

The following are preliminary questions and comments pertaining to the September 2016 C&H Integrity Pond Study conducted by Harbor:

- What material was the sonic core barrel bits made of;
- Please provide the physical address of where the potable water was obtained;
- Does the C&H concentrated animal feeding operation (CAFO) have a municipal water source on-site? If no, please provide an explanation of the water source for "PW-3" that is noted on the Chain of Custody form that reads "PW-3 are samples taken from the municipal water tap at the farm" dated September 26, 2016 and signed by Mr. Jason Bolenbaugh;
- Was water obtained from an on-site well at the C&H CAFO and used during drilling operations;
- What was the rate and total gallons of potable water injected into the borehole during drilling operations? It is noted on Harbor's boring log that " Total approx. 750 gallons of potable water added" at 38.5 feet (ft.) below ground surface (b.g.s.) while drilling a 120.5 ft. boring. Please be specific;
- Four groundwater samples, B1-GW-1, B-GW-2, B1-GW-3, B1-GW-4 were determined to be potable water or a possible mixture of potable water and groundwater rendering this data and associate efforts useless. Does the Arkansas Department of Environmental Quality (ADEQ) concur with this statement? If not, please explain.
- It was reported that the groundwater sample near the bottom of the borehole, B1-GW-5, was determined to be groundwater not mingled with potable water used during drilling operations by Harbor. Does ADEQ concur with this? Please provide a detailed explanation;
- Mr. Tai Hubbard of Hydrogeology Inc. provided a limitations section in his report. In item two (2) he stated "The drilling method employed during the investigation consisted of a rotosonic drill rig without a high speed rotation implement used for typical rock coring. This limitation resulted in poor rock core quality, preventing the calculation of Rock Quality Determination (RQD) as proposed" (Hydrogeology, Inc., C&H Hog Farms-Subsurface Geology Report, October 28, 2016). Does ADEQ find that not being able to calculate RQD to be of significance? If not, please provide a detailed explanation;
- Does ADEQ believe a more traditional drilling method (e.g. CME 55, 75, 95 with a hollow stem auger associated with a 5 ft. continuous core barrel or a split spoon sampling device) that has been consistently used in the Boone-St. Joe Formation for environmental site investigations could have resulted in a more effective delineation of potential perched groundwater in the epikarst zone (i.e. weathered zone above where consistent competent bedrock was encountered)? If ADEQ's response is no, please provide a detailed explanation;
- A different drill rig or the rotosonic drill rig equipped with "a high speed rotation implement" as Mr. Hubbard indicated could have been utilized when continuous competent bedrock was encountered for coring resulting in much improved core samples that would have enhanced lithologic interpretations and delineation of dissolution features by the on-site geologists. Why wasn't the rotosonic drill rig equipped with the proper drilling device to ascertain complete cores from the bedrock and/or why wasn't a different drill rig utilized for bedrock coring? Please provide a definitive explanation for both questions;

- Does ADEQ think it is possible that the Boone regolith (clays) could have a saturation percentage that if given time during the drilling operation would have created groundwater? If not, please provide a detailed explanation;
- The interval (epikarst) above where consistent competent bedrock was encountered was the most important area to delineate (i.e. perched and/or discrete groundwater intervals, fresh clay samples not exposed to potable water, etc.) because this lithologic interval is directly adjacent and below the swine waste lagoons. Does ADEQ agree? If not, please provide a detailed explanation;
- Does ADEQ think it is possible that discrete intervals or perched groundwater in the epikarst zone (e.g. commonly referred to as epikarstic flow by Hydrogeologists) could have been missed because of the introduction of potable water during the initial phase of drilling operations? If not, please provide a detailed explanation;
- Was the override casing and drill stem raised in the epikarst zone to create a sump to allow discrete intervals and/or perched groundwater to enter the borehole and be sampled? If so, please provide the depths and how long these mechanical components were raised;
- Why does ADEQ think there was a loss of circulation of potable water at approximately 25 feet b.g.s. as denoted on the Harbor Boring Log at this interval of the epikarst zone? How many gallons was lost in this interval? Does ADEQ agree this epikarst interval corresponds with the mid to lower levels of the liquid swine waste in lagoons No. 1 and No.2 ? Please be specific with each question and provide detailed explanation;
- Does ADEQ suspect the epikarst zone could underlie the swine waste lagoons? If not, please provide a detailed explanation;
- On page 8 of the Harbor report it states "no karst features, such as dissolution features were encountered". However, bedrock cores came out pulverized, broken, fragmented due to the rotosonic drill rig not having "a high speed rotation implement" which made the cores difficult to interpret, circulation losses were noted, fractures and/or voids were noted and the borehole was calculated to need 176 gallons of mixed Portland cement for grouting purposes but, 280 gallons were utilized. Mr. Hubbard partially states from 19.0 to 28.0 in his narrative"..... rock fragments showed evidence of moderate dissolution" and from 28.0 ft. to 120 ft. ".....nor ones of excessive dissolution" (Hydrogeology, Inc., C&H Hog Farms-Subsurface Geology Report, October 28, 2016). Therefore, there were dissolution features according to Mr. Hubbard. Does ADEQ agree with Harbors interpretation that "no karst features, such as dissolution features" existed in the single borehole as opposed to Mr. Hubbard's interpretation? What is ADEQ's interpretation of the Neutron log denoting intermitted permeable zones in the epikarst and competent limestone from 21 to 99 ft. b.g.s. ? Is it possible that these permeable zones could be enhanced solution features? Is it possible that there was an underestimate of 104 gallons of Portland cement required for grouting the borehole other than Harbor's explanation of weathered limestone or fractures? Please note that a groundwater dye trace was conducted adjacent to the C&H CAFO and groundwater velocity was determined to be approximately 2500 feet per day and epikarst is a karst feature that demonstrates enhanced solution. Please answer the above questions individually with detailed answers;

- Is it possible that no E Coli was detected because of the chlorination of the potable water resulted in dilution and/or sterilization as indicated by the detection of trihalomethane constituents used during drilling operations? Is it possible that the potable water resulted in dilution of AOI's in extract samples of sampled clays? Please note that in one the video clips there is potable water submerging a core sample in a core liner and in Mr. Huetter's field notebook two different entries state "water in sample from 7-9 feet due to drilling" and "Looking at sample cores from 18.5'-26.5' water in samples due to drilling". How often did this occur? Please provide a detailed explanation for each of your answers;
- Did only one lab (Atoka) conduct bacterial analyses? If so, how can this data be validated;
- Does ADEQ believe ERI geophysical signatures can change over time? Specifically, over eighteen months. If not, why? Please provide a detailed explanation;
- Some geologists refer to surface geophysics , such as ERI, as "black box" technology. In other words, "it is a tool in a box, but they wouldn't rely on it." Does ADEQ believe ERI is a "black box" technology or does ADEQ believe that it is a reliable technology. Please provide a detailed explanation for your answer;
- At what locations (e.g. facilities) has the Arkansas Department of Environmental Quality utilized a dated (e.g. at least 18 months ERI imaging study) to determine a single borehole location in the vicinity of potentially leaking impoundments? This is relevant and a probable legal question because ADEQ is making the C&H Integrity Investigation part of the permitting process for this facility;
- Please name the facilities that ADEQ required a characterization of potentially leaking impoundments with one borehole and no monitoring wells? This is relevant and a probable legal question because ADEQ is making the C&H Integrity Pond Investigation part of the permitting process for this facility;
- Please name the facilities that ADEQ approved data from one borehole as an adequate site characterization when there were potentially leaking impoundments at the facilities? This is relevant and a probable legal question because ADEQ is making the C&H Integrity Pond Investigation part of the permitting process for this facility;
- Were there any deviations made from the approved workplan? If so, please delineate them;
- Was there strict compliance with all Quality Control/Quality Assurance protocol? if not, please name the deficiency(s);
- The goals of the work were stated to include: Evaluating lithology below the waste storage ponds and assessing potential subsurface impact from the waste storage ponds. Please note the limitation by Mr. Tai Hubbard, P.G. "1) Evaluation of lithologic contacts and bed orientations are limited, both horizontally and vertically, due to the inability to correlate observations collected at a single location to any other bore holes" (Hydrogeology, Inc., C&H Hog Farms-Subsurface Geology Report, October 28, 2016). I concur and believe it is **impossible** to evaluate the lithology below the waste storage ponds and to evaluate the potential leakage from the swine waste lagoons with one six inch diameter boring. The approximate circumference of the swine waste lagoons is 1552 feet or 18,642 inches. Therefore, the six inch diameter borehole used to define the above goals represents approximately .00032 percent of the area

surrounding the two swine waste lagoons. Does ADEQ believe the above goals of the project scope were accomplished? If so, please provide a detailed explanation based on the results of one boring that was positioned on a dated (e.g. 18 month) ERI geophysical survey of how these goals were accomplished. Please note that the three shallow (11.5, 13.5 and 18.5 ft. b.g.s.) borings utilized in the Notice of Intent (NOI) for geotechnical purposes that was under the heading of "Geologic Investigation" did not provide enough data to adequately define the geology at the site or below the swine waste lagoons. Furthermore, the logs for the two on-site water wells are inadequate as well as the aforementioned geotechnical borings because lithologic interpretations were not conducted by a Arkansas Registered Professional Geologist.

- Please provide detailed explanation for the on-line notes stating that there was a void at 25 ft. b.g.s. and it may be plugged and abandoned by a bentonite plug as opposed to Mr. Huetter stating in his December 1st presentation that the driller "visually reported the grout to be at 25 ft. b.g.s." , but when they came back on Monday the grout had risen to 12 ft. b.g.s. How did this occur? Additionally, Mr. Huetter's field book indicates that 50 gallons of grout was needed to grout a six inch diameter borehole for 12 feet. Please provide a detailed explanation on this anomalous volumetric amount of grout required for this short distance;
- What was the total taxpayer cost for the for the C&H Integrity Pond Study? Please include taxpayer costs for ADEQ's associated internal costs for this project;

Alleviating public concern of potentially leaking swine waste lagoons situated on karst at the C&H CAFO which is located in the fifth largest watershed that drains into America's first designated national river, the Buffalo National River, by installing a synthetic liner (i.e. which ADEQ has suggested may be done) may raise more questions than answers by the public. ADEQ has already approved a design for a synthetic liners for ponds 1 and 2 at the C&H CAFO. As ADEQ is aware, there have been numerous incidents (e.g. leaks) with superior engineer designed synthetic/composite liners at Resource Conservation Recovery Act (RCRA) Subtitle D (Solid Waste Landfills) and RCRA Subtitle C (Hazardous Waste Landfills) when compared to the synthetic liner design that have been approved by ADEQ at the C&H CAFO. Leaks in sophisticated RCRA liners have caused contamination of soil, groundwater and surface water at facilities in Arkansas. Furthermore, there are concerns about the existing clay liner at the C&H CAFO because of oversized rocks incorporated into the clay liner. These oversized rocks were noted by an ADEQ inspector and photographs are on ADEQ website as well as other locations. Therefore, why did ADEQ initially approve the existing clay liner and subsequently the synthetic liners at the C&H CAFO? Does ADEQ plan to allow C&H to install the liners directly over the oversized serrated rocks incorporated in the clay liner? Please answer the above questions individually with detailed answers.

ADEQ has admitted that permitting the C&H CAFO was a mistake. Former Governor Mike Beebe has stated it was a mistake and our current Governor has stated he has received more questions regarding the C&H CAFO than any other issue since taking office. What do you do when you make a mistake? You correct it. It is time to be proactive instead of reactive and correct this mistake.

We must utilize sustainable technologies in agriculture, industrial and energy sectors in order to preserve our natural resources for those that follow. Sustainable agriculture has been defined as the production of food, fiber, or other plant and animal products using farming techniques that protect the environment, public health, human communities, and animal welfare. The C&H CAFO is a prime example of a non sustainable agriculture operation primarily because of environmental issues.

We are looking forward to receiving your detailed responses to our questions and comments.

Ray A. Quick, P.G.

John Murdoch
Geologist