

ORDINANCE NO. 97-01, AS AMENDED BY ORDINANCE 97-02

AN ORDINANCE ESTABLISHING HEALTH REGULATIONS FOR CONCENTRATED ANIMAL FEEDING OPERATIONS; PROVIDING STANDARDS FOR THE PERMITTING OF CONCENTRATED ANIMAL FEEDING OPERATIONS; PROVIDING DEFINITIONS; PROVIDING AN EFFECTIVE DATE; AND PROVIDING FOR SEVERABILITY.

WHEREAS, § 192.300, RSMo, provides that the County Commission may make and promulgate Ordinances as will tend to enhance the public health and prevent the entrance of infectious, contagious, communicable or dangerous diseases into such county; and

WHEREAS, § 192.300, RSMo, provides that the County Commission may establish reasonable fees to pay for any costs incurred in carrying out such Ordinances and that any such fees generated shall be deposited in the county treasury and shall be used to support the public health activities for which they were generated; and

WHEREAS, § 192.300, RSMo, provides that any person, firm, corporation or association which violates any such Ordinance adopted, promulgated and published by the County Commission is guilty of a misdemeanor and shall be prosecuted, tried and fined as otherwise provided by law; and

WHEREAS, the County Commission or County Health Board has full power and authority to initiate the prosecution of any action under § 192.300, RSMO; and

WHEREAS, H.B. No. 1207, 1288, 1408 & 1409 of the Missouri 88th General Assembly, § 640.710.5, RSMo, recognizes that local controls may be used to regulate concentrated animal feeding operations; and

WHEREAS, health standards and criteria for concentrated animal feeding operations consistent with state law have been prepared based upon state law and professional studies presented to and considered by the Linn County Commission; and

WHEREAS, the adoption and enforcement of said standards is hereby found to be necessary in order to enhance the public health and prevent the entrance of infectious, contagious, communicable or dangerous diseases into Linn County;

NOW, THEREFORE, BE IT ORDAINED BY THE BOARD OF COUNTY COMMISSIONERS OF LINN COUNTY, MISSOURI, AS FOLLOWS:

1 DEFINITIONS

Unless the context clearly indicates to the contrary, words used in the present tense include the future tense and words used in the plural include the singular. For purposes of

this Ordinance, the following words, terms and phrases shall have the following meanings unless otherwise indicated:

- 1.1 **ANIMAL UNIT ("AUP")**. A unit of measurement to compare various animal types at a concentrated animal feeding operation. One animal unit equals the following: 1:0 beef feeder or slaughter animal; 0.5 horse; 0.7 dairy cow; 2.5 swine weighing over 55 pounds; 15 swine under 55 pounds; 10 sheep; 30 laying hens; 55 turkeys; 100 broiler chickens or an equivalent animal unit. The total animal units at each operating location shall be determined by adding the animal units for each animal type.
- 1.2 **ANIMAL UNIT EQUIVALENT**. An equivalent animal type and weight that has a similar amount of manure produced as one of the animal unit categories set forth in the definition of "animal unit" herein. This also applies to other animal types which are not specifically listed.
- 1.3 **ANIMAL WASTE**: Any animal excrement, animal carcass, feed waste, animal water waste, or any other waste associated with animals.
- 1.4 **ANIMAL WASTE WATER**: Any animal excreta, any liquid which comes into contact with any manure, litter, bedding or other raw material or intermediate or final material or product used in or resulting from the production of animals or products directly or indirectly used in the operation of a CAFO, or any spillage or overflow from animal watering systems, or any liquid used in washing, cleaning or flushing pens, barns, or manure pits, or any liquid used in washing or spraying to clean animals, or any liquid used for dust control on the premises of a CAFO.
- 1.5 **APPLICATION**: The injection of animal waste or animal waste water into the land.
- 1.6 **CONCENTRATED ANIMAL FEEDING OPERATION ("CAFO")** all land and/or a lot, facility, parcel, or operating location in which animals have been, are or will be stabled or confined and fed or maintained for a total of forty-five (45) days or more in any twelve (12) month period and a ground cover of vegetation is not sustained over at least fifty percent (50%) of the animal confinement area. A "concentrated animal feeding operation" shall not include any land area, structure, lot, yard, or corral or other area which does not meet the numerical threshold for animals as set forth in the classification system of § 2 of this Ordinance. For purposes of this definition, the Concentrated Animal Feeding Operation means and refers collectively to an animal production facility which includes at least one Feedlot, Livestock Lagoon, and a Plant Filter Area. For purposes of this definition, "animal confinement area" includes the buildings or structures, including Feedlots, in which animals are confined, but does not include contiguous land used as plant filter areas over which liquid waste is applied and/or other areas upon

which grass or crops are used for waste disposal, landscaping, or land upon which crops or other vegetation are raised independent from the animal feeding operations. A CAFO does not include a feeding operation that has a capacity of less than three-hundred (300) AU.

- 1.7 CONSTRUCTION PERMIT: A construction permit/letter of approval required of a CAFO by the Missouri Department of Natural Resources pursuant to the Missouri Clean Water Law.
- 1.8 COUNTY HEALTH PERMIT: Written authorization issued by the Linn County Commission to construct, modify or operate a CAFO.
- 1.9 DRY HANDLING WASTE: Manure (urine or feces), litter, bedding, or feedwaste from animal feeding operations.
- 1.10 FEEDLOT: Any land area, structure, lot, yard, or corral or other area, whether enclosed with a roof or unenclosed, wherein livestock are confined in close quarters for the purpose of fattening, feeding, growing, raising, or birthing such livestock for final shipment to market or slaughter. Without limiting the generality of the foregoing definition, a lot or structure which contains three hundred (300) AU's per acre for the foregoing purposes shall be considered a Feedlot. A "Feedlot" does not include unenclosed pasture areas which are used for the raising of crops or other vegetation upon which livestock are allowed to graze or feed.
- 1.11 LAND: Any plot, parcel, lot or other area of land owned or leased by the CAFO to qualify for the capacity of "1 acre per 4 AU" formula for wet handling or "1 acre per 8 AU" formula for dry handling.
- 1.12 LEASE: A written contract for the exclusive use of real property, which contract specifically grants unto the lessee the right to apply animal waste and animal waste water to the leased premises.
- 1.13 LIVESTOCK: Cattle, sheep, swine, poultry, and other animals or fowl, which are being produced primarily for use as food or food products for human consumption.
- 1.14 LIVESTOCK LAGOON: An excavated, diked, or walled area designed for the biological stabilization, treatment and/or storage of liquid wastes generated by a Feedlot.
- 1.15 NUTRIENT APPLICATION LEVELS: The levels of nutrients applied to the Plant Filter Area.

- 1.16 OCCUPIED DWELLING: Any residence, or any church, school or business which has been in use at any time during the 12 month period immediately prior to the date upon which a permit is issued by the Department of Natural Resources for the construction of a CAFO. In regards to "setback" distance cemeteries, conservation areas and public use areas will be treated the same as occupied dwellings.
- 1.17 OPERATING PERMIT: An operating permit and/or letter of approval required of a CAFO by the Missouri Department of Natural Resources pursuant to the Missouri Clean Water Law.
- 1.18 OWNER: Anyone who owns, either individually and/or with any other persons, any of the following interests in the real property upon which a CAFO is situated:
- 1.18.1 Fee simple title,
  - 1.18.2 A leasehold interest,
  - 1.18.3 Any interest in an entity which holds fee simple title; or
  - 1.18.4 Any interest in any entity which has a leasehold interest.
- 1.19 PERSON: Includes natural persons and also includes corporations, partnerships, associations and any other business or charitable entities, including a natural person who has supervisory authority over the operation of a CAFO, whether or not such person is an owner of the CAFO, and a natural person who applies animal waste or animal waste water originating from the CAFO.
- 1.20 PLANT FILTER AREA. Land used or reserved for the application of liquid wastes from a Livestock Lagoon.
- 1.21 POPULATED AREA: An area having at least 10 occupied dwellings not on CAFO property, as measured in a straight line from the occupied dwelling to the nearest CAFO confinement building, confinement lot, or other confinement area, or waste handling facility.
- 1.22 SETBACK: The distance for the CAFO facility to the nearest occupied dwelling not on CAFO property, as measured in a straight line from the occupied dwelling to the nearest CAFO confinement building, confinement lot, other confinement area, or water handling facility.
- 1.23 SLOPE. The vertical drop divided by the horizontal distance of a land area multiplied by one-hundred, and expressed as a percentage.
- 1.24 WET HANDLING WASTEWATER: Water containing waste or contaminated by waste contact, including process-generated and contaminated rainfall runoff.

## 2 CLASSIFICATION OF CONCENTRATED ANIMAL FEEDING OPERATIONS

- 2.1 A Class I CAFO is one that has capacity of 2,000 or more AU.
- 2.2 A Class II CAFO is one that has a capacity of 1,500 to less than 2,000 AU.
- 2.3 A Class III CAFO is one that has a capacity of 1,000 to less than 1,500 AU.
- 2.4 A Class IV CAFO is one that has a capacity of 300 to less than 1,000 AU.

## 3 PERMIT REQUIREMENTS FOR ALL CAFOS

- 3.1 No CAFO shall be constructed, operated, used, or established within Linn County unless a County Health Permit has been issued by the Linn County Commission. To apply for a County Health Permit the proposed CAFO shall submit to the County Commission all of the application materials submitted to the Department of Natural Resources for an operating permit and an application fee as established by the Linn County Commission pursuant to Section 11 of this Ordinance. If the CAFO is issued an Operating Permit and if the proposed CAFO meets the requirements of this Ordinance, then the County Commission shall also issue a County Health Permit. If the proposed CAFO is not subject to regulation by the Missouri Department of Natural Resources ("DNR"), then to apply for a County Health Permit the proposed CAFO shall submit a plan to the County Commission showing the location of the proposed facility, the number of proposed animal units, the proposed method and location of animal waste disposal and the name and address of the owner of the proposed CAFO as well as the name and address of the owner of the land on which the CAFO will be located, if different from the owner of the CAFO. In such case, if the County Commission determines that the proposed CAFO complies in every respect with the terms of this Ordinance, then the County Commission shall issue a County Health Permit.
- 3.2 An application for a County Health Permit shall be submitted to the County Commission for approval. The County Commission may refer the application to the Linn County Health Department for its review and recommendations. The recommendation of the Linn County Health Department may be reported to the County Commission at the public hearing prescribed in Section 3.3 of this Ordinance. The recommendation of the County Health Department may be considered as evidence at such hearing, but shall not be considered binding on the Linn County Commission. [Amended by Ordinance 97-02]
- 3.3 At least one public hearing shall be held by the County Commission before approving any County Health Permit. Such public hearing may be continued from time to time and additional hearings may be held. The receipt and consideration of

evidence at said hearings shall comply with the requirements of § 536.070, RSMo.

- 3.4 Once a CAFO has received a County Health Permit, the CAFO must apply for a renewal of said permit each calendar year. All applications for renewal permits shall be submitted, along with the applicable renewal fee, at least thirty (30) days prior to the anniversary date of the issuance of the initial County Health Permit. If the County Commission determines that the CAFO has complied in all respects with the permit previously issued, then the County Commission may issue the renewal permit. Otherwise, the County Commission shall not issue a renewal permit and the CAFO immediately shall cease operation.
- 3.5 It shall be a violation of this Ordinance and unlawful for any person to operate a CAFO without first obtaining a County Health Permit from the County Commission.
- 3.6 It shall be a violation of this Ordinance and unlawful for any person to operate a CAFO with a number of Animal Units in excess of the number specified in the permit issued by the County Commission.
- 3.7 It shall be a violation of this Ordinance and unlawful for any person to apply animal waste or animal waste water in a manner inconsistent with the requirements of this Ordinance.

4 RULES APPLICABLE TO ALL CAFOS

Prior to issuance of a County Health Permit, the County Commission shall make findings of fact and conclusions of law as to the following:

- 4.1 The proposed CAFO shall be in compliance with the provisions of Sections 4 through 7 of this Ordinance, as applicable.
- 4.2 All Livestock Feedlots and Livestock Lagoons shall be designed in such a manner as to avoid the degradation the quality of surface or subsurface waters, water courses or other bodies of water.
- 4.3 All Livestock Feedlots and Livestock Lagoons shall be designed in such a manner as to avoid the degradation of air quality. In no event shall the concentration of gases at the boundary of the land resulting from the operation of a Livestock Lagoon or Livestock Feedlot exceed the following levels:

Gas	Maximum Allowable Concentration <sup>1</sup>	Exposure Period <sup>2</sup>
Carbon Dioxide (CO <sub>2</sub> )	5000	not applicable
Ammonia (NH <sub>3</sub> )	5	not applicable
Hydrogen Sulfide (H <sub>2</sub> S)	10	2 hours
Methane (CH <sub>4</sub> )	1000	not applicable
Carbon Monoxide (CO)	50	One hour

<sup>1</sup> In parts of pure gas per million parts of atmospheric air.  
<sup>2</sup> The time during which the effects of the noxious gas are felt by an adult human or a 150-pound livestock.

- 4.4 The applicant shall demonstrate that the soils on the premises, including an soil-plant filter area, are suitable for and compatible with the proposed Livestock Feedlot operations with respect to the location of Livestock Lagoons and the application of liquid, slurry or solid animal waste onto or into the soil on the premises. Further, no animal waste from a Livestock Lagoon shall be applied when soils are water saturated, frozen, or covered with snow, or when other soil conditions would result in waste runoff.
- 4.5 The Livestock Feedlot or Livestock Lagoon shall demonstrate that it shall at all times be operated in compliance with any required local, state or federal permits, licenses or other approvals, and in compliance with all applicable state and local laws and regulations.
- 4.6 The CAFO shall own or lease one acre of land for each 4 AU of capacity for wet handling systems or must own or lease one acre for each 8 AU of capacity for a dry waste handling system as specified in the County Health Permit. The land must be in a contiguous tract for all wet handling systems. The Nutrient Application Levels for the CAFO shall comply with Appendix A hereto, which Appendix A is hereby incorporated by reference as if set forth in its entirety herein.
- 4.7 Animal waste and animal waste water shall not be applied to land with a slope greater than 10%.
- 4.8 Animal waste water injected or knifed into the soil shall not be applied within one-thousand (1,000) feet of an occupied dwelling which existed prior to the date the CAFO is constructed. Dry animal waste shall not be applied within five-hundred (500) feet of an occupied dwelling which existed prior to the date the CAFO is constructed. This rule shall not apply to occupied dwellings owned by the CAFO.

The owner of an occupied dwelling may apply for a variance from this rule as part of the application for a County Health Permit.

- 4.9 Animal waste and animal waste water shall not be applied within one-thousand (1,000) feet of any sink hole or well or spring or other water supply or one-hundred (100) feet from any stream (including intermittent streams) or strip pits. This rule shall not apply to waste lagoons on the CAFO property, but shall apply to all other wells, water supplies, streams, ponds, strip pits, lakes, springs and sink holes on the CAFO property.
- 4.10 No County Health Permit shall be issued for a livestock and/or poultry manure storage system or other system of manure storage that is of like and similar nature that prevents feedlot runoff unless such manure storage system is in compliance with all Missouri Department of Natural Resources ("DNR") regulations for the control of wastes from livestock feedlots, poultry lots and other animal lots and said manure storage system has obtained a permit from DNR, if necessary, for the pollution control devices to be installed. Such manure storage systems shall be located at least two-thousand (2,000) feet from an existing residence.

## 5 SETBACK REQUIREMENTS

- 5.1 No CAFO shall be located within one mile of any Class I CAFO and no Class I CAFO will be located within one mile of any other CAFO. No Class II, III or IV CAFO shall be located within three-fourths (3/4) mile of any Class II CAFO. No Class III or IV CAFO shall be located within one-half (1/2) mile of any Class III CAFO. No Class IV CAFO shall be located within one-fourth (1/4) mile of any Class IV CAFO. This distance shall be measured from the nearest point of one CAFO's confinement or waste containment system to the nearest point of another CAFO's confinement or waste containment system.



Setback Distances	Class I	Class II	Class III	Class IV
Class I	1 mile	1 mile	1 mile	1 mile
Class II	1 mile	3/4 mile	3/4 mile	3/4 mile
Class III	1 mile	3/4 mile	1/2 mile	1/2 mile
Class IV	1 mile	3/4 mile	1/2 mile	1/4 mile

5.2 No Class IV CAFO shall be located within 1,000 feet of an occupied dwelling. No Class III CAFO shall be located within one-fourth mile of an occupied dwelling. No Class II CAFO shall be located within one-half mile of an occupied dwelling. No Class I CAFO shall be located within three-fourths of a mile of an occupied dwelling, and this setback requirement shall increase by one-fourth of a mile for each 500 AU (or fractional portion thereof) of capacity in excess of 2,000 AU. This rule shall not apply to occupied dwellings owned by the CAFO or to dwellings not in existence at the time of issuance of the County Health Permit.

Size of Concentrated Animal Feeding Operation	Minimum Distances From Occupied Dwellings
CLASS I	3/4 mile
CLASS II	1/2 mile
CLASS III	1/4 mile
CLASS IV	1,000 feet

No Class I CAFO shall be located within two miles of a populated area. This setback shall increase one-fourth (1/4) mile for each 500 AU (or fractional portion thereof) of authorized capacity in excess of 2,000 AU.

6 FINANCIAL SECURITY

- 6.1 No health permit shall be issued unless adequate security has been furnished to ensure proper cleanup and disposal as required by sections 6.2 and 6.3 hereto.
- 6.2 A cash or surety bond shall be furnished to the Linn County Treasurer for any manure storage system. A manure storage system may include one or more lagoons at any single CAFO. If the bond is a surety bond, the surety shall be

approved by the County Commission and found to be of reputable character and financially sound with respect to the obligation incurred. The bond shall be furnished before construction and during the operating period. The bond shall remain with the County Treasurer until the operator has complied with all Federal, State and Local laws in operation of the facility and until the prompt clean up and proper disposal of any waste improperly handled or disposed of at the facility and restoration of the premises upon which the facility is operated. If a cash bond is posted, all interest earned thereon shall become part of the bond subject to terms and conditions, including the condition of release. The County Commission shall give approval before release of the bond.

6.3 The case or surety bond schedule is as follows:

6.3.1	Class III	-	\$30,000.00
6.3.2	Class II	-	\$50,000.00
6.3.3	Class I	-	\$70,000.00 and \$20,000.00 for each additional 500 AU over the 2,000 AU

7 VARIANCE TO SETBACK RULES

Where, due to an extraordinary or exceptional situation or condition of a specific piece of property, the strict application of this Ordinance would result in peculiar and exceptional difficulties to, or an exceptional and demonstrable undue hardship upon, the owner of the property as an unreasonable deprivation of use as distinguished from the mere grant of a privilege, the County Commission may authorize, as part of the application for a County Health Permit, a variance from the strict application so as to relieve said demonstrable difficulties or hardships, provided the relief can be granted without substantial detriment to the public good and without substantially impairing the intent, purpose, and integrity of the regulations, standards and criteria established in this Ordinance.

8 APPLICATION OF ORDINANCE

A CAFO in existence at the time of the enactment of this Ordinance is exempt from its terms and conditions; provided, however, that before a CAFO in existence at the time of the enactment of this Ordinance may expand or change its operation in terms of a change of classification or amount or manner in which animal waste or animal waste water is applied or disposed of, the CAFO shall be in compliance with this Ordinance in every respect and shall obtain a new County Health Permit.

9 DISPOSAL OF DEAD ANIMALS AND AFTER BIRTHING MATERIAL

The proper disposal of dead animals and after birthing material shall be completed within twenty-four (24) hours from the time of occurrence.

10 ADMINISTRATIVE FEES

10.1 No application for approval of a County Health Permit shall be accepted until the applicant has paid all processing fees as set forth below. Fees paid shall be non-refundable except as provided in Section 11.4 below.

10.2 The fee amount shall not exceed the amount needed to recover the cost of inspection, investigation and review of the proposed application, which fee amounts are based upon the anticipated costs of review, inspection and investigation, and which fee amounts have taken into consideration the need for special investigative services including geologic inspections, hydrologic inspections, groundwater monitoring, soils evaluation, and other unique costs of a scientific or technical nature associated with the processing of the application. For purposes of this Ordinance, the administrative fee amounts shall be as follows:

Classification of CAFO	Fee
Class I	\$10,000
Class II	\$5,000
Class III	\$1,000
Class IV	\$1,000

10.3 There shall be established with the County Treasurer an escrow fund, for each application for a County Health Permit, for the purposes of reimbursing the County Commission and the County Board of Health for services rendered in connection with administration of this Ordinance. Said escrow account shall include the proceeds of project review fees established pursuant to this Section. The funds contained in said escrow account shall be used solely to reimburse the County Commission or County Board of Health for actual costs associated with administration of this Ordinance, for actual services rendered for investigation, administration and processing of a County Health Permit including costs associated with the retaining and compensation of experts on scientific and technical issues associated with the application, and costs associated with public hearings. The County Treasurer shall disburse payments based upon billings supplied by the County Commission or the County Board of Health and approved by the County Commission.

10.4 The applicant for a County Health Permit may apply to the County Commission for a credit against the fee previously paid in the event that a portion of the costs of review and processing is duplicative, pursuant to the standards of applicable case law or statutes then in effect. After the approval, conditional approval or

denial of a county health permit, the County Treasurer shall refund to the applicant any unexpended or unencumbered balance of the escrow account established pursuant to this Section for said application.

11 VIOLATION OF ORDINANCE

Any person violating this Ordinance shall be subject to punishment by imprisonment or fine as provided by law. Each day a person operates a CAFO in violation of this Ordinance, and each time a person applies animal waste or animal waste water in a manner inconsistent with the requirements of this Ordinance, shall be considered a separate offense.

12 SEVERABILITY

The chapters, sections, paragraphs, sentences, clauses, and phrases of this ordinance are severable, and if any phrase, clause, sentence, paragraph, or section of this ordinance shall be declared unconstitutional or otherwise invalid by the valid judgment or decree of any Court of competent jurisdictions, such unconstitutionality or invalidity shall not affect any of the remaining phrases, clauses, sentences, paragraphs, or sections of this ordinance since the same would have been enacted by the Board of County Commissioners without the incorporation in this ordinance of any such unconstitutional or invalid phrase, clause, sentence, paragraph, or section.

13 REPEAL OF ORDINANCES NOT TO AFFECT LIABILITIES, ETC.

Whenever any part of this ordinance shall be repealed or modified, either expressly or by implication, by a subsequent ordinance, that part of the ordinance thus repealed or modified shall continue in force until the subsequent ordinance repealing or modifying the ordinance shall go into effect unless therein otherwise expressly provided; but no suit, prosecution, proceeding, right, fine or penalty instituted, created, given, secured or accrued under this ordinance previous to its repeal shall not be affected, released, or discharged but may be prosecuted, enjoined, and recovered as fully as if this ordinance or provisions had continued in force, unless it shall be therein otherwise expressly provided.

14 EFFECTIVE DATE

This Ordinance shall be in full force and effect from and after its passage by the Board of County Commissioners, except as provided above.

## APPENDIX "A"

### PLANT AVAILABLE NITROGEN (PAN) APPROACH FOR ANIMAL FEEDING OPERATIONS

#### INTRODUCTION

The Department of Natural Resources recommends using a "Plant Available Nitrogen" (PAN) approach to determine the nitrogen application rates for animal manure and wastewaters. Other cookbook methods, such as the "Conservative" and "Intensive" management approaches are based on average textbook numbers. The actual nitrogen content of any individual operation may vary significantly from the textbook average numbers; thus, actual testing results from each operation should be used.

#### PLANT AVAILABLE NITROGEN APPROACH

The PAN method uses actual on-site testing results as a basis to develop and implement a specific land application plan that is tailored to each individual operation. The land application rates are based on the amount of nitrogen that will be available for crop uptake during the growing season. This requires testing applied wastes and soils; predicting and recording crop yields; and calculating nitrogen removal for each specific operation. Predicted nitrogen volatilization, denitrification and mineralization rates are used to determine the plant available nitrogen. Thus, the organic wastes from the animal feeding operations are utilized as a "nutrient resource." The recommended nitrogen availability rates for the Pan approach are shown below. Alternative nitrogen availability rates on a site-specific basis may be considered by the department upon submittal of adequate documentation. See Reference #1 and #3.

PAN Formula:  $wPAN = CNR - sPAN$

CNR = pounds per acre of nitrogen utilized by harvested crop:  
 $[(\text{crop yield unit/acre}) \times (\text{lbs N/yard unit}) \times (\% \text{ crop removal})]$

sPAN = soil PAN in pounds per acre:  
 $[(\% \text{ organic matter in soil}) \times (\text{OR rate})]$

OR = nitrogen availability rate for soil organic matter based on soil CEC and crop season (See Reference #2 and #5):

Summer crops: 10 for CEC  $\geq$  18; 20 for CEC 10-18; 40 for CEC  $\leq$  10.

Winter crops: 5 for CEC  $\geq$  18; 10 for CEC 10-18; 20 for CEC  $\leq$  10.

wPAN = wastewater PAN application rate in pounds per acre:  
 $[(\text{TKN-ammonia N}) \times \text{MR}] + [(\text{ammonia N}) \times \text{VR}] \times [(\text{nitrate N}) \times .9]$

MR = nitrogen availability rate for mineralization: Mineralization of organic nitrogen in animal manure is slowly raised over the first five years but reaches a constant by the fifth year when animal wastes are added every year. See Reference #3.

Waste Type	Year 1	Year 2	Year 3	Year 4	Year 5+
Lagoons: all animal types	.35	.53	.62	.66	.70
Poultry: slurry/dry litter	.60	.70	.75	.80	.85

VR = nitrogen availability rate for volatilization + denitrification: Ammonia nitrogen availability varies depending on weather conditions and application method. Department recommends factors (See Reference #3):

VR = .60 for sprinkler irrigation or surface application, and  
 VR = .90 for surface application followed by incorporation.

#### CROP YIELDS:

Crop yields should be based on actual measured yields for each field. Crop uptake of nitrogen should be based on nitrogen uptake per actual unit (ton or bushel) of crop removed from the field. Annual crop nitrogen rates for pasture land and for land in the USDA Conservation Reserve Program (CRP) should not exceed a PAN of 65 pounds/acre/year. See Reference #2 and #5.

#### SOIL TESTING:

Soil testing should be conducted in the spring of each year as near as possible to the start of water application for the year. Soil PAN (sPAN) is predicted based on soil testing for percent (%) Organic Matter times the nitrogen availability factor. This method predicts nitrogen availability from plant residues but does not predict original matter added by animal wastes. New predictive methods such as the pre-sidodress soil nitrate test (PSNT) may also be considered.

#### MANURE AND WASTEWATER TESTING:

Material to be land applied should be tested for Nitrogen as follows:

Total Kjeldahl Nitrogen (TKN) as N;  
 Ammonia Nitrogen (NH<sub>3</sub>) as N; and  
 Nitrate/Nitrite Nitrogen (NO<sub>3</sub>/NO<sub>2</sub>) as N.

Wastewater, sludge and biosolids should be sampled and tested separately if each is to be land applied. Anaerobic lagoon wastewater samples must be collected at lagoon depths and locations which represent the range of lagoon water levels to be removed. Samples should be collected at the same relative depth as the irrigation pump intake level. If a lagoon is to be stirred or mixed to facilitate removal, the sample should be collected immediately after stirring and again near the completion of pumping.

Plant Available Nitrogen from applied wastes (wPAN) should be based on testing as near as possible to when wastes will be land applied. Testing should be conducted once every two to three months during land application periods. Nitrogen content may vary significantly throughout the year due to differences in moisture content, animal diet, stocking rates, rainfall amounts, temperature, and other factors. For example the nitrogen content in a swine lagoon varies by as much as 30 percent depending upon the season of the year. See Reference #4, Table 37.

#### NUTRIENT MANAGEMENT PLAN

Nitrogen is only one of the nutrient factors that should be considered when developing a nutrient management plan for each field. Contact the Natural Resources Conservation Service (NRCS) concerning how to develop a complete Nutrient Management Plan. See Reference #5.

#### REFERENCES:

1. Agricultural Waste Management Field Handbook, USDA, Natural Resources Conservation Service (NRCS), April 1992.
2. Soil Test Interpretations and Recommendations Handbook, University of Missouri Department of Agronomy, December 1992.
3. Livestock Waste Facilities Handbook, MWPS-18, Midwest Plan Service, Iowa State University, Ames, Iowa, Second Edition, 1985.

- 4. Missouri Approach to Animal Waste Management, Manual 115, University of Missouri Extension, 1979.
- 5. Nutrient Management, Missouri Conservation Practice Standard 590, USDA, Natural Resources conservation Service (NRCS), July 1993.

DEPARTMENT CONTACT FOR QUESTIONS ARE:

If you have any questions regarding this publication, please contact Frank Miller or Ken Arnold at (573) 751-1300.

This information was revised January 23, 1997 by the Missouri Department of Natural Resources, Water Pollution Control Program, P.O. Box 176, Jefferson City, MO 65102.