January 12, 2006

Martin Maner, P.E.
Chief, Water Division
Arkansas Department of Environmental Quality
P.O. Box 8913
Little Rock, AR 72219-8913

Dear Mr. Maner:

Thank you for your recent letter, dated October 27, 2005, requesting review and approval of a site-specific water quality standards revision in Regulation No. 2, *Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas.* We have completed our review of your request for approval of a site-specific temperature criterion for the unnamed tributary to Lake June. The Arkansas Pollution Control and Ecology Commission adopted the site-specific temperature criterion as an amendment to the Arkansas surface water quality standards via a third party rulemaking in Minute Order 05-24 on September 23, 2005. In accordance with 40 CFR §131.20, the Arkansas Department of Environmental Quality then submitted the water quality standard revision and supporting documentation to the Environmental Protection Agency (EPA) for review and approval. The submittal package was received by EPA on November 1, 2005, and included a statement dated October 24, 2005, from the Administrative Hearing Officer, certifying that the amendment was duly adopted pursuant to State law.

Entergy Arkansas, Inc., operates the Harvey Couch Plant, a steam electrical plant located near Stamps, Arkansas, which discharges non-contact cooling water from the facility's cooling towers via Outfall 002 into the unnamed tributary to Lake June. The site-specific temperature criterion would apply to the unnamed tributary to Lake June, from Entergy Arkansas, Inc.'s Outfall 002 discharge (National Pollutant Discharge Elimination System (NPDES) Permit Number AR0000493) to the confluence of Lake June, in Lafayette County, Arkansas.

Based upon supporting documentation and upon the results of the study performed, the site-specific temperature criterion of 95°F (35°C) has been demonstrated as appropriate to protect the designated uses in the unnamed tributary to Lake June, including the seasonal Gulf Coastal fishery use, as well as the downstream designated uses in Lake June. For this reason, EPA is approving the site-specific criterion of 95°F (35°C) for the unnamed tributary to Lake June. EPA's approval of the site-specific temperature criterion of 95°F (35°C) applies only to the unnamed tributary to Lake June from Entergy Arkansas, Inc.'s Outfall 002 discharge to the confluence with Lake June. The designated uses for the unnamed tributary to Lake June have not been revised.

EPA is disapproving the proposal to remove the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C). The purpose for this limitation is to ensure that the fishery is not subjected to wide temperature fluctuations, which would potentially stress the indigenous populations. The technical justification report provided to support the proposed site-specific temperature criterion did not provide adequate justification to demonstrate that removal of the 5°F (2.8°C) limitation would be protective of the fishery use in the unnamed tributary to

Lake June. Further, the modeling results provided in the technical justification report indicate that the expected difference between equilibrium temperatures in the unnamed tributary to Lake June and Outfall 002 temperatures would be less than 5°F (2.8°C). For these reasons, EPA does not believe that removal of the 5°F (2.8°C) limitation is supported. Under 40 CFR §131.21(c), new and revised standards do not go into effect for CWA purposes until approved by EPA. Therefore, the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C), will continue to apply to the unnamed tributary to Lake June.

A detailed explanation of the approved site-specific temperature criterion and the rationale for EPA's approval/disapproval decision is provided in the enclosed Record of Decision. The approval of the site-specific temperature criterion of 95°F (35°C) is subject to the results of consultation under section 7(a)(2) of the Endangered Species Act (ESA). EPA initiated consultation with the U.S. Fish and Wildlife Service (USFWS) under section 7(a)(2) of the ESA on this site-specific amendment to the Arkansas surface water quality standards on November 17, 2005. Section 7(a)(2) requires that federal agencies, in consultation with the Services, insure that their actions are not likely to jeopardize the existence of federally listed species or result in the adverse modification of designated critical habitat of such species. As of today, this consultation has not been completed. By approving the standards "subject to the results of consultation under section 7(a)(2) of the Endangered Species Act," EPA retains the full range of options available under section 303(c) for ensuring that water quality standards are environmentally protective. EPA retains the discretion to revise its approval decision if the consultation identifies deficiencies in the water quality standards that require remedial action.

I would like to acknowledge the efforts of the Pollution Control and Ecology Commission, and particularly the Arkansas Department of Environmental Quality, in the development of these revised standards. It has been our pleasure to work with you on this water quality standards revision. We look forward to working with you on the next revision. If you have any questions or concerns, please contact me at (214) 665-7101, or have your staff contact Melinda Nickason at (214) 665-8059.

Sincerely yours,

/s/

Miguel I. Flores
Director
Water Quality Protection Division

Enclosure

cc: Donna Davis, Office of Science and Technology
Allan Mueller, U.S. Fish and Wildlife Service

RECORD OF DECISION FOR EPA'S ACTION ON THE REVISED ARKANSAS SURFACE WATER QUALITY STANDARDS, REGULATION NO. 2

Approval/Disapproval of a Revised Temperature Criterion for the Unnamed Tributary to Lake June

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I. BACKGROUND

By letter dated October 27, 2005, from Martin Maner, Arkansas Department of Environmental Quality (ADEQ) to Miguel I. Flores, U.S. Environmental Protection Agency - Region 6 (EPA), the ADEQ requested EPA approval of a revision to Regulation No. 2, *Regulation Establishing Water Quality Standards for Surface Waters of the State of Arkansas* in order to establish a site-specific temperature criterion for the unnamed tributary to Lake June from Entergy Arkansas, Inc.'s Outfall 002 discharge (National Pollutant Discharge Elimination System (NPDES) Permit Number AR0000493) to the confluence with Lake June. Supporting documentation, including a technical justification report,[1] was also provided along with the request for EPA approval.

Entergy Arkansas, Inc., operates the Harvey Couch Plant (or "Couch Plant"), a steam electrical plant, which discharges non-contact cooling water from the facility's cooling towers via Outfall 002 into the unnamed tributary to Lake June. Power generation in warm weather (July through September) causes temperature exceedances of the NPDES permit limit of 86°F (30°C), which is the default temperature criterion for streams in Arkansas' Gulf Coastal ecoregion. Temperature exceedances are mitigated by pumping groundwater from the Sparta Aquifer to reduce the temperature of the heated discharge. However, there is indication that the Sparta Aquifer is experiencing unsustainable rates of water withdrawal, and groundwater quality in some of the production wells used by the plant have shown significant increases in total dissolved solids (TDS) and chlorides. In order to reduce the volume of groundwater used to cool the heated discharge, an in-stream study of the unnamed tributary to Lake June was conducted in order to support the development of a site-specific temperature criterion of 95°F (35°C) and to provide technical justification that this site-specific criterion would be protective of the water quality and uses in the unnamed tributary, as well as Lake June located downstream. As part of the proposal to establish a site-specific temperature criterion for the unnamed tributary to Lake June, a proposal was also included to remove the sentence at Regulation 2.502 which states that, "Heat shall not be added to any waterbody in excess of the amount that will elevate the natural temperature, outside the mixing zone, by more than 5°F (2.8°C) based upon the monthly average of the maximum daily temperatures measured at mid-depth or three feet (whichever is less) in streams, lakes or reservoirs." This sentence shall be referred to in this record of decision as the "delta 5°F limitation."

During EPA's review of a state's water quality standards revision, a determination must be made as to whether the revised standard protects the designated uses of the waterbody and provides for the attainment and maintenance of the water quality standards of downstream waters (40 CFR §131.21(b), §131.5(a)(2), and §131.10(b)). Criteria must be based on sound scientific rationale and must contain sufficient parameters or constituents to protect the designated use (40 CFR 131.11(a)). Provided below is EPA's evaluation and rationale for the approval of the revised temperature criterion of 95°F (35°C) for

[1] FTN Associates, Ltd. 2005. *Technical Justification for a Site-specific Temperature Criterion for the Harvey Couch Plant Receiving Waterbodies.* Prepared for Entergy Arkansas, Inc. Little Rock, Arkansas.

the unnamed tributary to Lake June. Also included below is EPA's rationale for the disapproval of the proposal to remove the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C).

II. SITE DESCRIPTION

The Harvey Couch Plant is located in northeast Lafayette County, Arkansas, approximately two miles east of Stamps, Arkansas. The Couch Plant consists of two gas/petroleum fired units. Unit II (125 MW) operates intermittently throughout the year, but typically only during the summer months to supply power during periods of peak demand. Unit I (30 MW) operates primarily when Unit II undergoes maintenance outages and occasionally during high summer loads. The two sources of water discharged from the plant include low volume wastewater and cooling tower blowdown, which are discharged via two internal outfalls into a mixing pond. The combined effluent then flows into a constructed wetlands treatment system prior to discharge through Outfall 002 under NPDES permit number AR0000493.

Outfall 002 discharges into an unnamed tributary that flows into Lake June. As explained in the technical justification report supporting the site-specific temperature criterion, the receiving waterbody for the Couch Plant discharge can be considered as two somewhat distinct segments. The unnamed tributary begins at Outfall 002, and is a swampy, sluggish stream with a watershed area of 4.1mi^2. The upstream portion of the unnamed tributary has little shading from overstory vegetation, while the downstream portion of the unnamed tributary before it reaches the inflow to Lake June has significant shading from overstory vegetation. Except during periods of high run-off, stream flow is probably composed primarily of plant discharge. Designated uses for the unnamed tributary include: seasonal Gulf Coastal fishery, secondary contact recreation, and domestic, industrial, and agricultural water supply.

Lake June represents the lentic portion of the receiving waterbody and has a watershed area of 6.3 mi^2, including the watershed area of the unnamed tributary. In the vicinity of the lake inflow, the receiving stream transitions from a sluggish lotic system to the shallow swampy backwater of Lake June. The designated uses for Lake June include: fisheries, primary and secondary contact recreation, and domestic, industrial, and agricultural water supply.

III. RATIONALE FOR APPROVAL: Site-specific Temperature Criterion of 95°F (35°C) for Unnamed Tributary to Lake June

In support of a site-specific temperature criterion for the unnamed tributary to Lake June, an in-stream study of the unnamed tributary was conducted which employed chemical (temperature), physical, and biological sampling in order to:

- measure the maximum temperatures in the effluent during July and August weather conditions without the addition of groundwater for cooling;
- measure the temperature change in the discharge as it passes through the wetland treatment system prior to discharging through Outfall 002 and as it passes through the unnamed tributary to Lake June and into Lake June; and,
- survey the habitat and aquatic life (fish and benthic macroinvertebrates) present in the unnamed tributary in order to determine if the seasonal Gulf Coastal fishery use is being supported without the addition of groundwater to the Outfall 002 discharge.

A. Results of Chemical (Temperature) Monitoring

Results of the temperature monitoring during power generation (when heated effluent was being produced as a result of power generation) demonstrated that 67% of temperatures measured at Outfall 002 exceeded 86°F (30°C) without the addition of groundwater. The maximum temperature observed during power generation was 93.6°F (34.2°C). However, even during periods of non-generation, 27% of recorded temperatures exceeded 86°F (30°C), with the maximum Outfall 002 temperature observed as 91.2°F (32.9°C). This result indicates that although Outfall 002 temperatures were affected by generation activities, ambient atmospheric conditions and solar input also caused discharge temperatures to exceed 86°F (30°C) in the absence of power generation.

The Couch Plant discharge is heated because it is used as a cooling fluid. In addition, as mentioned previously, the discharge is stored in open waterbodies (i.e. mixing pond and wetland treatment ponds) prior to discharging through Outfall 002. Heated water stored in these ponds, given sufficient time, will cool to equilibrium conditions. Temperature measurements and analysis conducted during the study demonstrated that the water temperatures in the mixing pond and the wetland prior to discharge were at or near equilibrium with the ambient conditions present at the time of measurement.

Because the treatment pond system at the Couch Plant acted similar to a natural pond system, the discharge temperatures from Outfall 002 were naturally warmer than what would ordinarily be found in a stream system within the Gulf Coastal ecoregion, thereby creating a situation where discharge temperatures to the unnamed tributary even in the absence of power generation exceeded the default Gulf Coastal ecoregion temperature for streams of 86°F (30°C). Further, results of the study showed that Outfall 002 temperatures were comparable to surface water temperatures in upper Lake June.

The temperature regime in the unnamed tributary downstream of the Outfall 002 discharge reflected cooling of the discharge as it approached a new equilibrium determined by ambient meteorological conditions as the discharge passed through shaded portions of the unnamed tributary to Lake June. The smaller volume of water in the unnamed tributary also responded more rapidly to changes in atmospheric conditions than the larger volumes in Lake June or the treatment ponds. Data collected showed that mean and maximum temperatures in upper Lake June were higher than temperatures measured at the lake inflow from the unnamed tributary, demonstrating that temperatures in Lake June are primarily influenced by solar radiation and ambient atmospheric conditions (temperature, humidity, wind) rather than by the temperature regimes of the lake inflow or Outfall 002.

B. Results of Habitat Evaluation and Biological Sampling

No upstream habitat exists above the discharge from the Couch Plant, and the flows originating from the plant are far in excess of those that would be expected given the watershed size of the unnamed tributary. The technical justification report explains that locating a reference stream with similar flows would have required a watershed that was substantially larger than that of the plant's receiving stream and would have had distinctly different channel morphology and physical habitat. This expectation was verified through reconnaissance surveys of surrounding streams. Because a reference stream approach could not be used in this study, interpretation of the fish community data collected was based on ecoregion data.

Macroinvertebrate data was compared with data from summer collections in least disturbed streams in the Gulf Coastal ecoregion reported in Arkansas' *Physical, Chemical, and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas' Ecoregions*[2].

Sampling of the fish community in July, August, and November of 2003 demonstrated the presence of eight species of fish, including two "Key" and three "Indicator" species identified in the Arkansas water quality standards as being present in a typical Gulf Coastal ecoregion. The fish assemblage present in the unnamed tributary was clearly dominated by sunfish. Although no darters and few cyprinids were collected, piscivorous predators were present, indicating the presence of prey species.

The habitat evaluation of the unnamed tributary indicated essentially unimpaired, natural habitat. However, only slow shallow and slow deep depth/velocity regimes were present. In addition, substrate in both reaches was comprised entirely of silt, clay, fine organic matter and detritus. Physical habitat structure was comprised primarily of emergent and submerged vegetation. These findings indicate that, while existing habitat was of good quality, the diversity of habitat types was limited. Because the number of fish species present is a reflection of the diversity of habitat, a seasonal Gulf Coastal fishery appeared to be adequately represented given the limited diversity of habitat types present in the sampling reaches.

Macroinvertebrate sampling conducted in July, August, and November of 2003 revealed a total of 31 invertebrate taxa (not including gastropods and oligochaetes) from the unnamed tributary. Coleoptera, Diptera, Hemiptera, and Odonata dominated the samples, making up two-thirds of the total taxa and numbers of invertebrates identified. The families representing these orders are known to inhabit primarily heavily vegetated lentic habitats and/or vegetated areas of quiescent, sluggish streams. The taxonomic composition of the benthic invertebrate community in the unnamed tributary to Lake June was consistent with the type of habitat present and showed a level of richness (number of taxa) that overlapped that found in least disturbed streams in the Gulf Coastal ecoregion.

C. Protection of Designated Uses in the Unnamed Tributary to Lake June

As mentioned previously, designated uses for the unnamed tributary to Lake June include: seasonal Gulf Coastal fishery, secondary contact recreation, and domestic, industrial, and agricultural water supply. The supporting documentation provided for the development of the site-specific temperature criterion for the unnamed tributary demonstrated that the designated seasonal Gulf Coastal fishery use is an existing use given the limited diversity of habitat types present in the study's sampling reaches. Benthic macroinvertebrate taxonomic richness was comparable to least disturbed streams. These findings indicate that the unnamed tributary to Lake June is suitable for the propagation of fish and other forms of aquatic life and is attaining its designated aquatic life use in the presence of temperature exceedances at Outfall 002.

No change in the secondary contact recreation designated use for the unnamed tributary is being proposed, and it is unlikely that this use would be affected by the proposed site-specific temperature criterion of 95°F (35°C). Use of the unnamed tributary for secondary contact

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[2]ADPC&E. 1987. *Physical, Chemical, and Biological Characteristics of Least-Disturbed Reference Streams in Arkansas' Ecoregions.* Arkansas Department of Pollution Control and Ecology. Little Rock, Arkansas.

activities is limited due to difficult access. Access to the uppermost portion of the unnamed tributary must be gained through locked Entergy Arkansas, Inc. property. Access to other portions is made extremely difficult by the presence of dense vegetation and the lack of roads or trails. As explained in the technical justification report, although conversations with local residents did not indicate that the unnamed tributary was used for secondary contact and no evidence of use (litter, discarded fishing supplies) was observed by field sampling personnel, the designated secondary contact recreational use in the unnamed tributary to Lake June is attainable.

No changes in the domestic, industrial, or agricultural water supply designated uses for the unnamed tributary are being proposed, and it is unlikely that these uses would be affected by the proposed site-specific temperature criterion of 95°F (35°C). The supporting documentation states that no water intake structures or pump inlets were noted by sampling personnel during visits to the site. In regards to the agricultural water supply designation, the steep banks along the unnamed tributary and the very soft substrate of this waterbody indicate that the unnamed tributary to Lake June may be unsuitable for livestock watering. Further, a fence along the lower unnamed tributary to Lake June helps to prevent access by livestock.

D. Protection of Designated Uses in Downstream Lake June

The designated uses for downstream Lake June include: fisheries, primary and secondary contact recreation, and domestic, industrial, and agricultural water supply. Information provided in the supporting documentation demonstrates that the fishery use in Lake June is an existing, unimpaired use. Further, as outlined below, temperature exceedances at Outfall 002 are not likely to affect the fishery use, contact recreation uses, or domestic, industrial, and agricultural water supply uses in Lake June.

The technical justification report showed that surface temperatures measured in upper Lake June during July and August illustrate diel temperature fluctuations normally expected in surface waters of lakes during the summer months. Data collected showed that mean and maximum temperatures in upper Lake June were higher than temperatures measured at the lake inflow from the unnamed tributary, demonstrating that temperatures in Lake June are primarily influenced by solar radiation and ambient atmospheric conditions (temperature, humidity, wind) rather than by the temperature regimes of the lake inflow or Outfall 002.

E. Derivation and Justification of the Site-specific Temperature Criterion

The proposed site-specific temperature criterion for the unnamed tributary is a maximum of 95°F (35°C). This value is based on facility records and *in situ* monitoring during 2003 and is equal to the maximum temperature attained at Outfall 002 during 2001 through 2003 rounded up to the nearest whole Celsius degree. The approval of this site-specific criterion is justified by the following findings of the in-stream study of the unnamed tributary to Lake June:

- The temperature regime in the treatment pond system is at or near equilibrium with ambient conditions and acts as a natural pond system. The resulting temperature regime at Outfall 002 is similar to the surface temperature regime in Lake June.

- A diverse aquatic community is present in the unnamed tributary even during power generation without the addition of groundwater, and all designated uses are attained at the proposed temperature criterion.

- The temperature regime of Lake June is unaffected by the temperature regime of Outfall 002, thereby protecting downstream uses.

IV. RATIONALE FOR DISAPPROVAL: Proposal to remove the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C).

As part of the proposal to establish a site-specific temperature criterion for the unnamed tributary to Lake June, a proposal was also included to remove the sentence at Regulation 2.502 which states that, "Heat shall not be added to any waterbody in excess of the amount that will elevate the natural temperature, outside the mixing zone, by more than 5°F (2.8°C) based upon the monthly average of the maximum daily temperatures measured at mid-depth or three feet (whichever is less) in streams, lakes or reservoirs." The basis for the request to remove the delta 5°F limitation was that applying the limitation was problematic because Outfall 002 is the headwater flow for the Lake June watershed, and therefore, it is difficult to determine the "natural temperature" for the unnamed tributary.

However, Sections 5.1 and 5.2 of the technical justification report, described an approach used to determine the appropriate "natural temperature" for the Couch Plant discharge, as well as an analysis conducted to determine how much Outfall 002 temperatures under the influence of heated water from generation deviate from natural ambient temperatures throughout the year.

As described previously, the Couch Plant discharge passes through a treatment pond system (i.e., mixing pond and wetland) prior to being discharged through Outfall 002. Temperature measurements and analysis conducted during the study demonstrated that the water temperatures in the mixing pond and the wetland prior to discharge were at or near equilibrium with the ambient conditions present at the time of measurement. The resulting equilibrium temperatures in the pond system as indicated by Outfall 002 temperatures are similar to Lake June conditions. Because the discharge water is held in a pond system, the temperature of the discharge water will naturally be warmer than that found in stream systems. Therefore, as the technical justification report explains, the appropriate "natural temperature" for the discharge from Outfall 002 is the ambient equilibrium temperature attained in the pond.

Following the methods and equations for calculating equilibrium temperature and rates of heat exchange in Edinger et al. (1974)[3], the equilibrium water temperatures for each month due to ambient heating and cooling were calculated. Discharge water temperatures, with and without heated water from generation were calculated for both high and low ambient temperature scenarios. Under each scenario the expected Outfall 002 temperature was calculated considering residence time in the ponds, the inflow temperature and cooling due to surface heat exchange. The results indicated that Outfall 002 temperatures are very near equilibrium or natural ambient temperature as calculated above. The expected difference between equilibrium temperatures and Outfall 002 temperatures is less than 5°F (2.8°C) (predicted differences ranged from 0.2 to 3.8°F (0 to 2°C)). In other words, because the effluent has

[3]Edinger, J.E., D.K. Brady, and J.C. Geyer. 1974. *Heat Exchange and Transport in the Environment.* Electric Power Research duet. EPRI Publish No. 74-049-00-3. 125pp.

sufficient retention time in the ponds to reach equilibrium with ambient conditions, the discharge from Outfall 002 it is not expected to exceed the "natural temperature" by more than 5°F (2.8°C). The Couch Plant typically operates only during the summer months. However, the modeling results were obtained for all months of the year and are applicable to discharges from the Couch Plant during cold months if the plant were to be operated during the winter.

The purpose for the delta 5°F limitation is to ensure that the fishery in the unnamed tributary to Lake June is not subjected to wide temperature fluctuations, which would potentially stress the aquatic community. Since Entergy may occasionally discharge during winter months, it would be necessary to protect the aquatic life in the unnamed tributary from any wide temperature fluctuations that might occur. Therefore, it would be necessary to ensure that the delta 5°F limitation is not removed for this waterbody, without justification that the fish in this stream are able to tolerate changes greater than 5°F from the natural temperature. Further, the modeling results described above and provided in the technical justification report indicate that the expected difference between equilibrium temperatures in the unnamed tributary to Lake June and Outfall 002 temperatures would be less than 5°F (2.8°C). Therefore, EPA does not believe that removal of the delta 5°F limitation is supported.

V. ACTION

A. Approval

Based upon the rationale provided above, EPA believes the site-specific temperature criterion of 95°F (35°C) is scientifically defensible and sufficient to protect the designated uses in the unnamed tributary to Lake June and in the downstream waterbody (Lake June). For these reasons, EPA approves the site-specific temperature criterion of 95°F (35°C) for the unnamed tributary to Lake June from Entergy Arkansas Inc.'s Outfall 002 discharge to the confluence with Lake June.

B. Disapproval

Based upon the rationale provided above, EPA disapproves the proposal to remove the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C). Under 40 CFR §131.21(c), new and revised standards do not go into effect for CWA purposes until approved by EPA. Therefore, the sentence at Regulation 2.502 which prohibits the elevation of the natural temperature, outside the mixing zone, by more than 5°F (2.8°C), will continue to apply to the unnamed tributary to Lake June. The following language found on page A-33 in Appendix A of the Arkansas surface water quality standards (Regulation No. 2) under the section titled "Variations Supported by UAA" should be removed at the time of the State's next interim or triennial revision: "(limitation of 5 degrees above natural temperature does not apply)."