Archived Publication

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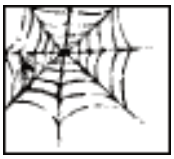

EPA promulgated regulations for Concentrated Animal Feeding Operations (CAFOs) in February 12, 2003 that expanded the number of operations covered by the CAFO regulations and included requirements to address the land application of manure from CAFOs. The rule became effective on April 14, 2003. NPDES-authorized 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 to view the 2008 CAFO Final Rule and supporting documents.

APPENDIX P - CALCULATIONS FOR ESTIMATING MEDIAN ANNUAL OVERFLOW VOLUMES AND ANNUAL AVERAGE DISCHARGE OF POLLUTANTS

The methodology for estimating overflows is presented in the following seven steps:

1. Each day over the 25-year period, EPA subtracts the evaporation from the precipitation to calculate the net precipitation. The net precipitation is multiplied by the pond surface area to get a net precipitation volume for the pond.

   Net Precipitation (in) = Precipitation (in) - Evaporation (in)

   Net Precipitation Volume (cf) = [Net Precipitation (in) * Pond Surface Area (sf)] / 12 (in / ft)

2. The runoff volume is calculated by subtracting 0.5 inches of infiltration from the daily precipitation and multiplying by the drylot runoff area. If precipitation less the infiltration is less than zero, the runoff is assumed to be zero.

   Runoff Volume (cf) = [Precipitation (in) - Infiltration (in)] * Runoff Area (sf) / 12 (in/ft)

   Where: Infiltration = 0.5 in

3. The daily volume of the pond is calculated by summing the net precipitation volume, the runoff volume, and the previous day's pond volume.

   Daily Pond Volume (cf) = Net Precipitation Volume (cf) + Runoff Volume (cf) + Previous Volume (cf)

   The minimum pond volume is equal to the accumulated solids volume plus the minimum treatment volume. If there is no precipitation, the net precipitation volume will be negative and the runoff volume will be assumed to be zero. However, the pond volume can not be less than the accumulated solids volume. Therefore, anytime a net precipitation volume loss results in the daily pond volume being less than the accumulated solids volume plus the minimum treatment volume, EPA assumes the daily pond volume is equal to the maximum accumulated solids volume plus the minimum treatment volume.

4. During the freeze-free period, EPA assumes liquid from the pond is applied to crop land at a specified period (e.g., every 7 days, every 30 days, every 180 days).

   Applications (applications / yr) = Freeze Free Days (days / yr) / Days Between Application (days / application)

5. The amount of liquid per application is assumed to be equal to the estimated daily flow into the pond (from the cost model) multiplied by 365 days and divided by the number of annual applications.

   Liquid per Application (cf / application) = Estimated Daily Flow (cf / day) * 365 (days) / Applications (applications / yr)

6. EPA uses freeze free days to estimate a start day for application. The pond volume is never allowed to drop below the sludge volume plus the minimum treatment volume. If the application volume is greater than the volume available in the pond, EPA assumes all available liquid is applied.

Daily Pond Volume (cf) = Net Precipitation Volume (cf) + Runoff Volume (cf) + Previous Volume (cf) - Application Volume (cf)

7. The pond volume for each day in the 25-year period is calculated. When the daily pond volume is greater than the maximum pond volume, EPA assumes an overflow equal to the daily pond volume less the maximum pond volume occurs. The pond volume is then set equal the maximum pond volume.

Overflow (cf) = Daily Pond Volume (cf) - Maximum Pond Volume (cf)

Daily Pond Volume (cf) = Maximum Pond Volume (cf)

Example for KT Pork Producers, Dubuque, IA

KF Pork Producers (KFP) is located in Dubuque County, Iowa. EPA uses 25-year daily precipitation and evaporation data from the Centerville, Iowa weather station to represent the climate of this county. The Centerville weather station is the closest weather station to Dubuque County, Iowa with readily available 25-year climate data. The climate data begins January 1, 1970 and ends December 31, 1995.

On January 1, 1970, KFP assumes the volume of was in the pond is equal to the sludge volume plus the minimum treatment volume which is 1,206,083 cubic feet (cf). It is assumed that the pond volume is never less than the accumulated solids volume plus the minimum treatment volume.

On January 2, 1970, the Centerville weather station reports 0.00 inches of precipitation and 0.0778 inches of evaporation. The daily pond volume is calculated as:

Daily Pond Volume (cf) = Net Precipitation Volume (cf) + Runoff Volume (cf) + Previous Volume (cf)

Where: Net Precipitation Volume (cf) = (0.00 - 0.0778) * 157,272 / 12 = -1020 cf
Runoff Volume = 0
Previous Volume = 1,206,083
Daily Pond Volume = -1020 + 0 + 1,206,083 = 1,205,063 cf

KFP applies liquids in the holding lagoon to crop land every 7 days during the freeze free period between April 21 and September 14, provided that there has been no significant precipitation during the 3 days prior to the day of application. If there has been significant precipitation, the application date is moved to the next available date. In some cases this may mean that the weekly application may not occur.

The freeze free period for Dubuque County, Iowa is 147 days from April to September. This results in 21 applications per year.

Applications (applications / yr) = Freeze Free Days (days / yr) / Days Between Application (days / application)

Where: Freeze Free Days = 147
Days Between Application = 7
Applications = 147 / 7 = 21 applications / year

Liquid per Application (cf / application) = Estimated Daily Flow (cf / day) * 365 (days) / Applications (applications / yr)

Where: Estimated Daily Flow = 8,356 cf/day
Liquid per Application = 8,356 * 365 / 21 = 145,235 (cf / application)

KFP's first day of application is April 21, 1970. In addition to adding the net precipitation and runoff volume to the previous volume, the application volume is subtracted April 21 and roughly every seventh day afterward until there are 21 applications. When overflow is calculated, the volume of the overflow is subtracted from the previous days pond volume.

On April 21, 1970, there is no precipitation and 0.349 inches of evaporation for Centerville, Iowa.

Daily Pond Volume (cf) = Net Precipitation Volume (cf) + Runoff Volume (cf) + Previous Volume (cf) - Application Volume (cf)

Where: Net Precipitation Volume (cf) = (0 - 0.349) * 157,272 / 12 = -4,574 cf
Runoff Volume = 0
Previous Volume = 776,594
Application Volume = 145,235
Daily Pond Volume = -4,574 + 0 + 776,594 - 145,235 = 626,785 cf

EPA estimates an average annual overflow for KFP to be 158,419 cf or 1,184,970 gal/yr over the 25-year period.

Using sampling data, the annual pollutant discharges are calculated by multiplying the overflow volume by the concentration:

Pollutant discharge (lbs/yr) = Pollutant concentration (mg/L) * 3.785 L/gal * Overflow volume (gal/yr) * 2.2 lbs/kg * 1 kg/10^6 mg