plateau inc

236 South 3rd Street, #340
Montrose, Colorado 81401
970-252-1363 * 970-728-5737

August 27, 2012

Delta County Health Department
Mr. Ken Nordstrom, Director of Environmental Health
255 West 6th Street
Delta, Colorado 81416

Subject: Inspection and Air Testing, Hostetler Poultry Farm

Dear Mr. Nordstrom,

Following is the report of inspection and testing at the subject building. The inspection was conducted on August 16, 2012 at your request. The inspection and report were completed by Chris Lakin, P.E., Industrial Hygienist, Plateau Inc.

Background: In April 2012 a chicken egg laying farm began operations on Powell Mesa in Delta County near Hotchkiss. The laying operation consists of approximately 15,000 laying hens housed in a 50' by 400' metal building facility at 34637 Powell Mesa Road, Hotchkiss Colorado. The operation does not utilize cages and the hens are periodically released to occupy a fenced in area adjacent to the "hen house". Since that time, persons occupying adjoining properties have expressed concern regarding discharges from the facility, including particulates and ammonia. It is my understanding that there have been allegations of illness related to the discharges from the property.

Plateau Inc. was contacted by the Delta County Health Department, Director of Environmental Health; Mr. Ken Nordstrom regarding options for evaluating the airborne discharges from the building. Plateau Inc. provided a proposal to provide sampling of the air at the facility to determine the nature of discharges. Specifically, Plateau Inc. suggested the following round of testing:

Six tests to evaluate viable bacteria.
Six tests to evaluate viable fungal aerosols.
Six tests to evaluate particulate emissions and total fungal aerosols.
Particle counts to evaluate total particle emissions under 10 microns.
Measurement of ammonia emissions from the facility.

Discussion of Sampling Procedure: The proposed sampling regime is based upon our research of testing and findings from similar operations. An operation housing chicken is likely to produce a variety of potential air contaminants including bacteria, fungal propagules, particulate discharges (including feathers, skin cells, and byproducts of feed and bedding), as well as ammonia. The sampling regime was suggested to elucidate as many of these potential contaminants as possible and

to quantify them in a manner that may prove useful to determine if potential hazards exist. The sampling regime was devised in concert with the analysts at an AIHA accredited EMLAP (Environmental Microbiology Laboratory Accreditation Program) laboratory. AIHA EMLAP ensures that the laboratory follows specific accreditation criteria for each type of test. Following is a discussion of each phase of the testing, discussing rationale.

Viable Bacteria – The selected medium for evaluating bacterial emissions from the facility was Tryptic Soy Agar with blood. This media is commonly used to isolate a wide variety of bacteria of interest including pathogenic species. The addition of blood aids with the identification of certain bacterial species. Results are returned as CFU's colony forming units.

Viable Fungus – Malt Extract Agar (MEA) was selected as a culture medium. MEA is in common use to isolate and culture a broad spectrum of fungal spores. Results are also in CFU's.

Non-Viable – A spore trap is a cartridge that utilizes a glass slide plated with an adhesive to capture a variety of airborne particulates. These devices are very useful for screening for a wide variety of particulates. By direct observation of the impact aerosols, a skilled analyst can quantify and describe fungal propagules and organic and non-organic particles of many kinds. Fungal spore counts are in spores per cubic meter.

Particle Counts – Plateau Inc. utilizes a Lighthouse 3016, handheld laser particle counter to count and trace particulate emissions. The 3016 is capable of counting particles 10 microns and smaller. These particles are generally considered respirable particles of interest in air quality surveys. The device is also used to find source or locations of maximum particle concentration which is useful as a precursor to viable and non-viable testing, as it was used in this case.

Ammonia – Screening for ammonia was accomplished with Gastec detector tubes and appropriate Gastec sampling pump. Absorbent tubes rely upon a chemical reaction to measure ammonia in the air. The chemical reaction causes a color change in the media to indicate a concentration in parts per million (PPM).

As applicable, sampling was conducted according to the manufacturer's recommendations and following the guidelines of AIHA's "Field Guide for the Determination of Biological Contaminants in Environmental Samples". Careful attention was given to equipment calibration and to aseptic handling procedures for all media and equipment. Plateau Inc. utilizes a Dry-Cal portable primary standard for calibration of the sampling pump.

Testing/Inspection: Evaluation of the facility began with a tour conducted by Mr. Edwin Hostetler. Mr. Hostetler described the operation of the essential features of the facility. The laying hens are housed in a 50' x400 foot laying barn. At the front of the barn is a personnel entrance and packaging area. A storage cooler is located here as well. The laying area is equipped with racks upon which the hens roost. The racks have grid like openings that allow feces to drop to the floor beneath. As eggs are deposited they roll towards a conveyor for collection. Feeding and watering are by an automated hoist and auger system that lowers according to a preset schedule. Bedding material consisting of saw dust and chips is layered around the inside perimeter of the building. All features are computer automated including the lighting and ventilation. The ventilation is controlled for temperature by adjusting the operation of several fans located towards the middle and rear of the building. Water misting is used to enhance the cooling effect of the moving air. Adjustable dampers are located along the side of the building in order to control the air movement and introduction of make-up through the building. The ventilation apparently operates in two different modes. Throughout the time of this inspection the system was operating in "general ventilation mode". In this mode the side exhausters were functioning to move air through the facility. There are additional fans at the rear of the facility

for increasing air flow, which is called "tunnel ventilation mode". I briefly observed this second mode and the airflow increase is noticeable.

During the testing the wind was consistently from the south-southwest at 1-2 miles per hour with gusts to 5 m.p.h.. Generally the wind was directed along the long axis of the building blowing from rear to the front. Testing was conducted during general ventilation mode as it would likely allow better analysis of disseminated particles by not discharging them forcefully and too widely in the vicinity. Also it appears that the general ventilation mode is the predominant mode of operation. Environmental conditions appeared ideal for testing. The direction and speed of the wind was sufficient for capturing the discharged air and directing towards the front of the building without excessively disseminating it by turbulent action. The particle counter was used upstream and downstream of the building to determine ambient particle concentrations. A transect was established 50 feet downwind (downstream) from the front of the building at a distance anticipated to be free of unstable vortices and turbulence and at such a distance to allow larger (over 10 micron) particles to settle. A particle count was taken every ten feet along this transect starting at 36' to the left of the front entrance. A zone of significantly elevated particle concentration (especially in the 0.5 to 10 micron range) was found centered at the right side of the building along the transect (as anticipated). Estimated width of this particle zone was 35 feet. Particle concentration was significant less to either side of this zone. The particle data is attached. The first thirteen samples were taken along the front transect. For comparison a similar transect was established at the rear of the building, along which samples 14 through 22 were measured. This data gives a general idea of the consistent volume concentration of respirable particles being discharged from the building in comparison to ambient levels. Also, the zone of higher concentration was used as a location for subsequent viable and non-viable testing. The upstream particle data did reveal a significant excursion from typical background data suggesting a wind gust. A similar process was followed for all other aerosol testing. Two samples of each type of test were conducted upstream and four samples downstream. The data was very useful for identifying the location of the particulate plume being generated from the facility. However, the plume is a combination of that being generated from within the facility, from material lofted adjacent to the facility, and from ambient particles entrained therein. Looking only at particle concentrations it is reasonable to assume that the facility is responsible for generating a significant (in comparison to ambient) number of particles in the 1 micron, 3 micron and 5 micron range and possible the 10 micron range. The particle characterization analysis (sample # 12010228-001) suggests that the majority of particulates are soil derived dust (mineral particles) and starch (likely from the feed).

Following is a discussion of the analysis of the non-viable (spore trap) tests. Non-viable testing was conducted utilizing conventional spore traps. Spore traps are a cartridge that contains a clear glass slide coated with a sticky adhesive substance. The cartridge is designed in a manner to turn the airstream allowing particles of certain sizes to be ejected from the airstream for deposition on the slide. As with other air sampling media, flow rate is critical so the sampling train was calibrated with a primary standard prior to sampling. Non-viable testing collects both culturable (viable) and non-culturable particles. The volume of air for each test was estimated based upon the expected particle concentration. In addition to the flow rate, total volume is selected to provide proper analytical sensitivity without masking the slide with debris. The analyst provides a debris rating and analytical sensitivity (AS) with the report. Sample volumes were varied to achieve an acceptable AS without excessive debris. Negative bias increases with masking by debris, and reported counts of identifiable particles can be expected to be higher. In our experience a debris rating of 3 or less is sufficient to adequately characterize slide deposits without excessive masking. The non-viable samples were analyzed by counting fungal spores and visually characterizing remaining debris. The analytical reports are attached. Samples 1NV and 2NV are upstream (background) and 3NV through 6NV are downstream samples from the location previously described. Samples 1NV and 2NV show a typical background spore concentration with fugal genera that are commonly described outdoors. Samples 3NV through 6NV also show these relatively common and benign fungal spores in similar concentration and distribution. However, the downstream samples 3NV through 6NV also reveal a

significant concentration of fungal spores not found upstream. These four samples also reveal an increase in hyphal elements. Specifically, this is compelling evidence that these spores are being generated by this facility. Three genera/groups were found to be significantly elevated: penicillium/aspergillus, microascus, and scopulariopsis. The microascus is a teleomorph (sexual state) of scopulariopsis. Scopulariopsis grows quickly and in very moist conditions (high water activity). Penicillium/aspergillus spores are not differentiated because of their similar appearance. These tests indicate that the facility, under the conditions of this test, is generating about 13,000 fungal spores per cubic meter of air discharged from the building compared to around 500 upwind.

The non-viable samples were further described. The analyst describes the entire trace (cover slip) in increments of 0.23 square millimeters (field). The downstream tests revealed elevated particle data relevant to the operation including wood particles, starch particles, skin cells, and feathers. Mineral and starch particles dominate the observations at 3-4 per field.

Viable testing followed similar methodology to the non-viable testing, with two samples (numbered 1F, 2F and 1B, 2B for fungi and bacteria) taken upwind of the facility. The laboratory calculates a corrected count that is a an adjustment based upon the type of sampler (Andersen 400 hole impactor). The corrected data is a more appropriate estimate of actual airborne concentrations. The results of the viable fungal tests (1F-6F) taken downwind of the facility, reveal similar results and species with significant burdens of viable scopulariopsis and penicillium species dominating the culture plates. Both species groups are considered relatively cosmopolitan, though it is not normal to quantify them to such an extent in either outdoor or indoor air. These species groups are of interest due to the quantities observed and their potential pathogenicity. Further analysis of these two groups has been requested by Plateau Inc. to determine identification to the species level. The results are pending. These two species groups are most likely sourced from the activities and conditions associated with this facility. The laboratory results are attached under 12010228 for analysis by method 1030, pages 3 and 4.

The viable bacteria counts were very high as indicated by tests 3B through 6B in comparison to the upwind samples 1B and 2B. These two groups dominated the reported bacterial counts; coagulase negative Staphylococcus and Corynebacterium. Though there are no real standards for comparison it would not be unexpected to see very high counts of Staphylococcus species or Corynebacterium species associate with a large group of confined animals, including humans. Species of each commonly inhabit the skin of humans and animals. Both groups also produce some pathogenic species. The laboratory provides commentary in the form of "possible reservoir" or sources of the identified bacteria. Though the reference of "human" as a reservoir for these two bacteria is common, in this case it is most likely from the chickens. I did discuss the results with the analyst who did confirm that such a finding would not be unexpected under the circumstances. However, he did express a concern regarding the "Lactose Fermenting Gram negative rod" that was found in samples 3B through 6B. This bacteria is likely fecal in origin and of interest as a pathogen. Plateau Inc. has asked the laboratory to further evaluate this bacteria to determine the species. Viable bacterial discharge from this facility easily exceeds 100,000 colony forming units (CFU) per cubic meter of air compared to likely less than 1000 CFU upwind.

Ammonia Tests: Ammonia levels were determined using Gastec detector tubes inserted through openings in the building envelope. Samples were extracted with a calibrated pump. Ideally, it is presumed that this would represent levels being discharged to the outdoors. The samples were taken from several locations and reported as follows.

1. Left side of building at intake near front – 4 ppm (parts per million)
2. Left side, middle of building – 14 ppm
3. Right side of building first fan outlet – 2 ppm
4. Right side of building second fan outlet – 10 ppm
5. Right side of building third fan outlet – 5 ppm

6. Outside, 50 downwind or front of building – 0 ppm

Stated results have been corrected for temperature. A noticeable ammonia odor was detected inside the building. The typical human detection threshold is approximately 5-18 ppm and OSHA specifies an 8 hour time weighted occupational exposure limitation of 25 ppm.

Conclusion: Persons reading this report are advised to interpret it with caution. It can be reasonably anticipated that the conditions at this facility are highly dynamic. The testing results at this phase of operation under the observed environmental conditions may be very different from that at another time or under different operational conditions. The microbiological emissions from this facility will possibly change with season, operational sequence and other environmental factors. In general it can be stated that the facility generates a considerable plume of particulates and biological components. Potentially, some of these components may be hazardous to certain persons. We are not aware of any regulatory or recommended guidelines for exposure to non-pathogenic molds and bacteria. However, the conditions within the facility are very likely of great concern for persons working in or around the facility. At this time, the exposure to adjoining property owners is not defined.

The plume size and volume were estimated by evaluating wind speed, the particle count data, and the data from the viable and non-viable tests conducted. The concentration of fungal and bacterial particles generated from the facility is in the tens of millions per second. At this time the downwind consequences are unknown as are the consequences of exposure. Further evaluation of the human health impacts of this facility should be conducted in concert with a medical specialist.

This report has been prepared to assist the owner in evaluating the impact the air quality and at the subject facility. Plateau, Inc. provided these services consistent with the level and skill ordinarily exercised by members of the profession currently practicing under similar conditions. This statement is in lieu of other statements expressed or implied. This report is intended for the sole use of the client. This report is not intended to serve neither as a bidding document nor as a project specification document. Actual site conditions and quantities should be field verified. A reasonable attempt has been made to identify all suspect problems in the identified areas. Currently, there are no standards for allowable exposure to mold, or mold byproducts. The response to mold exposure is highly dependant upon the individual, with some persons experiencing no reported symptoms, and others reporting physical responses including respiratory irritation, headaches, and exacerbation of asthma. Other more serious ailments have been alleged or documented.

Due to changing environmental conditions, the characteristics at this site may change from the time of inspection to the present. This report does not warrant against future operations or conditions that could affect the recommendations made. The results, finding, conclusions, and recommendations expressed in this report are based only on conditions that were observed on the date of Plateau Inc.'s inspection of the site.

Thank you for this the opportunity to be of service. Please contact Plateau Inc. 252-1363 should you have any questions.

Sincerely,

Christopher A. Lakin, P.E.
Industrial Hygienist
Plateau, Inc.

Attachments: Laboratory Results – 14 pages
Particle Count Data Sheets
Differential Data
Cumulative Data