ARAP AND ECONOMIC EVALUATION OF ALTERNATIVES:
NEW PINEY RIVER 2.6 MGD INTAKE AND TREATMENT PLANT
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William W. Wade, Ph.D[1]

Proposed ARAP Rule Change Invokes Economic Rigor.

TDEC's Aquatic Resource Alteration Permit (ARAP) establishes the permitting process for physical alteration of waters of the state. Chapter 1200-4-7 of the rules of the Tennessee Department of Environment and Conservation (TDEC) --ARAP -- governs activities that would alter state streams by withdrawal, discharge, wetlands drainage, etc. ARAP §1200-4-7-.04 (5)(c) 2 states that "... [P]ermit conditions shall protect the source stream's resource value[s]," where §1200-4-7-.03 (29) defines resource values as the benefits provided by the water resource. . . . [B]enefits include, but are not limited to, the ability of the water resource to:

(a) filter, settle and/or eliminate pollutants;
(b) prevent the entry of pollutants into downstream waters;
(c) assist in flood prevention;
(d) provide habitat for fish, aquatic life, livestock and water fowl;
(e) provide drinking water for wildlife and water fowl;
(f) provide and support recreational uses; and
(g) provide both safe and adequate quality and quantity of drinking water.

ARAP requires an applicant for a permit to withdraw water from a Tennessee stream to describe the proposed activity with all the necessary technical information for the Commissioner to make a determination, including an assessment of the practicable alternatives for a planned activity. Evaluation of either changes in resource values or assessment of alternatives has been given little attention at TDEC. The agency's capabilities are mostly physical science-based to the exclusion of economics. This orientation away from economics by TDEC has left the evaluation of alternatives with no objective criteria by which to measure the economics of alternatives that might satisfy an agency's needs. But this is about to change.

TDEC's currently proposed ARAP rule-change adds explicit clarity to the assessment of practicable alternatives. "When a proposed activity may result in degradation of waters, the alternatives analysis . . . shall include a discussion of the **feasibility of all potential alternatives, plus the social and economic considerations and environmental**

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[1] President of Energy and Water Economics, 39 Public Square, Columbia TN 38401. 931-490-0060 Goto www.energyandwatereconomics.com for more information. The author is a water resource economist who has worked for the last 20 years on economic policy in watersheds across the United States and within Tennessee. Paul Estill Davis, TDEC, Director, Division of Water Pollution, provided helpful comments. Remaining errors are the author's.

consequences of each consistent with the requirements of Chapter 1200-4-3-.06."
http://www.state.tn.us/environment/wpc/publications/2005RuleAmend1200_04_07.pdf

New language at §1200-4-3-.06 (3) a.2. defines alternatives for water withdrawals as "water conservation, water reuse or recycling, off-stream impoundments, water harvesting during high flow conditions, regionalization, withdrawing water from a larger water body, use of ground water, connection to another water supply with available capacity, and pricing structures that encourage a reduction in consumption." The proposed ARAP changes require financial and economic analysis of alternatives that conforms to EPA's 1995 guidance document entitled Interim Economic Guidance for Water Quality Standards: Workbook (EPA 823/B-95-002) (Economic Guidance) – or submittal of equivalent information. This new guidance fills the need for standards by which to evaluate alternatives.

Economic Evaluation of Alternatives within ARAP Requires Empirical Analysis.

A 2004 application filed by a small rural water district to double its withdrawal from the Piney River in Middle Tennessee provides a very good basis to illustrate TDEC's quandary in dealing with evaluation of alternatives without economic standards. Without clear criteria by which to evaluate alternatives, the assessment of "all practicable alternatives" is little more than window dressing with no policy significance. In the Piney River example, opposition to the permit application led to the author's involvement to evaluate the economic feasibility of the proposed alternative in comparison with other alternatives. This evaluation revealed deficient and missing objective empirical analysis of the alternatives available to the water district. Regardless of impacts on resource values of the Piney River, available alternatives dismissed in the applicant's submittal were shown to be substantially more economic than doubling the intake from the Piney River.

The first problem was the submitted demand forecast, which was the basis for the Purpose and Need for the project. The water district's engineer submitted the demand forecast shown in Chart 1, which showed a sharp rise in the District's customer connections to 7,100 by 2025. Examination of this forecast revealed it to be unsupported by any population forecast. In fact, the rural area population served by the district is expected by the UT Center for Business and Economic Research to continue slow growth. (The County is not in a rapidly growing area of Middle TN.) Chart 2 shows the author's growth forecast, which reaches only 4,400 customer connections by 2025, based on CBER's rural county population forecast. Whether or not CBER's forecast anticipated growth that might be catalyzed by completion of SR-840 was unknown to the engineer and the author; nonetheless, the engineer's forecast included no empirical support.

The engineer's forecast emphasized that the water district was nearing its permitted withdrawal capacity of 1.3 mgd, which justified its application to double the intake. Evaluation of data contained in the submittal revealed that while this was true, the district's average amount of water sold was under 0.6 mgd in recent years, less than half of permitted capacity. Both trends are shown on Chart 3. Chart 4 emphasizes the district's actual problem: water loss. The district's water losses averaged more than 40% 2000 – 2004, improving slightly to 38% for twelve months ending February 2005.

The engineer's water withdrawal forecast shown on Chart 5 implies that requirements will exceed permitted withdrawal amounts before the end of the decade. However, this forecast is flawed by two shortcomings:

1 it begins from and embeds in the forecast a constant 38 percent loss factor;
2 the forecast is unsupported by any empirical basis.

The engineer's solution to this problem was to double the permitted withdrawal amount and build a state of the art $4.85 million membrane filtration plant. Neither of the alternative demand forecasts based on UT's population forecasts done by the author exceeds existing permitted withdrawal amounts during the planning horizon. If the water district can improve its leak detection and management from 38% to 15% water loss – in line with good management performance – the existing permitted cap is not exceeded on peak days until late in the next decade. Ninety million gal/year could be saved in 2005 rising to 120 million gallons for the author's forecast, assuming the15% benchmark loss rate. Treating and losing 90 million gallons cost the water district $80,000 in 2005 at $0.85 per 1000 gpd. The present value of the money saved by improved leak detection over the planning horizon is $1.14 million.

The engineer's Alternative Analysis included three alternatives: (1) No Action; (2) Buy water from a nearby water system; (3) Build the new intake facilities with the water treatment plant. Reducing water losses was not among the alternatives. TDEC did not direct the district to consider the high water losses as a remedy for the district's perceived impending water shortage. Yet, improved leak detection alone is consistent with no needed action until late into the next decade when something will have to be done to accommodate peak day requirements.

The Alternatives analysis within the engineer's report comprised three pages of prose unsupported by any data and analysis that ruled out the do nothing and purchase water alternatives. Under EPA's Economic Guidance document, a small utility with existing bonded debt less than the $4.85 million new project would have to show substantial and far-reaching social and economic impacts to the community served by not undertaking the project before the new project could be approved. The cost of alternatives to avoid such a large addition of debt to ratepayers would be a legitimate policy question important to regulatory oversight.

Chart 6 shows the author's financial analysis of the alternatives. Leak detection is clearly the best policy, saving over $1 million in present value 2005 dollars, with either the UT forecast or the unsupported high engineer's forecast. Buying water incrementally as needed to meet out year peak day demands is a low cost option, $330,000, if future growth follows the UT population forecast, or $2.9 million following the engineer's forecast. Buying water incrementally as needed is clearly a substantially better alternative than building and operating a new sophisticated membrane plant, the present value cost of which is shown as $9.5 million, including capital and operating costs, plus periodic membrane replacement.

Another alternative considered for the small water district was to shut down and buy all water from a nearby larger water district with a new treatment plant, excess capacity, and substantially more management expertise – including a well-developed and low cost leak detection program. This alternative is shown costing between $7.0 and $8.98 million present value 2005. These costs represent the present value of the price per 1000 gallons offered by the selling water district to the small rural water district. Shutting down made more economic sense than building the new treatment plant.

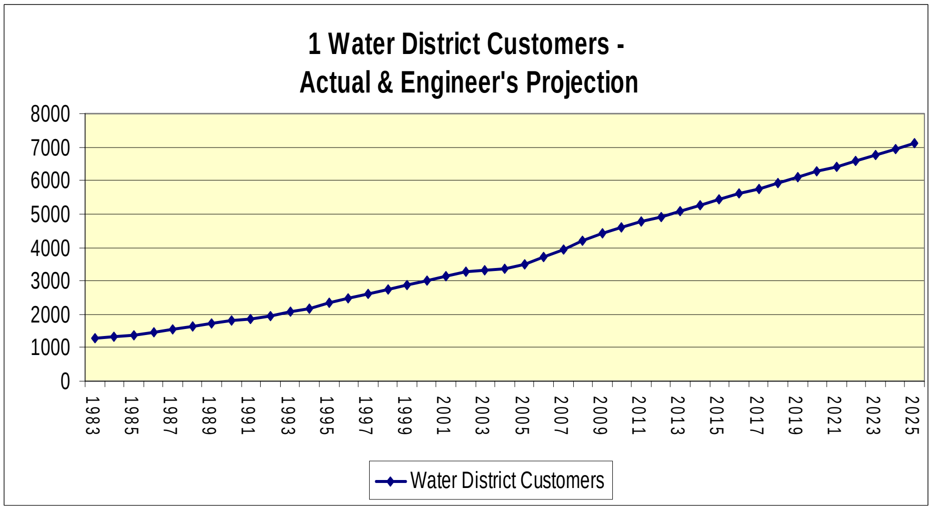
Implications of Piney River Application to Proposed Changes in ARAP.

When provided with the author's showing that the applicant's desire to double the Piney River withdrawal amount and build a new treatment plant was neither needed nor made good use of the ratepayers' money, TDEC found itself concerned about the implications of the information in both the author's and engineer's reports. The engineer was invited to respond, but submitted no written rebuttal or reconsideration of its initial report. TDEC found the district's withdrawal of 1.3 mgd to have a *de minimus* impact on Piney River stream flows. But for the rigorous evaluation of alternatives, the project might have gone forward to the detriment of the district's ratepayers – and to the perceived detriment of other interested Piney River stakeholders

The water district, when provided an objective analysis of the benefits of the buy water alternative, chose to do so. The applicant withdrew its permit application. Negotiations are in progress in January 2006 to contract to buy water from the nearby agency. TDEC did not have to evaluate formally the alternatives on their merits and decide whether or not the intake and treatment alternative was unneeded and uneconomic. The engineer did not get to build the $4.85 million plant.

TDEC's proposed new ARAP rules impose economic rigor into the evaluation of "all practicable alternatives" and provide criteria to support decisionmaking. The proposed changes to ARAP are much needed and will improve the evaluation process. Applicants will be required to provide rigorous analysis or alternatives. The agency will need to develop expertise to evaluate whether the proposed alternative is both needed and consistent with good use of the rate payers' money, benchmarked to EPA's criteria. Proposed ARAP changes to incorporate the financial and economic impacts of alternatives will affect the regulatory outcome.

State water policy supports regionalization efforts that include cost sharing by using or enhancing existing developed water resources to avoid new impacts to rivers and the environment. The buy water alternative, which was dismissed in three paragraphs by the engineer, is consistent with Tennessee's regionalization directive. With ARAP's enhancement of economic evaluations of alternatives, TDEC will have the tools to better evaluate and balance the needs of off takers with instream resource values.



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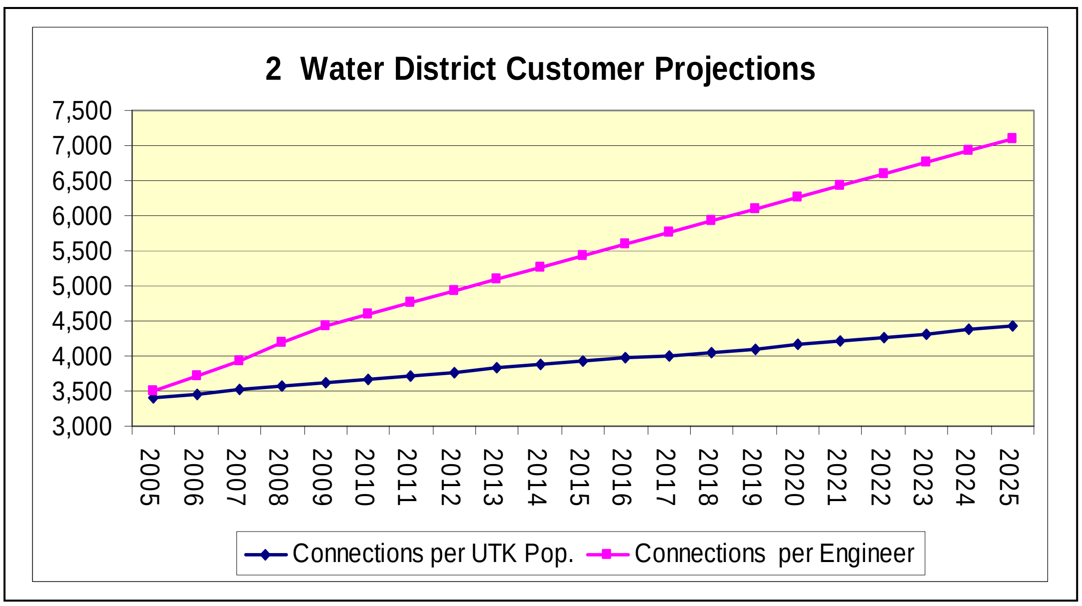

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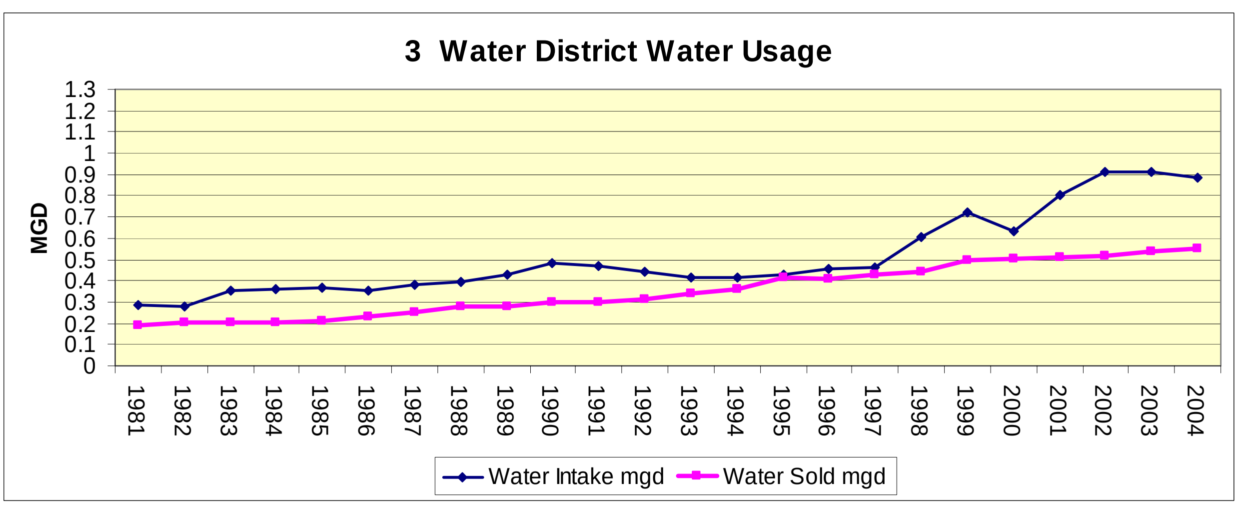

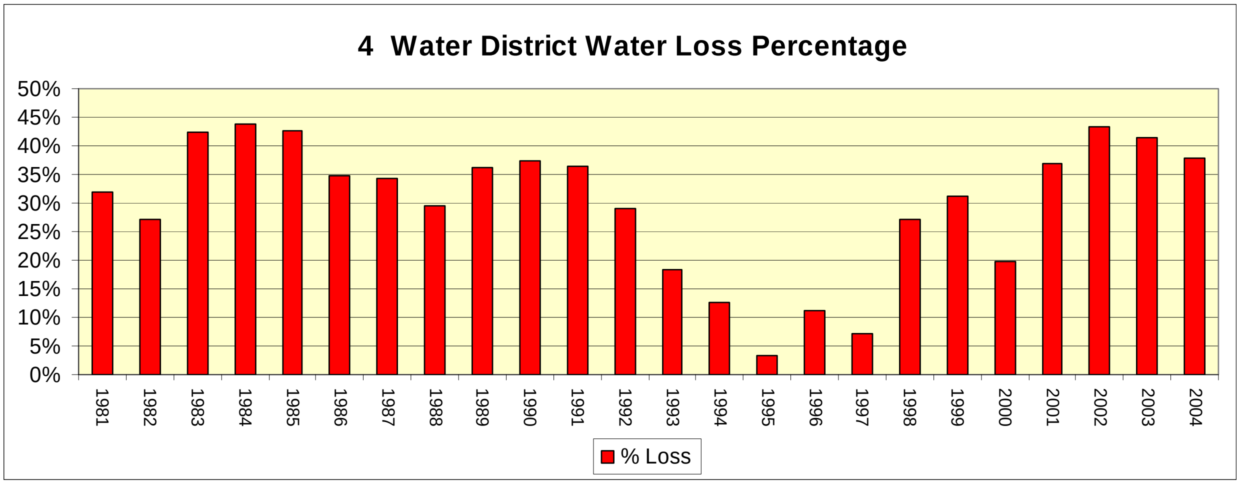

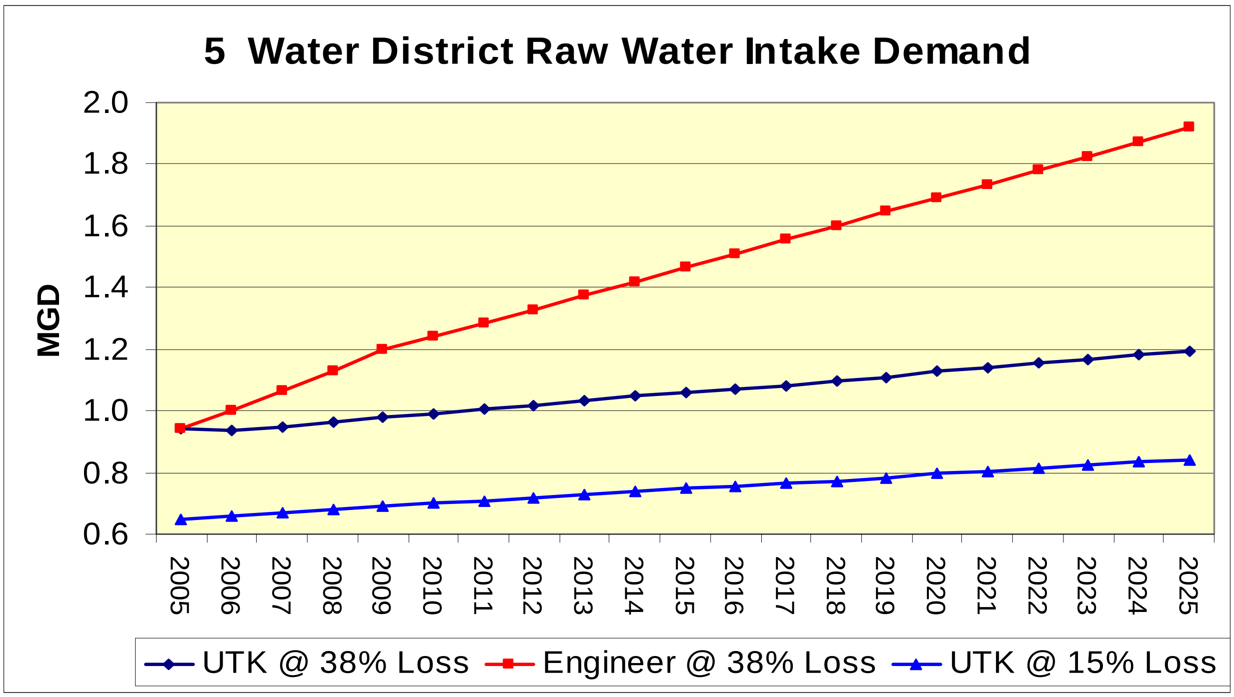

6 Comparison of Alternatives	PV 2005 $ Million
PV Savings to reduce to 15% loss rate - UT Forecast	$1.14
PV Savings to reduce to 15% loss rate - Engineer's Forecast	$1.52
PV Cost of purchased Incremental water - UT Forecast	($0.33)
PV Cost of purchased Incremental water - Engineer's Forecast	($2.95)
PV Buy All Water from DWA @ $1.71 per 1000 gal. - UT Forecast	($7.04)
PV Buy All Water from DWA @ $1.71 per 1000 gal. - Engineer's Fcst	($8.98)
PV Cost of Membrane Intake Project	($9.50)