

**Consolidated Scope of Work Items for TWDB Planning Grant Funding
for the
2011 Brazos G Regional Water Plan
July 23, 2006**

(based on results and conversations from the July 12, 2006 SOW Committee meeting)

Note: All study budgets are gut-level estimates at best and should be considered accordingly. The Brazos G consultants have not put together detailed scopes or budget estimates for any of these potential work items.

1. Largely BRA-funded Initiatives

Note: These are ongoing BRA-funded studies. Modest TWDB funding will be needed to coordinate and incorporate the results into the Plan. Potentially, these two items can be pursued in the next 2-year funding cycle after the studies are further along.

Scope: Several Water User Groups (WUGs) are projected in the 2006 Plan to use BRA supplies that might only be available from interruptible supplies for which the BRA has applied for water rights. These would be firmed up with local or regional groundwater supplies, or proximate existing surface water sources. The WUGs will be identified and proximate sources to be used to firm up the BRA supply will be identified and quantified. The BRA is also conducting a study with the U.S. Army Corps of Engineers to determine if it is feasible to reallocate a portion of the flood control storage in certain Federal reservoir to conservation purposes. Costs estimated by BRA will be adjusted to conform to regional planning costing assumptions.

Approximate Budget Range: \$5,000 - \$10,000

Funding Criteria Met:

2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Refine BRA Sys Ops interruptible water uses
- Reallocation of flood storage in Federal reservoirs to water supply

2. Re-evaluate water management strategies for Sweetwater

Scope: Use updated Edwards-Trinity GAM to evaluate supplies from the Champion Well Field, which is a recommended water management strategy for Sweetwater. If potential supplies from the well field are shown to be less than assumed in 2006, re-evaluate water management strategies for Sweetwater. Alternative strategies include 1. supply from City of Abilene, 2. other groundwater, 3. smaller configuration or off-channel alternative to Double Mountain Fork Reservoir, 4. scalping operation into Lake Sweetwater.

Approximate Budget Range: \$35,000 - \$80,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Updated evaluation of Champion Well Field and other Edwards-Trinity supplies to Sweetwater (Sweetwater WMS) using updated Edwards-Trinity GAM. Re-evaluate water management strategies for City of Sweetwater, if necessary
- Re-evaluate smaller or off-channel alternative for Double Mountain Fork Reservoir as potential supply to Sweetwater and others in the area

3. Refine and expand conjunctive use projects

Scope: Refine the formulation of the Lake Granger conjunctive use project to match the potential project sponsor's preferred configuration. Identify and evaluate other conjunctive use opportunities to increase supplies. Evaluate the use of Alcoa's End Lakes, Lake Alcoa, and Somerville Reservoir with Simsboro groundwater as examples of innovative strategies that utilize existing resources. Evaluate the potential for conjunctive use of groundwater to augment supplies in Lake Sweetwater.

Approximate Budget Range: \$35,000 - \$80,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Reformulate Granger conjunctive use project to match BRA's alternative to not commingle GW with SW in Granger
- Conjunctive use of GW & SW to increase supplies, for example Alcoa's GW and Lake Alcoa, Granger, Somerville, Alcoa End Lakes, or other large holders of land overlying groundwater resources
- Use of Alcoa End Lakes as a WMS to serve someone

4. Streamlined processes for indirect reuse

Scope: Introduction of reuse water into water supply reservoirs to increase yields may result in some undesirable effects on water quality, including the introduction of endocrine disruptors from pharmaceuticals, and increases in total dissolved solids (TDS), nutrients, and others. Evaluate recent literature on the subject, and perform an analysis (mass balance and fate/transport) using water samples obtained from potential reuse sources, such as the Clear Fork Scalping project into Hubbard Creek Reservoir. Describe barriers to implementation of reuse as a water supply and study/propose improvements to the process required for implementing reuse projects.

Approximate Budget Range: \$35,000 - \$120,000

Funding Criteria Met:

2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Evaluate water quality aspects of Clear Fork Scalping into Hubbard
 - a. endocrine disruptors (do baseline analysis on Clear Fork and in Hubbard)
 - b. chlorides in Hubbard from the Clear Fork
- Water quality effects of indirect reuse through reservoirs (ex. Hubbard Creek Reservoir)
- Study/propose streamlined process for implementing reuse projects

5. Updated evaluation of sources and control of chloride pollution

Scope: Identify and quantify current sources of elevated chlorides in the Brazos River, and identify future sources such as increased brine disposal from RO treatment. Prepare a basin-wide salinity mass balance using recently-implemented features in WRAP to model salinity under the Brazos G assumptions and implementation of the recommended water plan. Include the effects of secondary recovery by oilfields, such as is occurring in Hubbard Creek, Possum Kingdom, and Granbury Reservoirs. Use the analysis to identify the effects of salinity on water supplies for municipal, irrigation, and some industrial uses. Perform further evaluations of upper basin chloride control projects to improve water quality, including the U.S. Bureau of Reclamation's Garza County project. Consider the impacts on endangered/threatened species dependant on saline surface water. Also perform feasibility-level study of measures to control seepage into reservoirs from secondary recovery operations.

Approximate Budget Range: \$125,000 - \$150,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Chloride control projects to improve WQ and increase supply
 - a. Upper basin chloride control projects – incorporate BUREC Garza County project
 - b. Endangered/threatened species issues
- Brine disposal from RO treatment facilities
- Study potential solution to Hubbard chloride pollution from salt water seeps from GW (oil field secondary recovery operations) [combine with 6 and 30 into a more comprehensive chlorides analysis?]
- Analyze risks of secondary recovery by oilfields on reservoir water quality; leaking of brine into reservoirs (ex. Hubbard, PK, Granbury)
- Look at effects of surface water salinity on water supplies, and effects of 2006 Plan on salinity (TDS, chlorides, sulfates)
 - a. Brazos G WAM salinity balance using new salinity features recently developed by TAMU
 - b. Endangered/threatened species issues (Sharp-nosed Shiner, others?)

6. Effectiveness of conservation measures recommended in 2006 Plan (do in second 2 years)

Note: Many water utilities are unlikely to have implemented the advanced conservation strategies recommended in the 2006 Plan during the first 2-year funding cycle. Accordingly, it may be best to delay this study until the second 2-year funding cycle in order to obtain better participation rates and potentially some data concerning the effectiveness of those measures adopted.

Scope: Study implementation rates of conservation measures recommended as water management strategies in the 2006 Plan. Evaluate effectiveness of conservation when measures recommended in the plan are implemented.

Approximate Budget Range: \$20,000 - \$30,000

Funding Criteria Met:

2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;
6. Reevaluation of population and demand projections only under the presence of changed conditions;

Items identified during July 12 Scope of Work Committee meeting:

- Study effectiveness of water conservation strategies for specific utilities or study actual implementation rates

7. Effects of reservoir sedimentation strategies for control

Scope: Incorporate recent sedimentation surveys and studies to determine the effects of reservoir sedimentation on water supplies. Identify and evaluate sediment control projects to prolong reservoir yields, including watershed management, reservoir sedimentation ponds, dredging, and storage restoration using off-channel projects.

Approximate Budget Range: \$60,000 - \$120,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Revisit sedimentation effects on reservoir yields (much of the Aquilla shortfall is due to sedimentation, which is likely overstated). Incorporate recent sedimentation surveys into sedimentation and reservoir yield projections. Utilize recent NRCS study if possible.)
- Evaluate sediment control projects to prolong reservoir yields.

8. Augment water supplies in tributary areas

Scope: Evaluate several options for transporting water from the main stem of the Brazos River to tributary areas where supplies are limited, particularly the areas near Lake Aquilla, Lake Limestone and Lake Proctor.

Approximate Budget Range: \$30,000 - \$40,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Evaluate water transportation options moving supply from main stem to tributary areas
 - a. Lake Aquilla area
 - b. Lake Limestone area
 - c. Lake Proctor area (WCB pipeline from Possum Kingdom)
 - Revisit solutions for Lake Proctor area

9. Instream flows evaluation

Scope: Using instream flow recommendations from the ongoing studies by the TPWD, estimate instream flow targets at critical locations in the basin and study how those could be met using either existing supplies or recommended water management strategies. Determine how consideration of instream flows might influence available supplies. Determine how frequently those instream flow recommendations might be met under varying assumptions concerning use of existing or future supplies to partially supplement instream flows.

Approximate Budget Range: \$30,000 - \$60,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
7. Interregional coordination; (note: Region H is downstream)

Items identified during July 12 Scope of Work Committee meeting:

- Study how environmental flow needs could be met (quantities/needs established by TPWD study)
- Coordinate/comment on EFAC recommendations to Legislature

10. Refine water management strategies for Johnson and McLennan County areas

Scope: The Johnson County area is experiencing rapid growth from the north, and has large projected water needs. Update water management strategies for Johnson County. Due to recent studies and new water supply arrangements for Johnson County users, several of the water supply plans in the 2006 Brazos G Regional Water Plan may need significant revision during the next planning cycle. Updates to the plan may include:

- Johnson County Special Utility District – JCSUD is in the process of completing their Trinity River Basin Water Supply Study, which includes evaluating treated and raw water supplies from the Trinity River Basin to meet a part of its future water supply needs. The results of the study will need to be incorporated in the water supply plan for Johnson County Special Utility District.
- City of Joshua and Johnson County FWSD No.1 – In late 2005, the City of Joshua provided a letter of consent to proceed with merging Johnson County FWSD No. 1 with Johnson County Special Utility District. After receiving unanimous public support for the merger, an application was filed with approval anticipated by end of 2006. Changes in wholesale water provider (and water supply) based on merger will need to be considered during the next planning cycle.
- The City of Arlington is conducting a wholesale water rate study to include evaluating water supply arrangements with Johnson County water users.
- The Brazos River Authority and Tarrant Regional Water District conducted a "Regional Water Supply and Wastewater Service Study for Johnson and Parker Counties" in April 2004 and identified several water delivery scenarios that could provide water supplies to Johnson and Parker County water users. Contingent on interest by Johnson County water users identified in the study, possible work items could include continuation of study leading to project implementation.
- Additional water provider/supply revisions identified by Regional Water Planning Group during planning process.

In McLennan County, the City of Waco has been identified as the primary regional provider. However, Waco supplies are limited and would be virtually fully utilized by Year 2060. Explore additional water management strategies for the City, and identify water management strategies for specific water user groups that will serve as alternatives to the City of Waco.

Approximate Budget Range: \$60,000 - \$80,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;

Items identified during July 12 Scope of Work Committee meeting:

- Refine solutions for Johnson/Parker County area; coordinate with Region C
- Refine McLennan County water management strategies – develop/confirm consensus

11. Evaluate municipal water demands, supplies and strategies due to accelerated growth

Scope: Certain counties are experiencing growth rates significantly greater than projected from the 1990 and 2000 Census. Evaluate revised population growth rates, focusing on years 2010, 2020 and 2030, to determine if the implementation of recommended water management strategies needs to be accelerated, and if additional strategies are needed. Revise population projections for counties along the SH130 and Trans-Texas transportation corridors, as implementation of those two projects will foster increased economic and population growth in those areas. Coordinate with Regions K and L concerning appropriate assessments of the effects of SH130 and the Trans-Texas corridors. Develop alternative demand projections for water user groups in urban areas that have relatively flat population projections, to ensure that additional supply is available to serve desired economic growth, both from desired population growth as well as new industry.

Approximate Budget Range: \$60,000 - \$80,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
6. Reevaluation of population and demand projections only under the presence of changed conditions;
7. Interregional coordination;

Items identified during July 12 Scope of Work Committee meeting:

- Evaluate population trends in those counties/WUGs that feel they are experiencing higher than projected growth rates
 - a. Alternative water demand/population projections to ensure supplies to foster economic growth
- Revisit population and water demands along SH130 corridor; interregional coordination with Regions K and L
- Trans-Texas corridor effects on population and water demand; interregional coordination
- Revisit solutions to Hill County needs
- Refine Williamson County water supply plans, re. Hutto/Taylor supplies, specific WUG plans

12. Revise water demands and supplies for institutional water user groups.

Scope: Identify TAMU and other large institutions that have independent water supplies as specific water user groups instead of incorporating them into nearby municipal WUGs. Revise water demands and supplies accordingly. Develop a methodology for projecting water demands for Fort Hood and other institutional WUGs so that they are not solely based upon population.

Approximate Budget Range: \$8,000 - \$12,000

Funding Criteria Met:

3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
6. Reevaluation of population and demand projections only under the presence of changed conditions;

Items identified during July 12 Scope of Work Committee meeting:

- Break out TAMU from College Station as separate WUG with separate plan
- Refine Fort Hood water demands using methodology that is not completely population-based

13. Changed water needs for mining and steam-electric uses

Scope:

- Increased crude oil prices have fostered accelerated development of oil and natural gas supplies in the Barnett Shale. Development of those reserves requires significantly more water than was projected to be used for mining purposes in the 2006 Plan. Update mining water demands and strategies for those counties overlying the Barnett Shale, following projected development patterns.
- Steam electric generation is one of the largest users of water in Brazos G. Increased natural gas prices have prompted many steam electric generating utilities to begin planning coal-fired facilities to meet future electric power demands, which will alter the pattern and quantity of water needed to meet future steam electric needs. Coordinate with the SE industry to identify future development patterns so that SE demands in Brazos G counties can be projected and planned for accurately.

Approximate Budget Range: \$20,000 - \$30,000

Funding Criteria Met:

3. Refinement of water supply information or water management strategies;
6. Reevaluation of population and demand projections only under the presence of changed conditions;

Items identified during July 12 Scope of Work Committee meeting:

- Johnson County (actually Upper Trinity Aquifer) oil and gas production needs - follow Barnett Shale from Johnson County to the south
- Revisit steam-electric demands based on recent plans by steam-electric generating companies. Look at recent trends. Look at efficiency of water use.

14. Develop strategies to assist small water systems in meeting new SDWA requirements.

Scope: Identify areas where regionalization of small systems will allow multiple small utilities to share resources and reduce individual treatment costs. Identify areas where larger WUGs might become or participate as regional suppliers.

Approximate Budget Range: \$30,000 - \$50,000

Funding Criteria Met:

1. Evaluation of new water management strategies in response to changed conditions;
2. Studies that will further implementation of recommended water management strategies;
3. Refinement of water supply information or water management strategies;
5. Further evaluation of water management strategies, especially regional solutions, to meet needs in small communities or rural areas;
7. Interregional coordination;

Items identified during July 12 Scope of Work Committee meeting:

- Impacts of SDWA requirements on small water systems; analyze possibilities for regionalization; education and dissemination to decision makers (boards and city councils)

15. Participate in HB1763 process to assist GMA's in establishing desired future conditions

Scope: The GMA process required under HB1763 could significantly impact available groundwater supplies in Brazos G. For the 2011 Plan, groundwater availability estimates will be set by the GMAs and are to be used by the regional water planning groups. The regional water planning groups, in particular Brazos G, have spent considerable time and effort in developing reasonable groundwater availability estimates and should be involved in the GMA process in order to advise the GMAs on previous technical analyses developed by the regional plans and the likely outcomes and ramifications resulting from decisions considered by the GMAs.

Approximate Budget Range: \$15,000 - \$30,000, higher if technical analyses provided

Funding Criteria Met:

3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;
7. Interregional coordination;

Items identified during July 12 Scope of Work Committee meeting:

- Follow HB1763 process for desired future conditions in assessment of available groundwater supply for planning purposes
- Coordinate with GW Management Areas and revise GW availability estimates as necessary

16. Impact of drought on reservoir water supplies in the upper Brazos G area

Scope: The ongoing drought has reduced supplies from reservoirs in the upper Brazos G area significantly. An updated drought of record analysis was completed for the 2006 Plan, but only utilized data available through June 2004. Continuation of the drought since 2004 has likely reduced supplies further. For example, the available supply from O.H. Ivey Reservoir has been reduced by 28% of its originally estimated yield, but the Brazos G Plan only recognized a 15% reduction. This work item will update WAM flows for the upper basin through June 2008 to evaluate if supplies have been further modified since adoption of the 2006 Plan. In addition, multiple reservoirs in the upper Brazos G area are experiencing extremely low levels, which could affect water quality from the remaining supply. Correlations between water quality constituents and reservoir level will be developed for up to three selected reservoirs in the western portion of the region with sufficient available data, in order to determine if degradation in water quality occurs at lower lake levels. The implications of any degradation of water quality during drought with regard to the usability of the water supply from the reservoirs will be discussed and applied to other reservoirs in the region.

Approximate Budget Range: \$60,000 - \$80,000

Funding Criteria Met:

3. Refinement of water supply information or water management strategies;
4. Activities that will help overcome problems from the last round of planning;

Items identified during July 12 Scope of Work Committee meeting:

- Impacts of drought on water quality in reservoirs (at least upper basin, maybe include entire region)
- Re-evaluate water supplies to Abilene in light of recent reduction in O.H. Ivey yield

17. Impacts of stock tanks and small ponds on reservoir yields

Scope: A trend has been identified where historically large, undivided tracts of rangeland are being subdivided into smaller tracts or ranchettes, with multiple owners. These new owners are allowed to construct stock tanks and small ponds up to 200 acre-feet in capacity without acquiring water rights from the State. These tanks and ponds impound runoff from watersheds that would ordinarily fill downstream reservoirs. Reduced runoff from a reservoir watershed will decrease reservoir yields and dependable supplies. While any single tank or pond is unlikely to have a noticeable effect on runoff from a reservoir's watershed, the cumulative effect of multiple ponds could be large. For a moderately-sized watershed above a major reservoir, use historical mapping, historical aerial photography, and satellite imagery to identify changes in the numbers of tanks and ponds over time. Estimate cumulative surface acreages and cumulative storage volumes (if reasonable to do so), and evaluate the effects of these facilities on watershed runoff and downstream reservoir yields.

Approximate Budget Range: \$25,000 - \$50,000

Funding Criteria Met:

3. Refinement of water supply information or water management strategies;

Items identified during July 12 Scope of Work Committee meeting:

- Impacts of stock tanks and small ponds on reservoir yields