



13 September 2023

U. S. Army Corps of Engineers
Nashville District
P. O. Box 1070 (PMP)
Nashville, Tennessee 37202-1070

Tennessee Council of Trout Unlimited Comments on Center Hill Dam Water Control Manual Revision Environmental Assessment and Finding of No Significant Impact

The Tennessee Council of Trout Unlimited (TCTU) is pleased, on behalf of our 3011 members, to provide the U.S. Army Corps of Engineers (USACE) the attached comments on the “*Draft Environmental Assessment, 1998 Water Control Manual Revision, Center Hill Dam and Reservoir*” dated 31 July 2023 (hereafter simply “EA”), and the associated *Draft Finding of No Significant Impact* (hereafter “FONSI”).

The Attachment to this letter documents 22 deficiencies and defects in the EA. Our comments demonstrate the EA is compromised by internal inconsistencies, unsupportable presuppositions, questionable assumptions, unproven assertions, systematic biases, opaque and/or erroneous methodologies, and pervasive unquantified uncertainties. These flaws collectively disqualify the EA as a credible basis for a Center Hill Dam water control decision and FONSI. Thus, TCTU is reluctant to endorse any specific Alternative evaluated in the EA. However, it is our view that any water control Alternative that is adopted must include a continuous minimum flow and that USACE should immediately reopen the orifice gate that has been successfully employed for that purpose. Beyond this immediate action, the USACE should either (1) withdraw the EA and FONSI, address each of the flaws identified in the Attachment to this letter, and re-issue a modified EA and FONSI for public comment; or (2) execute the option provided in the National Environmental Policy Act (NEPA) to pursue a full Environmental Impact Statement (EIS) when, in cases such as this, the EA results indicate significant environmental impacts are likely to occur from the proposed Federal action.

Sincerely,

Ryan Turgeon,
Council Chair

ATTACHMENT

TENNESSEE COUNCIL TROUT UNLIMITED

Comments on Draft Environmental Assessment, 1998 Water Control Manual Revision, Center Hill Dam and Reservoir (dated 31 July 2023) and associated Draft Finding of No Significant Impact

13 September 2023

PREDICATES FOR COMMENTS

TCTU observes the following facts as predicates for the comments that follow:

- High dissolved oxygen levels and low water temperatures are, along with continuously wetted stream beds, essential enablers of healthy coldwater ecosystems and fisheries – and the economic benefits local communities derive from healthy riverine environments.
- After establishing a coldwater ecosystem in the Caney Fork River by virtue of building Center Hill Dam, the USACE has for decades habitually failed to meet applicable water quality standards (particularly a Dissolved Oxygen or “DO” concentration of 6.0 mg/L) [*Rules of the Tennessee Department of Environment and Conservation, Chapter 0400-40-03, General Water Quality Criteria*], and has failed to provide the minimum flows required to enable the Caney Fork River coldwater ecosystem to thrive.
- The only authorized purpose of Center Hill Dam in the original enabling project legislation [*Flood Control Act of 1938, P. L. 75-7861*] was flood control on the Cumberland River. All other authorized purposes (hydropower production, recreation, water supply, fish and wildlife conservation, and water quality) are later additions under various Federal legislative acts (EA, p. 4-5) that declared those project purposes to be equally valid. This fact is fully acknowledged in the “*Memorandum of Understanding (Operating Agreement) Between Corps of Engineers, U.S. Army, Tennessee Valley Authority, and Southeastern Power Administration, Department of Energy, with Respect to Operations of the Cumberland System Projects*” (1984) which states “*The Corps may through modification of power generation schedules take into account water quality conditions downstream of all Cumberland Basin Projects*” (Section 9, p.7) and “*Scheduling of power generation will take into consideration the effects, as determined by the Corps, on authorized purposes and secondary purposes in accordance with applicable requirements.*” (Section 11, p. 8) Nothing in subsequent USACE-TVA-SEPA agreements has rescinded USACE’s authority to exercise this flexibility.

- The Center Hill Dam does not exist in isolation; it is one dam in a fleet of ten dams USACE operates in the Cumberland River Basin to achieve collective fleet goals in areas such as flood control, hydropower production, etc. The reality of this “1 in 10” system topology provides USACE the flexibility, if it chooses to exercise it, to achieve Tennessee State water quality standards, and to provide essential continuous minimum flows from Center Hill Dam, without compromising USACE’s overall Cumberland Basin fleet operating goals and objectives. As noted above, USACE’s agreements with the Tennessee Valley Authority and the Southeastern Power Administration acknowledge this reality.

SPECIFIC COMMENTS AND RECOMMENDED ACTIONS

TCTU’S specific comments follow. Each comment and its associated recommended resolution (in boxed text) is assigned a unique identifier number to facilitate further discussion of the comments and to ensure accountability for resolution of the comments and requested actions in the final Center Hill Dam Water Control Manual Revision NEPA documentation.

TCTU-01: The EA exhibits heavy reliance on modeling and simulation while presenting little historical information and data regarding the observed consequences of Center Hill Dam water control strategies on the Caney Fork River. The EA briefly discusses (EA, p. 17) the fact that some historical data exists that connects Caney Fork River environmental and hydrological parameters to Center Hill Dam water control actions. However, the EA is devoid of a useful analysis of the history of Center Hill Dam operations and impact of Center Hill Dam water control policies on water quality metrics, weighted usable areas, habitat availability, recreational accessibility, etc. (Comment TCTU-2 is an illustration of the value of correlation of observational data and water control actions.) USACE has operated Center Hill Dam for over 70 years. The USACE has a stewardship responsibility to monitor, understand, and respond to the consequences of its Center Hill Dam water control policies. History and historical data matter. Where’s the data? What does the absence of data indicate regarding the USACE’s execution of its environmental stewardship responsibilities to the tailwaters and communities downstream of Center Hill Dam? Furthermore, data collected since 2019 by TU/TWRA’s instream data loggers strongly suggest the effect of Center Hill Dam sluice operation on Caney Fork River dissolved oxygen concentration is inadequately captured by USACE’s limited instream sensor network. Put simply, USACE’s lack of investment in the instrumentation necessary to understand the impact of its operations on Caney Fork River water quality is indefensible.

TCTU-R01a:

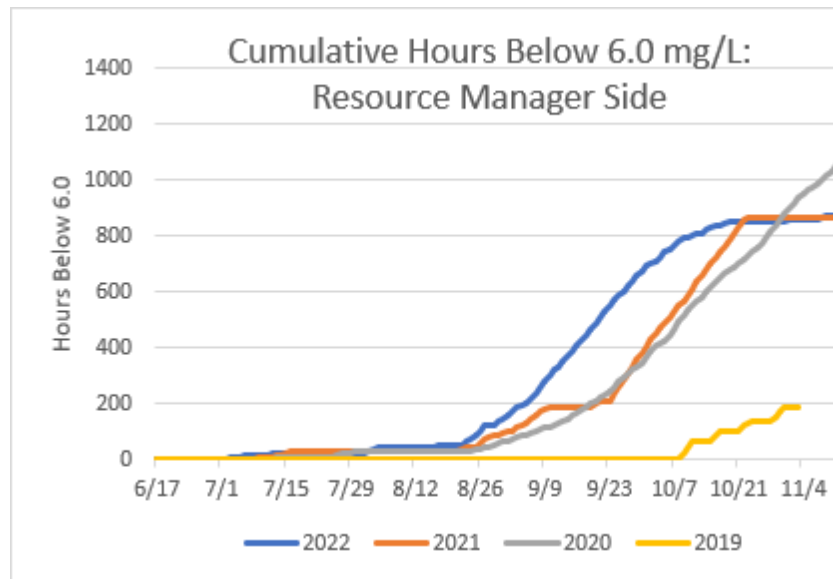
TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that contains a detailed discussion of available Caney Fork River observational data for key water quality and habitability parameters (such as water temperature, dissolved oxygen, water velocity, wetted area and perimeter, etc.) along with an assessment, based on this data, of how specific Center Hill Dam water control procedures and proposed Alternatives impact water quality and coldwater ecosystem viability below the Center Hill Dam.

TCTU-R01b:

TCTU requests the USACE install a network of instream water quality data loggers (specifically Temperature and Dissolved Oxygen) at several points in the river between Center Hill Dam (at discharge points on both sides of the river) and Betty's Island. The data from such a sensor network will be essential for understanding the impact of Center Hill Dam water control operations on Caney Fork River water quality regardless of the water control Alternative ultimately selected.

TCTU-02: USACE's recommended Alternative 4 will assure Center Hill Dam operations continue to inflict cumulating damage on the Caney Fork River ecosystem. Oxygen is essential to aerobic microbes, aquatic plants, fish and animals. The necessity of maintaining dissolved oxygen (DO) concentrations at or above 6.0 mg/L is well established for coldwater ecosystems and habitats. The EA states Alternative 4 *"is consistent with the operational conditions since 2021"*. (EA, p. i) Figures 1 and 2 and Table 1 and 2 below, depict and summarize Caney Fork River dissolved oxygen (DO) data collected during the same 53-day period in 2019, 2020, 2021, and 2022. The data was collected with instruments supplied by Trout Unlimited and monitored/analyzed by The Tennessee Wildlife Resources Agency (TWRA). The 2021-2022 data clearly demonstrate the inability of Alternative 4 and aerated turbines alone, to meet minimum acceptable DO concentrations in the Caney Fork River from late August to late October of each year. Additionally, the EA (p. 32-33) states when referring to the current water control procedures know as Alternative 4 in the EA, *"Within a 48-hour window, an 8-hour pulse shows flows in the 200-750 cfs range 6.3 percent of the time just below the dam and 37.5 percent at Lancaster Hwy. By the time the pulse gets to Happy Hollow, the period that flows are in the ideal range increases to 62.5 percent."* Eighty percent of the recreational use of the river occurs in the first five miles below the dam (i.e., in the section above Happy Hollow boat ramp).

Figure 1. Caney Fork River Cumulative Hours Below DO = 6.0 mg/L (Resource Manager side)
 Ref: Spaulding, Justin, unpublished data, Tennessee Wildlife Resources Agency (2023)



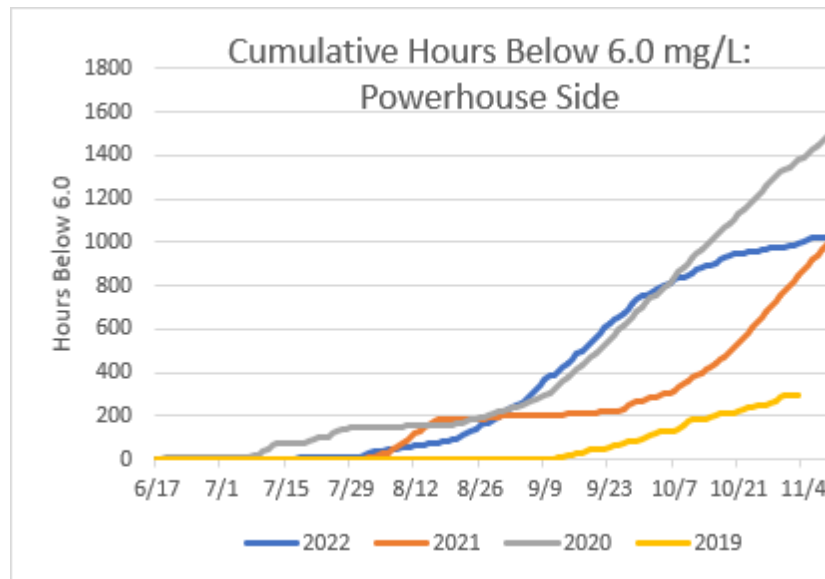
*53-day Observational period between 13 September – 4 November

Table 1. Caney Fork River Hours Below DO = 6.0 mg/L (Resource Manager side)*
 Ref: Spaulding, Justin, unpublished data, Tennessee Wildlife Resources Agency (2023)

Year	Total Hours Dissolved Oxygen (DO) < 6.0 mg/L	% Time Dissolved Oxygen (DO) < 6.0 mg/L
2022	794	62
2021	903	69
2020	873	69
2019	298	23

*53-day Observational period between 13 September – 4 November

Figure 2. Caney Fork River Cumulative Hours Below DO = 6.0 mg/L (Powerhouse side) *
 Ref: Spaulding, Justin, unpublished data, Tennessee Wildlife Resources Agency (2023)



*53-day Observational period between 13 September – 4 November

Table 2. Caney Fork River Hours Below DO = 6.0 mg/L (Powerhouse side)*
 Ref: Spaulding, Justin, unpublished data, Tennessee Wildlife Resources Agency (2023)

Year	Total Hours Dissolved Oxygen (DO) < 6.0 mg/L	% Time Dissolved Oxygen (DO) < 6.0 mg/L
2022	508	40
2021	442	35
2020	623	49
2019	93	7

*53-day Observational period between 13 September – 4 November

TCTU-R02:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that openly acknowledges and appropriately weights the observed unacceptable impacts of Alternative 4 on Caney Fork River water quality.

TCTU-03: The EA relies heavily on simulation methodologies for quantification of evaluation criteria without demonstrating the accuracy of the methods for the specific analyses conducted in the EA. The EA makes extensive use of HEC-ResSim and HEC-RAS software packages for prediction of hydrological parameters such as headwater pool elevation, hydropower impact, wadeability, and Caney Fork wetted perimeter. These software tools are widely used and well regarded. However, software tools and user-configured input models such as HEC-ResSim and HEC-RAS must be calibrated and validated for each specific river system, exact locations in the river, and specific flow regimes to which they are applied. This calibration, benchmarking, and validation must be done individually for every state variable or metric predicted by the software/model. Software validation is a context-sensitive exercise. These models must be benchmarked against actual location- and flow regime-specific data in order for the precision, uncertainty, and biases of their predictions to be known. The EA makes no pretense of providing this validation basis for the Caney Fork River and the specific water control Alternatives evaluated in the EA. Rather the EA states (Appendix A, page 13) *“This model did not need to be calibrated before it was used in this analysis since it had already gone through multiple levels of review for the 2019 study. The calibration of the HEC-RAS model consisted of comparing the flow and elevation output from the model to the observed flow and elevations at specific locations on the Caney Fork River. This is an iterative process to fine tune (sic) the model parameter until the modeled and observed results begin to mirror each other.”* **Validation by assertion is not an acceptable scientific method.** From a technical perspective, it is not possible for a reviewer of the EA to assess the extent to which the cited 2019 validation exercise is applicable for simulation of the Alternatives, locations, and metrics for which it is applied in the EA. While the absence of this validation basis does not, a priori, support a contention that the analyses conducted with the software and input models are incorrect, the absence of the validation basis absolutely denies USACE the scientific and technical basis to assert the analyses conducted with the models are valid. Given USACE’s assertion that the 2019 validation exercise is applicable to the EA exercise, USACE must present the documentation on the 2019 exercise along with a technical basis for justifying their claim the 2019 validation exercise is applicable and sufficient for the simulations conducted for the EA.

TCTU-R03:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that eliminates this serious methodological flaw in the EA by providing the validation case for the HEC-ResSim and HEC-RAS models for the Alternatives employed in the EA.

TCTU-04: It is impossible to discern the computational uncertainties in the HEC-ResSim and HEC-RAS calculations. It is impossible to discern the uncertainty in the resultant predictions (for parameters such as hydropower production, wetted stream perimeter, etc.) for the Caney Fork River and whether small differences (a few percent) in predicted parameters are even meaningful. **This shortcoming is one of the most glaring technical deficiencies in the EA. THE IMPORTANCE OF THIS ISSUE CANNOT BE OVERSTATED: A MODELING UNCERTAINTY OF LESS THAN 10% IN KEY PARAMETERS WOULD HAVE A PROFOUND IMPACT ON THE EA SCREENING RESULTS AND THE CONCLUSIONS OF THE EA ANALYSIS.**

TCTU-R04

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that includes a quantitative assessment of the uncertainties and error bands for each parameter estimated with HEC-ResSim and HEC-RAS.

TCTU-05: The EA falsely asserts that HEC-RAS software does not model water quality and then adopts opaque and undocumented water quality evaluation methodologies that are not open to scrutiny and independent review. The EA states: (Appendix A, p. 2) that “*HEC-RAS model cannot simulate a water quality analysis, so this report will not examine water quality impacts*” and (Appendix A, p. 17) “*ResSim and RAS do not currently have water quality modeling capabilities.*” These statements are false. The USACE Hydrological Engineering Center states the following regarding the water quality modeling capability of HEC-RAS: “*The currently available water quality constituents are: Dissolved Nitrogen (NO₃-N, NO₂-N, NH₄-N, and Org-N); Dissolved Phosphorus (PO₄-P and Org-P); Algae; Dissolved Oxygen (DO); and Carbonaceous Biological Oxygen Demand (CBOD).*” (See <https://www.hec.usace.army.mil/software/waterquality/modules.aspx> and <https://www.hec.usace.army.mil/software/hec-ras/features.aspx#Quality>). The EA fails to provide a technical justification for why HEC-RAS’s water quality simulation capability is not employed. Instead, the EA reverts to highly qualitative, subjective, and opaque methods for assessing water quality issues when they are explicitly addressed.

TCTU-R05:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that explains why USACE chose not to utilize HEC-RAS’s water quality modeling capabilities and that provides a detailed technical discussion of how USACE utilized data produced by TWRA and Trout Unlimited to provide credible estimates of the impacts of each Alternative on Caney Fork River water quality.

TCTU-06: Simulation models and methods utilized in the EA are incapable of accounting for “real-life flexibility” of the Water Control Manager to adapt to changing externalities. EA notes (EA p. 49), “...*real-life flexibility is something that the modeling cannot capture and may be able to mitigate some of the adverse effects of a continuous minimum flow on potential hydropower production.*” But the EA analyses do not reflect this fundamental truth. This shortcoming is the “elephant in the room” with respect to the validity of virtually every simulation of the Center Hill Reservoir and Caney Fork River’s responses to various water control alternatives. More sophisticated Monte Carlo based analysis methods might be able to address this shortcoming in USACE’s simulation methods. Given the prominence the EA places on “Flexibility”, this possibility should be explored.

TCTU-R06:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that re-evaluates Alternatives to better incorporate likely impacts of “real-life” flexibility of Center Hill’s Water Control Management to adapt to evolving circumstances without placing hydropower production goals at risk.

TCTU-07: The “Flexibility” sub-criterion employed in the evaluation of Alternative “Effectiveness and Efficiency” (EA, p. 11) is an imaginary discriminator that should be eliminated from consideration. The EA defines “Flexibility” as the “*Ability to alter Water Management operations as needed to react to changing environmental conditions, including reservoir elevations.*” (EA, p. 11) The EA asserts (without presenting any analytical support) that some water control alternatives intrinsically embody more “Flexibility” than others. This assertion is patently false, given the definition of “Flexibility” employed in the EA. The reality is that unless the structure of Center Hill Dam is physically modified (i.e., the number of sluice gates changed, the sluice orifice gate removed, or the number of generators

changed) the Center Hill Dam Water Control Manager ALWAYS has this “flexibility” regardless of the Alternative under consideration. Having made this false assertion, the EA proceeds to apply the imagined “flexibility” credit in a highly selective and biased manner that favors some Alternatives (typically those that involve greater hydropower production) with more “flexibility” than others. The word “*flexibility*” occurs no less than twenty times in the EA and EA Appendices, while the terms “*discretion*” or “*discretionary*” collectively occur another ten times). The critical point to be made here is that contrary to assertions made in the EA, “flexibility” does not favor any Alternative. The Flexibility sub-criterion should be eliminated from use and the EA analysis of Alternatives should be repeated.

TCTU-R07:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that provides a detailed explanation of the ability USACE has, by accessing the flexibility that Water Control Managers at Center Hill Dam and USACE’s other dams in the Cumberland River Basin fleet have, to overcome small deficits in individual dam performance relative to target goals and explains why such flexibilities aren’t reflected in USACE’s imposition of “hard and fast” screening criteria.

TCTU-08: The EA’s use of expert elicitation process for ranking the nine Alternatives that passed the original screening is so poorly documented as to give reason to question the outcome of the ranking process. Expert elicitation is an accepted method for evaluation of complex multidisciplinary issues. However, expert elicitation is an art as well as a science. The manner in which the exercise is conducted can influence the results. The description of expert elicitation process (EA Appendix A, p. 30-31 and Table 17) employed for ranking of Alternatives 1, 4, 8, 9,10,17, 17B, 21, and 22) is so poorly documented as to rob the analysis of the transparency required to discern the credibility of the results. Table 17 indicates that the standard deviations of the ratings for Alternatives 8, 9, 10, and 17 are high – revealing significant disagreement amount the subject matter experts (SMEs) who participated in the ranking exercise. The EA should, in such cases describe the reasons the SMEs’ evaluations differed as they did. What was the basis of the disagreements? Details such as the number of SMEs, the specific expertise of each SME, the instructions given to the SME panel, and the manner in which the SME polling is conducted can and do influence the outcomes of such exercises. None of this information is provided in the EA. The process is a “black box” with respect to the ability of an outside party to discern the credibility of the results.

TCTU-R08:

Given the dominant importance of this specific ranking exercise on the outcome of the EA, *TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that contains a clear and detailed account of the various expert elicitation exercises employed during the course of the EA and addresses the issues highlighted in this comment.*

TCTU-09: The repeated superposition of hydropower (i.e., energy) production of 351,000

MWh/year as the project objective of highest priority above all others is a systemic flaw in the EA. The EA repeatedly uses this invalid hydropower production criterion to eliminate Alternatives that score well on other evaluation criteria, but are estimated to generate less electrical energy on an annual basis. The use of this invalid hydropower criterion is so heavy-handed as to appear in multiple places in the EA to have been backfitted to the text of the EA after the original text was written. This prioritization of hydropower production over all other authorized project objectives cannot be justified based on Federal legislation or based on Center Hill Dam operating history. As noted above, hydropower production was not even an original authorized project objective. Hydropower production at Center Hill Dam is “an” authorized purpose of the project – not “the” authorized purpose. For example, the EA acknowledges (EA, p. 25) “*The Federal Water Project Recreational Act of 1965 (PL 89-72) established development of the recreational potential of Federal water resource projects as a full project purpose.*” TCTU is unaware of any federal legislation that mandates or advocates USACE’s prioritization of hydropower production over environmental stewardship, or other federally authorized project objectives of flood control, recreation, water supply, and fish and wildlife conservation.

TCTU-R09:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that that removes the EA’s unjustified bias towards electricity production. If USACE insists on maintaining an annual energy production goal as an Alternative screening criterion, TCTU requests the revised EA contain a reasoned analysis of what that electricity generation criteria should be given that the USACE has only met the 351,000 MWh goal 36% of the time over the past 25 years.

TCTU-10: The EA’s treatment of any fixed annual energy production from Center Hill Dam as an absolute “must meet” is inconsistent with the manner in which USACE operates its fleet of dams in the Cumberland River Basin. The EA (Appendix A, p. 15) states, *“The LRN projects within the Cumberland River Basin generate hydropower to meet a weekly system requirement. This means that all eight (does not include Laurel) of the projects’ hydropower total are added together to meet a minimum system MWh total each week... This makes determining a hydropower contribution from one specific project complicated since one or more projects may have the available storage to carry the majority of the hydropower load for that week... it is rare for the LRN projects to not meet the specified weekly minimums... There has and will be years where the annual hydropower production at Center Hill Dam will not meet the 351,000 MWh specification.”* (Indeed, as previously noted, Center Hill Dam has only met this 351,000 MWh annual energy production in 9 of the past 25 years.) The point is, small differences in annual hydropower production at Center Hill dam are routinely offset by operating flexibility at sister dams in the Cumberland River Basin. This fact is explicitly acknowledged in USACE’s 2008 *Record of Decision on Changes to Center Hill Lake Elevations*, which states,

“Lost hydropower at Center Hill may be compensated by storing additional water in other tributary projects for later hydropower releases in an attempt to maintain no net loss of hydropower.” (2008 ROD, p. 9)

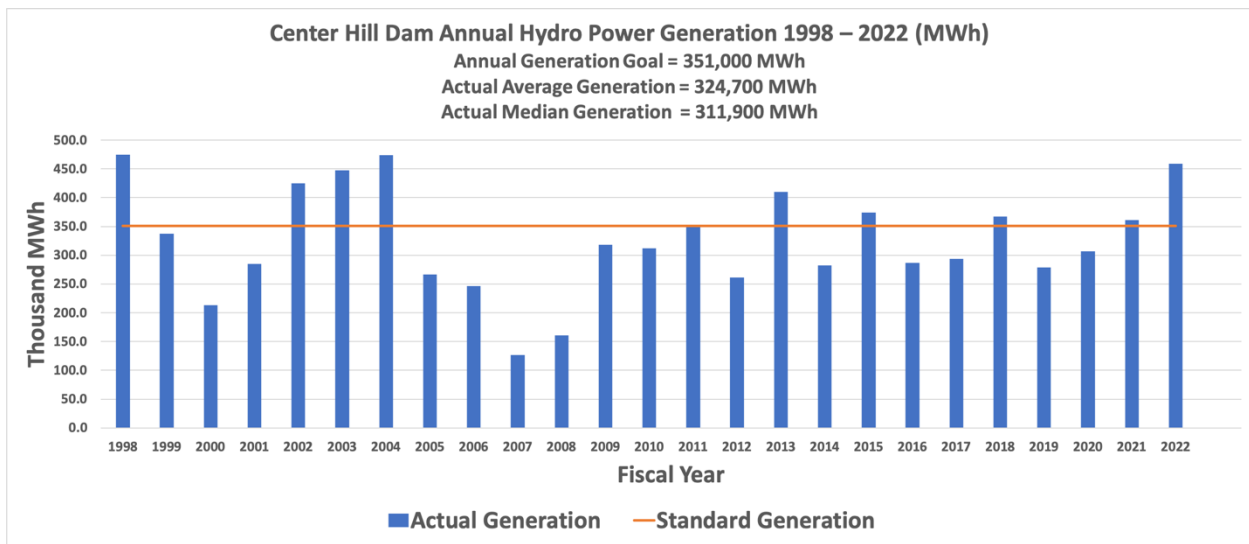
There is no basis in fact for penalizing Alternatives that involve small estimated deficits in energy production at one dam (even if the estimates are credible) because USACE operates their fleet of dams as a system.

TCTU-R10:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that includes a quantitative analysis of why USACE cannot utilize the fleet-level flexibility of its 10-dam Cumberland River Basin dam system to offset any Center Hill Dam electricity generation deficits that are required to meet Tennessee State water quality standards in the Caney Fork River.

TCTU-11: USACE’s insistence that an Alternative meet the 351,000 MWh energy production metric is illogical and unjustifiable given Center Hill Dam has only achieved this hydropower production quota 9 times over the past 25 years. The USACE obviously does not and has not historically been able to enforce this criterion. Figure 3 depicts Center Hill Dam’s actual annual energy generation from 1998 through 2022 (25 years). During this most recent twenty-five year period, Center Hill Dam has only achieved USACE’s 351,000 MWh generation quota nine times (36% of the time). Indeed, the dam’s *average* annual generation during this period was only 324,700 MWh. Its *median* (meaning half of the time its generation was below this level and half of the time it was above this level) annual generation during this 25-year period was only 311,900 MWh. Thus, USACE’s own Center Hill Dam generating history data is proof positive the USACE DOES NOT AND CANNOT actually prioritize an annual energy production of 351,000 MWh in Center Hill Dam. The superposition of this unrealistic energy production criterion over all other evaluation criteria subjugates attainment of essential environmental and economic objectives to the pursuit of an objective that history demonstrates is only attainable ~ 36% of the time.

Figure 3. Center Hill Dam Annual Electricity Generation 1998-2022
(Source Data: USACE)



TCTU-R11:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that includes a justification for USACE’s insistence that Alternatives meet a 351,000 MWh/year hydropower production quota that Center Hill Dam has failed to meet two-thirds of the time over the past twenty-five years.

TCTU-12: The EA fails to demonstrate that small differences in estimated hydropower generation values are real (see TCTU-02, 03, 04, 05, and 06), yet uses such small differences to reject many Alternatives. The absence of information concerning the uncertainty in predictions for hydropower production is particularly troubling, when it is realized that differences in estimated annual hydropower production of only 0.4 to 6.3% (compared to the base of 351,000 MWh) are utilized in Appendix A to eliminate six of the original twenty-two Alternatives. Such small differences, even if real, might easily be mitigated by the Center Hill Water Control Manager’s exercise of the “**flexibility**” and “**discretion**” they have under any Alternative to adopt variant reservoir pool management practices. The 2021 Southeastern Power Administration (SEPA) annual report notes that the total energy production from USACE’s Cumberland Basin hydro fleet was 3,069,581 MWh. Thus, even a 10% shortfall in Center Hill Dam’s 351,000 MWh quote (i.e., 35,100 MWh) is only 1.1% of USACE’s total annual Cumberland River Basin hydro fleet energy production. The EA’s refusal to acknowledge that such small Center Hill Dam energy production deficits can be offset by adjusting operations in other Cumberland River Basin dams is not credible. *The insistence on eliminating Alternatives that are predicted (with no uncertainty analysis or computational error bars) to fall short of this 351,000 MWh metric by even tiny amounts cannot be defended on logical or technical grounds.*

TCTU-R12:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that includes a quantitative assessment of the justification for elimination of Alternatives based on small estimated differences in hydropower energy production, along with a quantitative assessment of the extent to which USACE can, by adjusting operations at its other dams, mitigate small anticipated energy production losses at any one dam in the system (and at Center Hill dam in particular).

TCTU-13: The EA embodies a pervasive disregard for Tennessee State Water Quality Standards – standards that are directly traceable to the U.S. Federal Clean Water Act. The EA document repeatedly demonstrates USACE’s lack of concern for and unwillingness to comply with Tennessee Water Quality Standards. The Caney Fork River below Center Hill Dam is a habitual entry in Tennessee’s “303d” list of impaired waters due to low dissolved oxygen, high temperature, and flow regime modification. All three of these causal factors are direct artifacts of USACE’s operation of Center Hill Dam and the water control strategy implemented there. The EA relegates compliance with Tennessee’s Water Quality Standards to the lowest importance of factors considered in the analysis. Indeed, Tennessee’s water quality standards are treated as factors to be considered only when they do not conflict with any other consideration. This mindset is repeatedly confirmed via use of language in the EA such as:

- *“To the maximum extent practicable, while fulfilling authorized project purposes, attain tailwater temperatures and dissolved oxygen levels that are consistent with state water quality standards” (EA, p. 4).*
- *“The sluice gates (including the sluice gate retrofitted with an orifice gate) would primarily be used for the purpose of flood risk management but could also be used, when deemed necessary by LRN Water Management, to improve water quality to the maximum extent practicable while fulfilling the authorized project purposes. Supplemental (non-flood risk management) flow through sluice gates would only occur as necessary to help target state water quality standards during time where their use would not limit USACE’s ability to meet authorized project purposes.” (EA, p. 13-14)*
- *“Historically, during late summer and fall months, temperature and dissolved oxygen (DO) levels in the tailwater generally do not meet the Tennessee Department of Environmental and Conservation (TDEC) water quality standards for cold-water aquatic habitat. Adequate temperature and DO levels are vital to maintain the quality of the cold-water fishery in the Caney Fork River below the Center Hill Dam.” (EA, p. 24)*

TCTU notes the term “*maximum extent practicable*” has no consensus technical definition, is not objectively measurable, and is subject to such broad and conflicting interpretations as to render the term meaningless for Alternative assessment purposes. While first acknowledging that achievement of Tennessee’s water quality standards is “*vital*” for

maintenance of a “quality” coldwater fishery in the Caney Fork River, the EA, on the same page and repeated thereafter, glosses over three important realities:

- achievement of acceptable water quality standards in Caney Fork River is an authorized Center Hill Dam project objective
- Tennessee’s water quality standards are directly traceable to the Federal Clean Water Act, and
- the USACE has a seventy-year history of inflicting significant adverse environmental impacts on Caney Fork River ecosystems by virtue of habitual failure to meet reasonable minimum flow and water quality standards in the Caney Fork River below Center Hill Dam. The cumulative adverse impacts of USACE’s Center Hill Dam water management strategy will continue to grow under the proposed Alternative 4 water management strategy.

TCTU-R13:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that (1) provides a useful technical definition of “to the extent practicable”, (2) provides a legal and technical basis for granting USACE an exception from complying with water quality standards derived from the Federal Clean Water Act, and (3) provides quantitative, science-based assessments of the likely impacts of each of the nine Alternatives that cleared the original Alternative screening, on Caney Fork tailwater quality along with the likely resultant impacts on tailwater ecosystem health, recreational use, fishery health, and economic impacts on communities and businesses along the Caney Fork River below Center Hill Dam.

TCTU-14: The qualitative and subjective methodologies employed in the EA to assess water quality (e.g., dissolved oxygen and temperature) are unacceptable. The EA describes USACE’s dissolved oxygen estimates as “*an approximation*” (EA Table 5, p. 33) with no further elucidation. Additionally, Appendix A, p. 17 states, “*...DO and temperature data at various points along the Caney Fork River was provided by TWRA. This data shows how past operation methods using the turbines, sluice, and orifice can affect the DO and temperature and the PDT used this data to make general assertions on how these alternatives could potentially impact DO and temperature.*” TCTU is familiar with the data referred to in this instance. The data was collected by TWRA with sensors funded by Trout Unlimited’s Music

City Chapter. TCTU is unaware of any predictive “models” for quantitative assessment of location-specific Caney Fork DO and temperature as a function of “*past operation methods*”. “*General assertions*” about “*how these alternatives could potentially impact DO and temperature*” are not acceptable methods for assessing critical environmental impacts in NEPA analyses. USACE’s use of undocumented, non-peer-reviewed, and unvalidated qualitative models for prediction of critical water quality parameters such as DO and temperature is not an acceptable methodology for NEPA analysis.

TCTU-R14:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that adopts a more rigorous and defensible scientific method for estimating the impacts of differing Alternatives on Caney Fork River water quality, and incorporates into the EA a clear description of the method(s) employed.

TCTU-15: The EA acknowledges the critical importance of continuous minimum flows in enabling a healthy riverine ecosystem below Center Hill Dam, but then ignores this reality to pursue an elusive electricity production goal Center Hill Dam has only met 36% of the time over the past 25 years. The EA acknowledges that a 2004 report by Hauser et al. determined that “*continuous minimum flows of 200-750 cfs provide good WUA and are the most beneficial for the Center Hill Tailwater*” (EA, p. 32). The EA continues (EA, p. 34) “*...the benefits of a continuous minimum flow are measurably better than those from a pulsed flow...*”. Continuous minimum flows guarantee a maximum wetted perimeter, which in turn guarantees maximum benthic health. *Benthic organisms for the most part cannot escape dewatering, so they may suffer stress or mortality after a few hours of dewatering.* (EA p. 30) In addition, *TWRA’s Angler Reporting Program resulted in numerous reports of Lake Sturgeon as high up in the Caney Fork River as Center Hill Dam. In May of 2023, a spawning aggregation of Lake Sturgeon was reported just downstream from the Center Hill Powerhouse. Lake Sturgeon are a state listed endangered species and will be up for review in 2024 for federal listing by the USFWS.* (EA p.42) Any less than maximum wetted perimeter endangers Lake Sturgeon spawning, and any possible trout spawning. Yet the draft FONSI selects Alternative 4 (an option without a continuous minimum flow) as the recommended Alternative.

TCTU-R15:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that employs and describes a quantitative, science-based assessment of the environmental consequences to the Caney Fork River tailwater of the minimum flow provided by each Alternative evaluated in the EA.

TCTU-16: Alternatives that only utilize turbine operation for passage of water into the Caney Fork River are incapable of meeting Tennessee Water Quality Standards and should be eliminated from consideration. The EA explains (EA, p. 39) that although the auto-venting turbines recently installed at Center Hill Dam do result in improved Dissolved Oxygen concentrations in water discharged into the Caney Fork River, these auto-venting turbines are not by themselves capable of achieving minimum Tennessee State Water Quality Standards (specifically a Dissolved Oxygen concentration of 6.0 mg/L). It is clear, by extension, that any Alternative that relies exclusively on periodic power production and operation of the turbines (“pulsing”) is doomed to fail to achieve Tennessee State Water Quality Standards (i.e., DO = 6.0 mg/L of dissolved oxygen).

TCTU-R16:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that expands the Alternative beyond options limited to turbine operation, and eliminates options that do not dramatically reduce (relative to the 2021-2022 status quo) the number of hours per year the Caney Fork River fails to meet Tennessee’s Water Quality DO Standards of 6.0 mg/L.

TCTU-17: The refusal by USACE to consider Alternatives that employ sluice gate operations is not supported by analyses presented in the EA. The EA in several places notes the observed benefits of sluice gate operations in terms of improved water quality, recreational usability, etc. [e.g., “*Sluice Gate Operations... could also be used, when deemed necessary by LRN Water Management, to improve water quality to the maximum extent practicable...*” (EA, p. 13) and “*Sluice Gate Operation ... is anticipated to be a further benefit to recreation in the tailwater*” (EA, p. 25)]. However, EA Appendix A, p. 1 states, “*no sluice gate measures were carried forward*”. Thus, none of the original 22 Alternatives formulated as input to the EA included sluice gate operations.

TCTU-R17:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that quantitatively justifies (based on consideration of ALL project purposes) the preemptive exclusion of Alternatives that include sluice and orifice gate operation, and expands the original set of 22 Alternatives to include a reasonable set of Alternatives that incorporate sluice and orifice gate operations.

TCTU-18: The EA embraces, but disguises, an economic inequity that places the financial interests of the USACE above that of the citizens of Tennessee – especially those living along the banks of the Caney Fork River.

- No recent evaluations of the economic value of a healthy coldwater fishery in the Caney Fork River have been conducted. TWRA did conduct a creel survey in 2018, but did not assess the economic value of the fishery from the survey data. However, based on a limited number of creel surveys and economic analyses conducted between 2003 and 2010, the total value of the fishery to local economies along the river varied between \$1.6M and \$3.4M in then-year dollars. The inflation-adjusted value of the 2010 estimate of \$3.4M would be \$4.7M in 2023 dollars. The estimated economic value was highly dependent on USACE's actual water control strategy in place at the time of the survey and the manner in which that strategy impacted river accessibility and the health of the Caney's coldwater fishery. The USACE operated a seasonal orifice gate for several months in 2010, ensuring a some continuous minimum flow with commensurate positive impact on the health of the Caney Fork ecosystem and fishery below Center Hill Dam. Thus, we may safely assume the \$4.7M is a reasonable lower estimate for the current economic value of a healthy coldwater fishery in the Caney Fork River below Center Hill Dam.
- *How does the economic benefit of a healthy coldwater fishery in the Caney Fork compare with the financial revenues the USACE realizes from hydropower production at Center Hill Dam?* TCTU does not have access to historic USACE electricity and capacity sales revenues from Center Hill Dam. However, a notional estimate can be made from other publicly available data. According to the USACE, Center Hill hydropower production averaged ~ 354,440 MWh/yr for the years 2018-2022. According to SEPA's annual reports, the wholesale energy rates it paid its Cumberland River Basin generators was ~ 0.01326 \$/kWh and 2.89 \$/kW/Month for capacity during that same period. Using these SEPA energy rates (and ignoring the capacity

dividend), Center Hill Dam’s estimated average annual revenues from electricity sales between 2018 and 2022 was ~ \$4.7M. For purposes of comparison, Table 15 (EA Appendix A, p. 29) indicates that according to USACE’s estimates, the average annual energy production penalty of Alternative 17 (the Alternative with a continuous minimum flow of 250 cfs from the orifice gate with 1 turbine pulsed every 48 hours) is 7.7%. Thus, the annual electricity sales penalty of Alternative 17, compared to USACE’s recommended Alternative 4 can be estimated as $\$4.7\text{M} \times 0.077 = \$361,900$.

- Observational data from scores of fishermen, TU members, as well as TWRA/TU stream water quality data, attest to the significant adverse effects Alternative 4 has had on the coldwater ecosystem and fishery below Center Hill Dam over the past few years. **The “bottom line” truth that emerges from the rough analysis documented here is that USACE’s proposed adoption of Alternative 4 (that does not contain a continuous minimum flow) places in jeopardy a \$4.7 M/year economic benefit to communities along the Caney Fork River so that the USACE can increase its annual revenues by ~ \$362,000.** This economic inequity is made worse by the fact that much of the energy generated at Center Hill Dam is actually sold to municipalities in other states. **Tennesseans pay the price, while the USACE and municipalities in other states accrue the benefits.**

TCTU-R18:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that contains a quantitative analysis of: (1) the energy and capacity revenues to the USACE, and (2) the likely economic impacts on communities along the Caney Fork River, for each of the Proposed Action Alternative (PAA) identified in the draft FONSI. The community economic impact analysis should explicitly incorporate estimates of the impacts of water quality and minimum flow on fishery health and recreational uses of the river.

TCTU-19: The EA repeated employs opaque, illogical, inconsistent, and confounding reasoning in its Alternative screening, and, in particular, in selection of the Preferred Alternative. Witness:

- The EA, p. 34 states, *“Implementation of Alternative 4 would result in a long-term minor beneficial effect to water quality and habitat. Alternatives 17 and 23, due to the provision of a continuous minimum flow, would result in a substantial long-term beneficial effect to water quality and habitat. The provision of a continuous minimum flow through the orifice gate also provides the best opportunity to achieve state*

water quality standards and meet USACE water quality policy goals. Since the continuous minimum flow associated with Alternative 23 is applied only during a portion of the year—whereas Alternative 17 would apply a year-round continuous minimum flow—Alternative 17 would provide the greatest benefit to water quality and habitat availability in the tailwater.”

- The EA, p. 50 states, *“Neither the minimum flow or sluice gate operations are anticipated to impact the ability for Center Hill Dam to meet its congressionally authorized purpose for hydropower and would therefore not result in significant adverse impacts to hydropower.”*
- The EA, p. 60 states, *“While Alternative 17, the Environmentally Preferred Alternative, provides the greatest environmental and recreational benefits among action alternatives throughout the Caney Fork River, it may limit the available water for hydropower generation...Therefore, the agency selects Alternative 4 as its preferred alternative due to its measurable improvement on base flow as compared to the NAA while limiting the potential impacts to hydropower production.”*

TCTU-R19:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that explains in clear language why USACE embraces Alternatives that maximize electricity production while failing to achieve Tennessee’s water quality standards, but rejects Alternatives that fully meet USACE’s 351,000 MWh/yr electricity production goal while providing superior environmental benefits.

TCTU-20: The USACE has been employing since ~ 2021 a water control strategy at Center Hill Dam that appears to have never been subjected to NEPA-compliant environmental analysis nor documented in a formal Record of Decision, while abandoning sluicing and orifice gate minimum flow strategies that were evaluated in NEPA actions and adopted for execution in formal Record of Decisions. The EA identifies the “No Action Alternative” as the 1998 Center Hill Dam and Reservoir Water Control Manual minimum flow requirement of “one unit for one hour every 48 hours”. USACE’s 2008 *Record of Decision on Changes to Center Hill Lake Elevations*, states,

“The following measures would be taken for the duration of the dam repair period to protect water quantity and quality – An orifice gate would be installed

to provide a minimum flow of 200 cfs would (sic) be provided to protect water supply intakes below Center Hill Dam.”

Though the actual flow through the orifice gate depends on the Center Hill Reservoir pool height, we understand this continuous minimum flow strategy was employed to varying extents until dam repairs were completed. Furthermore, the USACE’s 2009 “*Environmental Assessment of Proposed Hydropower Rehabilitations at Center Hill Dam, Tennessee*”, states (p. 28),

“The Corps will continue to use the sluice gates and orifice gates to maintain minimum DO levels in the hydropower release and maintain a minimum flow below Center Hill Dam.”

TCTU notes this commitment to continued use of sluice gates and orifice gates has no explicit terminal date. Moving forward in time, the current EA states (EA, p. 14) USACE abandoned the 1998 operating strategy in 2020, and has, since 2021, actually followed an operating policy of “*one, one-hour pulse from a hydropower turbine every eight hours*”. It is this post-2020 water control strategy (identified as Alternative 4 in the EA) that is in reality the no action alternative. However, it appears USACE cannot declare their post-2020 operating strategy as the official No Action Alternative because it is unclear whether USACE ever conducted a formal NEPA analysis of the post-2020 operating strategy. While the impact of this procedural non-compliance with NEPA EA/EIS practices does not impact the results of the EA analysis, this use of the “No Action Alternative” label obscures the reality that (1) the USACE is currently operating with a strategy that has never been formally reviewed and selected under the NEAPA process, and (2) the adoption of Alternative 4 would actually constitute no change in the Center Hill Dam water control policy.

TCTU-R20:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that provides an accurate and detailed historical account of USACE’s post-1998 water control policies at Center Hill Dam and their compliance with NEPA mandates regarding environmental reviews of those historical water control policies up to and including 2023.

TCTU-21: The EA lacks clarity regarding the methodology employed to calculate Weighted Usable Areas (WUAs) for each Alternative. Weighted Usable Area is a widely employed metric for assessing species- and location-dependent habitability of rivers and streams based on hydrological parameters (water velocity, depth, etc.). However, the use of WUAs for this purpose is not without controversy, and different schemes are employed by different practitioners for converting hydrological parameters (such as those calculated with HEC-RAS) to WUAs. The EA places significant importance (p. 33, Table 5) on calculated WUA's as factors in selection of the final Recommended Alternative.

TCTU-R21:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that provides a detailed description of the process employed by USACE for calculation of the Weighted Usable Areas (WUAs) estimated for each Alternative.

TCTU-22: The terminology employed in the main body of the EA and in the supporting appendices for the seasonal alternative flow is inconsistent and potentially confusing to many readers of the EA. The EA refers to this “seasonal alternative flow” as “Alternative 23”. However, the supporting appendices refer to it as “Alternative 17B”. This inconsistency in terminology is unacceptable and should be corrected.

TCTU-R22:

TCTU requests the USACE re-issue a modified EA (or EIS) for public review and comment – an EA that employs consistent labeling of Alternatives in the main body of the EA and in the supporting appendices.

OTHER OBSERVATIONS AND RECOMMENDATIONS

TCTU-23: While TCTU understands the scope of the subject EA is limited to evaluation of revisions of the Center Hill Dam Water Control Manual, we nevertheless draw USACE's and the public's attention to the reality that the deployment of an oxygen diffuser system in Center Hill Reservoir similar to that USACE is installing at its Wolf Creek Dam in Kentucky, or the construction of a weir dam below Center Hill Dam, would enhance USACE's ability to meet

critical Caney Fork River environmental standards such as Dissolved Oxygen and habitat availability. As USACE has indicated in its press releases about the Wolf Creek project, *“Installation of an upstream diffuser system, in conjunction with auto-venting turbine runners, reduce or eliminate unit restrictions during the low dissolved oxygen season. When these capabilities are achieved, the Nashville District can provide more environmentally friendly releases while maximizing hydropower generation.”*¹ The Tennessee Valley Authority has successfully deployed both of these technologies in its reservoirs and tailwaters to improve the health of their tailwaters without compromising their ability to achieve critical flood control and electricity generation objectives. Tennessee’s citizens have a right to expect USACE to be as *“environmentally friendly”* to Tennessee as it is to Kentucky.

TCTU-R23:

TCTU requests the USACE conduct a feasibility study to assess the efficacy; potential environmental, recreational, and economic benefits; and costs of installing an oxygen diffuser system in Center Hill Reservoir and constructing a weir dam below Center Hill Dam.

¹ <https://www.lrn.usace.army.mil/Media/News-Releases/Article/3294258/nr-23-03-wolf-creek-dam-oxygen-diffuser-project-underway/>