QUESTIONS TO BE ANSWERED WITH STUDIES DESIGNED AND EVALUATED BY AN INDEPENDENT SCIENTIFIC ADVISORY COMMITTEE

Introduction
The environmental organizations invited to participate in the environmental review of the LCRA-SAWS project have made an initial effort to outline a process for our meaningful participation. We have not finalized the studies needed to ascertain the impacts of the project, but have set forth many of the key questions that such studies must address. It is our hope that together we can establish a new model by which water project developers and environmental advocates can cooperatively review proposed water projects to identify ways to meet the state's need for water with the least environmental impact.

Background information needed to formulate questions and studies:

- How will full utilization of return flows upstream impact this project? Has this been taken into account in the LCRA's modeling procedures?

- Conduct a historical review of instream flow and inflow conditions, particularly the duration and frequency of low inflow periods.

- From what we understand, LCRA has represented that it will capture all water only during high flows, to prevent further harm to bays and estuaries, i.e. this water will be "scalped" from "*flood flows and other high flows*", and will be used to provide *firm yield* to San Antonio by storage in off-channel reservoirs. What is meant by "*floods and other high flows*", and what is the cutoff flow below which water will not be captured? What proposed percentage is coming from actual "*flood flows*"? How much water must be captured during high flows to make this project technically and economically feasible? How can protections be put in place to assure that water other than "high flows" will not be captured for this project?

- What water rights will be relied upon in providing for San Antonio?

- Provide an analysis of the contracts pursuant to which LCRA purchased irrigation rights from the Garwood and Pierce Ranch Irrigation Districts, and specifically, of the obligations, and/or representations made by LCRA to continue to supply water for irrigation within the districts.

- Provide an analysis, comparable to that shown in the "2001 Interruptible Water Allocation Table," prepared by LCRA in the context of the consideration of amendments to LCRA's Water Management Plan, that addresses compliance with target and critical instream flows and bay and estuary inflows at 10-year intervals for at least 50 years in the future, assuming no sale of water to San Antonio.

Siting

Demonstrate that the chosen sites are the "best" sites for the project.

- What are the proposed sites of the reservoirs, diversion points, pipelines, and channels? What are the environmental impacts? What are the potential alternative sites for the projects? What would be the potential environmental impacts of such alternatives?

Economic implications

Demonstrate that this is the most cost-effective way to meet San Antonio's water needs.

- What will be the costs to municipalities to implement the required upgrades to wastewater treatment systems to maintain water quality standards with reduced river flows?
- What is the cost of this project compared to the cost of acquiring the water through further conservation efforts?
- Who benefits from this project, and who is paying the cost? What is the distribution of the costs and benefits?
- What is the intrinsic value of bays and estuaries? What is the economic impact of the project to commercial and recreational fishing industry? Do project benefits outweigh costs?
- In light of the decision to sell firm water rights from rice farming interests to the LCRA, what is the economic justification now to spend money to firm up water rights for rice farmers?
- What is the cost per acre-foot of the water provided to San Antonio? What will be the cost of the water to the irrigators? What is the productive effect of an acre-foot of water when used for rice irrigation?

Environmental impacts

Demonstrate that this project, as proposed, can be built without adversely effecting the environment, including, but not limited to: instream and riparian habitats and productivity, bay and estuary habitat and productivity,

riparian and terrestrial habitats, air quality, and aquifer sustainability.

Impacts – instream flows and riparian habitats

Demonstrate that this project will not adversely affect instream or riparian habitats

- How will a reduced streamflow affect riparian ecosystems, including, but not limited to, wetland environments?
- The proposal notes that instream flow effects would be minimal because the reservoirs would be sited near the mouth of the river. What *is* the anticipated instream flow impact? Will the criteria currently set up for minimum instream flows with an additional point of measurement below the proposed diversions still be met? If not, what evidence is there that the project will not harm instream ecosystems?
- How will the project impact recreational and sporting opportunities within the river system?

Impacts – bays and estuaries

Demonstrate that this project will not adversely affect the Matagorda Bay system and its associated estuaries.

- What are the ecologically characteristic species of Matagorda Bay, including organisms such as plankton that form the basis of the food chain? What studies and data support these conclusions?
- Conduct geomorphologic studies of flow patterns needed to maintain channel characteristics.
- How does the reduction of flow impact the projected percentage of time that inflows will be in critical and target range?
- If low inflow conditions occur during the study period, conduct intensive sampling of responses of aquatic organisms to those conditions. Model the impacts of the proposed low flows on salinity regimes (size, distribution).
- Can species that need this low salinity refuge at the mouth survive extended periods – i.e. what if it continues for more than one cycle? Revise the current productivity-inflow equations with further data at low inflow or identify other means for assessing impacts of lower inflows, as the regression equation used to relate productivity and inflow likely does not remain valid at lower levels of inflow. At what point is the regression line between productivity and inflows no longer applicable (indicating catastrophic loss)?
- Conduct a habitat analysis that will evaluate the suitability of a modified estuarine environment to support a productive ecosystem, including the ecologically significant species.

- Identify and locate, ideally using a GIS-based system, sensitive biological features in the vicinity of freshwater inflow points. Evaluate the salinity tolerances of plant and animal life occurring in those sensitive biological features.
- Study the significance of pulsation events on estuarine health. How does attenuation of floods affect productivity? Does there exist a way to design a "maintenance flow" event that simulates the significant, quantifiable, positive estuarine impacts of periodic floods?
- Firmly and unequivocally establish the environmental criteria which indicate the *health* of Matagorda Bay. Is salinity the best proxy to be used in modeling freshwater inflow impacts, or should other nutrients and/or geochemical conditions be included?
- How will the diversions impact the nutrient budget, primary productivity, vegetative ecosystems, planktonic and benthic environments, etc? If reservoir releases are proposed to mitigate loss of natural inflows, how will those releases affect the nutrient budget, primary productivity, vegetative ecosystems, and planktonic and benthic communities within the bay system?
- How might a modified estuarine environment be conducive to disease?
- How will the project impact recreational and sporting opportunities within the bay?
- If low inflow conditions occur during the study period, conduct intensive sampling of responses of aquatic organisms to those conditions.
- Conduct geomorphologic studies of inflow patterns needed to deliver adequate sediments and nutrients to the bay system.

Impacts – basin transfers

Demonstrate that there is no meaningful risk for the transport of problem species between river basins.

- Evaluate the potential for transport of problem species between basins (relevance of these studies will be dependent on how San Antonio stores the transferred water). Studies would involve survey of species in the two watersheds, and for species that differ between basins, evaluation of potential for any new to San Antonio to cause harm.

Impacts – air

Demonstrate that the project can be implemented without increasing air pollution in the eastern part of Texas.

- How much electricity will be consumed by the pumping of water from the project to San Antonio?

- How much additional air pollution will result from this increased consumption of electricity? What is the air pollution impact of construction activities related to the project? Will LCRA mitigate these impacts by offsetting 100% of air quality impacts?
- What are the effects of the inundation of land on carbon dioxide releases?

Impacts – groundwater

Demonstrate that the proposed project will not adversely affect groundwater resources.

- What are the implications of increased withdrawals on the Gulf Coast Aquifer? How will the proposed withdrawals affect current users? Will combined overall withdrawal rates be within the sustainable level of the aquifer system?
- How will reduced streamflow affect local groundwater recharge, springs, and seeps?

Alternative analysis

Assess the environmental impacts of alternative projects to the LCRA-SAWS project to provide water for San Antonio.

Mitigation strategies

Demonstrate that if the project has adverse impacts on the environment, all of those impacts will be offset by mitigation measures.

- What are the proposed mitigation measures? How can their effectiveness be modeled? How would an extra reservoir be operated to provide inflow and/or a design flood?
- Can strategically timing inflows fully offset low freshwater inflow volumes?
- How would the proposed extra reservoir be operated to mitigate the effects of reduced inflows?
- Could water be freed up from firm yield in the Highland Lakes to mitigate at critical times? Could withdrawals be timed so that they have no or de minimus adverse impacts?