

Memorandum

To: Environmental Flows Advisory Group
From: Texas Environmental Flows Science Advisory Committee
Date: March 18, 2010
Re: Review comments on Sabine and Neches Rivers and Sabine Lake Basin and Bay Expert Science Team Environmental Flows Recommendations Report dated November 30, 2009

Preface

The Sabine and Neches Rivers and Sabine Lake Basin and Bay Expert Science Team (BBEST) has submitted its environmental flow analyses and environmental flow regime recommendations to its Bay and Basin Area Stakeholders Committee (Stakeholders), the Environmental Flows Advisory Group (EFAG), and the Texas Commission on Environmental Quality (TCEQ). Texas Water Code **Sec. 11.02362 (q)**, as added by Senate Bill 3 in the 80th Texas Legislature, 2007 (SB 3), provides that “In accordance with the applicable schedule...the advisory group, with input from the science advisory committee, shall review the environmental flow analyses and environmental flow regime recommendations submitted by each basin and bay expert science team. If appropriate, the advisory group shall submit comments on the analyses and recommendations to the commission for use by the commission in adopting rules under Section 11.1471. Comments must be submitted not later than six months after the date of receipt of the analyses and recommendations.” This memorandum summarizes the Science Advisory Committee’s (SAC) input to the EFAG based on our review of the BBEST report.

Other potentially relevant provisions of the law, as added by SB 3, which influence and guide the preparation of the SAC’s input include:

- **Sec. 11.02362 (n):** “Each basin and bay expert science team [BBEST] shall submit its environmental flow analyses and environmental flow regime recommendations to the pertinent basin and bay area stakeholders committee, the advisory group [EFAG], and the commission [TCEQ]..... The ...advisory group may not change the environmental flow analyses or environmental flow regime recommendations of the basin and bay expert science team.”
- **Sec. 11.02361 (e):** “The science advisory committee [SAC] shall (1) serve as an objective scientific body to advise and make recommendations to the advisory group on issues relating to the science of environmental flow protection...”
- **Sec. 11.002 (15)** “Environmental flow analysis” means the application of a scientifically derived process for predicting the response of an ecosystem to changes in instream flows or freshwater inflows.

- **Sec. 11.002 (16):** “Environmental flow regime” means a schedule of flow quantities that reflects seasonal and yearly fluctuations that typically would vary geographically, by specific location in a watershed, and that are shown to be adequate to support a sound ecological environment and to maintain the productivity, extent and persistence of key aquatic habitats in and along the affected water bodies.
- **Sec. 11.02362(m):** “...In developing the [environmental flow] analyses and [environmental flow regime] recommendations, the science team [BBEST] must consider all reasonably available science, without regard to the need for the water for other uses, and the science team’s [BBEST’s] recommendations must be based solely on the best science available.”

SB 3 created a basin-by-basin process for developing recommendations to meet the instream flow needs of rivers as well as freshwater inflow needs of affected bays and estuaries. SB 3 further requires the TCEQ, through a formal rule making process, to adopt environmental flow standards. Such standards are to be utilized by TCEQ in permitting new water rights and amendments to water rights and in establishing an amount of unappropriated water to be set aside for environmental flow purposes.

SB 3 directs each BBEST to develop an environmental flow regime recommendation "through a collaborative process designed to achieve a consensus." Furthermore, in performing its work and developing its recommendations, the BBEST “must consider all reasonably available science, without regard to the need for the water for other uses, and the science team’s recommendations must be based solely on the best science available.” The timeframe dictated by SB 3 presents a significant challenge to the BBEST. They have only 12 months from their appointment to organize themselves, develop their agenda for addressing the requirements placed on them under the statute, conduct their analyses, and report their results. The Sabine-Neches BBEST is to be congratulated for their successful and timely completion of a consensus recommendation.

SAC Review Comments

This review has been conducted by the SAC to provide information to the EFAG and to the Sabine-Neches Stakeholder Committee regarding the overall work of the Sabine-Neches BBEST and the extent to which its environmental flow recommendations and the processes by which these recommendations were developed is consistent with SB 3 requirements. The SAC previously developed a *Framework for Review of BBEST Work Products*, which has been followed in preparing this review of the BBEST’s report. Following is a summary of findings by the SAC organized according to the major topics or questions of interest as set out in the SAC’s Framework document.

Do the environmental flow analyses conducted by the BBEST appear to be based on a consideration of all reasonably available science, without regard to the need for water for other uses?

The SAC has determined that the BBEST strove to and did acquire and use reasonably available science for its analyses and the development of its environmental flow recommendations. The BBEST approached the underlying science by developing a series of four discipline reports in the areas of Hydrology, Biology/Ecology, Geomorphology (Sediment Transport), and Water Quality. Each of the discipline reports appears to be well researched, and based on extensive literature review. The SAC is not aware of any significant research that has been overlooked or otherwise omitted from consideration by the BBEST.

Are the environmental flow analyses conducted by the BBEST grounded in a scientifically derived process for predicting ecosystem response to changes in instream flows or freshwater inflows?

In general, the SAC has determined that the BBEST's report and recommendations are founded in a science-driven process for predicting ecosystem response. While it is acknowledged that site-specific data and information describing flow-ecology relationships for streams in the Sabine-Neches basin are limited, the methodology used by the BBEST for evaluating instream flow needs did adopt SAC guidance that outlines a default procedure of starting with hydrology-based analysis and then applying various discipline overlays insofar as the data allow, including data from other basins. The BBEST, through a contractor, compiled considerable life history and habitat information for selected focal aquatic biological species for the basins and considered this information in a general sense when establishing the important components of the BBEST's recommended instream flow regime recommendations. In the end, these recommendations were established based principally on historical hydrologic data from streamflow gages located throughout the Sabine-Neches basins. The use of historical hydrologic data by the BBEST as the initial basis for establishing instream flow regime recommendations is justified based on the BBEST's finding that the Sabine and Neches rivers are currently characterized as representing a sound ecological environment.

It is noted, however, that there appears to be less certainty (more reservation) regarding the BBEST's Sabine Lake freshwater inflow recommendations. Again, focal species for Sabine Lake and the associated estuaries were selected and characterized in terms of their life histories and habitat requirements, including preferred salinities, and limited inflow-salinity analyses were undertaken for certain species, namely *Rangia*, blue crabs, oysters and brackish marsh communities, using inflows to Sabine Lake derived from the fluvial (i.e., instream) environmental flow recommendations. The conclusion of this overall effort was that the fluvial-derived environmental flow recommendations "fall within the range of values that should provide freshwater inflows sufficient to maintain a sound ecological environment within Sabine Lake under its current geomorphological configuration."

Do the environmental flow regime recommendations appear to be based solely on the best available science?

The SAC has concluded that the BBEST’s flow-regime recommendations appear to be based on best available science, given the time constraints, but not solely. An area of potential concern is that while acknowledging the environmental benefits of all of the basic flow-regime components, including the higher episodic events, the BBEST made no recommendation for overbank flows in its regime recommendations, stating that they did not support “producing”¹ overbank flow events that might cause flooding and/or property damage because of potential liability issues. This determination generally is considered by the SAC to be beyond the charge of the BBESTs as mandated by SB 3, and really should be an issue for consideration by the Stakeholders. It is the SAC’s opinion that the BBEST should have recommended the maintenance of overbank flows where they occur now on streams or segments of streams without significant flow regulation as a component of a flow regime that protects a sound ecological environment. This is not to say, however, that BBESTs in general should not inform Stakeholder groups regarding such issues that may be outside the specific charge of the BBESTs but still relevant to the process of establishing science-based environmental flow recommendations. The question remains, however, as to whether the overbank values presented in the tables in Section 6.2 of the BBEST report would be the BBEST’s “science-based” recommendations were it not for the flooding/property damage concerns.

The discussion of various state water planning activities in Section 3.4 of the BBEST report, while useful background information for the Stakeholders, probably goes beyond the general BBEST charge and is not considered necessary with regard to describing the work and findings of the BBEST. This is of concern with regard to the BBEST’s lack of a recommendation for overbanking flows, while also suggesting that such flows are expected to be produced under normal climatic conditions and flood events even with “full use of existing water rights and realistic projections of water supply development” (page 72 of the report). It should be noted, however, that the flow recommendations are based on HEFR analysis of the entire historical period of gaged flows, and as such, the formulation of the BBEST’s environmental flow recommendation is based on the need for a sound environment as long as it is assumed that the existing infrastructure would represent a sound state.

Section 5.2.2.1 of the BBEST’s report deals with the establishment of instream subsistence flows. The report discusses U.S. Fish & Wildlife Service (USFWS) studies (Werner 1982a and Werner 1982b) regarding the hydraulic habitat in the lower Sabine and lower Neches river reaches. The BBEST dismisses the Werner work without rigorous comparison between the Werner drought “maintenance” instream flows and the HEFR-based subsistence and base flows adopted by the BBEST. It would have been helpful if the reconciliation of the BBEST’s flow

¹ Although the reference to “producing” overbank flow events was not specifically described by the BBEST, it is interpreted to mean the creation of an overbank flow event downstream of a reservoir by passing floodwater inflows to the reservoir that otherwise could have been captured and impounded in the reservoir, thus eliminating the potential for downstream flooding and/or property damage.

regime recommendations with those from the USFWS studies and other reports would have been more specific with numerical values presented.

Do the environmental flow regime recommendations reasonably represent a schedule of flow quantities reflecting seasonal and yearly fluctuations that typically vary geographically, by specific location in the watershed?

SB 3 charges each BBEST with the development of consensus-based environmental flow analyses and recommended environmental flow regimes for the river basin and bay system for which the BBEST is established. Upon review of the BBEST report, the SAC has determined that the BBEST generally has fulfilled its charge in that it has made environmental flow recommendations that constitute key components of a flow regime, notwithstanding the BBEST's reluctance to recommend overbank flows because of flooding and property damage liability concerns and uncertainty as to the adequacy of the BBEST's base flow frequency achievement guidelines. The recommended flow regimes incorporate the requisite elements of quantities, seasonality and geographic scope.

Did the BBEST establish that the environmental flow recommendations are adequate to support a sound ecological environment and to maintain the productivity, extent and persistence of key aquatic habitats in and along the affected water bodies?

With regard to instream flows within the Sabine and Neches basins, the SAC has concluded that the BBEST's adoption of a hydrology-based flow regime, modified in part using water quality and biological overlays, generally should be adequate to maintain a sound ecological environment because the BBEST initially reached consensus that current stream conditions in the basins are "sound." This approach is consistent with SAC guidance.

It should be noted, however, that site-specific flow frequency achievement guidelines have not been adopted as part of the BBEST's recommendations for the base-flow components of the flow regimes. Without site-specific studies and data, as are currently being developed through the SB 2 Texas Instream Flow Program, the BBEST concluded that it could not recommend appropriate flow frequency achievement guidelines for base flows with confidence. However, as stated in the SAC's Implementation document, there is general agreement that flow frequency achievement guidelines based solely on historical flow records likely represent more than adequate values for streams determined to currently represent sound ecological conditions. Instead, as an indirect substitute and apparently without regard for seasonal variability, the BBEST has proposed through its Recommendation 5 that the dry base-flow requirement be engaged when the combined water supply storage in all upstream major reservoirs is less than the 25th percentile of the combined water supply storage in all upstream major reservoirs under full water rights utilization; and that the wet base-flow requirement be engaged when the combined water supply storage in all upstream major reservoirs is greater than the 75th percentile of the combined water supply storage in all upstream major reservoirs under full water rights utilization. The average base-flow requirement then is to be engaged when the combined water supply storage in all upstream major reservoirs is between these two values. With this

approach, instead of stipulating specific frequency achievement guidelines for the three base-flow values at a particular location, the BBEST defined the conditions under which each of the three base-flow values would be engaged based on upstream reservoir storage. Each of the base-flow values, when engaged, then would have to be fully satisfied or achieved. In effect, this approach requires that one of the three base-flow components be engaged at all times, and satisfied to the extent possible. This approach is more stringent than the SAC guidance, which specifies that each of the base-flow components should be satisfied a certain percentage of the time, i.e., the specified frequency achievement guideline, but collectively not all of the time.

While the BBEST has defined specific procedures, based on combined upstream reservoir storage, for engaging the dry, average, and wet base-flow components at a particular location, the question remains: are the resulting base-flow requirements adequate to maintain a sound ecological environment? It is difficult to answer this question without subjecting the BBEST's base-flow engagement procedures to actual reservoir and streamflow conditions. The BBEST did not calculate the historical frequencies of occurrence of its recommended dry-average-wet base-flow values based on historical flow records (even though they were derived from a base-flow subset of the historical record after hydrograph separation); therefore, it is not possible to compare the adopted reservoir storage-based frequency definitions with the actual historical frequencies of occurrence of the recommended base-flow values. Consequently, there remains uncertainty as to whether or not the BBEST's reservoir storage approach for defining dry, average, and wet hydrologic conditions and the resulting base-flow frequencies are adequate for maintaining a sound ecological environment. Certainly, with the available information, implementation of the BBEST's base-flow recommendations could be a challenge within the framework of SB 3.

Regarding freshwater inflow recommendations for Sabine Lake, the BBEST's confirmation of the adequacy of its recommended instream flows based on the National Wildlife Federation's salinity analyses and the BIO-WEST's focal species review is considered to be somewhat limited. However, given the uniqueness of the Sabine-Neches estuarine system (i.e., the "bay" is a relatively fresh Sabine Lake with considerably lower salinities than other Texas bays) and the substantial inflows to the system even with upstream reservoir development, the BBEST's conclusion that its instream environmental flow recommendations will yield a sound estuarine ecological environment appears justified.

Other Key Observations

- The BBEST generally has fulfilled its charge pursuant to the requirements of SB 3.
- Overall, the report prepared by the BBEST is well written and organized, with information generally easy to locate in the report and appendices.
- The BBEST has developed and reported a specific set of environmental flow recommendations for locations throughout the Sabine and Neches basins that provide the key components of a flow regime, including the requisite elements of quantities, seasonality and geographic scope.
- The BBEST has annotated each environmental flow recommendation in its report with a rationale.

- Development and use of the Decision Tree presented in the BBEST report was very important in identifying a series of issues/decision points, forming consensus decisions, and then moving forward with apparently very little revisitation of decisions and choices that the BBEST made.
- The Example Application (Section 6.1.4) is properly qualified as just an example and should prove useful to the Stakeholders to understand potential implementation of the BBEST recommendations.