Department of Geosciences
20 Gearhart Hall
University of Arkansas
Fayetteville, Arkansas 72701

January 28, 2016

VIA ELECTRONIC DELIVERY

U.S. Department of Agriculture Farm Service Agency
U.S. Small Business Agency

Dear U.S. Department of Agriculture Farm Service Agency and U.S. Small Business Agency:

I am writing to document and strongly restate my perception that the Environmental Assessment (EA) of C&H concentrated animal feeding operation (CAFO) and all of its waste-spreading fields near Big Creek, in Newton County, Arkansas, continues to have inaccuracies, misinterpretations, and misrepresentations. This Final EA does not adequately nor accurately discuss 1) the karst, 2) the hydrogeology, 3) the interaction of surface and groundwater, and 4) the water quality of surface water and groundwater in Big Creek and contiguous surface water drainages that are tributaries to the Buffalo National River. A finding of no significant impact (FONSI) in the Final EA (entitled "Final Environmental Assessment C & H Hog Farms Newton County, Arkansas" and dated December 2015 ignores numerous and relevant facts, thereby leaving unresolved many of the significant flaws that I previously pointed out in the draft EA (Brahana, 2015). It is my professional opinion (as a Professional Geologist of the State of Arkansas—Registration #1884) that this Final EA is neither accurate nor does it justify the FONSI.

Major flaws and inaccuracies of the Final EA:

1. The Final EA continues to assert that the cherty section of the Boone Formation in the vicinity of the C&H hog factory is not karst. This claim of no Boone karst is based on "lack of identifiable surface features on topographic maps and areal photos" in the immediate area of the farm. This is a flawed interpretation based on an erroneous definition that karst is "karst topography", or that karst topography is always an essential component of karst. Karst is a hydrogeologic term, wherein groundwater plays a greater role in the hydrologic budget. The CAFO study site is formally called mantled karst, which means that many of the internally drained depressions (sinkholes) the EA sought on maps were covered with a thin, nearly-flat layer of insoluble soil and regolith, and therefore not visible using the methods employed by the Final EA. Furthermore, in the area of outcrop of the Boone Formation in northern Arkansas, karst topography is not visible at areal-photographic or map scales (1:24,000), because many of the karst features are too small to be seen on maps of this scale (figure 1), or below land surface (figures 2 and 3). However, Arkansas Geological Survey geologic mapping of the 7.5-minute Mount Judea quadrangle (Braden and Ausbrooks,

Figure 1.—A sinkhole (swallet) captures all low flow from in Dry Creek and diverts it into the relatively pure-phase limestone of the upper Boone Formation upgradient from waste spreading field 16 (location shown on figure 6). This swallet served as a dye-injection point, and the feature is not present on the topographic maps or areal photographs because it is too small. This photo is courtesy of Carol Bitting.

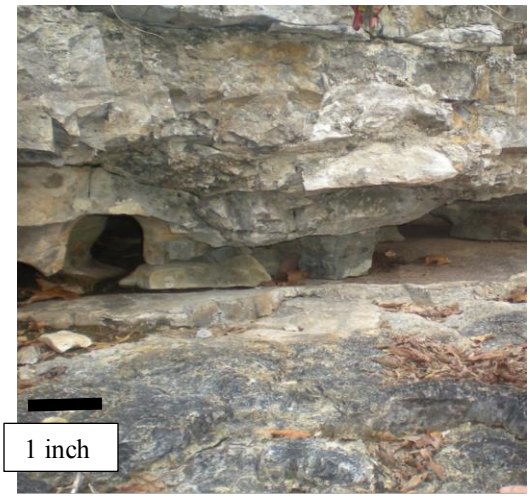


Figure 2.—These interconnected karst dissolution features in the limestone units between multiple chert layers in the Boone Formation in a bluff adjacent to Big Creek contradict the interpretation of lack of identifiable karst surface features in the immediate vicinity of the farm. The scale of these features and their near-horizontal, planar orientation beneath the surface is not amenable to identification using the large-scale karst-topography identification methods described in the Final EA. For an expanded view of the small-scale karst in this part of the limestone between chert layers in the Boone Formation, please see figure 4.

Figure 3.—This large conduit shows John Eddings Cave that lies between the CAFO and the Buffalo National River. Iit received dye from a dye trace conducted by KHBNR, and it is a hibernaculum for the endangered gray bats. The dye was injected into a farm well (BS-36) surrounded by the waste-spreading fields about 5 miles south of the cave. The land surface in the immediate vicinity and directly above the cave shows no evidence of karst topography on the 7.5-minute topographic map or on areal photographs, yet this very real karst feature exists, unidentified using methods described in the Final EA. This photograph is courtesy of Chuck Bitting.

2003), was described and based on intensive field work. Description of the Boone Formation includes this statement: "Boone Formation (Lower Mississippian, Osagean and Kinderhookian) – Coarse-grained fossiliferous and fine-grained limestones interbedded with anstamosing and bedded chert. Light to medium-gray on fresh surface but usually weathers dark-gray. The chert varies in color from light-gray to dark-gray. Springs and sinkholes are abundant…" If sinkholes are present, so is karst.

A further claim that the Mt. Judea topographic map (U.S. Geological Survey, 1980) was used for identification of karst features visible on the land surface appears to be scientifically inconsistent, inasmuch as names of streams that drain the region within 1 mile of the CAFO have names shown clearly on the map as Dry Creek, Cave Spring Branch, and Dry Branch, strongly suggesting that the area is likely underlain by karst. This was not evaluated nor pursued in any of the documentation offered, including the Notice of Intent (NOI), the draft EA, or the Final EA.

Another field-observable feature, erroneously interpreted from the 7.5-minute topographic map (U.S. Geological Survey, 1980), interprets Big Creek near C&H Hog Farms and its spreading fields as a continuously flowing stream and Dry Creek as an intermittent creek. In fact, under varying recharge and seasonal conditions, both show dry-stream reaches, zones of continuous streamflow upstream of dry reaches where streamflow has ceased (Brahana and Hollyday, 1988). Dry-stream reaches reflect underlying karst, where all streamflow is captured in an interval that flows completely underground.

The continued denial of the existence of karst in the Final EA not only fails to describe actual environmental conditions in Big Creek basin in the vicinity of the CAFO, it represents a serious flaw in the argument of a FONSI. The definition of karst in the Final EA ignores consideration of the key fact that the area is underdrained by interconnected zones of high permeability created by dissolution

Figure 4. Boone Formation at a bluff along Big Creek showing an expanded view of karst dissolution of limestone layers (dark-colored near-horizontal layers) between chert layers, which are not soluble. The near-vertical dark zones are systematic joints, brittle fractures that were created during uplift of the Boone Formation that allow water to move vertically downward and have facilitated the karstification process. This photograph is courtesy of John Murdoch.

of the soluble bedrock. This is an essential component of the definition of karst, not the limited aspects of "karst topography" to which the Final EA erroneously and steadfastly adheres. Because the waste, the contamination, and the water have moved underground and bypassed many of the surface measuring sites that the Final EA used to establish a FONSI, this negates claims that there is no impact from C&H. The Big Creek Extension and Research Team (BCRET) funded with tax dollars by Governor Beebe at the request of the Farm Bureau in 2013 acknowledges karst in some of their ancillary documents, but their focus is not karst. The Final EA simply failed to sample the natural groundwater outlets (springs) downstream from the karst resurgences, water and waste derived initially from the hog-waste spreading fields.

Scientific data collection by the Karst Hydrogeology of the Buffalo National River (KHBNR) team included field-based sampling starting in July 2013, when fewer than 500 hogs were housed at C&H Hog Farm. The KHBNR team rigorously followed U.S. Geological Survey (USGS) and U.S. Environmental Protection Agency (EPA) protocols and procedures, conducting karst inventorying, dye-tracing studies, major constituent water-quality sampling, continuous groundwater level monitoring, trace-metal sampling, microbial sampling, and dissolved oxygen analyses with continuous-sampling probes. The Final EA claims to adhere to the "best science", implying unbiased, fair assessment of all scientific facts that are readily available, but made no effort to pursue any data from KHBNR. KHBNR includes retired professors (Ph.D.s), professional geologists (P.G.s), previous employees of state and federal agencies (Arkansas Department of Environmental Quality [ADEQ], USGS, and National Park Service [NPS]), consultants, and graduate students. Discipline backgrounds are diverse, all are well-informed, honest, concerned citizens who pay the taxes that ultimately have provided funding for the EA, as well as for the BCRET study. The claim of "best science" is hollow unless the Final EA provides a full discussion of KHBNR data and interpretations, including the web address https://buffaloriveralliance.org under numerous headings of data, research and Dr. Van Brahana in red. This was done for BCRET webpage (page 3.8 of Section 3.2.1, Surface Water section of the Final Environmental Assessment), but not for KHBNR, the website where these important data and studies reside. The present Final EA reinforces the appearance of bias.

Photographs (figures 1-4) conclusively provide visual documentation that karst is indeed present in the immediate area of the CAFO and its spreading fields. This Final EA requires a thorough and adequate evaluation of the karst groundwater prior to the finding of a FONSI. No groundwater nor karst studies were used, further discrediting the Final EA.

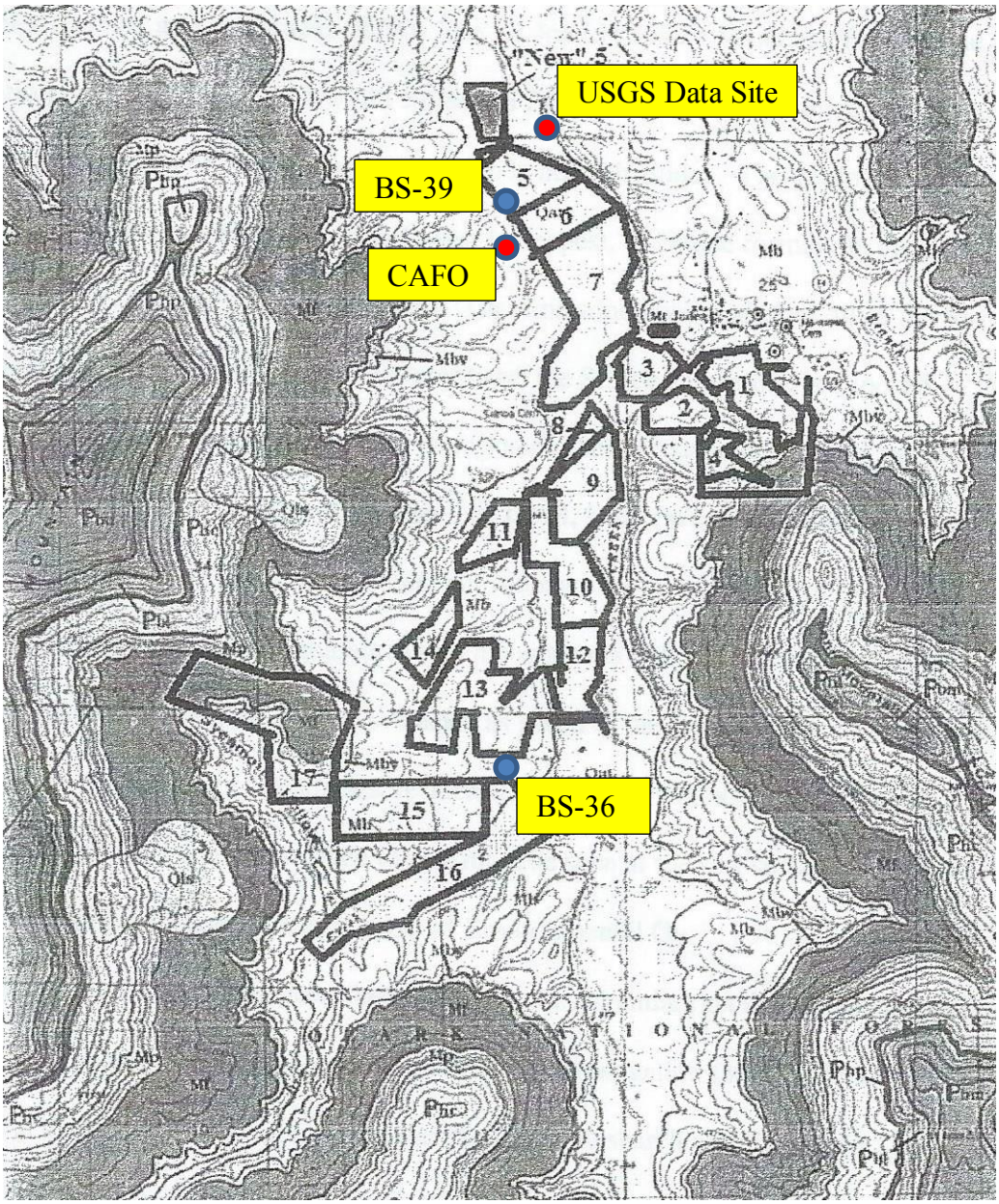


Figure 5. Approximate location of the spreading fields for hog waste from the CAFO in Big Creek valley, based on the Notice of Intent (Pesta, 2012), overlaid on the surface geology (Braden and Ausbrooks, 2003). Numbers are consistent with the Notice of Intent. The diagram was modified slightly from Hovis (2014) to show the inclusion of well BS-36, which was used for dye injection, for continuous monitoring of groundwater level, and precipitation, and for well BS-39, which was used for dye injection and for continuous monitoring of groundwater level. Also shown is the USGS data site, which provided the stage data for figure 6 used to document groundwater/surface water relations. The final addition on the figure is the CAFO. Spreading fields "new 5", 5, 6, 7, 9, 10, 12 are underlain by alluvium of Big Creek valley directly on Boone Formation; spreading fields 1, 2, 3, 4, 11, 13, 14, and 15 lie on Boone Formation with variable thickness soil, usually no more than several feet; spreading field 17 is underlain by Boone Formation in its lower elevations and Fayetteville Shale in its upper reaches.

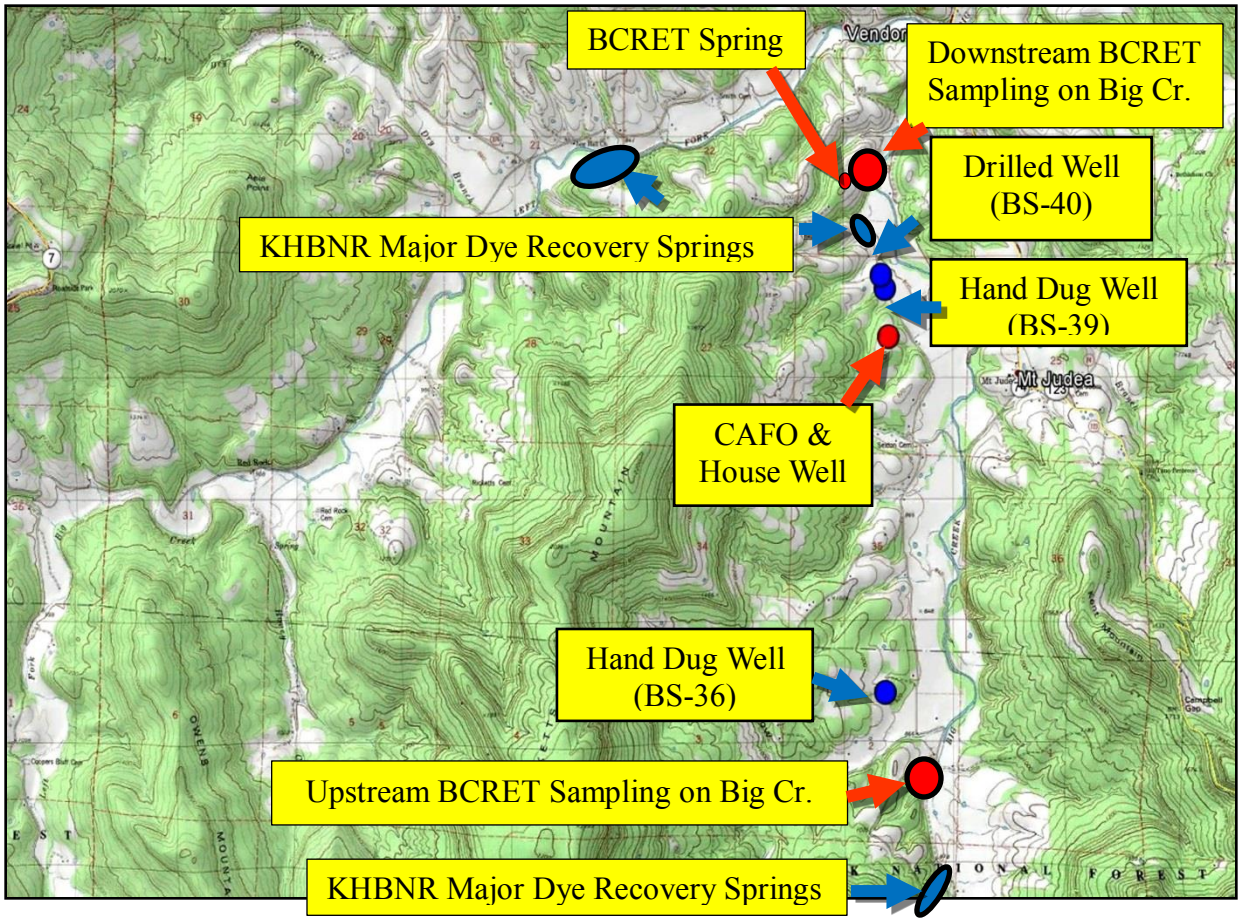


Figure 6.—Approximate locations of discussed sampling sites in this letter showing Big Creek and Left Fork of Big Creek in the vicinity of the CAFO and Mt. Judea, including shaded topography and topographic contours. The red symbols designate the CAFO and BCRET upstream and downstream sampling sites, and the blue circles represent wells used in dye injection; the blue ellipses represent the approximate locations of positive dye recovery. Map source is Google Earth, accessed 12/20/15. The figure is modified from Murdoch et al. (*in review with journal*)

2. Another major flaw of the Final EA is the lack of discussion of the relation of surface and groundwater, clearly pointed out by Tom Aley (2015) and myself (Brahana, 2015) in the draft EA. Karst scientists understand that the degree of groundwater/surface water interaction in Big Creek basin is another major characteristic of karst. Stated simply, water and waste in karst lands are not confined only to surface streams, but flow underground along unseen pathways until resurgence as springs or baseflow to surface streams occur (Winter et al., 1998). Figure 7 shows the relation of precipitation measured at 10-minute intervals over the course of more than a year, as well as the timing of water level response in several key wells in the area, and the stream level in Big Creek. Cause and effect are nearly coincident. The nearly identical timing of response of wells and the stream (near-identical lag times) clearly establishes the fact the water in the Boone Formation has moved from surface to groundwater amazingly rapidly, an essential characteristic of karst.

Another reason for establishing the existence of close groundwater/surface water interaction concerns the economics of widely spreading dye on the waste-spreading fields. Dye injection into a point source ("dug" wells), rather than areally broadcasting a large amount of dye on the waste-spreading fields (for which we have not been given permission by the CAFO and spreading field owners) requires much less dye be utilized in the test. Because: 1) the KHBNR is operating on a meager budget that is based on donations of cash and *pro bono* contributions of field sampling and lab analyses; because the cost of the dye represents a large part of the KHNBR budget; because some of our fluorescent dyes photodegrade on land surface in sunlight; and because these "dug" wells offer direct access to flowing groundwater in the Boone aquifer, we can optimize our scientific study while minimizing our expenditures.

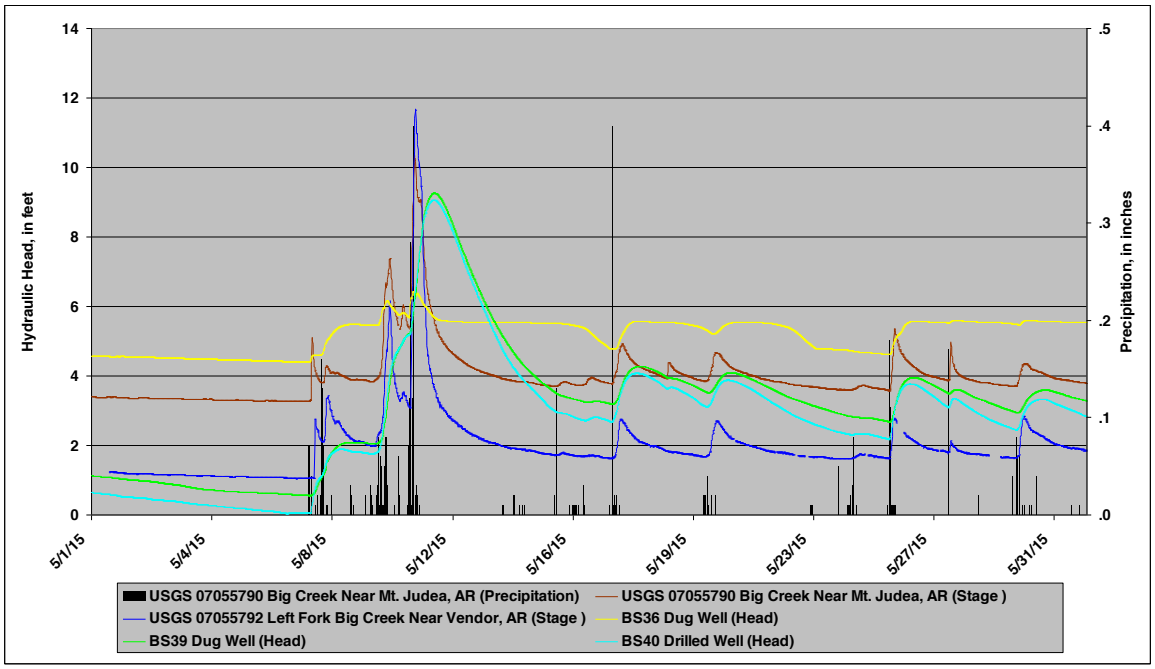


Figure 7. Comparison of continuous values of precipitation (vertical lines along the bottom of the graph), water levels in wells (yellow and blue curved lines that reflect water-level variations from left to right on the graph), and the stage of Big Creek, shown in brown at the same scale as water levels in wells (data from U.S. Geological Survey, 2015). The near-identical lag times between input (precipitation) and response (water levels in wells and water level in the stream [stage]), indicate that the precipitation on the land surface reaches the groundwater at essentially the same time as it reaches Big Creek. This plot documents near -identical interaction between groundwater and surface water, and justifies injection of dye into the "dug" wells. This figure is courtesy of John Murdoch.

3. The third major flaw in the Final EA is the continued ignoring of dye-tracing studies that have been conducted and described in peer-reviewed literature (Brahana et al., 2014; Kosic et al., 2015), and the noted existence of these studies in my previous review of the preliminary EA (Brahana, 2015). One such study is shown here, with the injection occurring in a dug well surrounded by waste-spreading fields, and wide and rapid dispersal of the dye not only in Big Creek, but in contiguous drainage basins, and downgradient as far as the Buffalo National River (figure 8). It should be noted that within 24 hours of dye injection, a major storm of about 6 inches of rain fell, and this recharge facilitated the rapid groundwater level rise and mobilization of the dye.

   Completely discounting the key details of the dye-tracing studies, including very rapid groundwater flow velocities and unexpected groundwater flow dispersal that the KHBNR team has established

ignores well-documented and important data that have a direct bearing on a FONSI. Dye tracing is an essential tool for studying karst hydrogeology, and the KHBNR dye studies utilize extensive experience involving project planning and objectives, challenging field conditions, thorough karst inventorying, and rigorous QA/QC (Aley, 2002). KHNBR studies were conducted to the highest of scientific standards (Brahana et al., 2014; Kosic et al., 2015). The importance of dye tracing in karst is that it documents where the water and waste flows in the subsurface (in this case, from a well immediately across the road from the pig factory, and another well surrounded by waste spreading fields near Dry Creek), how fast it flows (from about 1700 to 2500 feet per day), and the location where it reemerges at springs (in the middle of Big Creek, along upstream and downstream tributaries to spreading fields, and springs in Left Fork of Big Creek), and at 7 locations along the Buffalo National River (figure 8). None of this was mentioned in the Final EA. Especially noteworthy, dye recovery at John Eddings Cave from dye injection at BS-36 during conditions of high groundwater flow clearly indicates an hydraulic connection between CAFO waste-spreading fields and this cave. John Eddings Cave is a recognized hibernaculum for the endangered gray bat, *Myotis grisescens*. By failing to reference this most relevant information, it is my opinion that the Final EA has failed to pursue the potential for negative environmental impact to this

Dye-tracing results in Big Creek are mirrored by many other researchers throughout the Buffalo National River, especially with reference to the hydrogeology of the Boone Formation and its karst nature (Aley and Aley, 1989; Mott, 2003; Soto, 2014; Aley, 2015; Brahana, 2015; Kosic et al., 2015).

4. I have combined several items into the category of the fourth major flaw in the Final EA. These deal with important, human health-related aspects of groundwater and surface-water quality, both within and outside of the drainage basin of Big Creek. Sampling outside the drainage basin Big Creek and the waste spreading fields of the CAFO is based on dye tracing (Brahana, 2015; Kosic et al., 2015). Sampling springs where positive dye connections have been established is the accepted scientific method that underlies determining location of where samples should be collected from karst areas. Springs represent a legally valid point-source measurement of CAFO impact in karst and the real-world system (Quinlan et al., 1994); data they provide are definitive and indicative for establishing input and output from karst groundwater systems.

   The Final EA correctly notes that KHNBR data are not found in USGS or EPA data bases. However, these are only two of many data repositories that exist, and to exclude others can be both inappropriate and suggests an arbitrary and capricious approach to accurately defining a FONSI. KHBNR has looked for BCRET data in USGS and EPA data repositories, and as far as can be determined, BCRET data are not there either. BCRET data collection and analysis follows EPA and USGS standards, exactly as does KHBNR. Likewise, KHBNR uses some of the same labs as the BCRET team (microbes analyzed at University of Arkansas Water Quality Lab).

   Other labs [University of Arkansas Stable Isotope Lab (UASIL)] for trace constituents and stable isotopes, and the Water Lab at Ouachita Baptist University, both state-approved labs, require strict protocol and quality assurance/quality control procedures from sample collection through sample analysis. KHBNR concerns and criticisms are not intended to denigrate the effort involved with

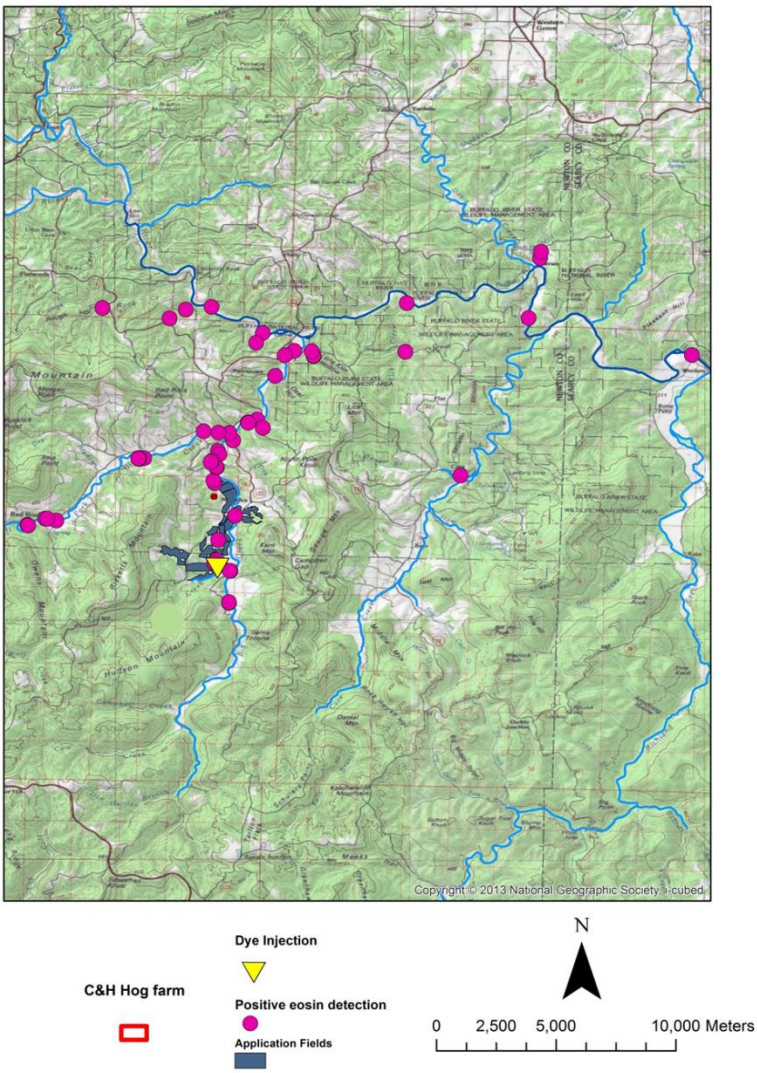


Figure 8. Results of eosin dye trace by KHBNR after an extremely high precipitation event during early summer of 2014. All locations lie at lower elevations than the injection point, which is surrounded on three sides by hog waste spreading fields. Dispersion of dye is explained by tilting of permeability zones (chert layers) caused by uplift (Bolyard, 2007) and by faulting, which is well documented throughout the area (Mark Hudson and various co-authors, multiple dates). The dye tracing is reinforced by KHBNR water-quality sampling, which is ongoing. Many of the positive detections of dye along Big Creek and downstream from its confluence with the Buffalo National River likely come from surface flow. Obviously, many do not, and instead come from groundwater.

preparing the EA, but instead to alert all stakeholders, consultants, and agencies to obvious scientific observations which we firmly believe have been erroneously dismissed resulting in significant misinterpretation. We are deeply concerned that ignoring KHBNR analyses and comments will lead to inaccurate conclusions, with long-term impacts on the water quality of Big Creek and the Buffalo National River. We strongly encourage fair and scientifically honest reconsideration of KHBNR facts.

Items that I feel are especially worthy of discussion are: a) *E. coli* and fecal coliforms, indicator organisms for fecal waste of warm-blooded animals in surface and groundwater; b) dissolved oxygen, which provides a general assessment for ecosystem health; and c) dissolved nitrate, a nutrient that is indicative of animal waste in surface and groundwater.

a. Concentrations of *E. coli* and fecal coliform in Big Creek, and upstream and downstream from its confluence with the Buffalo National River prior to spreading in 2013 is highly variable, and depends on land use of animals on the pastureland, on precipitation, on intensity of precipitation, and on antecedent streamflow and groundwater conditions. *E. coli* and fecal coliform are two pathogens that are used as "indicator organisms". As such, they provide meaningful indications that water supplies are contaminated with fecal waste from warm-blooded organisms (Rogers and Haines, 2005). Microbial pathogens such as these have a long history of causing more illness and death than any other substance we find in water, and for this reason, their presence in groundwater and tributaries contributing flow to the Buffalo National River is an essential parameter to track.

The greatest values of *E. coli* taken as grab samples (random) from the BCRET (2015) upstream site (figure 6) was 28,510 mpn/100 mL, sampled on 6/24/2014 during flood conditions; the greatest values of *E. coli* collected from the downstream site (figure 6) was 24,950 mpn/100 mL, sampled on the same date; the greatest concentration of *E. coli* at the BCRET spring site was 19,350 mpn/100 mL sampled 10/13/2014; and the greatest value of *E. coli* in the BCRET house well was ~920 mpn/100 mL measured on 8/6/2015 (BCRET, 2015). Greatest values for fecal coliforms are 173,290 mpn/100 mL on 10/13/2014 for the upstream site; 155,310 mpn/100 mL on 5/26/15 for the BCRET downstream site; 198,630 mpn/100 mL for the BCRET spring site on 10/13/2014; and 21,870 mpn/100 mL from the house well on 8/6/2015. Arkansas standards for "Primary Contact Waters -between May 1 and September 30, the maximum allowable fecal coliform criteria, calculated as a geometric mean, shall be 200 col/100 mL and the single-sample maximum shall be 400 col/100 mL. The maximum allowable *E. coli* criteria, calculated as a geometric mean, shall be126 col/100 mL and the single-sample maximum shall be 298 col/100 mL" (Arkansas Department of Environmental Quality, 2015). Obviously, these remarkably large concentrations of microbes in Big Creek, and in the springs and groundwaters that drain into the Buffalo National River (table 1) reflect much higher levels of pathogens than the

Table 1. Compilation of the number of times *E. coli* counts exceed 1000 mpn/100 mL (highlighted), the number of times the highlighted *E. coli* counts exceed 10,000 mpn/100 mL, the number of times the highlighted *E. coli* counts exceeded these standards before more than several hundred pigs moved into the CAFO, and the number of times the highlighted *E. coli* counts did this after more than several hundred pigs moved into the CAFO. The final column shows the number of number of times fecal coliforms exceeded 10,000 mpn/100 mL.

["upstream" and "downstream" are BCRET surface-water sites, with locations shown on figure 6 of this document; "spring" and "house well" are BCRET groundwater sites. mpn is most probable number; 100 mL is 100 milliliters; counts of *E. coli* that are greater than 1000 mpn per 100 mL measured before the CAFO started full operation and after the CAFO began full operation combine to equal counts of E. coli greater than 1000; date separating before and after is approximately 1/1/2014; the data on which this table is based are BCRET, 2015]

Location	Site Name	*E. coli* >1000 mpn	*E.coli* >10,000 mpn	(12/31/13) Before CAFO	(1/1/14) After CAFO	Fecal Coliforms >10,000 mpn
"upstream"	BC-6	6	2	1	5	9
"downstream"	BC-7	7	2	3	4	17
"spring"	BC-5	9	2	1	8	10
"house well"	House	0	0	0	0	3

standards allow. Insofar as the upstream and downstream sampling sites of BCRET have been shown by dye-tracing to lie well inside the natural groundwater boundaries of well BS-36, which is surrounded by the hog-waste spreading fields, BCRET data cannot be considered definitive in defining hog-waste impacted waters. Table 1 reflects compilation of *E. coli* concentrations that were greater than 1000 mpn/100 mL before 1/1/2014 as totaling 5events, and the same parameter and concentrations after 1/1/14 as totaling 17 events (BCRET, 2015).

Fecal coliforms had a total of 39 samples that were greater than 10,000 mpn/100 mL during the entire interval of sampling from summer 2013 through 2015. The remarkably great concentrations have not yet been definitively proven to come from the CAFO, although the CAFO represents the single, most-concentrated mass of animals and waste in Big Creek valley. It would be reasonable to conclude that C&H Hog Farms may be the cause of such dangerously high *E. coli*. Certainly, a fair and scientifically rigorous evaluation of the impact of C&H must be required for a FONSI. None was conducted.

b. Water-quality trends of dissolved oxygen (DO) as measured continuously in Big Creek during the past few summers indicate disturbing long-term decreases below calculated EPA standards, prompting a request by the National Park Service (NPS) that Big Creek be assigned "impaired" status last summer (Usrey, 2013; Usrey, 2015). DO measurements were ignored in the Final EA, and the "impaired" status request was rejected by the Arkansas Department of Environmental Quality (ADEQ) because the NPS data-collection scheme did not originate from an approved lab. This is the first time that ADEQ rejected NPS water-quality data, an unexpected decision, especially considering the time and careful development and rigorous sampling protocols implemented, clearly written, and carefully followed by NPS and USGS scientists (Green and Usrey, 2014).

The duration and extent of the low nighttime DO concentrations the last few summers (Usrey, 2013; Usrey, 2015) reinforces the observation that the added burden of waste from 6500 pigs, creating more than 2 million gallons of feces and urine per year is producing an impact in Big Creek, and downstream in the Buffalo. Informal observation by local landowners along the creek that the algae and biomass was particularly luxuriant last summer, following about 6 months of waste spreading on nearby CAFO fields. These values alone are not necessarily proof that the hog factory is the cause of the degraded water quality, but they are remarkably consistent that this CAFO has added to the total agricultural loading from this valley, and that data exist to suggest that it is stressed.

As a comparison of water quality in Big Creek with nearby surface water, the Little Buffalo River, the DO concentration in the Little Buffalo 7 miles upstream from the confluence of Big Creek and the Buffalo River dropped below 6 parts per million only 1 time (less than 3 hours total for the period of measured) during the sampling interval of summer 2013. The drainage area of the Little Buffalo River has similar land use and karst geology as Big Creek; what is not similar is that the Little Buffalo River does not have a huge hog factory upstream. Waiting until these water-quality degradations to build up to greater than EPA levels before seeking remediation for Big Creek and the Buffalo National River, Arkansas' Extraordinary Water Resource, seems short-sighted and potentially risky.

c. In figure 9, Nitrate-N data from BCRET (2015) serves to provide a plot of upstream versus downstream differences over the interval from 9/1/2013 through about 6/1/2015 (figure 9). The importance of this graph (BCRET, 2015, figure 19a) is not the fact that nitrate downstream is greater than upstream (figure 6), but that the groundwater component downstream likely contributes a larger portion of the hydrologic budget from the drainage area downstream from BCRET site (locations on figure 6). This is based on the greater downstream Nitrate-N differences from about 9/1/2013 to 1/1/2014, prior to spreading of the hog waste on the fields. Assessment that groundwater is the source of higher Nitrate-N differences is twofold; one, there are numerous springs that have been identified and traced to resurge in the bottom of Big Creek near the downstream sampling site; second, groundwater geochemistry processes favor higher Nitrate-N concentrations where anerobic conditions can be maintained, such as in the karstified limestone layers of the cherty part of the Boone Formation (figure 2). The upstream site monitors a higher lithologic interval in the Boone Formation, and therefore has more surface water and much less groundwater and spring input at its sampling location.

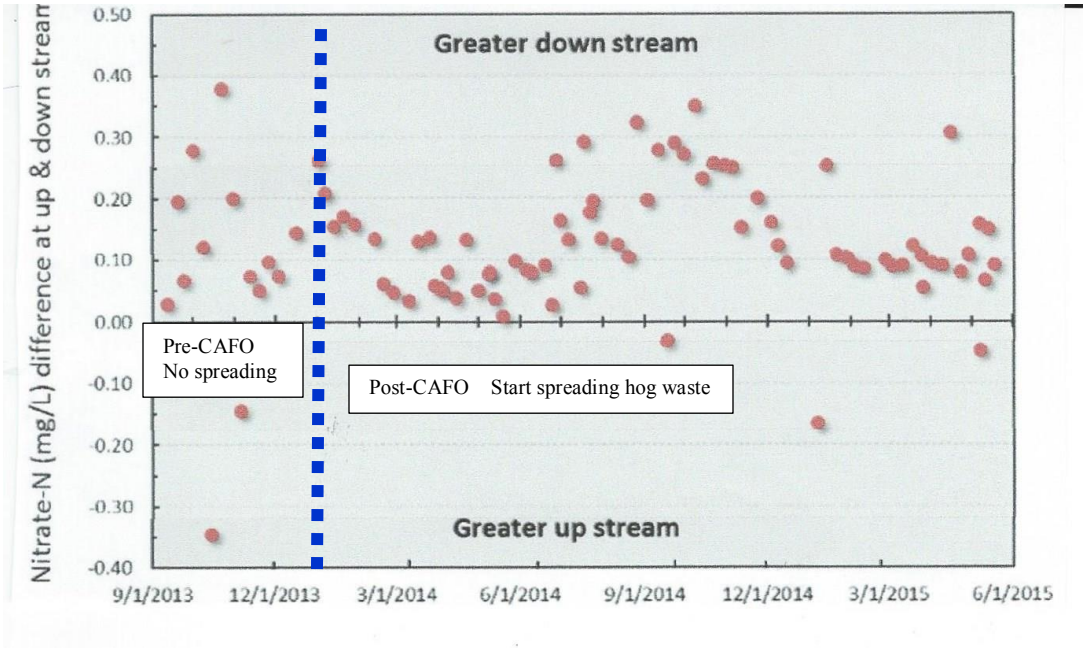


Figure 9. Nitrate-N difference between upstream and downstream BCRET locations (shown on figure 6), plotted versus time from 9/1/2013 to about 6/1/2015. Pre-CAFO higher concentrations downstream prior to hog waste spreading about 1/1/2014 indicate that the Nitrate-N source was in place. Semiannual seasonal fluctuations are consistent with water-level fluctuations, lower differences when water levels are seasonally lower. The source of the plot is BCRET, 2015, 7th quarterly review, figure 19a; the original BCRET figure has been modified by the addition of the dashed vertical line which shows the starting date for spreading hog waste.

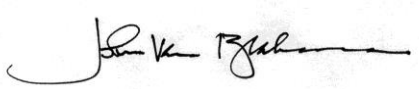
Judge Marshall's order involved addressing the National Environmental Policy Act, the Endangered Species Act, and the Buffalo National River Enabling Act, as well as regulatory rulings order (Case 4:13-cv-00450-DPM Document 58 Filed 12/02/14). Each of my comments is related directly to these acts because dynamically flowing water moving through hog waste on karst serves as the mechanism by which the contamination is carried in groundwater and downstream in surface water. The data I have described are

consistent with the observation that contamination from the hog factory and its spreading fields is moving offsite. At most current hydrologic flow conditions, water-contamination concentrations not have yet exceeded EPA standards, but obvious increases in trends portend potentially significant water-quality contamination.

Based on the compilation of all data in my letter, especially the misrepresentation of karst and hydrogeology in the Final EA, and the fact that the Buffalo National River is classified as Extraordinary Resource Waters with primary contact by thousands of canoes and floaters during spring and early summer months each year, it is my professional opinion that a FONSI is inaccurate and highly misrepresentative of the impact of C&H Hog Farms on the waters and environment of Big Creek and the Buffalo National River. Missing hydrologic considerations needed to accurately assess a Final EA should include: 1. full study of karst; 2. full assessment of groundwater; 3. full characterization of the interaction of surface and groundwater to the natural boundaries of both hydrologic basins; and 4. detailed research of all water quality (surface water, groundwater, and soil water) in all potentially impacted basins. Inclusion of these missing elements is the most fair, accurate, and ethical means to establish and document the potentially significant impact of the C&H CAFO on Big Creek and the Buffalo National River.

If you have specific questions, please contact me at vbrahana@gmail.com.

Sincerely,



John Van Brahana, Ph.D., P.G.
Professor Emeritus, University of Arkansas
Research Hydrologist Emeritus, U.S. Geological Survey

cc: The Honorable Asa Hutchinson, Governor of Arkansas
The Honorable John Boozman, Senator from Arkansas, U.S. Senate
The Honorable Tom Cotton, Senator from Arkansas, U.S. Senate
The Honorable Steve Womack, Representative from Arkansas, U.S. House of Representatives
Dr. Malcolm Field, U.S. Environmental Protection Agency
Mr. Andre Nogueira, CEO, JBS USA Holdings, Inc.
Ms. Becky Keogh, Director, Arkansas Department of Environmental Quality

Selected References

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