THE UNIVERSITY
of NORTH CAROLINA
at CHAPEL HILL

SCHOOL OF PUBLIC HEALTH

DEPARTMENT OF EPIDEMIOLOGY F 919.966.2089
McGAVRAN-GREENBERG HALL
CAMPUS BOX 7435
CHAPEL HILL, NC 27599-7435

December 6, 2013

Via Email

Christine Lawson
NC Division of Water Resources
Animal Feeding Operations Unit
1636 Mail Service Center
Raleigh, North Carolina 27699-1636
christine.lawson@ncdenr.gov

Re: General Permit AWG100000

Dear Ms. Lawson:

North Carolina's general permits for animal waste management systems at industrial swine operations fail to protect public health and the environment. As noted below, there is a large body of evidence documenting the negative health impacts of industrial swine operations, also known as concentrated animal feeding operations (CAFOs).[1] These negative consequences result from the use of lagoons and spray fields to manage animal waste, non-therapeutic use of antibiotics in swine production, the location of confinements and animal waste in flood plains, and the disproportionate burden of CAFO pollutants on communities that are particularly susceptible due to presence of other environmental exposures and inadequate access to medical services. North Carolina communities rely on the Department of Environment and Natural Resources to protect their air, water, and health, and this protection should apply equally regardless of race and wealth. NC DENR currently fails to meet this responsibility and will continue to fail unless future permits are altered to reduce off-site pollution and increase transparency about animal production activities, and regulations are strictly enforced.

I. Negative Health Impacts of Swine CAFOs

Swine CAFOs with liquid waste management systems release numerous air pollutants including particulate matter, endotoxin (a respiratory irritant and allergen that comes from bacteria), ammonia, hydrogen sulfide (a toxic gas that comes from decomposing feces), and other malodorous chemicals. The air pollutants come from barns that house hundreds or thousands of pigs, from open fecal waste pits, and from fields where the waste is spread. Several decades' worth of research shows that, due to exposures inside these facilities, CAFO workers suffer a range of health problems.[2] More recent research indicates that neighbors of swine CAFOs experience numerous symptoms similar to those seen among workers,

[1] Rather than the strict federal definition we use the term "CAFO" to refer to large livestock operations that house animals in confinement.

[2] D. Cole, L. Todd, and S. Wing, "Concentrated Swine Feeding Operations and Public Health: A Review of Occupational and Community Health Effects," *Environ Health Perspect* 108, no. 8 (2000).

including irritation of the eyes, nose and throat, respiratory symptoms, reduced lung function, and asthma-related symptoms. Swine CAFO neighbors also suffer from negative mood states and reduced quality of life. We summarize this research here, emphasizing studies conducted in North Carolina.

In 2000, researchers published a study showing that neighbors of an eastern North Carolina swine CAFO reported more episodes of headache, runny nose, sore throat, coughing, diarrhea, and burning eyes than residents of comparison areas with a dairy and no CAFO. Swine CAFO neighbors also reported more frequent episodes when they could not open their windows or go outside their homes compared to residents of the comparison areas.[3]

In 2006, researchers published a study showing that students at North Carolina public middle schools located within three miles of swine CAFOs had more asthma-related symptoms, more doctor-diagnosed asthma, and more asthma-related medical visits than students who attended schools further from swine CAFOs. Children attending middle schools where school staff reported that livestock odor was present inside the school twice or more per month had a 23% higher prevalence of wheezing symptoms compared to children who attended schools where no livestock odor was reported.[4] Particles and gases released from swine CAFO liquid waste storage and land application can produce these impacts, which have also been observed in other states.

More recently, investigators set up monitors to measure levels of air pollutants (airborne particles, endotoxin and hydrogen sulfide) outside the homes of eastern North Carolina residents who lived within 1.5 miles of one or more swine CAFOs. While the pollutants were being measured, community members reported twice daily about their mood and symptoms of illness. They also measured their lung function and blood pressure, and they reported the strength of the swine odor that they smelled inside and outside of their homes.

The study demonstrated that concentrations of CAFO pollutants recorded by the air monitors were correlated with neighbors' reports of swine odor.[5] This finding clearly shows that swine CAFO pollutants travel into neighboring communities where they are inhaled by residents. When swine odor was stronger, participants more often reported that their daily life activities were interrupted and that they felt stressed, gloomy, angry, and unable to concentrate. Higher levels of hydrogen sulfide and semi-volatile particles were associated with reports of feeling stressed or annoyed and nervous or anxious.[6] Swine CAFO neighbors report that they have lost some of the most treasured parts of their rural way of life, that family and community gatherings are no longer possible, that they can no longer use their private wells as a source for drinking water, and that their properties have depreciated in value.[7]

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[3] S. Wing and S. Wolf, "Intensive Livestock Operations, Health, and Quality of Life among Eastern North Carolina Residents," *Environ Health Perspect* 108, no. 3 (2000).
[4] M. C. Mirabelli et al., "Asthma Symptoms among Adolescents Who Attend Public Schools That Are Located near Confined Swine Feeding Operations," *Pediatrics* 118, no. 1 (2006).
[5] S. Wing et al., "Air Pollution and Odor in Communities near Industrial Swine Operations," *Environ Health Perspect* 116, no. 10 (2008).
[6] R. A. Horton et al., "Malodor as a Trigger of Stress and Negative Mood in Neighbors of Industrial Hog Operations," *Am J Public Health* 99 Suppl 3(2009).
[7] M. Tajik et al., "Impact of Odor from Industrial Hog Operations on Daily Living Activities," *New Solut* 18, no. 2 (2008).

In the same study, higher levels of hydrogen sulfide were associated with reports of irritation of the eyes and nose, and with runny nose and difficulty breathing. Particle pollution was associated with reports of poor appetite, burning eyes, nasal irritation, wheezing, difficulty breathing, and decreases in lung function. Higher levels of endotoxin were associated with nausea, chest tightness, and sore throat.[8]

Swine CAFO odors and hydrogen sulfide concentrations in these communities were also associated with neighbors' blood pressure levels.[9] Elevated blood pressure is a well-recognized cause of stroke and heart disease, and the area of eastern North Carolina with the highest density of swine CAFOs is part of a region known as the "stroke belt." Residents of this region, who already suffer excess hypertension-related disease, should not be exposed to pollutants from swine CAFOs that further raise their blood pressures. Additionally, treatment of high blood pressure is a financial burden to patients as well as to private and public insurance systems.

Results from these studies represent average responses among study participants. Some people are more sensitive to environmental exposures than others. Overall, however, the studies provide solid evidence, consistent with findings from worker studies and studies in other regions, that air pollutants from swine CAFOs negatively impact health and quality of life.

In addition to studies of swine CAFO air pollution conducted in our state, a growing body of evidence from other states and countries shows that swine, poultry, and cattle CAFOs contaminate air and water and negatively impact the health and quality of life in neighboring communities.[10] Furthermore, hundreds of CAFOs in eastern North Carolina are located in areas subject to flooding that can transport liquid wastes into local communities,[11] and runoff can convey fecal pollution and associated pathogens to surface and ground water supplies and soils.[12] It is just a matter of time before another flood causes massive loss of liquid waste from the thousands of fecal waste lagoons that are in our state's flood plains.

Another concern is the widespread use of antibiotics in CAFOs. Research shows that the use of antibiotics in CAFOs has contributed to the emergence of antibiotic resistant bacteria that can cause dangerous, difficult-to-treat human infections.[13] Airborne bacteria, including antibiotic resistant strains, have been connected to CAFO air emissions,[14] and antibiotic resistant bacteria are associated with animal vectors

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[8] L. Schinasi et al., "Air Pollution, Lung Function, and Physical Symptoms in Communities near Concentrated Swine Feeding Operations," *Epidemiology* 22, no. 2 (2011).

[9] S Wing et al., "Air pollution from industrial swine operations and blood pressure of neighboring residents. Environmental Health Perspectives. 121:92-96, (2013).

[10] K. Radon et al., "Environmental Exposure to Confined Animal Feeding Operations and Respiratory Health of Neighboring Residents," *Epidemiology* 18, no. 3 (2007); P. J. Villeneuve et al., "Intensive Hog Farming Operations and Self-Reported Health among Nearby Rural Residents in Ottawa, Canada," *BMC Public Health* 9(2009); P. S. Thorne, "Environmental Health Impacts of Concentrated Animal Feeding Operations: Anticipating Hazards--Searching for Solutions," *Environ Health Perspect* 115, no. 2 (2007).

[11] Wing et al., "The potential impact of flooding on confined animal feeding operations in eastern North Carolina," *Environ Health Perspect* 110, no. 4 (2002).

[12] Casteel et al., "Fecal contamination of agricultural soils before and after hurricane-associated flooding in North Carolina," *J Environ Sci Health A Tox Hazard Subst Environ Eng* 41, no. 2 (2006).

[13] E. K. Silbergeld et al., "One Reservoir: Redefining the Community Origins of Antimicrobial-Resistant Infections," *Med Clin North Am* 92, no. 6 (2008). E. K. Silbergeld, J. P. Graham, and L. B. Price, "Industrial Food Animal Production, Antimicrobial Resistance, and Human Health," *Annu. Rev. Public Health* 29, no. 15 (2008).

[14] J Schulz et al., "Longitudinal Study of the Contamination of Air and of Soil Surfaces in the Vicinity of Pig Barns by Livestock-Associated Methicillin-Resistant Staphylococcus aureus," *Appl Environ Microbiol* 78(16), 5666-5671 (2012). C. F.

near CAFOs, including flies,[15] rodents,[16] and migratory geese that land on North Carolina's swine waste lagoons.[17] A recent medical records study from Pennsylvania shows that people living near swine waste application sites have elevated hospitalization for infections with methicillin resistant *Staphylococcus aureus* (MRSA).[18] North Carolina swine and poultry CAFO workers carry strains of *Staphylococcus aureus* that are associated with livestock in general, and swine in particular,[19] that could be spread by liquid waste.

II. North Carolina's Swine CAFOs Overburden Low-Income Communities of Color

Research based on a review of state and federal records shows that North Carolina's swine CAFOs are disproportionately located in low-income communities of color.[20] Low-income people of color are more susceptible to CAFO pollution because of older housing, less access to air conditioning, increased exposures to other environmental and occupational hazards, higher prevalence of medical conditions that can be exacerbated by exposure to CAFO pollution, and inadequate access to medical services. The disproportionate burden of swine CAFOs in low-income communities of color represents an environmental injustice. Industrial swine production creates profits for out-of-state corporations and provides cheap pork for consumers at the expense of the health and dignity of eastern North Carolina residents who bear the brunt of the local pollution and health impacts. Additionally, the large numbers of CAFOs make these communities unattractive for economic development that would bring clean industries and good jobs.

The problem is not farming, rather it is the industrial production of animals in concentrations that produce massive quantities of waste and pollutants. These practices would never be tolerated in wealthy communities. In North Carolina, CAFO pollution is permitted by the Department of Environment and Natural Resources. The top ten swine-producing counties in the United States are all in eastern North Carolina; the health and environmental impacts of swine production in our state are not simply due to pollution from individual facilities, but result from the density of these operations. Sadly, our regulatory system has forsaken rural residents by allowing the destruction of their health and quality of life.

Green et al., "Bacterial Plume Emanating from the Air Surrounding Swine Confinement Operations," *J. Occup & Environ Hygiene*, 3:9-15, 2006. S. G. Gibbs, et al., "Isolation of Antibiotic-Resistant Bacteria from the Air Plume Downwind of a Swine Confined or Concentrated Animal Feeding Operation," *Environ Health Perspect*, 114:1032-1037, 2006.

[15] A. M. Rule et al., "Food animal transport: A potential source of community exposures to health hazards from industrial farming (CAFOs)," *J Infect & Pub Health*, 1:33-39, 2008.

[16] A. Van de Giessen, et al., "Occurrence of methicillin-resistant Staphylococcus aureus in rats living on pig farms," *Preventive Veterinary Medicine*, 91(2):270-273, 2009.

[17] D. Cole et al., "Free-livingCanada Geese and Antimicrobial Resistance," *Emerging Infectious Diseases*, 11:935-938, 2005.

[18] JA Casey et al., "High-Density Livestock Operations, Crop Field Application of Manure, and Risk of Community-Associated Methicillin-Resistant Staphylococcus aureus Infection in Pennsylvania," JAMA Internal Medicine, September 16, 2013.

[19] JL Rinsky et al., "Livestock-associated methicillin and multidrug resistant Staphylococcus aureus is present among industrial, not antibiotic-free livestock operation workers in North Carolina," PLoS ONE, 8(7): e67641, 2013. doi:10.1371/journal.pone.0067641.

[20] S. Wing, D. Cole, and G. Grant, "Environmental Injustice in North Carolina's Hog Industry," *Environ Health Perspect* 108, no. 3 (2000).

III. DENR Should Provide Records Needed to Document Environmental and Health Impacts

The ability of scientists to document health and environmental impacts of CAFO pollutants, and the ability of the public to become aware of the economic, social and health costs of the current system, is hampered by inadequate public availability of records. We request that DENR compile electronic records of information that permittees are required to collect and make them publicly available. These include:

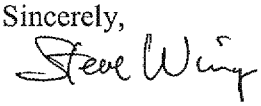
- The waste level in each lagoon (freeboard levels) (III.2(a))
- Precipitation events, including rain levels (III.3)
- Soil fertility (III.4)
- The amount of nitrogen, phosphorus, zinc, and copper in the waste (III.5) as well as arsenic
- Dates of irrigation and land application events, quantities of liquid applied on each day, and other information about land application including hydraulic loading rates, nutrient loading rates, and cropping information, as well as information as to whether solids were removed and information about how those solids were disposed on site, or offsite (if applicable) (III.6)
- Waste transfers between structures on site that are not typically operated in a series (III.7)
- Monthly stocking records (these records are given to DENR, III.8)

In particular we request that DENR obtain each permittee's daily record of the quantities and locations of animal waste applied to land. We also request that DENR make public the boundaries of each field where swine waste is applied to land and detailed information about all pharmaceuticals and other additives in each permitee's swine feed. This information is important for advancing the scientific understanding of environmental and health impacts of land-application of manure and it is critical to the public's right-to-know about environmental pollutants and their costs to neighboring communities and the general public.

IV. Conclusion

The body of research documenting the damage that industrial swine production causes to human and environmental health continues to grow, and these burdens disproportionately impact communities of color and low income communities. More information about swine CAFOs should be publicly available to allow scientists and concerned citizens to monitor potential impacts. We urge you to modify CAFO permits to set a date in the near future after which the following will be prohibited: 1) the management of swine waste using lagoons and spray fields, 2) the non-therapeutic use of antibiotics in livestock production, and 3) the location of animal confinements and animal waste storage in flood plains. These changes are the minimum required to preserve the health and well-being of rural residents near swine operations.

Sincerely,



Steve Wing, Ginger T. Guidry, Sarah Hatcher and Jessica Rinsky
UNC-CH School of Public Health