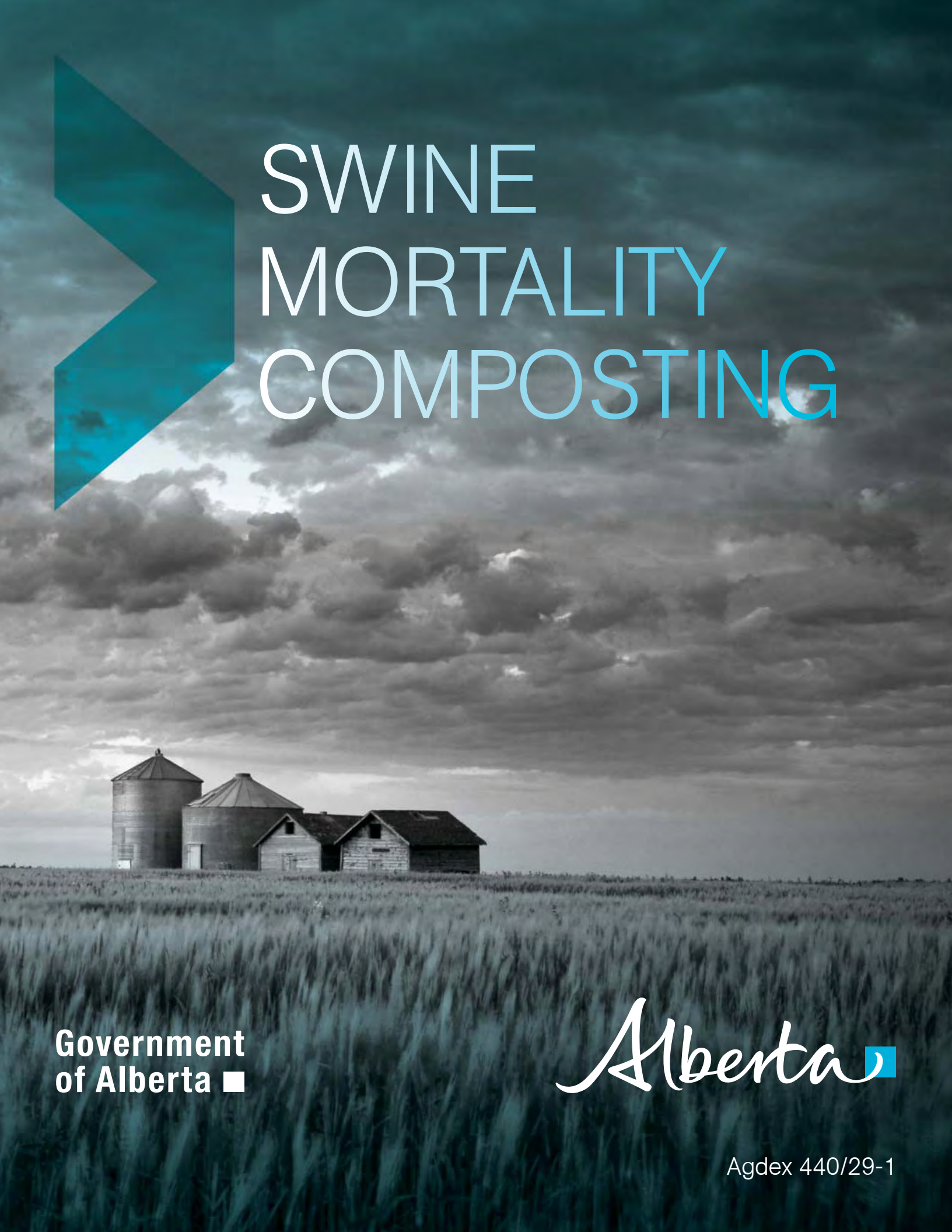
# SWINE MORTALITY COMPOSTING



Government of Alberta

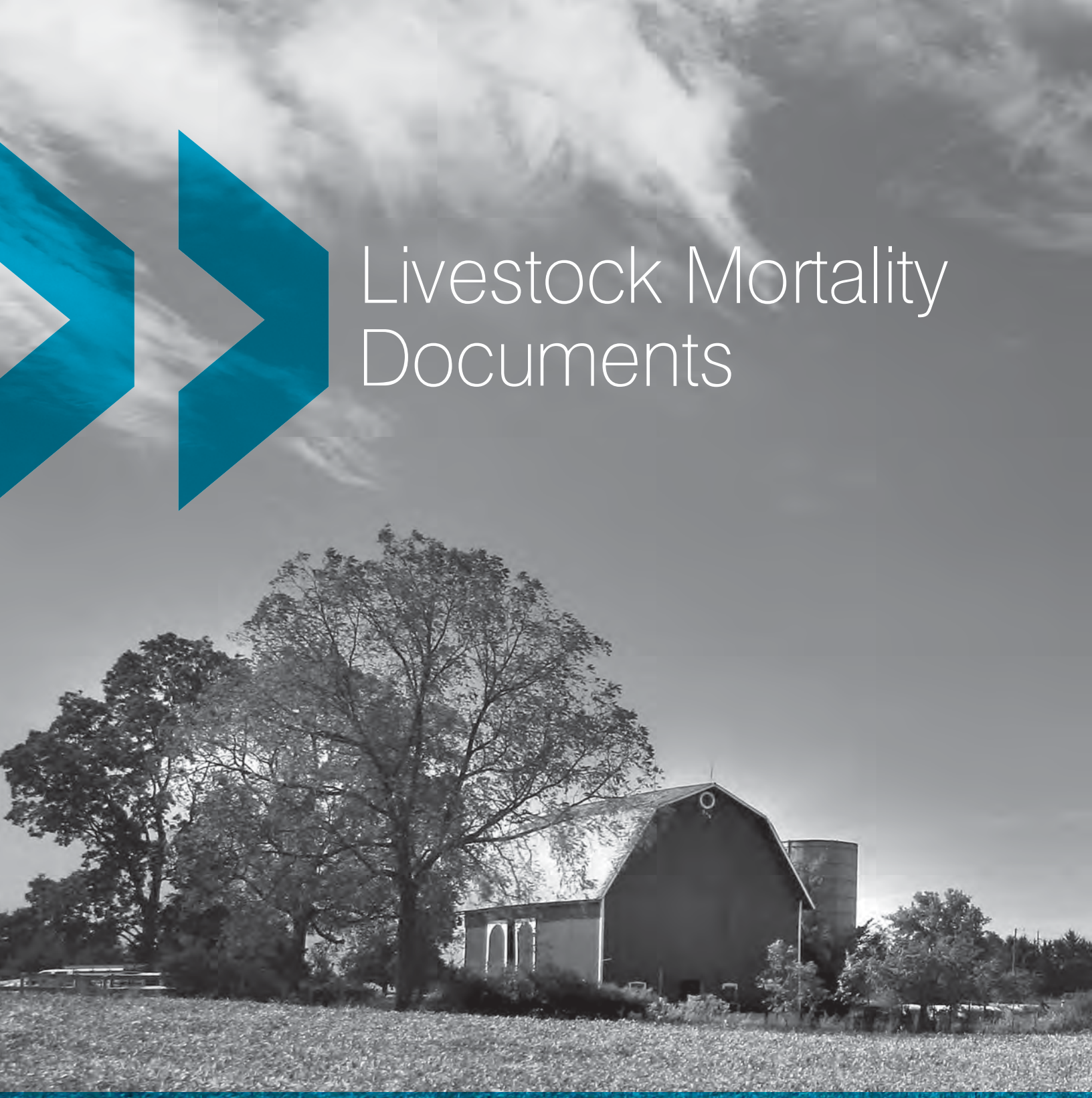
Alberta

Agdex 440/29-1

# SWINE MORTALITY composting

## contents

# Livestock Mortality Documents



Livestock Mortality Management (Disposal) Agdex 400/29-1

Poultry Mortality Composting Agdex 450/29-1

Large Animal Mortality Composting Agdex 400/29-4

Livestock Mortality Burial Techniques Agdex 400/29-2

# mortality disposal

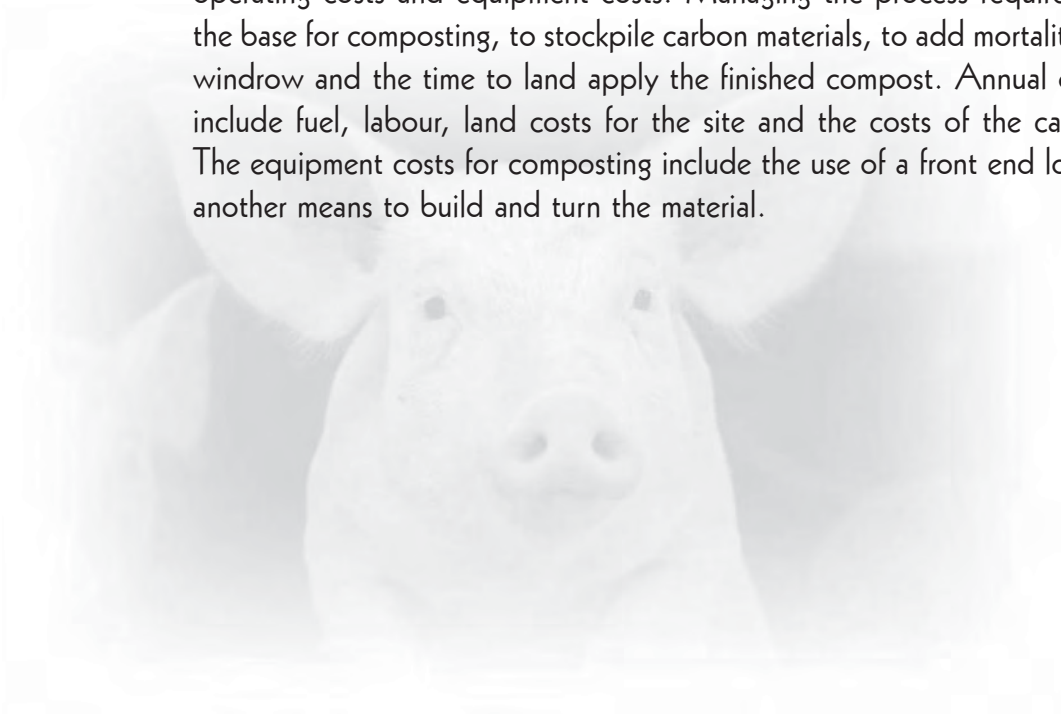
Mortalities happen. Under Alberta's Destruction and Disposal of Dead Animals Regulation of the *Animal Health Act*, Appendix A, the owner of a dead animal shall dispose of the animal within 48 hours of its death. Mortalities can be composted, incinerated, buried, rendered or naturally disposed. Today, animal agriculture is challenged to discover innovative ways to dispose of livestock and swine mortalities. Composting of livestock mortalities is one option. There are two general approaches to livestock mortality composting: bin systems and windrow systems.

The environmental considerations for improper disposal include:

- Odour – decomposition of organic matter, particularly the anaerobic (lacking oxygen) breakdown of proteins by bacteria, will produce a foul odour.
- Scavengers – ravens, magpies, coyotes, etc. and insects can transmit disease and are a nuisance.
- Pathogens – disease-causing spores may still be viable.
- Excess Nutrients – concentrated source of nitrogen.
- Nuisance – visible carcasses and bones fuel social issues and can puncture tires.

Composting in a properly managed system will work to prevent livestock disease transmission, protect air and water quality and reduce the nuisance of carcasses and bones. Composting improperly in an unmanaged system can result in a large nuisance and risks social repercussions.

Costs related to composting mortalities include the time to manage the process, operating costs and equipment costs. Managing the process requires time to form the base for composting, to stockpile carbon materials, to add mortalities, to turn the windrow and the time to land apply the finished compost. Annual operating costs include fuel, labour, land costs for the site and the costs of the carbon materials. The equipment costs for composting include the use of a front end loader tractor or another means to build and turn the material.



# potential environmental and biosecurity risk

POTENTIAL RISK

## lowest risk

- Compost in a properly managed system or burn in an approved incinerator on the farm.
- Bury in appropriate soils or store frozen for spring burial or rendering plant pick-up (Refer to Livestock Mortality Burial Techniques, Agdex 400/29 – 2).
- Partially buried or carcass left outside for scavengers or to decay.

## highest risk

- Inexpensive alternative for swine disposal.
- Can kill pathogens and reduce chance to spread disease.
- Destroys the viability of weed seeds.
- Environmentally safe and valuable soil carbon material.
- Can be operated year round.
- Utilizes equipment available on-farm.
- Low odour generated.
- Low labour and management requirements.
- Publically acceptable.
- "Green" option – recycles and promotes biosecurity.
- Expands social acceptance.

Composting is the biological breakdown of organic materials in an aerobic (presence of oxygen) environment. Livestock mortality composting requires a high-carbon material with moderate moisture levels and good porosity to surround the carcasses which have a high moisture content and nearly zero porosity. The carcasses and carbon materials are layered into the pile and no mixing is done until after the high-rate (primary) stage of composting has occurred. In and around the animal, the process is anaerobic but as gasses are produced and move away, they enter an aerobic zone. Here the gasses are trapped in the surrounding material which supports bacteria to form a biological filter, or a biofilter. Composting livestock mortalities is best described as an "above ground burial in a biofilter with pathogen kill by high temperature."

The carbon material around the carcass serves several key functions:

- Surrounds the carcasses making them less accessible and attractive to pests.
- Absorbs excess liquids released by decomposing carcasses.
- Provides structure and porosity which promotes air movement throughout the material.
- Provides an energy source for microbial growth.

Avoid turning the pile during the primary stage. After this time, the pile is moved to begin the secondary stage. Moving the pile introduces air and mixes the contents leading to uniformity in the finished compost. The secondary pile is then turned and placed in a pile for storage. Bones sometimes remain intact after completion of the storage process. They are generally quite brittle and pose no health risks or danger to equipment when land applied.

While composting is a natural process, it requires proper conditions to occur rapidly, minimize odour and prevent nuisance problems.

# keys to success

## Nutrient Balance (C:N)

The proper compost mix requires both carbon (C) and nitrogen (N) at the proper ratio near 30:1. This will result in a composting process that generates little odour yet offers an environment where microorganisms can flourish. Fresh swine carcasses have a low C:N of 14:1. Plant materials such as wood chips, sawdust, chopped corn stover, shredded paper or straw have a high C:N for on-farm mortality composting.

## Moisture

Like all living things, microorganisms need water. To encourage their growth and rapid composting, water content of the mixture should be 50 – 60% w.b. (wet basis). It is important to avoid excess water due to the potential for odour and excess liquids released by decomposing carcasses. When fresh swine carcasses are used, there is usually no need to add extra moisture. If the carbon material is extremely dry (>85% dry matter) or the carcasses have dried out before composting, water may be needed.

## Temperature

Temperature is a good indicator of the "health" of the compost process. A probe-type dial thermometer with a 1 m (39 in) stem is good for monitoring temperatures, Figure 1. Temperatures should be checked frequently throughout the pile. Normally, temperatures in the primary stage should rise to 55 – 65 °C (131 °F –149 °F ) in 1 or 2 days and peak at 60 – 70 °C (140 °F –158 °F ) within 7 to 10 days.

Temperatures above 55 °C (131 °F) over 3 days will kill parasites and fecal and plant pathogens within the pile. However, to maintain high temperatures, the pile must be adequately sized, 2.4 – 3.6 m (8 – 12 ft) wide at the base and 1.5 – 2.1 m (5 – 7 ft) tall. At temperatures above 66 °C (150 °F), microbial activity declines rapidly as compost temperature exceeds 71 °C (160 °F).

Although experience indicates that temperatures above 75 °C (167 °F) are rare, a remote possibility exists that temperatures could rise to spontaneous combustion levels. If temperatures appear to be rising towards 75 °C (167 °F), the compost should be spread on the ground to cool.


Figure 1. Temperature Measurement

## Carbon material selection

Sawdust is an ideal carbon material for swine mortality composting due to:

- Small particle size.
- Open spaces (porosity).
- Bulk density of approximately 24 to 111 kg/m$^3$ (40 to 186 ft/yd$^3$).
- pH of 6.5 to 8.0.
- Ease of handling.
- Absorbency.
- High carbon content.

If sawdust litter is not available, a mix (by weight) of one part caged layer manure with 0.2 parts sawdust can be used. Since these tend to be less absorptive and have poorer insulating properties than sawdust, their use requires more care during cold or wet weather.

**8 key factors for composting success and acceptable ranges to aim for when composting**

| Major factors | Reasonable range | Preferred range |
|---|---|---|
| Nutrient balance, C:N | 20:1 – 40:1 | 30:1 – 35:1 |
| Moisture | 45 – 65% w.b. | 50 – 60% w.b. |
| Temperature | 45 – 68 °C (113 – 155 °F) | 54 – 66 °C (130 – 150 °F) |
| Particle size | 0.8-1.2 cm (1/8 – 1/2 in) | Depends on material |
| Porosity | 30 – 50% | 35 – 45% |
| Bulk density | <640 kg/m3 (1100 lbs/yd$^3$) | |
| pH | 5.8 – 9.0 | 6.5 – 8.0 |
| Oxygen concentration | >5% | >10% |

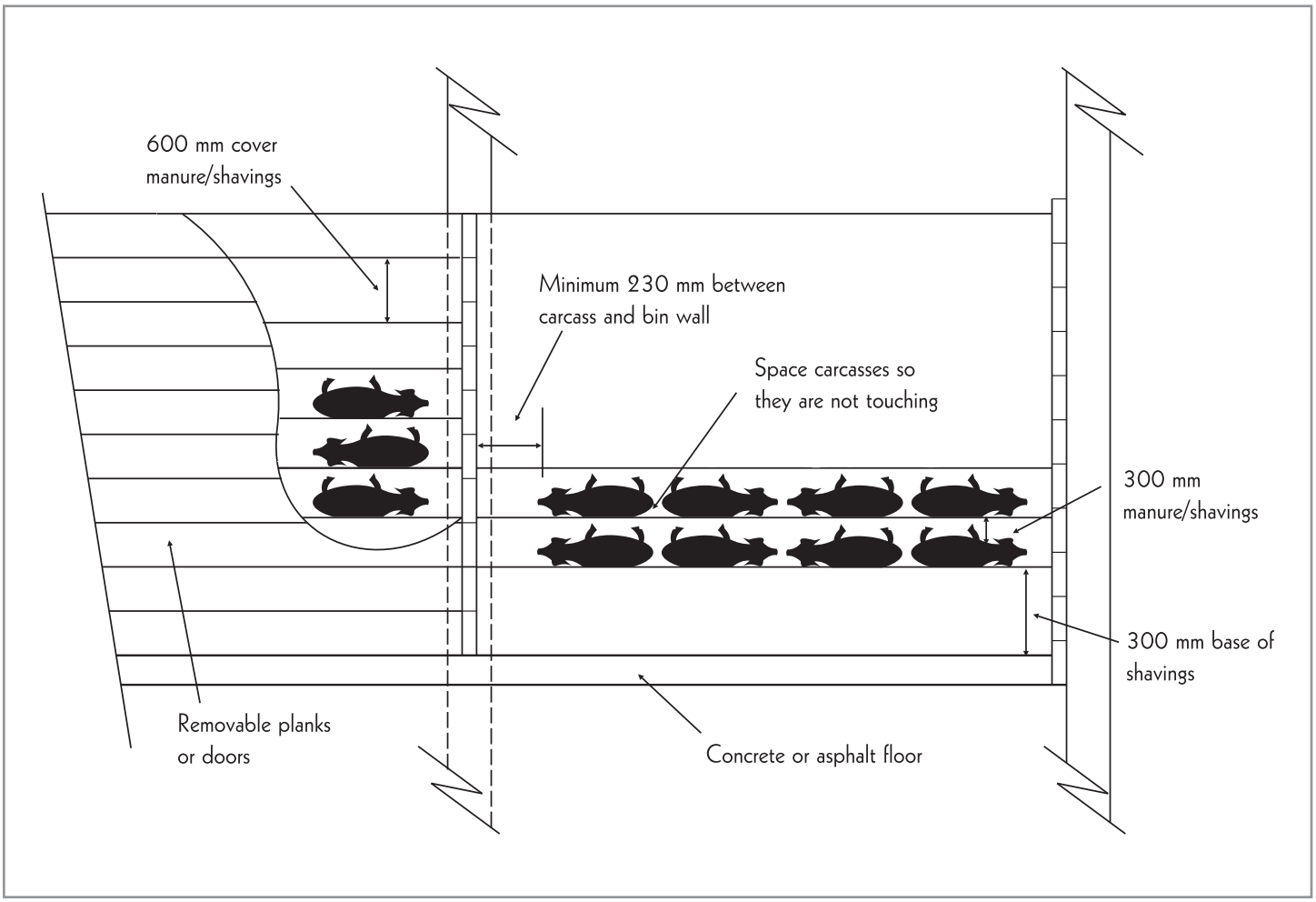
# build and manage compost piles

Swine composting can be accomplished by layering in either a bin or a windrow. The material is layered the same for both systems. Begin by placing a 300 mm (12 in) layer of carbon material such as sawdust on the bottom, Figure 2 and 3.

Carcasses are placed on top of the base layer at least 230 mm (9 in) away from the edge of the base. Carcasses should be 300 mm (12 in.) apart. Too many carcasses in one spot leads to localized wet areas and poor composting. Small pigs may be grouped or placed with less carbon material between them.

After the carcasses are positioned, they are covered immediately with 300 mm (12 in) of carbon material. Layering of carcasses and carbon material continues until the pile is 1.2 – 1.8 m (4 – 6 ft) tall. Cover the pile with **600 mm (24 in)** of carbon materials.

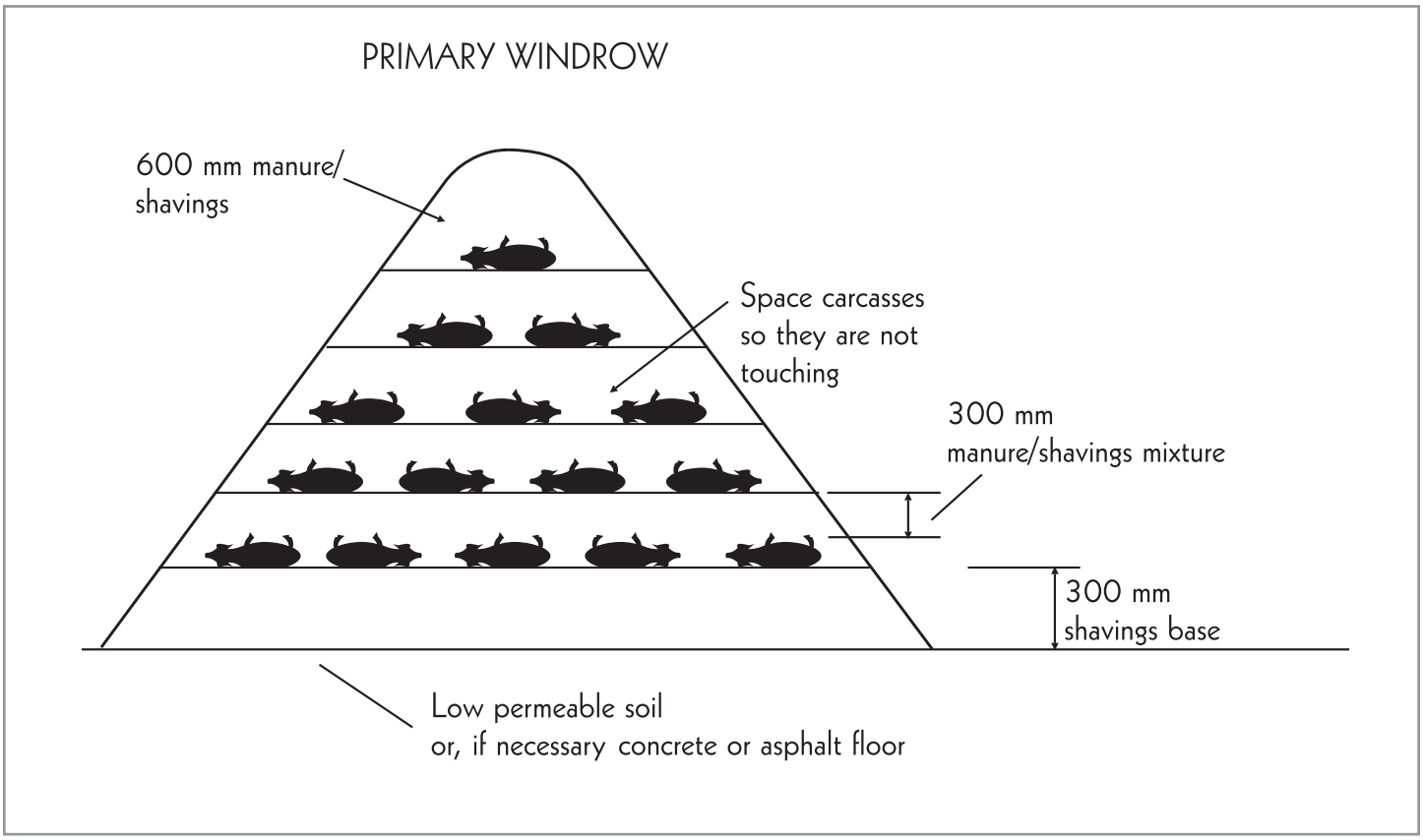
**Figure 2. Composting bins built in layers**



Carcasses should be 300 mm (12 in.) apart

Too many carcasses in one spot leads to localized wet areas and poor composting.

**Figure 3. Composting windrows built in layers**




## Two Stage Process

After the initial piling of a windrow or completely filling a bin, the material will heat up quickly and then gradually start to cool. The cooling is a normal sign that organisms are starting to be deficient in one of the ingredients. This primary stage for swine mortalities lasts approximately 3 months. It may be necessary to extend this period of time if an unusual number of large carcasses are composted or if ambient temperatures are low. Mix the pile to re-introduce oxygen and redistribute the composting material to encourage rapid decomposition causing the temperatures to rise again. This secondary stage lasts approximately another 3 months.

By the end of the second heating stage, carcasses are normally reduced to a few brittle bone fragments that are clean and free of tissues that cause odours and attract insects and scavengers. Large carcasses may need a third heating stage.

Failure to manage the system will result in odours that attracts flies, scavengers and other vermin to the site.

Composting is considered complete when there is:

- No soft animal tissue.
- No bones or bone fragments larger than 15 cm (6 in) in any dimension.
- No other animal matter larger than 2.5 cm (1 in) in any dimension.
- No offensive odours.

The compost structure is designed for daily losses and occasional periods of high loss.

To do this, there are two basic designs bin and windrow composting

# composter design

## Bin Composting

Bin composting improves the aesthetics of mortality composting. As described previously, the primary stage lasts 3 months before moving to a second bin or to a windrow for the secondary stage. The layout of the composter should be flexible. This will accommodate existing features, restrictions, traffic patterns, equipment or other factors particular to a given operation. No specific layout is best in all cases.

The following points should be taken into consideration when designing a mortality bin composter.

1. Surface water should be diverted away or around the compost site to eliminate contamination.
2. Depth of compost bins should not exceed 1.8 m (6 ft). This will reduce compaction effects and the potential for spontaneous combustion.
3. Since small carcasses are usually placed inside the primary compost bins by hand, the front of the bin should be designed so that carcasses will not have to be lifted too high. This can be done with removable drop boards that slide into vertical channels or with doors that split horizontally.
4. The width of compost bins is usually selected to accommodate loading/unloading equipment. Tractor front-end loaders or skidsteers are typically used. Bin width should be at least 0.3 m (12 in) wider but preferably 0.6 – 1 m (2 – 3 ft) wider than the bucket. If wheels on the equipment are wider than the bucket, the bin should be widened accordingly.
5. The length of the compost bins is generally 3 – 4.5 m (10 – 15 ft) for swine. A disadvantage of longer bins is that they are more difficult to enter and exit.
6. Several smaller primary composting bins work more efficiently than a few very large bins.
7. Even though calculations may indicate fewer, a minimum of two primary bins is required. This allows use of the second bin while the last additions to the first bin are composting.
8. Secondary composting volume may be provided in bins that are duplicates of primary bins or a large bin.
9. It may be desirable to add one or two extra primary composting bins. These bins can be used to store ingredients such as litter, sawdust, etc. If unusually high mortalities occur, the extra bins could be put into service. Experience has shown that some ingredient storage at the composter site greatly facilitates management of the process.

Extra space is inexpensive and provides valuable flexibility for contingencies such as busy times of the year when bins cannot be emptied on time or occasional batches requiring additional time to decompose completely.

Temporary bins for mortality composting have been constructed using large bales as sidewalls with no roof. This type of construction is less expensive and provides flexibility, such as the number of bins and their location, that a permanent structure would not. When the need arises, bale bins can also be used along with a permanent structure facility to provide additional composting capacity.

## Sizing the Composter

The design, number and size of bins can be calculated once an estimate of the number and weight of mortalities has been determined. Average daily death losses are located in Table 2. These average values may have to be modified to reflect different housing alternatives and management systems. Appendix B contains these calculations.

Bins with 15 – 30 $m^3$ (530 – 1060 $ft^3$) of capacity are recommended for large swine carcasses. These bins have a floor area of approximately 10 – 20 $m^2$ (108 – 216 $ft^2$).

Extremely large bins that take a long time to fill are undesirable as they lead to unnecessarily long heating times since the first carcasses were placed. Total bin volume recommendations suggested are based on average daily death losses.

Bin systems constructed for composting swine typically require 1.25 $m^3$/kg (20 $ft^3$/lbs) of room for primary composting and the same for secondary composting. For example, a farrow-to-finish farm averaging 50 kg (110 lbs) of loss each day would need approximately 62.5 $m^3$ (2200 $ft^3$) of primary capacity and the same amount for secondary bin space.

**Table 2. Average daily death losses**

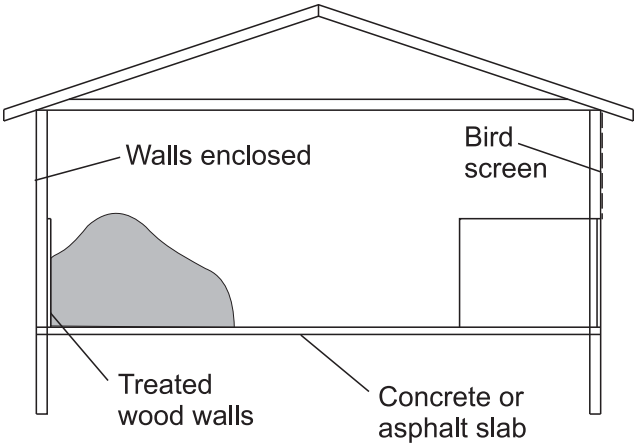
| Type | Example Number of Animals | Average Weight per Animal | | Average Cycle Mortality (%) | Cycle Length (days) | Expected Daily Mortality Weight | |
|---|---|---|---|---|---|---|---|
| | | kg | lbs | | | kg | lbs |
| Mature Sows/Boars | 150 | 200 | 441 | 5.5 | 365 | 4.5 | 9.9 |
| Pre-weaning | 150 | 2 | 4.4 | 19.0 | 21 | 2.7 | 6 |
| Weaners | 275 | 13 | 29 | 2.6 | 49 | 1.9 | 4.2 |
| Growers | 300 | 45 | 99 | 2.7 | 49 | 7.4 | 16.3 |
| Finishers | 300 | 88 | 194 | 3.0 | 49 | 16.1 | 35.5 |

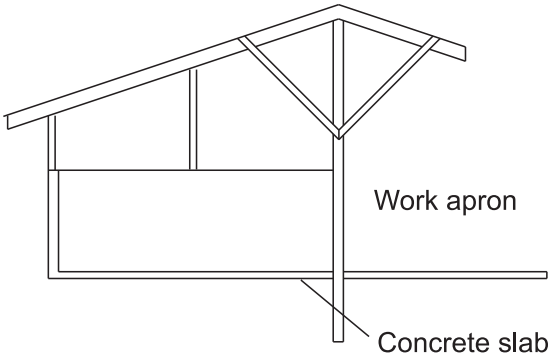
Appendix B illustrates the method for determining the number of primary bins needed for a swine mortality composting system. Primary bins may be arranged in any configuration. Generally, it is more efficient to arrange the bins so that primary compost can be quickly and easily moved to the secondary composting area.

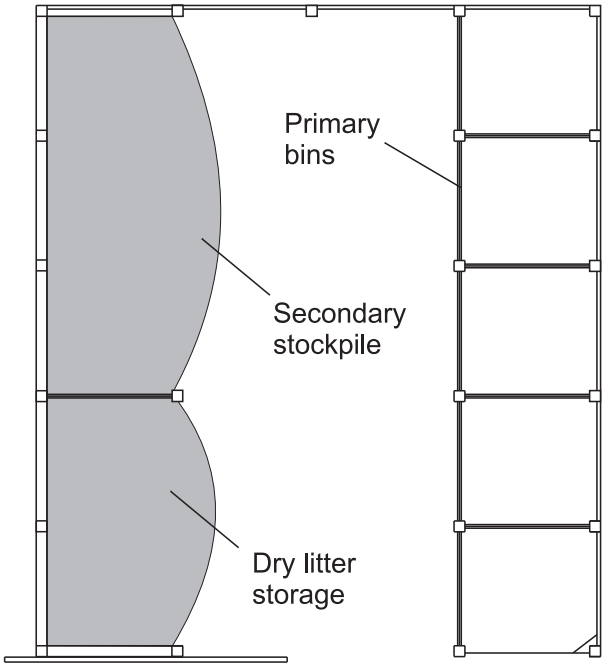
Figure 4. Layout A is a schematic of a composter with 5 primary bins and a large floor area for stockpiling the secondary compost. It also includes ingredient storage. This building can be enclosed on three sides (one end door) and the wall above the primary bins can be screened. These added features improve visual aesthetics, reduce odours and restrict bird access for better disease control.

Figure 4. Layout B is a schematic of a composter with 2 primary bins and 1 secondary bin. The bins are enclosed on 3 sides. The work apron provides easy accessibility to each of the bins.

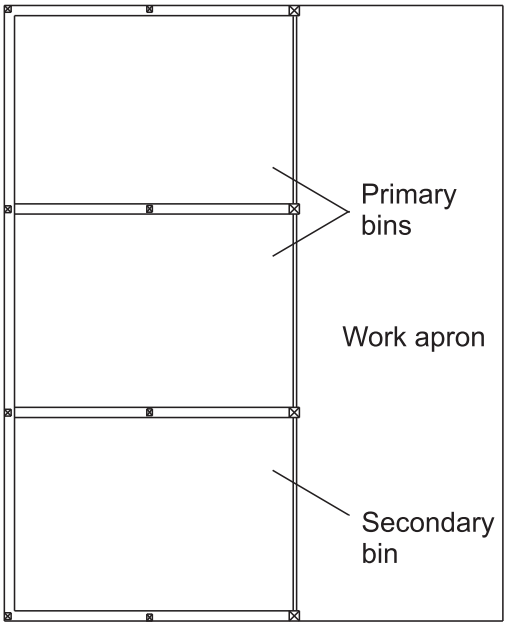
**Figure 4 – Two typical composting unit layouts**




**Layout A**
Composting bins and stockpiling with central work area.




**Layout B**
Composting bins in open front shed.

## Windrow Composting

Windrow composting is a relatively simple and inexpensive way to manage loss scenarios due to disease, ventilation failures or other unpredictable events which would require large facilities. As described previously, the primary stage lasts 3 months before mixing the windrow to begin the secondary stage. Windrows are generally not sheltered from the wind, rain and snow which can affect the process. Because walls and roofs are not required in these designs, it is easier to load, unload and mix the materials. Piles are constructed on all weather surfaces such as low permeable soils or concrete.

The length of the windrow is extended as mortalities occur.

The following points should be taken into consideration for site preparation and operation.

1. A composting pad with a 2% slope should be constructed on 0.5 m (1.6 ft) of clay with permeability less than $5 \times 10^{-8}$ m/s ($1.6 \times 10^{-7}$ ft/s) or an alternative with equivalent protection such as concrete.

2. The site should have a run-on control system to prevent surface water flowing onto the composting area.

3. The site should have a run-off control system to protect surface water from contamination.

4. To mix the material, start at one end of the windrow and move the contents to form a new windrow.

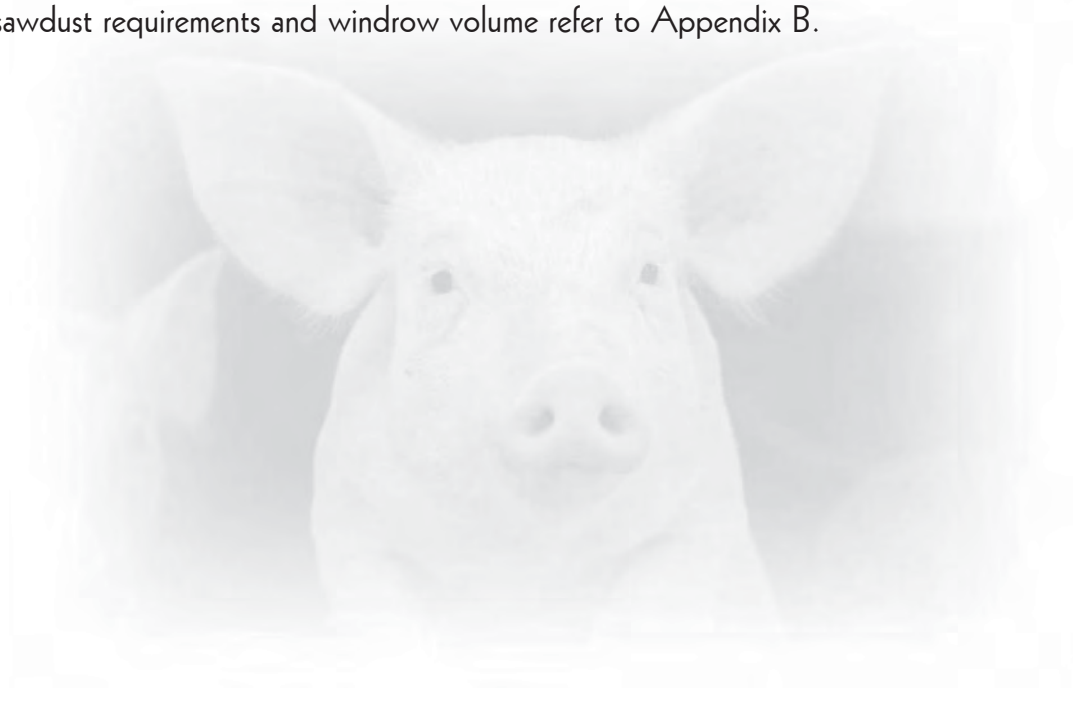
5. If the material is dry, add water while turning.

6. Cover any exposed carcass tissue after the windrow has been turned.

7. Be sure the piles are mounded to shed rainfall.

## Sizing the Windrow

The number of carcasses depopulated and the average weight needs to be known. Recommended windrow dimensions are 3.6 m (12 ft) wide at the base and no more than 2.1 m (7 ft) tall. To assist you in determining yearly losses, sawdust requirements and windrow volume refer to Appendix B.



When choosing a composting location, consult the local office of the Natural Resources Conservation Board (NRCB).

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**Lethbridge Office**
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# planning considerations

Actual construction of a composter can take many different forms, all producing good results. Some features to consider are location, type of structure, construction materials and ingredient storage.

## Location/Access

Location of a composter should follow the criteria in Section 2 subsection (4)(d)(ii) of the Destruction and Disposal of Dead Animals Regulation of the *Animal Health Act*. It states that the compost pile must be:

- At least 100 m (328 ft) from wells or other domestic water intakes, streams, creeks, ponds, springs and high water marks of lakes and at least 25 m (82 ft) from the edge of a coulee, major cut or embankment.
- At least 100 m (328 ft) from any residences.
- At least 100 m (328 ft) from any livestock facilities, including pastures, situated on land owned or leased by another person.

The location should also take into account any impact it may have on the farm residence and neighbouring residences. While offensive odours are not usually generated in the composting process, the handling of dead birds, manure and litter may not be aesthetically pleasing. When locating a composter, consideration should be given to traffic patterns required for moving dead birds, the required ingredients and removing the finished compost from the composter. The composter site should be well-drained and provide all-weather access roads and work areas.

## Foundation/Floor

Composting should have an impervious, weight-bearing foundation for all composting areas. This feature ensures all-weather operation, helps secure the composter against rodent access and generally minimizes the potential for contamination of the surrounding area. Consideration should also be given to providing a concrete floor in traffic areas and work alleys. Experience has shown that with the frequent loading and unloading activities associated with composting, dirt or even gravel areas tend to become rutted and potholed.

## Construction Materials

Any portion of the compost structure such as poles and sidewalls that will be in contact with dirt or composting material should be constructed with pressure treated lumber or other rot-resistant materials.

Temporary bins can also be constructed with bales of low-quality hay or straw. This type of construction is less expensive and provides flexibility such as the number of bins and their location that a permanent structure would not.

### Roof

A roof covering compost bins controls rainwater and the moisture content of the composting mass. Roofing the working area also facilitates all-weather activities. Additionally, any ingredient storage areas or bins should be roofed to preserve the ingredients at the desired moisture content. Roof heights must be adequate to ensure clearance for front-end loaders.

### Ingredient Storage

Having sufficient amounts of ingredients such as sawdust and litter present at the compost site greatly facilitates the day-to-day management of the process. In determining the amount of storage needed, consideration should be given to the frequency with which ingredient transfer and restocking can be managed. Storage requirements may vary considerably among different operations. Bins used for storage can double as primary composting bins during periods of high death loss or they may facilitate the expansion of the composter if the farm is increased. Ingredient storage does not have to be in bins. If the composter can be constructed in conjunction with a litter storage facility ingredient, handling may be greatly simplified.

### Utilities

A water line with a freeze-proof hydrant at the compost facility will aid in adjusting the moisture content of the recipe (if needed) and further facilitate cleanup and wash down of personnel, equipment and the composting area. A minimum 20-amp electrical circuit will allow for the use of power tools, lights or other appliances that may be required at the compost facility.

## compost uses

Well composted mortalities can be used as a soil conditioner and nutrient source for crops. The soil-amending and plant food properties of compost make it a valuable by-product of swine production.

Users of compost are encouraged to obtain a nutrient analysis of the product prior to its use. It is recommended that mortality compost not be spread on active pastureland or home gardens. Poorly composted animal mortalities may contain bones and other mortality residue that may damage equipment and be unsightly when land applied.

# troubleshooting

| Symptom | Problem | Recommendation |
|---|---|---|
| Pile fails to reach high temperatures | The pile is lacking oxygen because the material is too dense or contains too much moisture | Rebuild the pile with coarser material to allow for air to circulate |
| | The pile is too small | Increase size to at least 1.2 x 1.2 x 1.2 m (4 x 4 x 4 ft) |
| | Winter composting with not enough of an insulation layer | Provide an insulation layer of carbon material, 300 mm (1 ft) |
| | Pile is too dry | Add water |
| Temperature in the pile begins to drop near the end of the primary stage | The pile is lacking oxygen | Turn the pile to reintroduce air and mix the materials |
| | The pile is lacking moisture | Turn the pile and check to ensure the moisture content is between 45 and 65% |
| Odour | Too wet | Add bulking material and turn |
| | Too low C:N | Evaluate bulking material and adjust as necessary |
| Flies | Inadequate cover | Cover with 600 mm (2 ft) of carbon material |
| | Poor sanitation conditions | Provide an adequate base of carbon material to absorb all liquids from the mortalities. Provide run-on and run-off protection, due to precipitation, at the site by grading the pad to a 1-2% slope |
| | Too wet | Add bulking material and turn the pile |
| | Failure to reach proper temperature | Assess C:N |
| Scavenging animals | Inadequate cover | Maintain 600 mm (2 ft). Avoid initial entry with fence or barrier. Ensure the pile is heating properly |

# caution

If an animal is known or suspected to have died from an infectious or reportable disease, the owner must report this to authorities and dispose of the animal in the manner they recommend. For an animal that has been euthanized, owners need to prevent scavengers from gaining access to the dead animal. These animals cannot be disposed of by natural disposal.

Reportable Diseases are those which require action to control or eradicate because they are a threat to animal or human health, food safety or the economy.

Notifiable Diseases are those which simply require monitoring for trade purposes or to understand their presence in Alberta. No action will be taken.

Anyone who knows or ought to know that any of these diseases are or may be present in an animal MUST report that fact to the Office of the Chief Provincial Veterinarian within 24 hours by calling 1-800-524-0051.

# appendix A act and regulation

**1** In this Regulation,

(a) "composting", in respect of a dead animal, means decomposing the dead animal or a part of it through a controlled bio-oxidation process that results in a stable humus-like material;

(b) "dead animal" means

(i) a domestic mammal or bird, or part of a domestic mammal or bird, that has died from a cause other than having been slaughtered for human consumption, and

(ii) inedible offal or condemned material from animals slaughtered for human consumption;

(c) "licensed", in respect of a rendering plant, means licensed under the *Health of Animals Act* (Canada);

(d) "natural disposal", in respect of a dead animal, means disposing of the dead animal in order to allow scavenging;

(e) "owner", in respect of a dead animal, means the owner of the dead animal or a person who is in possession or control of it;

(f) "rendering plant" means a rendering plant as defined in the *Health of Animals Act* (Canada);

(g) "reportable disease" means

(i) a disease designed as a reportable disease under the *Health of Animals Act* (Canada), or

(ii) a communicable disease referred to in section 1 of the Designated Communicable Diseases Regulation (AR 8/98).

**Methods of Disposal**

**2** (1) The owner of a dead animal shall dispose of the animal within 48 hours of its death in accordance with this section.

(2) When an animal is known or suspected to have died from an infectious disease or from a reportable disease, the owner of the animal shall dispose of it in accordance with the directions of an inspector appointed under the *Health of Animals Act* (Canada) or a chief provincial veterinarian or an inspector appointed under section 6(2) of the *Animal Health Act*, but in no case may the animal be disposed of by natural disposal.

(3) The owner of the dead animal that has been euthanised with drugs or other chemical substances shall immediately take steps to prevent scavengers from gaining access to the dead animal between the time the animal is euthanised and the final disposal of the animal.

(4) Subject to subsection (2), the owner of the dead animal shall dispose of it by

(a) burying it in a farm burial pit, if

(i) the weight of dead animals in the pit does not exceed 2500 kg, unless subsection (4.1) applies,

(ii) the pit is

(A) at least 100 metres from wells or other domestic water intakes, streams, creeks, ponds, springs and high water marks of lakes and at least 25 metres from the edge of a coulee, major cut or embankment,

(B) at least 100 metres from any residences,

(C) at least 100 metres from any livestock facilities, including pastures, situated on land owned or leased by another person,

(D) at least 300 metres from a primary highway,

(E) at least 100 metres from a secondary highway, and

(F) at least 50 metres from any other road allowance,

(iii) the pit is covered with

(A) a minimum of one metre of compacted soil, or

(B) a wooden or metal lid that is designed to exclude scavengers, if quicklime is applied to the dead animal in sufficient quantities to control flies and odour, and

(iv) the bottom of the pit is at least one metre above the seasonal highwater table,

(b) burying it in a Class I or Class II landfill as defined in the Waste Control Regulation (AR 192/96), if the site has a full-time operator who agrees to immediately bury the dead animal,

(c) burning it in accordance with

(i) the Substance Release Regulation (AR 124/93), or

(ii) the Code of Practice for Small Incinerators, published by the Department of Environment,

(d) composting

(i) in a Class I compost facility as defined in the Waste Control Regulation (AR 192/96) that is designed, constructed and operated in accordance with sections 6 and 7 of the Code of Practice for Compost Facilities, published by the Department of Environment, or

(ii) subject to subsection (5), in a farm open compost pile that is

(A) located at least 100 metres from wells or other domestic water intakes, streams, creeks, ponds, springs and highwater marks of lakes and at least 25 metres from the edge of a coulee, major cut or embankment,

(B) located at least 100 metres from any residences,

(C) designed in a manner that will exclude scavengers, and

(D) at least 100 metres from any livestock facilities, including pastures, situated on land owned or leased by another person,

(e) transporting it to a licensed rendering plant for disposal, or

(f) subject to subsection (6), natural disposal.

(4.1) Where because of flood, fire, starvation or other similar disaster there are multiple deaths of animals and the weight of the dead animals exceeds 2500 kg, the animals may be buried in a farm pit subject to the approval of and in accordance with the direction of a chief provincial veterinarian or an inspector appointed under section 6(2) of the *Animal Health Act*.

(5) Where under subsection (4)(d)(ii) animals are to be composted in a farm open compost pile,

(a) repealed AR 189/2007 s2,

(b) the maximum volume of the animals or parts of them must not exceed 25% of the total compost pile, and

(c) the animals or parts of them must be covered by at least 15 cm of composting material.

(6) Subject to subsection (2), a dead animal, other than inedible offal or condemned material, may be disposed of by natural disposal if

(a) the animal is disposed of on property owned or leased by the owner of the animal,

(b) the animal was not euthanised with drugs or other chemical substances,

(c) the total weight of the animals being disposed of at any one site does not exceed 1000 kg,

(d) there is a distance of at least 500 metres between disposal sites,

(e) the disposal site is

(i) at least 500 metres from wells or other domestic water intakes, streams, creeks, ponds, water wells, springs and high water marks of lakes and at least 25 metres from the edge of a coulee, major cut or embankment,

(ii) at least 400 metres from any livestock facilities, including pastures, situated on land owned or leased by another person,

(iii) at least 400 metres from any residences,

(iv) at least 400 metres from any road allowance, and

(v) at least 400 metres from any provincial park, recreation area, natural area, ecological reserve, wilderness area or forest recreation area, and

(f) disposing by natural disposition does not create a nuisance.

(7) Notwithstanding, subsection (1), the owner of a dead animal may store the dead animal for more than 48 hours after its death if it is stored

(a) for not more than one week in an enclosed structure with impervious walls and floors that have been constructed for the storage of dead animals,

(b) outside during winter months when the ambient temperature is low enough to keep the dead animal completely frozen,

(c) in a freezer unit, or

(d) in accordance with the directions of an inspector appointed under the *Health of Animals Act* (Canada) or the chief provincial veterinarian or an inspector appointed under section 6(2) of the *Animal Health Act*.

AR 229/2000 s2;238/2002;255/2004;189/2007;288/2009

**Rendering Plant**

**3** (1) The owner or operator of a rendering plant shall ensure that

(a) a dead animal rendered at the plant is subjected to such temperature and pressure as is necessary to render every portion of the carcass free from all viable pathogenic organisms, and

(b) microbiological quality assurance processes are in place to prevent the occurrence of viable pathogenic organisms.

(2) The owner or operator of a rendering plant when shipping material from a dead animal to another rendering plant shall ensure that

(a) the material is shipped in such a manner so as to prevent

(i) any dissemination of pathogenic organisms into the environment from the leakage of blood or other body fluids, and

(ii) the contamination of any animal or human food,

(b) the other rendering plant will render the material free of all viable pathogenic organisms, and

(c) a complete record is kept of the shipment, including the date of shipment, method of transport and the name and address of the rendering plant to which it was shipped.

**Diagnosis of Animal Diseases**

**4** Nothing in this Regulation prohibits the collection and transport of a dead animal as may be required by a veterinarian or the owner of the dead animal for the diagnosis of animal diseases.

**Dead Animal as Food**

**5** No person shall feed a dead animal to other food producing animals unless

(a) the material from the dead animal has been properly rendered at a licensed rendering plant and the prohibition to feed prohibited material to ruminants under the Health of Animals Regulation (Canada) is complied with, or

(b) the feeding of the material is a recognized means of stimulating natural immunity for specific disease conditions and the prohibition to feed prohibited material to ruminants under the Health of Animals Regulation (Canada) is complied with.

**Advisory Committee**

**6** The Minister may appoint an advisory committee under section 7 of the *Government Organization Act* consisting of both government and industry representatives to oversee the implementation of this Regulation.

**Repeal**

**7** The Regulations Regarding the Destruction and Disposal of Dead Animals (AR 128/66) are repealed.

**Expiry**

**8** For the purpose of ensuring that this Regulation is reviewed for ongoing relevancy and necessity, with the option that it may be repassed in its present or an amended form following a review, this Regulation expires on November 30, 2012.

AR 229/2000 s8;354/2003;241/2009;136/2010

# appendix B design worksheet

To assist you in determining yearly losses, sawdust requirements, number and size of bins and windrow volume, refer to the following worksheets. Use the example worksheets as a guide for filling out your own.

## Swine Loss and Sawdust Calculations

**Mortality Material to be Handled**

(a) Sow/Boar losses

_____ (# sows) * _____ lbs (Avg. Wt.) * _____ /100 (% sow loss) = _____ lbs loss/year

(b) Pre-weaner losses (including still borns)

_____ (pigs born/year) * _____ lbs (Avg. Wt.) * _____ /100 (% loss pre-weaning) = _____ lbs loss/year

(c) Nursery losses

_____ (nursery pigs/year) * _____ lbs (Avg. Wt.) * _____ /100 (% nursery loss) = _____ lbs loss/year

(d) Grower/Finisher losses

_____ (grower/finished /year) * _____ lbs (Avg. Wt.) * _____ /100 (% grower/finishing loss) = _____ lbs loss/year

Total Mortality = _____ lbs loss/year

**Annual Sawdust Requirements**

_____ (lbs loss/yr) * 0.0037 (conversion factor) = _____ cu yards/year

Up to 50% of the sawdust can be replaced by finished compost.

**Conversion**

_____ cu yds/yr (sawdust requirements) * 0.7645 (conversion factor) = _____ cu meters/year

# EXAMPLE Swine Loss and Sawdust Calculations

**Mortality Material to be Handled**

(a) Sow/Boar losses

| 200 | * | 440 lbs | * | 5.5 /100 | = | 4840 | lbs loss/year |
|---|---|---|---|---|---|---|---|
| # sows | | Avg. Wt. | | % sow loss | | | |

(b) Pre-weaner losses (including still borns)

| 5980 | * | 4.4 lbs | * | 19 /100 | = | 4999.3 | lbs loss/year |
|---|---|---|---|---|---|---|---|
| pigs born/year | | Avg. Wt. | | % loss pre-weaning | | | |

(c) Nursery losses

| 4844 | * | 28.1 lbs | * | 2.6 /100 | = | 3614.6 | lbs loss/year |
|---|---|---|---|---|---|---|---|
| nursery pigs/year | | Avg. Wt. | | % nursery loss | | | |

(d) Grower/Finisher losses

| 4520 | * | 147 lbs | * | 4.2 /100 | = | 27906 | lbs loss/year |
|---|---|---|---|---|---|---|---|
| grower/finished /year | | Avg. Wt. | | % grower/finishing loss | | | |

Total Mortality = 41360 lbs loss/year

**Annual Sawdust Requirements**

| 4844 lbs loss/yr. | * | 0.0037 | = | 153.0 | cu yards/year |
|---|---|---|---|---|---|
| total death loss | | conversion factor | | | |

Up to 50% of the sawdust can be replaced by finished compost.

**Conversion**

| 157.6 cu yards/year | * | 0.7645 | = | 117 | cu meters/year |
|---|---|---|---|---|---|
| sawdust requirements | | conversion factor | | | |

# Bin Design and Selection for Swine

**Average Daily Mortality**

lbs/yr (total mortality) / 365 (days/yr) = _____ lbs loss/day

**Bin Volumes**

Primary Bin Volume = _____ (lbs mortality/day) * 20 (cu ft/lb of loss) = _____ cubic feet

Secondary Bin Volume = Primary Bin Volume = _____ cubic feet

**Bin Wall Height**

Bin Wall Height = _____ ft Recommended 5 ft

**Floor Areas**

Primary Bin Floor Area = _____ cu ft (primary bin volume) / _____ ft (bin wall height) _____ sq ft

Secondary Bin Floor Area = Primary Bin Floor Area = _____ sq ft

**Select Bin Size**

Typical Bin Dimensions: 10 ft x 10 ft, 10 ft x 12 ft, 12 ft x 12 ft, 10 ft x 14 ft, 12 ft x 14 ft, 10 ft x 16 ft, 12 ft x 16 ft

The bin area you choose should fall between 100 and 200 square feet.

**Number of Primary Bins**

# of primary bins = _____ sq ft (primary bin floor size) / _____ sq ft (bin size) = _____ bins

**Number of Secondary Bins**

# of secondary bins = # of primary bins = _____ bins

Be sure to round up to the next whole number.

Alternatively, 1 secondary bin can be used for every 2 primary bins if finished compost is utilized every 90 days (i.e. finished compost is not stored in bins).

**Total Number of Bins**

# bins = _____ (# of primary bins) + _____ (# of secondary bins) + _____ (# of additional bins) = _____ bins

Additional bins can be used for storage of finished compost, sawdust, etc.

# EXAMPLE Bin Design and Selection for Swine

**Average Daily Mortality**

41360 lbs loss/yr. (total mortality) / 365 (days/yr) = 113.3 lbs loss/day

**Bin Volumes**

Primary Bin Volume = 113.3 (lbs mortality/day) * 20 (cu ft/lb of loss) = 2266 cubic feet

Secondary Bin Volume = Primary Bin Volume = 2266 cubic feet

**Bin Wall Height**

Bin Wall Height = 5 ft Recommended 5 ft

**Floor Areas**

Primary Bin Floor Area = 2266 cu ft (primary bin volume) / 5 ft (bin wall height) 453.2 sq ft

Secondary Bin Floor Area = Primary Bin Floor Area = 453.2 sq ft

**Select Bin Size**

Typical Bin Dimensions: 10 ft x 10 ft; 10 ft x 12 ft; 12 ft x 12 ft; (10 ft x 14 ft); 12 ft x 14 ft; 10 ft x 16 ft; 12 ft x 16 ft

The bin area you choose should fall between 100 and 200 square feet.

**Number of Primary Bins**

# of primary bins = 453.2 sq ft (primary bin floor size) / 140 sq ft (bin size) = ~~3.24~~ 4 bins

**Number of Secondary Bins**

# of secondary bins = # of primary bins = 4 bins

Be sure to round up to the next whole number.

Alternatively, 1 secondary bin can be used for every 2 primary bins if finished compost is utilized every 90 days (i.e. finished compost is not stored in bins).

**Total Number of Bins**

# bins = 4 (# of primary bins) + 4 (# of secondary bins) + 2 (# of additional bins) = 10 bins

Additional bins can be used for storage of finished compost, sawdust, etc.

# Windrow and Pad Sizing

**Windrow Volume**

Primary Windrow Volume = _____ (lbs loss/day) * 20 = _____ cu ft

Secondary Windrow Volume = Primary Windrow Volume = _____ cu ft

**Windrow Height**

Windrow Height = _____ ft

A tall windrow generally makes better use of the pad area and sawdust.
(5 to 7 feet works best)

**Windrow Cross Section**

Select the primary cross section from the table below based on the windrow height.

| Windrow Height (ft) | Windrow Cross Section (sq ft) |
|---|---|
| 5 | 30 |
| 6 | 42 |
| 7 | 56 |

Secondary Windrow Cross Section = Primary Windrow Cross Section

**Windrow Lengths**

Primary Windrow Length = _____ cu ft (primary windrow volume) / _____ sq ft (primary windrow XS area) = _____ ft (To the nearest foot)

If the windrow length is less than twice the windrow height, you do not have enough volume to readily achieve the desired windrow height. Reduce the windrow height and go back to Step 2.

Secondary Windrow Length = Primary Windrow Length

# EXAMPLE Windrow and Pad Sizing

**Windrow Volume**

Primary Windrow Volume = 113.3 lbs loss/day * 20 = 2266 cu ft

Secondary Windrow Volume = Primary Windrow Volume = 2266 cu ft

**Windrow Height**

Windrow Height = 7 ft

A tall windrow generally makes better use of the pad area and sawdust.
(5 to 7 feet works best)

**Windrow Cross Section**

Select the primary cross section from the table below based on the windrow height.

| Windrow Height (ft) | Windrow Cross Section (sq ft) |
|---|---|
| 5 | 30 |
| 6 | 42 |
| 7 | 56 |

Secondary Windrow Cross Section = Primary Windrow Cross Section

**Windrow Lengths**

Primary Windrow Length = 2266 cu ft (primary windrow volume) / 56 sq ft (primary windrow XS area) = ~~40.5~~ 41 ft (To the nearest foot)

If the windrow length is less than twice the windrow height, you do not have enough volume to readily achieve the desired windrow height. Reduce the windrow height and go back to Step 2.

Secondary Windrow Length = Primary Windrow Length

# references


Bonhotal, J., L. Telega, J. Petzen. 2008. Natural rendering: composting livestock mortality and butcher waste. Ithica, New York: Cornell Waste Management Institute.

Canadian Food Inspection Agency. 2009. Enhanced animal health protection from BSE. http://www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/enhren/enhrene.shtml (Accessed: November 2009).

Canadian Food Inspection Agency. 2007. SRM Permits http://www.inspection.gc.ca/english/anima/heasan/disemala/bseesb/enhren/perme.shtml (Accessed: March 2010).

Crenshaw, M.A. 2006. Management guidelines for composting swine mortality in Mississippi. Publication 2332. Mississippi State University Extension.

Glanville, T. 2008. Composting swine mortalities in Iowa. PM 1917. Iowa State University Extension.

Harper, A.F., and M.J. Estienne. 2009. Composting for mortality disposal on hog farms. Publication 414-020. Virginia Cooperative Extension.

Haug, R.T. 1993. The Practical Handbook of Compost Engineering. Lewis Publishers. ISBN 0-87371-373-7.

Keener, H., D. Elwell, T. Mescher. 1997. Composting swine mortality principles and operation. AEX-711-97. Ohio State University Extension.

Laporte, J. 2009. Deadstock disposal options for on-farm, Agdex 729/400. Ontario Ministry of Agriculture, Food and Rural Affairs.

Mescher, T., K. Wolfe, S. Foster, R. Stowell. 1997. Swine composting facility design. AEX-713-97. Ohio State University Extension.

North Dakota State University. 2009. Composting animal manures and carcasses. North Dakota State University, Fargo, North Dakota.

Nova Scotia. On-farm livestock mortality management. http://nsac.ca/eng/outreach/mort_manage_narrow.pdf (January, 2010)

Ritz, C. and J. Worley. 2005. Poultry mortality composting management guide. Publication B-1266. University of Georgia Cooperative Extension Service.

Stettler, D. 2001. Mortality management. Lesson 51. Ames, Iowa: Midwest Plan Service. https://www.rhs.org.uk/AdviceSearch/Profile.aspx?pid=297

# for more information

## Reportable Diseases

Office of the Chief Provincial Veterinarian
780-427-3448 or toll-free by first dialing 403-310-0000
http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/cpv4264

## Alberta's Notifiable and Reportable Diseases Website

http://www1.agric.gov.ab.ca/$department/deptdocs.nsf/all/afs12455

## CFIA

http://www.inspection.gc.ca/english/anima/animae.shtml

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