LAGOON AND HOLDING POND HYDRAULICS AND MAINTENANCE

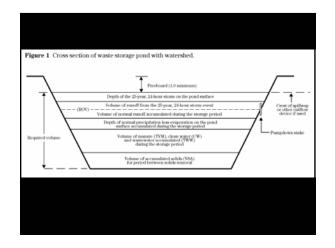
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TCEQ Rules Update (July 15, 2004)

- ✓ Revised to be consistent with new EPA
- ✓ Retains the 25-year, 24-hour design storm for dairies and feedlots
- ✓ Adopts the 100-year, 24-hour design storm for poultry, swine and veal CAFOs

TCEQ Rules Update (July 15, 2004)

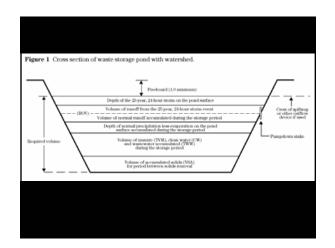
- ✓ New Voluntary Alternative Performance Standards (VAPS) provision
- ✓ Additional requirements for dairies in Major Sole-Source Impairment Zone -30 TAC §321.42

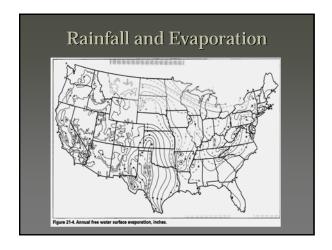


Treatment Volume

- Lagoons perform dual functions of storing and treating manure
- Minimum permanent treatment volume required for dilution and bacterial digestion of manure solids
- Bacteria activity increases with temperature
- Treatment volume based on volatile solids (VS) loading rate (lb VS/1,000 ft³/day)

Minimum Treatment Volume Treatment volume designed for a certain VS loading rate VS loading rate is selected according to climate 3.5 lb VS/day-1,000 ft³ in central South Dakota





25 - Year, 24 - Hour Storm

Depth of 25-yr, 24-hr storm is based on long-term rainfall data at a given location



TCEQ's "Chronic or Catastrophic Rainfall" Definition 30 TAC §321.32 (10)

A series of rainfall events that:

- Does not provide opportunity for dewatering a retention control structure; and
- Is equivalent to or greater than
 - the design rainfall event; or
 - any single rainfall event that is equivalent to or greater than the design rainfall event (e.g., a 36-hour storm whose cumulative rainfall depth exceeds the nominal depth of the 25-yr/24-hr event)

"Water Balance" Requirement

- Average monthly precipitation (direct + runoff)
- Monthly consumptive use of the cropping
- Wastewater irrigation shall not induce uncontrolled discharge
- 21-day storage of waste and processgenerated wastewater

"Imminent Overflow" Provision

If an RCS is in danger of imminent overflow from chronic or catastrophic rainfall or catastrophic conditions, then the CAFO operator shall take reasonable steps to irrigate wastewater to land management units (LMUs) only to the extent necessary to prevent overflow from the RCS

"Imminent Discharge" Contingency Plan

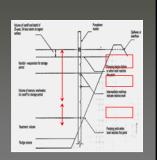
- Phone report to TCEQ regional office w/in 24h of preventive pumping
- Written report w/in 14 days
- Who will decide, and who will execute?
- Where/what fields?
- Does pumping capacity exist?

Stage/Level Markers

- Management indicators so that fill rate can be observed and pumping can be started at the correct time
- Shows critical liquid elevations in storage facilities
- Possible to automate this for \$5-7k

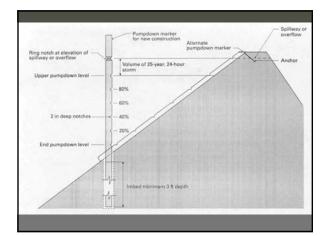
Pumpdown Marker – Lagoon

- 25-yr, 24-hr storm runoff and surface accumulation
- Regular pumpdown volume includes manure, washwater, openlot runoff and R-E



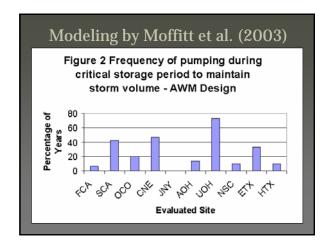
Pumpdown Frequency

- The design storage period is realized only when conditions are similar to assumptions used in design
- What can change the pumpdown frequency?
 - Rainfall, runoff or evaporation different than design assumption
 - Animal numbers different than planned or assumed
 - Lot areas or size different than planned or assumed



Additional requirements for dairies in Major Sole-Source Impairment Zone 30 TAC §321.42

- Primary motivation: prevent RCS overtopping
- Hydrologic needs analysis (water balance)
 - Adds a chronic (10-day) rainfall design basis;
 - Requires modeling certification of a 25-year discharge "return interval"
- Requires an RCS management plan



Conclusions by Moffitt et al. (2003)

- Occasionally pond levels will need to be lowered in less than ideal conditions
- Dairy operators need both:
 - A *strategic* nutrient management plan AND
 - Tactical management options and procedures for wastewater application during what would normally be nonapplication periods

Conclusions by Moffitt et al. (2003)

- Pond management is *critical*
 - Where the ponds are pumped down at the end of the critical storage period and kept lowered, there was little danger of overflow from design storms or chronic events
 - Where chronic rainfall events are more common, a combination of increased dewatering capability and lower maximum temporary storage level would prevent spills