

# ENVIRONMENTALLY SUPERIOR PERFORMANCE CRITERIA DEFINITIONS RECOMMENDATION DOCUMENT

## ADVISORY PANEL ENGINEERING SUBCOMMITTEE

### SCOPE

This document represents the recommendations of the Engineering Subcommittee to the Designee regarding the interpretation of the five performance criteria outlined in the NC Attorney General Agreements with Smithfield Foods, Premium Standard Farms, and Frontline Farmers. This recommendation sets goals for each of the five criteria and lists the possible processes, measurement methods, and design standards that should be evaluated when making a determination of an Environmentally Superior Technology (EST). These goals are not meant to define what is achievable for each criteria at the present time given the current suite of ESTs under evaluation nor what is economically feasible. Please note that not all factors for consideration were measured or evaluated as part of this evaluation process.

The goals and factors for consideration recommended by the Engineering Subcommittee are as follows:

#### **1. Eliminate the discharge of animal waste to surface waters and groundwater through direct discharge, seepage, or runoff,**

The goal of the systems should be to utilize proper design standards, reduce water usage, exclude rainfall from the waste stream, and reduce effluent concentrations as compared to a typical swine farm to eliminate the potential environmental risk from a discharge.

All wastewater holding structures, that convey using pumps, should have audible and visible high water alarms with an auto dialer device or a gravity overflow to a basin that can contain the flow rate of the largest pump in the system for the maximum amount of time that an operator will not be on-site. An alternative to the above option is a secondary containment structure that is designed, constructed, and operated to contain the steady state volume of the largest wastewater holding structure and the flow rate of the largest pump in the system for the maximum amount of time that an operator will not be on-site. Technologies should contain less than the volume equivalent of one month of flow in concentrated waste prior to complete treatment.

Earthen structures should be designed and constructed to current Natural Resource Conservation Service (NRCS) standards and have a maximum hydraulic conductivity of  $1.25 \times 10^{-6}$  cm/sec. Structures, other than earthen, should be designed and constructed

using proper engineering practices to eliminate seepage. Solids storage structures should meet current NRCS design standards.

*The Certified Animal Waste Management Plan (CAWMP) should utilize realistic yield expectations, land application setbacks, buffers, and hydraulic loading rates that at a minimum maintain compliance with current NRCS, Local, State, and Federal standards and/or requirements.*

## **2. Substantially eliminate atmospheric emissions of ammonia,**

The goal of the systems should be to reduce the atmospheric emissions of ammonia on the whole farm by 60% as compared to a typical swine farm. A 60% reduction from the current swine population in North Carolina represents a 30% reduction from the average population in 1991-1995. This is similar to the Neuse and Tar-Pamlico River Basin rules that target a 30% nitrogen reduction as compared to 1991-1995 levels.

Factors to be considered with respect to the housing units are:

- Measured emissions from the houses and the confidence of the measurements
- Control technologies implemented in the houses and their effectiveness
- Concentration levels of ammonia-N in the flush/pit recharge water

Factors to be considered with respect to the treatment system are:

- Measured emissions from the treatment system and the confidence of the measurements
- Removal efficiency of ammonia-N within the treatment system
- Concentration levels of ammonia-N in the stored treated waste

Factors to be considered with respect to the land application area are:

- Measured emissions from the land application area and the confidence of the measurements
- Land application method effect on emissions
- Concentration levels of ammonia-N in the land applied waste

## **3. Substantially eliminate the emission of odor that is detectable beyond the boundaries of the parcel or tract of land on which the swine farm is located,**

The goal of the system should be to reduce odor levels, frequency, and duration from the whole farm, such that odor intensity levels are less than or equal to 2, on a 0-8 scale, at 1500 feet from the housing units and treatment system or land application area. An odor intensity of 2 was chosen as a surrogate for 7:1 dilutions to threshold and should be used interchangeably.

Factors to be considered with respect to the housing units are:

- Modeled or measured odor levels and the confidence of the results
- Control technologies implemented in the houses and their effectiveness
- Quality of the flush/pit recharge water

Factors to be considered with respect to the treatment system are:

- Modeled or measured odor levels and the confidence of the results
- Quality of the stored treated waste

Factors to be considered with respect to the land application area are:

- Modeled or measured odor levels and the confidence of the results
- Land application method effect on odor levels
- Quality of the land applied waste

#### **4. Substantially eliminate the release of disease-transmitting vectors and airborne pathogens,**

The goal of the system should be to produce no detectable increase in vectors and a 99% reduction of detectable airborne pathogens for the whole farm as compared to a typical swine farm.

Factors to be considered with respect to the housing units are:

- Vector reduction BMPs implemented and their effectiveness
- Measured airborne pathogens and the confidence of the results

Factors to be considered with respect to the treatment system are:

- Measured airborne pathogens and the confidence of the results
- Concentration levels of pathogens in the stored treated waste

Factors to be considered with respect to the land application area are:

- Measured airborne pathogens and the confidence of the results
- Concentration levels of pathogens in the land applied waste
- Satisfying US EPA 40 CFR Part 503 Class A standards for commercially distributed solids
- Land application method effect on airborne pathogens

#### **5. Substantially eliminate nutrient and heavy metal contamination of soil and groundwater.**

The goal of the system should be to reduce total nitrogen mass by 75% from influent levels and phosphorus, copper, and zinc mass by 50% from influent levels for the whole farm. Phosphorus, copper, and zinc transported off of the farm should be considered a reduction.

Factors to be considered with respect to the whole farm are:

- Measured mass reductions of nitrogen, phosphorus, copper, and zinc

- Ability of a farm to meet the current NC NRCS Nutrient Management Standard 590 including the following additional considerations:
  - Current realistic yield expectations (RYE)
  - Individual plant available nitrogen (PAN) calculations for the waste stream
  - PLAT evaluation to determine phosphorus loss and application rates
  - Copper & Zinc soil test index threshold warning at 2000

## **FURTHER WORK**

This subcommittee is developing a tool that can be used to aid the Designee in the evaluation of different combinations of distinct unit processes, design standards, and Best Management Practices (BMPs). When this tool is completed, it can be used to rank combinations of unit processes and technologies based on weighted factors. The factors designed into the tool are the possible processes, measurement methods, and design standards highlighted throughout this document. Each of the factors will be weighted based on measured and perceived performance towards the goal for each of the five criteria. The weighted points will be totaled for each possible combination and can therefore be ranked comparatively to other combinations. This final comparison of all possible combinations can be used to determine the achievability of the goals. While sufficient improvement in environmental performance would be required before approval as an EST, the committee envisions that these rankings will allow the designation of a threshold score for approval as an EST for any one set of the currently available unit processes.

## **COMMENTS PROVIDED TO SUPPLEMENT THE RECOMMENDATIONS<sup>1</sup>**

Item #1 related to discharge—2<sup>nd</sup> para., last line – The term “complete treatment” could have broad interpretation. Would just “treatment” be adequate?

Item #2 related to ammonia emissions – Without significantly controlling emissions from barns, 60 % reduction in whole farm emissions is probably a very high goal. Ammonia emissions from the barns can be a significant portion of ammonia emissions from a swine farm, and control measures to address barn emissions have not been well established to date. Thus, to obtain whole farm reduction of 60 % without reducing barn emissions would likely require 80 % or more reduction in emissions from the storage/treatment and from the land application area. From this perspective, the greater than 80 % reductions of ammonia emission from storage/treatment and land application area could be considered

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<sup>1</sup> Some components of the Item 1-5 recommendations did not represent consensus subcommittee approval. The subcommittee chair requested additional comment to be provided by subcommittee members for inclusion in the Recommendation Document and for consideration by the Designee. Those comments are provided herein.

“substantial”. The logic of deriving the goal should probably be based on what is “achievable”, rather than swine populations now compared to some previous level which is a rather arbitrary method. Determining an “achievable” goal will require several assumptions or estimates, but a specific goal should probably not be set until more evaluation of available information and more discussion has occurred.

Item #3 Establishment of distance from land application area for evaluating odor seems to be an issue. Perhaps a distance shorter than 1500 ft. should be used. Is there a present requirement for distance between land application area and a residence so that distance might be used? Another concern is that the model being used to predict odor with distance has not been calibrated or verified for odor from land application areas. This model should probably not be used for this purpose until it has been verified for this application. There are several differences between the physical and meteorological conditions for odor emission from barns or lagoons and from land application areas.

Item #4 related to vectors and airborne pathogens -- Based on the data that has been presented, it is difficult to evaluate what is an “achievable” reduction in vectors and airborne pathogens, but 99 % seems too high based on the data presented. As with the goal for reduction in ammonia emissions, there should be more evaluation and discussion of available information before a particular goal is set.

Item #5 related to nutrient and heavy metal contamination of soil and groundwater -- It seems that the goal should be that all N, P Cu and Zn that is applied to land should be utilized within the present NRCS and DENR standards that have been established to protect soil and water quality. Considerations would be that if different technologies tend to conserve nutrients or result in more nutrients being available for land application, then the farm will need to use more land or the nutrients will need to be transported off farm. Instead of having a goal to reduce nutrients, either by loss of dinitrogen gas or moving off the farm, why not allow utilizing the resources “on site” if environmental regulations are met? The goal as stated will increase costs of pretreatment before land application, possibly “lose” nutrients that have fertilizer value (e.g., N lost as N<sub>2</sub> to atmosphere), and require additional storage facilities on site and transportation off site, as well as possible increased odor and fly problems with solids separation, storage and transport. If a goal of N, P, Cu and Zn reduction is set, there needs to be consideration of how diet can affect excretion of these elements. Reduction in excretion of these elements by the pig should be considered.

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#### General Comments:

I strongly support the current structure of the Engineering Subcommittee report. It provides for the need for two sets of standards; one set which allows the Designee to make Environmentally Superior Technology determinations, and a second set which sets the goals for desired levels of pollution reduction from hog operations beyond that achievable solely through the use of the limited suite of technologies currently being

evaluated under the Attorney General's Agreement. Without two sets of standards, performance goals would have to be set without the potential for pollution reduction from houses and land application areas since little or no reductions are likely to come from the technologies under evaluation from those areas of the waste management stream. Furthermore, the definition of "substantially eliminate," predicated solely upon pollution reduction achievable by the technologies under evaluation, would be so low it would cast doubt upon the credibility of the results of all the hard work done over the last four year of these evaluations.

#### Specific Comments:

##### Standard 3 – Odor Reduction at Boundaries:

I support the Designee's suggestion that a phrase be added to the end of the first sentence that states that the preceding conditions shall only be valid providing that odor intensity levels shall not exceed 2 at the property boundaries. It should be kept in mind that this statement is in the overall goals sections and not in the section the Designee would use to determine ESTs. (In other words, it is not necessary that the standards set up in the goal language be achievable by the current suite of technologies.) Furthermore, the goals need to be farsighted enough to provide for pollution control improvements over a number of years into the future. The current odor reduction goals do not provide sufficient improvement over the current situation.

I think any benefits obtained from the consistency provided by using the 1500 foot distance as a surrogate for the boundary for both the waste treatment/housing and the land application are far overshadowed by the substantial infringement upon community quality of life and property rights resulting from an odor standard based upon measurement 1500 feet from the outer edge of the land application area. Unlike the current waste treatment/housing standards which specify new structures shall be 1500 feet from property boundaries, the current set backs for land application are much smaller. Therefore, it is inconsistent to impose the setback standards for the structures upon the land application site. Furthermore, moving the structures would present a far greater burden and in most cases not be practicable, relative to changing the land application practices or changing the quality of the liquid being land applied. In my opinion, it is imperative that the land application odor standards be based upon an odor equal to or less than an (Schiffman's) odor intensity level of 2 at the property boundary.

It would also be valuable to include in the factors to be considered with respect to land application areas, the use of no spray days (Sunday would make the most sense) to provide a reliable refuge from odor for the community for example for planning outdoor activities.

#### Standard 4- Pathogens:

Panel member Fred Pfaender made some very good points at the July 15<sup>th</sup> meeting with regard to the current language on airborne pathogen reduction. I would support substituting treatment sufficient to achieve a 4 log reduction of pathogens in the treated liquid relative to that present in raw manure, to replace the current airborne pathogen reduction standard language. This would mirror the level of reduction sought in the current language (i.e. 99% reduction as compared to typical swine farm, which gets about 99% reduction = 4 log reduction.)

The goal language should point out that on current swine farms, the two most likely sources of airborne transport of pathogens are land application by high powered spray guns, and ventilation from houses. New treatment systems may contain additional sites of concern for vectors or other means of airborne transport of pathogens (e.g. solids separation.) Such a liquid treatment standard should address pathogen transport via spray gun land application. Perhaps some lesser standard of pathogen reduction in land applied liquids could be allow if alternate land application methods were used that did not result in spray drift (e.g. low pressure, low altitude application.) In addition, goal language is needed to provide for a reduction of airborne pathogens from house ventilation.

#### Standard 5 – soil and groundwater contamination:

The reductions sought should be adequate to offset the additional nutrients that will require day to day management given the reduction in ammonia volatilization and phosphorus capture in lagoon sludge which will be accomplished by ESTs. Therefore, the potential burden of finding additional land application acres should be avoided.