Appendix to rule 901:10-2-06 Manure Treatment Lagoon.

SINGLE STAGE LAGOON

As used in this appendix, the term "lagoon" refers to "manure treatment lagoon" as defined in rule 901:10-1-01 of the Administrative Code. The total storage volume shall be based on the storage period selected by the owner or operator which shall be a minimum of 180 days as required by paragraph ~~(A)(7)~~(A)(5) of rule 901:10-2-06 of the Administrative Code. The method for sizing total volume storage is based on the Rational Design Standard for Anaerobic Livestock Lagoons (Barth 1985). The owner or operator may choose to design and construct a single storage lagoon, a two-stage lagoon, or a manure storage pond followed by a manure treatment lagoon. If the owner or operator chooses either the two-stage lagoon or the manure storage pond and lagoon, then the owner or operator is required to calculate two lagoon volumes for comparison. The first volume is based on the maximum volatile solids loading rate for minimum treatment (MTV), plus the anticipated manure residual volume (mrV). The second is based on the volatile solids loading rate required to control odors and is called the Odor Control Volume (OCV). Precipitation plus liquid inputs shall be added to the larger of the two volumes to arrive at the total volume of the lagoon.

Additional liquid volumes to be added to the MTV or OCV for a single stage lagoon are as follows:

1. Manure volume for storage period.
2. Manure residual volume for design period.
3. Appropriate rainfall and runoff volumes collected by the structure that are in accordance with rule 901:10-2-04(D) of the Administrative Code.

The (MTV) is determined by dividing the daily volatile solids (VS) loading by a maximum volatile solids loading rate per unit volume (MLRV) times the activity ratio, (K) for the location: MTV=VS/(MLRV)(K). The following are MLRVs to be used for design:

Swine	MLRV=0.0062 lb/ft^3 - day
Dairy	MLRV=0.0105 lb/ft^3 - day
Poultry	MLRV=0.0062 lb/ft^3 - day

The minimum manure residual accumulation period shall be 7 years, preferably 20 years, or the expected life of the facility. Manure residual volume is based on the total solids (TS) entering the lagoon multiplied by the manure residual accumulation ration (mrAR) multiplied by the number of years: mrV = (TS/yr) x mrAR x YEARS.

The following are manure residual accumulation rations (mrAR) to be used for design.

High Concentrate Rations (Swine, Beef)	mrAR=0.0485 ft^3/lb (TS)
High Forage Rations (Dairy, Beef)	mrAR=0.0729 ft^3/lb (TS)
Poultry	
Layers	mrAR=0.0295 ft^3/lb (TS)
Pullets	mrAR=0.0455 ft^3/lb (TS)

The OCV is determined by dividing the daily volatile solids (VS) loading by a standardized loading rate (LRV), times the activity ratio (K) for the location: OCV= VS/(LRV)(K).

Swine	LRV=0.00378 lb/ft^3 - day
Dairy	The OCV for dairy and beef lagoons shall be equal to the MTV
Poultry	LRV=0.00253 lb/ft^3 day

Lagoon activity ratios (K) are based on lagoon reaction rates throughout the United States. Ohio Counties are listed as follows:

Findlay Area		**Medina Area**	
County	**K value**	**County**	**K value**
Allen	0.56	Ashland	0.56
Auglaize	0.57	Ashtabula	0.54
Crawford	0.56	Columbiana	0.57
Defiance	0.55	Cuyahoga	0.54
Fulton	0.54	Erie	0.54
Hancock	0.56	Geauga	0.54
Hardin	0.57	Huron	0.55
Henry	0.54	Lake	0.53
Lucas	0.54	Lorain	0.54
Marion	0.57	Mahoning	0.56
Morrow	0.57	Medina	0.55
Ottawa	0.54	Portage	0.55
Paulding	0.55	Richland	0.56
Putnam	0.56	Stark	0.56
Sandusky	0.54	Summit	0.55
Seneca	0.55	Trumbull	0.55
Van Wert	0.56	Wayne	0.56
Williams	0.54		
Wood	0.54		
Wyandot	0.56		
Coshocton Area		**Dayton Area**	
Belmont	0.59	Butler	0.61
Carroll	0.57	Champaign	0.59
Coshocton	0.58	Clark	0.59
Guernsey	0.59	Clermont	0.63
Harrison	0.58	Clinton	0.61
Holmes	0.57	Darke	0.59
Jefferson	0.58	Fayette	0.61
Knox	0.58	Greene	0.60
Licking	0.59	Hamilton	0.62
Monroe	0.60	Logan	0.58
Morgan	0.61	Madison	0.59
Muskingum	0.59	Mercer	0.57
Noble	0.60	Miami	0.59
Perry	0.60	Montgomery	0.60
Tuscarawas	0.57	Preble	0.60
Washington	0.61	Shelby	0.58
		Union	0.58
		Warren	0.61
Chillicothe Area			
Adams	0.64	Jackson	0.63
Athens	0.62	Lawrence	0.65
Brown	0.64	Meigs	0.63
Delaware	0.58	Pickaway	0.60
Fairfield	0.60	Pike	0.63
Franklin	0.59	Ross	0.62
Gallia	0.64	Scioto	0.64
Highland	0.62	Vinton	0.62
Hocking	0.61		

TWO STAGE LAGOON/POND (sizing)

First Stage: (MTV + mrV).

Second Stage: The summation of the following:

1. MTV (Based on VS loading at the overflow or estimates of the VS loading from the first stage effluent).

2. Manure volume for storage period.

3. Manure residual volume for design period.

4. Appropriate rainfall and runoff volumes collected by the structure that are in accordance with rule 901:10-2-04(D) of the Administrative Code.