



Liquid Animal Waste System Operation and Inspection Guide

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Good Environmental stewardship dictates recording actions taken by an animal feeding operation (AFO) to operate and inspect a liquid waste management system to "MEET OR EXCEED" the Alabama Department of Environmental Management (ADEM) AFO/CAFO RULE, the Natural Resources Conservation Service (NRCS) technical standards and guidelines, and Extension Recommendations. ACCURATE AND COMPLETE RECORDS DEMONSTRATE GOOD FAITH IN ENVIRONMENTAL STEWARDSHIP.

This publication contains RECORD FORM **R-6, Rainfall and Lagoon/Storage Pond Weekly Record - Operation Level Monitoring & Condition Inspection** for recording Weekly Storage Depths, Pumping Activity and Structural Inspections as required by ADEM, and rainfall amounts. RECORD FORM **R-7, Annual Lagoon/Storage Pond Structure Self-Inspection Record** is included for documenting inspections of liquid waste storage/treatment structures. These can be used to record on-farm actions taken by the AFO/CAFO operator to manage liquid manure storage, treatment, and handling operations according to the in-place management plan. Diligent use of these (or similar) forms will help the AFO/CAFO operator do a better job of meeting "good sense" management objectives of managing liquid manure to protect the environment and meet regulatory requirements.

Storage Ponds

Storage ponds are built to only STORE manure, wastewater, and rainwater FOR A SPECIFIC TIME ONLY (3 months, 6 months, etc.). Solid separation equipment may or may not be used. Manure solids and wastewater that enter the storage pond must be removed before the end of the design storage time to make room for the next batch of manure/wastewater. **This requires agitation** to suspend the solids in liquid form to allow pumpout with a solids-handling pump to honey wagons or slurry irrigation

equipment for land application. Usually the bottom 2 feet is *unpumpable volume* and not included in the required storage volume. Agitation up to 12 hours BEFORE and WHILE pumping is necessary to get and keep solids suspended for near uniform content for nutrient management purposes.

Lagoon Start Up and Loading Rate

Anaerobic lagoons are designed for WASTE TREATMENT based on VOLATILE SOLIDS (VS) loading rate AND for wastewater storage. The size of the treatment volume is based on the VS loading rate. Volatile solids are the organic solids in manure that are subject to bacterial degradation. For the bacteria to develop and function properly, the actual DAILY VS loading rate should be NO LARGER than designed.

At start-up (when first built or after a complete clean out), a lagoon should be filled with water to **at least** 60 percent of treatment volume before manure is introduced. This assures sufficient dilution for the establishment of bacterial activity and will also **minimize start-up odors**. Starting a lagoon in late spring or early summer will allow a good bacterial population to be established during the warm season. **Design treatment volume should be reached as soon as possible, adding fresh water as necessary to maintain full treatment volume level.**

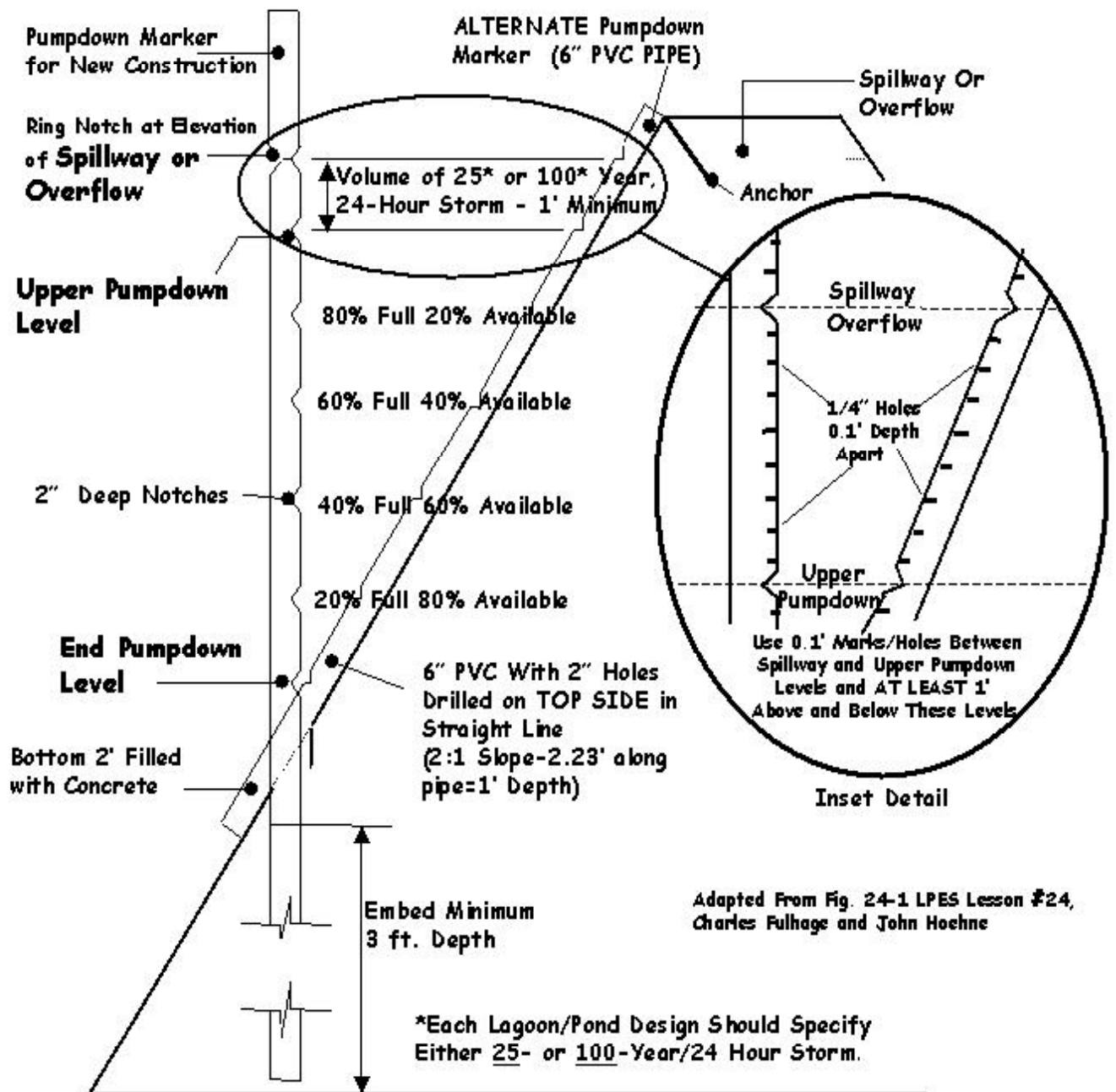


Figure 1. Lagoon or Pond Liquid Gauge Marker

After start-up, lagoons perform best when they are loaded continuously and uniformly. Daily flushing or operating underfloor pull plug systems to "even-out" pit discharge into the lagoon through the week works well to provide near ideal continuous loading conditions for lagoons.

Storage Pond & Lagoon Liquid Volume Management

Liquid volumes should be monitored and recorded weekly to properly manage storage and/or treatment structures. A liquid level gauge marker similar to Figure 1 is

recommended. A Liquid Level Gauge Marker is needed in the last cell of a multi-cell lagoon system. Single stage lagoons and storage ponds each need a marker. A treated post can serve as the marker if installed during construction. After construction, a 6-inch PVC pipe can be installed as shown in Figure 1, with 2-inch drilled holes marking the appropriate levels and 1/4-inch holes marking intermediate 0.1-foot levels. Installed slope of the PVC pipe will determine actual location of the 2-inch and 1/4-inch holes.

Annual Lagoon/Storage Pond Structure Self-Inspection, Extension, or QCP Record

Farm _____ Lagoon/Storage Pond ID _____

Inspected by _____ Extension (?) _____ QCP (?) _____ Date ____/____/____

MANURE/ EFFLUENT LEVEL and Other Observations :

REQUIRED* AVAILABLE STORM VOLUME DEPTH: _____ FT (1 FT Minimum)

Today: Liquid Level ELEVATION BELOW Required* Storm Volume Depth: _____ FT			
	Yes	No	Corrective Action Taken/Planned
Is liquid level marker available and visible?			
Does required AVAILABLE STORM VOLUME exist?			
Manure pump/transfer pipes functioning?			
Recycle pumps/transfer pipes functioning?			
Electrical Conductivity (anaerobic lagoon) : _____ micro-mho/cm			
EARTHEN STRUCTURE			
Interior liner erosion observed?			
Due to wave action?			
In vicinity of outlets?			
Due to erosion from rainfall?			
Near agitation equipment access points?			
Signs of berm/dam damage?			
Due to animals burrowing or traffic?			
Presence of trees or woody vegetation?			
Presence of large weeds?			
Erosion of gullies?			
Damp, soft, or slumping areas on berm?			
Seepage near bottom of berm slope?			
Seepage around pipes thru berm?			
CONCRETE/STEEL TANKS			
Signs of cracks or structural damage?			
Leakage, wet spots around base of tank?			
Wet spots around base of tank?			
CLEAN WATER DIVERSION			
Perimeter drains plugged or blocked?			
Roof water or runoff entering storage?			
Diversions/waterways maintained?			
VISUAL APPEARANCE AND SAFETY			
Site neat and recently mowed?			
Mortality or afterbirth observed?			
Medical consumables observed?			
Area fenced and properly marked?			
ODOR/LAGOON FUNCTION			
Anaerobic lagoon is purple/pink?			
Design Treatment Volume present?			
Actively bubbling?			
Inlet pipes submerged?			
Rate Downwind odor from facility:	None	Faint	Distinct Strong Unbearable

*EACH Lagoon/Pond design should specify either: 25YR/24HR OR 100YR/24 HR STORM (rev jun04)

Good management guidelines call for pumping the pond under appropriate conditions to keep the level below the "Upper Pumpdown Level". This level is a minimum of 1-foot below the designed maximum water level, which is normally the spillway or overflow level (check actual pond design for specific value). Pumping operations should be started well before critical liquid levels are reached to assure volume is always available to hold the 25-yr, 24-hour or 100-yr, 24-hour required storm event as noted in actual pond design in the waste management system plan.

Lagoons and storage ponds should be managed so that water levels are at the "End Pumpdown Level" at the beginning of the critical storage period (usually late fall, NRCS Code 359 Waste Treatment Lagoon). The "End Pumpdown Level" indicates the depth needed for the Minimum Re-Cycle Volume (usually 2-feet above the bottom of the structure) in the last cell of a multi-cell lagoon system or the Minimum Treatment Volume (MTV) in a single stage lagoon. It can also indicate the top of the shallow *"unpumpable volume"* in a storage pond. Marks between the "Upper Pumpdown" and "End Pumpdown" levels indicate % of "full" storage or "how much storage is left". *This gives the pond operator time to plan pumpout activities.*

The first cell of a multi-cell lagoon system is usually pumped only to remove accumulated solids that reduce the MTV. This typically requires storage pond-type agitation before and during this pumpout (lagoon renovation, once every 5 to 20 years depending on design).

Rainfall has a significant effect on management of storage ponds and lagoons. **Rainfall at the site should be recorded daily as it occurs.** Rainfall records can demonstrate proper operation and maintenance, particularly during long periods of rainy weather. Recording rainfall is evidence of good stewardship.

Monitoring Lagoon Treatment Performance

One visual sign of good lagoon bacterial action is a light purple or pink color seen in the lagoon water. Not overloading treatment volume with higher-than-design daily VS loading rates (not having more animals than originally planned, not "slug" loading, etc.) is critical to lagoon performance.

Bacterial performance is also critical and is especially sensitive to salt levels in the lagoon. Normal removal of salts during pump-out and addition of fresh water from rainfall usually keep salt content below the level that might slow or stop this bacterial action. High salt levels in lagoon water will result in increased odors or "sour" smells and increased sludge build-up rates in the lagoon. A simple field test called "electrical conductivity" (EC) can be used to effectively monitor lagoon salt build-up. **EC values of 8,000 to 12,000 umho/cm are associated with the greatest bacterial activity.** Above this level bacterial activity is reduced. When salt levels rise too high, the most effective remedy is to add fresh water to the lagoon from a nearby water source (pond, lake, well, etc). Land Application Note: EC content of animal waste lagoon effluent land applied as plant growth fertilizer in the humid Southeastern United States is generally not a concern due to typical, normal 55 to 60+ inches of annual rainfall. Check with your Auburn University land grant extension wastewater irrigation or soils specialist if questions arise.

Appearance and Safety

Efforts should be made to ensure a manure storage pond(s) or treatment lagoon(s) as aesthetically pleasing as possible. Berms and embankments should have **good grass cover** for erosion control and appearance and be **mowed and maintained on a regular basis.** A well-maintained lagoon is less likely to attract attention and cause controversy.

Berms should be **inspected weekly** for signs of erosion, woody growth, burrowing

animals, and damp or moist spots below the berm that may indicate leakage due to structural problems. All trees, bushes, or woody growth should be kept from growing on all berms and embankments. Burrowing animals should be removed and burrowing damage repaired. Any moist spots should be further investigated and any leaks corrected.

The lagoon should be fenced to prevent access of children, trespassers, and livestock. "WARNING" signs (9" X 10" MINIMUM) should be posted on each side of the lagoon and any access gate locked.

Facility and Structural Controls Inspection

The ADEM AFO/CAFO Rules require the following inspections and written records:

- a) annual Qualified Credential Professional (QCP) inspection of all liquid waste management system facilities and structural controls,
- b) weekly inspection/evaluation of all waste management system structural controls (tanks, ponds, berms, pumps, ditches, pipes, separators, etc),
- c) **weekly inspections of the wastewater level in or erosive structural damage to the liner**, at least once every five years an inspection and evaluation by a PE registered in the State of Alabama or a QCP under the direct supervision of the PE, of all waste management system structural controls, and PE certification that all have been maintained to meet or exceed NRCS technical standards and guidelines,
- d) **as often as is necessary** to assure proper operation and compliance with applicable requirements, or in response to any

observed maintenance deficiencies, water line leaks, significant weather events, etc.

All inspections and reviews except the annual QCP and year PE inspection should be performed by the farmer/owner/operator. The QCP inspection should be dated and signed by the person or person(s) performing the inspection/evaluation. Results of the reviews and follow-up actions taken should be recorded.

The ADEM AFO/CAFO RULE requires these records be kept to verify operation for a MINIMUM OF THREE YEARS. NRCS Conservation Practice Standard, NUTRIENT MANAGEMENT, CODE 590 requires records to document implementation of 590 be kept for a MINIMUM OF FIVE YEARS.

REFERENCES

ADEM AFO/CAFO RULE (REVISED DEC2000) SECTION 335-6-7-.28 Pollution Prevention

Alabama Natural Resources Conservation Service, Conservation Practice Standard, WASTE TREATMENT LAGOON, CODE 359.

ASAE Engineering Practice ASAE EP403.3. Design Of Anaerobic Lagoons for Animal Waste Management. ASAE Standards, 2002. St. Joseph, Missouri.

Fulhage, Charles and John Hoehne. 2001. Lesson 24: Operation and Maintenance of Manure Storage Facilities, in Livestock and Poultry Environmental Stewardship Curriculum, MidWest Plan Service, Iowa State University, Ames, Iowa. Funded by USDA-CSREES and EPA Ag Center grant to University of Nebraska Cooperative Extension.

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