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Farm Practices Guidelines for
PIG PRODUCERS
in Manitoba

Manitoba

Farm Practices Guidelines for **PIG PRODUCERS** in Manitoba

The Agricultural Guidelines Development Committee was mandated to develop guidelines for livestock operations that form the basis of regulations and functioning of the Farm Practices Protection Board. The Guidelines are used as a current reference to describe the evolution of modern livestock management practices when reviewing livestock regulations under *The Environment Act* and in the planning process at the municipal level.

THE MEMBERSHIP OF THE AGRICULTURAL GUIDELINES DEVELOPMENT COMMITTEE IS AS FOLLOWS:

- Manitoba Agriculture, Food and Rural Initiatives
- Manitoba Conservation
- Manitoba Water Stewardship
- Manitoba Intergovernmental Affairs
- Manitoba Health
- Manitoba Competitiveness, Training and Trade
- Agriculture and Agri-Food Canada
- Manitoba Pork Council
- Keystone Agricultural Producers
- Faculty of Agriculture and Food Sciences
- Prairie Agricultural Machinery Institute
- Prairie Farm Rehabilitation Administration
- Association of Manitoba Municipalities

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SECTION 1

Purpose of GUIDELINES

1.1 Guideline Objectives

These guidelines describe manure management systems and practices designed to protect the environment, reduce the risk of pollution[1] and minimize the odours experienced by neighbours.

The objectives of these guidelines are to:

- provide local governments with a basis for evaluating livestock operations
- assist livestock producers in their efforts to optimize the use of manure, prevent pollution and minimize odour
- provide a standard which may be used by the Farm Practices Protection Board in determining normal farming practices
- provide information to the general public
- provide information for government officials who evaluate livestock operations about potential effects on the surrounding area.

1.2 Background

Manitoba's pork industry has undergone significant changes, in size and production methods. In the past, pig production was generally part of a mixed farming operation. It has become a specialized industry, with a high degree of integration between livestock and crop production. To remain competitive, operations have become much larger than the farms of 20 years ago. The trend toward larger operations is likely to continue and will need considerable capital investment from producers.

The character of Manitoba's rural population has changed. People have built or bought houses in areas previously used for agriculture alone. These properties represent a major personal investment, and the owners are sensitive to any activity that may interfere with their enjoyment of the property, or affect the property value. Changes in the pig industry and increased rural residential development in agricultural areas have created a situation where conflicts may occur.

1.3 Dealing with Nuisances

Normal farming practices may cause odours, dust, noise and smoke that are a common cause of conflict between neighbours. Odours produced when storing and applying manure are the most likely causes of conflict between pig producers and their neighbours.

Nuisance conflicts may be best avoided through appropriate land use planning. In Manitoba, land use planning is the responsibility of local governments. This is set out in *The Planning Act* (see Section 2 for details). Under *The Planning Act*, local governments must uphold broad provincial and public interests in land use. This includes maintaining the province's ability to produce food and feed by protecting agricultural land and agricultural uses of land from non-agricultural development. Ideally, planning documents will direct developments that may

[1] Refer to the definition of pollution in the "Livestock Manure and Mortalities Management Regulation", Appendix B.

be incompatible with agriculture away from agricultural areas. To the greatest extent possible, agricultural land uses will be directed away from residential and recreational uses. Local planning documents also establish siting and development criteria, such as minimum separation distances between livestock and residential uses, with the intent of protecting the interests of all users of the land.

While land use planning is one method of avoiding conflict, an additional process is required to resolve conflicts when they occur. Nuisance complaints, such as odour, noise, dust or smoke, must be dealt with under *The Farm Practices Protection Act*. The scope of this Act is presented in Section 2.

1.4 Dealing with the Environment

Society is becoming increasingly concerned with environmental protection. Producers who follow the recommended practices described in these guidelines can expect to be in compliance with the relevant provincial regulations.

The viability of the livestock industry is dependent on the sustainability of the environment. Environmental protection, especially water quality, is a major concern for the livestock industry. Water quality is an environmental and health concern. The protection of water is regulated under *The Environment Act* and *The Water Protection Act*. Pollution of water and soil resources is illegal. Manitoba Conservation is responsible for the enforcement of the Livestock Manure and Mortalities Management Regulation under *The Environment Act* (see Section 2 for details).

Water quantity is also a concern for the public and livestock producers. Some operations require a significant amount of water for livestock. Under *The Water Rights Act*, these operations may require a water rights licence (see Section 2 for details).

Many livestock operators employ commercial manure applicators to apply manure. In 2002, *The Pesticides and Fertilizers Control Act* was amended to require commerical and off-farm manure applicators to be trained and licenced (see Section 2 for details).

SECTION 2

Acts, Regulations AND BY-LAWS

Livestock operators should be aware of all provincial Acts and regulations and local municipal by-laws that could affect the establishment, expansion and/or management of their operations.

Odour from livestock operations and other nuisance issues are addressed under *The Farm Practices Protection Act* as well as municipal by-laws. Livestock manure and mortalities management is regulated under *The Environment Act*. The licencing of custom and large, off-farm manure applicators will be required under *The Pesticides and Fertilizers Control Act*.

Siting and other land use issues are dealt with under *The Planning Act* and its regulations, through which the permitting and planning authorities have been delegated to local municipal governments by the Province.

A permit for water supply may be required by *The Water Rights Act*. *The Water Protection Act* provides the authority to regulate livestock operations through watershed management plans and water quality management zones.

These Acts, regulations and by-laws are subject to change. Please refer to the most recent version.

2.1 *The Farm Practices Protection Act*

The Farm Practices Protection Act (see Appendix A) was proclaimed in January 1994 to protect farmers who carry on normal farm practices from unreasonable court action under the common law of nuisance. It protects neighbours from nuisance caused by unacceptable farm practices. The Act establishes a process for reviewing and mediating nuisance disputes arising from the practices of legally established agricultural operations.

The Act states that a person who carries on an agricultural operation, and who:

- uses normal farm practices and
- does not violate
  - i) a land use control law,
  - ii) *The Environment Act* or the regulations and orders, or
  - iii) *The Public Health Act* or the regulations and orders;

is not liable in nuisance to any person for any odour, noise, dust, smoke or other disturbance resulting from the agricultural operation, and shall not be prevented from carrying on the agricultural operation. If the land use by-law of a municipality is amended, or the ownership changes, the agricultural operation may continue to operate and is protected from nuisance complaints.

A normal farm practice is defined as a practice conducted in a manner consistent with proper, acceptable customs and standards as established and followed by similar agricultural operations under similar circumstances. This includes the use of innovative technology with advanced management practices, and conformity with standards set out in regulation.

The Farm Practices Protection Board considers nuisance complaints against agricultural operations from people directly affected by the disturbance. Complainants may not undertake a nuisance action in court unless they have applied to the Board in writing at least 90 days in advance for a decision on whether the farm practice is normal. The Board will only consider complaints about odour, noise, dust, smoke and other such disturbances. It will not deal with pollution issues, erosion problems, inhumane treatment of animals or other non-nuisance items.

The complaint must be in writing and shall state the nature of the disturbance, name and address of the person making the application, and the name and address of the agricultural operation. There is a nominal application fee, which is refunded if the Board upholds the complaint.

Upon receipt of the complaint, the Board may investigate the disturbance, attempt to mediate the complaint, gather evidence, hold hearings and rule on the acceptability of the farming practices relating to the nuisance complaint. It may also refuse to consider the complaint if, in its opinion, the subject matter is trivial, frivolous, vexatious, or the complainant does not have a sufficient personal interest.

The Board shall dismiss the complaint if the disturbance results from a normal farm practice, or order the agricultural operation to either cease or modify the farm practice causing the disturbance. The Act makes provision for the Board to file its orders with the courts and have the orders enforced. Failure to comply with a Board order could result in the owner or operator of the agricultural operation being subject to court imposed enforcement and remedies. The Board's orders may also be used as evidence against an owner or operator of an agricultural operation in subsequent court proceedings based on the common law of nuisance.

The Act is intended to provide for a quicker, less expensive and more effective way than lawsuits to resolve complaints about farm practices. It may create an understanding of the nature and circumstances of an agricultural operation, as well as bring about changes to the mutual benefit of all concerned, without the confrontation and the expense of the courts.

2.2 *The Environment Act*

The Livestock Manure and Mortalities Management Regulation (see Appendix B), under *The Environment Act*, strengthens the protection of the environment, enhances enforcement capabilities and helps ensure livestock production is sustainable.

Winter application of manure – All livestock operations are prohibited from applying livestock manure from November 10 until April 10, unless they are exempted by regulation. Existing livestock operations (defined as those in existence prior to March 30, 2004) with fewer than 300 animal units of any one type of livestock are exempt from the prohibition unless they have been ordered to cease winter application because it is causing an environmental concern. Existing operations with 300 to 399 animal units have until November 10, 2010 to comply with the prohibition. Existing producers with 400 or

more animal units must comply with the prohibition on winter application. All new producers, regardless of size, must comply with the prohibition on winter application as soon as their operations are established.

Emergency situations may warrant exceptions to the prohibition of winter application, but require prior approval by Manitoba Conservation. Livestock operations exempt from the prohibition of winter application must meet minimum setback distances from sensitive areas such as watercourses, wells, sinkholes and springs (Table 10).

Application rate – All manure must be applied as a fertilizer for crop production. The regulation sets enforceable limits on the amount of residual soil nitrate-nitrogen as well as the amount of nitrate-nitrogen that can be present in the soil at any point in time. These soil nitrate-nitrogen limits vary depending on the Agricultural Capability class of the soil. To ensure that the soil nitrate-nitrogen limits are not exceeded, the rate of manure application should not exceed the additional nitrogen that is required to achieve a realistic crop yield. It should consider the residual soil nitrate-nitrogen and the nitrogen content of the manure.

Manure sources of phosphorus application are also regulated on the basis of a series of thresholds for soil test phosphorus levels as determined using the Olsen Procedure. There is increasing concern about elevated phosphorus levels in soils that receive long-term manure application and the risk that they may present to surface water quality. For these reasons, soil phosphorus levels should be monitored and application rates adjusted accordingly (see Section 4).

Manure management plans – Livestock operations with 300 or more animal units that store, handle, dispose of or apply livestock manure to land must prepare and submit for registration an annual manure management plan. The deadline for submission is February 10 for manure to be applied the following spring; July 10 for manure to be applied the following fall. Alternatively, for a $100 fee, the operator may submit a manure management plan up to 14 days prior to application of manure.

The manure management plan includes livestock information, manure storage system information, the type, amount and nutrient composition of the manure, and the details of each field application. Details include how, when and where the manure will be applied, soil nutrient levels and the crop to be grown on each parcel of land. The intent of the manure management plan is to ensure that adequate land is available for the manure that is to be applied.

Persons who prepare and certify manure management plans on behalf of livestock producers must have successfully completed a manure management planning course acceptable to the director of Manitoba Conservation and must be a member in good standing of the Manitoba Institute of Agrologists or hold the designation of Certified Crop Advisor under the international Certified Crop Advisor program of the American Society of Agronomy.

Manure storage structures – Livestock manure must be stored appropriately. Construction, modification or expansion of any manure storage structure (regardless of size) requires a permit from Manitoba Conservation. These structures must be certified by an engineer registered with the Association of Professional Engineers and Geoscientists of Manitoba, before their use or operation, as being constructed, modified or expanded according to regulatory requirements and engineering design standards.

Registration of manure storage structures without permits – Earthen manure storage facilities constructed prior to 1994 did not require permits, nor did molehills and concrete or steel tanks erected prior to 1998. Operators with manure storage structures that do not have permits must now apply to register these structures with Manitoba Conservation. After November 10, 2010, livestock operators will not be allowed to store manure in storage structures that have not been registered.

Field storage – Solid manure may be stored temporarily in the field, subject to setbacks from property boundaries and sensitive areas such as watercourses, wells, sinkholes and springs. Manure must be removed from the field storage annually and a crop must be grown on the site to recover nutrients before it can be used again for field storage.

Allowance for innovative practices – Considerable research and development are being done in livestock production and technological advancements are occurring rapidly. The requirements under the regulation may be varied where innovative and environmentally sound practices or procedures are proposed.

Mortalities – The Livestock Manure and Mortalities Management Regulation allows proper disposal of mortalities by rendering, composting, incineration, or burial where environmental conditions are suitable. Mortalities must be stored in a secure manner and kept either refrigerated or frozen if retained more than 48 hours after death. Livestock operations with 300 or more animal units that propose to use burial as a method of mortalities disposal must receive written approval from Manitoba Conservation for this practice.

Manure spills – Persons transporting livestock manure are required to immediately report to Manitoba Conservation the occurrence of manure spills that are 50 litres (L) or 0.25 m^3 or more onto a highway or road allowance. Spills of 10,000 L or more of liquid manure from a vehicle or a manure storage facility at any location or where the location or quantities of semi-solid or solid manure may cause an adverse effect on the environment, must also be reported.

Setbacks – Setbacks from water resources are required to protect them from contamination by manure and mortalities. Manure storage structures, field storage areas for manure, composting sites, confined areas and mortalities burial sites must be located at least 100 metres (m) from surface watercourses, sinkholes, springs and wells.

Pollution issues – The regulation also contains general provisions to prohibit the direct contamination of surface and groundwater by livestock manure. Similarly, livestock manure must not escape the property boundaries of land where it is either stored or applied as a fertilizer.

2.3 *The Pesticides and Fertilizers Control Act*

Changes to *The Pesticides and Fertilizers Control Act* were enacted in 2002. These changes require commercial and large, off-farm manure applicators to be formally trained, certified and licenced when they come into effect. The training requirements will be established by regulation and will cover nutrient management, environmental issues associated with the application of manure, equipment calibration, spills and liability issues.

2.4 *The Planning Act*

The Planning Act provides the legal framework for land use planning in Manitoba. Under the authority of *The Planning Act* local governments are responsible for the adoption, administration and enforcement of local land use by-laws, including the development plan and zoning by-laws.

The new *Planning Act* came into force in January 2006. Some of the significant features of the new Act relating to livestock development are:

- every municipality or planning district is required to have an adopted development plan by January 1, 2008
- a zoning by-law must be adopted within one year of the adoption of development plan or by January 1, 2008
- a development plan must include a livestock operation policy
- a technical review is required for livestock operations involving 300 or more animal units
- livestock operations involving 300 or more animal units must be designated as a conditional use in a zoning by-law.

2.4.1 Provincial land use policies

While *The Planning Act* provides the administrative framework for local planning processes, it also outlines the underlying principles for the development of the Provincial Land Use Policies Regulation. The Provincial Land Use Policies (PLUPs) outline broad public and provincial interests in land use. The PLUPs are to be used by local governments to create local planning documents, thereby ensuring that those broader interests are reflected in local land use plans.

The PLUPs outline the Province's development objectives in a number of policy areas. The policy areas that most directly address agricultural land uses, including development of livestock operations, are General Development and Agriculture.

Provincial objectives related to General Development are intended to encourage orderly, efficient development that is environmentally sound, economically sustainable and compatible with other land uses. The General Development policies also state that non-resource-related uses shall be directed away from agricultural land and livestock operations.

The Agriculture section of the PLUPs offers policy direction that more specifically outlines the Province's objectives with respect to the agriculture industry. The Province's agriculture-related objectives are to maintain a viable base of agricultural land for agricultural uses and to protect agricultural operations from encroachment by other land uses which could adversely affect the farmer's ability to manage, diversify or expand the operation.

Through the Agriculture Policy area, local governments are directed to develop policies that ensure protection for prime agricultural land, viable lower class land and agricultural operations. Specifically, land use plans are to designate suitable areas where agricultural uses will be protected and facilitated.

2.4.2 Development plan

Under *The Planning Act*, local land use policies are to be enacted through the creation of a municipal or planning district development plan. The development plan must be consistent with provincial land use policies while setting out local plans and policies. The development plan must establish areas where categories of development such as residential, agricultural, commercial or recreational may be considered appropriate.

The Planning Act now also requires all municipalities or planning districts to include a livestock operation policy in their development plans.

2.4.2.1 Livestock operation policy

When creating the required livestock operation policy, municipalities or planning districts must designate areas in the development plan where expansion or development of livestock operations:

- may be allowed
- may be allowed up to a specified maximum size and/or
- will not be allowed.

The livestock operation policy must also set out general standards regarding livestock operation siting and setback requirements. Siting and setback requirements must be based on the minimum standards set out in the Provincial Land Use Policies Regulation. The PLUPs recommend that these setbacks apply mutually to residential or recreational developments that propose to establish near existing livestock operations (see Section 6 for details).

2.4.3 Zoning by-law

Once a development plan has been approved, a municipality must enact a zoning by-law that is consistent with its development plan. The zoning by-law divides a municipality or planning district into zones such as rural residential, highway-commercial and general agricultural and lists uses which are permitted or conditional uses within each zone. The zoning by-law prescribes development criteria within each zone to which all developments must comply. It must specify livestock operation siting and setback requirements consistent with the livestock operation policy in the development plan.

Conditional Use – *The Planning Act* specifies that, where the livestock operation policy has designated an area where livestock operations may be allowed, operations with 300 or more animal units are a conditional use in the zoning by-law. The zoning by-law may designate livestock operations with fewer than 300 animal units as either a permitted or a conditional use. All operations with 300 or more animal units in size are subject to a Technical Review (see Section 8). The municipality or planning district must hold a public hearing for conditional use applications.

The Planning Act specifies the types of conditions related to management of manure that may be imposed on the approval of conditional use livestock operations, depending on operation size:

- fewer than 300 animal units – conditions may include requiring covers on manure storage facilities and requiring shelter belts and
- 300 or more animal units – conditions may include requiring covers on manure storage facilities, requiring shelter belts, and imposing measures to implement recommendations made by the Technical Review Committee.

In addition, the municipal council or planning district may require the owner of the property to enter into a development agreement concerning timing of construction, control of traffic, and construction or maintenance of roads or landscaping required to service the livestock operation.

The decision of the municipal council or planning district board on a conditional use application is final. There is no appeal process.

2.5 *The Water Rights Act*

An approval and/or a licence may be required under *The Water Rights Act* to withdraw water from a surface or groundwater source. For agricultural or irrigation purposes, a licence is required when water usage exceeds 25,000 L/day or 5,500 imperial gallons/day (imp. gal/day). At lesser rates of usage, a licence may not be required because it generally falls under the domestic use category.

If a licence or approval is required, an application must be submitted to the Water Licensing Branch of Manitoba Water Stewardship. An initial office review of the application is carried out to determine if the required volume is available from the indicated source. If the proposed source is groundwater and the required volume is expected to be available, a Groundwater Exploration Permit is issued to the proponent that allows the proponent to carry out activities such as test drilling. The permit may also require the proponent to undertake additional testing (for instance a pump test on the well for a specific duration) as part of the process of evaluating water availability and to determine potential impacts on other users of the same aquifer.

A report prepared by a hydrogeologist registered with the Association of Professional Engineers and Geoscientists of Manitoba must be supplied to the Water Licensing Branch. This report will meet the terms of the exploration permit and will be used to determine the licencing decision. If the water supply is available, a licence is issued which will specify both the instantaneous and annual allowable withdrawal rates. Additional conditions may be attached such as a requirement for monitoring water use rates and reporting of information. A similar assessment process is required if surface water is to be used as the water source.

Some of agro-Manitoba's important water sources are at or near full allocation. Therefore, it is important to submit an application for a water rights licence prior to developing your project as it may not be eligible for a water rights licence. Licences are issued in chronological order and rights have precedence based on the date of application: "First in Time, First in Right". Under no circumstances should a project be developed without first obtaining a water rights licence or an approval, where required.

2.6 *The Water Protection Act*

The Water Protection Act proclaimed in January 2006, provides a new framework for managing water in Manitoba. Social and economic well-being depends upon a sustained supply of high quality water. *The Water Protection Act* provides protection and stewardship of Manitoba's water resources and aquatic ecosystems. Regulations under the act will include water quality standards, objectives or guidelines, water quality management zones, water conservation, invasive species, and other issues. In addition to regulations aimed at providing better protection to water, it establishes a mechanism to develop local watershed management plans, and it identifies the minimum content of these plans. It also provides a funding mechanism through the Water Stewardship Fund to provide focused research as well as incentives and assistance in areas of priority.

The Nutrient Management Regulation will be the first regulation developed under the *Water Protection Act*. A proposed regulation defining Water Quality Management Zones for Nutrients was released for consultation in 2005. Under this proposal, the Manitoba landscape was divided into five zones based upon various characteristics that could lead to runoff of nutrients to adjacent bodies of water or leaching of nutrients to underlying aquifers. Buffer setback areas adjacent to drains, streams, rivers, lakes, and other bodies of water have also been identified. Zone 4 are sensitive and fragile areas of the landscape where it is intended that nutrients not be applied. Zone 5 is intended to apply to urban areas.

SECTION 3

Manure Handling AND STORAGE

Livestock manure handling, storage, and management are an important part of every livestock operation. Efficient removal of manure from the livestock production facility is necessary for optimum livestock productivity. The sustainability of the operation also depends on a sound manure management system, including the treatment, transfer or use of manure as a fertilizer for crop production.

Livestock production practices and manure properties often dictate the type of manure handling equipment that can be used. The storage structure type and its operation affect nutrient losses and the uniformity of the nutrients when the manure is removed from the storage.

3.1 Solids Content

The type of manure handling equipment that can be used depends on the solids content of the manure. Livestock manure is classified as either a liquid, semi-solid ("slurry") or solid:

- **Liquid** – Liquid manure contains less than five per cent solids. Pig manure typically has a solids content of nine to ten per cent as excreted. The additional liquid comes from washwater and spillage from drinkers.
- **Semi-Solid** – Semi-solid manure contains five to 25 per cent solids.
- **Solid** – Solid manure contains greater than 25 per cent solids. To produce solid manure, bedding must be added or the liquid must be drained off and the manure dried.

3.2 System Components

The components of a manure management system include collection, transfer, storage, treatment and utilization (Table 1). The application of manure is covered in detail in Section 4.

3.3 Equipment Selection and Maintenance

When handling manure, it is important to use equipment that is designed for that purpose and to operate and maintain the equipment according to the manufacturer's instructions. Manure handling equipment must function reliably in a corrosive environment. Equipment also requires proper maintenance if it is expected to have a long service life. Preventative maintenance and the use of reliable equipment are critical for avoiding problems.

Liquid manure systems generally rely on pumps for various stages of the manure management system. Problems can occur when clumps of solids enter the pumps so there must be some method of screening or cutting solid material. In liquid manure storages, solids settle out and agitation is required to bring the solids back into suspension. Chopper pumps are appropriate for agitation since they do not easily become plugged with solids. These pumps have capacities of about 200 litres per second (L/s) or 2,600 imperial gallons per minute (imp. gal/min). Pumps used for liquid manure application, on the other hand, may range in capacity from 20 to 90 L/s (260 to 1,200 imp. gal/min) and can

pump manure up to three kilometres (km) (1.86 miles (mi)) through pipes and flexible hoses. While liquids are transferred by gravity or by pumps, solid and semi-solid manure is transferred by conveyors, augers, piston pumps or front-end loaders.

3.4 Planning a Manure Storage Structure

Manure storage structures must be sufficiently impervious to prevent leakage, provide an appropriate level of odour control and have adequate capacity to provide flexibility for timing application operations. The design of the storage will depend upon the location, the size required, the characteristics of the manure and the methods of filling and emptying. Although

Table 1: Components Of A Manure Handling System For Livestock Production

Operation	Solids	Semi-Solid/Liquids
Collection	Gutter Cleaners Front-End Loaders	Slotted Floors (complete with gutters) Scrapers cable hydraulic tractor
Transfer	Manure Wagons Open Tank Appliers Dump Trucks Earth Moving Equipment	Pumps submerged, open impeller piston pneumatic Augers Vacuum Tank Wagon Pipeline Gravity Continuous Flow Gutters Large Diameter Pipes
Storage	Stockpile Bunk Silo	Glass Lined Steel Concrete Earthen
Treatment	Aerobic compost dry Anaerobic	Aerobic pre-storage partial total Anaerobic Solid/Liquid Separation
Use	Application Energy Production (e.g. syngas)	Application Irrigation Energy Production (e.g. biogas)

some design considerations are discussed, producers are advised to contact an agricultural engineer for design information.

3.4.1 Permits

Under the Livestock Manure and Mortalities Management Regulation (Appendix B), the construction, modification or expansion of any manure storage structure, regardless of size, requires a permit from Manitoba Conservation. All investigation, design, construction supervision and final certification must be done by a professional engineer registered in the Province of Manitoba. Schedule A of the regulation (see Appendix B) specifies the minimum siting and construction requirements for manure storage structures. These requirements are designed to protect surface water, groundwater and soil and provide consistent construction practices throughout the Province. Before a permit is issued, Manitoba Conservation must be satisfied that sufficient suitable land is available to implement an appropriate manure management plan. Contact Manitoba Conservation or Manitoba Agriculture, Food and Rural Initiatives for further information on storage structure design, siting criteria and regulatory requirements.

3.4.2 Location

Manure storages should be located close enough to barns to allow convenient filling, without limiting the expansion of the facilities. They may also be located close to fields for application purposes. For those storages requiring long distance pipelines, there are special design considerations that must be addressed, such as type and size of pipeline, and clean-out provisions. These considerations must be detailed by the design engineer and are included in the permit issued by Manitoba Conservation. The storage should be accessible for field application equipment.

The location of the manure storage should provide the recommended separation distances from neighbours and residential areas (see Section 6.2). Existing trees should be used for shelterbelts and the establishment of additional shelterbelts should be considered.

The storage location should not collect surface runoff. Manure storages must not be constructed on the banks of rivers or drainage channels, or in depressions that may carry surface runoff.

Surface and groundwater should be protected from potential spills from the manure storage. Any abandoned wells within 100 m of the manure storage should be identified and properly sealed. A grassed buffer strip should be provided to intercept manure that could enter a watercourse in the event that the storage leaks or overflows. In order to minimize any risk of polluting, all manure storages must meet minimum setback distances (Table 2) outlined in the Livestock Manure and Mortalities Management Regulation.

Soil and groundwater conditions should be assessed to ensure the site is suitable for the type of storage planned (see Section 6.4.1). For example, where groundwater levels are near the bottom of the storage, an earthen storage structure should not be used without a suitable liner. See Section 3.5.1 for details on the construction requirements of earthen manure storage structures.

Table 2: Required Manure Storage Setbacks[1]

Storage Type	Distance (m) to[2]	
	Surface watercourse, sinkhole, spring, or well	Property Boundary
All manure storage structures	100	100
Field storage	100	N/A
Composting	100	100

[1]Refer to Appendix B, Livestock Manure and Mortality Management Regulation.

[2]See Appendix C for imperial units.

3.4.3 Size

The size of the manure storage structure is determined by the volume of manure produced and the length of time that manure will be contained. The volume of manure produced varies from one operation to another and depends on the size of operation, management practices and facility design. The volume of manure can increase significantly due to drinker water spillage or from washing. In farrowing and nursery operations, where washing is performed regularly, the volume of liquid manure may increase by a factor of two or three. However, the use of water conserving devices such as wet/dry feeders can reduce water use by up to 40 per cent when compared to standard feeders. The amount of bedding used also affects the volume of manure produced. If bedding is used in solid systems, the weight of manure may increase by 20 per cent and the volume may double.

Accurate estimates of manure production are very important when expensive storage systems are used, such as covered or open concrete or steel structures. To estimate storage volume requirements, it is often beneficial to evaluate an existing operation that is similar to the planned facility. Tables 3a and 3b provide manure production rate estimates for various types of pig operations. Values may vary depending on management and design. For more assistance,

Table 3a: Minimum Manure Storage Volume Requirements (Including Spilled And Wash Water)

Livestock	Storage Volume[1]	
	Litres per day	m^3 per day
1 Sow, Farrow to Finish (110-115 kg)	65.1	0.0651
1 Sow, Farrow to Weanling (up to 5 kg)	22.7	0.0227
1 Sow, Farrow to Nursery (23 kg)	28.3	0.0283
1 Weanling, Nursery (5-23 kg)	2.8	0.0028
1 Grower/Finisher (23-113 kg)	7.1	0.0071

[1]See Appendix C for imperial units.

contact one of the resource professionals listed in Appendix K, Contact Information.

The storage should have reserve capacity to accommodate precipitation and the accumulation of solids. The storage must always have enough capacity to handle a major rain storm without overflowing. There should also be enough capacity to provide flexibility for applying manure when field conditions, labour availability, weather and local regulations allow. Short-term storage may require more management and labour, since the time required for setting up and putting away equipment is increased. More importantly, poor weather, labour shortages and equipment breakdowns can seriously disrupt the timing of application. For operations prohibited from winter application, a minimum storage capacity of 200 days is required. Increasing the storage capacity to 400 days for earthen manure storage structures is often recommended. This ensures that manure will not have to be applied during the banned winter period (November 10 to April 10) and provides more flexibility for any unforeseen events, such as inclement weather, during the application season.

3.5 Storage Types

In Manitoba, the most common manure storage structure is the earthen storage. There are single-cell, two-cell or three-cell earthen storages. Concrete and steel tanks and alternate storage structures are also in use.

3.5.1 Earthen storage structures

Earthen storage structures are used for storing liquid manure. Their advantage is the low capital cost relative to the volume stored. The disadvantages are the greater surface area for odour emissions, the nutrient losses to the atmosphere and the maintenance requirements. Earthen manure storages also have additional specifications for the site location (see Section 6, Site Selection and Appendix B, Livestock Manure and Mortalities Management Regulation).

Earthen manure storages should be constructed to accommodate the equipment used for emptying, agitating and maintaining the slopes. The slopes of the inside walls should be 1:3 or 1:4 (vertical: horizontal). The outside wall slopes should be 1:5 so that a grassed cover can be established and to allow equipment access for maintenance and manure pumping. A berm width of at least 2.4 m (eight feet (ft)) should be provided for tractors and pumps.

Table 3b: Estimated Rates Of Solid Manure Production For Pigs[1]

Livestock Type	Volume-basis[2] (m^3/day)	Weight-basis[2] (kg/day)
1 Sow, Farrow to Finish (110-115 kg)	0.049	39.2
1 Sow, Farrow to Weanling (up to 5 kg)	0.015	12.1
1 Weanling, Nursery (5-23 kg)	0.0017	1.3
1 Grower/Finisher (23-113 kg)	0.0048	3.7

[1]Adapted from Table 5 of the Province of Alberta's *Agricultural Operation Practices Act* - Standards and Administration Regulation (AR 267/2001)

[2]See Appendix C for imperial units.

3.5.1.1 Protection of earthen storage structures

Earthen manure storage structures should be erosion proof. The tops and outside slopes of the berms must be seeded to grass and regularly mowed to provide protection against erosion and to improve stability. During the emptying of the storage, vigorous agitation is necessary to bring the

settled solids into suspension. Most pumps will create enough turbulence at the bottom of the storage near the pump intake to severely erode the base of the storage structure and compromise the integrity of the storage liner. The same hazard may occur under or around the transfer pipe inlet to the storage. Curbed concrete ramps and pads prevent rutting from pump-out equipment and erosion from agitation and inlet piping.

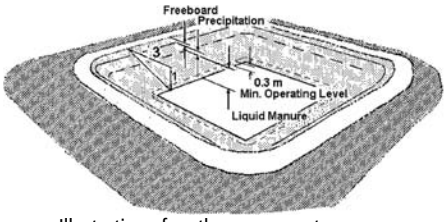


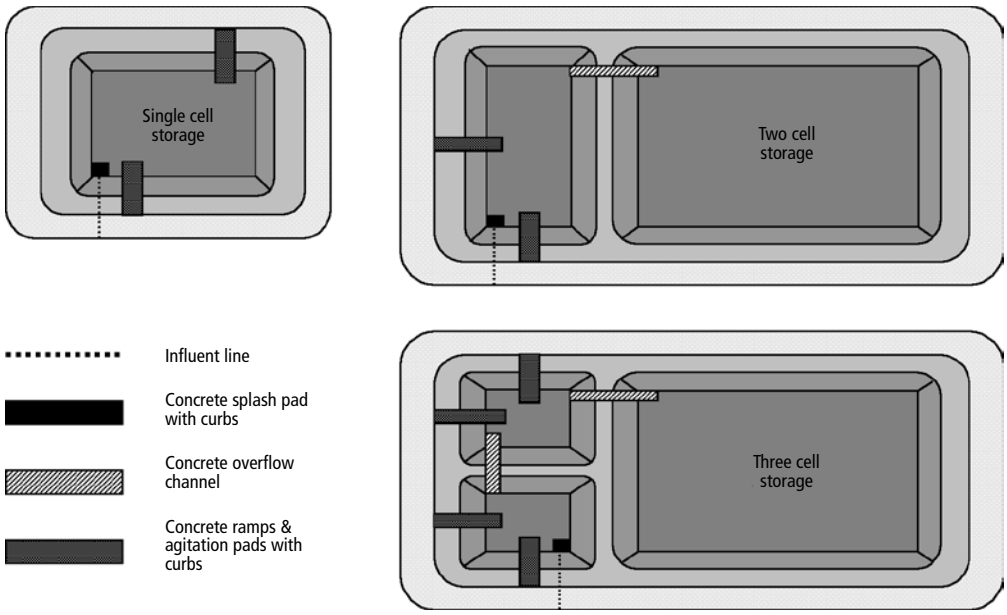
Illustration of earthen manure storage

3.5.1.2 Earthen storage designs

Most earthen storage structures designed with useable volumes under 10,000 m^3 (350,000 ft^3 or 2,000,000 imp. gal.) have a **single storage cell**. Depending on the size of the storage, multiple pumping stations may be required. Typically, the agitator has to be repositioned every 30 m around the perimeter of the storage to thoroughly suspend the settled solids and clean the storage bottom. Each of these pumping stations must have a curbed concrete access ramp and pumping pad.

Two-cell earthen storage structure designs are increasingly used for larger storage volumes. The primary, smaller cell, with a capacity from 25 to 30 per cent of the total structure's volume, allows the solid fraction of the manure to settle. The larger, secondary cell essentially stores liquids. The liquid manure from the primary cell has a greater solids content and, therefore, a higher organic matter level, than that from the secondary cell. Vigorous agitation is usually required in the first cell to suspend the solids, whereas the liquids from the second cell can be pumped out without agitation. Since agitation releases strong odours, it is advantageous to reduce the time required to agitate the manure and suspend the solids. The time required to agitate the primary cell of a two-cell storage is significantly less than that required to agitate and suspend the solids in a large, single-cell structure.

Some two-cell earthen storages have a bottom transfer pipe between the two cells with a valve that allows the liquids from the second cell to return to the primary cell during pumping. These storages only require one pumping station for the entire storage structure. Ideally, the primary cell should be small enough for the solids to be thoroughly suspended with a single pumping station.



Typical layout of a single-cell, two-cell and three-cell storage structure

A two-cell storage system makes clean-out and therefore, solids removal more manageable. Another advantage of the two-cell design is that the manure can be agitated more effectively providing a more uniform nutrient content, particularly in the case of phosphorus. With time, however, a significant amount of solids will still be transferred to the secondary cell, settle and require removal. Cleaning of the secondary cell requires ramps for access of heavy machinery. Precautions must also be taken to avoid scouring the unprotected storage liner in the secondary cell. When designing any storage, consider the need for a manure storage structure cover.

Final stage of the construction of an earthen storage: compacted with a sheepsfoot packer

3.5.1.3 Construction requirements

The Livestock Manure and Mortalities Management Regulation specifies strict design and construction requirements for earthen manure storage structures. Construction requirements are specified for earthen storage structures that are to be built in areas where good clay or clay-till type material exists (see Appendix B):

- topsoil must be stripped
- soil must be properly compacted using a fully ballasted sheepsfoot or vibrating packer to a density of at least 95 per cent of Standard Proctor dry density

- construction shall be completed under conditions where soil temperatures are above freezing
- curbed concrete ramps and pads must be provided for berm and liner protection. They must be provided at all locations in the storage affected by scouring (inlet, transfer pipes, agitation ramps)
- the top and outside berms must be covered with suitable soil for seeding to grass.

Where the earthen storage structures are located within the unsaturated part of an aquifer, or if sufficient clay or clay-till does not exist under the storage, the addition of a compacted clay or synthetic liner and monitoring wells are required.

3.5.1.4 Groundwater pollution concerns

Seepage from improperly constructed or poorly maintained earthen storage structures and the associated risk of groundwater contamination are a serious concern.

There is increased risk of groundwater contamination in areas where the subsoil underlying the storage consists of sand, sand and gravel or shallow bedrock forming the aquifers. In these areas and where there is less than 5 m to an aquifer, earthen storage structures must be lined and equipped with monitoring wells. Seepage detection systems may also be required. Compacted clay and/or artificial liners reduce the rate of seepage and potential for impact on groundwater.

In some areas, even a lined earthen storage may not be adequate. Concrete or steel storage structures may be acceptable alternatives in these situations.

3.5.2 Concrete and steel structures for liquid manure

Concrete or steel structures for liquid manure may be partially buried or above ground. Odours tend to be less from these structures than earthen manure storages because for an equivalent amount of storage volume, there is less surface area exposed to the atmosphere. Furthermore, depending on the type of feed used the manure in concrete and steel structures can develop a crust layer which can further reduce odours.

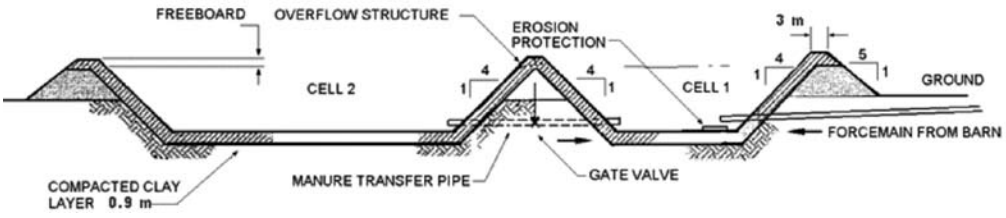


Illustration of a two-cell liquid storage structure design

Concrete (left) or steel (right) liquid manure storage structures

Typically, an above ground storage is a circular silo-type structure with an open top made from pre-cast concrete panels, reinforced cast-in-place concrete, or glass lined steel panels. Underground storages are generally rectangular in shape and require proper design to withstand all earth, hydrostatic and live loads.

The size and shape of the manure storage will dictate the number of agitation locations and the type of agitation equipment used for clean out. Large diameter, above ground storage tanks often require high capacity agitation pumps to be lowered into the tank over the wall and have a number of pump-out ports located around the perimeter. Larger, buried tanks will often be divided into smaller compartments with agitation pump access and partial dividing walls built inside the tank. These partial walls allow liquid overflow between compartments, but provide more effective clean-out by reducing the volume of manure to be agitated within each compartment.

Generally, above ground concrete or steel storage tanks are seldom covered due to the extremely high cost of the cover material and the support structure for the cover. However, covered concrete or steel storages have been used to capture gases when combined with manure treatment systems. See Appendix E for a comparison of nitrogen losses from different systems.

3.5.3 Field storage

Storage of solid manure from pig operations is generally limited to solid manure from straw-based housing systems or solid-liquid separation systems for treatment or handling. Solid manure must be stored in a manner that controls seepage and potential runoff.

Under the Livestock Manure and Mortalities Management Regulation, solid manure can be stored in a field. It must be at least 100 m away from any surface watercourse, sinkhole, spring or well and it must be stored in a manner that does not cause pollution of surface water, groundwater or soil. Dikes may be required to prevent runoff from the field storage from entering surface or groundwater or leaving the property. The regulation also restricts how long any particular site may be used to store solid manure. It states that if solid manure is stored as field storage at any particular site during the period January to December of one year, the manure must be removed from that site by November 10 of the following year. The field storage site must not be used again for at least 12 months and a crop must first be grown on the site in order to recover any nutrients that may have leached into the soil from the stored manure.

3.5.4 Earthen and concrete pads for solid manure

For coarse textured soil conditions, a compacted clay liner or concrete pad may be required under the manure pile. Perimeter curbs or a constructed collection basin may be required to contain runoff from the solid manure. The liquids can then be collected and applied to neighbouring crop land or treated through an adjacent vegetative buffer strip. To minimize the volume of liquids to be handled, the storage structure should be designed to divert outside runoff water away from the storage area.

A front-end loader or an excavator is normally used to remove manure from the solid manure storage area. Where there is a concrete pad, a concrete bucking wall should be provided to assist with filling the bucket. Access for loading and hauling equipment should also be provided.

Covered steel hoop structures are one type of alternative livestock housing for livestock production

3.5.5 Alternative housing systems

Hoop shelters are a proven alternative housing system. Most hoop shelters are quonset-shaped metal structures covered with polyethylene tarps. The ends are left open for most of the year, but covered during the winter months. Side walls are post-and-plank construction, typically 1.2 to 1.8 m (4.0 to 6.0 ft) high. The floor of the shelter is concrete at one end to hold the feeders and waterers, while the remainder of the floor is covered with deep straw bedding. The construction, modification or expansion of a hoop shelter operation capable of housing 300 or more animal units requires a permit from Manitoba Conservation. All hoop shelters should be designed and constructed according to guidelines issued by Manitoba Conservation.

In Manitoba, hoop shelters are generally used for grower/finisher pigs. The pigs are placed in the shelter at approximately 25 kilograms (kg) (55 pounds (lbs)) and are housed there until they reach market weight. Manure that accumulates in these systems must be managed in a manner that will not cause pollution. The deep straw bedding used in these systems must absorb all or most of the liquid. Any runoff which may occur must be contained on the owner's property and must not be allowed to cause pollution of surface water, groundwater or soil. Hoop shelter systems are normally cleaned out after every batch of grower/finisher pigs. Manure may be composted or temporarily stored in the field and then applied to cropland as fertilizer.

The simplicity of construction, natural ventilation, reduction of odours, and lower costs associated with hoop shelters make them an attractive option for some producers. Although producers can save money on building and energy costs, hoop shelters require increased labour and handling costs. Since these structures are naturally ventilated, prevailing wind direction, amount of natural shelter and other obstructions need to be considered to ensure good air movement in the summer so the pigs are kept cool. In the winter months, a generous supply of bedding is needed for the pigs to follow their natural burrowing instincts to keep warm. Feeding efficiencies are generally poorer in winter and fly control can be more difficult in summer.

When selecting a site for an alternative housing system, consider the following factors:

- avoid sites with porous soils and/or fractured rock that would allow direct access of any contaminants to the groundwater
- maintain minimum property setbacks and separation distances (see Tables 12 and 13, Section 6, Site Selection). A minimum setback of 100 m (328 ft) from a watercourse, well, sinkhole, etc. is required by the Livestock Manure and Mortalities Management Regulation (see Appendix B).

For more information regarding hoop shelter construction, please contact Manitoba Agriculture, Food and Rural Initiatives or Manitoba Conservation.

3.6 Manure Pathogens

All livestock, as well as pets and wildlife, may carry infectious diseases that can be transmitted between animals and humans called zoonotic diseases. There are three main types of microorganisms to consider: bacteria, viruses and protozoa. Human infection can occur through direct contact with an animal, through contact with animal manure, or through ingestion of food or water contaminated with manure. As with all illnesses, prevention is preferable to treatment. The key ways to prevent illness from occurring are:

- maintain good personal hygiene -- hand washing is important!
- select the site for a livestock operation according to the considerations specified in Section 6 (Site Selection)
- handle, store and apply manure according to these guidelines
- avoid water pollution by adhering to environmental regulations.

Proper siting and construction of manure storage structures is critical to preventing contamination of sensitive groundwater areas and nearby surface watercourses.

Bacteria are present in all animal feces, and some are capable of surviving a long time in stored and applied manure, and in soil and water. Some of the bacteria species that may be present in livestock manure include *Salmonella, Campylobacter, E.coli, Clostridium, Leptospira, Listeria* and *Yersinia. Coxiella* and *Brucella* are mentioned in the literature but have not been found in Manitoba in pigs.

Viruses that are found in animals do not usually cause human disease. Also, viruses do not survive well outside a host and are very sensitive to environmental conditions such as temperature and moisture. The bacteria that are present in manure tend to inactivate most viruses.

The protozoa *Giardia* and *Cryptosporidium* are emerging pathogens, which means they are being found more frequently than in the past. They are a particular risk for people with weakened immune systems. Protozoa tend to contaminate surface water supplies and can cause significant and widespread human illness if present in drinking water sources. These organisms have environmentally resistant forms (cysts) that are also resistant to inactivation by conventional water treatment. *Giardia lamblia* (beaver fever) and *Cryptosporidium parvum* (crypto) are shed by wildlife, livestock, pets, and humans; however, the original source of contamination is often difficult to determine.

Other parasites, such as nematodes and round worms, may also be present in livestock manure and warrant mention. However in most cases, the animal species of these parasites do not cause disease in humans.

When these Farm Practices Guidelines are followed, the risk to public health from manure handling operations or manure storage structures is low.

3.7 Safety

Livestock producers and manure applicators should use safety precautions around livestock manure structures and equipment. Access to manure storage structures should be limited and additional safety precautions may be warranted when handling livestock manure. Fencing the storage to restrict access and visible warnings for children and visitors should be considered. Although the crusted surface of manure in a storage structure may appear solid, it will not support a person.

3.7.1 Dangerous manure gases

As manure decomposes, gases are released. The types of gases produced depends on how the manure is stored. Under aerobic conditions (with oxygen present) fewer dangerous gases are produced. However, when manure is stored anaerobically (no oxygen present), such as liquid manure, some of the gases produced are very dangerous. When liquid manure is stored for several weeks in an enclosed space, dangerous gases can accumulate in the head space of the enclosed area and in bubbles and dissolved gases within the manure itself. The greatest danger occurs when the manure is agitated either mechanically or by gravity flow. During agitation, the gases held in the manure are released and the concentrations can reach lethal levels within the immediate vicinity of the storage. Several deaths have occurred as a result of farm workers entering enclosed spaces where manure gases have accumulated.

The most dangerous gas is hydrogen sulphide. Although it is readily detectable at low concentrations, at higher levels the gas paralyses the sense of smell. **So it is possible to unknowingly encounter a dangerous situation.** As the concentration increases, the hydrogen sulphide blocks the nerves that control the diaphragm causing a person to stop breathing. **When concentrations are high, a single breath of the gas can be fatal.** The other gases and their respective levels considered to be dangerous are listed in Appendix E.

The publication M-10710 *Manure Gas* from the Canada Plan Service, discusses the sources and types of gases of concern. This leaflet is available from Manitoba Agriculture, Food and Rural Initiatives.

Good design and safe practices can prevent accidents from happening. Long-term manure storage should not be in the same air space as the animals or workers. The agitation required to remove the manure from the barn can increase gas concentrations to lethal levels very rapidly. Connections between the barn and long-term storage must be separated by a gas trap to prevent the gases from returning to the barn. The facility should be designed so that all maintenance can be done without entering the storage.

When agitating manure in an in-barn storage, maximum ventilation must be provided. All personnel should work in pairs and wear H_2S detection monitors. Everyone should be evacuated from the air space above the storage. Sufficient headspace for the gases should be created by first pumping without agitation. The manure can then be agitated below the surface, but only as much agitation as is necessary should be carried out.

- **Never enter a manure tank without proper respiratory equipment that is designed for this purpose.** A breathing apparatus specifically built for this purpose, with a full face mask and a remote air tank and hose, is required. **SCUBA equipment is not adequate.**
- **Always work in pairs and carry H_2S monitors.**
- **If an accident does occur, do not attempt to enter the enclosed space. Call immediately for emergency assistance.**

3.8 Reporting Spills

Manure spills from transportation equipment or from manure storage facilities must be reported to Manitoba Conservation. Details on reporting spills can be found in the Livestock Manure and Mortalities Management Regulation (Appendix B).

3.9 Registration of a Manure Storage Structure Without a Permit

Manure storage facilities that do not have permits must be registered with Manitoba Conservation. These facilities include earthen manure storage structures constructed before April 29, 1994 and molehills, steel and concrete tanks constructed before March 31, 1998. Under-floor concrete storage pits that hold less than 30 days' worth of manure do not have to be registered. Manure storage structures that are not registered with Manitoba Conservation can not be used after November 10, 2010.

3.10 Decommissioning Manure Storage Structures

If a livestock operation is discontinued for more than a year, the operator must inform Manitoba Conservation of how they will maintain the integrity of the storage or how they plan to decommission the storage. Please contact Manitoba Conservation for advice on decommissioning the storage.

SECTION 4

Application of Manure

4.1 Manure – An Agronomic Resource

Manure is both a natural by-product of livestock production and an excellent source of plant nutrients. The use of manure as a fertilizer for crop production is a very beneficial way to recycle manure nutrients within an agricultural system. Most livestock operations are on or surrounded by, large areas of productive agricultural land where manure can be applied in a sustainable manner. In many instances, manure can be a substitute for commercial, inorganic fertilizers. Manure not only acts as a source of plant nutrients but, through the addition of organic matter, it also helps to improve soil tilth, structure, aeration and water holding capacity.

Manure application is a sustainable agricultural practice. To maximize the benefits of manure nutrients, prevent crop damage and minimize the risk of pollution, manure application rates should be based on crop nutrient requirements or removals.

The goals of using livestock manure as a fertilizer should be to:

- maximize the use of the manure nutrients by crops
- minimize the risk of polluting surface water and groundwater

4.1.1 Manure as a fertilizer

Manure contains both macro- and micro-nutrients needed for crop production in organic and inorganic forms. Inorganic nutrients are readily available to the growing crop, while the organic nutrients become available gradually over time. A crop responds to inorganic nutrients in soil, whether they originate from manure or commercial fertilizer.

As not all of the nutrients are available at the same time, proper management is needed to ensure sufficient nutrients are available when required by the crop. This will maximize nutrient use as well as crop yield and crop quality.

4.1.2 Manure content

A large proportion of the nutrients in livestock feed is excreted and not used by the animal. There are many factors that affect the nutrient composition of manure including the type of housing system, whether or not bedding is used, the type of bedding, the age of the animals, the feeds and feed supplements that are being used and the type of manure storage and handling system. The results of the manure nutrient analyses can be greatly affected by how the manure sample is taken. Information on how to take a manure sample is provided in Section 4.3.2. Typical nutrient concentrations for liquid and solid pig manures are provided in Tables 4a and 5.

These tables provide data on nutrient concentrations in manure prior to the adoption of phytase use to reduce the phosphorus (P) content of the manure. Table 4b contains nutrient data collected after the adoption of phytase use by the pig industry.

Housing system – The type of housing system influences various management practices including the quantity of washwater and bedding that is used. These differences will be reflected in the moisture and nutrient content of the manure.

Animal age – As pigs grow, their ability to convert the nutrients in feed to body tissue changes. Pigs that are actively growing will utilize some nutrients more efficiently than mature animals.

Feed type – The nutrients in pig manure are predominantly excess and undigested feed nutrients that have been excreted by the pig. Therefore, the nutrient content of manure is directly affected by the nutrient content of pig feed. Some of the nutrients in the feed are in a form that is not available to the pig and are excreted in the manure. If a ration is unbalanced, the pigs can not use all of the nutrients and the nutrients will also be excreted. Various feeding strategies, such as multi-phase feeding and the use of enzymes, can be adopted to minimize the amount of nutrient excreted by the animal.

Manure storage, handling and application – The manure handling system (e.g. liquid vs. solid) and storage type and duration affect the nutrient content of manure. Crop nutrient availability depends on the equipment selected to apply manure, the timing of application, post application field operations (such as tillage) and weather conditions during and after application. Nitrogen is the nutrient most affected by the various components of the manure management system.

■ Nitrogen

The nitrogen (N) content of manure is highly variable. A manure analysis is required to determine how much N is in the manure and in what forms. A proper manure analysis contains three N measurements:

Table 4a: Nutrient (kg/m³ Or kg/1000 L) And Dry Matter (%) Content For Liquid Pig Manure[1] (Pre-phytase Use)

Parameter[2]	Farrow			Nursery			Finisher			Farrow to Finish		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**1.7**	0.6	6.5	**2.7**	1.5	4.6	**3.4**	1.5	6.4	**2.8**	1.2	4.0
NH_4-N	**1.2**	0.5	3.2	**2.0**	1.3	3.0	**2.6**	1.2	4.1	**2.4**	1.1	3.4
Total P_2O_5	**1.5**	0.1	12.7	**2.7**	0.3	5.9	**2.3**	0.1	8.1	**2.4**	0.3	4.8
Total K_2O	**1.2**	0.3	4.2	**2.0**	1.5	2.4	**1.8**	1.1	3.2	**1.7**	0.8	2.1
Dry Matter	**3.0**	0.3	38.6	**3.1**	1.1	5.6	**3.7**	0.0	11.8	**2.1**	0.6	4.0

[1] Values are on an as-is basis (i.e. untreated). See Appendix C for imperial units. SOURCE: Racz and Fitzgerald 2001. Nutrient and Heavy Metal Contents of Hog Manure – Effect on Soil Quality and Productivity. Proceedings: Livestock Options for the Future. Results based on 37, 11, 92 and five samples for farrow, nursery, finisher and farrow to finish, respectively.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

- total nitrogen
- ammonia (or ammonium) nitrogen
- organic nitrogen

As the term suggests, total nitrogen is an estimate of all of the N contained in the manure. It includes ammonium N, organic N and any nitrate N that may be present. Not all of this N will be available to the crop following application.

Ammonium nitrogen (NH_4-N) is the predominant inorganic form of N in manure and it is immediately available to the crop following application. It may be expressed as either ammonium or ammonia on the soil test report and it is the same form of N as is in ammonium-based commercial fertilizers. Ammonium N is very susceptible to atmospheric losses through volatilization.

Nitrate nitrogen (NO_3-N) is another inorganic form of N. Although soil can contain significant quantities of nitrate N, it is typically present in manure in very low or insignificant amounts.

Organic nitrogen is determined indirectly by calculating the difference between total N and ammonium N. Organic N is slowly released to the crop and can have a significant impact on the N-supplying power of the soil if it is allowed to build up after several years of manure application.

Organic N = Total N – Ammonium N

In liquid manure, a larger fraction of the total N is typically in the ammonium form than in solid manure. The N in solid manure is mostly in the organic form. This has great bearing on the N value of the manure as a fertilizer and manure nutrient management. As well, many solid manure systems use large amounts of bedding materials that are high in carbon (C). This can increase the carbon to nitrogen ratio (C:N) in the manure significantly. A high C:N ratio in manure can delay the availability of the N to the crop following application.

- **Phosphorus**

The phosphorus (P) content of the manure is also highly variable. Pig manure is a mixture of organic and inorganic P. Studies have

Table 4b: Nutrient (kg/m[3] Or kg/1000 L) And Dry Matter (%) Content For Liquid Pig Manure From Operations (Phytase Use)

Parameter[2]	Farrow			Nursery			Finisher		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**2.2**	0.4	6.0	**2.7**	1.1	5.6	**3.4**	0.4	6.7
NH_4-N	**1.6**	0.4	2.7	**2.0**	0.6	3.3	**2.4**	0.4	4.7
Total P_2O_5	**1.5**	0.0	9.4	**1.1**	0.1	4.7	**1.5**	0.0	6.5
Total K_2O	**1.3**	0.7	2.0	**1.9**	1.3	2.8	**1.8**	0.1	3.4
Dry Matter	**2.1**	0.3	9.1	**2.2**	0.6	7.4	**3.4**	0.4	11.2

[1] Values are on an as-is basis (i.e. untreated). See Appendix C for imperial units. SOURCE: Industry co-operators. Results based on 132, 58 and 181 samples for farrow, nursery and finisher, respectively.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

shown that the relative proportions of organic P ranges from 20 to 50 per cent of the total P, depending upon the age of pig, diet, and production system. The balance which is inorganic P ranges from 50 to 80 per cent. However, manure analyses routinely measure only total P. Most of the P is contained within the solids, which tend to settle to the bottom of the liquid manure storage resulting in an increasing concentration of P with depth. This makes obtaining a representative manure sample very difficult. As the organic portion is only slowly available to the crop and some of the inorganic fraction is readily bound to soil, not all of the P in manure is available to the crop following application.

■ Organic Matter (Carbon)

The application of manure to cropland can help maintain or improve soil organic matter levels and improve soil tilth, soil structure, water infiltration, nutrient and water holding capacity and reduce soil erosion. When the soil is tilled and fields are cropped, a portion of the organic matter is broken down and lost from the field. Organic matter is also lost from upper hill slope positions when topsoil is transported down slope by repeated tillage.

The use of commercial, inorganic fertilizers does not replenish the lost organic material. Depending on soil type, a steady depletion of soil organic matter can result in a soil structure that is more susceptible to erosion and crusting. Application of manure, particularly solid manure, will help to slow or reverse this trend of degrading soil quality and potentially improve crop yields as a result.

■ Potassium

Pig manure can contain relatively high levels of potassium (K). Most Manitoba soils with the exception of sandy or peat soils are naturally high in K. As a result, crop productivity is not likely to benefit from additions of manure K.

Multiple applications of manure can increase the amount of plant-available soil K. High

Table 5: Nutrient (kg/tonne) And Dry Matter (%) Content For Solid Finishing Pig Manure[1] (Pre-phytase Use)

Parameter[2]	Fresh			Stockpiled[3]			Composted[4] Fresh			Composted Stockpiled		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**6.3**	4.8	8.9	**6.0**	3.7	12.9	**6.4**	5.0	8.1	**7.2**	5.8	8.8
NH_4-N	**1.4**	1.0	1.8	**2.1**	1.1	3.1	**0.5**	0.1	1.2	**0.7**	0.2	1.0
Total P_2O_5	**6.5**	5.0	9.9	**5.5**	3.4	8.8	**9.2**	7.6	10.5	**8.6**	6.4	9.9
Total K_2O	**8.8**	6.0	15.1	**9.0**	6.8	13.2	**10.4**	8.9	12.0	**10.8**	9.0	14.2
Dry Matter	**33.2**	24.0	45.3	**47.1**	32.1	63.7	**66.4**	63.4	69.4	**58.2**	44.0	63.4

[1] Values are on an as-is basis (i.e. untreated). See Appendix C for imperial units. SOURCE: Agriculture and Agri-Food Canada 2005. Results based on 10 samples.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

[3] Maintained in a pile for approximately six months and minimally disturbed (i.e. not moved repeatedly or mixed).

[4] Carefully managed to maintain necessary moisture and temperature, resulting in the breakdown of manure to form a stable and uniform material.

soil K can lead to increased uptake of potassium by forages, which can pose a health risk to dairy cows. High K levels in dry cow diets elevate the risk of certain metabolic disorders, such as milk fever. If high K levels in forage are a concern, tissue testing should be used to ensure that the forage is of acceptable quality. In some instances, it may be necessary to avoid manure applications on those fields producing low K forage for dry cows.

■ Sulphur

Manure contains sulphur (S) in both organic and inorganic forms. As with other nutrients, the organic fraction must be broken down by soil microorganisms before it is available to the crop. The inorganic portion in the sulphate (SO_4) form is readily available to the crop. However, manure analysis typically provides a result for total S only. Liquid pig manure can be low in S relative to N. This should be taken into account when fertilizing crops such as canola that have a relatively high S requirement.

■ Micronutrients

Micronutrients, such as copper (Cu), zinc (Zn), cobalt (Co), boron (B) and other metals are found naturally in soil as well as in both manure and some commercial fertilizers. They are required in small amounts for optimum crop performance. Reduced crop performance can result from either a deficiency or an excess of micronutrients. Micronutrient concentrations in manure often reflect the levels of micronutrients in the feed. Unless micronutrients are being fed at high levels, the micronutrient contents of manure will not result in a build up to toxic levels in the soil if manure is applied at rates to meet the N or P requirements of the crop.

Pigs require Cu and Zn for normal growth and reproduction. These minerals are routinely added at low levels to all pig diets. However, Cu and Zn concentrations are sometimes increased in pig feed since these minerals have been shown to improve growth performance (Cu) and have some pharmacological effects (Zn) in young and growing pigs. Feed samples can be analyzed to verify the levels of these micronutrients in pig diets. Manure, soil and plant tissue tests can also be used to monitor micronutrient levels if necessary.

■ Salts

Manure and soil contain the salts of ammonium (NH_4), calcium (Ca), magnesium (Mg), potassium (K), and sodium (Na). When manure is applied to soil, varying amounts of salts are also applied. In areas of adequate precipitation and drainage, salt accumulations in soil are rare and crop production is unaffected. In areas with borderline saline soils and low annual precipitation, manure applications may elevate the soluble salt content of the soil above crop tolerance. Elevated soil salinity can hinder the ability of a plant to absorb water from the soil. In these instances, salt levels in manure should be minimized through dietary changes. Salt accumulation in soil can also be monitored with soil testing. It is expressed as electrical conductivity (EC).

■ Weed seeds

Some weed seeds in manure may retain their viability even after digestion by livestock. Weed seeds can be effectively destroyed before they are fed to livestock by feed grinding, rolling or other aggressive treatment during the feed milling process. Weed seed viability can also be reduced by proper composting in which high temperatures are maintained. Weed flushes

following manure application may in fact be caused by an existing seed bank in the soil that responds to the addition of readily available nutrients.

■ **Microorganisms**
As discussed in Section 3.6, livestock manure contains a broad spectrum of microorganisms. Proper hygiene is required when handling livestock manure in order to reduce the transmission of pathogens.

4.2 Manure and Soils

When manure is applied, the nutrients can undergo a number of transformations that may accelerate or delay their availability for crop uptake. The fate of the N in the manure is highly variable and is influenced by the forms of N in the manure, application techniques and timing, along with weather conditions. The availability of the P in the manure depends on the forms of the P and its placement relative to the plant root system.

4.2.1 Manure nitrogen (N) after application

Manure N is affected by several processes after it is applied. Some make N available for plant uptake, while others make it less available to plants or even cause its permanent loss. Application techniques that conserve N maximize the fertility value of the manure and reduce the risk of N loss to air or water.

■ **Mineralization**
The organic N in manure must go through a decomposition process known as mineralization – the conversion of organic N to ammonium N. It can be slow and as a result, the N is released throughout the growing season rather than being immediately available following application as it is with commercial fertilizer. In Manitoba, it is estimated that about 25 per cent of the organic N in pig manure is mineralized and available to the next crop. The remainder becomes available during subsequent years at a significantly decreased rate.

■ **Nitrification**
Although nitrate is present at low concentrations in manure, manured soils can contain significant amounts. This is because the ammonium from the manure is converted to nitrate by soil microorganisms through the nitrification process.

■ **Volatilization**
The ammonium N in manure can be lost to the atmosphere as ammonia gas through the chemical process of volatilization. Nitrogen losses through this process can occur during storage as well as during application. Volatilization losses during storage are higher for open than enclosed structures and increase with exposed surface area for open structures. The amount of N lost through volatilization during application of manure depends on the amount of ammonium in the manure, exposure of the manure to the atmosphere and weather conditions (Table 6). The actual amount of ammonium available to the crop is calculated by subtracting the amount of ammonia estimated to be lost by volatilization during application, from the amount of ammonium in the manure.

Available Ammonium N = Total Ammonium N x (100% - % Volatilization loss)

■ **Immobilization**
Immobilization is the conversion of inorganic N to organic N (i.e. the opposite of mineralization). As soil microorganisms decompose plant material and manure, they use the carbon (C) as a source of food. As C is consumed, N is also consumed, making it temporarily unavailable to plants. Therefore, when high C materials (such as straw and manure with a lot of bedding) are added to soil, the availability of N to the crop can be reduced or delayed. When these microorganisms die, the nutrients they contain are released back into the soil.

■ **Nitrate Leaching**
Nitrate is highly soluble in water. As water moves down through the soil, such as after snowmelt or heavy rainfall, it can carry nitrate with it. Nitrate is more prone to leaching in coarse textured soils (e.g. sands) at times of the year when the crop is not actively growing and soil moisture levels are high. Nitrate and other dissolved forms of nitrogen are also contributed to adjacent water bodies through runoff both during spring melt as well as during runoff associated with rainfall events. Studies in Manitoba have shown that runoff can be an important source of nitrogen to surface waters where, along with phosphorus, it can cause large algal blooms.

■ **Denitrification**
Soils become anaerobic (lack oxygen) when saturated or during periods of high microbial activity. When soils are anaerobic, the soil bacteria can continue to breathe using nitrate instead of oxygen. During this process, nitrate is consumed and N gases (such as N_2 and N_2O) are released to the atmosphere. This process is called denitrification.

■ **Crop Uptake and Removal**
The amount of N that the crop takes up from the soil largely depends on crop yield. Crop yield depends on crop type, agricultural capability of the soil, weather conditions and management practices. The amount of N removed by the crop is also a function of the protein content of the plant and the amount of plant material harvested from the field.

4.2.2 Manure phosphorus (P) after application

Although P is less dynamic in soil than N, its management in manure is challenging. Most Manitoba soils are naturally deficient in plant-available P. Crops growing on low P soils require fertilization to reach optimal yields and will benefit from a build up in soil P until agronomic requirements are met. However, repeated applications can result in soil P levels well above agronomic requirements. In addition to being a valuable crop nutrient, at elevated levels, P is a serious contaminant in surface water. For this reason, loss of P from agricultural lands is of particular concern to surface water quality.

■ **Mineralization**
As with N, mineralization of organic P to inorganic P takes place in the soil and contributes to the supply of plant available P.

■ **Retention**
Inorganic P tends to bind readily in both alkaline and acidic soils to organic matter, calcium (Ca), magnesium (Mg), iron (Fe), and aluminum (Al). Fine textured soils (i.e. clays) are able to bind considerably more P than coarse textured soils (i.e. sands).

■ **Solubilization**
Soil does not have an unlimited capacity to bind P. Rising soil test P levels are often accompanied by an increase in soluble P (P dissolved in water). Soluble P can be easily transported to surface water in runoff and it is more difficult to control than P transported by soil erosion.

■ **Crop Uptake and Removal**
The amount of P that the crop takes up from the soil largely depends on crop yield. Crop yield depends on the crop type, agricultural capability of the soil, weather conditions and management practices of the producer. The amount of P removed by the crop is also a function of the P content of the plants and the amount of plant material harvested from the field.

4.3 Using Manure as a Fertilizer

The most common way to take full advantage of manure as a resource on the farm is to use it as a fertilizer for crop production. Producers who use manure as a fertilizer benefit economically because they can replace expensive commercial sources of plant nutrients with the manure nutrients. Good nutrient management practices also minimize the risk to the environment from manure nutrients. Following are the basic steps to integrating manure into a farm's nutrient management program.

4.3.1 Test the soil

Soil sampling and analysis are the only way to directly determine the plant-available nutrient status of a field and to receive field-specific fertilizer recommendations. There are a number of soil sampling strategies that may be adopted, depending on site-specific conditions. Whichever strategy is employed for a field, soils should be sampled at the 0 to 15 centimetres (cm) (0 to 6 in) and 15 to 60 cm (6 to 24 inch in) depths, and composite samples for each depth should be kept separate for analysis.

Although a variety of analytical packages are available, one that includes nitrate-N, exchangeable K, and available P should be selected. Nitrate-N should be determined on the both the 0 to 15 cm and 15 to 60 cm (0 to 6 in and 6 to 24 in) samples, whereas exchangeable K and available P only need to be determined on the 0 to 15 cm samples. There are several analytical methods for determining available P, and results from each can be considerably different. The P_2O_5 fertilizer recommendations contained in the Manitoba Soil Fertility Guide are based on sodium-bicarbonate extractable P or Olsen P. In areas where salinity (concentration of soluble salts) or sodicity (excess sodium relative to calcium and magnesium) is a concern, electrical conductivity (EC) and sodium adsorption ratio (SAR), should be considered.

Qualified professionals should be consulted for advice in selecting the most appropriate sampling strategy, analytical package and proper protocols for collecting, handling and shipping soil samples for laboratory analysis (see Appendix F).

■ **Fertilizer recommendations**
The soil test report should also contain recommendations for any additional fertilizer that is required. The amount of additional nutrients required should be based on the soil test results and a realistic crop yield target provided by the producer. Realistic yield goals can be determined using producer experience and knowledge of the productive capacity of soils on a given farm.

4.3.2 Test the manure

Testing manure for each livestock operation and each application event is the best way to estimate the nutrient content of manure. A manure analysis should be based on a well-mixed, representative sample. Manure is very heterogeneous and obtaining a representative sample can be very difficult. Sometimes, more than one sample is required to estimate the nutrient concentration because the characteristics of the manure change (for example, during pump-out of a liquid manure storage structure).

It is ideal to know the nutrient content of the manure before application so that application rates can be set to meet crop nutrient requirements. Receiving test results prior to manure application can be challenging, particularly for liquid manure. This is because the manure storage structure is not typically agitated until just before and during pump-out for application. One way to address this concern is to have a database of historical manure test results for a given operation to use until recent test results can confirm nutrient contents.

Manure samples should be analyzed by an accredited laboratory on at least an annual basis. More frequent manure analyses may be required if the manure is applied at multiple times during the year (such as spring and fall) or if management practices are likely to create a change in the nutrient content of the manure. Rapid field test kits for liquid manure exist for estimating the readily available portion of N, however, the result of a field test should be verified by comparing it to a laboratory analysis of the same manure sample. Historical laboratory test results for a given operation can be used to assess the accuracy of recent laboratory and field test results.

A basic manure analysis package should include total nitrogen (TKN), ammonium N, total P, total K, and dry matter content. Organic N is calculated by subtracting the ammonium N from total N. In some instances, micronutrient analyses may also be desired.

Application rates are often based on estimated manure nutrient levels or book values. Estimated values are not as reliable as multiple manure tests for an operation because manure nutrient levels vary widely. Inaccurate estimates will lead to application rates that are either lower or higher than required.

4.3.3 Crop selection and rotation

Designing a crop rotation system that uses manure as the nutrient source should be no different than designing a crop rotation system using commercial fertilizer. However, since manure is handled and applied differently than commercial fertilizer, some modifications may be necessary. The crops included in the rotation should not only use the nutrients from the manure as efficiently as possible, but the overall rotation should have the intensity and diversity to overcome other agronomic challenges such as weeds, disease, insects, residue management, moisture management and timing of field operations. Contact Manitoba Agriculture, Food and Rural Initiatives for information on crop selection and rotation (or refer to Manitoba Agriculture, Food and Rural Initiative's fact sheet Crop Rotations and Timing of Manure Application).

■ **Annual Crops and Forages**

The amount of nutrients, particularly N, used by different crops varies widely. Grass-based forage crops require much more N than annual cereal crops. Legume-based forage crops, such as alfalfa, can fix atmospheric N and require little fertilizer N. Although alfalfa is capable of fixing N, it is also capable of utilizing large quantities of N from soil, manure or commercial fertilizer. As such, it is a good recipient for manure. Alfalfa is also a deep-rooted plant, which is capable of withdrawing nitrate-N that has leached below the root zone of annual crops.

Forage crops offer other advantages to manure management planning. In-season and split applications are more feasible on forage crops. High yielding forages also have the ability to remove more P than most annual crops. Silage crops offer a similarly high P removal potential when yields are high.

■ **Pasture**

Pastures generally respond well to fertilization by manure because their soil fertility is typically depleted after many years of grazing. Unlike forage fields that are mechanically harvested, most of the nutrients applied to pastures will be re-deposited on the pasture by the livestock. Soil nutrient build-up should be monitored when manure is used regularly to fertilize pastures.

Fertilization of native or tame pastures, can affect the relative dominance of different forage species. Over time, species that respond well to applied nutrients tend to become dominant after manure application. Species that thrive under low fertility conditions tend to become less dominant after manure application. Although forage yield may increase with manure application, the potential shift in species on pasture should be considered when planning where to apply manure.

Consideration should be given to providing a period of time between manure application and subsequent grazing so that the stand can make use of the applied nutrients. This practice will ensure a stronger regrowth of the pasture forages and minimize the risk of nutrient loss to the environment. Delaying grazing following broadcast application of manure is also suggested as a preventive measure against transmission of potentially pathogenic organisms that may be present in livestock manure. A rest period provides the opportunity for natural environmental factors to inactivate potential pathogens. A minimum 30-day rest period is recommended before livestock are reintroduced to pastures on which manure has been broadcast applied. Certain application techniques or other circumstances may allow shorter rest periods. Manitoba Agriculture, Food and Rural Initiatives can provide advice on this issue. Application of manure from a particular livestock species onto a pasture that will be grazed by a different livestock species may be another effective way to interrupt the chain of infection from pathogens to livestock. Livestock should never be present on the pasture while manure is being applied.

■ **Fallow land**

Applying manure to fallow land is not a recommended practice for environmental reasons, and is prohibited before August 15 unless prior approval has been obtained from Manitoba Conservation. The absence of a growing crop in the year of application means manure nutrients will not be utilized until the following growing season and

increases the risk of nutrient loss from the field. Accumulation of nutrients in a fallow field, particularly nitrate-N, is likely to be accelerated as nutrients from manure and the soil are released through microbial activity. The build-up of soil nitrate-N may exceed the N requirements of the next crop. Soil sampling for N to a depth of 1.2 m (4 ft), either in the fall of the fallow year or the next spring, is recommended when applying manure to fallow land. Deeper sampling may detect leached nitrate-N that can be taken into account in crop selection and future manure management planning.

Under the Livestock Manure and Moralities Management Regulation, manure can only be applied to land as a fertilizer and the land must be cropped no later than the following growing season.

4.3.4 How to calculate the manure application rate

Manure application rate calculations are based on fertilizer recommendations. These fertilizer recommendations should be based on soil test results for nitrate-N and P and a realistic target yield for the crop to be grown. The target yields should be appropriate for the region, productive capacity of the soil and the producer's management practices. Crop insurance data and historical yield records for the operation provide guidance for establishing target yields. Agriculture Capability ratings, which are based on natural soil and landscape characteristics, can be used to identify the severity and kind of limitations to crop production for a given field. Manitoba Agriculture, Food and Rural Initiatives may be contacted for information on agriculture capability ratings. If the target yield chosen is not realized, soil nutrient levels should be monitored and future target yields should be adjusted accordingly.

The soil test report should provide fertilizer recommendations. When necessary, the Manitoba Soil Fertility Guide can also provide nutrient recommendations based on soil test values. In some situations, estimates of crop nutrient removals from appropriate published sources may also be useful when determining target manure application rates.

■ **Nitrogen based application rates**

Manure application rates are based on the soil analyses and fertilizer recommendations, manure analyses, timing and method of application and weather conditions. Traditionally, manure application rates have been based on N. For all crops except legumes, the rate of manure application has been based on the amount of fertilizer N required to achieve a target yield. Since legumes can fix their own N and do not require additional fertilizer, manure application rates for legumes have been based on the potential N removal of the crop (Table 6).

The N requirements of a crop can be provided by manure N. However, not all of the N in the manure will be available to the crop in the first year after application. Therefore, the available N in the manure must be calculated.

The manure test report provides results for total N (TKN) and ammonium N. Organic N is calculated from the manure test report as the difference between total N and ammonium N.

Table 6: Crop Removal Rates For N And P_2O_5 [1]

Crop[2]	Example Target Yield[3]	Average Nutrient Uptake Rate[4]		Average Nutrient Removal Rate[5]	
		N	P_2O_5	N	P_2O_5
Spring Wheat	2.69 t/ha	35.2 kg/t	13.4 kg/t	25.1 kg/t	9.8 kg/t
Winter Wheat	3.36 t/ha	22.5 kg/t	10.2 kg/t	17.4 kg/t	8.5 kg/t
Barley	4.30 t/ha	29.0 kg/t	11.7 kg/t	20.3 kg/t	8.8 kg/t
Oats	3.81 t/ha	31.5 kg/t	12.1 kg/t	18.3 kg/t	7.7 kg/t
Rye	3.45 t/ha	29.9 kg/t	15.0 kg/t	19.0 kg/t	8.1 kg/t
Grain Corn	6.27 t/ha	27.4 kg/t	11.3 kg/t	17.4 kg/t	7.9 kg/t
Canola	1.96 t/ha	63.9 kg/t	29.5 kg/t	38.7 kg/t	20.8 kg/t
Flax	1.50 t/ha	52.0 kg/t	14.8 kg/t	38.1 kg/t	11.6 kg/t
Sunflowers	1.68 t/ha	49.8 kg/t	17.0 kg/t	35.7 kg/t	10.7 kg/t
Alfalfa	11.2 t/ha	N/A[6]	N/A	29.0 kg/t	6.9 kg/t
Grass	6.7 t/ha	N/A	N/A	17.1 kg/t	5.0 kg/t
Corn Silage	11.2 t/ha	N/A	N/A	15.6 kg/t	6.4 kg/t
Barley Silage	10.1 t/ha	N/A	N/A	17.2 kg/t	5.9 kg/t

[1] Adapted from Nutrient Uptake and Removal by Field Crops, Western Canada, 2001. Compiled by the Canadian Fertilizer Institute.

[2] As bushel weights can vary considerably among some crop varieties, values other than those presented here may need to be chosen to better reflect a given cropping scenario.

[3] Example target yields for Manitoba. Site specific and actual yields for any parcel of land will depend on the agricultural capability of the land, climate and the producer's management practices.

[4] Total nutrient taken up by the crop

[5] Nutrient removed in the harvested portion of the crop

[6] Not applicable

Organic N = Total N – Ammonium N

Nitrogen availability is estimated for both the inorganic (ammonium) and organic forms. All of the ammonium is available to the crop, however, it is also highly susceptible to volatilization losses as ammonia gas. The actual amount of ammonium N available is the amount remaining after volatilization:

Available Ammonium N = Total Ammonium N x (100% – % Volatilization Loss)

Volatilization loss estimates are provided in Table 7.

Two factors are considered when estimating volatilization loss: weather conditions at the time of application and method of application. Generally, volatilization losses are expected to be greater under warmer and dryer conditions (e.g. summer) and lower under cooler and wetter conditions (e.g. early spring or late fall). Volatilization losses also increase with prolonged exposure of manure on the soil surface. Therefore, injection of liquid manure, or rapid incorporation following broadcast application, should minimize loss of ammonia to the atmosphere.

Table 7: Volatilization Losses (%)[1]

Method of Application	Cool Wet	Cool Dry	Warm Wet	Warm Dry	Average
Injected	0	0	0	0	0
Incorporated within 1 day	10	15	25	50	25
Incorporated within 2 day	13	19	31	57	30
Incorporated within 3 day	15	22	38	65	35
Incorporated within 4 day	17	26	44	72	40
Incorporated within 5 day	20	30	50	80	45
Not Incorporated	40	50	75	90	64
Irrigated	Above + 10%	Above + 10%	Above + 10%	Above + 10%	Above + 10%
Applied to Standing Crop	25	25	40	50	35

[1]MARC 2005. Manitoba Agriculture, Food and Rural Initiatives.

Organic N must be mineralized before it can be used by the crop. The proportion of organic N in manure that is estimated to be available to the following crop is 25 per cent:

Available Organic N = 25 per cent Organic N

For solid manure that contains considerable amounts of straw or other bedding materials, less than 25 per cent of the organic N may be available in the first year following a single application. As soil microorganisms consume the carbon (C) from the bedding materials, they tie up N from the manure and/or soil that would otherwise be available to the crop. Solid manure, that contains a lot of bedding, returns a significant amount of carbon to the soil. Application of this type of manure may result in temporary immobilization of N, reducing plant-availability. Repeated applications of solid manure, however, may result in a build-up of soil N that becomes available to crops grown in subsequent years.

The C:N ratio of the manure may provide information on how much N will be available to the crop in the year following application. Research has indicated that manures with C:N ratios higher than 15:1 are not likely to release N very quickly to the crop in the year following application. In these cases, less than 25 per cent of the organic N will be available in the first year. Eventually most of the additional N will be released and this must be taken into account, preferably through a soils test, when calculating the soil requirement for N in subsequent years.

The estimated total available N is determined by adding the available organic and inorganic fractions:

Total Available N = Ammonium N x (100% – % Volatilization loss) + 0.25 Organic N

■ Phosphorus based application rates

Unlike commercial fertilizer, manure nutrients are usually not in balance with the nutrient requirements of the crop. Manure application rates are based on the most limiting nutrient for crop production, which is most frequently N. Although P is usually found in manure in smaller quantities than N, crops require significantly less P than N to reach optimum yields. It is therefore common for more P to

be applied than the crop can remove when application rates are based on N. This results in a build-up of soil test P.

This nutrient imbalance is magnified when manure is applied using a practice that does not conserve N for crop use and, instead, exposes the N to greater loss from the field. For example, broadcast application of manure without incorporation leads to increased loss of N through volatilization. To compensate for this fact, the manure application rate must be increased to ensure that the N demand of the crop is satisfied. A higher manure application rate leads to a higher application of manure P and a more rapid rise in soil P. The same situation also arises with annual applications of manure having a low available N content (common with solid manure).

As soil test P levels increase, soluble P also increases. Soluble P is more mobile in water and can threaten surface water quality if it moves from the field to a watercourse. Controlling the build-up of soil test P will reduce the formation of soluble P. This can be achieved by reducing the P in manure or by basing manure application rates on P.

As soil test P builds, the requirement for additional fertilizer P decreases, often to only starter P levels. The fertilizer recommendation for P can be found on the soil test report. Fertilizer P is expressed as P_2O_5:

P x 2.3 = P_2O_5

It is often not feasible to apply manure at the typically low rates recommended in soil test reports to meet crop P requirements. When manure is applied based on P, the target application rate should be based on the crop-specific removal rate for P, expressed as P_2O_5 (Table 6). In order to slow the build up of soil test P, at moderate to high soil test P levels (60 to 119 ppm Olsen P), the manure P_2O_5 application rate should not exceed two times the crop P_2O_5 removal rate:

At 60 to 119 ppm Olsen P
Manure P_2O_5 Application Rate ≤ 2 x Crop Removal P_2O_5

When soil test P values are very high (120 to 179 ppm Olsen P), manure P2O5 application rates should not exceed the total amount of P_2O_5 that the crop can remove. This will prevent further build-up of soil test P.

At 120 to 179 ppm Olsen P
Manure P_2O_5 Application Rate ≤ 1 x Crop Removal P_2O_5

Manure should not be applied to soils that already have excessive levels of soil test P (>180 ppm Olsen P). These soils should be cropped to bring down soil test P levels before additional manure is applied. If an application rate based on P_2O_5 removal is still prohibitive, it may be necessary to apply manure once at a rate that is equivalent to multiple years of P_2O_5 removal (e.g. total removal by crops that will be grown over several years). After this single application, no additional manure is applied during that multi-year period; therefore, other nutrient requirements are met using synthetic fertilizer or other sources (e.g. N fixation by legumes).

Table 8a and 8b are worksheets for calculating N or P-based manure application rates (see appendix C for imperial version).

Table 8a: Manure Application Rate Calculation Worksheet[1] Based On Liquid Manure

Field I.D.:_____ Crop: _____ Target Yield: _____			
Step 1. Target Nutrient Rate			Units [2]
Nitrogen (based on soil test recommendation)	(A)	90	kg/ha
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)	60	kg/ha
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)	30	kg/ha
Other:	(B3)		kg/ha
Step 2. Manure Test Data			
Total Nitrogen	(C)	3.1	kg/m^3
Ammonium Nitrogen	(D)	1.9	kg/m^3
Organic Nitrogen = (C) - (D)	(E)	1.2	kg/m^3
Phosphorus	(F)	1.0	kg/m^3
P_2O_5 = (F) x 2.3	(G)	2.3	kg/m^3
Step 3. Amount of manure nitrogen available to crop:			
Application method	Incorporated within 1 day		
Volatilization losses due to application method (Table 6)	(H)	25%	
Ammonium nitrogen available = (D) x [100-(H)]% = 1.9 x 0.75 = 1.4	(I)	1.4	kg/m^3
Organic nitrogen available to the next crop = (E) x 0.25 = 1.2 x 0.25 = 0.3	(J)	0.3	kg/m^3
Total available N = (I) + (J) = 1.4 + 0.3 = 1.7	(K)	1.7	kg/m^3
Total available N in spring = (K) x 100% = 1.7 x 1.0 = 1.7	(L)	1.7	kg/m^3
Total Available N in fall = (K) x 83% = 1.7 x 0.83 = 1.4	(M)	1.4	kg/m^3
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) = 90 ÷ 1.7 = 52.9 or Fall N-based Application Rate = (A) ÷ (M) = 90 ÷ 1.4 = 64.3	(N)	64.3	m^3/ha
Amount of P_2O_5 applied = (G) x (N) = 2.3 x 64.3 = 147.9	(O)	147.9	kg/ha
P_2O_5 balance[3] (using 1x crop removal) = (O) - (B2) = 147.9 - 30 = 117.9	(P)	+117.9	kg/ha
Step 5. Applicaton rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) = 60 ÷ 2.3 = 26.1 or 1x crop removal P-based Application Rate[2] = (B2) ÷ (G) = 30 ÷ 2.3 = 13.0	(Q)	26.1	m^3/ha
Amount of available N applied in spring = (L) x (Q) = 1.7 x 26.1 = 44.4 or Amount of available N applied in fall = (M) x (Q) = 1.4 x 26.1 = 36.5	(R)	36.5	kg/ha
N balance[5] (N applied - N recomended) = (R) - (A) = 36.5 - 90 = -53.5	(S)	-53.5	kg/ha
Step 6. Compare N Rate (N) with P rate (Q):			
If soil test P is low to moderate (<60 ppm), apply manure at N rate (N)	64		m^3/ha
If soil test P is high)> 60 ppm), apply manure at P rate (Q)[6]	26		m^3/ha

[1] See Appendix C for imperial units and a blank template worksheet.

[2] 1 kg/m^3 = 1 kg/ 1000 L

[3] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[4] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[5] Positive value indicates N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative value indicates N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[6] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

Table 8b: Manure Application Rate Calculation Worksheet[1] Based On Solid Manure

Field I.D.:_____ Crop: _____ Target Yield: _____			
Step 1. Target Nutrient Rate			Units [2]
Nitrogen (based on soil test recommendation)	(A)	90	kg/ha
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)	60	kg/ha
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)	30	kg/ha
Other:	(B3)		kg/ha
Step 2. Manure Test Data			
Total Nitrogen	(C)	6.0	kg/t
Ammonium Nitrogen	(D)	2.1	kg/t
Organic Nitrogen = (C) - (D)	(E)	3.9	kg/t
Phosphorus	(F)	2.4	kg/t
P_2O_5 = (F) x 2.3	(G)	5.5	kg/t
Step 3. Amount of manure nitrogen available to crop:			
Application method	Incorporated within 1 day		
Volatilization losses due to application method (Table 6)	(H)	25%	
Ammonium nitrogen available = (D) x [100-(H)]% = 2.1 x 0.75 = 1.6	(I)	1.6	kg/t
Organic nitrogen available to the next crop = (E) x 0.25 = 3.9 x 0.25 = 1.0	(J)	1.0	kg/t
Total available N = (I) + (J) = 1.6 + 1.0 = 2.6	(K)	2.6	kg/t
Total available N in spring = (K) x 100% = 2.6 x 1.0 = 2.6	(L)	2.6	kg/t
Total Available N in fall = (K) x 83% = 2.6 x 0.83 = 2.2	(M)	2.2	kg/t
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) = 90 ÷ 2.6 = 34.6 or Fall N-based Application Rate = (A) ÷ (M) = 90 ÷ 2.2 = 40.9	(N)	34.6	t/ha
Amount of P_2O_5 applied = (G) x (N) = 5.5 x 34.6 = 190.3	(O)	190.3	kg/ha
P_2O_5 balance[3] (using 1x crop removal) = (O) - (B2) = 190.3 - 30 = 160.3	(P)	+160.3	kg/ha
Step 5. Applicaton rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) = 60 ÷ 5.5 = 10.9 or 1x crop removal P-based Application Rate[2] = (B2) ÷ (G) = 30 ÷ 5.5 = 5.5	(Q)	10.9	t/ha
Amount of available N applied in spring = (L) x (Q) = 2.6 x 10.9 = 28.3 or Amount of available N applied in fall = (M) x (Q) = 2.2 x 10.9 = 23.9	(R)	28.3	kg/ha
N balance[5] (N applied - N recomended) = (R) - (A) = 28.3 - 90 = -61.7	(S)	-61.7	kg/ha
Step 6. Compare N Rate (N) with P rate (Q):			
If soil test P is low to moderate (<60 ppm), apply manure at N rate (N)	35		t/ha
If soil test P is high)> 60 ppm), apply manure at P rate (Q)[6]	11		t/ha

[1] See Appendix C for imperial units and a blank template worksheet.

[2] 1 tonne = 1000 kg

[3] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[4] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[5] Positive value indicates N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative value indicates N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[6] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

4.3.5 Calibrate field equipment to deliver target rate

Calibration refers to the combination of settings needed to deliver manure at a particular rate. The calculation of manure application rates is of little value if the equipment is not properly calibrated to deliver the required application rate. Details on how to calibrate manure application equipment can be found in the Tri-Provincial Manure Application and Use Guidelines (Manitoba Version, 2004).

Solid, semi-solid and liquid manure application systems can discharge manure at various rates, depending on factors such as speed of travel, flow meter setting, width of application or other parameters. Whenever possible, data from the manufacturer should be used to calibrate application equipment.

4.3.6 Record keeping

Every livestock operation should keep track of soil and manure test results, manure application rates, application methods, application dates, crop rotations and yields, and any other relevant information for each field that receives manure.

Maintaining detailed records on an ongoing basis is an essential part of proper manure nutrient management. Complete sets of historical soil and manure test results, crop performance, weather conditions and management practices can help producers make sound decisions and document proper management of land and fertilizer resources on the farm. For instance, soil test results can be used to track nutrient levels over time and detect build-up in the soil before it becomes excessive. A manure test database for a particular operation can be used to determine more accurate manure application rates, confirm the accuracy of a single manure test and indicate changes in management that have affected the composition of the manure. Documenting weather conditions during and after manure application may help explain the fate of manure nutrients (e.g. loss from the field or uptake by the crop). Cropping information can indicate any adverse effects of manure application (e.g. compaction leading to depressed growth), as well as the suitability of soils for manure application (i.e. consistently high yields and quality on more productive land, consistently low yields and quality on less productive land).

4.4 Benefits of Using Manure as a Fertilizer

The costs of handling and applying manure are high when compared on an equivalent weight basis with commercial, inorganic fertilizers. However, proper periodic applications can also result in substantial long-term improvements in the physical and chemical characteristics of the soil. Manure should be viewed as a resource to be properly managed, rather than as a waste requiring disposal.

The direct economic benefits of livestock manure management rest in its ability to replace commercial fertilizers as a source of plant nutrients. The manure nutrients, particularly N and P, will reduce or replace the need for additional synthetic fertilizer, thereby reducing fertilizer purchasing costs.

Caution should be exercised not to over-apply manure. In addition to increasing environmental risks, excessive applications of manure can have a negative impact on crops by causing excessive vegetative growth, lodging, and/or delayed maturity. Applying manure nutrients in excess of

crop requirements also represents a missed opportunity for putting those nutrients to use on other fields where a crop response is likely to be observed.

4.5 Environmental Health Concerns

Manure is a valuable source of nutrients and organic matter that can replace or reduce the need for synthetic fertilizer and improve soil quality. However, there are risks associated with using manure that must be minimized through proper management.

4.5.1 Odour

The potential relationship between odours and health is addressed in detail in Section 5. This section also provides management options to address odour concerns when applying manure in close proximity to neighbours.

4.5.2 Nitrate contamination of drinking water

Groundwater may contain nitrate from natural sources (e.g. peat bogs), commercial fertilizers, domestic sewage systems or manure. Nitrate is very soluble in water and can be easily leached in soils with good internal drainage (e.g. sandy soils) when moisture levels are high. Nitrate that leaches below the crop rooting zone may eventually reach groundwater, which may serve as a drinking water source.

The guideline maximum acceptable concentration of nitrate in drinking water, set by Health Canada, is 10 milligrams per litre (mg/L) nitrate-N (or 45 mg/L nitrate). Below 10 mg/L, nitrate does not appear to cause health problems. Above this level, there may be heath concerns, particularly for infants less than one year of age and pregnant women. For infants, ingestion of nitrate may result in a shortage of oxygen in the blood, which manifests itself in a bluish colouration of the skin and mouth. This condition is called methemoglobinemia or "blue-baby syndrome". In pregnant women, the presence of nitrate may cause a lack of oxygen for the fetus. The possibility of blue-baby syndrome is entirely preventable by avoiding the consumption of water high in nitrates.

Although adults have a higher tolerance for nitrates, some studies suggest an association between nitrates in drinking water and the development of stomach cancer. For adults, food is generally the main source of ingested nitrate unless drinking water contains elevated concentrations. A link between drinking water high in nitrates and gastric cancer has been observed in some studies, however, other studies have not supported this association and, to date, no firm conclusions about drinking water high in nitrates causing gastric cancer have been made.

As there are many potential sources for elevated nitrate levels in private drinking water wells, it is advisable to have the water tested regularly. This is particularly important if members of the household include pregnant women or infants. Your regional Manitoba Water Stewardship office can be contacted for advice on how to have your drinking water tested.

- **Managing manure to reduce the risk of nitrate contamination of groundwater**

Careless or improper storage, excessive N applications, as well as improperly protected

well casings may result in groundwater contamination. The best preventive measures consist of ensuring that N sources, whether manure or commercial fertilizer, are stored properly and applied at rates that match plant requirements.

Although nitrate-N levels are very low in manure, the organic-N and ammonium-N can be converted to nitrate-N when manure is applied to soil. Heavy or repeated applications of manure can result in a build-up of N in the soil. All fields that are to receive manure should be tested for residual nitrate-N so that the appropriate manure application rate can be targeted. Fields that have received heavy or repeated applications of manure, or have supported low crop yields and quality, may have adequate N to supply crop needs and may not be suitable for additional applications. Those fields that require additional N should only receive enough manure to meet the crop's N requirement.

Ideally, manure should be applied so that N is available to the crop at the appropriate time and in the required amount. While spring, in-season or split applications may be the most desirable in this respect, fall applications may be more practical in areas where spring soil conditions limit opportunities for manure application, or in cases of limited manure storage capacity. Extra care should be taken when applying manure at times that increase the length of time during which nitrate leaching may occur.

Although the risk is low for many of Manitoba's agricultural soils and aquifers, **manure applications, like commercial fertilizers, must always be properly managed to minimize the risk of contaminating groundwater.**

Additional information on N management can be found in the Manitoba Agriculture, Food and Rural Initiatives fact sheets *Nitrogen Dynamics, Retrieval Strategies for Deep Leached Nitrates and Manure Nitrogen Losses and Prevention.*

4.5.3 Sensitive groundwater areas

In some areas, soil and groundwater conditions are more sensitive to agricultural practices, specifically the application of either inorganic or organic (manure) N fertilizers. The degree of sensitivity of an aquifer to contamination depends on many factors. These may include the depth to the aquifer, the type of aquifer, the properties of overburden material overlying the aquifer (soil, subsoil, and parent material composition and structure), the type of vegetation at the soil surface, and whether the area is located within a recharge source. Where very permeable soils, such as coarse sands or gravels, immediately overlay an aquifer or where the overburden above an aquifer is shallow, nutrients applied to the soil surface may leach rapidly downward beyond crop rooting depths and eventually reach the aquifer. Since these areas tend to be excessively well drained, crop productivity is often relatively low and plant uptake of nutrients tends to be limited.

4.5.4 Nutrient loss to surface water

Nitrogen and phosphorus are the two primary manure nutrients of concern with respect to surface water quality. Excess nutrients in water result in eutrophication and have been associated with fish kills.

Nitrogen – Manure contains N as ammonium (NH_4) which is toxic to aquatic

life and can convert to the more toxic ammonia (NH_3) form. The greatest risk of ammonium from manure entering surface water is through direct runoff or erosion soon after application.

Phosphorus – Eutrophication is the enrichment of water bodies by nutrients – both N and P. Phosphorus, however, is the nutrient that most commonly limits plant growth in fresh water bodies. Excess P entering water can result in increased production of algae and other aquatic plants, affecting water quality and the diversity of organisms present. During winter, the increased algae and aquatic plants decay and may deplete the oxygen supply in the water, potentially causing fish kill. At high concentrations of P in fresh water, blue-green algae can flourish and can release toxins that can harm wildlife, livestock, and humans if they drink the water.

- **Managing manure to reduce the risk of surface water contamination**

Manure nutrients can contaminate surface water if manure enters surface water directly or through runoff or soil erosion from lands that receive manure. Liquid manure application rates should not exceed the ability of the soil to absorb the manure. Heavy-textured soils, such as clay soils, have much slower infiltration rates than light textured soils. Manure application rates on these soils should avoid ponding or runoff. Reduced application rates may also be necessary on sloping lands and manure should not be applied when heavy rain is in the forecast. Tillage and cropping practices that reduce soil erosion should also be adopted.

4.5.5 Pathogen transfer to surface water or groundwater

Livestock manure contains bacteria, viruses, protozoa and parasites, some of which may be pathogenic (cause disease) in humans. Such organisms in manure may enter surface water if manure leaves the field through runoff or erosion or if manure is accidentally spilled or intentionally discharged into surface water. Although the soil tends to act as a natural filter that protects groundwater from contamination by pathogens, there may be a risk of micro-organisms moving through the soil profile to groundwater under certain conditions, such as the presence of coarsely textured surficial material, shallow water table, fractured bedrock or poorly constructed wells.

Manure applications must always be properly managed to minimize the risk of contaminating surface and groundwater. The risk of water contamination from pathogens will be reduced when the setbacks listed in Table 9 and Table 10 are maintained. Community health risks from pathogens are further reduced when the precautions in Section 3.6 are followed.

Table 9. Setback Requirements For Livestock Manure Application On Land Adjacent To Surface Water Or A Surface Watercourse[1] (m)

Surface Water or Surface Watercourse Feature	Manure Application Method	Manure Application Setback Width with Permanently Vegetated Buffer Width	Manure Application Setback Width with no Permanently Vegetated Buffer
Lakes	Injection or low-level application followed by immediate incorporation	15 m setback, consisting of 15 m permanently vegetated buffer	20 m setback
	High-level broadcast or low-level application without incorporation	30 m setback, including 15 m permanently vegetated buffer	35 m setback
Rivers, creeks and large unbermed drains, designated as an Order 3 or greater drain on a plan of Manitoba Water Stewardship, Planning and Coordination, that shows designations of drains	Injection or low-level application followed by immediate incorporation	3 m setback, consisting of 3 m permanently vegetated buffer	8 m setback
	High-level broadcast or low-level application without incorporation	10 m setback, including 3 m permanently vegetated buffer	15 m setback
All other types of surface water or surface watercourses	No manure application allowed		

[1] See Appendix C for imperial units.

4.5.6 Setback requirements for livestock manure application on land adjacent to surface water or a surface watercourse

To reduce the risk of runoff contaminated with manure entering drinking water wells, wells should be located and constructed to protect water quality over the long-term (See Section 6.3).

Setbacks from application on land adjacent to surface water or a surface watercourse reduces the risk of runoff contaminated with manure entering water. The effectiveness of the setbacks depends on such factors as its width, soil and landscape conditions and the intensity and duration of rainfall. To reduce the risk of overland flow entering sinkholes, springs or wells, the area immediately around these features should be sown to permanent cover. Table 9 provides setback requirements for livestock manure application on land adjacent to surface water or a surface watercourse.

Topography should be considered when applying manure. As the slope increases, the chance that manure may run off also increases. Therefore, added caution and management is needed when applying manure to sloping lands, particularly steeply sloping land (six per cent or greater). Soil management practices that reduce runoff and soil erosion should be practiced on lands fertilized with manure. Susceptible areas could be avoided during application. Crop or residue cover should be maintained to provide protection against erosion. In some instances, a grassed buffer strip may be required.

4.5.7 Greenhouse gas emissions

Greenhouse gases are compounds in the air that increase the amount of the sun's energy that is trapped on the earth, resulting in rising atmospheric temperatures. This is known as the greenhouse effect. Carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are the three greenhouse gases linked to agriculture. Manure application is a source of CO_2 and N_2O. Carbon dioxide is generated by the burning of fossil fuels to manufacture commercial fertilizer and operate manure application equipment. It is also produced when soil is tilled to incorporate surface application of manure because the tillage results in the breakdown of soil organic matter. Denitrification produces N_2O which is a potent greenhouse gas. Denitrification is most common in saturated soils where microorganisms are forced to use nitrate to respire because oxygen is unavailable.

Beneficial management practices that reduce greenhouse gases from the application of manure often have other environmental or economic benefits. Carbon dioxide emissions from application of manure can be reduced by minimizing the number of equipment passes in the field which burns less fossil fuel. This can be done by injecting manure to eliminate the need for an additional pass to incorporate the manure or by scheduling tillage operations to coincide with incorporation of surface applied manure so that additional tillage passes are avoided. Maximizing the N value of the manure reduces the need to purchase additional synthetic N fertilizer,

Table 10: Required[1] Distances From Watercourses, Sinkholes, Springs, Wells And Recommended Distances From Residential Property Lines For Applying Manure Between November 10 And April 10 [2] (m)

Slope	Application Method		
	Surface Applied and Irrigation		
	No incorporation	Incorporation within 48 hours	Injection
less than 4%	150	N/A	N/A
4 – less than 6%	300	N/A	N/A
6 – less than 12%	450	N/A	N/A
Greater than 12%	Prohibited	Prohibited	Prohibited

[1] Refer to the Livestock Manure and Mortalities Management Regulation – Appendix B.

[2] See Appendix C for imperial units.

the manufacturing of which generates CO_2. As well, maximizing crop uptake of manure N will reduce the amount of nitrate remaining in the soil at times of the year (such as early spring) when the risk of leaching or denitrification is high. This can be achieved through optimal timing of manure applications (as close to crop growth as possible) at rates that closely target crop requirements.

4.6 Regulations on Manure Application

The Livestock Manure and Mortalities Management Regulation (Appendix B) contains the environmental laws specific to manure management.

4.6.1 General rules regarding pollution of water

It is illegal to allow manure to enter surface or groundwater. Section 11 of the Livestock Manure and Mortalities Management Regulation requires that no person shall handle, use or dispose of livestock manure, or store manure in an agricultural operation, in such a manner that it is discharged or otherwise released into surface or groundwater.

4.6.2 Prohibition on winter application

Applying manure in the winter is not a recommended practice because manure can not infiltrate into frozen soil and thus is more susceptible to runoff and entry into surface watercourses. Furthermore, winter application of manure is the least desirable time to apply manure to land because more nutrients in the manure will be lost due to volatilization and spring runoff than applications at any other time of the year. However, where over-winter storage capacity is inadequate, winter application of manure may be necessary.

Under Section 14 of the Livestock Manure and Mortalities Management Regulation, all livestock operations are prohibited from application of livestock manure from November 10 until April 10, unless they are exempted by regulation. Existing livestock operations (defined as those in existence prior to March 30, 2004) with fewer than 300 animal units of any one type of livestock are exempt from the prohibition unless they have been ordered to cease winter application because it is causing unacceptable environmental risk. Existing operations between 300 and 399 animal units in size have until November 10, 2010 to comply with the prohibition. Existing producers with 400 or more animal units are currently required to comply with the prohibition on winter application. New producers must comply with the prohibition on winter application as soon as their operations are established. Upon approval by Manitoba Conservation, emergency situations may warrant exceptions to the prohibition on winter application.

Livestock operations that are exempt from the prohibition of winter manure application must meet minimum setback distance requirements from sensitive areas as set out in the Livestock Manure and Mortalities Management Regulation. The required winter setback distances from watercourses, sinkholes, springs, wells and the recommended setback distances from residential property lines are provided in Table 10. Winter application on land with slopes greater than 12 per cent is not permitted.

If manure must be applied in the winter, stubble fields with adequate trash cover or perennial forage fields should be used. Surface cover reduces runoff volumes. Fields with limited access should receive manure first, leaving nearer fields for later when access is more difficult due to snow or thawing conditions.

4.6.3 Registering manure management plans

Section 13 of the Livestock Manure and Mortalities Management Regulation (Appendix B) requires that all livestock operations, 300 animal units or greater in size, register a Manure Management Plan annually. The deadline for submission is February 10 for spring applications and July 10 for fall applications. Alternatively, for a $100 fee, the operator may submit a manure management plan up to 14 days prior to application of manure. See Appendix G for the Manure Management Plan registration form or contact Manitoba Conservation.

Manitoba Agriculture, Food and Rural Initiatives has developed a computer software program that calculates manure application rates. The Manure Application Rate Calculator (MARC 2005) facilitates the preparation of manure management plans for all livestock operation types. It supports easy record keeping of nutrient management information on a field-by-field basis. The software is programmed to fill in the manure management information directly on the Manure Management Plan registration form required by Manitoba Conservation. Alternately, persons who wish to electronically file a Manure Management Plan may do so using the MMP Filer program available on Manitoba Conservation's website.

Those who prepare and certify manure management plans on behalf of livestock producers must have successfully completed a manure management planning course acceptable to the director of Manitoba Conservation and must be a member in good standing of the Manitoba Institute of Agrologists or hold the designation of Certified Crop Advisor under the international Certified Crop Advisor program of the American Society of Agronomy.

4.6.4 Soil nitrate-N limits

To reduce the risk of nitrate contamination of groundwater, for those lands receiving manure, the Livestock Manure and Mortalities Management Regulation (Appendix B) sets enforceable limits on the amount of residual soil nitrate-N and the amount of nitrate-N that can be present in the soil at any point in time. The soil nitrate-N limits apply to the top 60 cm (24 in) of soil and vary depending on the agricultural capability rating of the soil. Nitrates in excess of these values may be subject to enforcement action by Manitoba Conservation.

To ensure soil nitrate-N limits are not exceeded, the rate of manure application should not exceed the additional N required to achieve a realistic crop yield. The rate should consider the residual soil nitrate-N and the N content of the manure.

4.7 Training and Licencing of Manure Applicators

Changes to *The Pesticides and Fertilizers Control Act* were assented to in 2002. These changes will require commercial applicators that apply manure from large (300 animal units or greater) operations off-farm to be formally trained, certified and licenced. The training requirements will be established by regulation and will cover nutrient management, environmental issues associated with the application of manure, equipment calibration, spills and liability issues.

SECTION 5

Odour CONTROL

Odours are one of the main causes of conflict between livestock producers and their neighbours. In most areas, pig producers represent a minority of the population. It is essential that pig producers develop and maintain a positive image within their community. Every reasonable effort should be made to control odours. It should be the goal of all pig producers to design, construct and manage their operations in a manner that minimizes the odour experienced by their neighbours.

It is unrealistic to expect a commercial pig operation to operate without some odour. However, the odour level of a pig operation can be significantly reduced when the facilities are properly designed and operated.

Odour nuisance can be divided into four factors: frequency, intensity, duration and offensiveness (FIDO). This section outlines some methods to manage the FIDO of odours from livestock operations, and to compare their effectiveness with their advantages and disadvantages. Although some practical methods to minimize odour concerns from pig operations are described, no single practice or technique will totally eliminate odour emissions.

Odour control within and around livestock operations should not be regarded as only a public relations issue. The control of odours within the barn is also beneficial for the pigs and the people working within the barn.

5.1 Sources of Odours

Odours from pig farms are produced mainly by the decomposition of the manure by various microorganisms. The activity of the different microorganisms (which depends upon temperature, moisture content, oxygen level and other characteristics of the manure) determines the type of gases and the rate at which the gases are produced. When enough oxygen is available, manure decomposes **aerobically**, and most of the gases released have very little odour. However, when the microorganisms are deprived of oxygen, manure decomposes **anaerobically** and most of the gases released have an offensive odour. Liquid manure is stored anaerobically and often results in more odour than solid manure. Both decomposition processes, aerobic and anaerobic, can occur during the various stages of the manure management system.

The two main strategies for odour control are to:

- collect, store, and apply the manure in a way that prevents odours from forming and
- control the release of the odorous gases into the air

5.2 Human Response to Odours

Odours from livestock operations are a major concern raised by neighbours who may feel that their health is being adversely affected. People vary in their sensitivity to odours. For some, unwanted odours can be very annoying, and may also result in symptoms such as headache, nausea, eye and throat irritation, anxiety, and depression. At high levels such as directly adjacent to the manure storage structure, odours may induce acute exposure symptoms.

The keys to reducing odour complaints are proper siting of the livestock operation and good manure management. If producers follow the practices outlined in these Guidelines, there should be low risk to human health from odours.

5.2.1 Other air quality concerns

Community health risks from airborne microorganisms, dust, and other gases such as methane, ammonia, and hydrogen sulfide are generally not a concern. The barn air is diluted when it mixes with outside air resulting in negligible risk to neighbours from manure gases. As well, most dust particles are deposited within a short distance from livestock housing exhaust fans. The use of some high pressure irrigation equipment (such as the "big gun") to apply manure to land, however, should be restricted to remotely located fields because bacteria can be transported downwind of these systems.

Although community health risks due to airborne microorganisms, dust and gases from the barn are negligible, agricultural workers may be exposed to high concentrations of dusts and airborne contaminants within the livestock housing facilities. Without preventative measures, this can cause adverse health effects for workers. Good ventilation, the use of appropriate masks when performing dust generating operations and dust reduction measures can protect the health of barn workers.

5.3 Sites of Odour Production

Odours are generated in three areas:

- facilities where the animals are housed
- areas where manure is stored or treated
- fields where manure is applied for crop production.

In general, barns create continuous sources of odour because they operate year-round. Odours from outdoor manure storage facilities vary seasonally, with negligible odour release in winter months when manure is frozen. High odour levels occur during agitation and pumping of manure from the storage facilities. These activities result in infrequent and intermittent sources of odour.

Depending upon the systems used, application operations, including agitation and pumping, can create the most offensive odours. Properly designed equipment and facilities, together with the use of beneficial management practices, can significantly reduce the frequency, intensity, duration and offensiveness of the odours produced. Odour reduction strategies at the livestock facilities and during application are presented in this section.

5.4 Livestock Operation Design

The intensity and offensiveness of odours produced depends to a large extent on the design and management of the barns and storage. The majority of odours come from manure decomposition in barns. Barns that have manure covered floors and dirty animals will have more odour problems than clean barns with clean animals. A clean barn is the product of proper barn design, good management practices and healthy animals. With a properly designed and managed ventilation system, pigs will develop relatively clean manuring habits.

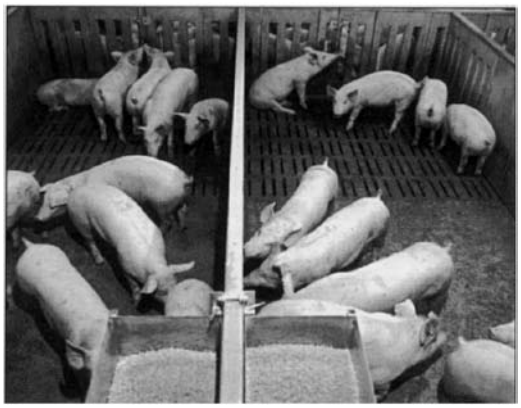
5.4.1 Manure management system

The manure handling system in the barn can affect odour production. Most barns with liquid manure systems are designed with shallow gutters under slotted sections of the pens or stalls. These are emptied when the level of manure approaches the slotted section. Odours can be reduced by removing the manure from the barn as frequently as possible. However, care must be exercised not to affect the operational aspects of the shallow gutter system. A certain depth of manure is required in order for the shallow gutter to drain properly when the plug is pulled. Also, some of the solid fraction of the manure is decomposed while it is in the gutter. The degree to which it is broken down is a function of the microbial action and the retention time. Removal of manure too frequently reduces the amount of breakdown and can result in an undesirable, accelerated accumulation of solids in the gutters.

Alternate manure handling and housing systems are available that may reduce the odour generated from pig operations. These include:

Solid/liquid separation – Much of the odour generated by liquid manure is due to the anaerobic decomposition of the solids in the manure. By separating the solids fraction from the manure, odours from the anaerobic decomposition of the liquid manure can be reduced. The solids fraction must be managed aerobically so that it does not become another source of odours. Solid/liquid separation is achieved through the use of:

- specially designed manure gutters, with the liquids continuously drained to storage and the solids scraped out of the barn each day
- mechanical screens or filters
- screw press equipment



Pig production facilities commonly use slotted floor systems to allow easier manure management

Screw press solid/liquid separator

Straw-based systems – Odours can be reduced by creating aerobic conditions for the manure. The use of straw or other bedding can maintain aerobic conditions if enough material is used. The labour requirement for material handling, however, is high.

Straw-based housing system

5.4.2 Environmental control in barns

In most pig operations, the build-up of odours in the barn can be prevented by following recommended ventilation practices and rates. Proper ventilation rates are required to remove moisture from the barn and to prevent the formation of very unpleasant "pockets of air" in the building. The ventilation system should not draw foul air from the gutter back into the housing. A professional agricultural engineer should be consulted for advice on proper ventilation system design and operation as well as the effectiveness and suitability of the technology for the operation.

Modifications of exhaust ventilation system - Attempts have been made to further reduce the odour levels of exhaust ventilation air by removing the dust from the air. Among the newer approaches to reducing dusts in pig barns, the misting of water in the air or sprinkling of vegetable oil directly onto the floor are promising approaches. Small amounts of very fine water droplets favour the collection of fine dust into larger particles which are less likely to enter the worker's respiratory tract. When using vegetable oil (canola, sunflower, etc.), the application rate must be carefully chosen to avoid slippery floor conditions for livestock and workers.

Barn air treatment - Treating air inside barns such as oil sprinkling and ozonation, can improve air quality for the workers and reduce odour released from the barns. When chemical agents are used for air treatment, the levels of these chemical agents should be monitored to ensure they are below the safe limits for the workers and livestock.

Biofilters - Biofilters are currently being researched and may be used to reduce odour from livestock barns. Biofilters consist of a bed of very porous granular material designed to allow rapid proliferation of aerobic bacteria. These bacteria thrive on the odorous compounds being exhausted from livestock housing, thereby degrading them. Wood chips, straw, peat moss, compost, coarse gravel or clay bead beds are typical examples of the main component of a biofilter. All air exhausted from the animal housing needs to be moved through the biofilter, with the biofilter operating within specific parameters. This approach is unsuitable to naturally ventilated housing since the exhaust air needs to be collected and treated within the biofilter. Two designs of biofilters can be retrofitted to livestock barns. Vertical-airflow biofilters are easy to construct, but occupy a lot of space surrounding the barn. Horizontal-airflow biofilters are more compact, but require more effort and expense to construct.

Feeding practices – Producers should ensure that their rations are properly balanced for the pigs being fed. For example, excessive protein levels can result in elevated ammonia levels and represent a wasteful expense.

Manure and feed additives - A wide variety of chemical and biological products are marketed as a means to mitigate odours for the benefit of the farm workers and the operation's neighbours. Research centres in Canada and the United States report very disappointing results with manure additives due to either low and unpredictable efficacy of the product or high costs. However, some of these additives may prove helpful in liquefying the solids in liquid manure, which would be beneficial for pumping liquid manure out of the storage structure. New developments may still yield products with merits for specific applications. It is advisable that conclusive proof from scientifically sound experiments conducted by a reputable research organization be obtained prior to investing in such products.

Manure additives may be grouped into the following five categories:

- masking agents - products that have a strong characteristic odour of their own designed to cover up (mask) the manure odour with a more desirable one
- counteractants – products that cancel or neutralize the manure odour such that the intensity of the mixture is less than that of the constituents
- digestive deodorant - bacteria or enzymes that eliminate undesirable odours through biochemical metabolic degradative processes
- adsorbents - products with a large surface area that adsorb odour compounds
- chemical deodorants - strong oxidizing agents or germicides that alter or eliminate microbial action responsible for odour production or chemically oxidize compounds that make up the odour mixture

  Recent research showed promising results for some feed additives in either improving feed digestibility by swine, implying less excretion of odour forming compounds, and/or changing the odour of fresh feces and urine. However, the latter effect often disappears when anaerobic decomposition of manure begins in the gutter or in the storage. Nevertheless, the improvement of feed digestibility, along with potentially lower odour levels in the swine housing may give an economic benefit to some of these products. Prior to being commercially available, feed additives must be registered under the federal *Feeds Act* and regulations.

5.4.3 Landscaping

Well kept grounds, attractive shelterbelts and other common landscaping features will ensure that the owner's pride in their operation will be conveyed to nearby neighbours and users of the rural roads. Well maintained livestock operation yards, surrounded by trees, are usually not the source of as many odour complaints from neighbours.

Shelterbelts – Carefully designed rows of trees or the maintenance of existing treed buffers around the perimeter of a livestock operation yard will help blend the physical facilities of the operation (buildings, yard, manure storage facility, heavy truck traffic, etc.) with the surrounding features of the local landscape. In addition to providing visual screening and a sound barrier, rows of trees may also be planted to help trap dust, minimize erosion, or reduce snow accumulation around low lying areas such as manure storage structures.

Rows of trees may help disperse odours and trap dust, however, the amount of wind porosity varies in shelterbelts with changes in height and leaf density. Therefore, there is no way to predict the impact of shelterbelts on odour. As such, there are no known design standards or recommendations specifically for odour control.

Historically, landowners have designed shelterbelts to meet their personal needs and/or improve farm efficiency. Since each farm is different, there is no simple recommendation on how to design a shelterbelt system. Although Agriculture and Agri-Food Canada's (AAFC) *Basic Shelterbelt Establishment Guidelines* can be found in Appendix J, it is essential to understand that the context and purpose of this document is to provide generic advice that can be adapted to suit individual requirements, and that it is not intended to be used as a regulatory template. The choice of the number of rows, width between rows and/or spacing between trees is as unique as each site and the landowner's reasons for planting trees. Typically, however, a three to five row shelterbelt is used.

Maintaining trees around the yard of a livestock operation is an asset

5.4.4 Setbacks from neighbours

Measures to reduce the intensity of odours that reach neighbouring properties should be taken in the planning phase for new operations when they can be located far enough from neighbours to maximize the dilution of odours. Section 6 contains recommended separation distances from livestock operations of different sizes to neighbouring residences. Whenever practical, the siting of the operation should also consider the prevailing wind direction to reduce the frequency of odours transported to the closest neighbours. Abiding by these recommendations will minimize the odour frequency and intensity in most situations. However, certain landscape features can concentrate odours in an undesirable direction. Producers should check with their local municipalities to determine what distances may be required under local planning regulations. The province also encourages local governments to ensure that incompatible land uses do not encroach on livestock operations.

5.5 Storage Odour Control

Manure is a valuable source of plant nutrients. Due to the cold climate in Manitoba, manure must be stored until such time as it can be applied to soil for optimum crop production. This requires storage during winter months. Manure that is stored in deep manure storage structures (three to five metres) undergoes anaerobic decomposition and can be the origin of significant nuisance odours when the gases are released into the air. Enclosed concrete structures and open manure storage structures that develop a crust on the surface reduce the release of odorous gases.

The most common type of liquid manure storage structure is the earthen manure storage structure. The manure in these structures is anaerobic and the large exposed surface area may permit increased quantities of odorous gases to be released. Also a significant release of odours may occur in the spring when the surface thaws and manure warms.

A significant advantage of earthen manure storage structures is that they are often designed with sufficient volume to only require emptying and application once per year. The more expensive concrete structures are often constructed with a smaller storage volume, requiring both spring and fall emptying. Agitation of the manure during the emptying operation releases significant odours. Therefore, reducing the number of times the manure storage is agitated and the manure is applied will decrease the frequency that neighbours experience unpleasant odours from these activities.

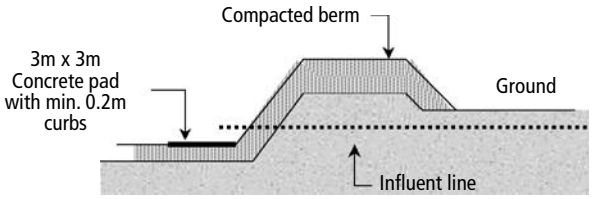
The agitation required to pump solids out of the storage structure releases considerable odours

In addition to maintaining maximum practical separation distances between storage structures and neighbours, several approaches have been used to help control odours from open storages. These include:

- transferring the manure from the barn to the storage with a bottom loading transfer pipe
- planting shelterbelts around open storages
- using covers to prevent the movement of air over the surface of the manure and the release of gases
- aerating the manure in the storage so that the decomposition changes from an anaerobic to aerobic process

Separation Distances - Odours naturally disperse in the air around the storage structure. Under normal climatic conditions, large separation distances between the storage and residences dilute the odours and reduce their impact on neighbours. When planning a new operation, providing adequate separation distances between the closest neighbors and a manure storage structure and, if possible, siting the storage so that predominant spring, summer, and fall winds blow odours away from them, are very good ways to prevent future nuisance problems. Since larger storage structures have a larger surface area for odour emissions, separation distances must be greater for larger operations. Section 6 lists minimum separation distances recommended for siting manure storage structures. Local municipalities may also have specific requirements for separation distances.

Bottom loading of the manure storage – Pumping manure from the barn into the manure storage under the manure surface minimizes turbulence of the manure and the release of odorous gases. Bottom loading of the manure storage requires that a few additional components be added to the manure handling system.



Representation of a bottom loading inlet to transfer liquid manure from the housing to the storage

Shelterbelts – Shelterbelts may help disperse and dilute odours from the manure storage structure. Rows of trees around the manure storage also improve the appearance of the operation (see Appendix J).

Storage covers – Liquid manure storage covers control odour effectively by creating a physical barrier between the manure surface and the air, thus reducing gas and odour emissions. There are many types of covers available including positively pressurized synthetic covers, negatively pressurized floating synthetic covers, non-pressurized floating synthetic covers, straw, and geotextile woven covers. When choosing a cover, cost, odour reduction, durability, and ease of installation and emptying should be considered.

The most commonly used covers are straw and synthetic covers. A straw cover involves applying straw uniformly, typically 20-25 cm (8-10 in) thick with a special blower. When good quality straw is properly applied, the straw cover can last up to five or six months. Poor quality straw, insufficient coverage depth, or significant rainfall events can result in the cover lasting as little as one month. If a straw cover starts to break or sink, additional straw should be applied. Typically, barley straw is used because it floats better and lasts longer than other straw.

Difficulty during the pump-out of straw-covered earthen storages has been a concern. However, plugging of pumps or outlet nozzles on transport tankers are rare and can be generally attributed to insufficient agitation. Directing the agitator nozzle to large straw clumps and having an agitator with chopper blades mounted on the end of the pump to help break up and shred straw clumps helps to create a homogeneous product that can be pumped more easily.

Synthetic cover on an earthen manure storage in Manitoba

Straw cover on an earthen manure storage in Manitoba

Synthetic covers have a high capital cost, but they may last up to ten years. Synthetic covers are made of high-density polyethylene that floats on top of the storage. On earthen manure storage structures, the edges of the cover are anchored at the top of the dike by laying the plastic into an excavated trench and refilling the trench with the excavated soil. Precipitation, which remains on the top of the cover, helps hold the cover in place. Excess water on top of a non-permeable cover should be removed with a small pump. Negative pressure synthetic cover systems use an exhaust system to hold down the cover and remove manure gases that are trapped under the cover. Agitation of the manure necessitates removal of the cover and reinstallation after cleanout.

Storage aeration – Theoretically, aeration of a liquid manure storage structure should change the decomposition process from anaerobic to aerobic and reduce unpleasant odours. Manitoba winters and the high costs associated with equipment and operation have prevented the widespread use of aeration as a means of controlling storage odours. Aeration and other methods of treatment are discussed in greater detail in Appendix D.

5.6 Odour Control with Manure Application

Odours from the application of manure can be a major concern for neighbours of livestock operations. Although manure is often applied on fields only once or twice a year, it can cause odours that may last for a few days. Producers must be considerate of their neighbours when choosing application techniques and planning their annual manure application.

5.6.1 Equipment selection

The amount of odour released during manure application depends on the exposure of the manure to the atmosphere. The less manure is exposed to the air, the fewer odours are emitted. The application equipment used will determine the amount of odours released. More careful timing and field selection are necessary when the application equipment creates increased odours. For liquid manure, the most effective means of odour control during application is direct soil injection. When manure is injected, nutrient loss and runoff are minimized.

There are two types of direct injection systems. One system consists of injectors mounted on conventional manure tankers. The other system is the pipeline or draghose injection system, where a tractor powered implement, connected by a long flexible hose to a pump and irrigation

Draghose or pipeline injector for liquid manure

Tanker system used for applying manure

pipeline, injects the manure into the soil. The latter system combines the time saving features of an irrigation system with the benefits of direct injection.

For forage crops and direct seeding systems, low disturbance, disk-type injectors have the ability to inject large volumes of liquid pig manure with very little residue or soil disturbance. High disturbance shank-type injectors, using sweeps or spikes, create considerable soil and residue disturbance. However, they may produce less odour than the low disturbance injectors. Both types of injectors should provide acceptable liquid placement at generally practiced rates of manure application. Another type of low disturbance applicator has a series of knives mounted on an axle which penetrate the soil creating a soil aeration effect. Liquid manure is delivered through a drop hose behind or in front of each knife set and into the holes. This low disturbance applicator is an excellent tool for minimum till, zero till applications, or forage fields as it allows for immediate infiltration of the manure into the soil while greatly reducing the odour versus surface application.

Low disturbance type applicator system

Manure tankers for broadcasting manure are often used to apply liquid manure to land. The potential for odours is greater with broadcast manure tankers than with injection systems or low-level applicators as the manure is discharged into the air during application. Liquid manure tankers typically hold 6,000 to 45,500 L (1,300 to 10,000 imp. gal) and have a low to moderate capital cost, depending on the application options and axle configuration. One disadvantage of liquid manure tankers is the amount of time required to apply the manure. Even when fields are near the storage, a large part of the time is spent traveling back and forth. Another disadvantage is the potential for soil compaction that occurs when transporting heavy loads over moist soil. High floatation tires should be used to reduce soil compaction. Heavy truck tires and used airplane tires should be avoided, as they limit floatation and may induce severe compaction.

Low-level manure applicators and dribble-bar systems, that direct manure toward the ground, reduce odours considerably during application by reducing the exposure of the manure to the air during application. When used on a growing crop, dribble bars deposit manure directly on the soil beneath the crop canopy. Fewer odours are released following application using low level application systems than with broadcast applicators.

Incorporation of manure, whether in liquid or solid form, on the same day as application can reduce odours neighbours encounter following application (see Table 11). When manure is incorporated into the soil very soon after application both nutrient loss to the atmosphere and runoff are minimized and nutrient retention for

crop use is maximized. Each day that passes without incorporation increases the risk of potential runoff and for nuisance to neighbours.

Stationary or traveling irrigation equipment, can be used to apply liquid manure. Irrigation equipment saves a great deal of labour, however, it has the potential to create the greatest odour nuisance (see Table 11). Unless the manure is applied on isolated fields under normal circumstances, irrigation equipment should not be used because it results in the uneven application and creates the greatest odour nuisance.

The success of any application method depends largely upon the abilities of the operator. With proper management, each system should be used in a manner that prevents pollution, minimizes odour nuisance and applies manure at a rate that matches the crop requirements.

Table 11: Recommended Distances From Residential Areas, Residences And Property Lines For Applying Manure [1] (m)

Application method	Odour suppression	Designated residential area	Residence	Property line with residence	Property line without residence
Irrigation	None	1600	300	15	1
Surface applied, no incorporation	Moderate to none	800	150	10	1
Surface applied, incorporated within 48 hours	Good	400	75	10	1
Injection	Maximum	75	15	3	1

[1] See Appendix C for imperial units.

5.6.2 Consideration for neighbours

Neighbours are less likely to complain if they understand the problems of odour control and see that a genuine effort is being made by the producer to minimize the odours. Maintaining good communication with neighbours is important in avoiding conflicts. Most people will recognize good intentions and will not have unreasonable expectations.

The following points should be considered as part of the preparation steps for the annual manure application operation:

- inform your neighbours ahead of time of your intentions to apply manure and attempt to accommodate them by applying at times when odours are least likely to be a problem

- avoid applying manure immediately before or during weekends and holidays when neighbours are more likely to be outdoors
- incorporate manure as soon after broadcast or irrigation application as practically possible
- consider injection for fields near residences
- use fields with windbreaks or shelterbelts that mix and dilute the odours

When applying manure, maintain setbacks that are reasonable for the type of equipment used. Table 11 should be used as a guideline for manure application setback distances from residential areas, residences and property lines.

These minimum distances are designed to minimize odour nuisances to neighbours and should be used in conjunction with good management practices. Each application method should be optimized for particular conditions to achieve maximum odour suppression.

5.6.3 Weather conditions

The capacity of the manure storage will determine how often manure must be applied. The storage should be large enough to permit some flexibility in timing application. Application should also occur at an optimal time for crop uptake of the manure nutrients. The storage size should allow the producer to avoid unsuitable weather and poor field conditions. See Section 3.4.3 for information on sizing a manure storage structure.

There are a number of odour mitigating factors to consider when deciding on where and when to apply manure.

- Weather conditions: Manure applied in cool or cold weather will create less odour than applying in warm weather. On calm, humid days, rapid drying of the manure and dilution of the odours will not occur and a gentle breeze may carry undiluted odours toward neighbours.
- Wind and direction. Caution must be used to avoid situations where winds will carry odours directly toward neighbours.
- Location of fields. Preference should be given to sites furthest away from neighbours.

5.7 Odour Control Plan

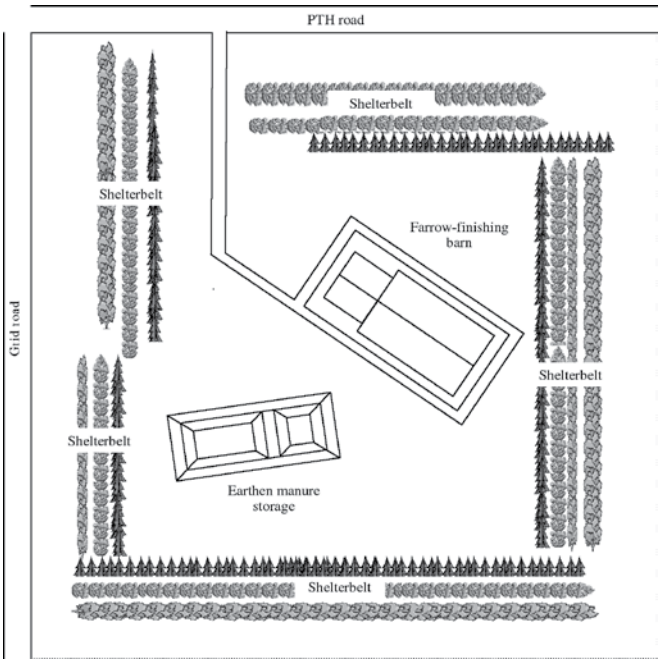
Determining the source of odours impacting a neighbour may not be an easy task. The frequency, intensity, duration and offensiveness of odours from each source should be considered and an odour abatement plan developed for the most probable source of odour or nuisance concerns. The odour abatement plan should include the most appropriate actions and technologies to remedy the odour problem. Advice from Manitoba Agriculture, Food and Rural Initiatives may be beneficial when developing an odour abatement plan.

When considering air treatment systems or manure and feed additives, advice from independent sources, such as the University of Manitoba or Manitoba Agriculture, Food and Rural Initiatives should be obtained on the product's safety, efficacy and on the most recent research results.

SECTION 6

Site SELECTION

When planning a pig operation, the selection of the site is critical in the planning stage. There are many factors that must be considered when choosing a site. The location of the facilities in relation to property lines, neighbours and rural residential developments can have a significant affect on potential nuisance issues and future expansion plans. As explained in Section 5, greater separation distances tend to reduce nuisance complaints.



Planning the yard design to include tree rows is a good idea

6.1 Setback of Facilities from Physical Features

A minimum setback of 50 m from housing structures (excluding hoop shelters) to property lines is required (Table 12). The Livestock Manure and Mortalities Management Regulation requires that all new manure storage structures and confined livestock areas, such as hoop shelters and feedlots be located at least 100 m from property boundaries (Table 12), watercourses, sinkholes and wells.

Power and gas lines should be located to avoid damage when digging, excavating or driving stakes into the ground. Verify that there are no Rights of Way on your site that authorize the use of a piece of public land for specific purposes for a specified period of time.

The location of buildings, structures, fences, plantings and the establishment of various enterprises adjacent to provincial roads and highways are regulated by Manitoba Transportation and Government Services. Access to provincial highways and the discharge of surface runoff into highway ditches is also controlled by Manitoba Transportation and Government Services.

In general, the construction of buildings, structures and fences or the planting of trees within 38 to 76 m (125 to 250 ft) of certain provincial highways or within 152 m (500 ft) of major highway intersections requires a permit from Manitoba Transportation and Government Services. These distances can vary from one

highway to another and at different intersections, so it is important to contact Manitoba Transportation and Government Services early in the planning stages.

6.1.1 Separation between livestock operations

Careful consideration must be given to the presence of other livestock operations when selecting a site for a new operation. Adequate separation from other livestock operations raising the same species is recommended to prevent the spread of livestock diseases.

Animal diseases can be transported by natural vectors, such as rodents and birds. This complicates the establishment of specific separation distances between livestock operations. However, the further a new operation is from other operations of the same type, the lower the risk will be of transmitting a disease. Other preventative measures, such as setting up a bio-security program and ensuring proper pest control, are as important as providing adequate separation distances.

6.2 Setbacks and Other Steps to Avoid Conflicts

Agricultural operations are a source of traffic, noise, dust and odours. One of the key elements to successful siting of a livestock operation is to observe appropriate separation distances between potentially conflicting land uses. This is particularly important for the effective dispersion and dilution of odours from pig production facilities.

When deciding where to build a new livestock operation, it is best to choose a site with as few neighbours as possible. Table 13 provides recommendations for the maximum number of residences, not including that of the operator, within a 1.6 km radius of various sizes of operations. The maximum number of residences within a 1.6 km radius of an operation applies to new operations only. If the number of residences exceeds the number in Table 13, an alternate site should be considered.

Table 13 also provides minimum separation distances from new and expanding livestock operations to single residences and designated residential areas. Greater separation distances are required as the size of the operation increases. Greater separation distances are also recommended for earthen manure storages as

Table 12: Setbacks[1,2] From Property Lines, Watercourses, Sinkholes And Wells

Recommended	To animal housing structure (excluding hoop shelters)	50 m
Required	To confined areas including hoop shelters and feedlots	100 m
	To manure storage structures[3]	100 m

[1] Agencies such as Manitoba Hydro or the local government may have requirements in addition to these.

[2] See Appendix C for imperial units.

[3] Requirement of the Livestock Manure and Mortalities Management Regulation – see Appendix B.

compared to other storage types and livestock housing. The Provincial Land Use Policies Regulation has incorporated the separation distances in Table 13 as minimum standards that are to be adopted in the zoning by-law, but municipalities may require greater separation distances. Table 14 illustrates the relationship between various types and sizes of pig operations and their animal unit (A.U.) equivalents. When a municipal council considers an application for a livestock operation development permit, the council will determine whether the proposal meets the zoning by-law's siting criteria. Contact your local Rural Municipality for the most recent setbacks.

6.2.1 Using the landscape

Other factors to consider when selecting a site are trees, windbreaks, prevailing wind direction and air movement. Air drainage can cause odour to drift downslope.

Multiple benefits can be derived from the proper use of naturally treed areas. Treed buffers and shelterbelts can effectively reduce and disperse odours from a site (see Section 5.4.3). The image conveyed by a well landscaped and maintained livestock operation can reduce odour complaints from neighbours. As much as possible, livestock facilities should be blended into the landscape and natural vegetative buffers should be preserved.

Benefits from the existing topography should be incorporated when planning the facilities. Some slopes can be an asset for the manure handling system. For example, by using the

Table 13: Recommended Criteria For Siting Livestock Operations

Animal Units[1] (A.U.)	Maximum Number of Residences[2] Within 1.6 km	Minimum Distance[3] (m)			
		From Single Residence		From Designated[4] Residential or Recreational Area	
		To Earthen Storage	To Buildings[5]	To Earthen Storage	To Buildings
10 - 100	18	200	100	800	530
101 - 200	16	300	150	1200	800
201-300	15	400	200	1600	1070
301 - 400	14	450	225	1800	1200
401 - 800	12	500	250	2000	1330
801 -1600	10	600	300	2400	1600
1601 - 3200	8	700	350	2800	1870
3201 - 6400	6	800	400	3200	2130
6401 - 12800	4	900	450	3600	2400
12801 and greater	2	1000	500	4000	2670

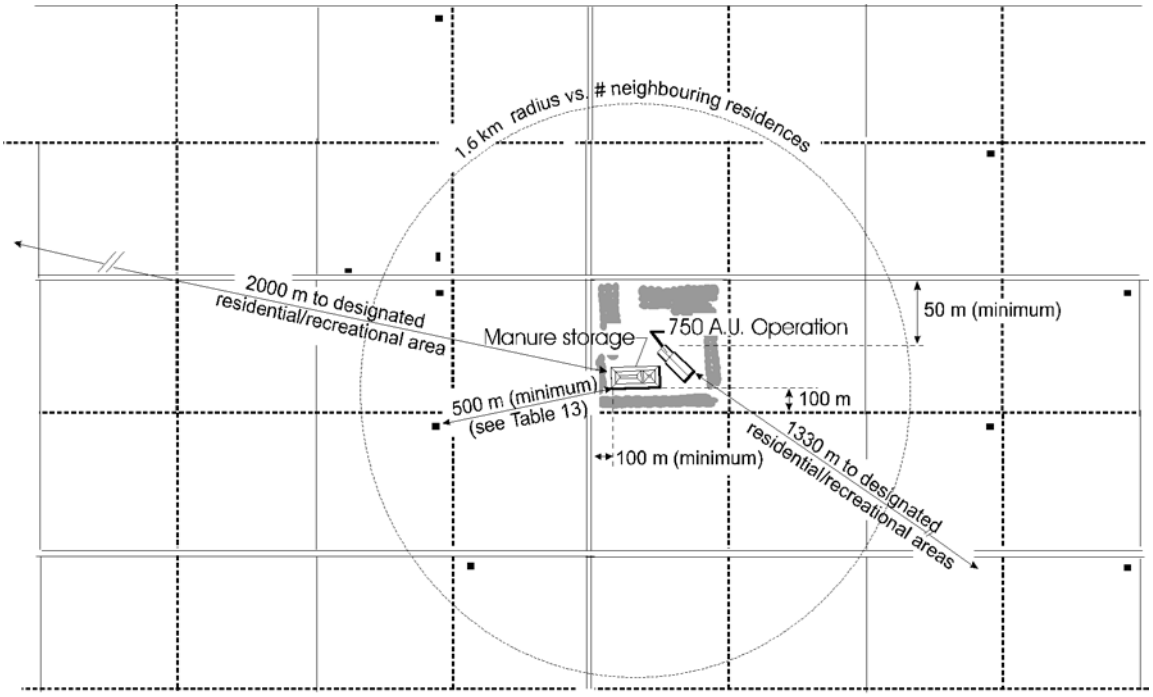
[1] Refer to Table 14 for number of animals.

[2] Number of residences within 1.6 km (one mile) of the center of the facility applies only to new facilities. Expansions of existing facilities and the proponent's residence are excluded.

[3] These separation distances apply to new and expanding operations; see Appendix C for imperial units.

[4] Officially designated areas in a development plan or basic planning statement.

[5] The distance to buildings includes barns and non-earthen manure storages such as above or below grade structures which may be covered or uncovered.



The planning process must take in account setbacks from a number of physical features (setbacks shown refer to Table 13)

Table 14: Converting Number Of Animals To Animal Units

Animal Units[1] (A.U.)	Barn Capacity or Animal Places				
	Sows, Farrow-Finish (110 – 115 kg)[2]	Sows, Farrow-Weanling (5 kg)[2]	Sows, Farrow-Nursery (23 kg)[2]	Weanlings (5 – 23 kg)[2]	Grower/Finishers (23 – 113 kg)[2]
10 - 100	8 - 80	32 – 319	40 – 400	303 – 3030	70 – 699
101 – 200	81 – 160	323 – 639	404 – 800	3061 – 6061	706 – 1399
201 – 300	161 – 240	642 – 958	804 – 1200	6091 – 9091	1406 – 2098
301 – 400	241 – 320	962 – 1278	1204 – 1600	9121– 12121	2105 – 2797
401 – 800	321 – 640	1281 – 2556	1604 – 3200	12152 – 24242	2804 – 5594
801 - 1600	641 – 1280	2559 – 5112	3204 – 6400	24273 – 48485	5601 – 11189
1601 – 3200	1281 – 2560	5115 – 10224	6404 – 12800	48515 – 96970	11196 – 22378
3201 – 6400	2561 – 5120	10227 – 20447	12804 – 25600	97000 – 193939	22385 – 44755
6401 – 12800	5121 – 10240	20450 – 40895	25604 – 51200	193970 – 387879	44762 – 89510
12801 and greater	10241 and greater	40898 and greater	51204 and greater	387909 and greater	89517 and greater

[1] Refer to Appendix I for definition of Animal Unit.

[2] Based on live weight.

slope, manure can be moved to the storage by gravity rather than pumps. Also, if attention is paid to existing yard elevations, potential savings in earth moving for driveways and building pads may be possible.

Wind can carry odour to neighbours. Prevailing winds, however, can vary between seasons. Since summer is the time when odours are more intense and neighbours are outdoors more often, the direction of the prevailing winds during the summer should be considered. Siting the operation so that summer prevailing winds are away from neighbours can minimize the number of times neighbours are exposed to odours.

During calm, summer evenings, the air near the ground will be cooled and drift down a slope; this is known as air drainage. In much of Manitoba, the land is fairly flat, so air drainage is not a major concern. However, if an operation is planned where a neighbour's residence is in a down slope direction, then the odour nuisance potential increases. As the air passes the pig operation, it will pick up odours which can create a problem. This phenomenon may occur frequently during calm summer evenings, just at the time when most people like to be outdoors.

6.3 Avoiding Contamination of Wells

Livestock facilities should be located to maximize the setback to water supply wells. This is particularly important with field storage or earthen manure storage structures where groundwater is obtained from shallow wells or where bedrock is found close to ground surface.

Manure storage structures must be constructed at least 100 m from wells. Setbacks from other sources of water as required by the Livestock Manure and Mortalities Management Regulation (Appendix B) are provided in Table 2 (Section 3).

Wells should be located and constructed to protect water quality over the long-term. They should be located up slope from manure storage structures and in areas isolated from vehicle traffic, livestock transport and handling areas and site activities. All wells should be constructed and maintained in a manner which will prevent water and/or contaminants from entering the well. All construction work should be completed by qualified and experienced people familiar with water well construction and proper well head protection. The following construction and maintenance practices should be used:

- grouting the annular space outside the casing with cement or bentonite where appropriate
- providing drainage away from the well
- extending the well casing adequately above grade (at least 0.30 to 0.45 m)
- using a watertight, vermin-resistant and properly sized well cap
- ensuring the well vent opening on the well cap is properly screened and clear of debris
- using a proper pitless unit or adapter to provide a sanitary hook-up of water lines
- in unprotected flood-prone areas, using a check valve type of air vent and conduit cable seal
- sealing old wells that are no longer in use as per Manitoba Water Stewardship guidelines

6.4 Environmental Considerations for Siting

The geological and hydrogeological features specific to a site may warrant particular construction requirements for the facilities. When choosing a site for a livestock operation, it is important to investigate these aspects.

6.4.1 Siting of manure storage structures

When planning an earthen manure storage, the suitability of potential sites must be evaluated using information on subsurface materials and the presence of aquifers. This information can be obtained from existing soils and geological or hydrogeolgical maps or by examining water well logs which are available from Manitoba Water Stewardship. In all cases, some exploratory drilling will be required to verify the geological and hydrogeological conditions beneath the planned storage. Earthen manure storage structures may not be suitable or they may have to be lined with a clay or synthetic liner at sites where an aquifer is shallow. Monitoring wells would likely also be required. In areas with complex geology or hydrogeology, specialized testing may also be required to evaluate site conditions. Please refer to Manitoba Conservation's website for more information.

6.4.2 Considerations for application of livestock manure

The suitability of all fields identified for manure applications should be assessed. Manure that is to be applied must be applied as a fertilizer for crop production. Manure application rates should be based on the nutrient requirements or removal capabilities of the crop. The crop's ability to use nutrients depends on its yield potential. This is determined by the agriculture capability of the soil, weather conditions and management practices.

The fields identified for manure application can be assessed using the Canada Land Inventory Soil Capability Classification for Agriculture. For new operations, the Livestock Manure and Mortalities Management Regulation prohibits manure application on soils with agriculture capability classifications of Class 6, 7 and unimproved organics. These soils are considered unsuitable for manure applications and are equivalent to Zone 4 soils under Manitoba Water Stewardship's proposed regulation defining Water Quality Management Zones for Nutrients. Information on the Canada Land Inventory Soil Capability Classification for Agriculture is available from Manitoba Agriculture, Food and Rural Initiatives.

Areas where the subsoil consists of coarse granular materials such as gravel or sand and gravel, as well as where bedrock aquifers are found close to ground surface, may be unsuitable for livestock manure application. In areas where limestone and dolomite bedrock is close to the surface, potential fields for application should be carefully examined to determine if sinkhole features are present.

6.5 Water Resource Availability

An approval and/or a licence may be required under *The Water Rights Act* to withdraw water from a surface or groundwater source (see Section 2). *The Water Rights Act* requires a licence for surface water or groundwater withdrawals that exceed 25,000 Litres per day (5,500 imp. gal/day).

Sources, availability and quality of water should be evaluated during the early planning stages. In some parts of the province the required volumes may be difficult to obtain. If surface water is being considered, ensure that the source, if it is a stream, flows at all times of the year and that the required amount of water is available for extraction. If considering a groundwater source, determine whether the aquifer is capable of producing the volume of water required. Information on groundwater availability can be obtained from Manitoba Water Stewardship. In some cases, test drilling may be required to determine if an aquifer is present and could provide the required amount of water. The quality of the groundwater should also be determined. In some parts of the province, groundwater is sufficiently saline, or contains high concentrations of some constituents, that may limit its quality or suitability for livestock watering purposes. All producers are encouraged to have their well water sampled and analyzed prior to introducing livestock to their new or expanding operation. This will establish a benchmark or baseline which can be used to evaluate water quality changes over time as well as to address allegations of impacts from the operation. Although producers with 300 or more animal units are required by the Livestock Manure and Mortalities Management Regulation to submit results of their well testing annually, all producers are encouraged to monitor their well water quality regularly to ensure that their livestock are being provided with water suitable for drinking.

6.6 Professional Support

Since every situation is unique, each site should be evaluated with the assistance of a land use planner for the area, a geoscientist or an agricultural engineer registered with the Association of Professional Engineers and Geoscientists of Manitoba, a Professional Agrologist and a Certified Crop Advisor.

SECTION 7

Mortality DISPOSAL

Disposal of dead livestock must be in accordance with Section 15 of the Livestock Manure and Mortalities Management Regulation (Appendix B). This regulation specifies that mortalities must be kept in a secure storage room, covered container or secure location and continually frozen or refrigerated if not disposed of within 48 hours after death. They must be stored in a location that prevents access by scavenger animals such as coyotes, wolves, dogs or birds. Acceptable methods of disposal include delivery to a rendering plant, burial, composting or incineration.

7.1 Rendering

Rendering is the ideal method of disposal for dead pigs. However, if a rendering plant is not nearby, the time and expense for traveling may make delivery impractical for small mortality numbers.

Container for temporary storage of mortalities.

Rendering companies may have restrictions on the condition of the mortalities they process. In general, the mortalities should be brought in as quickly as possible in the summer time. Pigs that die during the winter can be frozen and delivered to the rendering plant at periodic, convenient intervals. Rendering companies will generally not accept mortalities that do not remain intact when handled. Depending upon the end product of the rendering process, there may be other restrictions on mortality quality and condition.

7.2 Burial

Burial is an acceptable method for dead animal disposal under certain circumstances. Small operations (less than 300 A.U.) are allowed to bury routine mortalities, however, operations with 300 or more A.U. are not permitted to bury mortalities on the operation's property without written approval from the director of Manitoba Conservation.

Caution is required when selecting a burial site. The site should be at least 100 m (328 ft) from any surface watercourse, sinkhole, spring or well, property boundary, and any source of water used for domestic purposes. Areas with high groundwater levels or shallow aquifers must be avoided.

Dead pigs can be placed in a trench which is backfilled each time a mortality is added. Mortalities must be covered with a minimum one metre (3 ft) of soil. It should be noted that, depending on soil conditions, decomposition can be very slow with mortalities remaining intact for five years or more.

During the winter, mortalities must be stored in a secure location (such as a covered trailer) where they are frozen and protected from scavengers until burial is possible in the spring. If left unprotected, scavengers will drag the mortalities around, creating both a nuisance and a possible health hazard. For piglets, it may be practical to store the mortalities in a designated freezer until the numbers are sufficient to justify burial.

7.3 Composting

Composting is becoming an increasingly popular method of disposing of dead animals. Mortality composting is a controlled process in which bacteria, fungi, and other microorganisms convert the dead animals and organic material into a stable humus-like product through both aerobic and anaerobic decomposition.

There are two phases with mortality composting. In the primary phase, mortalities that are high in nitrogen are surrounded with a bulking material high in carbon such as sawdust, straw or wood chips. During this phase anaerobic microorganisms work to decompose the mortalities releasing fluids and gases. The material surrounding the mortality is aerobic. When the fluids and gases enter the aerobic zone, aerobic microorganisms break them down into carbon dioxide and water. Temperatures in the primary phase should reach above 40°C for at least seven consecutive days. Once the temperature in the pile drops continuously for 10 to 14 days, the primary phase is completed and it is time to turn the pile.

The secondary phase of the process involves turning the pile regularly to introduce oxygen and increase aerobic activity. Large bones and hair remaining from the primary phase decompose during the secondary phase. The pile should be turned once a week to maximize aerobic activity. This increase in microbial activity will cause the temperature in the pile to rise again. The compost is finished and ready for storing or applying on the field when the temperature of the pile has dropped to the outside air temperature, which indicates that bacterial decomposition is complete.

During the primary and secondary phases of mortality composting, the volume and weight of the pile is reduced due to the loss of carbon dioxide and water to the atmosphere. The bulky raw materials should be transformed into a crumbly, finer-textured compost. Properly finished compost should appear as a dark, granular material resembling humus or potting soil. It may have a slightly musty odour. Some resistant materials (bones, skull parts, teeth) may be visible, but they should be soft and crumble easily.

The amount of time required to complete the entire composting process will depend on the type of bulking agent, temperature, moisture, management and mortality size. Normally, the secondary stage of composting will take roughly the same length of time as the primary phase. Turning the pile frequently to maintain aerobic activity should reduce the time required for the secondary phase.

Once the compost process is finished, the compost can be used as an inoculant to quick start a new compost pile or applied to fields. If the finished compost is applied to fields, it should be tested to determine the nutrient content and applied at a rate beneficial to the soil.

Composting piles must be sited, designed and managed so they do not cause pollution and are secure from scavengers. Composting sites should be located at least 100 m (328 ft) away from any surface watercourse, sinkhole, spring or well, property boundary, and any source of water used for domestic purposes. When locating the composting site, the farm residence and any

neighbouring residences should be taken into consideration. Proper composting should not result in offensive odours. However, the handling of mortalities and compost on a daily basis may not be aesthetically pleasing. The following factors should be considered when planning the composting site:

- traffic patterns required to move dead pigs to composting site
- soil type - some soil types (sand, gravel) will require a clay or asphalt liner
- drainage of the site - a well-drained site that is not subject to runoff or ponding water and is accessible all season
- wind direction
- aesthetics
- future expansion

7.3.1 Windrow or static composting

Windrow or static composting piles are commonly used in Manitoba. They are less costly than other composting structures, such as bin or in-vessel composting units. However, they require more management, since weather conditions that affect composting can not be controlled.

7.3.2 Bin composting

There are many different types of composting bins that can be used for composting mortalities. They may be constructed with wood, concrete or straw bales. Hoop structures and altered machine sheds can also be used for bin composting. A bin system usually consists of at least two primary bins and one secondary bin, along with a roofing system to help control moisture levels. An asphalt or concrete pad with a 10 to 15 cm (4 to 6 in) curb to prevent leaching may be required in areas with readily permeable soils such as sands. Each bin must be wide enough to allow access with a front-end or skid-steer loader and tall enough to accommodate up to 1.8 m (6 ft) of material.

7.3.3 In-vessel composting

An in-vessel mortality composter is usually a container such as a drum or silo. It is aesthetically pleasing and is ideal for farms with space constraints. Batches of materials are enclosed in the container and mechanically mixed on a regular basis. This frequent mixing introduces more oxygen to the composting process, which increase the breakdown of the material and as a result, reduces the time of the primary composting phase. With an in-vessel system, the operator is able to control the composting environment, regardless of outdoor weather conditions.

Multi-bin composting system

In-vessel composting system

7.4 Incineration

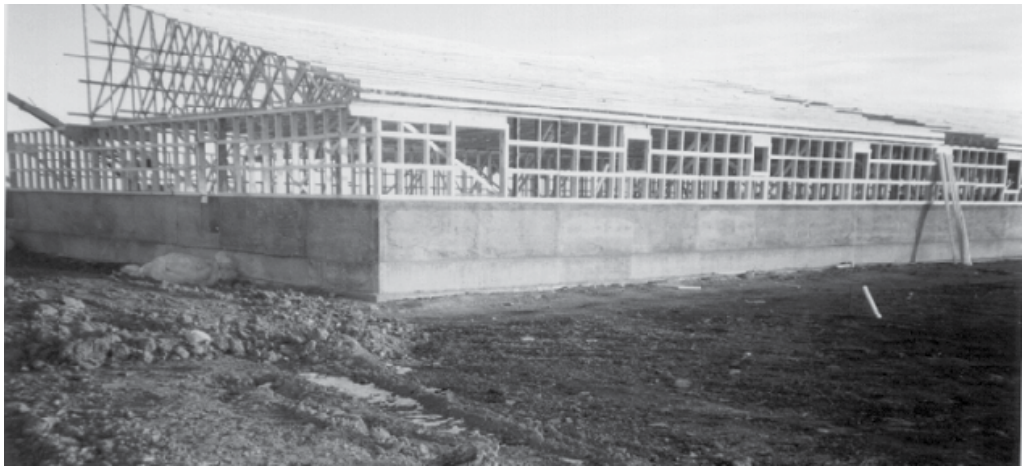
Incineration is an acceptable method of disposal if performed in accordance with the Incinerators Regulation or using an incinerator that is acceptable to Manitoba Conservation. For mortalities to be burned without creating an odour problem, the temperature of the incinerator must be sufficiently high. Incineration requires a large amount of energy to completely cremate mortalities.

7.5 Disposal of Mass Mortalities

In the case of mass mortalities from events such as a barn fire or a disease outbreak, operators should contact their local Environment Officer for instructions on appropriate disposal. If there is a suspected animal health issue, operators should work with their veterinarian to determine how to deal with the situation.

SECTION 8

Preparing a Livestock Operation
PROPOSAL



8.1 Public Relations

Rural residents often have questions and concerns about proposed developments in their communities. They want to know the potential impacts and benefits of livestock operations. The establishment of a new livestock operation is increasingly dependent on the proponent's ability to build public understanding and support. A participatory planning process can provide those who may be affected by the proposal some input in the process. This can build local understanding and support for a project. Open discussion between the project proponent and future neighbours is the first positive step in the communication process. Giving the neighbours a chance to participate can build acceptance, understanding and trust, and may result in changes that improve the project.

8.1.1 Public consultation process

There are a number of tools available to build public understanding and support for a proposal. Depending on the specifics of the planned operation, such as size and location, some or all of the following activities may be appropriate:

- Community Profile: Assess the benefits your project will have on the local community. Who are the people who are likely to have a direct interest in your project? Will local businesses service your project? Will there be employment opportunities? Will tax rolls benefit? Will roads be serviced?

- Neighbours: Assess and address the concerns of neighbours. Do your neighbours feel they will be affected? Will special interest groups or nearby home owners oppose the project? Make a list of the various public groups and their perspectives and concerns. Design an approach for addressing the concerns of each group.

- Personal Contact: Ask for neighbours' opinions on your proposed plan. Acknowledge their concerns and discuss possible solutions. Provide more information to address the concerns, where appropriate and practical, alter plans to accommodate concerns. Provide informative pictures, videos or field trips to similar operations to help your neighbours understand the project.

- Feedback: A large number of people can be contacted through a mail-out or newspaper announcement. Including a response form in the mail-out provides residents the opportunity to provide feedback. Be sure to ask the respondents to identify themselves so you can address their concerns directly.

- Open House: An open house is a positive way to educate the public about the project and provide them with the opportunity to express their concerns. Proponents should prepare posters that describe their project including a timetable which outlines projected completion dates for various aspects of the proposal. Information that demonstrates that the project meets all government regulations should be provided. This includes municipal by-laws and provincial requirements under various acts and regulations (refer to Section 2). Staff from the various government agencies should also be available to answer questions. The open house also provides an opportunity to show that the project meets the minimum suggested criteria in the Farm Practices Guidelines. An open house can be held in a local hall. Hours should be convenient and allow people to come and go at their leisure. Ample time for the public consultation process must be ensured and adequate staff should be available to answer the public's questions. Finally, questionnaires should be available to facilitate feedback. Visitors should be encouraged to fill out the questionnaires, leaving phone numbers so follow-up calls can be made.

- Planning Workshop: Bringing together representatives of concerned groups (such as citizen groups and special interest groups), staff from relevant government departments and the project proponents may be a way to address concerns and find alternatives. This approach requires a skilled workshop leader or facilitator and may be more successful when a broad base of people will benefit from the proposal. Check with the local municipality office to see if they would provide a facilitator.

- Reference Centre: Make a place available, such as the municipal office or library, where technical documents related to the project are available to the public. This demonstrates openness and may help to prevent misinformation. The documents to provide may include: blueprints, artist sketches, technical data such as well logs, aquifer locations or other technical reports.

- Communication: Keep interested parties up-to-date on project developments so they are not surprised by any changes.

8.2 Site Assessment

The objective of the site assessment is to determine the suitability of a proposed site for the intended purpose and to determine the engineering requirements that ensure the project is environmentally and structurally sound. Soil suitability for manure application and for manure storage and building construction should be determined. Other factors, including topography and drainage, wind direction, water availability, distance to neighbouring residences, and access to suitable road and power should be considered. A proposed site will need to meet the local and provincial planning and permitting requirements as well as any bio-security setbacks from other livestock facilities. For intensive livestock operations, the engineering requirements for the manure storage depend on the results of site-specific exploration.

There are six main steps to a site assessment process:

1. Identify potential sites.

2. Conduct a preliminary evaluation, including a review of existing available information such as topography, drill logs, soil maps, unique design requirements, etc.

3. Develop a site investigation plan, including field investigation, subsurface exploration, sampling and testing, probable number of bore holes, and site cost investigation.

4. Conduct a site investigation, based on proposed site investigation plan.

5. Prepare the final evaluation, including potential risks, level of project design, and consultation with permitting agencies.

6. Complete investigation and prepare report.

This six step process is iterative. One or more of the steps may need to be repeated. During each step of the assessment process, the client and consultant should evaluate if the assessment should continue, based on design objectives and cost, or if a new site should be selected. The process within each step may vary with the engineering consultation, specific site conditions, and the project objectives.

8.3 Provincial Review Processes for Livestock Operations

Under *The Planning Act*, any municipal council or planning district board considering an application for a livestock operation that is 300 animal units (A.U.) or greater, must obtain a Technical Review Report from the provincial government. The Technical Review Committees (TRC) may review proposals for operations under 300 animal units in size at the request of the council or board.

The purpose of the Technical Review process is to:

- Provide the municipality or planning district with an overview of land use and development in the vicinity, a review of the livestock proposal in the context of local soil conditions, local water resources, local and provincial regulatory requirements, and provide recommendations on siting, manure storage and application.

- Assist with the exchange of information between the proponent, local governments, the provincial governments and general public.

The review and approval of a new or expanding livestock operation by the board or council is a critical first step. Additional provincial reviews and approval processes commence after the proponent receives local approval. The province

requires operators to obtain a permit for the construction, expansion or modification of any manure storage structure. A permit is also required for the construction or expansion of a confined livestock area such as a hoop shelter capable of housing 300 or more animal units. These permitting processes require detailed, on-site investigation of soil and groundwater conditions. A Water Rights Licence is required if daily withdrawals of water exceed 25,000 litres. Operations that are 300 animal units or greater must also submit annual manure management plans for registration with Manitoba Conservation and must provide source water analytical results annually.

8.3.1 Structure of the technical review committees

The Technical Review Committee is not an approving body. It provides technical support and information to the municipal council or planning district board for their consideration.

Technical Review Committees have representation from the following provincial departments:

- Agriculture, Food and Rural Initiatives
- Intergovernmental Affairs and Trade
- Water Stewardship
- Conservation

Manitoba Agriculture, Food and Rural Initiatives chairs the Technical Review Committees. Other departments may be consulted during the process and additional information included in the Technical Review Committee report.

Livestock operations larger than 300 animal units that propose to locate within eight kilometers (five miles) of the Canada-United States border are subject to a process through which the neighbouring states – Minnesota or North Dakota – are notified of the application to build. The protocol is administered by Water Stewardship and is initiated through the Technical Review process.

8.3.2 Technical review process

To assist with selecting an appropriate site, proponents should familiarize themselves with local livestock development criteria as set out in the development plan and zoning by-law. The first step in the Technical Review process occurs when the proponent applies for a permit with the municipality or planning district. Where Technical Reviews are mandatory under *The Planning Act* (all operations 300 or more animal units in size), the council or board must send a written request for a technical review directly to the Chair of the Technical Review Committee, with a copy to the Minister of Intergovernmental Affairs and Trade, through the appropriate community planning office. The letter must be accompanied by a completed Livestock Production Operation Information Sheet, detailed site plans and current soil fertility test information. The review will not start until the required information is received in a form that is acceptable to the chair. The committee may contact the proponent for additional information if required.

The municipality or planning district must set a hearing not less than 30 days from receipt of the Technical Review Committee report. Notice of the public hearing must indicate that the report is available for inspection and copying at the municipal office. A copy of

the report will be filed at the same time with the Public Registry of Manitoba Conservation to facilitate public access to the report.

8.3.3 Basis of assessing the proposal

The Technical Review Committee assess proposals based on information provided by the proponent including:

- a completed Livestock Production Operation Information Sheet including detailed site plans (see Appendix H)
- soil fertility test results for the application fields
- published information including soil survey reports, drainage and watershed maps, the province's drilled well database, and other sources of information on soils, geology and hydrogeology
- *The Planning Act* and Provincial Land Use Policies
- municipal or planning district development plans and zoning by-laws
- the Farm Practices Guidelines for various livestock commodities in Manitoba
- Livestock Manure and Mortalities Management Regulation
- *The Water Protection Act*
- other applicable provincial Acts and regulations

8.3.4 Recommendations

The Technical Review Committee report will include:

- an assessment of site suitability based on soil, hydrogeological and surface water data
- an assessment of whether or not the proposal meets the intent of the local development plan, siting and setback criteria in the zoning by-law, regulations regarding storage and application of manure, and provincial guidelines with respect to siting
- an indication of site suitability from a nutrient management perspective, specifically based on soil characteristics, subsurface conditions, surface water resources, soil fertility information and landbase available for manure application
- comments on the methods the proponent will use to reduce the potential for production of nuisance odours (e.g. manure storage cover, manure application methods, tree planting, separation distances, new technologies, etc.)
- recommendations regarding siting, establishment and on-going management that the applicants may consider to avoid or minimize potential social and environmental risks.

Where operations are 300 or more animal units in size, the municipality or planning district may impose conditions of approval that may include measures to implement recommendations made by the Technical Review Committee.

8.4 Landbase Requirements for Manure Application

When preparing a livestock operation proposal, the proponent will need to estimate the total land required for the application of manure. Tables 15a and 15b provide a method for estimating landbase requirements for liquid and solid manure, respectively.

This method requires estimates of:

- the annual volume of manure generated by the operation (Tables 3a and 3b)
- average nutrient content of the manure (Tables 4a, 4b, and 5)
- the amount of nutrient removed by crops (Table 6)

Landbase requirements can be based on nitrogen (N) or phosphorus (P). Generally, more land is required if the manure is applied based on the P removal of the crops than if it is applied based on the crop N requirement.

Landbase calculations are estimates for planning purposes only and should not be used to estimate manure application rates. Manure application rates should be determined by the manure management plan (see Section 4).

8.5 Provincial Permits and Licences

Proponents are reminded that they may need to obtain permits and/or licences from the provincial government. Operations that will use 25,000 L (5,500 imp. gal) of water or more in any one day are required to apply for a Water Rights Licence from Manitoba Water Stewardship (Appendix K). Livestock operations that propose to construct, modify or expand a manure storage facility must obtain a permit from Manitoba Conservation prior to beginning construction, modification or expansion. Applications for a permit may be obtained from regional offices of Manitoba Conservation (Appendix K). A professional engineer, registered to practice in Manitoba, is required to design the manure storage facility and any proposed alterations to it.

Table 15a: Total Landbase[1] Required For The Livestock Operation In Hectares – Liquid Manure

STEP 1:	Determine the total number of animals produced by the livestock operation (i.e. pig places or barn capacity).	
STEP 2:	Determine the total annual volume of manure generated by the operation.	
STEP 3:	Determine the total landbase required for the operation based on nitrogen (N).	
OR STEP 4:	Determine the total landbase required for the operation based on 2X phosphorus (P_2O_5) removal by the crop.	
OR STEP 5:	Determine the total landbase required for the operation based on 1X phosphorus (P_2O_5) removal by the crop.	
STEP 1:	Number of livestock places	_____ (A)
STEP 2:	Volume of manure in litres/day or m^3/day (Table 3a)	_____ (B)
	Number of days per year animals are at the operation	_____ (C)
	Volume of manure per year for the operation (A x B x C)	_____ (D)
STEP3:	Total nitrogen **(N)** content of the manure in kg/1000 litres or kg/m3 (Table 4a or 4b)	_____ (E)
	Amount of N per year from the operation (D x E) (÷ 1000 if using kg/1000 litres) in kg	_____ (F)
	Nitrogen requirement (based on soil test) or removal in kg/ha	_____ (G)
	Hectares Required for Nitrogen (F ÷ G)	_____ **(ha)**
STEP4:	Total phosphorus **(P_2O_5)** content of the manure in kg/1000 litres or kg/m^3 of (Table 4a or 4b)	_____ (H)
	Amount of P_2O_5 per year from the operation (D x H) (÷ 1000 if using kg/1000 litres)in kg	_____ (I)
	1X crop P_2O_5 removal (calculate using Table 6) in kg/ha	_____ (J)
	2X crop P_2O_5 removal (J x 2) in kg/ha	_____ (K)
	Hectares Required for 2X crop P_2O_5 removal [I ÷ K]	_____ **(ha)**
STEP 5:	**Hectares Required for 1X crop P_2O_5 removal [I÷ J]**	_____ **(ha)**

[1] The landbase calculation is an estimate of the total landbase required for the disposition of all of the manure generated by the operation in a year. It is for planning purposes only. Actual manure application rates are determined through manure management planning.

Table 15b: Total Landbase[1] Required For The Livestock Operation In Hectares – Solid Manure

STEP 1:	Determine the total number of animals produced by the livestock operation (i.e. pig places or barn capacity).	
STEP 2:	Determine the total annual weight of manure generated by the operation.	
STEP 3:	Determine the total landbase required for the operation based on nitrogen (N).	
OR STEP 4:	Determine the total landbase required for the operation based on 2X phosphorus (P_2O_5) removal by the crop.	
OR STEP 5:	Determine the total landbase required for the operation based on 1X phosphorus (P_2O_5) removal by the crop.	
STEP 1:	Number of livestock places	_____ (A)
STEP 2:	Weight of manure in kg/day (Table 3b)	_____ (B)
	Number of days per year animals are at the operation	_____ (C)
	Weight of manure per year for the operation (A x B x C)	_____ (D)
STEP3:	Total nitrogen **(N)** content of the manure in kg/tonne (Table 5)	_____ (E)
	Amount of N per year from the operation (D x E ÷ 1000) in kg	_____ (F)
	Nitrogen requirement (based on soil test) or removal in kg/ha	_____ (G)
	Hectares Required for Nitrogen (F ÷ G)	_____ **(ha)**
STEP4:	Total phosphorus **(P_2O_5)** content of the manure in kg/tonne (Table 5)	_____ (H)
	Amount of P_2O_5 per year from the operation (D x H ÷ 1000) in kg	_____ (I)
	1X crop P_2O_5 removal (calculate using Table 6) in kg/ha	_____ (J)
	2X crop P_2O_5 removal (J x 2) in kg/ha	_____ (K)
	Hectares Required for 2X crop P_2O_5 removal [I ÷ K]	_____ **(ha)**
STEP 5:	**Hectares Required for 1X crop P_2O_5 removal [I÷ J]**	_____ **(ha)**

[1] The landbase calculation is an estimate of the total landbase required for the disposition of all of the manure generated by the operation in a year. It is for planning purposes only. Actual manure application rates are determined through manure management planning.

SECTION 9

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APPENDIX A

The Farm Practices Protection Act

C.C.S.M. CHAPTER F45
THE FARM PRACTICES PROTECTION ACT

Table of Contents Regulations

(Assented to June 24, 1992)

HER MAJESTY, by and with the advice and consent of the Legislative Assembly of Manitoba, enacts as follows:

DEFINITIONS

1 In this Act,

"agricultural operation" means an agricultural, aquacultural, horticultural or silvicultural operation that is carried on in the expectation of gain or reward, and includes

(a) the tillage of land,

(b) the production of agricultural crops, including hay and forages,

(c) the production of horticultural crops, including vegetables, fruit, mushrooms, sod, trees, shrubs and greenhouse crops,

(d) the raising of livestock, including poultry,

(e) the production of eggs, milk and honey,

(f) the raising of game animals, fur-bearing animals, game birds, bees and fish,

(g) the operation of agricultural machinery and equipment,

(h) the process necessary to prepare a farm product for distribution from the farm gate,

C.P.L.M. c. F45
Loi sur la protection des pratiques agricoles

Table des matières Règlements

(Date de sanction : 24 juin 1992)

SA MAJESTÉ, sur l'avis et avec le consentement de l'Assemblée législative du Manitoba, édicte :

DÉFINITIONS

1 Les définitions qui suivent s'appliquent à la présente loi.

« Commission » La Commission de protection des pratiques agricoles constituée en vertu de l'article 3. ("board")

« exploitation agricole » Exploitation agricole, aquicole, horticole ou sylvicole poursuivie dans l'attente d'un gain ou d'une rétribution. La présente définition inclut :

a) le labourage du sol;

b) la production de récoltes agricoles, y compris le foin et les fourrages;

c) la production de récoltes horticoles, y compris les légumes, les fruits, les champignons, le gazon, les arbres, les arbustes et les récoltes de serre;

d) l'élevage de bétail, notamment de volaille;

e) la production d'oeufs, de lait et de miel;

f) l'élevage de gibier, d'animaux à fourrure, de gibier à plumes, d'abeilles et de poissons;

g) le maniement de machines et de matériel agricoles;

(i) the application of fertilizers, manure, soil amendments and pesticides, including ground and aerial application, and

(j) the storage, use or disposal of organic wastes for farm purposes; (« exploitation agricole »)

"board" means the Farm Practices Protection Board established under section 3; (« Commission »)

"court" means the Court of Queen's Bench; (« tribunal »)

"land use control law" means any Act of the Legislature, regulation, plan or by-law that restricts or prescribes the use to which land or premises may be put or the nature of business or activities that may be carried on on any land or premises; (« loi de réglementation en matière d'utilisation du sol »)

"minister" means the member of the Executive Council charged by the Lieutenant Governor in Council with the administration of this Act; (« ministre »)

"normal farm practice" means a practice that is conducted

(a) in a manner consistent with proper and accepted customs and standards as established and followed by similar agricultural operations under similar circumstances, including the use of innovative technology used with advanced management practices, and

(b) in conformity with any standards set out in the regulations; (« pratique agricole normale »)

"person" includes an unincorporated association, partnership or cooperative. (« personne »)

h) le traitement nécessaire pour la préparation d'un produit agricole en vue de sa distribution depuis la ferme;

i) l'épandage d'engrais, de fumier, d'amendements et de pesticides, y compris la pulvérisation au sol et la pulvérisation aérienne;

j) le stockage, l'utilisation ou l'élimination de déchets organiques à des fins agricoles. ("agricultural operation")

« loi de réglementation en matière d'utilisation du sol » Loi de l'Assemblée législative, règlement, plan ou règlement municipal qui restreint ou prescrit, à l'égard d'un sol ou de locaux, l'utilisation qui peut en être faite ou la nature des entreprises qui peuvent y être exploitées ou des activités qui peuvent y être exercées. ("land use control law")

« ministre » Le membre du Conseil exécutif chargé par le lieutenant-gouverneur en conseil de l'application de la présente loi. ("minister")

« personne » S'entend notamment d'une association de personnes sans personnalité morale, d'une société en nom collectif ou d'une coopérative. ("person")

« pratique agricole normale » Pratique exercée :

a) d'une part, selon des coutumes et des normes reconnues appropriées, établies et respectées à l'égard d'exploitations agricoles comparables dans des circonstances similaires, y compris le recours à des technologies novatrices associées à une gestion moderne;

b) d'autre part, en conformité avec les normes réglementaires. ("normal farm practice")

PROTECTION FROM NUISANCE CLAIMS

2(1) A person who carries on an agricultural operation, and who, in respect of that operation,

(a) uses normal farm practices; and

(b) does not violate

(i) a land use control law,

(ii) *The Environment Act* or a regulation or order made under that Act, or

(iii) *The Public Health Act* or a regulation or order made under that Act;

is not liable in nuisance to any person for any odour, noise, dust, smoke or other disturbance resulting from the agricultural operation, and shall not be prevented by injunction or other order of a court from carrying on the agricultural operation because it causes or creates an odour, noise, dust, smoke or other disturbance.

Protection continues despite change in by-law, etc.

2(2) Subsection (1) applies notwithstanding the occurrence of one or more of the following:

(a) the land use by-law of the municipality in which the agricultural operation is carried on changes or the agricultural operation becomes a non-conforming use;

(b) the ownership of the land on which the agricultural operation is carried on changes;

(c) the agricultural operation is carried on by other persons;

(d) the use of land near to the land on which the agricultural operation is carried on changes.

« tribunal » La Cour du Banc de la Reine. ("court")

PROTECTION CONTRE LES PLAINTES ABUSIVES

2(1) La personne qui poursuit une exploitation agricole est dégagée de toute responsabilité en nuisance pour tout dérangement, y compris l'odeur, le bruit, la poussière ou la fumée, causé par l'exploitation agricole si elle :

a) a recours à des pratiques agricoles normales;

b) n'enfreint aucun des textes suivants :

(i) les lois de réglementation en matière d'utilisation du sol,

(ii) la Loi sur l'environnement et ses règlements et décrets d'application,

(iii) la Loi sur la santé publique et ses règlements et décrets d'application.

De plus, le tribunal ne peut prononcer contre cette personne aucune injonction ni rendre aucune ordonnance visant à l'empêcher de poursuivre l'exploitation agricole pour le motif que celle-ci cause un tel dérangement.

Maintien de la protection

2(2) Le paragraphe (1) s'applique malgré la survenance d'un ou de plusieurs des événements suivants :

a) le règlement qui régit l'utilisation du sol et qui est pris par la municipalité dans laquelle l'exploitation agricole est poursuivie est modifié ou l'exploitation agricole devient une utilisation non conforme;

b) le propriétaire du sol sur lequel l'exploitation agricole est poursuivie change;

c) l'exploitation agricole est poursuivie par d'autres personnes;

FARM PRACTICES PROTECTION BOARD

3(1) The "Farm Practices Protection Board" is established and shall consist of not less than three members appointed by the Lieutenant Governor in Council.

Chairperson and vice-chairperson

3(2) The Lieutenant Governor in Council shall designate one of the members of the board as chairperson and another as vice-chairperson.

Duties of chairperson

3(3) The chairperson is responsible for the general supervision and direction of the conduct of the affairs of the board and, if he or she is absent or unable to act, the vice-chairperson shall have the powers of the chairperson.

3(4) Repealed, S.M. 2001, c. 12, s. 2.

Remuneration and expenses

3(5) The members of the board shall be paid such remuneration and receive such expenses as the Lieutenant Governor in Council determines.

S.M. 2001, c. 12, s. 2.

Acting board members

4(1) The minister may from time to time nominate one or more persons from among whom acting members of the board may be selected.

Selection of acting board members

4(2) When in the opinion of the chairperson it is necessary or desirable for the proper performance of the board's duties, the chairperson may select not more than three persons nominated under subsection (1) as acting members of the board for a period of time or for the purpose of any matter before the board.

d) l'utilisation du sol près de celui sur lequel l'exploitation agricole est poursuivie change.

L.M. 1994, c. 20, art. 7; L.M. 1997, c. 30, art. 2.

COMMISSION DE PROTECTION DES PRATIQUES AGRICOLES

Constitution de la Commission

3(1) Est constituée la Commission de protection des pratiques agricoles, composée d'au moins trois membres nommés par le lieutenant-gouverneur en conseil.

Président et vice-président

3(2) Le lieutenant-gouverneur en conseil désigne le président et le vice-président parmi les membres de la Commission.

Fonctions du président

3(3) Le président est chargé de la direction générale des affaires de la Commission. En cas d'absence ou d'empêchement du président, le vice-président est investi de ses pouvoirs.

3(4) Abrogé, L.M. 2001, c. 12, art. 2.

Rémunération et indemnités

3(5) Les membres de la Commission reçoivent la rémunération et les indemnités que fixe le lieutenant-gouverneur en conseil.

L.M. 2001, c. 12, art. 2.

Membres intérimaires

4(1) Le ministre peut présenter une ou plusieurs personnes parmi lesquelles les membres intérimaires de la Commission peuvent être choisis.

Powers and duties of acting member

4(3) An acting member has and may exercise and perform the powers and duties of a member of the board.

Remuneration and expenses

4(4) An acting member is entitled to be paid such remuneration and receive such expenses as the minister determines.

Quorum

5 Three members of the board, of whom at least two are members appointed under subsection 3(1), constitute a quorum and are sufficient for the exercise of all of the jurisdiction and powers of the board.

Management and procedural rules

6(1) The board may make rules for the management of its affairs and for the practice and procedure to be observed in matters before it. The rules may also authorize the chairperson or another officer or member to sign board documents.

Information and representations from parties

6(2) In any matter before it, the board shall give full opportunity to the parties to present information and make representations.

Choix des membres intérimaires

4(2) Le président peut choisir au plus trois des personnes présentées en application du paragraphe (1) afin qu'elles agissent à titre de membres intérimaires de la Commission pour une période ou aux fins de l'étude d'une question dont la Commission est saisie, s'il estime qu'il est nécessaire ou souhaitable de le faire pour l'accomplissement efficace des fonctions de celle-ci.

Pouvoirs et fonctions des membres intérimaires

4(3) Les membres intérimaires ont les pouvoirs et les fonctions des membres de la Commission.

Rémunération et indemnités

4(4) Les membres intérimaires ont droit à la rémunération et aux indemnités fixées par le ministre.

Quorum

5 Le quorum est constitué par trois membres de la Commission, dont deux au moins sont nommés en vertu du paragraphe 3(1).

Règles de procédure

6(1) La Commission peut prendre des règles en vue de la gestion de ses activités et pour prévoir la procédure relative aux questions dont elle est saisie. Les règles peuvent également autoriser le président ou un autre dirigeant ou membre à signer les documents de la Commission.

Renseignements et observations

6(2) Dans le cadre de toute question dont elle est saisie, la Commission est tenue de donner aux parties l'occasion de présenter des renseignements et des observations.

L.M. 2001, c. 12, art. 3.

S.M. 2001, c. 12, s. 3.

Part V of Evidence Act powers

7 The members of the board have the powers of commissioners under Part V of The Manitoba Evidence Act.

Board to conduct studies

8(1) The minister may direct the board to study any matter related to farm practices and the board shall conduct the study and report its findings and recommendations to the minister.

Professional assistance

8(2) The board may appoint one or more persons having technical or special knowledge of any matter to assist the board in any capacity in respect of a matter before it.

Protection from liability

8.1 No action or proceeding may be brought against the board, a member or acting member of the board or any other person acting under the authority of this Act for anything done or not done, or for any neglect,

(a) in the performance or intended performance of a duty under this Act or the regulations; or

(b) in the exercise or intended exercise of a power under this Act or the regulations;

unless the board or the person was acting in bad faith.

Loi sur la preuve

7 Les membres de la Commission ont les pouvoirs des commissaires nommés en vertu de la partie V de la Loi sur la preuve au Manitoba.

Études effectuées par la Commission

8(1) Le ministre peut ordonner à la Commission d'étudier toute question relative à des pratiques agricoles; la Commission effectue l'étude et présente au ministre ses conclusions et ses recommandations.

Experts-conseils

8(2) La Commission peut nommer une ou plusieurs personnes ayant des connaissances techniques ou spéciales pour la seconder de quelque manière que ce soit sur toute question dont elle est saisie.

Immunité

8.1 Bénéficient de l'immunité la Commission, ses membres et membres intérimaires ainsi que les autres personnes qui agissent sous l'autorité de la présente loi pour les actes accomplis de bonne foi ou les omissions ou manquements commis non intentionnellement dans l'exercice effectif ou censé tel des attributions qui leur sont conférées en vertu de cette loi ou des règlements.

S.M. 2005, c. 54, s. 2.
COMPLAINTS

Application for determination
9(1) A person who is aggrieved by any odour, noise, dust, smoke or other disturbance resulting from an agricultural operation may apply in writing to the board for a determination as to whether the disturbance results from a normal farm practice.

Contents of application
9(2) An application under subsection (1) shall contain a statement of the nature of the complaint, the name and address of the person making the application and the name and address of the agricultural operation, and shall be in a form acceptable to the board.

Notices
9(3) The board may require that an applicant give written notice, in such form and manner that the board specifies, to the persons that the board specifies.

Parties
9(4) The parties to an application are the applicant, the owner or operator of the agricultural operation and any person added as a party by the board.

No action commenced unless application made

9(5) A person shall not commence an action in nuisance for any odour, noise, dust, smoke or other disturbance resulting from an agricultural operation unless the person has, at least 90 days previously, applied to the board under this section for a determination as to whether the disturbance complained of results from a normal farm practice.

L.M. 2005, c. 54, art. 2.
PLAINTES

Requête
9(1) Toute personne lésée par un dérangement causé par une exploitation agricole, y compris une odeur, un bruit, de la poussière ou de la fumée, peut demander par écrit à la Commission de déterminer si le dérangement résulte d'une pratique agricole normale.

Contenu de la requête
9(2) La requête visée au paragraphe (1) est présentée sous une forme satisfaisante pour la Commission et énonce la nature de la plainte, ainsi que le nom et l'adresse du requérant et de l'exploitation agricole.

Avis
9(3) La Commission peut exiger que le requérant avise par écrit les personnes qu'elle désigne. Elle précise la forme de l'avis et les modalités de sa remise.

Parties
9(4) Sont parties à la requête le requérant, le propriétaire ou l'exploitant de l'exploitation agricole et toute personne qu'ajoute la Commission.

Condition préalable à l'introduction d'une action

9(5) Une personne ne peut introduire une action en nuisance pour tout dérangement, y compris l'odeur, le bruit, la poussière ou la fumée, causé par une exploitation agricole que si elle a, au moins 90 jours avant l'introduction de l'action, demandé à la Commission, conformément au présent article, de déterminer si le dérangement faisant l'objet de la plainte résulte d'une pratique agricole normale.

Subsequent nuisance action not required

9(6) A person may apply to the board for a determination under this section whether or not an action in nuisance is subsequently commenced.

Investigation and resolution of dispute

10 On receiving an application, the board may inquire into and endeavour to resolve a dispute between the aggrieved person and the owner or operator of the agricultural operation and may determine what constitutes a normal farm practice in respect of that agricultural operation.

Refusal to consider application

11(1) The board may refuse to consider an application or to make a decision if in its opinion,

(a) the subject-matter of the application is trivial;

(b) the application is frivolous or vexatious or is not made in good faith; or

(c) the applicant does not have a sufficient personal interest in the subject-matter of the application.

Decision given to parties

11(2) The board shall notify the parties of its refusal to consider an application or to make a decision under subsection (1), and give them written reasons for its action.

Action en nuisance ultérieure

9(6) Une personne peut demander à la Commission de rendre une décision sous le régime du présent article, même si aucune action en nuisance n'est introduite ultérieurement.

Enquête et règlement du conflit

10 Saisie d'une requête, la Commission peut enquêter sur le conflit qui existe entre la personne lésée et le propriétaire ou l'exploitant de l'exploitation agricole, s'efforcer de régler ce conflit et déterminer ce qui constitue une pratique agricole normale à l'égard de l'exploitation agricole.

Refus d'examiner la requête

11(1) La Commission peut refuser d'examiner la requête ou de rendre une décision si elle est d'avis :

a) soit que l'objet de la requête est futile;

b) soit que la requête est frivole ou vexatoire ou n'est pas présentée de bonne foi;

c) soit que l'intérêt du requérant dans l'objet de la requête n'est pas suffisant.

Avis de la décision

11(2) La Commission avise les parties de son refus d'étudier une demande ou de prendre une décision en application du paragraphe (1) et leur donne les motifs écrits de son refus.

Decision of the board

12(1) If the board is unable to resolve the dispute between the aggrieved person and the owner or operator of the agricultural operation, the board shall

(a) dismiss the complaint if the board is of the opinion that the disturbance complained of results from a normal farm practice; or

(b) order the owner or operator of the agricultural operation to cease the practice causing the odour, noise, dust, smoke or other disturbance if it is not a normal farm practice or to modify the practice in the manner set out in the order to be consistent with normal farm practices.

Decision given to parties

12(2) The board shall give a copy of its decision to each of the parties together with written reasons for the decision.

Decision shall be considered by court

12(3) A decision of the board under this section respecting an agricultural operation shall be considered by the court in any subsequent action in nuisance taken in respect of that operation.

Order of board may be filed in court

12(4) Where a person has failed to comply with an order of the board made under subsection (1) and the time for an appeal against the order has expired, the board may file a copy of the order, certified by the chairperson or secretary of the board to be a true copy, in court.

Décision de la Commission

12(1) Si elle ne peut régler le conflit qui existe entre la personne lésée et le propriétaire ou l'exploitant de l'exploitation agricole, la Commission :

a) rejette la plainte si elle est d'avis que le dérangement qui en fait l'objet résulte d'une pratique agricole normale;

b) ordonne au propriétaire ou à l'exploitant de l'exploitation agricole, soit de cesser la pratique qui cause le dérangement si elle ne constitue pas une pratique agricole normale, soit de modifier la pratique de la manière énoncée dans l'ordonnance de façon à la rendre conforme à une pratique agricole normale.

Remise de la décision aux parties

12(2) La Commission remet aux parties une copie de sa décision accompagnée des motifs écrits de celle-ci.

Prise en considération de la décision

12(3) Le tribunal prend en considération la décision que rend la Commission à l'égard d'une exploitation agricole dans toute action en nuisance ultérieure introduite à l'égard de la même exploitation.

Dépôt de l'ordonnance de la Commission

12(4) Lorsqu'une personne fait défaut de se conformer à une ordonnance de la Commission rendue en vertu du paragraphe (1) et que le délai pour en appeler de cette ordonnance est expiré, la Commission peut déposer devant le tribunal une copie, certifiée conforme par le président ou le secrétaire, de l'ordonnance.

Board may apply to court

12(5) Upon filing under subsection 12(4), the order shall be deemed to be a judgment of the court in favour of the board and the board may apply to a judge of the court for an order requiring the person to comply with the judgment and the judge may also make one or more of the following orders:

(a) a contempt order against the person;

(b) an order respecting costs;

(c) any other order that may be necessary to give effect to the judgment or that the judge considers just.

S.M. 1997, c. 30, s. 3.

Appeal

13 Any party to an application may appeal an order of the board on a question of law to the court within 30 days after the making of the order.

Board may review orders

13.1(1) Subject to subsection (5), the board may review an order it has made, if a party or another person who is affected by the order applies.

Disposition by the board

13.1(2) After the review, the board may, by further order, dismiss the application or change, revoke or replace the order.

Membership of board on review

13.1(3) The members of the board who review the order may be different from the members who made it.

Ordonnance

12(5) L'ordonnance déposée en vertu du paragraphe 12(4) est réputée être un jugement du tribunal en faveur de la Commission et celle-ci peut en saisir un juge du tribunal en vue d'obtenir une ordonnance enjoignant à la personne de se conformer au jugement. Le juge peut également rendre l'une ou plusieurs des ordonnances suivantes :

a) une ordonnance pour outrage au tribunal;

b) une ordonnance relative aux frais et dépens;

c) toute autre ordonnance qui est nécessaire pour donner effet au jugement ou qu'il juge indiquée.

L.M. 1997, c. 30, art. 3.

Appel

13 Toute partie à une requête peut interjeter appel d'une ordonnance de la Commission au tribunal sur une question de droit dans les 30 jours suivant la date de l'ordonnance.

Révision des ordonnances par la Commission

13.1(1) Sous réserve du paragraphe (5), la Commission peut réviser une ordonnance qu'elle a rendue, si une partie ou toute autre personne que vise l'ordonnance le demande.

Décision de la Commission

13.1(2) Après avoir révisé l'ordonnance, la Commission peut rendre une autre ordonnance rejetant la requête ou modifiant, annulant ou remplaçant l'ordonnance initiale.

Composition du comité de révision

13.1(3) Les membres de la Commission qui révisent l'ordonnance peuvent ne pas être les mêmes que ceux qui l'ont rendue.

Application of certain previous provisions

13.1(4) Subsections 9(2) to (4) and sections 10 to 13 apply, with necessary changes, to an application or order made under this section.

Limitations on review power

13.1(5) The board shall not review an order

(a) before the end of the appeal period set out in section 13;

(b) after an appeal has been made under section 13 but before it is determined or withdrawn; or

(c) after the order has been filed in court under subsection 12(4).

S.M. 2001, c. 12, s. 4.

Injunction proceedings in abeyance

14(1) When an agricultural operation is the subject of an application under subsection 9(1), no injunction proceedings may be commenced or continued in respect of that agricultural operation until the board has made a decision under subsection 12(1) or has refused to hear the application.

Exception

14(2) Subsection (1) does not apply to proceedings taken under *The Environment Act* or *The Public Health Act*.

Application de certaines dispositions

13.1(4) Les paragraphes 9(2) à (4) et les articles 10 à 13 s'appliquent, avec les adaptations nécessaires, aux requêtes et aux ordonnances que vise le présent article.

Restrictions — pouvoir de révision

13.1(5) La Commission ne peut réviser une ordonnance :

a) avant la fin du délai d'appel prévu à l'article 13;

b) tant qu'un appel formé en vertu de l'article 13 n'a pas fait l'objet d'une décision ou n'a pas été retiré;

c) après que cette dernière a été déposée devant le tribunal en vertu du paragraphe 12(4).

L.M. 2001, c. 12, art. 4.

Suspension de la procédure d'injonction

14(1) Si une exploitation agricole fait l'objet d'une requête en vertu du paragraphe 9(1), aucune procédure d'injonction ne peut être entamée ni poursuivie à l'égard de cette exploitation agricole tant que la Commission n'a pas rendu une décision en application du paragraphe 12(1) ou n'a pas refusé d'entendre la requête.

Exception

14(2) Le paragraphe (1) ne s'applique pas aux procédures entamées en vertu de la Loi sur l'environnement ou de la Loi sur la santé publique.

GENERAL PROVISIONS

Regulations

15 The Lieutenant Governor in Council may make regulations

(a) prescribing fees payable in respect of applications made under subsection 9(1) or 13.1(1);

(b) respecting the nomination and selection of acting members of the board;

(c) respecting standards for the purpose of the definition of "normal farm practice";

(c.1) respecting matters that the board must have regard to in determining what constitutes a normal farm practice for agricultural operations;

(d) respecting any other matter or thing necessary or advisable for carrying out the purposes of this Act.

DISPOSITIONS GÉNÉRALES

Règlements

15 Le lieutenant-gouverneur en conseil peut, par règlement :

a) fixer les droits payables à l'égard des requêtes présentées en application du paragraphe 9(1) ou 13.1(1);

b) prendre des mesures concernant la présentation et le choix des membres intérimaires de la Commission;

c) prendre des mesures concernant des normes pour l'application de la définition de « pratique agricole normale »;

c.1) prendre des mesures concernant les questions dont la Commission doit tenir compte au moment de déterminer ce qui constitue une pratique agricole normale pour les exploitations agricoles;

d) prendre toute autre mesure nécessaire ou souhaitable pour l'application de la présente loi.

S.M. 1997, c. 30, s. 4; S.M. 2001, c. 12, s. 5.

16
NOTE: This section contained consequential amendments to The Nuisance Act which are now included in that Act.

C.C.S.M. reference

17 This Act may be cited as The Farm Practices Protection Act and referred to as chapter F45 of the Continuing Consolidation of the Statutes of Manitoba.

Coming into force

18 This Act comes into force on a day fixed by proclamation.

NOTE: S.M. 1992, c. 41 was proclaimed in force January 31, 1994.

L.M. 1997, c. 30, art. 4; L.M. 2001, c. 12, art. 5.

16
NOTE : Les modifications corrélatives que contenait l'article 6 ont été intégrées à la Loi sur les nuisances à laquelle elles s'appliquaient.

Codification permanente

17 La présente loi peut être citée sous le titre : Loi sur la protection des pratiques agricoles. Elle constitue le chapitre F45 de la Codification permanente des lois du Manitoba.

Entrée en vigueur

18 La présente loi entre en vigueur à la date fixée par proclamation.

NOTE : Le chapitre 41 des L.M. 1992 est entré en vigueur par proclamation le 31 janvier 1994.

APPENDIX B

Livestock Manure and Mortalities Management Regulation

THE ENVIRONMENT ACT
(C.C.S.M. c. E125)

Livestock Manure and Mortalities Management Regulation

LOI SUR L'ENVIRONNEMENT
(c. E125 de la C.P.L.M.)

Règlement sur la gestion des animaux morts et des déjections du bétail

Regulation 42/98
Registered March 30, 1998

Règlement 42/98
Date d'enregistrement : le 30 mars 1998

TABLE OF CONTENTS

TABLE DES MATIÈRES

All persons making use of this consolidation are reminded that it has no legislative sanction. Amendments have been inserted into the base regulation for convenience of reference only. The original regulation should be consulted for purposes of interpreting and applying the law. Only amending regulations which have come into force are consolidated. This regulation consolidates the following amendments: 52/2004; 194/2005; 219/2006.

Veuillez noter que la présente codification n'a pas été sanctionnée par le législateur. Les modifications ont été apportées au règlement de base dans le seul but d'en faciliter la consultation. Le lecteur est prié de se reporter au règlement original pour toute question d'interprétation ou d'application de la loi. La codification ne contient que les règlements modificatifs qui sont entrés en vigueur. Le présent règlement regroupe les modifications suivantes : 52/2004; 194/2005; 219/2006.

Interpretation

1(1) In this regulation,

"**agricultural operation**" means an agricultural, aquacultural, horticultural or silvicultural operation that is carried on in the expectation of gain or reward, and includes

(a) the tillage of land,

(b) the production of agricultural crops, including hay and forages,

(c) the production of horticultural crops, including vegetables, fruit, mushrooms, sod, trees, shrubs and greenhouse crops,

(d) the raising or keeping of livestock,

(e) the production of eggs, milk and honey,

(f) the raising of game animals, fur-bearing animals, game birds, bees and fish,

Définitions

1(1) Les définitions qui suivent s'appliquent au présent règlement.

« **animaux morts** » Bétail mort ou parties de bétail mort qui ne peuvent être mis en marché pour consommation humaine. ("mortalities")

« **aquifère** » Formation géologique contenant de l'eau et capable de fournir de l'eau à des puits ou à des sources en des quantités importantes au point de vue économique. ("aquifer")

« **azote de nitrate résiduel** » La quantité d'azote de nitrate qui demeure dans le sol après la production d'une espèce végétale. ("residual nitrate nitrogen")

« **bassin collecteur** » Ouvrage :

a) servant à recueillir les eaux de ruissellement contaminées par des déjections dans une exploitation agricole;

(f.1) the boarding or keeping of livestock on behalf of its owner, including, but not limited to, at a horse stable or livestock sale yard or auction mart,

(g) the operation of agricultural machinery and equipment,

(h) the process necessary to prepare a farm product for distribution from the farm gate,

(i) the application of fertilizers, manure, soil amendments or pesticides, including ground and aerial application, and

(j) the storage, use or disposal of organic wastes for farm purposes; (« exploitation agricole »)

"**animal unit**" means the number of animals of a particular category of livestock that will excrete 73 kg of total nitrogen in a 12 month period; (« unité animale »)

"**aquifer**" means a water bearing geological formation that is capable of producing water to wells or springs in quantities that are economically useful; (« aquifère »)

"**ASTM Standard D698**" means ASTM International Standard D698-00a *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))* as amended from time to time, and includes any replacement of that standard; (« norme D698 de l'ASTM »)

"**collection basin**" means a structure

(a) intended to collect runoff water contaminated with manure in an agricultural operation, and

(b) constructed primarily from soil by excavating or forming dikes; (« bassin collecteur »)

"**composting**" means a designed and managed system to facilitate the process of aerobic decomposition of organic matter by biological action; (« compostage »)

« **bétail** » Animaux, y compris la volaille, qui ne sont pas gardés exclusivement à titre d'animaux de compagnie. La présente définition exclut les abeilles. ("livestock")

« **classe de sol** » Classe de sol établie à l'aide de la méthode mentionnée sous la rubrique concernant la classification des sols selon leurs aptitudes à la production agricole dans *l'Inventaire des terres du Canada, rapport n° 2*, publié en 1972 par le ministère de l'Environnement du gouvernement du Canada. ("soil class")

« **compostage** » Système conçu et géré afin que soit facilitée la décomposition aérobie de matières organiques par action biologique. ("composting")

« **cours d'eau de surface** » Chenal dans lequel ou lit sur lequel l'eau de surface coule ou demeure stagnante, de façon continue ou intermittente; la présente définition exclut les mares-réservoirs, les bassins, les marécages intermittents, les fossés de drainage et les cours d'eau intermittents qui sont complètement entourés par des terrains privés relevant du propriétaire ou de l'exploitant d'une exploitation agricole et qui n'ont aucun exutoire allant au-delà des terrains privés. ("surface watercourse")

« **déjections** » Excréments et urine du bétail ainsi que l'eau qu'ils contaminent, y compris, le cas échéant, les aliments pour animaux gaspillés, les litières pour bétail, le sol, les déchets de laiterie, les poils, les plumes et les autres débris liés aux exploitations agricoles. ("manure")

« **déjections liquides** » Déjections contenant moins de 5 % de matières solides. ("liquid manure")

« **déjections pâteuses** » Déjections contenant de 5 à 25 % de matières solides. ("semi-solid manure")

« **déjections solides** » Déjections contenant plus de 25 % de matières solides et ne s'écoulant pas lorsqu'elles sont empilées. ("solid manure")

"**confined livestock area**" means an outdoor, non-grazing area where livestock are confined by fences or other structures, and includes a feedlot, paddock, corral, exercise yard, holding area and hoop structure; (« espace clos »)

"**contractor**" means a person who provides a service, such as

(a) supervising or taking part in the construction of a manure storage facility, or

(b) supervising or taking part in the handling of manure or application of manure to land; (« entrepreneur »)

"**crop removal rate of P_2O_5**" means the net amount of phosphorus, expressed as P_2O_5, removed from the field through plant uptake of phosphorus from the soil and export of the plant material from the field through mechanical harvesting or grazing, taking into account the crop that the person farming the land is fertilizing with the livestock manure; (« taux d'absorption du P_2O_5 »)

"**earthen storage facility**" means a structure built primarily from soil, constructed by excavating or forming dikes, and used to retain livestock manure; (« installation de stockage en terre »)

"**feedlot**" means a fenced area where livestock are confined solely for the purpose of growing or finishing, and are sustained by means other than grazing; (« parc d'engraissement »)

"**field storage**" means solid livestock manure that is stored in the open air other than in a manure storage facility; (« stockage dans les champs »)

"**groundwater**" means water below the surface of the ground; (« eau souterraine »)

"**incorporation**" means the mixing of livestock manure into soil, usually by tillage, to minimize exposure of the manure at the surface and to increase contact with the soil; (« incorporation »)

"**injection**" means the placement of liquid manure beneath the soil surface using specialized application equipment, including discs, chisels, openers and sweep-type tools; (« injection »)

« **doline** » Dépression en surface située dans une région karstique et de laquelle les eaux s'écoulent directement dans un aquifère du substratum rocheux sous-jacent ou dans la partie non saturée de l'unité géologique formant un aquifère du substratum rocheux. ("sinkhole")

« **eau de surface** » Masse d'eau mouvante ou stagnante, créée naturellement ou artificiellement; la présente définition vise notamment les lacs, les rivières, les ruisseaux, les sources, les fossés de drainage, les fossés en bordure de route, les bassins, les marais et les marécages ainsi que la glace qui s'y forme, mais exclut les mares-réservoirs et les bassins situés sur les lieux d'une exploitation agricole. ("surface water")

« **eau souterraine** » Eau qui se trouve sous la surface du sol. ("groundwater")

« **entrepreneur** » Personne qui fournit un service, notamment :

a) la supervision de la construction d'une installation de stockage de déjections ou la participation à cette activité;

b) la supervision de la manutention ou de l'épandage de déjections ou la participation à cette activité. ("contractor")

« **espace clos** » Espace à l'air libre, autre qu'un pâturage, où le bétail est confiné par des constructions, notamment des clôtures. La présente définition vise également les parcs d'engraissement, les enclos, les corrals, les aires d'exercice, les aires d'attente et les constructions cintrées. ("confined livestock area")

« **exploitant** » Personne qui dirige une exploitation agricole. ("operator")

« **exploitation agricole** » Exploitation agricole, aquicole, horticole ou sylvicole poursuivie dans l'attente d'un gain ou d'une rétribution. La présente définition inclut :

a) le labourage du sol;

b) la production de récoltes agricoles, y compris le foin et les fourrages;

"**liquid manure**" means manure that contains less than 5% solid matter; (« déjections liquides »)

"**livestock**" means animals or poultry not kept exclusively as pets, excluding bees; (« bétail »)

"**manure**" means livestock feces and urine, and water contaminated by either of them, and may include wasted feed, livestock bedding, soil, milkhouse waste, hair, feathers and other debris associated with an agricultural operation; (« déjections »)

"**manure management plan**" means a plan that is prepared on a form approved by the director and that provides for the storage and handling of the manure produced in an agricultural operation and the land application, treatment or other acceptable use or disposal of the manure; (« plan de gestion des déjections »)

"**manure storage facility**" means a structure, earthen storage facility, molehill, tank or other facility for storing manure or where it is stored, and includes any permanent equipment or structures in or by which manure is moved to or from the storage facility, but does not include

(a) a field storage site,

(b) a vehicle or other mobile equipment used to transport or dispose of manure,

(c) a gutter or concrete storage pit used to store liquid or semi-solid manure for less than 30 days,

(d) a collection basin, or

(e) a composting site for manure or mortalities; (« installation de stockage de déjections »)

"**modify**", in respect of a manure storage facility, does not include routine maintenance or repairs; (« modifier »)

"**molehill**" means a manure storage facility for manure in which manure is mechanically forced through a pipe and becomes mounded; (« monticule »)

c) la production de récoltes horticoles, y compris les légumes, les fruits, les champignons, le gazon, les arbres, les arbustes et les récoltes de serre;

d) l'élevage ou la garde de bétail;

e) la production d'oeufs, de lait et de miel;

f) l'élevage de gibier, d'animaux à fourrure, de gibier à plumes, d'abeilles et de poissons;

f.1) la prise en pension ou la garde de bétail au nom du propriétaire de celui-ci, notamment dans une écurie ou dans une halle à bestiaux ou une enceinte de mises aux enchères;

g) le maniement de machines et de matériel agricoles;

h) le traitement nécessaire pour la préparation d'un produit agricole en vue de sa distribution depuis la ferme;

i) l'épandage d'engrais, de fumier, d'amendements ou de pesticides, y compris la pulvérisation au sol et la pulvérisation aérienne;

j) le stockage, l'utilisation ou l'élimination de déchets organiques à des fins agricoles. ("agricultural operation")

« incorporation » Incorporation des déjections du bétail dans la terre, normalement par labourage, afin qu'elles ne se trouvent pas trop en surface et soient bien en contact avec le sol. ("incorporation")

« ingénieur » Personne physique titulaire d'un certificat d'inscription valide ou d'un permis temporaire sous le régime de la *Loi sur les ingénieurs et les géoscientifiques*, lequel certificat ou permis lui donne le droit d'exercer à titre d'ingénieur. ("professional engineer")

« injection » Enfouissement de déjections liquides au moyen de matériel d'épandage spécialisé, y compris des appareils comportant des disques, des dents, des ouvreurs ou des socs. ("injection")

"**monitoring well**" means an opening made by digging or drilling into the ground to detect and monitor seepage from a manure storage facility; (« puits de surveillance »)

"**mortalities**" means dead livestock, or parts of dead livestock, that are not marketable for human consumption; (« animaux morts »)

"**Olsen procedure**" means the sodium bicarbonate extractant method of determining soil test phosphorus outlined in the *Recommended Chemical Soil Test Procedures for the North Central Region* (North Central Region Research Publication No. 221, Revised January 1998; University of Missouri-Columbia); (« méthode Olsen »)

"**operator**" means a person who carries on an agricultural operation; (« exploitant »)

"**person**" includes a corporation, cooperative, partnership and limited-partnership; (« personne »)

"**P_2O_5**" means the amount of phosphorus in commercial fertilizer equivalent, expressed in oxide form; (« P_2O_5 »)

"**pollution**", in relation to surface water, groundwater or soil, means the presence in the water or soil of substances or contaminants that are foreign to or in excess of the natural constituents of the water or soil and that adversely affect the uses of the water or soil; (« pollution »)

"**poultry**" means any variety of fowl, including the breeding stock of that fowl, kept to produce

(a) meat or eggs, or

(b) feathers for commercial or other purposes; (« volaille »)

"**ppm**" means parts per million; (« ppm »)

"**professional engineer**" means a natural person who holds a valid certificate of registration or temporary licence under *The Engineering and Geoscientific Professions Act* entitling him or her to practise as a professional engineer; (« ingénieur »)

« installation de stockage de déjections » Ouvrage, installation de stockage en terre, monticule, cuve ou autre installation servant à stocker les déjections ou dans lequel celles-ci sont stockées. La présente définition vise notamment les constructions et l'équipement permanents dans lesquels ou au moyen desquels les déjections sont acheminées vers l'installation de stockage ou hors de celle-ci. Elle exclut :

a) les lieux de stockage dans les champs;

b) les véhicules et les autres pièces d'équipement mobile utilisés pour le transport ou l'élimination des déjections;

c) les rigoles et les fosses en béton servant au stockage temporaire des déjections liquides ou pâteuses pendant une période de moins de 30 jours;

d) les bassins collecteurs;

e) les lieux de compostage des déjections ou des animaux morts. ("manure storage facility")

« installation de stockage en terre » Ouvrage réalisé principalement à l'aide de terre, érigé par excavation ou aménagement de levées et servant à retenir les déjections du bétail. ("earthen storage facility")

« méthode Olsen » Méthode faisant appel à une solution d'extraction de bicarbonate de soude permettant de mesurer la quantité de phosphore à la suite d'une analyse de sol, conformément au document intitulé *Recommended Chemical Soil Test Procedures for the North Central Region (North Central Region Research Publication No. 221 Revised January 1998; University of Missouri - Columbia)*. ("Olsen procedure")

« modifier » Exclut l'entretien et les travaux de réparation normaux des installations de stockage de déjections. ("modify")

« monticule » Installation de stockage des déjections du bétail dans laquelle les déjections sont déversées mécaniquement à l'aide d'un tuyau et forment un amas. ("molehill")

"**Red River Valley Special Management Area**" means land designated in section 14.1; (« zone spéciale de gestion de la vallée de la Rivière rouge »)

"**refrigerated**", in relation to mortalities, means kept at a constant temperature of not more than 4°C; (« réfrigération »)

"**regularly inundated area**" means

(a) an area subject to flooding on an average basis at least once every five years, and

(b) the Red River Valley Special Management Area; (« zone régulièrement inondée »)

"**residual nitrate nitrogen**" means the amount of nitrate nitrogen that remains in soil after the production of a crop; (« azote de nitrate résiduel »)

"**semi-solid manure**" means manure that contains 5% to 25% solid matter; (« déjections pâteuses »)

"**sinkhole**" means a surface depression found in karst terraines that drains directly into an underlying bedrock aquifer or the unsaturated portion of the geological unit forming a bedrock aquifer; (« doline »)

"**soil class**" means a class of soil classified using the approach described under the heading "Soil Capability Classification for Agriculture" in *The Canada Land Inventory Report No. 2*, published in 1972 by the Government of Canada, Department of the Environment; (« classe de sol »)

"**soil test phosphorus**" means the concentration of the amount of phosphorus that can be extracted in solution from a soil sample in a soil test procedure; (« phosphore mesuré à la suite d'une analyse du sol»)

"**solid manure**" means manure that contains more than 25% solid matter and does not flow when piled; (« déjections solides »)

« **norme D698 de l'ASTM** » La version la plus récente de la norme internationale D698-00a de l'ASTM intitulée *Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3))*. La présente définition vise également tout texte qui remplace cette norme. ("ASTM Standard D698")

« **parc d'engraissement** » Enclos où le bétail est confiné uniquement en vue de sa croissance ou de son engraissement et se nourrit autrement qu'en pâturant. ("feedlot")

« **personne** » Sont assimilés aux personnes les corporations, les coopératives, les sociétés en nom collectif et les sociétés en commandite. ("person")

« **phosphore mesuré à la suite d'une analyse du sol** » Concentration de phosphore pouvant être extraite d'un échantillon de sol prélevé à l'occasion d'une analyse de sol. ("soil test phosphorus")

« **plan de gestion des déjections** » Plan établi au moyen de la formule qu'approuve le directeur et prévoyant le stockage et la manutention des déjections produites dans une exploitation agricole ainsi que l'épandage sur une terre, la transformation ou toute autre utilisation ou élimination acceptable des déjections. ("manure management plan")

« **P_2O_5** » Quantité de phosphore en équivalent engrais phosphaté commercial, exprimé sous la forme d'oxydes. ("P_2O_5")

« **pollution** » La présence dans l'eau de surface, l'eau souterraine ou le sol de substances ou de polluants étrangers à ses éléments naturels ou en excédent de ceux-ci et nuisant à son utilisation. ("pollution")

« **ppm** » Partie par million. ("ppm")

« **puits** » Ouverture que quelqu'un pratique par creusage ou forage dans le sol dans le but apparent d'obtenir de l'eau souterraine. La présente définition exclut les puits de surveillance. ("well")

"**surface water**" means any body of flowing or standing water, whether naturally or artificially created, including, but not limited to, a lake, river, creek, spring, drainage ditch, roadside ditch, reservoir, swamp, wetland and marsh, including ice on any of them, but not including a dugout or reservoir on the property of an agricultural operation; (« eau de surface »)

"**surface watercourse**" means the channel in or bed on which surface water flows or stands, whether continuously or intermittently, but does not include a dugout, reservoir, intermittent slough, drainage ditch or intermittent stream that is completely surrounded by private land controlled by the owner or operator of an agricultural operation and that has no outflow going beyond the private land; (« cours d'eau de surface »)

"**well**" means an opening made by digging or drilling into the ground for the apparent purpose of obtaining groundwater, but does not include a monitoring well. (« puits »)

M.R. 52/2004; 194/2005; 219/2006

« **puits de surveillance** » Ouverture pratiquée par creusage ou forage dans le sol afin que soit décelé et surveillé tout écoulement provenant d'une installation de stockage de déjections. ("monitoring well")

« **réfrigération** » Conservation des animaux morts à une température constante d'au plus 4 °C. ("refrigerated")

« **stockage dans les champs** » Stockage des déjections du bétail solides à l'air libre mais ailleurs que dans une installation de stockage de déjections. ("field storage")

« **taux d'absorption du P_2O_5** » Quantité nette de phosphore (exprimé sous la forme P_2O_5) que les plantes absorbent du sol ou qui est retiré à la suite du broutage ou de la récolte par des moyens mécaniques, compte tenu du genre de culture fertilisée avec des déjections du bétail. ("crop removal rate of P_2O_5")

« **unité animale** » Nombre d'animaux d'une catégorie particulière qui excrètent un total de 73 kg d'azote au cours d'une période de 12 mois. ("animal unit")

« **volaille** » Toute espèce de volaille, y compris les reproducteurs, élevée aux fins de la production, selon le cas :

a) de chair ou d'oeufs;

b) de plumes à des fins commerciales ou autres. ("poultry")

« **zone régulièrement inondée** »

a) Zone inondée en moyenne au moins une fois tous les cinq ans;

b) la zone spéciale de gestion de la vallée de la Rivière rouge. ("regularly inundated area")

« **zone spéciale de gestion de la vallée de la Rivière rouge** » Bien-fond désigné à l'article 14.1. ("Red River Valley Special Management Area")

R.M. 52/2004; 194/2005; 219/2006

ENVIRONNEMENT E125 — R.M. 42/98

1(2) For the purpose of the definition "**animal unit**" in subsection 1(1), the categories of livestock shall be determined by the director taking into consideration any guidelines or standards published or approved by the Manitoba Department of Agriculture, Food and Rural Initiatives.

M.R. 52/2004; 194/2005

1(3) For the purpose of the definitions "**surface water**" and "**surface watercourse**" in subsection 1(1), when this regulation requires any thing to be located a certain distance from surface water or a surface watercourse, that distance is to be measured from the high water mark of the surface water or watercourse or from the nearest and highest bank of the surface water or watercourse, whichever is further from the surface water or watercourse.

1(4) In determining the number of animal units in an agricultural operation for the purposes of this regulation,

(a) an agricultural operation has less than 300 animal units if it has less than 300 animal units of each category of livestock in the operation, notwithstanding that the total number of animal units of all the categories of livestock in the operation is 300 or more; and

(b) an agricultural operation has 300 animal units or more only if it has 300 animal units or more of at least one category of livestock.

M.R. 52/2004

1(2) Pour l'application de la définition de « **unité animale** », au paragraphe (1), le directeur établit les catégories de bétail en tenant compte des lignes directrices et des normes que publie ou approuve le ministère de l'Agriculture, de l'Alimentation et des Initiatives rurales du Manitoba.

R.M. 52/2004; 194/2005

1(3) Pour l'application des définitions de « **eau de surface** » et de « **cours d'eau de surface** », au paragraphe (1), la distance qui, en vertu du présent règlement, doit séparer des biens de l'eau de surface ou d'un cours d'eau de surface est mesurée à partir du niveau des hautes eaux ou du bord le plus rapproché et le plus exhaussé de l'eau de surface ou du cours d'eau de surface, selon ce qui est le plus éloigné de cette eau ou de ce cours d'eau.

1(4) Pour l'application du présent règlement :

a) une exploitation agricole est réputée posséder moins de 300 unités animales si, pour chaque catégorie de bétail, elle possède moins de 300 unités animales, et ce, même si le nombre total d'unités animales, toute catégorie confondue, est d'au moins 300;

b) une exploitation agricole est réputée posséder au moins 300 unités animales si elle possède au moins 300 unités animales appartenant à au moins une des catégories de bétail.

R.M. 52/2004

PURPOSE

Purpose

2 The purpose of this regulation is to prescribe requirements for the use, management and storage of livestock manure and mortalities in agricultural operations so that livestock manure and mortalities are handled in an environmentally sound manner.

OBJET

Objet

2 Le présent règlement a pour objet de prévoir les conditions d'utilisation, de gestion et de stockage des déjections du bétail et des animaux morts dans des exploitations agricoles de façon que leur manutention se fasse dans le respect de l'environnement.

ENVIRONMENT E125 — M.R. 42/98

STORAGE AND COMPOSTING OF LIVESTOCK MANURE

Storage methods
3 No person shall store livestock manure in an agricultural operation except

(a) in a manure storage facility; or

(b) as field storage.

Size and operation of manure storage facility
4 An operator who stores livestock manure in a manure storage facility shall

(a) ensure that the manure storage facility, alone or in combination with other manure storage facilities located on the property of the agricultural operation, is of sufficient capacity to store all of the livestock manure produced or used in the agricultural operation until such time as the livestock manure can either be applied as fertilizer or otherwise removed from the manure storage facility;

(b) design and construct the manure storage facility, or ensure that it is designed and constructed, so as to prevent the escape of any livestock manure that may cause pollution of surface water, groundwater or soil;

(c) maintain and operate the manure storage facility in a manner that does not cause pollution of surface water, groundwater or soil; and

(d) operate and maintain the manure storage facility in a manner that sustains its structural integrity.

M.R. 52/2004

Location of manure storage facility
5(1) No person shall locate a manure storage facility within the boundaries of the 100-year flood plain elevation, unless

(a) the manure storage facility is provided with flood protection for a flood water level at least 0.6 m higher than the 100-year flood water level the department anticipates at the location when the person proposes to construct, modify or expand the facility; or

STOCKAGE ET COMPOSTAGE DES DÉJECTIONS DU BÉTAIL

Méthodes de stockage
3 L'exploitant qui stocke des déjections du bétail dans une exploitation agricole le fait :

a) soit dans une installation de stockage de déjections;

b) soit par stockage dans les champs.

Dimensions et utilisation de l'installation de stockage de déjections
4 L'exploitant qui stocke des déjections du bétail dans une installation de stockage de déjections :

a) fait en sorte que l'installation puisse, soit seule, soit conjointement avec d'autres installations de stockage de déjections se trouvant sur les lieux de l'exploitation agricole, contenir l'ensemble des déjections du bétail produites ou utilisées dans l'exploitation agricole jusqu'à ce que celles-ci puissent en être retirées, notamment pour servir d'engrais;

b) conçoit et construit l'installation de façon à empêcher tout déversement de déjections du bétail pouvant polluer l'eau de surface, l'eau souterraine ou le sol;

c) entretient et utilise l'installation d'une manière qui ne pollue pas l'eau de surface, l'eau souterraine ou le sol;

d) utilise et entretient l'installation d'une manière permettant de maintenir l'intégrité structurale de celle-ci.

R.M. 52/2004

Emplacement de l'installation de stockage de déjections
5(1) Une installation de stockage de déjections ne peut être située dans les limites du niveau de crue centenaire que si, selon le cas :

a) l'installation est munie d'un dispositif de protection contre les inondations à l'égard d'un niveau de crue dépassant d'au moins 0,6 m le niveau de la crue centenaire que le ministère prévoit à l'endroit où la construction, la modification ou l'agrandissement de l'installation est projetée;

(b) the director is otherwise satisfied that the facility will have satisfactory flood protection.

M.R. 52/2004

5(2) Subsection (1) does not apply to a manure storage facility in operation on March 30, 1998, unless the agricultural operation is modified or expanded after that day.

M.R. 52/2004

5(2.1) Subsection (1) does not apply to a manure storage facility for solid manure in operation on the day this subsection comes into force unless the agricultural operation is modified or expanded after that day.

M.R. 52/2004

5(3) No person shall locate a manure storage facility other than in accordance with the siting requirements set out in section 1 of Schedule A.

5(4) Subsection (3) does not apply to a manure storage facility in operation on March 30, 1998, if the facility meets the requirements of section 4.

M.R. 52/2004

5(5) Unless otherwise approved by the director, no person shall create a well or a drainage ditch within 100 m of a manure storage facility, measured in the same manner as the minimum 100 m setback zone provided for in clauses 1(a) and (b) of Schedule A.

M.R. 52/2004

Permit required for manure storage facility

6(1) No person shall construct, modify or expand a manure storage facility except under the authority of a permit issued by the director under this section.

6(2) An application for a permit shall be made by an operator to the director on a form approved by the director and be accompanied by the information required on the application form and any additional information that the director requires.

b) le directeur est d'avis que l'installation sera suffisamment protégée contre les inondations.

R.M. 52/2004

5(2) Le paragraphe (1) ne s'applique pas aux installations de stockage de déjections qui sont déjà exploitées le 30 mars 1998, sauf si l'exploitation agricole est modifiée ou fait l'objet d'agrandissements par la suite.

R.M. 52/2004

5(2.1) Le paragraphe (1) ne s'applique aux installations de stockage de déjections qui sont utilisées à la date d'entrée en vigueur du présent paragraphe que si elles sont modifiées ou agrandies après cette date.

R.M. 52/2004

5(3) Nul ne peut situer une installation de stockage de déjections autrement qu'en conformité avec les exigences prévues à l'article 1 de l'annexe A.

5(4) Le paragraphe (3) ne s'applique pas aux installations de stockage de déjections qui sont déjà exploitées le 30 mars 1998 et qui sont conformes aux exigences que prévoit l'article 4.

R.M. 52/2004

5(5) Sauf autorisation contraire du directeur, il est interdit d'établir un puits ou un fossé de drainage à une distance de moins de 100 m d'une installation de stockage de déjections, laquelle distance est mesurée de la même manière que la distance minimale de 100 m prévue aux alinéas 1a) et b) de l'annexe A.

R.M. 52/2004

Permis

6(1) Nul ne peut construire, modifier ou agrandir une installation de stockage de déjections si ce n'est en conformité avec un permis délivré par le directeur sous le régime du présent article.

6(2) La demande de permis d'un exploitant revêt la forme qu'approuve le directeur et est accompagnée des renseignements demandés dans la formule et par le directeur.

6(3) After receiving an application, the director shall, in order to determine the appropriate siting and construction requirements for a proposed manure storage facility,

(a) examine the site of the proposed facility and evaluate the site's soil, geology and proximity to aquifers; or

(b) direct the applicant to conduct an examination and evaluation as described in clause (a) in a manner that is acceptable to the director.

M.R. 52/2004

6(4) An applicant is entitled to be issued a permit if

(a) the proposed construction, modification or expansion of the manure storage facility conforms to the siting and construction requirements set out in Schedule A; and

(b) the director is satisfied

(i) that sufficient suitable land is available to the operator to implement an appropriate manure management plan,

(ii) that the construction, modification or expansion of the manure storage facility can be carried out in a manner that ensures that the environment is protected in the event of a structural failure of the facility, and

(iii) that the construction, modification or expansion can be carried out in a manner that ensures that the environment is protected in the case of a manure storage facility located on land

(A) that consists of sand and gravel,

(B) in which an aquifer exists when less than 5 m of overburden having an expected hydraulic conductivity of 1 x 10^{-7} cm per second or less will separate the bottom of the facility from the top of the uppermost underlying aquifer or fractured rock, or

6(3) Sur réception de la demande de permis, le directeur est tenu, afin d'établir les exigences en matière d'emplacement et de construction auxquelles doit satisfaire l'installation de stockage de déjections :

a) d'examiner l'emplacement projeté et d'évaluer le sol, la géologie ainsi que la proximité d'aquifères à cet endroit;

b) d'ordonner à l'auteur de la demande de procéder à l'examen, à l'évaluation et à la détermination prévus à l'alinéa a) d'une manière qu'il juge acceptable.

R.M. 52/2004

6(4) L'auteur de la demande a le droit de se faire délivrer un permis si :

a) d'une part, les travaux projetés satisfont, en matière d'emplacement et de construction, aux exigences prévues à l'annexe A;

b) d'autre part, le directeur est convaincu, à la fois :

(i) que l'exploitant dispose d'un terrain lui permettant de mettre en œuvre un plan de gestion des déjections approprié,

(ii) que la construction, la modification ou l'agrandissement de l'installation peut être effectué de manière à ce que l'environnement soit protégé en cas de défaillance structurale de l'installation,

(iii) que la construction, la modification ou l'agrandissement de l'installation peut être effectué de manière à ce que l'environnement soit protégé dans le cas où l'installation est située sur un terrain :

(A) constitué de sable ou de gravier,

(B) dans lequel se trouve un aquifère, si un terrain de couverture mesurant moins de 5 m d'épaisseur et ayant une conductivité hydraulique prévue d'au plus 1 x 10^{-7} cm par seconde séparera le fond de l'installation et la partie supérieure de l'aquifère ou des roches fracturées sous-jacents,

(C) that is within the unsaturated portion of an aquifer.

M.R. 52/2004

6(5) The director may include terms and conditions in a permit.

6(6) An operator to whom a permit is issued shall comply with any terms and conditions contained in the permit and shall construct, modify or expand the manure storage facility or ensure that it is constructed, modified or expanded in a manner that conforms to the siting and construction requirements set out in Schedule A.

6(6.1) A professional engineer, contractor or other person who performs work for which a permit has been issued under this section shall

(a) comply with any terms and conditions contained in the permit; and

(b) ensure that the work complies with the siting and construction requirements set out in Schedule A.

M.R. 52/2004

6(7) No person shall set into operation a manure storage facility for which a permit is required under this section until

(a) the director has been provided with a sealed professional engineer's certificate certifying that

(i) the work of any contractor or other person performing work for which the permit is required conforms to the siting and construction requirements set out in Schedule A and the permit, and

(ii) the completed construction, modification or expansion of the manure storage facility conforms to the siting and construction requirements set out in Schedule A and the permit; and

(b) the director notifies the operator in writing that the certificate is satisfactory.

M.R. 52/2004

(C) se trouvant dans la partie non saturée d'un aquifère.

R.M. 52/2004

6(5) Le directeur peut assortir le permis de conditions.

6(6) L'exploitant à qui un permis est délivré observe les conditions de celui-ci et construit, modifie ou agrandit, ou veille à ce que soit construite, modifiée ou agrandie, l'installation de stockage de déjections conformément aux exigences prévues à l'annexe A.

6(6.1) L'ingénieur, l'entrepreneur ou toute autre personne qui effectue des travaux à l'égard desquels un permis a été délivré en vertu du présent article :

a) observe les conditions éventuellement rattachées au permis;

b) veille à ce que les travaux répondent aux exigences prévues à l'annexe A en matière d'emplacement et de construction.

R.M. 52/2004

6(7) Il est interdit de commencer à utiliser une installation de stockage de déjections devant faire l'objet d'un permis en vertu du présent article à moins :

a) d'une part, que le directeur n'ait reçu un certificat d'ingénieur scellé dans lequel il est attesté, à la fois que :

(i) les travaux effectués par un entrepreneur ou une autre personne et à l'égard desquels le permis est requis répondent aux exigences en matière d'emplacement et de construction prévues à l'annexe A et dans le permis,

(ii) la construction, la modification ou l'agrandissement de l'installation, une fois terminé, répond aux exigences en matière d'emplacement et de construction prévues à l'annexe A et dans le permis;

b) d'autre part, que le directeur n'avise l'exploitant par écrit que le certificat est satisfaisant.

R.M. 52/2004

6(8) Unless approved in writing by the director, no person shall construct, modify or expand a manure storage facility between November 1 of one year and April 30 of the following year.

6(9) No person shall start constructing, modifying or expanding a manure storage facility without notifying an environment officer in writing of the start date not more than 10 calendar days or less than five calendar days before starting.

M.R. 52/2004

6(10) If, after giving the notice, the start date changes, the person shall not start constructing, modifying or expanding the manure storage facility without first notifying an environment officer of the new start date.

M.R. 52/2004

6(11) If the construction, modification or expansion of a manure storage facility is suspended for more than 10 calendar days, no person shall resume constructing, modifying or expanding the facility without first notifying an environment officer.

M.R. 52/2004

6(12) Despite subsection (1), an operator may make repairs or have repairs made to a manure storage facility if the director first approves the repairs.

M.R. 52/2004

6(13) An operator who wishes to obtain the director's approval for repairs shall apply to the director in the manner the director directs and provide the director with the information the director requires about the repairs.

M.R. 52/2004

6(14) The director may,

(a) with or without conditions, approve the repairs; or

(b) if the director considers that the proposed work constitutes a modification of the facility,

(i) refuse to approve the repairs, and

6(8) À moins d'avoir obtenu l'autorisation écrite du directeur, nul ne peut construire, modifier ou agrandir une installation de stockage des déjections du bétail entre le 1er novembre d'une année et le 30 avril de l'année suivante.

6(9) Il est interdit de commencer à construire, à modifier ou à agrandir une installation de stockage de déjections sans aviser par écrit un agent de l'environnement, de cinq à dix jours avant le début des travaux, de la date du début de ceux-ci.

R.M. 52/2004

6(10) Si la date du début des travaux change après que l'avis a été donné, il est interdit de commencer à construire, à modifier ou à agrandir l'installation de stockage de déjections sans d'abord aviser un agent de l'environnement de la nouvelle date du début des travaux.

R.M. 52/2004

6(11) Si la construction, la modification ou l'agrandissement de l'installation de stockage de déjections est suspendue pendant plus de 10 jours civils, il est interdit de reprendre les travaux sans d'abord en aviser un agent de l'environnement.

R.M. 52/2004

6(12) Malgré le paragraphe (1), l'exploitant peut réparer ou faire réparer l'installation de stockage de déjections pour autant que le directeur approuve en premier lieu les réparations.

R.M. 52/2004

6(13) S'il désire obtenir l'approbation du directeur à l'égard de réparations, l'exploitant lui en fait la demande de la manière que celui-ci indique et lui communique les renseignements qu'il exige au sujet des réparations.

R.M. 52/2004

6(14) Le directeur peut :

a) approuver les réparations, avec ou sans conditions;

b) s'il estime que les travaux projetés constituent une modification de l'installation :

(i) d'une part, refuser d'approuver les réparations,

(ii) direct the operator to apply for a permit to modify the facility.

M.R. 52/2004

Monitoring

6.1(1) Without limiting the generality of subsection 6(5), the director may require an operator to install monitoring wells in relation to a manure storage facility. The operator shall install and maintain the monitoring wells in accordance with the director's requirements or in a manner that is satisfactory to the director.

M.R. 52/2004

6.1(2) The operator shall submit water analysis reports of water samples from the monitoring wells collected and analyzed in accordance with the sampling, analysis and reporting protocol for monitoring wells approved by the director under subsection (4).

M.R. 52/2004

6.1(3) Without limiting the generality of subsection (1), the operator of an agricultural operation with 300 animal units or more shall submit an annual water analysis report of water from the operation's livestock drinking water source collected and analyzed in accordance with the sampling, analysis and reporting protocol for water sources approved by the director under subsection (4).

M.R. 52/2004

6.1(4) The director may approve sampling, analysis and reporting protocols for the purposes of subsections (2) and (3).

M.R. 52/2004

6.1(5) In addition to requiring an operator to comply with subsections (1) to (3), the director may require an operator to implement a monitoring and reporting program if the director believes that the storage, handling and management of livestock manure in the agricultural operation is causing or would likely cause pollution of surface water, groundwater or soil.

M.R. 52/2004

(ii) d'autre part, ordonner à l'exploitant de demander un permis en vue de la modification de l'installation.

R.M. 52/2004

Surveillance

6.1(1) Sans préjudice de la portée générale du paragraphe 6(5), le directeur peut exiger de l'exploitant qu'il installe des puits de surveillance à l'égard d'une installation de stockage de déjections. Dans un tel cas, l'exploitant installe et entretient les puits en conformité avec les exigences du directeur ou d'une manière que celui-ci juge satisfaisante.

R.M. 52/2004

6.1(2) L'exploitant présente des rapports d'analyse de l'eau à l'égard des échantillons d'eau provenant des puits de surveillance, lesquels échantillons sont prélevés et analysés en conformité avec le protocole approuvé par le directeur en vertu du paragraphe (4).

R.M. 52/2004

6.1(3) Sans préjudice de la portée générale du paragraphe (1), l'exploitant d'une exploitation agricole comptant au moins 300 unités animales présente un rapport annuel d'analyse de l'eau à l'égard des échantillons d'eau provenant de la source d'eau potable destinée au bétail et se trouvant dans l'exploitation, lesquels échantillons sont prélevés et analysés en conformité avec le protocole approuvé par le directeur en vertu du paragraphe (4).

R.M. 52/2004

6.1(4) Pour l'application des paragraphes (2) et (3), le directeur peut approuver des protocoles s'appliquant au prélèvement d'échantillons, à l'analyse de ceux-ci et à l'établissement de rapports.

R.M. 52/2004

6.1(5) En plus d'exiger de l'exploitant qu'il se conforme aux paragraphes (1) à (3), le directeur peut exiger de celui-ci qu'il mette en œuvre un programme de surveillance et un programme de présentation de rapports s'il estime que le stockage, la manutention et la gestion des déjections du bétail dans l'exploitation agricole entraînent la pollution de l'eau de surface, de l'eau souterraine ou du sol ou risquent de le faire.

R.M. 52/2004

Decommissioning a manure storage facility

6.2(1) If livestock production in an agricultural operation with a manure storage facility is discontinued or a manure storage facility is not in active service for more than one year, the operator shall without delay inform the director in writing

(a) how the operator will maintain the structural integrity of the facility until he or she returns it to active service; or

(b) how and when the operator intends to decommission the facility.

M.R. 52/2004

6.2(2) An operator shall maintain the structural integrity of an inactive facility or decommission the facility in accordance with the information given to the director. This is subject to subsection (3).

M.R. 52/2004

6.2(3) If the director believes that an operator's proposed or actual maintenance or decommissioning of an inactive facility is not appropriate, the director may do either or both of the following:

(a) require the operator to submit a further proposal respecting maintaining or decommissioning the facility;

(b) order the operator to maintain or decommission the facility in another manner set out in the order.

M.R. 52/2004

6.2(4) Subsections (1) to (3) apply, with necessary changes, to a person who is not an operator but who owns or has possession and control of the land on which an inactive manure storage facility is located.

M.R. 52/2004

Mise hors service de l'installation de stockage de déjections

6.2(1) Si l'élevage de bétail dans une exploitation agricole où se trouve une installation de stockage de déjections est abandonné ou si une telle installation n'est pas en activité pendant plus d'un an, l'exploitant indique immédiatement par écrit au directeur, selon le cas :

a) la façon dont il maintiendra l'intégrité structurale de l'installation jusqu'à ce qu'elle soit remise en activité;

b) la façon dont il projette de mettre l'installation hors service et le moment où il a l'intention de le faire.

R.M. 52/2004

6.2(2) Sous réserve du paragraphe (3), l'exploitant maintient l'intégrité structurale de l'installation qui n'est pas en activité ou met celle-ci hors service en conformité avec les renseignements fournis au directeur.

R.M. 52/2004

6.2(3) S'il croit que le maintien ou la mise hors service actuel ou projeté d'une installation qui n'est pas en activité n'est pas convenable, le directeur peut prendre les mesures suivantes ou l'une d'elles :

a) exiger de l'exploitant qu'il présente une autre proposition concernant le maintien ou la mise hors service de l'installation;

b) ordonner à l'exploitant de maintenir ou de mettre hors service l'installation d'une autre manière qu'il précise.

R.M. 52/2004

6.2(4) Les paragraphes (1) à (3) s'appliquent, avec les adaptations nécessaires, à la personne qui n'est pas exploitant mais qui soit est le propriétaire du terrain sur lequel se trouve une installation de stockage de déjections qui n'est pas en activité, soit en a la possession et la responsabilité.

R.M. 52/2004

ENVIRONNEMENT E125 — R.M. 42/98

Field storage

7(1) No person shall store livestock manure as field storage other than solid manure.

M.R. 52/2004

7(2) A person who stores solid manure as field storage shall

(a) locate the livestock manure at least 100 m from any surface watercourse, sinkhole, spring or well; and

(b) store the livestock manure in a manner that does not cause pollution of surface water, groundwater or soil.

M.R. 52/2004

7(3) An operator shall construct dikes or other works around a field storage area that are effective to prevent the escape of livestock manure that may cause pollution of surface water, groundwater or soil, if generally accepted agricultural practices indicate their necessity. The operator shall maintain the effectiveness of the dikes or other works for so long as the field storage area is used to store livestock manure.

M.R. 52/2004

7(4) Without limiting the generality of subsection (3), the director may order an operator to construct dikes or other works around a field storage area if the director believes they are necessary to prevent the escape of livestock manure that may cause pollution of surface water, groundwater or soil.

M.R. 52/2004

7(5) An operator who is given an order under subsection (4) shall

(a) construct the dikes or other works in accordance with the order or ensure that they are constructed in accordance with it; and

(b) maintain the dikes or other works for as long as the field storage area is used to store livestock manure.

M.R. 52/2004

Stockage dans les champs

7(1) Les seules déjections qui peuvent être stockées dans les champs sont celles qui sont solides.

R.M. 52/2004

7(2) La personne qui stocke des déjections solides dans les champs le fait :

a) à au moins 100 mètres des cours d'eau de surface et des dolines, des sources ou des puits;

b) de manière à ne pas polluer l'eau de surface, l'eau souterraine ou le sol.

R.M. 52/2004

7(3) L'exploitant aménage autour de l'aire de stockage dans les champs des ouvrages, notamment des levées, permettant d'empêcher toute fuite de déjections du bétail pouvant entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol, si ces ouvrages sont nécessaires selon des pratiques agricoles généralement reconnues. Ces ouvrages doivent demeurer efficaces aussi longtemps que l'aire de stockage dans les champs est utilisée aux fins du stockage des déjections du bétail.

R.M. 52/2004

7(4) Sans préjudice de la portée générale du paragraphe (3), le directeur peut ordonner à l'exploitant d'aménager des ouvrages, notamment des levées, autour de l'aire de stockage dans les champs s'il croit que ces ouvrages sont nécessaires afin que soit empêchée toute fuite de déjections du bétail pouvant entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol.

R.M. 52/2004

7(5) L'exploitant à qui un ordre est donné en vertu du paragraphe (4) :

a) aménage les ouvrages en conformité avec l'ordre ou fait en sorte qu'ils soient aménagés en conformité avec celui-ci;

b) maintient les ouvrages aussi longtemps que l'aire de stockage dans les champs est utilisée aux fins du stockage des déjections du bétail.

R.M. 52/2004

7(6) An operator shall remove and dispose of all livestock manure in a field storage area no later than November 10 of the year following any year when the operator stores livestock manure in the area.

M.R. 52/2004

7(7) After the manure is removed, the field storage area must remain empty of manure for at least 12 months. Before storing livestock manure in the area again, the operator must grow a crop on the emptied manure storage area that will deplete the area of any leached nutrients.

M.R. 52/2004

Composting manure

8(1) No person shall compost livestock manure on the property of an agricultural operation unless

(a) the composting site is located at least 100 m from

(i) any surface watercourse, sinkhole, spring or well, and

(ii) the operation's boundaries;

(b) the manure is composted in a manner that does not cause pollution of surface water, groundwater or soil; and

(c) the composting facilities and process are acceptable to the director.

M.R. 52/2004

8(2) Clause (1)(a) does not apply to an operator, or the operator's employee, in respect of a composting site that is in operation on the day subsection (1) comes into force unless the agricultural operation is expanded after that day and the expansion increases the operation's capacity to 300 animal units or more.

M.R. 52/2004

7(6) L'exploitant enlève et élimine toutes les déjections du bétail se trouvant dans une aire de stockage dans les champs au plus tard le 10 novembre de l'année suivant celle où il les stocke à cet endroit.

R.M. 52/2004

7(7) Après l'enlèvement des déjections, il ne peut y avoir de déjections dans l'aire de stockage dans les champs pendant au moins 12 mois. Avant que des déjections du bétail soient stockées de nouveau dans l'aire, l'exploitant doit la cultiver afin de lui faire perdre tout nutriment lessivé.

R.M. 52/2004

Compostage des déjections

8(1) Il n'est permis de composter des déjections du bétail sur les lieux de l'exploitation agricole qu'aux conditions suivantes :

a) le lieu du compostage est situé à au moins 100 m :

(i) d'une part, des cours d'eau de surface, des dolines, des sources ou des puits,

(ii) d'autre part, des limites de l'exploitation;

b) le compostage se fait de manière à ne pas entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol;

c) les installations et le procédé de compostage sont acceptables pour le directeur.

R.M. 52/2004

8(2) L'alinéa (1)a) ne s'applique pas à l'exploitant ni à ses employés, relativement à un lieu de compostage qui est utilisé à la date d'entrée en vigueur du paragraphe (1), à moins que l'exploitation agricole ne prenne de l'expansion après cette date et que sa capacité soit portée à au moins 300 unités animales.

R.M. 52/2004

ENVIRONNEMENT E125 — R.M. 42/98

TRANSPORTATION AND APPLICATION OF LIVESTOCK MANURE

Transportation

9(1) In this section and section 10, "**manure spill**" means

(a) a series of intentional or negligent spillages, leakages, discharges or deposits of livestock manure on a highway or road allowance by the same person or from the same agricultural operation regardless of the amount of any individual spill, leak, discharge or deposit;

(b) a single event involving a total volume of not less than 50 L of liquid manure or 0.25 m^3 of solid manure spilled, leaked, discharged or deposited on a highway or road allowance;

(b.1) a single event involving a total volume of not less than 10,000 L of liquid manure spilled or leaked from a vehicle at any place; or

(c) a spillage, leakage, discharge or deposit of liquid, semi-solid or solid manure where

(i) the manure escapes from the boundary of the agricultural operation,

(ii) the manure is spilled, leaked, discharged or deposited into a surface watercourse, sinkhole, spring or well, or

(iii) the location or quantity of manure spilled, leaked, discharged or deposited is such that an adverse effect on the environment has occurred, or on a reasonable basis, in the opinion of an environment officer, is likely to occur.

M.R. 52/2004

9(2) For the purposes of the definition "manure spill" in subsection (1), "**highway**" means a highway as defined in *The Highway Traffic Act* and "**road allowance**" means a road allowance as defined in *The Highways and Transportation Department Act*.

TRANSPORT ET ÉPANDAGE DES DÉJECTIONS DU BÉTAIL

Transport

9(1) Pour l'application du présent article et de l'article 10, « **déversement de déjections du bétail** » s'entend :

a) d'une série de déversements, de fuites, d'écoulements ou de dépôts de déjections du bétail, qui surviennent intentionnellement ou par négligence, sur des routes ou des emprises routières et qui sont attribuables à la même personne ou à la même exploitation agricole, peu importe les quantités individuelles en cause;

b) du déversement, de la fuite, de l'écoulement ou du dépôt, en une seule fois, d'un volume total d'au moins 50 l de déjections liquides ou 0,25 m^3 de déjections solides sur une route ou une emprise;

b.1) du déversement ou de la fuite, en une seule fois, d'un volume total d'au moins 10 000 l de déjections liquides à partir d'un véhicule à un endroit quelconque;

c) du déversement, de la fuite, de l'écoulement ou du dépôt de déjections liquides, pâteuses ou solides lorsque, selon le cas :

(i) les déjections s'échappent des limites de l'exploitation agricole,

(ii) les déjections sont rejetées dans un cours d'eau de surface, une doline, une source ou un puits,

(iii) en raison de l'endroit où l'événement survient ou de la quantité des déjections en cause, un effet néfaste pour l'environnement s'est produit ou, de l'avis d'un agent de l'environnement, risque vraisemblablement de se produire.

R.M. 52/2004

9(2) Pour l'application de la définition de « **déversement de déjections du bétail** », au paragraphe (1), « **route** » s'entend au sens du *Code de la route* et « **emprise** » s'entend au sens de la *Loi sur le ministère de la Voirie et du Transport*.

9(3) A person who transports livestock manure in a vehicle shall ensure that a manure spill from the vehicle does not occur.

Reportable spills
10 An operator, or a person who transports livestock manure in a vehicle, shall immediately report to an environment officer the occurrence of a manure spill.

Manure spills from manure storage facilities
10.1(1) In this section, "**manure spill**" means a spillage, leakage or discharge of livestock manure from a manure storage facility, but does not include a discharge from the facility into a vehicle or a permanent structure or permanent equipment in or by which manure is moved from the storage facility in a manner permitted by this regulation.

M.R. 52/2004

10.1(2) An operator, or a person who operates livestock manure handling equipment, shall immediately report to an environment officer the occurrence of a manure spill from a manure storage facility if

(a) a single event involves a spillage, leakage or discharge of a total volume of 10,000 L of liquid manure or more;

(b) liquid, semi-solid or solid manure escapes from the boundary of the agricultural operation; or

(c) liquid, semi-solid or solid manure is discharged into a surface watercourse, sinkhole, spring or well.

M.R. 52/2004

10.1(3) If a manure spill that subsection (2) requires to be reported is accompanied by a structural failure of the manure facility, the person making the report shall include in the report the details of the structural failure.

M.R. 52/2004; 194/2005

9(3) La personne qui transporte à bord d'un véhicule des déjections du bétail fait en sorte que son véhicule ne déverse aucune de ces déjections.

Déversement – déclaration
10 Les exploitants ou les personnes qui transportent des déjections du bétail à bord d'un véhicule avisent immédiatement un agent de l'environnement de tout déversement de ces déjections.

Déversement de déjections provenant d'installations de stockage de déjections
10.1(1) Au présent article, « **déversement de déjections** » s'entend d'un écoulement, d'un échappement ou d'un rejet de déjections du bétail provenant d'une installation de stockage de déjections, à l'exclusion d'un déversement dans un véhicule ou dans des équipements ou des ouvrages permanents servant à acheminer les déjections hors de l'installation de stockage d'une manière permise par le présent règlement.

R.M. 52/2004

10.1(2) L'exploitant ou la personne qui utilise de l'équipement servant à la manutention de déjections du bétail fait immédiatement rapport à un agent de l'environnement de la survenance d'un déversement de déjections provenant d'une installation de stockage de déjections dans les cas suivants :

a) un volume total d'au moins 10 000 l de déjections liquides s'écoule, s'échappe ou est rejeté au cours d'un seul événement;

b) des déjections liquides, pâteuses ou solides s'échappent des limites de l'exploitation agricole;

c) des déjections liquides, pâteuses ou solides sont rejetées dans un cours d'eau de surface, une doline, une source ou un puits.

R.M. 52/2004

10.1(3) Si le déversement de déjections visé au paragraphe (2) est accompagné d'une défaillance structurale de l'installation de stockage de déjections, le rapport contient les détails relatifs à cette défaillance.

R.M. 52/2004; 194/2005

Burning of livestock manure prohibited

10.2(1) No person shall burn livestock manure at any time unless

(a) the director has given prior authorization for the burning; and

(b) the person complies with the terms of the authorization.

M.R. 52/2004

10.2(2) The director may authorize an operator to burn livestock manure if

(a) the director considers the burning to be an appropriate way to deal with an emergency or other unusual situation; or

(b) the burning is part of an alternative manure management method that the director considers to be acceptable.

M.R. 52/2004

No discharge into water

11(1) No person shall handle, use or dispose of livestock manure, or store livestock manure in an agricultural operation, in such a manner that it is discharged or otherwise released into surface water, a surface watercourse or groundwater.

M.R. 219/2006

11(2) An operator shall ensure that livestock manure that is handled, used, disposed of or stored in an agricultural operation is not discharged or otherwise released into surface water, a surface watercourse or groundwater.

M.R. 219/2006

Allowable application to land

12(1) No person shall apply livestock manure to land other than as fertilizer on land on which a crop

(a) is growing; or

(b) will be planted during the next growing season.

M.R. 52/2004

Interdiction de brûler les déjections du bétail

10.2(1) Il est interdit de brûler des déjections du bétail sauf si :

a) d'une part, le directeur a autorisé le brûlage au préalable;

b) d'autre part, les conditions de l'autorisation sont observées.

R.M. 52/2004

10.2(2) Le directeur peut autoriser l'exploitant à brûler des déjections du bétail dans les cas suivants :

a) il estime que cette mesure permet convenablement de faire face à une situation d'urgence ou à une autre situation inhabituelle;

b) le brûlage fait partie d'une méthode de rechange qu'il juge acceptable en ce qui a trait à la gestion des déjections.

R.M. 52/2004

Rejet dans l'eau

11(1) Nul ne peut manutentionner, utiliser, éliminer ou stocker des déjections du bétail dans une exploitation agricole de sorte que ces déjections soient rejetées d'une façon quelconque dans de l'eau de surface, un cours d'eau de surface ou de l'eau souterraine.

R.M. 219/2006

11(2) L'exploitant fait en sorte que les déjections du bétail qui sont manutentionnées, utilisées, éliminées ou stockées dans l'exploitation agricole ne soient d'aucune façon rejetées dans de l'eau de surface, un cours d'eau de surface ou de l'eau souterraine.

R.M. 219/2006

Épandage autorisé

12(1) Il n'est permis d'épandre des déjections du bétail que s'ils servent d'engrais sur une terre où une espèce végétale, selon le cas :

a) est cultivée;

b) sera plantée au cours de la saison de croissance suivante.

R.M. 52/2004

12(1.1) Despite clause (1)(b), no person shall, without the director's approval, apply livestock manure to unseeded land before August 15 if the land will not be seeded before spring of the next year.

M.R. 52/2004

12(1.2) The director

(a) may approve manure application before August 15, if the director considers the application appropriate; or

(b) may refuse to approve it.

M.R. 52/2004

12(1.3) No person shall apply livestock manure to soil that is in soil class 6 or 7 or is an unimproved organic soil.

M.R. 52/2004

12(1.4) No person shall apply livestock manure to land in a manner or at a rate of application that, taking into account the crop that the person farming the land is fertilizing with the manure, may result in the concentration of residual nitrate nitrogen being

(a) more than 157.1 kg/ha (140 pounds per acre) within the top 0.6 m (2 feet) of soil at any place in the application area for soils

(i) of soil class 1,

(ii) of soil class 2, and

(iii) of soil class 3, other than soil class 3M or 3MW;

(b) more than 101 kg/ha (90 pounds per acre) within the top 0.6 m (2 feet) of soil at any place in the application area for soil classes 3M, 3MW and 4; or

(c) more than 33.6 kg/ha (30 pounds per acre) within the top 0.6 m (2 feet) of soil at any place in the application area for soil class 5.

M.R. 52/2004

12(1.1) Malgré l'alinéa (1)b), il est interdit, sans l'autorisation du directeur, d'épandre avant le 15 août des déjections du bétail sur une terre non ensemencée dans le cas où l'ensemencement n'aura pas lieu avant le printemps de l'année suivante.

R.M. 52/2004

12(1.2) Le directeur :

a) peut approuver l'épandage de déjections avant le 15 août, s'il estime que cette mesure est appropriée;

b) peut refuser de l'approuver.

R.M. 52/2004

12(1.3) Il est interdit d'épandre des déjections du bétail sur un sol qui fait partie de la classe de sol 6 ou 7 ou qui est un sol organique non défriché.

R.M. 52/2004

12(1.4) Il est interdit d'épandre des déjections du bétail sur une terre s'il est possible, compte tenu de l'espèce végétale que la personne cultivant la terre fertilise à l'aide des déjections, que la concentration d'azote de nitrate résiduel dépasse, en raison du mode ou du taux d'épandage :

a) 157,1kg/ha (140 lb à l'acre) jusqu'à une profondeur de 0,6 m (deux pieds) dans le sol à un endroit quelconque de la zone d'épandage, en ce qui a trait aux sols appartenant :

(i) à la classe de sol 1,

(ii) à la classe de sol 2,

(iii) à la classe de sol 3, à l'exclusion de la classe de sol 3M ou 3MW;

b) 101 kg/ha (90 lb à l'acre) jusqu'à une profondeur de 0,6 m (deux pieds) dans le sol à un endroit quelconque de la zone d'épandage, en ce qui a trait aux classes de sol 3M, 3MW et 4;

c) 33,6 kg/ha (30 lb à l'acre) jusqu'à une profondeur de 0,6 m (deux pieds) dans le sol à un endroit quelconque de la zone d'épandage, en ce qui a trait à la classe de sol 5.

R.M. 52/2004

12(1.5) For the purposes of subsection (1.4), if livestock manure is applied to land on which a crop is not growing and a manure management plan has been registered respecting the application, the person farming the land is, in the absence of evidence to the contrary, deemed to be fertilizing the crop that the plan indicates will next be grown on the land after the application of manure.

M.R. 52/2004

12(1.6) Despite subsection (1.4), no person shall apply livestock manure to land in a manner or at a rate of application that results in the concentration of nitrate nitrogen within the top 0.6 m (2 feet) of soil at any place in the application area at any time being more than twice the amount of residual nitrate nitrogen allowed for the soil class under clause (1.4)(a), (b) or (c).

M.R. 52/2004

12(1.7) Subsection (1.3) and clause (1.4)(c) do not apply to an agricultural operation that is in operation on the day this subsection comes into force unless the director

(a) believes that the application of livestock manure in the agricultural operation to any of the soils referred to in that subsection and clause would likely

(i) cause pollution of surface water, groundwater or soil, or

(ii) result in the livestock manure escaping from the boundary of the agricultural operation; and

(b) notifies the operator in writing that subsection (1.3) or clause (1.4)(c) applies to the agricultural operation.

M.R. 52/2004

12(2) No person shall apply livestock manure to land if, due to meteorological, topographical or soil conditions, or the rate of application, livestock manure

(a) causes pollution of surface water, groundwater or soil; or

12(1.5) Pour l'application du paragraphe (1.4), s'il y a épandage de déjections du bétail sur une terre où aucune espèce végétale n'est cultivée et lorsqu'un plan de gestion des déjections a été enregistré relativement à l'épandage, la personne qui cultive la terre est, sauf preuve contraire, réputée avoir fertilisé l'espèce végétale qui, selon le plan, sera cultivée à cet endroit après l'épandage des déjections.

R.M. 52/2004

12(1.6) Malgré le paragraphe (1.4), il est interdit d'épandre des déjections du bétail sur une terre si la concentration d'azote de nitrate dépasse à un moment donné, en raison du mode ou du taux d'épandage, deux fois la quantité d'azote de nitrate résiduel permise en ce qui a trait aux classes de sol visées à l'alinéa (1.4)a), b) ou c), jusqu'à une profondeur de 0,6 m (deux pieds) dans le sol à un endroit quelconque de la zone d'épandage.

R.M. 52/2004

12(1.7) Le paragraphe (1.3) et l'alinéa (1.4)c) ne s'appliquent pas à l'exploitation agricole qui est en activité à la date d'entrée en vigueur du présent paragraphe, sauf si le directeur :

a) d'une part, estime que l'épandage de déjections du bétail dans l'exploitation, sur l'un des sols mentionnés dans ce paragraphe et dans cet alinéa, risquerait :

(i) soit d'entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol,

(ii) soit d'entraîner une fuite des déjections du bétail hors des limites de l'exploitation;

b) d'autre part, avise l'exploitant par écrit que ce paragraphe ou cet alinéa s'applique à l'exploitation.

R.M. 52/2004

12(2) Nul ne peut épandre des déjections du bétail sur un sol si, en raison des conditions du sol, des conditions météorologiques ou topographiques ou du taux d'épandage, ces déjections :

a) polluent l'eau de surface, l'eau souterraine ou le sol;

(b) escapes from the boundary of the agricultural operation.

12(2.1) In addition to the requirements of subsection (2), no person shall apply livestock manure to land adjacent to surface water or a surface watercourse, except in accordance with the minimum setback requirements set out in Schedule C.

M.R. 219/2006

12(3) An operator shall ensure that livestock manure is not applied to land in an agricultural operation except in accordance with subsections (1), (1.1), (2) and (2.1) and sections 12.1 and 12.2.

M.R. 52/2004; 219/2006

12(4) No person shall contract with a contractor to supervise or take part in the application of manure to land unless

(a) if the contractor personally does the supervision or application, the contractor has the qualifications, and holds any licence or permit, that any applicable Act or regulation of Manitoba requires a person who applies manure to land for a fee to have or hold; or

(b) if the contractor does not personally do the supervision or application,

(i) the contractor has the qualifications, and holds any licence or permit, that any applicable Act or regulation of Manitoba requires a contractor who provides manure application services for a fee to have or hold, and

b) s'échappent des limites de l'exploitation agricole en question.

12(2.1) En plus d'être tenue de respecter les exigences prévues au paragraphe (2), une personne ne peut épandre des déjections du bétail sur des terres contiguës à des eaux de surface ou à un cours d'eau de surface qu'en conformité avec les exigences relatives à la distance minimale énoncées à l'annexe C.

R.M. 219/2006

12(3) L'exploitant veille à ce que l'épandage des déjections du bétail sur le sol d'une exploitation agricole ne soit fait que conformément aux paragraphes (1), (1.1), (2) et (2.1) ainsi qu'aux articles 12.1 et 12.2.

R.M. 52/2004; 219/2006

12(4) Il est interdit de conclure un contrat avec un entrepreneur afin que celui-ci supervise l'épandage de déjections sur une terre ou y participe à moins que :

a) dans le cas où la supervision ou l'épandage est effectué personnellement par l'entrepreneur, celui-ci ne possède les compétences et ne soit titulaire de toute licence ou de tout permis que doivent posséder ou dont doivent être titulaires, en vertu d'une loi ou d'un règlement applicable du Manitoba, les personnes qui épandent des déjections sur des terres moyennant rétribution;

b) dans le cas où la supervision ou l'épandage n'est pas effectué personnellement par l'entrepreneur :

(i) d'une part, celui-ci ne possède les compétences et ne soit titulaire de toute licence ou de tout permis que doivent posséder ou dont doivent être titulaires, en vertu d'une loi ou d'un règlement applicable du Manitoba, les entrepreneurs qui fournissent des services d'épandage de déjections moyennant rétribution,

(ii) the person who will do the actual supervision or application, has the qualifications, and holds any licence or permit, that any applicable Act or regulation of Manitoba requires a person who applies manure to land for a fee to have or hold.

M.R. 52/2004

(ii) d'autre part, la personne qui effectuera en fait la supervision ou l'épandage ne possède les compétences et ne soit titulaire de toute licence ou de tout permis que doivent posséder ou dont doivent être titulaires, en vertu d'une loi ou d'un règlement applicable du Manitoba, les personnes qui épandent des déjections sur des terres moyennant rétribution.

R.M. 52/2004

Allowable application to land re phosphorus

12.1(1) No person shall apply livestock manure to land in a manner or at a rate of application contrary to subsections (2) to (6).

M.R. 219/2006

Restrictions en matière d'épandage

12.1(1) Il est interdit d'épandre des déjections du bétail selon un mode ou un taux d'épandage qui n'est pas conforme aux paragraphes (2) à (6).

R.M. 219/2006

12.1(2) Where soil test phosphorus levels within the top 0.15 m (6 inches) of soil, as determined using the Olsen procedure at any place in the application area, are

(a) 60 ppm or more but less than 120 ppm, the rate of livestock manure application must not exceed two times the annual crop removal rate of P_2O_5; or

(b) 120 ppm or more but less than 180 ppm, the rate of livestock manure application must not exceed the annual crop removal rate of P_2O_5.

M.R. 219/2006

12.1(2) Si les niveaux de phosphore mesurés à la suite d'analyses du sol, faites selon la méthode Olsen au moyen d'échantillons provenant de la couche supérieure de la terre, à savoir 0,15 m (6 po), à n'importe quel endroit de la zone d'épandage :

a) sont d'au moins 60 ppm, mais de moins de 120 ppm, le taux d'épandage ne peut correspondre à plus du double du taux annuel d'absorption du P_2O_5;

b) sont d'au moins 120 ppm, mais de moins de 180 ppm, le taux d'épandage ne peut correspondre à plus du taux annuel d'absorption du P_2O_5.

R.M. 219/2006

12.1(3) Despite subsection (2), when soil test phosphorus levels within the top 0.15 m (6 inches) of soil, as determined using the Olsen procedure at any place in the application area, are 60 ppm or more but less than 180 ppm a person may apply livestock manure at a rate of application no more than five times the annual crop removal rate of P_2O_5, if

(a) the next application does not occur until the number of years equivalent to the multiple of the rate of application have passed since livestock manure was applied to that land; or

12.1(3) Malgré le paragraphe (2), si les niveaux de phosphore mesurés à la suite d'analyses du sol, faites selon la méthode Olsen au moyen d'échantillons provenant de la couche supérieure de la terre, à savoir 0,15 m (6 po), à n'importe quel endroit de la zone d'épandage, sont d'au moins 60 ppm mais de moins de 180 ppm, il est permis d'épandre des déjections du bétail à un taux qui correspond au plus à cinq fois le taux annuel d'absorption du P_2O_5 si, selon le cas :

a) le prochain épandage n'a lieu qu'une fois que le nombre d'années correspondant au multiple du taux d'épandage se sont écoulées;

(b) soil test phosphorus levels within the top 0.15 m (6 inches) of soil at any place in the application area do not exceed values that existed prior to the manure application.

M.R. 219/2006

12.1(4) No person shall, without the director's prior approval, apply livestock manure to land where soil test phosphorus levels within the top 0.15 m (6 inches) of soil, as determined using the Olsen procedure at any place in the application area, are 180 ppm or greater.

M.R. 219/2006

12.1(5) The director may, in an emergency situation or other extenuating circumstances, approve the application of livestock manure in the circumstances set out in subsection (4), if the director is of the opinion that the application of livestock manure to the land would likely not

(a) cause pollution of surface water, groundwater or soil; or

(b) result in the livestock manure escaping from the boundary of the agricultural operation.

M.R. 219/2006

12.1(6) For the purposes of this section, if livestock manure is applied to land on which a crop is not growing and a manure management plan has been registered respecting the application, the person farming the land is, in the absence of evidence to the contrary, deemed to be fertilizing the crop that the plan indicates will next be grown on the land after the application of manure.

M.R. 219/2006

b) les niveaux de phosphore mesurés à la suite d'analyses du sol à n'importe quel endroit de la zone d'épandage n'excèdent pas ceux qui existaient avant l'épandage.

R.M. 219/2006

12.1(4) Il est interdit, sans l'autorisation préalable du directeur, d'épandre des déjections du bétail sur des terres dont les niveaux de phosphore mesurés à la suite d'analyses du sol, faites selon la méthode Olsen au moyen d'échantillons provenant de la couche supérieure de la terre, à savoir 0,15 m (6 po), à n'importe quel endroit de la zone d'épandage, sont d'au moins 180 ppm.

R.M. 219/2006

12.1(5) Le directeur peut, s'il s'agit d'une urgence ou s'il existe des circonstances atténuantes, donner son autorisation s'il est d'avis :

a) que l'épandage n'entraînerait vraisemblablement pas la pollution des eaux de surface, des eaux souterraines ni du sol;

b) que les déjections du bétail demeureraient vraisemblablement à l'intérieur des limites de l'exploitation agricole à la suite de leur épandage.

R.M. 219/2006

12.1(6) Pour l'application du présent article, s'il y a épandage de déjections du bétail sur une terre où aucune espèce végétale n'est cultivée et lorsqu'un plan de gestion des déjections a été enregistré relativement à l'épandage, la personne qui cultive la terre est, sauf preuve contraire, réputée avoir fertilisé l'espèce végétale qui, selon le plan, sera cultivée à cet endroit après l'épandage.

R.M. 219/2006

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12.1(7) Until November 10, 2008, this section does not apply to the operator of, or a person employed in, an agricultural operation that is in operation on the day this section comes into force unless

(a) the operation is expanded after that day and the expansion results in the operation being increased by more than

(i) 5% of animal units, or

(ii) five animals,

whichever is greater; or

(b) the director

(i) is of the opinion that the land application of livestock manure in the agricultural operation would likely cause pollution of surface water, groundwater or soil, and

(ii) notifies the operator in writing that this section applies to the agricultural operation for the period specified in the notice.

M.R. 219/2006

12.1(7) Jusqu'au 10 novembre 2008, le présent article ne s'applique pas à l'exploitant ni à l'employé d'une exploitation agricole qui est en activité à la date de son entrée en vigueur, sauf dans les cas suivants :

a) l'exploitation fait, après cette date, l'objet d'une expansion qui entraîne une augmentation de plus de 5 % des unités animales ou l'ajout de plus de cinq animaux, si ce nombre est plus élevé;

b) le directeur :

(i) est d'avis que l'épandage entraînerait vraisemblablement la pollution des eaux de surface, des eaux souterraines ou du sol,

(ii) informe l'exploitant par écrit que le présent article s'applique à son exploitation pour la durée que précise l'avis.

R.M. 219/2006

12.1(8) Until November 10, 2013, this section does not apply to the operator of, or a person employed in, an agricultural operation that is in operation on the day this section comes into force and that has not been expanded as set out in clause (7)(a) if

(a) the operator submits a plan to the director not later than November 10, 2008; and

(b) the director approves the plan.

M.R. 219/2006

12.1(8) Jusqu'au 10 novembre 2013, le présent article ne s'applique pas à l'exploitant ni à l'employé d'une exploitation agricole qui est en activité à la date de son entrée en vigueur et qui n'a pas fait l'objet de l'expansion visée à l'alinéa (7)a) si :

a) l'exploitant soumet un plan au directeur au plus tard le 10 novembre 2008;

b) le directeur approuve le plan.

R.M. 219/2006

12.1(9) The plan referred to in subsection (8) must describe the actions taken and proposed to be taken to achieve compliance with this section not later than November 10, 2013.

M.R. 219/2006

12.1(9) Le plan fait état des mesures prises et envisagées en vue de l'observation du présent article au plus tard le 10 novembre 2013.

R.M. 219/2006

12.1(10) Where the amount of phosphorus in the manure produced annually by livestock in an area of not less than 93.24 km^2 (36 mi^2) is greater than two times the annual crop removal rate of P_2O_5 in that area, as determined by the director, this section does not,

(a) until November 10, 2015, apply to the operator of, or a person employed in, an agricultural operation in that area that is in operation on the day this section comes into force unless

(i) the operation is expanded after that day and the expansion results in the operation being increased by more than

(A) 5% of animal units, or

(B) five animals,

whichever is greater, or

(ii) the director

(A) is of the opinion that the land application of livestock manure in the agricultural operation would likely cause pollution of surface water, groundwater or soil, and

(B) notifies the operator in writing that this section applies to the agricultural operation for the period specified in the notice; or

(b) until November 10, 2020, apply to the operator of, or a person employed in, an agricultural operation in that area that is in operation on the day this section comes into force and that has not been expanded as set out in subclause (a)(i) if

(i) the operator submits a plan to the director not later than November 10, 2015, and

(ii) the director approves the plan.

M.R. 219/2006

12.1(10) Si la quantité de phosphore que contiennent les déjections produites annuellement par du bétail dans une zone d'au moins 93,24 km^2 (36 mi^2) excède le double du taux annuel d'absorption du P_2O_5 dans cette zone, selon ce que détermine le directeur, le présent article ne s'applique pas :

a) jusqu'au 10 novembre 2015, à l'exploitant ni à l'employé d'une exploitation agricole qui est située dans cette zone et qui est en activité à la date de son entrée en vigueur, sauf dans les cas suivants :

(i) l'exploitation fait, après cette date, l'objet d'une expansion qui entraîne une augmentation de plus de 5 % des unités animales ou l'ajout de plus de cinq animaux, si ce nombre est plus élevé,

(ii) le directeur :

(A) est d'avis que l'épandage entraînerait vraisemblablement la pollution des eaux de surface, des eaux souterraines ou du sol,

(B) informe l'exploitant par écrit que le présent article s'applique à son exploitation pour la durée que précise l'avis;

b) jusqu'au 10 novembre 2020, à l'exploitant ni à l'employé d'une exploitation agricole qui est située dans cette zone, qui est en activité à la date de son entrée en vigueur et qui n'a pas fait l'objet de l'expansion visée au sous-alinéa a)(i) si :

(i) l'exploitant soumet un plan au directeur au plus tard le 10 novembre 2015,

(ii) le directeur approuve le plan.

R.M. 219/2006

12.1(11) The plan referred to in subsection (10) must describe the actions taken and proposed to be taken to achieve compliance with this section not later than November 10, 2020.

M.R. 219/2006

New or expanded livestock operations in certain areas

12.2(1) Where the amount of phosphorus in the manure produced annually by livestock in an area of not less than 93.24 km^2 (36 mi^2) is greater than two times the annual crop removal rate of P_2O_5 in that area, as determined by the director, no person shall establish an agricultural operation that includes livestock in that area or expand an agricultural operation that is in operation in that area on the day this section comes into force, unless the operator

(a) has access to additional lands suitable for the application of livestock manure located within a reasonable distance, in the director's opinion, from the new or expanded operation; or

(b) submits to the director and the director approves a plan that describes the action taken and proposed to be taken to achieve and maintain soil phosphorus levels below 60 ppm.

M.R. 219/2006

12.2(2) In subsection (1), "**expand**" means an expansion of the agricultural operation that results in the operation being increased by more than

(a) 5% of animal units, or

(b) five animals,

whichever is greater.

M.R. 219/2006

Manure management plans

13(1) No person shall store, handle or dispose of livestock manure, or apply livestock manure to land, except in accordance with a manure management plan registered with the director in accordance with subsection (4).

M.R. 52/2004

12.1(11) Le plan fait état des mesures prises et envisagées en vue de l'observation du présent article au plus tard le 10 novembre 2020.

R.M. 219/2006

Nouvelles exploitations ou expansion d'exploitations

12.2(1) Lorsque la quantité de phosphore que contiennent les déjections produites annuellement par du bétail dans une zone d'au moins 93,24 km^2 (36 mi^2) excède le double du taux annuel d'absorption du P_2O_5 dans cette zone, selon ce que détermine le directeur, il est interdit d'établir une exploitation agricole si du bétail doit se trouver dans cette zone ou de procéder à l'expansion d'une exploitation agricole qui est en activité dans cette zone à la date d'entrée en vigueur du présent article, sauf si l'exploitant, selon le cas :

a) a accès à d'autres terres sur lesquelles peuvent être épandues des déjections du bétail et qui se trouvent à une distance raisonnable, selon le directeur, de la nouvelle exploitation ou de l'exploitation ayant fait l'objet d'une expansion;

b) soumet au directeur un plan que celui-ci approuve et qui fait état des mesures prises et envisagées pour que les niveaux de phosphore dans le sol soient toujours inférieurs à 60 ppm.

R.M. 219/2006

12.2(2) Pour l'application du paragraphe (1), « **expansion** » s'entend d'une expansion de l'exploitation agricole entraînant une augmentation de plus de 5 % des unités animales ou l'ajout de plus de cinq animaux, si ce nombre est plus élevé.

R.M. 219/2006

Plans de gestion des déjections

13(1) Il est interdit de stocker, de manutentionner ou d'éliminer des déjections du bétail ou d'épandre de telles déjections sur une terre si ce n'est en conformité avec un plan de gestion des déjections enregistré auprès du directeur en conformité avec le paragraphe (4).

R.M. 52/2004

13(2) Subsection (1) does not apply to the operator of or a person employed in an agricultural operation that has less than 300 animal units on the day subsection (7) comes into force unless

(a) the operation is expanded after that day and the expansion results in the number of animal units in the expanded operation being 300 or more; or

(b) the director

(i) believes that the storage or handling of livestock manure in the operation, or that the land application of livestock manure in the agricultural operation, would likely

(A) cause pollution of surface water, groundwater or soil, or

(B) result in the livestock manure escaping from the boundary of the agricultural operation, and

(ii) notifies the operator in writing that subsection (1) applies to the agricultural operation for the period specified in the notice.

M.R. 52/2004

13(2) Le paragraphe (1) ne s'applique pas à l'exploitant ni aux employés d'une exploitation agricole qui compte moins de 300 unités animales à la date d'entrée en vigueur du paragraphe (7) sauf si, selon le cas :

a) le nombre d'unités animales de l'exploitation passe à 300 ou plus en raison de l'expansion que celle-ci prend après cette date;

b) le directeur :

(i) d'une part, estime que le stockage ou la manutention de déjections du bétail dans l'exploitation ou que l'épandage de telles déjections sur une terre située dans l'exploitation risquerait :

(A) soit d'entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol,

(B) soit d'entraîner une fuite des déjections du bétail hors des limites de l'exploitation,

(ii) d'autre part, avise l'exploitant par écrit que le paragraphe (1) s'applique à l'exploitation pendant la période précisée dans l'avis.

R.M. 52/2004

13(3) Until July 10, 2004, subsection (1) does not apply to the operator of or a person employed in an agricultural operation that, on the day subsection (7) comes into force, has 300 animal units or more but not more than 400 animal units unless the director

(a) believes that the storage or handling of livestock manure in the operation, or the land application of livestock manure in the agricultural operation, would likely

(i) cause pollution of surface water, groundwater or soil, or

(ii) result in the livestock manure escaping from the boundary of the agricultural operation; and

13(3) Jusqu'au 10 juillet 2004, le paragraphe (1) ne s'applique pas à l'exploitant ni aux employés d'une exploitation agricole qui, à la date d'entrée en vigueur du paragraphe (7), compte de 300 à 400 unités animales, sauf si le directeur :

a) d'une part, estime que le stockage ou la manutention des déjections du bétail dans l'exploitation ou que l'épandage de telles déjections sur une terre située dans l'exploitation risquerait :

(i) soit d'entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol,

(ii) soit d'entraîner une fuite des déjections du bétail hors des limites de l'exploitation;

(b) notifies the operator in writing that subsection (1) applies to the agricultural operation for the period specified in the notice.

M.R. 52/2004

13(4) Before applying livestock manure to land as part of the fertilization program for a growing season, an operator shall submit a manure management plan for the growing season to the director for registration. The manure management plan shall be in a form approved by the director and shall contain or be accompanied by the information the director requires.

M.R. 52/2004

13(4.1) An operator shall submit the manure management plan to the director

(a) before February 10, if the plan provides for a fertilization program starting in the following spring; or

(b) before July 10 of a crop year, if the plan provides for a fertilization program starting in the following fall.

M.R. 52/2004

13(4.2) Despite subsection (4.1), an operator may submit a manure management plan to the director for registration not less than 14 days before starting a land application of manure that is not provided for in a manure management plan that is registered with the director. An operator who submits a manure management plan under this subsection shall pay an administration fee of $100. when he or she submits the plan.

M.R. 52/2004

13(4.3) Subsection (4) does not apply to an operator who subsection (2) or (3) exempts from the application of subsection (1).

M.R. 52/2004

13(5) The director may register a manure management plan submitted under subsection (4), or may refuse to register the plan if

(a) the plan is not in the approved form or does not contain or is not accompanied by the information that the director requires;

b) d'autre part, avise l'exploitant par écrit que le paragraphe (1) s'applique à l'exploitation pendant la période précisée dans l'avis.

R.M. 52/2004

13(4) Avant de procéder à l'épandage de déjections du bétail sur une terre dans le cadre du programme de fertilisation s'appliquant à une saison de croissance, l'exploitant présente au directeur, pour enregistrement, un plan de gestion des déjections. Le plan revêt la forme qu'approuve le directeur et contient les renseignements que celui-ci exige ou est accompagné de tels renseignements.

R.M. 52/2004

13(4.1) L'exploitant présente le plan de gestion des déjections au directeur :

a) avant le 10 février, si le plan prévoit un programme de fertilisation débutant le printemps suivant;

b) avant le 10 juillet d'une année de récolte, si le plan prévoit un programme de fertilisation débutant l'automne suivant.

R.M. 52/2004

13(4.2) Par dérogation au paragraphe (4.1), l'exploitant peut présenter au directeur, pour enregistrement, un plan de gestion des déjections au moins 14 jours avant de procéder à un épandage de déjections non prévu dans un plan de gestion des déjections enregistré auprès du directeur. Le plan visé au présent paragraphe est accompagné de frais administratifs de 100 $.

R.M. 52/2004

13(4.3) Le paragraphe (4) ne s'applique pas à l'exploitant qui est soustrait à l'application du paragraphe (1) en vertu du paragraphe (2) ou (3).

R.M. 52/2004

13(5) Le directeur peut enregistrer un plan de gestion des déjections présenté en application du paragraphe (4), ou refuser de le faire dans les cas suivants :

a) le plan n'est pas en la forme approuvée ou les renseignements qu'il exige ne sont pas inclus dans le plan ni joints à celui-ci;

(a.1) the plan has been prepared by a person other than the operator and the person is prohibited from preparing plans by subsection (8);

(b) the director believes that the operator would likely be in violation of this regulation if the plan was implemented as submitted;

(c) the plan is submitted after the applicable submission deadline set out in subsection (4.2) or (4.3), or the plan is not accompanied by the required administration fee, when subsection (4.3) requires the operator to pay a fee;

(d) the soil nutrient analysis reports submitted with the manure management plan are based on soil samples taken to a depth of less than 0.6 m (2 feet); or

(e) the soil nutrient analysis reports submitted with the manure management plan are not based on analytical procedures acceptable to the director.

M.R. 52/2004; 194/2005

a.1) le plan est dressé par une personne autre que l'exploitant qui n'est pas autorisée en vertu du paragraphe (8) à établir des plans;

b) il est d'avis que l'exploitant risquerait de contrevenir au présent règlement si le plan était mis en œuvre tel qu'il a été présenté;

c) le plan est présenté après le délai applicable prévu au paragraphe (4.2) ou (4.3) ou n'est pas accompagné des frais administratifs visés au paragraphe (4.3) alors que ces frais devraient être versés;

d) les rapports d'analyse des nutriments du sol présentés avec le plan de gestion des déjections sont établis en fonction d'échantillons de sol prélevés à une profondeur de moins de 0,6 m (deux pieds);

e) les rapports d'analyse des nutriments du sol présentés avec le plan de gestion des déjections ne sont pas établis en fonction de méthodes d'analyse acceptables pour lui.

R.M. 52/2004; 194/2005

13(6) A manure management plan registered under this section may be amended by the director at any time upon receipt of a written application from an operator containing or accompanied by the information required by the director.

13(6) Sur réception d'une demande écrite de l'exploitant accompagnée des renseignements qu'il exige, le directeur peut modifier un plan de gestion des déjections du bétail enregistré en vertu du présent article.

13(7) No person shall prepare a manure management plan for the benefit of an operator, whether for a fee or not, unless the person has successfully completed a manure management planning course acceptable to the director, or has training or experience that the director considers to be equivalent, and the person

(a) is a member in good standing of the Manitoba Institute of Agrologists or is exempt from registration with the Institute for the purposes of preparing manure management plans; or

(b) holds the designation of certified crop adviser under the international certified crop adviser program of the American Society of Agronomy and is

(i) in compliance with the requirements of that program for maintaining his or her certification, and

13(7) Nul ne peut établir un plan de gestion des déjections à l'intention d'un exploitant, à titre onéreux ou non, à moins d'avoir terminé avec succès un cours de gestion des déjections que le directeur juge acceptable ou de posséder une formation ou une expérience qu'il juge équivalente et de satisfaire à l'une des exigences suivantes :

a) être membre en règle de l'Institut des agronomes du Manitoba ou ne pas avoir à y être inscrit en vue de l'établissement de plans de gestion des déjections;

b) porter le titre d'expert-conseil agréé sur les cultures conféré dans le cadre du programme international d'agrément des experts-conseils sur les cultures de la « American Society of Agronomy » et :

(i) satisfaire aux exigences du programme pour demeurer agréé,

(ii) carries on business as a crop adviser in Manitoba.

M.R. 52/2004; 194/2005

13(8) A person who prepares a manure management plan for registration with the director shall

(a) ensure that the plan complies with this regulation; and

(b) shall identify himself or herself on the plan form and sign the plan form to certify that he or she believes it complies with this regulation.

M.R. 52/2004; 194/2005

Prohibitions on winter spreading

14(1) Except as provided in subsections (2) to (5), no person shall apply livestock manure to land between November 10 of one year and April 10 of the following year.

M.R. 52/2004

14(2) Subject to subsections (6) to (9), subsection (1) does not apply to the operator of, or a person employed in, an existing agricultural operation that has less than 300 animal units on the day subsection (3.1) comes into force unless the operation is expanded after that day and the expansion results in the number of animal units in the expanded operation being 300 or more.

M.R. 52/2004

14(3) Subject to subsections (6) to (9), subsection (1) does not, until November 10, 2003, apply to the operator of, or a person employed in, an existing agricultural operation that has 400 animal units or more on the day this regulation comes into force unless the operation has been modified or expanded after that day.

M.R. 52/2004

(ii) travailler à titre d'expert-conseil sur les cultures au Manitoba.

R.M. 52/2004; 194/2005

13(8) La personne qui établit un plan de gestion des déjections pour enregistrement auprès du directeur :

a) fait en sorte que le plan soit conforme aux exigences du présent règlement;

b) indique son identité sur la formule de plan et signe celle-ci afin d'attester qu'elle croit qu'elle est conforme aux exigences du présent règlement.

R.M. 52/2004; 194/2005

Interdiction – épandage d'hiver

14(1) Sous réserve des paragraphes (2) à (5), nul ne peut épandre des déjections du bétail sur le sol entre le 10 novembre d'une année et le 10 avril de l'année suivante.

R.M. 52/2004

14(2) Sous réserve des paragraphes (6) à (9), le paragraphe (1) ne s'applique pas à l'exploitant ni aux employés d'une exploitation agricole qui compte moins de 300 unités animales à la date d'entrée en vigueur du paragraphe (3.1), sauf si le nombre d'unités animales de l'exploitation passe à 300 ou plus en raison de l'expansion que celle-ci prend après cette date.

R.M. 52/2004

14(3) Sous réserve des paragraphes (6) à (9) et jusqu'au 10 novembre 2003, le paragraphe (1) ne s'applique pas à l'exploitant ni aux employés d'une exploitation agricole qui compte au moins 400 unités animales à la date d'entrée en vigueur du présent règlement, sauf si l'exploitation a été modifiée ou a pris de l'expansion après cette date.

R.M. 52/2004

14(3.1) Subject to subsections (6) to (9), subsection (1) does not, until November 10, 2010, apply to the operator of or a person employed in an existing agricultural operation that has 300 animal units or more but not more than 400 animal units on the day this subsection comes into force unless the operation is expanded after that day and the expansion results in the number of animal units in the expanded operation being 400 or more.

M.R. 52/2004

14(3.2) Despite subsections (3) and (3.1) and subject to subsections (6) to (9), subsection (1) does not, until November 10, 2013, apply to the operator of, or a person employed in, an agricultural operation that is in operation on the day this subsection comes into force that

(a) has fewer than 300 animal units; and

(b) is located in a regularly inundated area.

M.R. 219/2006

14(4) Where, due to an emergency situation or to other extenuating circumstances, the director has given an operator prior authorization to apply livestock manure to land during all or part of the period between November 10 and the following April 10, subsection (1) does not apply to the operator or employees of the agricultural operation during that period.

M.R. 52/2004

14(5) Where the director considers it appropriate considering local soil and weather conditions, he or she may by order vary the dates provided for in subsection (1) in relation to any part of the province that is stated in the order.

M.R. 52/2004

14(6) No person shall apply livestock manure to land between November 10 of one year and April 10 of the following year except in accordance with the minimum setback distance requirements set out in Schedule B.

M.R. 52/2004

14(3.1) Sous réserve des paragraphes (6) à (9), le paragraphe (1) ne s'applique pas, jusqu'au 10 novembre 2010, à l'exploitant ni aux employés d'une exploitation agricole qui, à la date d'entrée en vigueur du présent paragraphe, compte de 300 à 400 unités animales, sauf si le nombre d'unités animales de l'exploitation passe à 400 ou plus en raison de l'expansion que celle-ci prend après cette date.

R.M. 52/2004

14(3.2) Malgré les paragraphes (3) et (3.1) et sous réserve des paragraphes (6) à (9), le paragraphe (1) ne s'applique pas, jusqu'au 10 novembre 2013, à l'exploitant ni à l'employé d'une exploitation agricole qui est en activité à la date d'entrée en vigueur du présent article et qui satisfait aux conditions suivantes :

a) elle compte moins de 300 unités animales;

b) elle est située dans une zone régulièrement inondée.

R.M. 219/2006

14(4) Le paragraphe (1) ne s'applique pas à l'exploitant ni aux employés d'une exploitation agricole qui, en raison d'une situation d'urgence ou de circonstances atténuantes, ont obtenu l'autorisation du directeur d'épandre des déjections du bétail sur le sol entre le 10 novembre d'une année et le 10 avril de l'année suivante.

R.M. 52/2004

14(5) Le directeur peut, s'il l'estime indiqué compte tenu du sol et des conditions météorologiques de la région, modifier par ordre les dates prévues au paragraphe (1) pour toute partie de la province indiquée dans l'ordre.

R.M. 52/2004

14(6) Nul ne peut épandre des déjections du bétail sur le sol entre le 10 novembre d'une année et le 10 avril de l'année suivante, si ce n'est en conformité avec les exigences relatives à la distance minimale indiquées à l'annexe B.

R.M. 52/2004

14(7) No person shall apply livestock manure to land between November 10 of one year and April 10 of the following year if the mean slope of the land is 12% or more.

M.R. 52/2004

14(8) Notwithstanding subsections (2), (3), (3.1) and (3.2), the director may by order prohibit an operator from applying livestock manure to land in the agricultural operation during all or part of the period between November 10 of one year and April 10 of the following year where, in the opinion of the director, the application would likely

(a) cause pollution of surface water, groundwater or soil; or

(b) result in the livestock manure escaping from the boundary of the agricultural operation.

M.R. 52/2004; 219/2006

14(9) Where the director has made an order under subsection (8) in relation to an agricultural operation, no person shall apply livestock manure to land in the agricultural operation except in accordance with the order.

Designation of Red River Valley Special Management Area

14.1 The land described in Plan No. 4298-2006, filed at the head office of Environmental Programs of the Department of Conservation in Winnipeg, is hereby designated as the Red River Valley Special Management Area.

M.R. 219/2006

Restrictions on fall spreading

14.2(1) No person shall apply livestock manure to land located in a regularly inundated area between September 10 and November 10 of any year unless

(a) the livestock manure is incorporated into the soil within 48 hours after application; or

(b) the livestock manure is injected into the soil.

M.R. 219/2006

14(7) Nul ne peut épandre des déjections du bétail sur le sol entre le 10 novembre d'une année et le 10 avril de l'année suivante si la pente moyenne du sol est de 12 % et plus.

R.M. 52/2004

14(8) Malgré les paragraphes (2), (3), (3.1) et (3.2), le directeur peut par ordre interdire à un exploitant d'épandre des déjections du bétail sur le sol de son exploitation agricole pendant la période comprise entre le 10 novembre d'une année et le 10 avril de l'année suivante si, selon lui, l'épandage risquerait :

a) de polluer l'eau de surface, l'eau souterraine ou le sol;

b) d'entraîner le déversement des déjections du bétail hors des limites de l'exploitation agricole.

R.M. 52/2004; 219/2006

14(9) Dans le cas où le directeur a donné l'ordre que vise le paragraphe (8) relativement à une exploitation agricole, nul ne peut épandre des déjections du bétail sur le sol de cette exploitation agricole si ce n'est en conformité avec l'ordre.

Désignation de la zone spéciale de gestion de la vallée de la Rivière rouge

14.1 Le bien-fonds indiqué sur le plan nº 4298-2006 déposé à Winnipeg, au siège social des Programmes environnementaux du ministère de la Conservation est désigné à titre de zone spéciale de gestion de la vallée de la Rivière rouge.

R.M. 219/2006

Épandage à l'automne

14.2(1) Il est interdit d'épandre, dans des zones régulièrement inondées, des déjections du bétail entre le 10 septembre et le 10 novembre sauf :

a) si les déjections sont incorporées dans la terre dans les 48 heures suivant leur épandage;

b) si les déjections sont injectées dans la terre.

R.M. 219/2006

14.2(2) Despite subsection (1), a person may, between September 10 and November 10 of one year, apply livestock manure to land located in a regularly inundated area if

(a) perennial forages are established on the land; or

(b) the land is managed in the following manner:

(i) the soil is not disturbed except for seed planting or commercial fertilizer application, and

(ii) there is adequate crop residue on the land to control erosion.

M.R. 219/2006

14.2(2) Malgré le paragraphe (1), il est permis d'épandre, dans des zones régulièrement inondées, des déjections du bétail entre le 10 septembre et le 10 novembre si, selon le cas :

a) des plantes fourragères pérennes poussent sur les terres;

b) les terres sont gérées de la manière suivante :

(i) elles ne sont travaillées qu'au moment des semis ou de l'épandage d'engrais commerciaux,

(ii) les résidus de culture sont suffisants pour freiner l'érosion.

R.M. 219/2006

DISPOSAL OF MORTALITIES

ÉLIMINATION DES ANIMAUX MORTS

Disposal of mortalities
15(1) No person shall keep mortalities in or at an agricultural operation unless the mortalities are kept

(a) in a secure storage room, covered container or secure location; and

(b) continually frozen or refrigerated, if not disposed of within 48 hours after death.

M.R. 52/2004

Élimination des animaux morts
15(1) Nul ne peut garder des animaux morts dans une exploitation agricole sauf s'ils sont gardés :

a) dans une salle de stockage sûre, un conteneur couvert ou un lieu sûr;

b) congelés ou réfrigérés continuellement, s'ils ne sont pas éliminés dans les 48 heures suivant leur mort.

R.M. 52/2004

15(2) No person shall dispose of mortalities except by

(a) burial in accordance with subsection (3), (3.1) or (3.2);

(a.1) by burning in accordance with subsection (3);

(b) composting in accordance with section 15.1; or

(c) delivery to a rendering plant.

M.R. 52/2004

15(2) Nul ne peut éliminer des animaux morts autrement que par :

a) enfouissement, conformément au paragraphe (3), (3.1) ou (3.2);

a.1) incinération, conformément au paragraphe (3);

b) compostage, conformément à l'article 15.1;

c) remise de ceux-ci à une usine d'équarrissage.

R.M. 52/2004

ENVIRONNEMENT E125 — R.M. 42/98

15(3) No person shall dispose of mortalities by incineration or burial on the property of an agricultural operation unless

(a) the disposal does not cause pollution of surface water, groundwater or soil;

(b) where disposal is by burial, the operation has less than 300 animal units and

(i) mortalities in a burial pit are covered with a minimum of one metre of soil,

(ii) the disposal site is located at least 100 m from any surface watercourse, sinkhole, spring or well and from the operation's boundaries, and

(iii) the disposal site is constructed so as to prevent the escape of any decomposition products of the mortalities that cause or may cause pollution of surface water, groundwater or soil; and

(c) where disposal is by burning, the mortalities are burned

(i) in an incinerator that is installed and operated in compliance with the *Incinerators Regulation*, or

(ii) in a another device that is approved by the director for burning mortalities.

M.R. 52/2004

15(3) Nul ne peut éliminer les animaux morts par incinération ou enfouissement sur les lieux de l'exploitation agricole, sauf en conformité avec les conditions suivantes :

a) l'élimination ne pollue pas l'eau de surface, l'eau souterraine ou le sol;

b) en cas d'enfouissement, l'exploitation compte moins de 300 unités animales et :

(i) les animaux morts placés dans une fosse sont couverts d'au moins un mètre de terre,

(ii) le lieu d'élimination est situé à au moins 100 mètres des cours d'eau de surface, des dolines, des sources ou des puits et des limites de l'exploitation,

(iii) le lieu d'élimination est aménagé de façon à empêcher tout déversement de produits provenant de la décomposition des animaux morts polluant ou pouvant polluer l'eau de surface, l'eau souterraine ou le sol;

c) en cas d'incinération, les animaux morts sont incinérés :

(i) dans un incinérateur installé et utilisé en conformité avec le *Règlement sur les incinérateurs*,

(ii) dans un autre appareil approuvé par le directeur à cette fin.

R.M. 52/2004

15(3.1) No person shall, without the director's written approval, dispose of mortalities by burial in an agricultural operation that has 300 animal units or more.

M.R. 52/2004

15(3.1) Il est interdit, sans l'approbation écrite du directeur, d'éliminer des animaux morts par enfouissement dans une exploitation agricole comptant au moins 300 unités animales.

R.M. 52/2004

15(3.2) Until November 10, 2004, subsection (3.1) does not apply to the operator of or a person employed in an existing agricultural operation that has 300 animal units or more on the day subsection (3.1) comes into force unless the operation is expanded after that day and the expansion results in the number of animal units in the operation being increased.

M.R. 52/2004

15(3.2) Le paragraphe (3.1) ne s'applique pas, jusqu'au 10 novembre 2004, à l'exploitant ni aux employés d'une exploitation agricole qui, à la date d'entrée en vigueur du paragraphe (3.1), compte au moins 300 unités animales, sauf si le nombre d'unités animales de l'exploitation augmente en raison de l'expansion que celle-ci prend après cette date.

R.M. 52/2004

15(4) Repealed.

M.R. 52/2004

15(5) Subject to subsection (6), an operator shall ensure that mortalities are not kept in or at an agricultural operation or disposed of, except in accordance with subsections (1) to (3.2).

M.R. 52/2004

15(6) In the event that the number of mortalities in an agricultural operation at any time exceeds the operation's routine capacity to dispose of mortalities, the operator shall

(a) without delay report the situation to an environment officer and provide the officer with any information about the situation that the officer requests; and

(b) dispose of the mortalities according to the director's or an environment officer's instructions.

M.R. 52/2004

Composting mortalities

15.1(1) No person shall compost livestock mortalities on the property of an agricultural operation unless

(a) the composting site is located at least 100 m from

(i) any surface watercourse, sinkhole, spring or well, and

(ii) the operation's boundaries;

(b) the mortalities are composted in a manner that does not cause pollution of surface water, groundwater or soil; and

(c) the composting facilities and process are acceptable to the director.

M.R. 52/2004

15(4) Abrogé.

R.M. 52/2004

15(5) Sous réserve du paragraphe (6), l'exploitant veille à ce que les animaux morts ne puissent être gardés dans une exploitation agricole ou éliminés qu'en conformité avec les dispositions des paragraphes (1) à (3.2).

R.M. 52/2004

15(6) Si le nombre d'animaux morts dans une exploitation agricole excède à un moment quelconque la capacité normale de l'exploitation en ce qui a trait à l'élimination de ces animaux, l'exploitant :

a) d'une part, fait immédiatement rapport de la situation à un agent de l'environnement et fournit à celui-ci les renseignements qu'il demande relativement à cette situation;

b) d'autre part, élimine les animaux morts en conformité avec les directives du directeur ou d'un agent de l'environnement.

R.M. 52/2004

Compostage d'animaux morts

15.1(1) Nul ne peut composter des animaux morts sur les lieux d'une exploitation agricole, sauf si les conditions suivantes sont réunies :

a) le lieu du compostage est situé à au moins 100 m :

(i) des cours d'eau de surface, des dolines, des sources et des puits,

(ii) des limites de l'exploitation;

b) les animaux morts sont compostés d'une manière n'entraînant pas la pollution de l'eau de surface, de l'eau souterraine ni du sol;

c) le directeur juge acceptable les installations et le procédé de compostage.

R.M. 52/2004

ENVIRONNEMENT E125 — R.M. 42/98

15.1(2) Clause (1)(a) does not apply to an operator, or the operator's employee, in respect of a composting site that is in operation on the day subsection (1) comes into force unless the agricultural operation is expanded after that day and the expansion increases the operation's capacity to 300 animal units or more.

M.R. 52/2004

15.1(2) L'alinéa (1)a) ne s'applique pas à l'exploitant ni à ses employés relativement à un lieu de compostage qui est utilisé à la date d'entrée en vigueur du paragraphe (1), sauf si la capacité de l'exploitation passe à 300 unités animales ou plus en raison de l'expansion que celle-ci prend après cette date.

R.M. 52/2004

CONFINED LIVESTOCK AREAS

Confined livestock areas

16(1) An operator shall ensure that livestock in a confined livestock area of an agricultural operation do not have access to surface water.

M.R. 52/2004

16(2) No person shall construct, modify or expand a confined livestock area capable of housing 300 animal units or more of livestock except under the authority of a permit issued by the director under section 16.1.

M.R. 52/2004

16(3) When there are livestock comprising more than 10 animal units in a confined livestock area of an agricultural operation, the operator shall, unless the director otherwise approves in writing, locate the area at least 100 m from

(a) any surface watercourse, sinkhole, spring or well; and

(b) the operation's boundaries.

M.R. 52/2004

16(4) If the director approves another location for a confined livestock area, the operator shall locate the area in accordance with the approval.

M.R. 52/2004

16(5) No person shall operate a confined livestock area of an agricultural operation in a manner that causes pollution of surface water, surface watercourse, groundwater or soil.

M.R. 52/2004

ESPACES CLOS

Espaces clos

16(1) L'exploitant veille à ce que le bétail se trouvant dans un espace clos sur les lieux de l'exploitation agricole n'ait pas accès à l'eau de surface.

R.M. 52/2004

16(2) Nul ne peut construire, modifier ni agrandir un espace clos pouvant loger au moins 300 unités animales si ce n'est en conformité avec un permis délivré par le directeur en vertu de l'article 16.1.

R.M. 52/2004

16(3) Sauf autorisation contraire écrite du directeur, l'espace clos qui loge plus de 10 unités animales sur les lieux d'une exploitation agricole est situé à au moins 100 m :

a) des cours d'eau de surface, des dolines, des sources et des puits;

b) des limites de l'exploitation.

R.M. 52/2004

16(4) L'espace clos à l'égard duquel le directeur autorise un autre emplacement est situé à l'endroit que prévoit l'autorisation.

R.M. 52/2004

16(5) Il est interdit d'utiliser un espace clos dans une exploitation agricole d'une manière entraînant la pollution de l'eau de surface, des cours d'eau de surface, de l'eau souterraine ou du sol.

R.M. 52/2004

ENVIRONMENT E125 — M.R. 42/98

16(6) If a confined livestock area constructed before the day this subsection comes into force is operated in compliance with subsection (5), subsection (3) does not apply to the area unless it is modified after that day or is expanded after that day and the expansion results in the number of animal units of the expanded area being 300 or more.

M.R. 52/2004

16(7) Subject to subsection (8), an operator shall at least once every year remove from a confined livestock area, regardless of its size, the manure that accumulates in the area and, in accordance with this regulation, shall

(a) store the manure at the agricultural operation;

(b) apply the manure to land; or

(c) otherwise dispose of the manure.

M.R. 52/2004

16(8) On request by an operator, the director may in writing approve less frequent manure removal if the director considers the less frequent removal appropriate. An operator who obtains the director's approval to less frequent manure removal shall remove the manure from the confined livestock area at least as frequently as the director's approval requires.

M.R. 52/2004

Permit to construct confined livestock area

16.1(1) An application for a permit to construct, modify or expand a confined livestock area shall be made by an operator to the director on a form approved by the director and be accompanied by the information required on the application form and any additional information that the director requires.

M.R. 52/2004

16.1(2) After receiving an application, the director shall, in order to determine the appropriate siting and construction requirements for a proposed confined livestock area,

(a) examine the site of the proposed confined livestock area and evaluate the site's soil, geology and proximity to aquifers; or

16(6) L'espace clos qui est construit avant la date d'entrée en vigueur du présent paragraphe et qui est utilisé en conformité avec le paragraphe (5) n'est pas visé par le paragraphe (3) sauf s'il est modifié après cette date ou s'il est agrandi après celle-ci et si le nombre d'unités animales qui y sont logées passe à 300 ou plus en raison de cet agrandissement.

R.M. 52/2004

16(7) Sous réserve du paragraphe (8), au moins une fois par an, l'exploitant enlève de l'espace clos, et ce, indépendamment des dimensions de celui-ci, les déjections qui s'y accumulent et, en conformité avec le présent règlement :

a) soit les stocke dans l'exploitation agricole;

b) soit procède à leur épandage;

c) soit en dispose autrement.

R.M. 52/2004

16(8) Sur demande de l'exploitant, le directeur peut, par écrit, autoriser l'enlèvement des déjections à des intervalles moins fréquents s'il l'estime indiqué, auquel cas l'exploitant enlève les déjections de l'espace clos au moins aussi souvent que le prévoit l'autorisation du directeur.

R.M. 52/2004

Permis de construction d'un espace clos

16.1(1) Une demande de permis de construction, de modification ou d'agrandissement d'un espace clos est présentée par l'exploitant au directeur au moyen de la formule que celui-ci approuve et est accompagnée des renseignements exigés sur cette formule ainsi que des renseignements supplémentaires que le directeur requiert.

R.M. 52/2004

16.1(2) Après avoir reçu la demande, le directeur est tenu, afin d'établir les exigences en matière d'emplacement et de construction auxquelles doit satisfaire l'espace clos projeté :

a) d'examiner l'emplacement prévu et d'évaluer le sol, la géologie ainsi que la proximité d'aquifères à cet endroit;

(b) direct the applicant to conduct an examination and evaluation as described in clause (a) in a manner that is acceptable to the director.

M.R. 52/2004

16.1(3) An applicant is entitled to be issued a permit if the director is satisfied that the construction can be carried out in a manner that ensures that the environment is protected.

M.R. 52/2004

16.1(4) The director may include terms and conditions in a permit.

M.R. 52/2004

16.1(5) Without limiting the generality of subsection (4), the director may require the operator to construct a collection basin for the confined livestock area if the director believes a basin is necessary to prevent the discharge of water contaminated with manure into a surface watercourse.

M.R. 52/2004

16.1(6) An operator to whom a permit is issued, and a professional engineer, contractor or other person performing work for which the permit has been issued, shall comply with any terms and conditions contained in the permit.

M.R. 52/2004

Collection basins

16.2(1) Unless otherwise approved in writing by the director, no person shall construct a collection basin between November 1 of one year and April 30 of the following year.

M.R. 52/2004

16.2(2) An operator who constructs a collection basin, whether on his or her own initiative or under the terms and conditions of a permit under section 16.1, shall

(a) ensure that the collection basin's minimum holding capacity is 7.5 cm of runoff from the confined livestock area's surface area and that its maximum capacity is 15 cm runoff from the surface area, in either case with a freeboard of at least 30 cm;

b) d'ordonner à l'auteur de la demande de procéder à l'examen et à l'évaluation visés à l'alinéa a) d'une manière qu'il juge acceptable.

R.M. 52/2004

16.1(3) L'auteur de la demande a le droit de se faire délivrer un permis si le directeur est convaincu que la construction peut avoir lieu de manière que l'environnement soit protégé.

R.M. 52/2004

16.1(4) Le permis peut être assorti de conditions.

R.M. 52/2004

16.1(5) Sans préjudice de la portée générale du paragraphe (4), le directeur peut exiger que l'exploitant construise un bassin collecteur pour l'espace clos s'il est d'avis qu'un tel bassin est nécessaire afin que soit empêché le déversement d'eau contaminée par des déjections dans un cours d'eau de surface.

R.M. 52/2004

16.1(6) L'exploitant à qui un permis est délivré ainsi que l'ingénieur, l'entrepreneur ou toute autre personne qui exécute un travail visé par ce permis observent les conditions éventuellement rattachées à celui-ci.

R.M. 52/2004

Bassins collecteurs

16.2(1) Sauf autorisation contraire écrite du directeur, il est interdit de construire un bassin collecteur entre le 1er novembre et le 30 avril de l'année suivante.

R.M. 52/2004

16.2(2) L'exploitant qui construit un bassin collecteur, de sa propre initiative ou conformément aux conditions d'un permis délivré en vertu de l'article 16.1 :

a) fait en sorte que le bassin ait une capacité de rétention de 7,5 cm à 15 cm d'eau de ruissellement provenant de l'espace clos et ait un espace libre d'au moins 30 cm;

(b) construct the collection basin in a manner that is acceptable to the director; and

(c) not allow the water level in the collection basin to rise above the required 30 cm freeboard at any time.

M.R. 52/2004

b) effectue les travaux d'une manière acceptable pour le directeur;

c) fait en sorte que l'espace libre de 30 cm soit maintenu en tout temps.

R.M. 52/2004

MANURE STORAGE FACILITIES THAT DO NOT HAVE PERMITS

Registration: facilities that do not have permits

16.3(1) This section applies to a manure storage facility if it is

(a) an earthen storage facility constructed before April 29, 1994; or

(b) a molehill, steel tank or concrete tank for storing livestock manure constructed before March 31, 1998, other than an under-floor concrete storage pit used for containment of liquid or semi-solid manure for less than 30 days.

M.R. 52/2004

16.3(2) After November 10, 2010, no person shall store liquid or semi-solid manure in a manure storage facility unless the facility is registered with the director.

M.R. 52/2004

16.3(3) An application for registration of a manure storage facility shall be

(a) made by an operator to the director on a form approved by the director;

(b) accompanied by the information required on the application form and any additional information that the director requires; and

(c) be submitted to the director on or before June 10, 2004.

M.R. 52/2004

INSTALLATIONS DE STOCKAGE DE DÉJECTIONS NON VISÉES PAR UN PERMIS

Enregistrement — installations non visées par un permis

16.3(1) Le présent article s'applique aux installations de stockage de déjections qui sont :

a) soit des installations de stockage en terre construites avant le 29 avril 1994;

b) soit des monticules ou des réservoirs en acier ou en béton servant au stockage de déjections du bétail construits avant le 31 mars 1998, à l'exclusion des fosses de stockage en béton sous le plancher servant à contenir les déjections liquides ou pâteuses pendant moins de 30 jours.

R.M. 52/2004

16.3(2) Après le 10 novembre 2010, il n'est permis de stocker des déjections liquides ou pâteuses dans une installation de stockage de déjections que si celle-ci est enregistrée auprès du directeur.

R.M. 52/2004

16.3(3) La demande d'enregistrement d'une installation de stockage de déjections :

a) est présentée par l'exploitant au directeur au moyen de la formule que celui-ci approuve;

b) est accompagnée des renseignements exigés sur cette formule ainsi que des renseignements supplémentaires que le directeur requiert;

c) est présentée au directeur au plus tard le 10 juin 2004.

R.M. 52/2004

16.3(4) After receiving the application and before deciding whether to register the manure storage facility, the director shall review the information provided by the operator and inspect the facility.

M.R. 52/2004

16.3(5) Before deciding whether to register the manure storage facility, the director may require the operator to conduct an examination of the facility's integrity and proximity to surface water, surface watercourses, wells, springs, sinkholes, groundwater or other environmentally sensitive areas in a manner that is acceptable to the director and to submit a report to the director stating the results, if the director believes that the facility's integrity is causing or would likely cause

(a) pollution of surface water, groundwater or soil; or

(b) livestock manure to escape from the boundary of the agricultural operation.

M.R. 52/2004

16.3(6) Before registering a manure storage facility, the director may require the operator

(a) to provide protection to nearby watercourses, wells, springs, sinkholes or other environmentally sensitive areas in a manner that is acceptable to the director;

(b) to repair the manure storage facility to correct anything the director considers to be a deficiency in the facility; or

(c) to modify the manure storage facility to correct anything the director considers to be a deficiency in the facility.

M.R. 52/2004

16.3(7) If the director requires an operator to modify a manure storage facility under clause (6)(c), the operator must obtain a permit under section 6 before modifying the facility.

M.R. 52/2004

16.3(4) Après avoir reçu la demande et avant de décider s'il va ou non enregistrer l'installation de stockage de déjections, le directeur examine les renseignements fournis par l'exploitant et inspecte l'installation.

R.M. 52/2004

16.3(5) Avant de décider s'il va ou non enregistrer l'installation de stockage de déjections, le directeur peut exiger que l'exploitant examine, d'une manière qu'il estime acceptable, l'intégrité de l'installation et la proximité de celle-ci par rapport aux zones vulnérables sur le plan environnemental, y compris l'eau de surface, les cours d'eau de surface, les puits, les sources, les dolines et l'eau souterraine, et lui présente un rapport faisant état des résultats, s'il croit que l'intégrité de l'installation :

a) entraîne ou risque d'entraîner la pollution de l'eau de surface, de l'eau souterraine ou du sol;

b) provoque ou risque de provoquer une fuite de déjections du bétail hors des limites de l'exploitation agricole.

R.M. 52/2004

16.3(6) Avant d'enregistrer une installation de stockage de déjections, le directeur peut exiger que l'exploitant :

a) protège les zones avoisinantes qui sont vulnérables sur le plan environnemental, y compris les cours d'eau, les puits, les sources et les dolines, d'une manière que le directeur estime acceptable;

b) répare l'installation de stockage de déjections afin d'y corriger toute chose qui, selon le directeur, constitue une lacune;

c) modifie l'installation de stockage de déjections afin d'y corriger toute chose qui, selon le directeur, constitue une lacune.

R.M. 52/2004

16.3(7) Si le directeur exige en vertu de l'alinéa (6)c) que l'exploitant modifie une installation de stockage de déjections, celui-ci obtient le permis visé à l'article 6 avant de procéder à la modification.

R.M. 52/2004

16.3(8) An operator who complies with the requirements of this section and any requirement the director requires under subsection (5) or (6) is entitled to registration of the manure storage facility.

M.R. 52/2004

16.3(9) The director may impose conditions on a registration.

M.R. 52/2004

16.3(10) The director may refuse to register a manure storage facility if

(a) he or she is not satisfied that the environment is protected; or

(b) the operator fails to comply with a requirement of this section or a requirement the director requires under subsection (5) or (6).

M.R. 52/2004

16.3(11) An operator shall comply with any conditions the director imposes on the registration.

M.R. 52/2004

16.3(12) A manure storage facility that has been constructed, modified or expanded under the authority of a permit under this regulation or the *Livestock Waste Regulation*, Manitoba Regulation 81/94, is deemed to have been registered under this section.

M.R. 52/2004

16.3(8) L'exploitant qui observe le présent article et les exigences que fixe le directeur en vertu du paragraphe (5) ou (6) a le droit d'obtenir l'enregistrement de l'installation de stockage de déjections.

R.M. 52/2004

16.3(9) Le directeur peut assortir l'enregistrement de conditions.

R.M. 52/2004

16.3(10) Le directeur peut refuser d'enregistrer une installation de stockage de déjections dans les cas suivants :

a) il n'est pas convaincu que l'environnement est protégé;

b) l'exploitant omet d'observer le présent article ou l'une des exigences que fixe le directeur en vertu du paragraphe (5) ou (6).

R.M. 52/2004

16.3(11) L'exploitant observe les conditions éventuellement rattachées à l'enregistrement.

R.M. 52/2004

16.3(12) L'installation de stockage de déjections du bétail qui a été construite, modifiée ou agrandie en vertu d'un permis délivré sous le régime du présent règlement ou du *Règlement sur les déjections du bétail*, *R.M.* 81/94, est réputée avoir été enregistrée en vertu du présent article.

R.M. 52/2004

GENERAL PROVISIONS

Variation of requirements

17(1) The director may, upon written application or on his or her own initiative vary any of the requirements of this regulation in respect of an agricultural operation, where in the opinion of the director, an innovative and environmentally sound practice or procedure relating to the use, management or storage of livestock manure or mortalities is not sanctioned or is prohibited by this regulation.

M.R. 52/2004

DISPOSITIONS GÉNÉRALES

Modification des exigences

17(1) Le directeur peut, sur réception d'une demande écrite en ce sens ou de sa propre initiative, modifier les exigences du présent règlement à l'égard d'une exploitation agricole lorsqu'il estime qu'une pratique ou une méthode innovatrice et sans danger pour l'environnement en ce qui concerne l'utilisation, la gestion ou le stockage des déjections du bétail ou d'animaux morts n'est pas permise ou est interdite par le présent règlement.

R.M. 52/2004

17(2) The director may, upon written application, vary the siting requirements for a manure storage facility, composting site or confined livestock area if the director believes its construction, modification or expansion would significantly lower the risk of pollution of surface water, groundwater or soil for an existing agricultural operation.

M.R. 52/2004

Experimental permits

17.1(1) On application, the director may issue a permit allowing the experimental application of manure to land other than in accordance with this regulation. The director may include terms and conditions in the permit.

M.R. 52/2004

17.1(2) The director may refuse to issue a permit without providing reasons for the refusal.

M.R. 52/2004

17.1(3) A person who obtains an experimental permit shall comply with any terms and conditions the director includes in it.

M.R. 52/2004

Review

18 Not later than March 31, 2011, the minister must

(a) consider the effectiveness of regulating livestock manure application to land on the basis of phosphorus, after consulting with such persons affected by livestock manure application as the minister considers appropriate; and

(b) if the minister considers it advisable, recommend to the Lieutenant Governor in Council that this regulation be amended or repealed.

M.R. 52/2004; 219/2006

Repeal

19 The *Livestock Waste Regulation*, Manitoba Regulation 81/94, is repealed.

17(2) Le directeur peut, sur demande écrite, modifier les exigences en matière d'emplacement s'appliquant à une installation de stockage de déjections, à un lieu de compostage ou à un espace clos s'il est d'avis que sa construction, sa modification ou son agrandissement diminuerait fortement le risque de pollution de l'eau de surface, de l'eau souterraine ou du sol à l'égard d'une exploitation agricole existante.

R.M. 52/2004

Permis d'épandage expérimental

17.1(1) Sur demande, le directeur peut délivrer un permis autorisant l'épandage expérimental de déjections sur une terre autrement qu'en conformité avec le présent règlement. Le permis peut être assorti de conditions.

R.M. 52/2004

17.1(2) Le directeur peut refuser de délivrer un permis sans donner les motifs de son refus.

R.M. 52/2004

17.1(3) La personne qui obtient un permis d'épandage expérimental observe les conditions éventuellement rattachées à celui-ci.

R.M. 52/2004

Examen

18 Au plus tard le 31 mars 2011, le ministre :

a) examine l'efficacité de la réglementation portant sur l'épandage de déjections du bétail et axée sur les niveaux de phosphore après avoir consulté les personnes dont l'opinion lui paraît utile et qui sont concernées;

b) s'il le juge indiqué, recommande au lieutenant-gouverneur en conseil la modification ou l'abrogation du présent règlement.

R.M. 52/2004; 219/2006

Abrogation

19 Est abrogé le *Règlement sur les déjections du bétail*, *R.M.* 81/94.

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SCHEDULE A
(Sections 5 and 6)

SITING AND CONSTRUCTION REQUIREMENTS FOR MANURE STORAGE FACILITIES

Siting requirements

1 The construction, modification or expansion of a manure storage facility shall meet the following minimum setback requirements:

(a) 100 m from any surface watercourse;

(b) 100 m from any sinkhole, spring or well;

(c) 100 m from the boundaries of the agricultural operation.

Construction of earthen storage facilities

2 The construction, modification or expansion of an earthen storage facility shall meet the following construction requirements:

(a) the storage volume of the completed earthen storage facility shall meet the requirements of clause 4(a) of this regulation;

(b) topsoil shall be stripped from the area where any dike is to be constructed before excavation and compaction;

(c) all excavated material shall be placed in 0.15 m lifts and then compacted;

(d) if a plastic or compacted clay liner will not be installed, the sides and bottom of the earthen storage facility shall be

(i) disced to a minimum depth of 20 cm, and

ANNEXE A
(articles 5 et 6)

EXIGENCES EN MATIÈRE D'EMPLACEMENT ET DE CONSTRUCTION DES INSTALLATIONS DE STOCKAGE DE DÉJECTIONS

Exigences en matière d'emplacement

1 Les installations de stockage de déjections doivent se trouver à au moins :

a) 100 mètres des cours d'eau de surface;

b) 100 mètres des dolines, des sources et des puits;

c) 100 mètres des limites de l'exploitation agricole.

Construction d'installations de stockage en terre 2

La construction, la modification ou l'agrandissement de toute installation de stockage en terre doit satisfaire aux exigences suivantes :

a) une fois les travaux terminés, l'installation de stockage doit avoir une capacité de stockage conforme aux exigences de l'alinéa 4a) du présent règlement;

b) la terre de surface doit être enlevée à l'endroit où des levées doivent être aménagées avant les travaux d'excavation et de compactage;

c) les matériaux excavés doivent être étalés en couches de 0,15 mètres puis être compactés;

d) dans le cas où aucun revêtement en plastique ou aucun revêtement en argile compacté n'est installé, les côtés et le fond de l'installation sont :

(i) d'une part, endigués jusqu'à une profondeur minimale de 20 cm,

(ii) compacted with a fully ballasted sheepsfoot packer, or other compaction equipment approved by the director, to at least 95% of maximum Standard Proctor dry density, determined by testing in accordance with ASTM Standard D698 at a moisture content between 0.9 and 1.2 optimum and a maximum hydraulic conductivity no more than 1 x 10^{-7} cm per second;

(d.1) if a plastic or compacted clay liner is installed, it shall be placed over a stable floor and dike that are to be compacted with a fully ballasted sheepsfoot packer, or other compaction equipment approved by the director, to at least 95% of maximum Standard Proctor dry density, determined by testing in accordance with ASTM Standard D698;

(d.2) if a compacted clay liner is installed, excavated material shall be placed to a minimum thickness of 1 m in successive 15 cm thick lifts compacted with a fully ballasted sheepsfoot packer, or other compaction equipment approved by the director, to at least 95% of maximum Standard Proctor dry density, determined by testing in accordance with ASTM Standard D698 at a moisture content between 0.9 and 1.2 optimum, and a maximum hydraulic conductivity no more than 1 x 10^{-7} cm per second;

(e) excavation and compaction shall be completed during temperature conditions that are above freezing;

(f) and (g) repealed, M.R. 52/2004;

(ii) d'autre part, compactés à l'aide de matériel de compactage approuvé par le directeur, notamment à l'aide d'un rouleau à pieds de mouton entièrement ballasté, de façon qu'ils aient au moins 95 % de leur masse volumique sèche maximale établie à l'aide de l'essai Proctor normal effectué en conformité avec la norme D698 de l'ASTM lorsque la teneur en humidité se situe entre 0,9 et 1,2 du niveau optimal et que la conductivité hydraulique maximale ne dépasse pas 1 x 10^{-7} cm par seconde;

d.1) dans le cas où un revêtement en plastique ou un revêtement en argile compacté est installé, ce revêtement est placé sur un sol et une levée stables devant être compactés à l'aide de matériel de compactage approuvé par le directeur, notamment à l'aide d'un rouleau à pieds de mouton entièrement ballasté, de façon qu'ils aient au moins 95 % de leur masse volumique sèche maximale établie à l'aide de l'essai Proctor normal effectué en conformité avec la norme D698 de l'ASTM;

d.2) dans le cas où un revêtement en argile compacté est installé, les matériaux excavés doivent être étalés jusqu'à une épaisseur minimale de 1 m en couches successives de 15 cm compactées à l'aide de matériel de compactage approuvé par le directeur, notamment à l'aide d'un rouleau à pieds de mouton entièrement ballasté, de façon qu'ils aient au moins 95 % de leur masse volumique sèche maximale établie à l'aide de l'essai Proctor normal effectué en conformité avec la norme D698 de l'ASTM lorsque la teneur en humidité se situe entre 0,9 et 1,2 du niveau optimal et que la conductivité hydraulique maximale ne dépasse pas 1 x 10^{-7} cm par seconde;

e) les travaux d'excavation et de compactage sont faits pendant que la température se situe au-dessus du point de congélation;

(f) et (g) abrogés, R.M. 52/2004;

(h) dike and floor protection shall be constructed of concrete, or another material approved in writing by an environment officer, at the following locations:

(i) at the access ramp where agitation equipment or a pump is rolled into the earthen storage facility in connection with agitation or pumping operations,

(ii) at the point of discharge of the inlet pipe, where livestock manure is pumped into the earthen storage facility,

(iii) in the case of earthen storage facilities with two or more cells, at the overflow channel;

(i) all dikes of the earthen storage facility shall be seeded to grass within one year of construction.

M.R. 52/2004

h) un ouvrage protégeant le sol et les levées est construit à l'aide de béton, ou d'un autre matériau dont l'utilisation fait l'objet d'une approbation écrite de la part d'un agent de l'environnement, aux endroits suivants :

(i) à la rampe d'accès à l'endroit où est introduit dans l'installation de stockage en terre de l'équipement d'agitation ou une pompe dans le cadre des activités d'agitation ou de pompage,

(ii) au point de rejet de la canalisation d'arrivée, à l'endroit où les déjections du bétail sont pompées dans l'installation de stockage en terre,

(iii) dans le cas d'installations de stockage en terre comportant au moins deux bassins, au canal de trop-plein;

i) les digues de l'installation de stockage en terre sont mises en herbe dans l'année qui suit leur construction.

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Special requirements for hydrogeologically sensitive areas

3(1) The director may require a person to comply with subsection (2) if

(a) the person proposes to construct, modify or expand a manure storage facility on a site that the director believes includes land

(i) consisting of sand and gravel,

(ii) in which an aquifer exists and less than 5 m of overburden having an expected hydraulic conductivity of 1 x 10^{-7} cm per second or less will separate the bottom of the facility from the top of the uppermost underlying aquifer or fractured rock, or

(iii) within the unsaturated portion of an aquifer; and

(b) the director is satisfied that the construction, modification or expansion can be carried out in a manner that ensures that the environment is protected.

M.R. 52/2004

Exigences particulières — zones vulnérables sur le plan hydrogéologique

3(1) Le directeur peut exiger qu'une personne observe le paragraphe (2) dans le cas suivant :

a) la personne projette de construire, de modifier ou d'agrandir une installation de stockage de déjections dans une zone où, selon ce qu'il croit, il y a un terrain :

(i) constitué de sable et de gravier,

(ii) dans lequel se trouve un aquifère, si un terrain de couverture mesurant moins de 5 m d'épaisseur et ayant une conductivité hydraulique prévue d'au plus 1 x 10^{-7} cm par seconde séparera le fond de l'installation et la partie supérieure de l'aquifère ou des roches fracturées sous-jacents,

(iii) situé dans la partie non saturée d'un aquifère;

b) il est convaincu que les travaux peuvent être effectués dans le respect de l'environnement.

R.M. 52/2004

3(2) In the circumstances described in subsection (1), the director may require the person proposing to construct, modify or expand the manure storage facility

(a) to implement a groundwater monitoring plan or install a groundwater monitoring system acceptable to the director;

(b) to install a plastic or compacted clay liner and implement a groundwater monitoring plan or install a groundwater monitoring system acceptable to the director; or

(c) to use an alternative method of construction or manure storage acceptable to the director.

M.R. 52/2004

3(2) Dans les circonstances visées au paragraphe (1), le directeur peut exiger que la personne qui projette de construire, de modifier ou d'agrandir l'installation de stockage de déjections :

a) mette en œuvre un plan ou installe un système de contrôle de l'eau souterraine qui soit acceptable;

b) installe un revêtement en plastique ou en argile compacté et mette en œuvre un plan ou installe un système de contrôle de l'eau souterraine qui soit acceptable;

c) utilise une autre méthode de construction ou de stockage des déjections acceptable.

R.M. 52/2004

SCHEDULE B
(Section 14)

SETBACK REQUIREMENTS FOR WINTER SPREADING OF LIVESTOCK MANURE

1 Where livestock manure spreading on land between November 10 of one year and April 10 of the following year is allowed under this regulation, the following minimum setback distance requirements apply :

(a) in all cases, 10 m from any property boundary;

(b) for land having a mean slope of less than 4%, 150 m from any surface watercourse, sinkhole, spring or well;

(c) for land having a mean slope of 4% or more but less than 6%, 300 m from any surface watercourse, sinkhole, spring or well;

(d) for land having a mean slope of 6% or more but less than 12%, 450 m from any surface watercourse, sinkhole, spring or well.

M.R. 52/2004

ANNEXE B
(article 14)

EXIGENCES RELATIVES AUX DISTANCES POUR L'ÉPANDAGE DES DÉJECTIONS DU BÉTAIL EN HIVER

1 L'épandage des déjections du bétail sur le sol permis par le présent règlement entre le 10 novembre d'une année et le 10 avril de l'année suivante, doit se faire à une distance de :

a) 10 m des limites des propriétés, dans tous les cas;

b) 150 mètres des cours d'eau de surface, des dolines, des sources et des puits, lorsque le sol a une pente moyenne de moins de 4 %;

c) 300 mètres des cours d'eau de surface, des dolines, des sources et des puits, lorsque le sol a une pente moyenne d'au moins 4 % mais de moins de 6 %;

d) 450 mètres des cours d'eau de surface, des dolines, des sources et des puits, lorsque le sol a une pente moyenne d'au moins 6 % mais de moins de 12 %.

R.M. 52/2004

SCHEDULE C
(Subsection 12(2.1))

SETBACK REQUIREMENTS FOR LIVESTOCK MANURE APPLICATION
ON LAND ADJACENT TO SURFACE WATER OR A SURFACE WATERCOURSE

1 Where livestock manure application on land adjacent to surface water or to a surface watercourse is allowed under this regulation, the following minimum setback distance requirements apply:

Surface water or Surface watercourse Feature	**Manure Application Method**	**Manure Application Setback Width (metres) with Permanently Vegetated Buffer Width (metres)**	**Manure Application Setback Width (metres) with no Permanently Vegetated Buffer**
Lakes	Injection or low-level application followed by immediate incorporation	15 m setback, consisting of 15 m permanently vegetated buffer	20 m setback
	High-level broadcast or low-level application without incorporation	30 m setback, including 15 m permanently vegetated buffer	35 m setback
Rivers, creeks and large unbermed drains, designated as an Order 3 or greater drain on a plan of Manitoba Water Stewardship, Planning and Coordination, that shows designations of drains	Injection or low-level application followed by immediate incorporation	3 m setback, consisting of 3 m permanently vegetated buffer	8 m setback
	High-level broadcast or low-level application without incorporation	10 m setback, including 3 m permanently vegetated buffer	15 m setback
All other types of surface water or surface watercourses	No manure application allowed.		

M.R. 219/2006

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ANNEXE C
[Paragraphe 12(2.1)]

EXIGENCES RELATIVES AUX DISTANCES POUR L'ÉPANDAGE DES DÉJECTIONS DU BÉTAIL SUR DES TERRES CONTIGUËS À DES EAUX DE SURFACE OU À DES COURS D'EAU DE SURFACE

1 Les exigences relatives à la distance minimale indiquées ci-dessous doivent être respectées lorsque le présent règlement permet l'épandage de déjections du bétail sur des terres contiguës à des eaux de surface ou à des cours d'eau de surface :

Nature des eaux de surface ou des cours d'eau de surface	**Mode d'épandage des déjections**	**Distance minimale (mesurée en mètres) s'il y a un écran de végétation permanente**	**Distance minimale (mesurée en mètres) s'il n'y a pas d'écran de végétation permanente**
Lacs	Injection ou épandage à faible hauteur suivi d'une incorporation immédiate	bande minimale de 15 m où se trouve un écran de végétation permanente de 15 m	20 m
	Pulvérisation à hauteur élevée ou épandage à faible hauteur sans incorporation	bande minimale de 30 m où se trouve un écran de végétation permanente de 15 m	35 m
Rivières, ruisseaux et drains importants ne comportant pas de bermes désignés à titre de drains d'ordre 3 ou d'ordre supérieur sur un plan de la Direction de la planification et de la coordination du ministère de la Gestion des ressources hydriques du Manitoba indiquant les désignations de drains	Injection ou épandage à faible hauteur suivi d'une incorporation immédiate	bande minimale de 3 m où se trouve un écran de végétation permanente de 3 m	8 m
	Pulvérisation à hauteur élevée ou épandage à faible hauteur sans incorporation	bande minimale de 10 m où se trouve un écran de végétation permanente de 3 m	15 m
Autres types d'eaux de surface ou de cours d'eau de surface	Épandage interdit		

R.M. 219/2006

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APPENDIX C

Imperial Units

Table 2: Required Manure Storage Setbacks[1]

Storage Type	Distance (ft) to	
	Surface watercourse, sinkhole, spring, or well	Property Boundary
All manure storage structures	328	328
Field storage	328	N/A
Composting	328	328

[1] Refer to Appendix B, Livestock Manure and Mortalities Management Regulation.

Table 3a: Minimum Manure Storage Volume Requirements (Including Spilled And Wash Water)

Livestock	Storage Volume	
	Gallons per day	Cubic feet per day
1 Sow, Farrow to Finish (243-254 lbs)	14.3	2.30
1 Sow, Farrow to Weanling (up to 11 lbs)	4.98	0.80
1 Sow, Farrow to Nursery (51 lbs)	6.23	1.00
1 Weanling, Nursery (11-51 lbs)	0.62	0.10
1 Grower/Finisher Pig (51-249 lbs)	1.56	0.25

Table 3b: Estimated Rates Of Solid Manure Production For Pigs[1]

Livestock Type	Volume-basis (ft^3/day)	Weight-basis (lb/day)
1 Sow, Farrow to Finish (243-254 lbs)	1.74	86.4
1 Sow, Farrow to Weanling (up to 11 lbs)	0.54	26.6
1 Weanling, Nursery (11-51 lbs)	0.06	2.8
1 Grower/Finisher (51-249 lbs)	0.17	8.2

[1] Adapted from Table 5 of the Province of Alberta's Agricultural Operation Practices Act - Standards and Administration Regulation (AR 267/2001)

Table 4a: Nutrient (lb/1000 Gallons) And Dry Matter (%) Content For Liquid Pig Manure[1] (Pre-phytase Use)

Parameter[2]	Farrow			Nursery			Finisher			Farrow to Finish		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**17**	6	65	**27**	15	46	**34**	15	64	**28**	12	40
NH_4-N	**12**	5	32	**20**	13	30	**26**	12	41	**24**	11	34
Total P_2O_5	**15**	1	127	**27**	3	59	**23**	1	81	**24**	3	48
Total K_2O	**12**	3	42	**20**	15	24	**18**	11	32	**17**	8	21
Dry Matter	**3.0**	0.3	38.6	**3.1**	1.1	5.6	**3.7**	0.0	11.8	**2.1**	0.6	4.0

[1] Values are on an as-is basis (i.e. untreated). SOURCE: Racz and Fitzgerald 2001. Nutrient and Heavy Metal Contents of Hog Manure – Effect on Soil Quality and Productivity. Proceedings: Livestock Options for the Future. Results based on 37, 11, 92 and five samples for farrow, nursery, finisher and farrow to finish, respectively.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

Table 4b: Nutrient (lb/1000 Gallons) And Dry Matter (%) Content For Pig Manure (Phytase Use)

Parameter[2]	Farrow			Nursery			Finisher		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**22**	4	60	**27**	11	56	**34**	4	67
NH_4-N	**17**	4	27	**20**	6	33	**24**	4	47
Total P_2O_5	**15**	0	94	**11**	1	47	**15**	0	65
Total K_2O	**13**	7	20	**19**	13	28	**18**	1	34
Dry Matter	**2.1**	0.3	9.1	**2.2**	0.6	7.4	**3.4**	0.4	11.2

[1] Values are on an as-is basis (i.e. untreated). SOURCE: Industry co-operators. Results based on 132, 58 and 181 samples for farrow, nursery and finisher, respectively.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

Table 5: Nutrient (lb/ton) And Dry Matter (%) Content For Solid Finishing Pig Manure[1] (Pre-phytase Use)

Parameter[2]	Fresh			Stockpiled[3]			Composted[4] Fresh			Composted Stockpiled		
	Avg	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max	**Avg**	Min	Max
Total N	**12.6**	9.6	17.8	**12.0**	7.4	25.8	**12.8**	10.0	16.2	**14.4**	11.6	17.6
NH_4-N	**2.8**	2.0	3.6	**4.2**	2.2	6.2	**1.0**	0.2	2.4	**1.4**	0.4	2.0
Total P_2O_5	**13.0**	10.0	19.8	**11.0**	6.8	17.6	**18.4**	15.2	21.0	**17.2**	12.8	19.8
Total K_2O	**17.6**	12.0	30.2	**18.0**	13.6	26.4	**20.8**	17.8	24.0	**21.6**	18.0	28.4
Dry Matter	**33.2**	24.0	45.3	**47.1**	32.1	63.7	**66.4**	63.4	69.4	**58.2**	44.0	63.4

[1] Values are on an as-is basis (i.e. untreated). SOURCE: Agriculture and Agri-Food Canada 2005. Results based on 10 samples.

[2] Total N refers to all forms of nitrogen in manure, but typically only includes ammonium N (NH_4-N) and organic N. NH_4-N is the inorganic, readily available form of nitrogen in manure. Total P_2O_5 refers to all forms of phosphorus in manure expressed in the fertilizer equivalent (P content x 2.3). Total K_2O refers to all forms of potassium in manure expressed in the fertilizer equivalent (K content x 1.2).

[3] Maintained in a pile for approximately six months and minimally disturbed (i.e. not moved repeatedly or mixed).

[4] Carefully managed to maintain necessary moisture and temperature, resulting in the breakdown of manure to form a stable and uniform material.

Table 6: Crop Removal Rates For N And P_2O_5 [1]

Crop[2]	Example Target Yield[3]	Average Nutrient Uptake Rate[4]		Average Nutrient Removal Rate[5]	
		N	P_2O_5	N	P_2O_5
Spring Wheat	40 bu/acre	2.11 lb/bu	0.8 lb/bu	1.5 lb/bu	0.59 lb/bu
Winter Wheat	50 bu/acre	1.35 lb/bu	0.61 lb/bu	1.04 lb/bu	0.51 lb/bu
Barley	80 bu/acre	1.39 lb/bu	0.56 lb/bu	0.97 lb/bu	0.42 lb/bu
Oats	100 bu/acre	1.07 lb/bu	0.41 lb/bu	0.62 lb/bu	0.26 lb/bu
Rye	55 bu/acre	1.67 lb/bu	0.84 lb/bu	1.06 lb/bu	0.45 lb/bu
Grain Corn	100 bu/acre	1.53 lb/bu	0.63 lb/bu	0.97 lb/bu	0.44 lb/bu
Canola	35 bu/acre	3.19 lb/bu	1.47 lb/bu	1.93 lb/bu	1.04 lb/bu
Flax	24 bu/acre	2.88 lb/bu	0.83 lb/bu	2.13 lb/bu	0.65 lb/bu
Sunflowers	50 bu/acre	1.49 lb/bu	0.51 lb/bu	1.07 lb/bu	0.32 lb/bu
Alfalfa	5 tons/acre	N/A[6]	N/A	58.0 lb/ton	13.8 lb/ton
Grass	3 tons/acre	N/A	N/A	34.2 lb/ton	10.0 lb/ton
Corn Silage	5 tons/acre	N/A	N/A	31.2 lb/ton	12.7 lb/ton
Barley Silage	4.5 tons/acre	N/A	N/A	34.4 lb/ton	11.8 lb/ton

[1] Adapted from Nutrient Uptake and Removal by Field Crops, Western Canada, 2001. Compiled by the Canadian Fertilizer institute.

[2] As bushel weights can vary considerably among some crop varieties, values other than those presented here may need to be chosen to better reflect a given cropping scenario.

[3] Example target yields for Manitoba. Site specific and actual yields for any parcel of land will depend on the agricultural capability of the land, climate and the producer's management practices.

[4] Total nutrient taken up by the Crop.

[5] Nutrient removed in the harvested portion of the crop.

[6] Not applicable

Table 7: Volatilization Losses (%)[1]

Method of Application	Cool Wet	Cool Dry	Warm Wet	Warm Dry	Average
Injected	0	0	0	0	0
Incorporated within 1 day	10	15	25	50	25
Incorporated within 2 day	13	19	31	57	30
Incorporated within 3 day	15	22	38	65	35
Incorporated within 4 day	17	26	44	72	40
Incorporated within 5 day	20	30	50	80	45
Not Incorporated	40	50	75	90	64
Irrigated	Above + 10%	Above + 10%	Above + 10%	Above + 10%	Above + 10%
Applied to Standing Crop	25	25	40	50	35

[1] MARC 2005. Manitoba Agriculture, Food and Rural Initiatives.

Table 8a: Manure Application Rate Calculation Worksheet For Liquid Manure

Field I.D.: _____ **Crop:** _____ **Target Yield:** _____

Step 1. Target Nutrient Rate			**Units**
Nitrogen (based on soil test recommendation)	(A)	80	lb/ac
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)	54	lb/ac
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)	27	lb/ac
Other:	(B3)		lb/ac
Step 2. Manure Test Data			
Total Nitrogen	(C)	25.9	lb/1000 gal
Ammonium Nitrogen	(D)	15.9	lb/1000 gal
Organic Nitrogen = (C) - (D)	(E)	10	lb/1000 gal
Phosphorus	(F)	8.4	lb/1000 gal
P_2O_5 = (F) ? 2.3	(G)	19.3	lb/1000 gal
Step 3. Amount of manure nitrogen available to crop:			
Application method		Incorporated within 1 day	
Volatilization losses due to application method (Table 6)	(H)	25%	
Ammonium nitrogen available = (D) ? [100 - (H)]% = 15.9 x 0.75 = 11.9	(I)	11.9	lb/1000 gal
Organic nitrogen available to the next crop = (E) ? 0.25	(J)	2.5	lb/1000 gal
Total available N = (I) + (J) = 11.9 + 2.5 = 14.4	(K)	14.4	lb/1000 gal
Total available N in spring = (K) x 100% = 14.4 x 1.0 = 14.4	(L)	14.4	lb/1000 gal
Total available N in fall = (K) x 83% = 14.4 x 0.83 = 12.0	(M)	12.0	lb/1000 gal
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) x 1000 = 80 ÷ 14.4 x 1000 = 5555.6 ***or*** Fall N-based Application Rate = (A) ÷ (M) x 1000 = 80 ÷ 12 x 1000 = 6666.7	(N)	6666.7	gal/ac
Amount of P_2O_5 applied = (G ÷ 1000) x (N) = 19.3 ÷ 1000 x 6666.7 = 128.7	(O)	128.7	lb/ac
P_2O_5 balance[1] (using 1x crop removal) = (O) - (B2) = 128.7 - 27 = 101.7	(P)	+101.7	lb/ac
Step 5. Application rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) x 1000 = 54 ÷ 19.3 x 1000 = 2797.9 ***or*** 1x crop removal P-based Application Rate[2] = (B2) ÷ (G) x 1000 = 27 ÷ 19.3 x 1000 = 1399.0	(Q)	1399.0	gal/ac
Amount of available N applied spring = (L) ÷ 1000 x (Q) = 20.1 = 14.4 ÷ 1000 x 1399.0 = 20.1 ***or*** Amount of available N applied in fall = (M) ÷ 1000 x (Q) = 12.0 ÷ 1000 x 1399.0 = 16.8	(R)	16.8	lb/ac
N balance[3] (N applied - N recommended) = (R) - (A) = 16.8 - 80 = -63.2	(S)	-63.2	lb/ac
Step 6. Compare N rate (N) with P rate (Q):			
If soil test P is low to moderate (< 60 ppm), apply manure at N rate (N)		6667	gal/ac
If soil test P is high (> 60 ppm), apply manure at P rate (Q)[4]		1399	gal/ac

[1] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[2] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[3] Positive values indicate N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative values indicate N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[4] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

Table 8b: Manure Application Rate Calculation Worksheet For Solid Manure

Field I.D.: _____ **Crop:** _____ **Target Yield:** _____

Step 1. Target Nutrient Rate			**Units**
Nitrogen (based on soil test recommendation)	(A)	80	lb/ac
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)	54	lb/ac
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)	27	lb/ac
Other:	(B3)		lb/ac
Step 2. Manure Test Data			
Total Nitrogen	(C)	12	lb/t
Ammonium Nitrogen	(D)	4.2	lb/t
Organic Nitrogen = (C) - (D)	(E)	7.8	lb/t
Phosphorus	(F)	4.8	lb/t
P_2O_5 = (F) × 2.3	(G)	11.0	lb/t
Step 3. Amount of manure nitrogen available to crop:			
Application method		Incorporated within 1 day	
Volatilization losses due to application method (Table 6)	(H)	25%	
Ammonium nitrogen available = (D) × [100 - (H)]% = 4.2 x 0.75 = 3.2	(I)	3.2	lb/t
Organic nitrogen available to the next crop = (E) × 0.25 = 7.8 x 0.25 = 2.0	(J)	2.0	lb/t
Total available N = (I) + (J) = 3.2 + 2.0 = 5.2	(K)	5.2	lb/t
Total available N in spring = (K) x 100% = 5.2 x 1.0 = 5.2	(L)	5.2	lb/t
Total available N in fall = (K) x 83% = 5.2 x 0.83 = 4.3	(M)	4.3	lb/t
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) = 80 ÷ 5.2 = 15.4 ***or*** Fall N-based Application Rate = (A) ÷ (M) = 80 ÷ 4.3 = 18.6	(N)	18.6	t/ac
Amount of P_2O_5 applied = (G) x (N) = 11.0 x 18.6 = 204.6	(O)	204.6	lb/ac
P_2O_5 balance[1] (using 1x crop removal) = (O) - (B2) = 204.6 - 27 = 177.6	(P)	+177.6	lb/ac
Step 5. Application rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) = 54 ÷ 11 = 4.9 ***or*** 1x crop removal P-based Application Rate[2] = (B2) ÷ (G) = 27 ÷ 11 = 2.5	(Q)	4.9	t/ac
Amount of available N applied in spring = (L) x (Q) = 5.2 x 4.9 = 25.5 ***or*** Amount of available N applied in fall = (M) x (Q) = 4.3 x 4.9 = 21.1	(R)	21.1	lb/ac
N balance[3] (N applied - N recommended) = (R) - (A) = 21.1 - 80 = -58.9	(S)	-58.9	lb/ac
Step 6. Compare N rate (N) with P rate (Q):			
If soil test P is low to moderate (< 60 ppm), apply manure at N rate (N)		19	t/ac
If soil test P is high (> 60 ppm), apply manure at P rate (Q)[4]		5	t/ac

[1] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[2] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[3] Positive values indicate N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative values indicate N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[4] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

Table 8c: Manure Application Rate Calculation Worksheet Template For Liquid Manure

Field I.D.: _____ **Crop:** _____ **Target Yield:** _____

Step 1. Target Nutrient Rate			**Units**
Nitrogen (based on soil test recommendation)	(A)		kg/ha or lb/ac
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)		kg/ha or lb/ac
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)		kg/ha or lb/ac
Other:	(B3)		kg/ha or lb/ac
Step 2. Manure Test Data			
Total Nitrogen	(C)		kg/m^3 or lb/1000 gal
Ammonium Nitrogen	(D)		kg/m^3 or lb/1000 gal
Organic Nitrogen = (C) - (D)	(E)		kg/m^3 or lb/1000 gal
Phosphorus	(F)		kg/m^3 or lb/1000 gal
P_2O_5 = (F) × 2.3	(G)		kg/m^3 or lb/1000 gal
Step 3. Amount of manure nitrogen available to crop:			
Application method			
Volatilization losses due to application method (Table 6)	(H)		
Ammonium nitrogen available = (D) × [100 - (H)]%	(I)		kg/m^3 or lb/1000 gal
Organic nitrogen available to the next crop = (E) × 0.25	(J)		kg/m^3 or lb/1000 gal
Total available N = (I) + (J)	(K)		kg/m^3 or lb/1000 gal
Total available N in spring = (K) x 100%	(L)		kg/m^3 or lb/1000 gal
Total available N in fall = (K) x 83%	(M)		kg/m^3 or lb/1000 gal
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) x [1000 gal for imperial units] ***or*** Fall N-based Application Rate = (A) ÷ (M) [x 1000 gal for imperial units]	(N)		m^3/ha or gal/ac
Amount of P_2O_5 applied = (G) x (N) ÷ [1000 gal for imperial units]	(O)		m^3/ha or gal/ac
P_2O_5 balance[1] (using 1x crop removal) = (O) - (B2)	(P)		m^3/ha or gal/ac
Step 5. Application rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) [x 1000 gal for imperial units] ***or*** 1x crop removal P-based Application Rate[2] = (B2) ÷ (G) [x 1000 gal for imperial units]	(Q)		m^3/ha or gal/ac
Amount of available N applied in spring = (L) x (Q) [÷ 1000 gal for imperial units] ***or*** Amount of available N applied in fall = (M) x (Q) [÷ 1000 gal for imperial units]	(R)		kg/ha or lb/ac
N balance[3] (N applied - N recommended) = (R) - (A)	(S)		kg/ha or lb/ac
Step 6. Compare N rate (N) with P rate (Q):			
If soil test P is low to moderate (< 60 ppm), apply manure at N rate (N)			m^3/ha or gal/ac
If soil test P is high (> 60 ppm), apply manure at P rate (Q)[4]			m^3/ha or gal/ac

[1] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[2] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[3] Positive values indicate N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative values indicate N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[4] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

Table 8d: Manure Application Rate Calculation Worksheet Template For Solid Manure

Field I.D.: _____ **Crop:** _____ **Target Yield:** _____

Step 1. Target Nutrient Rate			**Units**
Nitrogen (based on soil test recommendation)	(A)		kg/ha or lb/ac
Phosphorus (as P_2O_5): 2x Crop Removal	(B1)		kg/ha or lb/ac
Phosphorus (as P_2O_5): 1x Crop Removal	(B2)		kg/ha or lb/ac
Other:	(B3)		kg/ha or lb/ac
Step 2. Manure Test Data			
Total Nitrogen	(C)		kg/t or lb/t
Ammonium Nitrogen	(D)		kg/t or lb/t
Organic Nitrogen = (C) - (D)	(E)		kg/t or lb/t
Phosphorus	(F)		kg/t or lb/t
P_2O_5 = (F) × 2.3	(G)		kg/t or lb/t
Step 3. Amount of manure nitrogen available to crop:			
Application method			
Volatilization losses due to application method (Table 6)	(H)		
Ammonium nitrogen available = (D) × [100 - (H)]%	(I)		kg/t or lb/t
Organic nitrogen available to the next crop = (E) × 0.25	(J)		kg/t or lb/t
Total available N = (I) + (J)	(K)		kg/t or lb/t
Total available N in spring = (K) x 100%	(L)		kg/t or lb/t
Total available N in fall = (K) x 83%	(M)		kg/t or lb/t
Step 4. Application rate based on N requirements:			
Spring N-based Application Rate = (A) ÷ (L) ***or*** Fall N-based Application Rate = (A) ÷ (M)	(N)		t/ha or t/ac c
Amount of P_2O_5 applied = (G) x (N)	(O)		kg/ha or lb/ac
P_2O_5 balance[1] (using 1x crop removal) = (O) - (B2)	(P)		kg/ha or lb/ac
Step 5. Application rate based on P removal:			
2x crop removal P-based Application Rate[2] = (B1) ÷ (G) ***or*** 1x crop removal P-based Application Rate[2] = (B2) ÷ (G)	(Q)		t/ha or t/ac
Amount of available N applied in spring= (L) x (Q) ***or*** Amount of available N applied in fall = (M) x (Q)	(R)		kg/ha or lb/ac
N balance[3] (N applied - N recommended) = (R) - (A)	(S)		kg/ha or lb/ac
Step 6. Compare N rate (N) with P rate (Q):			
If soil test P is low to moderate (< 60 ppm), apply manure at N rate (N)			t/ha or t/ac
If soil test P is high (> 60 ppm), apply manure at P rate (Q)[4]			t/ha or t/ac

[1] A positive value indicates that more P_2O_5 will be applied than the crop will remove (1x crop removal) when manure is applied based on N. A negative value indicates that less P_2O_5 will be applied than the crop will remove (1x crop removal) and the rate should be compared to the soil test recommendation to determine if the crop requirement for P will be met.

[2] When soil test phosphorus (STP) is low to moderate, manure can be applied based on N. When STP is high, a P-based application rate can be used up to 2X the crop removal of P_2O_5. At very high to excessive STP, no more than 1X crop removal of P_2O_5 should be applied.

[3] Positive values indicate N application rate is above soil test recommendation when manure is applied based on P_2O_5. Negative values indicate N application rate is below soil test recommendation and supplemental commercial fertilizer is required to meet crop requirements.

[4] If annual applications are too low, multi-year application rates and rotation of fields should be considered.

Table 9. Setback Requirements For Livestock Manure Application On Land Adjacent To Surface Water Or A Surface Watercourse (ft)

Surface Water or Surface Watercourse Feature	Manure Application Method	Manure Application Setback Width with Permanently Vegetated Buffer Width	Manure Application Setback Width with no Permanently Vegetated Buffer
Lakes	Injection or low-level application followed by immediate incorporation	49 ft setback, consisting of 49 ft permanently vegetated buffer	66 ft setback
	High-level broadcast or low-level application without incorporation	98 ft setback, including 49 ft permanently vegetated buffer	115 ft setback
Rivers, creeks and large unbermed drains, designated as an Order 3 or greater drain on a plan of Manitoba Water Stewardship, Planning and Coordination, that shows designations of drains	Injection or low-level application followed by immediate incorporation	10 ft setback, consisting of 10 ft permanently vegetated buffer	26 ft setback
	High-level broadcast or low-level application without incorporation	33 ft setback, including 10 ft permanently vegetated buffer	49 ft setback
All other types of surface water or surface watercourses	No manure application allowed		

Table 10: Required[1] Distances From Watercourses, Sinkholes, Springs, Wells And Recommended Distances From Residential Property Lines For Applying Manure Between November 10 And April 10 (ft)

Slope	Application Method		
	Surface Applied and Irrigation		Injection
	No incorporation	Incorporation within 48 hours	
less than 4%	492	N/A	N/A
4 – less than 6%	984	N/A	N/A
6 – less than 12%	1476	N/A	N/A
12% or greater	Prohibited	Prohibited	Prohibited

[1]Refer to the Livestock Manure and Mortalities Management Regulation – Appendix B.

Table 11: Recommended Distances From Residential Areas, Residences And Property Lines For Applying Manure (ft)

Application method	Odour suppression	Designated residential area	Residence	Property line with residence	Property line without residence
Irrigation	None	5249	984	49	3.3
Surface applied, no incorporation	Moderate to none	2625	492	33	3.3
Surface applied, incorporated within 48 hours	Good	1312	246	33	3.3
Injection	Maximum	246	49	10	3.3

Table 12: Setbacks[1,2] From Property Lines, Watercourses, Sinkholes And Wells

Recommended	To animal housing structure (excluding hoop shelters)	164 ft
Required	To confined areas including hoop shelters and feedlots To manure storage structures[2]	328 ft 328 ft

[1]Agencies such as Manitoba Hydro or the rural municipality may have requirements in addition to these.

[2]Requirement of the Livestock Manure and Mortalities Management Regulation– see Appendix B

Table 13: Recommended Criteria For Siting Livestock Operations

Animal Units[1] (A.U.)	Maximum Number of Residences[2] Within One Mile	Minimum Distance[3]					
		From Single Residence		From Designated[4] Residential or Recreational Area			
		To Earthen Storage (ft)	To Buildings[5] (ft)	To Earthen Storage		To Buildings	
				(ft)	(mi)	(ft)	(mi)
10 – 100	18	656	328	2 625	(1/2)	1 739	(1/3)
101 – 200	16	984	492	3 937	(3/4)	2 625	(1/2)
201 - 300	15	1 312	656	5 250	(1.0)	3 511	(2/3)
301– 400	14	1 476	738	5 906	(1 1/8)	3 937	(3/4)
401 – 800	12	1 641	820	6 562	(1 1/4)	4 364	(5/6)
801 – 1600	10	1 969	984	7 874	(1 1/2)	5 250	(1.0)
1601 – 3200	8	2 297	1 148	9 187	(1 3/4)	6 135	(1 1/6)
3201 – 6400	6	2 625	1 312	10 499	(2.0)	6 989	1 1/3)
6401 – 12800	4	2 953	1 476	11 812	(2 1/4)	7 874	(1 1/2)
12801 and greater	2	3 281	1 641	13 124	(2 1/2)	8 760	1 2/3)

[1] Refer to Table 14 for number of animals.
[2] Number of residences within one mile of the centre of the facility applies only to new facilities. Expansions of existing facilities and the proponent's residence are excluded.
[3] These separation distances apply to new and expanding operations.
[4] Officially designated areas in a development plan or basic planning statement.
[5] The distance to buildings includes barns and non-earthen manure storage such as above or below grade tanks which may be covered or uncovered.

Table 14: Converting Number Of Animals To Animal Units

Animal Units[1] (A.U.)	Barn Capacity or Animal Places				
	Sows, Farrow-Finish (243 – 253 lb)	Sows, Farrow-Weanling (11 lb)	Sows, Farrow-Nursery (51 lb)	Weanlings (11 - 51 lb)	Grower/ Finishers (51 – 249 lb)
10 – 100	8 – 80	32 – 319	40 – 400	303 – 3030	70 – 699
101 – 200	81 – 160	323 – 639	404 – 800	3061 – 6061	706 – 1399
201 – 300	161 – 240	642 – 958	804 – 1200	6091 – 9091	1406 – 2098
301 – 400	241 – 320	962 – 1278	1204--1600	9121 – 12121	2105 – 2797
401 – 800	321 – 640	1281 – 2556	1604 – 3200	12152 – 24242	2804 – 5594
801 – 1600	641 – 1280	2559 – 5112	3204 – 6400	24273 – 48485	5601 – 11189
1601 – 3200	1281 – 2560	5115 – 10224	6404 – 12800	48515 – 96970	11196 – 22378
3201 – 6400	2561 – 5120	10227 – 20447	12804 – 25600	97000 – 193939	22385 – 44755
6401 – 12800	5121 – 10240	20450 – 40895	25604 – 51200	193970 – 387879	44762 – 89510
12801 and greater	10241 and greater	40898 and greater	51204 and greater	387909 and greater	89517 and greater

[1] Refer to Appendix I for definition of Animal Unit.
[2] Based on live weight.

Table 15a: Total Landbase[1] Required For The Livestock Operation In Acres – Liquid Manure

STEP 1:	Determine the total number of animals produced by the livestock operation (i.e. pig places or barn capacity).	
STEP 2:	Determine the total annual volume of manure generated by the operation.	
STEP 3:	Determine the total landbase required for the operation based on nitrogen (N).	
OR STEP 4:	Determine the total landbase required for the operation based on 2X phosphorus (P_2O_5) removal by the crop.	
OR STEP 5:	Determine the total landbase required for the operation based on 1X phosphorus (P_2O_5) removal by the crop.	
STEP 1:	Number of livestock places	_____ (A)
STEP 2:	Volume of manure in gal/day or ft^3/day (Table 3A)	_____ (B)
	Number of days per year animals are at the operation	_____ (C)
	Volume of manure per year for the operation (A x B x C)	_____ (D)
STEP3:	Total nitrogen **(N)** content of the manure in lb/1000 gal (Table 4A or 4B)	_____ (E)
	Amount of N per year from the operation (D x E ÷ 1000) in lb	_____ (F)
	Nitrogen requirement (based on Soil Test) or removal in lb/acre	_____ (G)
	Acres Required for Nitrogen (F ÷ G)	_____ **(ac)**
STEP4:	Total phosphorus **(P_2O_5)** content of the manure in lb/1000 gal (Table 4A or 4B)	_____ (H)
	Amount of P_2O_5 per year from the operation (D x H ÷ 1000) in lb	_____ (I)
	1X crop P_2O_5 removal (Table 6) in lb/acre	_____ (J)
	2X crop P_2O_5 removal (J x 2) in lb/acre	_____ (K)
	Acres Required for 2X crop P_2O_5 removal [I ÷ K]	_____ **(ac)**
STEP 5:	**Acres Required for 1X crop P_2O_5 removal [I÷ J]**	_____ **(ac)**

[1] The landbase calculation is an estimate of the total landbase required for the disposition of all of the manure generated by the operation in a year. It is for planning purposes only. Actual manure application rates are determined through manure management planning.

Table 15b: Total Landbase[1] Required For The Livestock Operation In Acres – Solid Manure

STEP 1:	Determine the total number of animals produced by the livestock operation (i.e. pig places or barn capacity).	
STEP 2:	Determine the total annual volume of manure generated by the operation.	
STEP 3:	Determine the total landbase required for the operation based on nitrogen (N).	
OR STEP 4:	Determine the total landbase required for the operation based on 2X phosphorus (P_2O_5) removal by the crop.	
OR STEP 5:	Determine the total landbase required for the operation based on 1X phosphorus (P_2O_5) removal by the crop.	
STEP 1:	Number of livestock places	_____ (A)
STEP 2:	Volume of manure in lb/day or ft^3/day (Table 3B)	_____ (B)
	Number of days per year animals are at the operation	_____ (C)
	Volume of manure per year for the operation (A x B x C)	_____ (D)
STEP3:	Total nitrogen **(N)** content of the manure in lb/ton (Table 5)	_____ (E)
	Amount of N per year from the operation (D x E) in lb	_____ (F)
	Nitrogen requirement (based on Soil Test) or removal in lb/acre	_____ (G)
	Acres Required for Nitrogen (F ÷ G)	_____ **(ac)**
STEP4:	Total phosphorus **(P_2O_5)** content of the manure in lb/ton (Table 5)	_____ (H)
	Amount of P_2O_5 per year from the operation (D x H) in lb	_____ (I)
	1X crop P_2O_5 removal (Table 6) in lb/acre	_____ (J)
	2X crop P_2O_5 removal (J x 2) in lb/acre	_____ (K)
	Acres Required for 2X crop P_2O_5 removal [I ÷ K]	_____ **(ac)**
STEP 5:	**Acres Required for 1X crop P_2O_5 removal [I÷ J]**	_____ **(ac)**

[1] The landbase calculation is an estimate of the total landbase required for the disposition of all of the manure generated by the operation in a year. It is for planning purposes only. Actual manure application rates are determined through manure management planning.

APPENDIX D

Alternate Methods of Manure Treatment and Use

INTRODUCTION

To date, many attempts have been made to adapt municipal or industrial waste treatment technologies to dispose of livestock manure. The treatment process may be designed to solve odour problems, recover nutrients or energy from the manure, increase the fertilizer value, reduce the volume, or decrease the pollution potential of the manure to allow safe discharge in the environment. In very intensive production countries, such as The Netherlands, manure management practices are strictly regulated and enforced to minimize pollution problems. In these circumstances, treatment systems can be justified economically. In countries where fuel is very expensive or not readily available, the energy recovered from methane gas production is worth the labour investment.

For the majority of pig producers in Manitoba, most odour problems can be solved by a combination of good management and the separation of pig farms from residential areas. Manure produced can be easily disposed of on the available crop land. As long as energy and feed prices are relatively low, the most cost-effective management system is to store the manure, followed by application of the manure on cropland. However, there are some circumstances where another method of treatment is desirable. This section presents some of the management systems that have been studied and outlines the feasibility and possible benefits of each system.

BIOLOGICAL TREATMENT

Aerobic Processes

The aerobic processes that may have some application in Manitoba are:

- biofiltration
- sequential batch reactors
- storage aeration
- pre-storage aeration
- composting.

Biofiltration
Biofiltration is a recent waste treatment process where aerobic bacteria growth and activity is promoted by fixing them on a very porous and solid media (clay beds, straw stalks, plastic discs, etc.). Once colonies of aerobic bacteria are established on the media, the liquid waste stream is trickled on the bacteria-media matrix, along with a flow of air. Alternatively, the waste stream could be pre-aerated.

Biofilters require backwashing to remove excess bacteria which would otherwise plug the matrix. This sludge has to be managed either as waste to recirculate into the treatment system, dispose of, or process. There is no reduction in the volume of liquid to store or apply. Installation and maintenance costs are much higher that the equivalent cost of application.

Sequential Batch Reactors
Sequential batch reactors are also relatively compact waste treatment systems where the growth of aerobic bacteria is controlled for efficient biodegradation of organic matter and denitrification of nitrogen in the liquid.

A series of tanks are typically used. In the first tank, a mixture of bacteria is entered (or reintroduced by recirculation) into the aerated and agitated waste stream. The liquid waste is either held in this tank for sufficient time to allow maximum bacterial activity, or transferred to a holding tank. Most systems are designed to allow strong nitrification (conversion of organic nitrogen and ammonia into nitrates). The liquid stream is then allowed to settle in an idle tank, where ideally, denitrifying bacteria convert nitrates into, elemental nitrogen and where solids (small clumps of bacteria) can settle. The treated liquids are then disposed of separately from the settled solids (sludges). The economical feasibility of this system for livestock manure has not yet been proven anywhere in Canada.

Storage Aeration

Storage aeration is used to maintain the manure in an aerobic state. When manure has sufficient amounts of oxygen present, very little odour is produced, and a significant amount of nitrogen can be removed from the manure by microorganisms. Where the land base available for application is limited, it may be necessary to try to reduce the nitrogen content of the manure before it is applied on the land. However, in most parts of Manitoba, the manure has value as a source of nutrients for plants, and the landbase is large enough to apply all the manure produced without risk of pollution.

During the summer, liquid manure can be treated aerobically by using mechanical aeration equipment. Mechanical aerators operate by either pumping air bubbles into the manure, or by spraying the manure into the air. A high energy input is required to supply enough oxygen to the manure and keep the manure well mixed, and as with all mechanical equipment, a certain amount of maintenance is required to keep the system functional. The energy costs and labour requirements needed to keep a large volume of manure aerobic are high. Generally, total aeration is only used when the manure is to be applied in an area where odour control is important and soil incorporation is not possible. It is not practical to aerate manure that has been collected and stored under anaerobic conditions during the winter. Aeration is only feasible when the storage is emptied in the spring and fall, and aeration is used as a method of odour control during the summer.

Another alternative is the partially aerated storage. In this system, a mechanical aerator supplies enough oxygen to keep the upper layer of the manure aerobic. When the system is functioning properly, the manure at the bottom of the storage is decomposed anaerobically and the gases released from the decomposing manure at the bottom are absorbed and further decomposed as they rise toward the top, preventing odorous gases from being released. If the mechanical aerator fails to supply enough oxygen, or if the manure is not properly mixed, then offensive odours will be released. This method of treatment has not proven effective in Manitoba.

In Manitoba, liquid manure storage aeration systems are not commonly used. The cost of aerating the manure and maintaining the equipment are high. A major disadvantage of storage aeration is the loss of significant amounts of ammonia nitrogen, one of the most valuable plant nutrients in liquid manure. It is usually less expensive to control odours by building a pig operation in an isolated area, or by covering storage structures.

Pre-Storage Aeration
An alternative method of controlling odours from stored liquid manure is pre-storage aeration. A treatment tank is used to hold seven days of manure production. The manure is partially decomposed under warm, aerobic conditions, and then transferred to long-term storage. Although the manure is held anaerobically in the long term storage, the odour level is reduced because the manure is partially decomposed. The success of this system under Manitoba conditions is unproven.

Composting
Composting is a biological process in which microorganisms aerobically convert organic materials into a soil-like material called compost. During composting, the microorganisms consume oxygen while feeding on the organic matter and generate heat and large quantities of carbon dioxide and water vapour. The rate at which manure will compost depends upon the moisture content, the temperature, the level of oxygen available, the size of the manure particles and the relative quantities of carbon and nitrogen available to the microorganisms for use as food. The optimum solids content for composting is between 40 and 50 per cent. In the case of swine production, it is necessary to separate the solids content of pig manure. The fresh manure can be screened and the resulting solids, which are about 25 per cent moisture can be mixed with a bulky, absorbent organic material such as straw or sawdust and then composted. The liquids are collected and sent to storage. During the composting process, the volume of manure will be reduced by up to 50 per cent. Considerable losses of nitrogen also occur during the process.

To provide the conditions for composting, it is necessary to ensure an adequate supply of oxygen throughout the pile, maintain the pile at 40 to 50 per cent solids and mix the material on a regular basis. This process can be carried out using either a windrow system, aerated static piles, or an in-vessel system. The windrow method consists of placing the mixture of raw materials in long narrow rows typically 1.2 to 1.8 m (4 to 6 ft) high and 2.4 to 3 m (8 to 10 ft) wide. The windrows are initially turned on a fixed schedule for the first month to increase aeration and rebuild the bed porosity. After the first month, the windrow should be turned according to temperature. If temperatures within the pile are above 45°C, there is no need to turn. Aerated static piles are aerated directly with forced air systems to speed up the process. The in-vessel system confines the composting material within a building or container and uses forced aeration and mechanical turning to speed up the composting process.

Manure composting takes approximately six months depending on the level of management. When maintained properly, the composting process is aerobic and the release of odours should be minimal and the product will have an earthy odour. If the conditions are not controlled and the manure begins to decompose anaerobically, strong offensive odours can be produced and the process can take much longer.

So far, the markets for composted livestock manure are limited and the costs of composting may not be recoverable in the sale of the final product.

Anaerobic Processes
With controlled anaerobic treatment processes, such as anaerobic lagoons and anaerobic digesters, the temperature and the nutrient levels of the manure are regulated so that only desirable gases and end products are produced. Whenever manure is stored in a pit or a pile, the manure decomposes anaerobically, but because the process is not controlled, many different gases can be formed.

The type of gases and end products from anaerobic decomposition depends on the temperature and characteristics of the manure. The most common anaerobic process is carried out at mesophilic temperatures (20 to 40°C), which allows rapid growth of methane-forming bacteria. Alternatively, thermophilic digestion is also used for biogas production, where temperatures are kept between 40 to 70°C. Thermophilic digestion tends to be less stable than digester operation at mesophilic temperatures. More recently, bacteria strains were selected for a strong activity at psychrophilic temperatures (10 to 20°C) with liquid pig manure.

Anaerobic Lagoons

Anaerobic lagoons are often confused with earthen manure storages. Lagoons are carefully designed and managed to maintain optimum loading rates, retention time and temperature of the manure to maintain a balance between the acid-forming and methane-forming bacteria. Earthen manure storage structures are simply basins designed to store the manure between periods of application. Lagoons have been used successfully in warmer climates, but in Manitoba where low temperatures occur for much of the year, the methane-forming bacteria become inactive, and the rate of decomposition is slow. The result is that lagoons fill rapidly with solids that do not become stabilized. During the spring, when the manure temperature begins to increase, the acid-forming, rather than the methane-forming bacteria become active and begin to decompose the manure accumulated over the winter. When this occurs, the system is unbalanced and produce offensive odours.

Anaerobic Digesters

Anaerobic digesters are used to produce and recover methane gas from the decomposition of manure. Digesters consist of a large, airtight tank with devices for controlling the input of fresh manure into the tank, mixing the manure, maintaining the correct temperature, and drawing off methane gas and components of the digested manure. Methane production is affected by the temperature, loading rate, mixing, digestion time, and characteristics of the manure. To optimize the amount of methane produced by a digester, all the factors mentioned above must be carefully controlled. The control of these factors can be accomplished by intensive labour or by mechanization. In most regions of Canada, much of the methane produced needs to be used to warm up the digester to maintain gas production.

PHYSICAL TREATMENT

Dehydration

Dehydration is a process that can be used for odour control. Dry manure does not support the growth of either microorganisms or insects such as flies. As well, dry manure can be used as a soil conditioner, in much the same way as composted manure. The problem with dehydration is that the costs associated with moisture removal are high and can not be fully recovered from the sale of the final product.

Solids Separation

Separating the solid and the liquid portions of pig manure has several benefits. In some manure handling systems, it is sometimes desirable to recycle the liquids for flushing. Another reason for separation of the solids from the liquid manure is to allow the use of different treatment processes. Since most of the phosphorus is associated with the solids in liquid manure, separation is also considered as an alternative

approach to phosphorus management. Removing the solids can serve a similar function to pre-storage aeration. The remaining liquid is less concentrated and therefore will produce less odour when it decomposes. Depending upon the degree of separation, the solids may be dry enough to be composted, and the remaining liquid will be easier to handle when applying on the land or aerating. The disadvantage of solids separation is the need for two separate manure handling systems.

Most long-term storage structures for liquid manure allow natural separation of the solids, as they effectively settle at the bottom of the structure. Separation can be done using filters or screens, or by allowing the solids to settle in a large tank or basin while removing the liquids from the top. The amount of settled solids can be increased by using chemical agents that act as a flocculant. Mechanical equipment is available, including centrifuges, cyclone separators, press augers, stationary and vibrating screens, in a variety of sizes. Depending upon the flow rate and the type of mechanical equipment used, up to 60 per cent of the solids can be removed. Settling basins can remove up to 85 per cent of the solids, depending on the design.

A method of separation that has been used in Manitoba is to transfer the fresh liquid manure to a covered concrete structure where the solids are separated by settling. Conventional manure pumps are then used to agitate and remove the solids. The liquids are transferred from the concrete tank to an uncovered earthen manure storage. This system has the benefit of using low cost, open storage for the large volume of liquids having a low nuisance potential, and a higher cost, covered storage for the smaller volume of highly concentrated manure which can produce the most offensive odours. Alternatively, two-cell earthen storage structures will also separately store solids and liquids; the first cell could possibly be covered. However, the effectiveness of this method of separation for odour control has not been quantified.

APPENDIX E

Nitrogen Losses From Manure Storages And Dangerous Gas Production

Nitrogen Loss Summary (Percent Loss)

System	Storage[1]	N loss (%)[2]
Liquid	Enclosed	10 – 20
	Open	10 – 30
	Earthen	30 – 50
Solid	Daily Scrape	15 – 35
	Manure Pack	20 – 40
	Open Lot	40 – 60

[1] Losses can vary widely depending on climatic and management factors. The values in this table are based on typical practices.

[2] Nitrogen losses after fall applications will be approximately 20 per cent greater than spring or summer applications.

Characteristics Of Dangerous Manure Gases

Gas	Symbol	Density	Odour	Concentration (ppm)[2]		
				TLV-TWA[1]	Effect on Humans	
Hydrogen Sulphide	H_2S	1.19	Rotten Eggs, Nauseating	10	5 150 700	Offensive odour Olfactory paralysis, death in 30 minutes Rapidly fatal
Carbon Dioxide	CO_2	1.53	None	5000	30,000 40,000 300,000	Increased breathing rate Drowsiness, headache May be fatal in 30 min.
Ammonia	NH_3	0.60	Sharp, Pungent	25	100-500 5,000	Irritation of eyes, nose and throat in 30 min. Respiratory spasm, may be fatal
Methane	CH_4	0.55	None		500,000	Could asphyxiate by displacement of oxygen

[1] TLV-TWA (Threshold Limit Value, Time-weighted Average), the concentration under which nearly all workers may be repeatedly exposed for an eight-hour work-day and 40-hour work week without apparent adverse effects. Established by the American Conference of Government Industrial Hygienists, P.O. Box 1937, Cincinnati, OH 45201, U.S.

[2] ppm (parts per million) of a gas in atmospheric air; to convert to percentage by volume, divide ppm by 10000.

Source: Canada Plan Service Plan M-10710 Manure Gas

APPENDIX F

Soil Sampling Programs

Soil sampling for laboratory analysis is the only way to determine the levels of plant nutrients in a field and obtain fertilizer recommendations for that field. It is also required to determine whether nutrients have accumulated deep in the soil profile. A proper soil sampling program for sustainable manure management follows sound principles and includes every field, every year. Fall sampling should be done when soil temperatures are low (ideally <5°C) so that nutrient concentrations are not likely to change after testing. Spring sampling should be done as early as possible so results are not affected by warming of the soil. There are several aspects to a comprehensive soil sampling program, and a number of sampling strategies that can be used, depending on field conditions, cost and management objectives.

I. Annual Soil Sampling

The most common type of sampling program is annual soil sampling. Manure application fields should be sampled annually to determine residual nutrient levels for both agronomic and environmental purposes. Continually elevated nitrate or phosphorus levels detected during annual sampling may indicate an increased risk of nitrate leaching below the root zone (predominantly the upper 60 cm or 2 ft) or phosphorus loss via runoff or erosion.

Sampling Procedure:

- Follow the general instructions contained here or, preferably, consult the appropriate publications from Manitoba Agriculture, Food and Rural Initiatives for more detailed explanations of the various sampling strategies:
- Tri-Provincial Manure Application and Use Guidelines
- Manitoba Soil Fertility Guide
- Soil Sampling Strategies for Site Specific Management factsheet
- Sample annually in late fall or just prior to manure application. Note: the turnaround time for soil test results is typically longer during peak periods (allow one to two weeks if possible).
- Sample one location every three to four hectares (ha) (seven to ten acres (ac)). A minimum of 15 to 20 sample locations per field is recommended.
- Follow standard recommended soil testing procedures for obtaining and handling samples.
- Form one composite sample for each of the 0 to 15 cm (0 to 6 in) depth and 15 to 60 cm (6 to 24 inch) depth.
- At a minimum, have the 0 to 15 cm (0 to 6 in) sample analyzed for nitrate-nitrogen and phosphorus. The remaining samples should be analyzed for nitrate-nitrogen.

Interpreting the Results:
If any of the following criteria are met, consult a qualified professional to obtain sound recommendations for cropping and fertilization practices. Manure application to soils with nitrate-N levels above the regulatory limits is not recommended.

- Nitrate-nitrogen levels in the 0 to 60 cm (2 ft) depth must not exceed the maximum permitted concentrations specified in the Livestock Manure and Mortalities Management Regulation (see Appendix B).
- If the concentration of soil test phosphorus is less than 60 parts per million (ppm) P (based on the Olsen method) in the 0 to 15 cm (0 to 6 in) depth, manure may be applied based on N, however, efforts should be made to minimize P loading to soil (e.g. N conservation during storage or application).
- If the concentration of soil test phosphorus is 60 to 119 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than two times the crop removal rate for P_2O_5.
- If the concentration of soil test phosphorus is 120 to 179 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than one times the crop removal rate for P_2O_5.
- If the concentration of soil test phosphorus is 180 ppm P (Olsen) or greater in the 0 to 15 cm (0 to 6 in) depth, manure application should be discontinued.

The latter criteria for phosphorus are based on recommendations found in the Final Report of the Manitoba Phosphorus Expert Committee (2006).

Maximum Allowable Nitrate-nitrogen In The Top 60 Cm (2 Ft) Of Soil Under The Livestock Manure And Mortalities Management Regulation.[1]

Agriculture Capability Rating	Maximum Residual[2] Nitrate-Nitrogen	
	(kg/ha)	(lb/ac)
Class 1, 2 and 3 (except 3M and 3MW)	157.1	140
Class 3M, 3MW and 4	101	90
Class 5	33.6	30
Class 6, 7 and unimproved organic soils	N/A	N/A

[1] Consult the Livestock Manure and Mortalities Management Regulation for details on the nitrate limits, including exemptions.

[2] Refers to nutrient remaining in soil after the production of a crop.

II. Initial Shallow and Deep Sampling

Initial shallow and deep sampling of benchmark sites is recommended for fields about which little is known regarding past fertilization practices or fields suspected of having received heavy or repeated fertilizer applications. The objective is to establish current soil nutrient levels, near and well below the surface before beginning or continuing manure application. Crop selection and manure application rates can then be tailored according to existing, site-specific conditions (e.g. accumulation of phosphorus near the surface or nitrate-nitrogen deep in the soil).

Sampling procedure:

- Follow the general instructions contained here or, preferably, consult the appropriate publications from Manitoba Agriculture, Food and Rural Initiatives for more detailed explanations of the various sampling strategies:
- Tri-Provincial Manure Application and Use Guidelines
- Manitoba Soil Fertility Guide
- Soil Sampling Strategies for Site Specific Management factsheet
- Sample an appropriate number of benchmark sites (minimum three to five depending on field size and expected variability) that represent the field as a whole. Results for these sites can be used as a baseline for periodic soil nutrient monitoring (see Section III of this appendix). At each benchmark site, a minimum of 15 to 20 randomly selected sample locations is required.
- Each location should be sampled to a depth of 3.6 m (12 ft).
- Follow standard recommended soil testing procedures for obtaining and handling samples.
- Form one composite sample for the 0 to 15 cm (0 to 6 in) depth, 15 to 60 cm (6 to 24 in) depth and for each 30 cm (1 ft) increment thereafter by combining soil from all locations.
- At a minimum, have the 0 to 15 cm (0 to 6 in) sample analyzed for nitrate-nitrogen and phosphorus. The remaining samples should be analyzed for nitrate-nitrogen.

Interpreting the Results:

If any of the following criteria are met, consult a qualified professional to obtain sound recommendations for cropping and fertilization practices. Deep rooted perennial crops, such as alfalfa, can be grown to recover nitrates that have leached deeply into the soil profile. Growing crops with relatively high capacities for P removal may also need to be considered. In any case, manure application may need to be done at reduced rates or avoided until nutrient levels decline to reduce agronomic and environmental risk.

- Nitrate-nitrogen that has accumulated between 0 and 1.2 m (4 ft) below the surface should not exceed 160 kg/ha (140 lb/ac).
- Nitrate-nitrogen that has accumulated between 1.2 and 3.6 m (4 and 12 ft) below the surface should not exceed 22 kg/ha (20 lb/ac) in each 30 cm (1 ft) increment.
- If the concentration of soil test phosphorus is less than 60 ppm P (based on the Olsen method) in the 0 to 15 cm (0 to 6 in) depth, manure may be applied based on N, however, efforts should be made to minimize P loading to soil (e.g. N conservation during storage or application).

- If the concentration of soil test phosphorus is 60 to 119 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than two times the crop removal rate for P_2O_5.
- If the concentration of soil test phosphorus is 120 to 179 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than one times the crop removal rate for P_2O_5.
- If the concentration of soil test phosphorus is 180 ppm P (Olsen) or greater in the 0 to 15 cm (0 to 6 in) depth, manure application should be discontinued.

The latter criteria for phosphorus are based on recommendations found in the Final Report of the Manitoba Phosphorus Expert Committee (2006).

III. Periodic Monitoring

Periodically, intensive shallow and deep sampling, using benchmark sites can be done to better monitor for nitrate and phosphorus accumulation, especially in areas near surface water or situated over aquifers that have limited protection from overlying materials.

Sampling Procedure:

- Follow the general instructions contained here or, preferably, consult the appropriate publications from Manitoba Agriculture, Food and Rural Initiatives for more detailed explanations of the various sampling strategies:
- Tri-Provincial Manure Application and Use Guidelines
- Manitoba Soil Fertility Guide
- Soil Sampling Strategies for Site Specific Management factsheet
- Sample an appropriate number of benchmark sites (minimum three to five depending on field size and expected variability) that represent the field as a whole. If initial shallow and deep sampling (Section I of this appendix) were conducted, these benchmark sites should ideally match those selected previously. At each benchmark site, a minimum of 15 to 20 randomly selected sample locations is required.
- Follow standard recommended soil testing procedures for obtaining and handling samples.
- Form one composite sample for the 0 to 15 cm (0 to 6 in) depth, 15 to 60 cm (6 to 24 in) depth and for each 30 cm (1 ft) increment thereafter to 1.2 m (4 ft) by combining soil from all locations.
- At a minimum, have the 0 to 15 cm (0 to 6 in) sample analyzed for nitrate-nitrogen and phosphorus. The remaining samples should be analyzed for nitrate-nitrogen.

Interpreting the Results:

If any of the following criteria are met, consult a qualified professional to obtain sound recommendations for cropping and fertilization practices. Deep rooted perennial crops, such as alfalfa, can be grown to recover nitrates that have leached deeply into the soil profile. Growing crops with relatively high capacities for P removal may also need to be considered. In any case, manure application may need to be done at reduced rates or avoided until nutrient levels decline to reduce agronomic and environmental risk.

- The total nitrates in the 0 to 1.2 m (0 to 4 ft) depth should not exceed 160 kg/ha (140 lb/ac).

- If the concentration of soil test phosphorus is less than 60 ppm P (based on the Olsen method) in the 0 to 15 cm (0 to 6 in) depth, manure may be applied based on N, however, efforts should be made to minimize P loading to soil (e.g. N conservation during storage or application).

- If the concentration of soil test phosphorus is 60 to 119 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than two times the crop removal rate for P_2O_5.

- If the concentration of soil test phosphorus is 120 to 179 ppm P (Olsen) in the 0 to 15 cm (0 to 6 in) depth, manure should be applied at a rate no greater than one times the crop removal rate for P_2O_5.

- If the concentration of soil test phosphorus is 180 ppm P (Olsen) or greater in the 0 to 15 cm (0 to 6 in) depth, manure application should be discontinued.

The latter criteria for phosphorus are based on recommendations found in the Final Report of the Manitoba Phosphorus Expert Committee (2006)

Soil Sampling Procedure
Reliable results can only be obtained if the samples are fully representative of the field or area from which they are taken. Proper sampling and sample handling procedures must also be followed.

Selecting Areas to Sample
Soil sampling is normally done on an individual field basis with a single composite sample representing the whole field. Individual fields that are not uniform should be divided into smaller sampling units with a single composite sample representing each unit. The soil in each of these sampling units should have similar properties, such as colour, texture, cropping history, and fertilizer or manure treatments. One way to separate sampling units is by limitation, such as droughtiness, slope, salinity, stoniness or excess moisture. Any area that is different in these features and which is large enough to have manure applied at a different rate should be sampled separately.

All abnormal areas such as old manure piles, burn piles, haystacks, corrals, fence rows or farmstead sites should also be avoided, as well as locations of past synthetic fertilizer spills. Samples should not be taken along headlands, within 15 m (50 ft) of field borders or shelterbelts, or within 45 m (150 ft) of built up roads.

If the field has been cultivated, take the sample from the compacted soil in wheel tracks.

Equipment and Supplies
Special augers or probes designed for soil sampling must be used. These may be hand or hydraulic powered. Independent service providers may also be available to custom sample fields. Use clean, labeled plastic pails for collecting samples. Information sheets, sample containers and shipping boxes are usually available from the lab conducting the analysis.

Mechanical and hydraulic samplers may yield poor samples on very dry or wet soils. In all cases avoid getting topsoil in the subsoil samples, or subsoil in the topsoil samples. For example, in very dry soils, be careful not to let topsoil spill into the hole before taking deeper samples.

Handling Samples

Take care to keep samples clean and uncontaminated. If possible, send samples to the laboratory immediately. If this is not possible, or if a delay of more than 48 hours is anticipated, freeze or dry the samples. Follow these steps to dry samples:

- Mix the soil in each container thoroughly breaking lumps so they are less than 12 mm (0.5 in) in diameter.
- Remove about 0.5 L (1 pint) of soil and spread on a piece of clean paper.
- Completely dry at a temperature of not more than 30oC. Do not dry in an oven at a high temperature, since this can change the phosphorus, potassium and sulphur levels.
- Avoid contamination of the samples with foreign materials such as commercial fertilizer, manure, salt, baking soda, water, dust, etc. Samples should not be dried on old fertilizer or feed bags, or in areas where fertilizers have been handled.
- A fan may be used to ensure constant air flow over samples and enhance drying.

Once the sample is thoroughly dry, fill the soil sample bags provided by the lab. Label each bag with the correct field identification and sample depth. Complete an information sheet for each field.

Keeping Records

It is wise to maintain long-term detailed records on fields sampled. The records should include:

- fertilizer and manure application rates
- previous soil test results
- soil condition at sampling (temperature, moisture, crop cover, etc.)
- a map of where the soil samples were taken in each field (preferably geo-referenced using GPS)
- production information

These records may be needed to explain variations in annual test results, track trends in soil nutrient levels and enable refining of manure application recommendations.

Summary

Properly designed and conducted soil sampling programs reduce risk to surface and groundwater from the application of commercial fertilizer or manure. Producers should learn the fundamentals of soil sample collection and handling regardless of whether they do their own soil sampling or contract the work to service providers. Information obtained from an intensive soil sampling program is of considerable value to crop production for both agronomic and environmental reasons.

Soil Sampling Summary Table

A. Metric	Number of Locations[1]	Sampling Depth	Number of Samples	Maximum Nitrate-Nitrogen that should be found
I Annual Monitoring	1 per 3 to 4 ha	0.6 m	One composite sample, 0 to 15 cm One composite sample, 15 to 60 cm	See section 13, Appendix B
II Initial Shallow and Deep Monitoring	3 to 5 benchmark sites	3.6 m	One composite sample, 0 to 15 cm One composite sample, 15 to 60 cm One composite sample, every 30 cm thereafter	0 to 1.2 m - 160 kg/ha 1.2 to 3.6 m - 22 kg/ha per 30 cm
III Periodic Monitoring	3 to 5 benchmark sites	1.2 m	One composite sample, 0 to 15 cm One composite sample, 15 to 60 cm One composite sample, every 30 cm thereafter	160 kg/ha
B. Imperial				
I Annual Monitoring	1 per 7 to 10 ac	2 ft	One composite sample, 0 to 6 in One composite sample, 6 to 24 in	See section 13, Appendix B
II Initial Shallow and Deep Monitoring	3 to 5 benchmark sites	12 ft	One composite sample, 0 to 6 in One composite sample, 6 to 24 in One composite sample, every 12 in thereafter	0 to 4 ft -140 lb/ac 4 to 12 ft - 20 lb/ac per ft
III Periodic Monitoring	3 to 5 benchmark sites	4 ft	One composite sample, 0 to 6 in One composite sample, 6 to 24 in One composite sample, every 12 in thereafter	140 lb/ac

[1] In all situations a minimum of 15 sample locations are recommended.

APPENDIX G

Manure Management Plan

Please contact Manitoba Conservation for the most recent form or visit www.manitoba.ca/conservation/envprograms/livestock/

LIVESTOCK MANURE AND MORTALITIES MANAGEMENT REGULATION

Manure Management Plan

Manitoba Conservation

All livestock operations in Manitoba with 300 animal units (A.U.) or more are required under Section 13(1) of the *Livestock Manure and Mortalities Management Regulation* under *The Environment Act*, to submit an annual manure management plan to Manitoba Conservation. The plan must be submitted by **July 10** for fertilization programs beginning in the fall, or by February 10 for fertilization programs beginning in the spring.

Section A – Operation Information

Name of Operation _____

Mailing Address _____

_____ Postal Code_____

Location of Operation _____

Qtr. Sec. Twp. Rge. E/WPM or River Lot/Parish

_____ Latitude: Longitude: _____

Rural Municipality G.P.S. in Decimal Degrees (if available)

Name of Contact _____

Contact Numbers _____

Business Residence Cellular Facsimile

Owner (legal name) _____ _____

Corp File # if app.

Mailing Address _____

_____ Postal Code_____

Contact Numbers _____

Business Residence Cellular Facsimile

Affiliate (legal name) _____

Note: Confirmation of manure spread including legal land description, actual application rates, analysis of manure, field maps, coordinates (if available), field access location, must be submitted after manure is spread. Additional plans may not be registered unless this information is received by Manitoba Conservation.

If this manure management plan is a requirement of a Director's Order or an Environment Officer Order, please indicate Order number: _____

FOR DEPARTMENT USE ONLY

Received by: _____ Date Received:

Office: _____

Follow-up required Yes ☐ No ☐

Nature of follow-up_____

Proprietary (confidential) information will be protected in accordance with Manitoba law.
Personal information is collected under the authority of *The Environment Act*, the *Livestock Manure and Mortalities Management Regulation*, and will be used to issue receipts, for surveys, administration and enforcement purposes. Information collected is protected by the privacy provisions of *The Freedom of Information and Protection of Privacy Act.* If you have any questions, contact the Access & Privacy Coordinator, Box 85, 200 Saulteaux Crescent, Winnipeg MB R3J 3W3; 1-204-945-4170.

Please complete this form and forward to the Environmental Livestock Section, Manitoba Conservation, Box 46, 200 Saulteaux Crescent, Winnipeg MB R3J 3W3. Phone: 204-945-3078/Fax: 204-948-2420

Section B - Animal Unit Inventory

Animal Type and Subtype[1]	A.U. Produced by One Livestock		Number of Livestock of Each Subtype	A.U. for Each Livestock Subtype
Eg. Beef – Feedlot Cattle	*.769*	X	*500*	*385*
		X		
		X		
		X		
		X		
		X		
		X		

[1] Refer to Animal Unit Worksheet –Schedule A. Retain Schedule A for your records. If additional room is required, the operator may choose to submit a copy of Schedule A. **USE ONLY CATEGORIES LISTED IN THE WORKSHEET.**

NOTE: **If your Animal Inventories have INCREASED since last year, please indicate below:**

Animal Type and Subtype Which Have Increased	A.U. Produced by One Livestock		Number of New Livestock	A.U. Increase of New Livestock Subtype
		X		
		X		

Section C – Manure Storage Systems Information[1]

Type of livestock manure stored	☐ Liquid manure (pumped as liquid; 0-5% dry matter) ☐ Semi-solid (paste like; 5-25% dry matter) ☐ Solid (handled with loader; over 25% dry matter)

Location of central manure storage facilities

Legal description of the location(s):	G.P.S. Coordinates (Decimal Degrees) (if available)	Anticipated Storage Time (months)	Construction Permit Number(s)[2] or Registration Number(s)[3] for Storage

Location of solid manure field storage **(complete only if you have field storage)**

Field Storage Site #1 : Legal Location: _____	Anticipated Storage Duration (months) _____
Field Storage Site #2 : Legal Location: _____	Anticipated Storage Duration (months) _____
Field Storage Site #3 : Legal Location: _____	Anticipated Storage Duration (months) _____

[1] Use additional pages if necessary
[2] A construction permit has been required by Manitoba Conservation for construction of earthen manure storage structures since 1994 and for all other types of constructed manure storage structures since 1998. You may inquire about your permit number at your Manitoba Conservation regional office (see last page).
[3] Registration numbers will be issued by Manitoba Conservation for earthen manure storage structures built before 1994 and all other constructed storage structures built prior to 1998.

Section D – Manure Information for Land Application

(One manure type per page; reproduce pages 4 and 5 as necessary)

Type of Livestock	**Total A.U. of this Type**
_____	_____

Volume of Manure to be Land Applied

_____

☐ Imp. Gallons (liquid manure)
☐ Tons (solid manure)
☐ Cubic Feet (solid manure)

Manure Analysis

Total **nitrogen** content in the manure _____ ☐ lb/1000 imp.gal ☐ lb/ton

NH_4 _____ ☐ lb/1000 imp.gal ☐ lb/ton

Total P _____ ☐ lb/1000 imp.gal ☐ lb/ton

% Dry Matter _____

The nutrient value stated above is:
☐ Actual (Please attach manure analysis report with this form)
☐ Estimated

If estimated, please indicate your source of information:
Source (ie Farm Practice Guidelines, Feed Model): _____

Earliest Anticipated Manure application starting date[1]: _____
(Month / Day / Year)

[1]This is the earliest date the first spread of manure will occur on this plan.

NOTE: If manure is to be treated, please complete and attach Schedule B – Manure Treatment
If manure is to be transferred to another party, please complete and attach Schedule C – Transfer of Manure or Effluent to a Second Party.

"transfer" excludes situations in which a contractor is hired, or the operator volunteers to land apply the manure from this operation. In this case, Section E - Field Application Summary must be completed.

Section E - Field Application Summary

Crop year for which manure will be applied: _____ Manure Form: ☐ SOLID or ☐ LIQUID
Livestock Type: _____ If no Manure is to be applied, check here: ☐

Legal Description								
Field ID								
G.P.S. COORDINATES (4 corners of the field) Coordinates in Decimal Degrees (If available)								
Legal Owner's Name and Phone								
Field Size [1] (acres)								
Soil Class and Subclass [2]								
Proposed Crop								
Is the Proposed Crop Grazed? (indicate by entering 'Yes')								
0 – 6 inch (15 cm) depth soil phosphorus (P) in ppm [3]								
0 – 24 inch (60 cm) depth soil nitrate (NO_3^--N) in lbs/acre [3]								
Target Yield (bus/acre, lbs/acre, tons/acre)								
Crop Nitrogen Recommendation [4] (lbs N/acre)								
Crop Removal of Phosphate [5] (lbs P_2O_5/acre)								
Manure Application Rate (gal/acre or tons/acre) * if using multi-year P_2O_5 rate circle # equal to multiple of years [6]	2 3 4 5		2 3 4 5		2 3 4 5		2 3 4 5	
Application Season (spring / fall / summer)								
Application Start Date (month / day / year)								
Application Method [7]								
Non manure Nitrogen Fertilizer (lbs N/acre)								
Non manure Phosphate Fertilizer (lbs P_2O_5/acre)								
Applicator – Name, Phone, Licence								

[1] Indicate only the available acres for manure spreading (exclusive of setbacks from surface water courses, etc.).
[2] Must list correct Agricultural Capability Class and subclass as determined by Published Manitoba Soil Survey Report, or electronic data distributed by Manitoba Land Initiative website. Use the worst class manure will be spread on.
[3] As shown on the soil analysis report appended to this form. If soil analysis reports are not available at the time of submitting the form, they **must** be forwarded to Manitoba Conservation 14 days **before** application of manure to allow for processing.
[4] Indicate the recommended nitrogen (N) application rate suggested by the soil fertility guide or soil analysis report, whichever is lower.
[5] Indicate the crop removal rate of phosphate (P_2O_5) as determined by the most appropriate source of information.
[6] When soil test phosphorus levels are 60 ppm to 179 ppm manure may be applied at a rate of up to 5 times the annual crop removal rate of P2O5.
[7] Choose 1 of the following and put the corresponding letter on the form: **A**. Broadcast and incorporate after 2 days, **B**. Broadcast + Incorporate after 3 days. **C**. Broadcast and incorporate within 2 days. **D**. Broadcast and no incorporation. **E**. Broadcast and no incorporation on forages. **F**. Injection. **G**. Irrigation and incorporation within 3 days. **H**. Irrigation and no incorporation.

Section F -Certification of Manure Management Plan

Note: The Plan must be certified or it is VOID. Mark appropriate box with "X".

I certify that the information contained in this plan is true and that no relevant information has been withheld.

Date _____ _____
Signature of Operator

Plan Prepared by:
☐ Operator
☐ Other

If other than operator:

I certify that the information contained in this plan is true and that no relevant information has been withheld.

Date _____ _____
Signature of person preparing plan on behalf of operator

Address and phone number of person preparing plan: _____

_____

MIA # [1]/CCA # _____

[1] - if exempt from registration to MIA as per Section 13(7) of MR 42/98 enter 0000.

**FOR ADDITIONAL INFORMATION,
PLEASE CONTACT ONE OF THE FOLLOWING REGIONAL OFFICES**

Red River Region 123 Main Street, Suite 160 Winnipeg MB R3C 1A5 Telephone: (204) 945-7100 Facsimile: (204) 948-2338	**Western Region** 1129 Queens Ave. Brandon MB R7A 1L9 Telephone: (204) 726-6064 Facsimile: (204) 726-6567
Red River Region Unit 5, 284 Reimer Avenue Box 2019 Steinbach MB R5G 1N6 Telephone: (204) 346-6060 Facsimile: (204) 326-2472	**Western Region** 27 – 2nd Av SW. Dauphin MB R7N 3E5 Telephone: (204) 622-2030 Facsimile: (204) 638-8626
Red River Region 3rd Floor 25 Tupper Street N Portage la Prairie MB R1N 3K1 Telephone: (204) 239-3204 Facsimile: (204) 239-3215	**Interlake Region** 75 – 7th Ave. Gimli MB R0C 1B9 Telephone: (204) 642-6095 Facsimile: (204) 642-6108
Eastern Region Air Services, Provincial Highway #502 Lac du Bonnet MB R0E 1A0 Telephone: (204) 345-1444 Facsimile: (204) 345-1440	
To report environmental emergencies call 944-4888 (24 hours)	

APPENDIX H

Technical Review Application Form for Livestock Operation Proposals

INSTRUCTIONS:

Please complete and return application to your municipal office or planning district. Attach the following documents:

- site plan
- recent (less than one year old) manure application field soil sample results (Nitrate- N lb/ac at 0-6 and 6-24 inch depths, Phosphorus – ppm at 0-6 inch depth).

Note: Should the applicant not provide relevant information, delays may occur in completing the Technical Review Committee Report.

PURPOSE:

- To assist the Technical Review Committee in the evaluation of proposed intensive livestock operations.
- To assist with the exchange of information between the applicant, municipal council(s) and the public.

BACKGROUND:

- Technical Review Committees were established to provide support to local governments through a technical review of proposals for intensive livestock operations. This review is based on:
  - Information provided by the applicant, including detailed site plans and current soil fertility information,
  - local land use plans (development plan and zoning by-law),
  - the Farm Practices Guidelines for various livestock commodities in Manitoba,
  - provincial acts and regulations, including the Livestock Manure and Mortalities Management Regulation,
  - soil and landscape properties,
  - other available information as deemed appropriate by the committee.
- The Technical Review Committee is made up of representatives from the provincial departments of Agriculture, Food and Rural Initiatives, Conservation, Water Stewardship, and Intergovernmental Affairs and Trade. Agriculture, Food and Rural Initiatives coordinates this committee.
- The final written report will be provided to the rural municipality or planning district, to the proponent and will be available to the public. Proprietary information provided in this form should be clearly noted.

PROPOSED LIVESTOCK OPERATION INFORMATION

Applicant Information

Name of Operation: _____

Corporation Name (if applicable): _____

Applicant's Name: _____

Mailing Address: _____

City/Town: _____ Province: _____ Postal Code: _____

Phone No: _____ Fax No: _____ E-mail: _____

Design Consultant/Advisor

Company Name: _____

Contact Person: _____

Mailing Address: _____

City/Town: _____ Province: _____ Postal Code: _____

Phone No: _____ Fax No: _____ E-mail: _____

I certify that the information provided in this form for the construction and operation of this proposed livestock production operation is accurate.

Applicant's Signature: _____

Date of Application: _____

For Office Use Only

Review Requested By: _____
Date of Receipt: _____
Confirmation of Receipt Sent: _____
Date Application Complete: _____

Description of Operation

Operation Location: R.M. of _____ Legal Description: _____

Type of Housing: ☐ Confinement ☐ Outdoor (show details on site plan)

Proposed Building Sizes:

Type of Building #1: _____ Size of Building #1: _____
Type of Building #2: _____ Size of Building #2: _____
Type of Building #3: _____ Size of Building #3: _____

Existing Building Sizes:

Type of Building #1: _____ Size of Building #1: _____
Type of Building #2: _____ Size of Building #2: _____
Type of Building #3: _____ Size of Building #3: _____

Are building plans available: ☐ Yes – included ☐ Yes – not included ☐ No
Operation: ☐ New ☐ Expansion ☐ Remodel

If any of the operations from the below chart are at a location other than that indicated above, please indicate the R.M. and the legal description below:

Type of Operation: _____ Type of Operation: _____
R.M. of : _____ R.M. of : _____
Legal Description: _____ Legal Description: _____

Type of Operation: _____ Type of Operation: _____
R.M. of : _____ R.M. of : _____
Legal Description: _____ Legal Description: _____

Type of Operation: _____ Type of Operation: _____
R.M. of : _____ R.M. of : _____
Legal Description: _____ Legal Description: _____

Type of Operation		A	B	C	D	E
		Existing Number	Proposed /Final Number	Animal Units Per Head	Total Animal Units	Annual Confinement Period (Days)
Dairy	Cows - milking cows			2.000		
Beef	Beef cows including associated livestock			1.250		
	Backgrounder			0.500		
	Summer pasture / replacement heifers			0.625		
	Feeder cattle			0.769		
Pigs	Sows - farrow to finish (234-254 lbs)			1.250		
	Sows - farrow to weanling (up to 11 lbs)			0.250		
	Sows - farrow to nursery (51 lbs)			0.313		
	Boars (artificial insemination units)			0.200		
	Weanlings, Nursery (11-51 lbs)			0.033		
	Growers / Finishers (51-249 lbs)			0.143		
Chickens	Broilers			0.0050		
	Roasters			0.0100		
	Layers			0.0083		
	Pullets			0.0033		
	Broiler breeder pullets			0.0033		
	Broiler breeder hens			0.0100		
Turkeys	Broilers			0.010		
	Heavy Toms			0.020		
	Heavy Hens			0.010		
Horses	Mares			1.333		
Sheep	Ewes			0.200		
	Feeder lambs			0.063		
Other Livestock	Type:					
	Type:					

For all other livestock or operation type please inquire with your Manitoba Agriculture, Food and Rural Initiatives GO office to determine the animal units per head.

Manure Storage & Handling

Manure Type:	☐ Solid	☐ Liquid	
Storage Systems:	☐ Enclosed pits	☐ Earthen	☐ Open top tanks
	☐ Daily scrape	☐ Manure pack	☐ Open lot
Application Method:	☐ Broadcast	☐ Broadcast & incorporation within 48 hours	
	☐ Injection	☐ Sprinkler	

Total Storage Capacity (see the following pages for storage capacity calculations):

Liquid volume (ft3): _____ Solid weight (tons): _____

Odour Control Measures

Manure Storage Cover: ☐ Yes ☐ No

Type of Cover: _____

Shelterbelt Planting: ☐ Yes ☐ No ☐ Existing shelterbelt

Other (specify): _____

_____

_____

Phosphorus Reduction Strategies:

_____

_____

_____

_____

Reduction at source (**Ie. Use of phytase, manure separation, etc.**):

_____

_____

_____

Transport reduction (**Ie: Cropping practices, use of buffer strips, etc.**)

_____

_____

_____

Land Used for Application of Manure

Legal Description	Field ID	Own, Lease, or Agreement (O,L,A)	Manure Application Field Acres Available	Expected Manure Application Rate (tons or gal/ac)	Expected Crop to be Grown	Soil Nitrate N (lb/ac at 0-24 inch depth)1	Soil Phosphorus (ppm P at 0-6 inch depth)1,2
Total Manure Application Field Acres Available							

[1] Soil fertility analysis completed by an accredited soil-testing laboratory

[2] Phosphorus concentration based on extraction method specified

Time of year for application: ☐ Spring ☐ Summer ☐ Fall ☐ Winter

Manure Storage Calculations

Species	Type of Operation	A			B	C	Total Storage Volume (A x B x C)
		Storage Volume (ft^3/day/animal)			Confinement Period (Days)	Number of Animals	
		Semi-solid	Solid	Liquid			
Dairy	Milking cows, including heifers						
	Free stall						
	Tie stall						
	Loose housing						
	Milk house wash water						
Beef	Beef cows including associated livestock						
	Backgrounder						
	Summer pasture / replacement heifers						
	Feeder cattle						
Pigs	Sows - farrow to finish (234 - 254 lbs)		1.74	2.30			
	Sows - farrow to wean (up to 11 lbs)		0.54	1.00			
	Sows - farrow to nursery (51 lbs)			0.80			
	Weanlings, Nursery (11 - 51 lbs)		0.06	0.10			
	Grower / Finisher (51 - 249 lbs)		0.17	0.25			

		A	B	Total Storage Volume (A x B)
		Storage Volume (ft^3/year/bird space)	Number of Birds	
Chickens	Broilers – floor			
	Broiler breeders			
	Broiler breeder pullets			
	Roasters			
	Layers – cage			
	Layers – floor			
	Layers – solid pack			
	Pullets – cage			
	Pullets – floor			
	Pullets – solid pack			
Turkeys	Broilers			
	Heavy toms			
	Heavy hens			

Site Description

Number of residences within a **one mile** radius: _____
Please attach municipal map of area.

Residence Number	Name	Legal Description & Civic Address	Type & Size of Livestock Operation associated with residence	Approximate Distance from Proposed Operation
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Attach list of additional residences if required.

Number of residences from one to **two miles** from the proposed operation: _____
Please attach municipal map of area.

Residence Number	Name	Legal Description & Civic Address	Type & Size of Livestock Operation associated with residence	Approximate Distance from Proposed Operation
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				

Attach list of additional residences if required.

Other nearby non-agricultural uses (e.g. vacation farm, golf course, cottage, rural residential developments, etc.)

Name:_____

Legal Description: _____

Description of Adjacent Use: _____

Approximate Distance from Proposed Operation: _____

Distance to nearest designated residential area (specify).____

Distance to nearest designated recreation area (specify):_____

Distance to nearest designated commercial area (specify):_____

Distance to known drains (specify):_____

Distance to known streams (specify):_____

Distance to known creeks (specify):_____

Distance to known rivers (specify):_____

Will livestock have direct access to watercourse? ☐ Yes ☐ No

Water Source for Operation: ☐ Pipeline (public) ☐ River

☐ Sandpoint ☐Lake

☐ Dugout (Dugout dimensions _____ x _____ x _____)

☐ Drilled Well ☐ Shallow Dug Well

In the space provided below, please list existing well(s) or spring(s) and their location(s). Please also indicate them on the site map or location map.

_____

_____

_____

_____

Expected Water Usage:

Max. daily use: _____ ☐ imp. gal; ☐ US gal; or ☐ litres

Max. annual use: _____ ☐ imp. gal; ☐ US gal; or ☐ litres

Is a Water Rights Licence required?
Note: A Water Rights Licence is required if use exceeds 5,500 imp. gal/day or 25,000 L/day.

☐ Yes, application submitted on: _____ ☐ No
D/M/Year

Please indicate the location of known bedrock outcrops, sinkholes, gravel pits, quarries on the attached maps.

Results from soil test boring or pits are: ☐ available ☐ not available
Note: If available attach soil logs to application

Describe primary site access route to nearest provincial road or PTH.

_____

_____

_____

_____

_____

_____

Other information regarding the proposed site (e.g. flooding problems, other known geological or groundwater information).

_____

_____

_____

_____

_____

_____

Dead Animal Disposal

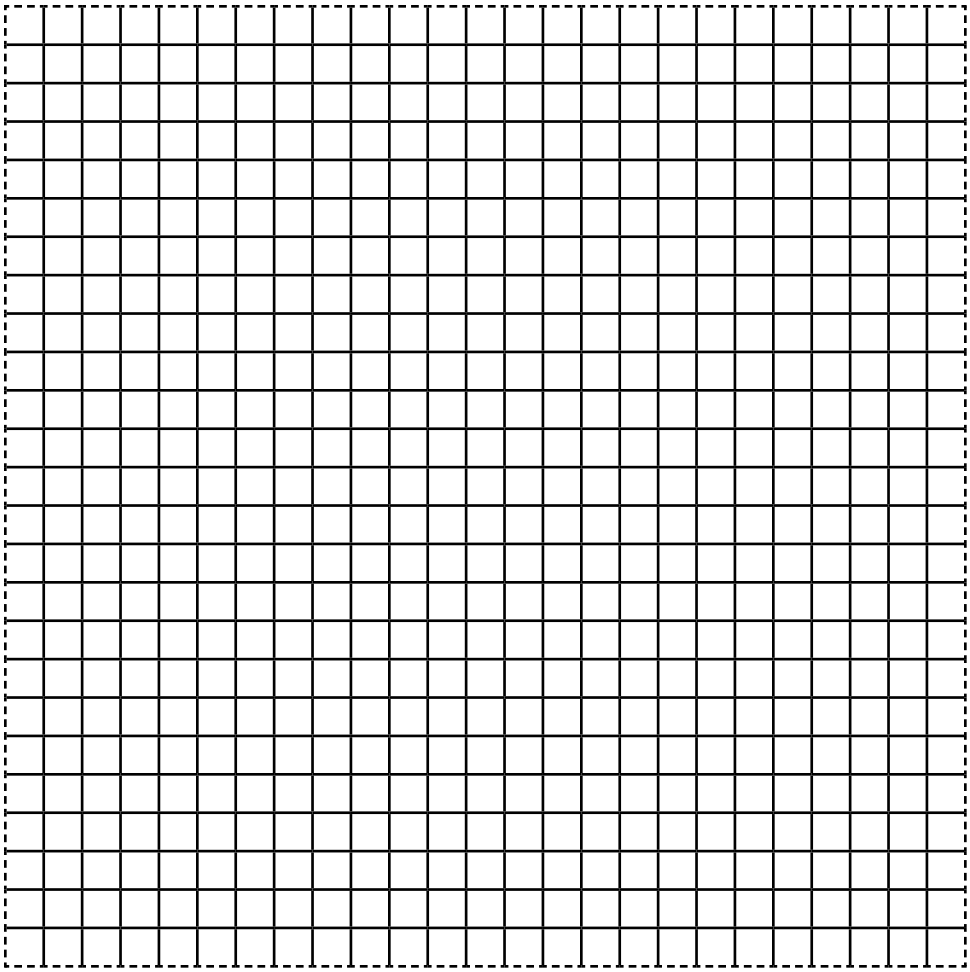
Type of Disposal:
☐ Rendering
☐ Burial
☐ Incineration
☐ Temporary Refrigerated Storage
☐ Composting

Location Map

Provide a map drawn to scale or include a municipal map showing the proposed livestock operation and existing land uses and other features (e.g. drains, wells, residences, recreation areas, etc.) within a two mile radius of the proposed livestock operation.

Yard Site Plan

Certificate of Title No. _____



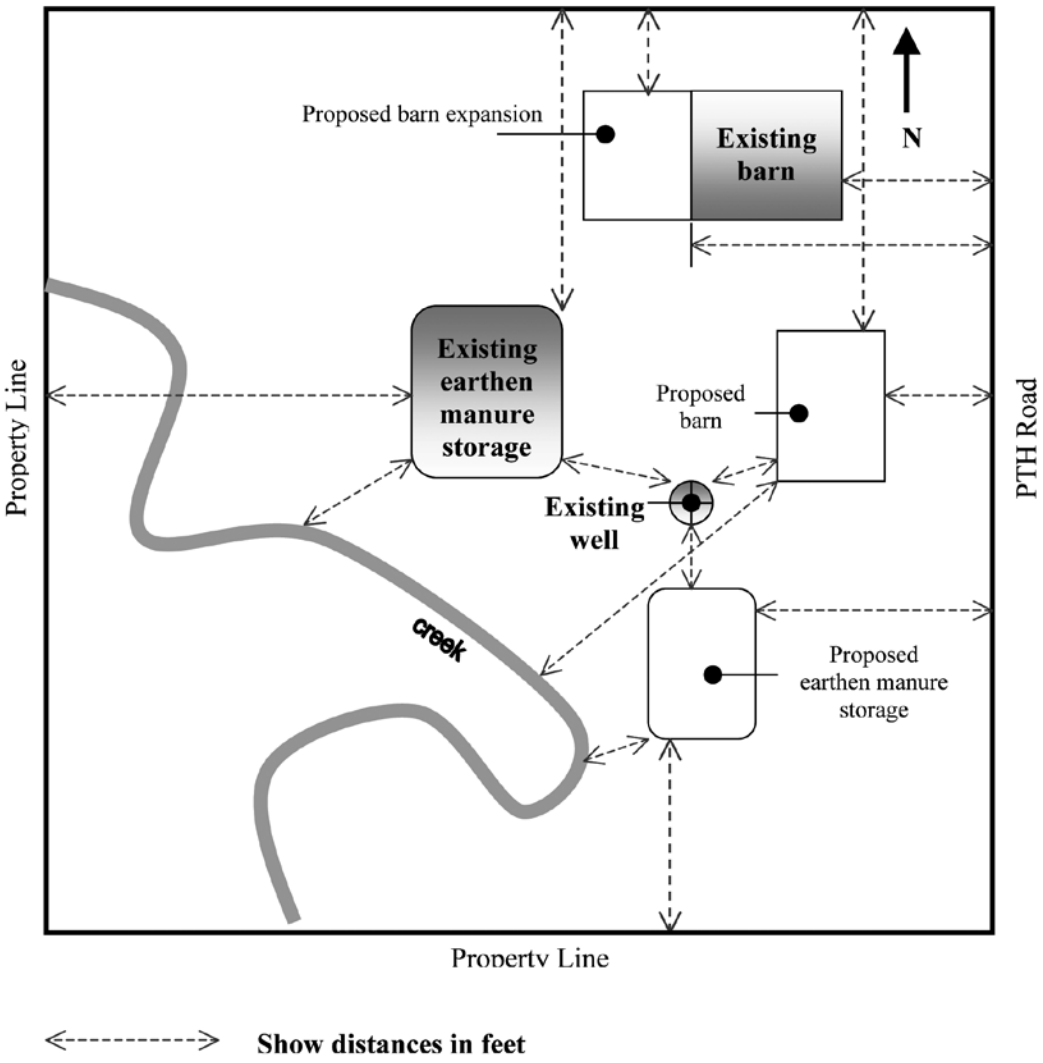
Please indicate the following:

1. Approximate distances between existing and proposed structures and facilities and property lines
2. Dwellings, shelterbelts, manure storage, water source locations, drainage patterns, and water courses
3. Property dimensions
4. Municipal or provincial roads and provincial trunk highways
5. Scale size

(Suggested scale: one square = 50 feet)

Please see Yard Site Plan Example for assistance.

Yard Site Plan Example



APPENDIX I

Development of the Animal Unit

BACKGROUND

The application of livestock manure on farm land presents an opportunity to recycle organic material and reduce the dependency on inorganic fertilizers. While livestock manure may be highly desirable as a fertilizer and a soil conditioner, too much of it must be avoided to prevent excessive build-up of elements like nitrogen and phosphorus in the soil. To equate livestock numbers with nitrogen production, the concept of a Livestock Waste Unit was developed in the 1960s in the United States. Reasoning that corn required 150 to 170 pounds (68 to 77 kilograms) of nitrogen per acre to maximize production, a Livestock Waste Unit was determined to be that number of animals required to produce 73 kilograms of nitrogen annually.

Although storage and application losses need to be determined to calculate the amount of nitrogen actually delivered for plant use, the Livestock Waste Unit remains as a measure of nitrogen production for each species of animal. Over time the efficiency of animals has improved due to both genetic and nutritional advances. Recalculation of nitrogen production and hence Livestock Waste Units was therefore warranted. In order to avoid confusion between the revised values and the old Livestock Waste Units previously used in Manitoba, the new values developed in 1994 are referred to as "Animal Units." The definition of the animal unit is the number of animals required to excrete a total of 73 kilograms of nitrogen in a 12 month period.

ANIMAL UNIT (A.U.) SUMMARY TABLE

	A.U. Produced By One Livestock	Livestock Producing One A.U.
Dairy		
Milking cows, including associated livestock	2.000	0.5
Beef		
Beef cows, including associated livestock	1.250	0.8
Backgrounder	0.500	2
Summer pasture/replacement heifers	0.625	1.6
Feeder cattle	0.769	1.3
Pigs		
Sows, farrow to finish (110-115 kg)	1.250	0.8
Sows, farrow to weanling (up to 5 kg)	0.250	4
Sows, farrow to nursery (23 kg)	0.313	3.2
Weanlings (5-23 kg)	0.033	30
Growers/finishers (23-113 kg)	0.143	7
Boars (artificial insemination operations)	0.200	5
Chickens		
Broilers	0.0050	200
Roasters	0.0100	100
Layers	0.0083	120
Pullets	0.0033	300
Broiler breeder pullets	0.0033	300
Broiler breeder hens	0.0100	100
Turkeys		
Broilers	0.010	100
Heavy toms	0.020	50
Heavy hens	0.010	100
Horses		
Mares, including associated livestock	1.333	0.75
Sheep		
Ewes, including associated livestock	0.200	5
Feeder lambs	0.063	16
Other livestock or operation type		
- Please inquire with your local Manitoba Agriculture, Food and Rural Initiatives GO Team office.		

APPENDIX J

Shelterbelt Guidelines for Manitoba PIg Producers

Adapted from Agriculture and Agri-Food Canada's Basic Shelterbelt Establishment Guidelines for Prairie Livestock Facilities.

Introduction
Properly planned shelterbelts around a livestock facility provide many benefits. Shelterbelts reduce the expense of snow removal by trapping snow, and reduce heating and maintenance costs of buildings by reducing wind velocities. Protected livestock are generally healthier and require less feed. Shelterbelts have the potential to effectively control odor, particularly when used in combination with other methods. Shelterbelts help blend the physical features of the facility with the landscape, and provide a more pleasant working environment.

Planning a Shelterbelt
Proper planning of a shelterbelt involves reviewing your present requirements, assessing your future needs, estimating the quality of existing shelterbelts, and planning new shelterbelts to achieve the benefits.

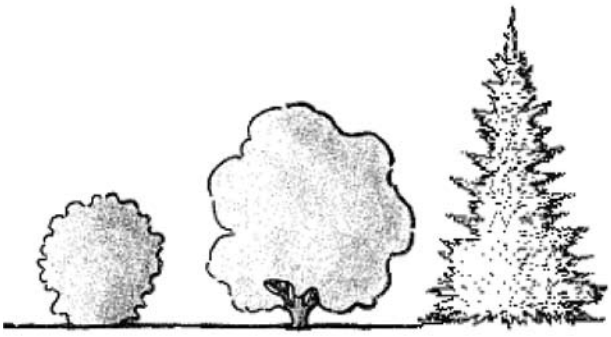
Most livestock facilities would have had some scale ground plans that provide the necessary measurements and locations of existing trees, sloughs, buildings, manure storages, corrals, access roads and power lines. If not, it is recommended to measure and map the area, keeping in mind prevailing wind directions and areas where excessive snow accumulations can cause problems.

To eliminate problems with snow buildup, it is recommended that all shelterbelts be at least 30 m (100 ft) from main buildings, manure storages and access roads. Compliance with shelterbelt setback regulations established by Rural Municipalities is strongly recommended, in addition to regulations set by the Canadian railroad and the provincial highways and transportations departments, where applicable.

Shelterbelt Design
There is no one ideal shelterbelt design with a set number of rows, planting width or species for every livestock facility. Factors such as soil conditions, operational activities, and layout among buildings, lagoons and roads must be taken into consideration to ensure the success and usefulness of the shelterbelt over the long-term.

For odour protection, a three-row shelterbelt is recommended where space is not limited, to obtain basic wind and snow protection **(Figure 1)**. Up to five or six rows of trees can be planted on sides of the property most subject to prevailing winds, or in areas where greater shelter is required to reduce wind or to trap snow.

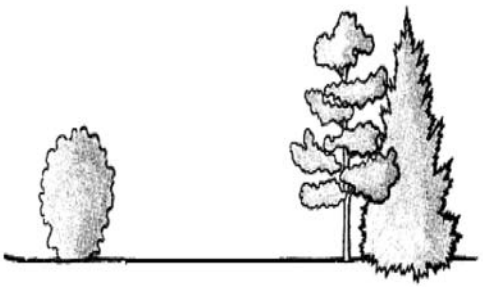
Shelterbelt Maintenance
Use of plastic mulch greatly reduces the growth of weeds and grass within the rows and allows trees to thrive in the early years. Mowing or tilling between the rows is still required to help control weeds. Trees should be planted at least 30 m away from manure storages to allow access.



(Figure 1)

The shelterbelt design should consist of a combination of dense shrubs, tall deciduous and coniferous material. Fast-growing trees can be planted to provide benefits sooner, but long-lived trees should also be considered for lasting effect. This can be accomplished by using a variety of species, each possessing at least one of the desired characteristics.

The outside row of a shelterbelt acts as a snow trap and starts to deflect the wind current upwards. This row should be a dense shrub, 15 to 30 m (50 to 100 ft) from the inside tree rows. This row acts as a trip line, and reduces the size of snowdrifts that build up on the inside of the tree rows (Figure 2). The tree rows should consist of a fast to moderate-growing species and a long-lived species at a minimum. If space allows, additional tree rows closer to the site could be tall, dense and long-lived conifer species. (Figure B)



|---------- 15 to 30 m ----------|

(Figure 2)

Establishing an alley crop system with distances up to 30 m (100 ft) between tree rows would achieve the benefits of a traditional shelterbelt system, and allow for the production of crops and/or forage between the tree rows. This would allow for greater utilization of the land surrounding the livestock facility.

A proper shelterbelt design for a livestock facility should be developed separately for each site and circumstance. On-site consultation ensures that all soil and site conditions are assessed accordingly, and that no other activities surrounding pig production are compromised with the establishment of a shelterbelt. For more information and technical assistance with the development and establishment of an appropriate shelterbelt design, contact Manitoba Agriculture, Food and Rural Initiatives, Agriculture and Agri-Food Canada, or Prairie Farm Rehabilitation Administration.

APPENDIX K

CONTACT INFORMATION

Manitoba Government Inquiry
1-866-MANITOBA
1-866-626-4862
www.gov.mb.ca/contact/

Manitoba Farm Industry Board
Boards, Commissions and Legislation Branch
Strategic Policy and Innovation Division
Manitoba Agriculture, Food and Rural Development
812-401 York Avenue
Winnipeg, Manitoba R3C 0P8
Phone: (204) 945-3856
Fax: (204) 945-1489
Email : agboards@gov.mb.ca

Manitoba Agriculture, Food and Rural Development (MAFRD)
MAFRD GO Centres:
http://www.gov.mb.ca/agriculture/contact/index.html

Manitoba Conservation and Water Stewardship (CWS)
Environmental Compliance and Enforcement:
http://www.gov.mb.ca/conservation/ece/contact.html
Water Stewardship Division:
http://www.gov.mb.ca/conservation/waterstewardship/misc/contact.html
Manitoba Conservation 24 Hour Emergency Response: 1-855-944-4888

Manitoba Municipal Government (MMG)
Livestock Technical Review Coordination Unit:
http://www.gov.mb.ca/ia/livestock/contact.html

Farm Practices Guidelines for Pig Producers published by
Manitoba Agriculture, Food and Rural Initiatives.