

EXHIBIT B
SCOPE OF WORK

NATIONAL ACADEMIES/NATIONAL RESEARCH COUNCIL
DIVISION OF EARTH AND LIFE STUDIES
WATER SCIENCE AND TECHNOLOGY BOARD

Methods for Establishing Instream Flow Recommendations for Texas

SUMMARY

The National Research Council's (NRC) Water Science and Technology Board (WSTB) proposes to undertake a review of the bases for establishing instream flow recommendations for rivers in Texas. The NRC study will evaluate and assess the scientific and engineering methods proposed for Texas instream flow studies by three Texas state agencies responsible for managing the state's water resources. Considerations for establishing instream flows in Texas include hydrology, biology, geomorphology, and water quality.

The study will be conducted by a multi-disciplinary committee that will produce a report, as described in the Anticipated Results section of this proposal. The duration of this effort will be 14 months, June 1, 2003 through July 31, 2004. The cost is estimated at \$300,000.

BACKGROUND

Texas has 191,000 miles of low to medium gradient, warmwater streams and rivers that provide habitats for more than 255 species of fish, over 150 of which are native to the state. This is an important natural resource that has co-evolved with the tremendous geographic and climatic variation present in the state. Most Texas rivers originate within the boundaries of the state and flow into bays and estuaries bordering the Gulf of Mexico after traversing several different physiographic regions and biotic provinces. Rainfall varies from more than 50 inches per year in the east to less than 10 inches per year in the west. Streamflows are directly related to episodic rainfall-runoff events, although the base flows of some Texas rivers and streams are groundwater dependent, while other stream segments are dominated by wastewater return flows from municipal areas.

All of the major rivers in Texas are regulated to some extent by the water supply operations of the 211 major reservoirs in the state with a conservation storage capacity greater than 5,000 acre-feet, only one of which was built before 1900. Some of these reservoirs also provide flood control and contain hydroelectric power facilities. Water quality characteristics vary widely and reflect geologic, hydrologic, and anthropogenic influences. Riparian areas also are variable, with east Texas featuring extensive bottomland hardwoods while the prairie streams in North Texas have vast floodplains.

Over the past two decades, Texas state agencies have increasingly recognized that certain conditions related to hydrologic flows, biology, geomorphology, and water quality are needed to maintain key fishery functions and valuable ecological aspects of Texas rivers. The three Texas

state agencies that administer studies on instream flows--the Texas Water Development Board (TWDB), Texas Parks and Wildlife Department (TPWD), and Texas Commission on Environmental Quality (TCEQ)--define instream flow as “the flow regime needed to maintain an ecologically sound environment in streams and rivers including riparian and floodplain features.” Further considerations in instream flow studies include hydrology, biology, geomorphology, and water quality, all of which are necessary to maintain diversity and productivity of characteristic Texas fish and wildlife. Instream flow recommendations may also be affected by social and economic concerns, as the concept can refer to flows necessary to support important activities such as water-oriented recreation and navigation.

Administered and developed by TWDB, TPWD, and TCEQ, the Programmatic Work Plan for Texas instream flow studies outlines the scope, timeframe, and methods that the agencies will use to plan, design, and implement priority flow studies. Instream flow studies typically seek to determine an appropriate flow regime (quantity and timing of water in a stream or river) that conserves fish and wildlife resources while providing sustained benefits for other human uses of water resources. Texas instream flow studies often focus on a fish and wildlife resources evaluation within a river reach. Occasionally, an instream flow study will be conducted at the (broader) sub-basin spatial scale, and even more rarely at the (still broader) river basin scale. The goals and purposes of instream flow studies vary by project, but almost always will include assessing the impacts of altered river flows on fish and wildlife communities.

Instream flow studies conducted by the State of Texas consist of eight key components: 1) study design; 2) hydrology and hydraulics; 3) biology; 4) physical processes; 5) water quality evaluations; 6) integration and interpretation; 7) study report, and; 8) monitoring and valuation. For every study, the three state agencies divide and share responsibilities among the eight elements, depending on expertise. The Texas instream flow study is to be implemented in three parts; the first part is the drafting of the Programmatic Plan (completed December 2002). The second and third parts are peer-review activities. The NRC study (part two) will provide an independent review and evaluation of the scientific basis and soundness of the scientific and engineering methods, including the eight study elements, proposed for use in Texas instream flow projects. Part three is continued participation by in-state river authorities and stakeholders impacted by instream flow water management decisions, to establish working relationships between these entities and ensure all involved of the scientific soundness of the studies.

While TWDB, TPWD, and TCEQ generally agree on this eight-element approach to quantifying instream flow needs, the agencies also agree that the proposed scientific and engineering methods would benefit from an evaluation from the National Research Council.

PROPOSED PLAN OF ACTION

The National Research Council will appoint a committee of about 10 members to appraise the scientific and engineering methods used to help establish instream flow recommendations in Texas rivers. It will focus on the soundness and adequacy of the Programmatic Work Plan for developing instream flow studies developed by the TWDB, TCEQ, and TPWD. Specifically, the NRC committee will:

1. Evaluate the key documents that explain these scientific and engineering methods and their applications in setting instream flow recommendations. These documents are a) the 2002 Programmatic Work Plan, and b) a supplementary technical volume that describes these methods in greater detail.

2. Review and provide advice on several scientific and technical matters relevant to instream flow studies and recommendations, including:
 - a. appropriate spatial scales of analyses in hydrologic and related models;
 - b. use of habitat-flow relations in setting instream flow requirements;
 - c. use of landscape ecology metrics in setting instream flow requirements;
 - d. range of biophysical model parameters employed in the Texas State TMDL program;
 - e. applicability of water quality models used in the Texas State TMDL program to instream flow studies.

(4/11/03 letter from Texas Water Development Board Executive Administrator, Kevin Ward, contains examples of questions related to the above categories).

3. Review and comment on the extent to which legal, economic, and policy considerations affect the establishment of instream flow standards in Texas.

The committee will be convened to study the issues and author a consensus report scheduled for publication within 14 months of receipt of funding. It will meet three times over the course of the study in locations, likely all in Texas, where it has the greatest opportunity to learn about the Programmatic Work Plan and relevant technical issues. It will work closely with the state agencies involved (Texas Parks and Wildlife Department, Texas Commission on Environmental Quality, Texas Water Development Board) to ensure it has adequate understanding of the relevant technical, institutional, and implementation issues. This proposed work on Texas Instream Flows does not duplicate previously completed or on-going research conducted by the National Academies of Science.

Committee members with knowledge and expertise relevant to the study subject matter will be sought from academia, government (federal and state/local), and public interest organizations. Committee members will be selected with a consideration for disciplinary expertise and balance in order to address the committee's statement of task. Disciplines represented on the committee are thus likely to include hydrology, geomorphology and sediment transport, hydraulics and river mechanics, water quality, aquatic ecology, fisheries biology, riparian ecology, and water resources management. The committee will include a balance of experts who have special knowledge of the hydrology and ecology of Texas rivers and experts whose research has been and is conducted in other regions.

The study will be organized and overseen by the Water Science and Technology Board in consultation with the Board on Environmental Studies and Toxicology. Both boards have carried out studies of similar issues in other geographical locations (e.g., Columbia, Missouri, Platte). In cooperation with the three state agencies, the WSTB will design a work plan for the study, identify and nominate appropriate committee members, maintain liaison as the study progresses, review the report(s) and help ensure its steady progress, and help disseminate and promote results. WSTB staff will support the study and the committee's efforts. Staff will organize meetings, ensure compliance with institutional policies, maintain liaison with the three state agencies and others, collect and disseminate material for the committee's evaluation, edit and review the committee's draft reports, and perform other appropriate duties that may arise.

ANTICIPATED RESULTS

The principal product from the study will be a report that will be reviewed in accordance with Academies' policies and published and distributed without restrictions by the National Academies Press. The report will serve as a resource for state scientists and officials engaged in the establishment of instream flows. It likely will also be useful to scientists in other regions engaged in similar issues, as instream flow issues present challenges nationwide. The study is timely, as a systematic, forward-looking approach is needed for water management and environmental decisions in Texas and elsewhere.

THE NATIONAL ACADEMIES PROCESS IN RESPECT TO COMMITTEE SELECTION AND REPORT REVIEW

By an act of Congress in 1863, the National Academy of Sciences (NAS) was created as a private, non-profit, national institution of distinguished scholars with a mandate to serve as official advisers to the government on matters of science and technology. NAS is dedicated to promoting the effective utilization of scientific and technologic resources of the country and to advancing the general interests of science. The NRC, established in 1916 by NAS, provides the organizational structure to undertake studies on the various technologic and scientific questions presented for consideration by federal agencies and other nongovernmental institutions, or by mandates of Congress. The NRC is the principal operating agency of National Academies, which includes the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The NRC presently has about 700 working committees, panels, and boards on which about 9,000 highly qualified scientists, engineers, and other professionals serve without compensation.

The National Academies are unique with regard to operation and policies. The core of the Academies' work consists of studies conducted by committees, with members selected by the NRC expressly for their expertise in the relevant scientific issues at hand. Those who serve on various committees, panels, and boards are responsible for carrying out most of the substantive tasks of the NRC and devote considerable time and expertise to the preparation and review of reports. Membership appointments are made by the NRC after a well-defined search and selection process in an effort to assemble committees of the highest competence and representing the necessary expertise for the task. All of these experts volunteer their time to serve on study committees, plan and participate in seminars, review documents, and assist in disseminating the work of the institution. They represent many fields of endeavor and a wide range of perspectives.

The search for specific candidates to serve on the committee begins when adequate funding commitments for a study have been received. To accomplish the work, the NRC will draw from the expertise of the more than 4,000 members of the National Academy of Sciences, National Academy of Engineering, and Institute of Medicine. Membership is a prestigious honor, as these professionals represent the best in their fields. Because the many issues and sheer volume of work exceed the capacity of the National Academies membership organizations, thousands of other experts from a wide range of disciplines are called upon to volunteer their time to serve on committees. In defining areas of expertise that should be represented on a committee and identifying individuals qualified to serve, the staff reviews scholarly literature and consults widely with members of the Academies and the Institute of Medicine, volunteers within the

institution, knowledgeable authorities, and professional associations. The three state agencies may also offer suggestions, but do not select committee members. Committee members are chosen on the basis of their knowledge and experience in the various aspects of the topic to be investigated, and after careful review are appointed by the chair of the NRC, who also is the president of the National Academy of Sciences. Formal NRC procedures assure that each committee has the appropriate expertise, is balanced with a range of perspectives, and is free from any real or potential perceived conflict of interest.

After approximately 11 months of study, the committee will submit its report for external review. Every report prepared by a NRC committee is reviewed by a group other than its authors. This independent review distinguishes the NRC from many other organizations offering scientific and technical advice on important national issues. The purpose of review is to assist the authoring committee in making its report as accurate and effective as possible and to ensure that the committee and the National Academies are creditably represented by the report published under their names.

Once the final version of the report has been prepared by the committee, it will be extensively reviewed by members of the WSTB, and a panel of six to eight outside reviewers. The panel of reviewers will be nominated by the WSTB based on their relevant expertise. The NRC's Report Review Committee will review and approve the review panel and appoint a review monitor to oversee the review. The review monitor will work with the review coordinator to ensure the committee is responsive to reviewer comments.

The authoring committee will address every comment provided by each of the reviewers and justify text retention or make changes in the report based on reviewer comments. The identity of reviewers is considered to be privileged information during the review process. Anonymous review is intended to encourage individual reviewers to express their views freely and to permit the authoring committee to evaluate each comment on its merits without regard for the position or status of the reviewer. The names and affiliations of participants in the review will be made public when the report is released (usually by acknowledgment in the printed report), but their comments remain confidential.

The second step in the review process will consist of a review of the revised report and the committee's response to review letter by the review coordinator and the NRC review monitor to ensure that the reviewers' comments have been adequately addressed by the committee. Prior to the completion of any report, it must be approved by the NRC. This final stage of report review generally requires up to three months to complete. While the review process is complex, it ensures that the report is unbiased and of the best possible quality.

PUBLIC INFORMATION ABOUT THE PROJECT

In order to afford the public greater knowledge of Academy activities and an opportunity to provide comments on those activities, the Academy may post on its website (<http://www.national-academies.org>) the following information as appropriate under its procedures: (1) notices of meetings open to the public; (2) brief descriptions of projects; (3) committee appointments, if any (including biographies of committee members); (4) report information; and (5) any other pertinent information.

ESTIMATE OF DURATION AND COSTS

The duration of this effort will be 14 months, June 1, 2003 through July 31, 2004. The cost is estimated at \$300,000 (see Exhibit C).