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## Archived Publication

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EPA promulgated regulations for Concentrated Animal Feeding Operations (CAFOs) in February 12, 2003 that expanded the number of operations covered by the CAFO regulations and included requirements to address the land application of manure from CAFOs. The rule became effective on April 14, 2003. NPDES-authorized states were required to modify their programs by February 2005 and develop state technical standards for nutrient management. On February 28, 2005, in response to litigation brought by various organizations, the Second Circuit court issued its decision in *Waterkeeper Alliance et al. v. EPA*, 399 F.3d 486 (2d Cir. 2005). EPA has updated the CAFO rule to reflect the changes requested by the Court. Visit [www.epa.gov/npdes/caforule](http://www.epa.gov/npdes/caforule) to view the 2008 CAFO Final Rule and supporting documents.



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## CHAPTER 2: OPERATION, MAINTENANCE, AND RECORDKEEPING REQUIREMENTS FOR THE PRODUCTION AREA

This chapter discusses the operation, maintenance, and recordkeeping requirements for a CAFO *production area*. The production area at a CAFO includes the *animal confinement area*, the *manure storage area*, the *raw material storage area*, and the *waste containment area*. It also includes areas where eggs are washed or processed and areas used for the storage, handling, treatment, or disposal of dead animals (i.e., mortalities). Throughout this chapter, “manure” means manure, litter, and manure combined with other process wastewaters. The terms “process wastewaters,” “production area,” and “land application area” are also used throughout this chapter. The effluent guidelines described in this chapter apply only to Large CAFOs. The NPDES requirements apply to all CAFOs. This document uses “CAFO rules” to mean both the effluent guidelines and the NPDES permit requirements. Permit writers, at their discretion on a case-by-case basis, may want to consider the information in this chapter pertinent to small and medium CAFOs on a case-by-case basis. The legal definitions are provided in the text box on the next page.



Runoff from raw material storage such as silos and feed bunkers is included in the definition of process wastewater, and must be handled to meet the effluent guidelines production area requirements. Some examples of water that come into contact with raw materials, products, or byproducts include water that comes into contact with spilled feed, contaminated milk, spent foot bath water, and other trace quantities of chemicals used at the operation.



Photo by USDA NRCS

Production areas include all of the following:

- *Animal confinement area* - area within a CAFO where animals are confined for a period of time for feeding or maintenance purposes.
- *Manure storage area* - area where manure and other wastes (e.g., bedding, compost, raw materials commingled with manure, or flush water) collected from the animal confinement area are stored or treated prior to final disposal.

- *Raw-materials storage area* - area where materials used in an animal feeding operation are stored.
- *Waste containment area* - area where wastes other than manure (e.g., contaminated storm water) from the production area are contained prior to final use or disposal.

All field storage and stockpiles of manure and raw materials are defined as production area. A CAFO may have more than one production area. For example, a poultry operation may have long term litter storage sheds or stockpiles (*manure storage areas*) that are remotely located from the poultry houses (*animal confinement areas*); or a CAFO may handle mortalities at an area remotely located from the animal confinement area. The CAFO requirements apply to all such production areas.

The definition of “production area” makes no distinction between short-term or temporary storage areas. Note in particular, however, that at layer and broiler operations, whether uncovered stockpiles of litter exist only temporarily or for a longer period of time *can* make a difference as to the facility’s regulatory status. At these operations, uncovered stockpiles of litter generally constitute a “liquid manure handling system,” and operations with a liquid manure handling system are defined in the regulations as Large CAFOs at a lower threshold number of animals than other operations. However, the permit authority may authorize some limited period of no more than 15 days for temporary storage of litter (e.g., where this time is needed to allow for contract hauling arrangements), within which time the uncovered stockpile of litter would not be deemed to be a liquid manure handling system. See Chapter 1 of this document and section 3.2.3 of the *Permit Writers’ Guidance* for more information.

The production area definition does not include the owner/operator’s office or homestead, and does not include the field areas to which manure and process wastewater may

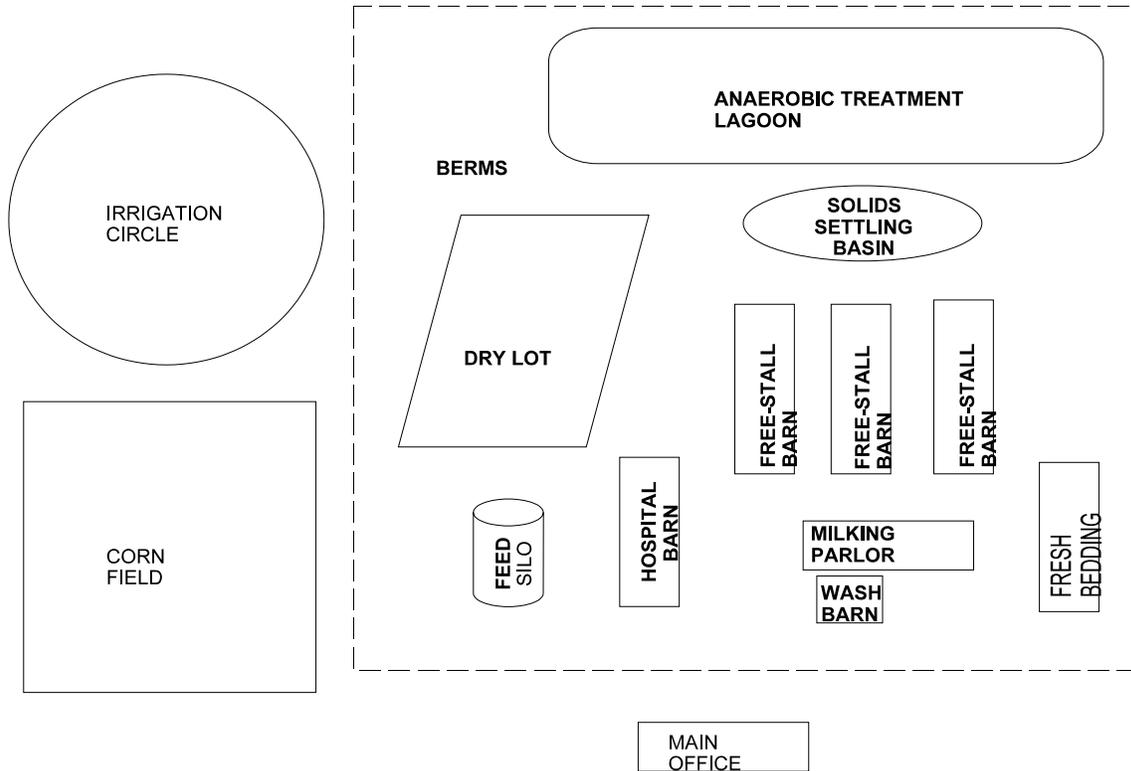
**Process Wastewater, Production Area, and Land Application Definitions**

**§412.2(d)** Process wastewater means water directly or indirectly used in the operation of the CAFO for any or all of the following: spillage or overflow from animal or poultry watering systems; washing, cleaning, or flushing pens, barns, manure pits, or other CAFO facilities; direct contact swimming, washing, or spray cooling of animals; or duct control. Process wastewater also includes any water which comes into contact with any raw materials, products, or byproducts including manure, litter, feed, milk, eggs, or bedding.

**§412.2(h)** Production area means that part of an AFO that includes the animal confinement area, the manure storage area, the raw materials storage area, and the waste containment areas. The animal confinement area includes but is not limited to open lots, housed lots, feedlots, confinement houses, stall barns, free stall barns, milkrooms, milking centers, cowyards, barnyards, medication pens, walkers, animal walkways, and stables. The manure storage area includes but is not limited to lagoons, runoff ponds, storage sheds, stockpiles, under house or pit storages, liquid impoundments, static piles, and composting piles. The raw materials storage area includes but is not limited to feed silos, silage bunkers, and bedding materials. The waste containment area includes but is not limited to settling basins, and areas within berms and diversions which separate uncontaminated storm water. Also included in the definition of production area is any egg washing or egg processing facility, and any area used in the storage, handling, treatment, or disposal of mortalities.

**§412.2(e)** Land application area means land under the control of an AFO owner or operator, whether it is owned, rented, or leased, to which manure, litter, or process wastewater from the production area is or may be applied.

be applied as nutrients for crop growth. See Figure 2-1 for an illustration of a dairy; the production area is indicated by the dashed line.



**Figure 2-1. Production Area at Whole Milk Dairy**

As a standard NPDES permit condition (see Section A of this chapter), all CAFOs are required to properly operate and maintain all facilities and systems of treatment and control which are installed or used to achieve compliance with the conditions of their permit. See 40 CFR 122.41(e). In addition, the CAFO rules require each CAFO to have a Nutrient Management Plan (NMP) which must include, to the extent applicable, a set of nine minimum practices, including the following specific activities that apply to the operation and maintenance of a CAFO production area (see 40 CFR 122.42(e)):

- Ensure adequate storage for manure, litter, and process wastewater, including procedures to ensure proper operation and maintenance of the storage facilities;
- Ensure proper management of mortalities (i.e., dead animals) to ensure that they are not disposed of in a liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities;
- Ensure that clean water is diverted, as appropriate, from the production area;

- Prevent the direct contact of confined animals with waters of the United States;
- Ensure that chemicals and other contaminants handled on-site are not disposed of in any manure, litter, process wastewater, or storm water storage or treatment system unless specifically designed to treat such chemicals and other contaminants;
- Identify appropriate site-specific conservation practices to be implemented, including as appropriate buffers or equivalent practices, to control runoff of pollutants to waters of the United States;
- Identify protocols for appropriate testing of manure, litter, process wastewater, and soil;
- Establish protocols to land apply manure, litter, or process wastewater in accordance with site specific nutrient management practices that ensure appropriate agricultural utilization of the nutrients in the manure, litter, or process wastewater; and
- Identify specific records that will be maintained to document the implementation and management of the minimum elements described above.

The following sections elaborate on each of these activities by describing both the required NPDES conditions as well as the applicable requirements from the effluent guidelines. The remainder of this chapter covers the CAFO's requirements for the following topics: design standards, proper operation and maintenance, mortalities, direct contact, chemical disposal, records, and additional voluntary controls.

#### **A. Design Standards**

The CAFO rules prohibit the discharge of manure, litter, and other process wastewaters from the production area, except for allowing a discharge when rainfall causes an overflow from a storage structure designed, constructed, maintained, and operated to contain all manure, litter, and process wastewaters, including storm water, plus runoff and the direct precipitation from a 25-year, 24-hour rainfall event. By requiring adequate storage (see 40 CFR

122.42(e)(1)(i)) plus the capacity for 25-year, 24-hour rainfall event (see 40 CFR 412.31(a)(1)(i)), the CAFO rules help to ensure that discharges of manure from a production area to waters of the U.S. are minimized or eliminated. At the same time, the CAFO rules provide a CAFO that has properly designed, constructed, maintained, and operated its facility with an allowance under its permit for a discharge from the production area in the case of uncontrollable rainfall events (see Example 2-1).

#### **Additional Conditions Applicable to CAFOs**

**§122.42(e)(1)(i)** Ensure adequate storage of manure, litter, and process wastewater, including procedures to ensure proper operation and maintenance of the storage facilities.

**Example 2-1. Design Standards that Comply with the Clean Water Act**

A permitted CAFO's waste handling system has the capacity to contain the expected volume of runoff from a 25-year, 24-hour rainfall event plus four month's worth of average daily process wastewater. Note that the definition of "process wastewater" includes contaminated runoff (see 40 CFR 412.2(d)). An unusually long and wet winter precludes the operator from dewatering the storage facility. It rains heavily for three weeks (a chronic rainfall), but the rainfall in any 24-hour period never exceeds the 25-year, 24-hour storm event. The facility's waste handling system reaches capacity and the resulting overflow discharges to a river.

*Did the CAFOs violate its permit?*

If the CAFO met the requirements of its permit regarding the design, construction, operation and maintenance of its waste handling system this overflow due to a chronic rainfall event, but less than the 25-year, 24-hour storm, is not a violation of the permit. To ensure that it is meeting the requirements of the permit, the CAFO may want to check with its permitting authority to verify that the design capacity it has chosen is adequate. For example, the permit authority may require additional design capacity to meet Water Quality Standards.

**1. Adequate Storage for Manure, Litter, and Process Wastewater**

CAFOs must ensure adequate storage of manure, litter, and process wastewater, including procedures to ensure proper operation and maintenance of the storage facilities (see 40 CFR 122.42(e)(1)(i)). Having adequate storage for all manure and wastewater provides flexibility to schedule land application of manure nutrients when weather and field conditions are suitable and when nutrients in the manure can best be used by crops. The link between adequate storage and land application practices is one of the most critical considerations in successfully developing and implementing a site-specific Nutrient Management Plan. In fact, the capacity for the 25-year, 24-hour storm event (or the 100-year, 24-hour storm, where appropriate) is just one component in determining overall storage capacity. Equally important is to ensure the capacity needed to store manure and wastes during those periods when land application is prohibited under a states' technical standards (see Chapter 4). Adequate storage will help CAFOs meet the land application practices specified in their NMP, the best management practices required for land application of manure and process wastewater, and will help CAFOs meet realistic production goals while minimizing nitrogen and phosphorus movement to surface waters, as required by the effluent guidelines for Large CAFOs (40 CFR 412.4(c)(1)). See Chapter 4 of this manual for more information on Nutrient Management Plans and land application requirements. See *Cost Methodology for the Final Revisions to the NPDES and Effluent Guidelines for CAFOs* (EPA 821-R-03-004) and *Development Document for the Final Revisions to the NPDES and Effluent Guidelines for CAFOs* (EPA 821-R-03-001) for additional information on adequate storage.

Adequate storage is not defined by the CAFO regulations. Adequate storage is based on a site-specific evaluation of the CAFO's entire waste handling system. Factors such as rainy seasons and storage capacity for the winter are relevant and are readily factored into the proper design and construction of any storage facility; see Example 2-2A. Also see Section B.1 of this chapter: Liquid Storage Structures and the accompanying text box on chronic rainfalls. Adequate storage is also affected by the individual CAFO's operation and maintenance

schedule and the site-specific Nutrient Management Plan; see Example 2-2B. CAFOs should also evaluate storage capacity and the adequacy of the existing waste handling system when the facility undergoes significant changes such as an expansion of herd size; see Example 2-2C. CAFOs should further ensure that storage is adequate to avoid pumping water at a non-optimal time to apply nutrients; see Example 2-2D. An example state regulatory requirement that defines adequate storage to include capacity for the winter plus freeboard is in Example 2-2E.

For additional information on designing, operating, and maintaining a storage structure, see U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Practice Standards 313, *Waste Storage Facility*, and 359, *Waste Treatment Lagoon*, and the Field Office Tech Guide. These practice standards include information on the foundation of the storage pond or lagoon, maximum operating levels, structural loadings for fabricated structures, slab designs, and considerations for minimizing the potential for and impacts of sudden breach of embankment or accidental release from the required volume. These resources are described in more detail in Chapter 8 of this document.

The CAFO rules do not have specific design requirements for how to choose a site for storage structures, or that site's effect on the design of storage structures. However, CAFOs should evaluate the soils, geology, and topography of the site, as well as the location and layout of the operation to determine the best storage area for each operation. Animal manure storage areas should be built following commonly approved standards (e.g., USDA NRCS standards, American National Standard for Good Environmental Livestock Production Practices (ANSI GELPP)<sup>1</sup>) and should be located away from water bodies, floodplains, drinking water wells, shallow ground water, sinkholes, and other environmentally sensitive areas. These standards also recommend that the production area is located with adequate separation distances from neighbors to minimize visual exposure and disrupt airflow. Where adequate separation is not possible, consider installing natural or manmade screening.

**Example 2-2. Examples of Site-Specific Determination of Adequate Storage**

**Example A: Capacity for the wet season.**

A feedlot is located in a southern climate where the typical winter is brief and mild. Manure solids are separated daily and picked up monthly by a third party hauler. The CAFO schedules wastewater irrigation every 21 days to empty the holding pond unless the ground is wet or it is raining at the time of scheduled irrigation. The CAFO constructed the holding pond for 21 days of storage. Historical records show during the rainy season it typically rains daily for 45 days and the ground remains wet for approximately three months.

<sup>1</sup>The ANSI GELPP standards are a compilation of management practices that are commonly applied throughout confined livestock production operations. For additional information on siting, see ANSI GELPP 0001-2002. For additional information on measures that can be taken to reduce adverse environmental impacts of CAFOs, see ANSI GELPP 0002-2002.

**Example 2-2. Examples of Site-Specific Determination of Adequate Storage**

*Does the CAFO meet the adequate storage requirements?*

No, the CAFO does not have adequate storage. When designing the holding pond, the CAFO did not consider the typical length of time (i.e., three months) that is required during the rainy season between emptying events. The CAFO should consider a more proactive operation and maintenance program to maintain capacity for the 25-year, 24-hour rainfall event.

**Example B: Capacity Consistent with NMP**

A poultry CAFO has a storage shed that can store the manure and litter removed from the poultry houses between each flock (i.e., manure “crust” or “cake”). The remaining manure and litter (i.e., the full house cleanout) is removed from the poultry houses once a year in the fall and stockpiled outside (the capacity of the shed cannot store a full-house cleanout). The practice does not coincide with the nutrient needs of the crops, and does not minimize the transport of nutrients from the crop fields. Rather than build additional storage or maintain covered temporary stockpiles, the CAFO coordinates with their integrator and arranges for full-house cleanouts to coincide with nutrient needs of the crops in the spring. Under the CAFO’s Nutrient Management Plan, 100% of the CAFOs manure and litter is to be used for land application. The CAFO has adequate land for all manure and litter produced. These practices and procedures are specified in the CAFO’s revised Nutrient Management Plan. The CAFO’s records and inspections show complete implementation of the Nutrient Management Plan.

*Does the CAFO meet the adequate storage requirements?*

The CAFO’s revised NMP includes spring cleanouts instead of fall cleanouts. Generally, the CAFO would be considered to have adequate storage.

**Example C: Adequate Capacity for Facility Expansion**

A 900 head dairy increases production by expanding the herd size to 1,200 head. The CAFOs original treatment lagoon was sized for 900 head.

*Does the CAFO meet the adequate storage requirements?*

No, the CAFO does not have adequate storage. The lagoon was neither sized nor designed to treat the manure and process wastewater for an additional 300 head. In addition, the lagoon may now experience operational problems due to overloading the treatment system, and may also experience significant increases in odors.

**Example D: Adequate Capacity for Appropriate Utilization of Nutrients**

A 1,500 head beef feedlot is located in a mild climate, and the state’s technical standards do not prohibit land application in the winter. The CAFO has a highly efficient solids separation system, a concrete holding pad for solids storage during inclement weather, and applies the manure solids as fertilizer in accordance with a Nutrient Management Plan. Any wastewater and runoff is directed to an evaporation pond sized solely for runoff from the 25-year, 24-hour storm event. Every year during the rainy season the wastewater accumulates until rainfall events fill the evaporation pond, overflows across a field, and discharges to a river.

*Does the CAFO meet the adequate storage requirements?*

No, the CAFO does not have adequate storage. The CAFO has not appropriately addressed the pollutants in the wastewater. The CAFO does not have capacity for all manure and process wastewater, including the runoff and direct precipitation from a 25-year, 24-hour rainfall event. In addition, the lack of adequate storage capacity contributed to the CAFO’s failure to ensure that manure application to fields was restricted to rates that would minimize phosphorus and nitrogen transport from

**Example 2-2. Examples of Site-Specific Determination of Adequate Storage**

the fields to waters of the U.S. (see 40 CFR 412.4(c)(1)). For example, the feedlot's design is such that the facility cannot store process wastewater during those periods when the fields are saturated. Furthermore, the annual occurrence of discharges from the CAFO's wastewater storage pond suggests the CAFO has not appropriately considered the rainy season in the design and construction of the pond.

**Example E: Sample State Regulation to Define Adequate Storage**

Storage structures containing manure with less than 20% total solids and exposed to precipitation must maintain a minimum freeboard of **one foot** at all times. This is in addition to the capacity needed to contain direct precipitation and runoff from the 25-year, 24-hour storm. For facilities with a drainage area, the storage structure must also have capacity to contain precipitation and runoff from the drainage area during the storage period. Adequate manure storage volume shall be provided and maintained to prevent the necessity of land applying manure on frozen and/or snow covered ground or periods of soil saturation. No later than September 15 of each year, the CAFO shall evaluate the storage capacity in their manure storage or treatment facilities and determine what steps are needed to avoid the need to land apply manure on frozen or snow covered fields for the upcoming winter. The operating record for the facility shall include documentation of the storage level as well as what was considered in this evaluation, and what actions were taken to avoid the need for land application of manure on frozen or snow covered ground. Failure to perform the evaluation or failure to take action if the evaluation indicates that action was necessary to avoid land application on frozen or snow covered ground shall be considered a violation of the permit.

**2. No Discharge for Production Areas**

The CAFO effluent guidelines require all Large dairy cow, cattle, veal calf, swine, chicken, and turkey CAFOs to meet a no discharge standard. ***This means there can be no addition of any pollutant or combination of pollutants to waters of the U.S. under any climatic circumstances*** (see the exception below). The no discharge requirement applies to the entire production area, including all manure, litter, and process wastewater whether stored close to or far away from the animal confinement area. Process wastewater includes, among other things, any water which comes into contact with any raw materials, products, or byproducts (see 40 CFR 412.2(d)). Dilution of manure or wastes does not exempt the waste stream from the no discharge requirement.

**Effluent Limitations for the Production Area**

**§412.31(a)** Except as provided in paragraphs (a)(1) through (a)(2) of this section, there must be no discharge of manure, litter, or process wastewater pollutants into waters of the U.S. from the production area.

Also **§412.32(a), §412.33(a), §412.43(a), §412.44(a), and §412.45(a)**.

Even a well-managed facility may experience unusual situations with the potential to cause a discharge beyond the operator's control. Consistent with existing provisions included in the NPDES regulations at 40 CFR 122.41, upset and bypass provisions are included as standard conditions in all NPDES permits to address the potential for unforeseen circumstances. An upset is an unintentional noncompliance event occurring for reasons beyond the reasonable control of the permittee. The upset provision in the NPDES permit operates as an affirmative defense to prosecution for violation of technology-based effluent limitations,

provided certain specified criteria are met. For example, flood damage or other severe weather damage to containment structures that cannot reasonably be avoided or controlled by the permittee could be a basis for an affirmative defense for an upset. A bypass, on the other hand, is an act of intentional noncompliance during which waste treatment facilities are circumvented under certain specified circumstances, including emergency situations. The bypass provision authorizes bypassing to prevent loss of life, personal injury, or severe property damage where there are no feasible alternatives to the bypass and where the permitting authority is properly notified. See 40 CFR 122.41(m)<sup>2</sup>. See the *Permit Writers Guide* and 40 CFR 122.41(n) for more information. In other words, even though the regulations prohibit discharges from the production area, a permitted CAFO can claim an upset/bypass defense for events that are beyond its reasonable control, including extreme weather events as well as other uncontrollable or unforeseen conditions.

The no discharge requirement in the CAFO rules does not apply to discharges of non-contact storm water. Requirements applicable to storm water discharges are specified at 40 CFR 122.26(b)(14). EPA generally defines "storm water associated with industrial activity" to include storm water discharges from facilities subject to effluent guidelines or New Source Performance Standards for storm water. Examples of such areas include immediate access roads and rail lines used or traveled by carriers of raw materials, manufactured products, waste material, or by-products used or created by the facility; refuse sites; sites used for the storage and maintenance of material handling equipment; and shipping and receiving areas. Additional permit conditions that apply to storm water discharges are beyond the scope of this document. However, CAFOs are encouraged to follow good housekeeping and spill prevention and response procedures at all times.

### **No Discharge Exception**

If a CAFO chooses to implement minimum design standards for containment (discussed in Section A.1 of this chapter), the CAFO may be allowed a discharge. Production area discharges from Large CAFOs are permitted only when they consist of weather related overflows, and are permitted only in those cases where a storage structure has been designed, constructed, operated, and maintained in accordance with the effluent guidelines requirements. Only the overflow is a legitimate discharge under the effluent guidelines. Consequently, an operation cannot "pull the plug" and empty the runoff control systems simply because an overflow is occurring. Proper operation and maintenance of storage structures is discussed in the following section.

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<sup>2</sup> One important distinction here is a facility with a "no potential to discharge" determination does not have a permit, and is, therefore, not entitled to the upset and bypass provisions.

## B. Proper Operation and Maintenance

Overflows from production areas are only in compliance with 40 CFR Part 412 if the facility's storage structure is properly designed, constructed, operated, and maintained. CAFOs that do not actively maintain the capacity of the storage structure, are not entitled to this overflow. For example, a CAFO that starts dewatering only when the storage structure is completely full (such that additional capacity to accommodate a 25-year, 24-hour rainfall event does not exist) is not deemed "properly operated" and any related overflows would be in violation of the permit.

The permissible overflow should be limited to the amount necessary to maintain the structural integrity of the storage structure. To reiterate, the overflow allowance does not allow CAFOs to use permissible overflows during heavy rainfalls as an opportunity to pump additional process wastewater out of the liquid storage structure.

For an overflow to be allowed, the effluent guidelines also require that the production area is operated in accordance with additional practice measures and record keeping requirements in the effluent guidelines at 40 CFR 412.31(a)(1)(ii) in addition to the more general operation and maintenance requirements in 122.41. All production areas must be operated and maintained to prevent the discharge of pollutants into waters of the U.S. This includes, but is not limited to, activities such as:

1. Conducting frequent inspections of storage structures to confirm they have adequate storage capacity as specified in 40 CFR 412;
2. Removing solids from storage structures as needed to maintain the design storage capacity;
3. Maintaining storage capacity for the design storm event (25-year, 24-hour storm event for existing CAFOs and 100-year, 24-hour storm event for new CAFOs);
4. Establishing controls to prevent burrowing animals and plants from eroding storage structure berms, embankments, liners, and sidewalls;
5. Stabilizing berms and embankments with vegetation, rock, or other materials to prevent erosion;
6. Checking to ensure that all inlets and outlets to the storage structure are not blocked by debris or ice; and

### Proper Operation and Maintenance

Proper operation and maintenance (O&M) is a standard condition in all NPDES permits (40 CFR 122.41(e)). Proper O&M of storage structures includes activities such as periodic solids removal to maintain storage capacity, maintenance of berms and sidewalls, prompt repair of any deficiencies, and appropriate dewatering activities. CAFOs must actively manage storage structures to maintain the appropriate capacity, including the capacity to contain the runoff and precipitation from the 25-year, 24-hour storm event.

7. Visually inspecting the perimeter of any storage structure to ensure any runoff or process wastewater is contained.

The following sections describe recommendations for the proper design, construction, operation, and maintenance of storage structures. When designing new or expanded storage structures, CAFOs should consider any potential air or ground water impacts. CAFOs should also properly handle non-contact storm water, as described in Section A.2 of this chapter. Section E of this chapter discusses additional voluntary controls that can be used to minimize volatilization and leaching of pollutants.

### **1. Liquid Storage Structures**

The minimum design volume for liquid storage structures should be based on the maximum length of time between emptying or dewatering events (i.e., the minimum storage period); see Example 2-2F. The appropriate frequency of emptying events may vary for each CAFO based on factors such as:

- Storage structure size (i.e., if it contains more than the minimum required storage capacity);
- Hydraulic limitations of a land application site;
- Typical rainfall for the area;
- Nutrient concentrations in the stored liquid;
- Allowable timing of land application such as winter applications as specified in a Nutrient Management Plan; and
- Extent to which the liquid in the storage structure is used for irrigation water.

**Example 2-2. Examples of Site-Specific Determination of Adequate Storage  
(Continued)**

**Example F: Capacity for the winter season**

A swine operation is located in a northern state that prohibits land application of manure to frozen, snow-covered, or saturated ground. For the CAFO's location, the winter season lasts about 150 days. The CAFO constructs 150 days of storage (length of the winter season). The CAFO plans to land apply manure and process wastewater every six months (before and after the main cropping season).

*Does the CAFO meet the adequate storage requirements?*

No, the CAFO does not have adequate storage. The CAFO sized their storage to hold manure, litter, and process wastewater generated during the 150-day winter season; however, the CAFO's land application schedule (every six months, or approximately 180 days) requires a larger storage capacity. To ensure adequate storage, this CAFO should take into account the number of days between land application and the start of the 150-day winter season; when that number of days is added to the 150-day "no application" period in the winter, the amount of necessary capacity might in fact exceed 180 days.

In most cases, storage is an integral part of overall nutrient management. This minimum storage period provides the capacity to store all manure and process wastewater plus rainfall events until optimal land application (i.e., the nutrients are needed by the crops, the soil can assimilate it, or there is little to no risk for runoff). States will generally establish this period through their technical standards for land application, as required by the regulations (see Chapter 6 of this manual for more information on technical standards).

The CAFO rules do not specify exactly how this site-specific total design volume should be calculated, but EPA provided clarification on how this should be done in the preamble as follows. The total design volume for a liquid storage structure must include an allowance for each of the following:

- The volume of manure, process wastewater, and other wastes accumulated during the storage period;
- The volume of "normal" precipitation (i.e., precipitation from other than the design rainfall event) minus evaporation on the storage structure surface area during the entire storage period;
- The volume of runoff from the facility's drainage area during "normal" rainfall events during the storage period;
- The volume of precipitation from the 25-year, 24-hour rainfall event on the storage structure surface area;
- The volume of runoff from the facility's drainage area from the 25-year, 24-hour rainfall event;

- In the case of anaerobic waste treatment lagoons, the minimum treatment volume;
- The volume of solids remaining in a storage structure after liquids are removed; and
- Necessary freeboard.

Additional storage may also be required to meet management goals or other regulatory requirements.

The volume of “normal” precipitation for the storage period should reflect all precipitation associated with the rainy season at times when dewatering is not possible. (see the text box on chronic rainfalls). Frequent overflows are a potential indicator that a CAFO is not meeting its permit obligations to ensure adequate storage and to properly manage the facility.

### **Chronic Rainfalls**

A storage structure should have capacity for the maximum length of time anticipated between emptying events. This storage volume should also accommodate all wastes, precipitation, and runoff for this period of time. Therefore, properly designed systems should already account for the “rainy season” or the non-growing season typical of the CAFO’s location.

When a series of rainfall events (such as chronic rainfalls) precludes dewatering, the remaining capacity of the storage structure is reduced. Even so, it is highly unlikely that any given series of storms would result in an overflow, unless the series of storms occurs so close to the end of the design storage period that the storage structure is already filled close to capacity. When dewatering is not possible, a rainfall event of any size, both smaller and larger than the 25-year, 24-hour storm event, could result in an overflow that is in compliance with effluent limitations based on 40 CFR Part 412. CAFOs that do not actively maintain the capacity of the storage structure, such as CAFOs with minimal capacity, or CAFOs that start dewatering only when the storage structure is completely full, are not entitled to this overflow allowance.

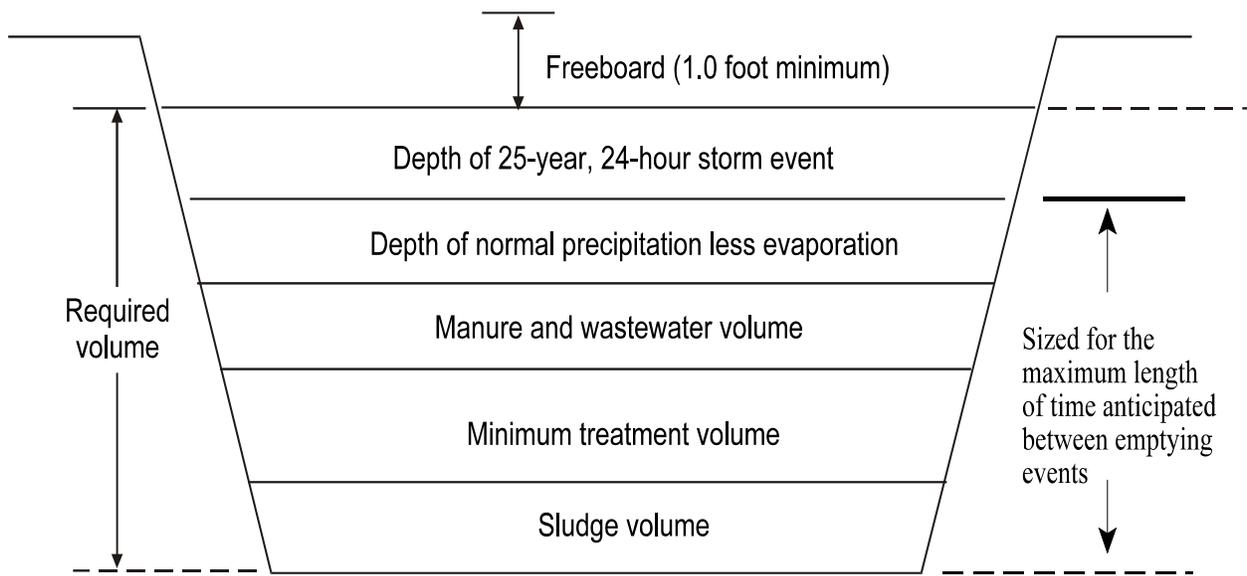
The volume needed for storing solids varies by the presence and efficiency of solids separation equipment or processes, and the extent to which the liquid storage structure provides treatment. The total volume needed for solids accumulation also depends on the length of time between solids removal. Facilities that completely agitate a manure pit prior to pumping are likely to need less solids storage volume than facilities that only draw irrigation water from the top of the liquid storage structure. Facilities that do not intend to remove solids for many years at a time will need solids storage volume for that entire period of time. Each CAFO must identify the site-specific design basis in their records and maintain a copy of these records on site; see Section D of this chapter for more information.

### Freeboard Definition

The term *freeboard* is not defined in the CAFO rules, and is not specified by EPA. EPA encourages the use of NRCS and American Society of Agricultural Engineers (ASAE) standards that use freeboard as a safety feature designed to protect the structural integrity of a liquid storage structure. Generally, freeboard is the distance from the top of the maximum design storage volume to the top of the storage structure.

The ASAE standard entitled *Design of Anaerobic Lagoons for Animal Waste Management (ASAE EP403.3 Dec 98)* recommends that freeboard be 0.3 meters (1 ft) for lagoons without a drainage area and 0.6 meters (2 ft) for lagoons with a drainage area. States may have additional requirements or alternate definitions of freeboard, but generally permitting authorities should consider the use of freeboard for additional storage not to be proper operation and maintenance. A spillway is often constructed at this level to prevent use of the freeboard area as additional storage capacity. Freeboard can vary from one foot in cases where inflow to the structure storage is controlled (e.g., influent is pumped into storage structure) to two feet when the inflow is not controlled (e.g., runoff from an uncovered animal confinement area flows freely into the storage structure).

The cross section in Figure 2-2 illustrates the design volume requirements for an anaerobic treatment lagoon used as the storage structure in a production area. Additional storage volumes may be required to meet management goals or other regulatory requirements established by the permitting authority. Examples of additional storage volumes include storage for when fields are dormant or no cover crop exists; extra capacity for those climates where the rainy season is exceptionally heavy or erratic; and additional storage for where land application to frozen or snow-covered ground is prohibited. CAFOs should check with their permitting authority for additional design requirements for storage structures at a CAFO production area.



**Figure 2-2. Cross Section of Properly Designed Lagoon**

### Treatment Lagoons

A lagoon is one type of liquid storage structure (a runoff pond is another example). Lagoons are different from most other liquid storage facilities in that a lagoon is designed to biologically treat high pollutant load wastes such as manure and wastewater. In a lagoon, the manure becomes partially liquefied and stabilized by bacterial action before eventual land application. In contrast, a waste storage pond or runoff pond is not designed to provide treatment, and thus is typically smaller than a lagoon. Anaerobic lagoons operate without any considerable oxygen present, and are considerably smaller than aerobic lagoons. Aerobic lagoons are designed to provide a higher degree of treatment with less odor production, but require significantly more surface area and/or mechanical means for increasing the oxygen content in the lagoon. Anaerobic lagoons also decompose more organic matter per unit volume than aerobic ones.

Lagoon capacity should be based on the maximum daily loading considering all waste streams to be treated by the lagoon. Most agricultural lagoons are anaerobic, which have a minimum treatment volume based on the volatile solids (VS) loading. Additional capacity may be necessary to accommodate the proper utilization of treated manure on crops. Usually this results in a minimum treatment period of several months; see the text box for more information on treatment lagoon design.

Lagoons can be designed as single-stage or multiple-stage lagoons. Lagoons may also be used in combination with a solids separator, which is a typical arrangement for many dairy CAFOs. CAFOs should consider multiple-stage lagoons where the first cell can be operated as a constant volume treatment cell, and the subsequent cells can be used for polishing and storage. Multiple stage lagoons do not require a significantly greater total volume than single-stage systems. This approach results in a higher quality lagoon effluent, and may be helpful where the CAFO has a limited land application area or a reduced need for manure nutrients on some fields. Many CAFOs recycle the treated effluent from a treatment lagoon for flushing or cleaning. CAFOs should consider the feasibility of multiple stage lagoons when designing or expanding a lagoon system.

When anaerobic lagoons biologically treat manure, nondegradable solids settle to the bottom as sludge. In addition, COD (chemical oxygen demand), VS (volatile solids), and P (phosphorus) accumulate in the sludge. Periodic removal of accumulated solids and sludge is necessary to maintain the treatment capacity (or minimum treatment volume) of the lagoon. The concentration of solids and nutrients (particularly phosphorus and potassium) in the solids may assist some CAFOs with an excess of nutrients or shortage of cropland, as this allows CAFO to transport the excess nutrients as a concentrated sludge much more economically than diluted wastewater. Solids accumulation beyond the design sludge volume is a potential indicator of an improperly operated and maintained lagoon, and can result from the expansion of the CAFO without a corresponding modification to the design of the treatment lagoon or failure to clean out the lagoon at specified intervals. Particularly malodorous lagoons may also be an indicator of overloaded or improperly maintained lagoons.

### **Treatment Lagoon Design**

One reference for design of an anaerobic lagoon is the ANSI/ASAE standard EP403.3 entitled "Design of Anaerobic Lagoons for Animal Waste Management." ASAE's standard on the design of anaerobic lagoons states that the lagoon depth should provide for a 6.6 foot minimum depth when the lagoon is filled to its treatment volume elevation which should be at least 1 foot above the highest ground water table elevation. ASAE also recommends making the lagoon as deep as practical to reduce surface area and convection heat loss, enhance internal mixing, reduce odor emissions, promote anaerobic conditions, minimize shoreline weed growth problems, and reduce mosquito production. This standard also provides equations for calculating the total lagoon volume and a listing of recommended maximum loading rates for anaerobic lagoons for animal waste in mass of volatile solids per day per unit of lagoon volume. The treatment volume is sized on the basis of waste load (volatile solids or VS) added per unit of volume and climatic region. Maximum lagoon loading rates are usually based on average monthly temperature and corresponding biological activity. If odors are of concern, consideration is also given to reducing the VS loading.

The NRCS Standard Practice 359 *Waste Treatment Lagoon*, provides information on minimum top widths, operating levels, embankment elevations, and considerations for minimizing the potential of lagoon liner seepage.

Other frequently used references are NRCS' "Agricultural Waste Management Field Handbook", Part 651, National Engineering Handbook, ASAE Engineering Practice standard ASAE EP393.3 "Manure Storages", and Midwest Plan Service publication MWPS-18.

In addition to solids management and careful attention to lagoon loading rates, other important operation and maintenance measures include:

- Proper start-up procedures whenever lagoons are modified or first operated;
- Protection of interior slopes with vegetation, mulch, stone, or other means to prevent erosion of the liner;
- Trimming of vegetation on embankments to prevent roots from digging through the liner;
- Inspection of embankments for animals, insects, or worms that may dig through the liner;
- Lagoons should be fenced and warning signs posted to ensure safety;
- Operation at minimum operating liquid level at the beginning of the design storage period, especially late fall and early winter;
- Permanent depth markers showing maximum liquid levels and the lowest pump-down level; and
- Periodic visual inspections.

See section 3 of this chapter for more information on visual inspections.

### **Evaporative Lagoons**

Some CAFOs send manure and process wastewater to an evaporative lagoon. This is a shallow, uncovered lagoon which has a large enough surface area that much of the liquid evaporates off the lagoon through exposure to sun and wind. The advantage of this is that CAFOs in arid climates may not have to be concerned with land applying effluent. In many cases, the amount of wastewater produced is generally small enough when compared to evaporation that the lagoon would pose little to no risk of overflow and, therefore, would not require any pumping during most years. The level of the surface area increases during the winter months when evaporation rates decrease. However, such lagoons have generally been designed with more than enough storage to ensure they do not have to be pumped during the winter.

The evaporative lagoon, by design, allows for the water to evaporate while the solids and salts remaining in the lagoon accumulate as a concentrated sludge. At some point, the solids that accumulate in the evaporative lagoon will require removal. When removed, any land application of these solids to crop land must be applied at appropriate agronomic rates, as described elsewhere in this guidance document. The accumulated solids are high in organic matter, but the nutrients will consist of concentrated phosphorus and little to no nitrogen. Thus the major disadvantage of evaporative lagoons is that evaporation causes most of the nitrogen to be lost to the air (primarily volatilized as ammonia).

## Depth Markers

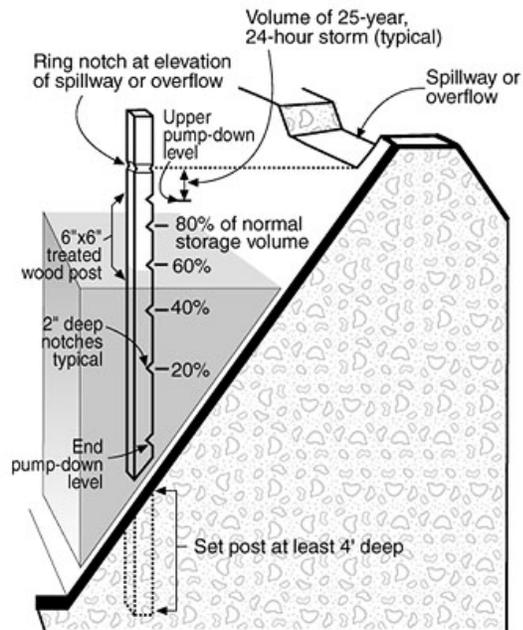
A depth marker is a tool that allows CAFOs to manage the liquid level in an impoundment to ensure that the impoundment has adequate capacity to contain direct precipitation and runoff from the design rainfall event. Without a depth marker, impoundments may fill to a level above their capacity, leading to overflows. The CAFO rules require that all open surface liquid impoundments in a production area have a permanent depth marker. The depth marker must indicate the minimum capacity needed for the runoff and direct precipitation from a 25-year, 24-hour rainfall event. In the case of closed or covered liquid impoundments, depth markers allow CAFOs to maintain levels in those impoundments so that accidental discharges do not occur. Only open surface liquid impoundments are required to have a depth marker, but level indicators are useful management tools for all types of liquid impoundments.

It is also a good practice to indicate the maximum drawdown level on the depth marker in a treatment lagoon to ensure that the lagoon has the volume needed for biological treatment and capacity for all solids accumulating between solids removal events. Figure 2-3 provides an illustration of an open surface liquid impoundment with a depth marker.

CAFOs may use remote sensors to measure the liquid level in an impoundment. Sensors can be programmed to trigger an alarm when the liquid level changes rapidly or when the liquid reaches a critical level. The sensor can transmit to a wireless receiver to alert the CAFO about an impending problem. One advantage of a remote sensor is that it can provide CAFOs with a real-time warning that the impoundment is in danger of overflowing. CAFOs may use remote sensors to track liquid levels to supplement the weekly required inspections of all manure and process wastewater structures (required inspections and associated records are described later in this chapter).

### Additional Measures

**§412.37(a)(2) Depth Marker.** All open surface liquid impoundments must have a depth marker which clearly indicates the minimum capacity necessary to contain the runoff and direct precipitation of the 25-year, 24-hour rainfall event, or, in the case of new sources subject to the requirements in §412.46 of this part, the runoff and direct precipitation from a 100-year, 24-hour rainfall event.



**Figure 2-3. Schematic of Lagoon Depth Marker**

Source: Earthen Pits (Basins) for Liquid Livestock Manure (November 2000)

Even though remote sensors are more expensive, the price may be offset by the additional assurance they can provide in preventing accidental discharges and circumventing catastrophic failures.

### Divert Clean Water From Production Areas

In some cases, CAFOs may choose to collect clean water, roof water, storm water, and other water streams that are not otherwise defined as process wastewater and contain them in liquid storage structures (e.g., runoff ponds). CAFOs located in extremely arid climates may decide to collect any and all clean water for irrigation. Other CAFOs use the additional water to aid in land application of manure (e.g., additional water partially dilutes the manure to aid in pumping through irrigation or land spreading equipment). CAFOs choosing to collect this water and store it commingled at the production area along with their process wastewater must now handle all of the water as process wastewater. CAFOs must account for these additional volumes in the design, construction, and operation of their storage facilities. Reducing the total volume of process wastewater generated in the production area benefits an operation by reducing the volume of wastewater that has to be stored, treated, land applied, and disposed of. Smaller volumes of process wastewater often translates to smaller storage structures, which has many positive environmental and economic advantages. In most cases, it is both appropriate and desirable to divert this clean water from the production area.

#### Additional Conditions Applicable to CAFOs

**§122.42(e)(1)(iii)** Ensure that clean water is diverted, as appropriate, from the production area.

CAFOs not including additional volume in the storage structures for “clean” storm water runoff (e.g., rain falling on roofs of buildings and runoff from adjacent lands) must prevent clean water from reaching the production area. Clean water can be diverted from the production area by using earthen perimeter controls and roof runoff management techniques.

Earthen perimeter controls usually consist of a berm, dike, or channel constructed along the perimeter of a site. Simply defined, an earthen perimeter control is a ridge of compacted soil, often accompanied by a ditch or swale with a vegetated lining, located at the top or base of a sloping area. When properly placed and maintained, earthen perimeter controls are effective in controlling the velocity and direction of storm water runoff. Used by themselves they do not have any ability to remove pollutants and, thus, must be used in combination with an appropriate sediment or waste trapping device. Roof runoff management techniques such as gutters and downspouts direct rainfall from roofs away from production areas. Roof gutters are illustrated in the picture on the right.



Both earthen perimeter controls and roof management devices must be maintained to remain effective. For example, vegetation in a channel (e.g., ditch or swale) that accompanies

an earthen perimeter control should be mowed periodically to prevent the vegetation from decreasing the channel velocity, which could cause the channel to overflow. In addition, the original height of a dike in an earthen perimeter control should be maintained; any decrease in height due to settling of manure, other solids, or erosion should be corrected. Roof management devices such as gutters and downspouts must be cleaned and inspected regularly to prevent clogging and to ensure their effectiveness.

## 2. Solid Storage Structures

Examples of solid storage structures include storage areas for solid manure such as the lower level of high-rise poultry houses, sheds for poultry litter, pits, stockpiles, mounds in dry lots, compost piles, and pads. CAFOs should manage all runoff from these areas. Permit authorities may also require CAFOs to manage any seepage to groundwater from these areas. The floor of solid manure storage areas should be constructed of compacted clay, concrete, or other material designed to minimize the movement of wastes beneath the storage area. The floor should be sloped toward a collection area or sump so that any runoff or liquid can be collected and transferred to a liquid manure storage area or treatment system. Also, CAFOs should consider storing stockpiles of solid manure under a roof or cover them to exclude precipitation whenever possible. For example, poultry litter stockpiled in a field for long term storage should be covered to reduce or eliminate the need to collect all runoff from the litter pile.



## 3. Visual Inspections

Visual inspections help ensure proper operation and maintenance of the production area. Most discharges can be prevented through early identification of potential equipment and system failures. The CAFO rules require periodic inspections of the production area. CAFOs should look for the following common problems during these inspections:

- Seepage through waste storage embankments;
- Erosion of waste storage embankments;
- Vegetation growing in storage areas;

### **Visual Inspections**

**§412.37(a)(1)** There must be routine visual inspections of the CAFO production area. At a minimum, the following must be visually inspected:

- (i) Weekly inspections of all storm water diversion devices, runoff diversion structures, and devices channelling contaminated storm water to the wastewater and manure storage and containment structure;
- (ii) Daily inspection of water lines, including drinking water or cooling water lines;
- (iii) Weekly inspections of the manure, litter, and process wastewater impoundments; the inspection will note the level in liquid impoundments as indicated by the depth marker.

- Animals accessing storage areas;
- Levels approaching freeboard;
- Improperly functioning rain gauges; and
- Improperly functioning irrigation and land application equipment.

CAFOs must inspect the water lines at the CAFO daily, including drinking water and cooling water lines, to ensure they are not leaking. Leaks from these lines can increase the volume of wastewater that has to be stored in the production area storage structures and could result in the discharge of pollutants from the storage structure. Leaks from these lines can also cause what is otherwise a “dry” manure management system to discharge. Leaking water lines also can increase water and electricity bills. Many facilities now use automatic shut-off valves to detect pressure changes in the water lines.

Weekly inspections are required for all storm water diversion devices, runoff diversion structures, and devices that channel contaminated storm water to the wastewater and manure storage and containment structures. These inspections help ensure that the devices (e.g., roof gutters) and structures are free from debris and remain in good working condition.

Weekly inspections are required for manure, litter, and process wastewater impoundments. For surface and liquid impoundments, CAFOs should inspect berms for signs of structural weakness (e.g., seepage and wind or water erosion). CAFOs must note the depth of manure, litter, and process wastewater in any open surface liquid impoundment as indicated by the depth marker during the weekly inspections.

CAFOs must correct all deficiencies found during the daily and weekly inspections as soon as possible (see 40 CFR 412.37(a)(3)). CAFOs must keep records to document that the corrective actions were taken, and the records must indicate any factors that prevented immediate corrective actions from being taken where deficiencies are not corrected within 30 days (see 40 CFR 412.37(b)). Appendix B contains a sample checklist for the daily and weekly inspections required for a Large CAFO production area. CAFOs may consider using this checklist to design their production area inspection routine.

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### C. Mortalities, Direct Contact, and Chemical Disposal

To prevent contamination of the nation's waters, the regulations require CAFOs to ensure proper management of dead animals to ensure that they are not disposed of in any liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities to prevent the direct contact of confined animals waters of the U.S. The regulations also require CAFOs to ensure that chemicals and other contaminants handled on-site are not disposed of in any manure, litter, storm water, or process wastewater storage or treatment system unless the system is specifically designed to treat such chemicals and other contaminants. CAFOs must properly handle animal mortalities, prevent animals from direct contact with surface water, and properly dispose of chemicals. These regulatory requirements are discussed below.

#### Mortality Handling

**§122.42(e)(1)(ii)** Ensure proper management of mortalities (i.e., dead animals) to ensure that they are not disposed of in a liquid manure, storm water, or process wastewater storage or treatment system that is not specifically designed to treat animal mortalities.

**§412.37(a)(4)** Mortalities must not be disposed of in any liquid manure or process wastewater handling system, and must be handled in such a way as to prevent the discharge of pollutants to surface waters, unless alternative technologies pursuant to §412.31(a)(2) and approved by the Director are designed to handle mortalities.

#### 1. Management of Animal Mortalities

Despite improved health and production practices, intermittent mortality occurs at animal feeding operations. In some cases, a CAFO may need to handle catastrophic mortality. The CAFO should ensure the proper handling and disposal of dead animals to ensure biosecurity, to avoid creating nuisance conditions, and to manage any pathogens decaying carcasses produce. All CAFOs must not dispose of dead animals in a liquid manure, storm water, or process wastewater storage or treatment system unless the system is designed specifically to treat mortalities (see 40 CFR 122.42(e)(1)(ii)). In addition, Large CAFOs subject to the effluent guidelines may not dispose of mortalities in any liquid manure or process wastewater system unless alternative technologies pursuant to the *Voluntary Alternative Performance Standards* have been approved by the Director (see 40 CFR 412.37(a)(4)). For example, homogenization of mortalities may be an appropriate method of treatment, but subsequent disposal in a runoff pond is not.



Photo by USDA NRCS

Mortality disposal methods include burial, composting, incineration, and rendering. CAFOs should determine the most appropriate method based on the type(s) of animal(s) maintained at the operation, state and local laws, and storage capabilities. For example, many poultry producers previously used fabricated pits for burying dead birds, but due to potential

contamination of groundwater from pollutants leaching from these pits, many states now prohibit burial. Currently, many poultry producers compost dead birds between layers of litter and straw. In many states, burial is now allowed only during instances of catastrophic mortality.

Due to the size of cattle carcasses, frequency of autopsies, and economics of mortality handling, most beef and dairy cow producers use rendering as their primary method of mortality disposal. Swine producers bury, incinerate, render, and compost their dead animals. During the last several years, however, more swine producers have switched from burial to composting.

CAFOs should consider incorporating a mortality management strategy into the Nutrient Management Plan that includes the following five components identified in ANSI GELPP 005-2002 *Mortality Management*:

- A schedule for collecting, storing, and disposing of carcasses;
- A description of how mortalities will be stored on site prior to disposal;
- A description of the final method for mortality disposals;
- A contingency plan that addresses reasonable foreseeable issues such as mass mortality due to mechanical failures or weather, loss of contract transporter for rendering, and euthanization due to disease outbreaks; and
- Records of mortality disposal (e.g., date, numbers of animal, final disposition).

To prevent the transmission of possible diseases, CAFOs should try to remove all carcasses from the animal living areas within 24 hours, minimize insect and rodent populations in the mortality storage areas, and use mortality storage areas with impermeable bases. Below are specific recommendations for each mortality disposal method as described in the ANSI *Mortality Management* standard:

- Off-Site Rendering: The CAFO's contingency plan should include at least one alternative carcass hauler and, if practical, one alternative rendering facility or other facility capable of properly disposing of carcasses.
- Composting: CAFOs must ensure that clean water is diverted from the composting areas. The composting facility should be constructed with an impermeable base and roofed, carcasses should be prepared properly for composting, carcasses should be placed in the compost structure properly, and all carcasses should be covered completely by the compost amendment.
- Burial: CAFOs should ensure that the burial locations are not in sensitive areas (e.g., floodplains, areas with shallow water tables, sandy soils, near surface water, or near groundwater wells), carcasses are prepared properly, and carcasses are covered properly.

- **Incineration:** CAFOs should ensure that the incinerator is operational, the capacity of the incinerator is not exceeded, and the incinerator is maintained and secured properly.

Additional information on the proper management of animal mortalities can be found in “NRCS Practice Standard Animal Mortality Facility-316.” This standard provides information for using freezer units, disposal and burial pits, incinerators, and considerations for planning normal and catastrophic animal mortality management.

## 2. **Direct Contact of Animals With Surface Water**

To help ensure that wastes generated by animals confined in a production area do not contaminate waters of the U.S., CAFOs must prevent direct contact by the animals with such waters. Direct contact means an animal is standing in a water body or walks through it. For example, if a cow walks through a stream in a production area, there is direct contact with the stream by the cow. Fences are a common method of preventing animals from contacting surface water bodies. CAFOs that use fencing in the production area to control animals’ access should check fence lines regularly and repair any damaged sections as soon as they are identified. CAFOs should also provide an alternative water source for the animals to discourage walking through streams.

### **Additional Conditions Applicable to CAFOs**

**§122.42(e)(1)(iv)** Prevent direct contact of confined animals with waters of the United States.



Photo by USDA NRCS

## 3. **Disposal of Chemicals**

CAFOs must not dispose of chemicals and other contaminants handled on-site into a manure, litter, process wastewater, or storm water storage or treatment system unless the system is specifically designed to treat these chemicals and other contaminants. If the storm water storage or treatment system is not designed to handle chemicals and other contaminants, disposing of the materials in those systems could cause the treatment system to fail, and could discharge pollutants. For example, expired or wasted antibiotics must not be disposed of in a confinement building pit or flushed out of hospital pens into the liquid manure storage areas. Biological treatment systems such as lagoons and digesters are sensitive to certain chemical loads, and these treatment systems could fail.

### **Additional Conditions Applicable to CAFOs**

**§122.42(e)(1)(v)** Ensure that chemicals and other contaminants handled on-site are not disposed of in any manure, litter, process wastewater, or storm water storage or treatment system unless specifically designed to treat such chemicals and other contaminants.

CAFOs should minimize the use of potentially harmful chemicals/contaminants and ensure these products are used and disposed of properly. For example, it may not be

consistent with chemical labels to dispose of rinse water from spent chemical containers in the storage structure. The permit may specify additional restrictions and controls for these trace chemicals where necessary. To properly dispose of any chemical, operators should follow instructions provided on labels or documentation from the supplier.

#### D. Records

CAFOs must keep records to document that the design, operation, and maintenance requirements for a CAFO production area described above are met. These records must be kept for a minimum period of five years after they are created. See 40 CFR 122.42(e)(1)(ix) and (e)(2). CAFOs must make these records available to the Director or his or her designee.

The CAFO must keep the following production area records:

- Specific records that will be maintained to document the implementation and management of the minimum elements listed in §122.42(e), including: ensure adequate storage; ensure proper management of mortalities; clean water diversions; prevent direct contact of animals; ensure proper chemical disposal.
- Documentation of all required visual inspections (see Section B.3 of this chapter). Note that though visual inspections of water lines are required daily, the record may consist of a signed weekly log assuring the inspections were conducted. See the *Producers Guide* for more information.
- Weekly records of the depth of the manure and process wastewater in the liquid impoundment as indicated by the depth marker. See Section B.1 of this chapter.
- Records documenting any actions taken to correct observed deficiencies.
- Explanation of the factors preventing immediate correction of deficiencies, for deficiencies not corrected within 30 days.
- Records of mortality management and practices used by the CAFO to meet the requirements for mortalities handling and disposal.

#### Recordkeeping

**§122.42(e)(2)** The permittee must create, maintain for five years, and make available to the Director, upon request, the following records...

**§122.42(e)(3)** ...Large CAFOs must retain for five years records of the date, recipient name and address, and approximate amount of manure, litter, or process wastewater transferred to another person.

**§412.37(b)** Each CAFO must maintain on-site for a period of five years from the date they are created a complete copy of the information required by 40 CFR 122.21(i)(1) and 40 CFR 122.42.(e)(1)(ix) and the records specified in paragraphs (b)(1) through (b)(6) of this section. The CAFO must make these records available to the Director and, in an authorized State, the Regional Administrator, or his or her designee, for review upon request.

- Records documenting current design of any manure or litter storage structures, including volume for solids accumulation, design treatment volume, total design volume, and approximate number of days of storage capacity. The documentation should also reflect any significant changes to these systems, such as changes to the waste handling system due to expanded or reduced number of animals.
- Records of the date, time, and estimated volume of any overflow.

Appendix C contains a sample checklist for the records that must be kept for a production area at a Large CAFO.

## **E. Additional Voluntary Controls**

In addition to the requirements described above, there are many other controls that CAFOs can implement to increase the efficiency and environmental protection of storage structures. CAFOs should consult their state and local regulatory authorities to make sure these voluntary controls are not already required or prohibited. Examples of voluntary controls include groundwater protection controls and lagoon covers. They are discussed below.

### **1. Groundwater Protection Controls**

Various controls are available to reduce the potential for the discharge of pollutants to the groundwater. These include, but are not limited to, storage structure liners and groundwater monitoring.

Liners prevent pollutants from leaching into the groundwater from the bottom and sides of a storage structure. They can be made of natural (e.g., heavy clay) or synthetic (e.g., plastic or rubber) materials. To be effective, liners must be inspected periodically to ensure they are not leaking. CAFOs should check with their permitting authority for any state requirements concerning lagoon liners. For example, California currently requires waste management units at CAFOs to be lined with or underlined with soils containing at least 10 percent clay and not more than 10 percent gravel or artificial materials of equivalent impermeability; Idaho currently requires a 2-foot compacted layer of heavy soil, concrete or asphalt, or synthetic membrane liners. Other states may also require additional monitoring or controls to protect groundwater (and drinking water) resources.

Groundwater can be monitored periodically to check for pollutant infiltration from a storage structure. Monitoring provides an early warning that there may be a problem with a storage structure and allows early correction of the problem. Monitoring typically requires installing at least one well up-gradient and two to three wells down-gradient from the storage structure. CAFOs should conduct a comprehensive hydrological assessment prior to installing the monitoring wells to ensure that the wells are located properly to detect pollutant releases to the groundwater. Groundwater in some areas is susceptible to seasonal variations of flow and may even change directions of flow. Monitoring of the groundwater beneath a storage structure in a production area is a good idea in areas where there is a strong likelihood of pollutants reaching the groundwater. These situations include areas where the storage structure is located over karst terrain and where the groundwater table is very shallow.

Note that ground water controls may not always be voluntary. On a site-specific basis a NPDES permit may set additional requirements on groundwater discharges where the groundwater has a direct hydrologic connection to surface water. In addition as noted above, a CAFO may be subject to certain ground water controls based on state or local regulatory authorities that are separate from the Clean Water Act NPDES requirements. The CAFO should consult with their state permit authority for more information.

## 2. Lagoon Covers

Though the CAFO rules do not require the use of lagoon covers, one way to reduce the potential for pollutant discharges from storage lagoons is to install an impermeable cover over the lagoons. Covered lagoon systems have been used successfully in all areas of the country including cold climates. They can now be designed and constructed from materials to resist freezing, high winds, and other extreme weather conditions that may have precluded their use in the past.

However, in some instances, covers are an attractive alternative to help reduce the potential for pollutants discharged to surface water bodies by decreasing the volume of storm water that has to be stored.

Therefore, CAFOs may be able to design a smaller lagoon to manage all manure and wastewater if it is covered. This will minimize the amount of land that has to be devoted to the impoundment and, in turn, reduces excavation costs. In wet climates, the use of covers can drastically reduce the costs of land application and hauling of manure by eliminating a lot of non-contact water, especially direct precipitation. In many cases the use of a cover can reduce evaporation and the associated loss of nitrogen which in turn may result in significant odor reduction. The additional conserved nitrogen can often be beneficially used by crops. Volatilization of nitrogen is generally viewed as unfavorable, and new treatment technologies specifically include volatilization controls.



Some covered lagoons can also be converted into anaerobic digesters which rely upon a bacterial process to produce methane gas while decomposing organic wastes. The methane generated from the anaerobic digestion can be burned in an engine generator to produce electricity or in a boiler to produce heat. Digesting manure may reduce odor emission, fly production, and may help control some pathogens. CAFOs should be cautioned that digesters still require effluent holding.

Expanding CAFOs in particular may wish to install a constant volume treatment cell in lieu of expanding the existing lagoon. The old lagoon may then be used as the effluent holding cell. As detailed in the ASAE Standard EP403.3 *Design of Anaerobic Lagoons for Animal Waste Management*, CAFOs may use multiple cell lagoons when allowed by local conditions and/or regulations. When operated in a series, the volume of the primary cell should be at least equal to the sum of the treatment volume and sludge accumulation volume. When operated in parallel, each cell's volume should be designed based on the anticipated loadings.

EPA's AgStar Program is a voluntary effort jointly sponsored by EPA, USDA, and the U.S. Department of Energy that encourages the use of methane recovery (biogas) technologies at CAFOs that manage manure as liquids or slurries. EPA's AgStar web site <[www.epa.gov/agstar](http://www.epa.gov/agstar)> provides information on anaerobic digestion systems and concepts; a directory identifying appropriate consultants, project developers, energy services, equipment manufacturers and distributors, and commodity organizations; a handbook and software to provide guidance on developing biogas technology at commercial farms; link to USDA standards; and other reports on anaerobic digestion.

Some CAFOs have had success using impermeable covers for odor control and to reduce volatilization. Synthetic impermeable covers include rigid materials (e.g., wood, concrete, fiberglass) or flexible materials (e.g., plastic). CAFOs typically use a floating cover (other types include inflated covers, which are susceptible to high winds, and covers suspended by cables). In addition to synthetic impermeable covers, CAFOs may choose to install biocovers (e.g., straw, cornstalks) or synthetic permeable covers (e.g., geotextile covers for earthen storage, clay ball covers (Leka rock) for concrete storage). When planning the addition of covers, CAFOs should plan for additional maintenance activities, such as removal of excess biocover materials to prevent line plugging and access to the lagoon for pumpout. CAFOs should be cautioned that such controls may be beneficial overall, but will not necessarily reduce potential for overflows.

### **3. Additional References**

A reference CAFOs and permit writers may use in determining whether a facility has adequate storage is EPA's *Cost Methodology for the Final Revisions to the National Pollutant Discharge System Regulation and the Effluent Guidelines for CAFOs* (December 2002)(EPA-821-R-03-004) available at <<http://epa.gov/guide/cafo/>>.