Illinois EPA

Subtitle E Agriculture Related Pollution Rule Revisions

Technical Support Document

Part 501—General Provisions

Unless specified otherwise in the Part, Part 501 applies to all livestock facilities regardless of whether they must obtain an NPDES permit. While many of the sections in Part 501 were left unchanged, the proposed revisions are intended to meet the federal rule requirements and clarify provisions adopted under 40 CFR Part 122 that affect all livestock operations. In addition, the Illlinois EPA are proposing a place-holder for additional regulations that could be based on currently proposed federal regulations regarding registration of concentrated animal feeding operations (CAFOs).

Definitions

In order to be consistent with the federal CAFO regulation regarding the terms "man-made" and "man-made ditch", the Illinois EPA is modifying Sections 501.305 and 501.310. The definition of Man-made in Section 501.305 is modified to remove the need for the Illinois EPA to determine the original use for the structures from the definition of man-made. USEPA guidance (page 3-8, 2003) states "Man-made device means a conveyance constructed by humans through which manure, litter, or process wastewater is transported. Man-made device includes, among other things, pipes, ditches and channels. If human action was involved in creation of the conveyance, it is man-made even if natural materials were used to form the conveyance."

Also, the definition of Man-made Ditch in proposed Section 501.310 is modified to remove the need for the Illinois EPA to determine the original use of the structure from the definition and to eliminate the exclusion of vegetative filters and disposal areas from the definition of Man-made Ditch.

ATTACHMENT
A

The Permit Applicability Determination

One of the most important requirements for all livestock facilities is to determine which rules in Subtitle E apply to their operation. The Illinois EPA proposes in Section 501.401 a requirement consistent with the federal rule that places this obligation on the owner or operator of the facility. This obligation is shared by the Illinois EPA as the administrator of the NPDES permit program in Illinois. The obligation on the facility owner or operator is to determine if his or her operation performs so as to discharge and therefore needs an NPDES permit. The owner and operator are required in this proposed section to make a site specific determination as to permit applicability. The federal preamble requires the owner and operator to make a case-by-case evaluation "as to whether the CAFO discharges… from its production areas or land application area based on the actual design, construction, operation and maintenance." (73 FR 70423) In making this determination, additional factors that may be or have been present, such as a past discharge or the occurrence of a sporadic discharge, should be considered by the owner and operator in making the site specific determination, and are specifically noted in the preamble to the federal rule (73 FR 70423).

Handling and Storage of Livestock Waste

The Illinois EPA proposes to clarify the prohibition on causing water quality violations from discharges from overflows and runoff from livestock waste management facilities and livestock waste-handling facilities, in Section 501.404(a). The Illinois EPA also proposes that the requirements for temporary manure stacks in Section 501.404(b), commonly used by farmers to store manure on the fields until conditions are favorable for manure application, be clearly specified. The proposal requires that the use of these temporary stacks conform to the groundwater protection requirements in the Environmental Protection Act, and that surface water protection must be afforded by the CAFO owner and operator. The use of temporary stacks is essential where the manure is available at a time when it cannot immediately be applied to the field. Temporary stacking also allows for more efficient use of manpower and equipment to move and store manure at certain times of the year.

The manure runoff from these temporary manure stacks has the potential to reach groundwater or streams, lakes, or other waters of the State. To help protect water quality, these manure stacks are subject to the handling and storage requirements of Section 501.404. These requirements

apply to all livestock management or livestock waste handling facilities, including CAFOs. To protect surface and groundwater, the existing requirement is that these manure stacks are constructed and maintained so that runoff and leachate do not enter surface or ground waters. In some cases, such as during heavy rainfall events or due to the proximity of these manure stacks to surface and groundwater, the existing requirement alone will be inadequate to protect these waters.

Therefore, the Illinois EPA is adding another requirement in Section 501.404 to address threats to ground and surface waters from such cases. By adding a cover to the temporary manure stack, the stormwater coming in contact with the manure will be reduced or eliminated, which in turn will minimize the livestock waste getting into surface waters. Similarly, adding a requirement to provide a pad under these temporary manure stacks will minimize or eliminate leachate reaching groundwaters. The floor of manure stacks should be constructed of compacted clay, concrete or other material with low permeability, designed to minimize the movement of leachate into groundwaters. The Agency recognizes that there could be other controls that might exist for a given site that accomplish the same objectives of minimizing the threat to surface and ground waters.

Runoff Field Application Systems

The Illinois EPA is also proposing a clarification for those facilities that use or choose to use runoff field application systems under Section 501.404(d). The modification clarifies that the option of using runoff field application systems is available only to facilities that are not CAFOs under Part 502 of the rules. In other words, large or medium CAFOs or facilities designated as CAFOs under proposed Section 502.106 cannot use this option as these CAFOs are subject to the Part 502 requirements. By modifying this subsection, the Agency is also ensuring that Illinois CAFOs are subject to handling and storage requirements that are consistent with federal CAFO regulations.

Field Application of Livestock Waste

The Illinois EPA is also proposing to modify the existing requirements related to field application of livestock waste in Section 501.405(a) to clearly indicate that these criteria do not apply to facilities that are required to obtain a CAFO NPDES permit. Permitted CAFOs must

follow the land application requirements specified in Subpart F of Part 502. Only when permitted CAFOs land apply livestock waste consistent with the requirements of Subpart F can they claim that discharges from the land application area qualify for the exemption provided for agricultural stormwater.

Large Unpermitted CAFOs

Section 501.405(a) is also modified to provide clarity as to the applicable requirements on large unpermitted CAFOs. In order for large unpermitted CAFOs to claim an agricultural stormwater discharge exemption, these facilities must comply with several requirements that are also applicable to large permitted CAFOs. Under the federal CAFO rule, large unpermitted CAFOs must develop site specific nutrient management practices that encourage appropriate agricultural use of nutrients in the livestock waste as proposed in Section 502.102(b). This requirement ensures that nutrient levels in the applied livestock waste are not in excessive levels for crop uptake. Without such requirement, nutrient levels in the applied livestock waste that are more than the agronomic crop need can lead to accumulation of nutrients in soils. These excessive levels of nutrients increase the threat of water pollution as they can, under severe weather conditions, contribute pollutants to runoff from fields into streams, lakes and other surface waters.

Under the proposed rule, large unpermitted CAFOs also must develop the nutrient management plan consistent with the requirements of proposed Section 502.510(b). Given the size of these facilities, and thus the potential threat to surface waters from these facilities, the Agency believes it is prudent for large unpermitted facilities to follow the same nutrient management plan requirements in proposed Section 502.510(b) which are also applicable to permitted facilities. The Agency notes that the federal rule at 40 CFR 122.23(e)(1) and (2) requires the land application practices for unpermitted large CAFOs and permitted CAFOs. In other words, to minimize the threat of pollution from large unpermitted facilities, the Agency proposes these facilities develop the controls and best management practices listed in proposed Section 502.510(b)(2) through (14) that permitted facilities are required to apply. This modification also provides large unpermitted facilities clear criteria if they later claim that a discharge from a land

application area was an agricultural stormwater discharge, and consequently exempt from the Clean Water Act.

Proposed Section 502.510(b)(2) requires the NMP for all large unpermitted CAFOs and permitted CAFOs to specify and demonstrate adequate land application area for livestock waste application. Large unpermitted CAFOs must not discharge livestock waste from the production area. Permitted CAFOs must not discharge from the production area except under conditions specified in their permit. Large unpermitted CAFOs and permitted CAFOs must have a means to handle livestock waste, remove accumulated waste from the production area and prevent discharge of livestock waste from the production area. By having adequate land application areas, large unpermitted CAFOs and permitted CAFOs provide a means to properly handle livestock waste.

Large unpermitted CAFOs and permitted CAFOs claiming the agricultural stormwater exemption under 40 CFR 122.23(e) and proposed Section 502.102 must meet federal regulations at 40 CFR 122.42(e)(1)(viii) for the land application area by ensuring appropriate agricultural utilization of the nutrients in the livestock waste. Not having adequate land application area may cause the CAFO to discharge and not meet 40 CFR 122.23(e).

Proposed Section 502.510(b)(3) requires the NMP to specify and demonstrate adequate storage of livestock waste, including procedures to ensure proper operation and maintenance of the storage facilities. Unpermitted large CAFOs and permitted CAFOs must have adequate storage and provide proper operation and maintenance of the facility to prevent discharges. The federal regulations at 40 CFR 122.23 require an NPDES permit for any discharge from the CAFO. Since the land application operations are tied directly to proper operation and maintenance of the livestock waste storage facilities, the Illinois EPA is proposing that large unpermitted CAFOs and permitted CAFOs that would potentially claim an agricultural stormwater exemption must demonstrate the adequacy of their operation and maintenance of the storage facilities, and maintain records that demonstrate the basis for the exemption claimed. Adequate storage provides the CAFO with a means to ensure appropriate agricultural utilization, in accordance

with proposed Section 502.102 and helps meet federal CAFO regulations at 40 CFR 122.42(e)(1)(viii).

Part 502—Permits

This Part of the proposed regulations applies to livestock facilities that must obtain an NPDES permit. However, there are certain sections of Part 502 that also apply to unpermitted large CAFOs. As discussed in the introduction, many of the requirements in the federal rule were specified while others were left to the state authority to develop. For example, the classification of large, medium and small CAFOs, as shown in Section 502.103 through 502.106, were revised in the 2003 federal rule. The Illinois EPA is not proposing to revise those classifications further and are simply proposing in this rulemaking that these specific provisions of the federal rule be adopted by the Illinois Pollution Control Board. In the same federal CAFO rule, states are required to adopt technical standards for permitted CAFO. USEPA granted the states latitude to develop technical standards, procedures and criteria for a number of provisions, including what is required within the NMP and how the NMP becomes part of the permit. The Illinois EPA has included these state technical standards in Part 502.

In describing the current proposal in Part 502, the Illinois EPA will address the permit application requirement for all permit applications, including general permits, and will then focus on the elements in the NMP requirements and the winter land application provisions.

Permit Application Requirements

Proposed Section 502.201(a)(7) requires that the CAFO owner provide a map of the CAFO area showing surface and subsurface water features. This is similar to the federal rule which requires, in 40 CFR 122.21(i), specific information regarding the CAFO. Specifically, 40 CFR 122.21(i)(1)(x) and 122.42(e)(5) require the land application area under control of the CAFO to be identified in the NMP which must be submitted as part of the permit application. In this proposal the Illinois EPA is asking that the map also show these drainage features.

Proposed Section 502.201(a)(12) is added to require the submission of a stormwater pollution prevention plan in the submittal of a permit application for the CAFO NPDES permit. The CAFO NPDES permit requirement applies to all CAFOs that discharge. CAFOs subject to the new source performance standards in 40 CFR 412 are subject to NPDES stormwater permitting requirements in accordance with 40 CFR 122.26(b)(14)(ii). Including the requirement for a stormwater pollution prevention plan in the application will satisfy stormwater permitting requirements for CAFO facilities that are required to obtain a CAFO NPDES permit. Proper stormwater management of locations outside the production area of the CAFO where raw materials, final products, waste materials and intermediate products may be handled or transported is an important component to protect surface water quality from CAFOs. Mishandling these materials and transportation spills at a CAFO or AFO can result in discharges that could harm water quality and aquatic life.

General Permits

All CAFOs seeking to be permitted must provide an NMP consistent with the requirements in Subpart E of Part 502. The procedure for the Illinois EPA to properly process applications for coverage under CAFO NPDES permits is described in proposed Section 502.310. That section specifies: (1) the obligations of the applicant to provide information consistent with proposed Section 502.201 and Subpart E, (2) the opportunity for the Illinois EPA to request additional information to fulfill the data required in those sections of this proposal, (3) the process and time frame by which a public notice of a complete application is issued by the Illinois EPA, (4) under what circumstance and obligations the Illinois EPA may hold a public hearing and so advise the public of the hearing and its finding at the conclusion of the hearing procedure, and (5) when the terms of the NMP become part of the permit if issued by the Illinois EPA.

The Agency expects most CAFOs to be covered by general permits. The procedures for general permitting of CAFOs outlined in proposed Section 502.310 allow the Agency to utilize its limited resources efficiently as well as provide the public a full opportunity to comment on the development, revision, and enforcement of the nutrient management plans.

The proposed Section 502.310 closely mirrors the federal requirements in 40 CFR 122.23(h). To satisfy the mandates of the federal rule, the Agency will publish the complete application and NMP, which includes terms of the NMP, on its website. The Agency believes publishing these

documents on its website is a sound way to provide public notification and keep the necessary flexibility in general permits. Unlike the federal rule, the Agency's proposal does not separate the draft terms of the nutrient management plan from the NMP in the public notice. The Agency believes providing the complete NMP, rather than separating and publishing only limited terms of the NMP, is a complete way of providing public notice. This public notice approach provides the public with the context that is necessary for a meaningful public review. It also simplifies the process of accessing necessary information for the public yet accomplishes the same objectives intended by the federal rule, which is to provide the public the opportunity to comment on the adequacy of the NMP and on the nutrient management terms of the draft permit developed for a specific CAFO facility.

The Agency also must provide the public an opportunity to review the permit application and NMP under the general permit, submit comments, and request a hearing. The proposed rule provides for a 30-day timeframe to comment as well as request a formal hearing. The Agency believes 30 days is appropriate in this case, as review of complex and detailed NMPs can be time consuming. This approach is consistent with the existing NPDES regulations in Subtitle C Part 309, which recognize the varying complexity involved with individual permits, and thus allows the public a timeframe of 30 days to comment and request a public hearing.

After the close of the comment period, once the Agency makes its final decision to authorize coverage under the general permit, the owner or operator will be informed of this decision via a cover letter and a copy of the general permit. This authorization will also indicate that the terms of the nutrient management plan have been incorporated as terms and conditions of the permit for that CAFO. To inform the public that coverage has been authorized to the owner or operator of the CAFO, the Agency will publish the final version of the NMP on its website.

Annual Report Requirement

The federal CAFO rule requires a detailed annual report from the CAFO owner in 40 CFR 122.42(e)(4), many of whose elements the Illinois EPA proposes in Section 502.325. Also, 40 CFR 122.41(l)(7) requires reporting of non-compliance at least once per year. In addition to the elements required under the federal CAFO rule, the Illinois EPA is requiring the reporting of instances of noncompliance with the NPDES permit in the annual report, as proposed in Section 502.325(b)(8). While instances of noncompliance may have been reported at the time to the

Agency, including a summation of all noncompliance in the annual report assists the Agency in determining the need for inspection and enforcement, and is a factor in the Agency's review for the renewal of the NPDES permit for the facility.

Developing and Implementing Nutrient Management Plans

Subpart E applies to CAFOs required to obtain a permit and specifies the requirements of the NMP, including in proposed Section 502.500(b) a link between Subpart E and applicable sections in Subparts F, G and H, which the Illinois EPAwill discuss later in this document. The components of an NMP are described in proposed Sections 502.505, 502.510 and 505.515.

A complete NMP must contain the location of application fields, features of the fields and nearby areas that may have setbacks[i], other restrictions regarding land application and best management practices (BMPs) required by these regulations, as proposed in Section 502.505(g). The federal CAFO rule requires the identification and setbacks for each land application field. The federal rule also requires the identification of site specific conservation practices (40 CFR 122.42 (e)(1)(vi)). The Livestock Management Facilities Act (LMFA) regulations have a similar requirement under 8 Ill. Adm. Code 900.803(f). USDA—Natural Resources Conservation Service 590 and 633 standards for Illinois require aerial maps or soil maps of land application sites as well as a depiction of setbacks or other restrictions. The Illinois EPA proposes similar requirements already part of a livestock producer's plan when they participate or must comply with USDA -NRCS programs or LMFA regulations.

Proposed Section 502.510(b)(4) requires that the NMP specify and demonstrate proper management of mortalities to ensure against improper disposal in liquid livestock systems, stormwater storage systems or treatment systems, unless those systems are specifically designed to treat animal mortalities. Unpermitted large CAFOs and permitted CAFOs must have adequate mortality management facilities to prevent discharges from the CAFO. Land application of improperly managed mortalities from a CAFO may not meet the provisions of federal regulations at 40 CFR 122.42(e)(1)(viii) regarding the agricultural utilization of nutrients. In addition, improper management of mortalities may result in improper land application of mortalities in a manner inconsistent with the Illinois Dead Animal Disposal Act administered by the Illinois Department of Agriculture.

Proposed Section 510(b)(5) requires that the NMP specify and demonstrate that clean water is diverted, as appropriate, from the production area. The federal regulations at 40 CFR 122.23 require an NPDES permit for any discharge from a CAFO. By accounting for and diverting clean water from the CAFO production area, unpermitted large CAFOs and permitted CAFOs reduce the likelihood of discharge. The federal regulations at 40 CFR 122.23(e) and 122.42(e)(1)(viii) requires nutrient management practices that ensure the agricultural utilization of nutrients to claim the agricultural stormwater exemption. Reducing the volume and minimizing dilution of livestock waste produced by the CAFO reduces the risk of runoff of livestock waste from the land application area. In cases where it is appropriate to divert clean water from the production area but no attempts were made to divert such water by the CAFO owner, unpermitted large CAFOs and permitted CAFOs that might land apply unplanned large volumes of livestock waste may not be fully justifiable in claiming the agricultural stormwater exemption.

Proposed Section 502.510(b)(6) requires the CAFO owner to specify and demonstrate prevention of direct contact of confined animals with waters of the State. Such a discharge would be prohibited without benefit of permit since the federal regulations at 40 CFR 122.23 require an NPDES permit for any discharges from the CAFO production area. Unpermitted large CAFOs and permitted CAFOs must prevent the confined animals in the CAFO production area from coming into contact with waters of the United States to prevent such discharges from the CAFO. An unpermitted large CAFO or permitted CAFO that does not plan to meet or cannot meet this provision, upon revising its production area practices to conform with the federal CAFO regulations by relocating animals or its production area, may find it needs more land application area to provide appropriate agricultural utilization of nutrients. In further support of this proposal, the Illinois EPA notes that the federal regulations at 40 CFR 122.23(e) and 40 CFR 122.42(e)(1)(viii) require unpermitted large CAFOs to have practices that ensure agricultural utilization of nutrients to claim the agricultural stormwater exemption under 40 CFR 122.23(e) and proposed Section 502.102.

Proposed Sections 502.510(b)(7) and 502.610(h) require that chemicals and other contaminants handled on-site are not disposed of in any livestock waste or stormwater storage or treatment system unless specifically designed to treat such chemicals and other contaminants. Unpermitted

large CAFOs must have adequate practices to handle these chemicals and other contaminants to prevent discharges from the CAFO. Improperly handling or disposing of chemicals from an unpermitted large CAFO and permitted CAFO may interfere with proper operation of the CAFO livestock waste storage structures by upsetting biological activity in lagoons and other storage structures. Livestock wastes contaminated with chemicals and other contaminants, such as pesticides and other toxic materials, may not be suitable for land application due to potential crop damage. Harm to aquatic life due to runoff of these toxic materials to surface waters from land application areas may occur. Including these requirements in the NMP for unpermitted large CAFOs prevents the improper land application of chemicals and other contaminants from a CAFO when discharge of these pollutants from the CAFO would require an NPDES permit.

Proposed Section 502.510(b)(9) requires that the NMP contain protocols for testing livestock waste and soil. The Illinois EPA proposes the same livestock waste and soil testing requirement for all permitted and unpermitted CAFOs. The basis for requiring this manure and soil sampling is explained in the Manure and Soil Sampling section of this document. The federal regulations at 40 CFR 122.23(e) and 40 CFR 122.42(e)(1)(vii) require any unpermitted large CAFOs and permitted CAFOs claiming the agricultural stormwater exemption to have practices that include protocols for testing livestock waste and soil. Further, the federal regulations at 40 CFR 122.23(e) and 40 CFR 122.42(e)(1)(viii) require the unpermitted large CAFOs and permitted CAFOs to have practices that ensure appropriate agricultural utilization of nutrients. The testing of livestock waste and soil in accordance with proposed Section 502.510(b)(9) provides the data to support the unpermitted large CAFOs and permitted CAFOs claim of the agricultural stormwater exemption under the federal regulations and proposed Section 502.102.

Proposed Section 502.510(b)(11) requires the CAFO owner to specify and demonstrate in the NMP that livestock waste will not be land applied within the distance from residences provided in proposed Section 502.645 and other areas prohibited by Part 502. The Illinois EPA proposes that all permitted and unpermitted large CAFOs meet the same setback provisions and prohibitions. In the case of setbacks from residences, this requirement is the same as that for facilities subject to the Livestock Management Facilities Act, as noted in the section in this document titled "Distance to Residences". Other setbacks and prohibitions prevent land application to areas that are surface waters, near surface waters, near conduits to surface waters

and floodplains, so that a discharge of livestock waste does not occur from land application of livestock waste. Large unpermitted CAFOs and permitted CAFOs that claim the agricultural stormwater exemption under the federal regulations at 40 CFR 122.23(e) and 122.42(e)(1)(vi) must have nutrient management practices that identify site specific conservation practices, including buffers or equivalent practices, to control runoff of pollutants to waters of the United States. The federal regulations at 40 CFR 122.42(e)(1)(viii) require unpermitted large CAFOs and permitted CAFOs to have practices that ensure appropriate agricultural utilization of nutrients. When employed, these practices provide the minimum practices that will prevent unauthorized discharges from the land application area of the CAFO.

The proposed Section 502.510(b)(12) requires the CAFO owner to specify and demonstrate in their NMP a winter time land application plan that meets the requirements of proposed Section 502.630. The Illinois EPA proposes that all unpermitted large CAFOs and permitted CAFOs meet the same winter time application requirements. The proposal includes requirements for determination of a lack of alternative storage and land application practices, application rates, slope of the land application area, method of application, erosion rates, weather conditions, setbacks and vegetative buffers for winter time land application. Large unpermitted CAFOs and permitted CAFOs that claim the agricultural stormwater exemption under the federal regulations at 40 CFR 122.23(e) and 122.42(e)(1)(vi) must have nutrient management practices that identify site specific conservation practices, including buffers or equivalent practices, to control runoff of pollutants to waters of the United States. In addition, the federal regulations at 40 CFR 122.42(e)(1)(viii) require unpermitted large CAFOs and permitted CAFOs to have practices to ensure appropriate agricultural utilization of nutrients. By providing the same criteria to unpermitted large and to permitted CAFOs, the unpermitted CAFOs are restricted to the same prohibitions for winter time application as permitted CAFOs. Therefore, unpermitted large CAFOs and permitted CAFOs are subject to the same criteria when claiming the agricultural stormwater exemption.

Section 502.510(b)(13) proposes that the CAFO owner specify and demonstrate in the NMP a plan for inspecting, monitoring, managing and repairing subsurface drainage systems at livestock waste application sites. Section 502.510(b)(13) proposes visual inspections prior to and after land application of livestock waste. The Illinois EPA proposes that all permitted and

412 establish land application requirements and limitations for livestock waste. Thus, to meet these provisions, the CAFO must have adequate land application area to utilize the waste to prevent discharges and inappropriate land application of the livestock waste. The Illinois EPA is requiring the NMP in proposed Section 502.510(b)(2) to specify and demonstrate adequate land area for its livestock waste. In so doing, the CAFO owner may own, rent or have available by a consent agreement with another party such land as may be necessary to fulfill this obligation. As a proof of the availability of this additional land, the Agency is requiring a statement of consent or agreement from the CAFO owner in proposed Section 502.505(h). By requiring this consent with another party, CAFO owners may then demonstrate that they have access to sufficient area for land application.

For purposes of this Subpart E, the land under the control of the CAFO includes situations where the CAFO owns, rents, or leases the land to which livestock waste from the production area is applied. As stated in USEPA's permit writer's guidance (USEPA, page 4-3, December 2003), "this may also include situations where a farmer releases control over the land application area and the CAFO determines when and how much manure is applied to fields not otherwise owned, rented, or leased by the CAFO."

Application Rate Determinations

At the heart of the NMP is the determination of how much livestock waste may be applied to any given field. The core of that determination is the calculation of application rates for each of two important nutrients—nitrogen and phosphorus. USEPA in 40 CFR 122.42(e)(1)(viii) and 40 CFR 122.42(e)(5) required nutrient management plans to contain protocols for site specific nutrient management practices that ensure appropriate agronomic use of the nutrients in the livestock waste. To set this federal requirement in place, the Illinois EPA proposes in Section 502.505(m) the NMP contain data or calculations showing:

- soil test results for phosphorus prior to land application,
- the rate of application of phosphorus,
- the amount of livestock waste to be land applied,
- the phosphorus content of the livestock waste,

- the phosphorus needs for each crop grown, and
- the maximum livestock waste application rate based on phosphorus for each field.

These data and calculations are intended to show the maximum rate of application based on phosphorus. This information can then be used by the CAFO owner to determine if adequate land area is available. The Illinois Agronomy Handbook provides the method for determining application rates based on the phosphorus amount needed for each crop, in pounds of P_2O_5 per acre. Phosphorus content of fertilizers is typically reported in the available phosphorus pentoxide form in pounds of P_2O_5 (Brady, N.C., 1974; and Lewis, R.J., 1993). In the Illinois Agronomy Handbook, the phosphorus recommendations are shown in units of pounds of P_2O_5 per bushel for corn and soybeans. Other crops have similar recommendations in pounds of P_2O_5.

Multi-year and Single Year Applications Rate Determinations

In addition to the rate calculation, the CAFO owner must then determine whether they will apply livestock waste at a single year or multi-year basis. This is needed in the NMP because when considering a single year phosphorus application rate, the rate of phosphorus application is for the phosphorus needed by the next crop grown. In a multi-year phosphorus application, phosphorus amounts applied exceed the phosphorus needs for the next crop grown, and go on to provide phosphorus for successive crops on the field over the next few years. For example, when livestock wastes are applied for all the plant available nitrogen demand of the next corn crop grown, typical ratios of plant available nitrogen to phosphorus needed to grow corn, and typical ratios of plant available nitrogen to phosphorus in most types of livestock wastes, will result in phosphorus application rates that will sustain crops for multiple years.

As indicated in the discussion above on the importance of plant available nitrogen (PAN), the estimate of PAN in livestock waste is used to determine the application rate based on the agronomic nitrogen needs of the crop grown. The calculations in proposed Section 502.505(n) are a part of the NMP, and show the livestock waste application rate based on nitrogen for each field. The calculations must show the land area required for application rates that do not exceed the nitrogen demand of the crop grown, as required in proposed Section 502.510. To make these calculations, the livestock waste must be analyzed or estimates from published sources of livestock waste data must be used to determine PAN. Organic nitrogen that mineralizes in the

unpermitted large CAFOs that apply livestock waste to tiled agricultural lands have a subsurface drainage system plan for reasons discussed in the section of this document titled "Consideration of Subsurface Drainage Systems on the Transport of Nutrients". When agricultural subsurface drainage systems fail, adequate site specific conservation practices, including buffers or equivalent practices, to control runoff of pollutants to waters of the United States may not be present and agricultural utilization of nutrients may not be achieved as required in the federal CAFO rule, at 40 CFR 122.23(e) and 122.42(e)(1)(vi). As previously cited for other related requirements, for permitted and unpermitted large CAFOs, the federal regulations at 40 CFR 122.23(e) and 122.42(e)(1)(viii) require all CAFOs that claim the agricultural stormwater exemption to have nutrient management practices to ensure appropriate agricultural utilization of nutrients. Therefore, this proposal requires all CAFOs whether unpermitted large or permitted CAFOs to have the same subsurface drainage system plan.

The Illinois EPA proposes a requirement in Section 502.510(b)(14) that all unpermitted large CAFOs and permitted CAFOs have a spill prevention and control plan. The technical justification for this plan is provided in the section of this document titled "Spill Prevention and Control Plan". Preventing and controlling spills at the land application area will, among other matters, help ensure the appropriate agricultural utilization of livestock waste at the land application area, as required in 40 CFR 122.23(e) and 122.42(e)(1)(viii). Preventing and controlling spills at the production area and other areas where livestock waste are handled, such as during transport to land application areas, will prevent unauthorized discharges from the CAFO and protect surface water quality and aquatic life.

The proposed Section 502.510(b)(15) requires the CAFO owner to specify the records to be kept to document the implementation and management of the minimum elements of the NMP described in proposed Sections 502.510(b)(2) through (14). The proposed federal regulations at 40 CFR 122.42(e)(1)(ix) require the NMP to include the records to be kept to document the implementation and management of the minimum elements at 40 CFR 122.42(e)(1)(i) through 122.42(e)(1)(viii). The federal regulations at 40 CFR 122.23(e) require the CAFO claiming the agricultural stormwater exemption to meet the recordkeeping requirements at 40 CFR 122.42(e)(1)(ix). The Illinois EPA proposes that records to document the minimum elements of

Sections 502.510(b)(2) through (14) be kept to fulfill the requirements of 40 CFR 122.42(e)(1)(ix). In addition, as noted in the discussion regarding the substantive requirements of the proposed Sections 502.510(b)(2) through (14), those sections require additional elements of the NMP that are not specifically listed in the federal regulations. However, these additional elements specify criteria and elements that the Illinois EPA believes should be in the NMP for all unpermitted large CAFOs and permitted CAFOs. In most cases these additional elements are practices that are important to the proper management and handling of livestock waste at the CAFO. Keeping appropriate records of implementation and management of the elements of the NMP is important to document that the CAFO is complying with its permit, or in the case of unpermitted large CAFOs, to adequately and justifiably claim an agricultural stormwater exemption.

The federal regulations at 40 CFR 122.42(e)(1) require the nutrient management plan to contain practices to meet the applicable effluent limitations and standards, including 40 CFR 412 which covers both production area and land application area requirements for CAFOs. In addition, the federal regulations at 40 CFR 122.42(e)(1)(i) through (e)(1)(ix) specify that the NMP contain practices regarding storage and land application of livestock waste. Section 502.510(b)(16) proposes that the CAFO owner specify and demonstrate livestock waste storage provisions and schedules in the NMP for those times when cropping practices, soil conditions, weather conditions and other conditions prevent the land application or disposal of livestock waste. An important element in the management of storage facilities and the land application of livestock waste is the proper planning and design of the livestock waste handling system in a manner that accounts for all factors that will prevent inappropriate land application or disposal of livestock waste. Permitted CAFOs must have adequate livestock management facilities for storage of livestock waste to prevent land application during periods when livestock waste application is not allowed under its permit and these proposed regulations due to the conditions cited above.

Land Application Consent Agreements

The federal rule at 40 CFR 122.42(e)(1) requires adequate livestock waste storage and adequate operation and maintenance of storage facilities. Discharge limitations for livestock waste produced or stored at the CAFO are set forth in 40 CFR 412. Together 40 CFR 122.42 (e) and

first year of application, and is therefore available to the plant, is used to determine the amount of PAN in the livestock waste (Midwest Plan Service, 1998). This is done by determining through chemical analysis or by estimating the amount of total Kjeldahl nitrogen and ammonia or ammonium nitrogen in the livestock waste. The amount of organic nitrogen from these data is determined by subtracting ammonia or ammonium nitrogen from total Kjeldahl nitrogen concentrations of the livestock waste (Midwest Plan Service, 1998). Finally, the amount of plant available ammonium nitrogen or ammonia nitrogen is determined based on estimated volatilization losses from land application (Midwest Plan Service, 1998).

In addition to PAN, other types of information are required to properly determine the application rate and land area needed. The rate calculation depends on the amount of nitrogen required by each crop as proposed in Section 502.505(n)(6) and nitrogen credits as specified in proposed Section 502.505(n)(7). Related factors in this calculation are the realistic yield goal and whether nitrogen will be provided from other sources. These sources of nitrogen may include chemical fertilizer, and carryover from previous crops or from livestock waste application in previous years. The federal CAFO rule at 40 CFR 122.42(e)(5)(i)(A) and (ii)(A) requires the above mentioned factors in the NMP. This method of calculation is also specified in the 2009 edition of the Illinois Agronomy Handbook and the Livestock Management Facilities Act Part 900 regulations. The proposed Sections 502.625(e) and (f) specify criteria for determining realistic yield goals and criteria for determining carryover credits for organic nitrogen, respectively.

40 CFR 122.42(e) requires the NMP to contain best management practices (BMPs) regarding management of the production area, livestock waste handling facilities and land application areas. Whereas 40 CFR 412 requires CAFOs to design, construct, operate and maintain the production area and livestock waste handling facilities to prevent discharges. 40 CFR 412.4 specifies best management practices for land application of livestock wastes. The CAFO's NMP must identify adequate land for the livestock waste, as stated in proposed Sections 502.505(n)(9) and 502.510(b)(2), to ensure that adequate land is available to prevent application rates of livestock waste above the nitrogen application rates allowed in this proposed Subtitle E regulations. Based on these factors and the calculations for nutrients and rates, the NMP must show the fields and planned amounts of livestock waste to be land applied to each field, in accordance with 40 CFR 122.42(e)(1)(B) and (2)(C), and required in proposed Section

502.505(o). To determine if adequate land is available, this information can be compared to the allowed maximum application rates based on agricultural utilization of livestock waste nutrients at agronomic rates in accordance with 40 CFR 122.42(e)(1)(viii) and the proposed Subtitle E regulations.

Other requirements for the proper application, storage of livestock waste and management of livestock waste in the production area are contained in proposed Section 502.510. The NMP must also include a provision that the application rate not exceed the nitrogen needs of a single crop year and the single year or multi-year phosphorus needs of the crops to be grown, based on realistic yield goals. The NMP must specify the maximum nitrogen and phosphorus application rates. The NMP must specify the appropriate agricultural use of nutrients.

Proposed Section 502.510(b)(1) requires the application rate of nitrogen and phosphorus to not exceed the nitrogen needs of a single crop year and not to exceed the single year or multi-year phosphorus needs of the crops to be grown based on realistic yield goals. This proposed section specifies the criteria for the maximum nitrogen and phosphorus application rates. Proposed Section 502.510(b)(1) addresses the requirements of 40 CFR 122.42(e)(5) that requires the nutrient management plan to specify the appropriate agricultural utililization of nutrients. The proposed Section 502.510(b)(1) specifies the recommendations required by 40 CFR 122.42(e)(5)(i)(A) and (ii)(A) for nitrogen and phosphorus. This proposed section also addresses portions of 40 CFR 412.4(c)(1) that require the nutrient management plan to include a field specific assessment of the potential for nitrogen and phosphorus transport and that addresses the form, source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters. The proposed Section 502.625(h) bases application rates on realistic production goals (i.e. realistic yield goals) and nitrogen and phosphorus recommendations established by the University of Illinois Agronomy Handbook (University of Illinois, 2009) and existing 35 Ill. Adm. Code 560 criteria for Field Application of Livestock Waste.

Assessment of the Potential Transport of Nitrogen and Phosphorus

The NMP must also address, as required in 40 CFR 412.4(c)(1), the need for a field specific assessment of the potential for nitrogen and phosphorus transport. 40 CFR 122.42(e)(5)(i)(A) and (e)(5)(ii)(A) require the terms of the NMP to include the outcome of the field assessment and the following factors. The field specific assessment must address the form, source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters. The assessment factors cited here are required in the NMP and specified in proposed Sections 502.510, 502.515 and 502.615.

Livestock Waste and Soil Sampling

Among the assessment factors is a requirement to address the minimum sampling and analysis frequency for livestock waste and soil, as provided in 40 CFR 122.42(e)(5)(i)(B), 122.42(e)(5)(ii)(A) and 412.4(c)(3). The results of the livestock waste and soil analyses are to be used in determining application rates, as previously discussed. The Illinois EPA believes allowing sampling twice in five years provides flexibility in the soil testing frequency so that soil samples would be taken at the same period of the crop or livestock waste application cycle and thus provide a more effective comparison of soil phosphorus levels across a multi-year period. This requirement is addressed in proposed Section 502.510(b)(9). The technical requirements for manure and soil sampling are further addressed as part of the discussion of proposed Section 502.635(a).

Distance from Residences

Management of livestock waste at the application field is provided through minimum distance to residences, as found in proposed Section 502.510(b)(11), with reference to proposed Section 502.645(a), the specific provisions of 8 Ill. Adm. Code 900.803(o) and the Livestock Management Facilities Act [510 ILCS 77/20(f)(5)]. By including this Livestock Management Facilities Act requirement in the proposed Subtitle E regulations the nutrient management plans developed under these rules should avoid areas not allowed under the existing state law and regulations. Avoiding these areas will also reduce the potential for odor emissions from the land application area affecting neighboring residents.

Consideration of Subsurface Drainage Systems on the Transport of Nutrients

Many agricultural fields in Illinois contain subsurface drainage systems. These systems can fail due to a collapse of the drain and erosion of the soil, forming a direct connection (e.g. blowout of the tile line) between the surface of a field and the subsurface drainage system. The subsurface drainage system of field tiles that, if mismanaged or poorly repaired, could result in a discharge from the land application of livestock waste, must also be taken into consideration when developing the NMP. Consequently, proposed Section 502.510(b)(13) requires a plan for the inspection, monitoring, management and repair of subsurface drainage systems at the land application site. The inspections must include visual inspections prior to and after land application to determine if failures will happen and can be repaired or if failures have occurred. In either case, the objective is to prevent the discharge that may occur or repair the tile to stop a discharge. This direct connection, if not repaired or identified, would not be protected by a buffer zone or setback zone. This proposed Section 502.510(b)(13) addresses 40 CFR 122.42(e)(1)(vi) and (viii) regarding the requirement that nutrient management plans have site specific conservation practices such as setbacks and buffers to control runoff of pollutants to surface waters and establish protocols to land apply livestock waste in accordance with site specific nutrient management practices that will provide for appropriate agricultural utilization of nutrients in the livestock waste.

Spill Prevention and Control Plan

The NMP must also have a spill prevention and control plan to deal with emergency situations. This provision, in proposed Section 502.510(b)(14), requires the creation of a plan for preventing and controlling spills when they occur to protect water quality and aquatic life. The spill control and prevention plan applies to spills that may occur at the production area, land application area or other areas where livestock waste or other materials of the CAFO are handled or transported.

Proposed Section 502.201(a)(13) is added to require submission of a spill control and prevention plan in the submittal of the permit application for the CAFO NPDES permit. The CAFO NPDES permit requirement applies to all CAFOS that discharge. Management and prevention of spills are important to the protection of surface water quality from the release of waste

materials, raw materials, intermediate products, by-products and final products handled at CAFOs. Spills at a CAFO or AFO can result in discharges that degrade water quality and harm aquatic life. This plan will address spills from the production area of the CAFO, transportation spills at the CAFO and other spills of materials from the CAFO.

Using Similar Requirements for Large, Medium and Small CAFOs

The livestock waste generated at medium and small dairy cows, cattle, swine, poultry, and veal CAFOs has the same characteristics as livestock waste from large dairy cows, cattle, swine, poultry, and veal CAFOs. Although quantities of livestock waste generated from smaller CAFOs is less than large CAFOs, smaller CAFOs can store large quantities of livestock waste. These livestock wastes can have high organic strength (e.g., high BOD_5 and ammonia concentrations), much higher than raw municipal sewage, that if released or discharged can impact water quality and harm aquatic life. The effect of the livestock waste discharge on receiving stream water quality and aquatic life is expected to be the same for these large, medium and small CAFOs. Therefore, Illinois EPA believes discharge of these wastes should be controlled in the same manner regardless of their size.

The operation and maintenance of livestock waste application commonly uses the same practices, equipment and technology for large dairy cows, cattle, swine, poultry, and veal CAFOs and for medium and small dairy cows, cattle, swine, poultry, and veal CAFOs. The effects on surface waters of stormwater runoff from land application of livestock waste is expected to be the same for large, medium and small dairy cows, cattle, swine, poultry and veal CAFOs. The nutrient management plan requirements of 40 CFR 122.42 require nutrient management plans to contain production area and land application area best management practices for all CAFOs. These elements include livestock waste storage, handling and land application protocols for the CAFO's livestock waste and other pollutants generated in the CAFO production area. In addition, NPDES permits and the approved NMPs must contain necessary terms and conditions to protect water quality. Therefore, the Agency proposes in Section 502.600 that the same technical standards and effluent limitations be applied to the large, medium and small CAFOs production areas and land application areas to protect surface water quality and aquatic life from these NPDES permitted CAFOs.

Assessing Nutrient Transport Potential

The new proposed technical criteria for the development of NMPs may be found in various sections of Subpart F (see Sections 502.615, 502.620 and 502.625). In those sections, the Illinois EPA proposes criteria (along with those in other sections that are directly derived from the federal rule) describing the means for assessing nutrient transport potential, how livestock waste may be land applied and how, using the previous information, application rates may be determined. All of these components make up significant and important parts of the NMP. The criteria for these three important factors—assessing nutrient transport potential, how livestock waste may be land applied and how application rates may be determined—are described below.

The Illinois EPA proposes that CAFO owners develop the NMP first by determining nutrient transport potential, using several physical factors and practices (e.g., soil type, conservation practices) they may use in controlling runoff and erosion on the land application fields. The general principle for assessing the potential for transport is to understand how these factors play a role and to what extent certain risk factors, such as the proximity to field tiles, may also be involved.

Determining the Basis for Application: Nitrogen versus Phosphorus Rates

Once assessed, these same factors are used by the CAFO owner to determine whether nitrogen or phosphorus based application of the livestock waste may be used in the NMP. These rate determining factors, as described in proposed Section 502.615(c) and (d), allow the CAFO owner to control the rate in certain circumstances when setback limits can be met and where excessive application of phosphorus has not built up soil concentration levels higher than those prescribed. The soil concentration levels specified were derived from the LMFA requirement and from other sources, as further explained below.

The preamble to the 2003 federal rule and the USEPA guidance document "Managing Manure Nutrients at Concentrated Animal Feeding Operations" specify that phosphorus transport and land application rates of phosphorus may be addressed using three USDA-NRCS protocols: a Phosphorus Index, a Soil Phosphorus Threshold Level, or a Soil Test Phosphorus Level. USEPA also allows use of other State-approved alternative methods (FR, Vol. 68, No. 29, p. 7209, 2003

and USEPA, pp. 4-10 and 4-11, 2004). These methods are outlined in USDA-NRCS standard 590 for Nutrient Management (USDA-NRCS, 2003). The method proposed in 502.615(d) is the Soil Test Phosphorus Level approach, which establishes the protocols for determining practices and phosphorus application rates. The determination of the phosphorus application rate depends on the factors listed in proposed Section 502.615(a) and the criteria provided in proposed Sections 502.615(b), (c) and (d). These criteria for land application include the application rates of livestock waste and phosphorus, setbacks, the method of application, soil erosion, conservation practices and phosphorus levels in the soil, tested for the specific fields that will be used. While the Illinois EPA bases these criteria on Illinois' NRCS 590 and 633 standards (USDA-NRCS, 2002; USDA-NRCS, 2002), the same factors are used in phosphorus indexes in other states.

The Illinois EPA is proposing that the CAFO owner apply livestock waste at rates that are phosphorus neutral when the soil contains more than 50 pounds of available soil phosphorus per acre, as determined using the Bray P1 or Mehlich 3 soil phosphorus tests. The Bray P1 and Mehlich 3 are widely used and accepted soils test methods to determine plant available phosphorus in soils. This proposal, in Section 502.615(d)(3), restricts phosphorus application to only the amount of phosphorus that can be used by the crops grown during the nutrient plan period. The objective of limiting phosphorus application to the amount of phosphorus that can be used by the crops grown is to achieve phosphorus rates at a neutral basis. The Illinois EPA bases this proposal on the federal CAFO rule which provides in 40 CFR 412.4(c)(2) that technical standards may include appropriate flexibilities, including consideration of multi-year phosphorus application on fields that do not have a high potential for phosphorus runoff to surface waters. Multi-year phosphorus application is the phosphorus application rate proposed in Section 502.615(d)(3).

Soils with more than 50 pounds of available phosphorus per acre do not require phosphorus buildup for the next crop grown according to the Illinois Agronomy Handbook (pages 101-102, University of Illinois, 2009). The CAFO owner may land apply livestock waste at the agronomic nitrogen rates for the next crop to be grown under this proposal. When livestock waste is applied at agronomic nitrogen rates, the livestock waste will typically provide phosphorus amounts equivalent to the phosphorus that will be removed by crop uptake over the next 2 or 3 years.

Daverede et al. (2003) determined that increases in soil test available phosphorus levels were correlated with increases in runoff of phosphorus from several agricultural test plots of Illinois soils. This proposal thus reduces the potential for phosphorus runoff to surface waters by limiting phosphorus application rates to a neutral basis. Further, soil test available phosphorus levels are not expected to increase over the long term under a neutral application rate basis.

Maximum Phosphorus Application: An Upper Limit

When the soil contains more than 300 pounds of available phosphorus per acre, the Illinois EPA proposes, in Section 502.615(d)(4), that the CAFO owner apply at rates that do not exceed the amount of phosphorus to be removed by next year's crop. This provision is similar to the land application criteria in the existing LMFA and the associated regulations. The Illinois EPA has also reviewed the available peer-reviewed literature regarding soil phosphorus test levels and the potential for runoff of phosphorus from land application sites. Among those articles, Sharpley (1993) identified that phosphorus application and soil phosphorus source factors must be managed to control phosphorus runoff to surface waters. In another study Sharpley (1996) suggested that dissolved phosphorus in runoff is related to the soil phosphorus test of surface soils. That study summarized soil phosphorus test restrictions on application of phosphorus to agricultural soils, showing in several states that no phosphorus application was allowed or that the annual phosphorus rate is restricted so as not to exceed crop removal rates when soil test levels exceeded 300 or 400 pounds per acre. In addition, this study showed that when the Mechlich 3 soil test phosphorus concentration is 400 pounds per acre, the dissolved phosphorus concentration in runoff was 1 mg/L. (On this basis, Sharpley concluded that 1 mg/L dissolved phosphorus be used for a goal because this was a suggested discharge limit for sewage treatment plants by USEPA.)

In another study, Daverede et al. (2004) showed that, six months after the application, there was no significant difference between the total phosphorus content of the runoff from surface applied manure plots and incorporated manure plots. Total phosphorus in the runoff six months after application ranged from approximately from 1-3 mg/L. Total phosphorus in runoff between the low and high swine manure application rates was not significantly different in this study. However, the higher application rates resulted in higher total phosphorus in the runoff one month after application.

Daverede et al. (2003) found that increased Bray P1 soil test levels were correlated with increased dissolved reactive phosphorus, total phosphorus and algal-available phosphorus in runoff from Illinois soils for no till and chisel plowed sites. This allowed the study authors to develop equations relating total phosphorus, dissolved reactive phosphorus and algal-available phosphorus concentrations in runoff to soil Bray P1 and sediment concentrations in the runoff. Sediment concentration in runoff from no-till plots ranged from 0.6 g/L to 2.6 g/L. When soil Bray P1 is 300 pounds per acre and sediment concentration in runoff is 1 g/L, calculations using one of the equations determined that total phosphorus in runoff from the Illinois soils would be 0.9 mg/L. This study also found the total phosphorus concentrations and total phosphorus loads in runoff from chisel plowed fields were not significantly different from concentrations in runoff from no-till plots. This regulatory proposal, therefore, attempts to prevent excessive available soil phosphorus when existing available soil phosphorus test levels are 300 pounds per acre or greater.

Similarly, Illinois EPA also propose a provision in Section 502.615(d)(5) that prohibits application of livestock waste when available soil phosphorus is greater than 400 pounds per acre. Studies on this issue, relating available soil phosphorus levels and potential runoff, indicate available soil phosphorus levels above 400 pounds per acre may produce runoff concentrations in excess of 1 mg/L total phosphorus.

As noted in the discussion above, various studies propose available soil phosphorus levels as thresholds above which additional practices to control phosphorus runoff should be implemented or phosphorus application should be prohibited. Sharpley et al. (1996) determined that an available soil phosphorus level of approximately of 400 pounds per acre caused dissolved phosphorus levels in runoff of approximately 1 mg/L. The best available erosion control practices, in this case no-till, resulted in sediment concentrations of approximately 1 g/L (Daverede et al., 2003). This same study, using data from Illinois soils, showed that, when available soil phosphorus levels in no-till plots reached approximately 400 pounds per acre and soil sediment concentration in runoff was approximately 1 g/L, the total phosphorus in runoff from the site was approximately 1 mg/L. This study also found that increased Bray P1 soil test levels were correlated with increased dissolved reactive phosphorus, total phosphorus and algal-available phosphorus in runoff from Illinois soils for no-till and chisel plowed sites. Based on

the outcomes of these studies, additional phosphorus application to a site will cause soil phosphorus levels to contribute to soil phosphorus concentrations in runoff that exceed targeted goals of 1 mg/L total phosphorus, even on sites implementing the best erosion control practices. Consequently, the Illinois EPA propose that no additional phosphorus be applied when soil phosphorus levels are above 400 pounds per acre.

Protocols to Land Apply Livestock Waste

Application of livestock waste is an acceptable practice as long as the application is conducted in accordance with well established best management practices or protocols. Poorly managed application of manure can lead to release of nutrients and pathogens to the environment including surface and ground water. According to USEPA's guidance, *Managing Manure Nutrient at Concentrated Animal Feeding Operations*, August 2004, historically, the majority of discharges from CAFOs occur from manure handling systems and during the land application of manure. (USEPA, 2004, p. 7-1) The guidance also states that in many cases, the discharges could have been prevented through better planning, management, and operation of the CAFO. (USEPA, 2004, p. 7-1)

Runoff potential of nutrients is influenced by several factors. Some factors such as location of receiving stream in relation to fields on which the livestock is being applied; slope of the field; soil and weather conditions; etc. cannot be altered through management as they are beyond the control of the CAFO owner or operator. However, factors such as nutrients present in the soils and livestock waste; nutrient needs of crops; etc. are well within the control of the CAFO owner or operator and can be altered through nutrient management practices. For example, excess nutrients in soil can adversely impact the surface or ground waters when these nutrients are dissolved or eroded by storms. The land application of livestock waste must be conducted in accordance with well established best management practices to minimize surface and groundwater contamination.

The proposed Section 502.620 outlines such best management practices that the Illinois EPA believes, at a minimum, must be used to protect surface and ground water resources. Some of the protocols identified in proposed Section 502.620 have been in existence in Illinois for several

years. These well established best management practices were taken from Code 590 and Code 633 of Illinois NRCS.

Soil Water Conditions

The Illinois EPA proposes, in Section 502.620(a) through (c), specific land application protocols to prevent runoff and water quality impacts. General provisions are included to clearly state that runoff of livestock waste cannot be allowed by the CAFO owner as a result of direct runoff (non-precipitation induced), through subsurface tiles or when the land cannot hydraulically adsorb the material, such as when water ponding on the ground indicates water has over-saturated the soil and that any application of livestock waste could result in runoff.

Predicting Precipitation Prior to Land Application

The proposed Section 502.620(d) prohibits surface land application of livestock waste within 24 hours preceding a forecast of 0.5 inches or more of precipitation in a 24 hour period as measured in liquid form. Under this proposed section, the CAFO owner is required to use one of two methods to determine whether or not these conditions exist and is also required to maintain a record of the forecast from that source. The two forecasts proposed are:

- a prediction of 60 percent or greater chance of 0.5 inches or more of precipitation in a 24 hour period as measured in liquid form by the National Weather Service, at http://www.nws.noaa.gov/mdl/forecast/graphics/MAV/ for the location of the land application site; or
- a prediction of 0.5 inches or more of precipitation in a 24 hour period as measured in liquid form and identified as higher than QPF category 3 by the National Weather Service at http://www.nws.noaa.gov/mdl/synop/products/bullform.mex.htm for the location nearest to the land application area.

The quantitative precipitation forecasts (QPF) are forecasts of the quantity of precipitation in a specified time period. There are seven categories of ranges of precipitation amounts for the 24-hour period. The proposed Section 520.620(d) uses the QPF category 3 which is 0.25 to 0.49

inches. The QPF category forecast is the forecasted precipitation quantity which is equaled or exceeded in the specified time period. Therefore, the proposed Section 520.620(d) criteria is for forecasts of 0.5 inches or greater in a 24-hour period.

The Illinois EPA bases this proposal on the federal CAFO rule, which in 40 CFR 122.42(e)(1)(i) requires the nutrient management plan to establish protocols to land apply livestock waste in accordance with site specific nutrient management practices that provide for appropriate agricultural utilization of livestock waste, and in 40 CFR 412.4(c)(1) the federal rule requires the nutrient management plan to develop a field specific assessment of the potential for nitrogen and phosphorus transport from the field and that addresses the form, source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters.

Daverede et al. (2004) showed that surface applied manure without incorporation[ii] caused total phosphorus in runoff one month after application of livestock waste of 8-12 mg/L. This proposal addresses the timing of land application with respect to forecasted precipitation events such that nitrogen and phosphorus movement from the field are minimized by reducing the times when livestock waste is applied to a field prior to runoff producing precipitation events.

In developing these criteria, the Illinois EPA considered that:

- the method provide a tool for the producer to plan land application considering forecasted weather conditions;
- the method apply to all land application sites without interpretation of site conditions, and that site condition criteria are found elsewhere in the proposed Subtitle E regulations;
- the forecast method is readily accessible to the CAFO owner;
- the forecast can be kept in the CAFO owner's records;
- a single forecasted amount of precipitation is used;
- the amount of precipitation forecasted for the criteria correspond to an estimated amount of precipitation that will cause runoff from a site; and
- the site conditions used to determine the amount of precipitation that will cause runoff apply to most land application sites used in Illinois.

Use of the Curve Number for Estimating Runoff

USEPA in its 2004 guidance "Managing Manure Nutrients at Concentrated Animal Feeding Operations" (USEPA, 2004, pp O-5 through O-7) suggests using the Curve Number method for determining when land application of livestock waste should be avoided for each hydrologic soil group and hydrologic condition at a land application site, using National Weather Service forecasts. The Illinois EPA proposes a method that determines the forecasted amounts without the need to determine the site specific hydrologic soil groups and site specific conditions, for sites that are not frozen, ice covered or snow covered. This method results in a single forecasted precipitation amount for sites that are not frozen, ice covered or snow covered (we will discuss land application criteria that will apply to those conditions in a later section of this document).

The source of the values used for Curve Numbers, the accuracy of the determination of hydrologic soil groups and the determination of the initial abstraction have all been subject to review in the technical literature (Ponce and Hawkins, 1996; ASCE/EWRI Curve Number Hydrology Task Committee, 2009; Garen and Moore, 2005). The ASCE/EWRI Curve Number Hydrology Task Committee suggests that the initial abstraction assumptions and Curve Number tables be revised based on more recent data. Ponce and Hawkins and the ASCE/EWRI Curve Number Hydrology Task Committee report that the data and methods used to obtain the published Curve Numbers and initial abstractions are not available. Further, the ASCE/EWRI Curve Number Hydrology Task Committee reports that the determination of hydrologic soil groups has not been consistent. Recent studies of hydrologic soil group classifications show that, based on the physical characteristics of the soils classified and soil physics, the hydrological soil groups may have an error of plus or minus one hydrologic soil group (ASCE/EWRI Curve Number Hydrology Task Committee, 2009). The Curve Number method was developed to predict the volume of runoff from long term flood events (ASCE/EWRI Curve Number Hydrology Task Committee, 2009). The Curve Number method was not developed to determine when runoff begins from precipitation.

However, to determine the amount of precipitation before runoff begins, the Curve Number method provides a method to assess a site using existing information to determine the precipitation amount. Therefore, the Curve Number method is frequently used, taking these limitations into account.

Site specific determinations of Curve Number introduces precision that does not appear to exist in the Curve Number method as noted above. In our proposal, the use of a single precipitation amount simplifies the proposed regulations and its implementation. USEPA (2004) requires a more specific determination of the Curve Number for each hydrologic soil group and, therefore, for each site a site specific forecast precipitation amount must be determined.

The forecast precipitation amount proposed in Section 502.620(d) is based on the runoff Curve Number method of estimating direct runoff from rainfall by a method developed by of the National Resource Conservation Service (USDA-NRCS, 2004). This method determines the volume of surface runoff from direct precipitation. The Curve Number (CN) is directly related to the maximum potential retention (S) by the equation

$$CN = \frac{1000}{10 + S}$$

where S is in inches.

The USDA-NRCS determined that the initial abstraction, Ia, which consists of mainly interception, infiltration during early parts of a storm and surface depression storage is as follows:

$$Ia = 0.2\,x\,S$$

USDA-NRCS states that "the initial abstraction, Ia, can be considered the boundary between the storm size that produces runoff and the storm size that produces no runoff."

The Curve Number is determined from four characteristics of the watershed: the antecedent runoff condition, the hydrologic soil group, cover type and description, and the hydrologic condition (USDA-NRCS, 2004).

Most soils in Illinois are in hydrologic soil groups "A" and "B", according to the listing provided in Notice 29 of the Illinois Engineering Field Handbook (USDA-NRCS, 2007). Table 9-1 of the National Engineering Handbook, Part 630 Hydrology, shows that, for hydrologic soil groups "A" and "B", the Curve Numbers for row crops, small grain and close seeded or broadcast legumes, pasture and hay fields are 81 or below. Note that the volume of runoff decreases with decreasing Curve Numbers. The application of livestock waste is not allowed on saturated[iii] soils or on soils

wetted by rainfall within 24 hours preceding application based on other criteria the Illinois EPA is proposing. In developing these criteria, the Illinois EPA set the soils at antecedent runoff condition II, the average condition. The initial abstraction, Ia, from Table 10.1 of the National Engineering Handbook, Part 630 Hydrology, is 0.47 inches for Curve Number 81. A value for initial abstraction, Ia, of 0.5 inches that matches Curve Number 80 is used to match the values of published forecasts and to round to the nearest tenth of an inch of precipitation. The proposed criteria use forecasts that provide a chance of 0.5 inches or greater of precipitation within 24 hours after land application. The two proposed forecast links in the proposed regulations provide this forecast.

Field Slope Considerations

Runoff of nutrients to surface waters is more likely from fields with steep slopes than fields with gentle or no slope. As the slope increases, so does the potential of runoff from fields where the livestock waste was applied. Code 633 of the Illinois NRCS recommends that waste (agricultural) shall not be applied to cropland with slopes over 15% to ensure that cropland meets soil loss tolerance. The Illinois EPA believes this protocol or best management practice is essential to minimize nutrient runoff potential, and is therefore proposing the criterion in Section 502.620(g).

Soil Depth and Soil Properties

Soil properties such as depth, texture, and permeability are keys in determining the potential for groundwater contamination. Deep, medium and fine textured soils are the best, whereas coarse textured materials are worse in terms of contaminant removal. In coarse materials like sand, water moves through rapidly, reducing contact between the water and soil particles.

Code 633 Illinois NRCS also recommends that liquid manure shall not be applied to soils with less than 10 inches of at least moderately permeable soil over fractured bedrock, sand, or gravel. This recommendation recognizes that soils act as a natural filter to many substances that are present in the livestock waste that may infiltrate to groundwater. Along with filtering solid particles, soils also remove chemicals or dissolved substances through microbial processing, and retard movement of various substances. Another important function provided by soils is that they hold essential nutrients for uptake by crops. The affinity for fine soils, and those higher in

organic matter content, to hold livestock waste contaminants is greater than the affinity in coarse, low organic matter content soils.

The liquid livestock waste applied directly on bedrock, sand or gravel soils will reach ground water quickly without the natural filtering affect of soil cover. Also, without an adequate soil cover, water will move rapidly move through soil particles, and nutrient present in the livestock waste would not be available for crop uptake. To minimize impact to ground water from liquid livestock waste directly on bedrock outcrops or on fractured bedrock, sand or gravel, the Agency's has proposed Section 502.620(h) and (i). Agency's proposal is consistent with the Illinois NRCS recommendations (NRCS, Code 633, 2002).

Soil Loss and the Use of RUSLE2

In addition to the general requirements, the Illinois EPA proposes the NMP include a determination of soil loss using the Revised Universal Soil Loss Equation Version 2 (RUSLE2), as described in proposed Section 502.620(e). RUSLE2 was developed by USDA, NRCS, to be used by land owners to predict the amount of soil that could be lost in a given land area, typically the size of a farm field. The soil loss calculations of the RUSLE2 equation depends on the following: soil erosivity, soil erodibility, slope length, slope steepness, cover management, and supporting practices. The Illinois EPA also proposes the prohibition of surface application of livestock waste when soil erosion is greater than the tolerable limit (T) or 5 tons per acre, whichever is less, when soil slope is greater than 5 percent. T is often less than 5 tons per acre and is regarded as the sustainable loss that may occur while still maintaining soil productivity.

This proposed Section 502.620(e) addresses several requirements in 40 CFR 412.4(c)(1) that require the NMP to include a field specific assessment of the potential for nitrogen and phosphorus transport to surface waters and that addresses the form, source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to surface waters. Determination of soil erosion rates using RUSLE2 addresses requirements in 40 CFR 122.42(e)(1)(vi) to identify the site specific conservation practices to control runoff of pollutants to surface waters. Soil erosion rates identified using RUSLE2 addresses requirements in 40 CFR 122.42(e)(1)(viii) to establish protocols to land apply livestock waste in accordance with site specific nutrient management

practices that provide for appropriate agricultural utilization of the nutrients in the livestock waste.

Calculations using RUSLE2 provide soil loss determinations for comparison to the soil loss criteria in the proposed regulations concerning land application to sites with greater than 5 percent slopes and sites receiving livestock waste at nitrogen based application rates. RUSLE2 is thus a tool to evaluate potential changes to the nutrient management plan that may affect soil erosion and transport of nitrogen and phosphorus from land application areas. Site specific conservation practices may affect several of the factors used in calculating soil loss with RUSLE2. By requiring the CAFO to calculate soil loss using RUSLE2, the CAFO can review its site specific conservation practices and nutrient management practices as well as their effects on soil erosion and transport of nitrogen and phosphorus to surface waters and make adjustments to those losses by choosing to install new or improved practices.

Incorporation and Injection as BMPs

Under the proposed rule, surface application of livestock waste would be allowed when the land slope is not more than 5%, or when the yearly soil loss is equal to or less than 5 tons per acre per year or erosion factor T[iv], whichever is less, regardless of slope, as determined by the Revised Universal Soil Loss Equation 2. Injection[v] or surface application with incorporation within 24 hours is required under the proposed rule when the land slope is greater than 5% and the yearly average soil loss is greater than 5 tons per acre per year or erosion factor T, whichever is less.

The following table shows the requirements of this proposed Section 502.620(f):

Surface Application allowed when the following conditions apply:
• Land slope not more than 5%, or • Soil loss less than or equal to 5 tons per acre or T, whichever is less.

Must Inject or Incorporate livestock waste within 24 hours when both of the following conditions apply:

- Land slope greater than 5%, and
- Soil loss greater than 5 tons per acre or T

The Illinois EPA proposes these measures at these levels since runoff of livestock waste is expected to be higher as slopes increase. Increased soil erosion rates mean that increased amounts of livestock waste will likely reach surface waters. Injection or incorporation of livestock waste reduces the runoff potential. The proposed rule in Section 502.620(f) provides criteria to reduce the pollutants in runoff by prohibiting surface application without injection or incorporation on slopes above 5% unless erosion is controlled to acceptable levels.

Studies indicate (Pote et.al., (2003)) that incorporation reduced total nitrogen (TN) loads compared to surface application between 61% and 68% percent, and total Phosphorus (TP) loads were reduced between 75% and 92%. Experiments on surface application of manure (Daverede et. al., (2004)) found that runoff collected from a rainfall simulation one month after manure application had a 90% or greater reduction of TP loads from sites where manure was incorporated by chisel plow on the contour or injected in the soil compared to surface applied manure without incorporation.

Application Near Bedrock and the Water Table

The application rate, depth to bedrock from the surface and the depth to the water table from the soil surface are important factors to consider when minimizing the risk to groundwater contamination. These factors affect the rate at which contaminants in the livestock waste reach groundwater.

In the absence of adequate depth of soils covering bedrock and water table, livestock waste contaminants will more quickly reach groundwater. The Agency is thus proposing a common sense conservative approach that the application rates should be halved when the potential to cause groundwater contamination is heightened due to less than 20 inches of unconsolidated material over bedrock or the water table is less than 2 feet from the surface. To address the

concern that livestock waste will contaminate groundwater, the Agency is recommending proposed Sections 502.620(j) and (k) in its proposal.

Soils with low infiltration rate or soils with limited water holding capacity are more likely to promote runoff than soils that absorb and retain large quantities of water. To address the concern that livestock waste applied at rates that are greater than the soil infiltration or water holding capacity, the Agency is recommending proposed Section 502.620(l) in its proposal. The Agency's proposal is consistent with the NRCS recommendations found in Code 633 of the Illinois NRCS standards (NRCS, 2002). In addition, the volume of livestock waste applied may be restricted due to high water tables, nearly saturated soil conditions, frozen, ice or snow covered ground or due to the presence of soils with low infiltration rate, under proposed 502.620(l), to prevent runoff of livestock waste from the land application area.

Determining Livestock Waste Application Rates

In the final analysis, the NMP must show that the selected application rate accounts for these various factors— the agronomic rate of the crops, the volume of waste to be applied, the nutrient value or content of the livestock waste, the PAN and phosphorus, the expected crop yield and the nitrogen credits. The following discussion concerns these factors and how the Illinois EPA intends the rule to affect the development of the NMP in that regard.

As previously discussed, livestock waste application rates should not exceed the agronomic nitrogen rate, defined as the annual application rate of nitrogen that can be expected to be required for a realistic crop yield goal. Multi-year phosphorus application is allowed when specified in a nutrient management plan and when that plan meets the requirements in proposed Section 502.615. Livestock waste application rates are limited in this way according to the specific agronomic needs for the crop and must be shown to minimize transport of nitrogen and phosphorus to surface waters. In general for most livestock wastes and crops grown, the agronomic nitrogen rate for a realistic crop yield goal will provide phosphorus at rates greater than the phosphorus demand of the next crop grown. Such application rates will be a multi-year phosphorus application rate. The Illinois EPA provides provisions for this to be established in the NMP in proposed Section 502.625(a).

Determining Livestock Waste Volumes and Nutrient Value

The next factor to be established in the NMP is the volume of waste produced. The application rate of livestock waste is the amount by weight or volume (in tons or gallons) of livestock waste applied according to the nutrient management plan or documented in the annual reports as required by the CAFO federal regulations at 40 CFR 122.42(e)(4)(viii), 122.42(e)(5)(i) and (ii), and 122.42 (e)(5)(ii)(D). Several well established and acceptable means for estimating this volume are provided (refer to proposed Section 502.625(b)), all of which are currently in use and are readily available to the CAFO producer. The process of making this estimate is similar to that prescribed in the LMFA and this proposal uses the same reference materials. Similarly, the nutrient content of the livestock waste may be determined from several sources, including those used in the same exercise under the LMFA. Provisions in proposed Section 502.625(c) allow CAFO owners to use other means if prior approval is granted by the Illinois EPA. Sampling and analytical procedures for testing manure are linked to the protocol provided in proposed Section 502.635. The concentration of several chemical forms of nitrogen and phosphorus compounds are determined in the livestock waste. These concentrations are used along with total solids content to calculate land application rates.

Adjustments to Nitrogen Availability

The Illinois EPA is also proposing in Sections 502.625(d) and (f), as discussed above, that nitrogen adjustments need to be made in any estimate of application rates, due to carry-over from previous crops and manure application in prior years (i.e., nitrogen credits), and due to losses through volatilization, for example, when manure is land applied.

Establishing a Realistic Crop Yield

The Illinois EA proposes that the realistic yield goal be determined by using the average crop yield over a five year period. Four proposed methods of determining the realistic yield goal listed are: proven yield, crop insurance yields, Farm Service Agency- United States Department of Agriculture yields and soil based yield data from the University of Illinois. Proven yields are based on an average of yields obtained over a five year period. As the preferred method, proven yields are to be used unless there is an agronomic basis to use a different data source to determine realistic yield goals. One of the alternative data sources is crop insurance yields,

which would be obtained from a crop insurance company. Another is data from the Farm Service Agency – United States Department of Agriculture yields. The last of the alternatives is data from soils based yield data from the University of Illinois, College of Agriculture, Consumer and Environmental Sciences (University of Illinois, Bulletin 810, 2000, revised 2011; University of Illinois, Bulletin 811, 2000, revised 2011). These provisions are similar to the targeted yield goal provisions in 8 Ill. Adm. Code 900.807 of the LMFA. In most cases the realistic yield goal attained under the proposed Subtitle E regulation will be the same as the targeted yield goal obtained under the LMFA. The exception is the determination of the soil based yield goals which may be based on University of Illinois recommendations proposed in Section 502.625(e).

Productivity indices from University of Illinois Bulletins 810 and 811 are used to determine farmland assessments for property tax purposes. Publication 122 (2011), from the Illinois Department of Revenue, provides a method and example of weighted productivity index determinations for soil complexes that contain more than one soil type. In that example, the weighted average of the soil productivity indices is calculated by multiplying the productivity index of each soil type by the fraction (percentage) of the whole soil complex (or field) that the soil type occupies. These results for each soil type are added to obtain the weighted soil productivity index for each field. The weighted soil productivity indices are used to obtain the average of the soil interpretation yield estimates. This approach to weighted averages would be used to obtain weighted averages for soil interpretation yield estimates for each field, using different productivity indices and other factors that will affect the soil interpretation yield estimates for each soil type or area, as explained in University of Illinois Bulletins 810 and 811.

Application rates must also account for phosphorus content in the livestock waste and how much can be land applied in any given year. The factors that must be used to determine the maximum livestock waste application rate based on phosphorus are:

- the phosphorus content of the livestock waste;
- the realistic crop yield goal for each field;
- the phosphorus amount required for each crop grown in the field in the planned crop rotation. The phosphorus amount should be obtained from a reliable source

such as the Illinois Agronomy Handbook. The determination of the phosphorus amount is then based on the realistic crop yield goal for the planned crop and the soil test for available phosphorus;

- the phosphorus carryover from previous phosphorus applications to the field;
- the soil test phosphorus results for that field; and
- the maximum livestock waste application rate must be consistent with proposed Section 502.615.

Again, this provision of the proposed rule addresses requirements in the federal CAFO rule that call for the NMP to specify how nitrogen and phosphorus movement to surface waters will be minimized.

Nutrient Values and the Rate Determination

The Illinois EPA is proposing that the CAFO producer use, in Sections 502. 625(g)(3) and 502.625(h), the Illinois Agronomy Handbook (2009) to make the determination of phosphorus application rates. Chapter 8 of the Illinois Agronomy Handbook, "Managing Soil pH and Crop Nutrients", provides specific recommendations for the determination of phosphorus application rates. The Natural Resource Conservation Service- United States Department of Agriculture Nutrient Management Standard 590 (USDA-NRCS, 2002) and Waste Management Standard 633(USDA-NRCS, 2002) published in 2002 reference the Illinois Agronomy Handbook for determination of nitrogen and phosphorus fertilization rates. 8 Ill. Adm. Code 900.813(c)(3) similarly references the Illinois Agronomy Handbook for phosphorus maintenance fertilizer amounts for each crop or use of a field. In addition, 8 Ill. Adm. Code 900.807(c) references the Illinois Agronomy Handbook and 35 Ill. Adm. Code 560, Appendix A, with regard to determining nitrogen and phosphorus fertilization rates. Therefore, by requiring these established sources of information to determine the maximum nitrogen and phosphorus rates for land application, the Illinois EPA believes this best addresses federal requirements regarding agricultural utilization of nutrient and protection of surface waters.

Winter Land Application Criteria

The Illinois EPA is proposing several new requirements for land application to frozen, snow and ice covered ground (hereafter referred to as winter application). Winter application of the

livestock waste can severely contaminate surface waters if improperly applied. This is especially the case when the soil is frozen, snow or ice covered since these soil conditions increase the potential for contaminated runoff to surface waters. This risk of the livestock waste runoff to surface water is further heightened if the air temperatures become warmer. A quick snow melt would flush the recently applied livestock waste to surface waters. Also, as frozen soils have limited or no infiltration, there will be an immediate runoff upon rainfall. Because of the high risk posed by winter application to water quality, the Illinois EPA believes winter application should be avoided unless no practical alternative exists.

These new provisions, in Section 502.630, when acted upon by the CAFO owner, proposes a means to determine when land application is allowed under these high risk conditions, linking the waste generation and storage operations at the facility to the need for and timing of land application. The CAFO owner must evaluate the storage available to the operation early enough to avoid winter spreading. If winter spreading is unavoidable during winter days, the CAFO owner must determine if other options for storage or livestock waste handling are available.

Determining the Winter Storage Volume Requirement

The Illinois EPA proposes the CAFO owner make a determination for the 120 day period between December 1 and April 1 concerning the production of and available storage capacity for livestock waste. This is the critical winter spreading period in Illinois, between December 1 and April 1, when ground is frozen or snow and ice covered. If adequate storage is available, winter spreading is prohibited because it is not necessary. Under those circumstances, livestock waste application can occur under less risk when done in the spring.

If the available capacity will be exceeded during the 120 day winter period, then six factors must be considered prior to winter spreading. Those six factors are: 1) the availability of practical alternatives, 2) the possibility that waste could be injected or incorporated, thereby reducing the risk for runoff, 3) that prior and ongoing efforts have been made to maximize storage capacity, 4) storage volume is less than 120 days and therefore the CAFO will risk discharging during that period, 5) that the CAFO owner notified the Illinois EPA prior to December 1, thus indicating they had made the necessary prior calculations and analysis and 6) those calculations and all

other factors taken together indicate that a discharge is likely during the December to April period.

Injection and incorporation is allowed under this proposal on frozen, ice and snow covered ground. In criterion 2) above, the proposal provides that injection and incorporation are the preferred methods on frozen ground to the extent that soil conditions and equipment capabilities allow.

There are several elements that must be included when calculating the storage capacity, and those are specified in proposed Section 502.630(a)(2). The Illinois EPA proposes that normal precipitation for the storage facility location based on National Weather Service records be used when estimating the storage volume that will be filled by rainfall during the 120 day period, and that the 25-year, 24-hour precipitation event[vi] should also be taken into account. In the case of new swine, poultry and veal CAFOs, because of the requirements in the federal CAFO rule, the provisions used in Subpart H of this rule (see proposed Section 502.840), need to be used in these calculations. Finally, to prevent overtopping the storage structure, the Illinois EPA has included a requirement for two feet of freeboard. Freeboard is the height between the maximum design surface elevation of the storage contents and the lowest elevation of the overflow point for the structure.

Winter Application Setback Criteria

In addition to the setback provisions previously discussed in reference to proposed Section 502.510(b)(11), to reduce the effects of odors on residences due to surface applied manure, the Illinois EPA proposes, in Section 502.630(b)(1) that surface application of livestock waste on frozen, snow or ice covered ground may only be conducted more than ¼ mile from a non-farm residence. When the ground is frozen, incorporation or injection of the manure will not be practical. The LMFA provides a one quarter mile distance requirement from residences that are not part of the livestock management facility for surface application of livestock waste, unless the waste can be incorporated or the site was in existence and used for surface application of livestock waste prior to May 21, 1996.

Winter Application Plan: Criteria for Land Applying

In Section 502.510(b)(12), the Illinois EPA is proposing the CAFO owner develop a winter time land application plan, consistent with the specific requirements proposed in Section 502.630. The Illinois EPA bases the requirement for the plan on the provisions in 40 CFR 412.4(c)(1) and (c)(2)(i) for an NMP and the development of appropriate application rates that address timing of land application. To achieve the federal objective of minimizing nitrogen and phosphorus movement to surface waters, provided in 40 CFR 122.42(e)(1) and 40 CFR 412.4(c)(1) and (2), the Illinois EPA is proposing in Section 502.630(b)(2) that no discharge of livestock waste occur during land application. Such discharges of livestock waste would be expected to cause violations of water quality standards and harm aquatic life in the receiving stream.

Predicting Precipitation Prior to Winter Land Application

The Illinois EPA also proposes in Section 502.630(b)(3) a prohibition for surface land application of livestock waste on frozen ground[vii] within 24 hours preceding a forecast of 0.25 inches or more of precipitation in a 24 hour period, as measured in liquid form. The CAFO owner must, according to our proposal, use one of two methods to determine whether or not these conditions exist, and then must also maintain a record of the forecast from the source used.

The two sources of information for the forecasts proposed are the same as those in Section 502.620(d). For frozen ground conditions, the forecasts are:

- a prediction of 60 percent or greater chance of 0.25 inches or more of precipitation in a 24 hour period as measured in liquid form by the National Weather Service, at http://www.nws.noaa.gov/mdl/forecast/graphics/MAV/ for the location of the land application site; or
- a prediction of 0.25 inches or more of precipitation in a 24 hour period as measured in liquid form and identified as higher than QPF category 2 by the National Weather Service at http://www.nws.noaa.gov/mdl/synop/products/bullform.mex.htm for the location nearest to the land application area.

For a discussion on the use of and justification for these methods, refer to our discussion in proposed Section 502.620(d), titled "Predicting Precipitation Prior to Land Application". The

Illinois EPA proposes the use of these forecast methods and the retention of records given the findings in Daverede et al. (2004), which showed that surface applied manure without incorporation on unfrozen ground caused total phosphorus in runoff one month after application of livestock waste of 8-12 mg/l. Since frozen ground can have a lower infiltration rate than unfrozen ground, a lower threshold of precipitation will cause runoff. The Illinois EPA proposes, therefore, a lower precipitation forecast criteria than for unfrozen ground. The forecast precipitation amounts available from the two National Weather Service websites (above) less than 0.5 inches, which the Illinois EPA proposes as the criterion for unfrozen ground, are 0.25 inches and 0.1 inches. The Illinois EPA is proposing a precipitation criterion of 0.25 inches of precipitation for frozen ground. The proposed Section 502.630(b)(3) addresses timing of land application with respect to forecasted precipitation events and minimizes nitrogen and phosphorus movement from the field by reducing the times when livestock waste is applied to a field prior to runoff producing precipitation events.

Similarly, the Illinois EPA is proposing a prohibition in Section 502.630(b)(4) for surface land application of livestock waste on snow or ice covered ground within 24 hours preceding a forecast of 0.1 inches or more of precipitation in a 24 hour period, as measured in liquid form. Ice covered and snow covered ground will have a lower infiltration rate than unfrozen ground due to increased saturation of the soils and ice limiting infiltration at the surface or in the soil profile. In addition, melting ice or snow on the ground surface may transport nitrogen and phosphorus to surface waters. In the case of ice or snow covered ground, precipitation runoff will begin at lower precipitation amounts than it would on frozen ground. The Illinois EPA proposes lower precipitation amounts than for unfrozen ground and frozen ground be used as the precipitation forecast criteria. The Illinois EPA has proposed 0.25 inches precipitation amount for frozen ground. For ice or snow covered ground, since the runoff risk is greater, the Illinois EPA proposes a criterion of 0.1 inches forecasted precipitation amount.

Recordkeeping of the Forecast for Winter Application

40 CFR 412.4(c)(1) requires the NMP to have been developed using a field specific assessment of the potential for nitrogen and phosphorus transport from the field, and the NMP must also address the form, source, amount, timing and method of application of nutrients on each field to achieve realistic production goals, while minimizing nitrogen and phosphorus movement to

surface waters. To address these requirements, Illinois EPA is proposing that the CAFO owner maintain a record of the forecast from the source used. Ice or snow melt events in the week following surface land application of livestock waste may result in significant amounts of runoff to surface waters. In Section 502.630(b)(5), the Illinois EPA addresses timing of land application with respect to reliable forecasted ice and snow melt events. When winter land application is necessary, the Illinois EPA proposes to reduce the possibility of runoff by requiring a best management practice to prevent surface application of livestock waste onto ice or snow-covered land immediately prior to ice or snow melt events using forecasts obtained from the National Weather Service. By providing adequate time between land application and the predicted time for melt events, this proposed rule will reduce the potential for violations of water quality standards and harm to aquatic life.

Visual Monitoring and Reporting Following Winter Application

If winter application must occur on ice covered or snow covered land, the Illinois EPA proposes in Section 502.630(b)(6) that, in addition to the practices explained above, when the ambient temperature is 32 degrees Fahrenheit or greater, the CAFO owner must visually monitor land application sites that have received surface applied livestock waste. The practice of visual monitoring is to continue until the ice or snow disappears from the land application site. Visual monitoring by the CAFO owner or operator will provide valuable information to the CAFO owner about the existence of contaminated runoff. This information can be used to inform the CAFO owner of the need for response actions regarding the discharge and that the CAFO owner must then report the discharge in accordance with the proposed Section 502.630(b)(7). These reporting provisions are based on the requirement in the LMFA for all livestock waste releases, the rules for which are found in 35 Ill. Adm. Code, Chapter II, Part 580.

Fields that are Suitable for Winter Application

Illinois in the past years had several of the wettest growing seasons on record, forcing farmers to delay livestock waste applications that generally follow the fall harvest. In several parts of the State, soil conditions were not suitable for farmers to harvest so they had to wait until the ground was frozen. Even for a well designed and properly managed facility, prolonged wet weather patterns will make livestock waste management extremely difficult. In such circumstances,

application of the livestock waste during winter months becomes a necessary practice, and is acceptable as long as it is done properly. According to USEPA's guidance, *Managing Manure Nutrient at Concentrated Animal Feeding Operations*, August 2004, "considerable research has demonstrated that runoff from manure application on frozen or snow covered ground has a high risk of water quality impact" (USEPA, 2004, p L-16). The guidance also indicates that winter applications increase pollutants in runoff during spring thaw and rainfall events (USEPA, 2004, p 16).

To minimize the risk of contaminated runoff to surface waters, it is important to understand factors affecting the runoff from fields where the livestock waste has been applied during winter and other times when the ground is frozen or snow or ice covered. To promote acceptable winter applications of the livestock waste, states are required to develop technical standards that CAFOs must follow for an acceptable application of the livestock waste during the winter (USEPA, 2004, p 16). The guidance recommends states' technical standards for winter applications of the livestock waste address factors such as slopes, distance to waters, roughness of the land surface and other relevant factors (USEPA, 2004, p 16). The above mentioned factors suggest that site selection is a critical factor in reducing the risk of runoff to surface waters from winter livestock waste application. Since the Illinois EPA recognizes that not all fields are suitable for the livestock waste application on frozen or snow or ice covered land, the Agency's proposal provides the criteria for the proper site selection by the CAFO owner. The Agency's proposed site selection criteria focus on factors such as erosion controls, buffers, field slope and setbacks.

Contaminated runoff from the livestock waste application on fields bordering surface waters is more likely than on fields that are covered by crop residue or fields that have borders with crop residue, pasture, wooded areas, or other suitable buffer strips. Properly designed buffer strips along surface waters can absorb the runoff, thus reducing the amount of livestock waste entering a stream.

LMFA promotes the use of erosion control practices as a means of reducing the amount of runoff from the livestock waste applied on frozen or snow or ice covered land entering surface waters (510 ILCS 77/20(f)(9); 8 Ill. Adm. Code 900.803(s)). Consistent with the LMFA, the Agency's proposal in Section 502.630(c)(1) requires that the livestock waste should be applied on those

fields where erosion and runoff control practices such as vegetative fence rows[viii], contour farming, terracing, etc., are actively applied. With this requirement, the Agency is establishing that fields without these erosion and runoff practices are not suitable for the livestock waste application during those adverse winter field conditions.

Livestock waste should not be applied adjacent to sensitive areas under frozen and snow and ice covered conditions without proper safeguards. CAFO owners should select fields that are located away from surface water or tile inlets to reduce the chance that livestock waste will be discharged into surface water. Consequently, the Agency is proposing that the fields selected for the livestock waste application during these winter conditions must have additional setback distances from sensitive areas, such as open tile intake structures, ditches, sinkholes, wellheads, or other conduits to surface water. Also, as properly designed buffers have the potential to absorb the runoff, the Agency is proposing at Section 502.630(c)(2) that a buffer of 200 feet down gradient of the livestock application area must exist between the select fields and the sensitive areas mentioned above. The Agency's proposal is similar to the LMFA recommendation that land application cannot occur within 200 feet of surface water, as specified in 510 ILCS 77/20(f)(6).

The LMFA recognizes that livestock waste application must be conducted in a responsible manner to protect the environment (510 ILCS 77/20(f)). One of the responsible practices identified in the LMFA is to limit application of livestock waste when the Bray P1 or Mechlich 3 soil phosphorus test levels exceed 300 pounds of elemental phosphorus per acre (510 ILCS 77/20(f)(3.6)). The LMFA thus restricts livestock waste application rates on fields that have Bray P1 or Mechlich 3 soil phosphorus test levels above 300 pounds to no more than the annual phosphorus amount to be taken up by the next crop grown based on targeted crop yield goal (510 ILCS 77/20(f)(3.6); 8 Ill. Adm. Code 900.813(b)).

Another factor that influences contaminated runoff to surface waters is soil erosion potential of the field. Fields with higher soil erosion losses release more contaminants in the environment during snow melt or rainfall. The Agency's proposal combines phosphorus and soil erosion factors in Section 502.630(c)(4) to create a more protective and conservative approach for the application of the livestock waste during the winter. In this section, the Agency proposes that the livestock waste application on frozen or snow or ice covered land can only occur on fields that

have soil erosion losses less than the erosion factor T, as well as having a soil phosphorus level less than or equal to 300 pounds per acre.

Livestock waste runoff from steeply sloping fields is more likely than from fields with little or no slope. The potential for runoff is even more likely when the livestock waste is applied on frozen or snow or ice covered fields. In Illinois, the LMFA restricts the application of the livestock waste on frozen or snow or ice covered fields to those fields that have slopes 5% or less (510 ILCS 77/20(f)(9); 8 Ill. Adm. Code 900.803(s)). To minimize the threat to the environment, the Agency's proposal in Section 502.630(c)(3) incorporates this LMFA requirement.

As application under these winter conditions increases the risk of contaminated runoff, the Agency's proposal sets additional criteria for fields that have slopes between 2 and 5 percent as well as those with less than 2 percent. As setbacks are used to increase the distance pollutants have to travel to reach surface waters, the Agency is requiring significantly greater distances for the winter application of the livestock waste. The rationale for increased setbacks is to ensure that pollutants such as nitrogen, phosphorus, and other contaminants in the livestock waste do not reach surface waters after it is applied on the frozen or snow or ice covered fields. Fields with slopes between 2 and 5 percent must maintain setbacks that are three times the setbacks required under proposed Section 502.615 and 502.645. These increased setbacks are necessary to minimize contaminated runoff potential from surface applications of the livestock waste on frozen or snow or ice covered fields.

Illinois EPA proposes a similar setback requirement for fields that have a slope less than 2 percent. Such fields are expected to maintain setbacks that are two times the setbacks prescribed under proposed Section 502.615 and 502.645. Again, the rationale for this requirement is that, although fields with lesser slopes are less likely to have runoff, these setbacks are essential to minimize runoff potential to surface waters from application of the livestock waste under these winter conditions.

<u>New Technical Standards and Effluent Limitations for Permitted and Unpermitted CAFOs</u>

There are new criteria contained in this proposal for the production areas and land application areas for permitted and unpermitted CAFOs. Many of those criteria were derived entirely from the federal rule. Where the federal rule requires the state authorities develop state-specific

criteria, Illinois EPA has done so and, again, proposes and describes them here. To a lesser extent, the Illinois EPA has not detailed the criteria if the federal rule was the sole basis for their inclusion. For example, the provisions for livestock waste discharges caused by overflows from containment or storage structures and for voluntary alternative performance standards for discharges, as shown in proposed Section 502.605, are adopted from the federal rule. Certain additional measures were not, as discussed below.

The Illinois EPA proposes at Section 502.605(a) that the CAFO owner properly operate and maintain the CAFO facilities, including all systems for livestock waste treatment, storage, management, monitoring and testing. The federal regulations at 40 CFR 122.41(e) and 122.42(e)(1)(i) require permitted CAFOs to properly operate and maintain their facilities to meet NPDES permits and 40 CFR 412 effluent limitations. The CAFO must properly operate and maintain its facilities so as to meet the requirements of the Subtitle E regulations and its CAFO NPDES permit. Failure to properly operate and maintain livestock facilities may cause an unauthorized discharge from the facilities, cause violation of water quality standards and harm aquatic life.

Production Area Inspections and Correcting Deficiencies

Further, the Illinois EPA proposes, in addition to the federally required avoidance of livestock coming in contact with surface waters and the various provisions for visual inspection of systems within the production area to control livestock waste, that deficiencies identified by inspections required by proposed Section 502.610 not corrected within 30 days must be accompanied by an explanation of the factors preventing immediate correction. The Illinois EPA believes this conforms to the intent of 40 CFR 412.37(a)(3) and (b)(3) regarding deficiencies found during inspections and the need to take corrective actions. The proposed Section 502.320(e) specifies the recordkeeping required to document the actions required in the proposal for this action in proposed Section 502.610(f).

Mortalities

The Illinois EPA also proposes a prohibition in Section 502.610(g) on the discharge of pollutants from dead livestock or dead animal disposal facilities to waters of the State. This proposal seeks

to prevent dead livestock and water contaminated by dead livestock from being disposed in the liquid manure storage structures, egg wash wastewater facilities, egg processing wastewater facilities, or areas used to hold products, by-products or raw materials that are set aside for disposal, or contaminated stormwater facilities, other than facilities used solely for disposal of dead livestock. The federal rule provides in, 40 CFR 412.37(a)(4), requirements for the disposal of mortalities and the prevention of any discharge of pollutants from dead livestock to surface waters. Specifically, 40 CFR 412.37(a)(4) does not allow disposal of mortalities in any liquid manure or processed wastewater system. Not allowing dead livestock to be stored or handled in livestock waste handling systems, other areas of CAFO wastewater handling, areas where CAFO materials are set aside for disposal or stormwater areas that are not the dead livestock handling and disposal facilities, keeps the dead livestock and associated pollutants separate from other materials that may be land applied or discharged as allowed under the CAFO permit. Separating runoff from mortalities also sets up waste handling systems in which these flows can be managed in accordance with the Illinois Dead Animal Disposal Act (225 ILCS 610/17).

Chemical and Other Contaminants

Proposed Section 502.510(b)(7) and 502.610(h) specify the proper handling of chemicals and other contaminants. Good housekeeping practices are essential to prevent the inappropriate introduction of chemicals into the livestock waste. For example, chemicals such as pesticides, hazardous and toxic chemicals, and petroleum products that are introduced to livestock waste or other liquid storage structures could be discharged to surface water during land application of the livestock waste or during other accidental releases. USEPA's Guidance, *Managing Manure Nutrients at Concentrated Animal Feeding Operations*, August 2004, Chapter 7, Chemical Handling, page 3, recommends that to encourage good housekeeping practices, the NMP should identify where chemicals are stored, where any mixing and loading are conducted, how empty containers and waste materials are disposed of, and what practices are employed to prevent chemicals from inappropriately entering the manure and wastewater storage structures.

The federal rule allows for disposal of chemicals and other contaminants into storage or treatment systems if such systems are specifically designed to handle or treat chemicals and other contaminants. However, not all storage systems are designed to handle or treat chemicals. USEPA's Guidance, *Managing Manure Nutrients at Concentrated Animal Feeding Operations*,

August 2004, Chapter 2, Disposal of Chemicals, page 23, provides that disposing of chemicals or other contaminants into storage or treatment systems that are not designed to handle chemicals could cause the systems to fail, and could discharge chemicals into surface water. It further provides that under certain chemicals loads, biological treatment systems such as lagoons and digesters could fail.

The Agency believes it is a good housekeeping practice to properly dispose of chemicals and other contaminants. Therefore, the CAFO owner or operator should follow instructions provided on labels or documentation from the chemical supplier, rather than dispose them off into storage or treatment systems.

Lagoon Structural Inspections

Another part of the routine maintenance of the production area concerns the routine inspection of the lagoon berm. Visual inspections of the exposed earthen surface of the lagoon should be conducted to ensure the structural integrity and condition of the materials used in construction. The proposed rule includes inspection provisions in Section 502.610(i) that require the CAFO owner to make observations of the earthen slopes of lagoons and similar structures for evidence of instability and damage that could adversely affect the structure. The CAFO owner is required to make these inspections at least once every week. This requirement is consistent with the provisions in the federal rule in 40 CFR 412.37(a)(1)(iii).

Sludge Removal from Storage Areas

In Section 502.610 (j) the Illinois EPA proposes that the CAFO owner perform periodic removal of the accumulated sludge in the liquid manure storage area and the waste containment area. Proper maintenance of the volume and the sludge accumulated in the structure affects the operation and biological condition of the manure stored there (Barker, 1996; Funk, T., Circular 1326, Jones, 1999). Also, the federal CAFO rule in 40 CFR 122.42 (e)(1)(i) recognizes the importance of proper operation and storage of livestock waste. Consistent with the approach in the 8 Ill. Adm. Code 900.608(a)(2) soils contaminated in the waste storage structure are handled in a manner similar to livestock waste for purposes of disposal.

180 Day Minimum Storage

Livestock waste storage system management provisions are proposed in Section 502.610(l). This proposed section requires livestock waste storage structures at permitted CAFOs to have 180 days of storage. The Illinois EPA proposes the process to account for the storage volume, by addressing the following factors: the expected livestock waste production during the 180 days, precipitation and runoff during the 180 days, wash waters generated during the 180 days, volume of precipitation and runoff from the 25–year, 24–hour storm event, design organic loading (if applicable), sludge accumulation volume, and a freeboard of 2 feet (except if the storage structure is covered or otherwise protected from precipitation). This provision requires the CAFO to provide storage for periods when livestock waste cannot be land applied, such as those periods when crops are in the fields, and when prevented due to weather conditions, frozen, ice or snow covered land or other reasons that prevent the land application or removal of livestock waste from the production area. The design organic loading is used to determine the design volatile solids loading volume component for systems that provide anaerobic treatment of livestock waste, such as anaerobic lagoons.

40 CFR 412 requires the production areas not to discharge livestock waste to surface waters, except when specified precipitation event overflows are allowed. USEPA used a 180 day storage assumption for comparison of alternatives costs for option 2, as explained in Cost Methodology for the Final Revisions to the National Pollutant Discharge Elimination System Regulation and the Effluent Guidelines for Concentrated Animal Feeding Operations, December 2002, pages 1-3 for the 2003 final federal CAFO rule. Option 2 was selected by USEPA as the basis for the 2003 CAFO rule. On page 7215 of the February 12, 2003 preamble to the final rule, USEPA states:

> CAFOs must properly design, operate, and maintain storage structures to contain all manure, litter, and process wastewater including the runoff from a 25-year, 24-hour precipitation event. The determination of the necessary storage volume should reflect the maximum length of time anticipated between emptying events. The design storage volume must reflect manure, wastewater, and other wastes accumulated during the storage period; normal precipitation less evaporation on the surface area during the entire storage period; normal runoff from the facility's drainage area during the storage period; 25-year, 24-hour precipitation on the surface (at the required design storage volume level) of the facility; 25-year, 24-hour runoff from the facility's drainage area; residual solids after liquids have been removed; necessary freeboard (USDA's Natural Resources Conservation Service (NRCS) recommends a minimum of 1 foot of freeboard); and, in the case of treatment lagoons, a minimum treatment volume necessary to allow anaerobic treatment to occur. Additional storage may also be required to meet management goals or

other regulatory requirements. For example, if the permitting authority needs further controls to assure compliance with site-specific water quality standards. EPA encourages CAFOs to consider relevant ASAE and NRCS standards as one method to ensure appropriate design and construction.

The LMFA regulation requires 180 days of storage, 150 days of storage and 270 days of storage for various types of livestock waste handling systems. The Illinois EPA proposes 180 days of storage as a minimum structural storage capacity necessary to prevent discharges of livestock waste. This requirement provides the necessary capacity so CAFOs can design, construct, operate and maintain the storage structure to meet the requirements of the federal CAFO regulations and these proposed Subtitle E regulations. The Illinois EPA is proposing the same storage period for all types of livestock waste storage structures to simplify the storage period requirement to a single standard for all CAFOs subject to the proposed Subpart F regulations. This includes all permitted CAFOs that have dairy cows, cattle and existing swine, poultry and veal permitted CAFOs.

The Illinois EPA does so with the understanding that the limitations on land application are the same for each type of livestock waste handling system, and therefore the same capacity is necessary for each system. Owners of large new swine, poultry and veal CAFOs are required to model the operation using climate data to determine the necessary volume to prevent a discharge from all precipitation events. Consequently, 180 days of storage may not be sufficient to meet the requirements necessary for large new swine, poultry and veal CAFOs subject to proposed Subpart H, which have additional technical requirements to evaluate adequacy of storage.

Manure and Soil Sampling

The Illinois EPA proposes technical criteria for manure and soil sampling and analysis since these are important components of the NMP. Accurate and reliable information is needed to make the necessary calculations in the NMP.

The Illinois EPA proposes sampling protocols in Section 502.635(a), in accordance with the requirement to develop these protocols as specified in 40 CFR 122.42(e)(1)(vii). Fields where livestock waste is to be applied are to be sampled for phosphorus in accordance with the Illinois Agronomy Handbook and analyzed according to procedures incorporated by reference in proposed Section 501.200. The Illinois EPA also proposes that samples be collected at the same

time within the cropping season to make results comparable year to year. As provided in 40 CFR 412.4(c)(3), which requires soil analysis a minimum of once in the five year permit term, the Illinois EPA proposes two samples at least one year apart within the permit term. This more frequent soil sampling is proposed so that more data are available for review when the permit must be modified or renewed.

Proposed Section 502.635(b)(1) requires the CAFO owner to annually obtain a laboratory analysis of the nutrient content, representative of the livestock waste to be land applied according to the CAFO's NMP. In order to make the results useful, livestock waste should be sampled during the land application process. Multiple subsamples should be obtained and combined into one sample so that a representative sample is obtained for analysis. Results of a sample taken during land application should be used for plan preparation in the following year, unless there have been changes in the waste management practices during that year. As indicated above, the analytical results of livestock waste samples should be used for calculation of the application rate allowed by the NPDES permit.

The rationale for this section rests with 40 CFR 122.42(e)(5)(i)(B) which requires that the land application rates must be calculated at least once per year based on the most recent livestock waste analysis results for nitrogen and phosphorus taken within 12 months of the date of the application. Additionally, 40 CFR 122.42(e)(5)(ii)(D)(2) requires that, in order to determine the maximum amounts of livestock waste that may be applied to each field, the most recent representative livestock waste analysis results for nitrogen and phosphorus taken within 12 months of the date of the application must be used to determine the amount of those nutrients in the livestock waste. Results from annual analysis of livestock waste must be used to determine land application rates, according to 40 CFR 412.4 (c)(3). The LMFA regulation in 8 Ill. Adm. Code 900.805(b)(1) requires sampling protocols similar to the federal rule, specifying how to obtain multiple subsamples for compositing. Peters et al, 2003, recommended subsamples of liquid and solid livestock wastes composited into a single sample of livestock waste for analysis, and that data for solid and liquid livestock waste composite sampling showed less variability in analytical results than results from single samples. These same authors also found that composite

sampling of liquid livestock waste from agitated liquid manure storage structures provided consistent results with low variability.

As previously stated, the results of the livestock waste analysis from a previous year's land application are allowed to be used to determine land application rates unless there have been changes in waste handling practices. However, it may not be possible in all instances to have the most recent samples analyzed for use in determining land application rates. If samples are taken during land application as required by this rule, the results of analysis may not be available to the CAFO owner prior to application of the livestock waste due to the time needed to process the samples in the laboratory. Variable weather conditions, such as wet periods, large storms or other unexpected events, may require the CAFO owner to land apply livestock waste on short notice to prevent discharges. Peters et al, 2003 recommended that long term averages be used for nutrient content of livestock waste rather than the single most recent analysis of the livestock waste when the conditions of the livestock waste storage and handling system have not changed.

The basis for this Section is in several sections of the federal rule, including 40 CFR 122.42(e)(1)(vii) which requires the NMP to identify appropriate protocols for testing of livestock waste. 40 CFR 122.42(e)(5)(i)(B) requires that the land application rates must be calculated at least once per year based on nitrogen and phosphorus analysis of the livestock waste to be land applied. Also, 40 CFR 122. 42(e)(5)(ii)(D)(2) requires a determination of the maximum amounts of livestock waste to be applied to each field, using the most recent representative analysis of the livestock waste for nitrogen and phosphorus taken within 12 months of the date of the land application. Further, 40 CFR 412.4(c)(3) requires annual analysis of livestock waste and the use of the results of the analysis to determine land application rates.

MWPS-18 (Livestock Waste Facilities Handbook, 1998) uses total Kjeldahl nitrogen, ammonium–nitrogen, phosphorus (as $P_2 0_5$) and potassium (as K_2O) in its example calculations for determining livestock waste application rate. MWPS-18 (Manure Characteristics Section 1, 2004) also states the typical nutrient content of livestock waste for various species and waste management systems for the same parameters. MWPS-18 (Manure Characteristics, Section 1, 2004) recommends that livestock waste analysis for land application include the same parameters cited above. In other studies, Peters et al, 2003 suggest analysis for total Kjeldahl nitrogen, ammonium-nitrogen, total phosphorus and potassium.

USEPA Method 350.1-Ammonia and Standard Methods for Examination of Water and Wastewater 4500-NH3 B through H are approved for ammonia determinations in wastewaters under 40 CFR 136. The USEPA Method 350.1 - Ammonia converts ammonium in the wastewater samples to ammonia and measures the total ammonia in the samples (USEPA, 1993; American Public Health Association, 1995). The methods 4500-NH3 B, 4500-NH3 C, 4500-NH3 D, 4500-NH3 E, 4500-NH3 F, 4500-NH3 G and 4500-NH3 H for ammonia nitrogen in the Standard Methods for Examination of Water and Wastewater convert ammonium in the samples to ammonia and measure the total ammonia in the samples (AHPA, 1995). The methods by Peters et al, 2003 also convert ammonium to ammonia, measured the total ammonia and reported it as ammonium nitrogen. At typical pH values of 8 or below for livestock waste, most of the ammonia and ammonium nitrogen is in the ammonium form. The determination of the ammonia species in the samples can be determined by published methods that report ammonia or ammonium nitrogen. The results are then used in the same manner to determine organic nitrogen content of the livestock waste, by subtracting ammonia or ammonium nitrogen from total Kjeldahl nitrogen in the sample (Midwest Plan Service, 1998). The ammonium nitrogen and ammonia nitrogen results can be used to determine the ammonium or ammonia fraction of the plant available nitrogen (Midwest Plan Service, 1998).

Therefore, the Illinois EPA is proposing, in Section 502.635(b)(2), that laboratory analysis of the livestock waste sample include, but not be limited to, total Kjeldahl nitrogen, ammonia or ammonium nitrogen, total phosphorus, total potassium, and percent total solids. The nutrient results are required to be reported in mg/Kg dry weight basis or mg/L wet weight basis on the laboratory analysis sheet. The results of these analyses are required to be used in determining application rates for livestock waste.

Equipment Inspection and Calibration

The Illinois EPA is proposing requirements for land application equipment, in Section 502.640, to prevent unintentional discharges and to ensure that the equipment is properly calibrated. Periodic equipment inspection requirement is specified in 40 CFR 412.4(c)(4) in the federal rule. Land application equipment, among other things, allows CAFO owners to apply livestock waste at the desired application rate, so long as the equipment is operating properly and calibrated to

discharge the amount calculated. The accuracy of these application rates, however, depends on routine calibration of equipment to produce reliable results consistent with performance criteria established by the equipment manufacturer. Illinois NRCS Practice Standard 590, *Nutrient Management*, recommends that land application equipment be calibrated to ensure uniform distribution of material at desired rates. ANSI GELPP 0004-2002, *Manure Utilization*, recommends annual calibration of manure application equipment. Illinois NRCS Practice Standard 633 Appendix B, *Waste Utilization*, also recommends calibration of application equipment on an annual basis to ensure uniform distribution of material at desired rates. The frequency of calibration should be consistent with the manufacturer's recommendations. Also, the equipment should be calibrated prior to use under different conditions. By calibrating the application equipments on a routine basis, the CAFO owner will eliminate or reduce variations in the application rate, including unknown, unwanted and undocumented over-application.
As calibration requirements are specific to the equipment used for land application, under the Agency's proposal, the CAFO owner or operator must provide a detailed description of procedures and schedules in the site specific NMP. By documenting procedures and schedules for equipment in the NMP, the CAFO owner can show through records that the specific intent of the NMP was followed, and thus avoid any allegations of improper application or an unpermitted discharge.

Land Application Setbacks to Sensitive Sites and Waters

As part of the technical requirements for land application areas, the Illinois EPA is proposing in Section 502.645(a) a one quarter mile distance between the land application area and any residence that is not part of the CAFO unless the livestock waste is injected under the soil surface or incorporated into the soil on that day of application. The Illinois EPA is also proposing setbacks and other requirements for land application near or on surface waters (200 foot setback), 10-year floodplains and grassed waterways[ix] in proposed Section 502.645(b). In addition, proposed Section 502.645(b)(1) allows adequate diking to meet setback requirements in lieu of the 200 foot setback from surface waters. For purpose of this section diking is adequate if it prevents runoff from the land application from entering surface water that are within 200 feet of the land application area. These provisions and others in this proposed section are derived

from Section 20(f) of the LMFA. In addition, setbacks to surface waters and conduits to surface waters are specified in proposed Section 502.645(b), in accordance with 40 CFR 412.4. Setbacks from surface waters and conduits to surface waters prevent application onto soils that are on low lying areas of land application sites next to these features. Garen and Moore (2005) indicated that areas at the bottom of sloping land and low lying areas have high water tables where saturated soils are most likely to occur. They further stated that overland flow is generated from areas of saturated soil and is "the dominant stream flow generating process during most storms of ordinary intensity." The Illinois EPA believes these distances and setbacks are needed to reduce odors and other impacts, in the case of distances to residences, and to prevent contaminated runoff to surface waters.

New Source Performance Standards

Proposed Section 502.710(b) requires the new source dairy cows and cattle other than veal calves to meet the discharge limitations and effluent standards of proposed Sections 502.605 and 502.610 for the CAFO production area. 40 CFR 412.35 of the federal CAFO regulations requires the same discharge limitations and effluent standards for new source dairy cows and cattle other than veal calves CAFOs as for existing dairy cows and cattle other than veal calves CAFOs. New sources and existing CAFOs are expected to have production areas, livestock waste systems and livestock management systems that are similar to each other in design, construction, operation and maintenance. Therefore, the Agency proposes the same controls and technical standards be applied to the new source and existing dairy cows and cattle other than veal calves CAFOs to provide equivalent protection of surface water quality and aquatic life.

Proposed Section 502.710(c) requires the new source dairy cows and cattle other than veal calves to meet the discharge limitations and effluent standards of proposed Section 502.615 through 502.645. This proposed requirement is consistent with 40 CFR 412.35 of the federal regulations that requires the same discharge limitations and effluent standards in 40 CFR 412 for new sources as for existing large CAFOs with dairy cows and cattle other than veal calves.
The federal CAFO regulations at 40 CFR 412.4(c)(2) require the determination of application rates in accordance with state technical standards for nutrient management applicable to existing and new sources CAFOs for dairy cows and cattle other than veal calves. The operation and

management of livestock waste application onto land is expected to be the same for existing and new source CAFOs in this category. The effect on surface waters of stormwater runoff from land application of livestock waste is expected to be the same for new source and existing dairy cows and cattle other than veal calves CAFOs. Therefore, the Agency proposes that the same technical standards for livestock waste land application are applied to new sources and existing dairy cows and cattle other than veal calves CAFOs to protect surface water quality and aquatic life.

Proposed Section 502.800(b) requires new source swine, poultry, and veal CAFOs to meet the discharge limitations and effluent standards in Subpart F of this Part except proposed Section 502.605. 40 CFR 412.46(a)(2) requires new source swine, poultry and veal CAFOs to meet the same production area requirements in 40 CFR 412.37(a) and (b) as existing swine, poultry and veal CAFOs. In addition, new source and existing CAFOs are expected to have production areas, livestock waste and livestock management systems that are similar to each other in design, construction, operation and maintenance. Therefore, the Agency proposes the same controls and technical standards in Section 502.610 be applied to the new source swine, poultry and veal CAFOs and existing swine, poultry and veal CAFOs to provide equivalent protection to surface water quality and aquatic life.

The federal CAFO regulations at 40 CFR 412.46 require new source swine, poultry, and veal CAFOs to meet the same land application requirements in 40 CFR 412.4 as for existing swine, poultry, and veal CAFOs. The federal regulations at 40 CFR 412.4(c)(2) require the determination of application rates in accordance with state technical standards applicable to existing and new source CAFOs for swine, poultry and veal. The operation and maintenance of livestock waste application onto land is expected to be the same for existing and new source swine, poultry, and veal CAFOs. The effects on surface waters of stormwater runoff from land application of livestock waste is expected to be the same for new source and existing swine, poultry, and veal CAFOs. Therefore, the Agency proposes that the same technical standards be applied to the existing and new source CAFOs in this category to protect surface water quality and aquatic life.

Recordkeeping

In order to track progress and verify that certain specific actions had been taken as prescribed in the permit (in much the same way that discharge monitoring reports submitted to the Illinois EPA are used to verify effluent quality), records of activities at the CAFOs will be needed. These records may be used by the Illinois EPA when inspections are made and when renewal of permit coverage is necessary. While there are a number of recordkeeping requirements specified in the federal CAFO rule, the following will highlight those the Illinois EPA proposes and includes here that are in addition to the federal requirements.

In Section 502.320(l) the Illinois EPA propose records of the CAFO owner's inspection of subsurface drainage system be kept. The inspections are required under proposed Section 502.510(b)(13), and are discussed in this document under " Consideration of Subsurface Drainage Systems on the Transport of Nutrients. As is the case in many recordkeeping requirements, the interest in keeping these records is to verify that the inspection—that may reduce or eliminate water pollution due to a discharge from a field tile—was actually conducted, that observations were made and, where appropriate, that necessary corrective action was conducted.

The Illinois EPA is also proposing in Section 502.320(v) that the CAFO owner keep records of the quantity of livestock waste removed during dewatering of the manure storage or waste containment area. The federal CAFO rule requires that adequate storage be provided and that sufficient volume within the storage structure be maintained for storm water and livestock waste. A tally of the amount stored and removed, and written records to verify those additions and withdrawals, is proposed here. The Illinois EPA believes this recordkeeping is useful and practical given the various other storage area requirements, such as those relating to maintenance of the structure and installation of a depth marker, all intended to ensure positive retention and adequate volume available at any time.

In Section 502.320(w)(2), in addition to other federally required factors in subsection (w) under 40 CFR 412.37 that require daily recordkeeping, the Illinois EPA is proposing that the CAFO owner record the soil water conditions at the time of application, thereby documenting if proper

and satisfactory conditions existed. Soils and water conditions must be known to determine if land application of livestock waste will meet the provision of proposed Sections 502.620 and 502.630. Soil water conditions at the time of application allow the CAFO owner to verify what those soils conditions were, should questions or complaints arise, and they correspondingly allow the Illinois EPA access to site-specific records when confirming application procedures and when responding to complaints. Similarly, the location of the field, as proposed in Section 502.320(w)(5), is important identification information that would be needed when documenting application rates, crop yields, subsurface drainage inspection locations and other important, site-specific information.

Keeping documentation of the weather forecasts used when determining the proper application times and field is very important. As proposed in Section 502.320(w)(9), the documents relied upon by the CAFO owner, as necessary under proposed Section 502.620(d) (for planning surface land application) and proposed Section 502.630(b)(3), (4) and (5) (for planning surface land application in the winter) would establish a record for the decisions made concerning when and where to land apply, and the important information concerning the basis for the CAFO owner's decision.

In addition to the above recordkeeping, the Illinois EPA is also proposing records for certain activities covered in proposed Section 502.510(b). While most of that section are required under the federal CAFO rule and therefore have not been described in this document, certain parts of that section— proposed Sections 502.510(b)(11), (12), (13) and (14), all of which have been described previously in this document—are proposed by the Illinois EPA and require that records be kept by the CAFO owner.

End Notes

[i] Section 501.363 Setbacks

The definition of setbacks is provided to clarify the meaning of the term and its use in Part 502. At the core of this term is the need to identify a distance from land application areas to Surface Waters or those features that may act as conduits to those waters. Examples of some conduits are provided in this definition.

[ii] Section 501.261 Incorporation

The term incorporation is defined in proposed Section 501.261 to identify and specify the actual methods for applying livestock waste to soils and distinguish this method from those methods that do not mix the manure with the soil at the time of application. These methods of incorporation would allow for the placement of manure on the top of the land so long as the manure and soil were mixed within 24 hours. Incorporation provides for protection from runoff primarily and secondarily inhibits the escape of volatile components of the manure to the atmosphere that may cause objectionable odor. Studies comparing incorporation to other methods and the timing of incorporation indicate substantial reductions in phosphorus loss from application fields (Allen and Mallarino, JEQ, 2008). This study indicated that for corn and soybean fields, comparing the same simulated rainfall, with and without incorporation in 24 hours, losses of P in various forms was from 2.2 (dissolved reactive P) to 5.4 (for total runoff P) times higher for non-incorporated plots when compared to those with incorporation of the manure.

[iii] Section 501.360 Saturated

The term saturated is added to define soil conditions where soil pore spaces are occupied by liquid such that additional inputs of water or liquid wastes cannot infiltrate into the soil. The term saturated is used in the proposed Subtitle E regulations to denote conditions when land application of livestock waste is not allowed under proposed Section 502.620(a). The technical evaluation for new large swine, poultry and veal facilities under proposed Section 502.840 must account for times when the soils are saturated and land application is not allowed. The proposed

Section 502.320(w)(2) requires records to be kept of land application site conditions including whether the land application site is saturated. The definition describes soil conditions when infiltration of livestock waste into the soil is restricted. When infiltration of the liquid livestock waste into the soil is restricted, runoff of livestock waste from the land application area is expected to occur.

[iv] Section 501.244 Erosion Factor T

Erosion Factor T is an estimate of the amount of soil erosion in tons per acre per year that will not affect crop productivity over a sustained period (USDA-NRCS, 2010). United States Department of Agriculture-National Resource Conservation Service Soil Surveys list the Erosion Factor T for each soil type. This factor is compared to the erosion estimate calculated using the Revised Universal Soil Loss Equation. The proposed Subtitle E revisions require for winter application on frozen, ice or snow covered land that soil erosion rates calculated using the Revised Universal Soil Loss Equation 2 (RUSLE2) must be less than Erosion Factor T. The proposed Subtitle E regulations require that surface applied livestock waste is not allowed when soil erosion is greater than T or 5 tons per acre, whichever is less, and soil slope is greater than 5 percent.

[v] Section 501.263 Injection

Similar to the rationale for identifying and distinguishing incorporation as a method for applying manure to soil, injection is one method of application that provides a simultaneous and proper coverage of the manure with soil. Injection affects the root zone of 4 to 12 inches below the soil surface, thereby benefiting the crop and reducing the possibility of runoff (Allen and Mallarino, JEQ, 2008).

[vi] Section 501.390 25-Year, 24-Hour Precipitation Event

This provision defines the 25-year 24-hour storm event as the maximum 24-hour precipitation event with a probable recurrence interval of once in 25 years, as defined by the National Weather Service in NOAA Atlas 14-Precipitation Frequency Atlas of the United States, Volume 2,

Version 3.0 (2004) found at http://hdsc.nws.noaa.gov/hdsc/pdfs/orb/il_pdfs.html. The federal CAFO regulations require the livestock waste handling facilities to be designed, constructed, operated and maintained to contain the precipitation and runoff from 25-year, 24-hour rainfall events. The federal regulations refer to the National Weather Service Technical Paper No. 40, "Rainfall Frequency Atlas of the United States," May 1961 or equivalent regional or State rainfall probability information developed from this source. The National Weather Service has published more recent regional data in NOAA Atlas 14-Precipitation Frequency Atlas of the United States, Volume 2, Version 3.0 (2004) and maintains it on its internet website address shown in the definition. This 2004 atlas includes more recent data and is expected to be a more accurate representation of future precipitation trends than the National Weather Service's 1961 atlas.

[vii] Section 501.252 Frozen ground

The intent of this definition is to provide clarity and specificity to the requirements for surface application in winter in Part 502, Subpart F (proposed Section 502.630). The inherent risks associated with the application of livestock waste are compounded when conducted on frozen ground. The limits imposed under this definition—1/2 inch to 8 inches, as measured from the soil surface—are proposed such that the application zone and no other soil layer is considered.

Several Midwest states have instituted restrictions on land application of manure in winter and in so doing here described frozen conditions including soils. The definition here is similar to that used in Wisconsin (see Wisconsin NR 243), which states, in part, "Except for liquid manure applications during February and March, manure applied on ground frozen in the first 1/2" or less of soil (or unfrozen in the first 8" of soil) and that has less than 1" of snow is not considered frozen or snow-covered and does not need to comply with winter spreading restrictions. NR 243.14(6)-(8)."

[viii] Section 501.378 Vegetative Fence Row

This provision defines a vegetative fence row as a narrow, permanent strip of perennial vegetation established at the edge of a field that is a minimum of 15 feet wide. The definition states that the vegetative fence row slows water runoff and enhances water infiltration thereby

reducing the risk of pollutants leaving the field. The proposed Subtitle E regulations Section 502.630(c)(1) identify vegetative fence rows as a soil erosion and control practice that provides protection of surface waters from livestock waste runoff from a winter (i.e frozen, ice or snow covered land) land application area. The Illinois EPA conducted a literature review regarding effectiveness of vegetative buffers and determined that a 15 feet vegetative buffer provides significant reduction in phosphorus, nitrogen and suspended solids loads and concentrations in runoff from land application sites.

Dillaha et. al. (1989) conducted experiments on the effects of vegetative filter strips (VFS) of orchard grass on phosphorus, nitrogen and sediment load reductions in runoff through the vegetative filter strips. The load reductions provided by the 15 feet VFS were 74% total suspended solids (TSS), 63% total nitrogen (TN), and 69% total phosphorus (TP). The pollutant load reductions of the 30 feet VFS were 87% TSS, 76% TN and 82% TP.

Mayer et. al. (2007) reviewed literature on nitrogen removal in riparian buffers. Based on their review of 88 studies, riparian vegetative buffers provided reduced concentration of nitrogen in runoff by 50% for a 13 feet buffer width, 75 % for a 160 feet buffer width and 90% for a 488 buffer width. When only surface flows provide pollutant concentration reduction the riparian vegetative buffer 88 feet wide provided a 50% TN concentration reduction in runoff. Vegetation type was not important to effectiveness of the buffer.

Zhang et. al. (2009) conducted a meta-analysis of vegetative buffer efficiency regarding nonpoint source pollution. Based on a review of the literature, sediment load reduction for 15 ft buffers is 79%, TN is 48%, and TP is 49%. For 35 feet vegetative buffers load reduction for sediment is 90%, TN is 75% and TP is 73%.

Based on the review of this literature a 15 feet vegetative buffer zone provides significant load reduction of total suspended solids, total nitrogen and total phosphorus to surface waters of approximately 50 percent or greater. This practice when added to other practices required for winter application of livestock waste will provide control and protection of surface water quality and aquatic life.

[ix] Section 501.253 Grassed Waterway

This proposed section defines grassed waterway as a natural or constructed waterway or outlet shaped or graded and established in suitable vegetation as needed for conveyance of runoff from a field, diversion or other structure. The definition of grassed waterway is derived from the definition and purpose of grassed waterway in USDA-NRCS Standard 412- Grassed Waterway (USDA-NRCS, 2008). The federal regulations 40 CFR 412.4(c)(5) require that livestock waste not be applied in setbacks from surface waters and conduits to surface waters. Grassed waterways may be conduits to surface waters or contain surface waters. Grassed waterways are frequently present in fields. Grassed waterways are listed as conduits to surface waters in the proposed Section 502.645. The proposed Subtitle E regulations propose setbacks from surface waters and conduits to surface waters. The proposed Subtitle E Section 502.645 prohibits livestock waste application onto grassed waterways. A definition of grassed waterways clarifies those areas of a field that are subject to setbacks or other prohibitions in the proposed Subtitle E regulations.

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