LCRA - SAWS Water Project

November 15, 2005

TO: Andy Sansom, Executive Director, Rivers Systems Institute, Texas State University and Moderator, LSWP Science Review Panel

FROM: Leah Manning, PE, PMP, LCRA, Program Manager

SUBJECT: Response to SRP Comments on LSWP October 2005 Workshop

Our responses to the SRP's comments are shown below in ***[Bold Italics]*** following each comment. We appreciate the SRP's valuable insights on this project.

General Comments

1. The SRP was quite impressed with the growth and quality of the project as well as the work done by most project teams, especially Bay Health which exceeded expectations.

[Thank you. We agree that the project is progressing well.]

2. The study teams have obviously spent time working on data archival and management. They should be congratulated for this important undertaking. The data management system will materially contribute to the overall success of the project.

[Thank you. We concur.]

3. The various tasks that comprise the LSWP have not come together in a holistic unit so far. It may be too early to achieve such a composite view of the project but it surely needs to occur in the near future. More specifically, it would be much more comfortable if the Surface Water Availability, Agricultural Groundwater, Water Quality, Aquatic Habitat and Bay Health would be fused to present an overall impression of a well planned project that has linkages that have been assessed and modified to obtain the suitable amount of water and maintain the highest environmental standards of the reservoir-river-estuary ecosystems.

[There are several coordination activities that are ramping up, including permitting, to help address this issue. Now that much of the basic data collection

is behind us, and model development is in the initial stages, the Program is facilitating communication between the study teams to ensure that the tools developed meet the broad needs of the project.]

4. In general, for the public it is fine, but for all LCRA-SAWS presentations, there was a lack of variance about the mean on their graphs (standard deviation, standard error, +/-, etc.). Knowing this variation become critically important from a scientific evaluation perspective.

[We concur. This type of information will be more prevalent in upcoming technical presentations.]

Economics

Overall the economics team seems to have their analysis well laid out. The study team is planning to do an analysis of rice farm budgets to determine what farmers might find profitable to adopt a new rice variety. In terms of going beyond just percent of farmers adopting, greater emphasis should be given in this analysis to the large rice farmers, as they use a majority of the water.

[We concur. We will do so as the analyses progress.]

Facility Siting

Overall the SRP felt that the facility siting is an area of concern.

1. While the existing alternative evaluation matrix approach using only publicly available data may be adequate, the SRP believe the current approach is far too subjective for evaluating the project alternatives. This is a multi million if not several hundred million dollar project, and the study team needs to have quantitative criteria for their evaluation. They appear to implicitly weight some components or evaluation criteria more than others. They need to make the relative importance rankings of components or criteria explicit in the next evaluation. For example the criteria or components that have a legal or regulatory tie such as wetlands might be weighted higher than noise. Otherwise LCRA-SAWS, SRP and the public will not be able to deduce how they arrived at the overall ranking of project sites.
[We share the SRP's interest in adequately defining and documenting the evaluation process for the facilities. Utilizing a process that provides for good decision-making as well as defensible permitting is in the best interest of the project and its stakeholders. Based on a conference call and the October 3rd Workshop in Bastrop, we understand that the alternative evaluation to date is appropriate given the general/conceptual nature of the information collected.

Our experience with many prior National Environmental Policy Act (NEPA) Environmental Assessments (EA) / Environmental Impact Statements (EIS) and long-term experience with the Galveston District of the U.S. Army Corps of Engineers

(USACE) does not support using a weighted analysis based on subjective professional opinion, similar to that described in your above comment. For example, your comment notes that "wetlands" might be weighted higher than "noise". This may depend also on the type and functional value of specific wetlands. The question then becomes how much more important are the wetlands in terms of a subjective number, compared to a subjective number for noise impacts, and then how much more or less important (weighted number) is moving a family out of their home compared to wetlands and noise – and so on through the entire list of criteria. Our experience shows that when weighted evaluations are challenged, the experts end up trying to defend why they placed a weight of "7" instead of "8" on a particular criterion, which may change the answer. It is our experience that arguing about a specific subjective number is more difficult to defend than a consensus of expert opinions. However, we are open to discussing any defensible weighting technique that is acceptable to LCRA, SAWS and the Galveston District of the USACE to identify the least environmentally damaging, practicable alternative, which meets the project purpose and need.

Currently we plan to proceed in the following manner, pending further discussions. Each technical expert will rank the facilities and alternative projects from their area of expertise for their criteria. The team will then utilize a modified Delphi Method to reach a consensus opinion and rank the alternatives in terms of potential impacts. This will include documentation of the decision making process, including which factors the experts believed were most important. The Program Team will then select which alternatives to present in the permit package, with the possibility of identifying a draft proposed action.]

2. If an evaluation panel of experts is used to rank the sites, the names and expertise of its members should be made known.

[We concur. The names and expertise of the team of experts utilized will be provided for future alternative evaluations.]

Bay Health

The SRP's overall impression was that a substantial amount of progress had been made in Bay Health tasks. Particularly impressive was the restructuring of the important TPWD Bay Fisheries Data. These data have been difficult for most to use and Smith's team has found a way to organize and present data in a spatially explicitly format.

1. Utilization of Bay sonde data. This is currently a large set of data that has not been examined but is a very valuable resource that can be used to assess temporal aspects of bay health. The variety of time responses of temperature, salinity and DO ranging from hours to months as inflow conditions change and weather systems modify tidal levels will provide a valuable range of conditions that the bay experiences. As the sonde data are used, the best sets of data that meet QA/QC requirements should be

analyzed for diel DO variations which would be helpful to understand and assess modeled bay rates of primary production. The sonde data are the best calibration data for temporal attributes of bay models.

[We agree that the sonde data constitute a valuable data resource that should be employed. Following methods developed by Dr. George Ward for the General Land Office (GLO) in Coastal Bend bays, we propose to incorporate an analysis of primary productivity using this data in our 2006 Scope of Work.]

2. Wean the LSWP away from using the salinity modeling as a primary goal of assessing bay health. Salinity is a valuable attribute that can be used to verify the circulation and fluxes in modeling exercises. Those verified models should then used to assess changes in bay health that are more directly related to biological resources in the estuary system.

[We concur, and view the modeling of salinity as a necessary stepping stone to support other measures of bay health, rather than an isolated and independent measure of bay health.]

3. Inject the estuarine organisms that are not commercial species into consideration of the ecological health and balance in the bay. This is related to moving away from salinity as a primary indicator of bay health and somewhat readjusting the focus to the general ecology of Matagorda Bay. The primary productivity and food environment in general is the largest attraction for larval and juvenile stages of many species that have an estuarine period in their life cycles. The grazers, browsers and filter feeders provide an intermediate step in the food web that greatly affect the fish and other commercial species. It may not be easy to include this concern into the quantitative modeling but it should at least be carried along as a long term goal to maintain high levels of biological productivity of the bay system.

[We agree that primary productivity and food availability are important factors, particularly in the early life stages of many species. We also agree that a long-term goal is to protect the biological productivity of the system. A preliminary primary productivity modeling effort is proposed in the 2006 Statement of Work (SOW). A benthic community evaluation will also be folded into the habitat assessment.]

4. One approach that should be considered is whether the benthic datasets can be correlated or integrated with any of the TPWD fisheries data to reveal parallel (or divergent) trophic level responses. This community wide approach will lend more support for flow vs. biological response relationships, and help to move our thinking beyond simply the effects of salinity changes from flow alterations.

[We agree that the use of benthic data, collected independently from the TPWD coastal fisheries data, needs to be considered. A separate analysis of the Montagna benthic data relative to inflows is proposed in the 2006 SOW. Following your suggestion, we will investigate integrating these benthic data into the full biostatistical effort.]

5. The Bay Health presentations highlighted the need to coordinate locations of transects to ensure that objectives of both projects are completed most efficiently. While salinity (again) conditions seem to be a major focus of the modeling, another major effect of inflow alterations may be inundation regimes (i.e. water levels). Marsh inundation changes also need to be evaluated in the modeling studies, and the transects will need to be carefully designed and monitored to detect these inundation changes.

[We agree that inundation regimes (frequency and depth) under various flow and tidal conditions are key components of the marsh modeling efforts. This along with obtaining salinity gradient information within these marshes were the driving factors in recently implementing the three additional field collection efforts focused on the marshes. We agree that transects to be established in the future for long-term monitoring will also need to consider the importance of inundation regime along with many other relevant factors.]

6. The wetlands and delineation along transects needs some very careful experimental design work. Right now it would be difficult to assess and is not statistically sound. There needs to be replication of transects. The transects should also mesh with the modeling sites.

[The primary focus of the transects included in the marsh evaluation was to assist in the ground-truthing effort of the aerial photography interpretation. Second, it allowed a first cut at identifying potential long-term monitoring transects. In the final design, we envision fewer, more specific areas, with an increased number of transects in a given area to allow more rigorous statistical analysis. Finally, we will focus on transect locations which exhibit the greatest likelihood of measuring potential project effects.]

7. The habitat characterization of the bay appears to focus on the physical/chemical (e.g., salinity) rather than biological (e.g., seagrasses) components. These habitats seem to be “forgotten” and are critical habitat for variety of marine life and need to be address directly. This should include data on nekton use of created vs. natural wetlands (esp. in light of mitigation work), and oyster reefs as habitat as well as a biogenic component. Finally, temporal/seasonal and spatial components need to be considered. For example “not all habitats are equal” and use depend on location and season.

[We agree that the biological components of the estuary are very important. The format of the SRP presentation (with the habitat presentation directly following the salinity modeling) may have unintentionally given the impression that the habitat analysis is focusing only on the physical/chemical components. The biological factors will play an integral role in the analysis. In fact, a ground truthing effort for oyster reefs and seagrassess in the eastern arm of West Matagorda Bay and East Matagorda Bay is being conducted at this time in coordination with the Texas Parks and Wildlife department (TPWD). The inclusion of marsh habitat (marsh edge, inner marsh), seagrasses, oyster reefs, shallow non-vegetated bottom, etc. are included in the analysis, as well as benthic communities. Finally, the temporal/seasonal component is being taken into consideration by focusing not only on when organisms are in the bay/various habitats but also by evaluating pulses of freshwater prior to the arrival of said organisms to the bay. On the spatial scale, the team is evaluating the use of habitat relative to location of fish passes, distance to open water, etc. as means of addressing spatial conditions.]

8. While the biostats of TPWD were impressive, they need to be refined to include Habitat, Spatial Locals, and Temporal/Seasonal variation.

[The current SOW already includes work on the spatial refinement and temporal/seasonal variation within the limits of the TPWD database. We are planning to look at segments of the bay on the order of the east arm, and on the order of Lavaca Bay. This will probably represent the lower limit of statistical resolution. Habitat is more problematic because the only variables we can depict statistically are those measured by TPWD. Thus we can address salinity, dissolved oxygen (DO) (sometimes), and the abundances of larger organisms. We do not have information on relation of, e.g., sampling location to seagrasses, marsh edge (and vegetation), bottom type, so these aspects of habitat cannot be included.]

9. The hydrodynamic modelers need to correlate their results to real-time data that is routinely collected in Matagorda Bay and readily available (e.g, TCOON network). They should be able to set up tide gauges at their modeling locals to reflect TCOON monitoring stations, and then collect real-time data to validate their model without have to leave the office.

[Long-term model validation is included in the MBHE 2006 SOW, using all available data sources, including the sonde data. It should be noted that Matagorda Bay has only two TCOON stations located at opposite ends of the estuary, and that neither of them include salinity monitoring. We will continue however to rely heavily on TCOON data for tide elevation records.]

Water Quality/Surface Water

1. LSWP effects during low flow conditions. The weakest component of the project at this date is the assessment of the river and bay environments under low or extremely low flow conditions. The clumsy presentation of the diel dissolved oxygen study and the lack of water sample calibration standards was the most disappointing discussion during the workshop. However, there were additional aspects that made this a potential "killer" issue. At this time it is apparent that not enough thinking or work has been directed at the issue of low flow conditions. The DO conditions and habitat analysis should be measured in the field during flows of 150 to 200 cfs. If those flow conditions do not occur, then measurements should be taken at the lowest possible flow that can be found. Modeling may be the only way to assess the extremely low flows but that would be an acceptable backup plan. Finally, the surface water availability team needs to work more closely with the water quality and aquatic habitat teams to produce a more integrated analysis.

[The past 16 months of work have primarily focused on trying to understand the potential impact of a summer low flow condition on the river as a result of the LSWP implementation. Unfortunately this is a very difficult endeavor for several reasons. Such low-flow conditions do not currently exist in the river. Two field studies (one in November 2004 and one in late October 2005) were implemented in order to obtained DO measurements during relatively low flow and warm temperatures. At times, the lower Colorado River experiences flows of less than 200 cfs at Bastrop, but this only occurs in the winter, when DO is not an issue because of low temperatures. Given the floods that occurred in late 2004, we were very fortunate to have sampled during the only window in 2004 that met our sampling criteria. Indeed, the SRP appeared to agree in their comments of March 21, 2005 "The study team did appear to capture in November a reasonable period for the low flow survey given the difficulties of capturing such in the present system." With the exception of the three days following the 2004 sampling event, during which a cold front was sweeping through central Texas, the 2004 event was truly "the lowest possible flow that can be found" in the latter half of 2004. Our most recent low flow sampling program that was implemented October 26 – 28, 2005 has captured the lowest flows on record for the last 16 months, with daily flows at Bastrop of approximately 530, 480, and 550 cfs, respectively. Time will tell if our 2005 event occurred during the lowest possible flow in 2005, but with certainty we can predict that the water temperatures will continue to drop as the year progresses to its end.

Current and future work with the modeling effort is also focused on low flow, including a sensitivity and uncertainty analysis that will be completed this year (and updated next year) that focuses on the low flow condition (as well as a storm flow and seasonal-type flow condition for other aspects of the project). For this sensitivity and uncertainty analysis, the Water Quality Team has been working closely with the Surface Water Availability Team in order to combine their flow

results with our river model. In this way, our analysis of the projected low flow condition on the river is fully integrated with the Surface Water Availability Team's simulated results.]

2. The water quality was the most disappointing of the talks. Taking water parameters (DO) is standard operating procedure for just about any work, and actually quite simple and not as difficult as they made it appear. In addition, the inconsistency with Winkler measurements is somewhat troubling. The design was poor, and there needs to be stations (at least a few) on the lower end of the watershed. It gave the appearance of trying to minimize the amount of work that was done, and what was done did not work. This area needs some work and the groups focusing on it should pay close attention.

[The Water Quality Team is disappointed that the very real problems encountered with some of the dissolved oxygen equipment and data have left the SRP with a negative impression. While we recognize that it is common to measure dissolved oxygen (indeed the team and LCRA have made thousands of successful DO measurements), the fact remains that we unfortunately had a faulty sonde in the November 2004 study and at least one dilute chemical in the summer 2005 diel DO study. We have given a lot of thought to adding appropriate redundancy to our upcoming studies without adding excessive cost and trust that the SRP will recognize this in the October 2005 low flow study.

In spite of these problems a significant amount of valuable data was obtained which will help us develop a sound water quality model of the lower river. As presented in a forthcoming memo, the diel DO survey resulted in the equivalent of 41 days of diel DO data for use in understanding the DO minima issue in the river. Note that this level of DO analysis is very unusual in support of permitting efforts in Texas, even in instances where the permitting action is directly related to water quality (such as TPDES permitting of discharges) rather than in this case indirectly related to water quality (amendment of existing and proposed water rights).

There are three lines of evidence to support the usefulness of the sonde data for the diel DO study purposes: (1) for several of the sampling dates, two sondes were placed side by side, thereby providing redundancy, (2) visually, most of the sonde data appear to be reasonable, and (3) the magnitudes of DO measured by the sondes are less important for our purposes than the diel DO ranges. There is no reason to believe that the diel DO ranges as measured by the sondes are inaccurate. Also preliminary results from this years' low flow validation study indicate that the DO data quality is good and will be usable to update the model calibration.

The apparently low Winkler results obtained during the diel DO sampling have

now been attributed to the chemicals used for fixing the sample. Changes to the Standard Operating Procedure (SOP) for the Low Flow Validation Study implemented in late October corrected this problem and good correspondence between sonde readings and Winklers have been observed during that subsequent study.

Finally, with respect to the design of the diel DO survey, the SRP reviewed our work plan, saying that we "…chose stations of scientific interest with respect to project goals, and these stations were chosen because they are areas where diel DO variations are likely to occur from photosynthetic activity upstream of the station." The SRP went on to state that the plan, overall "…is a solid work plan with good quality control, replication, scope and addresses a critical component of the LSWP." We believed, and continue to believe, that placing sondes at the lower end of the river would have taxed our resources and provided little information that would be helpful to the project. This is because increases in turbidity and decreases in available nutrients in the downstream direction limits primary productivity, suggesting that diel ranges will be most pronounced in the upstream portion of the study domain. Also the shifting nature of the substrate in those reaches limits the growth of macrophytes.

In sum, we implemented the plan as reviewed by the SRP. We took the risk to re-deploy sondes into the river after the theft of 4 of the sondes because we felt the importance of obtaining these data outweighed the risk. As mentioned earlier, although the Winkler results were low due to the fixing chemicals, the sonde data we did retrieve from the river was sound and will prove useful. The results from the diel DO study will be discussed in a memo that will be released to the SRP in the coming weeks.]

3. There was concern about the confusion caused by the presentation about water rights and availability. The project team covered an incredible amount of important information, but the SRP confused rights vs availability issues. If this kind (lengthy) of presentation is given to stakeholders they may get confused as well, and perhaps develop negative attitudes about the project.

[We concur that the information on the topic of water rights and surface water availability is complex and challenging. It is also challenging for the study team members. We are working on refining the presentation materials to make them clearer while still providing adequate detail to understand the modeling and assumptions.]

4. The Flow-Velocity power curve could be used to evaluate the feasible river travel times between public access points for canoes/kayaks at alternative flow regimes. It may be that at some low flows, currently boatable stretches may no longer be boatable in a typical day.

[This type of information will be considered in the study's river recreation analysis.]

Agricultural Conservation

1. The project assumes that rice farmers will plant new varieties of high-yield rice that use less water. In addition, the "new" varieties will take five months to reach harvest stage and we were also told that rice farmers will receive water for only one crop per season. If we assume that rice is planted in late February – early March, then harvest will occur in late July to late August. The timing of this system will put waste rice "on the ground" 2-3 months before the first goose species arrive in Texas (white-fronted geese). Later arriving geese, snow geese, Ross' geese, and Canadian geese will arrive in the rice prairie region well after rice grains have been eaten or deteriorated in muddy fields.

[This is a plausible potential consequence of this water conserving activity. To clarify one point, the rice variety would use slightly more water, but would avoid the second crop, thereby saving a considerable amount of water over two-crop rice. The effects of the new rice variety, including effects on migratory birds, are being considered in components of the study such as the Social and Economic Benefits and Costs Study.]

2. The rice-prairie region of the Lower Colorado River Basin and the harvest of geese by hunters is an important recreational and economic engine for the area. Indeed, Eagle Lake, Texas is the self-identified "Goose Hunting Capital of the U.S." The current two crop rice-growing system results in rice harvest at approximately the same time as the arrival of geese, and beginning of waterfowl hunting season. Many communities and land owners in the rice-prairie region receive significant revenues from hunting and the associated recreational support services. How will communities respond to potential changes in life styles and revenues? Radical changes in the ways that a community is organized without significant "advance" work could be detrimental to the project's acceptance.

[The public information and stakeholder involvement aspects of the study are continuing a dialogue on these issues with area residents. Also the Social and Economic Benefits and Costs Study has components that help analyze this issue.]

3. It is thought that the San Bernard River, which is out of the basin, is heavily dependent on irrigation return flows from the Colorado. If so, what will the impact of reduced use of irrigation water through conservation be on this neighboring river?

[The study will help estimate the potential change in irrigation return flows to the San Bernard River , as well as other basins. As these return flows originate from

the Colorado River, an analysis of the San Benard River itself is not envisioned as part of the study.]

Aquatic Habitat

1. The work on aquatic habitat was interesting and good, but there is a lot more to aquatic habitat than blue sucker biology. One can understand the "model species" concept, but there are other things to focus on (e.g., fish community analysis, etc.).

[We concur, and the study envisions this broader analysis. The timeframe allotted for the presentation and discussion at the SRP Workshop allowed only the highlights during the aquatic habitat discussion. Since the data collection associated with the modeling effort and fisheries guild analysis is still being collected and/or processed, we opted to focus on the blue sucker highlights. However the blue sucker is only one component of the study. The team is also collecting additional fisheries guild information to combine with the Mosier and Ray data to develop fish guilds for the lower Colorado River based on substrate, depth, and velocity preferences. Therefore, we will have the fish guild (more holistic) approach along with the specific indicator (blue sucker life stages) approach available for the habitat modeling activities.]

2. The instream macrophytic vegetation of the river certainly comprises a highly visible component of aquatic habitat, and it also has direct implications for water quality. There does not seem to be sufficient emphasis on evaluating effects of alterations in flow regime (especially low flows) on these plant communities. Will low flows and continued future levels of nutrient inputs create eutrophic conditions due to these plants that in turn must be managed?

[As part of the substrate characterization being conducted at each of the ten intensive sites we are also mapping aquatic macrophytes and woody debris. However, the abundance of aquatic macrophytes is very minimal in the lower Colorado River between Austin and Utley and even less in the remaining 200+ miles of river. We agree that aquatic macrophytes have direct implications on water quality and under low-flow conditions with high nutrient loads may pose dissolved oxygen concerns. The Water Quality Team is helping assess dissolved oxygen in their modeling.]