



The Center for Food Safety (CFS) is a non-profit, membership organization that works to protect human health and the environment by curbing the proliferation of harmful food production technologies and by promoting organic and other forms of sustainable agriculture. CFS represents nearly 200,000 members throughout the country that support safe, sustainable and organic agriculture and regularly purchase organic products. CFS members support the public's right to choose food and crops not sourced from industrial farming practices such as AFOs.

The Center on Race, Poverty & the Environment is a non-profit organization that provides legal and technical assistance to the grassroots movement for environmental justice. The Center has offices in San Francisco and Delano, California.

Food & Water Watch is a national nonprofit advocacy organization that advocates for common sense policies that will result in healthy, safe food and access to safe and affordable drinking water. The issue of industrialized livestock production is a core part of Food & Water Watch's work. Food & Water Watch has worked since 2005 to change federal and state policy on CAFOs and also works to educate the public on the variety of impacts these facilities have on public health and the environment.

The Illinois Citizens for Clean Air and Water (ICCAW) is a state-wide coalition of family farmers and community groups advocating for sound policies and practices that protect the environment, human health, and rural quality of life from the impacts of large-scale, industrialized livestock production facilities in Illinois. A majority of its members are family farmers and rural residents that live near large-scale livestock facilities that have been adversely impacted by the problems they create.

Iowa Citizens for Community Improvement (Iowa CCI) is a 37-year-old statewide non-profit grassroots organization. Iowa CCI has led the fight against factory farms in Iowa for the past 15 years and has pushed for better environmental and permitting laws for factory farms on the state and national level – including the first clean air standards established for ammonia and hydrogen sulfide in the state of Iowa.

Midwest Environmental Advocates (MEA) is a non-profit environmental law center, founded in 1999, which uses the power of the law to help communities protect Wisconsin's heritage of healthy water, air, land and government. As part of our work, MEA represents communities negatively affected by air and water pollution from CAFOs. MEA's clients have experienced many of the health impacts associated with air emissions from CAFOs including respiratory problems, dizziness, and nausea.

Sierra Club is the nation's oldest grassroots environmental organization. Our 1.4 million members and supporters work together to protect our communities and the planet. Through

litigation and administrative and legislative advocacy, the Sierra Club has worked for the past decade to improve controls over factory farm air pollution.

The Socially Responsible Agricultural Project educates the public about the problems caused by factory farms, works to help communities protect themselves from the devastating impacts of these facilities while, at the same time, providing help and guidance for those who are trying to reclaim agriculture by producing and marketing sustainable agricultural goods.

## **I. Introduction**

EPA's EEM process will have a defining impact on public access to information and clean air protections for rural communities across the U.S., and establishing methodologies to finally allow for nationwide estimation and regulation of toxic factory farm emissions is a critical step in the right direction. However, EPA's initial Draft EEMs raise significant concerns about the limitations of the National Air Emissions Monitoring Study (NAEMS) data, the agency's analysis of these data and other available information, and the sufficiency of the resulting EEMs. We were unable to consider all relevant information in these comments, because the Science Advisory Board (SAB) report is not yet available; we respectfully request that EPA re-open the public comment period after the SAB releases its findings.

Although the 2005 Air Quality Compliance Agreement (Consent Agreement)<sup>2</sup> that EPA entered into with numerous AFOs<sup>3</sup> established a framework for the current EEM process, simply complying with the terms of that Agreement will not alone provide for a successful scientific process or ensure the adequacy of the resulting EEMs. The goals of this process include "the achievement of real environmental benefits to protect public health and the environment while supporting a sustainable agricultural sector."<sup>4</sup> Thus, to truly meet the intent of the Consent Agreement, the final EEMs must accurately estimate emissions from AFO facilities, incorporate the best data available, be easy for AFO operators to apply, establish implementation and compliance steps to obtain emissions estimates from AFOs, including those that did not participate in the Consent Agreement, and ensure AFO industry compliance with all applicable statutory requirements pertaining to air emissions.

Further, the final methodologies should provide a basis for future modeling efforts that could improve the agency's ability to characterize exposures in rural communities. Only with scientifically sound and enforceable EEMs will EPA and the states be able to apply the Clean Air Act (CAA), the Comprehensive Environmental Response, Compensation, and Liability Act

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<sup>2</sup> EPA, Animal Feeding Operations Consent Agreement and Final Order, 70 Fed. Reg. 4958 (Jan. 31, 2005) [Hereinafter Consent Agreement], available at <http://www.epa.gov/compliance/resources/agreements/caa/cafo-agr-050121.pdf>.

<sup>3</sup> See EPA, Summary of the AFO Air Compliance Agreement Participants, available at <http://www.epa.gov/compliance/resources/agreements/caa/caforespondentlist-022309.pdf>.

<sup>4</sup> Consent Agreement at 4961.

(CERCLA), and the Emergency Planning and Community Right-to-Know Act (EPCRA) to factory farms that have been let off the hook for more than forty years.

## II. Unregulated AFO air emissions harm public health and welfare

In finalizing its AFO EEMs and determining how to best implement them, EPA should consider the well-documented adverse health and welfare impacts of AFO air emissions. Ammonia, hydrogen sulfide, volatile organic compounds (VOCs), and particulates each harm health and quality of life for AFO neighbors and workers, and these harms dictate that EPA should require all AFOs to use the final EEMs to report emissions and come into compliance with the CAA, CERCLA, and EPCRA without further delay.

### a. AFO emissions harm public and worker health

Each of the pollutants studied in NAEMS causes significant human health impacts.<sup>5</sup> In addition to its sharp, pungent odor, ammonia is a respiratory irritant that can chemically burn a person or animal's respiratory tract and can cause eye and skin irritations, severe cough, and chronic lung disease.<sup>6</sup> Ammonia is rapidly absorbed into the upper respiratory system, so direct exposure even at low levels can harm human and animal health.<sup>7</sup> Even as little as two minutes of exposure to ammonia emissions can result in a chemical burning of skin, eyes, permanent scarring of the respiratory system, and chronic lung disease.<sup>8</sup> Ammonia is also a precursor to the formation of PM<sub>2.5</sub>. OSHA's permissible exposure level for AFO workers is 50 ppm; exposures of 500 ppm can be fatal.<sup>9</sup>

At low levels, hydrogen sulfide has the odor of rotten eggs. It is considered immediately dangerous at 100ppm; levels of 150ppm cause loss of smell, and higher levels can cause death.<sup>10</sup> It is a broad-spectrum poison in that it can poison several different systems. It affects humans and animals by blocking oxygen from binding and stopping cellular respiration.<sup>11</sup> Hydrogen

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<sup>5</sup> See also Humane Society of the United States, et al., Petition to List Concentrated Animal Feeding Operations Under Clean Air Act Section 111(b)(1)(A), and to Promulgate Standards of Performance Under Clean Air Act Sections 111(b)(1)(B) and 111(d) (Sept. 21, 2009) and Environmental Integrity Project et al., Petition for the Regulation of Ammonia as a Criteria Pollutant Under Clean Air Act Sections 108 and 109 (April 6, 2011), incorporated herein by reference.

<sup>6</sup> Carrie Hribar, "Understanding Concentrated Animal Feeding Operations and Their Impact on Communities." *National Association of Local Boards of Health* at 6 (2010) [hereinafter Hribar], available at [http://www.cdc.gov/nceh/ehs/Docs/Understanding\\_CAFOS\\_NALBOH.pdf](http://www.cdc.gov/nceh/ehs/Docs/Understanding_CAFOS_NALBOH.pdf).

<sup>7</sup> Iowa State University / University of Iowa Study Group, "Iowa Concentrated Animal Feeding Operations Air Quality Study: Final Report" at 123 (Feb. 2002) [hereinafter Iowa Study], available at [http://www.public-health.uiowa.edu/ehsrc/CAFOstudy/CAFO\\_final2-14.pdf](http://www.public-health.uiowa.edu/ehsrc/CAFOstudy/CAFO_final2-14.pdf).

<sup>8</sup> Iowa Study at 123.

<sup>9</sup> See, e.g., Nat'l Inst. for Occupational Safety and Health, "NIOSH Pocket Guide to Chemical Hazards: Ammonia," <http://www.cdc.gov/niosh/npg/npgd0028.html>.

<sup>10</sup> See, e.g., U.S. Dep't of Labor, Occupational Health & Safety Admin. (OSHA) Chemical Sampling Information: Hydrogen Sulfide, [http://www.osha.gov/dts/chemicalsampling/data/CH\\_246800.html](http://www.osha.gov/dts/chemicalsampling/data/CH_246800.html); Iowa Study at 118.

<sup>11</sup> Agency for Toxic Substances and Disease Registry, *Toxicological Profile for Hydrogen Sulfide*. (July 2006), <http://www.atsdr.cdc.gov/toxprofiles/tp.asp?id=389&tid=67>.

sulfide causes a plethora of health problems, including eye, nose and throat irritations, diarrhea, hoarseness, sore throat, cough, chest tightness, nasal congestion, heart palpitations, shortness of breath, stress, mood alterations, sudden fatigue, headaches, nausea, sudden loss of consciousness, comas, seizures, and death.<sup>12</sup> Levels higher than 1,000 ppm have been reported at disturbed AFO lagoons.<sup>13</sup> In 2008, the Minnesota Department of Health asked families near the 1,500 head Excel Dairy to evacuate their homes because hydrogen sulfide emission concentrations were dangerously elevated.<sup>14</sup>

Particulate matter from AFOs is comprised of fecal matter, feed materials, agricultural dusts, pollen, bacteria, fungi, skin cells (including allergens such as dander) and silicates. Components of feed materials can include proteins and starches, but also vitamins, minerals, amino acids, supplements, and antibiotics.<sup>15</sup> Particulate matter is a vector for transmission of absorbed chemicals, endotoxin, allergens and other biological agents.<sup>16</sup> Not only does particulate matter reduce visibility and the public's ability to appreciate the outdoors, it can cause chronic bronchitis, chronic respiratory symptoms, declines in lung function, and organic dust toxic syndrome.<sup>17</sup> Smaller particles can actually be absorbed by the body and have systemic effects including cardiac arrest.<sup>18</sup> Exposure to particulate matter over long periods of time can lead to decreased lung function.<sup>19</sup> Particulate matter floats and settles, and can become re-suspended by human activity, erosion, and wind.<sup>20</sup> Emitted particles can remain airborne for weeks and be transported hundreds of miles from an AFO.<sup>21</sup> In areas with high concentrations of particulate matter, such as the AFO-laden San Joaquin Valley air basin in California, it is estimated that almost 1,300 deaths occur *annually* as a result of PM<sub>2.5</sub> levels and that the annual cost to residents is \$5.7 billion.<sup>22</sup>

VOCs are known to increase neurobehavioral problems in AFO area residents, causing negative mood states (tension, depression, fatigue, confusion) and neuropsychiatric abnormalities

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<sup>12</sup> Chapin et al., Yale Environmental Protection Clinic, "Controlling Odor and Gaseous Emission Problems from Industrial Swine Facilities: A Handbook for All Interested Parties" at § 2.3.1 (Spring 1998) [hereinafter Chapin].

<sup>13</sup> Iowa Study at 118.

<sup>14</sup> Tom Meersman, "Stunk out of house and home near a dairy feedlot." MINNEAPOLIS STAR TRIBUNE (Jun. 9, 2008) [http://www.startribune.com/local/19697279.html?location\\_refer=Most%20Viewed:Homepage](http://www.startribune.com/local/19697279.html?location_refer=Most%20Viewed:Homepage) (original link no longer available; article duplicated at <http://tech.groups.yahoo.com/group/sfbayoil/message/5287?var=1> ).

<sup>15</sup> Iowa Study at 35.

<sup>16</sup> D'Ann L. Williams et al. "Airborne cow allergen, ammonia and particulate matter at homes vary with distance to industrial scale dairy operations: an exposure assessment." ENVIRONMENTAL HEALTH 10:72 at 2-3 (2011) [hereinafter Williams].

<sup>17</sup> Hribar at 6.

<sup>18</sup> Hribar at 6.

<sup>19</sup> Hribar at 6, citing Michigan Department of Environmental Quality (MDEQ) Toxics Steering Group (2006).

<sup>20</sup> Williams at 2-3.

<sup>21</sup> Williams at 2-3.

<sup>22</sup> Renee Sharp and Bill Walker, Environmental Working Group, "Particle Civics: How Cleaner Air in California Will Save Lives and Save Money" (2002).

(impaired balance, impaired hearing, and decreased intellectual function).<sup>23</sup> VOCs are linked with decreased immune responses, increased cancer rates in animals, otolaryngological and respiratory irritation, congestion, and gastrointestinal problems.<sup>24</sup> VOCs are also precursors to PM<sub>2.5</sub>, smog, and ozone formation. There are approximately 165 known VOCs emitted at AFOs, and 21 are currently listed as hazardous air pollutants (HAPs) under 42 U.S.C. § 7412(b)(3)(B).<sup>25</sup> HAPs are pollutants “known to cause or may reasonably be anticipated to cause adverse effects to human health or adverse environmental effects.”<sup>26</sup> The fact that these AFO VOCs are listed as HAPs strongly suggests they pose a human health risk.

Air emissions from AFOs degrade air quality and create very real and serious public health threats. There is direct evidence of adverse health impacts to nearby residents and AFO workers. Residents living near AFOs often have higher levels of some diseases, including respiratory illness, gastrointestinal illness, and impaired neurobehavioral health.<sup>27</sup> Four large epidemiological studies have demonstrated “strong and consistent” associations between AFO air pollution and asthma.<sup>28</sup> While every resident is vulnerable to the effects, children, the elderly and individuals with chronic heart or lung disease are particularly vulnerable.<sup>29</sup> Some studies have focused exclusively on AFO air emission impacts on schools and children; these studies demonstrate that children take in 20% to 50% more air than adults do, making them more susceptible to lung disease and health effects;<sup>30</sup> schools closer to AFOs are also often attended by students of low socio-economic status.<sup>31</sup> All of these factors magnify the effect of AFO emissions on vulnerable populations.

AFO air emissions also cause AFO workers to suffer from harms, including asthma, sinusitis, chronic bronchitis, nose and throat irritation, muscle aches, inflamed membranes, and progressive decline in lung function.<sup>32</sup> Studies show that at least 25% of AFO workers suffer

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<sup>23</sup> Pew Commission on Industrial Farm Animal Production, “Putting Meat on the Table: Industrial Farm Animal Production in America” (2008) at 18-19 [hereinafter Pew].

<sup>24</sup> Iowa Study at 129-131.

<sup>25</sup> Humane Society of the United States, et al., Petition to List Concentrated Animal Feeding Operations Under Clean Air Act Section 111(b)(1)(A), and to Promulgate Standards of Performance Under Clean Air Act Sections 111(b)(1)(B) and 111(d) (Sept. 21, 2009) at 22.

<sup>26</sup> 42 U.S.C. § 7412(b)(3)(B).

<sup>27</sup> Union of Concerned Scientists, “CAFOs Uncovered: The Untold Costs of Confined Animal Feeding Operations at 61 (April 2008) at 60 [hereinafter UCS Report], *available at* [http://www.ucsusa.org/food\\_and\\_agriculture/science\\_and\\_impacts/impacts\\_industrial\\_agriculture/cafos-uncovered.html](http://www.ucsusa.org/food_and_agriculture/science_and_impacts/impacts_industrial_agriculture/cafos-uncovered.html); Pew at 17.

<sup>28</sup> Pew at 17.

<sup>29</sup> Pew at 17.

<sup>30</sup> Kleinman, M. “The health effects of air pollution on children” at 1-2 (Fall 2000). [http://www.aqmd.gov/forstudents/health\\_effects\\_on\\_children.pdf](http://www.aqmd.gov/forstudents/health_effects_on_children.pdf).

<sup>31</sup> Mirabelli, M.C., Wing, S., Marshall, S.W., & Wilcosky, T.C. “Race, poverty, and potential exposure of middle-school students to air emissions from confined swine feeding operations.” ENVIRONMENTAL HEALTH PERSPECTIVES 114(4) 591-596 (2006).

<sup>32</sup> Iowa Study at 6.

from respiratory diseases such as chronic bronchitis and occupational asthma,<sup>33</sup> that AFO workers have increased levels of organic dust toxic syndrome,<sup>34</sup> that AFO workers and animals have died from asphyxia and respiratory arrest due to high hydrogen sulfide levels created by manure pit agitation,<sup>35</sup> that hydrogen sulfide emissions are a leading cause of death in the workplace, and that individuals who survive hydrogen sulfide incidents often develop severe respiratory impairments or syndromes.<sup>36</sup>

#### **b. AFO emissions harm public welfare**

Air emissions from AFOs also decrease the quality of life in rural communities, disproportionately affect poor or minority communities, and lower property values.

Communities with AFOs have wider social and economic gaps than communities with small, locally-owned and operated farms,<sup>37</sup> and odors from AFOs impair the social life of residents nearby. AFO neighbors report not being able to enjoy their own homes. They cannot sit outside, open windows, read to grandchildren on the porch, or invite friends over to visit. AFO air emissions and odors disrupt routines and make intolerable activities that normally provide a sense of belonging and identity within a community, such as backyard barbecues, church attendance, and visits with friends and family.<sup>38</sup> In part due to air pollution, neighbors of AFOs have more negative feelings about “trust, neighborliness, community division, networks of acquaintanceship, democratic values, and community involvement” than independent farm neighbors.<sup>39</sup> Many AFO communities suffer a decline in community and civic life and have poor quality public services.<sup>40</sup>

AFOs are frequently located in poor or African American communities, and consequently AFO air emissions disproportionately impact these communities. In North Carolina, for example, one study found 7.2 times more swine AFOs in the highest poverty areas as compared to the lowest, and 5 times more AFOs in non-white population areas.<sup>41</sup> In addition, many poorer communities have less access to medical care than wealthier communities.<sup>42</sup>

AFO emissions also have effects beyond the immediate community. For example, the presence of particulate matter can cause severe haze. Haze creates significant losses for public

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<sup>33</sup> UCS Report at 60.

<sup>34</sup> Pew at 16.

<sup>35</sup> Chapin at § 2.3.1.

<sup>36</sup> Pew at 16; Iowa Study at 6.

<sup>37</sup> Pew at 42.

<sup>38</sup> Pew at 42.

<sup>39</sup> Pew at 43.

<sup>40</sup> Curtis W. Stofferahn, “Industrialized Farming and Its Relationship to Community Well-Being: An Update of a 2000 Report by Linda Lobao” at 18 (Sept. 2006), *available at* <http://www.und.nodak.edu/org/ndrural/Lobao%20&%20Stofferahn.pdf>.

<sup>41</sup> Carol J. Hodne, “Concentrating on Clean Water: The Challenge of Concentrated Animal Feeding Operations” at 28 (April 2005) <http://www.iowapolicyproject.org/2005docs/050406-cafo-fullx.pdf>.

<sup>42</sup> *Id.* at 28.

enjoyment of wildlife, wilderness areas, national parks, and areas of tourism reliant on scenery.<sup>43</sup> Loss of tourism creates a loss of revenue. The Smoky Mountains National Park, for example, has experienced a loss in visibility estimated to cost more than \$200 million each year; this region is also the second largest production area for hog AFOs in the U.S.<sup>44</sup>

Finally, air emissions from AFOs contribute to declines in property values near these operations. In addition to community perception, AFOs can cause physical manifestation of damage, lack of marketability, and impacts on the highest and best use of a property. Decreases in property value in turn negatively affect local property tax revenues, shrinking local government budgets. The rate by which an AFO affects property values varies, but what is clear is that the closer a property is to a AFO, or if a property is downwind, or close to the livestock on a AFO the property value will decrease by some degree. One study found an 88% decrease in value for properties within 1/10<sup>th</sup> of a mile.<sup>45</sup> For properties between 2 and 3 miles away, values still may be affected. Examples of devalued properties as a result of factory farms are numerous, and mounting.<sup>46</sup> For many families near AFOs, the residence is the family's single largest asset, and their only significant source of equity.

### **III. The National Air Emissions Monitoring Study was flawed**

At this stage in the EEM process, EPA cannot correct the flaws in NAEMS' design or implementation. However, if EPA wishes to move forward in finalizing substantive and defensible EEMs, it must recognize the issues limiting the scope of the data and affecting its current efforts to establish EEMs.

#### **a. The AFO Industry Exerted Significant Influence over NAEMS**

As EIP and other organizations have noted previously,<sup>47</sup> the design and implementation of NAEMS presented serious concerns about conflicts of interest. This is in part due to the small sample of 25 sites at just 20 AFOs in 10 states, despite the almost 14,000 facilities EPA granted immunity from enforcement of the Clean Air Act and other environmental statutes in 2005. The role of industry in encouraging certain AFOs to participate in the amnesty agreement helped shape the pool of potential study sites from the outset. For example, Perdue broiler facilities did not participate in the Consent Agreement. Perhaps as a direct consequence, NAEMS did not include a single broiler site in the Mid-Atlantic, despite incredible industry concentration in the

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<sup>43</sup> EPA, Basic Information – Visibility (Jun. 5, 2012) [www.epa.gov/oar/visibility/what.html](http://www.epa.gov/oar/visibility/what.html).

<sup>44</sup> See, e.g., NASS, 2007 Census of Agriculture State Profile: North Carolina.

<sup>45</sup> Hribar at 12.

<sup>46</sup> See, e.g., Vermont Law School Environmental & Natural Resources Clinic, Examples of Properties Devalued by Factory Farms, available at <http://www.factoryfarmtaxprotest.org>.

<sup>47</sup> See e.g. Brent Newell et al., Comments of Association of Irrigated Residents, Center on Race, Poverty & the Environment, Environmental Defense, Environmental Integrity Project, and Sierra Club on Animal Feeding Operations Consent Agreement and Final Order 14–15 (2005); Robert Lawrence et al., Center for a Livable Future, RE: Comment on the Development of Emission-Estimating Methodologies for Animal Feeding Operations (EPA-HQ-OAR-2010-0960) (Mar. 2011).



region.<sup>48</sup> Public communications obtained in a Freedom of Information Act request indicate that the AFO industry also played a significant role in selecting the few study sites from among the parties to the Consent Agreement.<sup>49</sup> Further, Tyson sponsored the data collection at its broiler site in Kentucky directly.<sup>50</sup>

#### **b. NAEMS Included an Inadequate Number of Sites**

The 20 operations included in NAEMS and the Tyson site may be insufficient to accurately estimate AFO emissions from varied broiler, swine, dairy, and layer facilities in the U.S. When designing NAEMS, EPA intended to study a statistically significant number of representative sites and generate “scientifically credible data to provide for the characterization of emissions from all major types of AFOs in all geographic areas where they are located.”<sup>51</sup> The Government Accountability Office (GAO) raised concerns during the study that the NAEMS sites likely would not “represent a valid sample of all animal feeding operations.”<sup>52</sup> Atmospheric conditions, facility age and design, feed, and other variables may significantly impact air emissions; a statistically significant study should have included multiple sites representing as many different sets of conditions as possible, but this was simply not possible with such a small number of sites. In addition, Primary Investigators for the sites were selected before the NAEMS sites, limiting the role of representativeness in the site selection process.<sup>53</sup> The Draft EEMs and related documents do not adequately explain how or whether this sampling strategy resulted in statistically significant or representative data for AFOs across the country in the sectors studied.

#### **c. The NAEMS data are incomplete**

There were many limitations in the NAEMS data that inevitably limit the conclusions EPA can draw from analysis of the data. Some limitations were built into the study’s design, while others were the result of equipment failures and other study implementation issues. While some of the data gaps are the result of unforeseen technical difficulties, they nonetheless compromise the overall data set and EPA’s ability to establish nationally applicable EEMs without supplementing the information. The GAO also noted incomplete data during the early stages of the study, concluding that NAEMS may not “ultimately provide data of sufficient quantity and quality” to establish the planned EEMs.<sup>54</sup>

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<sup>48</sup> See Pew Environment Group, *Big Chicken: Pollution and Industrial Poultry Production in America* (July 2011).

<sup>49</sup> Email from Heber to Nizich (Aug. 9, 2006), stating “the National Milk Producers Federation approved these site selections for the NAEMS.”

<sup>50</sup> Broiler EEM at 1-5.

<sup>51</sup> Consent Agreement at 4960; *see also* Government Accountability Office, *Concentrated Animal Feeding Operations: EPA Needs More Information and a Clearly Defined Strategy to Protect Air and Water Quality from Pollutants of Concern* at 36 (Sept. 2008) [Hereinafter GAO Report].

<sup>52</sup> GAO Report at 7.

<sup>53</sup> Heber, “Site Selection Procedure” (June 10, 2005).

<sup>54</sup> GAO Report at 7.

For example, SAB panel members noted that the California broiler data sets for TSP and PM<sub>2.5</sub> had less than 10 percent completeness, while that entire site had only 20 percent completeness during the fall. EPA also had problems receiving data from contractors and excluded data due to changes in monitoring method. Short monitoring periods at certain sites in combination with missing or invalidated data has resulted in a much smaller than anticipated dataset from which to develop EEMs. EPA must more clearly explain how NAEMS allows it to establish accurate EEMs, and how the current process will meet the goals of the Consent Agreement.

#### **IV. EPA should incorporate findings from additional peer-reviewed studies**

The Draft EEMs rely exclusively on the limited NAEMS data, rather than incorporating findings from numerous peer-reviewed AFO emissions studies. EPA should reconsider its decision to limit available information and should thoroughly explain its decisions to exclude studies it has not considered. The small number of sites in each livestock sector and the data gaps and technical problems experienced during NAEMS heighten the importance of outside research.

##### **a. EPA's Consent Agreement directs EPA to consider all relevant data**

The 2005 Compliance Agreement set forth the guidelines for the NAEMS study and the development of EEMs. The Agreement was clear in its definition of the term EEM that EPA must consider all relevant information:

The term “Emissions-Estimating Methodologies” means those procedures that will be developed by EPA, based on data from the national air emissions monitoring study *and any other relevant data and information*, to estimate daily and total annual emissions from individual Emission Units and/or Sources.<sup>55</sup>

Although the agreement does not define “relevant data and information,” EPA has seemingly elected to define this term so narrowly as to exclude all information not derived from NAEMS. In the Draft EEMs, EPA lists each study collected during the Call for Information,<sup>56</sup> only to conclude that each peer-reviewed emissions study does not contain relevant data, is of limited relevance to the development of EEMs, or has no possible application for NAEMS.<sup>57</sup>

The Swine and Dairy EEM attempts to justify the exclusion of outside data by saying that “none of the articles previously obtained by the EPA to support emissions factor development

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<sup>55</sup> Consent Agreement at 4963 (emphasis added); *see also id.* at 4960 (“EPA will use the data generated from the monitoring *and all other available, relevant data* to develop [EEMs]”) (emphasis added).

<sup>56</sup> EPA, Call for Information: Information Related to the Development of Emission-Estimating Methodologies for Animal Feeding Operations, 76 Fed. Reg. 3060 (Jan. 19, 2011).

<sup>57</sup> Broiler EEM at Table 4-4; Swine and Dairy EEM at Table 3-3.

used remote sensing techniques to measure lagoon emissions.”<sup>58</sup> This explanation is inadequate. EPA does not explain why it considers remote sensing techniques to be better than other techniques, and it does not explain why EPA considers the techniques used in the outside studies to be either worthless or incompatible with the remote sensing data. The articles in question appear from the Swine and Dairy EEM to use ‘flux chambers’ and ‘dynamic chambers.’<sup>59</sup> EPA must describe the differences between remote sensing and these other technologies in sufficient detail to support the exclusion of existing research, and EPA must explain why it was unable to harmonize outside data and remote sensing data. Similarly, EPA seems to have cursorily disregarded peer-reviewed poultry emissions studies solely because the researchers used different methods.<sup>60</sup>

The complexity of incorporating valid, peer-reviewed studies into the EEMs does not render those studies irrelevant or of no value. Moreover, the Consent Agreement requires EPA to do more than simply validate the EEMs with outside studies, or compare the EEMs with other research after the fact; it requires EPA to use these other data to *develop* the EEMs.<sup>61</sup> EPA’s exclusion of clearly relevant data from the EEM development process violates the Consent Agreement and is arbitrary and capricious. Requiring outside studies to report variables, such as the nitrogen content of feed and bedding, that EPA did not even take into account in the EEMs is also an arbitrary requirement for consideration.<sup>62</sup>

**b. Only using outside studies to validate NAEMS findings would be arbitrary and capricious, considering the problems with NAEMS**

EPA documented significant data completeness problems with the NAEMS study in the draft EEM reports.<sup>63</sup> The inherent limitations of NAEMS, as discussed previously, in combination with large data gaps even in this relatively limited study, heighten the value of additional data and information in developing nationally applicable EEMs. Yet as discussed above, EPA has failed to justify its exclusion of outside information.

In particular, EPA’s lack of broiler VOC data and overall lack of open source data require inclusion of outside studies. Due to persistent technical problems monitoring VOCs during the NAEMS study, EPA has virtually nothing upon which to base VOC EEMs. Because NAEMS did not effectively monitor these pollutants, EPA proposes to rely solely on the Kentucky broiler site data for the broiler VOC EEM.<sup>64</sup> EPA should instead consider any peer-reviewed studies of

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<sup>58</sup> Swine and Dairy EEM at 3-14.

<sup>59</sup> Swine and Dairy EEM Tables 3-4 and 3-5.

<sup>60</sup> Broiler EEM at 4-13.

<sup>61</sup> Consent Agreement at 4960.

<sup>62</sup> Swine and Dairy EEM at 3-7.

<sup>63</sup> For example, “the data completeness goal for liquid composition data of quarterly sampling was not achieved at any of the NAEMS monitoring sites” (Swine and Dairy EEM at 4-7); “the completeness goal for the two long-term monitoring sites was not achieved” (*Id.* at 4-12); “the completeness goal for the short-term monitoring sites was achieved only at site OK4A” (*Id.*).

<sup>64</sup> Broiler EEM at 8-66.

VOC emissions from broilers, though there may be few available. In addition, EPA should not ignore the data from one of just two broiler sites simply because the two sites used different measurement techniques. Though EPA may believe that one measurement method is superior to the other, its reliance on sparse data sets from single site may lead to EEMs incapable of representing AFO emissions from facilities nationwide. EPA must better explain its need to exclude the California site data.

EPA's open source data raises even greater concerns. First, EPA did not receive the VOC data from the open source sites, leaving it with no data to assess these sources' contributions to a facility's VOC emissions.<sup>65</sup> EPA should further explain the missing VOC data and attempts, if any, to obtain it. Even if no further opportunities remain to obtain valid VOC data from the open source sites, it is not too late for EPA to review existing research and pursue EEMs that address these pollutants. The data EPA did collect fared little better. The Draft EEMs to date only consider open source ammonia emissions, due to problems collecting hydrogen sulfide data. But even the limited ammonia monitoring data from the swine and dairy lagoons and basins have resulted in a model with essentially no predictive capability; the model does not show a correlation between facility size and emissions, or between animal weight and emissions. Due to the failure of the Swine and Dairy EEM model to track with variables such as AFO size and animal weight, EPA must, of necessity, seek any well-designed outside studies to move the process of developing an EEM forward. As EPA continues developing its hydrogen sulfide EEM, we encourage it to incorporate outside studies and reconsider its data completeness requirements to maximize the information available for consideration.

Given the significant data quality and quantity problems in NAEMS, forgoing the opportunity to improve the EEMs through the consideration of existing peer-reviewed research without justifying the decision is arbitrary and capricious. The fact that EPA did not receive VOC data from these sites is not a reason to forego establishing EEMs; without some estimate of open source VOC emissions AFOs will under-report total emissions, and this would hardly serve the goals of NAEMS or the EEM process. Neither the NAEMS study nor the draft EEMs provide any arguments that alternative measurement techniques are less reliable than those used in NAEMS, or that the inclusion of additional data would not improve the predictive ability of EPA's models.

**c. A more robust data set will result in more accurate EEMs**

We are aware that it may be difficult for EPA to combine NAEMS data and outside data into one dataset for EEM development, because earlier studies were not designed to develop confidence intervals on predicted emissions rates. There are, however, many alternative ways in which these outside data could be used in developing more accurate and protective EEMs. Perhaps the most significant application would be to clarify the degree of certainty in EEM

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<sup>65</sup> Swine and Dairy EEM at viii.

predictions. For example, comparisons of NAEMS data to outside data could reveal systematic differences in results; this would likely be attributable to the differences in measurement techniques or study methods. Such differences would increase the uncertainty in EEM predictions in a way that EPA could quantify. In cases where the EEMs present significant uncertainty, EPA should require facilities to report at or near the high end of the predicted emissions spectrum, rather than at the mean, to better protect public health and the environment.

Outside information could also be used to reaffirm apparent differences between swine and dairy operations or to validate the observed daily patterns in humidity and temperature. At the very least, EPA should include a narrative discussion of the results of existing research and, where appropriate, present quantitative comparisons of EEM predictions to emissions estimates found in outside studies, allowing the public to place the NAEMS data in context.

## **V. EPA should revise aspects of its NAEMS data analysis**

### **a. EPA should reconsider its use of a 75 percent completeness requirement**

EPA's data acceptance criteria appear arbitrary and likely to have excluded data that are valid. The NAEMS design required 75 percent of any hour's data to be valid to accept the hour's data, and 75 percent of any day's hours to accept the day's data.<sup>66</sup> The SAB panel for the Draft EEMs noted the study's low data completeness rates, questioning EPA's decision to require 75 percent completeness despite the study's frequent failure to meet that goal. If EPA believes it is necessary to throw out a significant amount of the NAEMS data, even though this rule results in a much smaller pool of data to analyze, it should justify the adoption of this standard. The use of a data quality-specific measure of valid data may allow EPA to use more data than the arbitrary cutoff in NAEMS. A lack of usable data appears to be responsible for many of the Draft EEMs' limitations, and this decision may warrant reconsideration.

### **b. EPA should revise its approach for the swine and dairy lagoons and basins**

EPA's Draft EEM for ammonia from open sources combines lagoons and basins from the swine and dairy sectors, but EPA does not adequately explain or justify its decision to do so. As noted by members of the SAB, these sources involve different waste streams and different biological processes that result in very different emissions. Moreover, NAEMS included significantly more swine and dairy open source sites than broiler sites – 6 swine open sources and 3 dairy. The swine and dairy sites in Indiana were monitored continuously for a year, and the other sites were monitored for up to 21 days each. In contrast, EPA studied only two broiler sites, including the Tyson site in Kentucky, and managed to establish Draft EEMs for these sources. This begs the question why EPA does not have, or did not collect, adequate data to establish separate EEMs for each livestock sector and waste storage method. EPA's selection of datasets may have unnecessarily limited its ability to do so.

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<sup>66</sup> Broiler EEM at 5-3.

The Draft EEMs also present problems related to data acceptance – or dataset choice – which significantly limited the datasets available for the open source analyses conducted. In addition to explaining its adoption of a 75 percent data completeness threshold, EPA should explain the apparent inconsistency in use of open source ammonia data collected with two different methods – “RPM” and “bLS.” In the Draft Swine and Dairy EEM, EPA states that the RPM data set was chosen in lieu of the bLS dataset because the RPM data “were obtained using instrumentation and procedures that were similar to the EPA’s developmental test method OTM-10.” This decision clearly seems to follow EPA’s design of utilizing consistent measurement methodologies. However, EPA also states that its rationale for excluding the bLS data was that the RPM dataset was much larger and that inclusion of the bLS dataset would not provide any additional information on lagoon emissions. These statements appear inconsistent with the NAEMS data. In fact, Table 4-1 shows that the bLS dataset has a substantially larger number of “valid emission days.”<sup>67</sup> The table shows 276 valid emissions days for NH<sub>3</sub> estimates using bLS and only 69 valid days for NH<sub>3</sub> using RPM. EPA should explain more clearly why the RPM dataset was nonetheless chosen for the model.

The valid RPM days for the dairy sites are particularly lacking; these sites had 96 valid bLS days and only 18 valid RPM days. Moreover, all of the valid RPM days for dairy data came from only one dairy. It seems that the bLS data would in fact provide a substantial amount of useful additional information for the dairy sites. These data seem particularly valuable considering that one of EPA’s concluding caveats is that the emissions from the dairy lagoons during summer were underrepresented, and “the great majority of measurements at two of the [three] dairy sites were made in the colder months of October through April.” Perhaps the bLS data would help address this bias. EPA should explain the apparent inconsistency and explain why, given the limited data pool, it chose to exclude the majority of its valid data points. Even if the inclusion of these data alone would not provide sufficient information to establish separate lagoon and basin EEMs for the swine and dairy sectors, EPA should consider including them along with other studies to improve the combined Draft EEM.

#### **VI. Despite data limitations, EPA should finalize AFO EEMs based on all information available**

Although NAEMS and its resulting data are far from perfect, EPA should finalize the Draft EEMs after incorporating other relevant studies and reconsidering its data selection criteria. The inherent challenges of measuring AFO emissions should not be used to further delay or limit EPA’s efforts to establish EEMs and begin regulating AFOs along with other stationary sources. Moreover, despite the numerous variables affecting AFO emissions and the limitations of the NAEMS data, these data appear to be as robust as the data underlying emission

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<sup>67</sup> Swine and Dairy EEM at Table 4-1.

factors for other polluting industries. For example, the N<sub>2</sub>O emission factors for the combustion of bituminous and subbituminous coal are based on approximately 75 data points.<sup>68</sup>

As discussed, EPA can and should revise the EEMs as more studies become available, and can err on the side of caution by requiring facilities to report their maximum potential to emit to address remaining uncertainty. The benefits of establishing benchmarks for emissions reporting and Clean Air Act regulation outweigh the risks of imperfect calculations, and even a small first step towards protecting public health from factory farm emissions is better than further delay.

## **VII. EPA's final EEMs should address implementation and reporting requirements**

The Consent Agreement outlines certain requirements for EPA's implementation of the final EEMs, including deadlines for emissions reporting by parties to the Agreement. However, to accomplish the goal of nationwide compliance with clean air laws, EPA must establish that all AFOs – not only the parties to the Consent Agreement – are required to apply the EEMs and either report emissions or certify that no CAA, CERCLA, or EPCRA requirements apply. The CAA clearly grants EPA this authority as to facilities not covered by the current CERCLA and EPCRA reporting rule.<sup>69</sup>

Moreover, EPA should not permit certain facilities to demonstrate compliance through cherry-picked studies instead of the EEMs. During the SAB meeting, EPA's Bill Harnett first indicated that AFOs intending to demonstrate compliance would have to use the appropriate EEMs; however, Mr. Harnett then stated EPA would consider allowing AFOs to use peer-reviewed studies to show compliance, after working with USDA to determine what estimates and efficiency calculations are most appropriate for specific Best Management Practices. This process would undermine the entire EEM process and the consistency and transparency it seeks to establish.

It also would defy logic to allow use of the site-specific peer-reviewed studies generally deemed irrelevant or inapplicable by EPA in the EEM process. Similarly, EPA cannot reasonably conclude that certain studies accurately calculate the emissions benefits of a specific practice when the very premise of NAEMS was the lack of reliable information about overall emissions. Finally, the use of case-by-case analysis of individual studies to demonstrate compliance would undermine the NAEMS goal of achieving industry-wide compliance on a shorter time frame than through individual enforcement actions.<sup>70</sup> EPA can, and should, continually improve and refine the EEMs as research evolves, and consideration of unproven Best Management Practices should be addressed through this process, rather than through ad hoc

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<sup>68</sup> EPA, Emission Factor Documentation for AP-42 Section 1.1 Bituminous and Subbituminous Coal Combustion, Tables 4-18 and 4-19 (April 1993).

<sup>69</sup> See 42 U.S.C. § 7414(a)(1).

<sup>70</sup> GAO Report at 34.

consideration of studies selected by AFO operators. The final EEMs must require all AFOs to report or demonstrate compliance based on the same standard, using the EEMs.

The Draft EEMs also fail to adequately explain EPA’s plan for dealing with the large confidence intervals in some of its datasets, although the use of emissions ranges will affect total emissions reported by facilities. For example, the Broiler EEM predictions for an individual day’s emissions rates are extremely variable, but averaging over longer periods of time, the prediction becomes far more stable and the confidence interval shrinks. During the SAB meeting, EPA indicated that it had not yet decided how to deal with the model’s ranges of estimated emissions, but that CAA regulations typically use mean values. Given the large uncertainty in the Draft EEMs, however, the final EEMs should require AFOs to base their emissions reports on the high end of the model range. Reports should also apply a potential to emit analysis. This should require AFOs to assume both that they are at full stocking capacity and that they emit at or near the upper bound of the EEM’s confidence interval. This will best set the stage for CAA, CERCLA, and EPCRA regulation of the largest emitters and protect public health and welfare.

In their current stage of development, the Draft EEMs do not provide individual AFO operators sufficient information or guidance on how they can practically apply the EEMs and achieve compliance with reporting requirements. Moreover, EPA’s statistical approach did not successfully condense the results into a form where AFO operators (or non-statisticians) would understand what practical information can be drawn from the analysis. The EEMs must provide straightforward information and guidance on applying the EEMs, including the scope of facilities to which they will apply.

### **VIII. EPA should pursue a process-based model after developing EEMs**

Although the establishment of EEMs is an important first step toward accurate measurement of AFO air emissions, the inherent limitations of NAEMS and other site-specific studies reiterate the importance of establishing a process-based model for emissions that would “consider[] the interaction and implications of all sources of emissions at an animal feeding operation.”<sup>71</sup> Estimates based on NAEMS and other studies will provide valuable ranges of emissions for AFOs. If EPA requires AFOs to report emissions at the high end of the EEM confidence intervals, these ranges should provide adequate certainty upon which to base CAA and other regulation. EPA can also continually improve the EEMs by periodically assessing emerging studies of AFO emissions, and can make these tools better able to calculate site-specific emissions over time. However, the variability between house design, lagoon and basin design, climate, feed, and other factors among the nation’s many thousands of AFOs – not to mention EPA’s difficulties in simply gathering data even at these limited sites – result in significant uncertainty. EPA should establish the strongest EEMs possible based on the data

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<sup>71</sup> GAO Report at 7.



available, but should commit to developing a model that incorporates these many varying factors to more accurately calculate pollution from individual facilities in the coming years.

## **IX. Conclusion**

Unchecked AFO air emissions cause well-documented harm to public health and welfare, and as the AFO industry continues to grow and concentrate geographically, the need for concrete emissions data and CAA regulation becomes more urgent. We support EPA's efforts to address this problem and establish scientifically sound methodologies to estimate and begin regulating AFO pollution, and we appreciate the opportunity to comment on the Draft EEMs.

However, EPA's decision to close the public comment period before the SAB report becomes publicly available unnecessarily limited the scope of these comments. Because we were unable to consider all information relevant to the adequacy of the Draft EEMs, we respectfully request that EPA re-open the public comment period after the SAB report becomes available. The report may answer questions raised in these comments, or clarify unclear aspects of the Draft EEMs. We further request that EPA time its public comment periods for the subsequent Draft EEMs to follow the SAB process, to ensure that all interested parties can fully consider the SAB reports and other relevant information before submitting public comments.

Thank you for your consideration,



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