Permit No. 5264-W AFIN 51-00164

STATEMENT OF BASIS

This Statement of Basis is for information and justification of the permitting decision only. The Arkansas Department of Environmental Quality (ADEQ) hereby issues a denial of the application for Arkansas Pollution Control and Ecology Commission (APC&EC or "Commission") Regulation 5 Permit 5264-W, AFIN 51-00164.

1. **Permitting Authority**

Arkansas Department of Environmental Quality
Office of Water Quality
5301 Northshore Dr.
North Little Rock, AR 72118-5317

2. **Applicant**

C&H Hog Farms, Inc.
HC 72 Box 2
Vendor, AR 72683

3. Permit History/Activity

The facility previously had coverage under APC&EC Regulation 6 General Permit ARG590000. The applicant submitted a permit application for a new permit under APC&EC Regulation 5, which was received on April 7, 2016 with additional information received on June 29, 2016. ADEQ issued a draft decision to grant this permit application on February 15, 2017. Additional information for this permit application was received from the applicant on December 6, 2017, December 26, 2017, and December 29, 2017. On January 10, 2018, the Department issued a decision to deny this permit application. The applicant appealed this decision to the Commission, Docket No. 18-001-P. On August 24, 2018, the Commission approved Minute Order 18-20, adopting the Administrative Law Judge's (ALJ) recommended decision to remand this case back to ADEQ. See Order No. 14 in Docket No. 18-001-P. The Department public noticed its draft decision to deny the application for a new permit under APC&EC Regulation 5 on September 17, 2018. C&H submitted additional information on October 23, 2018. The comment period on that draft decision closed on October 24, 2018.

4. **Facility Location**

The facility is located as follows: HC 72 Box 2 near the community of Mount Judea in Newton County, Arkansas. The facility is located at the following coordinates:
Latitude 35° 55' 30.47" N; Longitude 93° 4' 18.42" W

5. **Waterbody Evaluation**

The facility is located in Stream Segment 4J of the White River Basin, which is not in the Nutrient Surplus Area as designated by Ark. Code Ann. § 15-20-1104. Surrounding areas were evaluated to determine if any Extraordinary Resource Waters (ERWs), Ecologically Sensitive Waters (ESWs), Natural or Scenic Waterways (NSWs), or waterbodies in the 2016 or the proposed 2018 list of impaired waterbodies in the State of Arkansas are near the proposed land application sites.

In conjunction with the proposed 2018 impaired waterbodies list, the Department has proposed to place four impaired Assessment Units in Category 4(b) for the 2018 assessment:[1]

- Two segments of Big Creek (Newton County), one for pathogens (AR_11010005_022) and one for dissolved oxygen (AR_11010005_020), and
- Two segments of the Buffalo National River (AR_11010005_011, AR_11010005_010) for pathogens.

6. **Applicant Activity**

Under the standard industrial classification (SIC) code 0213 or North American Industry Classification System (NAICS) code 112210, the applicant's activities are the operation of a swine facility.

7. Facility Type and Size

This existing facility operates as a sow-farrowing facility. The permit application proposed the following numbers of swine: 6 boars, 2,252 gestating sows, 420 lactating sows, and 750 nursery pigs.[2]

8. **Basis for Permit Decision**

APC&EC Reg. 8.211(A)(1) states:

> The Director shall issue the final permitting decision in writing. The Director's decision shall be made upon consideration of the completed application, the public comments on the record, if any, and any other materials provided by law or regulation applicable to the application or other matters to be considered in the decision. The Director may impose special conditions upon issuance of a permit.

In addition, APC&EC Regulation 5 entitled "Liquid Animal Waste Management Systems" specifically, APC&EC Regulation 5.402, Design Requirements states:

[1] A map of these Assessment Units can be accessed at the following link: http://arkansasdeq.maps.arcgis.com/apps/MapJournal/index.html?appid=edf6259f9c8840e7b686287bc2c29799.
[2] These numbers were provided by the applicant.

(A) Design and waste management plans shall be in accordance with this Chapter and the following United States Department of Agriculture Natural Resources Conservation technical publications:

(1) Field Office Technical Guide, as amended.
(2) Agricultural Waste Management Field Handbook, as amended.

These technical publications provide design and operational considerations and requirements for agricultural waste management systems (AWMS) based on risk to public health and environment. Risks are defined based on the AWMS components' physical location within the geological setting, proximity to outstanding resource waters, size of operation, and AWMS design and operational methods. Based on the defined risks, the record demonstrates that this AWMS presents as a very high risk.

ADEQ denies issuance of the permit after determining, based upon the information provided, that the permit application does not demonstrate full compliance with the permitting requirements. The record lacks necessary and critical information to support granting of the permit, and the record contains information that the operation of this facility may be contributing to water quality impairments of waters of the state.[3] The permitting decision is based on the submitted permit application, comments received from the public, and other available and relevant data and information.

Deficiencies in the Geological Investigation:

The facility is located on the Boone Formation, an area known to have karst.[4] The hydrology of karst terrain is "created from the dissolution of soluble rocks, principally limestone and dolomite."[5] Karst terrain is characterized by springs, caves, and sinkholes.[6] "Karst hydrogeology is typified by a network of interconnected fissures, fractures and conduits emplaced in a relatively low-permeability rock matrix."[7] In karst, the groundwater flow usually occurs through these networks of interconnected fissures, and groundwater may be stored in that matrix.[8] Aquifers in karst are extremely vulnerable to contamination.[9]

The presence of karst triggers additional considerations for siting and design as stated in the Agricultural Waste Management Field Handbook (AWMFH). The following examples illustrate some of the issues presented by karst.

AWMFH, 651.0702(c) states:

[3] See 40 CFR 122.44(d)(1)(i).
[4] Karst: the result of natural processes in and on the Earth's crust caused by dissolution and leaching of limestones, dolomites, gypsum, halite, and other soluble rocks.
[5] USGS Website, What is Karst?, https://water.usgs.gov/ogw/karst/pages/whatiskarst.
[6] USGS Website, What is Karst?, https://water.usgs.gov/ogw/karst/pages/whatiskarst.
[7] USGS Website, What is Karst?, https://water.usgs.gov/ogw/karst/pages/whatiskarst.
[8] USGS Website, What is Karst?, https://water.usgs.gov/ogw/karst/pages/whatiskarst.
[9] USGS Website, What is Karst?, https://water.usgs.gov/ogw/karst/pages/whatiskarst.

> Sinkholes or caves in karst topography or underground mines may disqualify a site for a waste storage pond or treatment lagoon.

AWMFH, 651.0702(l) states:

> Common problems associated with karst terrain include highly permeable foundations and the associated potential for groundwater contamination, and sinkholes can open up with collapsing ground. As such, its recognition is important in determining potential siting problems.

ADEQ has determined that a detailed geological investigation of the facility is required because karst includes highly permeable foundations with the associated potential for groundwater contamination and potential for sinkholes to open up with collapsing ground or cause differential settlement.[10] In accordance with the AWMFH, a detailed geologic investigation is necessary to characterize and understand sites with complex geologies (i.e. karst) that includes, but is not limited to, groundwater flow direction studies, borings in the pool areas, berm integrity assessment, and pond and liner construction quality assurance. A facility located in a sensitive geologic area must also have an Emergency Action Plan to address any failure of the waste containment system. Section 651.0204(a) of the AWMFH requires facilities with waste impoundments with embankments to consider the risk to life, property, and the environment should the embankment fail.

Additionally, the AWMFH includes considerations based on site-specific conditions found in the land application sites. AWMFH 651.0504 addresses soil suitabilities and limitations for agricultural waste application. The suitabilities and limitations for each soil property are categorized as slight, moderate, or severe. Although a severe suitability rating does not necessarily infer that agricultural wastes cannot be applied to that site, a severe limitation does infer a need for careful planning to overcome the severe limitation or hazard associated with that soil characteristic.

AWMFH, 651.0503(b) states in part:

> Soils that have high permeability and intake rates, coarse texture, or shallow depth to a water table are the most susceptible to nitrate contamination of ground water.

The ground penetrating radar studies[11] at Fields 1, 5, and 12 indicated that land application to those fields should be limited in accordance with AWMFH 651.0504 (a)–(n) and Table 5-3. The ground penetrating radar studies suggest that these fields have characteristics identified in AWMFH 651.0504 (a)–(n) and Table 5-3, such as areas of higher permeability, thin soils of less than twenty (20) inches, and soils with a significant fraction of rock fragments, which prevented some soil samples from being taken. The limitations for land application sites based on these soil characteristics are included as part of the AWMFH for the purpose of preventing contamination of ground water. Geotechnical investigations of the land application fields are necessary to account for the soil characteristics that require limitations on animal waste application.

[10] AWMFH 651.0702(l)

[11] As part of the BCRET study, USDA, NRCS conducted Ground Penetrating Radar (GPR) Surveys for Fields 1 and 5 in November of 2013 and Field 12 in April of 2014.

Geotechnical investigations of the pond area and of the land application fields are necessary and may help demonstrate that this facility is not contributing to water quality impairments of Big Creek and the Buffalo National River. The 2018 proposed listing of two (2) segments of Big Creek and two (2) segments of the Buffalo National River as impaired further illustrates the need for these detailed studies.

C&H submitted two reports to ADEQ: one from Terracon Consultants, Inc. ("Terracon") and one from Carman Professional Services PLLC ("Carman"). The report from Terracon stated that "[k]arst features were not identified in the boring." The report from Carman states, "[b]ased on the QA report, as-built plans, and the Harbor Drilling information, there is no evidence of karst in the area of the ponds."

Comparing the reports from Terracon and Carman with the information contained in the C&H Drilling Study prepared by Harbor Environmental, Inc. ("C&H Drilling Study") and the included subsurface geology report prepared by Hydrogeology Inc. and signed by Tai T. Hubbard, LPG IN-2253/AR No. 14 ("Hydrogeology Report"), ADEQ has determined that the C&H Drilling Study and the Hydrogeology Report do not support Terracon's conclusions that "[k]arst features were not identified in the boring" or Carman's statements that "[b]ased on the QA report, as-built plans, and the Harbor Drilling information, there is no evidence of karst in the area of the ponds."

ADEQ agrees with the following conclusions and statements in the Hydrogeology Report:

> The highly weathered limestone bedrock and unconsolidated clay intervals observed between 13.8 and 28.0 ft. below ground surface (bgs.) appeared to have the characteristics of epikarst. [12]
>
> Although there were zones of thin bedding that appeared to be mechanically broken by the drilling process, there were no significant karst related voids identified in core recovery or by driller observation. The primary karst feature during the drilling of B-1 is the previously identified epikarst zone noted between 13.8 ft.bgs. and 28.0 ft.bgs.[13]

Based on the C&H Drilling Study and the Hydrogeology Report, ADEQ has concluded that the boring encountered a zone of epikarst[14] between 13 and 28 ft. bgs. that was described as limestone with fractures and moderate disintegration that showed evidence of dissolution and mineralization. This zone of epikarst is a karst feature in the boring. These conclusions are supported by the drilling logs and photographs in the C&H Drilling Study.[15]

[12] Hydrogeology Report, Page 3.
[13] Hydrogeology Report, Page 4.
[14] Epikarst is a relatively thick portion of bedrock extending from the base of the soil zone and is characterized by extreme weathering and enhanced solution. Thickness may vary considerably; epikarst may be up to 30 meters thick. Significant water storage and transport are known to occur in this zone.
[15] The Rock Core Photographic Logs support the conclusion in the Hydrogeology Report that the primary karst feature during the drilling is the "epikarst zone noted between 13.8 ft.bgs. and 28.0 ft.bgs." This

ADEQ reviewed the C&H Drilling Study and the Hydrogeology Report and compared it to the information in the boring logs provided by C&H. ADEQ has determined that the epikarst zone identified in the C&H Drilling Study and the Hydrogeology Report was encountered at or near the depth of the invert for Pond 2. The boring identified by C&H as BH2 is the boring that is closest to Pond 2, but BH2 did not extend beyond the invert of Pond 2.[16] The BH2 boring is insufficient to characterize the geology underlying Pond 2. The boring identified by C&H as BH3 was performed in the area of Pond 1 and appears to extend below the depth of the invert for Pond 2. However, the BH3 boring is also insufficient to characterize the geology underlying Pond 2.

Considering the BH2 and BH3 borings, the C&H Drilling Study, and the Hydrogeology Report, the bottom of Pond 2 is near the depth at which epikarst was encountered in the C&H Drilling Study. The AWMFH, in Appendix 10D states that the following conditions may require special design measures:

- at least 2 feet of natural soil in groups III or IV do not occur below the bottom and sides of the lagoon,
- the soils are flocculated (high calcium), or
- highly unfavorable geologic conditions, such as karst formations, occur at the site.

ADEQ has identified karst at the site, and BCRET reported that the core sample from the C&H Drilling Study had a calcium content of 382,176 mg per kg of soil at a depth of 25 feet. Based on the proximity to epikarst, the underlying karst of the Boone Formation, and areas of increased calcium, ADEQ has determined that these conditions warrant special design measures, and a detailed geological investigation is required for this facility. AWMFH 651.0704, Site Investigations for Planning and Design, states, "[a] detailed investigation must be scheduled if reliable information for design cannot be obtained without that detailed investigation." Without the detailed geophysical, hydrological, and engineering data specific to this facility ADEQ is unable to ascertain compliance with Reg. 5.402 and the AWMFH, as amended.

The AWMFH covers many aspects of agricultural waste management systems. ADEQ has compiled a list of some of the requirements of the AWMFH that are relevant to ADEQ's decision to issue this denial. The list below is not intended to reflect all requirements and recommendations of the AWMFH and it is not intended to reflect all factors that may have been considered by ADEQ during the review of the application.

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conclusion is supported by the Rock Core Photographic Logs, Hydrogeology Report, Attachment 2, Photographic Log, Page 3, C & H Hog Farms: B1 Rock Core Photographic Log:

Run 2, Box 4: 13.8 . bgs. close up of Boone Forma on Contact (likely epikarst)

Run 2, Box 4: 12.0 —14.0 .bgs. Boone Forma on Contact (likely epikarst).

[16] APC&EC Regulation 5.404 states that a boring should extend to at least two (2) feet below the planned bottom of the excavation.

• Groundwater Assessment: A groundwater flow direction study to determine the directional flow(s) from any waste storage ponds (Citation: APC&EC Regulation 5.402, A WMFH 651.0703(b)).

• Geologic Assessments: A complete geologic investigation, including but not limited to:

- Borings within the pool areas to ascertain that groundwater elevation is not within 5 feet of invert of the ponds (Citation: APC&EC Regulation 5.402, A WMFH 651, Table 10-4);
- Borings within the pool areas to ascertain the foundation of earth-filled structures ("For structures with a pool area, use at least five test holes or pits or one per 10,000 square feet of pool area, whichever is greater." Citation: APC&EC Regulation 5.402, A WMFH 651.0704(b)(4)); and
- Borings within the pool areas to rule out the presence of large voids in karst (Citation: APC&EC Regulation 5.402, AWMFH 651, Table 10-4).

• Berm Integrity Assessment: Borings are required in the embankment centerline of the berms as part of the detailed geologic investigation. (Citation: APC&EC Regulation 5.402, AWMFH 651.0704(b)(4)).

• Pond Construction Quality Assurance: The record included one recompacted permeability test. That single test is insufficient to determine liner integrity. The necessary soil investigations including, but not limited to, percentage of fines and soil permeability characteristics, have not been performed at this facility in accordance with the AWMFH 651 Table 10-4 and Appendix 10D. (Citation: APC&EC Regulation 5.402 and AWMFH 651: Table 10-4, Appendix 10D, and Appendix 10E).

• Assessment of High-Risk Areas of Land Application Sites: A field assessment for all land application sites including all of the characteristics listed in AWMFH 651.0504 (a)-(n), and the resulting field management plans (Citation: APC&EC Regulation 5.402, AWMFH 651.0504 (a)-(n) and Table 5-3).

• Pond Levee Integrity and Assessment Requirements**:** An adequate Operations and Maintenance Plan for the pond levee, including an inspection schedule and plan document, was not included in the record. An adequate plan should at a minimum include:

- Whether the inspections are internal or independently performed by a third party;
- The specific checklist of items for the inspection to cover;
- Recordkeeping requirements;
- Frequency of inspections; and
- How the inspection results will be reviewed and/or audited.

(Citation: AWMFH 651.1302(d); Natural Resources Conservation Service Operation and Maintenance, Waste Storage Facility, Code 313)

> • Emergency Response Preparedness: An emergency action plan regarding potential consequences of failure of the waste impoundment embankments or accidental release (Citation: APC&EC Regulation 5.402, AWMFH 651.0204(a)-(b)).

ADEQ has determined that the additional information submitted by C&H on October 23, 2018, including the proposed work plan, Emergency Action Plan, pond levee integrity inspection schedule, and additional soil survey information, was insufficient to address all of the deficiencies in the permit application and demonstrate compliance with APC&EC Regulation 5. ADEQ addresses the insufficiency of C&H's submission in ADEQ's response to C&H's comment.

As set out in the AWMFH, these detailed geophysical and engineering studies are necessary to inform the design and operation of the facility. These detailed geophysical and engineering studies are necessary for ADEQ to evaluate the design, as constructed, and continued operation of the facility. The ultimate aim of APC&EC Reg. 5 and the AWMFH is to prevent pollutants from being released from the facility and its operations into waters of the state.

Water Quality Issues:

The purpose of APC&EC Regulation 5 is generally to prevent point source pollution, minimize nonpoint source pollution to the waters of the state, and protect water quality (APC&EC Regulation 5.102). As stated in the AWMFH, 651.0108(a):

> Potential water pollutants derived from agricultural waste can be classified as nutrients, oxygen-demanding materials, bacteria that indicate potential presence of pathogens, sediment, suspended or dissolved materials, and agrichemicals and other organic and inorganic materials.

Since the initial January 10, 2018 decision to deny the applicant's permit, the Department has issued its proposed assessment of the status of water quality in Arkansas and identified waterbodies that fail to meet standards defined in APC&EC Regulation 2.[17] Four Assessment Units in close proximity to the ongoing operations of the applicant, C&H Hog Farms, Inc., failed to meet water quality standards under APC&EC Regulation 2 (two segments of Big Creek (Newton County) and two segments of the Buffalo National River).[18]

[17] Pursuant to 40 C.F.R. § 130.7(b)(5), ADEQ assembles and evaluates all existing and readily available water quality data and information, from ADEQ and outside entities, to make water quality standard attainment decisions. Title 40 C.F.R. § 130.7(b)(5) states in part, "[e]ach State shall assemble and evaluate all existing and readily available water quality-related data and information to develop the list required by §§ 130.7(b)(1) and 130.7(b)(2)." Data are evaluated for use by determining adherence (or not) to data quality considerations outlined in the 2018 Assessment Methodology. The 2018 Assessment Methodology can be assessed at the following link:
https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2018/final-2018-assessment-methodology.pdf

[18] See Section 5. Waterbody Evaluation.

The assessment units impaired for pathogens and dissolved oxygen[19] and other related water quality data indicate that this facility may be contributing to the water quality impairments observed in Big Creek and the Buffalo National River.

In addition to this proposed listing of two segments of Big Creek and two segments of the Buffalo National River as impaired waterbodies, the Big Creek Research Extension Team (BCRET) has documented an increase in nitrate-N near the facility. In the April 1 to June 30, 2018 Quarterly Report, BCRET presented data that documents a statistically significant increase of nitrate-N in the ephemeral stream (BC4) and the house well (W1) since 2014. (BCRET April–June 2018, Figure 24). Increased nitrate-N in both the ephemeral stream and the house well suggests that these systems may be hydrologically connected to areas where farm activities take place.

Data supplied from the C&H Hog Farms, Inc. 2014–2017 annual reports document an increase of soil test phosphorus (STP) from 20 ppm to 68 ppm in Field 17 to a more significant increase in Field 1, which increased from 45 ppm to 173 ppm. As stated in University of Arkansas Division of Agriculture Soil Phosphorus: Management and Recommendations FSA1029[20], "Arkansas scientists agree that there is no agronomic reason or need for STP to be greater than about 50 ppm (Mehlich-3 extraction)." However, "with the move from agronomic to environmental concerns with P, soil P testing has been used to indicate when P enrichment of runoff may become unacceptable. A common approach has been to use agronomic soil P standards, following the rationale that soil P in excess of crop requirements is vulnerable to removal by surface runoff or leaching" (FSA1029). "A large amount of research between 1985 and 2000, showed that as STP (Soil Test Phosphorous) increased, especially in the top 2–4 inches of soil, so did the concentrations of soluble P in runoff (Figure 1)" (FSA1029).

As of the C&H Hog Farms, Inc. 2017 Annual Report, results of all soil test phosphorus were greater than 50 ppm. Despite a reported increase of soil test phosphorus in waste application fields, pursuant to NRCS Code 590, the Arkansas Phosphorus Index may still allow application of swine waste because of other factors including phosphorus source potential, transport potential, and best management practice multipliers. FSA9516[21] states that the phosphorus index approach is most appropriate as it accounts for multiple risk factors and provides a better risk assessment of P loss in runoff.

Geotechnical investigations at all land application sites in accordance with AWMFH 651.0504 (a)–(n) and Table 5-3 are necessary to ensure the efficacy of the API and demonstrate that this facility is not contributing to water quality impairments of Big Creek and the Buffalo National River by rapid infiltration through highly permeable or thin soils.

[19] AWMFH, 651.0108(a) identifies oxygen-demanding materials and pathogens as potential water quality impacts from agricultural waste.
[20] Division of Agriculture Soil Phosphorus: Management and Recommendations FSA1029, https://www.uaex.edu/publications/pdf/FSA-1029.pdf
[21] Division of Agriculture Soil Phosphorus: Management and Recommendations FSA9516, https://www.uaex.edu/publications/PDF/FSA-9516.pdf

The proposed listing of two segments of Big Creek and two segments of the Buffalo National River as impaired waterbodies, the statistically significant increase of nitrate-N in the ephemeral stream and house well, and the increase of STP in all land application fields receiving waste further illustrate the need for C&H to provide the appropriate geotechnical data to demonstrate that this facility has been constructed in accordance with the AWMFH and that the assessment of soil suitabilities and limitations has been conducted in accordance with the AWMFH as required by ACP&EC Regulation 5.402.

9. Point of Contact

The preparation and technical review of this permit application was conducted by Office of Water Quality permitting staff with support from other resources within ADEQ including the Office of Law and Policy and the Office of Land Resources.

10. Sources

1. APC&EC Regulation No. 8, Administrative Procedures, as amended.
2. APC&EC Regulation No. 9, Fee System for Environmental Permits, as amended.
3. APC&EC Regulation No. 5, Liquid Animal Waste Management Systems, as amended.
4. Water and Air Pollution Control Act, Ark. Code Ann. § 8-4-101 et seq.
5. Application for permit No. 5264-W received April 7, 2016.
6. NMP dated April 6, 2016.
7. Additional information received on June 29, 2016.
8. Additional information received on December 6, 2017.
9. Additional information received on December 26, 2017.
10. Additional information received on December 29, 2017.
11. C&H Drilling Study prepared by Harbor Environmental and Safety, Inc. dated December 2016, as amended.
12. Agricultural Waste Management Field Handbook, as amended.
13. Buffalo River Watershed-Based Management Plan dated May 22, 2018: https://www.adeq.state.ar.us/water/planning/integrated/303d/pdfs/2018/2018-05-22-final-buffalo-river-wmp.pdf
14. Additional resources at the following link: https://www.adeq.state.ar.us/home/pdssql/p_permit_details_water_spb.aspx?AFINDash=51-00164&AFIN=5100164&PmtNbr=5264-W