EDC 269

Iowa Farm*A*Syst

A Farmstead Assessment System

Assessing Your Milking Center Wastewater Management

Simple *Confidential* *Accurate*

What is Iowa Farm*A*Syst?

Iowa Farm*A*Syst is a farmstead assessment system developed to assist rural residents in protecting their water resources, particularly their drinking water. Individuals can tailor the Iowa Farm*A*Syst program to meet their needs by choosing specific topics that fit their farmstead or acreage. The Iowa Farm*A*Syst program is based on a series of 12 publications, including the following:

- Assessing Your Farmstead Characteristics (EDC 264)
- Assessing Your Water Well Condition & Maintenance (EDC 265)
- Assessing Your Household Wastewater Management (EDC 266)
- Assessing Your Open Feedlot Manure Management (EDC 267)
- Assessing Your Confinement Livestock Manure Management (EDC 268)
- Assessing Your Milking Center Wastewater Management (EDC 269)
- Assessing Your Dead Animal Management (EDC 270)
- Assessing Your Pesticide Storage & Management (EDC 271)
- Assessing Your Fertilizer Storage & Management (EDC 272)
- Assessing Your Petroleum Storage & Management (EDC 273)
- Assessing Your Hazardous Materials Storage & Management (EDC 274)
- Assessing Your Emergency Response Planning for Manure Spills (EDC 328)

Each publication gives you a brief background on the subject and an assessment worksheet to evaluate on-farm practices affecting water quality. Also included are references to Iowa environmental laws and contact information for technical advice.

Why should I use the Iowa Farm*A*Syst materials?

Seventy-five percent of Iowans get their drinking water from groundwater sources. These sources include private wells, in addition to municipal wells and rural water sources. If your drinking water comes from a private well, you have good reason to be concerned about the quality of your drinking water. A 1990 statewide survey of rural well water found that 45 percent of private wells are contaminated with coliform bacteria, 18 percent contain unsafe levels of nitrate, and 14 percent contain pesticides. The Iowa Farm*A*Syst publications help you to determine what environmental risks could threaten your family's health and financial security and suggest the resources to help make necessary changes.

How do I start assessing my farmstead?

The 12 Iowa Farm*A*Syst publications are each designed to be stand-alone publications. However, the first step to assessing your farmstead should be to draw a map of the area, labeling any potential sources of contamination. *Iowa Farm*A*Syst Assessing Your Farmstead Characteristics* can help you get started. Every farmstead is unique. You need to evaluate your farmstead's site characteristics to determine the potential for groundwater and surface water contamination. You cannot change the features of your farmstead, but once you are aware of them you can modify your activities to minimize the potential for groundwater contamination. After you have mapped your farmstead, consider what management decisions may be affecting the quality of your water resources. This process will help you to prioritize which of the other Iowa Farm*A*Syst assessments you may want to complete.

For more information or to download additional Iowa Farm*A*Syst publications, visit www.iowafarmasyst.com
or
Contact Rick Robinson, Iowa Farm Bureau
(515) 225-5432

Publications are also available through the Iowa State University Extension Distribution Center at www.extension.iastate.edu/store/ or 515-294-5247.

Milking Center Wastewater Storage and Disposal

"Got milk?" is undoubtedly one of the most successful marketing campaigns in recent history. The marketing plan puts milk in the spotlight and tempts consumers with a wholesome, hip American beverage that leaves them thirsting for an ice cold milk and a plate of warm cookies. The ad campaign was dreamed up in California by a small band of dairy producers to combat a 20-year downslide in milk consumption. The campaign halted the decline in milk intake and put the phrase "Got milk?" into everyday vocabulary.

To maintain that healthful image, dairy producers must work diligently to produce a high-quality, economical product while protecting our natural resources.

Public awareness of milking center wastewater management tends to take a backseat to the more familiar environmental concerns such as managing manure produced by dairy farms. Milking center wastewater contains many possible water pollutants including milk solids, fat, casein, detergents, manure, soil particles, and strong acids and bases used to clean pipelines. The wastewater generated from cleaning dairy facilities is not a threat to ground and surface water if stored and disposed of properly. However, using poor wastewater disposal practices may endanger the quality of your drinking water or nearby surface water supplies.

There is great variability in the concentration of contaminants in milking wastewater from farm-to-farm, and season-to-season. On-farm processing operations, which may include blending, pasteurizing, and bottling milk for retail sale, often use more water and have higher concentrations of contaminants in the wastewater. All dairy farms are faced with the issue of properly disposing of milking center wastewater. Dairy operations require a wastewater management system that is environmentally acceptable, cost effective and easy to operate and maintain.

In Iowa, the Department of Natural Resources (DNR) strongly recommends the practice of combining milking center wastewater and manure in a liquid-manure storage facility and then field applying the slurry.

However, there are other acceptable ways to store and treat milking center wastewater. Each method has advantages and disadvantages, as described in this publication. On page 13 you will find a worksheet that will guide you through a systematic evaluation of your wastewater management practices as they relate to protecting your groundwater.

Whenever possible, waste water should be recycled. This conserves water and energy and reduces the magnitude of the wastewater disposal problem. Clean water that has been used solely for cooling purposes can be recycled for rinsing pipelines and milk-handling equipment. Milky water can be used for cleaning floors and flushing manure from animal holding areas.

NOTE: This publication does not summarize all the laws related to livestock operations in Iowa. Due to the complexity of Iowa law and Iowa Department of Natural Resources (DNR) rules concerning manure management and livestock operations, you are advised to contact your regional DNR office if you have additional questions that are not addressed in this publication. Contact information for the DNR regional field offices is located in the "For More Information" section on pages 11-12 of this publication.

Can I mix dairy water with manure?

If you combine your milking center wastewater with manure and land-apply it, you are subject to manure application separation distances. Please refer to the Iowa Farm*A*Syst Open Feedlot Manure Management & Confinement Livestock Manure Management publications for more information.

From an environmental perspective, delivery of milking center wastewater to a manure storage facility, if available, makes the most sense. The addition of the wastewater to the manure makes the slurry a consistency that can be more easily agitated and dramatically decreases the energy needed to pump the slurry. Some gravity flow systems need the extra water to help move the manure through the system. Additionally, the nutrients found in milking center wastewater add value to the slurry.

Combining milking center wastewater and manure requires foresight and good planning, because the addition of milking center wastewater may require additional storage capacity. Additionally, when milking center wastewater is combined with manure, the slurry is subject to Iowa law and the Department of Natural Resources (DNR) rules concerning manure management and livestock operations. For more information on these regulations, refer to the Iowa Farm*A*Syst *Open Feedlot Manure Management Practices & Confinement Livestock Manure Storage Practices* publications. The regional DNR field offices can also offer assistance on Iowa laws and recommended practices for manure management.

The slurry from the combination of wastewater and manure is most commonly applied with a liquid manure tank, a drag hose system, or an irrigation system. Application rates for wastewater and/or liquid manure are calculated based on the nutrient content of the slurry, crop nutrient needs and the ability of the soil to absorb the liquid. Iowa law requires minimum separation distances from buildings or public use areas, as well as designated areas such as wells, sinkholes, wetlands and high quality water resources. Contact your Iowa DNR Field office (see pages 11-12 for contact information) for specific information on separation distances.

The following list outlines the advantages and special considerations of combining wastewater with manure.

Advantages

- The system is flexible because it allows for variation in wastewater volumes and can handle large amounts of water.
- A liquid manure storage facility, properly constructed and sized, provides the additional flexibility of storing wastes until they can be land applied at the right time to the right sites.
- The addition of milking center wastewater to manure makes the slurry a consistency that can be easily agitated and pumped.
- Nutrients from wastewater and manure can be used to meet crop needs when field applied.
- It is not necessary to have two separate waste systems for manure and milking center wastewater.
- The system provides for the greatest amount of environmental protection.

Special Considerations

- The storage capacity must be increased approximately 4 gallons/day/cow milked above the recommended rate for manure alone. If parlor wash-down is added to the storage facility, the capacity should be increased by 2-3 times or 8 to 12 gallons/day/cow milked.
- Additional slurry volume may add to field application transportation costs.
- The wastewater and manure combination is not compatible with semi-solid or bedded-pack manure management systems.
- Care must be taken to keep soil phosphorus from accumulating to levels that will harm crops or exceed allowable levels under the new proposed P-Index.
- Lagoons must be carefully located to minimize offensive odors. All earthen lagoons require a DNR construction permit before construction begins. For more information on construction permits, refer to the Iowa Farm*A*Syst *Confinement Livestock Manure Management* publication.

Testing the nutrient content of the dairy wastewater is highly recommended. Best management practices advocate testing the wastewater and testing the soil so sound nutrient recommendations can be made.

What are my options for storing and pre-treating wastewater?

Holding Tank

A holding tank may be used for short-term storage of milking center wastewater. A minimum storage volume of 30 days is recommended for short-term storage tanks to avoid having to empty the tanks under adverse field application conditions. During winter, a storage capacity of five months is recommended. When emptying these tanks, the contents must be thoroughly agitated, completely removed and land applied.

The following list outlines the advantages and special considerations of using a holding tank.

Advantages

- A holding tank can be used when soils on the farm do not allow for other storage or treatment options.

Special Considerations

- Gases in a storage tank can be deadly. A self-contained breathing device is required to enter the tank.
- A holding tank should be located at least 100 feet from deep water wells and 200 feet from shallow water wells.
- Holding tanks need to be emptied frequently to prevent overflow.
- Aboveground tanks need to be protected from freezing, collisions and leakage.
- Underground tanks must be able to withstand the earth's pressure and external loading due to traffic. Underground tanks must be able to resist buoyancy forces when the tank is empty and the surrounding soil is saturated.
- A high volume, low-head pump that can handle grit in the liquid is required.
- If storage time is longer than three days, agitation may be needed to keep solids from building up in the bottom of the tank.
- Field application of wastewater during wet weather and on frozen ground increases the potential for contamination from runoff.
- If repeated field applications are necessary, monitor field nitrogen and phosphorous levels.

Settling System

A settling tank is used as a way to pre-treat wastewater before land application. The system allows solids to settle on the bottom of the tank and liquids and floatable organics and solid material (scum) to float to the top before moving on to the next stage of treatment. Wastewater that is passed through a settling tank results in more thorough pre-treatment and may help to control odor.

The smallest recommended settling tank size is 2000 gallons. When the settling tank is emptied, the solids and any remaining liquid should be removed. The liquid contents can be applied to fields with liquid manure handling equipment or with specially adapted sprinkler system irrigation equipment. Some farmers use an irrigation system to handle the liquid and a liquid manure pump and tank spreader for the slurry.

The following list outlines the advantages and special considerations of using a settling tank system.

Advantages

- Using a settling tank can extend the effective life of the wastewater application area by reducing the amount of solids that are applied to the land.
- A settling tank allows bacteria to break down, or decompose, some of the waste before it is land applied.

Special Considerations

- A settling tank should be located at least 100 feet from deep water wells and 200 feet from shallow water wells.
- A settling tank works best if the amount of solids entering the tank is limited. This may require extra precautions when cleaning the facilities.
- Dairies that use sand bedding may need to remove solids more frequently from their settling tank.
- The tanks should be checked regularly for build up of solids and pumped when half full of solids. A settling tank containing manure and wastewater must have solids and scum removed at least every 6 months for optimum treatment. It may be necessary to remove solids or scum more frequently depending on the amount of wastewater flowing through the system.
- A settling tank from just the milk house may only need to have solids removed once or twice a year.
- If a pump or siphon is used to move liquid to the next stage of treatment, a separate pumping tank may be required.
- All pipes and cleanouts must be installed in a manner to avoid freezing, and withstand heavy overhead traffic.

A shallow well does not have five feet of continuous low-permeability soil or rock (bedrock, for example) located at least 25 feet below the soil surface and above the aquifer.

A deep well has a minimum of five feet of continuous low-permeability soil or rock located at least 25 feet below the surface and above the aquifer.

What are my options for discharging pre-treated wastewater?

Irrigation

An irrigation system can be used to pump pre-treated wastewater from an intermediate storage, or settling tank, to the disposal area where rotating sprinklers distribute the liquid over the land. The solids and organic materials suspended in the water evaporate or are absorbed by the soil. If the sprinkler system remains in the same location, a diversion terrace should be constructed to protect the disposal area from off-site runoff. The entire disposal area should be fenced to prevent livestock from increasing soil compaction and creating areas where ponding of stagnant water can occur.

When using portable irrigation pipe, the disposal site can be easily changed. Two or more areas should be available as alternate disposal sites. The sites should have less than 5 percent slope and ideally located close to the milking facility. Pipelines need to be buried below the frost line and the pump must operate at high pressure and be able to handle small solids.

If manure is combined with the irrigated liquid, Iowa Law requires minimum separation distances from buildings or public use areas, designated areas such as wells, sinkholes, wetlands and high quality water resources. Irrigation is not allowed where surface or subsurface water drains into an ag drainage well directly or through an ag drainage well surface inlet. Contact your Iowa DNR Field office (see pages 11-12 for contact information) for specific information on separation distances.

The following list outlines the advantages and special considerations of using a sprinkler system with wastewater only.

Advantages

- Cropland or grassland may be suitable for sprinkler application of wastewater.
- Crop and on-site vegetation will utilize nutrients in wastewater.
- The disposal site can be easily changed with the use of portable irrigation pipe.
- Well-managed field applications pose little danger to groundwater because of soil filtering capabilities.

Special Considerations

- Non-crop disposal areas need to have thick vegetation to protect soil and utilize nutrients.
- Land application areas should be rotated so as not to over saturate soil, cause runoff or overload soil with nutrients.
- Disposal of wastewater on frozen ground is not permitted.
- Application areas should be at least 200 feet from water wells or 50 feet away if a grass buffer strip is present.
- Vegetation must be cut and removed, or the nutrients in the decomposing plant material may contaminate ground and surface water.
- Vegetation should be allowed to dry before harvest.
- Application areas may need diversion terraces to prevent runoff from upslope ground.

Overland Flow Methods of Wastewater Disposal

Overland flow methods are designed for the disposal of pre-treated wastewater only—**not wastewater and manure combined.** Before the water is sent to an infiltration area, the wastewater must first be passed through a settling tank. Pre-treated wastewater that is deposited onto an overland flow system is further treated as it infiltrates and passes through the soil profile. The overland flow method requires optimum soil infiltration. Soil compaction of the area with grazing or heavy traffic should be avoided.

Calculate the approximate area of a filter bed by multiplying the number of cows by 25. For example: Area of filter bed is equal to 60 cows X 25 = 1500 square feet.

Sloped Surface Infiltration

A sloped surface infiltration system uses a wide (up to 100 feet), mildly sloping vegetated area. Wastewater should be evenly distributed across the filter width and allowed to flow down the length of the filter surface. Filter cross slopes should be relatively flat. Lengthwise slopes should be more than 1 percent slope and should not exceed 8 percent slope. The vegetation must be periodically cut and removed to prevent it from degrading and leaching nutrients into ground and surface waters. Prevent surface water runoff from entering the infiltration area by building a berm or diversion. Sloped surface infiltration is not feasible during winter weather.

Sloped surface infiltration is not feasible during winter weather.

Highly permeable soils, such as sandy soils, are not well suited for sloped surface infiltration because they may allow wastewater to leach into the groundwater before it is filtered. The area selected for a sloped surface infiltration system should have at least three feet of soil above bedrock.

Flat Grass Infiltration

A flat grass infiltration system is similar to sloped surface infiltration, but it is located on flat ground instead of gently sloping land. The vegetated filter bed should contain a varied mixture of sod-forming species, such as reed canary grass, tall fescue and creeping fescue. All four sides of the grass filter bed should have a berm at least three feet high. Wastewater is evenly distributed over the flat grass area and allowed to infiltrate the soil.

An appropriately sized filter bed is important for proper maintenance and treatment. Wastewater accumulation in the filter bed should not exceed ¼ inch of liquid each day and should be large enough to handle 4 gallons of treated wastewater/cow/day and any additional clean water used to wash down the parlor. Each gallon of wastewater discharged requires approximately 6.4 square feet of surface area for proper distribution, or 25 square feet/cow/day.

An enhanced flat grass filter bed system may be used to hold winter accumulation of wastewater or to increase infiltration rates. This system also may be considered where potential disposal areas are located near waterways. An enhanced flat grass filter system uses narrow-spaced (10-20 feet apart), 4-inch, perforated subsurface tile located beneath a diked filter bed. Before considering an enhanced system with drainage tile, it is advisable to consult your Iowa State University Area Ag Engineer or a professional engineer for additional information.

The following list outlines the advantages and special considerations when using an overland flow method such as sloped surface infiltration or grass filter bed.

Advantages

- The risk of groundwater contamination is low to moderate if used on well-drained loamy soils.
- The system can be located on most farms and installed economically.

Special Considerations

- An overland flow method cannot be used on sandy soils.
- The risk of surface water contamination is high if used on soils with low permeability such as clay soils.
- An infiltration area should be at least 200 feet from wells.
- Wastewater must run through a settling tank before being applied to an infiltration area. The system will not work well if milk or milk solids are deposited into the filter bed. If solids build up in the infiltration area, it may be necessary to mechanically remove the solids.
- A spreading device at the entrance of a sloped surface filter strip is necessary to achieve even distribution of the wastewater over the area.
- The filter bed must be protected from surface runoff with a berm.
- Cold and wet weather slows down the infiltration process. A flat grass infiltration area must be designed to contain water during winter and wet weather conditions.
- Vegetation must be harvested from the discharge area. Mechanical removal may be difficult, especially because the area may be wet.
- Consider splitting the infiltration area in half, alternately mowing and depositing wastewater between the 2 sites.
- If using an enhanced system with subsurface tile, the tile outlet should deposit water onto a grassed waterway at least 150 feet before being directed to a watercourse. Care should be taken to prevent channels from forming in the waterway.

Underground Treatment of Milking Wastewater

Treatment of milking center wastewater with underground leach fields, or septic systems, is not acceptable. Groundwater contamination is always a risk when a septic system is used. Old underground treatment systems should be abandoned and updated systems should be installed when milking operations are expanded or remodeled. Abandoned septic tanks should be pumped out and filled with sand or completely unearthed.

Manure applied to forage and fed to beef or dairy cows may expose the livestock to salmonella or Johne's bacterial organisms. Consult either your veterinarian or ISU Extension dairy or livestock specialist before spreading manure on forage intended for beef or dairy consumption.

Are some sites better than others for wastewater or manure application?

Proper disposal practices are necessary to avoid risking contamination that could affect the water supplies and health of others. Your drinking water is least likely to be contaminated if you follow appropriate management practices or dispose of wastewater off the farmstead.

When determining the location of land application sites, evaluate the soil types. Soils that are reasonably deep and well-drained are optimum. Marshy and easily water-logged soils are more likely to develop odor and insect infestation problems and should be avoided. Sandy soils and areas of exposed or fractured bedrock, which allow for rapid infiltration, pose the greatest risks to groundwater.

Land application sites should be free of exposed and shallow fractured bedrock. Avoid undesirable sites near water wells, tile inlets or stream banks. Areas that contain sand or gravel, have shallow groundwater, or flood frequently should also be avoided.

Refer to the Iowa Farm*A*Syst publication *Assessing Your Farmstead Characteristics* and your county Soil Survey for more information on the suitability of specific soils for land application.

For More Information

Iowa Department of Natural Resources Information
www.iowadnr.com 515-281-5918
24 Hour Emergency Spill Reporting 515-281-8694

DNR Environmental Services Division Field Offices

Atlantic	712-243-1934
Des Moines	515-725-0268
Manchester	563-927-2640
Mason City	641-424-4073
Spencer	712-262-4177
Washington	319-653-2135

- Provide open feedlot permitting assistance.
- Assist with understanding Iowa law and DNR rule requirements.

Iowa Manure Management Action Group (IMMAG) 515-294-9590
http://extension.agron.iastate.edu/immag/
- Provides comprehensive information on manure management research, policy and events.
- Offers manure management publications and educational programs.
- Lists manure management service providers.

Iowa State University Extension
www.extension.iastate.edu/
Contact your county extension office. The county director, ag engineer, field specialist or livestock field specialist may be able to answer your questions or direct you to other extension specialists.
- Provides information on systems to handle milking center wastewater.
- Delivers open feedlot design assistance.
- Assists in the development of manure management plans.
- Provides information on alternative systems to handle milking center wastewater.
- Distributes publications on a variety of topics. Publications are available at Iowa State University Extension county offices or from the Extension Distribution Center, Ames, IA 515-294-5247. Many of the publications are available online at *www.extension.iastate.edu/store/*

Natural Resources Conservation Service
www.ia.nrcs.usda.gov 515-284-4769
Contact the local NRCS/SWCD (Soil and Water Conservation District) office located in your county.
- Provides information from the Soil Survey on soil drainage capabilities for site selection.
- Dispenses information on NRCS standards for livestock manure storage structures.
- Assists in the development of manure management plans.
- Provides engineering services for manure control facility design.

For More Information

The Dairy Practices Council
51 E. Front Street, Suite 2
Keyport, NJ 07735
www.dairypc.org 732- 203-1947

- Provides publications on facility design and management.
- Promotes issues such as milk quality, sanitation and regulatory uniformity.

Midwest Plan Services
www.mwpsq.org 800-562-3618

- Develops and distributes agricultural publications covering topics including: agricultural engineering; farm business management; animal production; construction; grain and postharvest; soil, air, and water management; manure management; and ventilation for livestock housing.

Milk & Dairy Beef
Quality Assurance Center
801 Shakespeare, Box 497
Stratford, IA 50249
www.DQACenter.org 515-838-2793

- Provides a national voluntary system to verify and certify quality. For more information call the DQA Environmental Hotline – 800-55-DAIRY.
- Provides Environmental Stewardship Program information – certification by third-party and registration of volunteer efforts.
- Administers inexpensive independent audit of facilities.

Assessment: Milking Center Wastewater Management

Evaluate your potential risk for having unsafe drinking water as a result of your milking center wastewater management. The evaluation areas are in the shaded "Risk" column. Choose the risk category that best fits your situation. Note how likely you are to have drinking water problems, as indicated by "low risk," "moderate risk" or "high risk."

Take special note of the critical evaluation points. If you fail to meet these standards, your drinking water supply is in immediate danger.

Those situations that violate Iowa law are indicated by '**!**' and printed in bold text.

RISK	LOW RISK	MODERATE RISK	HIGH RISK
No discharge method			
Wastewater directed to manure storage and applied to fields. *	❒ Wastewater is delivered directly to liquid manure storage facility. No discharge of wastewater expected.		❒ Wastewater is directed to unsound manure storage facility OR ❒ **Wastewater is discharged through a tile line, waterway or ditch or into any waters of the State.**
*If properly using this practice, you do not need to complete the rest of this worksheet. You are at low risk for water contamination from milking center wastewater mishandling. For information on recommended manure handling practices, please refer to the Iowa Farm*A*Syst publications entitled Open Feedlot Manure Management and Confinement Livestock Manure Management.			
Pre-treatment & storage of wastewater			
Milking parlor wash down	❒ First pipeline rinse captured and added to barn manure AND ❒ Manure and excess feed removed from parlor before wash-down AND ❒ Waste milk never poured directly down the drain.	❒ Waste milk sometimes poured down drain OR ❒ Manure and excess feed sometimes washed down the drain.	❒ Waste milk always poured down the drain OR ❒ Manure and excess feed frequently washed down the drain.
Holding tank storage	❒ Holding tank has more than 5 months capacity	❒ Holding tank has 2 to 5 months capacity	❒ Holding tank has less than 2 months capacity.
Settling tank cleanout	❒ Holding tank is cleaned out at least every six months or when tank is half full of solids.		❒ Holding tank is cleaned out once a year or less frequently.
Storage location (holding tank or settling tank)	❒ Holding tank or settling tank is located more than 100 feet from deep water wells AND ❒ More than 200 feet from shallow water wells.		❒ Holding tank or settling tank is located less than 100 feet from deep water wells OR ❒ Less than 200 feet from shallow water wells.

RISK	LOW RISK	MODERATE RISK	HIGH RISK
Discharge methods for wastewater			
Field application of wastewater only	❒ Land application area is 200 feet or more from water wells AND ❒ Wastewater applied to growing crops at nutrient levels that do not exceed adequate crop fertilization needs AND ❒ Vegetation cut and removed regularly from site.	❒ Land application area is 200 feet or more from water wells AND ❒ Wastewater applied to growing crops at nutrient levels that do not exceed adequate crop fertilization needs AND ❒ Vegetation occasionally cut and removed.	❒ Land application area is less than 200 feet from water wells AND ❒ Wastewater applied to cropped or uncropped fields without knowing nutrient content or soil nutrient requirements OR ❒ Wastewater consistently applied to same area OR ❒ Vegetation left uncut OR ❒ Vegetation cut and not removed.
Overland flow method (sloped surface or flat grass infiltration)	❒ Wastewater applied in a thin sheet to vegetation growing on soil with low permeability AND ❒ Vegetation removed regularly AND ❒ Water never ponds on the soil surface.	❒ Wastewater applied in a thin sheet to vegetation growing on soil with low permeability AND ❒ Vegetation sometimes removed OR ❒ Wastewater seeps from berm during wet and freezing weather.	❒ Wastewater applied to highly permeable soil OR ❒ Vegetation is not well established OR ❒ Vegetation never removed OR ❒ Area not bermed OR ❒ Water ponds on the surface.
Flat grass infiltration with subsurface drain system	❒ Subsurface drain system installed AND ❒ Approved by a licensed engineer AND ❒ Grass is mowed frequently.		❒ Subsurface drain system installed without the approval of a licensed engineer.
Septic system for wastewater only			❒ An underground absorption system is used to treat milking center wastewater.

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