitive land uses under the Territory Plan should be treated as if the land were being used for that activity regardless of its current use. The nearest zone boundary to an actual or potential source of emissions is the measurement point in this case.

By careful layout within a site, and by locating the source of the residual emissions as far as practicable from the nearest sensitive land use, the impact on neighbouring landholders can be reduced. Careful examination of the proposed site, activities, plant and installation, in conjunction with the relevant planning and environmental legislation and details of existing land uses in the vicinity, is necessary if the separation distance requirements of a proposal are to be addressed adequately.

Industries themselves can be incompatible neighbours. For example, chemical works are incompatible with food preparation premises; a dusty concrete plant is incompatible with a paint shop requiring a dust free atmosphere. The reasons for their incompatibility are often highly individual and need to be addressed on a case-by-case basis to ensure sensible planning solutions are reached.

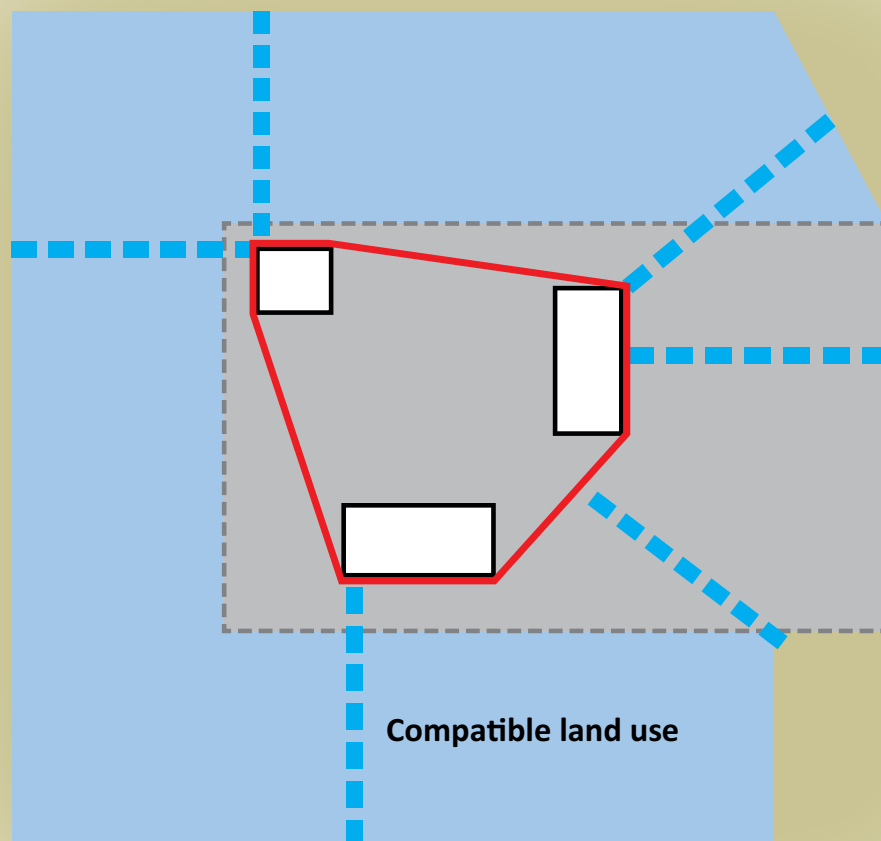
When setting up initial separation distances, the developer should make allowance for the possibility of future expansion on a site. Otherwise the expansion could be prevented by the lack of separation.

4.2 SENSITIVE LAND USES

These guidelines are intended to protect the amenity of sensitive land uses, such as, but not limited to:


- Caravan park
- Community centres
- Consulting rooms
- Educational establishments
- Childcare centres
- Hospitals
- Hotels
- Motels
- Nursing homes
- Tourism accommodation
- Residential (including detached dwellings, multiple dwellings, semi-detached dwellings)
- Parklands, recreation areas or reserves (regular public use)


Figure 1 Concepts of activity boundary and separation distance



Sensitive land use

 Activity

 Activity boundary

 Property boundary

 Separation distance

5. AMENDMENTS TO SEPARATION DISTANCES

If site specific circumstances appear to indicate a reason for departing from the recommended separation distance (e.g. scale of operation, local topography, state of the art technology etc.), a separation distance different from the recommended distances may be justified.

The onus will be on the party seeking an amendment to the recommended distance to demonstrate that the recommended separation distance is inappropriate for the particular situation.

As a guide, the following criteria should be addressed when seeking a site-specific variation from the recommended separation distance:

- the scale of operation of the proposal (e.g. the proposed plant is significantly smaller/larger than the normal operation for that activity and will produce substantially lower/higher emissions)
- evidence of pre-existing incompatible land use impacts extending beyond the recommended separation distance
- the standard of emission control technology to be used (e.g. will have a standard of emission control technology significantly better than the good level of control normally applied to that activity, i.e. Best Available Technology, rather than BATEA)
- evidence of the effectiveness of the proposed technology
- an environmental audit of residual emission (air, water, noise, waste) from an existing plant on the proposed site or a similar plant at another site, that has been carried out and made available to support an increase/decrease to the recommended separation distance
- details of how the residual emissions will be addressed
- details of any history of complaints arising from residual emissions from an existing plant, on the proposed site or a similar plant at another site
- details on how the proposed development may comply with industry guidelines (if available)
- existence of new applicable research
- existence of exceptional topographic, meteorological or other circumstances that will affect the emission or dispersion of residual emissions
- evidence from tools such as odour modelling, demonstrating that the potential odour impact is less/more than the adopted odour criteria for normal conditions and other conditions including times of higher emissions from accident, power failure, equipment failure, unusual meteorological conditions or human error.

Variation to the recommended separation distances should be included by proponents as either part of the development application process, or in a submission in relation to a development application. Such variations should address the criteria outlined above. It is suggested that those seeking a variation to recommended separation distances engage the services of experienced and appropriately qualified environmental consultants.

Separation distances embody the principle of best available technology economically achievable (BATEA), requiring processes and emissions control technologies that commensurate with current practices for the industry sector. BATEA forms part of a 'reasonable and practical' approach to regulation of industry. However, BATEA does not remain fixed and will evolve as more effective technologies become competitive. Therefore, separation distances are not a substitute for effective source control, cleaner production methods or facility management.

6. SEPARATION DISTANCES FOR AIR EMISSIONS (AIR QUALITY AND ODOUR)

The separation distances for odour or air pollutants are shown in Appendix 1. The distances given should be adjusted for the vegetation/surface roughness between the source and the receptor and the terrain effects around the site, particularly the effects of terrain features on the meteorology of the area.

The recommended separation distance for air quality purposes from Appendix 1 is multiplied by the appropriate surface roughness factor and the terrain weighting factor to give the final recommended separation distance.

- **Recommended distance = value in Appendix 1 x surface roughness factor (Table 1) x terrain weighting factor (Table 2)**

6.1 SURFACE ROUGHNESS FACTOR

The surface roughness factor varies according to the roughness of the land surface between the site and the receptor. The principal elements that determine surface roughness are vegetation density and surface topography. Recommended values of surface roughness are provided in Table 1. The values presented in this table are not to be added; only the value for the single category that best represents the site conditions should be used.

The roughness factors given in Table 1 assume that the selected roughness is continuous between the site and the receptor. Where roughness is variable or non-continuous, judgment should be used in selecting an appropriate composite factor.

The values given in Table 1 should be used with care; a number of qualifications apply to their use. For receptors located at larger separation distances, more than one surface roughness factor may apply over different sections of the separation. In this instance, the surface roughness factor applied should be selected after considering the relative weighting of the different factors. When selecting factors based on the presence of vegetation, some consideration should be given to the potential for the vegetation to be cleared during the life of the activity. For example, off-site vegetation is beyond the control of the operator, but may be regarded as permanent depending on the owner of the land (e.g. national park/reserves where no timber harvesting is undertaken).

Table 1. Values of surface roughness factor

Surface roughness features	Description	Factor
Settled areas	Metropolitan area or continuous residential, commercial and/or industrial areas.	1.00
Long grass, few trees	Open country with few or scattered trees. Topography would be predominantly flat to slightly undulating.	1.00
Undulating hills	Situations where topography consists of continuous rolling, generally low-level hills and valleys, but without sharply defined ranges, ridges or escarpments. (Assumes minimal vegetation.)	0.93
Level wooded country	Open forest country with tree density not sufficient to provide a continuous canopy, but sufficiently dense to influence air movement. There would be little or no lower storey vegetation. The density is such that the vegetation can be considered as a continuous belt.	0.85
Heavy timber	Generally tall forests with dense timber stands, providing a continuous canopy. There is limited understorey vegetation, mainly associated with regrowth.	0.77
Significant hills and valleys	Situations where one or more lines of hills sufficiently large enough to influence air movement exist between the receptor and the activity.	0.68

Table 2 Values of terrain weighting factor

Terrain	Weighting factor Downslope	Upslope
Broad valley/drainage (0.1–1%)	1.6	1
Sloping terrain (1–2%)	1.5	1
Flat (<0.1% in all directions)	1	1
Hilltop (>4%)	1.2	–
Narrow valley (1–2%)	1.2	0.5

Notes

1. These factors may not apply where prevailing winds are a significant influence on weather patterns, or where odour is emitted from elevated vent sources.
2. Downslope factors should be applied across an angle of 90° centred on the terrain feature. Upslope factors should be applied across an angle of 60° centred on the terrain feature.
3. % is percentage slope.

The location of the operation should be checked in relation to the topography. For example:

- If the operation is on a slight slope (<1%) within a broad valley, a terrain weighting factor of 1.0 should be used upslope and 1.6 downslope of the facility.
- If the operation is situated on a moderate slope (1–2%), a terrain weighting factor of 1.0 should be used upslope and 1.5 downslope of the facility.

Weighting factors should be applied for the range of distances applicable to site impacts.

However, the application of these weighting factors is dependent on the homogeneity of terrain between source and receptor. For example, if the terrain remains similar between the operation and receptor, the weighting factor can be applied for an indefinite distance. The weighting factor is, however, less reliable if significant terrain changes occur between source and receptor.

The terrain weighting factors apply to most locations. If, however, the site is not described by these factors, a terrain weighting factor of 1.0 should be used.

Examples

The recommended separation distance for Hot Mix Asphalt Preparation in Appendix 1 is 1,000 metres.

If the proposed plant has heavy timber between the plant and the receptor and the plant is located on a slight slope (<1%) within a broad valley the recommended distance is $1000 \times 0.77 \times 1.0 = 770$ metres for upslope of the plant and $1000 \times 0.77 \times 1.6 = 1,232$ metres downslope of the plant.

The recommended separation distance from Appendix 1 for Milk Processing Works is 100 metres.

If the proposed plant is located in residential/industrial area and the land is flat (<0.1%) the recommended distance is $100 \times 1.0 \times 1.0 = 100$ metres.

7. REFERENCES

Queensland Department of Infrastructure, Local Government and Planning, State Planning Policy – state interest guideline: Agriculture, April 2016

Queensland Department of Natural Resources, Planning Guidelines Separating Agricultural and Residential Land Uses, 1997 DNRQ 97088.

South Australian Environment Protection Authority, Guidelines for Separation Distances December 2007

South Australian Environment Protection Authority, Evaluation distances for effective air quality and noise management, August 2016

Victorian Environment Protection Authority, Recommended separation distances for industrial residual air emissions, March 2013

Victorian Environment Protection Authority, Assessing planning proposals within the buffer of a landfill, October 2017

APPENDIX 1. RECOMMENDED SEPARATION DISTANCES FOR AIRBORNE EMISSIONS

The distances provided in this appendix are in metres.

Recommended separation distances		Meters
Agriculture and other animal activities		
Abattoirs or slaughterhouses	The conduct of slaughtering works for commercial purposes for the production of meat or meat products for human or animal consumption:	
	Other than poultry	500
	Poultry only	300
Agricultural chemical spray drift	Open ground conditions	300
	Vegetated buffer (see Appendix 2 for buffer conditions)	40
Cattle feedlot		See note #
Dairies	A dairy involving more than 100 milking animals at any one time	300
Dog kennels		200
Poultry farms	Keeping of poultry involving an enclosed shed area exceeding 1,000 square metres	750
Saleyards	Commercial conduct of yards at which cattle, sheep or other animals are gathered or confined for the purpose of their sale, auction or exchange, including associated transport loading facilities, being yards with a throughput >50,000 dry sheep equivalent units per year [dry sheep equivalent units: 1 sheep or goat = 1 unit; 1 pig (<40kg) = 1 unit; 1 pig (>40kg) = 4 units; 1 cattle (<40kg) = 3 units; 1 cattle (40 – 400kg) = 6 units; 1 cattle (>400kg) = 8 units].	500
	With throughput >25,000 but <50,000 dry sheep equivalent units per year	200

Recommended separation distances		Meters
Chemical and petroleum		
Chemical storage and warehousing facilities	Storage of warehousing of chemicals or chemical products that are, or are to be, stored or kept in bulk or in containers having a capacity exceeding 200 litres at facilities with a total storage capacity exceeding 1,000 cubic metres.	500
Chemical works		500
Petroleum storage	Petroleum products are stored in tanks with a total storage capacity exceeding 2,000 cubic metres	250
Hydrocarbon production, refining, processing and recovery	Production, processing or recovery of petroleum products/ derivatives (other than refining oil or gas, producing hydrocarbon fractions or liquefying gas)	500
Food and beverage production and animal and plant processing		
Bakery	> 40 tonnes/day	100
	< 40 tonnes/day	See note ~
Breweries	The conduct of works for the production of beer by infusion, boiling or fermentation, with a beer production capacity, where liquid waste is discharged onto land or into waters:	
	> 5,000 litres/day	500
	< 5,000 litres/day	See note ~
Coffee roasting	Roasting >200 tonnes per year of coffee beans	250
	Roasting <200 tonnes per year of coffee beans	See note ~
Milk processing works	Works where milk is separated evaporated or otherwise processed for the manufacture of evaporated or condensed milk, cheese, butter, ice cream or other similar dairy products at a rate of greater than 1 M litres per year.	100
Produce processing works	Processing agricultural crop material by deep fat frying, roasting or drying through the application of heat	150
	Processing any agricultural crop material where waste water is generated and disposed of otherwise than to a sewer or septic tank effluent disposal system	150
Tanneries or fellmongeries	The commercial preservation or treatment of animal skins or hides (excluding the processing of skins or hides by primary producers in the course of primary production activities outside built up areas and the processing of skins or hides in the course of taxidermy)	500

Recommended separation distances		Meters
Wineries or distilleries	Processing of grapes or other produce to make wine or spirits where greater than 50 tonnes of grapes or other produce are processed per year with: Mechanically treated wastewater	300
	Wastewater storage lagoons without any aeration device: BOD >4000mg/L Mechanically treated wastewater	1,000
	BOD >1000 & <4000mg/L BOD	750
	>100 & >1000mg/L BOD	500
	<100mg/L	300
	Bottling only	300
Wool scouring		500
Manufacturing and mineral processing		
Abrasive blasting	Blasting outside	500
	Blast cleaning cabinets less than 5 cubic metres in volume or totally enclosed automatic blast cleaning units	100
Ceramic works	Works for the production of ceramics or ceramic products such as bricks, tiles, pipes, pottery goods, refractories or glass that are manufactured or are capable of being manufactured in furnaces or kilns fired by any fuel with a total capacity for the production of products exceeding 100 tonnes per year	500
Concrete batching works	Works for the production of concrete or concrete products that are manufactured or capable of being manufactured by mixing cement, sand, rock, aggregate or similar materials with a total capacity for production exceeding 0.5 cubic metres per production cycle.	100
Hot mix asphalt preparation	Conduct of works at which crushed or ground rock aggregates are mixed with bituminous or asphaltic materials for the purposes or producing road building mixtures	1,000
Pulp or paper works	Works at which paper pulp or paper is manufactured where production is: >100 tonnes/year	2,000
	<100 tonnes/year	1,000
Scrap metal recovery	Works at which scrap metals are treated in any type of fuel burning equipment or electrically heated furnaces or are disintegrated by mechanical means for recovery of metal, but excluding commercial printing establishments at which type metal is melted or re-melted in thermostatically controlled ports for the purpose of type casting	500

Recommended separation distances		Meters
Surface coating	Electroplating, electrolyse plating, anodising (chromating, phosphating and colouring), chemical etching or milling, or printed circuit board manufacture	100
	Hot dip galvanising	300
	Spray painting and powder coating with a capacity to use more than 100 litres/day of paint or 10 kilograms/day of dry powder	300
	Spray painting and powder coating with a capacity to use less than 100 litres/day of paint or 10 kilograms/day of dry powder	100
Timber preserving works	Treating or preserving timber using hazardous or toxic chemical substances	100
Wood processing works	The conduct of works other than works at a builders supply yard or a home improvement centre at which timber is sawn, cut, chipped, compressed, milled or machined (sawmills and joineries)	100
Material handling		
Crushing, grinding or milling	Processing (by crushing, grinding, milling or separating into different sizes by sieving, air elutriation or in any other manner) of chemicals or rubber	300
	Rock, ores or minerals excluding lease or private mine or wet sand	500
Crushing, grinding or milling (excluding non-commercial processing for on-farm use)	Agricultural crop products	300
Extractive industries	Operations involving extraction, or extraction and processing (by crushing, grinding, milling or separating into different sizes by sieving, air elutriation or in any other manner), of sand, gravel, stone, shell, shale, clay or soil:	
	with blasting	500
	no blasting	300
Composting works	Compost is produced at a rate of:	
	> 200 tonnes/year	1,000
	>20 & < 200 tonnes/year	300
Waste management		
Biosolid depot	Receiving, drying, composting, mixing or processing biosolids	400
Incineration	Destruction of chemical wastes	1,000
	Destruction of medical wastes	500
	Cremation	150
	Solid municipal waste	500
Landfill	Municipal solid waste and commercial and industrial waste landfill activities	500
Materials recovery facility*	Collecting, dismantling, treating, processing, storing or recycling used or surplus materials	300

Recommended separation distances		Meters
Permanent contaminated soil treatment facility	Permanent facility for the temporary storage, processing and treatment of contaminated soil (excludes on-site contaminated site soil treatment)	500
Sewage pumping stations	Facilities including, pumps and equipment, for pumping sewage to processing sites	100
Sewage treatment works	Mechanical/biological wastewater plants including aerated lagoons: <1,000 equivalent population	100
	>1,000 & <5,000	200
	>5,000 & <15,000	300
	>15,000	Individual assessment
Sewer vents	Facultative lagoons: <1,000 equivalent population	150
	>1,000 & <5,000	350
	>5,000 & <15,000	700
	>15,000	Individual assessment
Sewer vents	A ventilation system to ensure there is air movement in the sewer system, pits and drains to decrease gaseous build ups	50
Waste transfer station*	Collection, consolidation, temporary storage, sorting or recovering refuse or used materials prior to transfer for disposal or use elsewhere	300
Miscellaneous		
Dying/finishing	Dying or finishing cotton, linen, woollen yarns or textiles	100
Fibre-reinforced plastic manufacturing		300
Gas distribution works	Regulating stations, boundary regulators, trunk receiving stations and similar types of gas infrastructure capable of causing air emissions	300
Marinas and boating facilities: repair or maintenance	Works for the repair or maintenance of vessels	300
Printing	Printing works emitting >100 kilograms per day of volatile organic compounds	500

Department of Primary Industries and Resources (SA) and Local Government Association of South Australia 2006, EPA 252/06 *Guidelines for establishment and operation of cattle feedlots in South Australia*.

~ For food and beverage manufacturing where, no separation distances are specified. For these cases it is recommended that there be no visible discharge of dust or emission of odours offensive to humans, beyond the boundary of the premises, subject to the adoption of BATEA.

* Does not include the temporary storage at the place at which the waste (not being tyres or tyre pieces) is produced while awaiting transport to another place; or the storage, treatment or disposal of domestic waste at residential premises.

Note: These separation distances apply to air emissions only. Certain activities may require further separation for noise emissions.

APPENDIX 2. VEGETATED BUFFER ELEMENT DESIGN FOR AGRICULTURAL SPRAY DRIFT

Separation distances should be determined on the basis of the sustainable agricultural land use with the potential to have the most impact on adjacent land uses and which is reasonably likely to be practised regardless of current use.

The separation distance of vegetated buffer area should be located within the site being developed for sensitive land uses, and be provided/funded by the proponent of that development.

While a separation distance of 300 metres is recommended for forward planning between sensitive receivers and agricultural areas, 'vegetated buffers' can offer an alternative to this separation requirement. Research into the behaviour of pesticide spray drift has shown that vegetation screens can prove effective barriers to spray drift where they meet **all** the following criteria:

- are of a minimum total width of 40 metres
- contain random plantings of a variety of tree and shrub species of differing growth habits at spacings of 4-5 metres for a minimum width of 20 metres
- include species with long, thin and rough foliage which facilitates the more efficient capture of spray droplets
- provide a permeable barrier which allows air to pass through the buffer. A porosity of 0.5 is acceptable (approximately 50% of the screen should be air space)
- foliage is from the base to the crown
- include species which are fast growing and hardy
- have a mature tree height 1.5 times the spray release height or target vegetation height, whichever is higher
- have mature height and width dimensions which do not detrimentally impact upon adjacent cropped land
- include an area of at least 10 metres clear of vegetation or other flammable material to either side of the vegetated area.

Vegetated buffers have other advantages in that they:

- create habitat and corridors for wildlife
- increase the biological diversity of an area, thus assisting pest control
- favourably influence the microclimate
- are aesthetically pleasing
- contribute to the reduction of noise and dust impacts.

Applications for development, where vegetated buffers are proposed, should include a landscape plan indicating the extent of the buffer, the location and spacing of proposed and existing trees and shrubs and a list of tree and shrub species to be planted. The application should also contain details concerning proposed ownership of the vegetated buffer and the means by which the buffer is to be maintained.

While the recommended vegetated buffer (which includes multiple rows of trees) will not capture 100% of the chemical spray drift, it may reduce spray drift to less than 1% at a sensitive land use when managed in terms of porosity, litter build up and noxious weed control to ensure effectiveness.

Farm management can also influence the effectiveness of the separation distance and vegetative buffer areas. The separation distance and vegetative buffer areas recommended assumes farmers and their employees and contractors carry out their activities in a reasonable manner and apply agricultural and veterinary chemicals registered by the Australian Pesticides and Veterinary Medicines Authority (APVMA), or for which a permit has been issued by the APVMA under the *Commonwealth Agricultural and Veterinary Chemicals Code Act 1994*, in accordance with directions specified on the label of the registered agricultural or veterinary chemical or directions specified in a permit.

Factors affecting separation distance and vegetative buffer area requirements for reducing agricultural chemical spray drift include:

- chemical composition/formulation e.g. toxicity, evaporation rates
- method of application/release height e.g. aerial application, air blast mister etc
- spray technology, e.g. nozzle type, droplet size
- frequency of application
- ability of the vegetation to capture spray droplets
- target structure
- weather conditions, e.g. wind speed and direction, air turbulence, inversions
- microclimate
- geographical conditions and barriers, e.g. topography.

In order to locate new sensitive receivers so that the impact of agricultural chemical spray drift on amenity and health is avoided and complaints from residents regarding the use of agricultural chemicals is unlikely, the following must be implemented:

- the separation distance between a sensitive receiver and agricultural land is a minimum of 300 metres or
- a vegetated buffer designed by a suitably experienced consultant that incorporates the criteria outlined above is located between the sensitive receiver and adjacent agricultural land. The vegetated buffer should:
 - » be provided with a suitable watering system
 - » include access strips on either side which are kept clear of vegetation and other flammable materials
 - » be of a height, density and width (40 metres minimum) acceptable to the EPA prior to the development of sensitive receivers within 300 metres of the agricultural land.

