Summary Minutes of the
U.S. Environmental Protection Agency (EPA)
Science Advisory Board Animal Feeding Operations Air Emissions Review Panel
Public Meeting, March 14-16, 2012

Date and Time: Wednesday, March 14, 2012, 8:30 am – 5:30 pm; Thursday, March 15, 2012, 8:30 am – 5:30 pm; and Friday, March 16, 2012, 8:30 am – 12:00 pm ET.

Location: Marriott at Research Triangle Park Hotel, 4700 Guardian Drive, Durham, North Carolina 27703

Purpose: The purpose of the March 14-16, 2012 public meeting was for the SAB Animal Feeding Operations Air Emissions Review Panel to review the following two EPA documents associated with SAB's review of EPA's air emissions estimating methodologies for Animal Feeding Operations: a) "Draft - Development of Emissions Estimating Methodologies for Broiler Animal Feeding Operations" - February 2012 draft; and b) "Draft - Development of Emissions Estimating Methodologies for Lagoons and Basins at Swine and Dairy Animal Feeding Operations" - February 2012 draft (First Review Meeting).

Participants:

SAB Animal Feeding Operations Air Emissions Review Panel (See Roster, Attachment A):

Dr. David T. Allen, Chair
Dr. Viney Aneja
Dr. Brent Auvermann
Dr. Peter Bloomfield
Dr. Alicia Carriquiry
Dr. Nichole Embertson
Dr. William Faulkner
Dr. Robert Hagevoort
Dr. Richard Kohn
Dr. April Leytem
Dr. Ronaldo Maghirang
Dr. Deanne Meyer
Dr. Wendy Powers
Dr. C. Alan Rotz
Dr. Paul Sampson
Dr. Eric P. Smith
Dr. John Smith
Dr. Eileen Fabian Wheeler
Dr. Lingying Zhao

Drs. Brent Auvermann and John Smith could not participate during the March 14-16, 2012 meeting. One Panel member (Dr. Alicia Carriquiry) participated via teleconference.

EPA SAB Staff:	Mr. Edward Hanlon, Designated Federal Officer Mr. Thomas Brennan, Deputy Director, EPA Science Advisory Board Staff Office
EPA Staff:	Ms. Janet McCabe, EPA Office of Air and Radiation Mr. Bill Harnett, EPA Office of Air Quality Planning and Standards Ms. Robin Dunkins, EPA Office of Air Quality Planning and Standards Mr. Larry Elmore, EPA Office of Air Quality Planning and Standards Ms. Ally Mayer, EPA Office of Air Quality Planning and Standards
Other Attendees:	A list of members of the public who attended or requested information for calling into the meeting is provided in Attachment B, Public Attendance.

Materials Available: The agenda and meeting materials were circulated to the SAB Animal Feeding Operations (AFO) Air Emissions Review Panel in advance of the meeting, and were made available to the public via the SAB website (www.epa.gov/sab) on the following SAB Animal Feeding Operations Air Emissions Review Panel website: http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/e46976786e2520b4852579840066535e!OpenDocument&Date=2012-03-14

Meeting Summary

The meeting was announced in the Federal Register[1] and proceeded according to the meeting agenda[2]. A summary of the meeting follows.

March 14, 2012

Opening Statements and Welcome

Mr. Edward Hanlon, the Designated Federal Officer (DFO), opened the meeting, and made a brief opening statement noting that the SAB Animal Feeding Operations Air Emissions Review Panel is a Federal Advisory Committee under the Federal Advisory Committee Act (FACA). He noted the meeting was open to the public and that Agency-provided briefing materials were posted onto the meeting website. He stated the purpose of the meeting, and noted this is the first meeting of this panel to review these two documents. He stated that one member of the public had requested to present an oral statement during the 3/14/12 meeting, and that seven sets of written public comments for the 3/14/12 meeting were received. He noted that the SAB Staff Office has determined that there were no conflict-of-interest or appearance of a lack of impartiality issues for any Panel members for this review. He noted that minutes of the meeting were being taken to summarize discussions and action items in accordance with requirements under FACA. Mr. Tom Brennan, Deputy Director of the SAB Staff Office, welcomed everyone and expressed appreciation to the Panel and to the EPA staff for their support in preparing for the meeting.

Dr. David Allen, Chair of the Panel, then welcomed everyone and requested that all members introduce themselves. Dr. Allen noted the goals, purpose and objectives for the meeting, and stated that during discussions on each charge question, the Panel would try to articulate a reflection of the Panel's viewpoints, and that areas of consensus and differing viewpoints would be identified. He also noted that the Panel would listen to and consider public comments, each other on the Panel, and EPA staff. He noted that the Panel's draft report would undergo a quality review process by the chartered SAB. After the approval of the report, the final report would be transmitted to the EPA Administrator**.** Dr. Allen then welcomed Ms. Janet McCabe of EPA's Office of Air and Radiation for her opening remarks.

Ms. McCabe made a brief opening statement and summarized the history of EPA's activities associated with animal feeding operations air emissions methodologies. Ms. McCabe noted that EPA developed draft emissions methods for several pollutants for dairy and swine lagoons and basins and for the broiler industry, and that egg layer, dairy, and swine sectors would be addressed in the future.

Mr. Larry Elmore, EPA Office of Air Quality Planning and Standards, then made a brief opening statement and presented and discussed his PowerPoint slides[3] that were provided on the meeting website. Mr. Elmore presented slides 1 through 9, and Dr. Amy Nail, EPA contractor from HONESTat, presented slides 10 through 31. Dr. Nail explained the statistical analyses that were presented in the two draft EPA reports. She described the analyses and estimations of variability, uncertainty, covariance functions, validation, point estimates, and probability distributions that were generated. Mr. Elmore presented slides 32 through 34, and discussed why Kentucky volatile organic contaminant (VOC) data was used rather than the California data.

Several Panel members asked questions on how the collected data were used in the analyses and modeling, and EPA staff and Dr. Nail responded to these questions. Several questions were also asked and answered regarding bird manure composition, testing, and analysis, and how much data was eliminated for incompleteness. A number of questions were asked regarding negative data values that were reported and VOC data, which Mr. Elmore and Dr. Nail responded to.

One Panel member asked whether a mass balance was developed and whether that balance affected emission estimation; Mr. Elmore responded that the data relevant to mass balances will be useful at a later date, but that EPA did not make use of it for this purpose of these reports. Ms. Dunkins noted that EPA was developing a methodology and not a process-based model discussed under the National Academy of Science's report on animal feeding operations emissions. She noted that when EPA entered into the consent agreement, it was understood that a process-based model would be a long term research project, and that statistical methods would be used until a process-based model can be used.

One Panel member asked whether chemical data for animal feeds was available. Mr. Elmore responded that feed composition was highly sensitive data from industry. He noted that EPA would welcome this data, but that industry would need to provide this information to EPA. Ms. Dunkins requested Panel suggestions for how to frame questions on feed composition to avoid industry confidentiality concerns.

Public Comment

Ms. Sally L. Shaver, representing the U.S. Department of Agriculture Agricultural Air Quality Task Force (AAQTF), provided an oral statement. Ms. Shaver noted that the AAQTF was

established in 1991 by a Federal Act, and noted that the AAQTF's purpose was to assess scientific issues associated with agricultural air quality. She noted there were 26 members of the AAQTF representing broad, diverse backgrounds. In September 2010, the AAQTF sponsored a workshop and developed three white papers written by experts in different areas. These white papers were submitted as public comments for the Panel's consideration, and described recommendations on practices; collection, use and analysis of data; and reporting associated with air emissions estimating methodologies for Animal Feeding Operations. These recommendations were also presented to the Director of the U.S. Department of Agriculture on September 30, 2010, and were published in an Engineering Technical Reference. The Papers also recommended best practices for baseline data collection.

Upon hearing no questions from the Panel for the public commenter, Dr. Allen moved forward with Panel responses to the Charge Questions.

A. "Draft - Development of Emissions Estimating Methodologies for Broiler Animal Feeding Operations" (February 2012 draft)

Discussion of Response to Charge Question 1:

- **Review of Sections 1, 2 and 10 of the Broiler Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Sections 1, 2 and 10 of the Broiler Report (Introduction; Overview of Broiler Industry; and References) were presented in a clear, comprehensive, and scientifically sound manner. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

The Panel agreed that Section 1 should describe the importance of retaining a long-term goal for producing process-based models. The Panel suggested that the role of manure on EEMs be incorporated into these process-based models. The Panel also noted that the limitations of the data set should be more comprehensively described in the draft Reports. In addition, the Panel agreed that the Report's discussions on mechanisms of data collection, ventilation rates within barns, and feed concentration should be enhanced.

Several Panel members described the importance for producing process-based approaches for estimating AFO emissions. Several Panel members recommended that a mechanistic model be constructed and compared to the statistical methods in order to conclude that the statistical approach was appropriately relevant. Several Panel members also emphasized the need to better characterize uncertainties associated with collecting data from a very limited number of sites. The Panel noted that while the four broiler sites appeared to be representative of the industry, the four sites tended to be uniform. Another Panel member expressed concern that the EEM for VOC was based on one Kentucky site, and questioned whether this was representative of the industry.

One Panel member noted that EPA rejected use of a regression analysis due to a relatively small number of data sets, and commented that the Report should discuss the importance of conducting such analysis even though there was insufficient data to conduct the analysis.

One Panel member questioned why data from manure storage was not collected as part of the data collection effort. Regarding model applications, a Panel member requested that ranges of data should be explained in the reports, and suggested that data extrapolation beyond some limits is not recommended.

Discussion of Response to Charge Question 1:

- **Review of Sections 3 and 4 of the Broiler Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Sections 3 and 4 of the Broiler Report (NAEMS Monitoring Sites; and Data Available for EEM Development) were presented in a clear, comprehensive, and scientifically sound manner. The Panel discussed strengths and limitations of the broiler data set, and commented on how these strengths and limitations affect the development of the EEMs. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

The Panel recommended that EPA improve the clarity of the discussions on the NAEMS monitoring sites, and on the data available for EEM development. The Panel also recommended that EPA consider using more data than it used in the report. The Panel noted it could suggest criteria for considering additional data and how to use it. The Panel suggested that EPA could conduct a performance evaluation on the EEM using some of the additional data, to see how well the EEM performed outside of the data set on which the EEMs were developed. The Panel requested that EPA discuss why certain data were disqualified. The Panel agreed that EPA should consider use of available data for performance evaluation of the EEMs, and that EPA should clarify why some data were accepted and other data rejected.

Several Panel members discussed using available data from other studies, and the Panel agreed that EPA should consider existing studies that used data from multiple facilities. One Panel member noted that the report should clarify the periods that data were collected, and clarify the VOC discussions regarding Kentucky and California VOC analyses.

Regarding strengths/limits of data, one Panel member stated that it is not desirable to characterize an industry based on two sites, and for VOCs, one site. The Panel member also noted that the California site had only 60 days of measured data. The Panel member recommended that EPA discuss why 40% of data was invalid, and why these data sets were representative of the industry. Several Panel members discussed the collected data and reasons why some data were not collected. A Panel member noted that EPA did not and should discuss dietary influences on emissions in the report, and commented that growers do not routinely measure certain parameters such as bird weight. A Panel member commented that Section 3.1's discussion on site selection should better describe the farms that were considered representative and were sampled.

Discussion of Response to Charge Questions 5 and 6

- **EPA's General Approach for Handling Negative or Zero Emission Measurements**

Charge Question 5: *Please comment on the EPA's approach for handling negative or zero emission measurements.*

Charge Question 6: *In the interest of maximizing the number of available data values for development of the draft H_2S EEMs for swine and dairy lagoons/basins, does SAB recommend any alternative approaches for handling negative and zero data other than the approach used by the agency.*

The Panel discussed EPA's Charge Questions 5 and 6 regarding EPA's general approach regarding inclusion of negative and zero emissions values in the data. The Panel offered suggestions for EPA's approach for handling negative or zero emission measurements, and discussed alternative approaches for handling negative and zero values other than the approach used by the agency. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

The Panel agreed that there were two types of negative data – raw and calculated data. The Panel noted that negative calculated data should be included in the analysis. The Panel suggested that raw data be qualified and considered for use. The Panel noted that not considering these values would affect and decrease the data available for measurement/analysis. The Panel commented that if raw data is being considered, various scenarios exist for use of data. Overall, data should be reevaluated and used. The Panel suggested an alternative approach to consider: use available general statistical methods to fit non-linear models with negative values. The Panel commented there was no statistical problem with fitting such values, and noted that if the model were truncated at zero, a linear model may be turned into a non-linear model.

A Panel member noted that if instrument drift occurred, it was acceptable to not include negative or zero emission measurements. The member noted that if such measurements were calculated, then they should be included.

Discussion of Response to Charge Question 1:

- **Review of Section 5 of the Broiler Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Section 5 of the Broiler Report (NAEMS Data Preparation) was presented in a clear, comprehensive, and scientifically sound manner. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

The Panel agreed that EPA should clarify and provide more specific information regarding the two data acquisition sites. The Panel noted that EPA should specify criteria for data completeness, and how data can be used. Regarding the two sites, EPA should note the varying conditions (weather, other factors) to see if these sites represent the entire United States. Within this section, EPA should also provide rationale for dropping data. In addition, it was suggested that data available in the literature should be used in a modeling verification effort. Regarding

data assessment, EPA should use median data rather than means.

A Panel member requested that EPA clarify instrument calibration and how outliers were assessed. The Panel member requested that EPA clarify the data completeness discussion in Section 5.1.3. In particular, discussion on why a 75% value was used, why are there missing data days, and why some data was collected in some seasons and not in others. The Panel member also requested that EPA include an analysis indicating the similarities between the data sites.

Another Panel member suggested that EPA identify the criteria for using data, expectations for data frequency, and whether the data was reproducible. The Panel member noted that EPA should clarify why such a small number of sites were used in comparison with the entire United States. Since some sites are different than others, information on differences in weather, operations, range, and other factors should be included to help assess whether data could be applied elsewhere to other locations.

Another Panel member suggested that this section discuss how background data was collected. Several Panel members pointed out several errors in Tables and in the text. One Panel member suggested that Table 5-10 should be broken down into two tables to improve clarity.

Discussion of Response to Charge Question 7:

- **Use of Volatile Organic Compounds (VOC) Data in Developing VOC Emissions Estimating Methodologies**

Charge Question 7: *Please comment on the approach EPA used to develop the draft broiler VOC EEM.*

The Panel discussed EPA's Charge Question 7 that describes EPA's use of VOC data submitted for the California and Kentucky broiler sites. The Panel commented on the approach EPA used to develop the draft broiler VOC emissions estimating methodologies, and discussed suggestions for alternative analyses or presentation that should be conducted.

The Panel commented that the data had various limitations, and do not seem sufficient to provide for a good prediction of VOC emissions. The Panel agreed that the California data should not be used to calculate EEMs, and that the EPA Report needs more explanation on VOC emissions. The Panel also stated that VOC data was too limited and inadequate to calculate EEMs, and that more information was needed on what drives VOC emissions. The Panel also agreed that EPA should further discuss VOC speciation and how that affects VOC emissions. The Panel also commented it would be helpful for EPA to compare data to other facilities to assess the significance of this VOC data set. The Panel was concerned that VOCs had a very limited data set which would potentially be applied across the United States. The Panel also expressed concern regarding reactivity of VOCs in the atmosphere.

A Panel member noted that EPA should develop uncertainty bounds to assess the regression coefficient analysis associated with the VOC measurements. One Panel member commented that details on the instrumentation and on the quality assurance/quality control (QA/QC) associated with the VOC analyses were needed to assess data completeness and usability of the VOC data. Another Panel member requested information clarifying the total and speciated VOC results, and which VOCs are considered reactive. Ms. Dunkins noted that there are provisions in the consent agreement noting that if EPA has issues with inadequate data, EPA will attempt to

resolve the data issues.

Discussion of Response to Charge Question 1:

- **Review of Section 6 of the Broiler Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Section 6 of the Broiler Report (Measured Emissions from Broiler Operations) was presented in a clear, comprehensive, and scientifically sound manner. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

Overall, the Panel noted this Section of the report was clear and concise. The Panel recommended that EPA improve the statistical analyses presented in this section of the report (e.g., calculate confidence values to see variability of data; include quantitative statistical analyses that compares data between houses).

One Panel member recommended that the discussion on seasonal influences should be improved to discuss whether such influences should be incorporated into the model. The Panel member also noted that the text should describe how anomalies are defined and applied in the data set. The Panel member noted that the amount of data for PM 2.5 and TSP in California was limited, and questioned whether emission factors should be generated on this data.

Another Panel member requested that negative values should be described in the text. One Panel member suggested various improvements in the graphs in this Section.

Discussion of Response to Charge Question 1:

- **Development and Structure of the Broiler Emissions Estimating Models:**
- **Review of Sections 7, 8 and 9 of the Broiler Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Sections 7, 8, and 9 of the Broiler Report (Development of the EEMs for Grow-Out Periods; Results of Grow-Out Period EEM Development; and Development of Decaking and Full Litter Cleanout Period EEMs), and the statistical approaches described therein, were presented in a clear, comprehensive, and scientifically sound manner. The Panel also discussed suggestions for alternative variables that could have been considered in the statistical analyses of the data, and alternative analyses or presentation that should be conducted.

The Panel identified a number of issues associated with the statistical methodology that was presented in these Sections of the Report, and discussed various options to address these issues. The Panel recommended that EPA develop a modeling approach that is more consistent with the sampling design structure and data limitations. The Panel suggested that model development consider the effects of location, houses within the locations, and flocks within houses in the

model inference and prediction.

The Panel noted that model uncertainty needs to recognize the limitations in using data from a small number of geographic locations. The Panel also expressed concern that any model developed from information on two sites is not applicable to all sites in the U.S. Several Panel members expressed concern about the appropriateness of using the statistical and modeling tools to extrapolate the data beyond the geographic areas that were covered in the data set due to the limitations of the small data set. Several Panel members suggested that EPA compare the data gathered for this analysis with data published in literature.

The Panel recommended that EPA carefully consider the process for developing the statistical model, particularly the mean and variance model components and the approach for evaluating random effects. The Panel also expressed concern about using a polynomial model for estimating the relationship between animal mass and concentrations.

The Panel also recommended that EPA consider other approaches to the crossvalidation method used to evaluate the model. The Panel suggested that splitting of data based on factors related to model usage (such as flock, house and location) should be considered as a way to evaluate model predictive ability. The Panel noted that it is preferable if EPA plotted residuals to identify oddities, lack of fit, serial correlation and lack of support for the probability model rather than histograms of the data. The Panel recommended that EPA assess the mean and variance specifications and covariance structure in an extensive analysis of residuals.

Several Panel members described the importance for producing process-based approaches for estimating AFO emissions, and recommended that a mechanistic model be conducted and compared to the statistical methods. One Panel member commented that, for example, if EPA did not consider feed conversion and how nitrogen gets tied up, the overall statistical result may not be credible.

Regarding data sufficiency, the Panel noted that the combination of information from separate datasets into a single dataset may limit the application of the model to the locations and houses where data were gathered. The Panel commented that the model's use of N=3 sites is a rather small sample for developing models that would be applied in other locations. The Panel noted that such a small N size makes it difficult to estimate variance components.

The Panel expressed concern about the both deterministic and stochastic components of the model. The Panel noted that for nonlinear models, polynomial regression, such as the use of cubic functions to represent nonlinear dependence in average mass of animals, leads to poor predictions near the extremes of the experimental conditions. The Panel suggested that restriction on the range of mass should be reported if the cubic model is used. The Panel also recommended that orthogonal polynomials should be used if a polynomial approach is taken.

The Panel also noted that the extremely high autocorrelations that were calculated suggest that perhaps there are some other temporal trend features that should be identified. The Panel further noted that regarding random effects for flocks, while house and location are also considered as potentially random, there are too few levels of the house and site factors to analyze them as random effects.

March 15, 2012

Summary of March 14 Discussions:

Dr. Allen projected onto the meeting screen a list of preliminary key summary points that Panel members drafted to summarize the March 14, 2012 meeting discussions[4], and requested that Panel members who were lead discussants for each charge question discuss the preliminary key points. Mr. Hanlon noted these preliminary summary points would be posted onto the SAB meeting website the week of March 19th.

The Panel discussed each set of preliminary key summary points, and suggested changes to each set of preliminary key summary points were incorporated.[5]

Clarifying Comments from Members of the Public

Dr. Jamie Burr of Tyson Foods, Inc. provided an oral statement. Dr. Burr noted there is significant variability in the size and data of birds, and that it was very important to have separate EEMs based on bird classes. He noted that EEMs are only for farms that are tunnel ventilated, not cross ventilated. Dr. Burr stated that Tyson Foods had a third party audit on the NAEMS monitoring report submitted on Tyson's Kentucky facility. Dr. Burr noted he appreciated Mr. Elmore's comment that data should be readily collectible. Dr. Burr noted that there is a decaking process that causes a spike in flock emissions, and that EPA should consider the accuracy of such spikes related to litter storage. Dr. Burr noted that EPA's report should discuss and capture significant differences between the different NAEMS monitoring reports. He also noted that EPA should compare the current NAEMS monitoring with previously developed data. He stated that missing data for the NAEMS monitoring report submitted on Tyson's Kentucky facility were commonly due to instrument malfunction or servicing/maintenance issues. He also commented that there were four ammonia readings taken in the NAEMS monitoring report submitted on Tyson's Kentucky facility.

A Panel member asked whether audits of the data within the NAEMS monitoring report submitted on Tyson's Kentucky facility were available. Dr. Burr responded that EPA should have that audit information. Another Panel member asked whether Tyson Foods could provide information on composition of feed, such as protein information. Dr. Burr responded that the Panel should use industry standards for feed composition.

Dr. Lingjuan Wang Li of North Carolina State University provided an oral statement. Dr. Li stated that when selecting the predictors for EEMs, particulate matter (PM) and gaseous pollutants should be treated differently. Dr. Li noted that while the driving force for gas emissions is from animal manure, the driving force for PM generation is mainly from animal activity. Dr. Li also noted that when the EEM prediction is in mass/day, the stocking density is very important and should be considered. Dr. Li stated that although numbers of animals and total body weight of animals are counted as the EEM inputs, housing dimensions and stocking density were not considered, and consequently the house emission (mass/day) prediction would be the same for different house size with different stocking density. Dr. Li noted this is an incorrect prediction. Dr. Li also noted it was premature for EPA to develop the VOC EEM for broiler operations because there is a lack of data for the broiler VOC EEM model performance evaluation.

Dr. Al Heber of Purdue University provided an oral statement and presented slides.[6] Dr. Heber noted that relative humidity is not a good variable to include in an emission model since it is subject to temperature. Dr. Heber suggested that a simple statistical model would be appropriate. He stated that a reasonable model is noted on slide 1 of his presentation. He noted that area should be considered in the model, and that R squared values are important. He stated that missing ammonia data was primarily due to instrument problems and leaks in the gas sampling system. He also commented that he was presently submitting additional monitoring data to EPA. He stated that feed composition data was taken (4 samples taken 11 times), with an attempt to be representative. He noted that nitrogen content within the feed ranged from 2.2 to 4.4% total mass, solids were 88 or 90% of total mass, and that the spreadsheet with all data values will be sent to EPA within a day. Carbon dioxide was not measured since it was not considered a target pollutant. Several Panel members asked Dr. Heber questions regarding VOC emissions, negative data, and procedures for assessing PM completeness, which Dr. Heber answered.

Continuation of Discussion on Sections 7, 8 and 9 of the Broiler Report, and Charge Questions 5, 6 and 7:

Charge Question 5: *Please comment on the EPA's approach for handling negative or zero emission measurements.*

Charge Question 6: *In the interest of maximizing the number of available data values for development of the draft H_2S EEMs for swine and dairy lagoons/basins, does SAB recommend any alternative approaches for handling negative and zero data other than the approach used by the agency.*

Charge Question 7: *Please comment on the approach EPA used to develop the draft broiler VOC EEM.*

The Panel identified a number of additional issues associated with Sections 7, 8, and 9 of the Broiler Report (Development of the EEMs for Grow-Out Periods; Results of Grow-Out Period EEM Development; and Development of Decaking and Full Litter Cleanout Period EEMs), and the statistical approaches described therein, and with the statistical methodology that was presented in these Sections of the Report, and discussed various options to address these issues.

The Panel further discussed its concerns regarding the limited data available for statistical application and modeling. One Panel member expressed concern regarding the lack of uniformity on the calculated variance. The Panel member suggested that EPA provide more information on what causes changes in emissions. Another Panel member commented that for each animal sector, EPA should consider identifying biologically realistic limits for parameters that would be used in that sector's model. One Panel member noted his concerns that the dairy lagoons data set may miss 80% of eastern U.S. dairy farms. The Panel member suggested that EPA develop a model that could be applied on a unit basis to assess at the extreme values as well as on any extreme values outside the data range.

Several Panel members suggested that EPA normalize the data, and consider which physical parameters should be normalized (e.g., number of chickens in and out of barns; dietary information to estimate excretion). A Panel member noted that the measured data to be used in the statistical and modeling analyses should have bounds, within stated levels of uncertainty.

Ms. Dunkins asked the Panel to consider which key variables should be assessed in a modeling methodology. In considering this issue, Mr. Elmore suggested that the Panel consider whether data could be readily collected at farms. For example, Mr. Elmore noted that he was uncertain how many farmers have information on manure quality and daily temperatures. One Panel member suggested that EPA's model does not need to be a 'one size fits all'. A Panel member suggested that while feed composition data may not be readily available to farmers, levels of feed protein should be readily available and should be gathered.

Regarding Charge Question 7, the Panel agreed generally that data do not support a VOC EEM at this time. However, the Panel noted that there are valuable components of VOC data that should be disseminated and used as appropriate. Regarding Charge Questions 5 and 6, the Panel agreed there were a number of elements associated with the topic of negative and zero measurements. The Panel agreed there were a few situations where negative concentrations could remain as useful data. One Panel member noted that if a model excluded negative values, the model will be biased when predicting at low emission rates, and that any bias in a model weakens model usability. As a path forward, Dr. Allen noted he would distribute a summary of draft responses to Charge Questions 5, 6 and 7 to the Panel on the morning of March 16 for Panel discussion.

B. "Draft - Development of Emissions Estimating Methodologies for Lagoons and Basins at Swine and Dairy Animal Feeding Operations" (February 2012 draft).

Mr. Larry Elmore, EPA Office of Air Quality Planning and Standards, made a brief opening statement and presented and discussed his PowerPoint slides[7] that were provided on the meeting website. Beginning at slide 5, Dr. Amy Nail presented the statistical approaches taken for the EEMS for lagoons and basins at swine and dairy operations. Dr. Nail also presented additional slides that discussed missing data, pH, and other parameters.[8] Mr. Elmore presented slide 30 and remaining slides.

Several Panel members commented that EPA should not combine swine and dairy data, and should use a process-based approach. One Panel member commented that a process-based model can describe data outside of data bounds more accurately than a statistical approach, and that a statistical approach may not fit for other data sets. One Panel member noted that dairy and swine lagoons differed from each other in several ways (e.g., swine lagoons have purple sulfide bacteria that treat H_2S which affects emission rates). The members noted that from an animal science perspective, there are many reasons why swine and dairy operations were not comparable (e.g., one is, and one is not, a ruminant).

Several Panel members expressed concern regarding lagoon variability, noting that lagoon volume capacity varies depending on side slopes and depth, and that no two lagoons are the same with precipitation causing much of the variability. These Panel members suggested that EPA modify its model assumptions on lagoon surface area to more appropriately reflect actual lagoon conditions and variables.

Several Panel members requested information on meteorological variables and other physical parameters that were collected, which EPA responded to. A few Panel members asked why PM-2.5 was not being modeled for lagoons, noting that a lagoon releases gases that form PM-2.5. Ms. Dunkins noted that emissions are the key issue here, not atmospheric formation of PM, and that the consent agreement is for permitting requirements which are emissions-based.

Several Panel members questioned the statistical approaches taken for this analysis. One Panel member noted that EPA developed a linear function for variables such as wind speed and emission rate, and asked whether EPA considered different formulations when developing the link. Another Panel member noted that predictions for dairy and swine sites could be assessed by reviewing the R-squared values, and noted that dairy had smaller point predictions than swine. The Report also noted that EPA did not find a correlation coefficient for this data. The Panel member encouraged EPA to assess whether the fits are equally good over time for dairy and swine sites, and to look at residuals and examine them for auto-correlation. Another Panel member commented that EPA fit the data using separate models, then combined the models together to develop emissions estimates. One Panel member expressed the importance that EPA's statistical model mirror a mechanistic model. Dr. Nail responded that EPA used an iterative process to assess different functional forms, and considered the log normal values for the variables.

One Panel member noted concern regarding the static variables applied for the manure management system, noting that manure management varies significantly within different dairy lots. The member also suggested that specific management options should be compared against other options (e.g., compare anaerobic digester with other types of management). One Panel member responded that there is enormous variability in site conditions across all states. Dr. Nail encouraged the Panel to provide recommendations on which systems and which variables should be compared.

Several Panel members commented on EPA's use of measurements obtained using the RPM model (Radial Plume Mapping) rather than use of bLS data in the development of the NH_3 EEMs, noting there were many more "valid test days" for bLS than for RPM. Another Panel member noted that the RPM model has shown 30% variation, whereas the bLS model has shown 2% variation, in the one validation effort that has been conducted. EPA responded that it intended to use RPM data because it was closer to the federal reference method.

Regarding data limitations, one Panel member asked whether there were sufficient data to conduct a power calculation, and whether data needs varied if taking a statistical vs. process-based approach. One Panel member commented that most power calculations have a hypothesis to be tested. Another Panel member suggested that EPA conduct a transferability analysis to see if the modeling approach taken for one type of site was transferable to use at other sites.

Public Comment:

Mr. Michael Formica, Chief Environmental Counsel for the National Pork Producers Council, provided an oral statement. Mr. Formica noted he would be submitting written comments, and that he had four points for the Panel's consideration:

a) While it is important to consider the National Research Council's 2002 study, NAEMS data was gathered out of a consent agreement. The agreement noted that EEMs would be developed as tools that farmers could use to establish determination that they meet requirements of three environmental laws. Anything beyond goal is unnecessary.
b) Six Farms in four states were picked that are representative of industry as a whole, and reflect regional differences. Within those states, 52% of the sows in the U.S. are raised there, and the sites represent 95% of cases in the country. EPA should assess

data from each individual site. Meteorological conditions in North Carolina are different than in Iowa, and lagoon management differs across sites.

c) It is inappropriate to combine all of this data, and inappropriate to combine swine and dairy. A pig is not a cow.
d) There are concerns over the need for additional data. Data on nutrients and pH content in lagoons should be gathered. EPA can reach out to industries directly to gather more data. The National Pork Producers Council would be happy to gather this information, information on feed formulations, and information on industry standards for how farms adjust feed, pH and nitrogen.

Dr. Al Heber of Purdue University provided an oral statement and presented slides.[6] Dr. Heber discussed releases from barns, and commented that he'd like to see a comparison on an area-specific basis. He discussed factors affecting ammonia emissions, including wind speed. Another Panel member commented that ammonia emissions increase with increased wind, and noted that the model should reflect this. Several Panel members asked questions regarding relationships between emission rates and various physical parameters, and Dr. Heber responded that he would provide more information on these issues later in the meeting.

Discussion of Response to Charge Question 1:

- **Review of Sections 1, 2 and 3 of the Swine and Dairy Lagoon/Basin Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

The Panel discussed whether Sections 1, 2 and 3 of the Lagoons Report (Introduction; Overview of Open Sources; and Data Available for EEM Development) were presented in a clear, comprehensive, and scientifically sound manner. The Panel discussed strengths and limitations of the lagoons data set, and commented on how these strengths and limitations affect the development of the EEMs. The Panel also discussed suggestions for alternative analyses or presentation that should be conducted.

Several Panel members expressed concern that Section 2 appears to have been written by someone not very familiar with the dairy industry, and suggested that EPA rewrite that section and include additional details on the industry.

Several Panel members requested additional details regarding hydrocarbon and VOC sampling results, average dairy weight, and manure management systems. One Panel member requested that EPA conduct a nitrogen balance analysis to better understand the mass of nitrogen that may be emitted. Another Panel member expressed concern that monitoring was conducted intermittently.

Several Panel members requested more information on the lagoons where data were collected, and standard lagoons throughout the industry. One Panel member noted that one of the dairy lagoons used for data was not used for manure storage; it was primarily wash water, and may not have a good relationship with the animal numbers.

March 16, 2012

Summary of March 15 Discussions:

Dr. Allen projected onto the meeting screen a list of preliminary key summary points that Panel members drafted to summarize the March 15, 2012 meeting discussions[9]. Mr. Hanlon projected onto the meeting screen a list of draft data needs identified by the Panel, and Panel members provided comments on those data needs. Dr. Allen noted that Panel members should send in additional comments on data needs by March 20, 2012. Dr. Allen requested that Panel members who were lead discussants for each charge question discuss the preliminary key points. Mr. Hanlon noted these preliminary summary points would be posted onto the SAB meeting website the week of March 19th.

The Panel discussed each set of preliminary key summary points, and suggested changes to each set of preliminary key summary points were incorporated.[5]

Several Panel members commented that EPA should not apply the broiler or lagoons model across the U.S., and noted that EPA should use available science to develop a more biologically precise surrogate than the approach presented in the Reports to define the EEMs. A few members suggested that EPA consider taking more than one approach to assess emissions, and use assumed values available in the literature and use those to make EEM calculations. One Panel member noted that farms adjust their emissions and releases and would need to get credit through the modeling effort for controls they are doing to reduce emissions.

Regarding development of a process-based model in addition to a statistical approach, a Panel member noted that the model would be applied nationally, and the current model as formulated will be a challenge to apply. One Panel member noted that the cubic equation for animal mass results in a negative emission rate for a portion of the animal weights provided in available data, which is evidence that a different approach should be investigated (e.g., a statistical approach that builds in biology and a performance evaluation step). Another Panel member suggested that a statistical approach based on some mechanistic approach may be an appropriate method.

A Panel member commented that regardless whether a statistical or mechanistic approach is taken, it was unclear whether there was sufficient data to take either approach. The Panel member suggested that perhaps the Panel could discuss what are the key data needs to appropriately model this scenario. One Panel member suggested that emissions could be assessed based on the existing dataset, but that suggestions on how to improve that analysis could be pursued.

One Panel member suggested that various approaches could be taken for the different sectors, since there was a mixed degree of complexity between sectors and media and a mixed degree of data availability in either the NAEMS data or in literature. Another Panel member suggested that statisticians would appreciate having process information to inform a statistical approach. The member noted that if the science is correct and a simpler model could be developed, such an approach would be easier to apply to other sites.

The Panel further discussed whether to combine dairy and swine lagoon data. Upon discussion, the Panel had a strong recommendation that those data sets not be combined. The Panel members also commented that there were significant flaws in the static predictor variables provided by EPA in the Reports. Several Panel members commented that EPA should develop a

variable predictor for loading into the lagoons.

Clarifying Comments from Members of the Public

Dr. Al Heber of Purdue University provided an oral statement and presented slides.[6] Dr. Heber discussed Dr. Grant's feedback on various questions raised by the Panel on March 14 and March 15. One Panel member asked when other reports will be released publicly so that the Panel could have access to that data. Dr. Heber responded that the Pork report was still being worked on, but that the Dairy reports should be submitted to industries by April or May 2012. The Panel member noted that if these reports become public information, the Panel should consider that information.

Discussion of Response to Charge Questions 1, 2, 3 and 4:

- **Development and Structure of the Swine and Dairy Lagoon/Basin Emissions Estimating Model:**
- **Review of Section 5 of the Swine and Dairy Lagoon/Basin Report:**

Charge Question 1: *Please comment on the statistical approach used by the EPA for developing the draft EEMs for broiler confinement houses and swine and dairy lagoons/basins. In addition, please comment on using this approach for developing draft EEMs for egg-layers, swine and dairy confinement houses.*

Question 2: *Please comment on the agency's decision to combine the swine and dairy dataset to ensure that all seasonal meteorological conditions are represented. In addition, the agency also seeks the SAB's comments on whether the agency should combine lagoon and basin data.*

Question 3: *Please comment on the agency's decision to use static predictor variables as surrogates for data on lagoon/basin conditions. Given the uncertainties in that approach, does the SAB recommend that EPA consider specific alternative approaches for statistically analyzing the data that would allow for the site-specific lagoon liquid characteristics to be used as predictor variables?*

Question 4: *Does the SAB recommend that EPA consider alternative approaches for developing the draft NH_3 EEM that balances the competing needs for a large dataset (to reflect seasonal meteorological conditions) versus incorporating additional site-specific factors that directly affect lagoon emissions. If so, what specific alternative approaches would be appropriate to consider?*

The Panel discussed the development and structure of the swine and dairy lagoon/basin EEMs and the statistical approaches described therein, and whether Section 5 of the Lagoons Report (Overview of the NH_3 EEM) were presented in a clear, comprehensive, and scientifically sound manner. The Panel also discussed suggestions for alternative variables that could have been considered in the statistical analyses of the data, and alternative analyses or presentation that should be conducted.

Several Panel members noted that negative results in open basins must be assessed on case by case basis. The members noted that discarded data may have uses in the analysis.

A Panel member noted that statistical approaches can provide insights, and the Panel will provide comments on how to do that. Alternative approaches such as mechanistic approaches

could also be taken. The Panel will also provide comments on suggested performance approaches to assess statistical and mechanistic approaches taken. One Panel member requested an analysis of time-varying data compared with static data.

EPA Clarifying Comments and Statements:

Ms. Dunkins and Mr. Elmore thanked the Panel for its review. Ms. Dunkins noted she heard that the Panel sought appropriate, biological process-based models to assess emissions. She requested the Panel's feedback on key parameters that should be assessed in such an approach. She stated that EPA is restricted to requirements of the consent agreement, and requested Panel comments on how EPA could use parameters that have been collected under NAEMS and how EPA could develop a process-based model.

Ms. Dunkins noted that the EPA reports developed three EEMs using various process parameters. Three EEMs were developed: a) an EEM based on bird inventory parameters; b) an EEM based on bird inventory and ambient parameters; and c) an EEM based on bird inventory, ambient and confinement parameters. She asked the Panel to submit other options for EPA to consider, or a hybrid statistical approach.

Ms. Dunkins noted the Panel agreed that supplemental data could fill data gaps. She requested the data to provide information on available datasets and available studies that could be used for this purpose. She noted that in January 2011, EPA requested additional data from the public and only twenty documents were received through this effort.

Ms. Dunkins noted that the tool that is ultimately developed should be user friendly and based on readily accessible data. The tool should be scientifically sound and usable by farms. Farms will need to use the tool to meet permitting requirements within a certain time period. She stated that a producer may want to get to a limit below which no permit is needed, and noted that farms would need to produce data indicating they are below the limit. She noted it was uncertain whether farms could keep adequate records to show they are in compliance, 365 days a year.

Ms. Dunkins stated that when the consent agreement was initiated, there was an understanding of the number of farms who signed the agreement. She noted that EPA is seeking feedback from the Panel on how to develop EEMs that would be representative of farms across the nation. She noted that all farms who signed the agreement agreed that the sites to be sampled would be considered representative of the industry.

Ms. Dunkins noted that EPA was in the process of correcting chapters of the two reports. She also noted that the two documents were released for a 90-day public comment period on EPA's docket, and that States and other members of the public will be providing comments. She stated that EPA will take information presented by this Panel and consider public comments that are received, and will finalize the documents accordingly. She stated that EPA seeks to develop a scientifically sound tool that can be used by the producer. She noted that the process followed for the broiler sector would be followed for each of the other sectors (swine, egg layers, and dairy), and that EPA will await further comments before finalizing the broiler report.

A Panel member asked whether EPA was concerned about having multiple tools to assess EEMs. Ms. Dunkins noted that multiple tools were acceptable, and that it would be easier to have a simplistic, screening analysis tool. Another Panel member asked whether EPA will receive and incorporate the additional data that Dr. Heber noted he was working on into its reports. Ms.

Dunkins responded that EPA would consider this additional information if it is made available to EPA in a timely manner. Another Panel member asked whether EPA would be willing to accept use of default, conservative values such as for manure composition. Ms. Dunkins responded that EPA would consider published, peer reviewed data.

A Panel member asked how EPA would provide 'credit' to users who are managing wastes differently with controls. Ms. Dunkins noted that EPA was considering how to apply the baseline model, and how to adjust baseline conditions if appropriate. She also noted EPA would provide guidance on how to use methodologies, and how to implement them.

One Panel member stated that while industries that signed the consent agreement agreed that the sites would be considered representative of the industry, that does not mean that the sites are scientifically representative. Dr. Allen noted that the Panel should focus on science issues before the Panel.

Another Panel member asked whether EPA would be considering what States and other jurisdictions are doing to assess EEMs from these facilities. Ms. Dunkins responded that EPA will consider what States and other organizations are doing to assess and control emissions.

Several Panel members noted that farms that were not signatories to the consent agreement may not agree that two broiler houses are representative of their industry. Ms. Dunkins noted that EPA could require testing and farms could submit data. Mr. Bill Harnett of EPA's Office of Air and Radiation noted that as new data becomes available, EPA will consider that data. Also, industry can submit an alternative EEM and EPA would consider that.

Next Steps and Action Items:

Mr. Hanlon noted that by March 20, 2012, individual Panel members should submit their comments on the draft summary of Additional Data Needs. Mr. Hanlon would update the draft list of data needs with Panel member feedback, and send that updated list to Mr. Elmore. By March 30, 2012, individual Panel members should submit their preliminary comments on the responses to charge questions (succinctly if possible), responses on anything else that the Panel has not talked about at the meeting that Panel members have already prepared, and any new additional comments that a Panel member may have. Mr. Hanlon would package these individual Panel Members preliminary comments and post those comments on the SAB Meeting website by the first or second week of April.

Upon receipt of additional data from EPA, Dr. Allen and Mr. Hanlon would send out Lead Writing Assignments to certain Panel Members with a request that they draft sections of the draft SAB report, taking into consideration the Preliminary Comments of Panel members, draft summary response write-ups presented at this meeting, public comments, and other meeting materials. A draft of the SAB report would be released onto the SAB meeting website for public comment, and a public teleconference call or public meeting would be arranged to discuss the draft report.

Dr. Allen asked if the Panel members had any additional questions or comments. Hearing none, Dr. Allen thanked the Panel members and EPA staff who participated at the meeting. With the meeting business concluded, the Designated Federal Officer adjourned the meeting at 12:00 pm ET.

Respectfully Submitted:	Certified as Accurate:
/signed/	*/signed/*
Mr. Edward Hanlon Designated Federal Officer	Dr. David T. Allen, Chair SAB Animal Feeding Operations Air Emissions Review Panel

NOTE AND DISCLAIMER: The minutes of this public meeting reflect diverse ideas and suggestions offered by Panel members during the course of deliberations within the meeting. Such ideas, suggestions and deliberations do not necessarily reflect consensus advice from the Panel members. The reader is cautioned to not rely on the minutes to represent final, approved, consensus advice and recommendations offered to the Agency. Such advice and recommendations may be found in the final advisories, commentaries, letters or reports prepared and transmitted to the EPA Administrator following the public meetings or teleconferences.

Materials Cited

The following meeting materials are available on the SAB website (www.epa.gov/sab) or through the following SAB Animal Feeding Operations Air Emissions Review Panel website: http://yosemite.epa.gov/sab/sabproduct.nsf/a84bfee16cc358ad85256ccd006b0b4b/e46976786e2520b4852579840066535e!OpenDocument&Date=2012-03-14

[1] Federal Register Notice announcing the public meeting

[2] Agenda for March 14-16, 2012 public meeting

[3] EPA Presentation - Broiler Animal Feeding Operations Emissions

[4] Preliminary list of key summary points from March 14, 2012 meeting discussions

[5] Updated Preliminary Response to Charge Questions, Report Sections and Data Needs

[6] Dr. Al Heber Presentations at March 14-16, 2012 SAB AFO Emissions Panel Meeting

[7] EPA Presentation - Overview of Statistical Methodology Used to Develop EEMs for Swine and Dairy Manure Storage

[8] Additional EPA Presentation at March 14-16, 2012 SAB AFO Emissions Panel Meeting

[9] Preliminary key summary points from March 15, 2012 meeting discussions

ATTACHMENT A – ROSTER

U.S. Environmental Protection Agency
Science Advisory Board
Animal Feeding Operations Emission Review Panel

CHAIR

Dr. David T. Allen (Chair), Professor, Department of Chemical Engineering, University of Texas, Austin, TX

MEMBERS

Dr. Viney Aneja, Professor, Department of Marine, Earth, and Atmospheric Sciences, North Carolina State University, Raleigh, NC

Dr. Brent Auvermann, Professor of Biological and Agricultural Engineering, Texas AgriLife Extension Service, Amarillo, TX

Dr. Peter Bloomfield, Professor, Statistics Department, North Carolina State University, Raleigh, NC

Dr. Alicia Carriquiry, Distinguished Professor and Associate Chair, Statistics Department, Iowa State University, Ames, IA

Dr. Nichole Embertson, Nutrient Management and Air Quality Specialist, Whatcom Conservation District, Lynden, WA

Dr. William Brock Faulkner, Assistant Professor, Department of Biological and Agricultural Engineering, Texas A&M University, College Station, TX

Dr. Robert Hagevoort, Assistant Professor and Extension Dairy Specialist, New Mexico State University Agricultural Science Center, Clovis, NM

Dr. Richard Kohn, Professor, Animal and Avian Sciences Department, University of Maryland, College Park, MD

Dr. April Leytem, Research Soil Scientist, Northwest Irrigation and Soils Research Laboratory, U.S. Department of Agriculture-Agricultural Research Service, Kimberly, Idaho

Dr. Ronaldo Maghirang, Professor, Biological and Agricultural Engineering Department, Kansas State University, Manhattan, KS

Dr. Deanne Meyer, Livestock Waste Management Specialist, Department of Animal Science, University of California, Davis, Davis, CA

Dr. Wendy Powers-Schilling, Director of the Institute for Agriculture and Agribusiness, Director of Environmental Stewardship for Animal Agriculture, and Professor in the Departments of Animal Science and Biosystems and Agriculture Engineering, Michigan State University, East Lansing, MI

Dr. C. Alan Rotz, Agricultural Engineer, Pasture Systems and Watershed Management Research Unit, U.S. Department of Agriculture-Agriculture Research Service, University Park, PA

Dr. Paul D. Sampson, Research Professor and Director of Statistical Consulting Programs, Department of Statistics, University of Washington, Seattle, WA

Dr. Eric P. Smith, Professor and Head, Department of Statistics, Virginia Polytechnic Institute and State University, Blacksburg, VA

Dr. John Smith, Dairy Specialist and Professor, Department of Animal Sciences, The University of Arizona, Tucson, AZ

Dr. Eileen Wheeler, Professor, Department of Agricultural and Biological Engineering, The Pennsylvania State University, University Park, PA

Dr. Lingying Zhao, Associate Professor, Department of Food, Agricultural and Biological Engineering, The Ohio State University, Columbus, OH

SCIENCE ADVISORY BOARD STAFF

Mr. Edward Hanlon, Designated Federal Officer, U.S. Environmental Protection Agency, Washington, DC

ATTACHMENT B – Public Attendance

List of Members of the Public Who Attended or Requested Information for Calling into the Public Meeting is Provided Below:

March 14-16, 2012

Name	Affiliation
Baylon, Jacqueline	Inside EPA
Beasley, Lynn	EPA
Benedict, Kristen	EPA
Berezinicki, Sarah D	EPA
Bertrand, Charlotte	EPA
Bredwell, Paul	U.S. Poultry and Egg Association
Burr, Jamie	Tyson Foods, Inc.
Crenshaw, John	ERG
Critchter, Jennifer	Court Reporter
Do, Bebhinn	ERG
Dunkins, Robin	EPA
Elmore, Larry	EPA
Flood, Brian	Duke Environmental Law and Policy Clinic
Formica, Michael	National Pork Producers Council
Frane, Alex	SRA
Friedman, Kristina	EPA
Graves, Elvis	U.S. Department of Agriculture
Greene, Danny	ERG
Harnett, Bill	EPA
Heber, Al	Purdue University
Heinzen, Tarah	Environmental Integrity Project
Hissim, Mary Ellen and Dale	Local Residents
Howland, Sanda	EPA
Igoe, Shelia	EPA
Kutchins, Courtney	Duke University

Name	Affiliation
Li, Lingjuan Wang	North Carolina State University
Mayer, Ally	EPA
McCabe, Janet	EPA
McLaughlin, Kevin	EPA
Merrill, Ray	EPA
Myers, Ron	EPA
Nail, Amy	HONESTat
Potter, Richard	North Carolina State University
Royden-Bloom, Amy	National Association for Clean Air Agencies
Rudek, Joe	Environmental Defense Fund
Rumsey, Ian	EPA
Saunders, Gary	North Carolina Department of Agricultural Quality
Schrock, Bill	EPA
Shatas, Angie	EPA
Shaver, Sally	Shaver Consulting Inc.
Shores, Richard	EPA
Sullivan, Tim	EPA
Thompson, Rhonda	EPA
Thompson, Rhonda	EPA
Weeramunda, Eshani	SRA
Zwicke, Greg	U.S. Department of Agriculture