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Thursday, 6April2016

Water-Draft-Permit-Comment@adeq.state.ar.us

Ms. Becky Keogh
Director
Arkansas Department of Environmental Quality
5301 Northshore Dr. North Little Rock, AR 72118-5317

Re: Permit 5264-W; AFIN 51-00164; C&H Hog Farms, Inc.

Dear Director Keogh:

Comments and concerns specific to listed permit conditions

NMP states "soil samples are to be taken once every five years or when the nutrient management plan is revised"[1]. Since addition of fields resulted in the revision of the nutrient management plan, recent soil samples should be available for existing fields as well. **Please update this in the Permit Conditions**[2], otherwise this is not an enforceable condition[3].

While spreadable acreage on Fields 15 and 17 seem to exclude the limestone outcroppings that were noted during a 2013 inspection[4], **shouldn't buffers be added to those areas?**

The NW corner of Field 15B should be excluded from spreadable acreage, as the September 2013 Inspection report noted that this area had visible limestone outcroppings[5].

Condition No. 26 requires that the interceptor trenches be sampled quarterly[6]; however, these data are being collected much more frequently than that by the BCRET team. **Please update this condition so that all data collected must be reported**, otherwise this obviously opens up an opportunity for data to be cherry picked to only include data with lowest concentrations. Also, it is stated that the monitoring and reporting of the interceptor trenches will provide a method to

[1] See NMP on page 5 of Farm Overview, specific language in reference under "Soil and Swine Fertilizer Sampling" https://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/5264-W_Application%20Packet_20160406.pdf
[2] Part I on page 4 of Statement of Basis only mentions soil analysis will occur at least once every five years, but makes no mention of when NMP is updated.
[3] According to Specific Condition #4, see Page 1 of Part II of the permit.
[4] See page 13 of report. https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/073447-insp.pdf
[5] See page 15 of report. https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/073447-insp.pdf
[6] See page 4 of Part II for Specific Condition No. 26 of 5264-W.

assess the liner integrity[7], but at best this is an indirect method of assessing that. A detailed water balance study was suggested by the expert review team[8] and has been completely ignored[9]. From the very first inspection report from the facility it was noted that there were significant flaws with the integrity of the liner[10]; however, the permittee never addressed these concerns[11] and the Department still came to the conclusion that all issues had been resolved[12][13][14] without any indication that there had been anything done to address this[15] (**Table 1**. Summary of violations noted regarding the integrity of holding ponds.**Table 1**). Just because the permittee has a daily inspection log in which they check a box indicating the ponds were checked, obviously does not ensure that self-inspecting is actually sufficient[16].

Table 1. *Summary of violations noted regarding the integrity of holding ponds.*

Inspection Date	ADEQ Inspection #	Violation	Corrective Action
23July2013	073447	Erosion rills, desiccation cracks, gravel to cobble-sized substrate in liner	No specific actions were reported and no pictures were provided.[17]
23January2014	075752	Holding pond embankments were not stabilized and erosion rills still present. Large	No specific actions were reported, mention was made of future intent to

[7] See page 5 of the Statement of Basis of 5264-W.
[8] https://bigcreekresearch.org/project_reports/docs/Review%20Panel%20Report%20-%20May%2019%202014.pdf
[9] https://bigcreekresearch.org/project_reports/docs/Response%20to%20Expert%20Review.pdf
[10] See ADEQ Inspection Report #073447 dated 10September2013, https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/073447-insp.pdf
[11] See 20September2013 letter from Jason Henson (C&H Hog Farms, Inc) to Jason Bolenbaugh (ADEQ), *Re: Compliance Assistance Inspection (Newton Co) AFIN: 51-00164, Permit No.: ARG590001,* on page 16 of Inspection Report #073447 referenced above.
[12] See 3October2013 letter from Jason Bolenbaugh to Jason Henson, *RE: Response to Compliance Inspection, AFIN: 51-00164, Permit No.: ARG590001,* on page 20 of Inspection Report #073447 referenced above.
[13] See 5May2014 letter *RE: Adequate Response Letter, AFIN 51-00164, NPDES Permit Tracking Number: ARG590001.*
[14] It should be noted that p. 2 of 15-17April2014 EPA Inspection Report noted "turf reinforcement mats had recently been installed on the inside of the two waste holding ponds". https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/078360-insp.pdf
[15] *Id.* to footnote #14. Although an erosion control blanket was later added, as noted in Table 1, this has not been a long term or a remotely successful solution.
[16] See January 2014 CAFO Inspection Report on page 8 of document. Note that although the inspection log was completed every day, ADEQ still noted deficiencies with the pond liner. https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/075752-insp.pdf.
[17] See page 2 of response from permittee, 20 September 2013 in letter titled *Re: Compliance Assistance Inspection (Newton Co.) AFIN: 51-00164, Permit No.: ARG590001.* Permittee notes that necessary maintenance was performed on the "minor erosion rills and desiccation cracks on Pond 2", but makes no mention of any actions to correct issues with pond liner substrate. https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/073447-insp.pdf

		cobble still present in inspection photos of pond liner.	install erosion control blankets[18].
15-17April2014	078360	None noted	N/A
5November2014	081071	None noted, but site pictures show vegetation still has not established on inner pond banks[19].	N/A
30December2015	088608	None noted, but site pictures show very little vegetation has established on inner pond banks[20].	N/A

Really, just in general, Condition No. 26 makes no sense. **Please describe the study design and anticipated inferential statistics that will be used to determine this statistical significance**. The interceptor trenches were installed after the installation of the ponds, so there are no "Before" data that can be used for comparison purposes. Likewise, there is not a "Control" site that can be used to make comparisons of the liner integrity. So, one would not anticipate there would be a statistically significant change in the monitoring results given that the study was not designed to find one in the first place. Other no-discharge permits that propose to monitor for groundwater contamination require the additional monitoring of upgradient wells to use for comparison purposes[21]. There is actually no other scenario in which statistical significance could be determined, so this should certainly be added to the permit requirements. Functionally, the waste produced at this CAFO is just as harmful as industrial waste[22] and should be treated as such.

BCRET Data Indicate Water Quality Degradation Related to C&H Hog Farm Operations

BCRET data indicate that C & H Hog farms is having a negative impact on surface waters. By evaluating nitrate concentrations in Left Fork Big Creek (BC9, Control) compared to Big Creek (BC7, Impact), we see they are significantly greater at BC7 (Student's t-test, df = 37.1, t = -2.11, P = 0.042; **Figure 1**). The same trend holds true with total nitrogen (**Figure 2**). Because the watershed sizes, land-use land-cover (**Table 2**), and proximity to one another, these sites serve as pretty decent control and impact sites. Despite the higher proportion of pasture land in LFBC, we still see higher nitrate concentrations in Big Creek. The significance of this should not be lost on

[18] See page 1 of response from permittee, 6February 2014 in letter titled *Re: Compliance Inspection/Complaint Investigation AFIN: 51-00164, Permit No: ARG590001.*
https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/075752-insp.pdf
[19] See pages 4-5 of 25November2014 Inspection Report.
https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/081071-insp.pdf
[20] See page 4 of 30December2015 Inspection Report
https://www.adeq.state.ar.us/downloads/WebDatabases/InspectionsOnline/088608-insp.pdf
[21] See Future Fuel Chemical Company, Permit No. 5278-W.
[22] Download the document available on https://www.epa.gov/npdes/animal-feeding-operations-afos

the reviewer, as one would expect to see the highest concentrations in LFBC based on percent pasture alone.

Condition No. 2 prohibits discharge from this facility, and if the facility anticipates any discharge then the facility must be covered under a NPDES permit. Here ADEQ is relying on the argument that just because this particular CAFO is not actually *proposing* to discharge that a NPDES permit is not necessary. However, data indicate that the permitted facility, either through the holding ponds or through the application fields, *has* already violated the condition of this permit by discharging to waters of the state (Figure 1).

Since the purpose of Governor Beebe requesting $340,510 of tax payer funds was for the University of Arkansas to form the Big Creek Research and Extension Team (BCRET) to develop a study for "the use and benefit of ADEQ and to inform its ultimate performance of its regulatory functions"[23], these data cannot be dismissed. If the Department cannot assume that the current study design and methods will allow the Department to make a permitting decision based on definitive evidence of contamination, then the Department is obligated to take a weight of evidence approach to determine the potential for irrevocable harm. And although the state has not adopted numeric nutrient criteria for Arkansas, the recommended total nitrogen aggregate ecoregion criteria for this area is 0.31mg/L[24], which is well below the 0.41 mg/L mean TN concentration found on Big Creek.

[23] See page 2 of Memorandum of Agreement between the Board of Trustees of the University of Arkansas System for and on behalf of the University of Arkansas System-Division of Agriculture and the Arkansas Department of Environmental Quality, signed September 2013. (Attachment: UofA and ADEQ_BCRET MOA)

[24] See Aggregate Ecoregion XI for Rivers and Streams. https://www.epa.gov/sites/production/files/2014-08/documents/criteria-nutrient-ecoregions-sumtable.pdf . For more information for how these criteria were developed, see https://www.epa.gov/nutrient-policy-data/ecoregional-criteria.

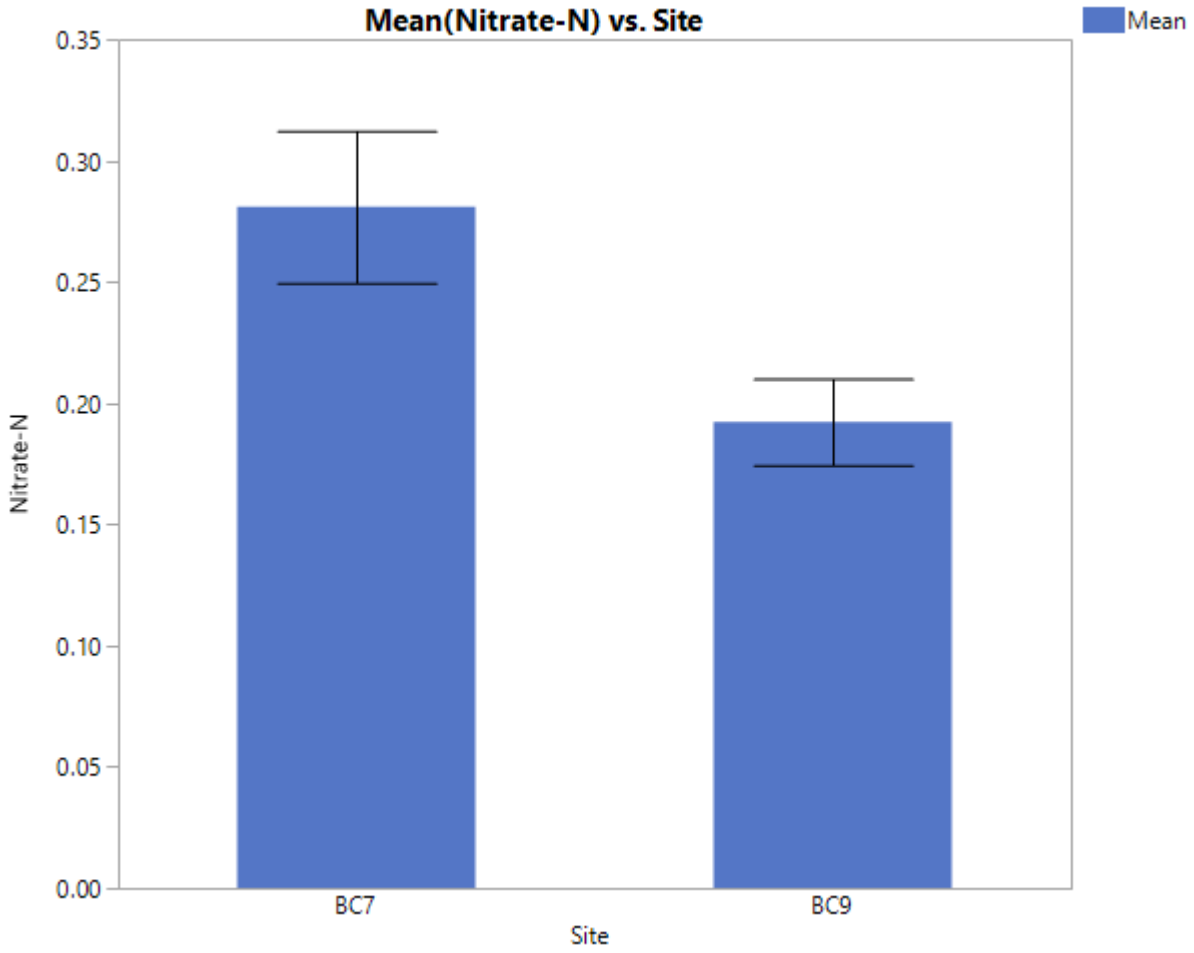

Figure 1. *Comparison of mean nitrate concentrations (mg/L) from BCRET sites BC7 (Big Creek downstream of hog farm) and BC9 (Left Fork Big Creek) with one standard error from the mean. Monthly mean nitrate concentrations were significantly greater at the Big Creek site downgradient of the large swine CAFO and waste application fields compared to the control site on Left Fork Big Creek (Student's t-test, df = 37.1, t = -2.11, P = 0.042)*[25].

[25] Data obtained from Andrew Sharpley on 8March2017 via personal communication (see Attachment: BCRET_01-2017). Data were analyzed from 4May2015 to 5January2017, as these were the only dates data were available from Left Fork Big Creek. Because data were not normally distributed, values were Log_{10} transformed. Data plotted in graph are actual, non-transformed nitrate values. However, Zar claims that Student t-tests are robust enough to overcome most violations of assumptions – so really there is no need to transform data. Students t-test on non-transformed data are still significantly different, so that doesn't tell a different story (Student's t-test, df = 144.9, t = -3.84, P = 0.0002).

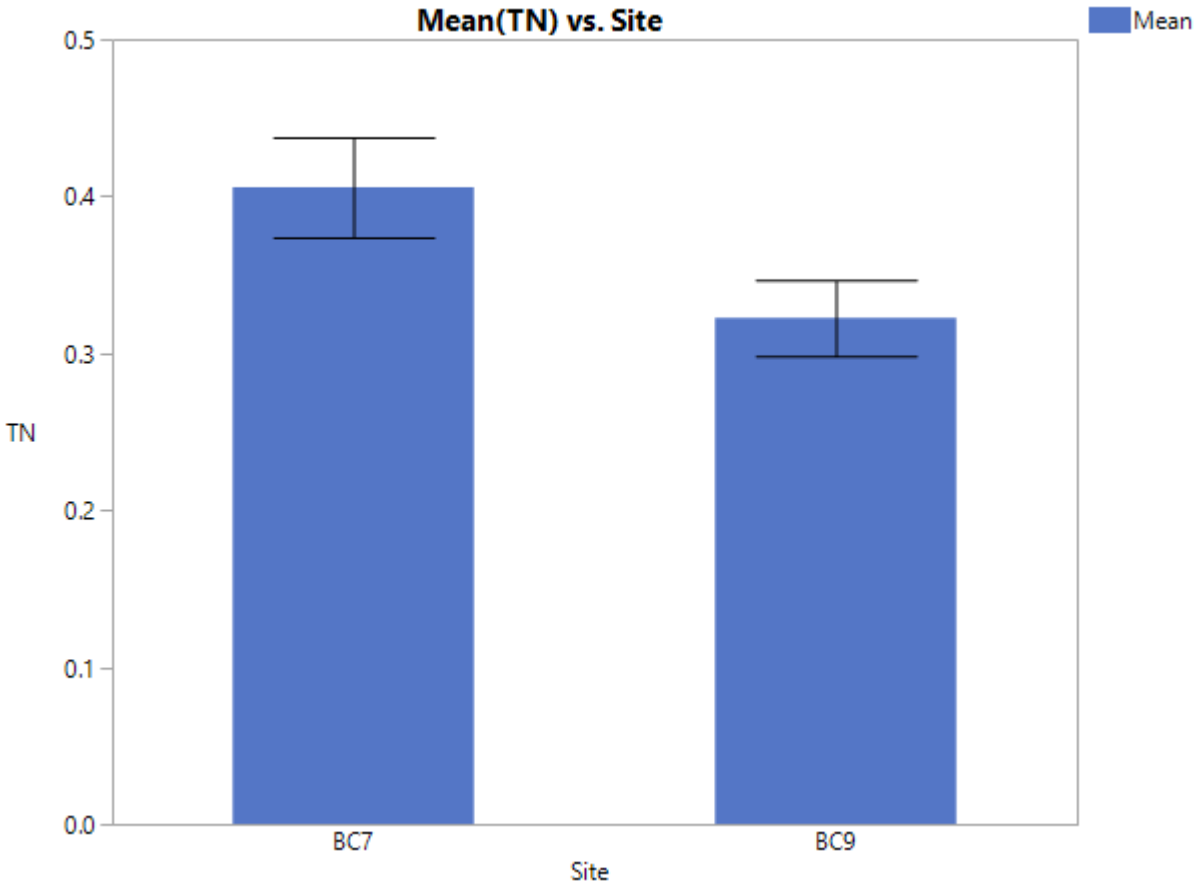

Figure 2. *Comparison of mean total nitrogen concentrations (mg/L) from BCRET sites BC7 (Big Creek downstream of hog farm) and BC9 (Left Fork Big Creek) with one standard error from the mean. Monthly mean total nitrogen concentrations were significantly greater at the Big Creek site downgradient of the large swine CAFO and waste application fields compared to the control site on Left Fork Big Creek (Student's t-test, df = 39.7, t = -2.07, P = 0.045)*[26].

Table 2*. Watershed area and land use land cover data*[27] *for BCRET sites at Big Creek (BC7) and Left Fork Big Creek (BC9).*

	BC7	**BC9**
Watershed Area (mi^2)	41.2	38.1
Urban (%)	3	3
Forest (%)	84	79
Pasture (%)	13	18

These data indicate that either a) current permitting requirements are not sufficient enough due to karst topography (more on this below) or b) the permittee is not following requirements set out in the permit and therefore is in violation and should not be issued a new permit. Because it is

[26] *Id.*
[27] These data calculated from 2011 National Land Cover Database. https://www.mrlc.gov/nlcd2011.php

within ADEQ's right to deny a permit based on violations[28] and it should be their prerogative when considering how best to protect the Buffalo River.

Holding Ponds

Again, large cobble is still present in the existing clay liners of the holding ponds. Which is a violation of the existing permit as it stands[29]. Due to the poorly constructed clay liner and the apparent long term issues addressing erosion control on the inner sidewalls of the ponds, increased leakage is certain to be expected[303132]. While it is the expectation that manure solids will clog subsurface pores beneath holding ponds, that's an assumption that is taken for granted and has proven to be false even under ideal construction circumstances[33].

Also, as I already explained how there would not actually be any way to detect a significant change in any kind of steady leak from the holding ponds. If the interceptor trenches are in fact properly placed, which it's karst, so I would agree that there should be a potential to catch *some* subsurface movement, but there is no reason to assume that this would be the case in the given setting, then they only have the potential to detect a catastrophic failure in the liner. But this is only a chance. Increased monitoring would have to be required if the Department expects to actually detect an impact, let alone a statistically significant one.

Sinkhole occurrence below the holding ponds should be expected. It's apparent that other states that understand the importance of taking karst into consideration in their permitting decisions acknowledge this. Missouri bans earthen liners in karst terranes with severe collapse potential[34]. Iowa also bans earthen liners in karst terrain for holding ponds other than for small CAFOs[35]. Minnesota has specific manure holding pond requirements for areas "susceptible to soil collapse or sinkhole formation" for karst areas where depth to bedrock is less than 50 feet, and does not allow earthen liners for CAFOs with more than 1000 animals if bedrock is less than 40 feet below liner[3637]. That is because it is well understood and acknowledged that CAFOs can easily

[28] Cite Arkansas code

[29] https://www.adeq.state.ar.us/downloads/WebDatabases/PermitsOnline/NPDES/PermitInformation/ARG590001_Additional%20Information%20Waste%20Management%20Plan_20120712.pdf

[30] Schulte, Dennis. 1998. Do Earthen Structures Leak? Manure Matters, Volume 4, Number 1. http://infohouse.p2ric.org/ref/16/15510.htm [accessed 20March2017]

[31] Benson, Craig, David Daniel, and Gordon Boutwell. 1999. Field Performance of Compacted Clay Liners. *Journal of Geotechnical and Geoenvironmental Engineering, 390-403.* https://chbenson.seas.virginia.edu/images/stories/pdfs/K/field%20performance.pdf

[32] Ham, J. M. Seepage Losses from Animal Waste Lagoons: *A Summary of a Four-Year Investigation in Kansas. Transactions of the American Society of Agricultural Engineers*, **45:** 983-992. http://www.agronomy.k-state.edu/documents/env-phys-group/ham2002--seepage-losses-from-animal-waste-lagoons.pdf

[33] See p 229-230 of Frank Spellman and Nancy Whiting. 2007. Environmental Management of Concentrated Animal Feeding Operations (CAFOs). Boca Raton, FL, CRC Press.

[34] Pfost, D.L., Fulhage, C.D., and Rastorfer, D., 2007, Anaerobic Lagoons for Storage/Treatment of Livestock Manure, Technical Report EQ 387, MU Extension, University of Missouri, Columbia, Mo., URL http://extension.missouri.edu/ explorepdf/envqual/eq0387.pdf, [accessed 18 March 2017].

[35] See p. 27 of Iowa Environmental Protection, Chapter 65, 65.9(5) https://www.legis.iowa.gov/docs/iac/chapter/11-23-2016.567.65.pdf [accessed 19March2017].

[36] Minnesota Pollution Control Agency. 2017. Locating Feedlots and Manure Storage Areas in Minnesota's Karst Region. https://www.pca.state.mn.us/sites/default/files/wq-f8-13.pdf [accessed 19March2017].

contaminate groundwater through runoff from land application of manure, leaching from manure that has been improperly spread on land, or through leaks from holding ponds[3839]. Even if sinkhole formation doesn't occur, the holding ponds are undoubtedly currently leaking due to the insufficient integrity of the liner.

PVC liners are incapable of supporting liquid waste over a sinkhole and even plastic liners are susceptible to degradation due to environmental weathering[40]. The only way to provide a moderate safeguard for the very likely potential for contamination from the holding ponds would be to require that these are built to specification for hazardous waste lagoons (steel reinforced concrete) as required by USEPA Resource Conservation and Recovery Act. These requirements are similar to those that are required by Florida, New York, and Ohio for manure lagoons sited in karst terranes. This is because urine and manure can be rather acidic, which can result in the increased dissolution of underlying carbonate rocks. Even more unfortunate is this can lead to weakening of even concrete lined ponds[41]. Since it is standard practice that RCRA programs assume holding ponds and landfills assume leakage, regardless of double liners and leak detection and collection systems, it doesn't make any sense that this would not be the assumption in this case as well.

Abnormal rainfall events and water table declines are becoming more and more frequent in Arkansas. These issues are known to be the direct result of sinkhole development and are likely to exacerbate the increased potential that is likely to occur below these holding ponds given the karst terrain [424344454647].
Because, again, this is literally our nation's first national river and if we don't require proactive and sustainable practices in this watershed then I don't really know where else they would be

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[37] Minnesota Pollution Control Agency. 2017. Liquid Manure Storage Areas: MPCA Guidelines for Design, Construction, and Operation of all Types of Liquid Manure Storage Areas. https://www.pca.state.mn.us/sites/default/files/wq-f8-04.pdf [accessed 19March2017].
[38] See p. 3 of Hribar, C., 2010, Understanding Concentrated Animal Feeding Operations and Their Impact on Communities, Technical Report, National Association of Local Boards of Health, Bowling Green, Ohio. https://www.cdc.gov/nceh/ehs/docs/understanding_cafos_nalboh.pdf [accessed 19March2017].
[39] Field, Malcom. 2011. DRAFT – CAFOs in Karst: How to Investigate Concentrated Animal Feeding Operations in Soluble Rock Terranes for Environmental Protection.
[40] http://www.ejnet.org/rachel/rhwn217.htm
[41] Ip, I., 2005, Sulphuric Acid Attack on Concrete Tanks: Waterloo Biofilter Systems Inc., The Science Corner, URL http://waterloo-biofilter.com/downloads/sulphuric-acid-attack-on-concrete-septic-tanks.pdf [accessed 19March2017]
[42] Zhao Haijun, Ma Fengshan, and Gao Jie, 2010, Regulatory and formation mechanism of large-scale abrupt large collapse in southern china in the first half of 2010: Natural Hazards, v. 60, no. 3, p. 1037–1054, doi:10.1007/s11069-011-9888-3.
[43] Youssef, A.M., Pradhan, B., Sabtan, A.A., and El-Harbi, H.M., 2012, Coupling of remote sensing data aided with field investigations for geological hazards assessment in jazan area, kingdom of saudi arabia: Environmental Earth Sciences, v. 65, no. 1, p. 119–130, doi:10.1007/s12665-011-1071-3.
[44] https://www.researchgate.net/profile/Jo_De_Waele/publication/264827203_A_review_on_natural_and_human-induced_geohazards_and_impacts_in_karst/links/5638f3f608ae4624b75ef7b9.pdf?origin=publication_list
[45] https://gq.pgi.gov.pl/article/download/7427/6077
[46] Hyatt, J.A., and Jacobs, P.M., 1996, Distribution and morphology of sinkholes triggered by flooding following tropical storm Alberto at Albany, Georgia, USA: Geomorphology, v. 17, no. 3–4, p. 305–316, doi:10.1016/0169-555X(96)00014-1.
[47] See Section 2.2 of https://www.pca.state.mn.us/sites/default/files/karst.pdf

more applicable. This is not an assault on landowner rights, and certainly not on farmers. This is just thinking about the big picture and long term consequences.

Insufficient Monitoring

First of all, for sufficient reason listed above, pH from holding ponds should be regularly monitored and reported. Preferably at different depth intervals to make sure there is an accurate depiction of the pH

If the Department believes that the 2015 Primary Contact season *E. coli* impairment on Big Creek, the 2015 dissolved oxygen impairment on Big Creek, and the significantly higher nitrate and nitrogen levels (**Figure 1** and **Figure 2**) are not sufficient enough to make a determination that **C & H Hog Farms is having a negative impact on water quality,** then it's obvious that using nutrients, *E. coli* and Fecal coliform as the only means for determining whether or not water quality impacts can definitively be attributed to this facility[48] is not sufficient enough for ADEQ to make a determination and they should require additional monitoring.

If the agency wanted to monitor parameters that they would not eventually end up disregarding or attributing to a number of other sources (e.g. feral hogs), they would also require monitoring of steroid hormones[49], antibiotics[50], or a number of the numerous carcinogenic pharmaceuticals that are commonly used at CAFO[51]s. As we all know, *E. coli* is a surrogate for measuring the potential for presence of other microbial pathogens. These pathogens that we should really be concerned about in swine manure are pathogens such as*, Salmonella* spp*., Campylobacter* spp., *Clostridium perfringens,* and *Cryptosporidium parvum*[52].

Pathogens can survive longer in groundwater than surface water because of the lower temperature and protection from the sun. Viruses can become attached to sediment particles and linger as a source of viral contamination to groundwater[53]. Unfortunately, long periods of survival in groundwater are somewhat irrelevant, as rapid transport of pathogens is extremely common in karst settings[5455]. At the same time, long-term storage in karst terranes often occurs[565758].

[48] Big Creek Research and Extension Team data as a whole. Reports and water quality monitoring data can be found in quarterly reports at https://www.bigcreekresearch.org.

[49] Shan, Liu, Ying Guang-Guo, Zhou Li-Jun, Zhang Rui-Quan, Chen Zhi-Feng, and Lai Hua-Jie, 2012, Steroids in a typical swine farm and their release into the environment: Water Research, v. 46, p. 3754–3768, doi:10.1016/j.watres.2012.04. 006.

[50] Shore, L.S., and Pruden, A., 2009, Introduction, in Shore, L.S., and Pruden, A., eds., Hormones and Pharmaceuticals Generated by Concentrated Animal Feeding Operations: Emerging Topics in Ecotoxicology, Springer, p. 147.

[51] *Id.*

[52] Jenkins, M.B., 2009, Persistence and Transport of Pathogens from Animal Agriculture in Soil and Water, in Bowman, D.D., ed., Manure Pathogens: manure Management, Regulations, and Water Quality Protection: Alexandria, Va.,Water Environment Federation (WEF), p. 347–368. https://naldc.nal.usda.gov/download/34372/PDF [accessed 20March2017].
Jenkins,

[53] See p. 18-23 of USEPA, 2005, Detecting and Mitigating the Environmental Impact of Fecal Pathogens Originating from Confined Animal Feeding Operations: Review, Technical Report EPA/600/R-06/021, U.S. Environmental Protection Agency, Washington.

[54] See p. 34-35 of Worthingon, S. R. H., C. Smart, and W. Ruland, 2001 Karst Hydrogeological Investigations at Walkerton. http://www.worthingtongroundwater.com/Walkerton%20Exhibit%20416%20text.pdf [accessed 19March2017].

More issues attributable to karst

As part of a larger effort to map the threats to Arkansas' species of greatest conservation need, The Nature Conservancy of Arkansas modified the EPA DRASTIC index[59] to more accurately reflect the vulnerability of (relative attenuation capacity of geologic material between the land surface and saturated zone) groundwater in karst terrain, termed DRASTIK[60].

I spatially referenced overlays of land application maps provided in the permit application in order to create geographic shapefiles of the existing and proposed land application sites in ArcGIS 9.3 (**Figure 3**). Overlaying the land application sites on the DRASTIK map, the most comprehensive and groundwater vulnerability index specifically calibrated to the karst regions in Arkansas, it is apparent that these locations offer little soil attenuation and land application of waste poses a high risk to groundwater resources (**Figure 4** and **Figure 5**). Using these data to assess risk in sensitive karst terrains, such as the Big Creek watershed, provides a more comprehensive and accurate method of ascertaining potential for negative water quality impacts than simply relying on Web Soil Survey data to assess risk.

Rapid response of the groundwater level is an indicator that karst conditions facilitate rapid flow of precipitation into the ground[61]. This also indicates the importance of relying on dye trace studies to identify sampling locations of where nutrients transported through subsurface channels will eventually emerge, as was suggested by the BCRET expert review team[62] and also ignored[63]. This information also helps emphasize the importance of calculating realistic nutrient loss to surface and groundwater sources through land application and manure storage rather than relying on edge of field and nearby surface water monitoring alone[64].

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[55] **See Attachment: Brahana et al 2016_geochemical processes big creek**

[56] Even, H.I., Magaritz, M., and Gerson, R., 1986, Timing the transport of water through the upper vadose zone in a karstic system above a cave in Israel: Earth Surface Processes and Landforms, v. 11, no. 2, p. 181–191, doi:10.1002/esp. 3290110208.

[57] Chapman, J.B., Ingraham, N.L., and Hess, J.W., 1992, Isotopic investigation of infiltration and unsaturated zone flow processes at Carlsbad Cavern, New Mexico: Journal of Hydrology, v. 133, no. 3–4, p. 343–363, doi:10.1016/0022-1694(92) 90262-T.

[58] Kaufman, A., Bar-Matthews, M., Ayalon, A., and Carmi, I., 2003, The vadose flow above Soreq Cave, Israel: a tritium study of the cave waters: Journal of Hydrology, v. 273, no. 1–4, p. 155–163, doi:10.1016/S0022-1694(02)00394-3.

[59] https://cfpub.epa.gov/si/si_public_record_Report.cfm?dirEntryID=35474

[60] See Attachment: TNC DRASTIK

[61] Murdoch, J., C. Bitting, J. V. Brahana. 2016. Characterization of the karst hydrogeology of the Boone Formation in Big Creek Valley near Mt. Judea, Arkansas – documenting the close relation of groundwater and surface water. Environ Earth Sci 75:1160. **See Attachment: Murdoch et al 2016.**

[62] https://bigcreekresearch.org/project_reports/docs/Review%20Panel%20Report%20-%20May%2019%202014.pdf

[63] https://bigcreekresearch.org/project_reports/docs/Response%20to%20Expert%20Review.pdf

[64] **See Attachment: Sharpley et al 2003.**

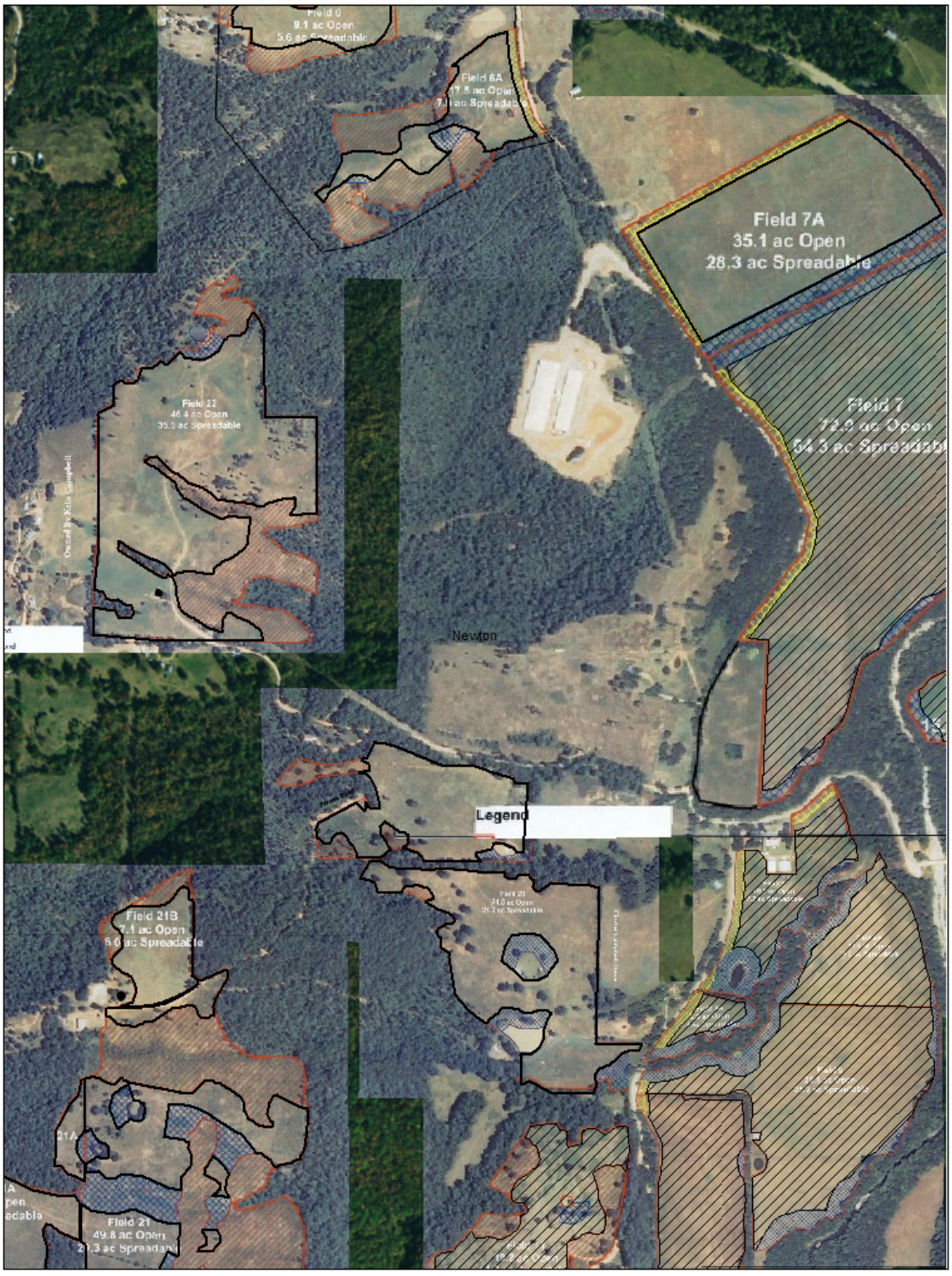

Figure 3. *Visual representation of how shapefiles were created of land application areas (excludes buffers) for C&H Hog Farm.*

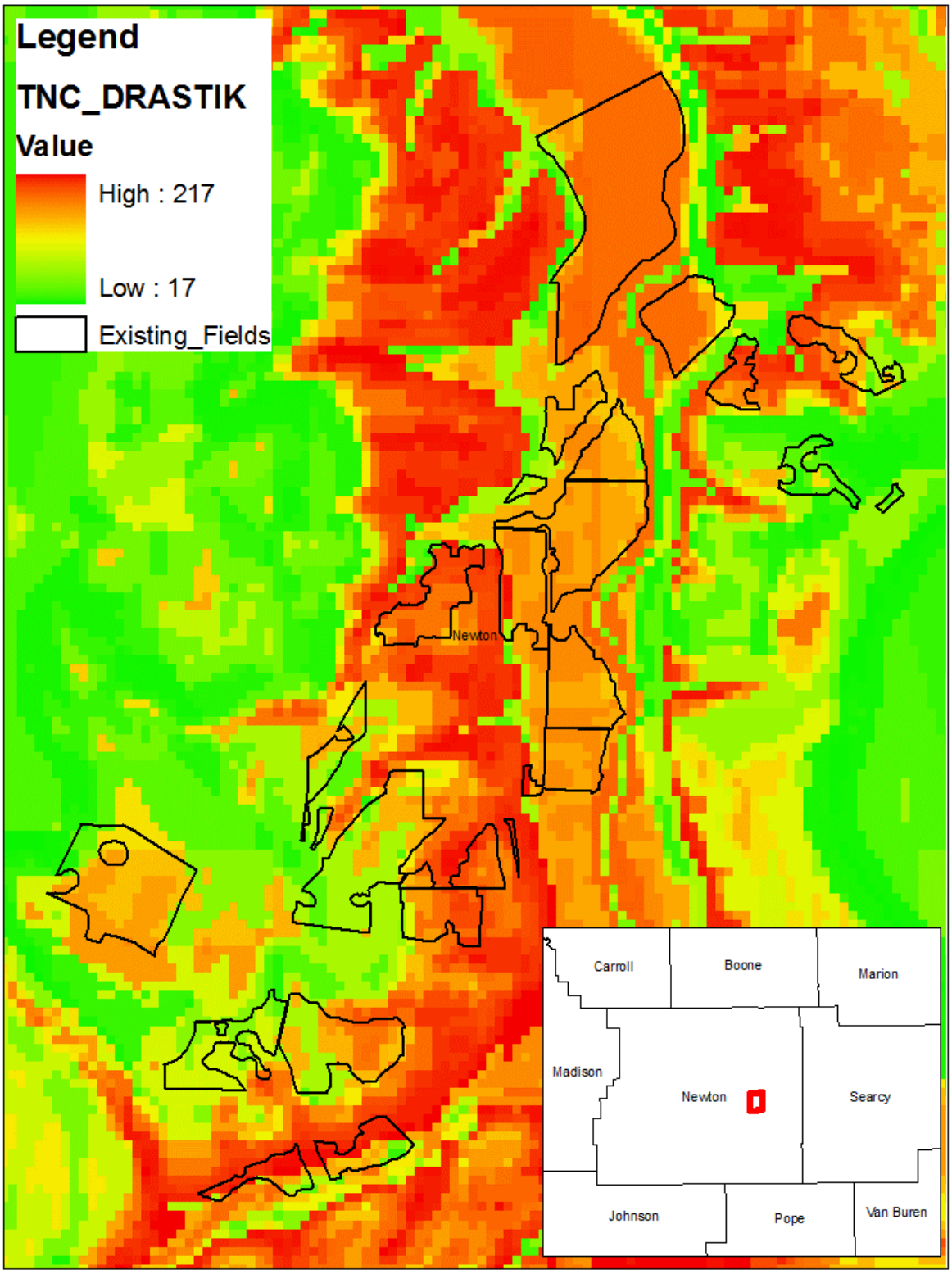

Figure 4. *Existing land application fields overlaying DRASTIK groundwater vulnerability map.*

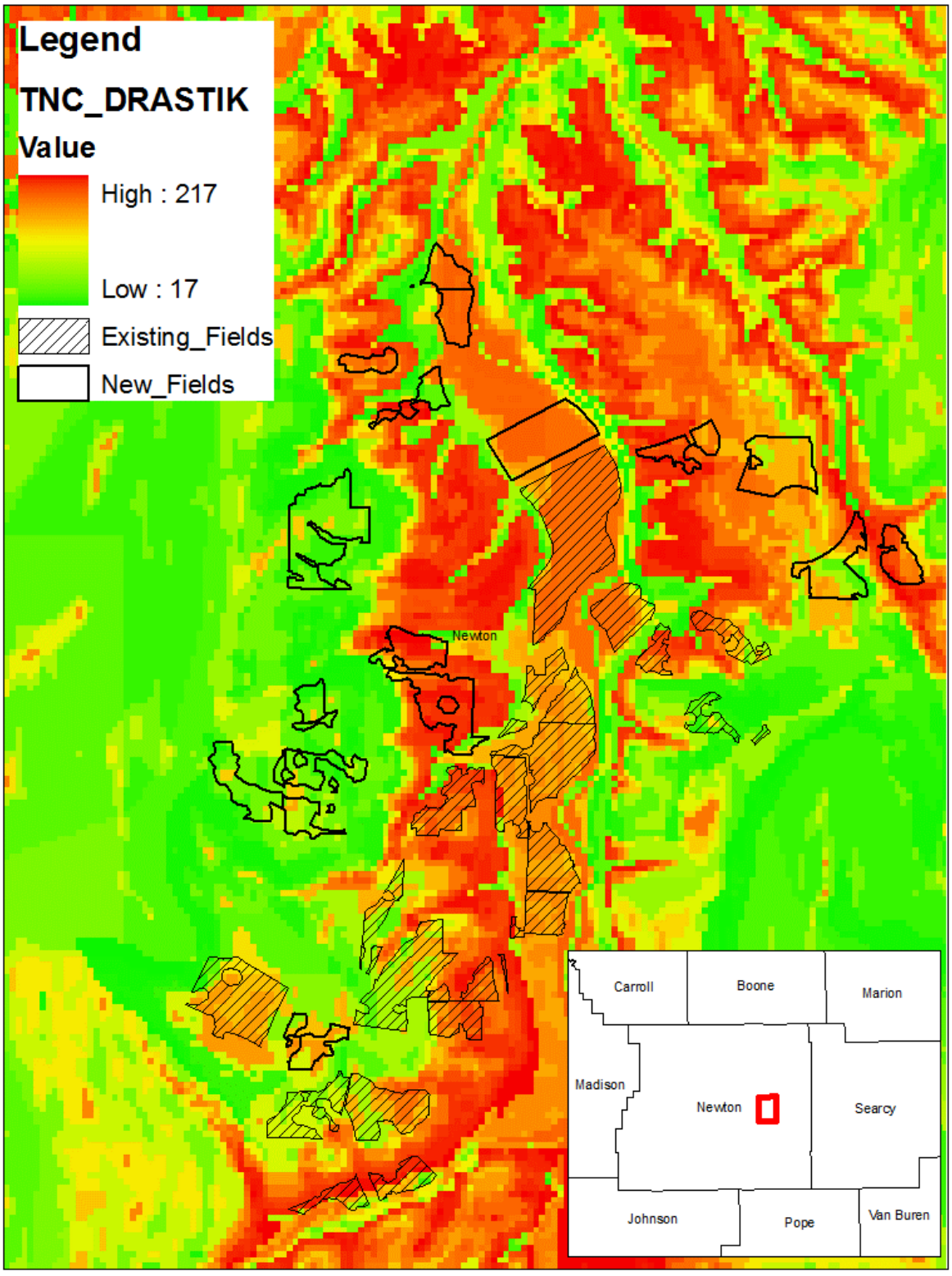

Figure 5. *New and existing land application fields overlaying DRASTIK groundwater vulnerability map.*

Miscellaneous comments regarding public health risks

Physical health risks such as toxic or inflammatory respiratory effects have been found to be significantly higher in close proximity to a large swine CAFO compared to rural residents living near minimal livestock production[65]. This should be of upmost consideration given the proximity to Mt. Judea School.

Pollutants expected to be found in swine waste poses a huge risk to human health considering X percentage of Newton county relies on groundwater as a drinking water source[66]. In addition, the thousands of people that recreate on the Buffalo National River each year are at a huge risk of falling suspect to ailments from pathogens transported through the subsurface or through surface runoff.

Suggestions for Basis of Permit Denial

This permit should not be issued on the basis that the permitted activity *does* endanger human health *and* the environment[67].

The director has the authority to deny a permit based on a history of noncompliance[68]. See above arguments for basis of noncompliance.

"A person with a history of noncompliance with the environmental laws or regulations of this state or any other jurisdiction is affiliated with the applicant to the extent of being capable of significantly influencing the practices or operations of the applicant that could have an impact upon the environment. "[69] The integrator, JBS, has been accused multiple times of violating rainforest deforestation laws[7071].

In reference to placement of the holding ponds and land application fields within karst topography, Ark Code 8-4-217(a)(2) states "it shall be unlawful for any person to place or cause to be placed any sewage, industrial waste, or other wastes in a location where it is likely to cause pollution of any waters of this state".

The director shall not issue a permit under this chapter if the discharge or any term of the permit would violate the provisions of any federal law or rule or regulation promulgated thereunder, including the duration of such permit[72].

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[65] Thu, K., K. Donham, R. Ziegenhorn, S. Reynolds, P.S. Thorne, P. Subramanian, P. Whitten, and J. Stookesberry. 1997. A Control Study of the Physical and Mental Health of Residents Living Near a Large-scale Swine Operation. Journal of Agricultural Safety and Health, **3**: 13-26. http://www.sraproject.org/wp-content/uploads/2007/12/acontrolstudyofthephysicalandmentalhealth.pdf

[66] See Figure 7 on page 37 of https://pubs.usgs.gov/sir/2014/5149/pdf/sir2014-5149.pdf

[67] See page 1 of Part III of permit 5264-W which states that a determination of this may result in the termination of this permit.

[68] Ark. Code 8-1-106(b)(3)

[69] Ark Code 8-1-106(c)(3)

[70] Blankfeld, Keren. 2011. *JBS, World's largest beef producer, responds to lawsuit.* 20April2011. https://www.forbes.com/sites/kerenblankfeld/2011/04/20/jbs-worlds-largest-beef-producer-responds-to-lawsuit/#388a897641d3

[71] Boadle, Anthony. 2017. *Brazil's JBS accused of violating Amazon rainforest protection laws.* Reuters, 2April2017. http://www.reuters.com/article/us-brazil-environment-cattle-idUSKBN1722O1

[72] Ark Code 8-4-207(2)

Various Questions

Please provide an explanation for why ADEQ is not adhering to the definition of an ERW in this permitting decision.

Since ADEQ has no formal antidegradation implementation plan in place, **please describe the process the Department is using to insure protections of Tier III waters and determine when degrading high quality waters is necessary.**

Please describe how the ADEQ interprets the results of the 1994 CAFO study, the basis for determination that the 1992 CAFO moratorium is no longer in effect, and how a determination of a facility of this size meets the intent of the Basin-Wide Initiative of the Buffalo River Watershed and Moratorium[73].

Regardless of whether or not ADEQ acknowledged that data supported Big Creek was impaired for *E. coli* and dissolved oxygen during the 2016 305(b) integrated reporting cycle[74], these data and information should still be factored into the permitted decision when it comes to a facility likely to contribute to these impairments. This should especially be the case when it comes to sensitive waterbodies. Since the Department did not provide a justification as to why the 2016 Assessment Methodology and prior impairment decisions were not used as the basis for concluding there was not an impairment on Big Creek, then there is no reason to believe that EPA will not choose to list Big Creek as impaired when they approve the 2016 303(d) list. **Please provide an explanation as to why it should be believed EPA will conclude that Big Creek is impaired** and **an explanation of how a determination that Big Creek is impaired will impact this permitting decision**. [7576]

Sustainability of the Buffalo River Watershed

As is pointed out in the 2011 Comprehensive Regulatory Review of CAFOs under the CWA,[77] we would be doing a great disservice to our first national river to do anything other than acknowledge the truth of the matter:

> *As is clear from its divisive history, the federal regulation of CAFO- produced pollutants under the Clean Water Act has been, and continues to be, complex. Yet, the basic principle behind their regulation remains the same: CAFOs are categorized as point sources under the Clean Water Act; as such, they must obtain a valid NPDES permit to discharge any pollutants into waters of the United States, except in accordance with the agricultural stormwater exemption. To interpret that principle any other way would not only contravene the plain*

[73] See Attachment: 1992 CAFO Moratorium.
[74] 303(d) and 305(b) integrated report.
https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2016/integrated-report.pdf
[75] https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2016/comments/teresa-turk.pdf
[76] https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2016/comments/carol-biting.pdf
[77] See page 325, Connor, Hannah. 2011. Comprehensive Regulatory Review: Concentrated Animal Feeding Operations under the Clean Water Act from 1972 to the Present. *Vermont Journal of Environmental Law.* **12**: 275-326. http://vjel.vermontlaw.edu/files/2013/06/Comprehensive-Regulatory-Review-Concentrated-Animal-Feeding-Operations-Under-the-Clean-Water-Act-from-1972-to-the-Present.pdf

> *language of the Act, but it would also jeopardize the Act's goal of "restor[ing] and maintain[ing] the chemical, physical, and biological integrity of the Nation's waters" by eliminating the discharge of pollutants from point sources into those waters.*

As the design plans allow for, and as the scientific community acknowledges, large CAFOs discharge waste. Simply refusing to acknowledge something doesn't mean it's not actually occurring. And I don't actually believe the Department has a defensible enough case to *prove* that reasonably expected discharge is not occurring. Estimates of holding pond leakage and loss of nutrients during runoff events could be calculated and would more accurately reflect current conditions. Estimating runoff through surface water monitoring is extremely complicated in karst topography without a comprehensive understanding of where and how water is transported from land surface to surface and groundwater sources. Assumptions of lamellar flow off of fields and into surface waters do not hold up in karst terrain. This is a huge problem when relying on surface water monitoring alone to inform the likelihood of pollution transport.

Although ADEQ ignores the "and its watershed" portion of the Extraordinary Resource Water definition due to difficulty in making management decisions in that regard, permitting of this large hog factory still undoubtedly ensures the degradation of Big Creek and the Buffalo River. By permitting a facility that is absolutely not sustainable in this watershed, ADEQ is thereby limiting the amount of sustainable farms that could potentially operate in the watershed. The necessity to continue adding land application fields will only persist in order to accommodate the waste generated from this one facility that only employs less than 10 individuals. Future options will either lead to transporting the waste out of the watershed entirely, which will result in burdensome costs to the permittee and pose a serious risk to the environment should a likely accident happen, OR will result in the conversion of more forest land to pasture. Permitting a facility that encourages the additional conversion of land to pasture should at least benefit more individuals than a measly few. In the event that ADEQ had an Antidegradation Implementation Plan in place and required an Analysis of Alternatives, I think it would be obvious that there are better options for both the permittee, the Buffalo National River, *and* Arkansas' tourism industry.

By permitting a facility that is estimated to generate 1,897,635 gallons of waste annually[78] with only 13,004,000 gallons that can be received by the currently proposed land application sites[79], the life expectancy of this facility to remain "sustainable" would be less than 7 years.

However, simply finding additional pasture land to spread waste on within this geographic area simply won't solve the issues of the Arkansas Phosphorous Index not being appropriate for the geologic area. By relying on a method that allows the application of nutrients in excess of agronomic needs, the excess nutrients will either build up in the soil or be transported to surface and groundwater through overland and subsurface flow. Obviously phosphorous buildup in the

[78] See Condition No. 10 on page 3 of the Statement of Basis for Permit No. 5264-W.
[79] See Condition No. 11 on page 3 of the Statement of Basis for Permit No. 5264-W.

soil has its own set of issues, but when we are talking about protecting the Buffalo National River which will ultimately be the sink for excess nutrients that are not up taken by terrestrial crops, it really is necessary to evaluate the risk to sensitive receiving streams. And it has been well accepted that measuring surface water nutrient concentrations is not as environmentally protective as measuring nutrient loads when trying to manage an entire watershed or groundwater basin[80], hence the necessity for calculating loads when developing a Total Maximum Daily Load to manage point and nonpoint sources of pollution.

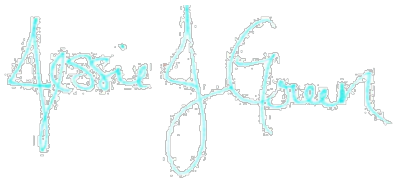
Also, relying on physicochemical measures of water quality alone to measure changes in stream ecosystems ignores nutrient cycles and disregards basic aquatic ecology principles of trophic interactions. Reactive nitrogen and phosphorous in the water column aren't the endpoints of concern when one is trying to protect water quality. Uptake of nutrients by plants such as algae (generally the most common form of submerged vegetation) and emergent vegetation such as water willow can have a significant impact on aesthetics and recreational quality of a waterbody, by stimulating plant growth. Aquatic life beneficial uses are impacted by the change in food web dynamics that result from increasing plant productivity (the result of increased nutrients), but they are also impacted by the oxygen depletion that results in response to increased photosynthesis and decomposition in the waterbody.

The whole premise of regulating large scale productions versus small scale productions, whether it be through construction stormwater permits administered based on size of area disturbed or through NPDES or no discharge permits for CAFOs based on the number of animals at a facility, this is to limit infringement on individual landowner rights while insuring large corporations and industries do not disproportionately impact shared resources. This concept is also the very basis for antidegradation implementation policies and the necessary consideration for weighing social and economic impacts against environmental impacts. While some might take the majority of the comments focusing on the importance of preserving the scenic beauty of the Buffalo National River as simply appeals to emotion, drawing such conclusions fails to connect the dots between the purpose of actively managing watersheds through regulatory avenues and tools water quality administrators have been given to protect our Outstanding Natural Resource waters. There is generally no textbook approach to managing natural environments. Adaptive management and best professional judgement are *always* going to be necessary when protecting our resources. The Arkansas Department of Environmental Quality, as well as every other management agency, realizes this. That is why it is built in to virtually every single piece of law, regulation, and policy administered by the Department there is always some clause that allows discretion by the Director. Now is the time to use that discretion. Sustainability has majorly differing definitions depending on the context. Think of dams. We all recognize that dams may be a sustainable source of energy, but dams prevent a sustainable fishery. I have no doubt that the state of the art facility currently in operation at C&H Hog Farms is sustainable in the context of recycling water, feed, and air, or whatever it may be – but it is not environmentally sustainable if your goal is to protect the Buffalo River. You have to weigh the risks in every decision. We cannot protect the recreational sustainability of our first national river, which was designated for it's recreation

[80] http://cemonterey.ucanr.edu/files/171000.pdf

potential and scenic beauty, by permitting facilities that don't even provide enough social or economic benefit to outweigh the negative environmental effects. Not only due to the tourist dollars that are brought into the state by the beauty of the Buffalo River, but also the number of jobs that rely on the Buffalo River remaining a favored destination, it's imperative that we understand what we are managing this watershed for. We designate beneficial uses to our waterbodies in order to define our management goals and actions to achieve those goals. While I have no doubt denying this permit for a facility that is already in operation, but never should have been permitted in the first place, will not be without it's pushback; it must be acknowledged that we have already set our management goals for the Buffalo River watershed. We are to protect it for its "scenic beauty, aesthetics, scientific values, broad scope recreation potential and intangible social values". Please, use your regulatory discretion to uphold the values that have been set by the Buffalo River region, and state as a whole, and deny this permit.

Thank you for this opportunity to comment on this permit.



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