



expected. Some of these activities may be required by regulation, but all are evidence of good management and stewardship regardless of regulatory requirements.

### Monitoring during pumping activities

Experience has shown that unplanned discharges and spills sometimes occur with pumping activities. Sources of such unplanned discharges include burst or ruptured piping, leaking joints, operation of loading pumps past the full point of hauling equipment, and other factors. Hence, pumping activities should be closely monitored, especially in the “start-up” phase, to ensure that no spills or discharges occur. Continuous pumping systems such as drag-hose or irrigation systems can be equipped with automatic shut-off devices (which usually sense pressure) to minimize risk of discharge in the event of pipe failure.

### Periodic inspections and checklists

A manure storage facility should be inspected periodically to ensure that any potential problems are detected before environmental impacts occur. The frequency of inspections may vary, but a regular inspection schedule should be developed and followed for each system. Inspection frequency might depend on such factors as system size, system complexity, mechanical devices (recycle pumps, float switches in reception pits), flow rate of recycle system, proximity to a sensitive water source, and type of storage facility. Checklists offer a means of ensuring that all items are inspected and noting when they were inspected. They also are evidence of environmental stewardship and may be useful in the event of litigation.

### Liners

Liners in earthen manure storage impoundments are designed and constructed to provide an adequate barrier between the potential contaminants in the impoundment and groundwater. Hence, liner integrity is extremely important in maintaining an environmentally sound manure storage facility. To the extent possible, liners should be regularly inspected for signs of damage, erosion, or other compromising factors. Wave action can cause liner erosion at the level of the liquid in the impoundment. If this condition is severe, consideration might be given to the use of riprap or similar mitigation methods to preserve liner integrity.

The area around the pipes that discharge into the impoundment is also subject to erosion, especially if the pipes discharge directly onto the liner surface. A better configuration is to install inlet pipes such that they discharge into at least 4 ft of liquid, which may require a supporting structure for the end of the pipe. Concrete or rock chutes should be used with inlet pipes that discharge onto the liner surface. Agitation is also an activity that can damage liners. Care should be taken to operate agitators a sufficient distance above the liner so that liquid velocities are reduced enough to ensure that erosion does not occur. Heavy or unusual rainfall events can also erode liners, and special attention should be given to liner inspection after such storm events.

### Logbooks and recordkeeping

Certain data and recordkeeping involving manure storage structures can aid in overall maintenance and management, and is also evidence of responsible operation and good recordkeeping. In addition to the periodic inspections, manure levels in a storage structure should be monitored and recorded. This data can illustrate the effects of excessive

rainfall and lot runoff, and help in planning pump down or other land application activities. Manure levels should be observed and recorded frequently enough to provide a “feel” for the rate of accumulation, and pumping activities should be scheduled accordingly. When a lagoon is pumped or other manure storage structure is emptied, the date of the activity should be recorded along with the volume or date of manure removed, locations where the manure is spread, and the nutrient content (lab analysis) of the manure. This information is required by the Utah Department of Environmental Quality – Division of Water Quality (UDEQ-DWQ) for interim or year-end reports from those operations with Utah Pollution Discharge Elimination System (UPDES) permits.

### Pump down or manure-level markers

Pump down or manure-level markers, or indicators, are a simple but important component of a manure storage facility. Such a marker enables the operator to ascertain quickly and easily the degree of fill of the manure storage facility, the point at which pumping or emptying should begin, and the point at which it should end. The presence of a durable, easily read marker gives UDEQ-DWQ personnel confidence that a manure storage facility is being managed properly.

Experience has shown that pump down markers must be made of durable materials and properly installed to afford the long life needed. The operator or inspector should be able to ascertain the following information when observing a pump down marker:

- When pumping operations should begin and end
- Level at which overflow will occur
- Fraction of total storage that is currently filled

A common practice is to install steel fence posts at the upper and lower pump down levels for earthen impoundments. While this approach provides basic information on beginning and ending pump down, experience has shown that more knowledge is needed. Also, fence posts installed in this manner are subject to damage and displacement. A good pump down marker will indicate the level, or elevation, of manure throughout the possible range (from lower pump down level to overflow, or spillway) in the storage facility. Experience has shown that a 6 inch by 6 inch treated wood pole properly imbedded makes a good pump down marker. Notches or other indicators can be carved into the pole to show pertinent elevations. Painted numbers or colors on the pole are not durable enough to maintain readability over a number of years. Figure 1 shows a type of pump down marker that provides the information needed.

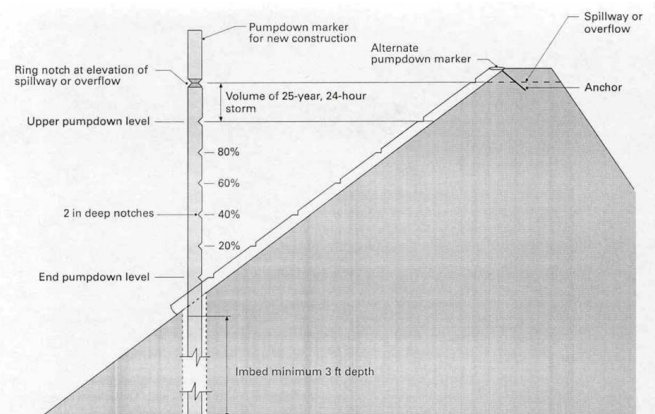


Figure 1.

## Weather stations

A simple weather station that indicates or records rainfall can be a useful tool in maintaining and managing a manure storage structure. Rainfall has a significant impact on open storage structures and structures serving open lots, so knowledge of rainfall amounts can be very useful. A weather station can aid in the documentation of such events without resorting to “off-site” data from stations that may not be descriptive of conditions at the storage facility. Recorded rainfall data is also evidence of good stewardship.

## Aesthetics and Appearance

Aesthetics and appearance may not be critical factors in protecting the environment or complying with environmental regulations. However, these characteristics are major factors in the perceptions formed by the public, tour groups, UDEQ-DWQ personnel, and others who may not be intimately associated or familiar with the livestock industry. Therefore, aesthetics and appearance should be given major priority for the overall benefit and viability of animal agriculture.

## General cleanliness and sanitation

The general cleanliness and sanitation characteristics of a livestock enterprise are often perceived as a measure of the concern of that enterprise for environmental stewardship and environmental compliance. A clean, well-landscaped production area will project a positive image for the operation, while the presence of debris, litter, and poorly maintained buildings will project a negative image. Typical items of concern for livestock production enterprises include leftover construction debris or refuse; old, unused vehicles; worn-out equipment; rusted equipment from the buildings (farrowing crates, pen dividers, feeders); torn and worn-out ventilation curtains; and loose roofing panels, etc.

All livestock production operations experience animal death loss. A specific plan for managing animal mortalities should be

developed and implemented. The visual and olfactory perceptions generated by the presence of dead animals in or around the production facility are highly offensive and likely will be attributed to the industry as a whole by the public. Additionally, poorly managed mortalities represent a very real health and disease risk to the enterprise.

## Mowing

Few activities undertaken by the producer are as effective as frequent mowing in conveying a positive image of livestock production. Producers who maintain “front yard quality” around the production and manure storage facilities provide a powerful first impression of pride and responsibility. Conversely, the presence of tall grass, weeds, shrubs, and trees in undesirable locations creates an impression of laxity and disrespect for environmental responsibility. UDEQ-DWQ personnel inspect UPDES permitted livestock production and manure storage facilities on an annual basis. If tall grass, weeds, brush, and trees hamper the inspector, a positive report is an unlikely outcome. Routine inspections for seepage, rodent burrowing, erosion, or other damage are much more effective if the areas have been mowed at regular intervals.

## Control of surface water

As confined production units become larger, control of surface water in the production area is a primary concern. Wider, longer buildings, placed relatively close together, create high rates of discharge from roof and paved areas. Special considerations and landscaping are needed to manage this water in a manner that does not create erosion and unwanted ditches and washed-out culverts or waterways. A surface water management plan should be developed based on a design storm event, expected runoff rates, soil types and erosive velocities, and properly designed and vegetated channels for carrying surface water away from the production area. Some states may require that surface water from production areas be contained and/or checked for contaminant levels before discharge to a watercourse.

## References:

Livestock and Poultry Environmental Stewardship curriculum, lesson authored by Charles Fulhage and John Hoehne, University of Missouri, courtesy of Midwest Plan Service, Iowa State University, Ames, Iowa 50011-3080.

Agricultural Waste Management Field Handbook. Natural Resources Conservation Service, USDA.

Livestock Waste Facilities Handbook, MWPS-18. Midwest Plan Service, Ames, Iowa.

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